AD-A134 834 AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES VO..(U) NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY WASHINGTON DC C W STOKES ET AL. 1/5

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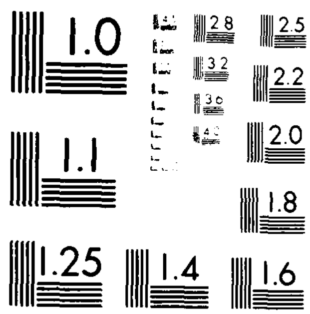

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(12)

AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES)

IN-SERVICE USAGE DATA ANALYSES

(VOL II)

PAPERS

PRESENTED AT THE 21st ANNUAL SAFE SYMPOSIUM

SAN ANTONIO, TEXAS

5, 6, 7, 8 NOVEMBER 1983

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READ INSTRUCTIONS BEFORE COMPLETING FORM

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7. AUTHOR(s) CHARLES W. STOKES III, G. RONALD HERD (APPLIED SCIENCES GROUP, INC.) FREDERICK G. GUILL (NAVAL AIR SYSTEMS COMMAND), LCDR. JAMES F. PALMER, MSC, (PACIFIC MISSILE TEST CENTER, PT. MUGU)		8. CONTRACT OR GRANT NUMBER(s)
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18. SUPPLEMENTARY NOTES

CONTAINS SEVERAL PAPERS PRESENTED AT THE 21ST ANNUAL SAFE SYMPOSIUM

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

EJECTION SEATS, AIRCREW AUTOMATED ESCAPE SYSTEMS, DATA ANALYSIS, RELIABILITY, SYSTEM SAFETY, QUALITY ASSURANCE, VULNERABILITY, TEST PLANNING, WINDBLAST, FLAIL, NECK INJURIES, ANTHROPOMETRY, MAINTENANCE, AIRCREW LIFE SUPPORT SYSTEMS, EJECTION INJURIES, FLIGHT SURGEON'S REPORT

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

COMPILATION OF PAPERS CONCERNING EJECTION SEAT TYPE AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE AND EXPERIENCE. SUBJECTS INCLUDE PROBLEMS IN USING SUCCESS RATES TO QUANTIFY ESCAPE SYSTEM RELIABILITY; THE EFFECTS OF FAMILY TIES AMONG EJECTION SEATS; A CRITIQUE OF U.S. NAVY EJECTION SEAT DESIGN; TEST AND R&M SPECIFICATIONS, DISCUSSIONS OF PLANS FOR CONTINUING TO ANALYZE ESCAPE SYSTEM USAGE DATA; IN-SERVICE SAFETY ASPECTS OF EJECTION SEAT TYPE ESCAPE SYSTEMS; QUALITY ASSURANCE PLANNING OF ESCAPE SYSTEMS TESTING AND TEST DATA ACQUISITION; ANALYSIS OF WINDBLAST, FLAIL AND TUMBLE; FACTORS INFLUENCING FREQUENCY AND SEVERITY OF NECK INJURIES SUSTAINED BY EJECTEES; MISHAP AIRCREW ANTHROPOMETRY ANALYSIS AND SCREENING TECHNIQUES, DISCUSSION OF MAINTENANCE INDUCED FATALITIES AND INJURIES; EXPERIENCE WITH SIDE-BY-SIDE UNSEQUENCED EJECTION

SEATS; PILOT STUDY TO ASCERTAIN MEANS FOR ENHANCING KNOWLEDGE CONCERNING USAGE OF LIFE SUPPORT SYSTEMS DURING EJECTIONS; INJURY AND EQUIPMENT DAMAGE PATTERNS: THE FLIGHT SURGEON'S REPORT (FSR) USEFULLNESS, AND PROPOSED FIELD INVESTIGATOR'S GUIDES FOR INVESTIGATING THE EMERGENCY USE OF ESCAPE AND LIFE SUPPORT SYSTEMS.

PREFACE

PREFACE

This collection of papers represents in part a report of the considerable progress made during the past year, in part a report of changes made from the prior published plans, and in part a report of plans for this next year for the effort to analyze U.S. Navy in-service usage data for ejection seat type aircrew automated escape systems (AAES) and for other aircrew life support systems (ALSS) equipments. This work is being performed by the Analytical Systems Division (ESA-31), Naval Weapons Engineering Support Activity under tasking assigned by the Crew Systems Division (AIR-531), Naval Air Systems Command.

These papers, however, could not have been prepared without the generous assistance provided by personnel of the Naval Safety Center, Norfolk, who created the necessary data tapes and provided guidance and counseling to the program team concerning the many nuances and pitfalls in the data. Especially helpful among the many have been Mr. Hardy Purefoy and Mrs. Betty Weinstein (Aviation Mishap Records Branch), Mrs. Sharone Thornton (Life Support Equipment Branch), and Capt. Trostle, Lcdr. Robert Bason, and Mrs. Jean Connery (Aeromedical Division). Major support also was provided by the Life Support Engineering Division, Aircraft and Crew Systems Technology Directorate, Naval Air Development Center, Warminster; the Aircrew Systems Branch, Naval Air Test Center, Patuxent River; and the Crew Systems Branch, Pacific Missile Test Center, Pt. Mugu.

One task, which early on became obvious as being extremely necessary, was to develop means for enhancing the quality of the average post-mishap investigation into and reportage of AAES/ALSS emergency usage and performance. To that end, the team has enlisted the services of Lcdr. James Palmer, Crew Systems Branch (1131), Pacific Missile Test Center, Pt. Mugu, to draft experimental "in-field investigative guides"; the full collection of those written to date being included in this volume.

Considerable assistance and guidance has been furnished to the team by Dr. Ronald Herd, now president of Applied Sciences Group, Incorporated, who, even if he has not simplified statistical analyses, has succeeded through great patience in explaining to the team the techniques, results, dangers, and the benefits of statistical analyses in a comprehendable manner. Dr. Herd's review, critique and advice concerning findings and, especially proposed findings and proposed analytical approaches, have been especially invaluable and the team is grateful for the resulting improvements in product quality. In addition, Dr. Herd has contributed one special analysis paper and one of the progress report papers presented in this volume.

As discussed in *U.S. Navy Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) In-service Usage Data Analyses Program: A Progress Report and Future Plans,* a major effort is currently underway at the Departmentof Energy's Oak Ridge National Laboratory with technical guidance being furnished by Mr. L. d'Aulerio of the Naval Air Development Center, Warminster, to develop escape system simulation models tailored to the characteristics of each AAES included in these data to permit enhanced analysis of each escape attempt and also of the collective series of escape attempts with the attendant identification and definition of problem areas as well as aspects that appear successful.

Acknowledgement also is due to the Graphics Section, Publications Department of ManTech International Corporation, responsible for creating the majority of the illustrations employed in the volume and for its on-time publication and delivery despite all of the problems caused by authors and the sponsor. Programming to develop the data used and presented in this volume was generated by Messrs. Robert Cox of the Institute of Modern Procedures and Tom Henke of Evaluation Research Corporation. These individuals must be commended for their willingness on often extremely short notice to rapidly develop new programs and program modifications to permit those analyzing the data to pursue and examine multitudinous interrelationships among the data.

The Naval Weapons Engineering Support Activity personnel contributing to these papers were Mr. Charles Geiberger (ESA-31C, team leader), Mr. Charles Stokes, Mrs. Myrtice Roberson, and Mr. John Vetter (ESA-31 Division Head). As has most unfortunately, despite the best of intentions of the team members to, for once, present the drafts early and to require fewer of them, this work, as so often is the case in human endeavors, has been delayed and subject to interminable changes, especially to satisfy the program sponsor. So once again without the multitudes of drafts quietly, quickly and efficiently readied on short notice by the Division Secretary, Miss Sandi Dorwart, much of this collection of papers would not be.

The Crew Systems Division Sponsor for this program is Mr. Frederick C. Guill (AIR-531C).

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AIRTASK/WORK UNIT ASSIGNMENT
NAVAIR FORM 3930/1 (REV 2-77)

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
WASHINGTON, D.C. 20361

See NAVAIR 3900.8 or supersedure for applicable details on completing this form.

CLASSIFICATION		
UNCLASSIFIED	OCT 29 1982	PAGE 1 OF 3

ADDRESSEE		AIRTASK NO.	AMEND NO
Director, Naval Weapons Engineering Support Activity Systems Analysis Dept. (ESA-31) Washington Navy Yard, Wash, DC 20374		A511-5111/184-4/3511-000-055	
		WORK UNIT NO. A531C-04	AMEND NO
		EFFORT LEVEL Normal	
NAVAIR PROJECT ENGINEER	CODE	CLASSIFICATION OF AT/WU	
Mr. Frederick C. Guill AV 222-7486	AIR-531C	UNCLASSIFIED	

1. The [redacted]/WORK UNIT ASSIGNMENT described below is assigned in accordance with the indicated effort level and schedule. Funding authorization [redacted] will be provided in separate correspondence. If this [redacted]/WORK UNIT ASSIGNMENT cannot be accomplished as assigned, advise the NAVAIR HQ cognizant code. No work beyond the planning phase will be accomplished unless the addressee has funds in hand or written assurance thereof.

2. Cancellation, References and/or Enclosures:

Work Unit Assignment A5312B-04 of 8 Oct 1981 with amendments, AIRTASK A511-511C/1844/2511-000-055 is cancelled.

Reference: (a) In-Service Engineering Aircraft Systems Support Report dtd 29 Sept 1982

Encl: (1) NAVAIR Consolidated Priority List - Aircraft Systems Fleet Support Projects dtd 29 Sep 1982

3. Technical Instructions:

a. TITLE. IDENTIFICATION AND REVIEW OF AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) AND AIRCREW LIFE SUPPORT SYSTEMS (ALSS) EQUIPMENTS IN-SERVICE RELIABILITY AND MAINTAINABILITY PROBLEMS

b. Purpose. To assign the responsibility to continue a systematic investigation of in-service AAES and ALSS data to identify problems for potential corrective action.

c. Background: (1) A multitude of pervasive, non-spectacular, low-grade AAES and ALSS in-service problems are continuously reported which lower AAES/ALSS reliability and maintainability and adversely affect aircrew and/or groundcrew safety and/or effectiveness. These problems left unmonitored and uncorrected occasionally manifest themselves in fatalities, serious injuries and/or very great difficulties to aircrews. Some problems, by degrading aircrew capability of operating/functioning effectively and efficiently can reduce total weapons system capability. Some manifest themselves in increased maintenance costs and/or increased hazards to maintenance personnel. (2) NAVAIR Headquarters established this effort in order to provide management with a valid basis for allocating resources based on predictions of need

SIGNATURE (By Direction of NAVAIR)	DATE
R E Malatino	10/29/82
CLASSIFICATION AND GROUP MARKING UNCLASSIFIED	

Previous issues of this form are obsolete.

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(3) Sponsor/convene symposia for disseminating the data, analyses and findings within the AAES and ALSS technical communities after NAVAIRHQ (AIR-531, AIR-00D and AIR-960) approval. Provide copies of released reports to AIR-531 and AIR-6103B.

(4) A semi-annual program review shall be held at NAVAIRHQ in February and August with NAVAIRHQ publishing a report of findings in March and September.

(5) Report to the Commander, Naval Air Systems Command (AIR-5111C & 531E) the man years and associated cost, cost of materials, travel and cost of contracts awarded for this project. This report shall be submitted 1 May 1983 and 1 November 1983 for final status.

b. Requirements for Future Planning Information.

In preparation for investigations to be undertaken during the forthcoming and ensuing fiscal years submit work unit plans prepa ed in accordance with the format and guidelines in NAVAIR INST 3900.8A by 15 ruary and 1 August of each year. A work unit plan is required for each isting or proposed WUA under the AIRTASK. The original of each work uni an shall be submitted to the originator of the WUA with a copy to AIR-5

6. Contractual Authority. Contracts to perform all or por of this WUA are hereby authorized within the funding indicated by the cost mate.

7. Source and Disposition of Equipment. N/A

8. Aircraft Requirements None.

9. Status of Applicable Funds. Funds will be provided separately.

10. Security Classification Requirements. All work under this WUA is unclassified. In performing the prescribed work, access to information which is classified and/or to areas containing classified equipment may be required. Any reference to such classified material shall be in accordance with the applicable materials security classification. Information concerning survivability/vulnerability shall be classified in accordance with OPNAVINST. C5513.2A, Encl. (63), and OPNAVINST. S5513.8, Encl. (7). Data employed in this project are sensitive in the context of the Privacy Act. Precautions shall be exercised to guard against unauthorized disclosures and disclosures inconsistent with the Privacy Act.

Copy to:
Addressee (3)
NAVMATDATASYSGRU, Morgantown, W. Va. 26505
NAVAIRDEVCEN (603) WARMINSTER
NAVAIRTESTCEN (SY-70) PAXRIV
NAVWPNCEN (64) CHINA LAKE
NAVORDSTA (51) INDIAN HEAD
NAVSAFECEN NORFOLK
AFISC/SEL NORTON AFB, CA
PACMISTESTCEN 1131
U.S. Dept. Energy Oak Ridge TENN

predicated upon a continuous analysis of the total AAES and ALSS in-service experience.

d. Detailed Requirements/Cost Estimates: (1) The primary effort shall be for establishment of baseline data to aid in subsequent identification of trends and specific problems. Subsequent tasks for extending previous analytical techniques and data sources investigating efforts to identify specific AAES and ALSS inservice reliability and maintainability problems shall be assigned by AIR-531. (2) Continue to refine a system for the continuous systematic review of AAES and ALSS in-service data in a manner designed to identify and assess the significance of the many commonly occurring in-service problems affecting AAES in-service reliability and maintainability, aircrew and/or groundcrew safety, and aircrew mission performance and/or effectiveness. Utilize 3-M Systems, Unsatisfactory Reports (URs), Medical Officer's Reports (MORs)/Flight Surgeon's Reports (FSRs), Aircraft Accident Reports (AARs)/ Mishap Investigation Reports (MIRs), Subsystem Capability Impact Reports (SCIR), and Naval Air Rework Facility data systems. (3) Systems outputs shall be structured to provide data of assistance to NAVAIRHQ in the management of the scarce AAES/ALSS resources. Identify types of problems experienced, frequency of occurrence,experience severity, potential severity, causal factors, range of activities and/or types of AAES/ALSS experiencing the problems, etc. Integrate outputs into existing reporting systems to assure regular, early notification of NAVAIRHQ concerning in-service problems being experienced. (4) Perform specific, specialized, nonroutine analytical tasks of high priority as assigned. (5) The cost estimate is $119.0K for FY-83. Obligate quarterly as follows: first quarter $58.0K, second quarter $21.0K, third quarter $20.0K, fourth quarter $20.0K. (P.E. 78012N (O&MN), Subhead 47BS, Engineering Services Program).

e. Detailed Program Plan. N/A

f. Field Activity Contact. Mr. John Vetter, NAVWESA (ESA-31), (202)433-3621.

g. Headquarters Technical Support. NAVAIRHQ (AIR-531C) will provide technical guidance and assistance concerning AAES and ALSS throughout the project.

4. Schedule. A program schedule of major milestones for each task is outlined in reference (a).

5. Reports and Documentation:

a. Reports:

(1) Upon completion of each task outlined in reference (a), present data and findings in letter-type reports to NAVAIRHQ (AIR-531) and (AIR-6103B).

(2) Provide NAVAIRHQ approved (AIR-531, AIR-00D and AIR-960) for release summaries of findings to AAES and ALSS meetings such as the annual FAILSAFE and ILS/AMP meetings, and other appropriate technical forums for assuring the maximum dissemination of the data, analyses and findings throughout the AAES and ALSS technical communities. Provide copies of released reports and papers to AIR-531 and AIR-6103B.

INTRODUCTORY NOTES

MISHAP INVESTIGATION/REPORTAGE

Two of the most critical problems facing the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-Service Usage Data Analysis project are (1) the completeness of the data for each mishap, the mishap crew and their condition, and the mishap crew ALSS and its retrieved condition, and (2) the accuracy of the data that is presented in the Flight Surgeon's Report (FSR) for each aviation mishap. Without complete and accurate data for compilation and analyses, the project would be unable to provide the AAES/ALSS problem identification and definition service to the Crew Systems Division as tasked. Without accurate identification and definition of the AAES/ALSS problems, especially with respect to frequency of occurrence and the seriousness of the problem consequences, the Crew Systems Division will remain in its present operating mode of having insufficient accurate, unbiased data and analyses with which to (1) set priorities for allocating its scarce AAES and ALSS resources, (2) ascertain whether a proposed course of action is likely to resolve a serious AAES or ALSS problem and therefore represent a worthy candidate for receiving resources, (3) overcome the present lack sufficient information (sometimes termed "blood on the water") with which to seek and justify in a presuasive manner, amongst a highly competitive host of perceived serious Naval aviation problems, the resources necessary for resolving problems occurring with current inventory AAES and ALSS, and (4) resolve lack of the sufficient information with which to formulate specification design, performance, design analyses, design evaluation, and design test requirements for eliminating currently occurring and similar problems from future AAES and ALSS designs.

Thus, as demonstrated in the first paper in this section <u>The Flight Surgeon's Report (FSR) From A Data User's Viewpoint</u>, which is reprinted from the previous compilation of papers, the proper investigation and reportage of the circumstances and events leading to, and of the mishap and their impact upon the aircrew and their AAES and ALSS, is critical. This in turn is dependent upon the procedures employed in retrieving and examining all of the AAES and ALSS equipments and associated materials. Thus the project has funded a very low-level effort to create potential on-site investigation guides for the retrieval and examination of each article of AAES and ALSS equipment involved in the mishap. Several of these are in their proposed "ready for evaluation" form and are included for general information.

THE FLIGHT SURGEON'S REPORT (FSR) FROM A DATA USER'S VIEWPOINT (reprinted)

Frederick C. Guill

ABASTRACT

Virtually the only source of information concerning how well or how poorly an aircrew automated escape system (AAES) or an article of aircrew life support system (ALSS) performs during attempted emergency usage is derived from mishap investigation reports (MIRs) and, in particular, from that portion prepared by the medical officer, the Flight Surgeon's Report (FSR). Many medical officers undoubtedly when preparing an FSR may question the value of the report or of specific segments of the report. Nonetheless, as discussed from one FSR data user's prespective, the properly prepared report is an extremely valuable tool, and often the only available means, for providing AAES/ALSS managers, performance and design requirements formulators, designers, and others insights into the problems and successes being experienced with the equipment. Such information can result in design improvements or other actions to correct problems and also ensure retention of equipment or design concepts enjoying success.

THE FLIGHT SURGEON'S REPORT (FSR) FROM A DATA USER'S VIEWPOINT

Frederick C. Guill

INTRODUCTION

A quick scan through the sixteen (16) blank forms (fourteen (14) of which have on their reverse instructions concerning how to complete the blanks) comprising the basis for preparing Flight Surgeon's Reports (FSRs) concerning aviation mishaps undoubtedly is sufficient to dismay many who either face the immediate task or may potentially face the task of preparing an FSR. The topics included in the FSR cover a broad range and, in most instances, with a requirement for considerable detail concerning each. Undoubtedly those viewing the form with the realization that someday the task of preparing the FSR may be theirs question the validity of the request for so great a quantity of information. They might even wonder if the FSR perhaps represents another example of "make work" which when completed eventually disappears in musty, dusty files or into a computer never to be meaningfully used. And, undoubtedly, they might wonder how and where, considering the wide range of the questions and the large and constantly changing Navy inventory of escape systems, flight garments and equipments, and survival garments and equipments, does one obtain the technical expert assistance required to assure the completed FSR's accuracy.

A user of the data obtained from FSR's, of course, has considerably different concerns. These include concern with respect to the accuracy and completeness of the data and how to obtain sufficient detail to permit proper interpretation of the report. The user also soon finds that he is extremely concerned regarding the tendancy, understandable though it may be, for FSR preparers to furnish what might be termed "classical" responses for many FSR blanks, particularly those requesting causal factor identification for injuries and for problems. The user also soon becomes perturbed concerning the system or equipment operation knowledge of the preparers which ranges from exceptionally good to poor. For the most part, users of FSR data are attempting to learn how well or how poorly systems and equipment worked when required; how well or how poorly people responded to situations and whether training, systems and/or equipments were appropriate and useful or inappropriate and harmful; and the role that environmental conditions and/or personal factors may have had in producing, ameliorating or exacerbating the situations. The data are reviewed and analyzed in hopes of enhancing the safety and effectiveness of the Navy's aviation community personnel, be they pilots, flight officers, enlisted aircrew, ground crew, and/or maintenance personnel.

The FSR, as was its predecessor, the MOR (Medical Officer's Report), is an attempt at balancing the legitimate concerns of those about whom the report is written, of those preparing the report and of those using the report or extracts and compilations of FSR data. In January 1981 the Naval Safety Center convened a meeting at its headquarters in Norfolk, Virginia, to review the FSR format and content requirements. Attending the meeting were fleet flight surgeons and aviation physiologists representing the preparing community (and to some extent the community of aviation personnel likely to be report subjects) and user community flight surgeons, aviation physiologists, data encoders, and engineers. The formal sessions were long with extensive discussion of the various viewpoints and concerns. The evening drafting sessions involving small groups also were quite long with considerable discussion. Users constantly and properly were required to justify their requests for information and, in many instances, eliminated requests or combined requests. A major effort was mounted to improve the FSR format to make the preparer's and reader's tasks easier.

Resolution of system and equipment in-service problems requires three separate but interrelated activities. Information has to be obtained concerning the conditions and results of the in-service usage of the system or equipment; that information has to be analyzed and interpreted, often through reference to previously collected similar data for that and/or similar systems or equipments, to define as thoroughly and accurately as feasible the problem, including probable causal factors and mechanisms; and, finally, the problem definitions and related information must be furnished to those organizations capable of, and responsible for, initiating corrective actions for the particular system or equipment.

The almost exclusive source of information concerning how well or how poorly aircrew automated escape systems (AAES) and associated aircrew life support system (ALSS) equipments perform under emergency conditions is the FSR prepared by the aeromedical community for specific categories of aviation mishaps. Occasionally that information is supplemented with information gleaned from the Mishap Investigation Report (MIR) (previously the Aircraft Accident Report (AAR)) or by laboratory investigations involving recovered articles and equipments. The information obtained from these sources has been for years, and continues to be, used to define the operational environments and emergency environments to which AAES and ALSS are subjected and under which they must function correctly and to define the problems being encountered with AAES and ALSS in daily and emergency usage. These definitions, in turn determine whether attempts will be made to develop in-service fixes or to replace AAES and ALSS performing less than satisfactorily. These definitions also are employed to define the design performance, test, and evaluation requirements of specifications employed in contracts for acquiring future AAES and ALSS inventories. These definitions and the underlying data also serve to guide the AAES and ALSS research aimed at providing new technology for enhancing the safety and effectiveness of the Navy aviation community's personnel.

Thus the AAES and ALSS research, development and acquisition community, both Navy and industry, wants and urgently needs accurate, complete FSR data concerning these equipments and the conditions of their usage and their successes, problems and failures to enable improvements to be made. These needs underlay the establishment of a formal system for acquiring and analyzing rigorously the FSR information (later to be supplemented with 3M and similar maintenance data) under Naval Air Systems Command tasking to the Naval Weapons Engineering Support Activity, Washington, D.C., with data and assistance furnished by the Naval Safety Center, Norfolk. This project is introduced in a separate paper entitled U.S. Navy Aircrew Automated Escape System (AAES) In-service Usage Data Analysis Program. The Work Unit establishing this project is furnished within the collection of papers and information provided conference attendees.

FSR INFORMATION NEEDED AND USED BY AAES AND ALSS COMMUNITY

When attempting to explain something as long and as detailed as the FSR forms, one faces two opposing dangers with respect to communicating with one's audience. Explaining in too great detail, covering all items, often results in an overly long explanation which will include many items which individual members of the audience might consider obvious and not requiring explanation. Yet, if one should pass over or incompletely explain items, someone in the audience might not understand that item and believe an explanation is necessary. In either case, there is risk of losing one's audience either through boredom or through an inability to jump the deliberate gaps.

This written explanation provides an item-by-item explanation of the FSR data requests which can fulfill the data needs of the AAES In-service Usage Data Analysis Program in identifying and defining for the Crew Systems Division (AIR-531), Naval Air Systems Command problems being experienced with, or deficiencies discovered in, the Navy's AAES and associated ALSS during flight operational uses and during emergency uses. For ease of organization, the explanations are provided on a page-by-page basis, sequentially for each page, as depicted by the highlighting of the FSR forms, figures 1 through 16.

OPNAV 3752/3 (page 1 of 1) (Fig. 1)

Section I. General Information

Block 3. Mishap Category:

This identification is used in the basic sorting of the cases for preliminary analyses and in preparation for subsequent routine and special data analyses.

Block 6. Model A/C

This data is employed both in initial sortings of the cases and as a means for cross checking the validity of other data presented in the completed FSR. Eventually it is planned that limited flight type data formulations will be included in the automated data analyses and the data presented in this block will help trigger the use of those formulae.

Block 7. BUNO

Future plans for the data anlaysis program include experimentation in combined analyses of FSR and 3M, as well as other sources of maintenance data, and FSR, 3M and configuration (changes incorporation data, etc.) data. Thus the aircraft BUNO will be necessary to permit cross correlation of the data sources.

Block 8. No. of Occupants

Since Privacy Act problems make undersirable that the Data Program acquire and hold the Block 9 (Name) information of the individuals involved, this data is employed to assure that the records used by the Data Program cover the correct number of individuals. This of course is not a problem in single seat aircraft, but in multi-seat aircraft it has at times been a problem.

Block 10. Sex

This is a new data item reflecting the new and growing presence of female naval aviators. This information will permit analyses of ejection data for female aviators both to spot danger signals and to calm doubts concerning female safety during ejection and subsequent survival phase of escape.

Block 15. Injury Classification

This constitutes another basis for preliminary sorting of the cases.

Block 17. Terrain Clearance

This data concerning the conditions when the emergency began is used to identify the frequency of occurrence of major emergencies outside escape system performance envelopes, to identify the needed escape system performance envelope capabilities for present and future Navy aircraft to minimize loss of aircrew lives, to ascertain the consequences of delays between emergency onset and escape initiation on improving or worsening aircrew ability to escape and survive, and, also, for many other purposes concerning the use and non-use of the escape system. Even in cases in which escape was not attempted, knowledge of the probable terrain clearance and/or terrain profile at emergency onset may prove valuable in defining performance requirements for equipments to alert the aircrew concerning their danger, actions needed and/or need to eject.

Block 24. Airspeed at Time of Mishap

This data has an independent function similar to that of the data requested by Block 17 (Terrain Clearance). In addition, the information often is combined with the Block 17 and Block 6 (Model A/C) information for analyses.

Section III. Narrative Account of Mishap

The narrative account of a mishap, the events and conditions preceding, during and following it, is an extremely critical aspect of an FSR. Properly written, using the balance of the FSR as a form of checklist, the narrative ties together the information presented throughout the FSR, clarifying the case for the analyzer. Poorly developed and written the narrative can reduce the value of the information presented elsewhere in the FSR. The narrative is examined under the Data Program to corroborate, expand and clarify the information presented in the many blocks of the FSR. Parts of the narrative are, upon occasion, employed to illustrate in a meaningful manner problems, deficiencies and/or issues of interest to, or requiring action by, the Crew Systems Division and its field activities.

OPNAV 3752/4 (page 1 of 2) (Fig. 2)

Section I. General

Blocks 1 through 6.

These data provide information concerning the impact of mishaps upon aircrew readiness for duty and, thereby, on the Navy's mission readiness. The data also provide an initial basis for developing mishap cost data with respect to the personnel aspects.

Block 7. Duration of Altered State of Consciousness

A potentially important problem requiring careful collection and reportage of information is the affect of escape conditions, systems and equipments upon ejectee conscioueness. Periods of unconsciousness, dazedness, dizzyness, and/or inability to function effectively due to mental impairments among survivors whether over land or over water; whether cleared prior to surface contact, continuing through surface contact, or occurring after surface contact may be warnings concerning operation of systems and/or equipments under specific or all escape conditions which might require corrective action. Transient problems of this nature under certain circumstances can, of course, cause fatalities and therefore need to be carefully identified and reported with explanations. Even though an ejection may occur over land, altered state of consciousness information is important for it might aid in understanding, for example, high overwater ejection fatality rates. This poses a potential problem for the FSR preparer since the surviving ejectee, particularly one who ejected over land, may not be sufficiently concerned to remember and/or mention a brief period of unconsciousness, dazedness, dizzyness, etc. Nonetheless this data is extremely critical for analyzing how well or how poorly AAES and associated ALSS equipments are performing.

Section II. Injuries Incurred During Mishap

Blocks 1 through 5.

Careful and complete reportage of injury diagnoses and body part locations aids in developing system/equipment injury relationships. Injury cause is a controversial data item which can cause, and has caused, considerable effort and resource expenditure in attempts to prevent recurrence of particularly severe injuries or frequent injuries. When the factor(s) advanced as the cause(s) for particular injuries/injury patterns has been incorrect, the efforts and resources expended generally have not produced means for eliminating or ameliorating the factors and/or their consequences. Therefore, to help ensure the Navy's limited ALSS and AAES resources are employed beneficially to resolve problems producing injuries and to guard against these resources being wasted, it is important that the FSR preparer exercise care in stating causal factors. (Note that the instructions for identifying cause require a brief description of "the mechanism of injury, i.e., 'Hyperflexion', 'Blunt Trauma', etc." and caution that describing "external factors which affected mechanism of injury" should be done "only if those factors can be established with a reasonable degree of confidence" and that the "means for establishing that confidence, i.e., 'paint from seat found on helmet', 'aircrew statement', 'rescuer's statement'" should be described.) All of these data are analyzed for patterns of occurrence for particular groups and combinations of systems and equipments, as well as for the individual systems and equipments in an attempt to ascertain likely causal factors, likelihood of recurrence and overall significance to survival and/or lengthy groundings of Navy aircrew.

The ICD (International Classification of Diseases) Code (a new request) is requested in an attempt to help standardize and thereby clarify the injury reportage by the many preparers of FSRs. The Injury Severity Code serves as an aid in assessing the significance of reported patterns of injuries.

OPNAV 3752/4 (page 2 of 2) (Fig. 3)

Section VIII. Injury Profile

It is planned that eventually the Data Program will have the capability of superimposing these injury location sketches as a further step in ascertaining injury patterns and causes.

Section IX. Remarks

To enable analyzers to ascertain complete injury patterns for comparison with those reported in other ejections and determination of likely causation of recurring injury patterns, it is especially important that all injuries be completely recorded. Data will be used as indicated for Section II (Injuries Incurred During Mishap).

OPNAV 3752/5 (page 1 of 1) (Fig. 4)

Data of specific interest to the Data Program on this page include:

2.E. Inadequate Knowledge of ALSS

3.C. Workspace Incompatibility
3.D. Anthropometric Incompatibility
3.E. Confusion of Controls, Switches, etc.
3.I. Inadvertent Operation
3.K. Personal Equipment Interference
3.L. Inadequate Crashworthy Design

4.C. Disrupted Communications
4.D. Poor Crew Coordination

5.A. Acceleration/Decceleration Forces
5.B. Decompression
5.C. Vibration
5.D. Heat/Cold
5.E. Windblast
5.F. Weather
5.G. Visibility Restriction
5.H. Smoke, Fumes in Cockpit
5.I. Air Turbulence

6.A. Poor Physical Conditioning
6.D. Sleep Deprivation
6.E. Missed Meals
6.F. Medication(s) (self-prescribed)
6.G. Medication(s) (MD-prescribed)
6.H. Altered Consciousness
6.I. Disorientation, Vertigo
6.O. Hypothermia
6.P. Hyperthermia

specifically as the data potentially relate to usage, non-usage, mis-usage of AAES and/or ALSS and to survival, death or injury of the aircrew. Analyses of these data will focus primarily on patterns and will also use some of these for further grouping and/or for flagging the need to search FSR hard copies for specific additional data for subsequent analyses. From time-to-time other data items on this page might be subjected to special analyses.

OPNAV 3752/6 (page 1 of 2) (Fig. 5)

Current Data Program plans do not include analysis of this information, since it properly is outside the purview of the tasking assignment. The data requested is in accordance with the request of physiologists attending the FSR meeting in January 1981.

OPNAV 3752/6 (page 2 of 2) (Fig. 6)

Section III. Anthropometric Data

Blocks A through I describe specific anthropometric data normally available for aviators as a consequence of measurements made during physicals. These data will be examined for pattern relationships with aircrew injury and/or problems during egress and during subsequent phases of escape. Problem categories which will be checked include tumbling occurrences, certain types of injuries and problems, toe strikes and other body or equipment contact with cockpit during egress, etc. One type of anthropometric data not normally obtained during physicals and therefore not requested in this Section but which may prove critical in view of the increased female naval aviator population and increased numbers of small and very large male naval aviators is the Buttock-Popliteal Length. (An overly short B-P Length could result in pelvic rotation and submarining or lower leg and foot extension outside of the design ejection envelop with increased chance for foot strikes during egress. A very large B-P Length could result in a long thigh overhang beyond the end of the thigh support with consequent pelvic rotation and submarining. Pelvic rotation and/or submarining which result in misalignment of the spinal column have long been suspected causes of vertebral compression fractures and have on at least one occasion during human tower testing been the most probable causal factor.) As a substitute, "F. Buttock-Knee Length", will be examined for potential relationship with types of injuries and problems.

Additional anthopometric data concerning ejectee hand breadth when grasping (bare and gloved) and maximum and minimum grasp diameter (bare and gloved) probably will be sought later by questionnaires to ascertain the potential role that these grasping hand dimensions which are not normally described in collections of anthropometric data might play in the prevention of and production of upper limb flailing. (Refer to the enclosed paper Preliminary Generalized Thoughts Concerning Ejection Flail Phenomena concerning preliminary thoughts regarding potential factors, including anthropometric considerations, which might be contributing to the incidence of flail.) It is anticipated that other anthropometric data not furnished by FSRs also might be sought through questionnaires when analyses of FSR data suggest a potential involvement either in producing or in preventing specific injury patterns and/or problems.

OPNAV 3752/7 (pages 1 and 2 of 2) (Figs. 7 and 8)

In order to reduce the recurrence of problems occurring in FSRs and MORs in the past, wherein information concerning aircrew life support systems equipments, especially the normal, flight and survival garments worn by aircrew, has not been furnished unless circumstances such as problems with the particular equipment, equipment absence made conspicuous by the conditions attendant to the escape and/or the survival, or the particular equipment performed a major role (eg., parachute, ejection seat) and a line was identified by the form for the information; the list of equipments on these pages was made more complete to serve as a check list. This general lack of information concerning flight and survival garments worn by the aircrew during ejections largely precludes any meaningful analyses concerning the ability, or inability, of present (and past) inventories of these equipments to perform successfully during and after an ejection. To some degree, of course, reports of failures shed some light on the issue. However, without information concerning the exposure that these equipments receive to the full spectrum of escape and survival conditions, whether or not the equipments sustain damage, it is impossible to ascertain how frequently problems occur and whether the equipment generally performs well except under limited sets of conditions or whether it generally performs poorly, etc. In turn, definition of the problem and of the required design performance suffer. Thus a fix or replacement equipment might not solve the problem completely and/or may introduce problems not previously experienced. In addition, these data eventually will result in the Data Program having ejected weight computed automatically based upon the cited equipments and then inserted into formulae concerning aircraft dynamics and ejection seat functioning to produce estimates concerning whether escape was initiated in or out of the system's performance envelope, and stability issues and other aspects of system functioning. These data will also be employed to examine their relationships (presence, absence, usage, non-usage, etc.) with injuries and problems occurring during escape or survival phases. Care will be required to ensure that all equipments which were present are recorded and properly (accurately and completely) identified and that usage and problems are noted and described (see decision tree presented separately).

OPNAV 3752/8 (page 1 of 2) (Fig. 9)

Section 1. Location in Aircraft

These data locate the specific individual in a specific locale for multi-seat aircraft. Since time delays, trajectory divergence and other critical AAES/ALSS factors often vary with seat location, accurate "location in aircraft" data is critical to analyses. Eventually the Data Program will automatically select the proper variables for the specific seat location and insert these into the formulae for automatically computing ejection trajectory for the conditions reported.

Section II. Escape

These data define whether an escape was attempted and, if so, what type of escape, i.e., whether it was intentional, and in what sequence among multi-crew it was accomplished. These data are included in various analyses looking for injury, fatality and problem patterns. In many instances, data analyses would be aided by narrative descriptions of the information bases used by the FSR preparers for selecting specific categories of escape method and intent.

Section IV. Terrain of Parachute Landing or Crash Site

These data concern the site at which the individual aircrew reached the surface. Since many forms of post-egress injury relate to parachute landing terrain, these data are examined for relationship to patterns of injury, fatality and problems.

OPNAV 3752/8 (page 2 of 2) (Fig. 10)

Section V. Aircraft Parameters at Time of Escape

These data are currently analyzed for their relationships with injury, fatality and problems. Eventually the planned automatic analysis will combine these data with ejected weight (generated from data presented on OPNAV 3752/7), aircraft model, seat type, location in aircraft, etc., to produce estimates concerning whether escape was initiated within the escape system performance envelope, escape system dynamic stability behavior, escape system performance envelope capabilities needed, relationship of conditions attendant to escape with injury and problem patterns, etc. This data will also be compared with the data requested in Blocks 17 (Terrain Clearance) and 24 (Airspeed at Time of Mishap) of OPNAV 3752/4 to ascertain the affects of delays following the onset of various types emergencies upon aircrew safety.

Section VI. Egress Problems

These data are examined for patterns within individual seat types and seat families or with specific equippage configurations. In many instances, wherein details are known or information possibly related to the problems encountered is known, narrative comments will be exceeding helpful. This aspect is discussed in greater detail in a later section of this paper.

OPNAV 3752/9 (page 1 of 2) (Fig. 11)

Section I. Time From Emergency Until Escape Attempt Was Initiated

This information helps in the analysis of escape survival and fatality rates and when examined in conjunction with the information requested in Blocks 17 (Terrain Clearance) and 24 (Airspeed at Time of Mishap) of OPNAV 3752/4 and Section V (Aircraft Parameters at Time of Escape) of OPNAV 3752/8 and Section II (Delay In Initiating Escape Due To:) below, provides considerable insight concerning the types of emergencies requiring aircrew escape, the conditions attendant to such emergencies, and the rapidity with which those conditions deteriorate. In turn these types of information are needed to assure that required AAES design performance provide aircrew safe escape for the broadest range of manned aircraft mishaps.

Section II. Delay In Initiating Escape Due To:

Many escapes are delayed, some sufficiently so as to make doubtful the success of any attempt at escape. Careful documentation of the causes for delay is important in terms of potential impact upon AAES future design requirements and upon aircrew training. This is another area in which a narrative description of the bases for the FSR preparer's selection can be helpful.

Section III. Protective Helmet/O_2 Mask

Over the years helmet/oxygen mask loss has been a major concern. There is considerable confusion and controversy concerning both the frequency of loss and the possible causes for the losses. Assessment of the problem significance and resolution of the causal factors is dependent upon accurate reportage of helmet type and configuration (OPNAV 3752/7, lines 1 through 1.d.), oxygen mask type and configuration (OPNAV 3752/7, lines 3, 3a and 3b) (with careful attention given to correctly identifying the oxygen mask retainer fittings type/configuration, i.e., butterfly, bayonet with two straps, angled bayonet with one strap, etc.) (Figures 17 through 20) and the information requested in this section. Particularly desirable is information concerning whether the helmet and/or oxygen mask were recovered and if so, a narrative description of the equipment's recovered condition and configuration (i.e., helmet recovered without mask, chin strap and pads; oxygen mask recovered without helmet but with retainer and retainer fittings; helmet and mask recovered connected by left bayonet mask retainer fitting, chin strap and nape strap intact and connected; etc.)

Section IV Ejection Envelope

This has always been a complex question to answer, moreso than probably most people, including the preparers of MORs and FSRs, realize. The effects of descent rate, attitude, speed, rates of attitude change, aircraft accelerations, ejected weight, to identify only the more obvious, often require computer simulation to ascertain. If the ejectee is not recovered under a fully blossomed parachute and there was no indication of AAES malfunction, one has a good indication of an out-of-envelope escape attempt, yet not uncommonly even these are listed as in envelope attempts. If a full parachute is achieved, then, probably, the escape was attempted within the AAES performance envelope. If the parachute was deploying or filling when the ejectee impacted the surface and there was no indication of AAES malfunction, probably the escape attempt was inititated outside the envelope. However, there can occur various types of malfunctions which leave no obvious evidence as, for example, overly long time delays. Other types of malfunctions such as operation in a back-up mode and not primary mode often are detectable only through careful laboratory analysis of all of the potentially affected parts as undisturbed as possible from their recovered condition. After the Data Program achieves the fully automated integration of aircraft conditions, AAES performance, ejected weight, etc., for analyzing escape attempts, this question will be resolvable with far less guesswork.

Section V. Removal of Aircraft Canopy

This information helps define, on occasion, the presence of problems, and helps in special groupings and analyses to ascertain the effects upon safe escape of the several canopy modes. Note in particular under Block C (Removal) lines 4, 5 and 6 ("Ejected Through Canopy", "Complete Cutting of Glass", and "Partial Cutting of Glass", respectively). These were added to reduce potential confusion concerning what is meant by, or intended to be meant by "through canopy". Ejection through the canopy means that seat and ejectee broke through otherwise intact canopy glass. Complete cutting of glass describes the case where the canopy frame is not jettisoned but the glass is cut/shattered/fragmented by an explosive charge so that seat and ejectee pass through an essentially empty canopy frame during egress from the aircraft. Partial cutting of glass describes use of explosives (at present) to weaken or partially break out sections of the canopy glass to reduce resistance to passage of seat and ejectee through the glass. (This selection may also be used to describe partial operation of a system designed to completely cut the glass but which through malfunctioning leaves large glass sections in place which were removed by the seat. In the event it is so used a narrative description of the evidence forming the basis for the selection decision would be helpful for the analyzer.)

Section VI. Method of Ejection Initiation

This information is useful in analyzing flail incidence and severity, access to specific handles, which individual in multi-place aircraft initiated escape, system free windstream stability, and other factors affected by "method of ejection initiation" which might be and/or often are alleged to affect ejectee safety.

Section VII. Body Position at Ejection (As Compared To Optimal)

This information also is useful in analyzing flail incidence and severity (i.e., elbows), and the incidence and severity of other injuries, especially vertebral. Narrative statements concerning the bases for selection would be useful. It should be noted by FSR preparers that injury, for example vertebral compression fracture or paravertebral muscle strain, does not per se indicate non optimal body position.

Sections VIII. Position of Ejection Seat, IX. Method Of Separating Man From Seat, and X. Method of Deploying Parachute

This information usually is examined for evidence of malfunction or possibly non-standard system configuration, especially since the last two data types are pre-determined by system design unless there is a malfunction.

Section XI. Parachute Opening Shock

Information from this section is used as a gross indicator of possible injury potential and for gross comparisons between systems used under similar ejection speeds, descent rates, attitudes, and ejected weights, and between similar probable parachute pack opening, full line stretch, etc., airspeeds and altitudes. Due to the qualitative nature of the data from individuals not accustomed to parachuting, these data can only be used for gross comparisons and gross indications but, nonetheless, are of value in assessing likelihood of adverse impact upon ejectee safety.

Section XII. Oscillations

Oscillations can ..duce, and have induced, among ejectees motion sickness, can cause, and have caused, ejectee entanglement with suspended equipments, can lead and probably have led, to parachute landing injuries which otherwise might be avoided. The 4-line release was introduced in part as a means of reducing the incidence and severity of ejectee oscillations while descending under a parachute and to thereby reduce the likelihood of oscillation induced problems.

Sections XIII. Parachute Damage and XIV. Cause of Parachute Damage

Parachute damage not caused on surface contacts can be valuable in assessing opening shock, system malfunctions, and ejectee descent rate at surface impact. Ground damage can help in assessing the dragging potential and other potentially injurious ejectee-surface interactions for specific escapes and for various types of landing sites and sets of landing site conditions.

OPNAV 3752/9 (page 2 of 2) (Fig. 12)

Section XV. Direction Faced at Parachute Landing With Respect to Horizontal Travel

This information will be reviewed for indications of potentially adverse effects upon ejectee safety.

Section XVI. Landing Conditions

This information will be examined for evidence of ejectee landing injuries and/or problems.

Section XVII. Canopy Deflation Pockets (Water Landing Only)

This information will be examined in conjunction with that presented in Section XVI (Landing Conditions), this page, and Section XII (Survival Problems Encountered by This Person) of OPNAV 3752/10, especially 01 (Inadequate Flotation Gear), 05 (Entanglement (Parachute)), 06 (Dragging (Parachute)), 07 (Parachute Hardware Problem), and 09 (Pulled Down by Sinking Parachute) to ascertain types, frequencies and severities of problems encountered by ejectees during and after landing in water.

Sections XVIII. Sequence of Actions Accomplished Before Landing,and XIX. Sequence of Actions Accomplished After Landing

This information is useful, when compared to probable parachute inflation altitude and speed, to help ascertain how well ejectees are able to function, how well they are able to prepare for landing, and how well they are able to function after landing to enhance their survival. It is especially important information for over water ejections but is also important for ejections occurring over land (the overland information might help in the analyses of the overwater situation). Narrative discussion concerning ejectee reasons for both the actions taken and the sequence in which they were performed might help in assessing success or deficiencies in training programs and/or success or problems with equipments.

OPNAV 3752/10 (pages 1, 2 and 3 of 3) (Figs. 13, 14 and 15)

Section I. Conditions Prevailing at Survival/Rescue Site

This information can help in ascertaining causes for fatalities, injuries, delayed rescue, and other problems which, if clearly and correctly defined, might result in the future acquisition of improved systems and/or future development of improved techniques.

Section II. Time Lapse Sequence for Actual Rescue Vehicles/Personnel

Time lapse information is important in assessing the amount and types of survival equipments which should be provided ejectees as standard elements of the AAES (i.e., how long must an ejectee be essentially self-supporting relying only upon survival equipments provided with the system).

Section III. Time This Individual Spent

Hypothermia and poor flotation seem to be likely major causal factors/associated factors for many drownings and possibly some lost at sea ejectees. Time spent in water and in raft when combined with air temperature, water temperature and information concerning other conditions might help better define the post-ejection in-water survivors' problems.

Sections VI. Rescue Alerting Means, VII. Alerting Communications Problems, VIII. Delays in Departures of Rescue Vehicle(s), IX. Rescue Vehicle Problems Enroute, X. Problems in Locating Individual or Keeping Individual in Sight, and XI. Rescue Equipment Used

SAR problems can be, and have been, very critical to survival or death of an ejectee. Better definition of these problems could direct attention to better systems, techniques and training for SAR forces or perhaps impact future AAES technology in ways enhancing ejectee survival, detectability by rescue forces, and rescue.

Section XII. Survival Problems Encountered by This Person

This information helps in defining the degree of self-sufficiency required by an ejectee under various conditions for survival and suggests problems requiring resolution. Certain of these data will be analyzed with other information presented on the various pages of the completed FSR to better define the types, frequency and severity of survival problems.

Section XIII. Problems That Complicated Rescue Operations

This information will be analyzed in conjunction with that presented in Sections VI, VII, VIII, IX, X, and XI.

Section XIV. Individual's Physical Condition

This information can help define both survival and rescue problems and their causes and will be analyzed in conjunction with other information presented in the FSR to define system/equipment, training and other requirements.

OPNAV 3752/11 Analysis, Conclusions and Recommendations (Fig. 16)

This is probably one of the most important parts of a well prepared FSR and one of the most dangerous for poorly prepared, poorly reasoned ones. This section has been used to advance many novel ideas as well as time worn "classic" ideas. Caution should be exercised by the FSR preparer in developing and presenting analyses, conclusions and recommendations to ensure that they are supported by, and in consonance with, the facts reported throughout the FSR or that full explanation is provided for the discrepancies. The preparer needs to fully document and explain his analyses, conclusions and recommendations so that all who read them can understand the statements and the associated rationale, irrespective of their agreeing or disagreeing with them.

This section will be examined under the Data Program in the light of the collections of other cases to ascertain which analyses, conclusions and/or recommendations appear most likely to best define problems, requirements and/or solutions.

TYPICAL PLANNED ANALYSES AND THEIR FSR DATA NEEDS

At present the Aircrew Automated Escape System (AAES) In-service Usage Data Analysis Program is primarily directed toward development and implementation of automatic data analysis techniques capable of providing rapid, repeatable, non-labor intensive (and therefore less error prone) analysis automatically as the data bank is updated. Staffing limitations coupled with recent personnel losses make exceedingly difficult simultaneously developing and implementing such techniques and performing specific analyses. Nonetheless, to a limited degree, the Data Program is proceeding with analyses of the available data. In many instances these, as well as future planned analyses, cannot be completed until the data bank is expanded to include data from ejections prior to 1969, perhaps back to approximately 1954, and upgraded to include data for ejections occurring after the initial transfer of data.

What are some typical on-going and planned ejection data analyses? What techniques and what data are being or will be used in these analyses? What problems must be overcome to develop meaningful analyses capable of generating what sorts of outputs to impact Fleet AAES/ALSS problems? Is the Data Program just an academic exercise or is it likely to serve a useful purpose in resolving Fleet AAES/ALSS problems?

One of the many problems subjected to preliminary analysis with plans for later in-depth analysis under this Data Program is that of the out-of-envelope ejectee. The most obvious question concerning this problem, a question that has generated considerable controversy and virtually no agreement is: Why did ejection occur out of the escape system's performance envelope? Preliminary analytic efforts concerning that question are presented as Figure 21 while preliminary thinking concerning the inseparable issue of why an ejection might be classified as having been initiated out-of-the-envelope is set forth in Figure 22. In addition, the preliminary review conducted on the data suggests that there well may be an interrelationship between many of the out-of-envelope ejections and many of the failures of aircrew to eject prior to aircraft impact with the surface.

In some cases determination whether an ejection was initiated within or outside an escape system's performance envelope is a very complex question requiring information concerning:

- o Aircraft parameters
  - airspeed
  - altitude above terrain and terrain profile
  - descent rate
  - attitude
  - rate of attitude change
  - accelerations during initiation and egress phases of escape

- o Escape system configuration
  - type escape system
  - location within aircraft
  - system stabilization effectiveness
  - system timing
  - trajectory control/alteration/divergency
  - parachute functioning
- o Total ejected weight
- o Total weight suspended under parachute
- o Type landing terrain
- o Ejectee physical condition from onset of emergency through rescue or death

as well as other data normally furnished in an FSR. Manipulation of these data requires generation and use of a number of formulations and standard data banks for each aircraft-escape system combination in service. Except when ejection is abruptly stopped by aircraft impact with the surface (a type 2 ejection) or the non-malfunctioning system sequencing is abruptly stopped by impact with the surface or surface objects, resolution of the in or out-of-envelope issue may be too complex for easy answers.

What must be done to reduce the incidence of out-of-envelope ejections and failures to eject? The preliminary data reviews completed were not sufficient to provide sufficiently clear and complete problem definitions suitable for initiating and guiding design efforts. However, they offer some initial insights into the problems and the general nature of possible solutions:

- o When the emergency is not an aircraft failure or a departure from controlled flight, resolution of both the out-of-envelope ejection and the failure-to-eject problems might not involve changes to the escape system but might involve development of means for avoiding unintended surface contact by the aircraft, possibly with emphasis on specific missions or phases of flight such as shallow dive angle bombing, strafing, night landings, or foul weather low level flights over rough terrain.

- o When the emergency involves aircraft failure or a departure from controlled flight occurring under conditions within the escape system performance envelope, resolution of both the out-of-envelope and failure-to-eject problems might involve improving means influencing aircrew escape initiation decisions to ensure a greater proportion are initiated well before the performance envelope margins are reached or breached.

- When the emergency involves aircraft failure or a departure from controlled flight occurring at or below minimum existing performance capabilities, resolution of the out-of-envelope ejection and failure-to-eject problems might require both enhancement of the escape envelope and the speed of aircrew decision to initiate escape.

Further analyses are required and planned to develop the data more completely to ascertain whether the preliminary indications are valid and, if so, to define the problems in ways that will aid designers in comprehending and addressing them.

Another problem, a perennial one, is the issue of ejecting through-the-canopy versus jettisoned-canopy, partially-cut-canopy or totally-fragmented-canopy ejection. Aspects of this problem are addressed in separate papers enclosed in this brochure. Similarly, flail, a long standing, ever present problem, is addressed in separate papers included in this brochure and therefore need not be treated in depth in this paper. However, both problems have been the subjects of considerable preliminary data review and analyses and, it is planned, will be the subjects of continuing efforts within the Data Program as the effort of achieving automated data analyses progresses.

A fourth example is one that also has long stood, that of helmet loss. Some preliminary data sorts have been made and some preliminary findings offered in October 1981 during a presentation at the Aircrew Automated Escape Systems (AAES) Data Analysis Program Symposium. Additional efforts are planned but are not expected to begin in the near term.

A major problem confronting the Data Program is the vast trove of ejection data already available and the many problems awaiting investigation. Some are now underway and many are planned but awaiting the availability of resources. Others are planned but are awaiting acquisition of additional data; for example the development, solicitation and analyses of questionnaires to amplify or clarify the existing data.

What is the role of the ejection investigator and/or FSR preparer in this effort? Figure 23 depicts the data chain which provides the data used by this Data Program while Figure 24 lists some of the expected use-oriented results of the analyses to be conducted. The ejection investigator and FSR preparer are extremely critical links in the AAES data chain, for it is they who provide the data used in the Data Program. Very little data not gathered and reported during the investigation and preparation of the FSR can be obtained by the Data Program. Hence, if the information is not acquired or, although acquired, not reported, it cannot be analyzed to help define problems. If data reported either is inaccurate or incorrect or is incorrectly entered into the FSR, that data might not be detected as being faulty and thus might adversely affect the analyses and problem definitions. One specific aspect of the MORs and now the FSRs has been, and is, especially vulnerable to these types of problems and, therefore, requires specific addressal: determining causes of injuries and/or problems.

ASCERTAINMENT AND REPORTAGE OF THE CAUSATION OF EJECTION ASSOCIATED INJURIES AND PROBLEMS

The ejection investigator often faces an extremely difficult task of explaining the causes of injuries incurred during ejections or of problems experienced during the escape. In many, if not most, cases the investigator is confronted either with major gaps in the available data (eg., ejectee cannot recall, no witnesses, equipment lost, etc.) or with apparent or actual contradictions (eg., disagreement between witnesses' reported observations, discrepancies between witnesses' observations and condition or location of equipment, etc.). How should the investigator resolve these problems, what actions should he take?

Probably the single most important task which the investigator is required to perform is the search for, and the accurate and complete reportage, of all facts concerning the ejection and identifying how each reported fact or piece of information was ascertained (eg., measured with a ruler, measured with 25 ft. tape, measured by pacing off the distance; reported by ejectee, reported by witness, reported by investigating team members; statement from a manual, statement from an expert, hypothesis; etc.). Probably the least useful and often most dangerous thing an ejection investigator can do is to guess concerning the causal factors of reported events, problems and injuries and/or to arbitrarily rule out reported facts and information without both explaining that such action has been taken and defining clearly the reasoning underlying that action.

One of the aspects of ejection investigation which at first appears helpful only to later turn out to cause more troubles than it helps to solve, is the existing extensive body of what might be termed "classical causal factors" for ejection associated injuries and/or problems. These are the "hand-me-downs" passed from one generation to the succeeding generation of ejection investigators. Most of us, be they engineers, flight surgeons, life support equipment officers, aviation medical safety officers, pilots, naval flight officers, etc., even aviation physiologists, have heard and perhaps without any question accepted some of these long-accepted, taught and used explanations for certain types of injuries and/or problems associated with ejection. These appear with frequency, unchallengeable articles of faith, in the FSRs (Flight Surgeon's Reports). Thus we see upon occasion in an FSR causal factors advanced that do not and cannot square with the facts reported for the individual case as, for example, in a recent ejection resulting in an upper arm fracture. After reporting that the ejectee's arms had flailed, the investigator stated that the cause for the fracture was windblast, even though the total airspeed of the aircraft at ejection reportedly was 3 knots. It is easy to understand the train of logic evolution in this case: the injury was a flail type break, flail classically is understood to be caused by windblast and, therefore, ipso facto, the break was caused by windblast.

Table I offers the reader a number of examples of common ejection related injuries and problems and the often cited "classical" causal factors. This list is offered not to provide a list from which causes may be selected (PLEASE DON'T) but, rather, as simply a list of what often are too pat answers to the question of why did that result occur.

What problems, however, if any, can use of classical causal factors or guessed causal factors induce? Such citations help to direct and constrain the definitions of problems and, in turn, focus the attention and efforts of those who attempt to correct the problems in very specific, often limited scope directions. The frequent result is that the fixes produced appear suitable since design, testing and evaluation are driven by the stated causal factors, although in actual service the problem continues to occur largely unabated after the fixes have been incorporated.

The Navy's resources are limited and those devoted to aircrew automated escape systems (AAES) and aircrew life support systems (ALSS) appear generally to be even more so. Thus the Navy cannot afford attempting solutions of incorrectly and/or misleadingly defined problems. Nor can the AAES/ALSS community afford the consequent ancillary result of appearing to either not care about aircrew problems or to not be sufficiently competent to resolve the "everyone knows about it" type problem that unresolved, long-existing problems soon become. And certainly, most importantly, our Navy aircrew deserve better from all of us.

There is another problem which, although serious, seldom, if ever, has impacted the ejection investigators but probably will soon. This problem does have serious impact upon the suppliers of Navy AAES/ALSS and, eventually, could have serious implications concerning AAES/ALSS cost, performance and availability. The problem is product liability. In many product liability cases excerpts of the investigations have been prepared by the Judge Advocate General's office for release and contain the classical and/or incorrect/misleading causal statements developed by the ejection investigator. (Another critical problem in this regard has been the appearnace in journals of articles describing ejection associated injuries and/or problems and offering as the determined causal factors some of the classical causal factors. In many instances the authors of such articles display to knowledgeable individuals a surprising degree of misinformed opinion and lack of knowledge concerning the equipments involved.) With respect to the product liability problem, an ejection investigator should keep in mind that increasingly the investigators are being called as witnesses and their statements as to the causal factors, influences and mechanisms then subjected to merciless public scrutiny. One should be prepared to very carefully and exactingly prove one's findings and theories, particularly if published in journals.

What on the other hand, is the problem if an ejection investigator cannot clearly identify certain causal factors and admits that fact. From the viewpoint of AAES/ALSS data analysis aimed at defining problems, lack of a defined causal factor does not pose any serious problems. Certainly not stating causal factors when one cannot be certain produces less of a problem than stating a not clearly proven causal factor. One should not, however, be discouraged from hypothesizing which might be the causal factor as long as one clearly indicates both that the factor listed as the causal agent is a hypothesis and the bases underlying that choice of agents.

In many instances the information obtained during a thorough investigation of a single ejection case (whether involving one or multiple individual ejectees) may be sufficient to permit identification of all injury and problem causal factors. However, in many cases, the information which the in-field investigator can develop is inadequate and assistance is needed. A considerable community of AAES/ALSS equipment expertise exists within the Navy, much of which can, on request, provide assistance. Table II lists and provides points of contact for U.S. Navy activities having specific and detailed expertise concerning AAES/ALSS. The investigator also should be aware that there exists an immense, growing body of data which, when properly treated and analyzed, might prove helpful in understanding or interpreting the data and information acquired for a specific case. (This latter aspect is discussed in more detail in a separate paper.)

To summarize, then, the critical points concerning the ejection investigator's task:

- Identify and record all data
- Where causation can be clearly established, so state and define bases for statement
- Where hypotheses concerning causal factors seem reasonable, state them, identify them as hypotheses and furnish your rationale for the hypotheses.
- Do not state event or causal factor guesses or hypotheses as though they were established.

NEED FOR NARRATIVE DESCRIPTIONS AND EXPLANATORY NOTES IN THE FSR

Throughout an ejection investigation and the subsequent preparation of the Flight Surgeon's Report (FSR), the investigator(s) and preparer(s) should remember that the FSR out of necessity is a checklist type formatted report. The checklist format, of course, in part is used to simplify complicated tasks, such as ejection investigations, and to ensure completeness of reportage concerning common, anticipatable and/or potential aspects.

Throughout the FSR, therefore, checklist subsets are provided from which the preparer is required to select the term(s) or phrase(s) most applicable. These subsets are employed to solicit descriptions of events, problems and behavioral aspects frequently associated with or commonly occurring prior to, during and/or following an ejection. The terms and phrases offered usually are simple, often one, two or three words long, and can encompass a broad spectrum of specific aspects of an escape which share one or more common attributes.

Unfortunately, often, despite shared attributes, the lumping of specific aspects under one term conceals important differences among those for an individual case and among those for a collection of cases. Often concealed through lumping are those differences, such as relationship of a specific aspect with sequenced events (i.e., did "flailing - lower extremities" occur prior to, during or after man-seat separation, during drogue operation, during parachute opening shock, etc.), which would help clarify the actual causal mechanism(s). Thus lumping serves to make, for example, all "flailing - upper extremities" occurring after egress appear to be the same and, therefore, implicitly, likely to result from the same causal factors. In fact there are many likely causes, as for example, for "flailing - upper extremities" and, therefore, the oversimplified lumping may confuse those seeking to identify the causal mechanisms.

The complexity of specific aspects such as upper limb flail is discussed in greater detail in the accompanying paper entitled Preliminary Generalized Thoughts Concerning Ejection Flail Phenomena. It is because of the potential complexities hidden by the offered terms that throughout the FSR there are provisions for and requests for, narrative descriptions and/or explanations illuminating the specific aspect(s) covered by the selected term. In essence, then, when a report is fully annotated with explanatory notes, the terms have served as a checklist during the ejection investigation and FSR preparer, therefore, need to recognize the critical importance of the explanatory notes and to seek and report information which may help researchers and designers to identify and correct the individual causal mechanisms causing undesirable specific aspects. As examples of the degree of complexity which might be concealed, consider Figures 25 and 26 which are questionnaires currently being developed to enhance AAES community knowledge concerning upper limb flail and concerning post-egress tumble in the hopes that the underlying causes can thereby be identified and eliminated.

GUIDANCE AND ASSISTANCE FOR THE INVESTIGATOR/FSR PREPARER

As a side effort to the analytic effort being undertaken by the Naval Weapons Engineering Support Activity, an effort has been initiated with the assistance of the Naval Aeromedical Research Laboratories, Pensacola, to develop a number of field investigator guides concerning both the AAES and associated ALSS subjected to an emergency use. These guides are being developed in an attempt to aid the investigator/FSR preparer in conducting a thorough investigation to glean and report maximal information with a minimum of effort and confusion on their part and, also, to thereby enhance the quality and quantity of information presented in FSRs. Preliminary drafts of the guides for examining and investigating helmets and oxygen masks have been prepared and are included in this brochure. In addition, a very general decision tree has been developed in preliminary form and included.

It is intended that these and other guides, as they are developed, will be evaluated during post-test investigative efforts following ejection tests and then furnished to selected flight surgeons and aviation physiologists for further evaluation and comment. If the guides appear suitable, helpful and acceptable, ways will then be sought to formalize their development, updating and availability.

TABLE I

OFTEN CITED CLASSICAL CAUSAL FACTORS FOR

INJURY AND PROBLEMS ASSOCIATED

WITH EJECTION

INJURY/PROBLEM	CITED CLASSICAL CAUSAL FACTORS
o Vertebral compression facture.	- Poor body position. - Poor restraint. - Seat acceleration. - Seat slap. - Scoliosis - Anthropometry
o Aviator rising off seat and/or striking canopy during negative G flight conditions.	- Loose lapbelt. - Poor restraint. - Mis-sized torso harness used.
o Helmet lost during ejection.	- Windblast. - Loose/broken chin strap. - No nape strap. - Improper fit/fit pads. - Wind under visor - Helmet weight/c.g.
o Limb flail.	- Windblast.
o Neck injury.	- (If present Ballistic spreader gun parachute opener induced excessive opening shock. - Poor body position. - Windblast induced helmet aerodynamic lift.

TABLE II

SOURCES OF OUTSIDE ASSISTANCE

FOR THE ACCIDENT INVESTIGATING FLIGHT SURGEON

AND AVIATION PHYSIOLOGIST

ALSS/AAES EQUIPMENT TYPE	ADDRESS	TELEPHONE NUMBERS
o Total Escape System/ Life Support System	Superintendent Life Support Engineering Division Aircraft and Crew Systems Technology Directorate Naval Air Development Center (603) Warminster, Pennsylvania 18974	215-441-2503 Auto: 441-2503
	Technical Director Crew Systems Division Naval Air Systems Command (AIR-531A) Washington, D.C. 20361	202-692-7486/ 7548 Auto: 222-7486
o Parachutes	Head Parachute Engineering Div. Parachute Systems Dept. Naval Weapons Center (641) China Lake, California 93555	714-939-2943 Auto: 437-2943
oCartridges/Cartridge Actuated Devices/ Cartridge (Ballistic) Catapults	Director CAD Engineering Division CAD/PAD Department Naval Ordnance Station (512) Indian Head, Maryland 20640	301-743-4261/ 4876 Auto: 364-4261
o Rocket Motors/ Rocket Catapults	Director Aircrew Escape Propulsion Division CAD/PAD Dept. Naval Ordnance Station (515) Indian Head, Maryland 20640	301-743-4757/ 4369 Auto: 364-4757
o Maintenance & General Systems	Head Air Crew Systems Branch Systems Engineering Test Directorate Naval Air Test Center (SY-71) Patuxent River, Maryland 20670	301-863-4141/ 4673 Auto: 356-4141

o FSR Data/ Data Analyses	Head Aeromedical Division Naval Safety Center Naval Air Station Norfolk, Virginia 23511	804-444-2261 Auto: 690-2261
	Head Life Support Equipment Branch Aircraft Maintenance and Material Division Naval Safety Center Naval Air Station Norfolk, Virginia 23511	804-444-3949 Auto: 690-3949
o AAES/ALSS Data Analyses	Head Analytical Systems Division Information Systems Dept. Naval Weapons Engineering Support Activity (ESA-31) Washington Navy Yard Washington, D.C. 20374	202-433-3621/ 3623 Auto: 288-3621

FLIGHT SURGEON'S REPORT
GENERAL INFORMATION AND NARRATIVE DATA
OPNAV 3752/3

REPORT SYMBOL
OPNAV 3752-1
PAGE 1 OF 1

THIS IS PART OF A LIMITED USE NAVAL AIRCRAFT MISHAP INVESTIGATION REPORT.
LIMITED DISTRIBUTION AND SPECIAL HANDLING REQUIRED IN ACCORDANCE WITH OPNAVINST 3750.6.

I. GENERAL INFORMATION

1. Reporting Custodian of Mishap Aircraft	2. Mishap Severity	3. Mishap Category ☐ Flight Mishap ☐ F[illegible] Mishap [illegible]

4. Mishap Serial #	5. Date and Time (local) of Mishap	6. Model A/C	7. BUNO	[illegible]

9. Name: (last, first, middle initial of individual involved (*Use additional sheets, if necessary*)	10. Sex	11. Check pilot in control at time of mishap	12. Grade/Rate	13. Branch of Service	14. In-flight Duties	[illegible]	16. Disposition code
A. Pilot in command (at time of mishap)							
B. Co-pilot/others							
C.							
D.							

17. Terrain Clearance	18. Cabin Altitude	19. Time at Cabin Altitude	20. Ambient Altitude	21. Time at Ambient Altitude
______ feet (AGL)	______ feet	______ hours ______ tenths	______ feet (MSL)	______ hours ______ tenths

22. Place in Formation (N/A if single aircraft) ☐ 1 – lead ☐ 2 – wing ☐ 8. other (Explain) ______	23. Duration of Flight ______ hours ______ tenths	24. Airspeed at Time of Mishap

25. Cloud Conditions	26. Horizon
____ 0 – clear ____ 3 – in clouds ____ 1 – overcast ____ 4 – in & out of clouds ____ 2 – undercast ____ 5 – other (*specify*) ______	____ 1 – distinct 8 – other (specify) ______ ____ 2 – obscured visibility ______

II. MODEL OF OTHER AIRCRAFT (IF INVOLVED)

1. Reporting Custodian of this Aircraft	2. Model A/C
3. BUNO	4. No. of Occupants

III. NARRATIVE ACCOUNT OF MISHAP (Continue on a separate sheet, if necessary)

SUBMITTED BY: NAME (Flight Surgeon) ______ **SIGNATURE** ______ **DATE** ______

INSTRUCTIONS FOR COMPLETION OF FORM OPNAV 3752/3: GENERAL INFORMATION AND NARRATIVE DATA

I. GENERAL INFORMATION:

1. See OPNAVINST 3750.6.
2. Mishap severity (from MIR A, B, or C)
3. Self explanatory.
4. From MIR, e.g., 1-81, 3-81, etc.
5. Self-explanatory
6. Self-explanatory
7. Self-explanatory
8. Number of occupants in mishap aircraft
9. - 11. Self-explanatory. For number 10, state (M) for male, (F) for female
12. Give grade or rate, if military, e.g., LT, CAPT, E-1, etc. If civilian or foreign national indicate as (CIV) or (FN) respectively
13. USN, USNR-R, USMC, etc.
14. Refers to duties during mishap flight, e.g., pilot, BN (do not use term NFO), aft observer, passenger, etc.
15. For proper classification, see Chapter 4 of OPNAVINST 3750.6
16. Disposition Code:
   - A – Insufficient remains recovered for autopsy but sufficient for tissue and/or fluid specimen analysis
   - B – Death due to cause(s) other than injuries sustained
   - C – Death after 48 hours due to injuries sustained and autopsy *not* performed
   - D – Death after 48 hours due to injuries sustained and autopsy performed
   - E – Death within 48 hours due to injuries sustained and autopsy *not* performed
   - F – Death within 48 hours due to injuries sustained and autopsy performed (include instantaneous and DOA)
   - G – Hospitalization, observation, SIQ, or grounding exceeding 48 hours
   - H – Returned to full duty between 12 and 48 hours after mishap, to include hospitalization, SIQ and [illegible]
   - N – Return to full duty between 0-12 hours after mishap.
   - U – Disposition unknown. Includes remains lost or individual missing. Submit supplementary report of status change.

Questions 17-26 refer to the parameters at the moment the adverse occurrences began. If estimated, indicate by [illegible]

17. Distance above ground.
18. This varies between pressurized and nonpressurized aircraft. If unpressurized, it will be the same as the [illegible] surized, ask the survivor to what altitude the cabin was pressurized, or estimate same (est)
19. The amount of continuous time that the aircraft spent at that altitude. On a long cross country [illegible] of flight (item 23). If during ACM or bombing run, it may be a very short period of time
20. What the altimeter reads – the height above mean sea level
21. Same as item 19, unless there has been a depressurization or change in cockpit pressurization during the flight [illegible]
22. Self-explanatory.
23. From takeoff until mishap
24. Ask survivor. If estimated, add ("est")
25. & 26. Self-explanatory. Visibility is given in statute miles

II. MODEL OF OTHER A/C (IF INVOLVED):

If there were no injuries, fatalities, psychophysiological factors, escape/egress, or survival/rescue [illegible] cause factor in the mishap, the information requested is all that is required. If this is not the case [illegible] required. Instructions are the same as for Section I.

III. NARRATIVE ACCOUNT OF MISHAP:

Give a synopsis of the significant events leading up to, during, and following the mishap in the Flight Surgeon's [illegible] placed on human factors, aeromedical, egress, survival, and rescue aspects of the mishap. The thrust of this narrative should [illegible] "Why" and "how" belong in the analysis section of the OPNAV 3752/11 form. Do not include [illegible]

DO NOT WRITE HERE

FLIGHT SURGEON'S REPORT
MEDICAL INFORMATION
OPNAV 3752/4

REPORT SYMBOL
OPNAV 3752-1
PAGE 1 OF 2

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LIMITED DISTRIBUTION AND SPECIAL HANDLING REQUIRED IN ACCORDANCE WITH OPNAVINST 3750.6.

I. GENERAL

1 ________ On Flight Status
2. ________ Injury Classification
3 ________ Days in Hospital
4 ________ Days in Quarters
5 ________ Days Limited Duty
6 ________ Days Grounded
7 ________ Duration of Altered State of Consciousness

II. INJURIES INCURRED DURING MISHAP (list additional injuries in IX)

			ICD Code	INJURY SEVERITY CODE
1	Body Part			
	Diagnosis			
	Cause			
2	Body Part			
	Diagnosis			
	Cause			
3	Body Part			
	Diagnosis			
	Cause			
4	Body Part			
	Diagnosis			
	Cause			
5	Body Part			
	Diagnosis			
	Cause			

III. LAB TESTS

	Date Drawn (D-M-Y)	Elapsed Time	Lab Used	Tissue Used	Results	Lab Norm Range	Significant Factor
Carbon Monoxide							
Alcohol							
Brain Lactic Acid (Fatal)							
Drug Screen							
Hgb/Hct							
Other							
Other							

URINALYSIS: SP. GR. ________ SUGAR ________ KETONES ________ OTHER ABNORMALITIES ________
DATE TAKEN ________ ELAPSED TIME TAKEN AFTER MISHAP ________

IV. X-RAY RESULTS

☐ Check if performed. Where performed: ________
(Submit results on a separate sheet)

V. PRE-EXISTING DISEASES/DEFECTS AND DISEASES/DEFECTS PRESENT AT THE TIME OF THE MISHAP

Diagnosis	Method of Discovery				Waivers (as applicable)	
	Annual Physical	Sick Call	Autopsy	Other	Authority	Date

VI. SMOKER ☐ Yes ☐ No # packs/day ________ Has smoked for ________ years.

VII. AUTOPSY

1. Conducted By/In Presence Of:	2. Material Submitted to AFIP:
________ M – Military Pathologist ________ F – Flight Surgeon	________ 1 – Autopsy Report ________ 3 – Pictures
________ C – Civilian Pathologist ________ Y – Other	________ 2 – Frozen Tissue ________ 4 – Fixed Tissue
3. ☐ Protocol Attached ☐ Will be Forwarded	

NAME OF THIS INDIVIDUAL ________ SSN ________ AIRCRAFT ________ BUNO ________

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/4: MEDICAL INFORMATION

I. GENERAL:

1 Flight Status Check if on competent flight orders regardless of actual participation in mishap Otherwise leave blank
2 Injury classification in accordance with Chapter 4 of OPNAVINST 3750.6.
3 Self-explanatory.
4 Include days spent as "sick in quarters" or on convalescent leave Used as an indication of time not available for any duty
5 Excludes hospitalization, convalescent leave, and S I Q
6 – Include total days grounded including day of mishap but not day of return to flight status. Do not include days hospitalized [illegible] and or on convalescent leave.
7 Altered state of consciousness as defined in International Classification of Disease (ICD) 780. Duration in hours and minutes.

II. INJURIES INCURRED DURING MISHAP:

List injuries in decreasing order of severity In fatal cases, list primary cause of death first Use standard medical terminology for body parts and diagnosis, and insert ICD code which most nearly describes injury in column provided. Indicate the estimated injury severity of each injury as if no other injury were present, using OPNAVINST 3750.6. For "Cause," briefly describe the mechanism of injury, i.e., "Hyperflexion," "Blunt Trauma," etc. (Explain in detail on the 3752/11 form.) Indicate external factors which affected mechanism of injury only if those factors can be established with a reasonable degree of confidence, and describe means for establishing that confidence, i.e., "paint from seat found on helmet," "aircrew statement," "rescuer's statement," etc. on the 3752/11 form. In the event more than five injuries were sustained, list the remaining injuries in Section [illegible] injuries (little things are important). Do not simply state "injuries multiple extreme" for fatalities

Example:

			ICD Code	INJURY SEVERITY CODE
1.	Body Part	Lumbar spine L-3	805.2	D
	Diagnosis	Anterior compression Fx		
	Cause	Hyperflexion due to ejection forces		
2.	Body Part			
	Diagnosis			

III. LAB TESTS:

Retain aliquot of frozen blood and urine for future use/verification, as per OPNAVINST 3750.6. Brain lactic acid to be obtained on all fatalities. Both serum and urine shall be submitted for drug screen testing.

"Elapsed Time" – indicate time in hours and minutes from time of mishap to time specimen obtained.

For all abnormal lab values, provide an explanation for value or indicate plan for follow up studies. Results of follow up studies [illegible] forwarded to the Naval Safety Center (Code 14). State whether abnormal lab results were significant or not to mishap. Place any additional lab results in Remarks section.

IV. X-RAY RESULTS:

Spinal x-rays are required following all ejections/bailouts or in any instance of suspected back injury as evidenced by pain or limitation of motion. Attach copy of x-ray reports to this form. Indicate name of facility where x-rays were made.

V. PREEXISTING DISEASES/DEFECTS:

List all known preexisting diseases/defects and diseases/defects present at time of mishap. Include all defects listed in BLOCK 74 of S.F. 88 such as defects of vision, hearing, etc.

VI. SELF-EXPLANATORY

VII. AUTOPSY:

Check as many boxes as are applicable.

Do NOT delay submission of FSR while awaiting return of AUTOPSY REPORT

<u>DO NOT WRITE HERE</u>

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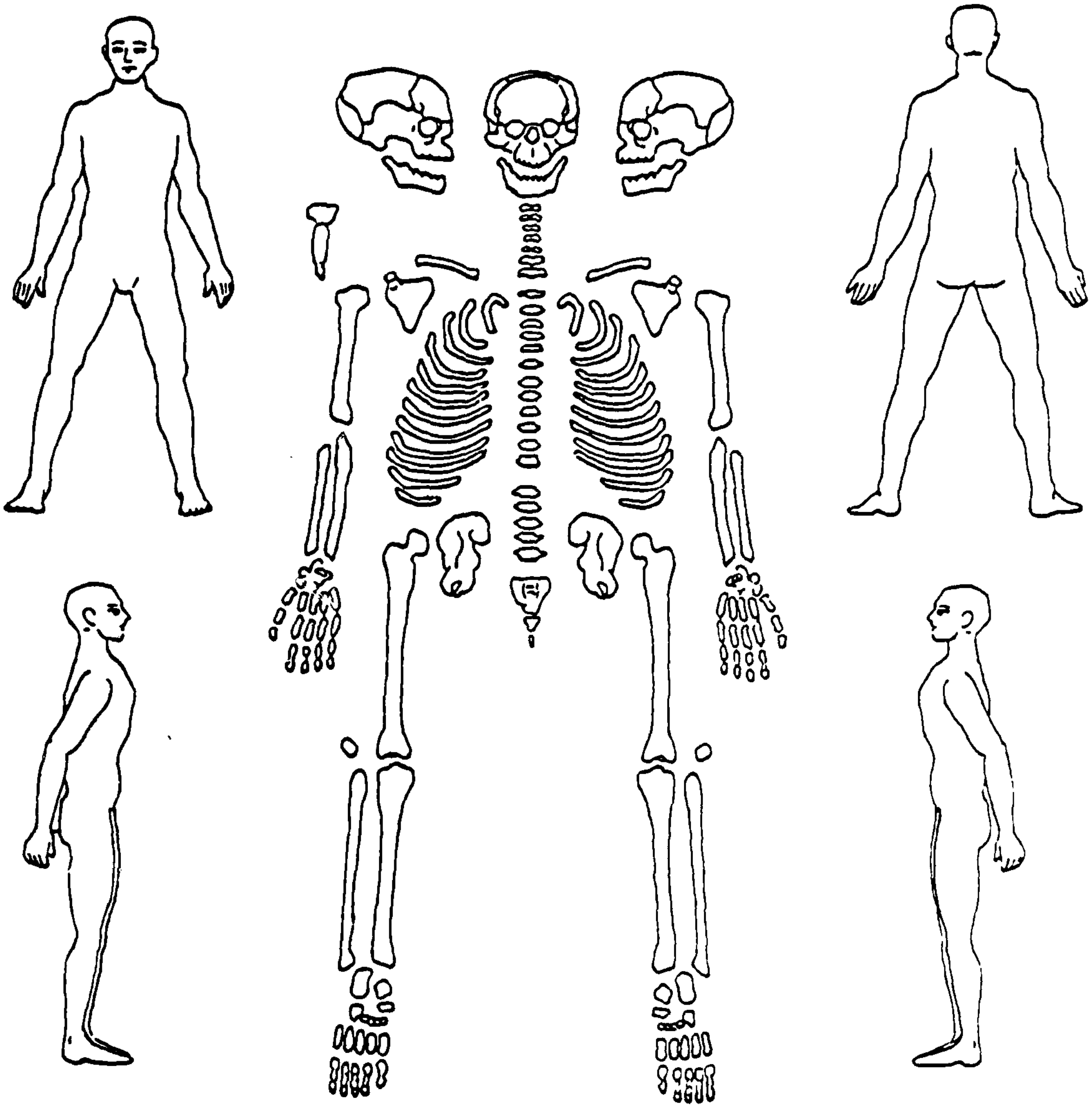
VIII INJURY PROFILE
(Please mark or draw injuries, where applicable)



IX REMARKS: List additional injuries and/or abnormal lab values related to this mishap, and any other pertinent remarks. (Continue on separate sheet, if necessary.)

NAME OF THIS INDIVIDUAL____________ **SSN**________ **AIRCRAFT**______ **BUNO**______

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/4: INJURY PROFILE

VIII. INJURY PROFILE:

Supplement with photographs where possible. Attach additional sheets of paper, as required. Send photos *only* to Naval Safety Center.

From external examination, specify exact location of the injury, abrasion, amputation, burn and degree, contusion, discoloration, hemorrhage, etc. on the included diagram.

From skeletal examination, specify exact location and type of fracture or dislocation on included diagram.

IX. REMARKS:

May be used for listing additional injuries, laboratory values, or any other information considered germane to investigation.

DO NOT WRITE HERE

FLIGHT SURGEON'S REPORT
PSYCHOPHYSIOLOGICAL AND ENVIRONMENTAL FACTORS
OPNAV 3752/5

REPORT SYMBOL
OPNAV 3752-1
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PLACE APPROPRIATE MISHAP FACTOR IMPORTANCE CODE (0=Present but did not contribute; 1=Possibly a factor; 2=Probably a factor; 3=Definitely a factor) in the applicable phase of mishap block (M=Mishap, E=Escape; S=Survival (includes parachute landings) and R=Rescue)

1. SUPERVISORY FACTORS	M	E	S	R
A. Inadequate Brief/Checkout				
B. Ordered/Led on Flight Beyond Capability				
C. Failure to Allow for Adequate Rest				
D. Tempo of Operations				
E. Lack of Aircrew Surveillance				
F. NATOPS Manual Inadequacy				
G. Other				

2. EXPERIENCE/TRAINING FACTORS	M	E	S	R
A. Limited Experience				
B. Inadequate Transition				
C. Lack of Currency/Proficiency				
D. Inadequate Knowledge of A/C Systems				
E. Inadequate Knowledge of ALSS				
F. Other				

3. HUMAN ENGINEERING DESIGN FACTORS	M	E	S	R
A. Design/Location of Instruments, Controls				
B. Lighting				
C. Workspace Incompatibility				
D. Anthropometric Incompatibility				
E. Confusion of Controls, Switches, Etc.				
F. Misread Instruments				
G. Visual Restrictions Due to Structure				
H. Task Oversaturation				
I. Inadvertent Operation				
J. Cockpit Standardization (Lack of)				
K. Personal Equipment Interference				
L. Inadequate Crashworthy Design				
M. Other				

4. COMMUNICATIONS FACTORS	M	E	S	R
A. Misinterpretation				
B. Noise Interference				
C. Disrupted Communications				
D. Poor Crew Coordination				
E. Other				

5. ENVIRONMENTAL FACTORS	M	E	S	R
A. Acceleration Deceleration Forces				
B. Decompression				
C. Vibration				
D. Heat/Cold				
E. Windblast				
F. Weather				
G. Visibility Restriction (Glare, etc.)				
H. Smoke, Fumes in Cockpit				
I. Air Turbulence				
J. Oxygen Contamination				
K. CO Poisoning				
L. Toxic Chemicals				
M. Work Area Lighting				
N. Radiation				
O. Pitching Deck				
P. High Seas				
Q. Electrical Shock				
R. Noise				
S. Other				

6. MEDICAL FACTORS	M	E	S	R
A. Poor Physical Conditioning				
B. Motion Sickness				
C. Fatigue				
D. Sleep Deprivation				
E. Missed Meals				
F. Medication(s) (self prescribed)				
G. Medication(s) (MD prescribed)				
H. Altered Consciousness				
I. Disorientation/Vertigo				
J. Visual Illusions				
K. Hypoxia				
L. Hyperventilation				
M. Dysbarism				
N. Circadian Rhythm Disturbance				
O. Hypothermia				
P. Hyperthermia				
Q. Other Acute (Illness(es)				
R. Pre-Existing Disease(s)				
S. Other				

7. BEHAVIORAL FACTORS	M	E	S	R
A. Faulty Planning (Pre-Flight, Flight)				
B. Haste (Hurried Departure, etc.)				
C. Get-Home-itis				
D. Boredom, Inattention, Distraction				
E. Preoccupation with Personal Problems				
F. Overconfidence, Excessive Motivation				
G. Lack of Confidence				
H. Apprehension/Panic				
I. Violation of Flight Discipline				
J. Error in Judgment				
K. Delay				
L. Lack of Motivation				
M. Interpersonal Tensions				
N. Inadequate Stress Coping				
O. Drug Abuse				
P. Alcohol/Hangover				
Q. Other				

REMARK(S): (List the number and letter from each item marked above, and briefly explain. Use separate sheet, if necessary.)

NAME OF THIS INDIVIDUAL______________ **SSN**________ **AIRCRAFT**______ **BUNO**______

INSTRUCTIONS FOR COMPLETION OPNAV 3752/5: PSYCHOPHYSIOLOGICAL AND ENVIRONMENTAL FACTORS

PARAMETERS:

For appropriate factor importance codes, see form. Care and sound judgment based on all facts shall be *exercised in the selection of items in* this section. A brief explanation concerning each item *selected shall be made in the "remarks"* section. A complete and full discussion of each factor selected shall appear on the Flight Surgeon's Analysis, Conclusions, and Recommendations form (3752/11).

DEFINITION OF TERMS:

M or Mishap phase: From the beginning of the emergency until its termination, with the occupant still inside the aircraft or until the occupant initiated an attempt to escape from the aircraft.

E or Egress/Escape phase: From *the initiation of the escape procedure* until actual exit from aircraft (on ground), or until contact with the ground or water (after inflight escape).

S or Survival phase: From the completion of ground/water egress or parachute *landing until physical contact was established with rescue* personnel or rescue vehicle.

R or Rescue/Recovery phase: From the time rescue personnel actually reached the individual until he has been recovered aboard ship or *hospital, or until rescue attempts were abandoned.*

1. "Supervisory Factors" shall be applicable to any and all levels of supervision, as appropriate, from petty officer to the highest level of command.
2. Experience/Training Factors:
   E. "ALSS" – Aviation Life Support Systems include ejection system (seat, parachute, restraint systems, etc.), O2 mask, flotation equipment, signaling devices, etc.
3. Human Engineering Design Factors:
   B. "Lighting" includes the design of cockpit lighting, formation lights, runway/carrier landing platform lighting, etc. which affects aircrew per*formance (does not include lighting of maintenance* workspaces, etc.).
   L. "Inadequate Crashworthy Design" includes the design of such items as the airframe, aircrew restraints, fuel systems, etc.
4. Communications Factors:
   A. "Misinterpretation" includes difficulty in understanding foreign accents or language, unintelligible utterings, nonstandard nomenclature, etc.
5. Environmental Factors:
   A. "Acceleration Deceleration Forces" applies to any phase of the mishap wherein these forces act as an adverse factor but does not include cases where death resulted from *extreme deceleration forces* or the complete disintegration of the aircraft on impact.
   M. "Work Area Lighting" refers to such things as inadequate lighting of maintenance spaces, line areas, or any problem with [illegible] workspaces.
6. Medical Factors:
   A. "Poor Physical Conditioning" includes any significant obesity.
   H. *"Altered Consciousness"* includes the full range from dazed to complete loss of consciousness according to the International Classification of Disease Code 780.
7. *Behavioral* Factors:
   M. "Interpersonal Tensions" refers to problems relating to others, e.g., wife, peers, superiors, subordinates.
   N. "Inadequate Stress Coping" refers to a problem in any phase which might affect the aircrewmember because of his inability to handle that level of psychological stress, whether it be due to an inflight emergency or to cumulative life difficulties stresses.

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I. AVIATION PHYSIOLOGY, EGRESS, AND WATER SURVIVAL TRAINING DATA:

A. Did the training contribute to any injury, rescue, or survival problem? YES ☐ NO ☐ POSSIBLY ☐

B. Did the lack of training contribute to any injury, rescue, or survival problem? YES ☐ NO ☐ POSSIBLY ☐

NOTE. If the answer to either A or B is yes, please explain on form 3752/11.

C. Type/Syllabus (most recent). Check one: TAC JET_____ HELO_____ CARGO/TRANS._____ OTHER _____

D. List only the most recent training	Place Training Accomplished	Completed (month year)	Role in Mishap*
Naval Aviation Physiology Training Program (NAPTP)			
1. Physiology Lectures			
2. Chamber flight (type profile)			
3. Sensory: Visual Problems			
4. Sensory: Flash Blindness			
5. Sensory: Scan Training			
6. Spatial Orientation-Lecture-Portovon			
7. Spatial Orientation-Vertigon (SMU-97/F)			
8. Spatial Orientation-MSDD (9B6)			
9. ALSS Lecture			
10. ALSS "hands on" training			
11. Signalling Devices (Drills)			
12. Emergency Egress System Lecture			
13. Emergency Ground Egress			
14. Emergency Bailout Egress			
15. Ejection Initiation (seat shot)			
16. Seat-Man Separation Drill			
17. Parachuting (four-line release)			
18. Seat Kit Deployment/Use Drill			
19. Emergency First Aid			
20. Helo Rescue (Land Phase) 9H1			
21. Annual Ejection Seat Training			
Naval Aviation Water Survival Training Program (NAWSTP)			
22. Water Survival Training-Lectures			
23. Water Survival Training-Drills			
24. Deep Water Environment (DWEST)			
25. Parasail Training			
26. Parachute Drag Training 9F2/9F2A			
27. Parachute Disentanglement 9F6			
28. Underwater Breathing 9H19			
29. Dilbert Dunker 9U44 series			
30. Multi-placed Dunker 9D5 series			
31. Helo Rescue (Water Phase) 9H1			
OTHER TRAINING			
32. Cold Weather Environmental Survival (CWEST)			
33. Jungle Environmental Survival (JEST)			
34. Desert Environmental Survival (DEST)			
35. Survival, Evasion, Resistance, Escape (SERE)			
36. Other			

*For role in mishap, use following codes.

1. Definitely helped
2. Possibly helped
3. Lack of training a possible factor
4. Lack of training a definite factor
5. Possibly hindered
6. Definitely hindered
9. Unknown
0. Not a factor

II. BACKGROUND: (complete for all pilots and for others who possibly contributed to mishap)

A. Leave Data

1. Date last leave taken _____
2. Duration last leave (days) _____
3. Type of leave last taken

_____ 1. Ordinary _____ 3. Sick or Convalescent

_____ 2. Emergency _____ 9. Unknown

B. Flight Data

1. Date of last flight _____

NAME OF THIS INDIVIDUAL _____ **SSN** _____ **AIRCRAFT** _____ **BUNO** _____

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/6: PERSONAL DATA

I. TRAINING:

All training requirements must be in accordance with OPNAVINST 3710.7 series and type commander directives. Answer items A and B by checking correct space. ***Fully explain*** a "yes" or "possibly" answer in the Analysis section (OPNAV 3752/11).

This information can be obtained from the health record/individual NATOPS training jacket, or from the site where the training was conducted. If training is deficient, e.g., out-of-date, a comment is required on the 3752/11 form. Item D36 refers to any other schools and/or training programs that this individual may have attended. Squadron training and any "other" physiology, egress and/or water survival training programs should also be listed. A copy of the training record from the health record or NATOPS qualification jacket should be included.

NOTE: *Section I* may be omitted on "selected" passengers that were not required to have the training. (A statement of this fact is required.)

Terms. "A L S S" – Aviation Life Support Systems

DO NOT WRITE HERE

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C. Work/Rest Data:

1. Hours worked:
   a. in last 24 hours: ______ hours
   b. in last 48 hours: ______ hours
   c. in last 72 hours: ______ hours
2. Continuous duty prior to mishap: ______ hours
3. Time in cockpit prior to flight (in hours and tenths): ______ hours
4. Hours continuously awake prior to mishap: ______ hours
5. Hours slept:
   a. in last 24 hours: ______ hours
   b. in last 48 hours: ______ hours
   c. in last 72 hours: ______ hours
6. Duration of last sleep period: ______ hours
7. Last sleep period was (see instructions)
   a. continuous ______ b. broken ______

III ANTHROPOMETRIC DATA:

A. Height Inches ______
B. Current Weight Pounds ______
C. Sitting Height Inches ______
D. Trunk Height Inches ______
E. Functional Reach Inches ______
F. Buttock-Knee Length Inches ______
G. Buttock-Leg Length Inches ______
H. Shoulder Width (Bideltoid) Inches ______
I. Anthropometric Coding (4 digit code IAW NAVAIRINST 3710.9) ______
J. Other BUTTOCK - POPLITEAL

IV GENERAL:

A. Date of Birth ____ Day ____ Month ____ Year
B. Date of last flight physical ______
C. Total years of formal education ______
D. Highest degree attained ______
E. Number and type of prior mishaps (complete for all pilots and/or other persons in control of aircraft).
   1. Number ______ 2. Type aircraft ______
   3. Describe mishap(s) briefly: ______

V. CHRONOLOGICAL ACCOUNT OF ACTIVITIES OF PREVIOUS 72 HOURS

(For all pilots, co-pilots, and/or persons possibly contributing to mishap. Continue on separate sheet, if necessary.)

NAME OF THIS INDIVIDUAL ______ SSN ______ AIRCRAFT ______ BUNO ______

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/6: PERSONAL DATA

II. BACKGROUND

C.7 "Sleep period" refers to a normal regular prolonged sleep period. An example of a "broken" sleep period is: An aircrewmember has the SDO watch, sleeps from 2200 to 0600, but is awakened three times by phone calls.

III. ANTHROPOMETRIC DATA:

Complete items A through H on all aircrewmen. Complete items A through I on all pilots and NFOs. Also complete A through I on any other individual who ejected, bailed out, or experienced any difficulty with equipment, fit, or egress. Complete item I IAW NAVAIRINST 3710.9. List as "other" in block J any unlisted measurements which result in anthropometric problems.

IV. GENERAL:

Items A, B, and D self-explanatory. Item C includes 12 years of education through high school, 4 years of college training, and any years spent in graduate education. Items E(1) and E(2) include all prior aircraft mishaps regardless of the cause of the mishap. This information shall be obtained from the NATOPS Flight Training Qualifications Jacket. Describe the circumstances of the mishap(s) and include any pertinent facts concerning the mishap in Item E(3).

V. CHRONOLOGICAL ACCOUNT OF ACTIVITIES OF PREVIOUS 72 HOURS:

This history should begin 72 hours prior to the time of the mishap and proceed in a chronological order. Among important items to consider are: (1) exact content of meals (if known), (2) alcohol consumption, (3) sleep periods, (4) stressful situations of any nature, (5) significant events, and (6) medications/drugs. Items listed should be accompanied by time of occurrence (if known). Provide comments concerning any deviation from normal habit patterns. An example is provided:

CHRONOLOGICAL ACCOUNT OF ACTIVITIES OF PREVIOUS 72 HOURS (sample):

FRIDAY: 2 OCT 81

1800 Ate dinner at home: turkey, mashed potatoes and gravy, peas, 2 glasses of red wine, coffee and apple pie a la mode
1900 Relaxed with family, watched TV, ate popcorn, drank 1 glass sherry.
2300 Went to bed. Took 2 *Coricidin* tablets for residual URI.

SATURDAY: 3 OCT 81

0700 Woke up, ran 2 miles.
0800 Showered, breakfast with family: 1 egg, 2 strips bacon, 1 slice toast, orange juice and coffee
0830 Read paper, relaxed.
0900 Worked on car, mashed finger, finger throbbing, took 2 APCs, treated finger with iodine, band-aid
0930 Cut grass.
1130 Ate lunch: bologna sandwich, iced tea.
1200 Went shopping with wife.
1700 Dinner at a pizza parlor – ate half of a large pepperoni and mushroom pizza, drank small pitcher of beer
1800 Went to movie with family.
2030 Arrived back home, relaxed, listened to music, 1 glass brandy.
2200 Went to bed.
2300 Finger throbbing, got up and took 2 APCs.
2330 Back to bed.

SUNDAY: 4 OCT 81

0800 Woke up, ran 2 miles.
0900 Showered, breakfast with family, 8-ounce glass orange juice, coffee, 2 waffles with syrup
0930 Read Sunday paper.
1030 Dressed for church.
1100 Left to go to church with family.
1330 Lunch at hamburger joint, 1 quarter-pound cheeseburger, fries, and large coke
1400 Took kids to zoo and park.
1600 Returned home, watched sports on TV, 2 beers.
1900 Supper at home, spaghetti and meat sauce, 2 glasses Chianti, salad, 2 slices garlic bread
2000 Call from mother: father had heart attack, in hospital, condition – satisfactory.
2200 1 glass sherry, went to bed.
2300 Awakened by baby crying, helped wife with sick baby.
2400 To sleep.

MONDAY: 5 OCT 81

0530 *Awoke, ran 2 miles.*
0600 Showered, dressed for work, no breakfast.
0630 Left for squadron.
0700 Arrived at squadron.
0730 Brief for flight.
0900 Fly – *one-on-one ACM mission with F-14s from sister squadron.*
1015 Land at NAS Homebase.
1040 Debrief
1100 To Division Office, paperwork.
1200 Lunch: hot dog, coke, candy bar.
1300 In Squadron maintenance spaces.
1630 Brief for hop.
1700 T.O.
1800 Firewarning light, observed deteriorating engine instruments, flames and smoke, ejected no injury
1815 Rescued by SAR helo.
1830 Landed at NAS Homebase, to dispensary.

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NOMENCLATURE	Specific Type	Required	Available	Used/Worn	Needed	PROBLEM(S)/ CONDITION(S) CODE
1. HELMET						
a. Helmet Visor						
b. Chin Strap						
c. Nape Strap						
d. Reflective Tape						
2. GLASSES (prescription/plano)						
3. OXYGEN MASK						
a. Oxygen Regulator						
b. Oxygen Mask Retainer Fittings						
4. UNDERWEAR						
5. FLIGHT SUIT						
6. FLIGHT GLOVES						
7. BOOTS						
8. ANTIEXPOSURE SUIT						
9. SURVIVAL VEST						
CONTENTS:						
a. Radio						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						
j.						
10. HARNESS, INTEGRATED RESTRAINT, MA-2(SIZE)						
11. HARNESS, NONINTEGRATED STANDARD						
12. HARNESS, OTHER						
13. HARNESS, INTEGRATED RESTRAINT (MA-2) MODIFIED BY ACC-380 (size)						
CONTENTS:						
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						
14. ANTI-G-SUIT						
15. LIFE PRESERVER						
Autoinflator						
16. LIFE RAFT						
17. EJECTION SEAT						
a. Restraint System						
b. Leg Restraint/Garters						
18. PARACHUTE						
a. Parachute Canopy Release						
b. Automatic Parachute Divestment Devices						
c. 4-line release						

NAME OF THIS INDIVIDUAL____________ SSN________ AIRCRAFT______ BUNO______

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/7: AVIATION LIFE SUPPORT SYSTEMS

List all individual protective equipment and life support systems (e.g. O2 regulator, multiplace liferaft, parachute) that did or could have affected survivability. For numbers 9, 13, 19, and 20, continue listing in number 22 or on separate sheet, if necessary.

In the column "specific type," list the specific model of equipment clothing, when applicable, in accordance with NAVAIR 13-1-6 series Crew Systems Manuals maintained by the life support equipment specialist. For ejections, the specific type and model of ejection seat and type of parachute shall always be listed (i.e., don't just say Martin Baker, Escapac, etc.). Consult with life support equipment and ejection seat personnel to ensure that specific nomenclature and types of equipment are properly listed. Include service changes and modifications to aid in pinpointing the identity and configuration of a particular item. The part number is useful and should be included when possible.

When applicable, the columns "required," "available," "used worn," and "needed" are to be filled in with a "Y" for yes, "N" for no, or "U" for unknown. The column "required" refers to items that were required by "official directives." For example, OPNAVINST 3710.7, NAVAIR 13-1-6 series manuals and or type commander directives. (Note: If other than OPNAVINST 3710.7 or NAVAIR 13-1-6 series, list the directive.) "Available" indicates that the individual had this with him or available to him at the time of the mishap. "Used/Worn" is self-explanatory. "Needed" indicates that the item did or could have improved survivability.

The column "problem(s) condition(s)" is extremely important and shall be completed with a great deal of care. Enter the codes only if the problem condition is known reported or real evidence exists to substantiate it. The fit of flight clothing/garments (e.g., torso harness, helmet, anti-G suit) shall be specifically addressed in terms of its effect(s) on performance and survivability. All problems/conditions coded shall be discussed in the Remarks section.

Use specific code number(s) to indicate the nature of a problem/condition whenever possible. For example, in the case of a failure, in addition to or instead of entering a 10, any of the following could also be applicable: 15, 17, 21, 35, and/or 36. More than one problem condition may apply and any one problem condition frequently leads to another. Ensure the codes are listed in chronological order of occurrence. Add the phase of the mishap (see mishap phase codes) to the number, when known. Bracket all related problems/conditions. Example: A pilot loses his helmet during ejection because the chin strap is not tightened properly. During helo rescue hoisting, he hits his head on the helo and suffers a scalp laceration and concussion. In the "problems" column, enter the following on the line where helmet data have been reported (24M, 04E, 45R). Bracket the items to indicate relationship of events.

The "Problem/Condition" codes provided represent most of the problem factors which historically have been associated with Life Support Systems. Ongoing studies of tabulations of these problems/conditions result in recommendations for the evaluation and development of improved ALSS, and in instructions for their maintenance and use to ensure maximum aircrew protection. Note: Do not list equipment as being damaged or failing if impact forces were of such magnitude that it could not have been expected to remain intact.

PROBLEM/CONDITION CODES

01 – Not available – supply problem
02 – Not available – left behind
03 – Discarded
04 – Lost
05 – Damaged – Minor
06 – Damaged – Major
07 – Burned – Minor
08 – Burned – Major
09 – Destroyed by extreme force/fire
10 – Failed to operate (radio, actuator, etc.)
11 – Operated partially
12 – Difficulty locating
13 – Beyond reach
14 – Connection/closure difficulty
15 – Connection/closure failure
16 – Release/disconnect difficulty
17 – Release/disconnect failure
18 – Inadvertent release/disconnect
19 – Inadvertent actuation
20 – Actuation difficulty
21 – Actuation failure
22 – Actuated by other person
23 – Restraint/attachment inadequacy
24 – Restraints/attachments not used properly for maximum protection
25 – Improper use (other)
26 – Unfamiliar with use
27 – Cold hampered use
28 – Injury hampered use
29 – Water hampered use
30 – Other equipment interfered
31 – Donning/removal problem
32 – Discomfort/bulkiness
33 – Poor fit
34 – Leaked
35 – Material deficiency
36 – Design deficiency
37 – Hangup/entanglement with A/C or other equipment
38 – Entanglement (Parachute suspension lines only) – Major
39 – Entanglement (Parachute suspension lines only) – Minor
40 – Dragging (Parachute only)
41 – Non-standard configuration
42 – Aided in location/rescue
43 – Not effective in location/rescue (used in area of SAR vehicles)
44 – Prevented/minimized injury
45 – Equipment problem (loss, failure, etc.) a factor in producing injury
46 – Equipment produced injury (hit by ejection seat, etc.)
47 – Failure/delay in using compromised survival/rescue
48 – All crew equipment (code only once)
49 – Maintenance/installation error
50 – Problem experienced by others in actuation/release of equipment
51 – Equipment damage – self induced
52 – Equipment failure – self-induced
53 – Air dropped equipment
54 – Not available – needed
55 – Available – needed, not used
56 – Dislodged from normal position
60 – Other (specify)

MISHAP PHASE CODES

M = Mishap
E = Egress
D = Descent (after ejection/bailout)
L = Landing (parachute) from first contact with ground, water, building, tree, etc., until stable
S = Survival
R = Rescue
U = Unknown
T = Not applicable

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NOMENCLATURE	Specific Type	Required	Available	Used/ Worn	Needed	PROBLEM(S)/ CONDITION(S) CODE
19. SEAT SURVIVAL KIT CONTAINER ______ CONTENTS						
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						
j.						
k.						
20. OTHER LIFE SUPPORT EQUIPMENT (Use also for ground personnel involved)						
a.						
b.						
c.						
d.						
21. ID TAGS ______						

(APPROPRIATE REFERENCE FOR THIS SECTION: NAVAIR 13-1-6 SERIES MANUAL. AVAILABLE AT PARALOFT)

22. REMARKS: List number and letter of each problem/condition marked above and briefly explain.

NAME OF THIS INDIVIDUAL ______________________ **SSN** ____________ **AIRCRAFT** ________ **BUNO** ________

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I. LOCATION IN AIRCRAFT (crew/passenger seating)

A. Location
1. ______ Cockpit (pilot/copilot compartment)
2. ______ Navigator/Engineer Compartment
3. ______ Cabin/Passenger Compartment
4. ______ Other
9. ______ Unknown

B. Longitudinal Location
1. ______ Forward
2. ______ Center
3. ______ Aft
9. ______ Unknown

C. Lateral Location
1 ______ Center
2 ______ Left Side
3 ______ Right Side
9. ______ Unknown

D. Direction Facing
1. ______ Forward
2. ______ Aft
3. ______ Sideward
9. ______ Unknown

E. Use of Seat
1. ______ Not in Seat
2. ______ In Seat
3. ______ Bunk/Litter
9. ______ Unknown

II. ESCAPE (see instructions for definition of terms)

A. Method

1. Ejection
1. ______ Accomplished (free of cockpit)
2. ______ Initiated (did not clear cockpit)
3. ______ Attempted (not initiated)
4. ______ Seat Ejected on Impact With Terrain
5. ______ Inadvertent Ejection
6. ______ Underwater Ejection
7. ______ Unknown if Attempt Was Made
8. ______ Suspected Ejection
9. ______ Definitely Not Attempted

2. Bailout
1. ______ Accomplished (free of aircraft)
2. ______ Attempted (not accomplished)
3. ______ Bailed Out After Ejection Attempt Failed
4. ______ Unknown if Attempt Was Made
5. ______ Suspected Bailout
6. ______ Definitely Not Attempted

3. Other
1. ______ Standard Emergency Ground Egress
2. ______ Underwater Egress (not ejection)
3. ______ Did Not Escape
4. ______ Exit Unassisted (other than #1)
5. ______ Carried/Assisted Out
6. ______ Blown/Thrown Out
7. ______ Jumped/fell from A/C (airborne)
8. ______ Unknown if Escape Accomplished
9. ______ Escape Method Unknown

4. Sequence of Actions Performed Prior to Egress
1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______

B. Intent for Escape
1. ______ Intentional
2. ______ Unintentional, Self-induced
3. ______ Unintentional, Mechanical
4. ______ Unintentional, Other-induced
9. ______ Intent Unknown

C. Communications Prior to Escape
1. ______ Distress Signal Transmitted
2. ______ Position Fix Transmitted
3. ______ Emergency IFF (manual)
4. ______ Emergency IFF (automatic)
5. ______ None
6. ______ Other
9. ______ Unknown

D. Order of Escape ______ of ______

E. PREVIOUS EJECTIONS/BAILOUTS
Number of Ejections ______
Number of Emergency Bailouts ______
Other Parachute Jumps (training sky diving etc.) ______
______
______

III. COCKPIT/CABIN CONDITION AFTER IMPACT

1. ______ Aircraft Abandoned in Flight
2. ______ No Damage (other than canopy loss, etc.)
3. ______ Minor Damage (definitely habitable)
4. ______ Reasonably Intact (probably habitable)
5. ______ Major Damage (probably not habitable)
6. ______ Destroyed (definitely not habitable)
9. ______ Unknown

IV. TERRAIN OF PARACHUTE LANDING OR CRASH SITE (more than one may be applicable)

A ______ Open Sea
B ______ Large Lake
C ______ River
D ______ Deep Water, Other
E ______ Shallow Water
F ______ Deep Snow
G ______ Thick Ice
H ______ Marsh/Swamp/Mud
I ______ Soft Ground
J ______ Building
K ______ Flight Deck
L ______ Dense Woods
M ______ In Trees
N ______ Ravine/Steep Slope
O ______ Rocks
P ______ In/Near Fireball
Q ______ Desert
R ______ Through Trees
S ______ Hard Ground
T ______ Not Applicable Aircraft Landed Normally
U ______ Runway
V ______ Unknown
Z ______ Other (Explain)

NAME OF THIS INDIVIDUAL ______ SSN ______ AIRCRAFT ______ BUNO ______

INSTRUCTIONS FOR COMPLETING OPNAV 3752/8: ESCAPE – EGRESS

I. Indicate where this individual was located at the time of the mishap. If individual was in the passenger or crew compartment of a large aircraft, indicate approximate location (forward, center, or aft section). A line drawing with the individual's location marked is desirable in multi placed aircraft.

II. A.1. "Ejection" is the completion of action by the aircrewmember to initiate the ejection sequence (raising handle, and/or squeezing trigger and/or pulling face curtain), regardless of the outcome of the action, e.g., an "ejection" includes those cases wherein the sequence is interrupted by ground impact or system malfunction.

A.2. A bailout is an emergency egress with a parachute from an aircraft aloft without the use of an automated aircrew escape system.

A.3. "Other" refers to any type of egress not listed under Ejection or Bailout.

A.4. List the sequence of preparatory actions accomplished by this individual before he/she actually egressed from the aircraft. This information is important for emergency egress training and elaboration of NATOPS changes. Examples would be: visor down, lap belt/shoulder harness straps adjusted, MAYDAY, seat moved/adjusted, tightened mask, crew alert, etc.

II. B,C, and E. Self-explanatory.

D. Give order of egress from aircraft, e.g., first of five (1 of 5), first of one (1 of 1), etc. If unknown, so state.

III. If 1. is checked, an attempt can still be made to ascertain the condition of the cockpit/cabin after impact. This helps determine crash force survivability and cockpit crash worthiness.

IV. Self-explanatory.

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V. AIRCRAFT PARAMETERS AT TIME OF ESCAPE (Either inflight or after crash, ditching, etc.)

1. Altitude ________ FT (AGL)
2. Airspeed ________ KIAS
3. Ground Speed ________ KTS (if not airborne)
4. Sink Rate ________ FT/MIN
5. Nose Up ________ °
6. Nose Down ________ °
7. Right Bank ________ °
8. Left Bank ________ °
9. ___Inverted
10. ___Nose Down Spin
11. ___Flat Spin
12. ___Oscillating Spin
13. ___Tumbling
14. ___Mushing
15. ___Disintegrating
16. ___Rolling
17. ___Other (describe) ________
18. ___Unknown
19. Rate of Roll ________ °/SEC.
20. Rate of Pitch ________ °/SEC.
21. Rate of Yaw ________ °/SEC.
22. ___*G Forces: (Estimate number and vector)

________ / ________

*If G forces were a factor during the mishap/egress phase, explain briefly below. Discuss fully on 3752/11. ________

____

____

____

VI. EGRESS PROBLEMS (Place X in appropriate column)

B. Before; D – During; A – After (Egress)

			Ground			Water			Air			
			B	D	A	B	D	A	B	D	A	
1.	Buffeting	01										01
2.	*G Forces	02										02
3.	Windblast	03										03
4.	Seat Left in "Safed" Condition	04										04
5.	Difficulty Locating Canopy Jettison Mechanism	05										05
6.	Hampered by Clothing	06										06
7.	Hampered by Equipment (include body armor)	07										07
8.	Hampered by Injuries	08										08
9.	Difficulty Releasing Canopy/Hatch	09										09
10.	Failure to Release Canopy/Hatch	10										10
11.	Face Curtain Failed to Activate Seat	11										11
12.	Face Curtain Problem (locating, reaching, etc.)	12										12
13.	Lower Ejection Handle Failed to Activate Seat	13										13
14.	Lower Ejection Handle Problem (locating, etc.)	14										14
15.	Canopy Jettison Problem	15										15
16.	Canopy Jettison Failure (automatic means)	16										16
17.	Could Not Open Canopy/Hatch	17										17
18.	Difficulty Releasing Restraints	18										18
19.	Difficulty Reaching Hatch/Exit – Obstructions	19										19
20.	Difficulty Reaching Hatch/Exit – Injuries	20										20
21.	Difficulty Reaching Hatch/Exit – Aircraft Attitude	21										21
22.	Difficulty Reaching Hatch/Exit – Equipment Hangup	22										22
23.	Pinned in Aircraft (other than equipment hangup)	23										23
24.	Confusion/Panic/Disorientation	24										24
25.	Darkness/No Visual Reference	25										25
26.	Fire/Smoke/Fuel	26										26
27.	Anthropometric Problem	27										27
28.	Personal Equipment Factor (other than hangup)	28										28
29.	Upper Extremities Hit Cockpit Structures	29										29
30.	Lower Extremities Hit Cockpit Structures	30										30
31.	Man Struck Canopy/Canopy Bow	31										31
32.	Struck External Surface of Aircraft	32										32
33.	Flailing – Upper Extremities	33										33
34.	Flailing – Lower Extremities	34										34
35.	Drogue Slug Swinging	35										35
36.	Drogue Slug Struck Man	36										36
37.	Man Struck by Other Equipment	37										37
38.	Seat/Man Collision	38										38
39.	Seat Separation Difficulty	39										39
40.	Seat/Parachute Entanglement	40										40
41.	Parachute Riser Interference	41										41
42.	Man Entangled in Raft Lanyard	42										42
43.	Parachute Line Over/Inversion/Semi-Inversion	43										43
44.	Man Held onto Seat	44										44
45.	Tumbling/Spinning (man and/or seat)	45										45
46.	Parachute Container Did Not Open	46										46
47.	Parachute Canopy Streamed/Malfunctioned	47										47
48.	Inadvertent Opening of Lap Belt	48										48
49.	Failure of Lap Belt to Open	49										49
50.	Inrushing Water	50										50
51.	Cold	51										51
52.	Unconscious/Dazed	52										52
53.	Other (explain)	53										53

VII. REMARKS OR CONTINUATION: (List number and letter of each egress problem marked and briefly explain each. Continue on a separate sheet, if necessary.)

NAME OF THIS INDIVIDUAL ________ **SSN** ________ **AIRCRAFT** ________ **BUNO** ________

INSTRUCTIONS FOR COMPLETING OPNAV 3752/8: ESCAPE – EGRESS

V. Fill in or check the spaces to accurately describe the condition of the aircraft at the time of the escape. Indicate the approximate degrees of pitch and bank. If straight and level, enter "0" degrees. Check all parameters necessary to adequately describe condition at escape.

VI. Complete for all aircraft occupants who experienced egress difficulties. Normally, only one section will apply: e.g., in the air, on the ground, or on or underwater. There will be cases when problems were experienced in preparation for egress while still airborne, or on the ground or in the water. However, problems checked must relate to the egress attempt, not to the emergency phase preceding the initiation of the escape. The following guidelines apply:

- **"B"** – Before Egress – from initiation of egress attempt until the individual is on his/her way out of the aircraft.
- **"D"** – During Egress – from start of movement out of the aircraft until his/her body is outside the confines of the aircraft structure.
- **"A"** – After Egress – from outside of the aircraft until he/she reaches the ground or water (if inflight egress), or until he/she is clear of all parts of the aircraft (if on ground or in water).

VII. Remarks and/or explanation(s) of any egress problems here.

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I. TIME FROM EMERGENCY UNTIL ESCAPE ATTEMPT WAS INITIATED Hours_____ Minutes_____ Seconds_____

II. DELAY IN INITIATING ESCAPE DUE TO:

a.
___ 1. Avoiding Populated Area
___ 2. Avoiding Unsuitable Terrain
___ 3. Insufficient Altitude
___ 4. Excess Altitude
___ 5. Excess Airspeed
___ 6. Adverse Aircraft Attitude
___ 7. Adverse Body Position
___ 8. None
___ 9. Unknown
___ 10. Other (describe) __________

b. ___ Delayed Decision to Eject Because Attempting to Overcome Problem

III. PROTECTIVE HELMET/O_2 MASK

	CHIN STRAP FASTENED			HELMET VISOR LOWERED			O_2 MASK FASTENED (BOTH SIDES)		
	YES	NO	UNK	YES	NO	UNK	YES	NO	UNK
1. Before Emergency									
2. During Egress									
3. During Landing									
4. During Rescue									

IV. EJECTION ENVELOPE.

___ 1. Within the Envelope
___ 2. Outside the Envelope
___ 3. Possibly Outside Envelope (marginal)
___ 9. Unknown

V. REMOVAL OF AIRCRAFT CANOPY:

A. INTENT
___ 1. Intentional
___ 2. Unintentional, Self-induced
___ 3. Unintentional, Mechanical
___ 9. Unknown

B. INITIATED BY
___ 1. This Individual
___ 2. Another Individual
___ 3. Other __________
___ 9. Unknown

C. REMOVAL
___ 0. Definitely Not Attempted
___ 1. Jettisoned Successfully
___ 2. Attempted (unsuccessful)
___ 3. Unknown if Attempted
___ 4. Ejected Through Canopy
___ 5. Complete Cutting of Glass
___ 6. Partial Cutting of Glass

D. METHOD
___ 1. Ejection Sequence
___ 2. Manually Unlocked
___ 3. Canopy Jettison Handle
___ 4. External Force (explain) __________
___ 8. Other __________
___ 9. Unknown

VI. METHOD OF EJECTION INITIATION

___ 1. Arm Rest
___ 2. Face Curtain
___ 3. Lower Ejection Handle
___ 4. Command Sequencer
___ 5. Impact
___ 6. Fire
___ 7. Mechanical Malfunction/Failure
___ 8. Other External Force (explain) __________
___ 9. Unknown

VII. BODY POSITION AT EJECTION (As compared to optimal)

		A. Head	B. Hips	C. Feet	D. Elbows
Optimal	1				
Forward	2				
Upward	3				
Lateral	4				
Unknown	9				

VIII. POSITION OF EJECTION SEAT

___ 1. Full Up
___ 2. Full Down
___ 3. Intermediate Position
___ 9. Unknown

IX. METHOD OF SEPARATING MAN FROM SEAT

___ 0. Did Not Separate
___ 1. Automatic (as designed)
___ 2. Manual Override
___ 8. Other (describe) __________

X. METHOD OF DEPLOYING PARACHUTE

___ 0. Not Deployed
___ 1. Automatic (as designed)
___ 2. Manual
___ 8. Other (describe) __________
___ 9. Unknown

XI. PARACHUTE OPENING SHOCK

___ 0. Negligible
___ 1. Moderate
___ 2. Severe
___ 9. Unknown

XII. OSCILLATIONS	0-Negligible	1-Moderate	2-Severe	9-Unknown
A. During descent prior to 4-line release system actuation.				
B. During descent after 4-line release system actuation.				
C. During descent without 4-line release system installed/actuated.				
D. Accentuated by seat survival kit deployment.				

XIII. PARACHUTE DAMAGE (Give number of)

1. Severed Suspension Lines _____
2. Missing Panels _____
3. Torn Panels-Major _____
4. Torn Panels-Minor _____

XIV. CAUSE OF PARACHUTE DAMAGE

___ 1. Opening Shock
___ 2. Fouled on Ejection Seat
___ 3. Fouled on Aircraft
___ 4. Fire
___ 5. Landing
___ 6. Trees
___ 7. Dragging
___ 8. Other (Describe) __________
___ 9. Unknown

NAME OF THIS INDIVIDUAL__________ **SSN**__________ **AIRCRAFT**__________ **BUNO**__________

INSTRUCTIONS FOR COMPLETING OPNAV 3752/9: EJECTION OR BAILOUT

An Ejection/Bailout Episode is the sequence of events beginning with the ejection/bailout initiation and ending after parachute landing.

I. – Time commences from the moment that the aircrewmember recognized that an ejection/bailout situation existed. Use "est" for estimated if actual times cannot be determined. In many mishaps, an emergency does not warrant an immediate attempt to leave the aircraft, instead, an emergency landing, ditching, etc., may be attempted. When this proves futile due to recognition of deterioraton of the situation (e.g., flameout, loss of control, realization that runway cannot be reached, etc.), a decision to escape is made. Give the time from this recognition until escape attempt was initiated.

II. A. There may be one or more reasons for delaying the initiation of escape. If known, provide these in numerical sequence (1,2,3...).

B. Refers only to the period of time before ejection decision.

III. – Self-explanatory

IV. – As defined in the aircraft's NATOPS manual. (Check only one block)

V. – This section is designed to show how and by whom the canopy was removed. *Ejection through the canopy means literally through the canopy glass.* Complete or partial cutting of the glass (V. C. 5&6) refers to the action of canopy fracturing systems. Consult NAVAIR 11-100-1 technical manual and ejection seat specialists (paraloft) for assistance.

VI. – If ejection was initiated by ground impact or mid-air collision, check block #5. If ejection was initiated by windblast, etc., check block #8 and explain.

VII. – The optimal body position for ejection is: head against headrest, chin slightly elevated, hips all the way back, feet on the rudder pedals, heels on the deck and elbows tucked in. Check the appropriate boxes to indicate in what direction these parts of the body were displaced from the optimal, or to indicate that the body parts were in optimal position.

VIII., IX. & X. – Self-explanatory

XI. – Based on the survivor's statements and/or your judgment.

XII. – Based on the survivor's/witnesses' statements.

XIII. – Consider a panel missing if the damage is so severe that it is totally ineffective as a means of deceleration, even though remnants are still attached to the edges of the panel. Identify gores and panels by number and letters based upon information in NAVAIR 13-1-6.2 Personnel Parachute Manual. Use this information to fill in parachute damage chart (obtainable from paraloft.)

XIV. – More than one cause may apply. Number in sequence, if known. Parachute engineers (e.g. NAVWPNCEN (Code 64) China Lake) should be consulted prior to determination, when possible.

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XV. DIRECTION FACED AT PARACHUTE LANDING WITH RESPECT TO HORIZONTAL TRAVEL

___1. Directly Facing
___4. Quartering, Back
___2. Facing Away
___5. Directly Sideways
___3. Quartering, Facing
___9. Unknown

XVI. LANDING CONDITIONS

1. Surface Winds:_______Knots.
2. Dragged by Chute:____Yes____No
3. Distance/time dragged:_____Yards_____Sec.
4. Underwater utilization of emergency oxygen ___Yes ___No

XVII. CANOPY DEFLATION POCKETS (Water landing only)

___0. Not Effective in Collapsing Chute
___8. Unknown if Installed
___1. Aided in Collapsing Chute
___9. Unknown if Effective
___7. Not Installed

XVIII. SEQUENCE OF ACTIONS ACCOMPLISHED BEFORE LANDING

	USE	ORDER		USE	ORDER
A. Life Preserver Actuated			F. 4-line Release System Actuated		
B. Survival Kit Deployed			G. Parachute Canopy Release Actuated		
C. Life Raft Actuated (if not auto)			H. Helmet Visor Raised		
D. O_2 Mask Removed			I. Other (describe)		
E. Gloves Removed					

XIX. SEQUENCE OF ACTIONS ACCOMPLISHED AFTER LANDING

	USE	ORDER		USE	ORDER
A. Life Preserver Actuated			F. Boarded Liferaft		
B. Survival Kit Deployed			G. Parachute Canopy Release Actuated		
C. Life Raft Actuated (if not auto)			H. Helmet Visor Raised		
D. O_2 Mask Removed			I. Other (describe)		
E. Gloves Removed					

XX. PARACHUTE ACTUATION DURING BAILOUT

___A. Automatic Parachute Actuator Lanyard Connected
___B. Parachute Actuated Manually (D-Ring)
___C. Other (Describe) ______________________________

XXI. REMARKS List number and letter of each item marked above and briefly explain each item.

NAME OF THIS INDIVIDUAL__________________ **SSN**__________ **AIRCRAFT**________ **BUNO**________

INSTRUCTIONS FOR COMPLETING OPNAV 3752/9: EJECTION OR BAILOUT

XV. – Show direction the individual was facing with respect to the horizontal travel over the surface.

XVI. – Use "est." if an estimate.

XVII. – Self-explanatory

XVIII. & XIX. – In the column "use," enter one of the following letters, as appropriate **Y** – yes, **F** – attempted/failed, **N** – not attempted, **U** – unknown/not applicable. In the column "order," enter the number **1,2,3,** etc. to indicate the order in which the action was accomplished or attempted. If the survival kit or 4-line release was deployed before parachute landing, indicate in the "Remarks" section specifically when they were deployed and effect deployment had on parachute oscillations, if any.

XX. – Self-explanatory (complete only for bailouts).

XXI. – Briefly explain answers that are not covered adequately by the blocks available on the form. If appropriate, describe the individual's physical state just prior to landing in terms of altered consciousness or impaired ability to perform a Parachute Landing Fall (PLF) or water landing.

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I. CONDITIONS PREVAILING AT SURVIVAL/RESCUE SITE (if widely variable, give range)

A. Temperature/Winds/Waves

1. Water Temperature ____°F
2. Air Temperature ____°F
3. Surface Winds ____ Knots ____°
4. Wave Height ____ Feet
5. Wave Frequency ____ Per Minute

B. Terrain

____ 1. Open Ground
____ 2. Woods/Jungle
____ 3. Mountains
____ 4. Desert
____ 5. Water
____ 6. Ice/Snow
____ 7. Swamp
____ 8. Other
____ 9. Unknown

C. Weather

____ 1. Clear
____ 2. Overcast
____ 3. Fog
____ 4. Rain
____ 5. Snow
____ 6. Sleet
____ 7. Hail
____ 8. Other
____ 9. Unknown

II. TIME LAPSE SEQUENCE FOR ACTUAL RESCUE VEHICLES/PERSONNEL

	ACTUAL RESCUER (24 HOUR CLOCK)	ELAPSED TIME	LIGHT CONDITIONS (CHECK ONE FOR EACH)			
			DAWN	DAY	DUSK	NIGHT
A. Rescue personnel notified that mishap had occurred						
B. Rescue vehicle departed						
C. This individual located by rescue personnel						
D. This individual physically reached by rescue vehicle personnel						
E. This individual actually in rescue vehicle or rescue attempt abandoned						
F. Rescue completed (Person returned to station, hospital, etc.)						

III. TIME THIS INDIVIDUAL SPENT: A. IN WATER ____ HRS ____ MIN B. IN LIFE RAFT ____ HRS ____ MIN

IV. PERSONNEL/VEHICLES PARTICIPATING IN RESCUE

A. Vehicle Performing Actual Pickup of This Person

1. Organization ____
2. Type/Model ____
3. Location When Alerted ____
4. Duty When Alerted ____
5. Miles from Rescue Vehicle/Personnel to Victim(s) (straight-line distance) ____
6. Actual Miles Rescue Vehicle/Personnel Traveled ____

B. SAR Report Information

1. SAR Report Attached ☐ Yes ☐ No
2. If #1 is "No", SAR Report Number ____
3. Report Available from (activity) ____

C. Did Rescue Personnel Leave Vehicle to Assist in Rescue?

1. Yes ____ 2. No ____ → If yes, how?

____ A. Parachuted
____ B. Jumped Without Parachute
____ C. Descended Line/Ladder/Net
____ D. Lowered by Hoist
____ E. Normal Ground/Water
____ Y. Other ____

V. ASSIST VEHICLES THAT ATTEMPTED RESCUE

A. Organization ____
B. Type/Model ____ C. Experienced Problems: Yes ____ No ____ (If yes, comment in REMARKS section)
D. List Other Vehicles Participating in Rescue Effort or Who Stood by Ready to Render Assistance if Required:
1. ____
2. ____
3. ____

VI. RESCUE ALERTING MEANS (Use numbers to show sequence)

____ A – Witnessed
____ B – Radar Surveillance
____ C – Overdue Report to SAR
____ D – Airborne Rapid Relay
____ E – Crash Phone
____ F – Other Telephone
____ G – Radio MAYDAY Call
____ H – Survival Radio
____ I – Other Radio Report
____ J – Visual Signaling Equipment
____ K – Audio Signaling Equipment
____ L – Survivor Report
____ M – Loss of Radio Contact
____ N – Smoke/Fire/Crash Scene
____ Y – Other (Describe) ____

VII. ALERTING COMMUNICATIONS PROBLEMS

____ A – Poor Radio Reception
____ B – Telephone Line Busy
____ C – Poor Radio Discipline
____ D – Aircraft Radio IFF Equipment Inoperative
____ E – Poor Radio Procedures
____ F – Language Problems
____ G – Incompatible Radio Frequency
____ H – None
____ Y – Other ____

NAME OF THIS INDIVIDUAL ____ **SSN** ____ **AIRCRAFT** ____ **BUNO** ____

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/10: SURVIVAL AND RESCUE

I More than one condition may prevail under A, B, and C

II Take care in completing this section. *Report all times as local. Elapsed time* begins from the moment rescue personnel are first notified. The length of time that a survivor is exposed to environmental hazards before aid arrives forms the basis for a great deal of research in Aviation Life Support Systems (ALSS).

III Do not count time in the raft as part of the time in the water. A total of A plus B should represent total time from *water entry until rescue*. If the individual abandons his raft for rescue, this time is part of A.

IV A. Pertains only to the vehicle that performed the actual rescue. *Title of organization* effecting the rescue is, e.g., HS-1, Sheriff's Department, etc. If civilian, list name and address. The rest of this section is self-explanatory.

V: A, B, and C: This is a rescue vehicle/person that was physically capable of making the rescue but did not for some reason [illegible] that developed a problem with the hoist and stood by while a motor whale boat made the rescue.

D: Refers to vehicles other than those listed in A, B, and C that participated or could have participated in a rescue attempt.

VI Indicate how rescuers units were alerted to the need for a rescue effort. Include all active participants.

VII Include all active participants' problems.

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VIII. DELAYS IN DEPARTURE OF RESCUE VEHICLE(S)

___ 1. Vehicle Operator Not Available
___ 2. Vehicle Not Ready
___ 3. Vehicle Crew Not Available
___ 4. Communications Breakdown
___ 5. Completing Previously Assigned Duties
___ 6. Lack of Information on Crash Site
___ 7. Nature of Terrain
___ 8. Weather
___ 9. None
___ 98. Other ___

IX. RESCUE VEHICLE PROBLEMS ENROUTE

___ 1. Headwind
___ 2. Poor Visibility
___ 3. High Sea State
___ 4. Mechanical Problems
___ 5. Nature of Terrain
___ 6. Other Obstructions (Fences, etc.)
___ 7. Rescuers Lost
___ 8. Weather
___ 9. None
___ 98. Other ___

X. PROBLEMS IN LOCATING INDIVIDUAL OR KEEPING INDIVIDUAL IN SIGHT

___ 1. Heavy Seas
___ 2 Trees
___ 3. Fog/Clouds
___ 4. Precipitation
___ 5. Darkness
___ 6. Radio Interference
___ 7. Confusion Due to Other Lights
___ 8. Malfunction of Directional Equipment
___ 9. Lack of Correct Information on Location of Survivor
___ 10. Inability to Visually Distinguish Survivor from Terrain
___ 11. Loss of Radio/Radar Contact
___ 12. Survivor's Failure to Use Signalling Equipment
___ 13. Inadequate/Improper Search
___ 14. None
___ 98. Other (Describe) ___

XI. RESCUE EQUIPEMENT USED
(Use numbers to show sequence)

___ 1. Sling
___ 2. Seat
___ 3. Cargo Net
___ 4. Rope
___ 5. Life Ring
___ 6. Basket
___ 7. Boom Net
___ 8. Davit
___ 9. Raft
___ 10. Webbing Cutters
___ 11. Torso Harness / Ring
___ 12 Grapnel
___ 13. Boarding Ladder
___ 14. Knife/Axe/Saw
___ 15. Makeshift Carrier/Support
___ 16. First Aid Equipment
___ 17. Tree Penetrator Seat
___ 18. Helicopter Platform
___ 19. Stretcher
___ 20. Cable Cutters
___ 21. Helicopter Rescue Boom
___ 22. Billy Pugh Net
___ 98. Other (Describe) ___

XII. SURVIVAL PROBLEMS ENCOUNTERED BY THIS PERSON (Number in the sequence experienced)

___ 01 Inadequate Flotation Gear
___ 02 Inadequate Cold Weather Gear
___ 03 Lack of Signalling Equipment
___ 04 Lack of Other Equipment
___ 05 Entanglement (Parachute)
___ 06 Dragging (Parachute)
___ 07 Parachute Hardware Problem
___ 08 Entrapment in Aircraft
___ 09 Pulled Down by Sinking Parachute
___ 10 Entanglement (Other than Parachute)
___ 11 Unfamiliar with Procedures/Equipment
___ 12 Confused, Dazed, Disoriented
___ 13 Incapacitated by Injury
___ 14 Poor Physical Condition
___ 15 Exposure (Heat, Cold, Sunburn)
___ 16 Fatigue
___ 17 Weather
___ 18 Topography (Swamps, Mountains, Deserts, etc.)
___ 19 Darkness
___ 20 Thrown Out of Raft
___ 21 Hampered by Helo Downwash
___ 22 Problem Boarding Rescue Vehicle
___ 23 Thirst
___ 24 Hunger
___ 25 Insects, Snakes, Animals, etc
___ 26 Sharks
___ 27 Proximity to Ship (___ Yards)
___ 28 Hampered by Injuries
___ 29 None
___ 98 Other (Describe) ___

NAME OF THIS INDIVIDUAL ___ SSN ___ AIRCRAFT ___ BUNO ___

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XIII. PROBLEMS THAT COMPLICATED RESCUE OPERATIONS

___ 01 Failure of Rescue Vehicle (Mechanical Problems)
___ 02 Inadequacy/Lack of Rescue Vehicle
___ 03 Failure of Rescue Equipment (Hoist, etc.)
___ 04 Inadequacy/Lack of Rescue Equipment
___ 05 Inadequacy of Rescue Personnel Knowledge/Training
___ 06 Inadequate Medical Equipment
___ 07 Inadequate Medical Facilities
___ 08 Vehicle Operator Factor (Poor Procedures)
___ 09 Rescue Crewman Assist Hesitancy
___ 10 Fire/Explosion
___ 11 Entrapment in Aircraft
___ 12 Physical Limitations of Rescue Personnel
___ 13 Physical Limitations of Person Being Rescued
___ 14 Carelessness of Rescue Personnel
___ 15 Panic/Inappropriate Actions of Person Being Rescued
___ 16 Rescue Vehicle Accident
___ 17 Communications Problems
___ 18 Drag/Entanglement by Deployed Parachute
___ 19 Topography (Rough Seas, Mountains, etc.)
___ 20 Interference From Other Vehicles
___ 21 Victim Pulled Away by External Forces
___ 22 Weather
___ 23 Darkness
___ 24 Weight/Drag Problem Not Due to Parachute
___ 25 Hampered by Personal/Survival Equipment of Person Being Rescued
___ 26 Floating Debris
___ 27 Primary Rescuer Delayed Awaiting Futile Attempts by Other Rescuers
___ 28 Hampered by Helicopter Downwash
___ 29 Inadequate Training of Person being Rescued
___ 30 Inadequate Knowledge of Aircraft Emergency Escape Means
___ 31 Inadequate Knowledge of Personal Equipment Releases/Actuators
___ 32 Inadequate Rescue Procedures/ Pre-Mishap Plans
___ 33 Poor Availability of Rescue Equipment
___ 34 Poor Suitability of Rescue Equipment
___ 35 Poor Survivor's Techniques
___ 36 Poor Coordination of Rescue Efforts
___ 37 None
___ 98 Other (Describe) ____________

XIV. INDIVIDUAL'S PHYSICAL CONDITION	DURING RESCUE	AFTER RESCUE
1. Fully Able to Assist		
2. Partially Able to Assist		
3. Immobile or Unconscious		
4. Fatal on Recovery-Due to Injuries		
5. Fatal on Recovery-Drowned		
6. Recovered Alive-Died From Injuries		
7. Lost During Rescue Attempt-Apparently Injured or Drowned		

XV. LOCATOR MEANS (Actual Rescue Vehicle, see instructions)

MEANS	ROLE	PROBLEM	MEANS	ROLE	PROBLEM	MEANS	ROLE	PROBLEM
1.			7.			13.		
2.			8.			14.		
3.			9.			15.		
4.			10.			16.		
5.			11.			17.		
6.			12.			18.		

XVI. REMARKS (Indicate item referred to. Continue on separate sheet, if necessary)

NAME OF THIS INDIVIDUAL ____________ **SSN** ________ **AIRCRAFT** ________ **BUNO** ________

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/10: SURVIVAL AND RESCUE

XIII: Pertains *only* to the vehicle that performed the actual rescue. *If another vehicle experienced problems, these should be commented on in the REMARKs section.* The problems and conditions listed here should be checked if present. A condition which does not affect the outcome of today's rescue may result in a loss of life tomorrow. (Interpretation of this item is in direct contrast to Section XII above, which stresses individual reaction rather than potential hazard.)

XIV: Check appropriate columns concerning survivor's/victim's condition.

XV The following covers Naval signaling devices, as well as general locator means. *This list is very specific as to method/device.* Accurate reporting of these methods/devices is of paramount importance, since evaluation and improvement of these items are constantly being conducted. Consult Life Support Equipment Specialists for accurate nomenclature of these locators. Since new devices are constantly becoming *available, this list may not be all-inclusive. Indicate* any additional locator means which are not on the list if applicable to this individual. List the devices in the order they were actuated. Use following codes for locator means.

LOCATOR MEANS CODES

GENERAL

01. Mishap observed.
02. Crash scene located without aid of signaling or personal equipment.
03. Individual sighted without aid of signaling or personal equipment.
04. *Survivor located rescuers.*

ELECTRONIC SIGNALING DEVICES

05. Radio/radar vector or DF steer.
06. AN/URT-26
07. AN/PRC-112
10. RT-10.
11. RT-10 Dual Channel.
13. AN/PRT-5.
19. AN/PRC-63.
20. AN/PRC-63 Beacon only.
21. AN/PRC-63 Dual/Multi-Channel.
22. AN/CRT-3.
23. AN/URT-33.
24. AN/PRC-90
25. RT-60.

PYROTECHNICS

26. Flare, MK-13-Mod 0.
27. Smoke, MK-13-Mod 0.
28. Pencil Flare MK-79-Mod 0.
29. Flare MK-124-Mod 0.
30. Smoke MK-124-Mod 0.
32. Pyrotechnic Pistol (Very Pistol).
33. Mini Flare.
34. Mini Smoke

BALLISTICS

35. .38 Flare (Victory Model).
36. .38 Flare (Air Weight).
37. .38 Tracers.
38. .38 Tracers (Air Weight).

AUDITORY

39. Smith and Wesson (Model 39, 9mm).
40. Gunfire (other).
41. Whistle.
42. Voice.

VISUAL

43. Fire/Smoke (Made by Survivor).
44. *Other Aircraft Orbiting Scene.*
45. Signals Tramped in Snow, etc.
46. SDU-5/E Strobe Light.
47. SDU-5/E Strobe Light With Shroud.
49. Signal Wand.
50. Smoke Float.
52. Smoke Grenade.
53. Flashlight.
54. Mirror.
55. Dye Marker.
56. Raft/Vest/Poncho.
57. Parachute.
58. Helmet.
59. Flight Suit.
60. Reflective Tape.
61. SDU-30.
62. LPP Preserver Light (P/N 68A94C13-1)
63. Other/Explain.

I – The individual experienced difficulty with the use of the device (i.e., familiarity, training, knowledge, injury, etc.)

M – Malfunction of the device.

NOTE: A detailed description and discussion of problems should be given on the Equipment form (OPNAV 3752/7) *and on the Analysis* form (OPNAV 3752/11) if significant.

Code the role of a particular method/device in the discovery of the survivor/rescuer as follows:

"P" – Primary

"S" – Secondary

NOTE: *Even though a device was utilized more than once, it shall* be listed again in its proper sequence.

An example follows: An A-7 was heading back to the CV at sunset when it suddenly experienced an engine failure. The pilot ejected before broadcasting a "MAYDAY." On ejection, the URT-33 (243 MHz frequency) beacon (in his seat pan) actuated. Once *safely under his parachute*, the pilot attempted to contact someone with the PRC-90 radio. The beacon in the seat pan interfered with the transmission. (He had selected 243 on his PRC-90.) His PRC-90 radio was knocked out of his hand on water entry and the pilot lost it. (It was not secured to his MA-2 *torso harness pocket.*) The pilot boarded his LR-1 liferaft and deployed the sea dye marker and his strobe light. In the distance, a helo approached. The pilot fired off two MK-79 pen flares. He also attempted to use his mirror, even though the sun was setting. (He later learned that the helo crew *had seen* the flashes from the mirror, causing them to head in his general direction.) As the helo approached, the crew simultaneously saw the sea dye marker and the strobe light. The helo continued its approach. The pilot attempted to give them wind direction *information by actuating* a MK 13 flare. He accidentally actuated the night end. The second MK-13 flare failed to actuate and the third one functioned properly. An uneventful rescue followed.

MEANS	ROLE	PROBLEM	MEANS	ROLE	PROBLEM	MEANS	ROLE	PROBLEM
1 23			7 54	P				
2 24		I	8 26		I			
3 55	S		9 27		M			
4 46	S		10 27					
5 28								
6 28								

XVI: Self explanatory. Amplify any item as necessary in space provided or on separate sheet of paper.

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LIMITED DISTRIBUTION AND SPECIAL HANDLING IS REQUIRED IN ACCORDANCE WITH OPNAVINST 3750.6.

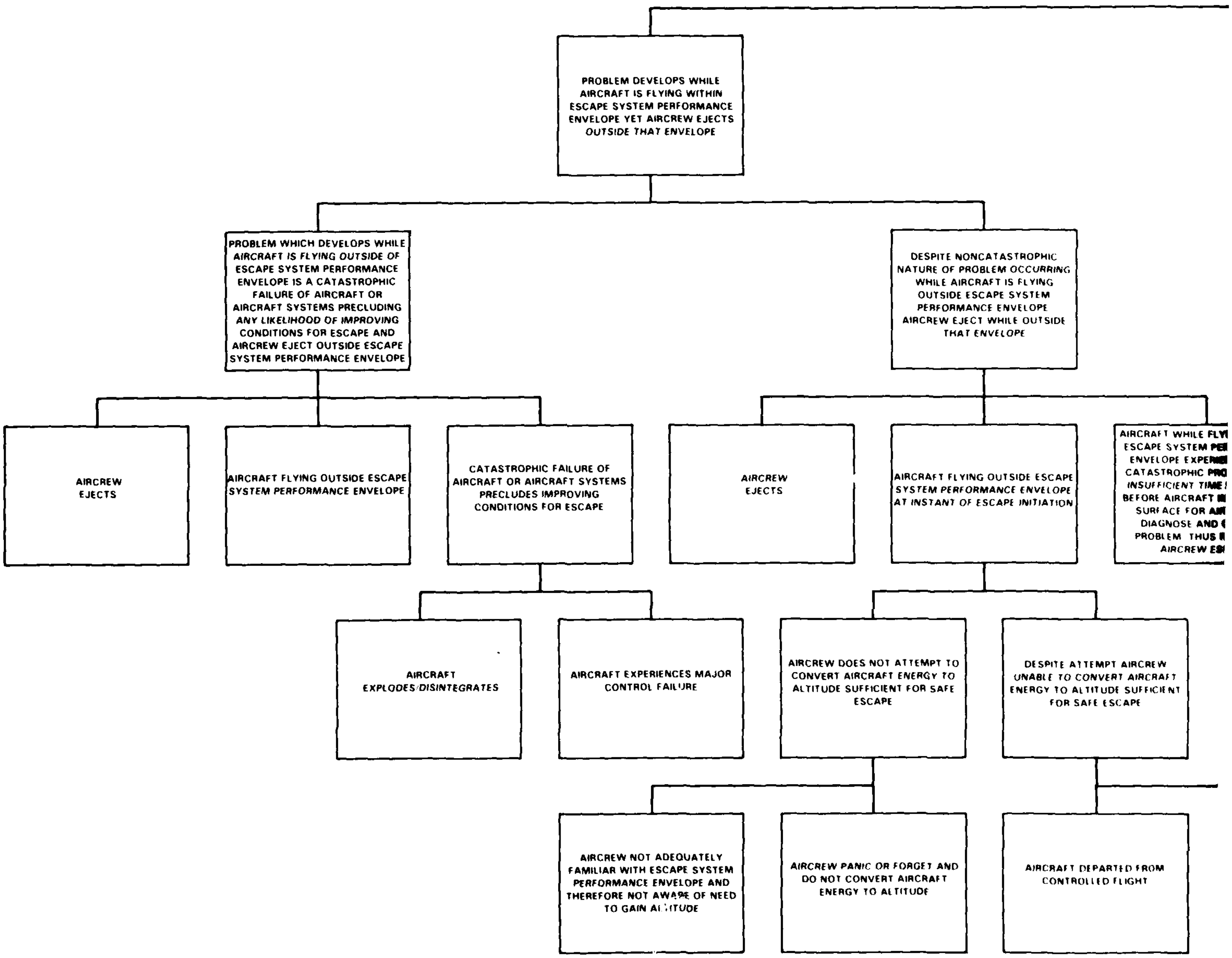
ANALYSIS, CONCLUSIONS AND RECOMMENDATIONS (Continue on separate sheet, if necessary)

FLIGHT SURGEON PARTICIPATED FULLY IN INVESTIGATION ______YES ______NO			NO. OF HOURS SPENT	DATE OF FSR
FLIGHT SURGEON PARTICIPATED FULLY IN BOARD PROCEEDINGS ______YES ______NO			NO. OF HOURS SPENT	TELEPHONE (FLIGHT SURGEON) AUTOVON: ______ COMMERCIAL: ______
FLIGHT SURGEON'S NAME AND GRADE			DUTY STATION	
AMSO OR OTHERS WHO ASSISTED	RANK/GRADE	HOURS SPENT	DUTY STATION	TELEPHONE NUMBER (AMSO) AUTOVON: ______

INSTRUCTIONS FOR COMPLETION OF OPNAV 3752/11: FLIGHT SURGEON' ANALYSIS CONCLUSIONS AND RECOMMENDATIONS:

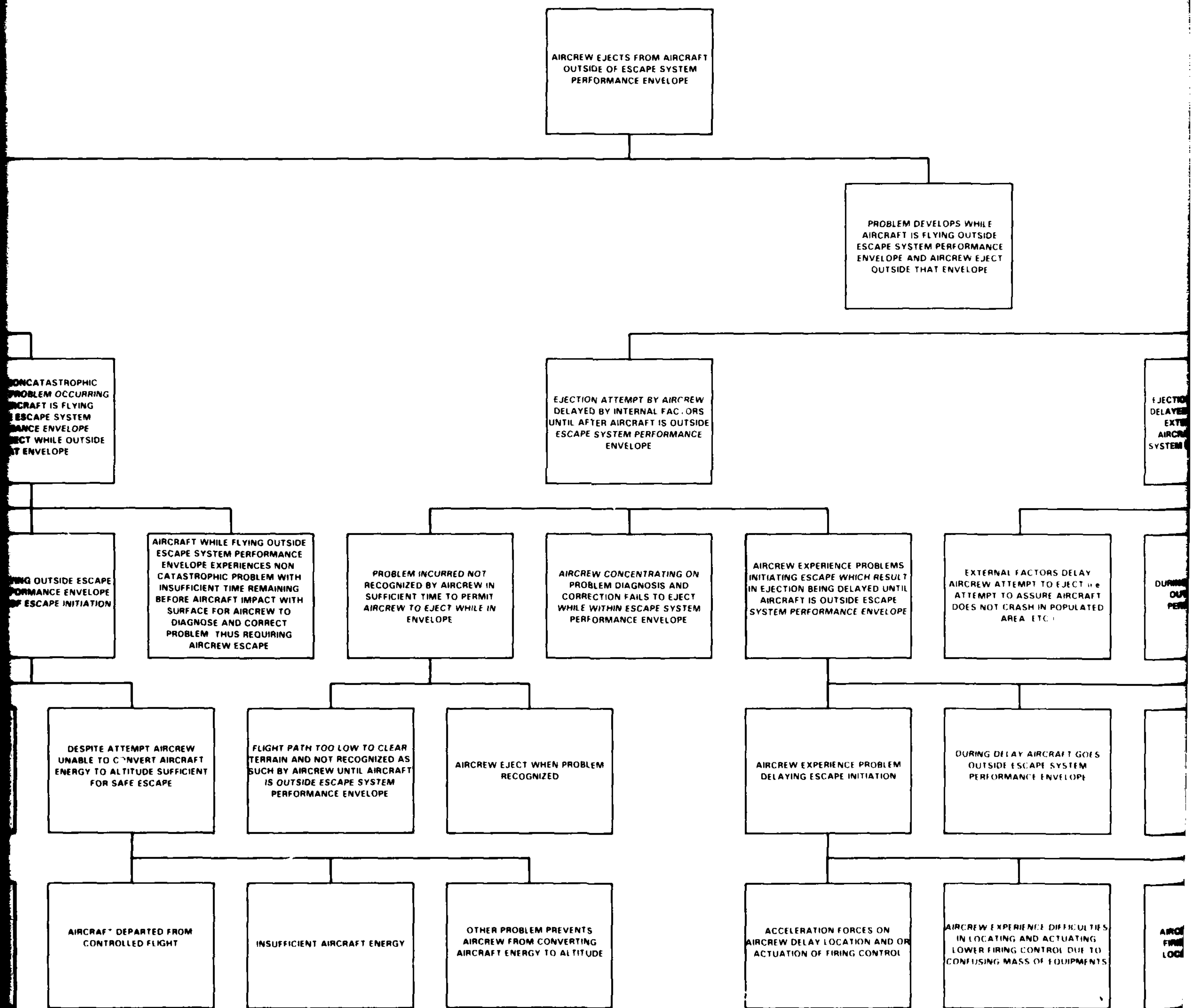
Problems, difficulties, and deficiencies which have been noted on the preceding pages shall be described and analyzed in full here. The analysis shall extend from the time period before the mishap, considering those factors felt to be contributory, to the completion of the entire mishap sequence (e.g., egress, rescue, etc.). It may be as all-encompassing and detailed as necessary. Conclusions and Recommendations shall be based on the analysis and be presented to the entire Aircraft Mishap Board. Conclusions should be brief and address only those topics analyzed. Each recommendation shall be based on a specific conclusion. Where possible, action agencies shall be recommended. If the flight surgeon is not in complete agreement with the *aeromedical* findings or recommendations of the AMB, this difference of opinion shall be documented in this section.

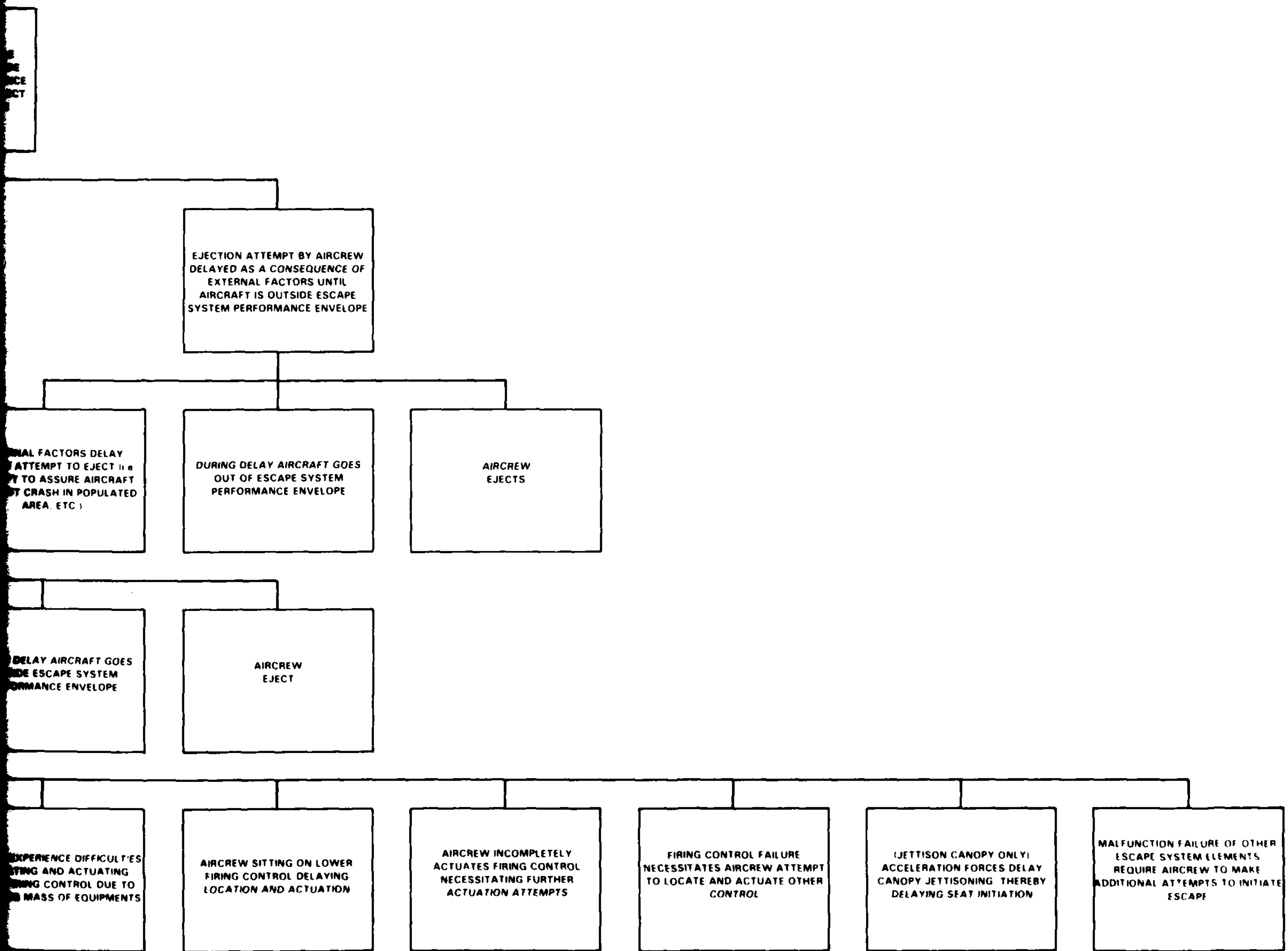
DO NOT WRITE HERE



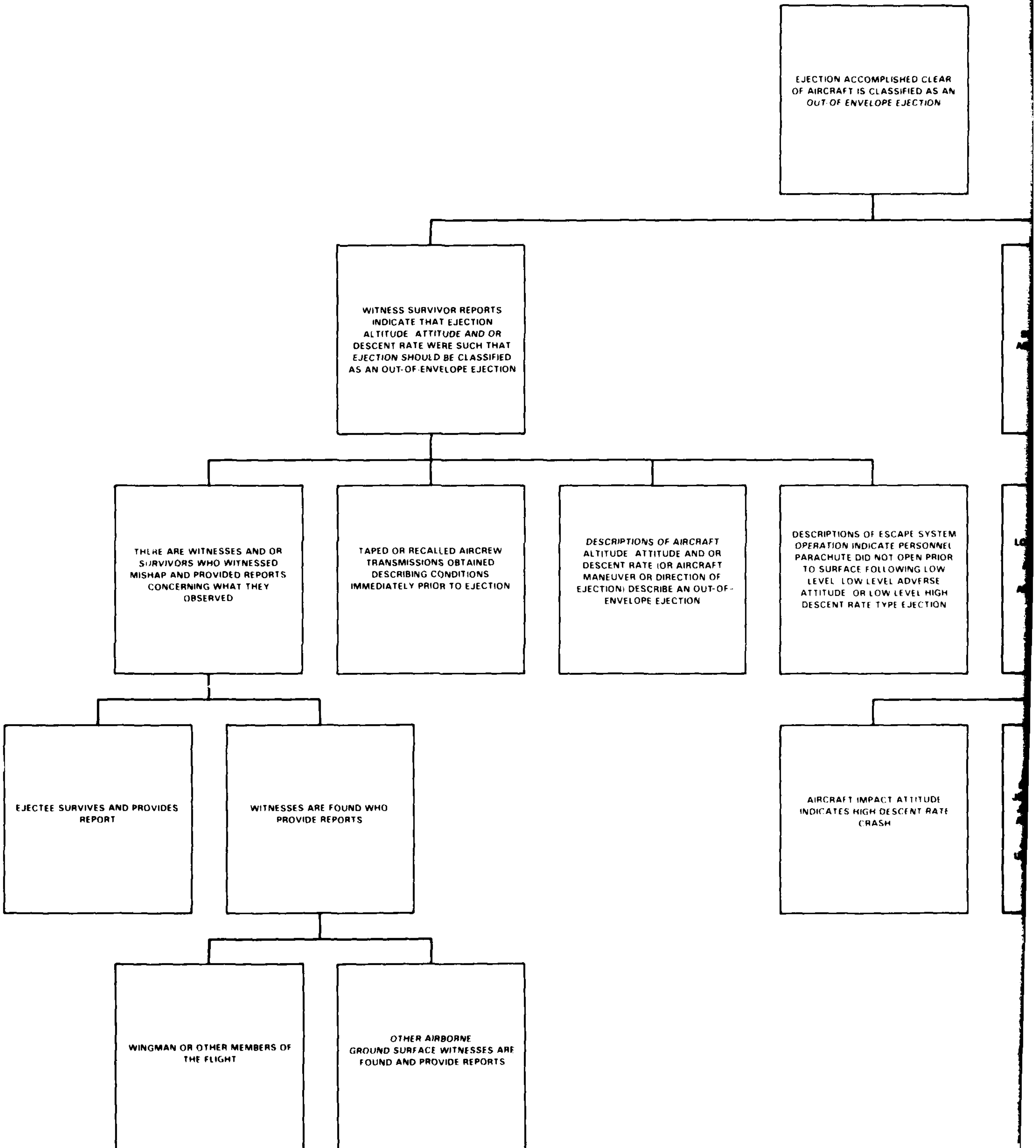
PROBLEM DEVELOPS WHILE AIRCRAFT IS FLYING WITHIN ESCAPE SYSTEM PERFORMANCE ENVELOPE YET AIRCREW EJECTS OUTSIDE THAT ENVELOPE
PROBLEM WHICH DEVELOPS WHILE AIRCRAFT IS FLYING OUTSIDE OF ESCAPE SYSTEM PERFORMANCE ENVELOPE IS A CATASTROPHIC FAILURE OF AIRCRAFT OR AIRCRAFT SYSTEMS PRECLUDING ANY LIKELIHOOD OF IMPROVING CONDITIONS FOR ESCAPE AND AIRCREW EJECT OUTSIDE ESCAPE SYSTEM PERFORMANCE ENVELOPE
DESPITE NONCATASTROPHIC NATURE OF PROBLEM OCCURRING WHILE AIRCRAFT IS FLYING OUTSIDE ESCAPE SYSTEM PERFORMANCE ENVELOPE AIRCREW EJECT WHILE OUTSIDE THAT ENVELOPE
AIRCREW EJECTS
AIRCRAFT FLYING OUTSIDE ESCAPE SYSTEM PERFORMANCE ENVELOPE
CATASTROPHIC FAILURE OF AIRCRAFT OR AIRCRAFT SYSTEMS PRECLUDES IMPROVING CONDITIONS FOR ESCAPE
AIRCREW EJECTS
AIRCRAFT FLYING OUTSIDE ESCAPE SYSTEM PERFORMANCE ENVELOPE AT INSTANT OF ESCAPE INITIATION
AIRCRAFT WHILE FLY ESCAPE SYSTEM PE ENVELOPE EXPERI CATASTROPHIC PRO INSUFFICIENT TIME BEFORE AIRCRAFT I SURFACE FOR AI DIAGNOSE AND PROBLEM THUS AIRCREW E
AIRCRAFT EXPLODES/DISINTEGRATES
AIRCRAFT EXPERIENCES MAJOR CONTROL FAILURE
AIRCREW DOES NOT ATTEMPT TO CONVERT AIRCRAFT ENERGY TO ALTITUDE SUFFICIENT FOR SAFE ESCAPE
DESPITE ATTEMPT AIRCREW UNABLE TO CONVERT AIRCRAFT ENERGY TO ALTITUDE SUFFICIENT FOR SAFE ESCAPE
AIRCREW NOT ADEQUATELY FAMILIAR WITH ESCAPE SYSTEM PERFORMANCE ENVELOPE AND THEREFORE NOT AWARE OF NEED TO GAIN ALTITUDE
AIRCREW PANIC OR FORGET AND DO NOT CONVERT AIRCRAFT ENERGY TO ALTITUDE
AIRCRAFT DEPARTED FROM CONTROLLED FLIGHT

REASONS FOR OUT-OF-ENVELOPE EJECTION ATTEMPTS

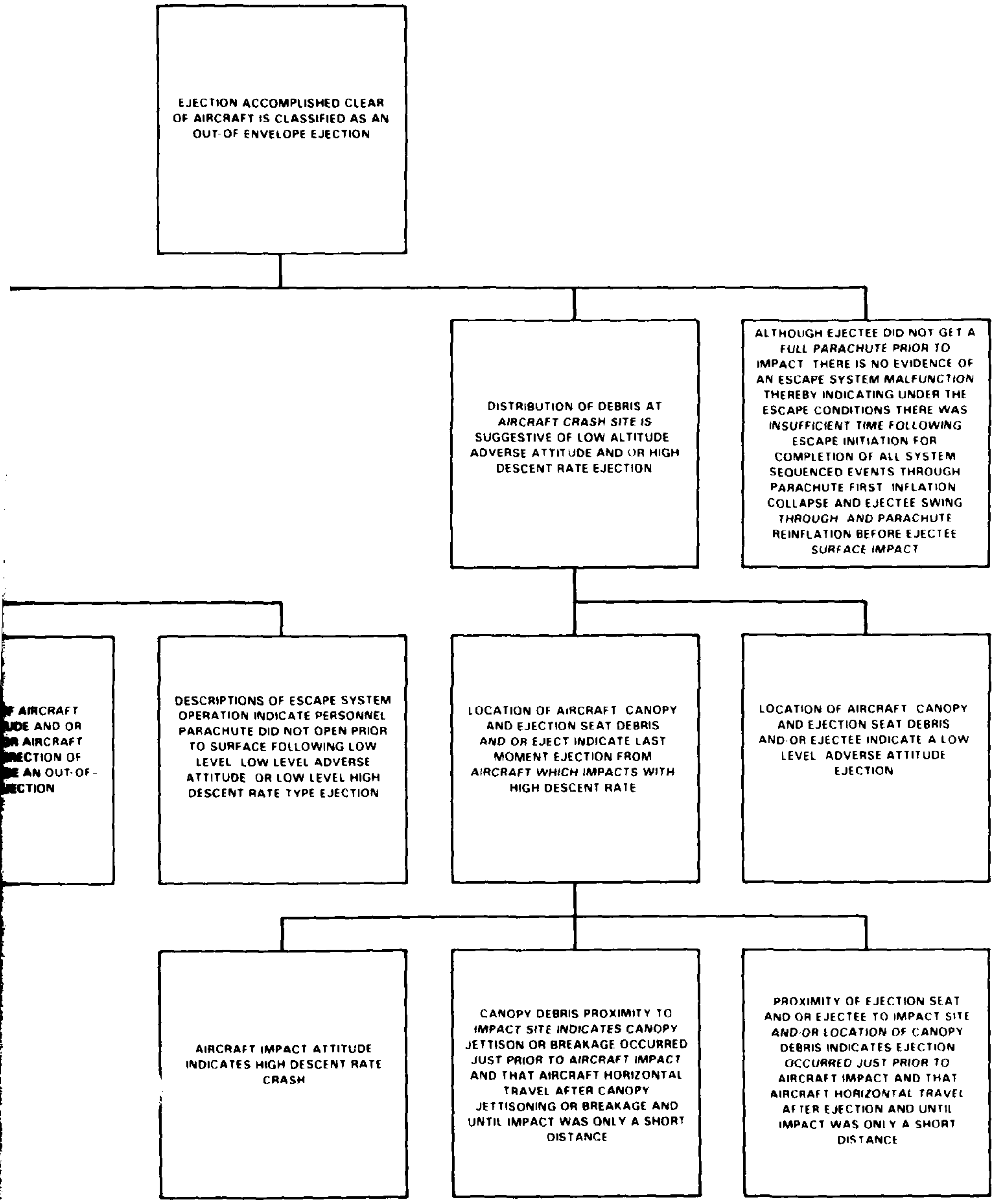


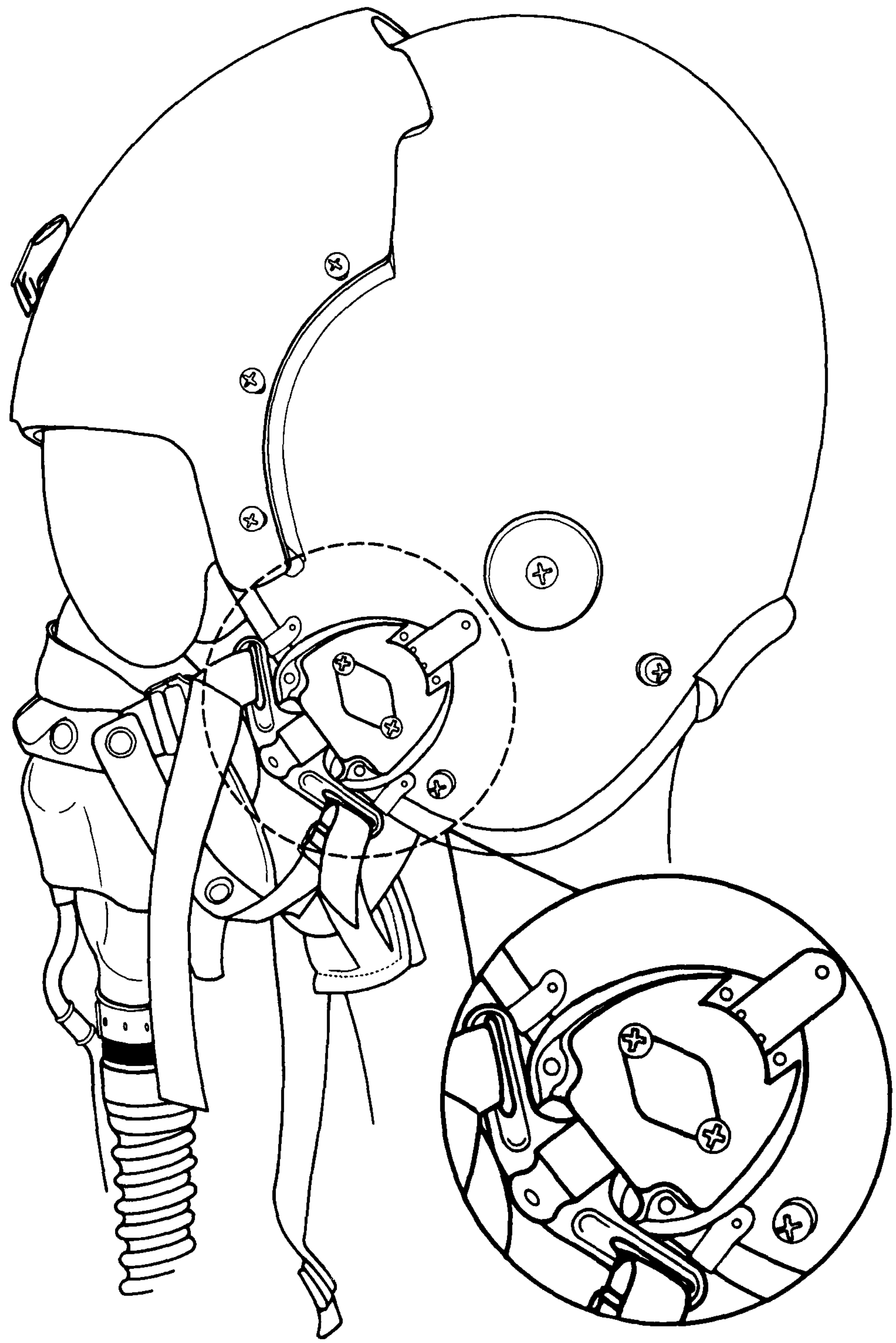

EJECTION ATTEMPT BY AIRCREW DELAYED AS A CONSEQUENCE OF EXTERNAL FACTORS UNTIL AIRCRAFT IS OUTSIDE ESCAPE SYSTEM PERFORMANCE ENVELOPE
NAL FACTORS DELAY ATTEMPT TO EJECT TO ASSURE AIRCRAFT CRASH IN POPULATED AREA, ETC)
DURING DELAY AIRCRAFT GOES OUT OF ESCAPE SYSTEM PERFORMANCE ENVELOPE
AIRCREW EJECTS
DELAY AIRCRAFT GOES DE ESCAPE SYSTEM RMANCE ENVELOPE
AIRCREW EJECT
XPERIENCE DIFFICULTIES TING AND ACTUATING NG CONTROL DUE TO MASS OF EQUIPMENTS
AIRCREW SITTING ON LOWER FIRING CONTROL DELAYING LOCATION AND ACTUATION
AIRCREW INCOMPLETELY ACTUATES FIRING CONTROL NECESSITATING FURTHER ACTUATION ATTEMPTS
FIRING CONTROL FAILURE NECESSITATES AIRCREW ATTEMPT TO LOCATE AND ACTUATE OTHER CONTROL
(JETTISON CANOPY ONLY) ACCELERATION FORCES DELAY CANOPY JETTISONING THEREBY DELAYING SEAT INITIATION
MALFUNCTION FAILURE OF OTHER ESCAPE SYSTEM ELEMENTS REQUIRE AIRCREW TO MAKE ADDITIONAL ATTEMPTS TO INITIATE ESCAPE

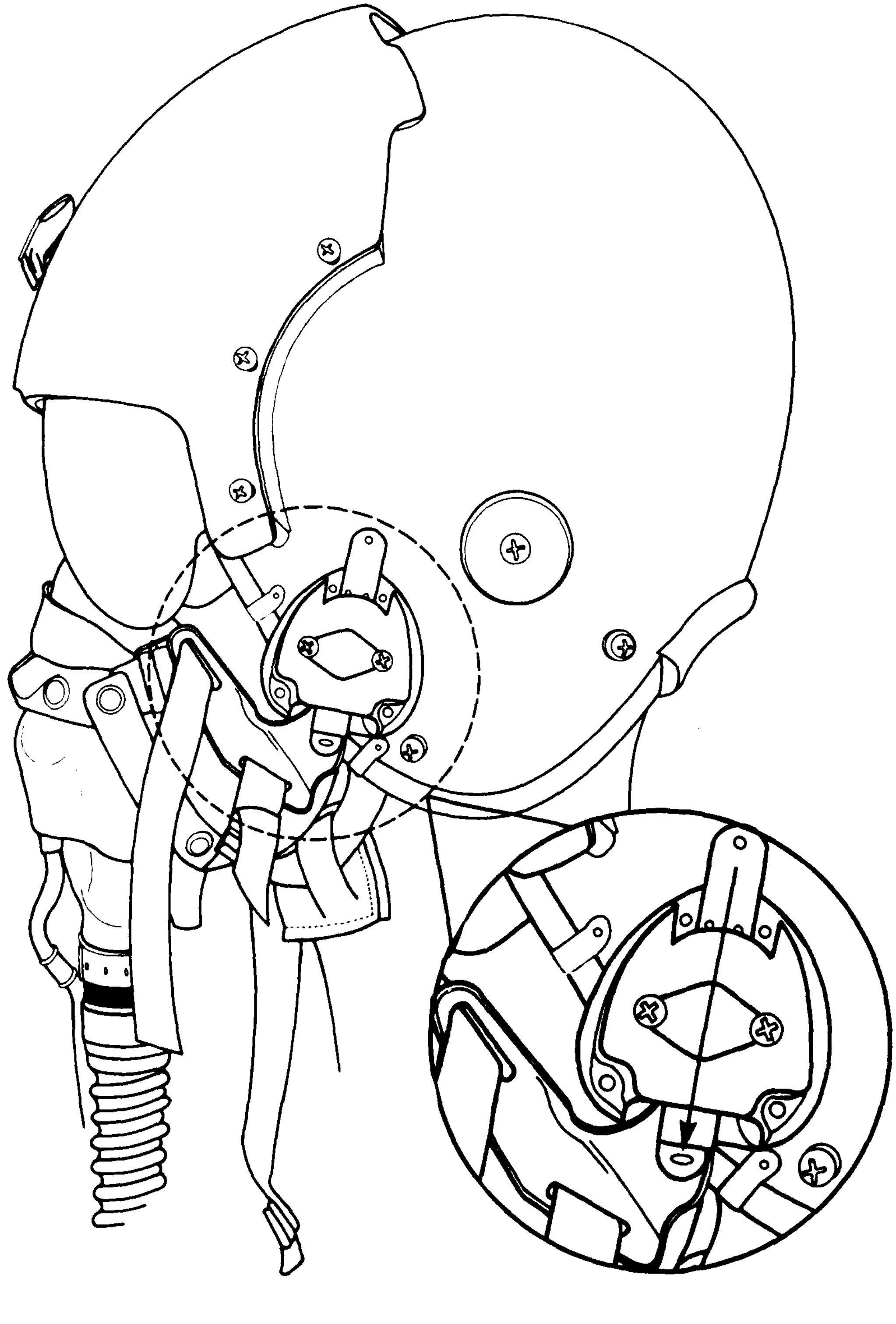
REASONS FOR CLASSIFYING AN EJECTION ACCOMPLISHED CLEAR
OUT-OF-ENVELOPE EJECTION

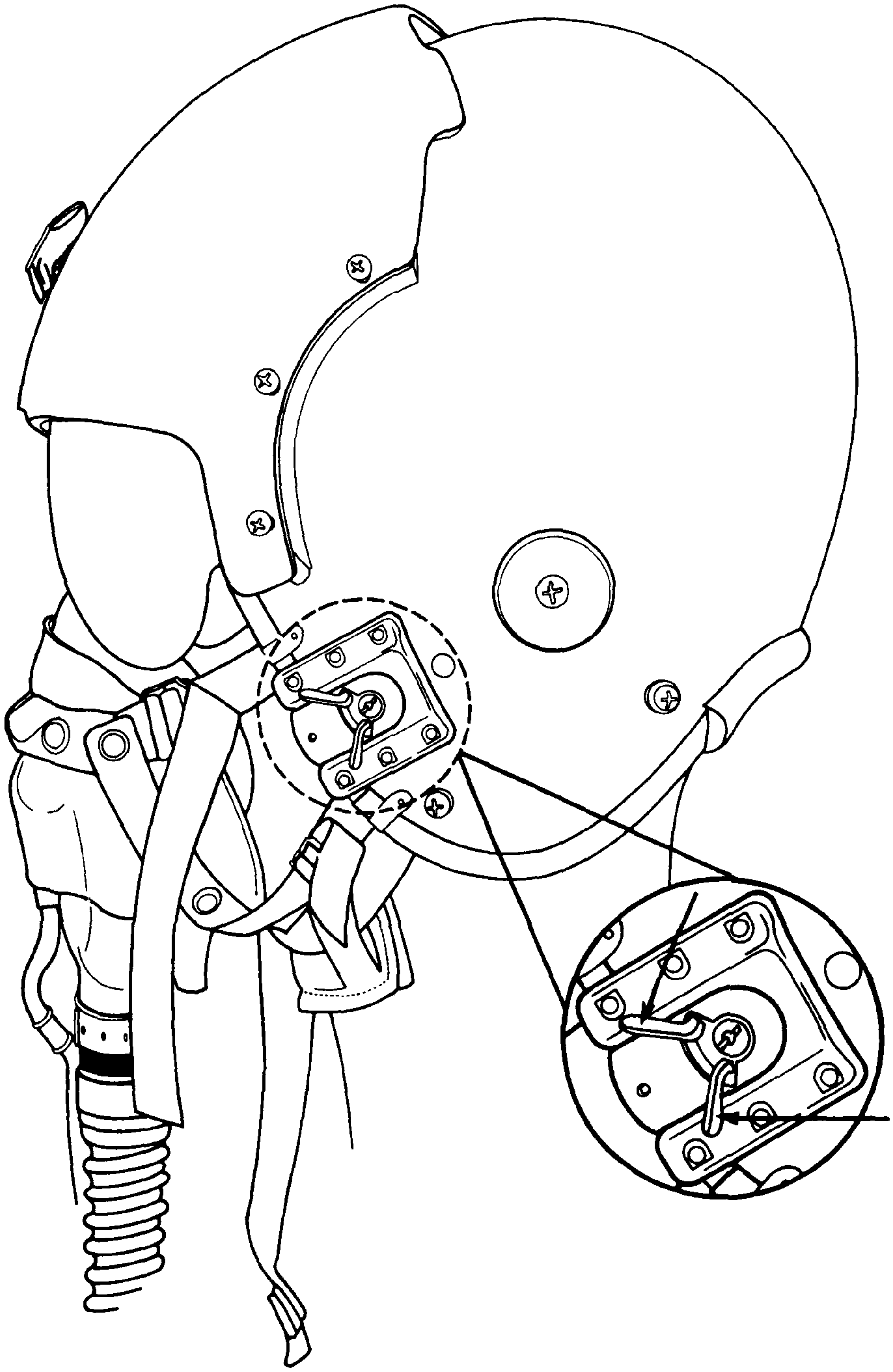


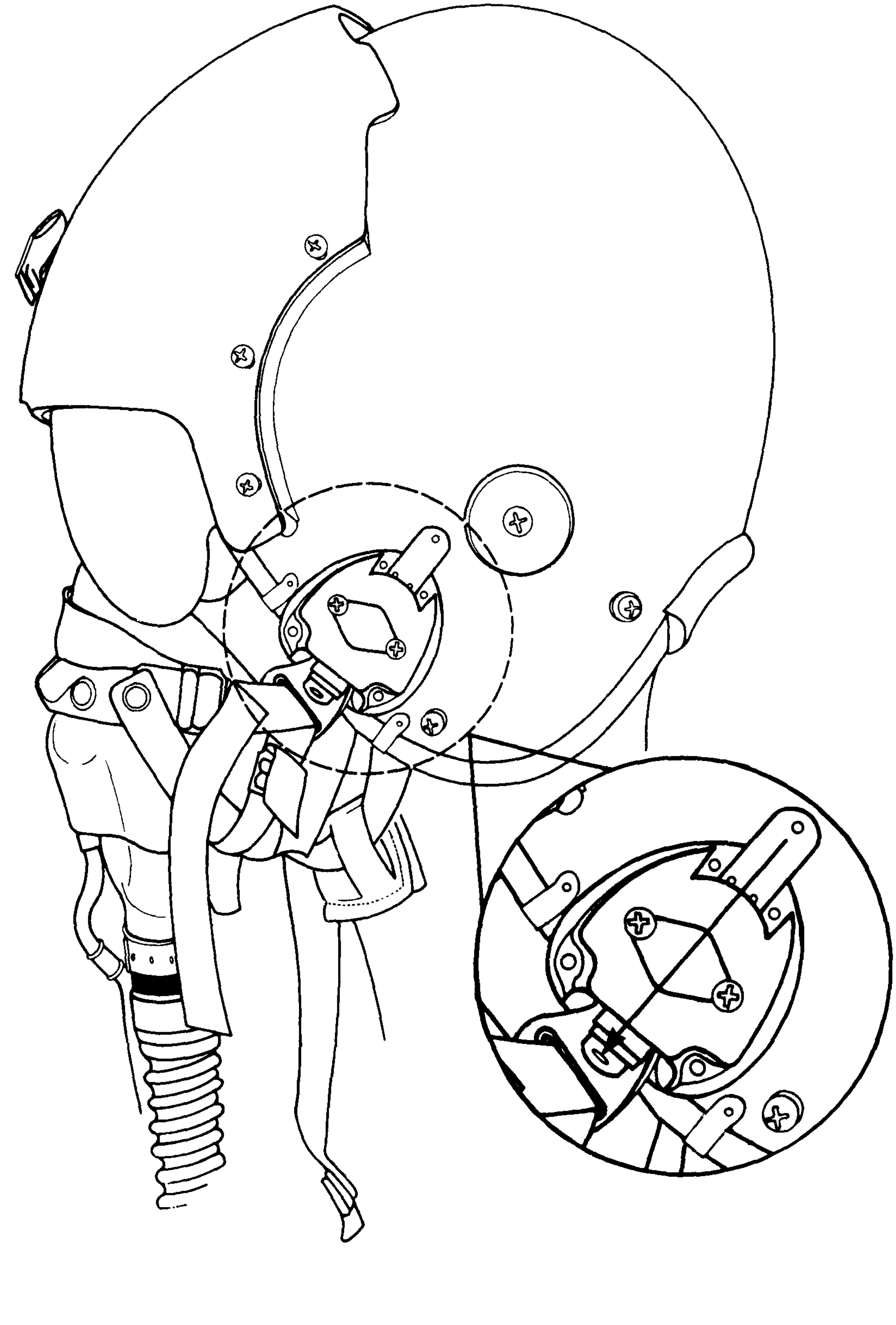
LASSIFYING AN EJECTION ACCOMPLISHED CLEAR OF THE AIRCRAFT AS AN OUT-OF-ENVELOPE EJECTION



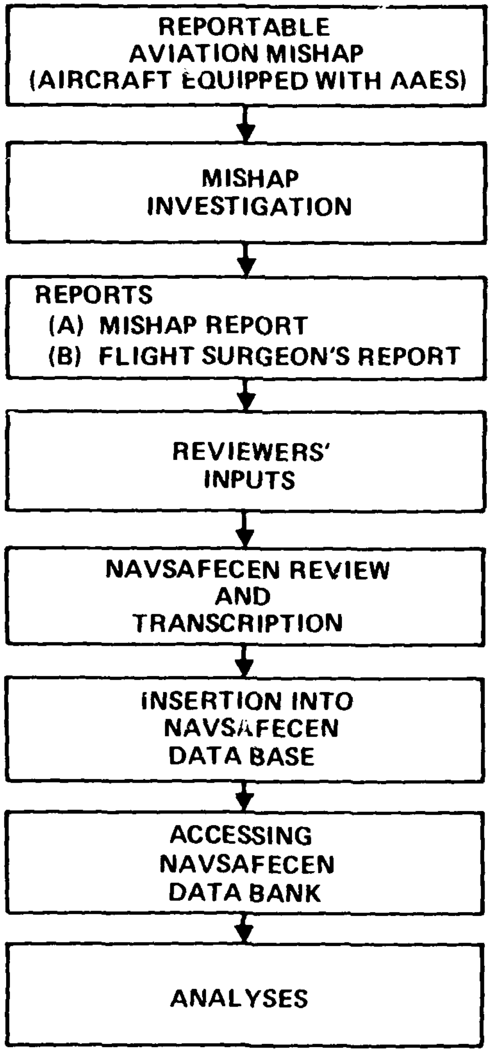




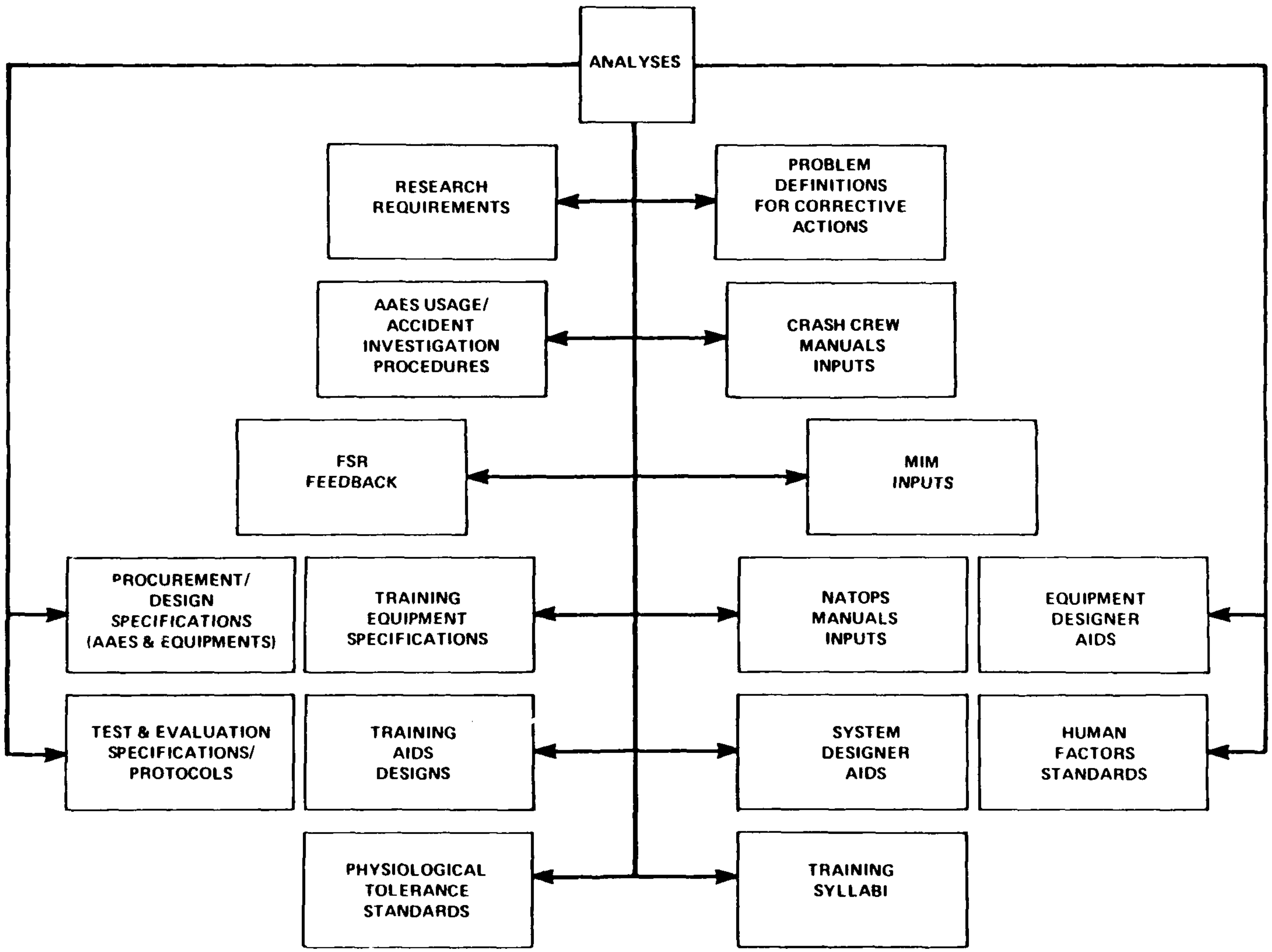




AAES DATA CHAIN



AAES DATA ANALYSES USAGES



PRELIMINARY DRAFT

AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSIS PROGRAM

UPPER LIMB FLAIL QUESTIONNAIRE

1. Date of ejection: ________ Aircraft model ________ Seat type ________
   Nature of emergency requiring ejection ________

2. Which firing control handle did you use? Upper ___ Lower ___ Side ___ None ___ (Sequenced/Inadvertent)

3. How many hands were used to grasp and pull handle? One ___ Two ___ None ___ (Sequenced/Inadvertent)

4. If one or both hands were not grasping handle, what were they doing at time of ejection?

   Holding throttle ________
   Holding stick ___ (Fwd ___ Aft ___ Center ___ Left ___ Right ___)
   Holding onto personal equipment ___ (Describe) ________
   Holding wrist of hand grasping handle ________
   Free ________

5. Were you wearing flight gloves? Yes ___ No ___. If yes, what type (describe)? ________

6. Did your arms flail? Yes ___ No ___. Left ___ Right ___. (If no, you need not answer the remaining questions.).
   Did you see them flail? Yes ___ No ___. If you did not see them flail, what were the indications of arm flail? (Describe) ________

   Describe, if you can, the flail behavior of each arm, particularly direction of arm motions (forward, aft, laterally, down, up; forward then down; up then aft; etc.) ________

   Did either arm (which) contact anything while flailing? Yes ___ No ___ Which ________

   Describe, if you can, your attitude with respect to wind when flailing first occurred (facing, feet into, head into, back towards, sidewards, etc.). ________

   Were you tumbling (Rolling ___ Yawing ___ Pitching ___ Combined ___) Before ___ or During ___ (Neither ___) when arm flail was experienced?

   Describe any other aspect of arm flailing you recall such as when in sequence, forces experienced, etc. ________

PRELIMINARY DRAFT

AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSIS PROGRAM

POST-EGRESS TUMBLE QUESTIONNAIRE

1. Date of ejection:________________ Aircraft model________________Seat type________________
   Nature of emergency requiring ejection ________________________________
   ____
   ____
2. Which firing control handle did you use? Upper____Lower____Side____None____(Sequenced/Inadvertent)
   ____
3. How many hands were used to grasp and pull handle? One____Two____None____(Sequenced/Inadvertent)
   ____
4. If one or both hands were free, did either or both flail? Yes____No____. If yes, which? Left ____Right ____, and in what direction? Forward______Up______Lateral______Down______ Aft ______
5. Did you experience tumbling? Yes _____ No_____. If yes, what indications did you have that you were tumbling? Visual____________________Other____________________ (Describe)________________
   ____
   ____
   ____

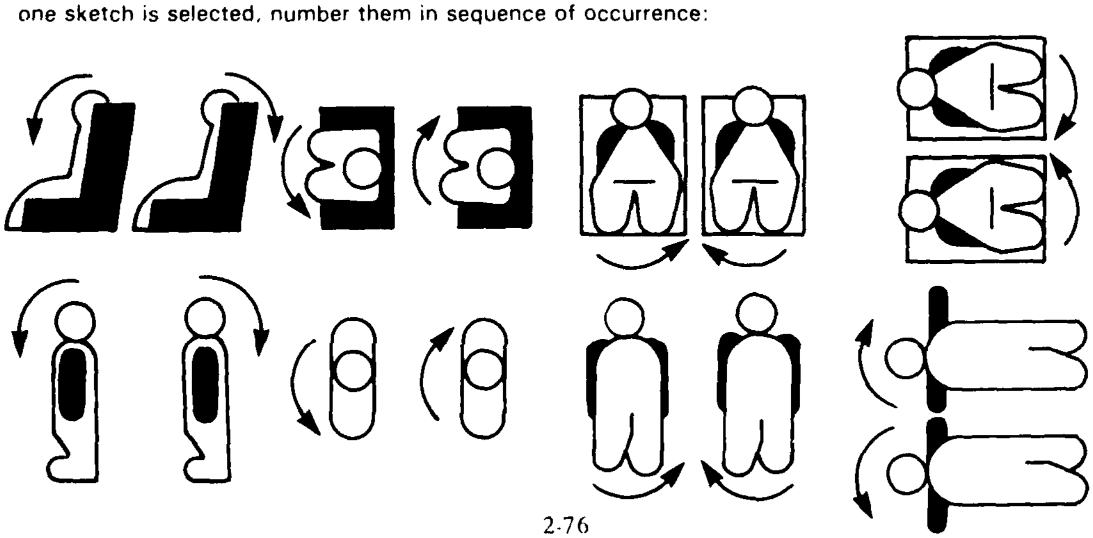
IF TUMBLING WAS NOT EXPERIENCED, YOU NEED NOT ANSWER THE REMAINING QUESTIONS

6. Did tumbling occur before or after separation from seat? Before_____After_____Both______________
7. Did tumbling occur before or after personal parachute opening? Before_____ After________________
8. Did tumbling involve one or more complete revolutions or only a partial revolution? One_____ More_____ Partial______.
9. Did tumble involve:

   PITCH: Forward_____ Aft_____Forward then aft_____ Aft then forward__________

   YAW: Left_____Right_____Left then right_____ Right then left________________

   ROLL: Left_____Right_____Left then right_____ Right then left ________________
10. Select sketch/sketches best depicting tumble you experienced or provide sketch/sketches. If more than one sketch is selected, number them in sequence of occurrence:



Aircrew Life Support Systems (ALSS), Post Emergency Usage

Guides

Part I: Aircrew Protective Helmets

INTRODUCTION

Aircrew protective helmets are designed to reduce the likelihood and severity of head injuries resulting from impact with objects in the aircrew environment. Helmets are employed as mounting platforms for targeting, communications and oxygen systems. Current helmet designs provide impact protection and sound attenuation while functioning as the mounting platform for the variety of components listed above and other components depending upon the aircraft community.

Currently, there are questions concerning the need for the ballistic protection in fixed winged aircraft and whether the weight associated with present helmets may contribute to neck injuries. There is a requirement for an accurate and indepth analysis of each aircraft accident to clarify and define the injury mechanisms and determine the injury trends associated with various combinations of life support equipment and aircraft communities. These injuries may result from interaction of the helmet and man, helmet and escape system components, or helmet and the parachute. Detailed analysis of the accidents will improve the understanding of what the helmet incurs with each injury and help establish accurate injury trends.

Thorough investigation of, and accurate record of, each accident is essential to provide the data base necessary for statistical and engineering analysis of the mishap event sequence associated with accidents occurring within various naval aviation communities and to define the interactions which occur. To clearly define the problems and standardize data acquisition associated with aircraft accidents, it is necessary to introduce systematic analytical procedures to evaluate aircrew life support equipment involved in accidents regardless of the injuries to the aircrew. The acquisition of this data allows for the continuing evaluation and appraisal of the equipment and its performance and interactions with the aircrew. Further systematic analysis of the accidents will clarify causal relationships within the accident environment and indicate injury producers and suggest preventive techniques which may be useful.

To begin the development of procedures for ensuring and enhancing the systematic analysis of the aircrew equipment, the helmet evaluation was selected for the development of evaluation guidelines. It is necessary to document the conditions and circumstances of use, damage and abuse of the helmet before, during and post accident, extent and location of the damage, pattern of the damage and injury to the aircrewman, indicators of the damage to the helmet and injury to the aircrewman. The damage patterns may provide data necessary to define peculiar interactions which may endanger the aircrewman during ejection sequences or during other aviation emergencies. Non-destructive inspection techniques are selected to provide data for evaluation while retaining the equipment intact. Despite the focus on and interest in the identification and documentation of damage and wearer injury as the circumstances attendant to their occurence, a very critical need exists for the equally careful identification and documentation of lack of damage or wearer injury and the circumstances attendant to their occurrences. This information can aid in identifying those conditions for which the equipment performs satisfactorily and thereby help put damage and wearer injury into proper perspective. From this data, equipment interactions and performance can be assessed and design requirements defined or redefined for future equipment development or modification of present systems to reduce the likelihood of the introduction of additional risk, or increase the existing risk, of injury severity and frequency.

To define the environment in which the helmet is used and effects upon (1) user's safety, (2) protective capability, and (3) helmet integrity, all helmets involved in aircraft accidents/mishaps shall be subjected to Non-Destructive Inspection (Phase I). If peculiar conditions or unusual helmet behavior is identified, further inspections should be conducted in greater detail. The Phase II Non-Destructive Inspection will provide an enhanced visual inspection of the helmet to describe and identify the damage patterns and extent of the damage. Should this inspection indicate the need for further testing, then Phase III Destructive Inspection may be selected to aid the analysis of the accident and damage.

This handbook provides guidance for Phase I and II procedures and includes a worksheet format and the supporting information required for the investigation and analysis of the accident data. The supporting information will assist the investigators in determining if Phase III Inspection is warranted and how this inspection should proceed. The information contained within the helmet report format (1) will be combined with all available data acquired on damage patterns associated with accidents and testing; (2) shall be provided to the investigating medical officer for the aircraft accident; and (3) will be employed to update the design criteria and quality assurance assessment standards for helmets, helmet mounted equipment, and other appropriate subcomponents of the system.

The procedures established by this document have been implemented by the enclosed OPNAVINST and amendments which provide for systematic acquisition and analysis of aircraft accident data to develop information for reducing the potential risk to the aircrewman. Failure to completely institute systematic "in-service" data acquisition and analysis can result in valuable data being overlooked and lost thereby introducing bias into the informational system.

The issuance of this handbook is accompanied by the enclosed OPNAVINST, which requires that all helmets employed in ejections or other aircraft mishaps be subjected to systematic inspection designed to provide (1) full documentation of the conditions attendant to the helmet's usage, (2) identification and cataloguing of damage to the helmet and its subcomponents, (3) identification and documentation of all head and neck injuries sustained by aircrewman, (4) comparison of the damage patterns under varying conditions, (5) comparison of the injury patterns resulting under comparative conditions with the associated helmet damage, and (6) determination of the protective efficiency of the helmet in preventing impact injuries to the head. This OPNAVINST also sets forth conditions where Phase III Destructive Inspection is necessary.

Should Phase III Inspection be indicated, guidelines for shipping of the equipment will be provided and the appropriate destination indicated. Receipt of the equipment will be acknowledge using a form letter which will contain the receipt of the helmet, indicate the time in which to expect a response, and the inspection procedures to be employed.

Suggested photographic data and views are represented in Appendix F. It is suggested that either 8x10 color or black and white photographs be used to most effectively indicate the damage or strains. These photographs should be crisp and clear and a notation made on the reverse as to the suspected damage on interactions indicated as requested in Appendix B. Line drawings should be used liberally to enhance damage documentation and to support your hypotheses and analysis. Additionally, give all the data as accurately and completely as possible, and do not be fearful of not having any clear hypothesis.

WORK SHEET

Appendix A

A. Data required for all life support equipment

1. Date of accident   Accident I.D. No.

2. Type of aircraft   Bureau No.

3. Location of accident

4. Ejection   Yes____   No_____

If yes: a.   Altitude

b.   Airspeed

c.   Attitude

d.   Ejection seat type Ser. No

e.   Crew station

f.   Parachute

g.   Survival kit type

h.   Reported winds aloft in area

i.   Landing site

5. Crash (occupied)   Yes_____   No_____

a.   Altitude of impact site

b.   Estimated airspeed at impact

c.   Estimated attitude at impact

d.   Impact site (ground - water - flight deck)

e.   Wind conditions

B. Injuries Sustanined: Fatal_________   Nonfatal________

1. Overall injuries reported (FSR):

2. Specific injuries: (a)   Head fx   Yes__   No__

(b)   Neck fx   Yes__   No__

(c) Neck strain/sprain Yes__ No__

(List type and location of injuries using anatomical landmarks. Describe how the injury was determined - X-ray, postmortem, etc.)

C. Personal data: (1) Age ____ Blood Type ____

(2) Sex ____

(3) Weight ______

(4) Height ______

(5) Anthropometric Measurements

(a) Total Sitting Height _____

(b) Neck Circumference _______

(c) Cervical Length (C1 thru C7) ________

(d) Head Circumference _________

(e) Buttock Knee Length ________

(f) Buttock Popiteal Length _________

(g) Total Leg Length ___________

(h) Chest Circumference __________

(i) Torso Length (Shoulder Height) ________

WORK SHEET

Appendix B

Phase I Non-Destructive Inspection

Helmet Data: (1) Manufacturer

(2) Model

(3) Serial No.

(4) Date of manufacture

(5) Type of fitting (Pads ____ Form Fitted ____)

If pads then list type and location

(a) Frontal

(b) Crown

(c) Parietal

(d) Ear Pads

(6) Visor Up ______ Down ____

(7) Was helmet recovered with the crewmember?

Yes _____ No ______

(8) Was helmet recovered separately?

Yes _____ No ______

(9) Helmet was lost / discarded (circle one)

(10) Modicications (a) Yes __ No ___

(b) Authorized Yes __ No ___

(c) Description of helmet mounted equipment with photographs as indicated in appendix F.

(11) Damage to the helmet Yes __ No ___

Indicate damage by circling in the photographs above. Describe damage and use closeup photographs as appropriate.

(12) If helmet was recovered without the crewman: (a) Was oxygen mask attached?

one side ________

both sides ________

not attached ___________

both sides loose _________

(b) Was tissue present in/on helmet? Yes __ No ___

(13) If the helmet was lost which phase was it lost?

Appendix C

WORK SHEET

Phase II Non-Destructive Laboratory Inspection

A. All data obtained from Phase I observations plus additional general information:

   1. Shipped from:

   2. Date shipped:

   3. Date received:

B. Inspection Procedures

   1. Coherent Light Inspection (Photograph as required to document damage pattern)

      a. Light wavelength

      b. Light intensity

      c. Lens size (aperature)

      d. Focal distance from item

   2. Infra-red Light Inspection

      a. Light wavelength

      b. Light intensity

      c. Lens size (aperature)

      d. Focal distance from item

   3. Microscopic Inspection of Damaged Area

      a. Macroscopic Inspection

      b. Scanning Electron Microscopic Inspection

C. Comparison of Damage and Injury - (e.g. trauma/injury site to damage pattern on helmet; tissue and blood type)

WORK SHEET

Appendix D

Phase III Destructive Laboratory Inspection

A. Phase I & II inspection data evaluated prior to further inspection.

1. Microscopic section of damaged areas for evaluation of the extent of damage to the site and further chemical analysis on the helmet or other sub structures if required.

2. Chemical analysis as required

B. Other inspection and test procedures which could be required in specific cases:

1. Impact test to duplicate damage patterns using a like item.

2. Windblast test to duplicate the damage to the item and materials using comparable items.

3. Controlled drop testing of comparable items.

4. Micro-analysis of the components of the item.

WORK SHEET

Appendix E

GENERAL HELMET INVESTIGATION CHECKLIST FOR AIRCRAFT MISHAPS

1. Was the equipment used? Yes___ No___

2. Did the equipment function as designed? Yes___ No___
(If no, go to 6)

3. Did the equipment interact with other equipment? (If yes, go to 9) Yes___ No___

4. Was the equipment damaged? Yes___ No___
(If no, what is the disposition of the equipment?)

5. Could the equipment be considered as suitable for re-use? (Exclusive of instructions governing re-use/non re-use. If no, please explain and give your rationale.) Yes___ No___

6. Was there sufficient altitude/time to allow for successful ejection/functioning of the of the system? Yes___ No___

7. Was the ejection sequence terminated by ground impact? Yes___ No___

8. Was the ejection sequence retarded/delayed by other actions? (If yes, explain) Yes___ No___

9. Was dynamic interaction indicated by injury to the aircrew/ damage to the helmet? Yes___ No___
(If yes, explain and give rationale and indicationsl)

10. How was this interaction determined? Give logic tree which you used to determine the associated damage/injury and the interaction; give evidence of what other equipment was involved and what was the indications?

11. was the damage indicative of interactions? Yes___ No___
(If yes, describe)

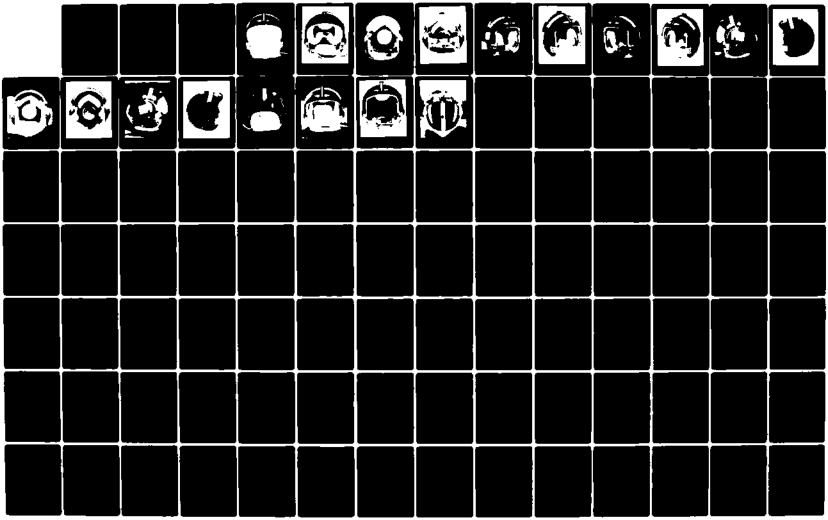
12. Was there damage to the helmet prior to the accidnet? (If yes, describe and advise how this was determined!) Yes___ No___

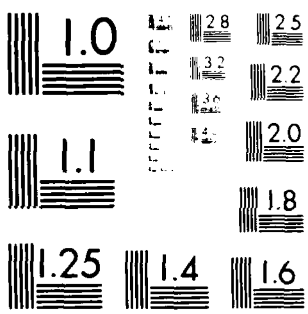
13. Does the damage pattern on the helmet align with any injury of the aircrewman? (If yes, describe using the attached charts!) Yes___ No___

14. Does the equipment indicate abuse (e.g. pre-emergency or as the result of the emergency) treatment? (If yes, describe and give rationale for this determination!) Yes___ No___

AD-A134 834 AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES VO..(U) NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY WASHINGTON DC C W STOKES ET AL. 25

UNCLASSIFIED 05 NOV 83 NAVWESA-1-83-VOL-2 F/G 1/3 NL





MICROCOPY RESOLUTION TEST CHART

15. Was there indications of equipment deterioration? (If yes, describe type!) Yes___ No____

16. Was any predisposing problems discovered with the equipment which could contribute to failure? Yes___ No____

17. Was the equipment age limited; If so, was it within its useful life span? Yes____ No____
Date of mfg.______________ Manufacturer________________________

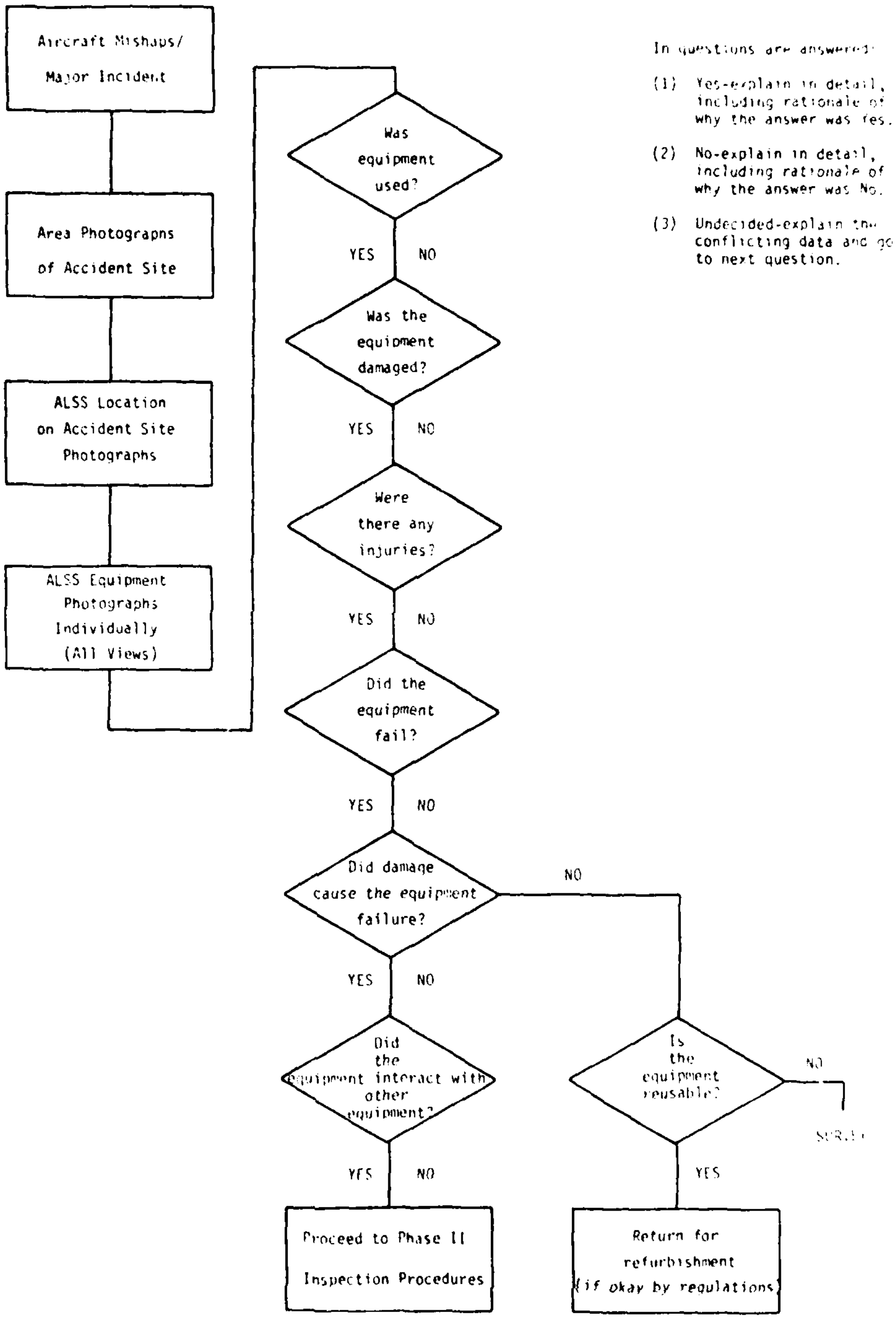
18. Had the equipment been inspected routinely? Yes___ No____
Date of last inspection____________ Inspector_______________

19. Were any predisposing medical problems with the aircrewman? (If yes, describe fully even slight symptoms!) Yes____ No____

20. Should further analysis of the equipment be undertaken? (If yes, please specify rationale and which procedures would be helpful!) Yes____ No____

AIRCREW LIFE SUPPORT SYSTEM (ALSS)

INVESTIGATION FLOW



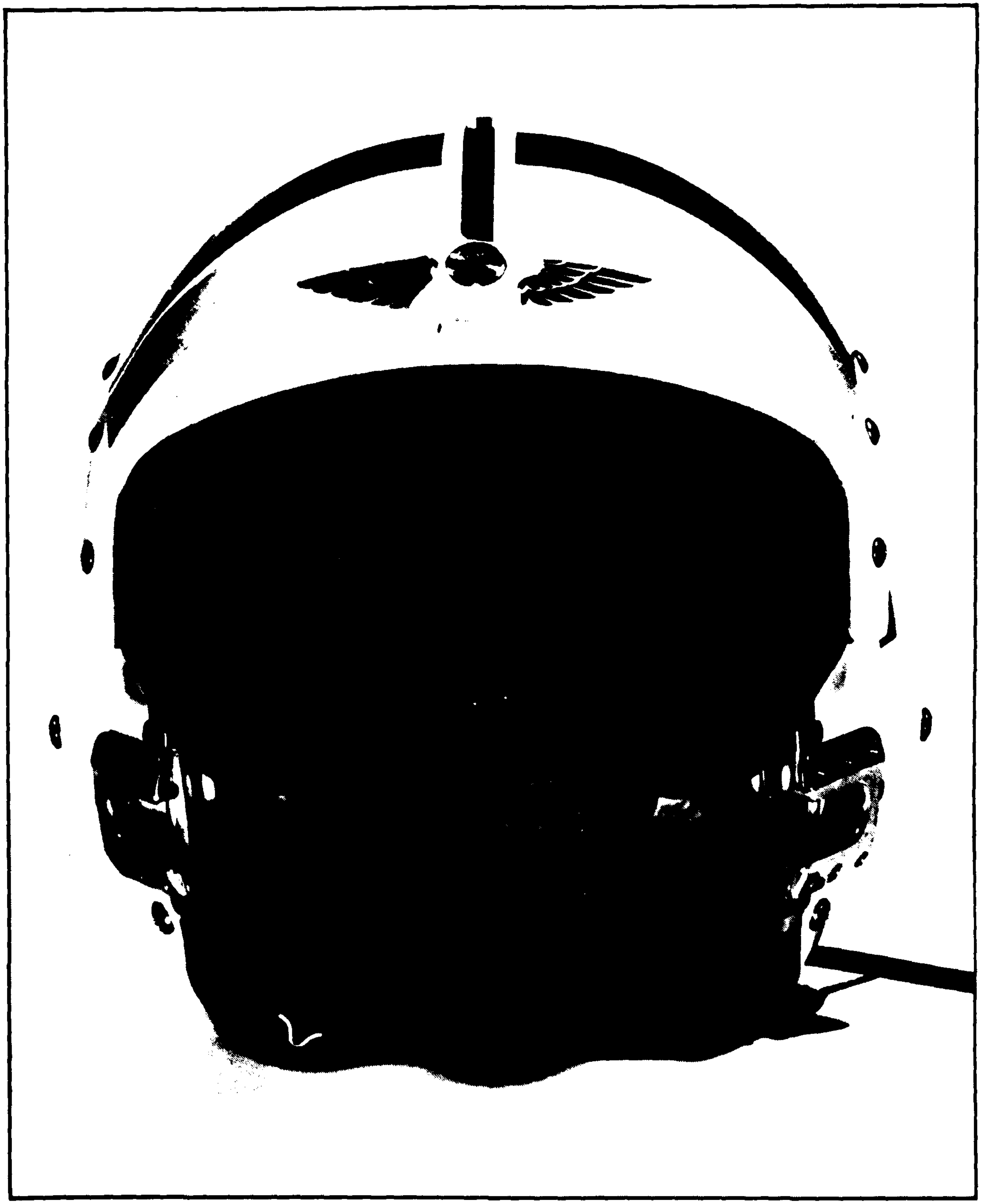


Figure 1. Helmet Visor Down Front
(light background)

Figure 1A. Helmet Visor Down Front
(dark background)

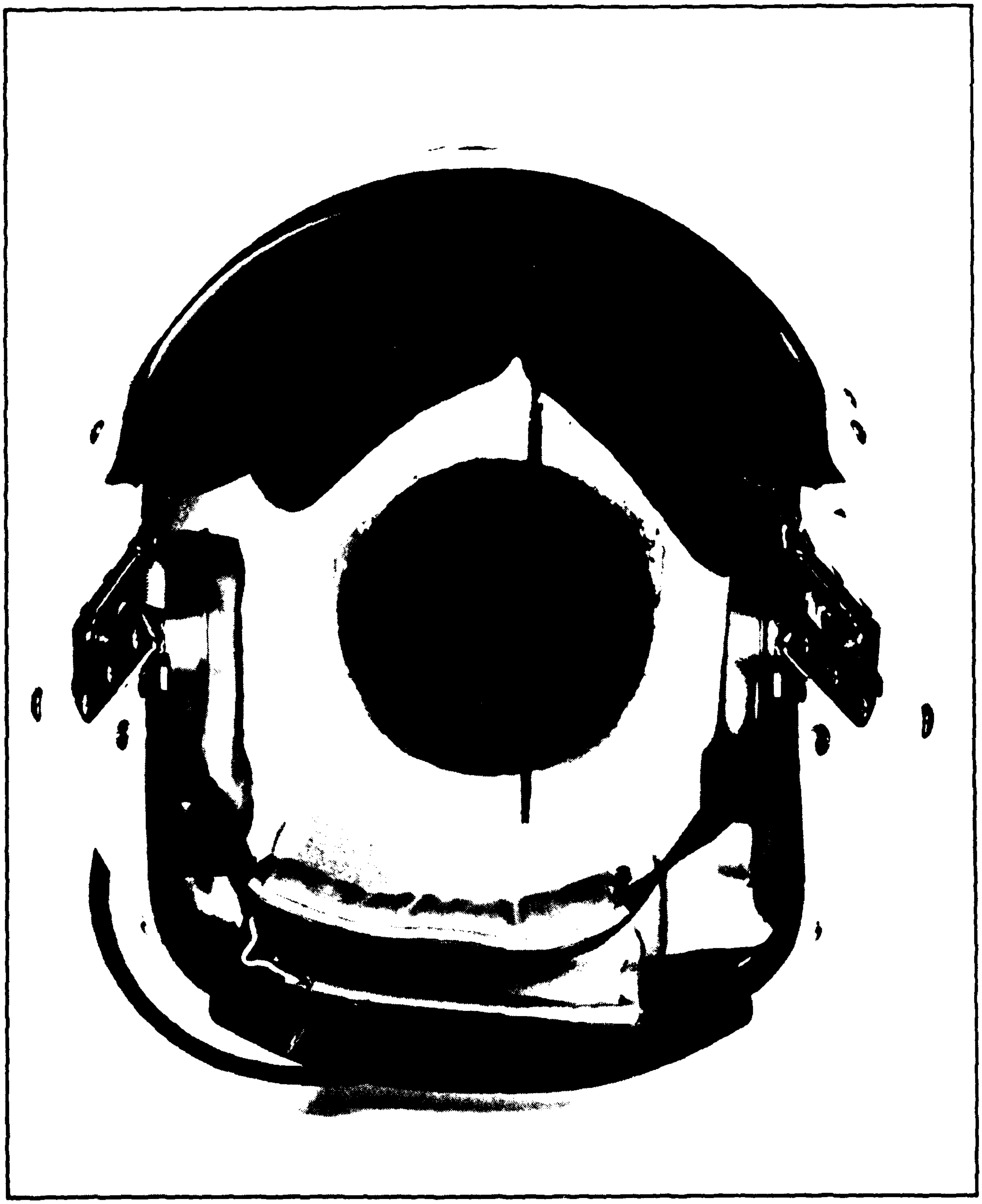


Figure 2. Helmet Visor Down Bottom
(light background)

Figure 2A. Helmet Visor Down Bottom
(dark background)

Figure 3. Helmet Visor Up 45° left
(shows right side)

Figure 3A. Helmet Visor Up 45° left
(shows right side)

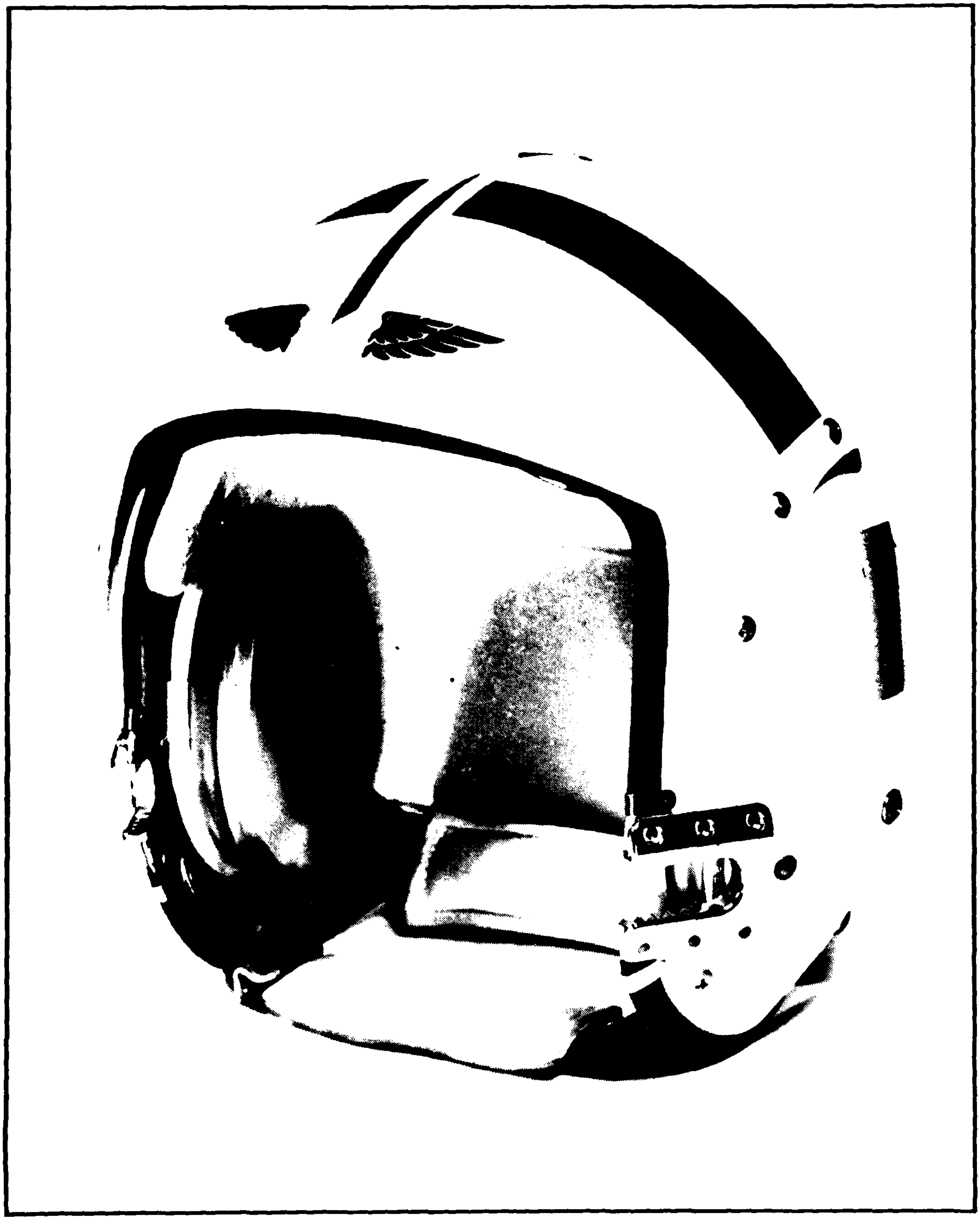


Figure 4. Helmet Visor Up 45° right
(shows left side)

Figure 4A. Helmet Visor Up 45° right
(shows left side)

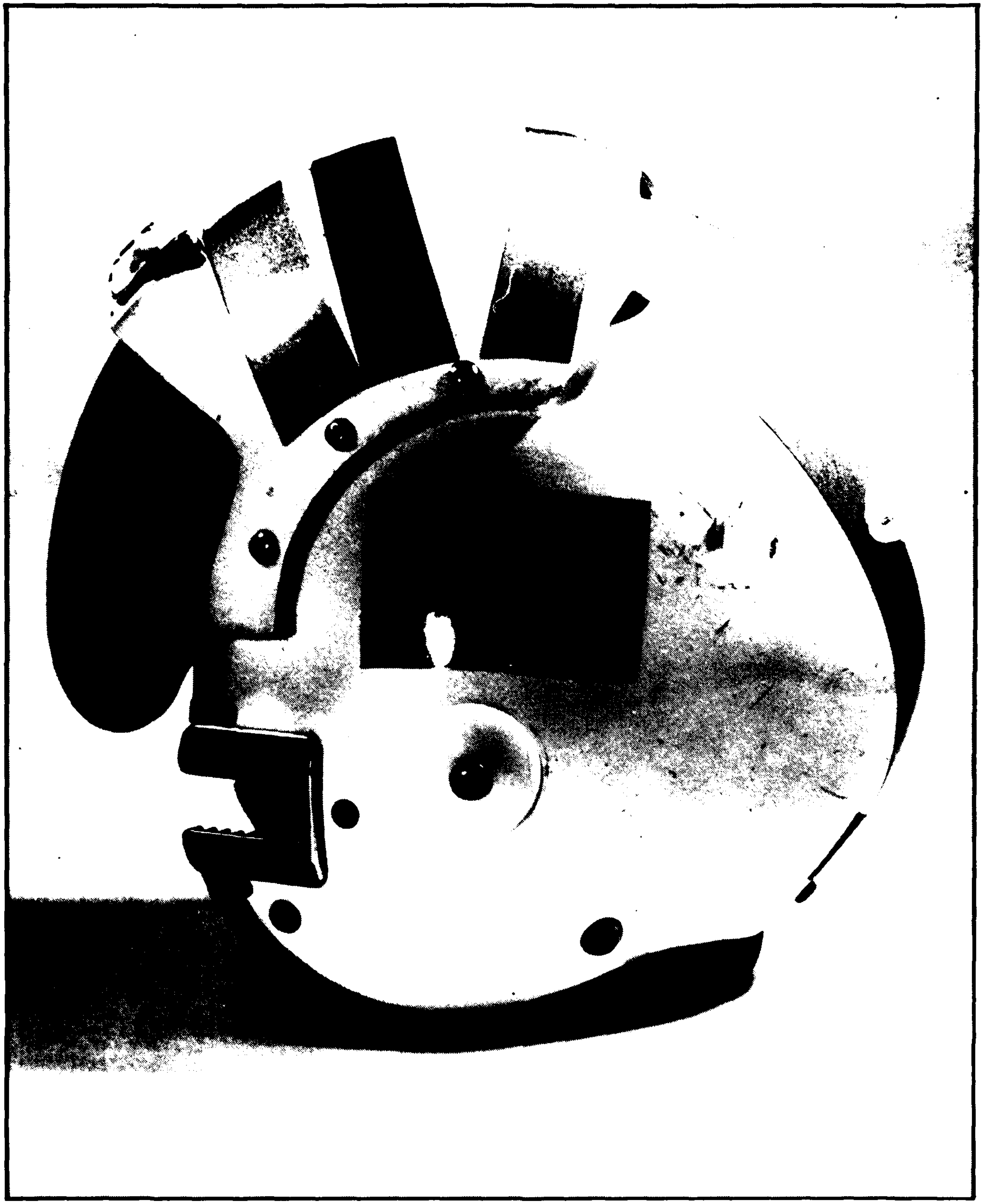


Figure 5. Helmet Visor Down Left Side
(light background)

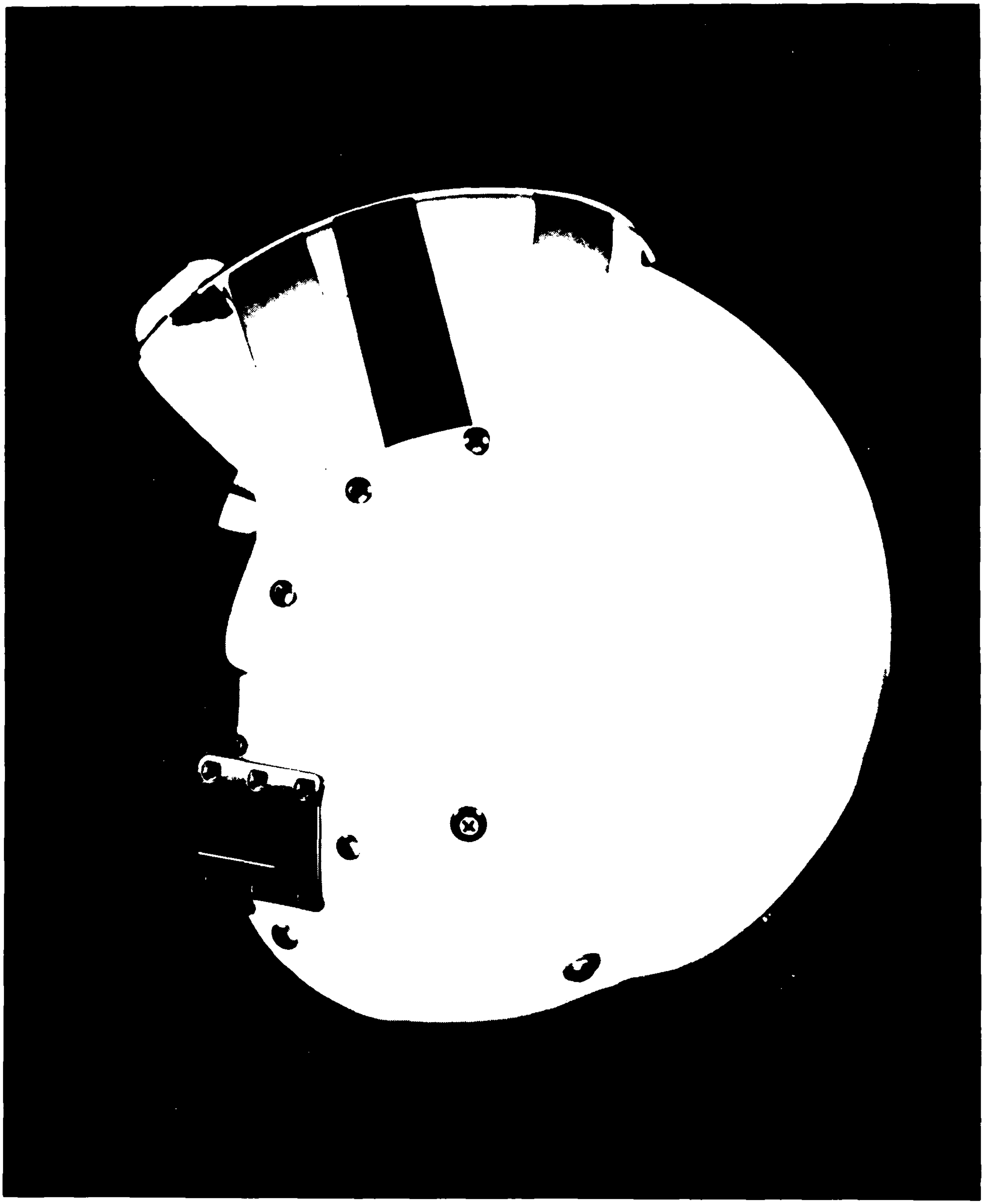


Figure 5A. Helmet Visor Down Left Side (dark background)

Figure 6. Helmet Visor Up Bottom
(light background)

Figure 6A. Helmet Visor Up Bottom
(dark background)

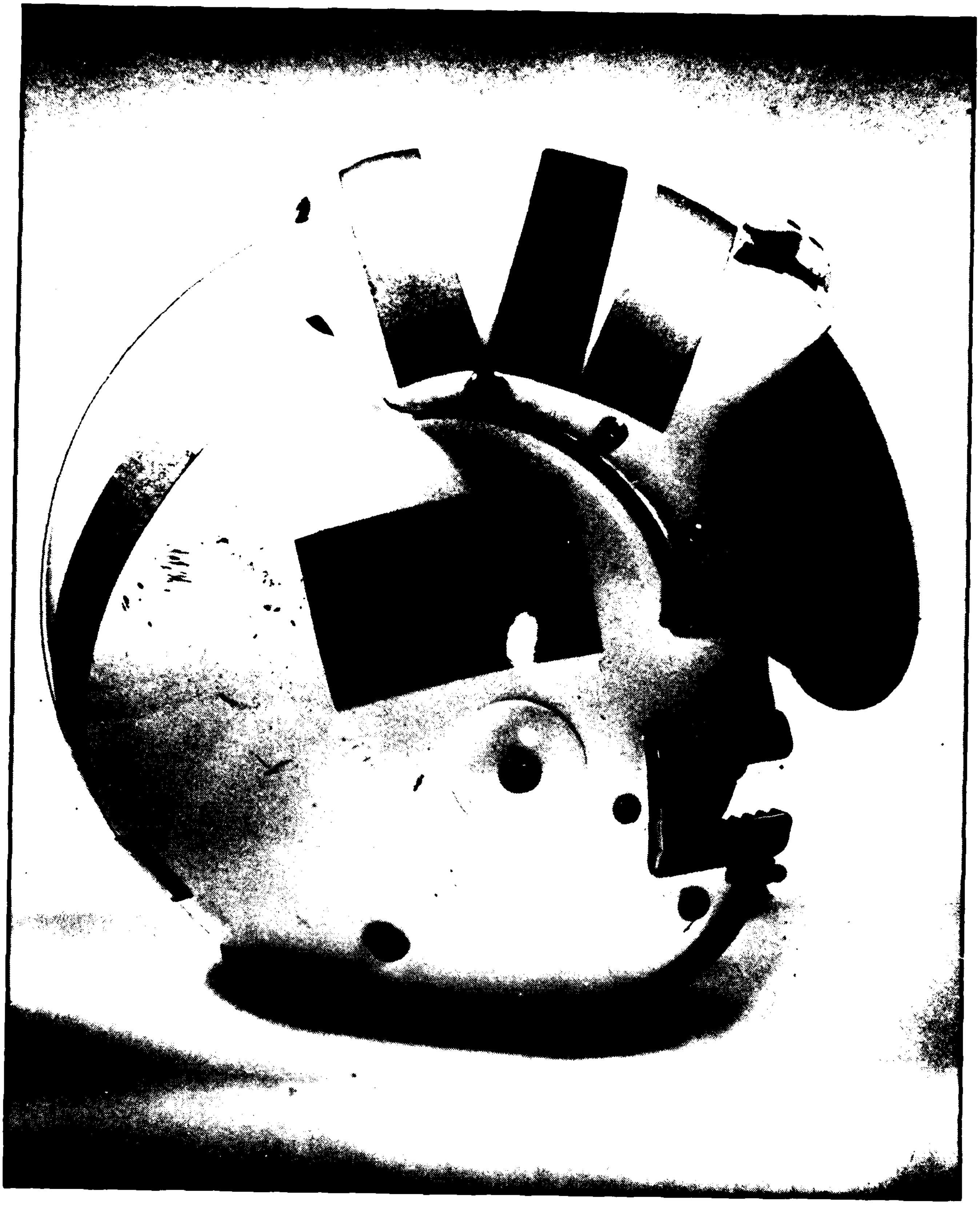


Figure 7. Helmet Visor Down Right Side
(light background)

Figure 7A. Helmet Visor Down Right Side (dark background)

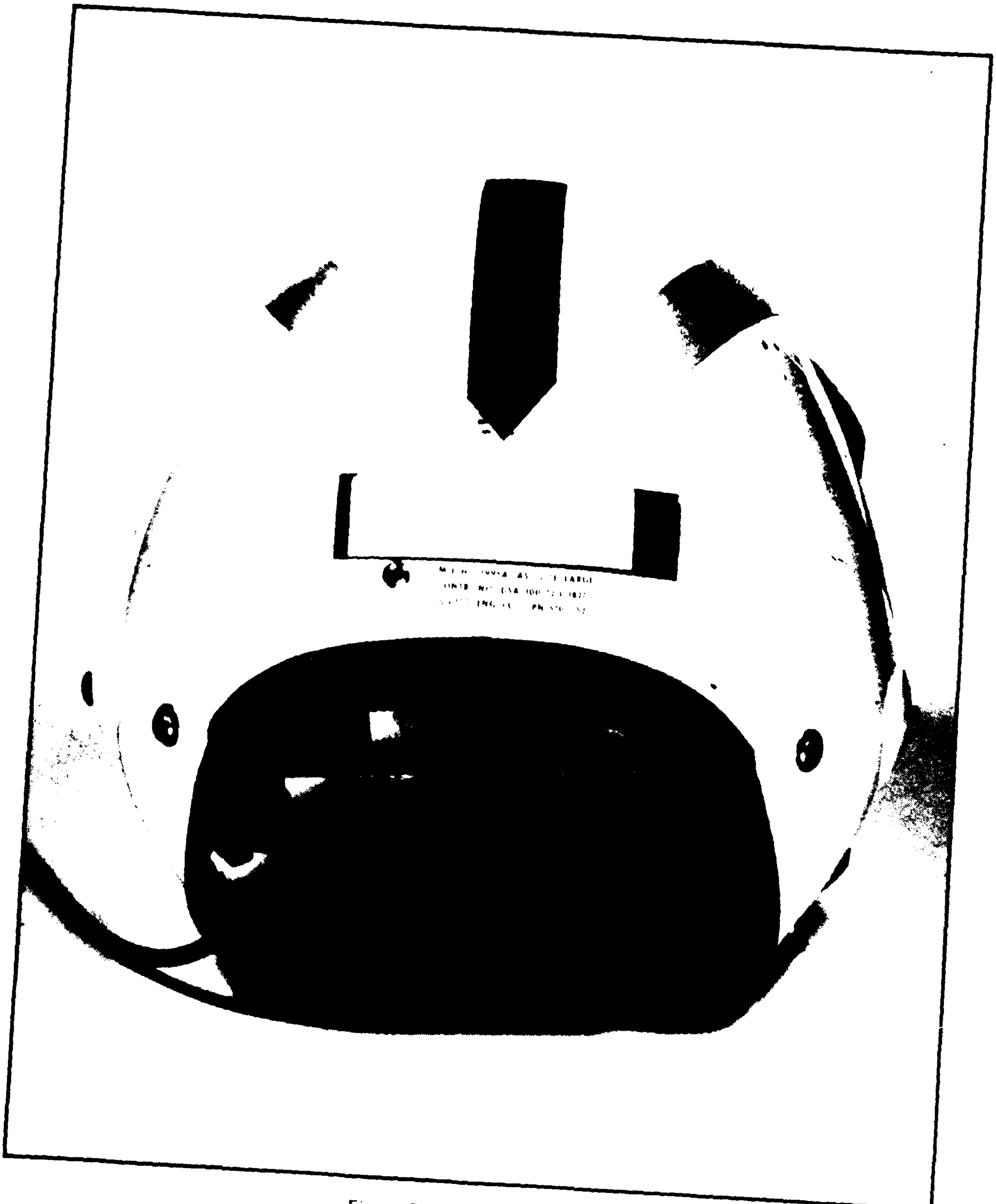


Figure 8. Helmet Rear View

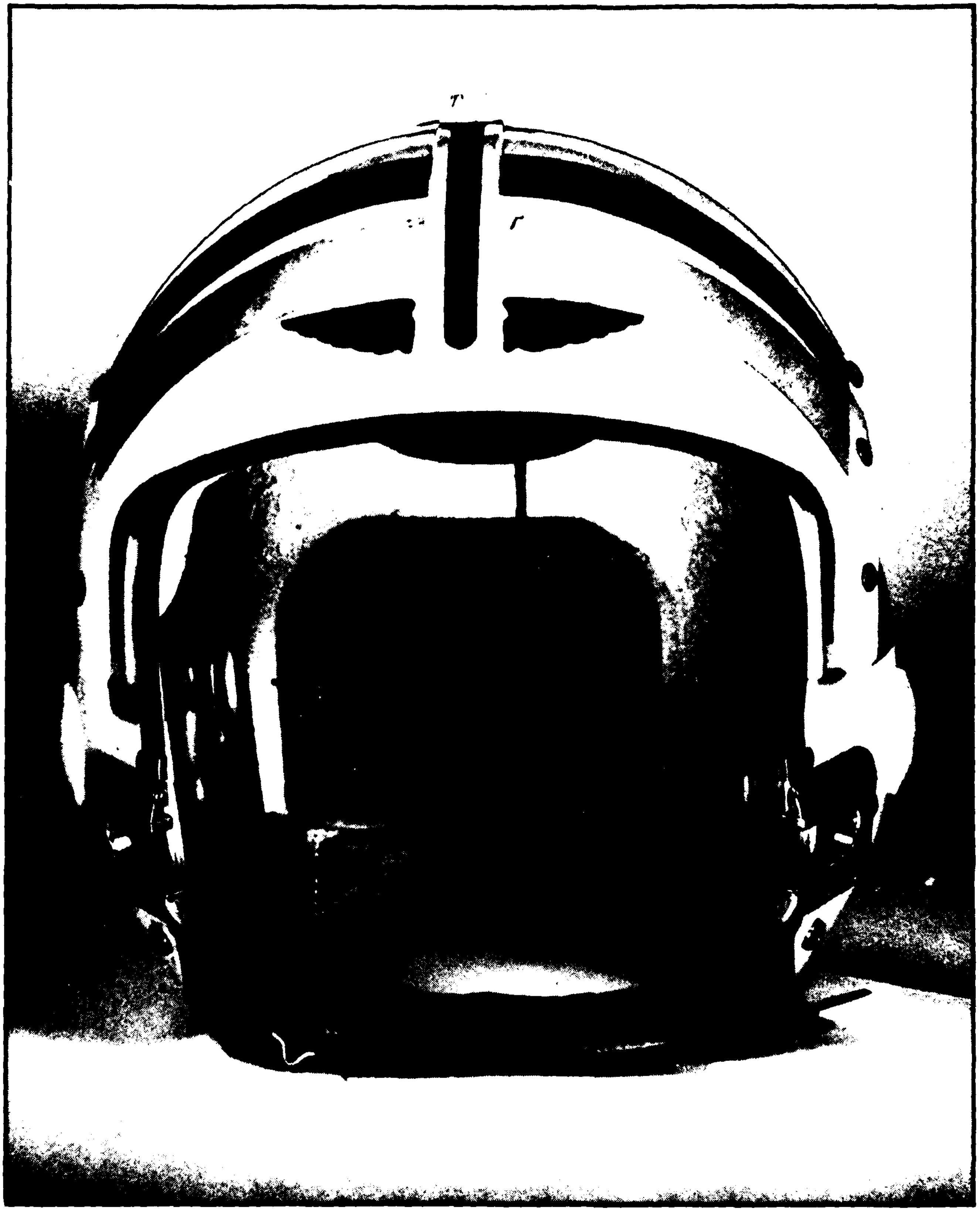


Figure 9. Helmet Visor Up Front
(light background)

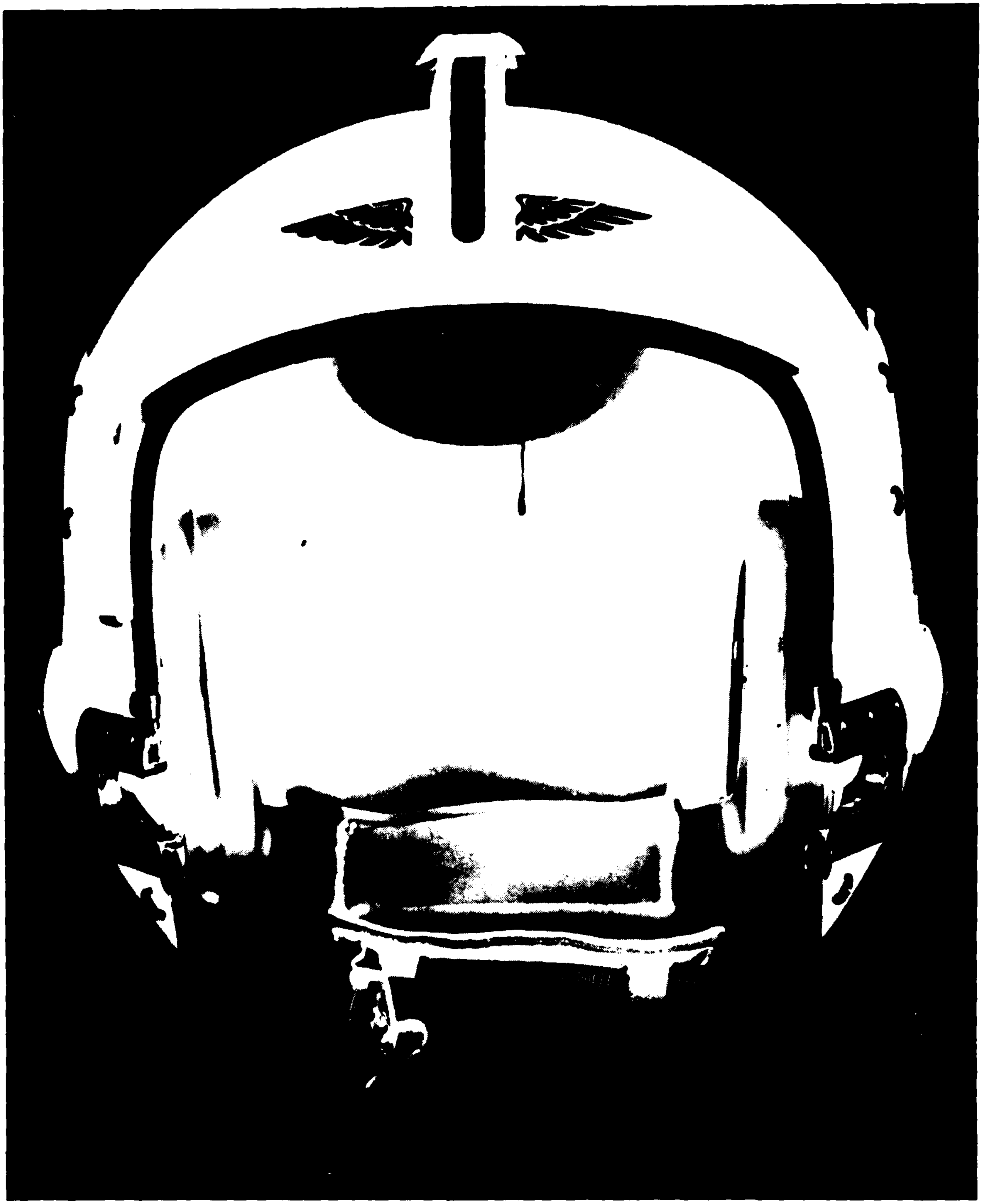


Figure 9A. Helmet Visor Up Front
(dark background)

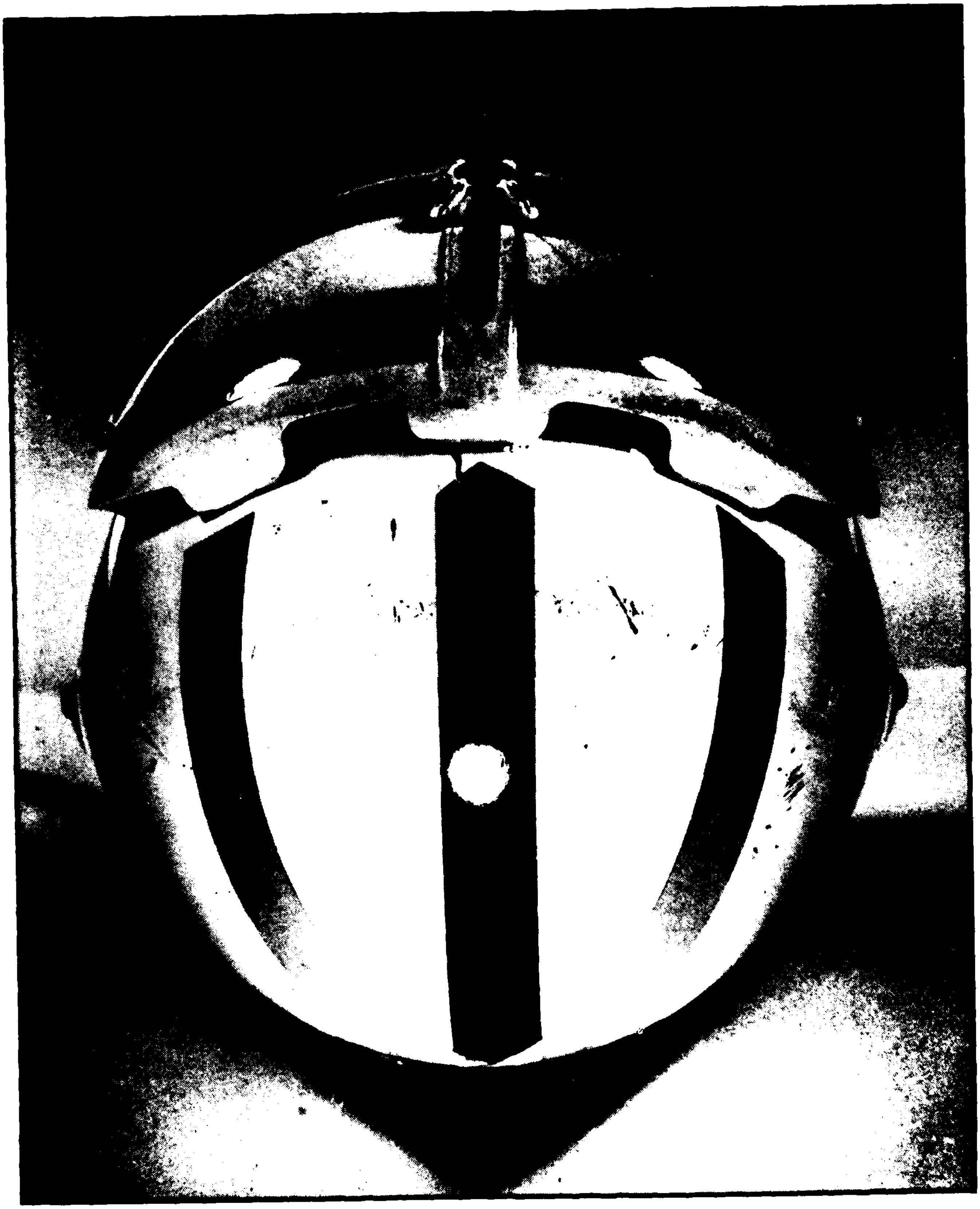


Figure 10. Helmet Top View

Aircrew Life Support Systems (ALSS), Post Emergency Usage

Guides

Part II: Oxygen Equipment, Man-Mounted

INTRODUCTION

Military man-mounted oxygen system components are designed to serve several purposes: (1) provide life sustaining breathing gases during normal flight and emergency escape; (2) provide inflight communications through the microphone; and (3) provide enhanced helmet retention. Additionally, the mask provides facial protection during the initial stages of emergency egress. Indepth assessment of the performance of the entire man-mounted oxygen system (oxygen mask, retention assembly, upper hose assembly, regulator, lower hose assembly, and the connector block assembly) is required to determine the dynamic interactions of these components and other life support equipment during aircraft mishaps and emergencies. An improved understanding of these interactions and the effects upon the aircrewman under diverse conditions associated with aircraft mishaps will provide the basis for improving the man-mounted equipment designs and the testing and evaluation process.

The enhanced data base is provided through detailed inspection of all man-mounted oxygen equipment and subcomponents involved in aircraft mishaps. This data will provide the background information to develop dynamic test and evaluation guidelines as well as improved design criteria for future equipment. To accomplish this data gathering, each subcomponent should be inspected for damage, displacement, malfunction, and indications of interactions with other equipment (e.g. paint, fibers) during the dynamic events of the mishaps.

The evaluation is not just the functioning of the equipment items but must be related to evidence of injury or injury prevention. It is vital to determine the conditions associated with the mishap to assess the interactions and determine casual effects. An example would consist of the oxygen mask being lost and the aircrewman reported to have facial lacerations; it is important to know (only if established fact, guesses and hypothesis should be identified and the rationale explained), if the mask was attached securely to the helmet and the patterns of the facial laceration; it is necessary to know when the loss was first experienced. Another example would be damage to the helmet bayonet fittings which could provide indications of dynamic involvement with the parachute or debris.

Further it is desirable to inspect the interior of the oxygen mask, performance of the regulator, and the hoses to determine if the aircrewman might have experienced physical difficulties prior to the actual emergency (e.g. blocked airflow, motion sickness). This handbook provides general guidance for Phase I and Phase II inspection procedures for the man-mounted oxygen system components and includes a data worksheet format for supporting the documentation of the mishap. The information contained on the man-mounted oxygen equipment: (1) will be combined with all available testing and mishaps data; (2) shall be provided to the investigating medical officer for the aircraft mishap; and (3) will be employed to update design criteria and quality assurance assessment standards for man-mounted oxygen equipment and subcomponents.

The inspection procedures established by this document have been implemented by the enclosed OPNAVINST and its amendments which provide for systematic acquisition and analysis of aircraft mishaps data to develop information for reducing potential risks to the aircrewman. Failure to completely institute systematic "in-service" data acquisition and analysis can result in valuable data being overlooked and lost thereby introducing bias into the informational system.

The issuance of the Handbook is accompained by the enclosed OPNAVINST which requires that all man-mounted oxygen equipment employed in ejections or other aircraft mishaps be subjected to systematic inspection designed to provide: (1) full documentation of the conditions associated with the oxygen equipment's usage; (2) identification and cataloging of the damage to the man-mounted oxygen system and its components; (3) comparison of the damage under varying conditions; (4) comparison of the injury patterns resulting under comparable conditions with the associated damage patterns; and (5) determination of the protective efficiency of the man-mounted oxygen system's components in preventing injurious conditions. This OPNAVINST, also sets forth conditions where Phase III Destructive Inspection procedures are necessary and what types of procedures might be employed.

Should Phase III inspection be indicated, guidelines for shipping of the equipment will be provided and the appropriate destination indicated. Receipt of the equipment will be acknowledged using a form letter which will contain the receipt of the equipment, indicate the time in which a response can be expected, and the inspection procedures to be employed.

Work Sheet

Appendix A

A. Data required for all life support equipment

1. Date of accident   Accident I.D. No.

2. Type of aircraft   Bureau No.

3. Location of accident

4. Ejection   Yes____   No____

   If yes: a. Altitude

   b. Airspeed

   c. Attitude

   d. Ejection seat type Ser. No.

   e. Crew station

   f. Parachute

   g. Survival kit type

   h. Reported winds aloft in area

   i. Landing site

5. Crash (occupied)   Yes____   No____

   a. Altitude of impact site

   b. Estimated airspeed at impact

   c. Estimated attitude at impact

   d. Impact site (ground - water - flight deck)

   e. Wind conditions

B. Injuries Sustained: Fatal_____   Nonfatal_____

1. Overall injuries reported (FSR):

2. Specific injuries: (a) Head fx Yes____   No____

   (b) Neck fx Yes____   No____

(c) Neck Strain/sprain Yes____ No____

(List type and location of injuries using anatomical landmarks.

Describe how the injury was determined - X-ray, postmortem, etc.)

C. Personal data: (1) Age____ Blood Type ____

(2) Sex____

(3) Weight____

(4) Height____

(5) Anthropometric Measurements

(a) Total Sitting Height ________

(b) Neck Circumference __________

(c) Cervical Length (C1 through C7) ______

(d) Head Circumference __________

(e) Buttock Knee Length _________

(f) Buttock Popiteal Length _________

(g) Total Leg Length ____________

(h) Chest Circumference __________

(i) Torso Length (Shoulder Height) ______

Work Sheet

Appendix B

Phase I Non-Destructive Inspection

Oxygen Mask: (1) Manufacturer

(2) Model

(3) Date of Manufacture

(4) Was the oxygen mask recovered with the helmet?

Yes____ No____

(5) Was the oxygen mask attached to the helmet?

Yes____ No____

(6) Was the hose/mask assembly recovered?

Yes____ No____

(7) Was the hose/mask assembly damaged?

Yes____ No____

(8) Was the mask recovered with the aircrewman?

Yes____ No____

(9) Were any facial laceration/injuries indicated?

Yes____ No____

(If yes, describe using drawings and/or photographs)

(10) Is the hose/mask operable?

Yes____ No____

(If no, describe why it is not operable)

(11) If oxygen mask/hose assembly was lost, when was it lost?

(Deliberate discard or inadvertent. Describe in detail)

Work Sheet

Appendix C

Phase II Non-Destructive Laboratory Inspection

A. All data obtained from Phase I observations plus additional general information:

1. Shipped from:
2. Date shipped:
3. Date received:

B. Inspection Procedure

1. Microscopic examination mask assembly
    a. Macroscopic inspection
    b. Internal inspection
    c. Fittings to helmet
2. Infra-Red light inspection
    a. Light wavelength
    b. Light intensity
    c. Lens size (aperature)
    d. Focal distance from item
3. Coherent light inspection
    a. Light wavelength
    b. Light intensity
    c. Lens size (aperature)
    d. Focal distance from item

C. Damage/Injury Comparison - (Tissue damage, present or absent in oxygen mask assembly. Where? Indicate using drawings.)

Work Sheet

Appendix D

Phase III Destructive Laboratory Inspection

A. Phase I and II inspection data evaluated prior to further inspection.

B. Other procedures and inspections which may be required.

1. Duplicate injury equipment pattern using windblast or impact tests.

2. Micro analysis of the components of the item.

Work Sheet

Appendix E

General Oxygen Mask Assembly Investigation Checklist for Aircraft Mishaps

1. Did the quipment interact with other equipment? (Describe what indicated the interaction.) Yes____ No____

2. Could the equipment be considered suitable for reuse? (Exclusive of the interaction governing use/reuse. If no, please explain and give your rationale.) Yes____ No____

3. Was the equipment interaction a contributor to the injuries sustained by the aircrewman? (Describe what leads you to either answer.) Yes____ No____

4. How was the interaction determined? (Describe in detail the steps you used to arrive at your conclusion.) Yes____ No____

5. Was the damage indicative of interactions? (Describe your logic.) Yes____ No____

6. Does the damage reflect injury to the aircrew? (Describe using drawing, photographs and words to support your decision.) Yes____ No____

7. Were any predisposing problems with the equipment which could contribute to the mishap? (Explain if yes.) Yes____ No____

8. Was the equipment age limited? If so, was it within its useful life span? Yes____ No____

   Date of mfg. __________ Manufacturer __________________________

9. Had the equipment been routinely inspected? Yes____ No____

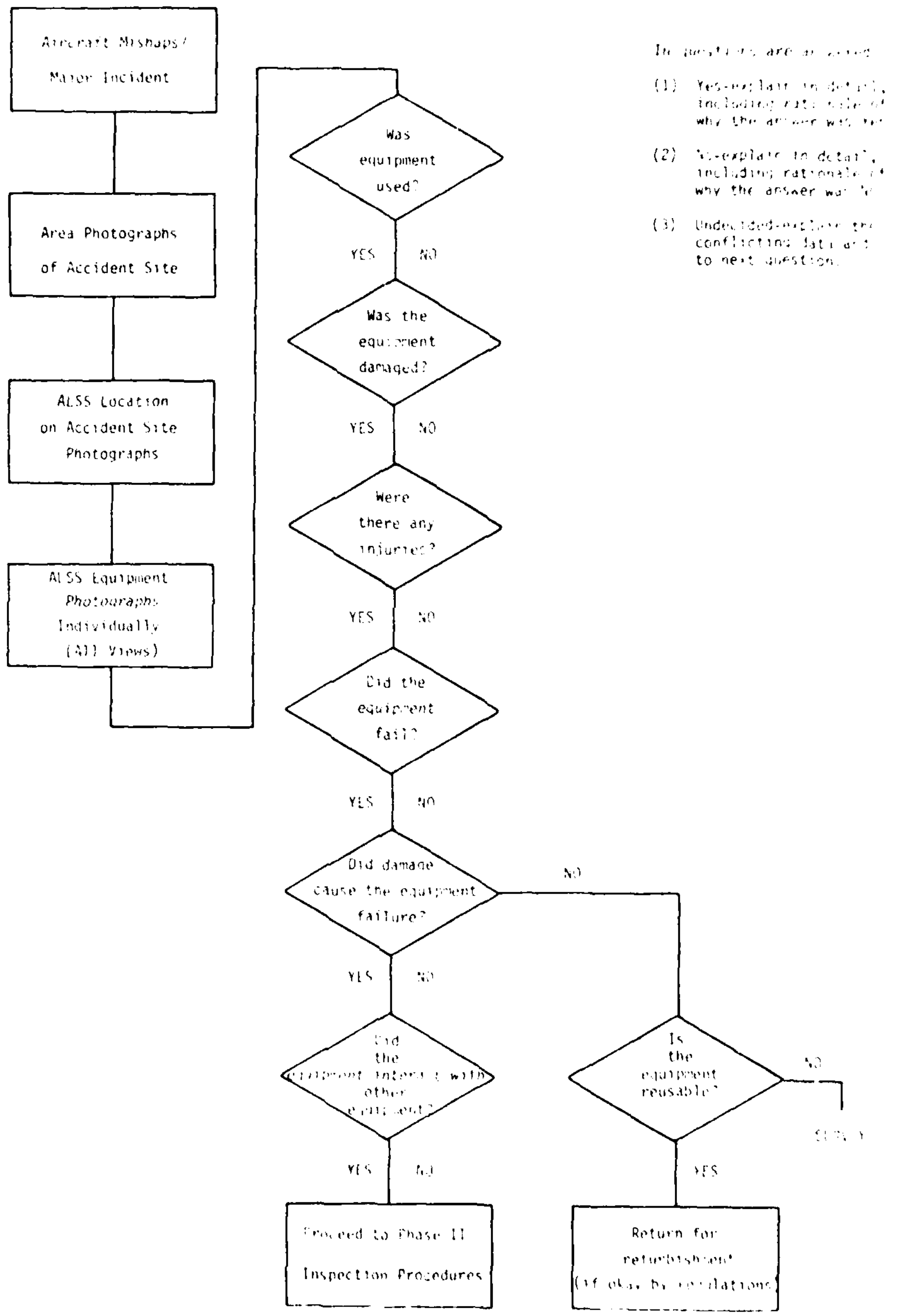
   Date of last inspection ________ Inspector ____________________

10. Did the aircrewman have any predisposing medical problems? (If yes, describe the symptoms.) Yes____ No____

11. Should further inspection of the equipment be undertaken? (If yes, explain why and give your reasons. What procedures would you suggest may be helpful?) Yes____ No____

AIRCREW LIFE SUPPORT SYSTEM (ALSS)

INVESTIGATION FLOW



Aircrew Life Support Systems (ALSS)

Post Emergency Usage Guides

Part III. Aircrew Personnel Flotation Equipment (Life Preservers)

INTRODUCTION

Aircrew personnel flotation equipment (life preservers) are designed to (1) be compatible with crew mobility requirements and aircrew station spatial limitations during flight, (2) withstand maximum escape speed windblast without failure or sustaining damage that degrades operability or flotation or that degrades escape system operation or injures the wearer, and (3) provide individual immersed flotation to enhance survival following entry into an aquatic environment. Current models and designs of personnel flotation provide approximately sixty-five pounds of positive flotation to the aircrew member if all lobes are optimally inflated and support the individual in a manner keeping the head upright and the face clear of the water to permit breathing. There are concerns about the adequacy of this flotation under less than optimal conditions (e.g., sea state, incomplete filling of the lobes due to cold, leakage rates). To provide answers regarding these concerns and to determine the performance of these equipments during emergency usage, it is necessary to obtain clear and concise data concerning each use or attempted use. This data can assist in determining whether the equipment is performing satisfactorily or whether new designs or modifications to existing designs are required. Additionally, improvement of the use data will aid the development of realistic criteria for testing and evaluating new equipments and modifications prior to fleet operational introduction.

Thorough investigation of and accurate recordation of the events and conditions of each mishap is essential for developing the data base necessary for statistical and engineering analyses of the mishap event sequences, the performance of the life support equipments within various naval aviation communities under a wide spectrum of emergency conditions, and to define the man-equipment-environmental dynamic interactions. Clearly defining problems and standardization of data acquisition associated with the mishaps requires the introduction of systematic investigative procedures to develop and report information concerning the performance of the life support and survival equipment regardless of the injuries to the aircrew. This data acquisition process provides for continuing evaluation and appraisal of the equipment, its performance and interactions with the aircrew. Future systematic analyses of the mishap data will clarify the causal relationships within the dynamic mishap environment, suggest the injury causal factors, and suggest potential preventive techniques.

To ensure and enhance systematic investigation of aircrew life support and survival equipment usage, guidelines and directions are being developed and furnished for each item of equipment concerning the data required to support systematic analyses. It is necessary to (a) document and accurately record the conditions and circumstances of use, (b) damage and abuse occurring prior to, during, and after the mishap, (c) the extent and location of damage, (d) the pattern(s) of damage relative to other equipment's damage and injury to the aircrew, and (e) indication of damage and injury to the aircrew. Damage patterns provide data which can be used to define dynamic interactions which degrade crew survival potential or pose a threat through various mechanisms to the crewmember. Therefore, it is especially critical to accurately and completely document damage and injury patterns, lack of damage or injury and conditions attendant to the mishap and survival event for all emergency usages or attempts to use. Nondestructive inspection techniques are described which can enable the investigator to develop more fully data for the evaluation of the mishap and the use and performance of the equipment during and following the mishap, while retaining the equipment intact and without degrading the equipment's condition. This ability to extract a maximum of data systematically from recovered equipments without further degrading its condition is critical to (1) assure that maximal data is acquired immediately after the location and recovery of each article prior to its being transported and perhaps mishandled and damaged in such a way as to mask vital information, and (2) assure that the need for laboratory assistance is held to a minimum, yet when such assistance is required that the area of assistance is well defined and the involved articles are in as near recovered condition as possible. The nondestructive inspection data will aid in identifying conditions where equipment performs satisfactorily and aid in putting damage and injuries into proper perspective and will aid in laboratory investigations.

To define the environment(s) to which life preservers are exposed and under which they are used and the effect upon (1) user's safety and survival, (2) performance capability, and (3) equipment integrity, all personnel flotation equipment involved in mishaps shall be subjected to Nondestructive Inspection (Phase I). If circumstances or conditions exist which warrant further investigation (e.g., seam failure of equipment, cuts, tears, et cetera), then the equipment shall be subjected to Nondestructive Inspection (Phase II). (Note: Only following completion of Phase I including the full recordation of that data to visually inspect, describe and identify damage patterns, extent of damage, failure points, and other abnormal conditions.) Should this inspection fail to adequately document potential causal factors for the reported difficulties experienced with the equipment, further testing may be required (Destructive Inspection - Phase III) to obtain complete documentation and identification of failure points and parameters. However, Phase III may only occur after the completion with full recordation of the data of Phase I and II.

This guide provides Phase I and Phase II procedures and includes worksheet formats and supporting information required for the investigation and assessment of personnel flotation equipment post mishap. The supporting information will assist in determining whether Phase III Inspection is necessary and, if so, how it should proceed. This data combined with other worksheets will furnish the information necessary to complete the FSR plus engineering assessment. The data will be (1) combined with all available data on damage patterns associated with mishaps and testing; (2) provide the engineering investigators potential occurrence information during mishaps; and (3) be employed to update design criteria and quality assurance/assessment standards for personnel flotation equipment.

To assure the maximum opportunity for obtaining early indication of potential problems and to provide the means for defining the causal factors and mechanisms, equipment investigation and reportage should be performed whether or not the equipment sustained damage, whether or not the equipment was actively employed (i.e., equipment worn but no attempt was made to inflate it) and whether or not the aircrew entered the water. The procedures outlined in this guide have been developed to provide systematic acquisition of data to provide the basis for systematic analysis of aircraft mishaps and the role(s) and performance of aircrew life support systems equipments in an attempt to reduce potential risks to the aircrew. Failure to completely report the data acquired in a systematic investigation can result in the loss of valuable data with consequent introduction of bias into the entire data base and into the subsequent actions.

The mishap data requested for personnel flotation equipment in this guide has been implemented by OPNAVINST and its amendments which provide for the systematic collection and analysis of aircraft mishap data. This instruction requires that all aircrew life support and survival equipment employed during the escape or survival phase of an aircraft mishap be subjected to systematic inspections designed to: (1) fully document the conditions attendant to equipment exposure and usage; (2) identify and catalogue damage to the equipment, its packing, and its subcomponents; (3) identify and document all injuries sustained by the aircrew member, primarily focused on the torso, head and neck; (4) permit subsequent comparison of the damage patterns under varying mishap conditions; (5) permit subsequent comparison of injuries sustained, injury patterns under comparative conditions and correlation with equipment damage; and (6) permit subsequent determination of performance efficiency of personnel flotation equipment and its effect on survival. Guidelines in this OPNAVINST set forth the conditions under which further Destructive Inspection (Phase III) may be required. Should Phase III Inspection be indicated, guidelines for shipping of the equipment will be provided under separate cover, and the appropriate destination indicated. Receipt of the equipment will be acknowledged using a form letter which will contain the receipt of the equipment, indicate the expected response time, and the proposed inspection procedures to be used.

It is suggested that 8x10 color photographs be used to most effectively illustrate damage or strains. These photographs should be sharply focused and clear with notation made on the reverse identifying the mishap and the equipment and concerning the suspected damage or interactions as indicated on the work-sheets as in Appendix B. Line drawings, diagrams, or sketches should be used liberally to enhance description of damage and support your rationale for your conclusions in support of your hypotheses and investigational results. Additionally, record and provide all data accurately and legibly and do not be concerned if you do not have a clear developed hypothesis.

APPENDIX A

GENERAL WORK SHEET

I. Data required for all life support equipment.

A. Date of Accident__________ Accident I.D. No.__________

B. Type of Aircraft__________ Bureau No.__________

C. Location of Accident__________

D. Ejection Attempted: Yes________ No________

E. Ejection Accomplished: Yes________ No________

1. Altitude at Ejection__________
2. Airspeed at Ejection__________
3. Attitude at Ejection__________
4. Ejection Seat Manufacturer__________
5. Ejection Seat Serial Number__________
6. Ejectee's Crew Station__________
7. Parachute__________
8. Survival Kit__________
9. Reported Winds Aloft in Ejection Area__________
10. Landing Site Type__________
11. Air Temperature Aloft in Ejection Area__________
12. Water Temperature in Landing Area__________
13. Estimated Time in the Water__________

F. Aircraft Crashed: Yes________ No________

1. Altitude of Crash Site__________
2. Estimated Impact Airspeed__________
3. Estimated Impact Attitude__________
4. Impact Site Type__________
5. Wind Conditions at Impact Site__________

G. Aircrew Injured: Yes________ No________

1. Injuries Sustained were: Fatal________ Nonfatal________
2. Summary of All Reported Injuries__________

3. Specific Injuries to:

a. Head Area Fractures: Yes________ No________

(1) Location____________________

(2) Description____________________

b. Neck Area Fractures: Yes________ No________

(1) Location____________________

(2) Description____________________

c. Vertebral Column Fracture: Yes________ No________

(1) Location____________________

(2) Description____________________

d. Appendicular Skeleton Fractures (e.g. Arm/Leg): Yes___ No___

(1) Location____________________

(2) Description____________________

e. Torso Area Fractures: Yes________ No________

(1) Location____________________

(2) Description____________________

F. Vertebral Column Strain/Sprain: Yes______ No______

(1) Location____________________

(2) Description____________________

g. Appendicular Skeleton Strain/Sprain: Yes______ No______

(1) Location____________________

(2) Description____________________

NOTE: When describing injuries use anatomical landmarks to describe the injury location and describe how the injury was determined.

II. Personal Data of Aircrew.

A. Age____________________

B. Sex____________________

C. Blood Type____________________

D. Anthropometric Data:

1. Height____________________
2. Weight____________________
3. Sitting Height____________________
4. Neck Circumference____________________
5. Cervical Length (C1 through C7)____________________
6. Head Circumference____________________

7. Buttock Knee Length______________________________

8. Buttock Popliteal Length______________________________

9. Buttock Leg Length______________________________

10. Chest Wall Circumference______________________________

11. Shoulder Height______________________________

NOTE: Record all the anthropometric measurements in consistent units and note which units used, also the source of the anthropometic data. This information is useful in retrospective analysis of the mishap and dynamic interactions of the aircrew.

APPENDIX B

FLOTATION EQUIPMENT WORK SHEET

I. Nondestructive Inspection (Phase I & II)

A. Personal Flotation Equipment Data

1. Manufacturer____________________

2. Model____________________

3. Serial Number____________________

4. Contract Number____________________

5. Contract Lot Number____________________

6. Date of Manufacture____________________

B. Usage Data of the Equipment

1. Was the equipment worn by the aircrew? Yes____ No____

2. Was the equipment inflated by the aircrew? Yes____ No____

3. Was the equipment recovered with the aircrew? Yes____ No____

4. Was the equipment lost? Yes____ No____

a. Lost during recovery? Yes____ No____

b. Discarded by the aircrew during recovery? Yes____ No____

c. Discarded by other than aircrew? Yes____ No____

(1) Location____________________

(2) Describe circumstances____________________

____

(3) Who discarded the equipment?____________________

(4) Reason equipment discarded.____________________

5. Were there modifications on the equipment? Yes____ No____

a. Modifications were authorized. Yes____ No____ (If yes, go to 5b)

(1) Modifications present____________________

(2) Date Modified____________________

(3) Source of Modification Data____________________

b. Modifications were not authorized.

(1) Describe the modification____________________

____

(2) Source of the modification____________________

____

(3) When did the modification occur?____________________

____

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(4) Did the modification inhibit the function of the equipment or result in the loss function? Yes____ No____

NOTE: Use photographs and line drawings to illustrate the modifications.

6. Equipment malfunctioned? Yes____ No____

   a. Malfunction resulted from damage? Yes____ No____

   b. Malfunction due to material failure? Yes____ No____

      (1) Describe the malfunction____________________________________

      ____

      (2) What item failed/malfunctioned?____________________________________

      ____

      (3) Did the malfunction result in injury or reduction of survival changes? Yes____ No____

         (a) Describe which injury____________________________________

         ____

         (b) How did it reduce survival chances?____________________________________

         ____

7. Equipment Damaged? Yes____ No____

   a. Damage resulted in malfunction? Yes____ No____

      (1) Describe the malfunction____________________________________

      ____

      (2) Source of the damage____________________________________

      ____

      (3) Describe the damage____________________________________

      ____

   b. Damage did not result in malfunction. Yes____ No____

8. Equipment recovered with the aircrew. Yes____ No____

   a. Attached to the MA-2? Yes____ No____

      Attached to the Survival Vest? Yes____ No____

   b. Aircrew noted equipment problems during emergency sequence or during survival? Yes____ No____

      (1) Failed to properly inflate. Yes____ No____

         (a) Both Lobes. Yes____ No____

         (b) Right Lobe. Yes____ No____

         (c) Left Lobe. Yes____ No____

         (d) Neck Lobe. Yes____ No____

      (2) Both carbon dioxide cartridges were activated/expended during the event. Yes____ No____

(a) Cartridges were properly seated? Yes____ No____

(b) Seats were not damaged? Yes____ No____

(c) Cartridge manufacturer________________________________

____

(d) Cartridge Lot No.________________________________

(e) Cartridge size________________________________

(3) Leakage occurred in lobes? Yes____ No____

(a) Due to damage? Yes____ No____

(b) Due to seam failure? Yes____ No____

(c) Due to material leakage? Yes____ No____

(d) Determined leakage rate________________________________

(e) Date of last inspection________________________________

Inspector________________________________

Location of last inspection________________________________

____

Aircrew Life Support Systems (ALSS)

Post Emergency Usage Guides

Part IV: Survival Vests (SV-2)

INTRODUCTION

Aircrew survival vests are designed to provide storage and availability of survival equipment during normal flight, emergency egress, descent; and through the landing, survival, and rescue. The survival vest contains communication equipment, signaling equipment, basic navigation equipment, survival medical packets, water, and cutting equipment. It is capable of being expanded to include additional or modified equipment during combat or times when the operational requirements change or unique aircraft requirements exist.

Currently, the survival vest is incorporated as part of the torso harness (MA-2) for those aircrew flying ejection seat equipped aircraft. This interaction of the two items provides less bulk and improves retention of the survival equipment during emergency escape. The interactions of the survival equipment, the aircrew, and other life support equipment during the dynamic events of the mishap are virtually unknown. There are injuries which may result from the placement of equipment in specific areas or injuries which may be intensified by interactions with other equipment or its placement. Detailed analysis of each mishap will improve the understanding of these dynamic interactions and the role of the survival vest and its contents in the overall injury and survival of the aircrew.

Thorough investigation of, and accurate recording of, each mishap is essential to provide the data base necessary for statistical and engineering analysis of the mishaps and the event sequences which occur within various naval aviation communities, and define the interactions which occur during mishaps. It is necessary to have accurate information to clearly define and to standardize the data analysis for aircraft mishaps. To accomplish this, it is necessary to use a systematic analytical approach to the initial acquisition process of a mishap investigation. This provides the accurate data required for engineering evaluation of the equipment. Each piece of equipment must be inspected in detail and the results of the inspection recorded fully, regardless of the injury to the aircrew or even if the item was used. This systematic approach to gathering data provides the information base required to allow continuing evaluation and appraisal of life support equipment, its performance and interactions during and following a mishap. Long-term systematic analysis of mishap data will clarify interactions, injury-equipment associations, potential causal relationships, and suggest directions for future development of life support and survival equipment.

To ensure systematic inspection of aircrew equipment, this guide for the survival vest is part of a continuing series of procedures designed to enhance the data gathering process. The first step in a systematic investigation is to document the conditions and circumstances of the mishap; the equipment available and used during the mishap; circumstances of the equipment's use; damage and abuse of the equipment prior to, during, and subsequent to the mishap, egress, survival, and rescue; damage patterns to the equipment; injuries to the aircrew; injury patterns on the aircrew; and relationships of the injury and damage patterns. Complete documentation of each of the above is necessary and can contribute to the understanding of the dynamic behavior of life support equipment during all phases of the mishap. Non-destructive inspection techniques are the first step of this systematic analysis. It provides desired data to the investigator while retaining the equipment intact. Despite the focus on and interest in the identification and documentation of damage and injury to the wearer, a critical need exists for an equally careful identification and documentation of lack of damage or injury to the wearer. This information aids in identifying those conditions for which the equipment performs satisfactorily and helps to put the damage and injuries into proper perspective. From this data, equipment interactions and performance can be assessed and requirements can be defined or redefined for future equipment development or modifications which are designed to reduce the likelihood of increased risk, or increase the existing risk, injury severity, or frequency for the aircrew. An improved understanding of the conditions of equipment usage will provide guidelines for the conditions which should be used when equipment is tested and evaluated in the future.

To define the environment in which the survival vest is used and exposed to, it is necessary to assess the effects upon (1) user safety, (2) integrity of the equipment during the dynamics of the mishap, and (3) functional performance in providing survival items required by the aircrew. All survival vests involved in mishaps shall be inspected using Non-Destructive Inspection Techniques (Phase I). If conditions arise, or unusual behavior is identified by the investigator, further inspection shall be conducted in greater detail using Non-Destructive Inspection Techniques (Phase II) which are enhanced visual techniques. Should the engineering evaluator require further information on a particular mishap because of malfunction, damage, or injury, provisions will be made for Destructive Inspection Techniques (Phase III) to provide the requested data.

This guide provides the basic information requested for Phase I and II inspections. Included are worksheet formats which should be filled out to assure gathering of all supporting information required for the mishap investigation and post-mishap analysis. This information will assist in determination of the requirements of further inspection of the equipment and how that inspection should be conducted. The information contained in these inspection worksheets will be (1) combined with all available data gathered from other mishap investigations and during equipment test and evaluation for engineering evaluation, (2) available to the investigating medical officer for use in preparation of the mishap report, and (3) employed to update design, test and evaluation criteria and quality assurance/assessment standards for life support and survival equipment.

The procedures in this guide are a development for the upgrading of the investigating and reporting implemented by OPNAVINST 3750.6 (series) that require the systematic gathering, reporting and analysis of mishap data to improve safety and to reduce the risk to the aircrew. Failure to completely institute a systematic "in-service" data acquisition and analysis results in the loss of valuable information, introduces bias into the overall data system, and compromises the safety of the aircrew.

The issuance of this guide is an upgrade to the present requirements which require all aircrew life support equipment employed during aircraft mishaps be subjected to a systematic inspection and reporting of the inspection to (1) fully document the conditions of use, (2) identify and catalogue the damage to the equipment, (3) identify and document all injuries to the aircrew, (4) comparison of the injuries under varying conditions, (5) comparison of the damage patterns to the injury patterns under comparable conditions, and (6) determine the performance of the life support equipment under operational, emergency, survival, and rescue conditions for which it was intended.

To accomplish the detailed inspections required, Phase III inspections may be deemed necessary by the engineering evaluator. If this is necessary, instructions will be provided under separate cover with appropriate accounting information, procedures for packing and shipping, and the destination for shipment. The receipt of the equipment will be acknowledged using a form letter which will contain the date received, projected response time for the inspection and the procedures which will be used in the inspection. The results of the Phase III inspection will be provided to the engineering evaluator and would become available in specific cases to others.

Documentation of the mishap and the equipment is vital to a systematic investigation. The mapping of the mishap area is vital with the notation of the location of each item of life support and survival equipment. The equipment should be tagged, photographed, and recorded. It is suggested that 8 X 10 color photographs be used to most effectively indicate the damage, abuse, or strains on the equipment. These photographs should be clearly focused with notations on the reverse side as to the mishap, date, equipment, suspected damage, and interactions suspected from your investigation. Line drawings, sketches, and diagrams should be used liberally to enhance the photographic documentation and writing to support your theories, hypotheses, and analyses of the mishap. Additionally, record and present all data as accurately and completely as possible citing the source of the information. If you have no clear hypothesis as to the interactions and causal relationships of the mishap, do not worry, it takes a detachment and large amount of background data at times to form an impression. Your impressions are welcomed!

APPENDIX A

GENERAL WORK SHEET

I. Data required for all life support equipment.

A. Date of Accident ____________ Accident I.D. No. ____________

B. Type of Aircraft ____________ Bureau No. ____________

C. Location of Accident ____________

____

____

D. Ejection Attempted: Yes ________ No ________

E. Ejection Accomplished: Yes ________ No ________

1. Altitude at Ejection ____________
2. Airspeed at Ejection ____________
3. Attitude at Ejection ____________
4. Ejection Seat Manufacturer ____________
5. Ejection Seat Serial Number ____________
6. Ejectee's Crew Station ____________
7. Parachute ____________
8. Survival Kit ____________
9. Reported Winds Aloft in Ejection Area ____________
10. Landing Site Type ____________
11. Air Temperature Aloft in Ejection Area ____________
12. Water Temperature in Landing Area ____________
13. Estimated Time in the Water ____________

F. Aircraft Crashed: Yes ________ No ________

1. Altitude of Crash Site ____________
2. Estimated Impact Airspeed ____________
3. Estimated Impact Attitude ____________
4. Impact Site Type ____________
5. Wind Conditions at Impact Site ____________

G. Aircrew Injured: Yes ________ No ________

1. Injuries Sustained were: Fatal ________ Nonfatal ________
2. Summary of All Reported Injuries ____________

____

____

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3. Specific Injuries to:

a. Head Area Fractures: Yes________ No__________

(1) Location____

(2) Description____

b. Neck Area Fractures: Yes____________ No___________

(1) Location____

(2) Description____

c. Vertebral Column Fracture: Yes____________ No__________

(1) Location____

(2) Description____

d. Appendicular Skeleton Fractures (e.g. Arm/Leg): Yes___ No____

(1) Location____

(2) Description____

e. Torso Area Fractures: Yes________ No___________

(1) Location____

(2) Description____

F. Vertebral Column Strain/Sprain: Yes______ No________

(1) Location____

(2) Description____

g. Appendicular Skeleton Strain/Sprain: Yes_____ No______

(1) Location____

(2) Description____

NOTE: When describing injuries use anatomical landmarks to describe the injury location and describe how the injury was determined.

II. Personal Data of Aircrew.

A. Age____

B. Sex____

C. Blood Type_______________________________________

D. Anthropometric Data:

1. Height____

2. Weight____

3. Sitting Height__________________________________

4. Neck Circumference_____________________________

5. Cervical Length (C1 through C7)________________

6. Head Circumference_____________________________

7. Buttock Knee Length____________________

8. Buttock Popliteal Length____________________

9. Buttock Leg Length____________________

10. Chest Wall Circumference____________________

11. Shoulder Height____________________

NOTE: Record all the anthropometric measurements in consistent units and note which units used, also the source of the anthropometic data. This information is usetul in retrospective analysis of the mishap and dynamic interactions of the aircrew.

APPENDIX B

SURVIVAL VEST (SV-2) WORK SHEET

I. Phase I Non-Destructive Inspection

A. Survival Vest:

1. Manufacturer______________________________

2. Date of Manufacture______________________________

3. Model______________________________

4. Lot Number______________________________

5. Serial Number______________________________

6. Was the survival vest recovered? Yes______ No______

7. Was the survival vest damaged? Yes______ No______ (If Yes, describe the damage using words, drawings, and photographs.)

8. Was the survival vest recovered with the ai.-rew? Yes______
   No______ (If no, describe why the survival vest was not recovered.)

9. List effective aircrew changes incorporated on survival vest with dates, locations, and person modifying vest.
   ____
   ____

10. Was the survival vest discarded? Yes____ No____ (If yes, was it deliberately or inadvertently discarded by aircrew, rescuers, or others. Describe the details why and where discarded.)

11. Was the survival vest part of the torso harness (e.g., integrated with the torso harness)? Yes______ No______ (If yes, give the date, location, and persons performing the modifications.)

12. Were the attachments to the torso harness intact? Yes____ No____

13. Was the survival vest damaged during the survival phase? Yes____
    No____ (If yes, describe fully.)

14. Was the survival vest damaged during the rescue phase? Yes____
    No____ (If yes, describe how, when and under what conditions.)

15. Was the survival vest damaged after the recovery phase? Yes____
    No______ (If yes, describe the location, type of damage, under what conditions did the damage occur.)

16. Did the survival vest remain intact during the dynamic egress (ejection) phase of the mishap? Yes____ No____ (If no, describe when did the aircrew note that damage had occurred. Did the failure degrade the egress, survival, or rescue? Describe fully and in detail the problems and how it degraded the egress, survival or rescue.)

17. Were there modifications to the basic survival vest? Yes______

No______ (If yes, describe the modifications in detail, illustrate the modifications using line drawings, and photographs. Give the date and location when and where the modifications occurred.)

18. Were these modifications authorized? Yes______ No______ (If yes, cite the date of authorization, source, and individual authorizing the modification.)

Survival Vest Contents

Record a detailed inventory of all authorized and unauthorized items contained in the survival vest. For each item, list its date of manufacture, manufacturer, lot and serial number, and its location in the survival vest. For non-standard items, list the rationale for having the items in the survival vest.

APPENDIX C

SURVIVAL VEST (SV-2) WORK SHEET

I. Phase II Non-Destructive Laboratory Inspection

A. Evaluate all data obtained from Phase I inspection, plus additional general mishap information.

1. Shipped from: ______________________________

2. Date shipped: ______________________________

3. Date received: ______________________________

B. Inspection Procedures

1. Microscopic inspection of the strained or torn (cut) fabric, seams, and stitching, both externally and internally. This inspection may be performed using natural, coherent, or other light sources as required to determine the damage to the material.

2. Other non-destructive inspections may be conducted if warranted by a review of the circumstances associated with its usage.

APPENDIX D

SURVIVAL VEST (SV-2) WORK SHEET

I. Phase III Destructive Laboratory Inspection (as determined by the engineering investigator/evaluator).

   A. Evaluate and review all findings from Phase I and II inspections and correlate the data with all other mishap findings prior to further inspection.

   B. Other procedures and techniques which may be required are:

      1. Duplication of equipment damage using windblast or impact testing.

      2. Duplication of equipment damage using static dynamic load test equipment.

      3. Micro-analytical techniques to assess the failure points for damage prior to the mishap which contributed to failure.

Aircrew Life Support Systems (ALSS)

Post Emergency Usage Guides

Part V: Integrated Torso Harness (MA-2)

INTRODUCTION

Torso harnesses are designed to provide restraint during flight in tactical aircraft, restraint and attachment to the ejection system, and attachment to the parachute and survival kit upon ejection. The torso harness has been modified to incorporate the storage functions of the survival vest (Aircrew Change ACC-380) for survival equipment. To enhance aircrew body position and restraint during dynamic events of parachute deployment, emergency egress, and air combat, cinch straps have been added (ACC-422) to the torso harness and will maintain the riser connectors (Koch quick release fittings) in position.

Currently, the torso harness has been discussed as a problem during negative G conditions as not providing adequate restraint. During the modification of the harnesses to accommodate ACC-422, it was identified that many harnesses were improperly fitted during initial issue. The interactions of the man and the torso harness during various dynamic events are virtually unknown. Injuries may result to various body areas either directly or indirectly being induced for force distribution. To improve the data derived from each mishap and to improve the restraint system, it is necessary to improve the understanding of dynamic interactions, fit, load distribution, and the torso harness during the dynamics of aircraft mishaps and the injuries which occur. To obtain the detailed information through a thorough investigation and recording of data derived from each mishap is essential to provide the data base required for statistical and engineering analysis of mishaps and dynamic sequences which occur within various naval aviation communities and define the interactions which occur in a particular mishap. It is necessary to have accurate information to define and standardize the data analysis of each aircraft mishap. To accomplish this, it is necessary to use a systematic analytical approach for the initial acquisition process during a mishap investigation to provide accurate data for engineering evaluation for the life support equipment.

Each item of equipment must be inspected in detail and the results of the inspection recorded fully regardless of the aircrew's injury/lack of injury or even if the item was used. This systematic approach to gathering data provides the informative base required to allow continuing equipment evaluation and appraisal, its performance and interactions before, during, and following a mishap. Long-term systematic analysis will clarify interactions, injury and equipment association, potential causal relationships, and suggest directions for future development of life support and survival equipment.

To ensure systematic inspection of aircrew equipment, this guide for the torso harness is part of a continuing series of procedures designed to enhance the data gathering process. The first step in a systematic investigation is to document the conditions and circumstances of the mishap, the equipment available and used during the mishap, circumstances of the equipment's use, damage and abuse of the equipment prior to, during, and subsequent to the mishap, egress, survival, and rescue, damage patterns to the equipment, injuries to the aircrew, injury patterns on the aircrew, and relationships of the injury and damage patterns. Complete documentation of each of the above are necessary and can contribute to the understanding of the dynamic behavior of life support equipment during all phases of the mishap. Non-destructive inspection techniques are the first step of this systematic analysis. It provides desired data to the investigator while retaining the equipment intact. Despite the focus on and interest in the identification and documentation of damage and injury to the wearer, a critical need exists for an equally careful identification and documentation of lack of damage or injury to the wearer. This information aids in identifying those conditions for which the equipment performs satisfactorily and helps to put the damage and injuries into proper perspective. From this data, equipment interactions and performance can be assessed and requirements can be defined or redefined for future equipment development or modifications which are designed to reduce the likelihood of increased risk, or increasing the existing risk, injury severity, or frequency for the aircrew. An improved understanding of the conditions of equipment usage will provide guidelines for the conditions which should be used when equipment is tested and evaluated in the future.

To define the environment in which the torso harness is used and exposed to, it is necessary to assess the effects upon (1) user safety, (2) integrity of the equipment during the dynamics of the mishap, and (3) functional performance in providing survival items required by the aircrew. All torso harnesses involved in mishaps shall be inspected using Non-Destructive Inspection Techniques (Phase I). If conditions arise or unusual behavior is identified by the investigator, further inspection shall be conducted in greater detail using Non-Destructive Inspection Techniques (Phase II) which are enhanced visual techniques. Should the engineering evaluator require further information on particular mishap because of malfunction, damage, or injury, provision will be made for Destructive Inspection Techniques (Phase III) to provide the requested data.

This guide provides the basic information requested for Phase I and II inspections. Included are worksheet formats which should be filled out to assure gathering of all supporting information required for the mishap investigation and post-mishap analysis. This information will assist in determination of the requirements of further inspection of the equipment and how that inspection shall be conducted. The information contained in these inspection worksheets (1) will be combined with all available data gathered from other mishap investigations and during equipment test and evaluation for engineering evaluation, (2) will be available to the investigating medical officer for use in preparation of the mishap report, and (3) will be employed to update design, test and evaluation criteria, and quality assurance/assessment standards for life support and survival equipment.

The procedures in this guide are a development for the updating of the investigating and reporting implemented by OPNAVINST 3750.6 (series) that require the systematic gathering, reporting, and analysis of mishap data to improve safety and to reduce the risk to the aircrew. Failure to completely institute a systematic "in-service" data acquisition and analysis results in the loss of valuable information, introduces bias into the overall data system, and compromises the safety of the aircrew.

The issuance of this guide is an update to the nearest requirements which require all aircrew life support equipment employed during aircraft mishaps be subjected to a systematic inspection and reporting of the inspection to (1) fully document the conditions of use, (2) identify and catalogue the damage to the equipment, (3) identify and document all injuries to the aircrew, (4) comparison of the damage under varying conditions, (5) comparison of the injuries under varying conditions, (6) comparison of the damage patterns to the injury patterns under comparable conditions, and (7) determine the performance of the life support equipment under operational, emergency, survival, and rescue conditions for which it was intended.

To accomplish the detailed inspections required, Phase III inspections may be deemed necessary by the engineering evaluator. If this is necessary, instructions will be provided under separate cover with appropriate accounting information, procedures for packing and shipping, and the destination for shipment. The receipt of the equipment will be acknowledged using a form letter which will contain the date received, projected response time for the inspection, and the procedures which will be used in the inspection. The results of the Phase III inspection will be provided to the engineering evaluator and would become available in specific cases to others.

Documentation of the mishap and the equipment is vital to a systematic investigation. The mapping of the mishap area is vital with the notation of the location of each item of life support and survival equipment. The equipment should be tagged, photographed, and recorded. It is suggested that 8 x 10 color photographs be used to most effectively indicate the damage, abuse, or strains on the equipment. These photographs should be clearly focused with notations on the reverse side as to the mishap, date, equipment, suspected damage, and interactions suspected from your investigation. Line drawings, sketches, and diagrams should be used liberally to enhance the photographic documentation and writing to support your theories, hypotheses, and analyses of the mishap. Additionally, record and present all data as accurately and completely as possible citing the source of the information. If you have no clear hypothesis as to the interactions and causal relationships of the mishap, do not worry, it takes a detachment and large amount of background data at times to form an impression. Your impressions are welcome!

APPENDIX 7

GENERAL WORK SHEET

I. Data required for all life support equipment.

A. Date of Accident____________________ Accident I.D. No.____________

B. Type of Aircraft____________________ Bureau No.____________

C. Location of Accident____________________________________

____

____

D. Ejection Attempted: Yes__________ No__________

E. Ejection Accomplished: Yes__________ No__________

1. Altitude at Ejection______________________________
2. Airspeed at Ejection______________________________
3. Attitude at Ejection______________________________
4. Ejection Seat Manufacturer__________________________
5. Ejection Seat Serial Number__________________________
6. Ejectee's Crew Station____________________________
7. Parachute____________________________________
8. Survival Kit__________________________________
9. Reported Winds Aloft in Ejection Area__________________
10. Landing Site Type________________________________
11. Air Temperature Aloft in Ejection Area_________________
12. Water Temperature in Landing Area____________________
13. Estimated Time in the Water________________________

F. Aircraft Crashed: Yes__________ No__________

1. Altitude of Crash Site____________________________
2. Estimated Impact Airspeed__________________________
3. Estimated Impact Attitude__________________________
4. Impact Site Type_________________________________
5. Wind Conditions at Impact Site_______________________

G. Aircrew Injured: Yes__________ No__________

1. Injuries Sustained were: Fatal__________ Nonfatal__________
2. Summary of All Reported Injuries_______________________

____

____

3. Specific Injuries to:

a. Head Area Fractures: Yes______ No______

(1) Location______________________________

(2) Description______________________________

b. Neck Area Fractures: Yes______ No______

(1) Location______________________________

(2) Description______________________________

c. Vertebral Column Fracture: Yes______ No______

(1) Location______________________________

(2) Description______________________________

d. Appendicular Skeleton Fractures (e.g. Arm/Leg): Yes___ No___

(1) Location______________________________

(2) Description______________________________

e. Torso Area Fractures: Yes______ No______

(1) Location______________________________

(2) Description______________________________

F. Vertebral Column Strain/Sprain: Yes______ No______

(1) Location______________________________

(2) Description______________________________

g. Appendicular Skeleton Strain/Sprain: Yes______ No______

(1) Location______________________________

(2) Description______________________________

NOTE: When describing injuries use anatomical landmarks to describe the injury location and describe how the injury was determined.

II. Personal Data of Aircrew.

A. Age______________________________

B. Sex______________________________

C. Blood Type______________________________

D. Anthropometric Data:

1. Height______________________________

2. Weight______________________________

3. Sitting Height______________________________

4. Neck Circumference______________________________

5. Cervical Length (C1 through C7)______________________________

6. Head Circumference______________________________

7. Buttock Knee Length ____________________

8. Buttock Popliteal Length ____________________

9. Buttock Leg Length ____________________

10. Chest Wall Circumference ____________________

11. Shoulder Height ____________________

NOTE: Record all the anthropometric measurements in consistent units and note which units used, also the source of the anthropometic data. This information is useful in retrospective analysis of the mishap and dynamic interactions of the aircrew.

APPENDIX B

INTEGRATED TORSO HARNESS (MA-2) WORK SHEET

I. Phase I Non-Destructive Inspection

A. Torso Harness:

1. Manufacturer______________________________

2. Date of Manufacture______________________________

3. Model______________________________

4. Lot Number______________________________

5. Serial Number______________________________

6. Was the torso harness recovered? Yes______ No______

7. Was the torso harness damaged? Yes_____ No______ (If yes, describe the damage using words, drawings, and photographs.)

8. List incorporated aircrew changes on torso harness, dates of incorporation, location and person performing identification.

____

____

9. Was the torso harness recovered with the aircrew? Yes_____ No_____ (If no, describe why the torso harness was not recovered.)

10. Was the torso harness discarded? Yes_____ No_____ (If yes, was it deliberately or inadvertently discarded by aircrew, rescuers, or others. Describe the details of when and why discarded.)

11. Were the torso harness attachments intact? Yes_____ No_____ (If no, describe the damage fully.)

12. Was the torso harness damaged during the egress phase? Yes_____ No_____ (If yes, describe fully.)

13. Was the torso harness damaged during the survival phase? Yes_____ No_____ (If yes, describe fully.)

14. Was the torso harness damaged during the rescue phase? Yes_____ No_____ (If yes, describe how, where, and under what conditions.)

15. Was the torso harness damaged after the recovery phase? Yes_____ No_____ (If yes, describe the location, type of damage, under what conditions the damage occurred.)

16. Did the torso harness remain intact during the dynamic egress (ejection) phase of the mishap? Yes_____ No_____ (If no, describe when the aircrew noted damage. Did the failure degrade egress, survival, or rescue? Describe fully, in detail, the problems and how egress, survival or rescue was degraded.)

17. Were there any modifications to the torso harness? Yes_____
No_____ (If yes, describe the modifications using line drawings and photographs. Give the date and location of when and where modification occurred.)

18. Were these modifications authorized? Yes_____ No_____ (If yes, cite the date of authorization, source, and individual authorizing the modification.)

APPENDIX C

INTEGRATED TORSO HARNESS (MA-2) WORK SHEET

I. Phase II Non-Destructive Laboratory Inspection

A. Evaluate all data obtained from Phase I inspection plus additional general mishap information.

1. Shipped from:____

2. Date shipped:____

3. Date received:_______________________________________

B. Inspection Procedures

1. Microscopic inspection of strained or torn (cut) fabric, seams and stitching, both externally and internally. This inspection may be performed using natural, coherent or other light sources as required to determine the damage to the material.

2. Other non-destructive inspection may be conducted if warranted by a review of the circumstances associated with its usage.

APPENDIX D

INTEGRATED TORSO HARNESS (MA-2) WORK SHEET

I. Phase III Destructive Laboratory Inspection (as determined by the engineering investigation/evaluation).

A. Evaluate and review all findings from Phase I and II inspections, correlate the data with all other mishap findings prior to further inspection.

B. Other procedures and techniques which may be required are:

1. Duplication of equipment damage using windblast or impact testing.

2. Duplication of equipment damage using static and dynamic load test equipment.

3. Micro-analytical techniques to assess the failure points for damage prior to mishap which contributed to failure.

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Aircrew Life Support Equipment Post-Usage Investigation/Reportage Generic Decision Tree

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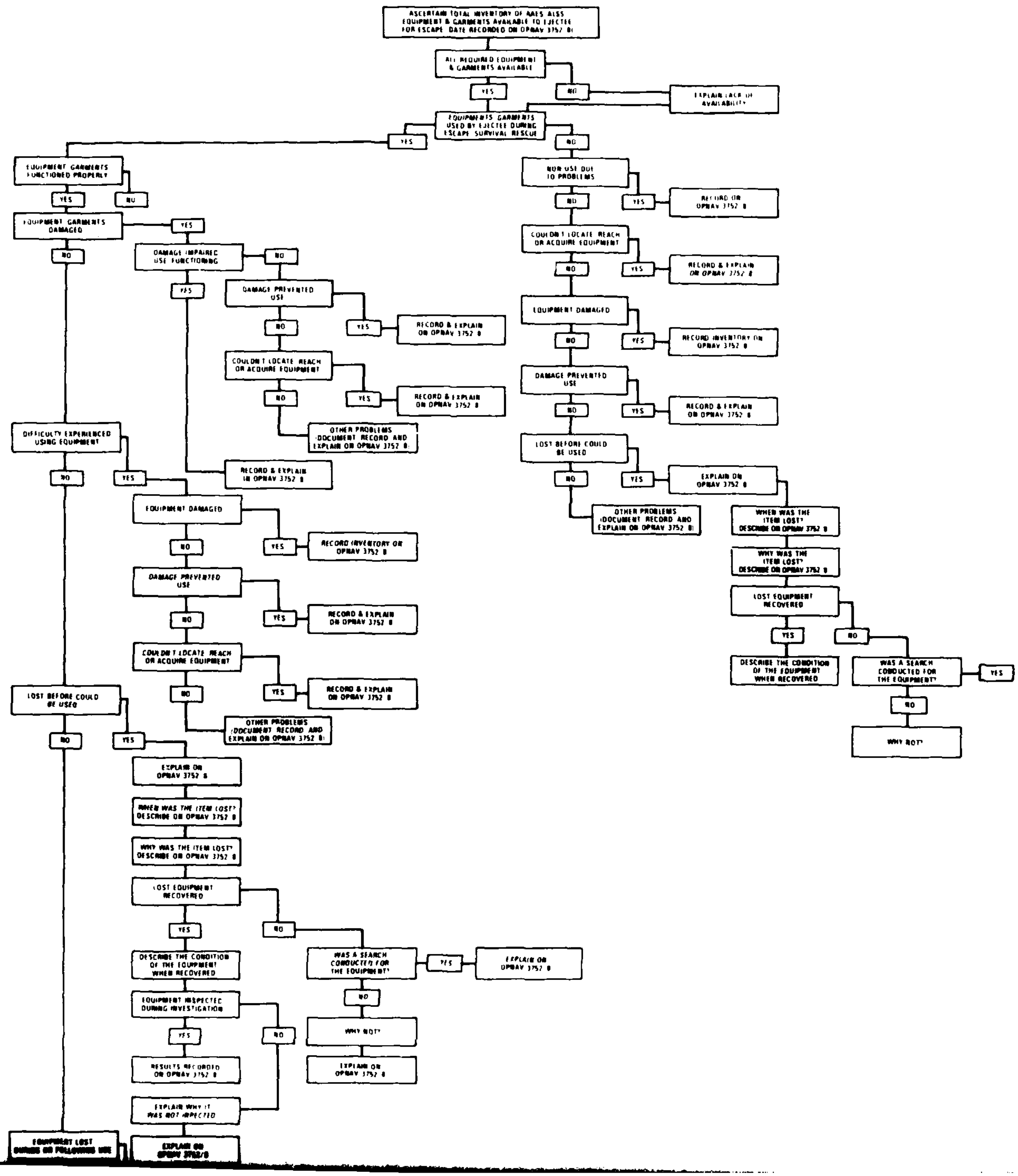
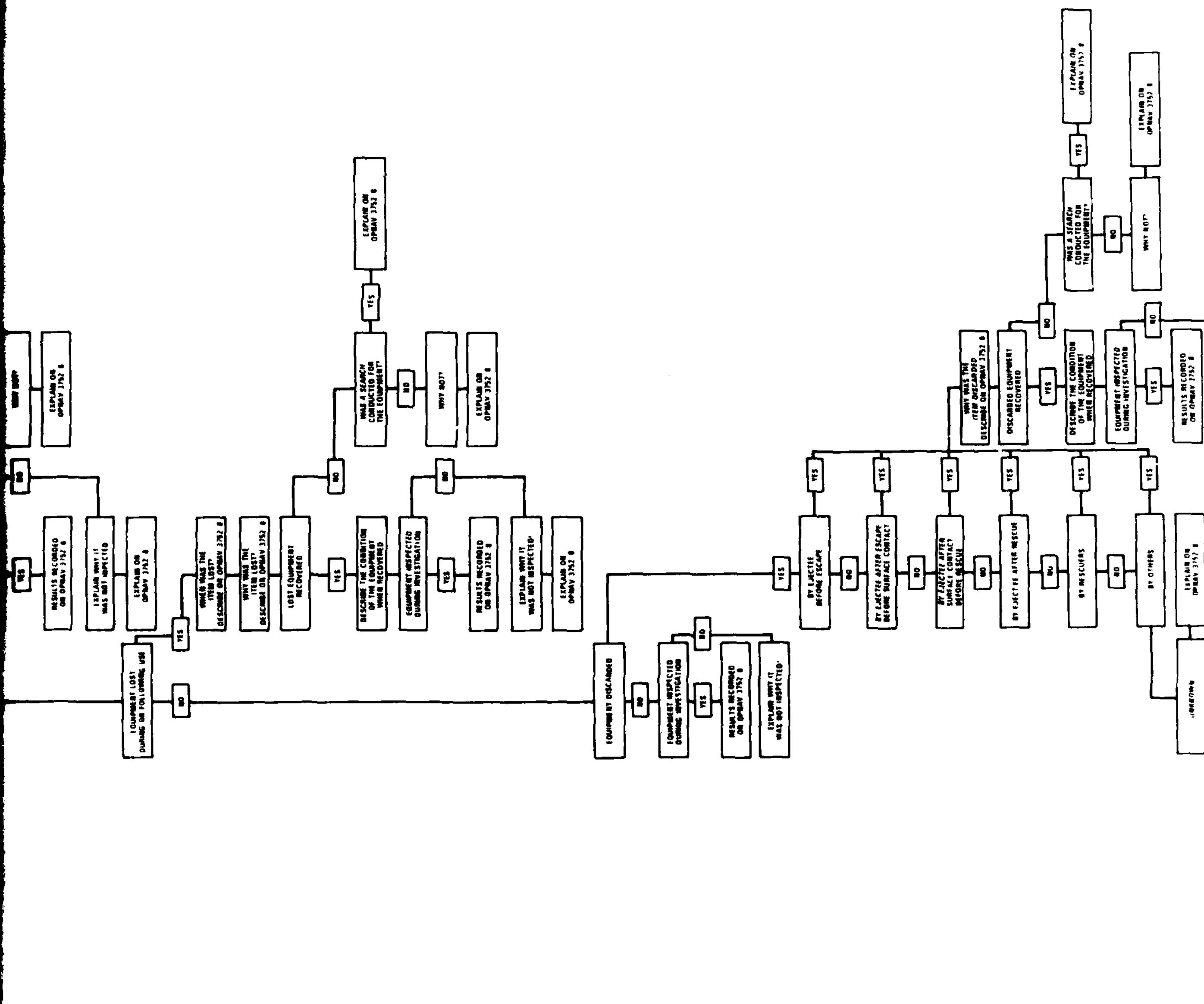
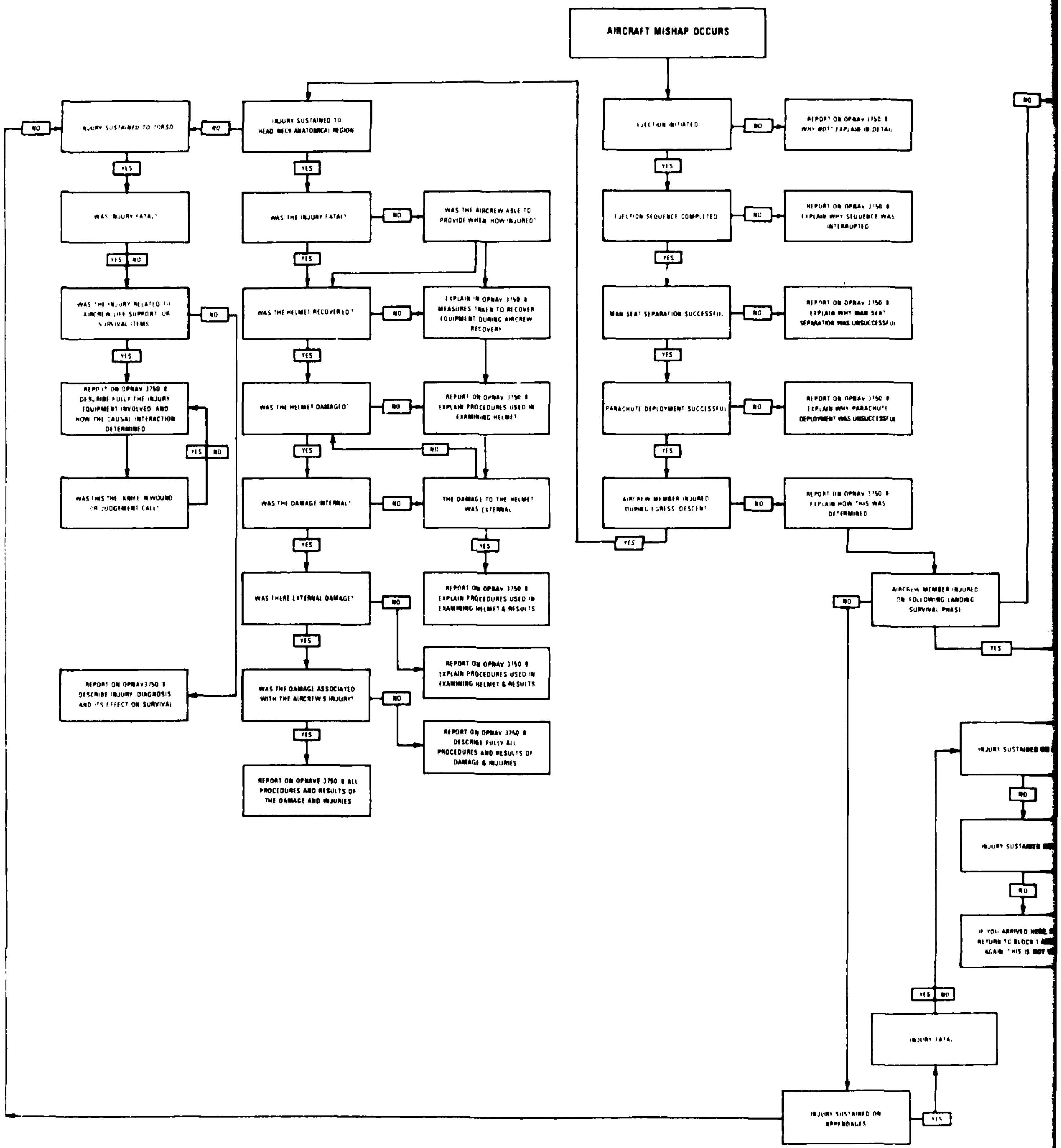
AIRCREW LIFE SUPPORT EQUIPMENT (ALSS) POST USAGE
INVESTIGATION REPORTAGE GENERIC DECISION TREE

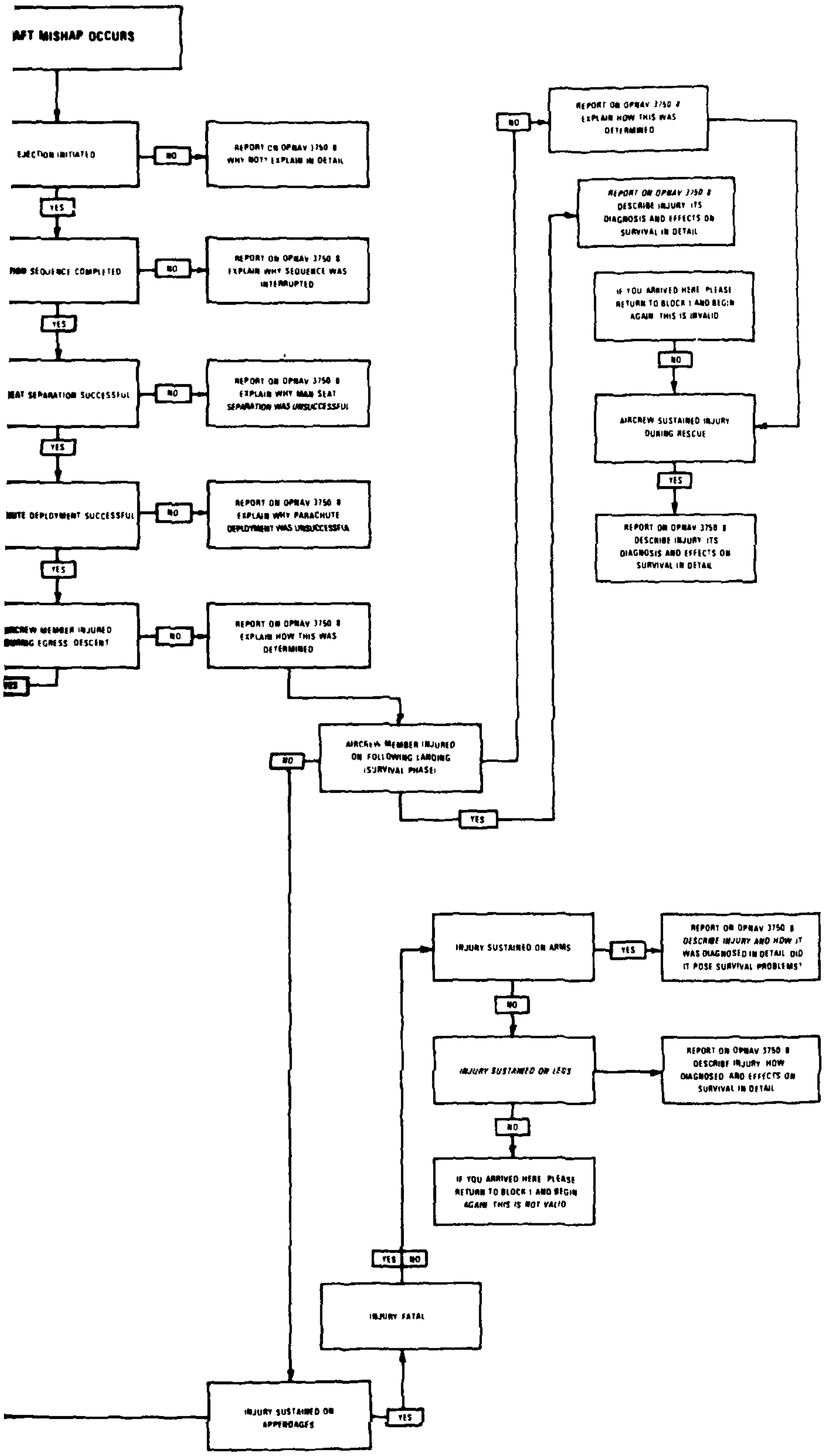



EQUIPMENT LOST DURING OR FOLLOWING USE
YES
NO
WHEN WAS THE ITEM LOST? DESCRIBE ON OPNAV 3752 8
WHY WAS THE ITEM LOST? DESCRIBE ON OPNAV 3752 8
LOST EQUIPMENT RECOVERED
DESCRIBE THE CONDITION OF THE EQUIPMENT WHEN RECOVERED
EQUIPMENT INSPECTED DURING INVESTIGATION
RESULTS RECORDED ON OPNAV 3752 8
EXPLAIN WHY IT WAS NOT INSPECTED
EXPLAIN ON OPNAV 3752 8
WAS A SEARCH CONDUCTED FOR THE EQUIPMENT?
WHY NOT?
EQUIPMENT DISCARDED
BY EJECTEE BEFORE ESCAPE
BY EJECTEE AFTER ESCAPE BEFORE SURFACE CONTACT
BY EJECTEE AFTER SURFACE CONTACT BEFORE RESCUE
BY EJECTEE AFTER RESCUE
BY RESCUERS
BY OTHERS
WHY WAS THE ITEM DISCARDED DESCRIBE ON OPNAV 3752 8
DISCARDED EQUIPMENT RECOVERED

AIRCREW LIFE SUPPORT EQUIPMENT (ALSS POST USAGE INVESTIGATION REPORTAGE
GENERAL DATA FLOW LOGIC



...T (ALSS POST USAGE INVESTIGATION REPORTAGE
...AL DATA FLOW LOGIC



ASSOCIATED DATA APPENDICES

APPENDIX A

NECK INJURY CASES DATA
(PART I)

APPENDIX A PART I

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTED SUSTAINED SEVERE "EJECTION ASSOCIATED" NECK INJURIES

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
108 (FATAL)	LS-1	JETTISON CANOPY	X					X			360 KIAS		5,000 FT AGL	NOSE DOWN 50°		LOST ?	APH-6A				DIVE HIGH SPEED NEGATIVE G CONDITIONS AIRCRAFT DISINTEGRATING	DISINTEGRATION	UNK EVIDENCE SUGGESTS PILOT POSITIONED FORWARD & UPWARD PRIOR TO EJECTION		NONE	N A	ROCKET FAILED TO IGNITE EVIDENCE OF NEGATIVE G CONDITIONS	RECOVERED						
558 (FATAL)	ESCAPAC IA-1	JETTISON CANOPY								UNK	225 KAIS		8,000 FT AGL	NOSE DOWN 5°		LOST	APH-6				FLAME OUT. FIRE IN COCKPIT	NOT STATED												
1179 (FATAL)	HS-1A	JETTISON CANOPY								UNK	400 KIAS		10,000 FT AGL	NOSE LEVEL. WINGS LEVEL							INFLIGHT FIRE WITH LOSS OF ALL HYDRAULIC CONTROLS	NOT STATED												
1236 (FATAL)	HS-1A	JETTISON CANOPY	X							TWIST & PULL KNOBS	400 KIAS		10,000 FT AGL	40° NOSE DOWN		DISLODGED	APH 6B				INFLIGHT FIRE WITH LOSS OF ALL HYDRAULIC CONTROLS	NOT STATED												
1573 (FATAL)	ESCAPAC IF-3		X						X		275 KIAS		450 FT AGL	35° NOSE DOWN		LOST	PRIVATE FORM FIT				INFLIGHT FIRE. FIRE IN O_2 SYSTEM	NOT STATED												

K A PART I
CONCERNING EJECTEES REPORTED TO HAVE
N ASSOCIATED'' NECK INJURIES
UGH 31 DECEMBER 1979

L ES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
N/A	ROCKET FAILED TO IGNITE EVIDENCE OF NEGATIVE G CONDITIONS	RECOVERED							
									TWO CURVED GROOVES ON INSIDE LEFT SIDE OF SEAT BUCKET PRODUCED BY SCREWS ON SURVIVAL KIT

APPENDIX A PART I (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT SUSTAINED SEVERE "EJECTION ASSOCIATED" NECK INJURIES
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO			ESCAPE INITIATION METHOD					FIRING CONTROL HANDLE USED			ESCAPE CONDITIONS				HELMET			ALTERED CONSCIOUSNESS			MANEUVER		BODY POSITION		SPEC INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT		
	TYPE EJECTION SEAT	CANOPY MODE	DELIBERATE SELF INITIATED	INADVERTENT SELF INITIATED	SEQUENCED WITH WARNING	SEQUENCED WITHOUT WARNING	NON CREW CAUSED ACTUATION	FACE CURTAIN	LOWER HANDLE	OTHER	AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	DAMAGE (LOCATION)	LOST (WHEN)	TYPE	REPORTED (YES NO)	DURATION	EVENT FIRST PAIN NOTICED	PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	TYPE LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
1735 (FATAL)	MK GRU7	THROUGH THE CANOPY	X					X			450 KIAS		22,000 FT AGL	NOSE DOWN 60° RIGHT BANK			PRIVATE FORM FIT APH 6D				INFLIGHT FIRE (PROBABLE) HIGH SPEED DIVE	NOT STATED											
708 (FATAL)	ESCAPAC IC 2	JETTISON CANOPY	X				X	X		DISLODGED BY MID AIR COLLISION	250 KIAS		300 FT AGL	NOSE DOWN 20° RIGHT BANK		LOST	TYPE NOT SPECIFIED				POST MID AIR COLLISION TUMBLING	TUMBLING			HEMORRHAGE	STRUCK BY OTHER AIR CRAFT							
793 (FATAL)	ESCAPAC IA 1	JETTISON CANOPY	X						X		350 KIAS		4,000 FT AGL	NOSE DOWN 80°			APH 6C				SPIN UNCONTROLLED FLIGHT	NOT STATED					EPC RISERS ENTANGLED PILOT'S HEAD AND SEAT HEADREST	PILOT'S DESCENT OBSERVED HEADREST FOAM IN O2 MASK FITTING MARKS & PAINT TRANSFER SEAT TO HELMET					
992 (FATAL)	ESCAPAC IC 3	JETTISON CANOPY	X							UNK	450 KIAS		5,000 FT AGL	NOSE DOWN 60°		LOST DESTROYED BY EXTREME FORCE	APH 6				UNCONTROLLED FLIGHT HIGH SPEED	NOT STATED			FRACTURE BASE OF SKULL LACERATION BRAIN STEM		SEAT ENTANGLED IN DEPLOYING PARACHUTE THEN STRUCK PILOT'S HELMET	SEE GENERAL COMMENTS NOTES					
643	MK H7	JETTISON CANOPY	X						X		132 KIAS		60 FT AGL	NOSE LEVEL WINGS LEVEL							DISINTEGRATING POST RAMP STRIKE	NOT STATED	THROWN FORWARD AT AIRCRAFT IMPACT	NECK FLEXED FORWARD									

T I (Continued)
ONCERNING EJECTEES REPORTED TO HAVE
ASSOCIATED'' NECK INJURIES
H 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
EPC RISERS ENTANGLED PILOT'S HEAD AND SEAT HEADREST	PILOT'S DESCENT OBSERVED HEADREST FOAM IN O_2 MASK FITTING MARKS & PAINT TRANSFER SEAT TO HELMET							
SEAT ENTANGLED IN DEPLOYING PARACHUTE THEN STRUCK PILOT'S HELMET	SEE GENERAL COMMENTS NOTES							HELMET WHEN RECOVERED, HAD LARGE HEMISPHERICAL CRACK AND SEVERAL RADIATING CRACKS CRACK PATTERN SIMILAR TO CONTOUR OF THE SEAT'S BROKEN FIRING MECHANISM COVER PARACHUTE SUSPENSION LINES REVEALED BLACK STAINS ON SEVERAL INCLUDING A BROKEN ONE
								AIRCRAFT EXPLODED AND BROKE APART AFTER IMPACTING RAMP IN NOSE HIGH ATTITUDE LARGE, BURNING SECTION OF FUSELAGE CONTINUED UP DECK RIO EJECTED AT RAMP IMPACT PILOT (INJURED SUBJECT) SHORTLY THEREAFTER

APPENDIX A PART I (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT SUSTAINED SEVERE "EJECTION ASSOCIATED" NECK INJURIES
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE SELF-INITIATED	INADVERTENT SELF-INITIATED	SEQUENCED WITH WARNING	SEQUENCED WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
726	ESCAPAC IA-1	JETTISON CANOPY	X					X			200 KIAS		5 000 FT AGL	NOSE DOWN 8 WINGS LEVEL						DURING BOOST PHASE	ENGINE FAILURE	NOT STATED	TILTED HEAD FORWARD TO REACH FACE CURTAIN	POSITIONED HEAD BACK AGAINST HEADREST PRIOR TO INITIATING EJECTION									
1397	ESCAPAC IC-3	JETTISON CANOPY	X						X		205 KIAS		2 000 FT AGL	NOSE DOWN 10 BANK 15		LOST	HGU 30 P				ENGINE FAILURE	NOT STATED					REVERSE BURNING ROCKET MOTOR	BURN DAMAGE IN JURIES					
1587	ESCAPAC IG 3	JETTISON CANOPY	X						X		210 KIAS		2 000 FT AGL	NOSE DOWN 15 WINGSLEVEL						FOLLOWING PARACHUTE OPENING	FLAME OUT	NOT STATED		POSITIONED HIMSELF FOR EJECTION THEN PULLED LOWER FIRING HANDLE								LANDED ON HIS BACK IN A THICK BRIAR BUSH	
791	ESCAPAC IC 2	JETTISON CANOPY		X				X			310 KIAS		6 500 FT AGL	WINGS LEVEL	MAJOR LARGE GASH OVER POSTERIOR AREA		APH 6A		FROM BEGINNING OF BOOST TO PARACHUTE DESCENT		INADVERTENT EJECTION WHILE ATTEMPTING TO STOW RADIATION SHIELD	NOT STATED		HEAD TURNED TO LEFT AND LOOKING DOWN							CONTACT WAS HARD	FIRST HIS FEET THEN HIS BUTTOCKS	

RT I (Continued)

CONCERNING EJECTEES REPORTED TO HAVE

ASSOCIATED" NECK INJURIES

GH 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD NECK	GENERAL COMMENTS NOTES
								SITTING HEIGHT NOTED TO BE INCOMPATIBLE WITH THERMAL RADIATION SHIELD HAMPERING HIS USE OF FACE CURTAIN AND POSSIBLY CAUSING INJURY THOUGHT CHIN AND HEAD ROTATED FORWARD DURING CATAPULT BOOST
REVERSE BURNING ROCKET MOTOR	BURN DAMAGE INJURIES							MARKS ON HELMET INDICATE EJECTEE HAD BEEN TURNED FACING SEAT WHILE STILL ATTACHED TO IT BY SHOULDER HARNESS. SHOULDER HARNESS ASSEMBLY WAS RIPPED FROM SEAT DUE PROBABLY TO ROCKET BLAST DAMAGING BELLCRANK
					LANDED ON HIS BACK IN A THICK BRIAR BUSH			EXTREME TUMBLING AND FAILING NOTED DURING EJECTION VIOLENT TUG DURING PARACHUTE OPENING MOVEMENT OF BOTH ARMS DIFFICULT DUE TO SPASMS AFTER LANDING MOVEMENT OF EXTREMITIES WAS NOT POSSIBLE FOLLOWING SEAT MAN SEPARATION EJECTEE NOTED EXTREME TUMBLING PROBABLY RESULTING FROM TORQUING AS EVIDENCED BY DAMAGE TO SEAT, PARACHUTE PACK & CONNECTIONS BETWEEN PACK AND SURVIVAL KIT INJURY PATTERN SUGGESTS EJECTEE WAS POORLY POSITIONED FOR PARACHUTE OPENING SHOCK
				CONTACT WAS HARD	FIRST HIS FEET THEN HIS BUTTOCKS			FROM HELMET DAMAGE POSTULATED HEAD WAS STRUCK BY ACTUATED CANOPY BREAKERS APPARENTLY CANOPY WAS INADVERTENTLY RELEASED CAUSING IMPLOSION OF RADIATION SHIELD WITH POTENTIAL THAT HEAD NECK WERE STRUCK BY SHIELD CYLINDER AS WELL AS CANOPY BREAKERS

APPENDIX A PART I (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE SUSTAINED SEVERE "EJECTION ASSOCIATED" NECK INJURIES

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE SELF INITIATED	ESCAPE INITIATION METHOD: INADVERTENT SELF INITIATED	ESCAPE INITIATION METHOD: SEQUENCED WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED WITHOUT WARNING	ESCAPE INITIATION METHOD: NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
735	MK GRU5	THROUGH THE CANOPY	X					X			225 KIAS		8 000 AGL	NOSE UP 5°							INFLIGHT FIRE	NOT STATED									PARACHUTE SNAGGED IN TREES HELMET VISOR & LEFT LENS OF EYEGLASSES SHATTERED BY IMPACT WITH TREE BRANCHES O. MASK RIPPED LOOSE ON LEFT SIDE	HALF STANDING		AFTER SIGNALLING TO BE HOISTED. CABLE WAS TENSIONED AND SLACKENED SEVERAL TIMES.
119	MK GRU5	THROUGH THE CANOPY	X					X			400 KIAS		1 500 FT AGL			DISCARDED	APH 6C				POST MID AIR COLLISION SNAP ROLLING TUMBLING NEGATIVE G CONDITIONS (FIRE IN COCKPIT)	ROLLING	STRAINING AGAINST LAP BELT. BOUNCING AROUND	COULDN'T PULL FACE CURTAIN STRAIGHT OVER HIS HEAD JUST PULLED IT										
1757	ESCAPAC IG 3	JETTISON CANOPY	X					X			UNK		10 800 FT AGL				PRIVATE CONTRACTOR FORM FIT	X	DAZED AFTER MID AIR COLLISION		POST MID AIR COLLISION MUSHING	MUSHING (PROBABLY NEGATIVE G)		EJECTEE FELT HE WAS IN POOR POSITION FOR EJECTION UP OFF SEAT					CROSSED BEHIND HEAD	FOUND HIMSELF LOOKING DOWN TO THE GROUND. HEAD FORCED DOWN BY RISERS. AFTER PULLING RISERS APART WAS ABLE TO MOVE HEAD				
1536	ESCAPAC IG 2	THROUGH THE CANOPY	X						X		350 KIAS		8 000 FT AGL	NOSE DOWN 15° LEFT BANK		DISLODGED LATER LOST	APH 6			AFTER PARACHUTE OPENING	SPIN FLAT (MODERATE NEGATIVE G)	FLAT SPIN	FLOATING OFF SEAT POSSIBLY INVERTED	FLOATING OFF SEAT HEAD CANTED LEFT AND SLIGHTLY BACKWARDS							LANDED ON STEEP SLOPE AT BASE OF ROCK SLIDE INJURY PREVENTED RELEASE OF PARACHUTE WHICH HUNG ON A BUSH			
1087	ESCAPAC IC 2	JETTISON CANOPY	X						X					NOSE DOWN 80 LEFT BANK						AFTER LANDING	SPIN OSCILLATING (PITCHING UP AND DOWN)	OSCILLATING SPIN	LEFT WING VIOLENTLY TUCKED UNDER THROWING HIM TO RIGHT REAR CORNER OF COCKPIT	THINKING SEAT HAD FAILED HE LOOKED DOWN JUST AS SEAT FIRED							HIT GROUND IN LEFT TO RIGHT DRIFT UPON IMPACT SEAT PAN STRUCK LEFT LEG FELL ON SURVIVAL KIT			

PART I (Continued)

A CONCERNING EJECTEES REPORTED TO HAVE ON ASSOCIATED" NECK INJURIES

ROUGH 31 DECEMBER 1979

ULL URIES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
					PARACHUTE SNAGGED IN TREES HELMET VISOR & LEFT LENS OF EYEGLASSES SHATTERED BY IMPACT WITH TREE BRANCHES O_2 MASK RIPPED LOOSE ON LEFT SIDE	HALF STANDING		AFTER SIGNALLING TO BE HOISTED, CABLE WAS TENSIONED AND SLACKENED SEVERAL TIMES CAUSING HIM TO BE BATTERED CONSIDERABLY	DESCRIBED LANDING AS "CRASHED THROUGH TREES"
			CROSSED BEHIND HEAD	FOUND HIMSELF LOOKING DOWN TO THE GROUND. HEAD FORCED DOWN BY RISERS. AFTER PULLING RISERS APART WAS ABLE TO MOVE HEAD					SUPPORT STRAPS BETWEEN PARACHUTE PACK AND SURVIVAL KIT BROKEN
					LANDED ON STEEP SLOPE AT BASE OF ROCK SLIDE. INJURY PREVENTED RELEASE OF PARACHUTE WHICH HUNG ON A BUSH				HELMET AND O_2 MASK PUSHED UP COVERING FACE WHILE ATTEMPTING TO ADJUST HELMET. ENTIRE ASSEMBLY FELL AWAY. DAMAGE TO RECOVERED HELMET APPEARED TO CORROBORATE EJECTEE'S DESCRIPTION OF HEAD POSITION AT EJECTION
					HIT GROUND IN LEFT TO RIGHT DRIFT. UPON IMPACT SEAT PAN STRUCK LEFT LEG. FELL ON SURVIVAL KIT				

APPENDIX A PART I (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE SUSTAINED SEVERE "EJECTION ASSOCIATED" NECK INJURIES

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO.	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	ESCAPE INITIATION METHOD: INADVERTENT, SELF-INITIATED	ESCAPE INITIATION METHOD: SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD: NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS
1452	ESCAPAC IG-3	JETTISON CANOPY						X			275 KIAS		14,000 FT AGL	NOSE DOWN 80°, LEFT BANK		LOST DURING LANDING	PRIVATE CONTRACTOR FORM FIT			AFTER PARACHUTE OPENING	SPIRAL, 80° NOSE DIVE, AFCS MALFUNCTION	OTHER (DESCRIBE)	SUSPECTED UPWARD DISPLACEMENT OF BODY FROM SEAT AT TIME OF EJECTION	EJECTEE NOTED HIS HEAD MAY HAVE BEEN SLIGHTLY FLEXED										
957	MK H7	JETTISON CANOPY				X				SEQUENCED	5 KGS		0 FT AGL (GROUND LEVEL)	NOSE DOWN 15° ROLLING INVERTED							STRUCK DITCH AND ROLLING INVERTED	ON GROUND STATIONARY OR BARELY MOVING							PARACHUTE DID NOT HAVE TIME TO DEPLOY		EJECTED INTO SOFT EARTH SUSTAINING MAJOR INJURIES PARACHUTE DID NOT DEPLOY. STILL IN SEAT			

I (Continued)

ONCERNING EJECTEES REPORTED TO HAVE

SSOCIATED'' NECK INJURIES

H 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
								LOST RIGHT MAXILLARY INCISOR (TOOTH)
		PARACHUTE DID NOT HAVE TIME TO DEPLOY		EJECTED INTO SOFT EARTH SUSTAINING MAJOR INJURIES PARACHUTE DID NOT DEPLOY. STILL IN SEAT				EJECTION WAS ACCOMPLISHED OUTSIDE SYSTEM PERFORMANCE ENVELOPE

APPENDIX A

NECK INJURY CASES DATA
(PART II)

APPENDIX A PART II

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF. NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE-EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE-EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
1492	MK H7	JETTISON CANOPY	X						X		125 KIAS		75 FT AGL	NOSE UP							CATAPULT LAUNCH ENGINE MALFUNCTIONING AS STROKE BEGAN	NOT STATED										FEET FIRST INTO WATER (RELEASED PARACHUTE AS FEET TOUCHED WATER)	
74	MK H7	JETTISON CANOPY	X						X		65 KGS		80 FT AGL	NOSE DOWN 10° BANK 2°		DISLODGED	TYPE NOT SPECIFIED				CATAPULT LAUNCH COLD SHOT (BRIDLE BROKE NOSE GEAR FAILED)	NOT STATED		AT EJECTION, HEAD SLIGHTLY FORWARD FORCED DOWN & TOWARD LEFT LEG					BRIEFLY ENTANGLED ON HELMET	LIFTED HELMET & O2 MASK			
656	ESCAPAC IC 2	JETTISON CANOPY	X					X			150 KIAS		300 FT AGL	NOSE UP 5°							CONTROL LOSS CAUSED BY CANOPY STRIKING TAIL DURING CATAPULT LAUNCH	NOT STATED											
1209	ESCAPAC IF 3	JETTISON CANOPY	X						X		300 KIAS		12 000 FT AGL								DISINTEGRATION FOLLOWING MISSILE STRIKE BEGINNING TO SPIN	DISINTEGRATION										WHEN RAFT HIT WATER RELEASED PARACHUTE ENTERED WATER FEET FIRST	
921	LS 1	JETTISON CANOPY						X			220 KIAS		4 500 FT AGL	NOSE DOWN 25							ENGINE EXPLOSION & LOSS OF HYDRAULIC CONTROLS, PITCHING NOSE DOWN	NOT STATED									[illegible] ANKLE		

ENDIX A PART II
DATA CONCERNING EJECTEES REPORTED TO HAVE
RATE) "EJECTION ASSOCIATED" NECK INJURIES
THROUGH 31 DECEMBER 1979

	SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
EJECTION	TYPE LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD NECK	GENERAL COMMENTS NOTES
								FEET FIRST INTO WATER (RELEASED PARACHUTE AS FEET TOUCHED WATER			[illegible] OR 2 TUMBLES IN THE SEAT THEN A DEFINITE JERK AS THE CHUTE OPENED
TOWARD LEFT LEG					BRIEFLY ENTANGLED IN HELMET	LIFTED HELMET & [illegible] MASK					MINOR DIFFICULTY WITH CHUTE RISER ENTANGLEMENT RISERS PULLED HELMET AND O MASK UP APPROX 6 INCHES COVERING EYES
											WENT THROUGH ONE MORE MANEUVER TO GET LEVEL
								WHEN RAFT HIT WATER RELEASED PARACHUTE ENTERED WATER FEET FIRST			HEARD LOUD NOISE OBSERVED AN OBJECT SHOOTING FORWARD OF HIS AIRCRAFT ALSO SAW FLAMES IN REAR VIEW MIRROR AND BEGAN TO SPIN
							HIT AND ROLLED AND SLIGHTLY SPRAINED ANKLE				

APPENDIX A PART II (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NE
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT-POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE-LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
587	MK F7	JETTISON CANOPY	x					x			270 KIAS		9 500 FT AGL			RETAINED				AFTER RETURNING TO READY ROOM	ENGINE FAILURE	NOT STATED											
1176	ESCAPAC IC 2	JETTISON CANOPY	x						x		220 KIAS		3 500 FT AGL	NOSE DOWN 30 WINGS LEVEL							ENGINE FAILURE NOSE PITCHING DOWN VIOLENTLY	NOT STATED		NOSE PITCHED DOWN VIOLENTLY WITHOUT BEING ABLE TO STRAIGHTEN UP EJECTED PARALLEL TO GROUND					BELIEVED TWISTED BEHIND HELMET HELD HEAD FORWARD	COULD NOT LOOK UP BECAUSE RISERS WERE RIGHT UP AGAINST HELMET			
1439	MARTIN BAKER TYPE 9	CANOPY FRAGMENTATION	x						x		110 KIAS	900 FPM	300 FT AGL	NOSE DOWN 10 BANK 5	x		APH 6D				ENGINE FAILURE DURING APPROACH	NOT STATED		SAT UP STRAIGHT HEAD BACK CHIN TUCKED DOWN INTO NECK									
1537	ESCAPAC IC 3	JETTISON CANOPY	x						x		150 KIAS		700 FT AGL	OSE & WINGS LEVEL							ENGINE FAILURE DUE TO BIRD STRIKE	NOT STATED		NECK FLEXED DURING EJECTION									
1658	ESCAPAC IC 2	THROUGH THE CANOPY	x					x			160 KIAS		800 FT AGL	NOSE UP WINGS LEVEL	x	DISLODGED	APH 6C				ENGINE FAILURE	NOT STATED											

(Continued)

NCERNING EJECTEES REPORTED TO HAVE
JECTION ASSOCIATED" NECK INJURIES
31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
[illegible]	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
								INITIAL REACTION WAS OF UNCONTROLLED FLAILING OF HEAD ARMS LEGS THIS LASTED A FEW SECONDS AND MY PARACHUTE BLOSSOMED
		BELIEVED TWISTED BEHIND HELMET HELD HEAD FORWARD	COULD NOT LOOK UP BE CAUSE RISERS WERE RIGHT UP AGAINST HELMET					EXPERIENCED SPINNING AFTER PARACHUTE OPENING AS RISERS UNTWISTED
								CANOPY INADVERTENTLY JETTISONED BY PILOT
								HELMET CAUSED DISCOMFORT BY A FORWARD BACKWARD ROTATION AND SUSTAINED DAMAGE IN THREE AREAS NOT DESCRIBED EXPERIENCED EX CESSIVE TUMBLING WITH CONSIDERABLE G FORCES AT PARACHUTE DEPLOYMENT

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTED SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK IN

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO			ESCAPE INITIATION METHOD					FIRING CONTROL HANDLE USED			ESCAPE CONDITIONS				HELMET			ALTERED CONSCIOUSNESS			MANEUVER		BODY POSITION		SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT			
	TYPE EJECTION SEAT	CANOPY MODE	DELIBERATE SELF INITIATED	INADVERTENT SELF INITIATED	SEQUENCED WITH WARNING	SEQUENCED WITHOUT WARNING	NON CREW CAUSED ACTUATION	FACE CURTAIN	LOWER HANDLE	OTHER	AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	DAMAGE (LOCATION)	LOST (WHEN)	TYPE	REPORTED (YES NO)	DURATION	EVENT FIRST PAIN NOTICED	PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	TYPE LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
1711	MK H7	JETTISON CANOPY	x						x		150 KIAS		250 FT AGL	NOSE & WING LEVEL							ENGINE FAILURE FIRE	NOT STATED		POSITION FORWARD AT EJECTION										
1713	ESCAPAC IG 3	JETTISON CANOPY	x						x		140 KIAS		700 FT AGL	NOISE UP WINGS LEVEL						NEXT DAY	ENGINE FAILURE ATTEMPTING A NO POWER LANDING (DEAD STICK LANDING ATTEMPT	NOT STATED		PILOT WAS TOO FAR FORWARD AS HE REACHED FOR THE HEAD FORWARD							LANDED SO CLOSE TO CRASH FIREBALL THAT 25% OF PARACHUTE WAS CONSUMED	FELT FALLING TO RIGHT SIDE IN MOIST SAND		
1728	ESCAPAC IG 2	THROUGH THE CANOPY	x					x			130 KIAS		180 FT AGL							AS SEAT FIRED	ENGINE FAILURE & FIRE DURING LANDING APPROACH	NOT STATED												
1775	SHS 3	CANOPY FRAGMENTATION (PARTIAL)	x					x			200 KIAS		1 000 FT AGL	NOSE LEVEL 25 BANK						AFTER LANDING	ENGINE FAILURE DURING LANDING APPROACH	NOT STATED												
169	ESCAPAC IC 2	JETTISON CANOPY						x			200 KIAS		3 500 FT AGL			LOST	APH ?				ENGINE FIRE	NOT STATED												

RT II (Continued)
CONCERNING EJECTEES REPORTED TO HAVE "EJECTION ASSOCIATED" NECK INJURIES
JGH 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT		POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY			
				LANDED SO CLOSE TO CRASH FIREBALL THAT 25% OF PARACHUTE WAS CONSUMED	FEET FALLING TO RIGHT SIDE IN MOIST SAND			
								OVERHEAD CANOPY CUTTING FAILED BUT CANOPY PERIPHERY WAS CUT. PILOT HAD WIND KNOCKED OUT OF HIM. (POSSIBILITY SEAT TIPPED AFT END OF CANOPY UP ALLOWING WINDBLAST TO DRIVE LARGE SEGMENT AGAINST PILOT DURING CATAPULT BOOST PHASE OF ESCAPE.)
								WHILE REMOVING O2 MASK LOST HELMET WHICH FELL 800 FEET TO WATER. ON RECOVERY HELMET WAS CRACKED BADLY IN RIGHT TEMPLE AREA. SEAT TUMBLED VIOLENTLY. HE THEN NOTICED OPEN CHUTE AND THAT HE WAS SPINNING AS RISERS UNTWISTED.

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO			ESCAPE INITIATION METHOD					FIRING CONTROL HANDLE USED			ESCAPE CONDITIONS				HELMET			ALTERED CONSCIOUSNESS			MANEUVER		BODY POSITION		SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT			
	TYPE EJECTION SEAT	CANOPY MODE	DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FACE CURTAIN	LOWER HANDLE	OTHER	AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	DAMAGE (LOCATION)	LOST (WHEN)	TYPE	REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	TYPE LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
231	LW 3B	THROUGH THE CANOPY								SEQUENCER	120 KIAS		60 FT AGL	NOSE DOWN 13 17 BANK							ENGINE FIRE	NOT STATED												
358	MK GRU5	JETTISON CANOPY	x					x			200 KIAS		2 000 FT AGL	NOSE AND WINGS LEVEL							ENGINE FIRE LOSS OF HYDRAULIC CONTROLS	NOT STATED												
359	MK GRU5	JETTISON CANOPY	x					x			200 KIAS		2 000 FT AGL	NOSE AND WINGS LEVEL							ENGINE FIRE LOSS OF HYDRAULIC CONTROLS	NOT STATED											PULLED FACE DOWN [illegible] 20 YARDS	
1696	SHS 3	CANOPY FRAGMENTATION									350 KIAS		2 750 FT AGL	NOSE UP 15 20 BANK		LOST UPON LANDING	PRIVATE CONTRACTOR FORM FIT				ENGINE FIRE	NOT STATED		BODY POSITION CITED AS POOR FOR EJECTION							AVOIDED LANDING ON INJURED RIGHT LEG	LEFT LEG, THEN FELL OBLIQUELY BACKWARDS TO LEFT STRIKING HEAD ON GROUND		
1057	MK F7	JETTISON CANOPY									150 KIAS		2 500 FT AGL	LEFT BANK			APH 6C	LANDING IMAPCT BLOW TO HEAD		PARACHUTE OPENING	ENGINE SEIZURE	NOT STATED		DURING EJECTION LOOKED DOWN TO SEE HIS FEET					RISERS SNAPPED BEHIND HEAD FORCING HEAD DOWN DURING PARACHUTE OPENING	EJECTEE STATEMENT	DRIFTING INTO HIGH TENSION WIRES, PULLED KNEES TO CHEST	BUTTOCKS ON ASPHALT PARKING LOT AND FELL BACKWARDS STRIKING HEAD		

ART II (Continued)
A CONCERNING EJECTEES REPORTED TO HAVE
E) "EJECTION ASSOCIATED" NECK INJURIES
ROUGH 31 DECEMBER 1979

KULL URIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT		POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY			
										HAD PRIOR EJECTION WITH SMALL ARMS INJURY IN SEASIA HAD WAIVER FOR SURGICALLY INDUCED HORNER'S SYNDROME LEFT AND LEFT SHOULDER AND ARM HYPESTHESIA
								PULLED FACE DOWN 15 20 YARDS		HAD HAD C6 H N P TREATED LAMINECTOMY ONE YEAR EARLIER
						AVOIDED LANDING ON IN JURED RIGHT LEG	LEFT LEG THEN FELL OBLI QUELY BACKWARDS TO LEFT STRIKING HEAD ON GROUND			CHUTE SHOCK WAS HARD AND HIS MASK WAS TORN OFF (OR INADVERTENTLY RELEASED) AND HELMET WAS TWISTED TO LEFT ON HIS FACE SEAT OBSERVED TO TUMBLE ONE TO ONE AND HALF TIMES TWISTED IN RISERS ESTIMATED HE UNTWISTED THREE OR FOUR TURNS
				RISERS SNAPPED BEHIND HEAD FORCING HEAD DOWN DURING PARA CHUTE OPENING	EJECTEE STATEMENT	DRIFTING INTO HIGH TEN SION WIRES PULLED KNEES TO CHEST	BUTTOCKS ON ASPHALT PARKING LOT AND FELL BACKWARDS STRIKING HEAD			EJECTEE LOOKED TO WATCH FLAILING LEGS STILL LOOKING DOWN WHEN PARACHUTE OPENED LANDED ON BUTTOCKS ON ASPHALT PARKING LOT SUR FACE AND FELL BACKWARDS STRIKING HELMETED HEAD HARD ENOUGH TO DAZE HIM

APPENDIX A PART II (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPC
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NE
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
1385	ESCAPAC 1A 1	JETTISON CANOPY	x					x			200 KIAS		1 000 FT AGL	NOSE AND WINGS LEVEL	x		APH 6				ENGINE SEIZURE FLAME OUT	NOT STATED											
1634	ESCAPAC IG 2	THROUGH THE CANOPY	x					x			130 KIAS		2 000 FT AGL	NOSE DOWN 5				x	STUNNED BRIEFLY FOLLOWING BOOST		ENGINE SEIZURE	NOT STATED		COWERED SEAT PARTIALLY POSITIONED BODY PROPERLY AND EJECTED VIA FACE CURTAIN							LANDED ON 45 60 SLOPE MOUNTAINOUS ROCKY TERRAIN LEFT FOOT LODGED IN ROCKS CAUSING FRACTURE		
453	ESCAPAC IC 2	JETTISON CANOPY	x					x			200 KIAS		2 000 FT AGL	NOSE AND WINGS LEVEL			APH 6A				FLAME OUT	NOT STATED		POSITIONED ERECT IN SEAT HOLDING STICK WITH LEFT HAND AND PULLING FACE CURTAIN WITH RIGHT HAND									
972	ESCAPAC IC 2	JETTISON CANOPY	x					x			200 KIAS		2 000 FT AGL	NOSE UP WINGS LEVEL							FLAME OUT	NOT STATED											
1183	MK GRUS	THROUGH THE CANOPY						x			210 KIAS	2 000 FPM	150 FT AGL	NOSE UP 5 WINGS LEVEL	DISCARDED ON BEACH		APH 6A				FLAME OUT DURING APPROACH NOSE PITCHING DOWN	NOT STATED		[illegible]									

T II (Continued)

CONCERNING EJECTEES REPORTED TO HAVE "EJECTION ASSOCIATED" NECK INJURIES

UGH 31 DECEMBER 1979

CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
									LANDED IN OPEN GRAZING LAND AND WAS IMPRESSED WITH HARDNESS OF HIS IMPACT
					LANDED ON 45 50 SLOPE MOUNTAINOUS ROCKY TERRAIN LEFT FOOT LODGED IN ROCKS CAUSING FRACTURE				DURING CATAPULT BOOST FELT A GREAT DEAL OF PRESSURE ON HIS HEAD FLEXING HIS NECK FORWARD RECALLS WORRYING THAT HIS NECK WAS ABOUT TO BREAK
									PILOT (EJECTEE) FORCED TO USE CONSIDERABLE BACK STICK PRESURE TO HOLD NOSE UP BETWEEN TIME STICK RELEASED TO PULL LEH AND CATAPULT FIRING SINKRATE OF 2 000 FPM WITH NOSE FALLING THROUGH HAD BEEN ESTABLISHED WITH RUDDER PEDALS FULL FORWARD GAP EXISTED BETWEEN HIS THIGHS AND THIGH SUPPORTS

APPENDIX A PART II

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR[T...]
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC[K...]
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF. NO.		1187	1564	1660	1132	4
TYPE EJECTION SEAT		ESCAPAC IC 2	ESCAPAC IF – 3	LS-1	MK F7	MK H7
CANOPY MODE		JETTISON CANOPY	JETTISON CANOPY	JETTISON CANOPY	JETTISON CANOPY	JETTISON CANOPY
ESCAPE INITIATION METHOD	DELIBERATE, SELF-INITIATED	X				
	INADVERTENT, SELF-INITIATED					
	SEQUENCED, WITH WARNING		X	X		X
	SEQUENCED, WITHOUT WARNING					
	NON-CREW CAUSED ACTUATION					
FIRING CONTROL HANDLE USED	FACE CURTAIN				X	
	LOWER HANDLE	X				
	OTHER		SEQUENCER	SEQUENCER		SEQUENCER
ESCAPE CONDITIONS	AIRSPEED	200 KIAS	230 KIAS	150 KIAS	110 KIAS	85 KGS
	DESCENT RATE					
	ALTITUDE	1 500 FT AGL	4 500 FT AGL	400 FT AGL	60 FT AGL	0 FT AGL GROUNDLEVEL
	ATTITUDE	NOSE UP WINGS LEVEL	NOSE DOWN 15°, WINGS LEVEL	NOSE UP 5°, RIGHT BANK	NOSE UP 5°, 40° BANK	NOSE AND WINGS LEVEL
HELMET	DAMAGE (LOCATION)					
	LOST (WHEN)		DISLODGED ROTATED			
	TYPE		APH 6			APH 5B
ALTERED CONSCIOUSNESS	REPORTED (YES NO)		BLACKED OUT			DAZED ON AIRCRAFT LANDING
	DURATION		BOOST TO OPENING SHOCK			
EVENT FIRST PAIN NOTICED						AIRCRAFT LANDING
MANEUVER	PRE-EJECTION AIRCRAFT MANEUVER	FLAME OUT	FLAME OUT	FLAME OUT, DUAL	HARD LANDING ON [illegible] ROLLING [illegible]	HARD LANDING SHEAR [illegible]
	AIRCRAFT MANEUVER AT EJECTION	NOT STATED	NOT STATED	NOT STATED	[illegible]	NOT STATED
BODY POSITION	PRE-EJECTION BODY MOVEMENT POSITION					[illegible]
	BODY POSITION AT EJECTION	AT EJECTION FELT HEAD SNAP HARD TO THE LEFT	ERECT, HEAD BACK POSITION WITH ARMS FOLDED ACROSS CHEST		BENT [illegible] RIGHT [illegible]	[illegible]
SKULL INJURIES	TYPE LOCATION					
	CAUSAL FACTORS					
SYSTEM MALFUNCTION	TYPE MALFUNCTION					
	EVIDENCE OF MALFUNCTION					
RISER LOCATION AT PARACHUTE OPENING	RELATIVE TO HEAD NECK	DURING DESCENT RISERS WERE INSIDE LPA COLLAR				
	EVIDENCE CONCERNING LOCATION					
SURFACE CONTACT	PROBLEMS		PARACHUTE OSCILLATIONS CAUSED POOR LANDING, HITTING LEVEE AVOIDING POWERLINES, FEET CAUGHT IN BARBED WIRE FENCE, IMPACT WITH GROUND KNOCKED WIND OUT OF HIM			
	PART OF BODY		LANDED ON LEFT SIDE AS FEET HUNG UP IN BARBED WIRE FENCE		[illegible]	
POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK				LANDED ON CONCRETE RUNWAY AND DRAGGED APPROX [illegible]		

NDIX A PART II
TA CONCERNING EJECTEES REPORTED TO HAVE
TE) "EJECTION ASSOCIATED" NECK INJURIES
HROUGH 31 DECEMBER 1979

SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE/LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
				DURING DESCENT RISERS WERE INSIDE LPA COLLAR						
						PARACHUTE OSCILLATIONS CAUSED POOR LANDING HITTING LEVEE AVOIDING POWER LINES FEET CAUGHT IN BARBED WIRE FENCE IMPACT WITH GROUND KNOCKED WIND OUT OF HIM	LANDED ON LEFT SIDE AS FEET HUNG UP IN BARBED WIRE FENCE			COMMAND SEQUENCE EJECTEE HELD HIS HARNESS WITH CROSSED ARMS PARACHUTE PACK RETAINER STRAPS TO SURVIVAL KIT PULLED OUT
								LANDED ON CONCRETE RUNWAY AND DRAGGED APPROX [illegible] YDS		HAD CONTUSION ON RIGHT NECK PROBABLY FROM RISERS
							ENTERED WATER FEET FIRST FAC[illegible] SKYWARD			AT TOUCHDOWN STBD MLG FAILED NUMBER 3 WIRE ENGAGED THEN DISENGAGED ON EJECTION LEFT LEG WAS FULLY EXTENDED GIVING LEFT RUDDER IN ATTEMPT TO CONTROL AIRCRAFT
										HEAD HIT INSTRUMENT PANEL DURING ACCIDENT JUST PRIOR TO BEING EJECTED LANDED WITH INERTIAL REEL UNLOCKED

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTED SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK IN

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	ESCAPE INITIATION METHOD: INADVERTENT, SELF-INITIATED	ESCAPE INITIATION METHOD: SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD: NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE-EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE-EJECTION BODY MOVEMENT POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
1247	ESCAPAC IC 2	JETTISON CANOPY	X					X			120 KIAS	DEVELOPED	[illegible]5 FT AGL	NOSE UP 15°							IMPROPER POWER RESPONSE DURING LANDING APPROACH LATE RECOGNITION OF EXTREMIS CONDITION	NOT STATED							DART LANYARD ROUTED OVER LOWER FIRING CONTROL PREVENTING PROPER DART PAYOUT LANYARD FAILED	INSPECTION OF RECOVERED SEAT				
794	MK GRUEA5	JETTISON CANOPY	X					X			250 KIAS		12 000 FT AGL	NOSE DOWN 10° 30° BANK							INFLIGHT EXPLOSION AND FIRE (AIRCRAFT UNCONTROLLABLE)	NOT STATED												
465	MK H7	JETTISON CANOPY	X					X			275 KIAS		1 000 FT AGL	15° BANK							INFLIGHT FIRE	NOT STATED		DUE TO HIS HEIGHT HAD TO BEND SLIGHTLY FORWARD AT NECK TO PULL FACE CURTAIN										
466	MK H7	JETTISON CANOPY	X					X			275 KIAS		1 000 FT AGL	NOSE AND WING LEVEL		DISCARDED	APH 6A				INFLIGHT FIRE	NOT STATED		FAILING TO REMEMBER THAT THERE IS SLIGHT DELAY IN SEAT FIRING, TURNED HIS HEAD TO LOOK UP										
631	MK GRU5	THROUGH THE CANOPY	X					X			[illegible] KIAS		50[illegible] FT AGL	NOSE DOWN 10° 30° BANK							INFLIGHT FIRE	NOT STATED		SEAT FAILED TO FIRE ON FIRST PULL BELIEVES NOT UPRIGHT POSITIONED DURING SECOND PULL WHEN HE FIRED SEAT										

ART II (Continued)
A CONCERNING EJECTEES REPORTED TO HAVE
E) "EJECTION ASSOCIATED" NECK INJURIES
OUGH 31 DECEMBER 1979

ULL URIES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
			DART LANYARD ROUTED OVER LOWER FIRING CONTROL PREVENTING PROPER DART PAYOUT LANYARD FAILED	INSPECTION OF RECOVERED SEAT					
									AFTER JETTISONING CANOPY WINDBLAST TORQUED HEAD TO LEFT THORACIC AND CERVICAL SPINE SHOWED EVIDENCE OF MODERATE TO PROMINENT OSTEOARTHRITIC CHANGE DUE TO OLD SCHEURMAN DISEASE
									BECAUSE OF HIS HEIGHT FLIES WITH HIS SEAT ALL THE WAY DOWN AND RUDDER PEDALS MODERATELY EX TENDED FORWARD WITH FEET ON PEDALS DISTAL ½ UPPER LEGS NOT RESTING ON SEAT
									WAS STRUCK SHARPLY ON RIGHT SIDE OF NECK BY SOMETHING DURING PARACHUTE OPENING BUT NO APPARENT INJURY

APPENDIX A PART II (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK I
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
1195	MK H7	JETTISON CANOPY	X						X		200 KIAS		10 000 FT AGL	NOSE LEVEL 10 BANK							INFLIGHT FIRE	NOT STATED												
1290	MK GRU7A	JETTISON CANOPY				X (INSUFFICIENT)				SEQUENCER	210 KIAS		14 000 FT AGL	NOSE DOWN 15 RIGHT BANK		LOST	PRIVATE CONTRACTOR FORM FIT				INFLIGHT FIRE AIRCRAFT UNCONTROLLABLE	NOT STATED		NOT FULLY PREPARED FOR EJECTION (STILL TRYING TO POSITION SELF PROPERLY WHEN EJECTED)										
1560	MK GRU7A	JETTISON CANOPY	X						X		250 KIAS		10 000 FT AGL	NOSE DOWN 60 20 BANK							INFLIGHT FIRE AND LOSS OF CONTROLS NOSE PITCHING DOWN	NOT STATED												
1561	MK GRU7A	JETTISON CANOPY	X						X		250 KIAS		10 000 FT AGL	NOSE DOWN 5 WINGS LEVEL							INFLIGHT FIRE AND LOSS OF CONTROLS NOSE PITCHING DOWN	NOT STATED												
1579	MK H7	JETTISON CANOPY									25[illegible] KIAS		[illegible] 000 FT AGL	NOSE UP 5 WINGS LEVEL							INFLIGHT FIRE	NOT STATED												

A PART II (Continued)
)ATA CONCERNING EJECTEES REPORTED TO HAVE
ATE) "EJECTION ASSOCIATED" NECK INJURIES
THROUGH 31 DECEMBER 1979

SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE/LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
										ALTHOUGH PILOT HAD TIGHTENED SHOULDER HARNESS AS SECURELY AS POSSIBLE BEFORE FLIGHT IT STILL RODE UP UNDER HIS CHIN DURING PARACHUTE DES CENT CAUSING DISCOMFORT AND IMPAIRED HEAD MOBILITY SIZE OF HARNESS LARGE LONG
										SUPERFICIAL ABRASION LEFT SIDE OF NECK AT TRIBUTED TO LOSS OF HELMET DURING EJECTION
									RESCUE HELO DITCHED AND ALL BOARDED 20 MAN RAFT	

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT

SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF INITIATED	ESCAPE INITIATION METHOD: INADVERTENT, SELF INITIATED	ESCAPE INITIATION METHOD: SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD: NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
624	ESCAPAC IA 1	JETTISON CANOPY	x					x			165 KIAS		2 000 FT AGL	NOSE DOWN 35 INVERTED		LOST FOLLOWING EJECTION	OTHER TYPE NOT SPECIFIED				INVERTED DUE TO FLAP MALFUNCTION	INVERTED											
437	ESCAPAC IC 2	JETTISON CANOPY	x					x			330 KIAS		3 000 FT [illegible]	NOSE D[illegible] INVERTED							INVERTED UNCONTROLLED FLIGHT AFTER CATAPULT LAUNCH	INVERTED							CROSSED BEHIND HEAD	AFTER PARACHUTE OPENING EXPERIENCED DIFFICULTY TURNING HEAD AFTER RISERS UNTWISTED PROB LEM RESOLVED			
1493	ESCAPAC IA 1	JETTISON CANOPY	x						x		230 KIAS		14 000 FT AGL	INVERTED							INVERTED UNCONTROLLED AFTER AIRCRAFT STRUCK BY MISSILE (SPIN)	INVERTED	OFF THE SEAT AND NEARLY PINNED AGAINST THE CANOPY	FIRST PULL ON LEH HAND SLIPPED OFF SECOND TIME MADE SURE GRIP WAS GOOD THEN YANKED WHILE TRYING TO THROW SELF BACK INTO A GOOD POSITION								BUTTOCKS ATOP SURVIVAL PACK	
1272	ESCAPAC IA 1	JETTISON CANOPY	x						x		35 KGS		0 FT AGL (GROUND LEVEL)	NOSE DOWN 20							LANDED ON SIDE	NOT STATED		EJECTED AS NOSE FELL THROUGH PROBABLY LEANING FORWARD									
1194	ESCAPAC IC 2	JETTISON CANOPY					x	x			2[illegible] KIAS		25 [illegible]00 FT AGL	NOSE DOWN 25 WINGS LEVEL				POSSIBLY AFTER EJECTION			LEVELING OUT AFTER DIVE FOLLOWING INADVERTENT CANOPY LOSS	NOT STATED											

T II (Continued)
ONCERNING EJECTEES REPORTED TO HAVE
EJECTION ASSOCIATED" NECK INJURIES
H 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
		CROSSED BEHIND HEAD	AFTER PARACHUTE OPENING EXPERIENCED DIFFICULTY TURNING HEAD AFTER RISERS UNTWISTED PROBLEM RESOLVED					
					BUTTOCKS ATOP SURVIVAL PACK			BEGAN SPINNING VIOLENTLY AT MAN SEAT SEPARATION WAS PERPEND. .LAR TO RISERS WATCHING PARACHUTE DEPLOY . .D CANOPY BLOSSOM OPENING SHOCK KNOCKED WIND OUT OF HIM
								NOSE WHEEL SHEARED WHEN IT STRUCK ARRESTING GEAR HOUSING

AD-A134 834 AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES VO..(U) NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY WASHINGTON DC C W STOKES ET AL. 35

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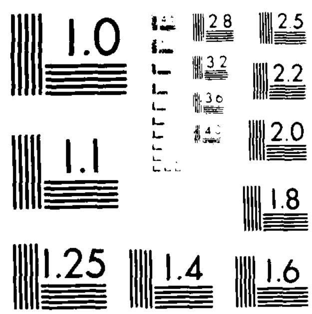

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJE(TEES REPOR SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
1248	ESCAPAC IC 2	JETTISON CANOPY	X						X		135 KIAS		215 FT AGL	NOSE DOWN 10°						CATAPULT BOOST	LOCKED FLIGHT CONTROLS	NOT STATED		FLEXED HIS HEAD FORWARD SLIGHTLY WHILE PULLING LEH									
1049	ESCAPAC IC 2	JETTISON CANOPY	X					X			200 KIAS		4 000 FT AGL	NOSE UP WINGS LEVEL							LOSS OF POWER	NOT STATED							BEHIND HEAD TWISTED	PUSHED HEAD DOWN AGAINST CHEST			
239	ESCAPAC IA 1	JETTISON CANOPY	X						X		UNK		20 FT AGL	NOSE UP							MUSHING LOST POWER DURING CATAPULT LAUNCH	MUSHING		PULLED LEH WITH LEFT HAND WHICH HAD BEEN ON HANDLE DURING LAUNCH									
888	MK H7	JETTISON CANOPY	X						X		150 KIAS		30 FT AGL	NOSE UP							NOSEDOWN ATTITUDE DURING AND FOLLOWING CATAPULT LAUNCH	NOT STATED											
149	ESCAPAC 1	JETTISON CANOPY	X					X			190 KIAS		1 100 FT AGL	NOSE DOWN 20							NOSE FALLING THROUGH AT EJECTION POST ENGINE FAILURE ZOOM CLIMB	NOT STATED											

(Continued)

CERNING EJECTEES REPORTED TO HAVE
CTION ASSOCIATED" NECK INJURIES
31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
								NB 10 PARACHUTE HAD ONE PARTED AND ONE FRAYED SHROUDLINE AND SEVERAL SMALL HOLES IN CANOPY
		BEHIND HEAD TWISTED	PUSHED HEAD DOWN AGAINST CHEST					
								WHEN HE RELEASED STICK TO PULL FACE CURTAIN NOSE STARTED FALLING THROUGH AFTER SEAT FIRED HE WAS LOOKING THROUGH HIS FEET AT THE SKY

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APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
627	MK H7	JETTISON CANOPY	x						x		160 KIAS		60 FT AGL	NOSE DOWN 10°		DISCARDED	OTHER TYPE NOT SPECIFIED				NOSE FALLING THROUGH AFTER GEAR CONTACTED FLIGHT DECK (LATE WAVE OFF)	NOT STATED		PULLED LFH WITH LEFT HAND WHILE RIGHT HAND HELD STICK							HIT THE WATER GOING FORWARD		
1089	MK GRU7A	JETTISON CANOPY	x					x			450 KIAS		8 300 FT AGL	NOSE UP 45°, WINGS LEVEL							NOSE PITCHED AFTER AIR CRAFT WAS STRUCK BY MISSILF	NOT STATED	PILOT PITCHED FORWARD BY AIRCRAFT VIOLENTLY PITCHING NOSE UP	POOR HEAD POSITION									
1158	MK GRU5	THROUGH THE CANOPY	x					x			300 KIAS		12 000 FT AGL	NOSE DOWN 90	(OTHER EQUIPMENT INTERFERED)		OTHER TYPE NOT SPECIFIED				NOSE PITCHING UP AND DOWN STEEP DIVE ROLL ING	NOT STATED	FORCED TO RIGHT AND FORWARD BY G FORCES	HEAD THROWN FORWARD LOOKING AT TOP OF CONTROL HANDLE AND DOWN LENGTH OF STICK HEAD WAS NEVER STILL								FEET FIRST THEN FACE AND CHEST IN WATER	SURFACED ON CHEST BEING DRAGGED THROUGH 1 FT WAVES
174	ESCAPAC IA 1	JETTISON CANOPY	x						x		200 KIAS		200 FT AGL	35 BANK							OVERROTATION OF AIRCRAFT POST CATAPULT LAUNCH RADAR SCOPE SHIFTED AFT AGAINST STICK ROLLING	NOT STATED	RIGHT LEG WAS RAISED AND BACK WITH SCOPE WEDGED BE TWEEN LEG AND STICK	TORSO HARNESS NOT AS TIGHT AS HE COULD GET IT NECK SLIGHTLY FLEXED RIGHT FOOT BACK FROM RUDDER PEDAL									
771	MK GRU5	THROUGH THE CANOPY	x					x			90 KIAS		300 FT AGL	NOSE UP 20 40 BANK			APN 6C				OVERROTATION AND STALL POST CATAPULT LAUNCH	NOT STATED											

...ART II (Continued)

... CONCERNING EJECTEES REPORTED TO HAVE ... "EJECTION ASSOCIATED" NECK INJURIES

...OUGH 31 DECEMBER 1979

...LL ...ES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
					HIT THE WATER GOING FORWARD			AS SWIMMER CONNECTED EJECTEE WITH THE SLING HELO LIFTED BOTH. SWIMMER CLUNG TIGHTLY TO EJECTEE WHO WRAPPED HIS LEGS AROUND SWIMMER	
									(FLIGHT OFFICER STATED NOSE PITCH UP WAS VIOLENT (8G) DUE TO G LOADS HE INITIALLY COULD NOT REACH FACE CURTAIN)
						FEET FIRST, THEN FACE AND CHEST IN WATER	SURFACED ON CHEST BEING DRAGGED THROUGH 1 FT WAVES		
									ON EJECTION, I FELT AS IF SOMEONE HAD HIT ME IN THE CHEST

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO			ESCAPE INITIATION METHOD					FIRING CONTROL HANDLE USED			ESCAPE CONDITIONS				HELMET			ALTERED CONSCIOUSNESS			MANEUVER		BODY POSITION		SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT		
	TYPE EJECTION SEAT	CANOPY MODE	DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FACE CURTAIN	LOWER HANDLE	OTHER	AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	DAMAGE (LOCATION)	LOST (WHEN)	TYPE	REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	PRE-EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	PRE-EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	TYPE/LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
770	ESCAPAC IC 2	JETTISON CANOPY	x					x			35 KGS		0 FT AGL (GROUND LEVEL)	NOSE AND WINGS LEVEL							OVERRUNING END OF RUN WAY FOLLOWING FAST LANDING	NOT STATED		POSITIONED HIS HEAD								ENTERED WATER FEET FIRST	
199	MK H7	JETTISON CANOPY	x						x		450 KIAS		600 FT AGL								PITCH OSCILLATION VIOLENT	OTHER (DESCRIBE)											
1052	MK H7	JETTISON CANOPY				x				SEQUENCER	140 KIAS		5 FT AGL	NOSE DOWN 15 · 15 BANK							PITCHING NOSE DOWN POST CATAPULT LAUNCH	NOT STATED											
1751	MK H7	JETTISON CANOPY	x						x		185 KIAS		6 000 FT AGL	NOSE & WINGS LEVEL		DISLODGED ON EJECTION	PRIVATE CONTRACTOR FORM FIT			AFTER RESCUE	PLANNED EJECTION UTILITY HYDRAULIC FAILURE PREVENTED FLAPS AND MLG EXTENSION	NOT STATED		HEAD WAS PROBABLY TILTED FORWARD									PLASTIC PARACHUTE CONTAINER ENTANGLED IN RISERS STRUCK EJECTEE'S FACE
6	ESCAPAC IC 2	JETTISON CANOPY							x		200 KIAS		5 000 FT AGL			DISLODGED AT EJECTION					POST MID AIR COLLISION TUMBLING	TUMBLING	FORCED FORWARD IN STRAPS UNABLE TO REACH FACE CURTAIN	BENT FORWARD IN STRAPS PULLED LEH									

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IING EJECTEES REPORTED TO HAVE

ɴN ASSOCIATED'' NECK INJURIES

CEMBER 1979

RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
			ENTERED WATER FEET FIRST			SOMERSAULTED FORWARD OUT OF SEAT AND CONTINUED TO TUMBLE UNTIL PARACHUTE OPENING SHOCK
						SUSTAINED FLAILING OF RIGHT ARM AND COMPLAINED OF SHOULDER STIFFNESS AND DISCOMFORT EJECTION SEEMED VERY VIOLENT
				PLASTIC PARACHUTE CONTAINER ENTANGLED IN RISERS STRUCK EJECTEE'S FACE		EXPERIENCED BRIEF BACK PAIN DURING CATAPULT BOOST

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT[ED AS HAVING] SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE SELF INITIATED	INADVERTENT SELF INITIATED	SEQUENCED WITH WARNING	SEQUENCED WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK
139	ESCAPAC IC 2	JETTISON CANOPY	x						x		265 KIAS		2 500 FT AGL			DISLODGED	APH 6B				POST MID AIR COLLISION	UNKNOWN											
438	ESCAPAC IC 2	JETTISON CANOPY	x						x		340 KIAS		8 000 FT AGL	NOSE DOWN 80°							POST MID AIR COLLISION TUMBLING	TUMBLING		EJECTION ACCOMPLISHED UNDER NEGATIVE Gs									
562	LS 1	JETTISON CANOPY						x			200 KIAS		1 000 FT AGL	NOSE DOWN 10							POST MID AIR COLLISION PITCH DOWN	NOT STATED									PARACHUTE CAUGHT IN TREE AFTER RELEASING SURVIVAL KIT RELEASED PARACHUTE AND SLID DOWN APPROX 20 FT	LANDED ON LIMB PUNCTURING THIGH APPROX 1½ INCHES DEEP	
694	LW 3B	THROUGH THE CANOPY	x						x		145 KIAS		5 500 FT AGL	NOSE UP 23°							POST MID AIR COLLISION FIRE WITH LOSS OF PORTION OF WING	NOT STATED							BEHIND HEAD	TRIED TO LOOK UP AT PARACHUTE COULDN'T SINCE NECK WAS AGAINST UNRELEASED SEAT BACK			
874	MK H7	JETTISON CANOPY				x				SEQUENCER	110 KIAS		1 000 FT AGL	NOSE UP		LOST	APH 6C				POST MID AIR COLLISION DISINTEGRATING	DISINTEGRATION	TURNING ON EQUIPMENT										

II (Continued)

NCERNING EJECTEES REPORTED TO HAVE
IECTION ASSOCIATED'' NECK INJURIES
I 31 DECEMBER 1979

SYSTEM IALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
				PARACHUTE CAUGHT IN TREE AFTER RELEASING SURVIVAL KIT RELEASED PARACHUTE AND SLID DOWN APPROX 20 FT	LANDED ON LIMB PUNC TURING THIGH APPROX 1½ INCHES DEEP			UPON MID AIR COLLISION IMPACT EXPERIENCED NEGA TIVE G FORCES AND BRIEF VIOLENT PITCH DOWN
		BEHIND HEAD	TRIED TO LOOK UP AT PARACHUTE COULDN T SINCE NECK WAS AGAINST UNRELEASED SEAT BACK					SEAT BACK HUNG UP AND DID NOT RELEASE UNTIL WATER ENTRY
								PILOT KILLED IN MID AIR COLLISION IMPACT

APPENDIX A PART II
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR[T]
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC[K]
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER
1281	ESCAPAC IC 2	JETTISON CANOPY	x						x	
1346	MK GRUEA 7	THROUGH THE CANOPY	x			x			x	SEQUENCER
1567	ESCAPAC IG 2	THROUGH THE CANOPY	x				x			
1598	MK H7	JETTISON CANOPY	x						x	
1761	MK H7	JETTISON CANOPY	x						x	

CASE REF NO	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED
1281	300 KIAS		15 000 FT AGL	NOSE DOWN 90						
1346	270 KIAS		14 000 FT AGL	NOSE DOWN 20°, 90° BANK		LOST ON EJECTION	APH 6C			
1567	350 KIAS		2 000 FT AGL							
1598	350 KIAS		1 500 FT AGL							
1761	400 KIAS		16 500 FT AGL	NOSE DOWN 10						

CASE REF NO	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION
1281	POST MID AIR COLLISION DIVE NEGATIVE G FORCES	NOT STATED	AIRCRAFT PITCHED OVER ABRUPTLY FORCING HEAD ONTO CANOPY	PUSHED HIMSELF BACK INTO SEAT BY PUSHING WITH LEFT HAND AGAINST CANOPY AND PULLED LEH WITH RIGHT HEAD WAS FORWARD AT EJECTION
1346	POST MID AIR COLLISION	NOT STATED		
1567	POST MID AIR COLLISION	UNKNOWN		
1598	POST MID AIR COLLISION DISINTEGRATING ROLLING	DISINTEGRATION		HEAD WAS IN FORWARD FLEXED POSITION
1761	POST MID AIR COLLISION INVERTED OUT OF CONTROL	INVERTED	VIOLENT YAW THREW CREW TO RIGHT SIDE HELMET HIT CANOPY RAIL DAMAGING HELMET	GRABBED SIDE OF SEAT AND PULLED HIMSELF DOWN TO REACH LEH

CASE REF NO	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
1281					BEHIND HEAD	HEAD FORCED FORWARD UNTIL MANUALLY SPREAD RISERS APART			
1346									
1567								RELEASED KOCH FITTINGS WHEN RAFT HIT WATER	
1598								FEET THEN FELL ONTO RIGHT SIDE OF CHEST	
1761	HAIRLINE FRACTURE OF CHEEK BONE	STRIKING CANOPY RAIL							

NDIX A PART II
ATA CONCERNING EJECTEES REPORTED TO HAVE
TE) "EJECTION ASSOCIATED" NECK INJURIES
HROUGH 31 DECEMBER 1979

SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE/LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
				BEHIND HEAD	HEAD FORCED FORWARD UNTIL MANUALLY SPREAD RISERS APART					AFTER DEPLOYING RAFT WAS STRUCK BY IT SEVERAL TIMES DURING DESCENT
										FELT A SEVERE AND HARD JOLT ON THE AIRCRAFT WHICH IMMEDIATELY WENT INTO A LEFT WING DOWN NOSE LOW ATTITUDE EJECTEE GRABBED AND PULLED LEH PILOT INITIATED SEQUENCED EJECTION NOT CLEAR WHICH CAUSED EJECTION
							RELEASED KOCH FITTINGS WHEN RAFT HIT WATER			EJECTEE STATED THAT HE DID NOT INITIATE EJECTION PROBABLE T 3 COMPRESSION FRACTURE HEMATOMA AND BRUSES ON LEFT MANDIBLE FROM VIOLENT IMPACT
							FEE, THEN FELL ONTO RIGHT SIDE OF CHEST			AIRCRAFT WAS STRUCK TWICE IN QUICK SUCCESSION LAST TIME IN AREA OF RADOME FRONT COCKPIT AND CANOPY
HAIRLINE FRACTURE OF CHEEK BONE	STRIKING CANOPY RAIL									

APPENDIX A PART II (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPO
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NE
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	ESCAPE INITIATION METHOD: INADVERTENT, SELF-INITIATED	ESCAPE INITIATION METHOD: SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD: NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE-EJECTION BODY MOVEMENT/POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: UNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
1760	MK H7	JETTISON CANOPY				x				SEQUENCER	300 KIAS		16 500 FT AGL	NOSE DOWN 30°							POST MID AIR COLLISION ROLLING, OUT OF CONTROL	ROLLING	VIOLENT YAW THREW CREW TO RIGHT SIDE OF COCKPIT										
997	ESCAPAC IC 2	JETTISON CANOPY	x						x		200 KIAS		12 000 FT AGL	NOSE AND WINGS LEVEL			APH 6C				POST RAMP STRIKE ENGINE SEIZURE DURING CLIMBOUT	NOT STATED	HEAD FIRMLY BACK						STRUCK RIGHT SIDE OF NECK DURING PARACHUTE OPENING				
1405	MK H7	JETTISON CANOPY			x					SEQUENCER	250 KIAS		290 FT AGL	NOSE AND WINGS LEVEL		LOST DURING EJECTION	APH 6A				PULL OUT, POST ROCKET RUN EXPLOSION AND IN FLIGHT FIRE	NOT STATED		ASSUMED STRAIGHT BACK, EX TENDED LEGS, HEAD AGAINST HEADREST, HANDS IN LAP POSITION, HEAD PULLED DOWN DURING EJECTION									
1404	MK H7	JETTISON CANOPY						x			250 KIAS		290 FT AGL	NOSE AND WINGS LEVEL		DISLODGED	APH 6A				PULL OUT, POST ROCKET RUN EXPLOSION AND INFLIGHT FIRE	NOT STATED		AFTER REAR SEAT FIRED LOOKED AFT, STRAIGHTENED, PULLED LEFT AGAIN AND PULLED FACE CURTAIN WHEN SEAT FIRED									
1334	ESCAPAC IC 2	JETTISON CANOPY	x						x		400 KIAS		3 000 FT AGL	NOSE UP 30° BANK		DISLODGED, ROTATED OVER FACE	APH 6D	YES, BEFORE DURING BOOST		ON BOARD RESCUE HELO	PULL OUT POST BOMBING RUN GRAYING OUT	NOT STATED							BEHIND HELMET	TO STRAIGHTEN HELMET ON HEAD REQUIRED MOVING ONE RISER TO SIDE			

Continued)

ERNING EJECTEES REPORTED TO HAVE
TION "ASSOCIATED" NECK INJURIES
) DECEMBER 1979

EM CTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
							EJECTEE WAS PHOTOGRAPHER – LOST CAMERA AT MAN SEAT SEPARATION (NO INDICATION WHETHER CAMERA HAD STRAP AROUND HIS NECK OR WHETHER IT WAS SIMPLY HELD)
	STRUCK RIGHT SIDE OF NECK DURING PARACHUTE OPENING						
	BEHIND HELMET	TO STRAIGHTEN HELMET ON HEAD REQUIRED MOVING ONE RISER TO SIDE					

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT[illegible] SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC[illegible]

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	ESCAPE INITIATION METHOD: INADVERTENT, SELF-INITIATED	ESCAPE INITIATION METHOD: SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD: SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD: NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	FIRING CONTROL HANDLE USED: LOWER HANDLE	FIRING CONTROL HANDLE USED: OTHER	ESCAPE CONDITIONS: AIRSPEED	ESCAPE CONDITIONS: DESCENT RATE	ESCAPE CONDITIONS: ALTITUDE	ESCAPE CONDITIONS: ATTITUDE	HELMET: DAMAGE (LOCATION)	HELMET: LOST (WHEN)	HELMET: TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES NO)	ALTERED CONSCIOUSNESS: DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	MANEUVER: AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION: BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	SKULL INJURIES: CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	SYSTEM MALFUNCTION: EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING: EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	SURFACE CONTACT: PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
1613	ESCAPAC IG 2	THROUGH THE CANOPY	X					X			150 KIAS		150 FT AGL	NOSE LEVEL 45° BANK							ROLLING UNCONTROLLED IMMEDIATELY AFTER CATAPULT LAUNCH	NOT STATED											
126	ESCAPAC IC 2	JETTISON CANOPY	X						X		260 KIAS		3 300 FT AGL	NOSE DOWN 15° 15 BANK		DISLODGED ROTATED TO BACK OF HEAD	APH 7				ROLLING UNCONTROLLED GENTLE AFTER HYDRAULIC CONTROL FAILURE	NOT STATED									UNABLE TO FACE INTO WIND FOR GROUND IMPACT	LANDED ON HEELS AND ROLLED UP ON HIS BACK SHOULDERS AND THEN HEAD OVER HIS RSSK	
464	ESCAPAC IA 1	JETTISON CANOPY	X						X		160 KIAS		175 FT AGL	NOSE UP 10 60 BANK		DISLODGED ROTATED FORWARD ON EJECTION	OTHER TYPE NOT SPECIFIED				ROLLING UNCONTROLLED CONTROLS STIFF FOLLOWING CATAPULT LAUNCH	NOT STATED		HEAD AND TORSO FORWARD AND LEANING RIGHT RIGHT HAND ON STICK PULLING LEH WITH LEFT									DRAGGED AFTER WATER ENTRY
496	MK H7	JETTISON CANOPY	X						X		180 KIAS		10 FT AGL	45° BANK							ROLLING UNCONTROLLED DURING APPROACH TO FIELD	NOT STATED											
1058	HS 1A	JETTISON CANOPY	X							TWIST PULL KNOB (LEFT)	280 KIAS	ROLL RATE 300 400 DEG SEC	250 FT AGL	NOSE DOWN 10°		LOST DURING EJECTION	APH 6A				ROLLING UNCONTROLLED IN FLIGHT FIRE FOLLOWING LOSS OF FUEL TANK DURING CATAPULT LAUNCH	ROLLING										ENTERED WATER FEET FIRST	

ART II (Continued)
CONCERNING EJECTEES REPORTED TO HAVE
"EJECTION ASSOCIATED" NECK INJURIES
UGH 31 DECEMBER 1979

LL IES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS NOTES
									EJECTEE USED FACE CURTAIN DUE TO CONCERN REGARDING HERNIATED LUMBAR DISC
					UNABLE TO FACE INTO WIND FOR GROUND IMPACT	LANDED ON HEELS AND ROLLED UP ON HIS BACK SHOULDERS AND THEN HEAD OVER HIS RSSK			
							DRAGGED AFTER WATER ENTRY	WHILE BEING HOISTED INTO HELICOPTER HEAD STRUCK SEVERELY BY UNDERSIDE OF AIRCRAFT	
						ENTERED WATER FEET FIRST			

APPENDIX A PART II (Continued)
GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD					FIRING CONTROL HANDLE USED			ESCAPE CONDITIONS				HELMET			ALTERED CONSCIOUSNESS		EVENT FIRST PAIN NOTICED	MANEUVER		BODY POSITION		SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT		POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
			DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FACE CURTAIN	LOWER HANDLE	OTHER	AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	DAMAGE (LOCATION)	LOST (WHEN)	TYPE	REPORTED (YES/NO)	DURATION		PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	TYPE LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	
1330	ESCAPAC IF 3	JETTISON CANOPY	x					x			365 KIAS		6 000 FT AGL	NOSE DOWN 75°		DISCARDED IN WATER	PRIVATE CONTRACTOR FORM FIT	BLACKOUT	BOOST TO OPENING SHOCK		ROLLING NOSE DOWN	ROLLING											
784	MK AJ	THROUGH THE CANOPY	x						x		200 KIAS		1 500 FT AGL	NOSE DOWN 75		DISLODGED	APH 6C				ROLLING UNCONTROLLED POST STALL	ROLLING		HEAD SLIGHTLY FORWARD PULLING LEH WITH LEFT HAND									
1466	MK GRU7A	JETTISON CANOPY	x						x		40 KGS		0 FT AGL (GROUND LEVEL)	NOSE AND WING LEVEL	DAMAGED		APH 6D				RUNNING OFF DECK UNDER UNCOMMANDED ENGINE POWER	NOT STATED		LOOKING DOWN DURING EJECTION							LANDED BACKWARDS ON FLIGHT DECK	LANDED ON BOTH FEET & FELL BACKWARD	DRAGGED SEVERAL YARDS ALONG FLIGHT DECK
419	MK F7	JETTISON CANOPY	x					x			100 KIAS		60 FT AGL	NOSE AND WINGS LEVEL		DISCARDED & REDONNED	APH 6A				POST RAMP STRIKE SLIDING DOWN FLIGHT DECK	NOT STATED											
1585	MK GRU7A	JETTISON CANOPY								SEQUENCER	115 KGS		60 FT AGL	NOSE UP		DISCARDED IN WATER	PRIVATE CONTRACTOR FORM FIT				POST RAMP STRIKE SLIDING DOWN FLIGHT DECK	NOT STATED		WAS BRINGING HEAD UP AND BACK WHEN EJECTED AND FORCES PULLED HIS HEAD DOWN									HIGH SEAT STATE [illegible]

II (Continued)

ONCERNING EJECTEES REPORTED TO HAVE

JECTION ASSOCIATED" NECK INJURIES

H 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
								TWO PANELS OF PARACHUTE TORN SEAT PAN RETEN TION STRAPS HAD BEEN TORN AWAY FROM TORSO HARNESS ALLOWING RSSK 3A TO SLIDE DOWN TO HIS KNEES
				LANDED BACKWARDS ON FLIGHT DECK	LANDED ON BOTH FEET & FELL BACKWARD	DRAGGED SEVERAL YARDS ALONG FLIGHT DECK		
							HELMET STRUCK HELO WHEEL WHILE BEING HOISTED INTO HELO	PULLED NOSE UP AND OVERROTATED SLAMMING AIR CRAFT TAIL INTO RAMP AIRCRAFT CAME DOWN ON ITS MAIN GEAR AND LEFT MAIN GEAR BUCKLED ABOUT A THIRD THE WAY DOWN FLIGHT DECK
						HIGH SEAT STATE 5 6 FT	DRAGGED ALMOST 100 YDS BY HELO AND HIT IN HEAD WITH A COUPLE OF TIMES WITH BOOM	IMPACTED RAMP WITH TAIL HOOK CATCHING LOWER PORTION OF SAFETY NET AND FLYING INTO FANTAIL WEATHER DECK BOTH WHEELS AND MAIN STRUTS IM PACTED ON ROUND DOWN

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
41	ESCAPAC IA 1	JETTISON CANOPY	x						x		UNK		9 000 FT AGL	LEFT BANK							SPIN	NOT STATED	HELMET HIT CANOPY A FEW TIMES ALTHOUGH NOT VIOLENTLY BEFORE EJECTION	BENT SLIGHTLY FORWARD TO GRAB LEH AS HE EJECTED FELT JERK ON NECK					BEHIND HELMET	HEAD FORCED FORWARD BY RISERS			
180	HS 1	JETTISON CANOPY				x				SEQUENCER	100 KIAS		9 000 FT AGL	NOSE DOWN						PARACHUTE OPENING	SPIN	NOT STATED							BEHIND HELMET AND AGAINST NECK	HEAD HELD FORWARD BY RISERS UNTIL RISERS MANUALLY SPREAD			
1313	ESCAPAC IG 1	JETTISON CANOPY				x				SEQUENCER	200 KIAS		11 000 FT AGL			LOST	APH 6D				SPIN INVERTED	INVERTED	NEGATIVE G FORCES PUSHED HIM AGAINST CANOPY						RISER CAUSED LPA 2 COLLAR TO STRIKE NECK ON OPENING SHOCK				
1312	ESCAPAC IG 1	JETTISON CANOPY				x			x		200 KIAS		11 000 FT AGL								SPIN INVERTED	INVERTED	NEGATIVE G FORCES PUSHED HIM AGAINST CANOPY										
1806	MK H7	JETTISON CANOPY	x						x		80 KIAS		2 000 FT AGL	NOSE DOWN 25 WINGS LEVEL							SPIN OSCILLATING	OSCILLATING SPIN											DRAGGED FACE DOWN IN WATER SHORT DISTANCE

II (Continued)

...ONCERNING EJECTEES REPORTED TO HAVE ...EJECTION ASSOCIATED" NECK INJURIES ...H 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
		BEHIND HELMET	HEAD FORCED FORWARD BY RISERS					
		BEHIND HELMET AND AGAINST NECK	HEAD HELD FORWARD BY RISERS UNTIL RISERS MANUALLY SPREAD					
		RISER CAUSED LPA 2 COLLAR TO STRIKE NECK ON OPENING SHOCK						
						DRAGGED FACE DOWN IN WATER SHORT DISTANCE		

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPOR
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NEC
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF. NO.	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE-EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
116	ESCAPAC IC-2	JETTISON CANOPY	X						X		150 KIAS		6 000 FT AGL								SPIN FLAT	FLAT SPIN											
1043	MK H7	JETTISON CANOPY	X						X		190 KIAS		6,000 FT AGL	NOSE DOWN 15°, 20° BANK							SPIN FLAT	FLAT SPIN		TILTED HEAD BACK TO HEADREST WITHOUT STRAIGHTENING SPINE									
1614	ESCAPAC IC-2	JETTISON CANOPY	X						X		0 KIAS		8 750 FT AGL	NOSE DOWN 10°			PRIVATE CONTRACTOR FORM FIT				SPIN FLAT	FLAT SPIN											
1641	MK GRU7A	JETTISON CANOPY	X						X		150 KIAS		7 000 FT AGL	NOSE DOWN 10°, 60° BANK							SPIN FLAT	FLAT SPIN	SHOULDERS AGAINST RIGHT UPPER PORTION OF CANOPY FEET LEVEL WITH SEAT PAN	REACH WAS 6 INCHES SHORT OF LEH EXTREME DIFFICULTY PULLED HIMSELF DOWN TO REACH IT									
168	LS-1	JETTISON CANOPY	X					X			300 KIAS			NOSE DOWN 75°				EJECTION TO GROUND			SPIN NOSE DOWN	NOSE DOWN SPIN											

ART II (Continued)
A CONCERNING EJECTEES REPORTED TO HAVE
) "EJECTION ASSOCIATED" NECK INJURIES
OUGH 31 DECEMBER 1979

ALL IES	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
								HELMET STRUCK HELO DURING RESCUE	SHIVERING SPASTIC MUSCLES SECOND DEGREE TO COLD EXPOSURE
									DURING SPIN AIRCRAFT SUDDENLY AND VIOLENTLY UPRIGHTED ITSELF
									WHEN HE CAME TO HE WAS LYING ON GROUND GAZING AT PARACHUTE IN TREES WONDERING WHOSE IT WAS

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPO

SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NE

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF. NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF-INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE-EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK
278	MK GRU5	THROUGH THE CANOPY	x					x			425 KIAS		8 000 FT AGL	NOSE DOWN 60		DISLODGED	OTHER TYPE NOT SPECIFIED				SPIN NOSE DOWN	NOSE DOWN SPIN		POORLY POSITIONED FOR EJECTION									
313	MK H7	JETTISON CANOPY	x					x			325 KIAS		5 000 FT AGL	NOSE DOWN 30							SPIN NOSE DOWN	NOSE DOWN SPIN											
760	MK [illegible]	JETTISON CANOPY	x						x		[illegible] KIAS		1[illegible],000 FT AGL								SPIN NOSE DOWN THEN SPIRAL NEG G	NOSE DOWN SPIN	AGAINST CANOPY AND TO RIGHT SIDE OF COCKPIT	PULLED LEH WITH LEFT HAND									
[illegible]	[illegible]	[illegible] CANOPY									[illegible]		[illegible]	[illegible]							[illegible]	[illegible] SPIN		[illegible] EFFORT [illegible] OTHER THAN [illegible]									
[illegible]	[illegible]	[illegible]	x								[illegible] KIAS		[illegible] FT AGL	[illegible]							[illegible]	[illegible]	[illegible]	[illegible]									

II (Continued)

ONCERNING EJECTEES REPORTED TO HAVE EJECTION ASSOCIATED'' NECK INJURIES

GH 31 DECEMBER 1979

SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
								ONE CANOPY OF PARACHUTE MISSING AND TWO SUSPENSION LINES BROKEN
								PRIOR TO EJECTION BUFFETING CAUSED HEAD TO REPEATEDLY BANG BOTH SIDES OF CANOPY

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTED

SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK IN

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD – DELIBERATE, SELF INITIATED	ESCAPE INITIATION METHOD – INADVERTENT, SELF INITIATED	ESCAPE INITIATION METHOD – SEQUENCED, WITH WARNING	ESCAPE INITIATION METHOD – SEQUENCED, WITHOUT WARNING	ESCAPE INITIATION METHOD – NON-CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED – FACE CURTAIN	FIRING CONTROL HANDLE USED – LOWER HANDLE	FIRING CONTROL HANDLE USED – OTHER	ESCAPE CONDITIONS – AIRSPEED	ESCAPE CONDITIONS – DESCENT RATE	ESCAPE CONDITIONS – ALTITUDE	ESCAPE CONDITIONS – ATTITUDE	HELMET – DAMAGE (LOCATION)	HELMET – LOST (WHEN)	HELMET – TYPE	ALTERED CONSCIOUSNESS – REPORTED (YES/NO)	ALTERED CONSCIOUSNESS – DURATION	EVENT FIRST PAIN NOTICED	MANEUVER – PRE EJECTION AIRCRAFT MANEUVER	MANEUVER – AIRCRAFT MANEUVER AT EJECTION	BODY POSITION – PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION – BODY POSITION AT EJECTION	SKULL INJURIES – TYPE/LOCATION	SKULL INJURIES – CAUSAL FACTORS	SYSTEM MALFUNCTION – TYPE MALFUNCTION	SYSTEM MALFUNCTION – EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING – RELATIVE TO HEAD/NECK	RISER LOCATION AT PARACHUTE OPENING – EVIDENCE CONCERNING LOCATION	SURFACE CONTACT – PROBLEMS	SURFACE CONTACT – PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK
1228	ESCAPAC IF 3	JETTISON CANOPY	x					x			UNK		8 000 FT AGL							ABOARD RAFT HELO	SPIN NOSE DOWN	NOSE DOWN SPIN	SUSPENDED IN SHOULDER HARNESS WITH HELMET TOUCHING CANOPY	LEANED BACK AGAINST SEAT WITH SLIGHTLY FORWARD TO ALLOW REACHING CURTAIN AND FEET FOR WARD TOWARDS PEDALS			SURVIVAL KIT OPENED PRE MATURELY	BEFORE EJECTEE MOVED TO OPEN KIT HE SAW INFLATED LIFE RAFT IN HIS RISERS						
1318	MK H7	JETTISON CANOPY	x						x		150 KIAS		10 000 FT AGL	NOSE DOWN 45° RIGHT BANK			APH 6				SPIN NOSE DOWN	NOSE DOWN SPIN												
1674	MK GRU EA 7	THROUGH THE CANOPY								SEQUENCER	UNK		9 000 FT AGL	NOSE DOWN 50							SPIN NOSE DOWN	NOSE DOWN SPIN												
106	MK H7	JETTISON CANOPY				x				SEQUENCER	120 KIAS		800 FT AGL	LEFT BANK							SPIN ROLLING DURING AP PROACH TO CV	ROLLING		AT EJECTION LEANING FORWARD AND HEAD WAS BENT FORWARD CHIN AGAINST CHEST										
1785	[illegible]	JETTISON CANOPY	x					x			[illegible] KIAS		[illegible] FT AGL	NOSE DOWN 80				BLACKED OUT	[illegible] OPENING SHOCK		SPIN ROLLING	ROLLING					[illegible]	[illegible]						

ʼART II (Continued)
ΓA CONCERNING EJECTEES REPORTED TO HAVE
ΓE) "EJECTION ASSOCIATED" NECK INJURIES
IROUGH 31 DECEMBER 1979

SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
...LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
		SURVIVAL KIT OPENED PRE MATURELY	BEFORE EJECTEE MOVED TO OPEN KIT HE SAW INFLATED LIFE RAFT IN HIS RISERS							AIRCRAFT ENTERED A VIOLENT RIGHT SPIN AFTER PARACHUTE OPENING WHEN EJECTEE LOOKED UP AT PARACHUTE SAW LIFE RAFT FULLY INFLATED CAUGHT IN RISERS
										EXPERIENCED A VIOLENT INSTANTANEOUS INCREASE IN POSITIVE G LOADING CAUSING MOMENTARY GRAY OUT AIRCRAFT SUBSEQUENTLY DEPARTED
										EJECTEE FELT A RUSH FEELING FROM UNDER NEATH ME PRESSING ME TOWARD THE CANOPY FELT JUST A SLIGHT COMPRESSION OF THE HEAD VERY SLIGHT AND THEN I WAS THROUGH THE CANOPY
										AIRCRAFT EXPERIENCED AIRSPEED AND ALTIMETER FAILURES FOLLOWED BY LOSS OF GENERATOR AND ONE ENGINE AIRCRAFT THEN ENTERED LOW ALTITUDE SPIN
		SURVIVAL KIT SPONTANE OUSLY OPENED DURING OR FOLLOWING MAN SEAT SEPARATION	LIFE RAFT DEPLOYED WITHOUT EJECTEE ACTION							PORT EQUIPMENT BAY DOOR STRUCK AND BROKE AWAY AN 18 INCH SECTION OF CANOPY EJECTEE DESCRIBED EJECTION AS VIOLENT AFTER LEAVING AIR CRAFT FELT HIS HEAD BEING THROUGH ABOUT THEN RECALLS DANGLING UNDER A FULL PARACHUTE

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORT
SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE, SELF-INITIATED	INADVERTENT, SELF INITIATED	SEQUENCED, WITH WARNING	SEQUENCED, WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES/NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT/POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE/LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS
1786	LS 1A	JETTISON CANOPY	x		x			x		SEQUENCER	350 KIAS		4 000 FT AGL	NOSE DOWN 80				BLACKED OUT	BOOST TO OPENING SHOCK		SPIN ROLLING	ROLLING		REMEMBERS BODY TWISTING TO LEFT DURING EJECTION			SURVIVAL KIT SPONTANEOUSLY OPENED DURING OR FOLLOWING MAN SEAT SEPARATION	LIFE RAFT DEPLOYED WITHOUT EJECTEE ACTION						
706	MK H7	JETTISON CANOPY				x				SEQUENCER	200 KIAS		1 000 FT AGL	NOSE DOWN 20 60 BANK		DISCARDED	APH 6	UNCONSCIOUS	EXCESSIVE G ON AIRCRAFT		STALL LOW LEVEL	NOT STATED	AT SEQUENCED EJECTION PILOT POSITIONED WITH HEAD FORWARD RIGHT HAND PUSHING STICK FULL LEFT FEET ON PEDALS WITH FULL LEFT RUDDER AND REACHING UNDER RIGHT ARM WITH LEFT FOR LEH											
813	HS 1	JETTISON CANOPY								SEQUENCER	110 KIAS		700 FT AGL	NOSE UP 5 45 BANK							STALL LOW LEVEL	NOT STATED									BRUSHED THROUGH TOP OF PINE TREE	LANDED ON FEET FELL BACKWARDS		
94	MK H7	JETTISON CANOPY	x						x		200 KIAS		900 FT AGL	NOSE AND WINGS LEVEL		DISCARDED	APH 6A				FLAME OUT DUAL	NOT STATED		BELIEVES HEAD NECK FLEXED DURING CATAPULT BOOST										
49	MK H5	JETTISON CANOPY	x						x		180 KIAS		130 FT AGL	NOSE DOWN 10 45 BANK							ROLLING UNCONTROLLED INDUCED BY RAISING FLAPS PREMATURELY DURING TAKE OFF	NOT STATED		FELT LIGHT IN SEAT AND BELIEVES HEAD WAS SLIGHTLY FORWARD							OSCILLATION UNDER PARACHUTE AND IMPACTED GROUND			

A PART II (Continued)
DATA CONCERNING EJECTEES REPORTED TO HAVE
RATE) "EJECTION ASSOCIATED" NECK INJURIES
THROUGH 31 DECEMBER 1979

	SKULL INJURIES		SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
EJECTION	TYPE/LOCATION	CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST-SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
EJECTION			SURVIVAL KIT SPONTANEOUSLY OPENED DURING OR FOLLOWING MAN SEAT SEPARATION	LIFE RAFT DEPLOYED WITHOUT EJECTEE ACTION							PORT EQUIPMENT BAY DOOR STRUCK AND BROKE AWAY AN 18 INCH SECTION OF CANOPY EJECTEE WAS REACHING FOR FACE CURTAIN UNKNOWN WHETHER EJECTED SELF OR EJECTED BY SEQUENCING SYSTEM
AND REACHING UNDER RIGHT ARM WITH LEFT FOR LEH											
							BRUSHED THROUGH TOP OF PINE TREE	LANDED ON FEET FELL BACKWARDS			AS CHUTE OPENED EJECTEE WAS HEAD DOWN. OB SERVED PARACHUTE STARTING TO STREAM BY LOOKING BETWEEN FEET OPENING SHOCK AND RESULTING SOMERSAULT VERY POSITIVE (MODERATE OPENING SHOCK OCCURRED IN A HEAD DOWN SOMEWHAT SIDEWAYS POSITION)
BODY											
SLIGHTLY FORWARD							OSCILLATION UNDER PARACHUTE AND IMPACTED GROUND				

APPENDIX A PART II (Continued)

GENERAL TABULAR COMPILATION OF DATA CONCERNING EJECTEES REPORTE[D] SUSTAINED SPRAIN/STRAIN (MODERATE) "EJECTION ASSOCIATED" NECK [INJURY]

1 JANUARY 1969 THROUGH 31 DECEMBER 1979

CASE REF NO	TYPE EJECTION SEAT	CANOPY MODE	ESCAPE INITIATION METHOD: DELIBERATE SELF INITIATED	INADVERTENT SELF INITIATED	SEQUENCED WITH WARNING	SEQUENCED WITHOUT WARNING	NON CREW CAUSED ACTUATION	FIRING CONTROL HANDLE USED: FACE CURTAIN	LOWER HANDLE	OTHER	ESCAPE CONDITIONS: AIRSPEED	DESCENT RATE	ALTITUDE	ATTITUDE	HELMET: DAMAGE (LOCATION)	LOST (WHEN)	TYPE	ALTERED CONSCIOUSNESS: REPORTED (YES NO)	DURATION	EVENT FIRST PAIN NOTICED	MANEUVER: PRE EJECTION AIRCRAFT MANEUVER	AIRCRAFT MANEUVER AT EJECTION	BODY POSITION: PRE EJECTION BODY MOVEMENT POSITION	BODY POSITION AT EJECTION	SKULL INJURIES: TYPE LOCATION	CAUSAL FACTORS	SYSTEM MALFUNCTION: TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RISER LOCATION AT PARACHUTE OPENING: RELATIVE TO HEAD NECK	EVIDENCE CONCERNING LOCATION	SURFACE CONTACT: PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD NECK	RESCUE PROBLEMS AFFECTING HEAD NECK
529	MK H7	JETTISON CANOPY	x						x		400 KIAS		2,200 FT AGL	NOSE DOWN 10°		LOST	TYPE NOT SPECIFIED				UNCONTROLLED FLIGHT	NOT STATED		LEANING FORWARD										
600	ESCAPAC IC-2	JETTISON CANOPY	x						x		200 KIAS		1,000 FT AGL	NOSE DOWN 10°				DAZED	BY IMPACT WITH TREE		UNCONTROLLED FLIGHT PILOT DISORIENTED	NOT STATED		FEET ON PEDALS, BACK FAIRLY STRAIGHT HEAD SLIGHTLY FORWARD							PARACHUTE CAUGHT IN TOP OF PINE TREE CAUSING EJECTEE TO BE THRUST IN TO TRUNK OF TREE HANGING, ONE FOOT ABOVE GROUND	ELBOW, SIDE & SURVIVAL KIT		
799	LS-1	JETTISON CANOPY	x					x			150 KIAS		6,000 FT AGL	LEFT BANK					BOOST TO OPENING SHOCK	AFTER PARACHUTE OPENING	UNCONTROLLED FLIGHT	NOT STATED		FEET, CHIN RAISED AS HE PULLED FACE CURTAIN							LANDED BY AN ALT DRIFT	LANDED ON FEET, BUTTOCKS AND SHOULDERS, HEAD HIT HARD		
1210	ESCAPAC IC-2	JETTISON CANOPY	x					x			200 KIAS		1,000 FT AGL	NOSE UP, WINGS LEVEL						WHEN STANDING AFTER LANDING	ZOOM CLIMB POST ENGINE FAILURE	NOT STATED		BACK ERECT AND FEET ON PEDALS										

T II (Continued)

CONCERNING EJECTEES REPORTED TO HAVE "EJECTION ASSOCIATED" NECK INJURIES

GH 31 DECEMBER 1979

	SYSTEM MALFUNCTION		RISER LOCATION AT PARACHUTE OPENING		SURFACE CONTACT				
CAUSAL FACTORS	TYPE MALFUNCTION	EVIDENCE OF MALFUNCTION	RELATIVE TO HEAD/NECK	EVIDENCE CONCERNING LOCATION	PROBLEMS	PART OF BODY	POST SURFACE CONTACT PROBLEMS AFFECTING HEAD/NECK	RESCUE PROBLEMS AFFECTING HEAD/NECK	GENERAL COMMENTS/NOTES
									IMMEDIATELY AFTER PARACHUTE OPENING EJECTEE ENTERED WATER SPLASH CREATED BY AIRCRAFT IMPACT THEN HIT WATER SURFACE
					PARACHUTE CAUGHT IN TOP OF PINE TREE CAUSING EJECTEE TO BE THRUST IN TO TRUNK OF TREE HANGING ONE FOOT ABOVE GROUND	ELBOW SIDE & SURVIVAL KIT			
					LANDED BY AN AFT DRIFT	LANDED ON FEET BUT TOCKS AND SHOULDERS HEAD HIT HARD			AFTER PULLING FACE CURTAIN EJECTEE FELT WIND SLAPPING FACE CURTAIN AGAINST HELMET THEN JERK OF PARACHUTE OPENING AFTER OPENING HIS ARMS WERE HANGING DOWN REACHED FOR RISERS AND FOUND ARMS AND SHOULDERS SORE AND NECK VERY SORE LIFTED MY HEAD UP WITH MY HANDS SINCE I COULDN T MOVE IT
									AFTER MAN SEAT SEPARATION BELIEVES HE TUMBLED WHILE IN A 30 HEAD BELOW HORIZON ATTITUDE SAW PARACHUTE STREAMING OVER RIGHT SHOULDER OPENING SHOCK DID NOT APPEAR VERY VIOLENT AFTER TWO SWINGS HE WAS BASICALLY VERTICAL WITH 180 TWIST IN RISERS PANEL #26 RUPTURED FROM APEX TO SKIRT BAND

APPENDIX A

NECK INJURY CASES DATA
(PART III)

APPENDIX A, PART III
IN-FLIGHT (I.E., NON-EJECTION, NON-BAILOUT, NON-CRASH, NON-LANDING) SUSTAINED NECK INJURIES AMONG U.S. NAVY AIRCREW WHILE STRAPPED IN SEAT
1 JANUARY 1969 THROUGH MID-1982

#1 INCIDENT

MODEL: F004J

STATUS: NFO. MINOR INJURY.

1ST INJURY: POSTERIOR NECK, STRAIN, 1 OR MORE LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

DURING DIVE BOMBING RUN, THE PILOT INADVERTENTLY ACTUATED NOSE GEAR STEERING VICE ORDNANCE RELEASE BUTTON. THE PILOT REALIZED HIS MISTAKE AND ACTUATED CORRECT BUTTON BUT CONSIDERABLE ALTITUDE HAD BEEN LOST. AT 21C FEET, THE RIO TOLD PILOT TO "PULL OUT". HE EXECUTED A 9 G PULL OUT. THE RIO SUSTAINED A CERVICAL AND LUMBAR STRAIN WHEN INERTIA REEL LOCKED AND STOPPED HIS FORWARD MOTION.

#2 INCIDENT

MODEL: F004N

STATUS: NFO. MINOR INJURY.

1ST INJURY: NECK, STRAIN, 1 OR MORE LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*DURING ACM ENGAGEMENT RIO SUSTAINED MINIMAL NECK INJURY AS A RESULT OF 600 KT. 5.6 G TURN A 15M FT MSL.

**INJURY: CERVICAL STRAIN.

#3 INCIDENT

MODEL: F004J

STATUS: NFO. MINIMAL OR NO INJURY.

1ST INJURY: POSTERIOR NECK, STRAIN, LESS THAN FIRST AID NO LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*AIRCRAFT WAS INVOLVED IN A 2V1 ACM FLIGHT AND HAD COMPLETED A FORWARD QUARTER FOX 1. BODY POSITION WAS SUCH THAT THE RIO HAD BEEN LEANING FORWARD FOR SCOPE OBSERVATION. AS THE A 4 ADVERSARY PASSED HEAD ON, THE F 4 PILOT COMMENCED A NOSE LOW SLICE TURN IN AN ATTEMPT TO OBTAIN A REAR QUARTER FOX 2. THE RIO, WHILE ATTEMPTING TO MAINTAIN AN ERECT POSITION, LAGGED THE G FORCES, WHICH WERE SOMEWHERE BETWEEN 5.5 G and 6.0 G. AFTER THE MANEUVER, THE RIO NOTIFIED THE PILOT OF HIS INJURY AND PILOT RETURNED TO BASE. RIO SUSTAINED MINIMAL (WHIPLASH) INJURY. CAUSE: WEIGHT OF HELMET AND MASK ON RIO'S HEAD WHILE IN IMPROPER BODY POSITION FOR HIGH G MANEUVER. LACK OF COORDINATION BETWEEN PILOT AND RIO CONTRIBUTED.

**INJURY RIO: CERVICAL STRAIN (WHIPLASH TYPE INJURY)

#4 FLIGHT MISHAP SEVERITY C

MODEL: T028C

STATUS: PILOT. 1 OR MORE LOST WORK DAYS.

1ST INJURY: NECK, STRAIN, 1 OR MORE LOST WORK DAYS.
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES

* THE PILOT WAS ON AN IFR ROUND ROBIN AIRWAYS INST TRAINING FLIGHT AT 700028 FLIGHT WAS IN AND OUT OF CLOUDS PILOT NOTED ICE ON WINDSCREEN AND WINGS AND REQUESTED LOWER ALTITUDE DURING DESCENT HE ENCOUNTERED FREEZING RAIN AIRCRAFT ROLLED OFF INTO A RIGHT SPIN A FEW SECONDS AFTER PILOT INITIATED SPIN RECOVERY PROCEDURES THE AIRCRAFT AGAIN ROLLED OFF TO THE RIGHT PILOT EXPERIENCED COMPLETE DISORIENTATION UNTIL OUT OF CLOUDS IN AN INVERTED NOSE DOWN POSITION NEAR THE GROUND PILOT ROLLED UP RIGHT AND DID A HIGH G (8 8 5) PULLOUT TO AVOID TERRAIN HIS HEAD BENT FORWARD STATES HE BLACKED OUT AND OVERSTRESSED THE AIRCRAFT THE PILOT HAD NOT BEEN IN FLYING STATUS FROM JANUARY 1972 UNTIL JULY 1976 HE HAD MANY YEARS OF EXPERIENCE IN MULTI ENGINE AIRCRAFT BUT HAD JUST RECENTLY QUALIFIED IN SINGLE ENGINES PILOT FACTORS FLIGHT INTO AN AREA OF VISIBLE MOISTURE AT AN ALTITUDE WHERE ICING SHOULD HAVE REASONABLY BEEN EXPECTED FAILURE TO REQUEST A VECTOR BACK TO AN AREA WHERE KNOWN ACCEPTABLE WX CONDITIONS EXISTED CONTRIBUTING CAUSE INADEQUATE WX BRIEFING

** INJURY: CERVICAL MUSCLE STRAIN CAUSED BY G FORCES DURING PULLOUT FROM DIVE WITH HEAD FLEXED FORWARD.

#5 FLIGHT RELATED MISHAP SEVERITY C

MODEL: TA004J

STATUS: PILOT. 1 OR MORE LOST WORK DAYS.

1ST INJURY: 6TH CERVICAL VERTEBRA, COMPRESSION INJURY WITHOUT FRACTURE. 1 OR MORE LOST WORK DAYS.
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

* DURING ACM TRAINING, VARYING DEGREES OF Gs WERE EXPERIENCED. IN ONE MANEUVER, THE PILOT'S HEAD WAS TURNED WHILE Gs WERE BEING APPLIED, CAUSING MAJOR INJURY TO PILOT.

** INJURY – COMPRESSION PINCHED NERVE OF C-6

#6 MINOR ACCIDENT

MODEL: F004J

STATUS: NFO. MINOR INJURY.

1ST INJURY: POSTERIOR NECK, SPRAIN, 1 OR MORE LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

2ND INJURY: LEFT LOWER LEG(S), CONTUSION, UNKNOWN SEVERITY
CAUSE(S): 1) CONTACT WITH INTERIOR OF AIRCRAFT.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

AIRCRAFT ENGAGED IN ACM WITH ANOTHER SQUADRON AIRCRAFT WAS OVERSTRESSED WHEN RIO BECAME DISORIENTED AND CALLED TO THE PILOT "PULL OUT". THE PILOT BELIEVED THE RIO HAD SEEN ANOTHER AIRCRAFT AND ATTEMPTED RECOVERY FROM A SPLIT "S" MANEUVER AND THEREBY APPLIED EXCESSIVE G TO THE AIRCRAFT. ALTHOUGH THE PILOT AND RIO WERE WEARING G SUITS, THEIR INJURY WAS ATTRIBUTED TO G FORCE AND POOR BODY POSITION. FAILURE OF THE RIO'S INERTIAL REEL MAY HAVE CONTRIBUTED TO HIS INJURY.

APPENDIX A

NECK INJURY CASES DATA
(PART IV)

APPENDIX A, PART IV
CRASH OR HARD LANDING ASSOCIATED NECK INJURIES SUSTAINED BY U.S. NAVY AIRCREW WHILE STRAPPED IN SEAT IN AIRCRAFT
1 JANUARY 1969 THROUGH MID-1982

#1 MINOR ACCIDENT

MODEL: TA004J

STATUS: SNA. MINIMAL OR NO INJURY

TERRAIN CRASH SITE: FLIGHT DECK.

1ST INJURY: NECK, STRAIN, LESS THAN FIRST AID NO LOST WORK DAYS
CAUSE(S): 1) IMPACT FORCE.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

2ND INJURY: LEFT SHOULDER(S), CONTUSION, LESS THAN FIRST AID NO LOST WORK DAYS
CAUSE(S): 1) RESTRAINTS (SAFETY BELT, SHOULDER HARNESS, ETC.).
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*DURING CARQUALS STUDENT ALLOWED AIRCRAFT TO SETTLE RAPIDLY IN CLOSE AND WAS SLOW TO LSO'S POWER CALLS AND SUBSEQUENTLY WITHOUT IN-FLIGHT ENGAGEMENT OF #1 COP RESULTED FROM LATE WAVE OFF AND NOSE LANDING GEAR COLLAPSED ON TOUCHDOWN. STUDENT SUSTAINED A NECK SPRAIN FROM WHIPLASH AND A BRUISED LEFT SHOULDER FROM KOCK FITTING STRIKING HIS LEFT SHOULDER. PILOT ERROR IN TECHNIQUE.

**STUDENTS INJURY: WEAK STRAIN FROM WHIPLASH AND BRUISED LEFT SHOULDER FROM KOCK FITTING.

#2 MAJOR ACCIDENT

MODEL: F014A

STATUS: NFO. MAJOR INJURY.

TERRAIN OF CRASH SITE: NORMAL LANDING.

1ST INJURY: NECK, SPRAIN, 1 OR MORE LOST WORK DAYS
CAUSE(S): 1) OTHER.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*AIRCRAFT TOOK OFF 10 SECONDS BEHIND FLIGHT LEADER. THE THROTTLES WERE RETARDED TO 95% AFTER GEAR AND FLAP RETRACTION AND A RUNNING RENDEZVOUS TURN WAS INITIATED. IMMEDIATELY PRIOR TO JOIN UP AND ACCEL. THROUGH 250 KIAS, A LOUD EXPLOSION WAS HEARD FOLLOWED ALMOST SIMULTANEOUSLY BY SEVERE AIR FRAME VIBRATIONS, RAPIDLY RISING TURBINE INLET TEMPERATURE AND ILLUMINATION OF THE PORT ENGINE FIRE WARNING LIGHT. PILOT SECURED PORT ENGINE WITH THROTTLE AND FUEL SHUT OFF HANDLE. VISUAL CONFIRMATION OF FIRE WAS MADE BY THE NFO, FLIGHT LEADER AND THE TWR. AIRCRAFT WAS CONTROLLABLE AND CREW REVIEWED SINGLE ENGINE LANDING PROCEDURES AND GROUND EGRESS PLANS. PILOT MADE A SUCCESSFUL ARRESTMENT AND BOTH CREWMEN EGRESSED WITH NO APPARENT INJURY. HOWEVER, TWO DAYS POST ACCIDENT NFO COMPLAINED OF NECK PAIN AND WAS HOSPITALIZED FOR ONE MONTH. NO PILOT FACTORS. CAUSE NOTED AS DEFECTIVE 1ST STAGE FAN BLADE WHICH CAUSED ENGINE FAILURE.

**NFO'S INJURY: CERVICAL SPRAIN PROBABLY FROM DECELERATION FORCES OF ARRESTMENT.

#3 MAJOR ACCIDENT

MODEL: T034B

STATUS: PILOT. MINIMAL OR NO INJURY.

TERRAIN OF CRASH SITE: HARD GROUND.

1ST INJURY: NECK, STRAIN, LESS THAN FIRST AID NO LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*PIC WAS CONDUCTING A NATOPS CHECK FLIGHT ON THE COPILOT FLIGHT WAS BEING CONCLUDED WITH A HIGH ALTITUDE EMERGENCY LANDING. APPR. LOOKED GOOD TO BOTH PILOTS UNTIL JUST A FEW SECONDS BEFORE A PREMATURE TOUCHDOWN SHORT OF RUNWAY POWER WAS APPLIED AT THE INSTANT OF TOUCHDOWN BUT SOFT DIRT CAUSED FAILURE OF THE NOSE GEAR AND THE AIRCRAFT SKIDDED TO A STOP BOTH CREWMEN EXITED NORMALLY. PC. SUSTAINED A MINIMAL CERVICAL STRAIN FROM G FORCES DURING RAPID DECELERATION COPILOT MISJUDGED SPEED AND DISTANCE AND PC FAILED TO TAKE CORRECTIVE ACTION REPORT NOTED A TERRAIN DEPRESSION ON APPR. WHICH CAUSES TURBULENCE WHICH LOCAL PILOTS DESCRIBE AS A "SINK" HOLE." FLIGHT SURGEON NOTES LIMITED RECENT EXPERIENCE AS A SUSPECTED FACTOR

**PC'S INJURY: MINIMAL CERVICAL STRAIN FROM DECELERATION (G) FORCES.

#4 FLIGHT MISHAP SEVERITY B

MODEL: AV008A

STATUS: PILOT. 1 OR MORE LOST WORK DAYS.

TERRAIN OF CRASH SITE: RUNWAY.

1ST INJURY: POSTERIOR NECK, STRAIN, 1 OR MORE LOST WORK DAYS.
CAUSE(S): 1) IMPACT FORCE. 2) RESTRAINTS (SAFETY BELT, SHOULDER HARNESS, ETC).
PHASE – TERMINATION OF FLIGHT.

2ND INJURY: RIGHT FACE, HEMATOMA, GREATER THAN FIRST AID NO LOST WORK DAYS.
CAUSE(S): 1) CONTACT WITH INTERIOR OF AIRCRAFT. 2) IMPACT FORCE.
PHASE – TERMINATION OF FLIGHT.

*AIRCRAFT EXPERIENCED ENGINE FAILURE WHILE IN HOVER AT APPROXIMATELY 80 FEET AIRCRAFT IMPACTED GROUND WINGS LEVEL. PILOT SUSTAINED MINOR INJURY CAUSE – MATERIAL FAILURE. NO PILOT CAUSE FACTOR

**CERVICAL MUSCLE STRAIN AND HEMATOMA RIGHT SIDE OF FACE – CAUSED BY GROUND IMPACT SHOULDER HARNESS NOT LOCKED FACE STRUCK HUD GLASS – OXYGEN MASK POSSIBLY CONTRIBUTED TO INJURY

#5 FLIGHT MISHAP SEVERITY A

MODEL: T028B

STATUS: SNA. GREATER THAN FIRST AID NO LOST WORK DAYS.

TERRAIN OF CRASH SITE: HARD GROUND.

1ST INJURY: NECK, TRAUMA, GREATER THAN FIRST AID NO LOST WORK DAYS.
CAUSE(S): 1) IMPACT FORCE.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

*DURING TRAINING FLIGHT AIRCRAFT EXPERIENCED ENGINE FAILURE GLIDED TO NALF AND EXECUTED ELP AIRCRAFT RAN OFF DEPARTURE END OF RUNWAY AND FLIPPED INVERTED. IP, IN FORWARD COCKPIT SUSTAINED "D" INJURY SNA "E" INJURY CAUSE MATERIAL FAILURE. POSSIBLE CONTRIBUTING FACTORS IP FAILED TO RECOGNIZE THAT ENGINE HAD SEIZED DID NOT FOLLOW CORRECT PROCEDURE FOR GENERATOR FAILURE, THUS LOSING COMMUNICATIONS AND ABILITY TO OBTAIN CURRENT WIND CONDITIONS. ABOVE FACTORS RESULTED IN A LESS THAN OPTIMUM LANDING SNA NOTED 0 RPM (INDICATING ENGINE SEIZURE) BUT MADE NO ATTEMPT TO NOTIFY IP

**IP FX RIGHT PROXIMAL PHALANGES 2, 3, AND 4. HAND CAUGHT BETWEEN WINDSCREEN EDGE AND GROUND
SNA SLIGHT NECK STRAIN. IMPACT

***IP AND SNA WERE TRAPPED IN AIRCRAFT WHEN IT FLIPPED OVER. IP'S HAND WAS CAUGHT BETWEEN WINDSCREEN EDGE AND GROUND. CRASH RESCUE PERSONNEL ON SCENE IMMEDIATELY AFTER APPROXIMATELY 45 MINUTES, SNA WAS EXTRICATED BY DIGGING A HOLE UNDER THE AFT COCKPIT UNABLE TO FREE IP IN LIKE MANNER. FIRST CRANE ON SCENE HAD MECHANICAL FAILURE NO LIFTING CAPABILITY SECOND CRANE IN APPROXIMATELY 1 HOUR – OVERHEATED WHILE MANEUVERING INTO POSITION RESULTING IN FURTHER DELAY AIRCRAFT WAS FINALLY LIFTED AND IP REMOVED FROM COCKPIT APPROXIMATELY 1.6 HOURS AFTER MISHAP

#6 MAJOR ACCIDENT

MODEL: F008H

STATUS: PILOT. MINOR INJURY.

TERRAIN OF CRASH SITE: FLIGHT DECK.

1ST INJURY: POSTERIOR NECK, STRAIN, 1 OR MORE LOST WORK DAYS
CAUSE(S): 1) IMPACT FORCE.
PHASE – OTHER – INCLUDES IN-FLIGHT OCCURRENCES.

ON LAND ABOARD CVA NLG COLLAPSE DUE TO FAILURE OF LINK ASSEMBLY. THE PILOT WAS NOT INJURED. THE HOT SUIT CREW HAD DIFFICULTY RELEASING PILOT'S KOCK FITTINGS DUE TO BULKINESS OF ASBESTOS GLOVES. THE M.O. RECOMMENDED REPLACEMENT OF GLOVES AND REEVALUATION OF HOT SUIT BOOTS SINCE PRESENT BOOT SOLE TENDS TO CAUSE SLIPPING.

#7 MAJOR ACCIDENT

MODEL: TA004F

STATUS: PILOT. MINIMAL OR NO INJURY.

TERRAIN OF CRASH SITE: HARD GROUND.

1ST INJURY: POSTERIOR NECK, STRAIN, LESS THAN FIRST AID NO LOST WORK DAYS
CAUSE(S): 1) G FORCES.
PHASE – TERMINATION OF FLIGHT.

WHILE ATTEMPTING TO DEMONSTRATE AND HPA, THE INSTRUCTOR PERMITTED AIRCRAFT TO DEVELOP A HIGH SINK RATE. HIS ATTEMPTS TO CORRECT WERE UNSUCCESSFUL AND THE AIRCRAFT TOUCHED DOWN HARD SHORT OF THE RUNWAY. THE AIRCRAFT BECAME AIRBORNE WITH DAMAGED LANDING GEAR. AN ARRESTED LANDING WAS MADE WITHOUT FURTHER INCIDENT. THE MOR INDICATES THAT PREOCCUPATION WITH PERSONAL PROBLEMS PLUS AN EXTENSIVE TEACHING SCHEDULE, WHICH INDUCED A DEGREE OF MENTAL FATIGUE, MAY HAVE CONTRIBUTED TO MISHAP.

APPENDIX A

NECK INJURY CASES DATA
(PART V)

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APPENDIX A PART V
INJURY DIAGNOSIS, DESCRIPTION, LOCATION, AND CITED CAUSE FOR FATALITIES SUSTAINING SEVERE "EJECTION ASSOCIATED" NECK INJURIES SORTED BY EJECTION SEAT TYPE AND LISTING PRE-EJECTION AIRCRAFT MANEUVER AND MANEUVER AT EJECTION
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

REFERENCE NUMBER: 558 **SEAT TYPE:** ESCAPAC IA-1 **SPEED:** 225 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** FLAME OUT, FIRE IN COCKPIT

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	2ND CERVICAL VERTEBRA	TRANSECTION	WIND BLAST	A
POSTERIOR	3RD CERVICAL VERTEBRA	FRACTURE, SIMPLE	WIND BLAST	9

REFERENCE NUMBER: 793 **SEAT TYPE:** ESCAPAC IA-1 **SPEED:** 350 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** SPIN, UNCONTROLLED FLIGHT

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	2ND CERVICAL VERTEBRA	TRANSECTION	MISUSE OF UNFAMILIARITY W ALSS	A
TOTAL (REFERS TO)	3RD CERVICAL VERTEBRA	TRANSECTION	MISUSE OF UNFAMILIARITY W ALSS	9

REFERENCE NUMBER: 708 **SEAT TYPE:** ESCAPAC IC-2 **SPEED:** 250 **EJECTION:** 5
MANEUVER AT EJECTION: TUMBLING **PRE-EJECTION AIRCRAFT MANEUVER:** POST MID-AIR COLLISION, TUMBLING

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
BILATERAL	THORAX	DROWNING	INCAPACITATION	A
POSTERIOR	1ST CERVICAL VERTEBRA	COMPRESSION	CONTACT WITH OTHER AIRCRAFT	9

REFERENCE NUMBER: 992 **SEAT TYPE:** ESCAPAC IC-3 **SPEED:** 450 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** UNCONTROLLED FLIGHT, HIGH SPEED

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	SKULL (CRANIUM)	LACERATION	PERSONAL SURVIVAL NEC	A
POSTERIOR	1ST CERVICAL VERTEBRA	TRANSECTION	PERSONAL SURVIVAL NEC	9

REFERENCE NUMBER: 108 **SEAT TYPE:** NORTH AMERICAN LS-1 **SPEED:** 360 **EJECTION:** 1
MANEUVER AT EJECTION: DISINTEGRATION **PRE-EJECTION AIRCRAFT MANEUVER:** DIVE, HIGH SPEED, NEGATIVE G CONDITIONS, AIRCRAFT DISINTEGRATING

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	4TH CERVICAL VERTEBRA	TRANSECTION	WIND BLAST	A
POSTERIOR	5TH CERVICAL VERTEBRA	TRANSECTION	WIND BLAST	9

REFERENCE NUMBER: 1735 **SEAT TYPE:** MARTIN-BAKER MK GRU7 **SPEED:** 450 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** INFLIGHT FIRE (PROBABLE) HIGH SPEED DIVE

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	1ST CERVICAL VERTEBRA	DISLOCATION	MISUSE OF UNFAMILIARITY W ALSS	A
			OPENING SHOCK	A
POSTERIOR	1ST CERVICAL VERTEBRA	COMPRESSION	MISUSE OF UNFAMILIARITY W ALSS	9
			OPENING SHOCK	9

REFERENCE NUMBER: 1573 **SEAT TYPE:** ESCAPAC IF-3 **SPEED:** 275 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** INFLIGHT FIRE, FIRE IN O. SYSTEM

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL BODY	TOTAL BODY	DROWNING	OTHER (CAUSE OF INJURY)	A
TOTAL (REFERS TO)	5TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	OPENING SHOCK	9
			POOR BODY POSITION	9
TOTAL (REFERS TO)	6TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	OPENING SHOCK	9
			POOR BODY POSITION	9

REFERENCE NUMBER: 1179 **SEAT TYPE:** NORTH AMERICAN HS-1A **SPEED:** 400 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** INFLIGHT FIRE WITH LOSS OF ALL HYDRAULIC CONTROLS

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	5TH CERVICAL VERTEBRA	TRANSECTION	POOR BODY POSITION	A
TOTAL (REFERS TO)	6TH CERVICAL VERTEBRA	TRANSECTION	POOR BODY POSITION	9
ANTERIOR	NECK	FRACTURE, SIMPLE	POOR BODY POSITION	9

REFERENCE NUMBER: 1236 **SEAT TYPE:** NORTH AMERICAN HS-1A **SPEED:** 400 **EJECTION:** 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER:** INFLIGHT FIRE WITH LOSS OF ALL HYDRAULIC CONTROLS

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	NECK	DISLOCATION	PERSONAL SURVIVAL NEC	A
ANTERIOR	NECK	FRACTURE, SIMPLE	PERSONAL SURVIVAL NEC	9

APPENDIX A

NECK INJURY CASES DATA
(PART VI)

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APPENDIX A PART VI
INJURY DIAGNOSIS, DESCRIPTION, LOCATION, AND CITED CAUSE FOR SURVIVORS SUSTAINING SEVERE "EJECTION ASSOCIATED" NECK INJURIES SORTED BY EJECTION SEAT TYPE AND LISTING PRE-EJECTION AIRCRAFT MANEUVER AND MANEUVER AT EJECTION
1 JANUARY 1969 THROUGH 31 DECEMBER 1979

REFERENCE NUMBER: 735 **SEAT TYPE**: MARTIN BAKER MK GRU5 **SPEED**: 225 **EJECTION**: 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: INFLIGHT FIRE

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	7TH CERVICAL VERTEBRA	COMPRESSION	EJECTION FORCES	B

REFERENCE NUMBER: 1199 **SEAT TYPE**: MARTIN BAKER MK GRU5 **SPEED**: 400 **EJECTION**: 1
MANEUVER AT EJECTION: ROLLING **PRE-EJECTION AIRCRAFT MANEUVER**: POST MID AIR COLLISION, SNAP ROLLING TUMBLING NEGATIVE G CONDITIONS

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	2ND CERVICAL VERTEBRA	FRACTURE, SIMPLE	POOR BODY POSITION	B

REFERENCE NUMBER: 726 **SEAT TYPE**: ESCAPAC IA 1 **SPEED**: 200 **EJECTION**: 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: ENGINE FAILURE

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
BILATERAL	2ND CERVICAL VERTEBRA	FRACTURE, SIMPLE	POOR BODY POSITION	B

REFERENCE NUMBER: 791 **SEAT TYPE**: ESCAPAC IC 2 **SPEED**: 310 **EJECTION**: 5
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: INADV. EJT., ATTEMPTING TO STOW RADIATION SHIELD

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	5TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	CONTACT WITH DISLODGED OR UNATTACHED EQUIPMENT	B
POSTERIOR	6TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	CONTACT WITH DISLODGED OR UNATTACHED EQUIPMENT	9

REFERENCE NUMBER: 1087 **SEAT TYPE**: ESCAPAC IC-2 **SPEED**: 300 **EJECTION**: 1
MANEUVER AT EJECTION: OSCILLATING SPIN **PRE-EJECTION AIRCRAFT MANEUVER**: SPIN, OSCILLATING

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	2ND CERVICAL VERTEBRA	FRACTURE, SIMPLE	POOR BODY POSITION	9

REFERENCE NUMBER: 1397 **SEAT TYPE**: SCAPAC IC-3 **SPEED**: 205 **EJECTION**: 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: ENGINE FAILURE

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	5TH CERVICAL VERTEBRA	COMPRESSION	EJECTION FORCES	B

REFERENCE NUMBER: 643 **SEAT TYPE**: MARTIN-BAKER MK H7 **SPEED**: 132 **EJECTION**: 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: DISINTEGRATING, POST RAMP STRIKE

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	5TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	POOR BODY POSITION	F

REFERENCE NUMBER: 957 **SEAT TYPE**: MARTIN BAKER MK H7 **SPEED**: 005 **EJECTION**: 1
MANEUVER AT EJECTION: ON GROUND-STATIONARY OR BARELY MOVING **PRE-EJECTION AIRCRAFT MANEUVER**: STRUCK DITCH & ROLLING INVERTED

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	7TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	OUTSIDE ESCAPE SYSTEM ENVELOPE	9

REFERENCE NUMBER: 1536 **SEAT TYPE**: ESCAPAC IG 2 **SPEED**: 350 **EJECTION**: 1
MANEUVER AT EJECTION: FLAT SPIN **PRE-EJECTION AIRCRAFT MANEUVER**: SPIN, FLAT

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	2ND CERVICAL VERTEBRA	FRACTURE, SIMPLE	MISUSE OF UNFAMILIARITY W ALSS	B
			POOR BODY POSITION	8

REFERENCE NUMBER: 1452 **SEAT TYPE**: ESCAPAC IG-3 **SPEED**: 275 **EJECTION**: 1
MANEUVER AT EJECTION: OTHER (DESCRIBE) **PRE-EJECTION AIRCRAFT MANEUVER**: SPIRAL, 80 DEG NOSE DIVE, AFCS MALFUNCTION

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	2ND CERVICAL VERTEBRA	COMMINUTED	EJECTION FORCES	B
			OPENING SHOCK	B

REFERENCE NUMBER: 1587 **SEAT TYPE**: ESCAPAC IC 3 **SPEED**: 210 **EJECTION**: 1
MANEUVER AT EJECTION: NO MANEUVER GIVEN **PRE-EJECTION AIRCRAFT MANEUVER**: FLAME OUT

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
TOTAL (REFERS TO)	6TH CERVICAL VERTEBRA	FRACTURE, SIMPLE	POOR BODY POSITION	B
			OPENING SHOCK	B
TOTAL (REFERS TO)	7TH CERVICAL VERTEBRA	COMPRESSION	POOR BODY POSITION	9
			OPENING SHOCK	9
TOTAL (REFERS TO)	NO DESCRIPTION FOUND	COMPRESSION	POOR BODY POSITION	9
			OPENING SHOCK	9

REFERENCE NUMBER: 1757 **SEAT TYPE**: ESCAPAC IG 3 **SPEED**: UNK **EJECTION**: 1
MANEUVER AT EJECTION: MUSHING **PRE-EJECTION AIRCRAFT MANEUVER**: POST MID AIR COLLISION, MUSHING

LOCATION	DESCRIPTION	DIAGNOSIS	CITED CAUSE	SEV
POSTERIOR	2ND CERVICAL VERTEBRA	FRACTURE, SIMPLE	OPENING SHOCK	B

APPENDIX B

MAINTENANCE ERROR MAJOR MALFUNCTIOI: CASES DATA (PART I)

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Date of Incident: 62 04 23

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE CANOPY FELL NEAR THE WITNESSES. THE RECOVERED PARTS WERE SHIPPED FOR DIR. IT IS PRESUMED THAT SEAT FIRING MECH FAILED AS A RESULT OF EITHER EXCESSIVE PRESS OR FAULTY MATERIAL. THE ROCKET MOTOR DID NOT MOVE WITHIN THE LAUNCHER TUBE.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

THERE IS INADEQUATE EXPLANATION FURNISHED IN THE MISHAP NARRATIVE SYNOPSIS FOR ACTUALING ASCERTAINING THE CAUSE FOR CATAPULT NON-FIRING. HOWEVER, IN AT LEAST ONE INSTANCE IN THIS TIME PERIOD, A RECOVERED RAPEC I FIRING PIN WAS PREVENTED FROM FUNCTIONING BY MAINTENANCE PERSONNEL APPLICATION OF PARALKE-TONE IN AN ATTEMPT TO PREVENT CORROSION (RUST) OF THE FIRING HEAD. THE PARALKETONE HAD GATHERED DUST AND DIRT AND HARDENED, EFFECTIVELY "FREEZING (IMMOBLIZING)" THE FIRING PIN IN THE FIRING HEAD. EVEN WITH THE FIRING PIN SEAR PULLED, HAMMERING COULD NOT DRIVE THE FIRING PIN DOWN. THE CONSEQUENCES WERE NON-EJECTION AND THE DEATH OF THE PILOT IN THE SUBSEQUENT CRASH OF THE AIRCRAFT.

Date of Incident: 62 05 21

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE PLT EJT AT 1M FT ALT & RECVD FATAL INJURIES DUE TO FAILURE OF THE AUTO LAPBELT. PLT EJT WHEN CPY WAS PARTIALLY OPEN & STRUCK THE CPY BOW WITH BOTH LEGS WHICH FRACTURED THE CPY BOW.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

AS INITIALLY DESIGNED, THE F-11 ESCAPE SYSTEM USING THE STANDARD CATAPULT (NAMC) INCLUDED CANOPY JETTISONING. THE MOST PROBABLE CAUSE FOR THE MIS-TIMING BETWEEN THE CANOPY JETTISONING AND THE SEAT EJECTION WOULD BE MISRIGGING (OR IMPROPERLY OPEN CANOPY). THE AUTOMATIC LAPBELT FAILURE COULD HAVE BEEN MAINTENANCE OR PILOT INDUCED ERROR. EITHER PROBLEM BY ITSELF WOULD HAVE RESULTED IN PILOT FATALITY.

Date of Incident: 62 06 08

Extract from Mishap Narrative Synopsis Describing Maintenance Error

DURING A MAINT CHECK THE MARTIN-BAKER SEAT WAS BEING REASSEMBLED. THE DROGUE GUN WAS ATTACHED TO THE SEAT. THE BARREL WAS LOADED WITH THE CART AND THEN INSTL TO THE DROGUE GUN. AT THIS TIME IT WAS DISCOVERED THE SAFETY PIN COULD NOT BE INSTALLED. AS THE CREWMAN CUT THE SAFETY WIRE TO REMOVE THE DROGUE GUN BARREL THE GUN FIRED. MAT FAILURE IS CONSIDERED THE PRIMARY FACTOR. PERS PROCEDURES CONTRIBUTED DUE TO NOT INSTL THE SAF PIN BEFORE LOADING THE DROGUE GUN. FAULTY DESIGN CONTRIBUTED DUE TO NO POSITIVE INDICATION THAT DROGUE GUN IS PROPERLY COCKED. RECM REDESIGN TO POSITIVELY DETERMINE IF GUN IS COCKED PROPERLY. ALSO A MORE POSITVE SAFETY LOCK OF DROGUE GUN WHEN IT IS LOADED. DIR SHOWED NO EVIDENCE OF PLUNGER CREEP. PROBABLE CAUSE WAS QUICK REL PIN PROTRUDING TO EXTENT THAT SAF PIN COULD NOT BE INSERTED. NEW PIN ALLOWED INSERTION OF SAF PIN. ROUGH SURFACE SHOWED INDICATION OF FILING OR GRINDING. ALSO COMPRESSION SPRING TOO SHORT. PISTON AND BARRELL CORRODED.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

A NUMBER OF PROBLEMS OCCURRED DURING MAINTENANCE ACTIONS PERFORMED UPON OR WITH THE DROGUE GUN WHICH RESULTED IN INADVERTENT FIRING. PERSONNEL HAD TO, AND MUST NOW, EXERCISE EXTREME CARE IN ASSEMBLING THE DROGUE GUN. UNTIL RECENTLY, SEVERAL PARTS COULD BE MISINSTALLED TO PRODUCE A "HAIR TRIGGER" CONDITION IN THE DROGUE GUN FIRING MECHANISM AND MAKE DANGEROUS WORKING WITH, OR ON, SUCH DROGUE GUNS.

Date of Incident: 62 03 22

---------- Extract from Mishap Narrative Synopsis Describing Maintenance Error ----------

PLT ATTEMPTED TO EJECT, UNSUCCESSFULLY. CPY JETTISONED FROM ACFT BUT PLT COULD NOT EJT. PLT WAS OBSERVED TRYING TO CLIMB OUT OF ACFT. MOST PROBABLE MALF WAS DUE TO MATERIAL FAILURE.

---------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ----------

IN A-4 AIRCRAFT CANOPY JETTISONING WAS A REQUIREMENT DUE TO THE METAL STRUCTURAL FRAME IN THE CANOPY WHICH PRECLUDED THROUGH-THE-CANOPY ESCAPE. ALTHOUGH MATERIAL FAILURE IS CITED IN THIS CASE AS A POTENTIAL CAUSE, THE COMPLEXITY OF THE SYSTEM SUGGESTS MAINTENANCE ERROR AS A LIKELY ALTERNATIVE CAUSE.

Date of Incident: 62 09 23

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE CPY DID NOT JETSN DUE TO THE INITIATOR CHAMBER NOT BEING SCREWED FULLY INTO THE CAP. THIS PRECLUDED THE FIRING PIN FROM STRIKING THE CART. THE SEAT WOULD HAVE FIRED IF THE INTERRUPTOR HAD BEEN ACTUATED BY THE D HANDLE..

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

IMPROPER MAINTENANCE OF THE CANOPY JETTISON INITIATOR; FAILING TO PROPERLY AND COMPLETELY SEAT THE CHAMBER AND THE FIRING HEAD. CANOPY FAILURE TO JETTISON WOULD BLOCK EJECTION UNLESS AND UNTIL INTERRUPTOR D-RING HANDLE WERE PULLED TO PERMIT EJECTION THROUGH-THE-CANOPY. THIS REQUIRES RECOGNITION BY THE PILOT OF THE PROBLEM AND UNDERSTANDING OF BOTH THE PROBABLE CAUSE FOR THE PROBLEM AND THE BYPASS PROCEDURE TO BE EMPLOYED. SUCH ACTION ENTAILS LOSS OF TIME AND CAN RESULT IN OUT OF ENVELOPE EJECTION OR EVEN FAILURE TO EJECT.

Date of Incident: 62 09 19

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT ADVISED EJECT. EJECT ATTEMPTS PRIM & SECO METHODS NEG. PLT RTD TO FIELD ARRESTED LDG EFFECTED. CANOPY FAIL FIRE DUE WATER/OIL INSIDE INITIATOR M3A1. AT 4M THE PLT ATTEMPTED TO EJT BY UTILIZING THE FACE CURTIAN AND SECONDARY HANDLE BUT WAS UNSUCCESSFUL DUE TO FAILURE OF CPY TO JETTISON. INVEST REVEALED CPY FAIL CAUSED BY OIL AND WATER CONTAMINATION IN M3A1 INITIATOR. RECM ESTABLISH SVC LIFE ON M3A1 INITATOR AND REPLACE AT PAR OR EVERY 2 YRS. ALSO INSP ALL GAS LINES FOR MOISTURE AND CONTAMINATION AND SEAL INITIATORS.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

OIL AND WATER CONTAMINATION IN THE CANOPY JETTISONING INITIATOR SUGGESTS POOR MAINTENANCE PRACTICES. AS IN THE A-4 AIRCRAFT THE F-6 (SKYRAY) CANOPY METAL STRUCTURAL FRAME PRECLUDED THROUGH-THE-CANOPY EJECTION.

Date of Incident: 63 03 11

Extract from Mishap Narrative Synopsis Describing Maintenance Error

MAINT PERS PERFMNG DE-ARM CK WITH ALL SAFETY PINS/CARTRIDGS IN CKPT CKD. WHN SEAT BOLT WAS LOOSEND TO MOVE SEAT, CPY EJCTD FR A/C. O/P-PREV UNK PERS INSERTD PIN IMPROPERLY. MAINT PERS FAIL POSITIVLY IDENTIFY IMPROPERLY INSTALLD PIN. POOR DESIGN OF PIN 0053. WHILE DE-ARMING FOR SEAT REMOVAL, THE MAIN MAN CHECKED FOR INSTL OF SAFETY PINS AND PROCEEDED TO REMOVE THE PRIMARY CTG FROM THE EJT SEAT AND THEN LOOSENED THE TOP BOLT ON THE SEAT CATAPULT AND SLIGHTLY MOVED THE SEAT. THIS TIGHTENED THE CABLE TO THE CPY JETTISON INITIATOR AND FIRED, EJECTING THE CPY. INVEST REVEALED IMPROPER INSTALLATION OF SAFETY PIN. SOME UNKNOWN PERSON HAD PREVIOUSLY INSERTED THE SAFETY PON IMPROPERLY. DUE TO THE DESIGN OF THE SAFETY PIN IT IS EASILY IMPROPERLY INSERTED AND DIFFICULT TO DETECT BY CLIPPING IT OVER THE ENTIRE FIRING PIN ASSEMBLY RATHER THAN INSERTING STRAIGHT PART OF THE PIN THROUGH THE HOLE.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

THE INTERRUPTOR MECHANISM TO WHICH THE CANOPY JETTISON LANYARD IS ATTACHED IS MOUNTED ON THE REAR TOP PORTION OF THE SEAT. REMOVAL OF THE TOP TRUNION MOUNTING BOLT AND THEN TIPPING THE SEAT FORWARD WOULD TENSION THE LANYARD SUFFICIENTLY TO INITIATE CANOPY JETTISONING IF THE CANOPY JETTISONING SAFETY PIN WERE MISSINSTALLED. PROBLEM COULD HAVE BEEN AVOIDED BY DETACHING THE CABLES IN THE INTERRUPTOR MECHANISM. MAINTENANCE ERROR, THEREFORE ON TWO COUNTS; IMPROPERLY SAFETIED PIN NOT CAREFULLY CHECKED OUT AND OVER RELIANCE ON FIRING MECHANISM HAVING BEEN SAFETIED TO PERMIT SHORT-CUT PROCEDURE TO BE EMPLOYED.

Date of Incident: 63 04 13

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

PLT COULD NOT JETTISON CPY DUE MISALIGNMENT BETWEEN HANDLE AND INITIATOR. AFTER PROPER ALIGNMENT THE FORCE REQ TO ACTUATE THE INITIATOR WAS 35-40 POUNDS. RECM ALL MAINT PERS BE INSTR ON IMPORTANCE OF FOLLOWING CHECK SHEETS.*

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

CLEAR CUT MAINTENANCE ERROR WHICH PREVENTS EJECTION UNLESS THE INTERRUPTOR D-RING HANDLE IS PULLED OR WHICH COULD DELAY EMERGENCY GROUND EGRESS.

Date of Incident: 63 06 19

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT ATTEMPTED TO EJT BY PULLING FACE CURTAIN BUT CPY DID NOT SEP & SEAT DID NOT FIRE. PLT PULLED ALTERNATE FIRING HANDLE WITHOUT RESULTS & CPY WAS OPENED MANUALLY. PLT BAILED OUT OF ACFT BUT EXPER DIFFICULTY IN OPENING PRCHT. ... CPY JETSN FAILURE IS UNDET & DUE TO THIS MALF THE EJT SEQUENCE WAS INTERRUPTED.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

SEE CASE 62 05 23. SAME PROBLEM APPARENTLY AND PILOT DID NOT EMPLOY INTERRUPTOR D-RING HANDLE NOR ATTEMPT EJECTION AFTER MANUALLY JETTISONING CANOPY. THIS GIVES AN INDICATION OF THE PILOT STRESS AND THE NEED FOR CORRECT MAINTENANCE BACKED-UP WITH OUTSTANDING QUALITY ASSURANCE PROCEDURES AND PERSONNEL.

Date of Incident: 63 07 11

Extract from Mishap Narrative Synopsis Describing Maintenance Error

AT INSTANT OF 5TH CAT LAUNCH B/N SEAT MOVED/DROGUE GUN FIRED. PROJECTILE WENT THRU CPY. DROGUE DEPLOYED OUT S/SIDE A/C. B/N SEAT & OCCUPANT WAS PULLED UP & AFT PINNING OCCUPANT AGAINST CPY REMAINS. CAUSE-SUSP PERS FAIL TO PERFORM MAINT PER HANDBK PRESCRIBED PROSCRIBED PROCEDURES FOR INSTALLING MARTIN BAKER EJCT SEAT ALLOWED SEAT TO RIDE UP RAILS, FIRING DROG GUN & ACTUATING TIMED RELEASE MECHANISM.
DURING CAT LAUNCH THE B/N SEAT MOVED AND DROGUE GUN FIRED. DROGUE CHUTE DEPLOYED THRU CPY. AT END OF DECK RUN THE TIME REL MECH FIRED RELEASING B/N FROM SEAT AND DEPLOYED PARACHUTE. B/N COULD NOT FREE HIMSELF AND PLT LANDED BACKBOARD CV. SEAT WAS NOT PROPERLY LOCKED IN POSITION BY MAINT PERS.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

IMPROPER MAINTENANCE PROCEDURES IN RE-INSTALLING THE B/N'S SEAT. SEAT HAD TO BE FULLY DOWN BEFORE THE TOP LATCH MECHANISM KNURLED NUT WAS TURNED OR THE LOCKING PLUNGER WOULD PASS OVER, NOT THROUGH, THE "WINDOW" ON THE TOP OF THE CATAPULT. THE "WINDOW" WAS HIDDEN FROM SIGHT, BUT A CAREFUL MAINTENANCEMAN SHOULD HAVE BEEN AWARE OF PROBLEMS BEING EXPERIENCED IN ATTACHING PRIMARY AND SECONDARY FIRING CABLES TO THE CATAPULT FIRING PIN SEAR (IT WOULD BE LOW IN A WELL WITH LITTLE CLEARANCE) AND THE DROGUE GUN AND TRM TRIPRODS (WHICH WOULD BE RELATIVELY EXTENDED).

Date of Incident: 63 07 23

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE CPY COULD NOT BE JETTISON FROM THE OUTSIDE OR INSIDE. THE PLT FINALLY CUT A HOLE IN THE CPY WITH HIS KNIFE. INVEST REVEALED THE CPY JETTISON TEE HANDLE WAS PULLED AND THE M1A1 INITIATOR HAD FIRED. THE CPY DID NOT JETTISON BECAUSE THE CTG WAS MISSING FROM THE CPY ACTUATOR. THE ACTUATOR HAD LAST BEEN INSP BY O-R ALAMEDA DURING PAR.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEARCUT MAINTENANCE ERROR, IN THIS INSTANCE DELAYING AN EMERGENCY GROUND EGRESS.

Date of Incident: 63 09 11

Extract from Mishap Narrative Synopsis Describing Maintenance Error

HALFWAY ON CAT TRACK CPY LEFT A/C FOL BY DROGUE GUN FIRING 3 STAB 3 CONTRO-LER CHUTES STREAMED FR F/C OVR R/C. A/C N/D PAST BOW INTO WATER. 1ST FLT FOL SEAT REINSTALN SEAT PROB NOT LOCKD MOVING UP CAUSING DROGUE MECH TO FIRE. OP MAINT. 00209 DURING CAT LAUNCH THE PLTS CPY JETTISON AND DROGUE CHUTE DEPLOYED. AS THE A/C LEFT THE BOW THE MAIN PRCHT WAS SEEN TO DEPLOY PULLING THE PLT UP IN HIS SEAT. THE PRCHT STREAMED AFT AND AROUND THE VERTICAL STAB. THE A/C ASSUMED A NOSE DOWN ATTITUDE AND CRASHED FWD OF THE CARRIER. THE ACDT WAS CAUSED BY THE SEAT MOVING UP THE RAILS AND FIRING THE CPY, DROGUE GUN AND TIME REL MECH. THIS CAUSED THE PRCHT TO DEPLOY AND IMMOBILIZING THE PLT. IT IS SUSPECTED THE SEAT WAS NOT PROPERLY LOCKED TO THE CATAPULT OR POSSIBLE MATERIAL FAILURE. RECM THE INSTL OF THE NEWLY DESIGNED TOP LATCH MECH WHICH INCORPORATES A VISUAL INDICATOR. MAINT PUBLICATIONS BE WRITTEN TO PREVENT MISINTERPRETATION BY MAINT PERS. BUWEPS WILL INCLUDE ADDITION INFO IN APPLICABLE PUBLICATION TO PREVENT MISINTERPRETATIONS WHEN INSTALLING EJT SEAT. NATC & M/B VISUAL INDICATORS WILL BE EVALUATED.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PROBLEM SIMILAR TO 63 07 11. IMPROPER MAINTENANCE.

Date of Incident: 63 10 09

Extract from Mishap Narrative Synopsis Describing Maintenance Error

EXPERIENCED DIFFICULTY WITH FACE BLIND ON EJECTION. PULL FORCES HIGH & SEAT DID NOT FIRE UNTIL THIRD PULL.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PULL FORCES WERE SUPPOSED TO BE CHECKED TO ENSURE THAT THEY WERE WITHIN SPECIFIED LEVELS. PILOT WAS FORTUNATE TO HAVE TIME FOR THREE SUCCESSIVE PULLS TO EFFECT ESCAPE. PROBABLY POOR MAINTENANCE, BUT ALSO POSSIBLY EFFECT OF POOR PILOT POSITION, I.E., HEAD TOO HIGH CAUSING CURTAIN TO BE PULLED UP AND OVER HELMET - - POSSIBILITY FACE CURTAIN FIRING CABLE SLIPPED OFF CENTER DURING FACE CURTAIN PULL, ALLOWING FACE CURTAIN TO FULLY EXTEND WITHOUT PULLING INTERRUPTOR MECHANISM SUFFICIENTLY.

Date of Incident: 63 11 26

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE CPY WOULD NOT JETTSN BY ACTUATING THE FACE CURTAIN. THE PLT PULLED THE CPY INTERRUPTOR AND EJT THRU THE CPY. FAILURE OF CPY JETTSN SYS IS UNDET. RECM REV QUALITY CONTROL PROCEDURES AND TRAINING SYLLABUS OF SAFETY & SURVIVAL PERS. ASC 383 AND 384 HAD BEEN INSTALLED.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PROBABLE MAINTENANCE ERROR IN THE INTERRUPTOR-CANOPY INTERFACING IN THE CANOPY JETTISON MECHANISM.

Date of Incident: 64 07 19

Extract from Mishap Narrative Synopsis Describing Maintenance Error

NO EJECT DUE INTERRUPTOR MECH FAILURE. SUSP ME AS CAUSE.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

IN F-6A (F4D-1 SKYRAY) PILOT HAD TO JETTISON CANOPY TO EJECT DUE TO THE STRUCTURAL FRAMING OVERHEAD WITHIN THE CANOPY. FAILURE OF THE INTERRUPTOR EITHER TO JETTISON THE CANOPY OR TO CLEAR AND PERMIT EJECTION FOLLOWING JETTISONING WOULD LIKELY BE CAUSED BY MAINTENANCE ERROR.

Date of Incident: 64 07 24

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

PLT EJECTED SAT 3500 FT 230 KTS. CPY FAILED TO LEAVE ACFT BY INTERRUPTOR HANDLE & EMERG HANDLE.*

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

PILOT HAD TIME TO ATTEMPT AT LEAST TWO METHODS OF CANOPY JETTISONING WHICH FAILED, SUGGESTING MAINTENANCE ERROR IN THE JETTISONING SYSTEM.

Date of Incident: 64 07 24

Extract from Mishap Narrative Synopsis Describing Maintenance Error

LAN AT CIV FIELD & RAN OFF RWY DOWN 40 FT DROP OFF. EGRESS FROM ACFT, CPY FAILED TO FIRE, PLT MANUALLY OPENED CPY.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PILOT PULLED INTERNAL EMERGENCY CANOPY JETTISON HANDLE UNSUCCESSFULLY, DELAYING HIS EMERGENCY GROUND EGRESS. PROBABLE MAINTENANCE ERROR IN THE CANOPY JETTISONING SYSTEM, ONE CAPABLE OF ADVERSELY AFFECTING EJECTION HAD IT BEEN ATTEMPTED.

Date of Incident: 64 08 31

------ Extract from Mishap Narrative Synopsis Describing Maintenance Error ------

PLT ATTEMPTED TO EJECT AT 5M FT. PULLED FACE BLIND & FOUND HARD TO EXTEND. RELEASED FACE BLIND & JETTISONED CANOPY. THIRD ATTEMPT TO EJECT WAS SUCCUSSFUL @ 1100-1400 FT UNDET CAUSE POSS PLT INDUCED STALL & USED IMPROPER RECOVERY TECH. SUSP EJECTION PORBLEM FACE BLIND RESTRAINT LINE & FACE BLIND CABLES HUNG UP.*

------ Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ------

POSSIBLE MAINTENANCE PROBLEM, BUT ALSO POSSIBILITY THAT FIRING CABLE SLIPPED TO SIDE OF HELMET ALLOWING FACE CURTAIN FULL EXTENSION WITHOUT EXTRACTING SEAR FROM CATAPULT FIRING PIN.

Date of Incident: 64 11 12

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT EJT AT 5700 FT, 150 KTS. SEAT STRUCK CPY DURING EJT SEQUENCE. SEAT OUT OF SEQUENCE DUE TO INTERLOCK NOT CONNECTED.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEAR MAINTENANCE ERROR. INTERLOCK (INTERRUPTOR) INCORPORATED IN SYSTEM DESIGN SINCE THROUGH-THE-CANOPY EJECTION IMPOSSIBLE DUE TO METAL STRUCTURAL FRAMING IN CANOPY OVERHEAD AND THE NEED TO ASSURE CANOPY HAS BEEN JETTISONED CLEAR OF SEAT PATH PRIOR TO EJECTION SEAT CATAPULT FIRING.

Date of Incident: 65 03 09

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT EJT AT 2M FT. CHUTE DID NOT DEPLOY. DELAYED SEAT SEPARATION PREVENTED CHUTE DEPLOYMENT, DUE TO EXCESS FORCE REQUIRED TO SEPARATE RELEASE CABLE HOUSING FROM SEAT. PRIMARY CAUSE FACTORY AND O&R QUAL CONT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

IF THE RELEASE CABLE HOUSING REMAINED ATTACHED TO SEAT, THE ARMING CABLE WOULD NEVER BE PULLED AND, THEREFORE WOULD NEVER ACTUATE THE PARACHUTE PACK OPENER.

Date of Incident: 65 05 03

Extract from Mishap Narrative Synopsis Describing Maintenance Error

INVESTIGATION REVLD THE EJECTION WAS THRU THE CANOPY. SUSPECT INTERUPTER NOT COCKED ALLOWING SEAT TO FIRE WITHOUT CANOPY ACTUATION.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

POSSIBLE MAINTENANCE ERROR, POSSIBILITY PILOT DELIBERATELY PULLED INTERRUPTOR HANDLE AND RESTORED IT DURING PRE-FLIGHT OF SEAT ENSURE A FAST, THROUGH-THE-CANOPY ESCAPE.

Date of Incident: 65 05 12

Extract from Mishap Narrative Synopsis Describing Maintenance Error

TIME RELEASE MAL. PLT HEARD LOUD SNAP ON CAT SHOT FOLLOWED BY ALL PRESS ON SEAT STRAPS RELEASED MECHANISM HAD FIRED. TRIP ROD CONNECTED PROPERLY BUT RELEASE SEAR ROD FOUND PULLED OUT OF DETENT. DIR REVLO MOST PROBABLE CAUSE OF MAL INCOMPLETE SEATING OF DOOR DUE TO BINDING OF CLEVIS PIN AGAINST MECH BODY.*

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEAR CUT MAINTENANCE ERROR. PILOT NO LONGER RESTRAINED IN SEAT ADEQUATELY FOR TRAPPING ABOARD THE CARRIER OR FOR SAFE EJECTION (MIGHT BE PITCHED OUT OF SEAT DURING SEAT BOOST).

Date of Incident: 63 05 17

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

PLT SEAT MAL DURING EJT. NORMAL SEAT SEP SEQUENCE INTERUPTED WHEN DROGUE GUN FAILED TO ACTUATE. PLT CLIMBED RISERS & SEP MANUALLY WITH GUILLOTINE, THEN MANUALLY DEPLOYED PERS CHUTE.*

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

DROGUE GUN HAD TO HAVE CARTRIDGE INSTALLED (NOT VISIBLE), HAD TO HAVE A COCKED FIRING MECHANISM (NO VISIBLE INDICATION), AND HAD TO HAVE TRIPROD CONNECTED TO AIRCRAFT PART OF CATAPULT IN ORDER TO FIRE. THIS FAILURE PRE-VENTED DROGUE DEPLOYMENT, HENCE THERE WAS NO PERSONNEL PARACHUTE DEPLOYMENT FORCE. PILOT WAS FORTUNATE TO REMEMBER GUILLOTINE FOR CUTTING WITHDRAWAL LINE, FOR MERE PULLING OF THE RIPCORD HANDLE, ALTHOUGH PERMITTING PARACHUTE DEPLOYMENT WOULD HAVE RESULTED IN THE SEAT REMAINING ATTACHED TO THE PARACHUTE APEX, PROBABLY PREVENTING PARACHUTE OPENING OR CAUSING ITS PERMANENT POST-OPENING COLLAPSE AND STREAMING.

Date of Incident: 65 07 04

------ Extract from Mishap Narrative Synopsis Describing Maintenance Error ------

SHOULDER HARNESS FAILED TO LOCK PRIOR TO CV LAN. PLT USED LEFT ARM AS A BRACE UPON ARRESTMENT & PREVENTED INJURY. THE SHOULDER HARNESS STRAP HAD FRAYED & THICKENED AT THE SNUBBING UNIT PREVENTING LOCKING OF THE STRAP.*

------ Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ------

MAINTENANCE PERSONNEL REQUIRED TO INSPECT INERTIA REEL STRAP FOR EXCESSIVE FRAYING AND TO ENSURE PROPER PAYOUT AND SPRING POWERED HAULBACK OF SLACK. OBVIOUSLY THIS HAD NOT BEEN DONE, LEAVING THE PILOT'S UPPER TORSO IMPROPERLY OR NOT AT ALL RESTRAINED. THIS COULD HAVE RESULTED IN SERIOUS FACIAL INJURIES DURING ARRESTMENT DECELERATION.

Date of Incident: 65 11 30

Extract from Mishap Narrative Synopsis Describing Maintenance Error

EJECTION SEAT SEP SEQUENCE INITIATED DURING ATTEMPT TO DISCONNECT FIRING LINKAGE WITHOUT SAFETY PIN INSTALLED. THE SEAT SEP BLADDERS WERE RUPTURED & ALUMINUM FITTINGS BURNED OUT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

ANOTHER CLEAR CUT MAINTENANCE ERROR SIMILAR TO 66 09 23. THIS FORTUNATELY OCCURRED ON THE GROUND SINCE SOME FITTINGS (BENT TUBING ELBOWS) FAILED AND THE BLADDERS MIGHT NOT HAVE INFLATED SUFFICIENTLY UNDER LOAD TO CAUSE ADEQUATE SEPARATION VELOCITY IN AN ACTUAL EJECTION. THIS MAINTENANCE ERROR (ACTUATING THE INITIATORS) WAS A FORTUNATE ONE SINCE IT EXPOSED A POTENTIALLY SERIOUS PROBLEM WITHOUT CAUSING INJURIES.

Date of Incident: 66 02 23

Extract from Mishap Narrative Synopsis Describing Maintenance Error

STARTED DESCENDING IN A STEP FASHION & WINGS OBSERVED TO ROCK TWICE BEFORE HITTING GROUND. PILOT DID NOT EJECT. INVES REVLD FOLLOWING SAFETY PINS STILL IN SEAT, 1. EJECTION GUN, SEAR, 2. FACE CURTAIN & 3. DROGUE GUN. ALT FIRE HANDLE WAS INTACT & FULLY SEATED. SEAT PINS SHOULD HAVE BEEN REMOVED BY THE PLT & CHECKED BY THE P/C PRIOR TO ACFT START.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

BOTH PILOT AND PLANE CAPTAIN AT FAULT FOR NOT PERFORMING A SAFETY PIN RE-MOVED COUNT AND VERIFICATION. MAINTENANCE ERROR.

Date of Incident: 66 02 24

Extract from Mishap Narrative Synopsis Describing Maintenance Error

INADVERTENT ACTUATION OF SEAT SEP SYSTEM. THE LOWER BOLT OF THE HARNESS RELEASE SEAR GUARD WAS MISSING. REASON FOR LOST BOLT UNDET. SUSP IMPROPER INSTALLATION.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

POOR MAINTENANCE TO ALLOW IMPROPER INSTALLATION OR TO NOT CATCH AND CORRECT THE DISCREPANCY IF IT DEVELOPED AFTER INSTALLATION.

Date of Incident: 66 07 13

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT EJT IN NEAR VERT POSIT, OUTSIDE THE DESIGN ENVELOPE OF THE FSA SEAT. INSP OF SEAT CONTROL UNITS REVLD DROGUE GUN NOT PROPERLY ASSEMBLED BY O&R, TIMING NOT AFFECTED. TRM TESTED OVER MAX TIME ALLOWABLE SUSP DUE TO TWO DAYS WATER IMERSION.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

MAINTENANCE ERROR IN RE-ASSEMBLING DROGUE GUN.

Date of Incident: 66 07 23

---- Extract from Mishap Narrative Synopsis Describing Maintenance Error ----

EJECTION SEAT FIRED DURING ARMING. AFTER INSTALLING THE PRIMARY CARTRIDGE IN THE EJECTION GUN OF THE REAR SEAT WITH THE BUCKET REMOVED, THE ORDNANCEMAN MOVED THE SEAR FWD TO CONNECT THE BANANA LINKS. HE FAILED TO INSTALL ANY SAFETY DEVICE & THE SEAR CAME OUT. THE GUN FIRED CAUSING MINOR INJURY TO THE MECHANIC AS THE SEAT WITHOUT BUCKET LEFT THE AIRCRAFT THROUGH THE REAR CANOPY.*

---- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ----

A NOT UNCOMMON SHORT-CUT TYPE PROBLEM - ATTEMPTING TO CONNECT FIRING CABLES OR MECHANISMS TO THE CATAPULT FIRING PIN SEAR BY PUSHING IT SLIGHTLY TOWARDS THE PARTS TO BE CONNECTED WITHOUT USING SAFETY DEVICES. MOVING THE SEAR RAISES THE FIRING PIN, COMPRESSING ITS SPRING. IF THE SEAR IS MOVED TOO FAR, THE FIRING PIN ROLLER IN CONTACT WITH THE SEAR WILL BEAR UPON THE STEEP BACK RAMP OF THE SEAR, DRIVING IT OUT, ALLOWING THE FIRING PIN TO FALL AND FIRE THE CATAPULT.

Date of Incident: 66 09 23

Extract from Mishap Narrative Synopsis Describing Maintenance Error

SEAT/MAN SEPARATION SYS INADV ACTUATED DURING REMOVAL OF SEAT FOR MAINT. MECH IN CKPT INCURRED MINOR BURNS WHEN BLADDERS INFLATED AND RUPTURED. MAINT ERROR FOR FAILURE TO INSTL SAFETY HARNESS PRIOR TO SEAT REMOVAL AND FAILURE TO UTILIZE MRC AS A CHECK LIST. IF THE MRC HAD BEEN USED THE ANEROID ARMING PLATE WOULD NOT HAVE BEEN POSITIONED TO STRIKE THRUSTER ARM. SUPV ERROR FOR FAILURE TO REQUIRE USE OF MRC AND FAILURE TO INSP SEAT FOR PROPER PREPARATION FOR LIFTING.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEAR CUT MAINTENANCE ERROR ON SEVERAL CLEARLY DESCRIBED COUNTS.

Date of Incident: 66 12 03

---- Extract from Mishap Narrative Synopsis Describing Maintenance Error ----

ADMIN- MAINT PERS NEGLECTED TO REINSTALL "B" NUT WHICH CONNECTS THE MK 11 INITIATOR BUT EJECTION SEAT WAS NOT UTILIZED. POSSIBLE "MURPHY" EXISTS IN THAT THE .4 SEC DELAY INITIATOR CAN BE INSTALLED UPSIDE DOWN.

---- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ----

ONE MAINTENANCE ERROR CLEARLY IDENTIFIED WHICH WOULD HAVE PREVENTED INITIATION OF THE MK 11 INITIATOR. A POOR DESIGN CAUSED POTENTIAL FOR MAINTENANCE ERROR WAS NOTED SINCE THE INITIATOR COULD BE INSTALLED REVERSED, THEREBY FAILING TO INITIATE.

APPENDIX B

MAINTENANCE ERROR MAJOR MALFUNCTION CASES DATA (PART II)

RIO: ############ Ref. Number: 15 A/C: RF0043 Seat: Martin-Baker MK H7 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	0601	APH-6A Helmet	Lost	E
	0701	Chin strap	Failure/Delay in using compromised survival/rescu	E
			Equipment problem (loss, failure, etc.) A factor	E
	0799	Error in MOR coding	Failure/Delay in using compromised survival/rescu	E
			Equipment problem (loss, failure, etc.) A factor	E
				D
	0899	Gloves--Type not specified	Not available-left behind	S
	1201	A-13A	Lost	E
	1303	Robertshaw Fulton, mini-reg	Lost	E
	1401	Emergency-Survival kit	Maintenance/Installation error	T
			Failed to operate (radio, actuator, etc.)	E
			Other (specify)	T
	1807	PRC-63	Not available-supply problem	T
	1902	Signal light, strobe SDU-5/E	Not available-supply problem	T
	1905	Signal mirror	Not available-supply problem	T
	2004	Suspension line cutter	Not available-supply problem	T
	2007	SEEK-2	Not available-supply problem	T
	2619	NES-8	Aided in location/rescue	N

------------------------- Extract from Mishap Narrative Synopsis Describing Maintenance Error -------------------------

RIO EJT AT 15M FT 475 KTS. DUE TO INSTL ERROR EMERG O2 WAS NOT ACTUATED.

--------------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---------------

HAD RIO NOT LOST HIS OXYGEN MASK, THE FAILURE OF THE EMERGENCY OXYGEN TO BE
ACTUATED AS HIS SYSTEM DISCONNECTED FROM AIRCRAFT OXYGEN DURING EJECTION
COULD HAVE LED TO THE RIO SUFFOCATING.

Maintenance Errors Degrading or Capable of having Degraded Ejectee Safety
(Extracts from MOR/FSR Data

RID: ############# Ref. Number: 32 A/C: A006A Seat: Martin-Baker MK GRU5 Injury Class.: A Ejt. Envelope: Out

Seat/Parachute Function---> Code: 2 Description: Other(see narrative)

Equip. Factors	Code	Description	Factor	Phs
	1807	PRC-63	Not available-left behind	E
	9999	General equipment	Destroyed by extreme force/fire	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE LEAD ACFT PLT EJT USING ALTERNATE HANDLE BUT DUE TO AN APPARENT MIS-RIGGED PRCHT IT FAILED TO OPEN. HE PULLED THE MANUAL D-RING BUT TOO LATE. HE RECD FATAL INJ.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

SERIOUSNESS OF ERROR SELF-EXPLANATORY.

RID: ############ Ref. Number: 94 A/C: TAF009J Seat: No Seat Given Injury Class.: A Ejt. Envelope:

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	0605	APH-6 Helmet (MDS not specified)	Damaged-minor	A
			Other (specify)	A
	2199	Type seat survival kit not specified	Maintenance/Installation error	T
	2502	Shoulder harness/inertia reel	Other (specify)	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

RSSK IMPROPERLY INSTL ALLOWING IT TO MOVE FWD APPROX. 2.5 IN. INVEST INDICATES SHOULDER HARNESS UNLOCKED & PLT LEANING FWD OUT CKPT AT IMPACT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PILOT HAD COMPLETED SECOND TOUCH & GO LANDING THEN AIRCRAFT CRASHED. LOOSNESS OF RSSK UNDER LANDING DECLERATIONS COULD CAUSE IT TO SHIFT UNDER THE PILOT CREATING CONCERN REGARDING PERSONAL RESTRAINT SYSTEM TIGHTNESS (LAPBELT ANCHORED TO RSSK), INDUCE EXCESSIVE BODY MOTION AFFECTING ABILITY TO CONTROL AIRCRAFT, AND/OR INDUCING/WORSENING DISORIENTATION.

RID: ############ Ref. Number: 113 A/C: F0083 Seat: No Seat Given Injury Class.: A Ejt. Envelope:

Seat/Parachute Function- -> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	2804	Rocket jet fitting - lower	Other (specify)	T
	2902	Error in MOR coding		A
	9999	General equipment	Destroyed by extreme force/fire	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

MARTIN-BAKER REP BELIEVES THE TIMED RELEASE MECHANISM TRIPROD WAS NOT CONNECTED TO ACFT BULKHEAD. HAD EJT BEEN SUCCESSFUL THE PLT WOULD HAVE HAD TO MANUALLY RELEASE RESTRAINTS AND DEPLOY PRCHT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

NON-CONNECTION OF TIMED RELEASE MECHANISM (TRM) TRIPROD WOULD MEAN THAT THE PERSONAL RESTRAINTS WOULD NOT BE RELEASED AND THAT THE DROGUES WOULD REMAIN ATTACHED TO THE UNOPENED SHACKLE RELEASE AND WOULD NOT PULL THE PARACHUTE OUT OF THE PACK. PILOT WOULD HAVE TO RECOGNIZE THE SITUATION, PULL THE EMERGENCY RELEASE HANDLE WITH HIS RIGHT HAND TO RELEASE HIS RESTRAINTS AND TO CUT THE PARACHUTE WITHDRAWAL LINE, THEN PUSH FREE FROM THE SEAT, WAIT UNTIL CLEAR AND FIND AND PULL RIPCORD HANDLE ON FRONT OF LEFT SHOULDER. PARACHUTE DEPLOYMENT WOULD BE SLOWER THAN NORMAL DUE TO DEPENDENCE UPON SPIDER SPRING PILOT CHUTE TO DEPLOY IT.

RID: ############# Ref. Number: 123 A/C: A004C Seat: No Seat Given Injury Class.: A Ejt. Envelope:

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	2920	Error in MOR coding	Failed to operate (radio, actuator, etc.)	E
			Other (specify)	T
	9999	General equipment	Destroyed by extreme force/fire	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT SECURED HIS ENG & PREPARED TO EJT. HOWEVER, THERE WAS A FAIL IN THE CPY JETTISON SYSTEM & ALL EFFORTS (FACE CURTAIN, ALTERNATE HANDLE & CPY RELEASE) PROVED FUTILE. THE FLT LEADER ADVISED PLT TO ATTEMPT BAILOUT. THE CPY WAS FINALLY RELEASED MANUALLY & THE PLT RELEASED HIS HARNESS APPARENTLY WITH THE INTENT TO BAILOUT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

A-4C CANOPY JETTISONING SYSTEM REQUIRES CAREFUL, FINE ADJUSTMENT. SEAT CANNOT EJECT UNTIL CANOPY IS JETTISONED AND THE SEAT INTERLOCK RELEASES TO PERMIT FIRING CABLE TO PULL CATAPULT FIRING PIN SEAR.

RID: ############ Ref. Number: 243 A/C: TA0048 Seat: Escapac 1A-1 Injury Class.: B Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	0601	APH-6A Helmet	Restraints/attachments not used properly for maxi	E
			Lost	E
	1201	A-13A	Lost	E
	1701	LR-1	Injury hampered use	S
			Other (specify)	U
	1801	PRT-3	Operated partially	S
			Aided in location/rescue	N
			Other (specify)	U
	1904	Distress signal, day/night, MK13 MOD 0	Injury hampered use	S
	1905	Signal mirror	Damaged-major	U
	2003	Water bottle, 4 oz.	Maintenance/Installation error	T
			Not available - Needed	S

------------------------ Extract from Mishap Narrative Synopsis Describing Maintenance Error ------------------------

HIS PRT-3 PRODUCED WEAK & SHORT LIVED SIGNAL DUE TO CORRODED BATTERIES. SOP
SOP DIRECTED THAT DRINKING WATER BE INCLUDED IN SURV PACK FOR DESERT OPS.
HE LOOKED FOR WATER BUT HAD NONE.

-------------------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors --------------------

LACK OF SIGNAL FROM PRT-3 COULD DELAY INITIATION OF SEARCH AND ELIMINATES A
SOURCE OF "HOMING IN" ON DOWNED AIRMAN. CONSEQUENCES OF LACK OF WATER ARE
SELF EVIDENT. BOTH ITEMS ARE PART OF ESCAPE SYSTEM MAINTENANCE.

RID: ############ Ref. Number: 296 A/C: TA004F Seat: Escapac 1C-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	9999	General equipment	Destroyed by extreme force/fire	A

------ Extract from Mishap Narrative Synopsis Describing Maintenance Error ------

THE INSTR INFORMED STUDENT OF HIS INTENT TO EJT. THE STUDENT CONFIRMED THE INSTR'S XMISSION & THE INSTR INITIATED EJT. AFTER A DELAY THE FRONT SEAT FIRED. THE REAR SEAT FAILED TO FIRE & THE STUDENT SUSTAINED EXTREME FATAL INJ. THE INSTR WAS RECOVERED W/O INJ. INVST REVLD A REDUCER FAIL IN REAR SEAT AS THE MOST PROBABLE CAUSE OF ITS FAIL TO FIRE. THE MOR INDICATES THAT THE ROCKET BLAST FROM FRONT SEAT WOULD HAVE BEEN SUFFICIENT TO KILL OR INCAPACITATE OCCUPANT OF REAR SEAT.

------ Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ------

POTENTIAL FAILURE OF MAINTENANCE ..A.

RID: ############ Ref. Number: 334 A/C F004J Seat: Martin-Baker MK H7 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Z Description: Other(see narrative)

Equip. Factors	Code	Description	Factor	Phs
	9999	General equipment	Destroyed by extreme force/fire	A

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

THE RIO INITIATED COMMAND EJT & THE FRONT SEAT FAILED TO FIRE. THE PLT REGAINED CONSCIOUSNESS, LEVELED THE ACFT AT 3M FT & MADE AN EMERG GCA LAN.

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

POSSIBLE MAINTENANCE ERROR IN RIGGING INTER-SEAT SEQUENCING AND SEATS FOLLOWING SEAT REMOVAL AND RE-INSTALLATION. CONSEQUENCE, HAD PILOT NOT REGAINED CONSCIOUSNESS IS SELF-EVIDENDENT.

RID: ############ Ref. Number: 393 A/C: A004C Seat: Escapac 1A-1 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Z Description: Other(see narrative)

Equip. Factors	Code	Description	Factor	Phs
			Lost	U
	1307	PRC-63	Failed to operate (radio, actuator, etc.)	E
	2614	NB-11	Other (specify)	E

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE PRCHT FAILED TO OPEN BECAUSE THE SWAGED BALL ON THE ARMING CABLE WAS NOT LOCKED IN THE HARNESS RELEASE HANDLE AT THE TIME OF SEAT/MAN SEPERATION.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

A COMMON PROBLEM ON ESCAPAC EJECTION SEATS, REQUIRING CAREFUL MAINTENANCE AND Q.A. INADVERTENT MOVEMENT OF EMERGENCY RELEASE HANDLE BY PERSONNEL WORKING IN COCKPIT COULD RESULT IN ARMING CABLE SWAGED BALL BEING RELEASED. UPON SEPARATING FROM SEAT, EJECTEE WOULD HAVE TO MANUALLY PULL HIS RIPCORD HANDLE TO OBTAIN PACK OPENING AND PARACHUTE DEPLOYMENT. (SEE ALSO REFERENCE CASE 776).

RID: ############ Ref. Number: 673 A/C: OV010A Seat: North American LW-3B Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: A Description: Seat operated partially

Equip. Factors	Code	Description	Factor	Phs
	0101	CS/FRP-1 Summer Flying Coverall	Damaged-minor	U
	0602	APH-6B Helmet	Damaged-minor	U
	2502	Shoulder harness/inertia reel	Release/disconnect failure	E

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

THE PLT EJT. MAN-SEAT SEPARATION APPARENTLY DID NOT FUNCTION PROPERLY & THE PLT DIED AS A RESULT OF DROWNING. PLT EJT AT 450 FT 110 KTS. LAP BELT APPARENTLY RELEASED AUTOMATICALLY, BUT SHOULDER HARNESS FAILED TO RELEASE. RAFT WAS DEPLOYED & PLT DESCENDED INTO WATER WITH SEAT ATTACHED TO HARNESS.

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

IN THE LW-3B EJECTION SEAT, THE PARACHUTE PACK IS MOUNTED ON THE BACK OF THE SEAT BACK. SEAT-MAN SEPARATION FOLLOWS PARACHUTE OPENING. IN THIS INSTANCE THE EJECTEE REMAINED SECURILY ATTACHED AT THE SHOULDERS TO AN APPROXIMATELY 2' X 3' METAL ASSEMBLY WHICH WOULD (1) BE FREE TO SLAP HIM DURING PARACHUTE OPENING SHOCK REBOUNDS AND DURING DESCENT AND (2) WOULD TEND TO DRAG HIS SHOULDERS AND HEAD UNDERWATER UNLESS HE COULD RELEASE HIS PARACHUTE QUICK RELEASE FITTINGS. SEVERAL ASPECTS OF THIS CASE SUGGESTED MAINTENANCE ERRORS RE-ASSEMBLING AND THEN RE-INSTALLING THE SEAT INTO THE AIRCRAFT.

RID: ############ Ref. Number: 711 A/C: TA004F Seat: Escapac 1C-3 Injury Class.: G Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	1914	URT-33	Maintenance/Installation error	T
			Failed to operate (radio, actuator, etc.)	E

Extract from Mishap Narrative Synopsis Describing Maintenance Error

BOTH URT-33 RADIOS (ONE IN EACH SEAT) FAILED TO AUTOMATICALLY ACUATE UPON EJT. ON FAILED DUE TO BEING INSTALLED IN "OFF" MODE; THE OTHER DUE TO FAILURE OF AUTOMATIC ACTUATOR LANYARD ATTACHMENT. (ENG INVEST REVLD LANYARD HAD NOT FAILED & ACTUATION HAD OCCURRED.)

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEARLY A MAINTENACE ERROR. THESE "BEEPERS" OFTEN ARE THE FIRST INDICATION THAT AN EJECTION HAS OCCURRED AND THEIR FAILURE TO BEEP AS A CONSEQUENCE OF BEING IMPROPERLY INSTALLED (1) COULD RESULT IN DELAYED AWARENESS OF AN ESCAPE AND (2) ELIMINATE MENAS FOR "HOMING IN" ON DOWNED AVIATOR.

RID: ############ Ref. Number: 775 A/C: A007E Seat: Escapac 1C-2 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	1314	URT-33	Error in MOR coding	E
			Damaged-major	L
			Failed to operate (radio, actuator, etc.)	L
	2007	SEEK-2	Not available-supply problem	T
	2703	Hitek 7000	Maintenance/Installation error	T
			Failed to operate (radio, actuator, etc.)	E
	2801	Koch fitting - upper	Inadvertent release/disconnect	E

---------- Extract from Mishap Narrative Synopsis Describing Maintenance Error ----------

THE PILOT EJT. DUE TO A SEAT LANYARD PROB HIS PARACHUTE FAILED TO OPEN 3 THE PILOT SUSTAINED FATAL INJ ON GND IMPACT.... INVEST REVLD SWAGED BALL ON ACTUATOR ARMING CABLE WAS NOT SECURED IN EMERG HARNESS RELEASE HANDLE; THUS ALLOWING CABLE TO PULL FREE FROM HANDLE AT SEAT SEP, RATHER THAN PULLING PIN ON OPPOSITE END OF CABLE FROM THE ACTUATOR. THIS PREVENTED ACTUATOR FROM FIRING. PLT HAD APPROX 10 SEC IN WHICH HE COULD HAVE PULLED D-RING, BUT FAILED TO DO SO. IT IS UNKNOWN WHETHER UNSECURED CABLE WAS DUE TO MAINT ERROR OR INADVERTENT RELEASE AT A LATER DATE.

---------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ----------

THIS IS A REPEAT OF THE PROBLEM IN REFERENCE CASE 393. IT HAS OCCURRED WITH FREQUENCY AND FORTUNATELY, AS A CONSEQUENCE OF INCREASED DEMANDS FOR ITS CAREFULL AND REPEATED Q.A. HAS BEEN FOUND FREQUENTLY ON THE GROUND. IT MUST BE REMEMBERED THAT BY NOW (1971) AIRCREW WERE EXPECTING TOTALLY AUTOMATIC SEQUENCING OF THEIR ESCAPE AS THOSE WHO HAD HAD TO PERFORM MANY OF THE FUNCTIONS MANUALLY IN THE EARLIER SEATS WERE NO LONGER IN FLYING BILLETS IN ANY QUANTITY. IN ADDITION, THE CONCEPT OF THE EJECTEE ATTEMPTING TO "BEAT THE SEAT" WAS BEING DISCOURAGED SINCE AN EJECTEE COULD INTERRUPT THE AUTOMATIC SEQUENCE AND OBTAIN A WORSENED PERFORMANCE. HENCE RECOGNITION THAT SOMETHING WAS WRONG AND DECIDING TO INITIATE ACTION WOULD REQUIRE CONSIDERABLE TIME.

RID: ############# Ref. Number: 781 A/C: A0073 Seat: Escapac 1C-2 Injury Class.: G Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	0605	APH-6 Helmet (MOD not specified)	Prevented/minimized injury	P
			Damaged-minor	R
	0301	Gloves, Flying(MIL-G-31183) fire resista	Discarded	E
	1201	A-13A	Discarded	E
	1904	Distress signal, day/night, MK13 MOD 0	Actuation difficulty	S
			Maintenance/Installation error	T
			Other (specify)	T
	2110	RSSK-3A	Maintenance/Installation error	T
			Dislodged from normal position	E
			Actuation difficulty	E
	2509	Torso garment MA-2	Damaged-minor	E
			Maintenance/Installation error	T

-------------------------- Extract from Mishap Narrative Synopsis Describing Maintenance Error --------------------------

PLT EJT 5M FT, 190 KTS. TORSO RESTRAINT STRAP FAIL (STITCHED WITH WRONG THREAD), CAUSING RSSK TO DROP TO KNEES.

---------------------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ----------------------

(SIMILAR TO CASE REFERENCE NUMBER 1330. REFER TO THOSE COMMENTS.)

RID: ############ Ref. Number: 752 A/C: F008H Seat: Martin-Baker MK F7 Injury Class.: 4 Ejt. Envelope: In

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	9999	General equipment	Destroyed by extreme force/fire	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

INVEST FAILED TO REVEAL ANY EVIDENCE OF MATL FAIL OTHER THAN EJT SYSTEM.... INVEST REVEALED EJT HAD BEEN ATTEMPTED PRIOR TO IMPACT. THERE WAS A FAIL IN THE RIGGING OF THE CABLES, EITHER MECHANICAL OR HUMAN, WHICH PREVENTED CPY SEPARATION. ADDITIONALLY A DIR INDICATES THAT THE SEAT FIRING CABLE WAS NOT HOOKED UP TO THE FIRING SEAR PRIOR TO IMPACT, THEREBY RENDERING EJT IMPOSSIBLE.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

NOTE TWO, OR MORE, SERIOUS ERRORS. EITHER OF THE MAJOR ONES ALONE COULD RESULT IN FATALITY. IN THE F-8, UNLESS THE PILOT PULLED THE INTERRUPTOR HANDLE MONTED ON THE RIGHT HAND SIDE OF THE HEADREST BOX (THE HANDLE'S RIGID METAL LOOP WAS SMALL), THE CANOPY HAD TO CLEAR AND A CABLE FROM IT HAD TO FUNCTION THE INTERRUPTOR TC ALLOW CONTINUED FIRING CABLE PULLING TO FIRE THE CATAPULT. SINCE CANOPY JETTISONING WAS THE PRIMARY EJECTION MODE, THE INTERRUPTOR WAS NECESSARY TO PREVENT COLLISION WITH THE METAL STRUCTURAL FRAME OF THE JETTISONING CANOPY. IF THE INTERRUPTOR HANDLE WERE PULLED, EJECTION COULD BE ACCOMPLISHED THROUGH-THE-CANOPY, BUT THIS TOOK TIME FOR PILOT RECOGNITION DUE TO NORMAL DELAYS. THE FAILURE TO CONNECT THE FIRING LANYARD TO THE CATAPULT SEAR OBVIOUSLY RENDERED THE SEAT TOTALLY AND FATALLY INOPERABLE AND CAN ONLY BE A MAINTENANCE AND MAINTENACE Q.A. ERROR.

RID: ############ Ref. Number: 815 A/C: A007E Seat: Escapac 1C-2 Injury Class.: G Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	1201	A-13A	Discarded	E
	1601	LPA-1	Improper use (other)	S
			Operated partially	S
	1508	PRC-90	Aided in location/rescue	S
	1904	Distress signal, day/night, MK13 MOD 0	Lost	E
			Not available - Needed	S
			Other (specify)	S
	1998	Other signalling devices/lights	Aided in location/rescue	S
	2012	SV-2A Survival vest	Inadvertent release/disconnect	E
			Material deficiency	T
			Other (specify)	E
	2110	RSSK-8A	Maintenance/Installation error	T

------------------------ Extract from Mishap Narrative Synopsis Describing Maintenance Error ------------------------

RSSK DEPLOYED DURING DESCENT. RAFT FELL TO END OF LANYARD & INFLATED. REST OF RSSK CONTENTS FELL AWAY & WAS LOST. CONTENTS NOT SECURED BY REQUIRED LANYARD. PLT DIDN'T CARRY MK-13 DAY-NIGHT FLARES ON LPA-1 DUE TO THEIR LOCATION ON LPA-1 HINDERING OPERATION OF VARIOUS SWITCHES ON CONSOLE. THOUGHT HE COULD DEPEND ON FLARES IN RSSK, BUT WITH THEM LOST HE HAD NO MK-13 FLARES.

-------------------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors --------------------

CLEAR MAINTENANCE ERROR IN FAILING TO CONNECT SURVIVAL KIT CONTENTS PACKET TO LIFE RAFT IN ACCORDANCE WITH SURVIVAL KIT PACKING INSTRUCTIONS. LOSS OF MK-13 DAY-NIGHT FLARES (AS WELL AS OTHER CONTENTS) COULD HAVE RESULTED IN SEARCHERS BEING UNABLE TO LOCATE DOWNED AVIATION AND HIS INABILITY TO SURVIVE DUE TO LOSS OF DRINKING WATER AND OTHER LIFE SUPPORTING SUPPLIES.

RID: ############ Ref. Number: 892 A/C: A006E Seat: Martin-Baker MK GRU7 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	1601	LPA-1	Not available-left behind	T
	1807	PPC-63	Not available-left behind	T
	1814	URT-33	Not available-left behind	T
	1901	Flaregun, MK 79 MOD 0	Not available-left behind	T
	1902	Signal light, strobe SDU-5/E	Not available-left behind	T
	1911	Flashlight	Not available-left behind	T
	2012	SV-2A Survival vest	Not available-left behind	T
	2506	Leg restraint	Not available-left behind	T
	2633	NES-14A	Failed to operate (radio, actuator, etc.)	E
			Equipment problem (loss, failure, etc.) A factor	L

Extract from Mishap Narrative Synopsis Describing Maintenance Error

B/N EJT AS ACFT LEFT RWY, FOLLOWED IMMEDIATELY BY PLT. PLT'S PRCHT FAILED TO DEPLOY. REASON UNDET. SUSPECT DROGUE MALF.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

INVESTIGATION REVEALED DROGUES HAD BEEN IMPROPERLY PACKED (JAMMED IN TOO TIGHTLY) INTO THE SEAT HEADREST BOX DROGUE STOWAGE SPACE PREVENTING DROGUE SLUG EXTRACTION OF EVEN THE 22 INCH CONTROLLER DROGUE WHICH POSSIBLY COULD HAVE THEN EXTRACTED THE 60 INCH STABILIZER DROGUE. THUS WHEN THE TRM (TIMED RELEASE MECHANISM OPERATED) AND RESTRAINTS WERE RELEASED AND THE SHACKLE RE-LEASE OPENED, THE DROGUES WERE NOT DEPLOYED AND WORKING AND THE PERSONNEL PARACHUTE WAS NOT AUTOMATICALLY DEPLOYED. SINCE THIS WAS A GROUND LEVEL EJECTION, THERE WAS INSUFFICIENT TIME FOR THE PILOT TO RECOGNIZE AND REACT TO HIS SITUATION AND INITIATE PARACHUTE PACK OPENING BY MANUALLY PULLING RIPCORD AFTER PUSHING CLEAR OF SEAT. EVEN IF HE HAD, THERE WOULD HAVE BEEN INSUFFICENT TIME FOR THE CONSEQUENT SLOWED DEPLOYMENT OF THE PERSONNEL PARACHUTE AND ITS OPENING PRIOR TO GROUND IMPACT.

RID: ############ Ref. Number: 395 A/C: A007C Seat: Escapac 1C-2 Injury Class.: A Ejt. Envelope: Out

Seat/Parachute Function---> Code: A Description: Seat operated partially

Equip. Factors	Code	Description	Factor	Phs
	9999	General equipment	Destroyed by extreme force/fire	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

THE PLT EJT OUTSIDE THE ENVELOPE, ADDITIONALLY, THE EJT SYSTEM MALF DUE TO AN APPARENT INSTALLATION ERROR, & SEAT SEP NOT OCCUR .... CPY SEP & EGRESS FROM CKPT APPEAR TO HAVE BEEN NORMAL, BUT SEAT-MAN SEP DID NOT OCCUR. SEAT SEP BLADDER FAILED TO INFLATE. SEAL ON NITROGEN BOTTLE WHICH INFLATES BLADDER NOT RUPTURED. APPARENTLY THE RETAINING NUT CAME LOOSE ALLOWING GAS PRESSURE FROM THE MK-86 CARTIRIDGE TO VENT TO THE ATMOSPHERE, VICE THROUGH THE PROPER PATH TO RUPTURE NITROGEN SEAL.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

THIS EJECTION WAS MARGINALLY OUT OF ENVELOPE OR MARGINALLY IN ENVELOPE. THE CRITICAL FACTOR IS THE FAILURE TO EFFECT SEAT-MAN SEPARATION. THE RETAINING NUT MIGHT HAVE COME LOOSE OR IT MIGHT HAVE NEVER BEEN PROPERLY TORQUED. THIS NUT WAS CONSIDERED CRITICAL AND HAD PROVISIONS, APPARENTLY NOT USED, FOR LOCK WIRING TO PREVENT IT FROM INADVERTENTLY BACKING OFF. UNDER THE EJECTION CONDITIONS THERE WAS INSUFFICIENT TIME FOR THE PILOT TO RECOGNIZE AND REACT TO HIS SITUATION BY PULLING EMERGENCY RELEASE HANDLE TO RELEASE HIS RESTRAINTS, PUSHING FREE OF THE SEAT, WAITING FOR ADEQUATE CLEARANCE TO DEVELOP, AND THEN MANUALLY PULLING RIPCORD HANDLE.

RID: ############ Ref. Number: 973 A/C: F008J Seat: Martin-Baker MK F7 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	2801	Koch fitting - upper	Improper use (other)	T
			Restraints/attachments not used properly for maxi	A
			Equipment problem (loss, failure, etc.) A factor	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT EJT BUT DID NOT HAVE PRCHT/TORSO HARNESS KOCH FITTINGS CONNECTED. HE SUSTAINED MASSIVE FATAL INJ ON GND IMPACT. MOR INDICATES LACK OF PLANE CAPT AT STRANGE FIELD MAY HAVE CAUSED A BREAK IN HABIT PATTERN IN STRAP IN PROCEDURES.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

PILOT/MAINTENANCE ERROR. PLANE CAPTAIN ASSISTS PILOT IN ENTERING AIRCRAFT AND IN MAKING ALL NECESSARY HOOK-UPS PILOT, THOUGH, SHOULD HAVE PAID ATTENTION AND BEEN AWARE OF CRITICAL ASPECTS SUCH AS FAILURE TO CONNECT KOCH FITTINGS.

RID: ############ Ref. Number: 1133 A/C: F004J Seat: Martin-Baker MK H7 Injury Class.: A Ejt. Envelope: Out

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs

-------> No Equipment Factors Found <-------

Extract from Mishap Narrative Synopsis Describing Maintenance Error

RIO EJECTED AT GND LEVEL, 130 KTS, 30 DEG LEFT ROLL, OUTSIDE EJT ENVELOPE. ALL SEAT COMPONENTS WORKED AS DESIGNED EXCEPT ROCKET MOTOR WHICH FAILED TO FIRE DUE TO BROKEN FIRING CABLE. CAUSE OF BROKEN CABLE UNKNOWN. FAIL OF ROCKET MOTOR WAS OF NO SIGNIFICANCE IN OUTCOME OF EJT AS SEAT WAS EJT TOWARD GND.

Notes and Comments Concerning Seriousness/Consequences of *Maintenance* Errors

POSSIBLE DESIGN PROBLEM, POSSIBLE MAINTENANCE ERROR ASSOCIATED WITH ROCKET MOTOR FIRING CABLE BREAKAGE.

RID: ############ Ref. Number: 1154 A/C: F004N Seat: Martin-Baker MK H7 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Description: No Seat/Parachute Function Given

Equip. Factors	Code	Description	Factor	Phs
	C101	CS/FRP-1 Summer Flying Coverall	Prevented/minimized injury	A
			Other (specify)	A
	0504	APH-6D Helmet	Lost	E
			Damaged-major	E
			Burned-minor	E
	0801	Gloves, Flying(MIL-G-81188) fire resista	Other (specify)	T

Extract from Mishap Narrative Synopsis Describing Maintenance Error

EJT OCCURED AT GND LEVEL, & ZERO, OR NEAR ZERO SPD. APPARENT CAUSE OF INADVERTENT ROCKET MOTOR FIRING WAS A MISROUTED LEG RESTRAINT LINE, WHICH CAUSE A LOOP TO HANG UP ON , & EXTRACT THE SEAR, WHEN PRESSURE WAS APPLIED TO THE LINE BY MOVEMENT OF SEAT, OR RIO'S LEG.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

THE INITIAL MBA MK7 SERIES EJECTION SEAT ROCKET MOTORS WERE FIRED BY A LANYARD LEADING FROM THE ROCKET MOTOR SEAR THROUGH A LANYARD STOWAGE DEVICE TO A BRACKET MOUNTED ON THE DECK. THE ENTANGLEMENT OF THE LEG RESTRAINT CORD WITH THAT FIRING LANYARD, ALTHOUGH IT MAY HAVE OCCURRED EITHER DURING OR LONG AFTER, THE LAST REMOVAL AND RE-INSTALLATION OF THE REAR SEAT BUCKET (REMOVED FREQUENTLY TO PROVIDE ACCESS TO REAR COCKPIT AVIONICS), CAN ONLY BE CONSIDERED A MAINTENANCE OR MAINTENANCE Q.A. ERROR SINCE IT IS THE REPONSIBILITY OF THE SEAT INSTALLERS TO ASSURE PROPER ROUTING OF LANYARDS AND RESTRAINT LINES AND THE REPONSIBILITY OF THOSE PERFORMING THE DAILY CHECKS TO ENSURE THAT RESTRAINT CORDS ARE CLEAR AND READY FOR IMMEDIATE HOOK-UP. IT IS EXTREMELY UNLIKELY THAT THIS RIO OR PRIOR COCKPIT OCCUPANT COULD HAVE INDUCED THE ENTANGLEMENT WHILE HOOKING UP THE CORDS TO HIS LEG RESTRAINT GARTERS.

RID: ############ Ref. Number: 1243 A/C: TA004J Seat: Escapac 1F-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Z Description: Other(see narrative)

Equip. Factors	Code	Description	Factor	Phs
	0801	Gloves, Flying(MIL-G-81188) fire resista	Not available-left behind	T
	2008	SRU-31/P	Not available-supply problem	T
	2502	Shoulder harness/inertia reel	Restraints/attachments not used properly for maxi	T
	2627	NES-12C	Failed to operate (radio, actuator, etc.)	E
			Other (specify)	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

STUD EJT NORMAL THRU SEAT SEP BUT PRCHT DID NOT DEPLOY. INVES REVLD HARNESS RELEASE HANDLE IN ITS HOLDER, BUT FWD PORTION OF HANDLE WAS NOT FULLY SEATED IN ITS DETENT WHICH RELEASED AUTO PRCHT ACTUATOR ARMING CABLE & EPC STATIC LINE FROM SEAT & ALLOWED THEM TO REMAIN WITH PLT AT SEAT SEP, PREVENTING AUTO PRCHT OPENING. SUSP STUD MISSED IMPROPER STOWAGE OF HANDLE ON PRE-FLT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

REFERENCE CASES NUMBERS 393 AND 776 RE PARACHUTE ARMING CABLE. EVEN HAD THE EPC (EXTERNAL PILOT CHUTE) LANYARD BEEN CONNECTED, WITH THE PARACHUTE ARMING CABLE DISCONNECTED, THE PILOT WOULD HAVE HAD TO RECOGNIZE THE SITUATION AND MANUALLY PULL HIS RIPCORD HANDLE. WERE THE PARACHUTE ARMING CABLE CONNECTED BUT THE EPC STATIC LINE NOT, PARACHUTE DEPLOYMENT DURING A SLOW SPEED EJECTION (TYPICALLY CLOSE TO THE GROUND FOLLOWING OR DURING TAKE-OFF OR LANDING) WOULD HAVE BEEN EXTREMELY SLOW AS THE INTERNAL PILOT CHUTE SPENDS SOME TIME IN THE EJECTEE'S WAKE EFFECTS BEFORE PULLING THE PARACHUTE OUT OF THE PACK. MOVEMENT OF THE EMERGENCY RELEASE HANDLE CAN OCCUR DURING NON-SEAT COCKPIT MAINTENANCE AND RELEASE THESE TWO ITEMS OR THEY MIGHT NOT HAVE BEEN INSTALLED PROPERLY TO BEGIN WITH. DAILY CHECKS AND PRE-FLIGHT CHECKS INCLUDE CHECKING FOR PROPER CONNECTION OF THESE ITEMS.

RID: ############ Ref. Number: 1260 A/C: A004M Seat: Escapac 1E-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: Z Description: Other(see narrative)

Equip. Factors	Code	Description	Factor	Phs
	1404	Aircraft system	Maintenance/Installation error	A
			Other (specify)	A
	1314	URT-33	Failed to operate (radio, actuator, etc.)	E
			Damaged-minor	E
			Maintenance/Installation error	E
	2111	RSSK-8A-1	Inadvertent actuation	E
			Hangup/entanglement (with A/C or other equipment)	E
			Equipment problem (loss, failure, etc.) A factor	E
	2629	NES-12C-2	Hangup/entanglement (with A/C or other equipment)	E
			Equipment problem (loss, failure, etc.) A factor	E

----- Extract from Mishap Narrative Synopsis Describing Maintenance Error -----

PLT EJT. PRCHT FAILED TO OPEN DUE TO ENTANGLEMENT WITH SURVIVAL KIT CONTENTS. PLT SUSTAINED FATAL INJ AT GND IMPACT.... INVEST REVLD HARNESS RELEASE HANDLE HAD BEEN PARTIALLY ACTUATED, OR IMPROPERLY STOWED PRIOR TO EJT, THUS PRECLUDING AUTO PRCHT ACTUATION. PLT HAD MANUALLY PULLED PRCHT D-RING. RSSK-8A-1 SURV KIT CAME OPEN DURING SEAT/MAN SEPARATION. THE LR-1 & OTHER CONTENTS OF THE RSSK-8A-1 ENTANGLED PRCHT PREVENTING IT FROM OPENING. THE BOARD CONCLUDED THAT THE RSSK-8A-1 RELEASE HANDLE HAD PROBABLY BEEN REMOVED PRIOR TO EJT, THUS PRECLUDING THE TWO SECTION BEING LOCKED TOGETHER. WHEN, OR HOW, THE HANDLE WAS REMOVED WAS NOT KNOWN. IT WAS NOT FOUND IN THE WRECKAGE.

----- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors -----

POSSIBLE MAINTENANCE ERROR - POSSIBILITY ALSO THAT SEAT-MAN SEPARATION INDUCED RSSK HANDLE BREAKAGE AND LOCK FAILURE, CAUSING IT TO OPEN. THERE THERE WERE TWO SIMILAR CASES.

RID: ############ Ref. Number: 1330 A/C: A004M Seat: Escapac 1E-3 Injury Class.: F Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	0515	Private Contractor Form Fit/Custom manuf	Discarded	E
	0901	Boot, flying(MIL-B-21409) Heel toe	Damaged-minor	E
			Prevented/minimized injury	E
	1201	A-13A	Inadvertent release/disconnect	E
	1303	Robertshaw Fulton, mini-reg	Maintenance/Installation error	T
	1603	LPA-2	Operated partially	E
	1807	PRC-63	Lost	E
	1902	Signal light, strobe SDU-5/E	Failed to operate (radio, actuator, etc.)	T
	2112	RSSK-36	Dislodged from normal position	E
			Release/disconnect failure	E
			Discarded	E
	2503	Torso garment MA-2	Damaged-major	E
			Maintenance/Installation error	T

------------------------- Extract from Mishap Narrative Synopsis Describing Maintenance Error -------------------------

RSSK RETAINER STRAPS TORN FROM TORSO HARNESS, ALLOWING RSSK TO DROP BELOW KNEES. (INVESTIGATION REVEALED FAULTY STITCHING AS CAUSE.).... O2 REG INLET BODY TO INLET ASSY SCREW MISSING. O2 REG OVERDUE FOR INSP. SDU-5E STROBE INOPERABLE - HAD BAD BATT. LATER WHEN REPLACED, STROBE STILL FAILED TO OPERATE.

--------------------- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---------------------

FAULTY STICHING PROBABLY OCCURRED IN PARACHUTE RIGGER SHOP DUE TO NEED TO AFFIX STRAPS PECULIAR FOR EACH PARTICULAR RSSK TO THE HARNESS. WITH THE RSSK HANGING BELOW KNEES, EJECTEE WAS AT EXTREME RISK DURING CONTACT WITH LAND SURFACE OF BREAKING ONE OR BOTH LEGS, ESPECIALLY FOLLOWING A LOW LEVEL EJECTION WHEREIN EJECTEE WOULD NOT HAVE TIME TO RLEASE ONE SIDE OF THE RSSK RESTRAINTS TO LET IT SWING TO ONE SIDE. OXYGEN SYSTEM OVERDUE FOR INSPECTION AND A CRITICAL SCREW WAS MISSING; A SCREW WHICH NORMALLY WOULD ASSURE THAT THE PARTS REMAINED CONNECTED. DISCONNECTION COULD RESULT IN SUFFOCATION. STROBE LIGHT LAST TWO DEFECTS BOTH OF WHICH SHOULD HAVE BEEN DETECTED DURING MAINTENANCE AND CORRECTED. (SEE ALSO CASE REFERENCE NUMBER 781 IN WHICH STICHING PROBLEM OCCURRED).

RID: ############ Ref. Number: 1389 A/C: TA004J Seat: Escapac 1C-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 6 Description: Seat failed to operate/actuate

Equip. Factors	Code	Description	Factor	Phs

-------> No Equipment Factors Found <------

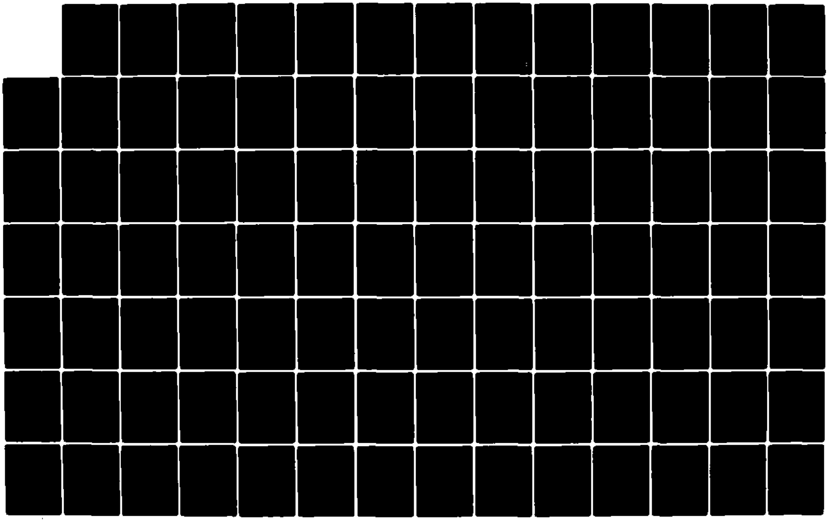
Extract from Mishap Narrative Synopsis Describing Maintenance Error

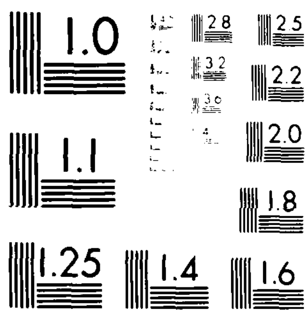
IP INITATED CMD SEQ BY FACE CURTAIN. CPY DEPARTED ACFT BUT BOTH SEATS FAILED TO EJT. FAIL REASON DUE TO MISRIGGING BY MAINT PERS. BOTH OCCUPANTS RECD FATAL INJ. BOTH OCCUPANTS SUSTAINED MULTIPLE EXTREME IMPACT & BURN INJ. EJT WAS INITIATED BY IP IN REAR CKPT AT 4000 FT, 180 KIAS. THE CMD EJT SEQ ENDED AT ACFT CPY DEPARTURE. INVEST REVLD THAT EJT INITIATION HAD NOT BEEN ATTEMPTED BY STUD - FRONT CKPT. THE MISRIGGED SYSTEM WOULD NOT HAVE PREVENTED A NORMAL EJT SEQ IF IT HAD BEEN INITATED FROM FRONT CKPT. THE MISRIGGING CONSISTED OF THE INTERLOCK ACTUATOR EYE & INTERLOCK STOP BEING UNSCREWED 3/8 IN FROM ITS NORMAL POSITION. IN THIS CONDITION THE INTERLOCK PISTON WAS NOT IN THE FULLY EXTENDED POSIT, (CON'T IN RECORD REFERENCE NUMBER 1390)

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

CLEARLY IDENTIFIED MAINTENANCE PROBLEM, SUFFICIENTLY EXPLAINED. AS DEMONSTRATED IN THIS FATAL MISHAP WE CANNOT DEPEND ON AIRCREW UNDERTAKING STEPS NECESSARY TO OVERCOME SYSTEM FAILURE WHATEVER THEIR CAUSATION. THE STUDENT PILOT UNDOUBTEDLY HAD BEEN TOLD BY IP THAT THE IP WAS INITIATING EJECTION AND WHEN CANOPY DEPARTED WAITED FOR HIS SEAT TO FIRE. THE IP, DUE TO THE MAINTENANCE ERROR, HAD NO OPTIONS FOR FIRING HIS OWN SEAT AND WITH CANOPY JETTISONED UNDOUBTEDLY COULD NOT COMMUNICATE WITH THE STUDENT PILOT DUE TO NOISE FROM WIND ENTERING OPEN COCKPITS AND PERHAPS STUDENT PILOT REACTION TO EMERGENCY.

AD-A134 834 AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE 45
USAGE DATA ANALYSES VO..(U) NAVAL WEAPONS ENGINEERING
SUPPORT ACTIVITY WASHINGTON DC C W STOKES ET AL.
UNCLASSIFIED 05 NOV 83 NAVWESA-1-83-VOL-2 F/G 1/3 NL





MICROCOPY RESOLUTION TEST CHART

RID: ############ Ref. Number: 1390 A/C: TA004J Seat: Escapac 1C-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 5 Description: Seat failed to operate/actuate

Equip. Factors	Code	Description	Factor	Phs
	0301	Gloves, Flying(MIL-G-81188) fire resista	Prevented/minimized injury	A
			Other (specify)	A

Extract from Mishap Narrative Synopsis Describing Maintenance Error

(CON'T FROM RECORD REFERENCE NUMBER 1339) BUT WAS ALMOST FULLY RETRACTED, THUS NOT ALLOWING THE INTERLOCK STOP TO TRAVEL SUFFICIENTLY TO ALLOW ACTUATION OF THE CATAPULT INITIATOR FIRING CRANK. THE SYS HAD BEEN MISRIGGED BY A MAINT MAN WHO HAD MISTAKENLY CONCLUDED THAT THE INTERLOCK PISTON WAS IN ITS FULLY EXTENDED POSIT, EVEN THOUGH ORANGE/YELLOW STRIPE INDICATING PROPER POSIT WAS NOT VISABLE AT THE INSPECTION HOLE. CONSEQUENTLY HE UNSCREWED THE INTERLOCK STOP SUFFICIENTLY TO MAKE THE ORANGE/YELLOW STRIPE VISABLE.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

SEE COMMENTS CASE REFERENCE NUMBER 1339

RID: ############ Ref. Number: 1431 A/C: F014A Seat: Martin-Baker MK GRU7A Injury Class.: G Ejt. Envelope: In

Seat/Parachute Function---> Code: 1 Description: Seat and parachute functioned properly during ejec

Equip. Factors	Code	Description	Factor	Phs
	1201	A-13A	Design deficiency	T
	1303	Robertshaw Fulton, mini-reg	Material deficiency	A
	1814	URT-33	Not available-supply problem	T
	1902	Signal light, strobe SDU-5/E	Maintenance/Installation error	T

Extract from Mishap Narrative Synopsis Describing Maintenance Error

ON INSP HIS STROBE LIGHT WAS FOUND TO BE INOPERABLE DUE TO MAINT ERROR.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

STROBE LIGHTS REPEATEDLY HAVE PROVEN TO BE THAT CRITICAL ELEMENT BY WHICH SEARCHERS LOCATE THE DOWNED AVIATOR TO EFFECT HIS RESCUE.

12/13/13 Maintenance Errors Degrading or Capable of having Degraded Ejectee Safety Data from 1/69-12/79
Program: MAINERPT (Extracts from MOR/FSR Data Page 55

RID: ############ Ref. Number: 1476 A/C: TA004J Seat: Escapac 1G-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 8 Description: Seat failed to operate/actuate

Equip. Factors	Code	Description	Factor	Phs
	0603	APH-6C Helmet	Lost	A
			Damaged-major	A
			Equipment problem (loss, failure, etc.) A factor	A
	1201	A-13A	Improper use (other)	T
			Lost	A
			Equipment problem (loss, failure, etc.) A factor	A
	2503	Torso garment MA-2	Release/disconnect difficulty	E
			Injury hampered use	E
			Water hampered use	E

--- Extract from Mishap Narrative Synopsis Describing Maintenance Error ---

FLAMEOUT OCCURRED AT 2M FT, PLT ATTEMPTED TO EJT AND REPT THAT SEAT DID NOT FIRE. ACFT MADE A FLARED WINGS LVL LDG IN WATER OF BAYOU OFF APPR END OF RWY. AFTER WATER IMPACT ACFT INVERTED & IMPACTED BOTTOM AT DEPTH OF APPROX 15 FT. CPY FELL OFF ON IMPACT. FRONT EJT SEAT BROKE LOOSE FROM DEMOLISHED CKPT & CAME TO REST ON BOTTOM STILL CONNECTED TO CONSOLE BY O2 CORD. PLT RECD INJS ON IMPACT BUT THEY WERE NOT FATAL. DEATH WAS CAUSED BY DROWNING. WHEN PLT PULLED BOTH FACE CURTAIN & LOWER EJT HANDLE BUT CPY FAILED TO LEAVE ACFT. THIS INTERRUPTED EJT SEQ & PREV SEAT FROM LEAVING ACFT. INVES REVLD EJT SEQ HAD BEEN INITIATED BY BOTH FACE CURTAIN & LOWER HANDLE. THE MK-13 THRUSTERS HAD FAILED UNLOCKING CPY. GAS WAS ROUTED TO MK-73 FIRING HEAD ASSY BUT FIRING PIN DID NOT STRIKE CARTRIDGE BECAUSE FIRING HEAD ASSY HAD BEEN INCORRECTLY INSTALLED - DISTANCE BETWEEN FIRING HEAD ASSY & CPY REMOVER SHAFT FLANGE WAS 1/8 INCH MORE THAN THE REQUIRED MAX OF 5 INCHES. THUS PLT WAS UNABLE TO JETTISON CPY VIA CPY CONTROL HANDLE OR EMERG CPY JETTISON SYS. ON IMPACT ACFT INVERTED & CAME TO REST IN 15 FT WATER AND THE UNLOCKED CPY FELL OFF ON IMPACT

--- Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors ---

CLEAR EVIDENCE OF MAINTENANCE ERROR IN ADJUSTING CANOPY JETTISONING SYSTEM ELEMENTS. DUE TO METAL STRUCTURAL MEMBER RUNNING FORE-AND-AFT ON CENTERLINE OF CANOPY, THROUGH-THE-CANOPY EJECTION IS NOT FEASIBLE. AGAIN, AS INDICATED IN CASE REFERENCE NUMBER 15[illegible], SIMULTANEOUS INITIATION OF CANOPY JETTISONING AND SEAT CATAPULT FIRING IS TOO HAZARDOUS. THEREFORE CANOPY MUST SEPARATE AND ITS LANYARD ACTIVATE THE FIRING LANYARD INTERRUPT MECHANISM TO PERMIT PULLING INITIATING CATAPULT DOFFLY.

RID: ############ Ref. Number: 1632 A/C: A004M Seat: Escapac 1G-3 Injury Class.: A Ejt. Envelope: In

Seat/Parachute Function---> Code: 3 Description: Seat failed to operate/actuate

Equip. Factors	Code	Description	Factor	Phs

-------> No Equipment Factors Found <-------

Extract from Mishap Narrative Synopsis Describing Maintenance Error

ACFT EXPER INFLT FIRE. PLT ATTEMPTED TO EJT. EJT SEAT FAILED TO OPERATE. PLT ELECTED TO LAN ON DESERT FLOOR. AFTER 600-700 FT OF ROLL OUT, ACFT FLIPPED INVERTED & WAS IMMED ENGULFED IN FLAMES. PLT SUFFERED FATAL INJ. PLT PULLED BOTH FC & LEH IN FUTILE ATTEMP TO EJT. CPY JETTISONED BUT SEAT FAILED TO FIRE. CAUSE OF SEAT FAILURE WAS FAIL OF MAINT PERS TO CONNECT THE QUICKIE CONNECTION, A SWAGED BALL CABLE CONNECT, WHICH IS PULLED BY THE CPY WHEN IT IS JETTISONED & SUBSEQUENTLY ACTUATES EJT SEAT FIRING MECHANISM. THE QUICKIE CONNECTION IS ALSO A PREFLT ITEM FOR BOTH THE PLT & PLAN CAPT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

UNLESS THE CANOPY LANYARD TO THE SEAT IS CONNECTED AND FUNCTIONS, THERE IS NO WAY TO FIRE THE SEAT. THROUGH-THE-CANOPY EJECTION IN A-4 SERIES AIRCRAFT HAS BEEN INFEASIBLE DUE TO THE EARLY DESIGN OF THE CANOPY WITH SEVERAL PIECES CONNECTED BY STRUCTURAL METAL FRAME. CANOPY JETTISONING AND SEAT CATAPULT FIRING CANNOT BE SIMULTANEOUSLY INITIATED DUE TO THE RISK OF A FAST MOVING SEAT COLLIDING WITH A SLOW MOVING CANOPY AND INVOLVING SERIOUS OR FATAL INJURIES TO THE EJECTEE AND/OR SERIOUS DAMAGE LEADING TO SEAT MALFUNCTION AND INJURY OR DEATH OF THE EJECTEE.

RIO: ############ Ref. Number: 1727 A/C: F014A Seat: Martin-Baker MK GRU7A Injury Class.: L Ejt. Envelope: In

Seat/Parachute Function---> Code: A Description: Seat operated partially

Equip. Factors	Code	Description	Factor	Phs
	2633	NES-14A	Failed to operate (radio, actuator, etc.)	E
			Equipment problem (loss, failure, etc.) A factor	E

Extract from Mishap Narrative Synopsis Describing Maintenance Error

PLT & RIO EJT AT FLT DK LVL, APPROX 5 KTS. BOTH INITIATED EJT APPEARED NORMAL. RIO FEET CONTACTED GLARE SHIELD. HE TRAVELLED UPWARD IN SEAT, STABILIZED BY DROGUE CHUTE TO APPROX 60 FT ABOVE FLT DK. DURING DESCENT HIS PERSONNEL PRCHT STREAMED BUT FAILED TO OPEN. SEAT/MAN SEPARATION DID NOT OCCUR. HE IMPACTED WATER NEAR VERTICAL, SITTING UPRIGHT IN SEAT. SEAT/MAN SLOWLY SANK, REMAINING VISIBLE BENEATH WATER 10-15 SECS. RIO WAS NOT OBSERVED TO MOVE. PLT'S TRAJECTORY & HEIGHT WAS SIMILAR TO RIO'S. HE HAD SEAT SEPARATION & PRCHT DEPLOYMENT AT APEX OF TRAJECTORY. HE DEPLOYED LR-1 & LPA PRIOR TO WATER ENTRY. HE WAS ABLE TO BREATH THRU MASK WHILE SUBMERGED & WAS DRAGGED APPROX 20 FEET PRIOR TO RELEASING PRCHT.

Notes and Comments Concerning Seriousness/Consequences of Maintenance Errors

EJECTION, AS DEMONTRATED BY PILOT'S EJECTION, APPEARED WELL WITHIN SYSTEM CAPABILITY, ESPECIALLY SINCE HEIGHT ABOVE WATER WOULD HAVE BEEN BETWEEN APPROXIMATELY 120 TO 140 FT. STRONGLY SUSPECT IMPROPER PARACHUTE RIGGING PROBLEM CAUSING PARACHUTE STREAMER AND THEREFORE NON-SEPARATION OF MAN AND SEAT. WITH MORE ALTITUDE, RIO MIGHT HAVE OVERCOME THE PROBLEM BY PUSHING SEAT AWAY AND SHAKING PARACHUTE. IT IS CLEAR HOWEVER, FROM WITNESSES, DESCRIPTION THAT ALL MECHANICAL PARTS OF SEAT APPEARED TO HAVE FUNCTIONED CORRECTLY IN SEQUENCE.

APPENDIX C

FAULT TREE "BAD ITEM OUT THE GATE", DRAWING NUMBERS 838AS162-01 THROUGH 838AS162-88

CARTRIDGES

CARTRIDGE ACTUATED DEVICES

FAULT TREE ANALYSIS

Prepared for:

NAVAL ORDNANCE STATION
Indian Head, Maryland

Contract No. N00174-79-C-0452

SOS — SPACE ORDNANCE SYSTEMS — 25977 SAND CANYON ROAD, CANYON COUNTRY, CALIFORNIA 91351

CARTRIDGES

CARTRIDGE ACTUATED DEVICES

Fault Tree Analysis

Prepared for:

NAVAL ORDNANCE STATION
Indian Head, Maryland

Contract No. N00174-79-C-0452

Prepared by:

Space Ordnance Systems
TransTechnology Corporation
25977 Sand Canyon Road, Canyon Country, California 91351

TABLE OF CONTENTS

ILLUSTRATIONS

-oOo-

SUMMARY

FAULT TREE ANALYSIS -- REASONS FOR DELIVERY OF UNSERVICEABLE ORDNANCE DEVICES

This booklet contains a fault tree analysis of the reasons unacceptable cartridges and cartridge actuated devices (CADs) may be built and delivered to the Government. The fault tree has been deduced from the top level undesired event specified in the NOS Indian Head contract statement of work:

BAD ITEM OUT THE GATE

The fault analysis addresses the internal operations of a typical ordnance supplier developing and producing pyrotechnic and explosive devices for military and aerospace applications. The events in the in-house life cycle of these products are identified and traced to root causes of faults/failures. The events are deduced down to the primary faults/failures along logical networks of interconnected events. The logic chains are interconnected by digital logic -- AND and OR gates.

The fault analysis has been prepared by Space Ordnance Systems Division, TransTechnology Corporation, Canyon Country, Calif : NOS/Indian Head Contract No. N00174-79-C-0452, dated 28 September 1 9. Technical direction for the project was provided by NOS/Indian Head Code 5121G, Vic Fredette Jr., Senior Data Manager.

-oOo-

STATEMENT OF WORK

The NOS/Indian Head Contract No. N00174-79-C-0452 statement of work is reproduced below:

STATEMENT OF WORK

The contractor shall review the below enumerated items and such other items as the contractor deems necessary and shall develop a Fault Tree Chart, for Bad Item Out the Gate, which visually/descriptively outlines reasons for unacceptable cartridges/Cartridge Actuated Devices (CADs) being built and delivered to the Government. This chart shall be prepared in a format similar to the example provided (SK600113). The following specific efforts shall be performed by the contractor.

Review Actions

The contractor shall:

A. Review his raw material procurement procedures.

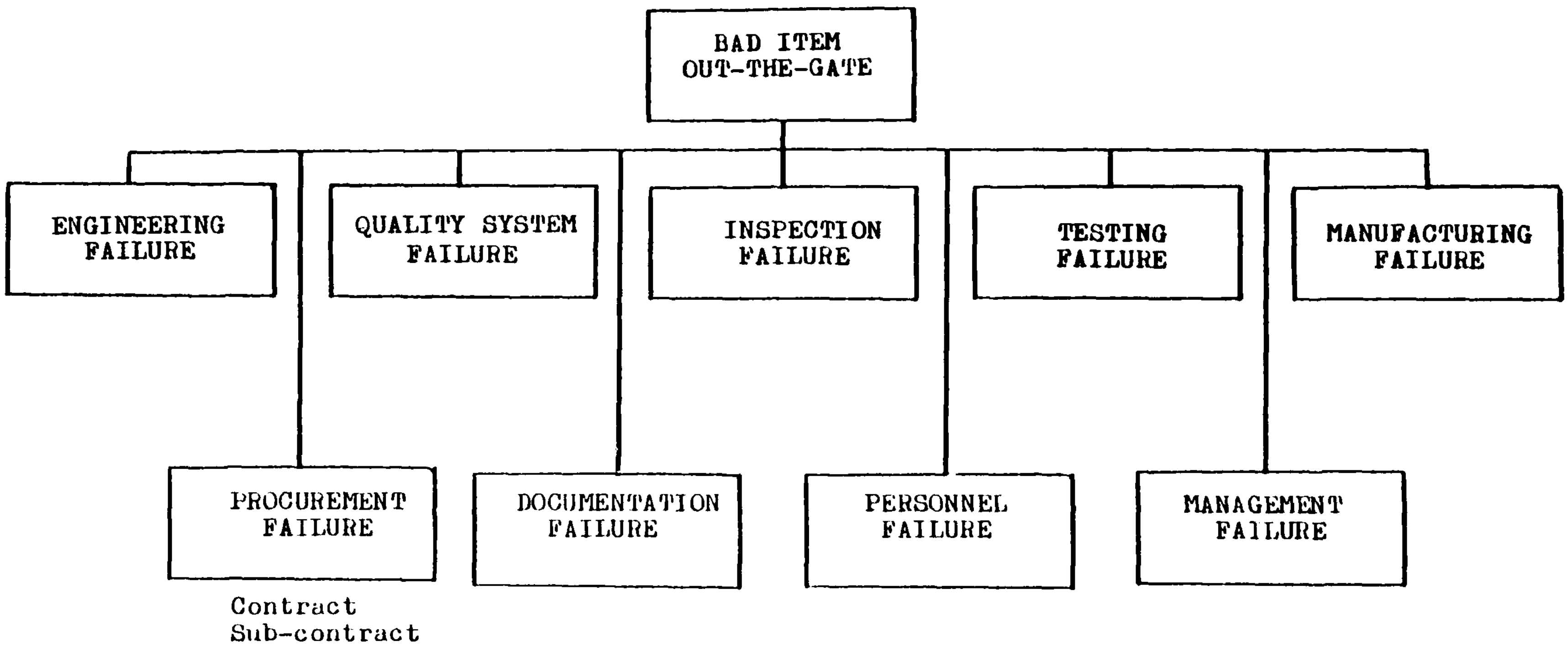
B. Review his sub-contracting procedures.

C. Review his cartridge/CAD Quality Control/Quality Assurance plans and procedures.

D. Review his cartridge/CAD *Manufacturing/Safety procedures.*

E. Review his cartridges/CAD Packaging/Delivery plans and procedures.

In developing the Fault Tree Chart required by the Statement of Work, Space Ordnance Systems analyzed the activities shown in Figure 1.



<u>Elements Affecting Ordnance Faults</u>

- Product Design (Performance, Reliability, Maintainability, Serviceability, Producibility)
- Components & Materials (Qualification for Application)
- Item Construction (Assembly, Processes/Operations, Inspectability, Complexity)
- Information & Data (Specs, Dwgs -- Quality/Availability/Usability)
- Personnel (Experience, Skills, Dependability)
- Plant Capability/Capacity (Workload/Schedule -- Tooling/Test Equip Suitability/Avail'ity)
- Supplier's Experience With Item and History of the Item
- Management Philosophy/Capability

FAULT TREE ANALYSIS -- ACTIVITIES ANALYZED

Figure 1

FAULT TREE ORGANIZATION

The original fault tree is depicted on 88 mylar drawings of C-size (17 x 22 inch) bearing NOS/Indian Head titleblocks with drawing number 838A8162-01 through -88. For convenience, the originals have been reduced to A-size (8½ x 11 inch) film positive reproducibles furnished to NOS as the deliverable data item under the contract. This booklet provides a reference to the originals/reproducibles and explains the organization and logic of the fault tree development.

TOP LEVEL UNDESIRED EVENT

The top level undesired event defined by NOS/Indian Head for the fault analysis is:

BAD ITEM OUT THE GATE

This event summarizes the situations where unserviceable ordnance items -- cartridges or cartridge actuated devices -- are produced and shipped by an ordnance supplier, either advertently or inadvertently.

The fault tree deduced down from the top level undesired event traces the trail of probable faults, events, normal/abnormal conditions, situations and decisions which may occur to cause the top undesired event.

SCOPE OF THE FAULT ANALYSIS

The analysis looks at the performance of developing, testing, producing, inspecting and managing the "*system*" from which precision explosive/pyrotechnic devices are procured by the Government -- in effect the precision ordnance business.

The analysis addresses the business model as it exists. The analysis does not consider alternatives to improve the existing system by either administrative or technical means. Neither does the analysis consider alternatives to supplant the existing system with any different one.

In common with all businesses dealing with the Government, the ordnance business is impacted by many external stimuli of very stressful sorts. The stimuli are also dynamic as the increasing intervention of governmental bodies at all levels from national to local adds complexity to business operations and in some cases serves to make successful performance more difficult. The socio-economic and environmental considerations (laws) are examples. Figure 2 shows the external stimuli.

Some of the logic paths terminate in *primary* faults of the basic human values, with suggestion that root causes are the general decaying of Christian morals, loss of the Yankee work ethic, diminished individual pride, degeneration of group esprit, general malaise of today's youth, and so on. These have been mentioned without pursuing the philosophical roots which might produce these faults.

SCOPE OF THE FAULT ANALYSIS

The analysis has covered the normal and nominal events occurring in the usual cycle of procurement of a cartridge or cartridge actuated device from a vendor by the Government or one of its prime contractors.

OBJECTIVES OF THE FAULT TREE ANALYSIS

The fault analysis objectives were:

(1) Deduce the logical chains of events/faults down to root causes from the top lvel undesired event.

(2) Identify systematically all possible modes of occurrence of the top undesired event.

(3) Provide a clear and demonstrable record of the analytical process of deduction by successive deduction along the tree branches.

(4) Express the fault logic qualitatively but in digital logic methodology.

(5) Provide a baseline for evaluation of existing or planned ordnance development and production operations.

(6) Provide a reference model to assess outcome/consequences of changes in the system or introduction of procedural alternatives.

(7) Identify the critical single-point failures in the system.

(8) Indicate by the logic train the relative sensitivity of critical faults.

Although the networks and logic branches flow through digital AND/OR gating, the analysis presents only a qualitative view of the bad product problem.

OBJECTIVES OF THE FAULT TREE ANALYSIS cont'd

No quantitative weighting has been given to the faults. Assignments of primary fault rate (lambda) and fault duration time (tau) have not been made. Thus, numerical processings for risk assignments (tau-lambda, kinetic tree theory, etc.) are not within the scope of this work.

The Ordnance Fault Tree does provide visibility to identify critical junctures in the system. The logic gates identify these. OR gates are the "bad" ones since any one of the events below the gate can cause the fault/failure above the gate. AND gates are "good" because all the events inputting the gate must occur to cause the fault/failure above the gate.

Remedial actions to improve the system can be based on changes to the events/faults along the critical paths of single-point failures -- that is, the continuous chains of OR gates. The fault tree provides the diagnostic analyst with clues for breaking OR-gate chains by introducing AND gates, thereby requiring redundant failures to occur rather than single-point failures if the gate event is to occur.

FAULT TREE DEFINITIONS

Fault is a state of existence, not necessarily a failure, that contributes to a possible mode of occurrence of an undesired event. Any event that does not contribute to a possible mode of occurrence of the undesired event is not a "fault" for inclusion.

FAULT TREE DEFINITIONS

FAULT cont'd

In defining the fault there are only two states:

ON -- element has failed or is operating inadvertently
OFF -- element operating normally

There are no partial faults. They are total -- present or not present in the scheme. System faults may return from ON to OFF because of remedial action, another fault, a normal event or other factors. The time a system element is ON is the Fault Duration Time (FDT) for fault events and Event Duration Time (EDT) for normal events. FDT & EDT are not indicated in this analysis.

FAILURE

A failure is the ultimate fault for the item under consideration. There are three kinds:

(1) Primary -- failure due to inherent characteristics of the element.
(2) Secondary -- failure due to excessive environmental or operational stresses. This can be caused by primary or secondary failure of another component or element.
(3) Command -- Inadvertent operation due to failure of a control element or failure of the system due to a normal operation being commanded at the wrong time.

2.326

FAILURE cont'd

In real life there are partial failures. A partial failure could change the severity of the top undesired event or induce an entirely different sequence. In the fault tree logic there is no partial failure. To preserve the digital nature of the event, each failure is cleanly and clearly complete, "perfect."

EVENT

A dynamic change of state occurring in the system is an event. An undesired event is an abnormal function, intended function not achieved, or an unintended function obtained. A normal event is an intended function occurring as designated. Some failures require that one of the inputs be an normal event for the undesired event to occur.

The top undesired event is the focus of the analysis. This is the accident, gross malfunction, operational failure or safety hazard that invalidates the system purpose. The accidental launch of a missile, crash of an airplane or the shipment of an unserviceable cartridge/CAD. The statement of the top undesired event sets the scope of the fault analysis.

PRIMARY CAUSES

These are the terminal events at the end of the logic branches which state the lowest reason for a fault. This is the limit of resolution of the fault analysis.

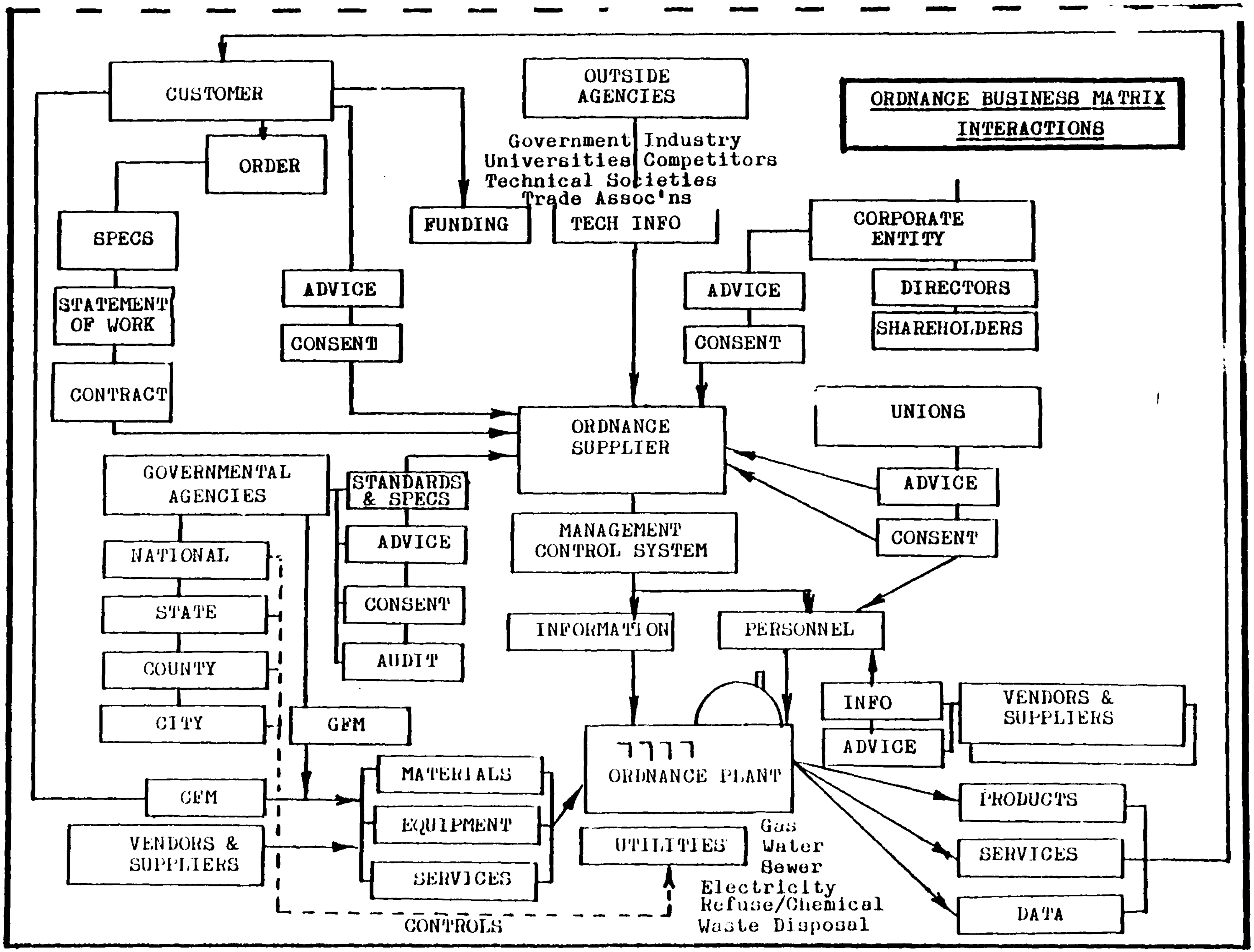

ORDNANCE BUSINESS MATRIX INTERACTIONS
CUSTOMER
ORDER
SPECS
STATEMENT OF WORK
CONTRACT
ADVICE
CONSENT
FUNDING
OUTSIDE AGENCIES
Government Industry
Universities Competitors
Technical Societies
Trade Assoc'ns
TECH INFO
CORPORATE ENTITY
DIRECTORS
SHAREHOLDERS
ADVICE
CONSENT
UNIONS
ADVICE
CONSENT
ORDNANCE SUPPLIER
GOVERNMENTAL AGENCIES
NATIONAL
STATE
COUNTY
CITY
STANDARDS & SPECS
ADVICE
CONSENT
AUDIT
MANAGEMENT CONTROL SYSTEM
INFORMATION
PERSONNEL
INFO
ADVICE
VENDORS & SUPPLIERS
GFM
GFM
VENDORS & SUPPLIERS
MATERIALS
EQUIPMENT
SERVICES
ORDNANCE PLANT
UTILITIES
Gas
Water
Sewer
Electricity
Refuse/Chemical
Waste Disposal
PRODUCTS
SERVICES
DATA
CONTROLS

Figure 2

-10

NATURE OF THE ORDNANCE BUSINESS

Suppliers of ordnance specialty devices are typically small businesses. Their make-or-buy pattern emphasizes use of many sub-tier vendors and suppliers to provide the MIL-STD materials, components and services required in ordnance work. With heavy dependence on outside suppliers, ordnance houses are sensitive to inflation. Material prices and outside service costs are a substantial portion of work costs. These costs rise completely outside the control of the ordnance house. The only factor wholly within control of ordnance management is wages. The industry typically pays low. A minimum of high skill (high wage) labor is maintained. Good people drift away to higher pay. The main workforce is the untrained, not previously employed worker. The typical ordnance assembler is in his first job.

The Government has not been helpful to the business environment. Enacted laws call for ever *more mandatory actions in* socio-economic areas while inflation fighting programs seek cost reductions. To comply with the proliferating Government requirements, each prime contractor issues his own contract verbiage expressed in phraseology and technical language familiar to his experience and concerns. The literature of boilerplate and specifications on generalities issued by the Government and prime contractors have grown in parallel, with every prime ballooning his own reflective library. Big business (and the Government) can afford individual specialists (or perhaps many) on one subject. Small businesses do not assign personnel on an integer basis -- i.e., one man-one job. Few people carry many functions. The competitive situation requires non-integer assignments. The contract verbiage is overwhelming. A typical ordnance house will have several scores of on-going contracts with perhaps almost that many different customers. Paper reading for compliance is a heavy load. It is hard to be familiar with all that is issued.

NATURE OF ORDNANCE BUSINESS

Ordnance products have an elastic demand curve. The work is highly cyclic. Typically, each house has a sustaining base of proprietary and sole-source (or limited source) items to keep alive. A variety of other jobs are pursued and obtained based on highly competitive marketing/procurement/pricing activities. Future workload is obtained by shaving profit margins. Problems are seldom bid into the job. The bid is based on everything staying on the optimum critical paths of time and money.

Future workload by type is not easy to forecast with accuracy. Long-term plans change frequently in the wash of jobs actually received. Every house has a relatively constant capture ratio in bids and proposals work. If X-number are bid, Y-number in percent are obtained. To keep the plant busy, X-number are bid. Occasionally, more work than can be handled is obtained.

Ordnance work is typically "job shop" with many different short-term jobs always in flux, under development, with heavy front-ends, then short production runs. The plants usually have a large number of small jobs rather than a few large volume ones. The short runs tend to be problem filled. By the time the problems are solved, the run is over. Always the urgent deadlines demand shipment at the soonest time. The same types of problems seem to repeat for reasons that are not easy to explain in specific detail in each case. The general reason is quite clear: long-term solutions cost money, and ordnance houses, like the Governement, are cost conscious. Money is spent only for essentials. Facilities, tooling and test equipment are designed-to-cost. Operations are tailored in the same mode. Figure 3 shows the sequence of events in a typical ordnance development and production job.

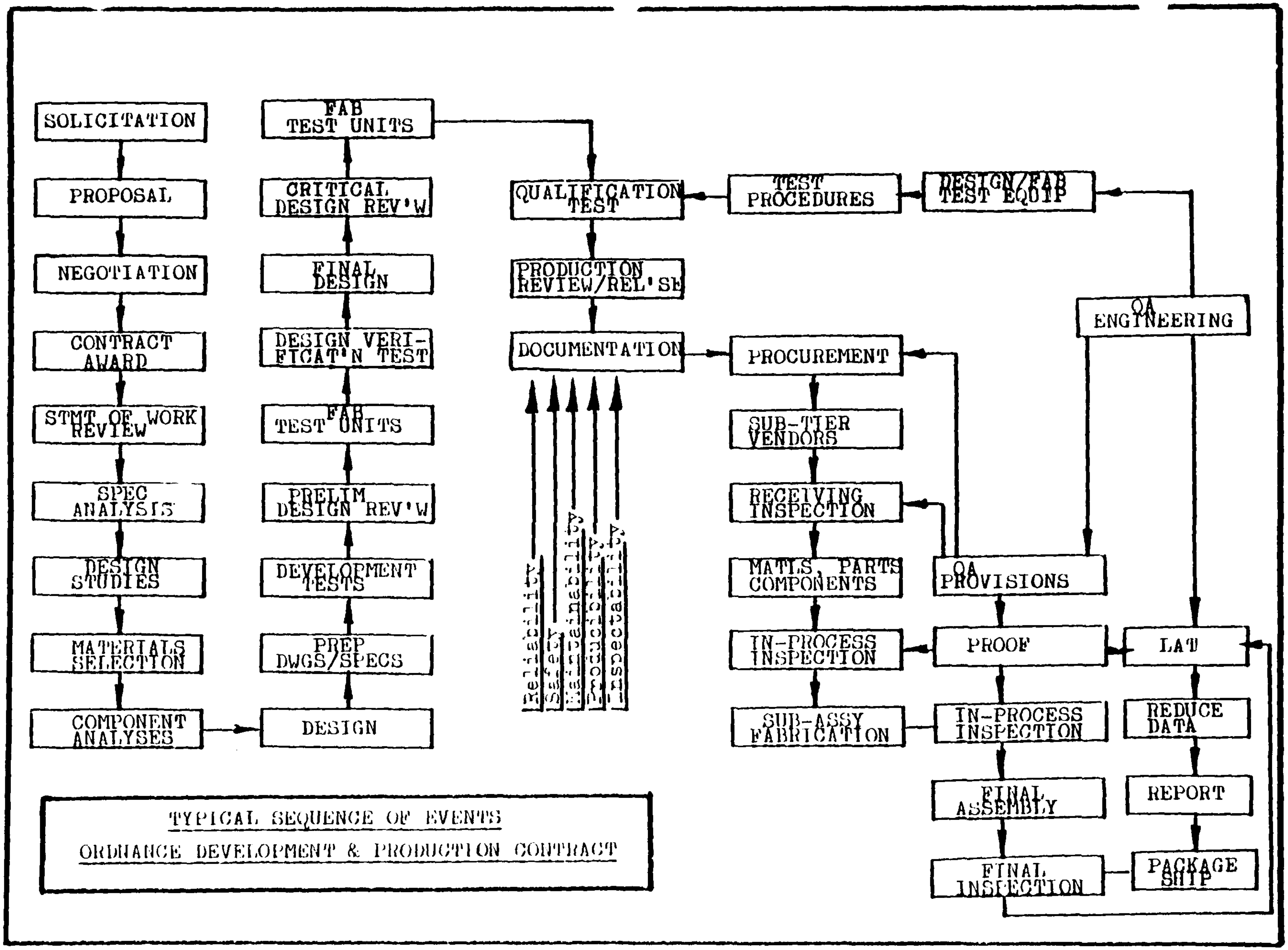

SOLICITATION
PROPOSAL
NEGOTIATION
CONTRACT AWARD
STMT OF WORK REVIEW
SPEC ANALYSIS
DESIGN STUDIES
MATERIALS SELECTION
COMPONENT ANALYSES
FAB TEST UNITS
CRITICAL DESIGN REV'W
FINAL DESIGN
DESIGN VERI-FICAT'N TEST
FAB TEST UNITS
PRELIM DESIGN REV'W
DEVELOPMENT TESTS
PREP DWGS/SPECS
DESIGN
QUALIFICATION TEST
PRODUCTION REVIEW/REL'SE
DOCUMENTATION
Reliability
Safety
Maintainability
Producibility
Inspectability
TEST PROCEDURES
DESIGN/FAB TEST EQUIP
QA ENGINEERING
PROCUREMENT
SUB-TIER VENDORS
RECEIVING INSPECTION
MATLS, PARTS COMPONENTS
IN-PROCESS INSPECTION
SUB-ASSY FABRICATION
QA PROVISIONS
PROOF
IN-PROCESS INSPECTION
FINAL ASSEMBLY
FINAL INSPECTION
LAT
REDUCE DATA
REPORT
PACKAGE SHIP
TYPICAL SEQUENCE OF EVENTS
ORDNANCE DEVELOPMENT & PRODUCTION CONTRACT

Figure 3

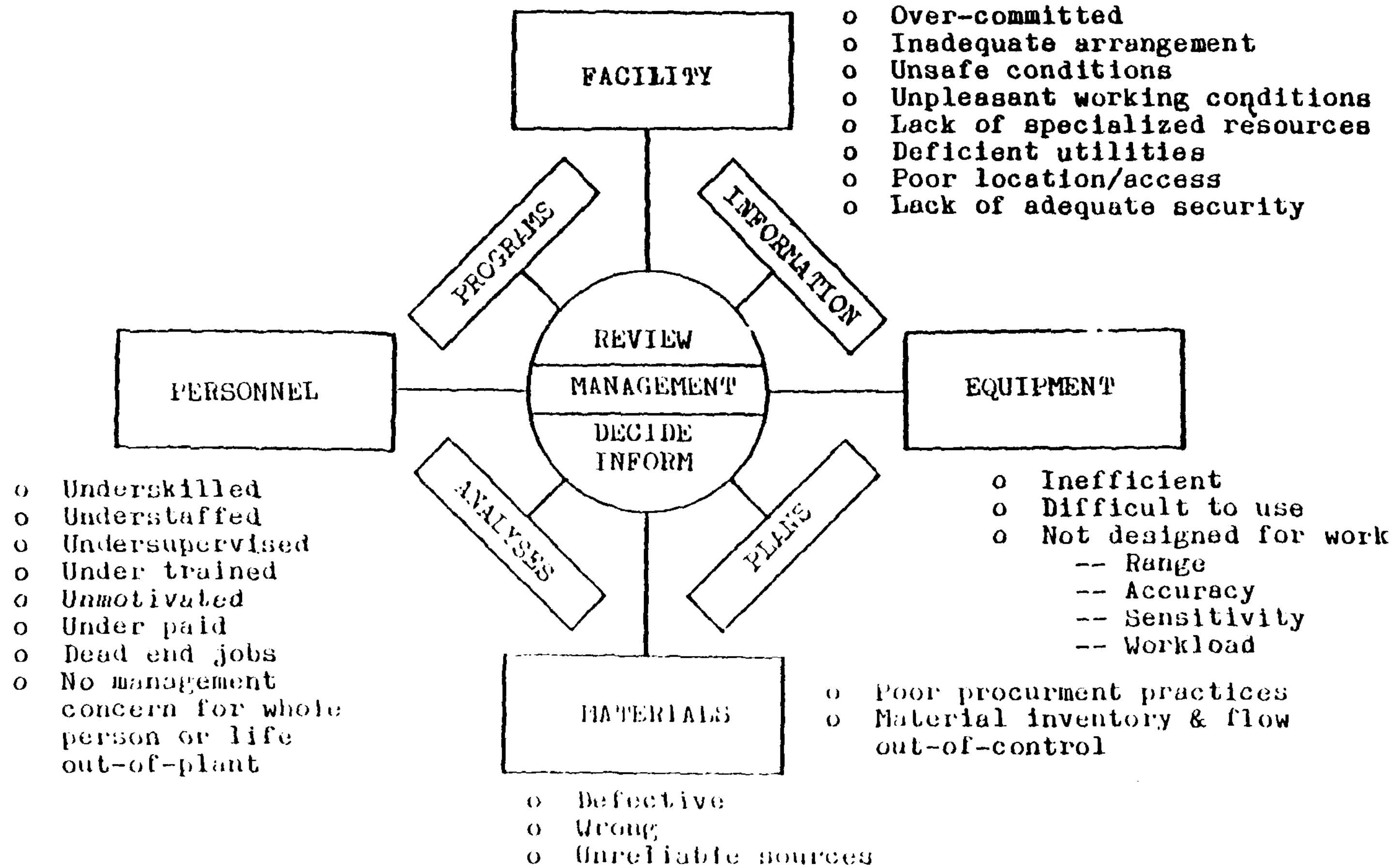
NATURE OF THE ORDNANCE BUSINESS

Success in providing good hardware is easier to define than achieve. Producing good hardware depends on applying skilled people to the tasks at hand at the proper time and for the length of time needed to do things correctly and to check all critical aspects to be sure the product is right. The problem is in resource management. The failure modes all lie in the resources and the way they are used.

Whether the available resources are adequate and adequately managed depends on the character of the company. Figure 4 indicates some of the failure modes/causes in resource management.

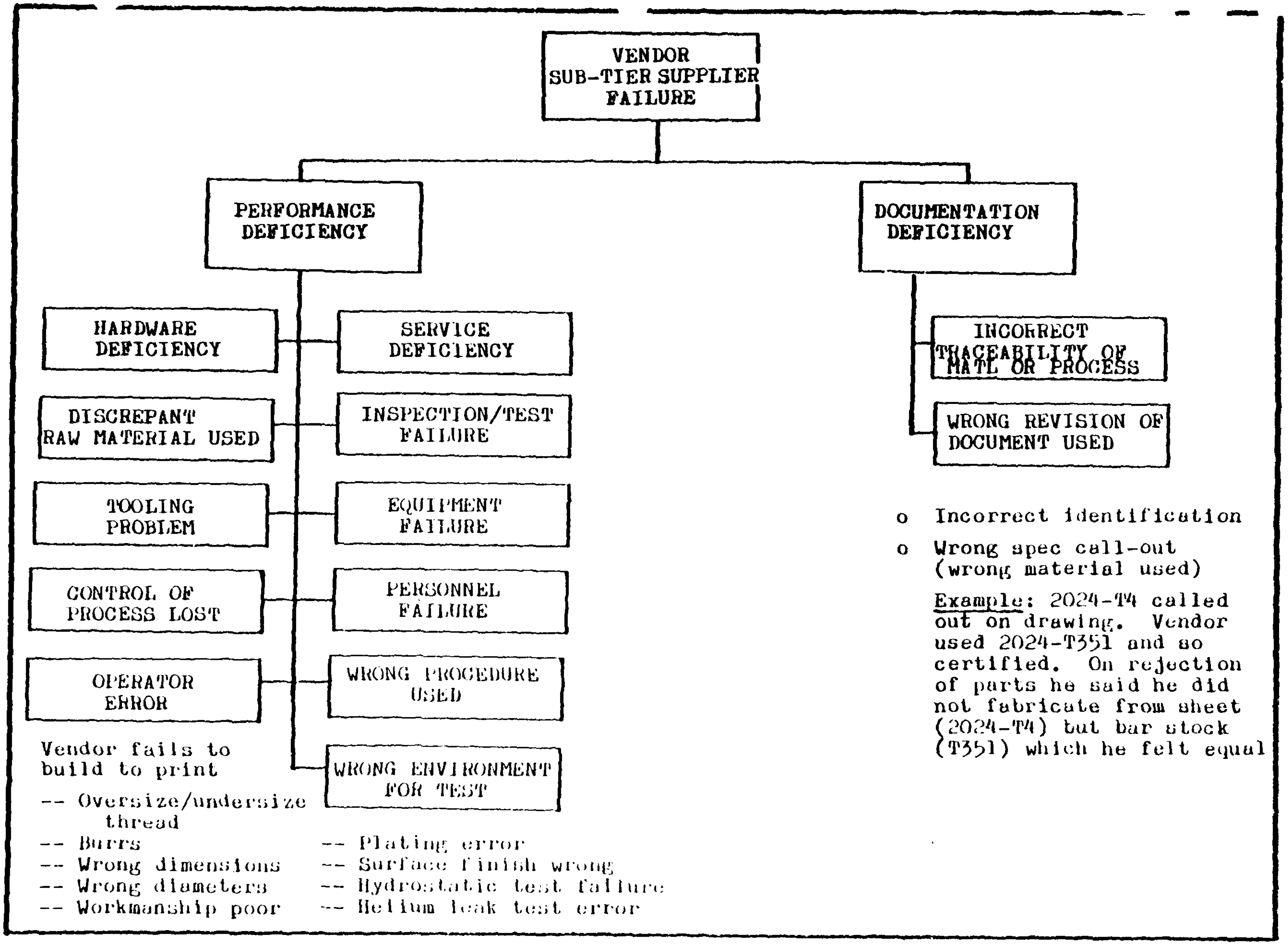
Because ordnance houses rely to a large degree on specialized support from sub-tier vendors/suppliers, control of these sources is important to success in producing good hardware. Causes of sub-tier vendor failures are indicated in Figures 5 & 6.

The ordnance supplier alone is not the single source influencing quality of products. Government, Sub-tier suppliers, the customer and the ordnance house all contribute as shown in Figure 7.



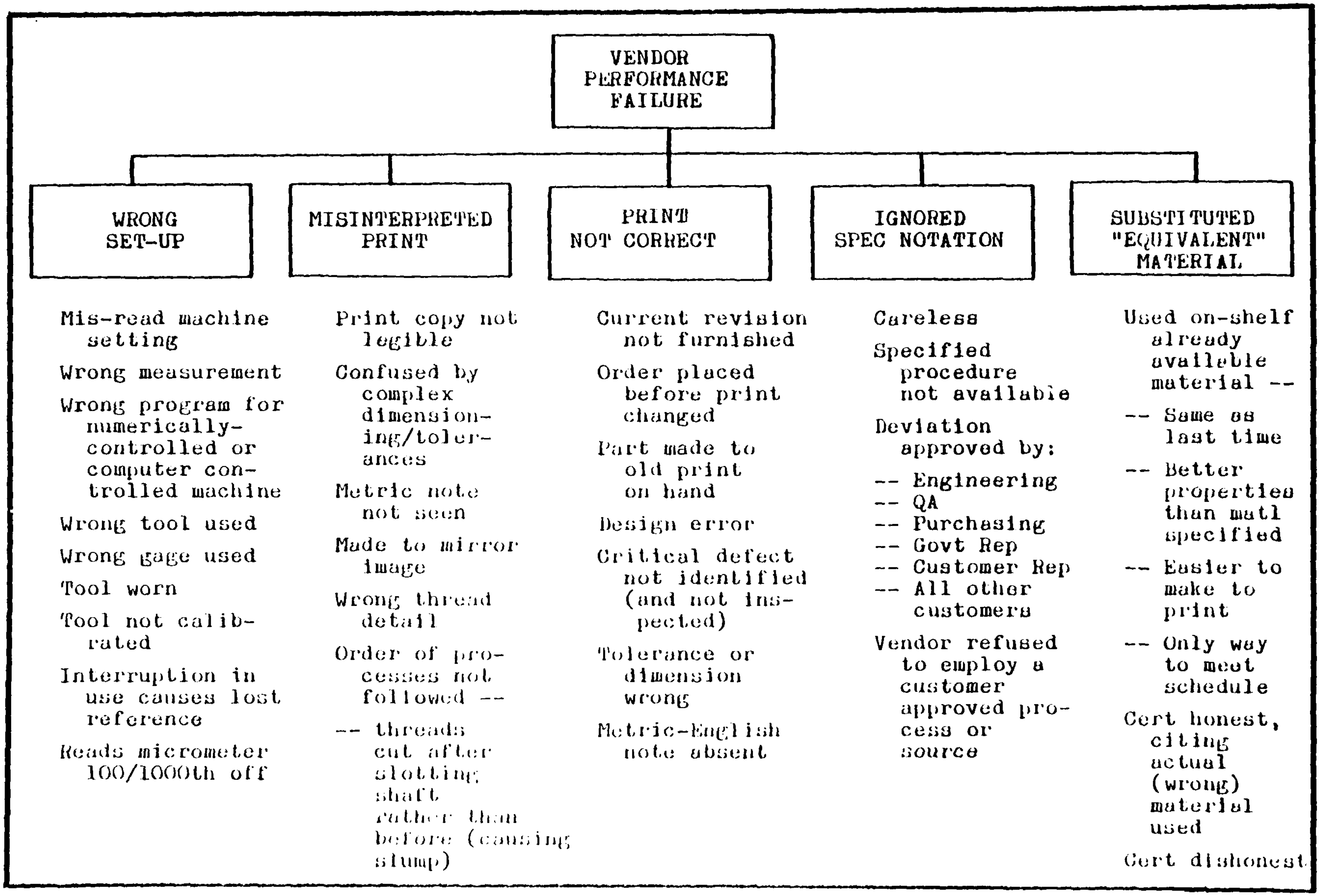
RESOURCE FAILURE MODES/CAUSES

Figure 4



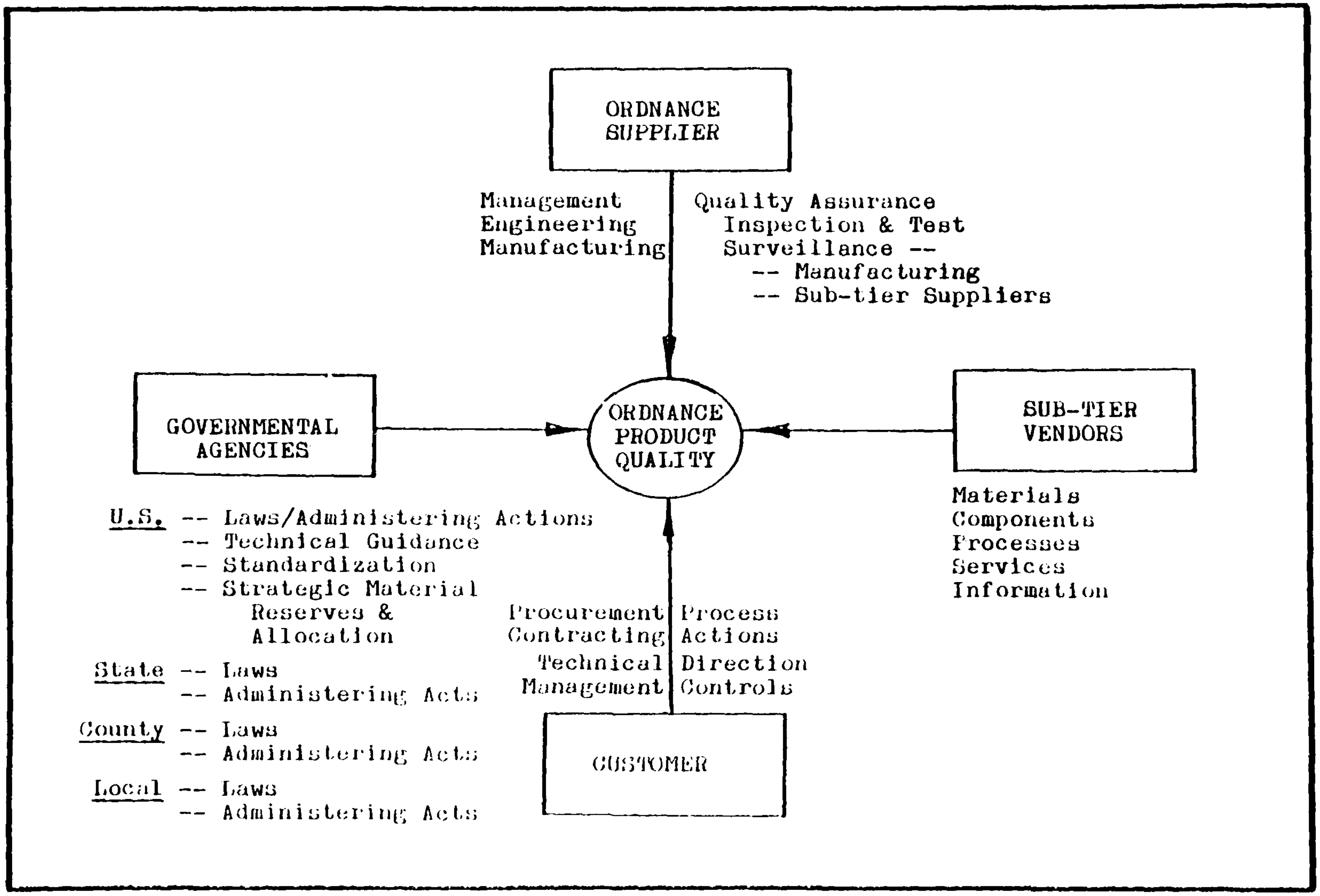
SUB-TIER VENDOR FAULTS & CAUSES

Figure 5



VENDOR PERFORMANCE FAILURES

Figure 6



AGENCIES INFLUENCING QUALITY

Figure 7

DEFINITION OF "BAD ITEM"

There are two varieties of "bad" hardware:

- Item deficient in actual use
- Item discrepant to contract requirements

Not always is the contractually specified item (or the item which is able to meet the contract specifications) sufficient for the intended use. Many technical specifications are written by cut-and-paste artistry which leaves some vestiges of possibly unrelated requirements from the original document used as the source. Some information included may not really be required or may be more stressful or restrictive than actually required (or too loose). Bad hardware, discrepant to the contract requirements, may actually be serviceable in the intended application. Certainly, in most instances, however it will not. To make this analysis, the customer's information should be susceptible to the same errors/omissions as that of the supplier. This is particularly so if the system requirement is in evolution.

In this fault analysis the possible errors include the fault that the customer specification does not fully define the actual need (specification error or omission). This possibility is only incidental and included for completeness, not as a frequent or probable fault causing bad hardware to be shipped. In practice, the customer's paper is considered "perfect" until proven otherwise. At these times a request for change is made to restore perfection.

DEFINITION OF "BAD ITEM" cont'd

Good (serviceable) hardware of the wrong part number or dash number can be unusable and therefore "bad." It is also possible that the correct item is defective or even that the wrong item is shipped and it is also defective. It is possible that an item fully meeting contract requirements is "bad" because the requirements have changed but the technical data (contractually required data) have not been amended, or that they have been amended wrongly. There may be conflict in documents, one to another, which involve performance, configuration, approved material, customer-furnished part. Interface problems involving other system components may make an otherwise "good" item deficient, defective or even unsafe.

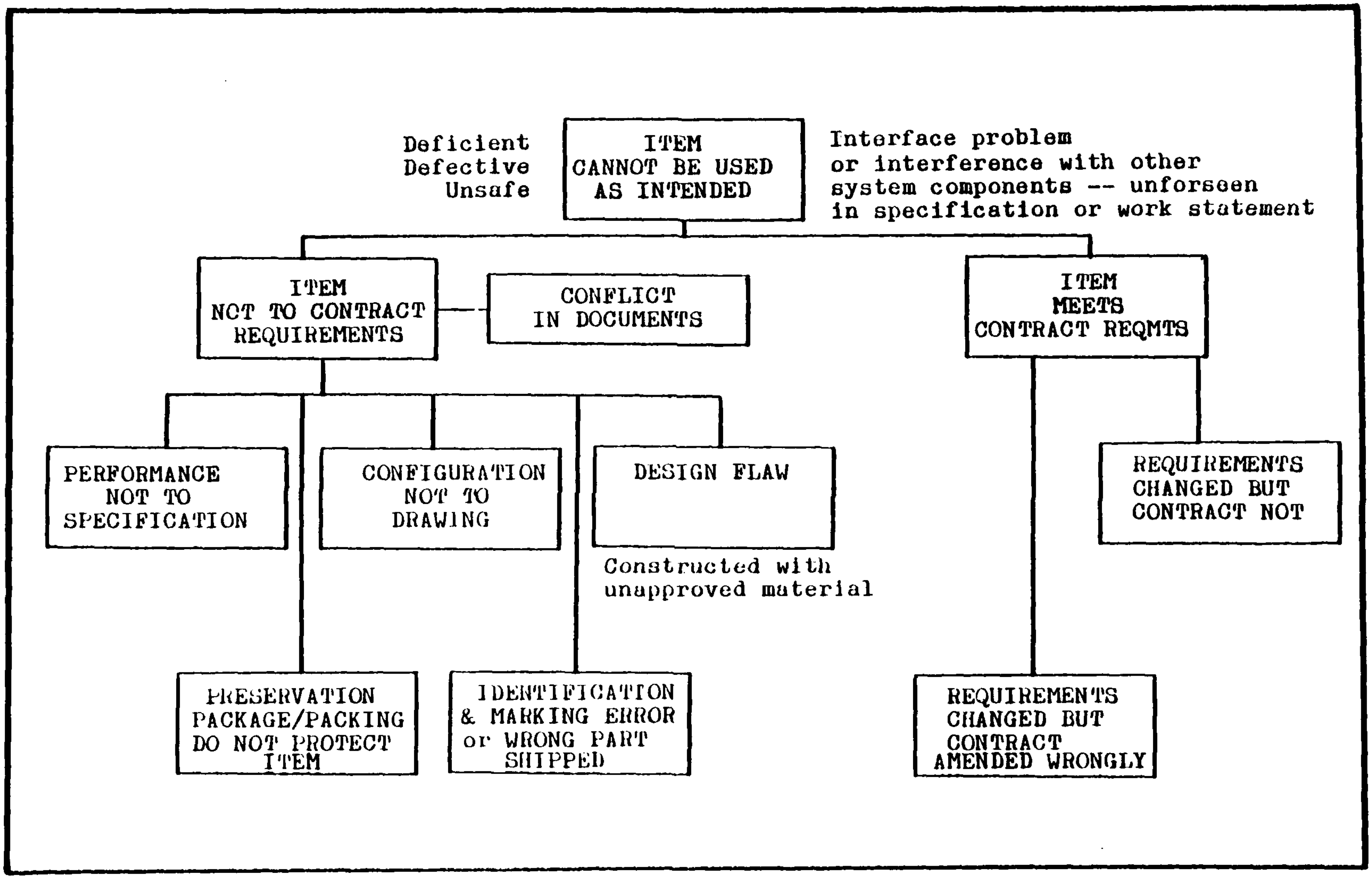
Fundamentally, there are two reasons for an item to be deficient for intended use (i.e. "bad"):

(1) Performance Inadequacy

- o Input/output out-of-tolerance
- o Service life cycle too short
- o Safety problem
- o Unplanned maintenance needed
- o Calibration out

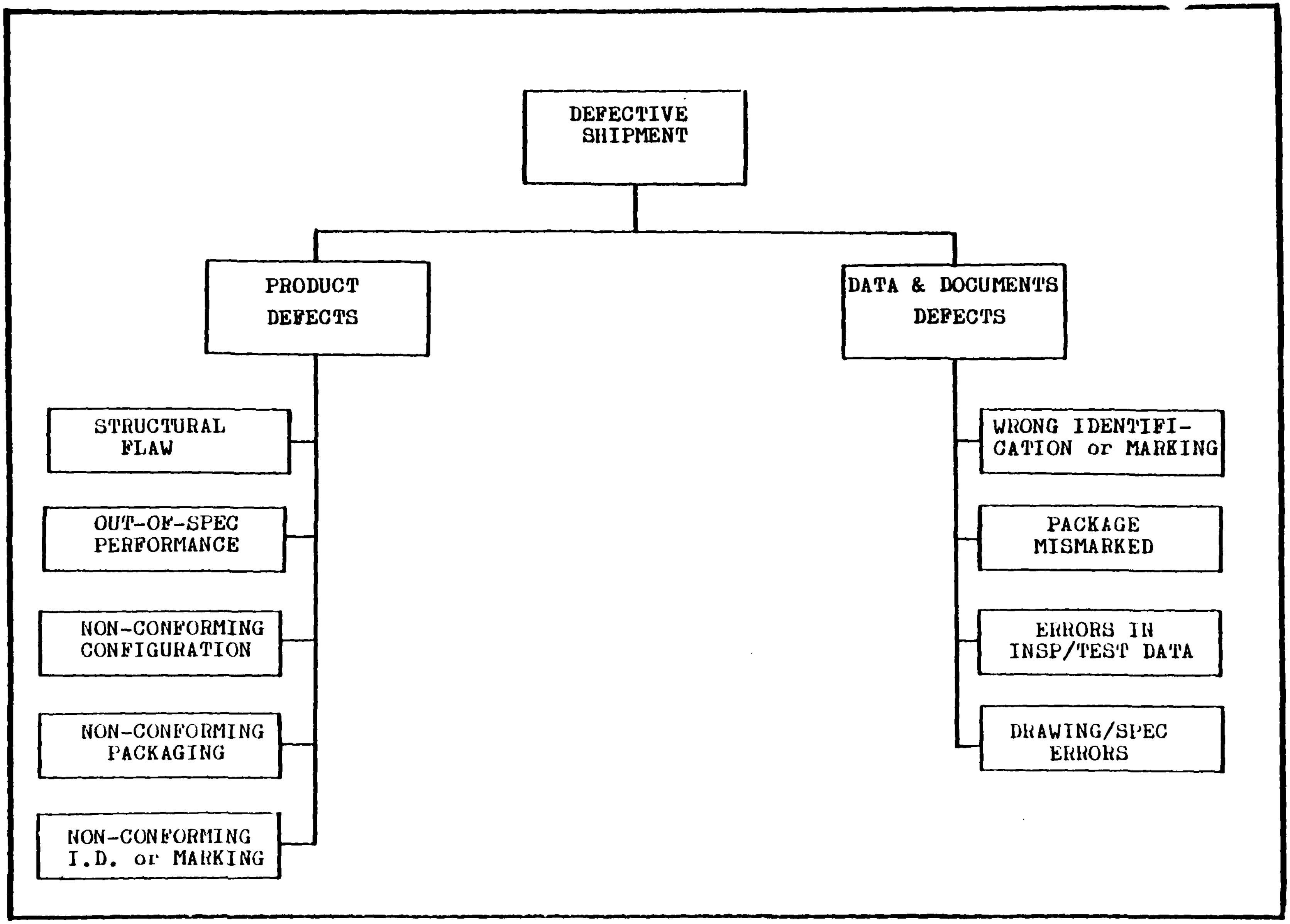
(2) Physical Deficiency

- o Configuration wrong
- o Weight/balance problem
- o Mounting or interface mismatch
- o Structural/material flaw



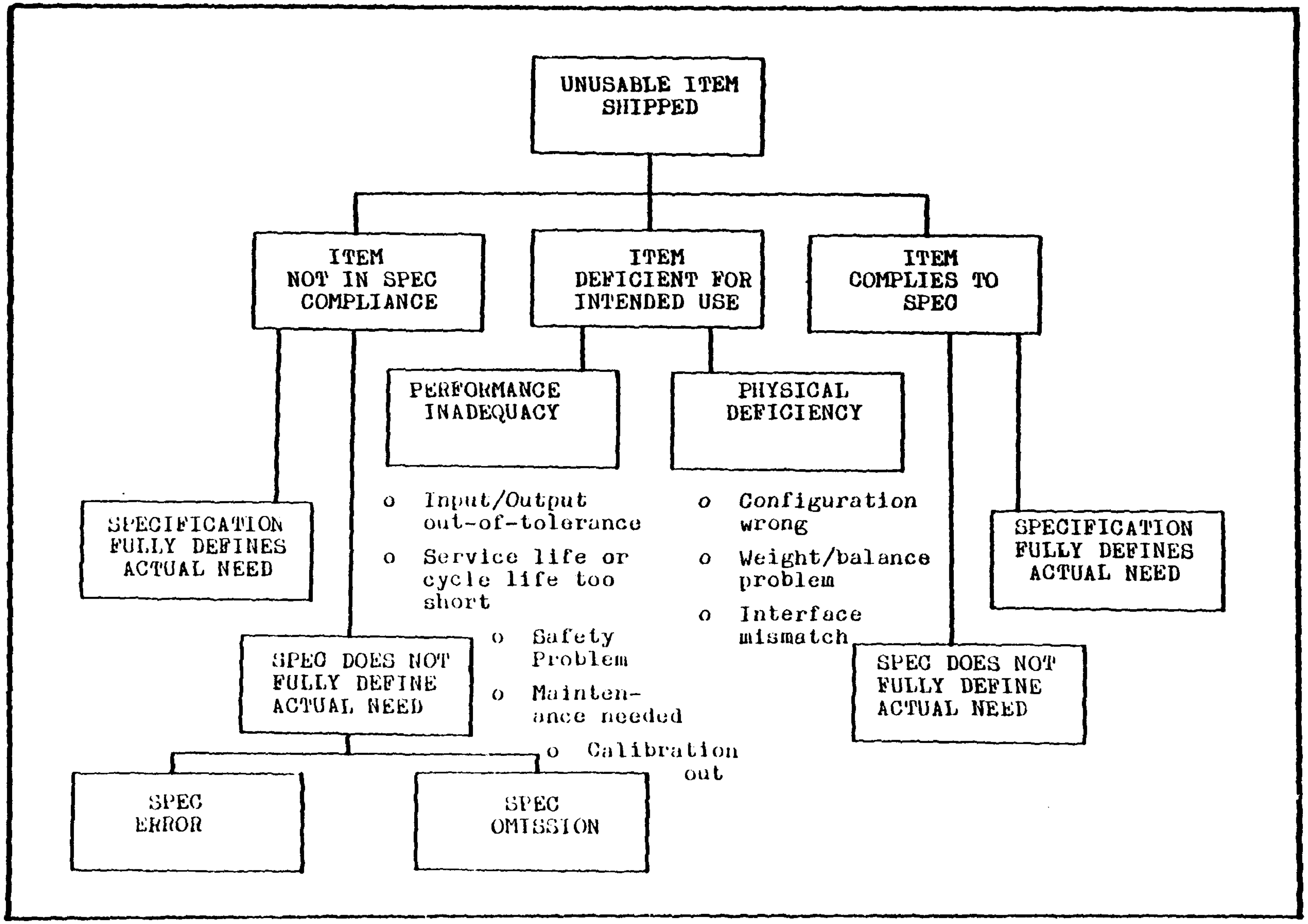
<u>UNUSABLE ITEM</u>

Figure 8



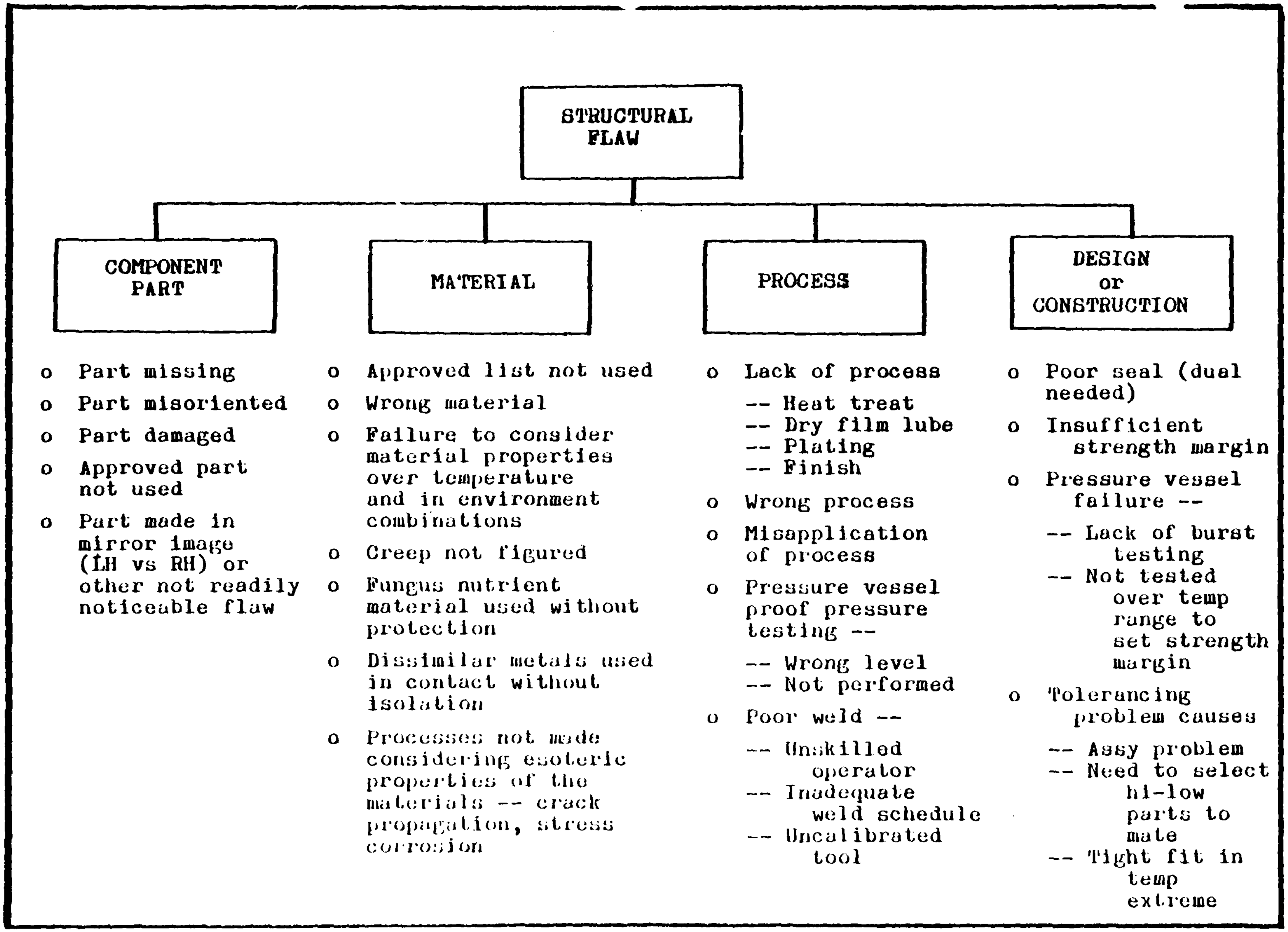
<u>ITEM SHIPMENT MAY BE DEFECTIVE IN HARDWARE/SOFTWARE</u>

Figure 9



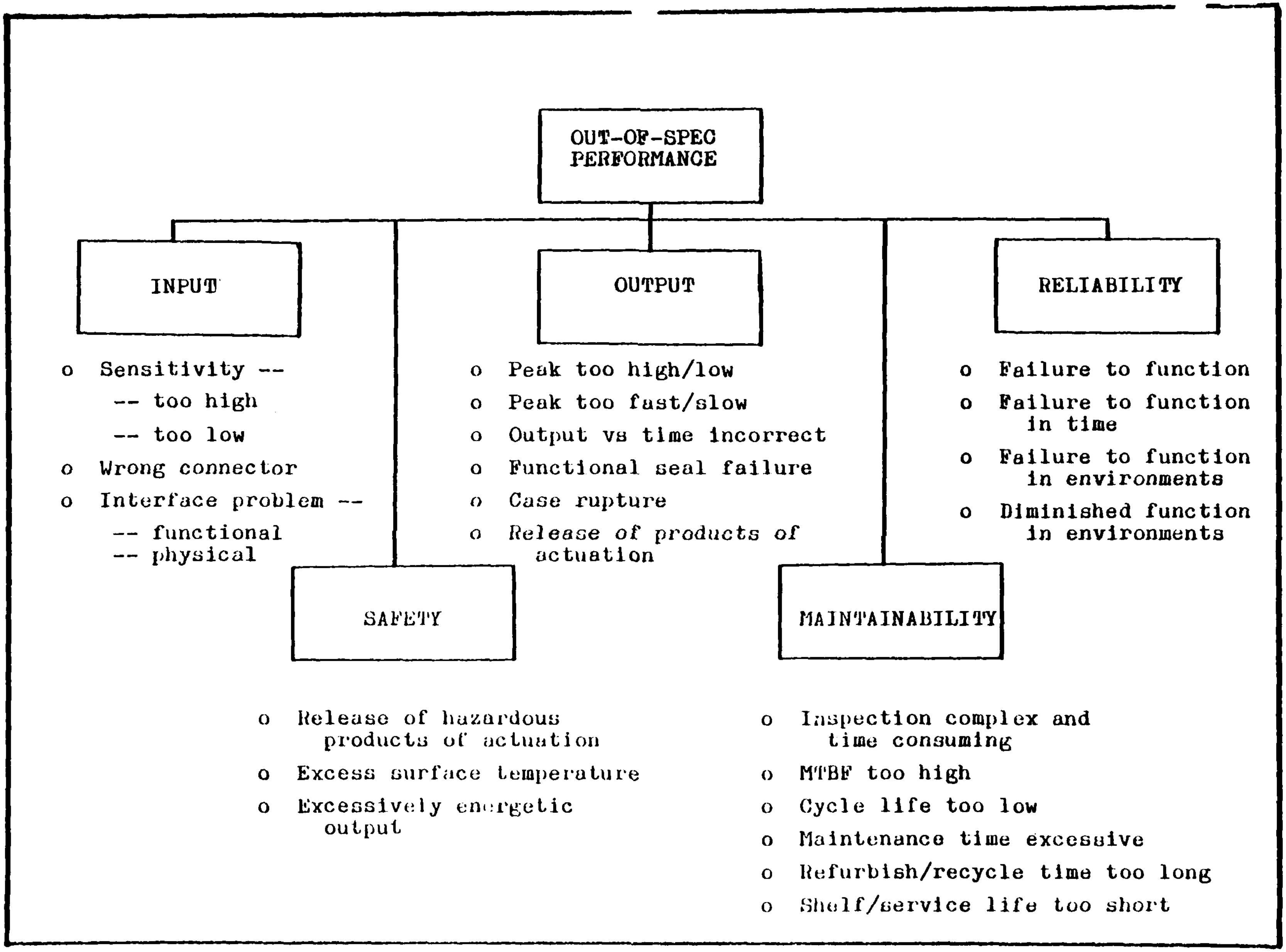
<u>ITEM FAULTS IN SPECIFICATION COMPLIANCE</u>

Figure 10



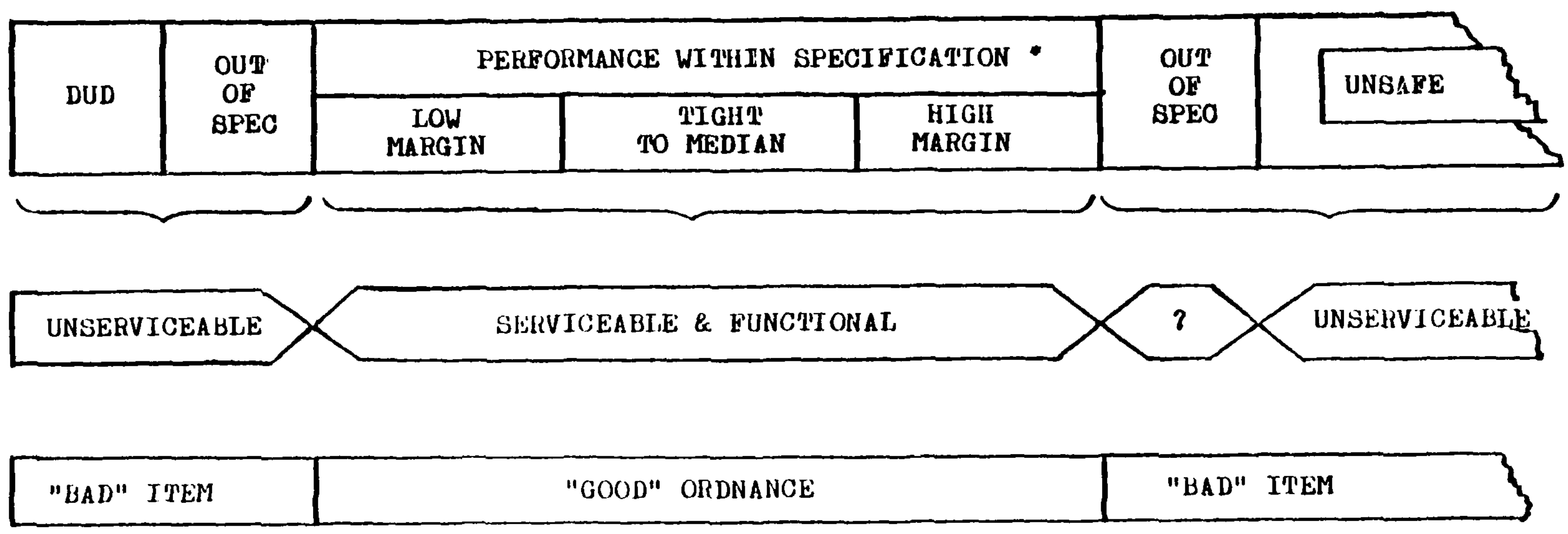
CAUSES/TYPES OF STRUCTURAL FLAWS

Figure 11



PERFORMANCE FAULTS

Figure 12



* Assumes specification is "perfect" in defining fully the performance required in actual use

ORDNANCE ITEM PERFORMANCE SPECTRUM

Figure 15

NON-CONFORMING CONFIGURATION

MATING PROBLEM

- Wrong location of mounting provisions
- Wrong size of mounting provisions
- Wrong configuration of mounting provisions
- Connector mismatch
- Connector pin assignment wrong
- Lockwire provision missing
- Incorrect thread details

CRITICAL DIMENSION OUT-OF-TOLERANCE

- Envelope exceeded
- Interface conflict
- Inability to assemble to next unit
- Output interference
- Inability to secure
- Leakage between parts
- Environmental seal lost
- Actuation engagement out-of-tolerance
- Damaged

WEIGHT BALANCE OUT-OF-TOLERANCE

- Moment of interia
- Weight too heavy
- Center of gravity
- Rotational balance problem
- Static balance problem
- Weight too light, requiring addition of ballast

POOR WORKMANSHIP

- Burrs
- Rough surface prevents proper assembly to next unit
- Sharp edges present hazards
- Metal chips offer contaminating element
- Lack of radii and stress relief provisions induce crack propagation
- Poor finishes and coatings introduce dissimilar metals contact
- Poor application of finish offers corrosion opportunity

CONFIGURATION FAULTS

Figure 14

NON-CONFORMING PACKAGING

WRONG LEVEL

- Specified package not provided
- Pre-used unit package no longer authorized
- Re-usable type container now obsolete

COMPONENT OMITTED

- Dunnage
- Heat-seal
- Desiccant
- Humidity indicator
- Can seal
- Opening key

WRONG D.O.T. SHIPPING CLASS

- Class not obtained (operator assumes class)
- Documentation error or change in product invalidates class assignment originally obtained
- Wrong label selected and affixed --
  - -- mix-up in stores
  - -- operator error
- QA document error

PACKAGE MARKING ERROR

- Re-usable container not reconditioned/remarked properly
- Mix-up in shipping as to contents
- Mix-up of QA shipper vs hardware
- Non-current stamp or stencil used
- Marking method causes illegible impression

PACKAGING FAULTS

Figure 15

IDENTIFICATION & MARKING INCORRECT

WRONG DATA

- Serialization duplication
- Wrong serial numbers assigned to lo
- Powder lot wrong
- Mfg lot number wrong
- Date of manufacture wrong
- Customer part number error
- Supplier code wrong
- Supplier name address or logo change not reflected

WRONG MARKING METHOD

- Dual marking not done
- Metallized label not used (method used not permanent)
- Space for data to be added later not provided
- Wrong color label
- Part not color coded

ILLEGIBLE MARKING

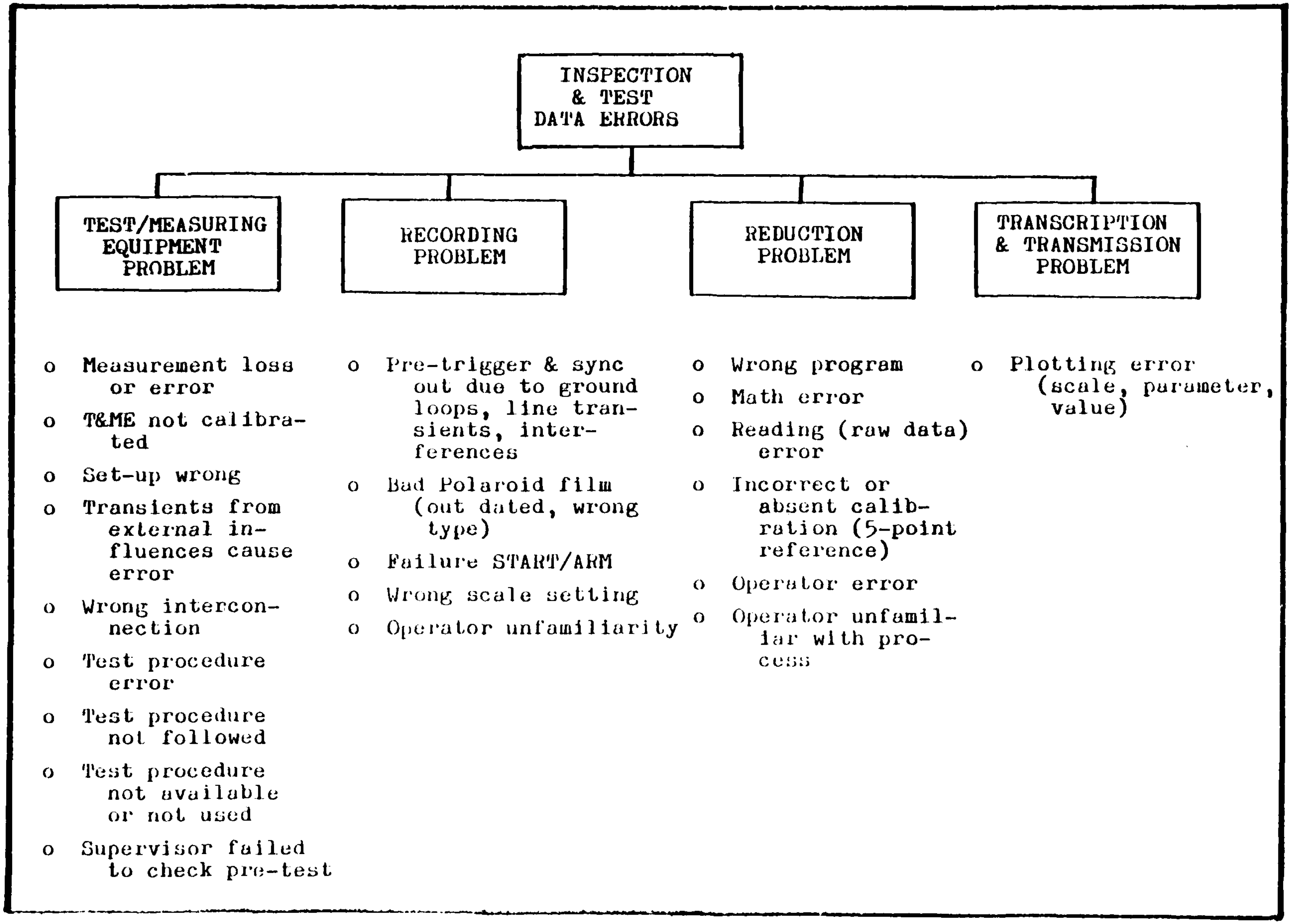
- Silk screen smear
- Use of overcoating obscures data
- Marked in wrong place or on opposite face
- Electro-etch failure --
  - -- Bad stencil
  - -- Bad transfer
  - -- Misaligned

UNSATISFACTORY ADHESION

- Label corners lift
- Peel test failure
- Chemical reaction with finish
- Moisture sensitive adhesive used
- Heat or other environment damages adhesion

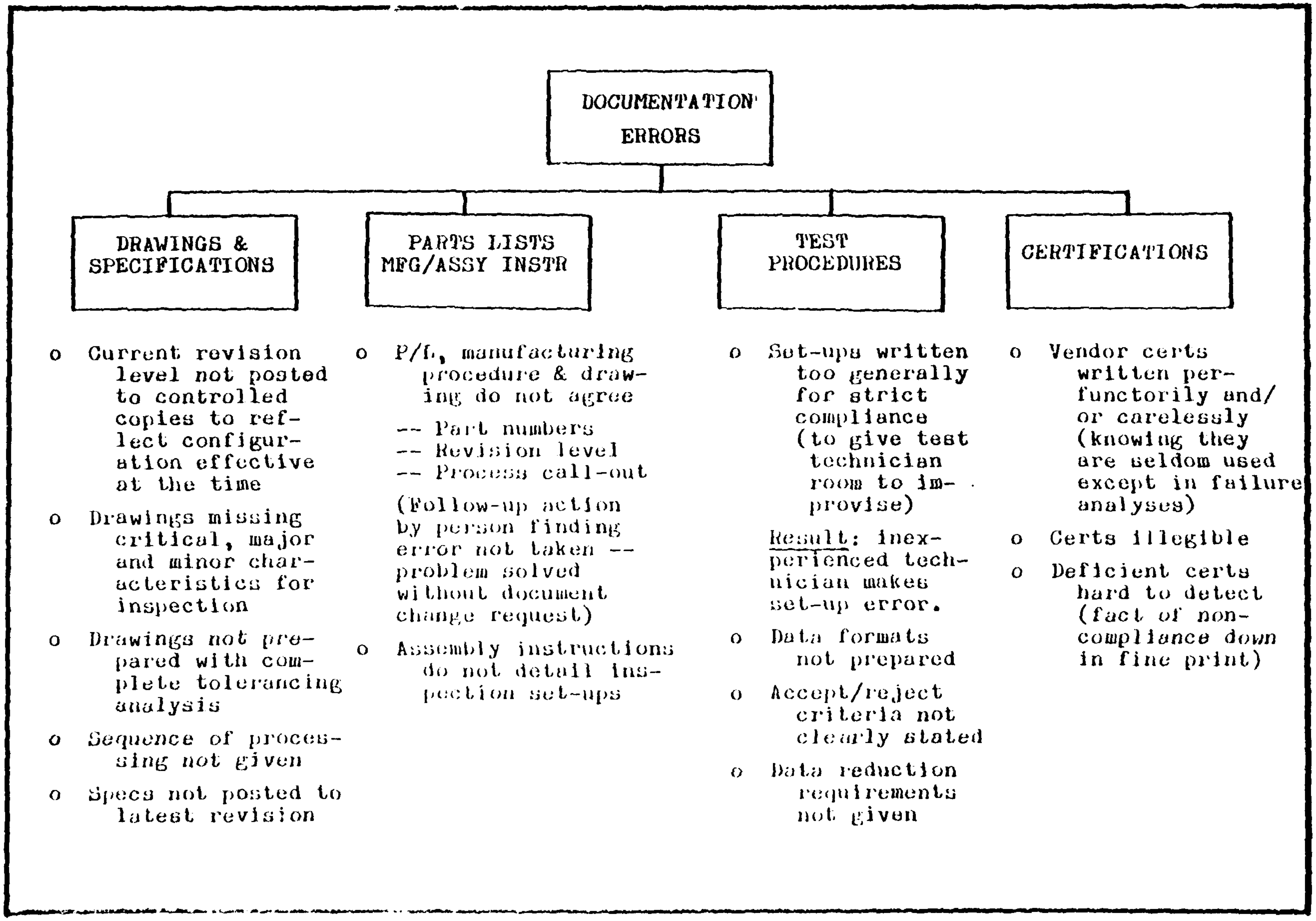
IDENTIFICATION & MARKING FAULTS

Figure 16



INSPECTION/TEST FAULTS CAUSING DATA ERRORS

Figure 17



KINDS/CAUSES OF FAULTY DOCUMENTATION

Figure 18

METHODOLOGY

The Ordnance Fault Tree has been prepared following the general procedure of Air Force Systems Command Design Handbook 1-6 "System Safety," Fourth Edition, Combined Revision 2 & 3, (20 December 1975). Chapter 2, "System Safety Engineering," Section 2-E, "Safety Analyses" presents a methodology for fault tree analysis for use in aerospace accident prevention and post-accident analysis

The Ordnance Fault Tree follows the "system" approach, with the "system" here being the aggregation of situations, operations, organizations, events, influences and forces which act on the ordnance business and within it to cause its ultimate fault -- delivering bad hardware. Or, more explicitly, to deliver a BAD ITEM OUT THE GATE. Components in the system are the elements conceived and carried out by ordnance houses. The elements include: organization, management, personnel, information, plans, actions, external influences, decisions and so on. The Ordnance Fault Tree logic addresses all the resources involved in the ordnance business system and what can go wrong within it.

FAULT TREE SYMBOLOGY

Event Relationships -- Logic Gates

OR Gate -- Logical Union

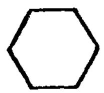
The event above the gate occurs if any one (or more) of the inputs occur.

AND Gate -- Logical Intersection

The event above the gate occurs if all (and only if all) the inputs occur.

Event Relationships -- Logic Gates cont'd

The AND and OR gates are the only gates used in the fault tree analysis. There are several special cases of the AND gates which have individual symbology for convenience:



Hexagon

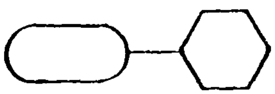
INHIBIT GATE

A one-input AND gate describing a causal relationship between a single fault and another event. Coexistence of the input and the conditional event is required for the output event to occur.

Oval

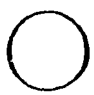
CONDITIONAL INPUT TO INHIBIT GATE

A special *failure mode*, *state* (*normal* or abnormal) or fault which permits the gate fault to occur. It *may* be normal to the system operation or abnormal. The condition is stated in the oval.



INHIBIT GATE + CONDITION

An inhibit gate always appears with the conditional input.



Circle

PRIMARY EVENT

A primary event, failure or primary cause of events representing a basic fault requiring no further development. It is always an input to a logic gate, never an output. The event is defined by a caption in the circle.

FAULT-TREE SYMBOLOGY cont'd

Rectangle

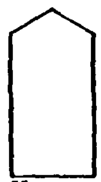
GATE EVENT

Events above the logic gates are dependent on the type of logic gate below and the inputs to the logic gate.
All gate events have a more basic cause. The caption within the symbol explains the event.

Triangle

TRANSFER SYMBOLS

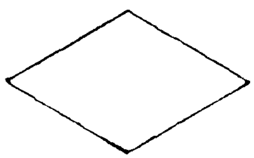
Transfer In:  Transfer Out: 



House

NORMALLY OCCURRING EVENT -- Normal Input to AND Gates

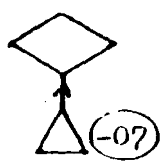
The event must occur (or is expected to occur) because of design and/or normal operating conditions of the element within the system.



Diamond

UNDEVELOPED EVENT

Events not deduced further at this point. These are not primary failures/faults but are not developed further because of a low probability of occurrence, lack of information, or where another separate analysis gives sufficient information.



Undeveloped events which are developed further elsewhere are shown with an input symbol. The dash number in the oval near the input symbol refers to the 838AS162 dash number drawing having more data.

RULES OF CONSTRUCTION

(1) The fault/event is defined by the caption within the symbol.

(2) There are no gate-to-gate relationships -- gates do not connect to gates.

(3) There are no miracles. Those events that would normally occur as a result of the fault/failure will occur, and only those.

(4) Normal system operation can be expected unless there is a fault/failure.

(5) For every input to a gate there is an output. If an input exists, an output exists.

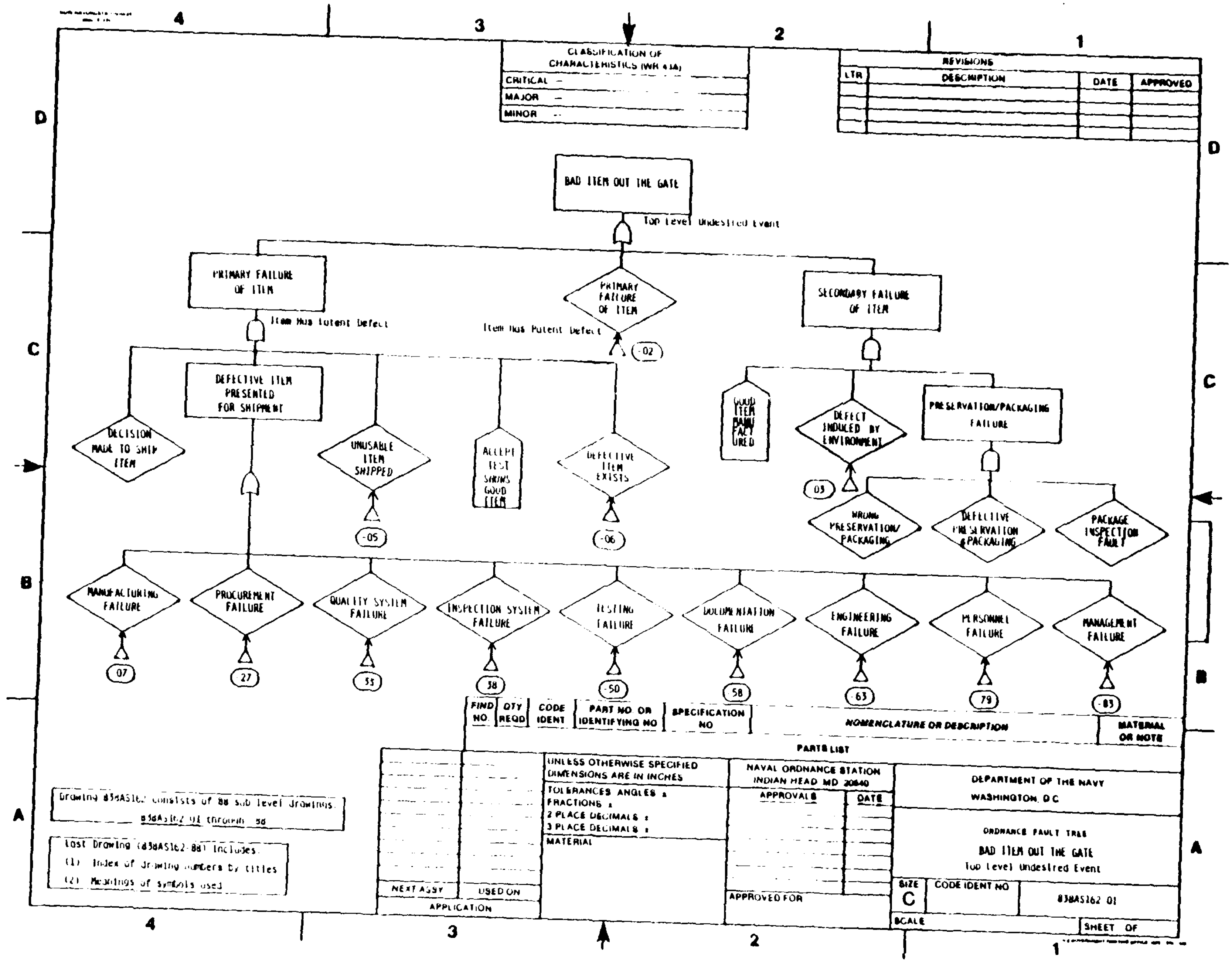
(6) Faults under the gate may be a restatement of the output event.

(7) There are no partial faults/failures.

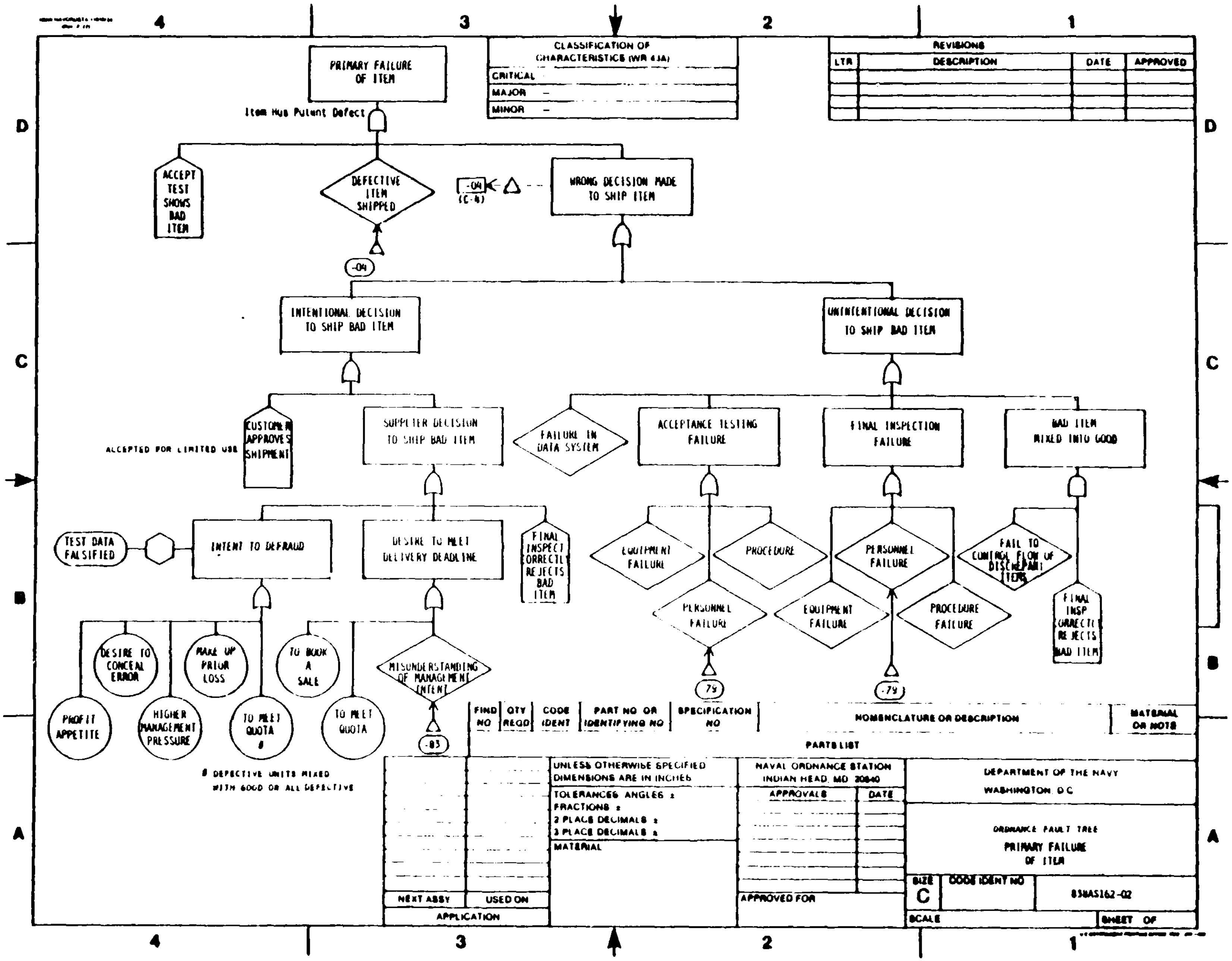
(8) The selection/identification of a primary fault/failure is somewhat arbitrary, depending on the decision not to deduce further.

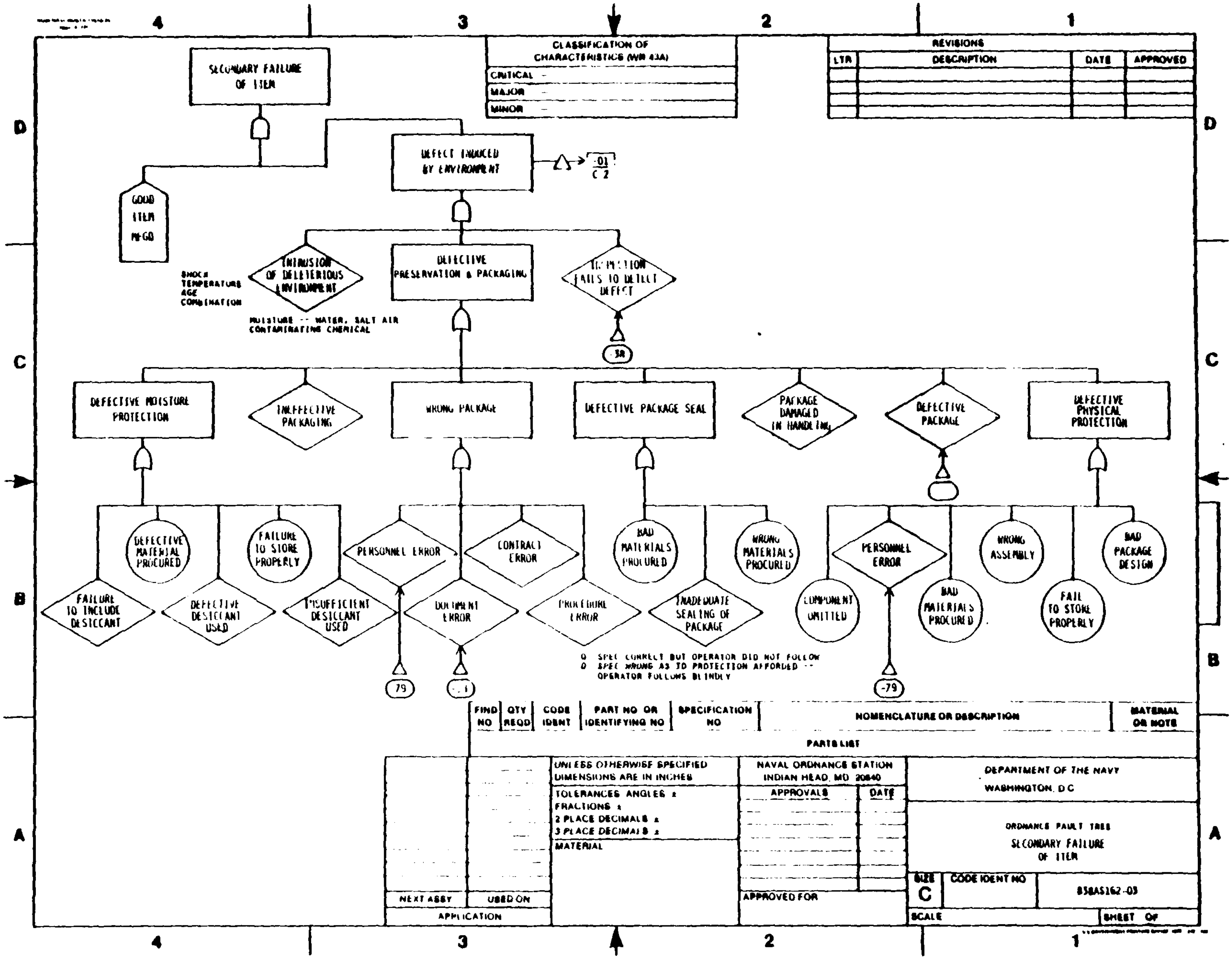
(9) Undeveloped events (diamond symbol) are shown with an input symbol (triangle) when they are developed in more detail elsewhere. The dash number in the oval near the input symbol indicates the dash number fault tree drawing where further development occurs.

ORDNANCE FAULT TREE CHART

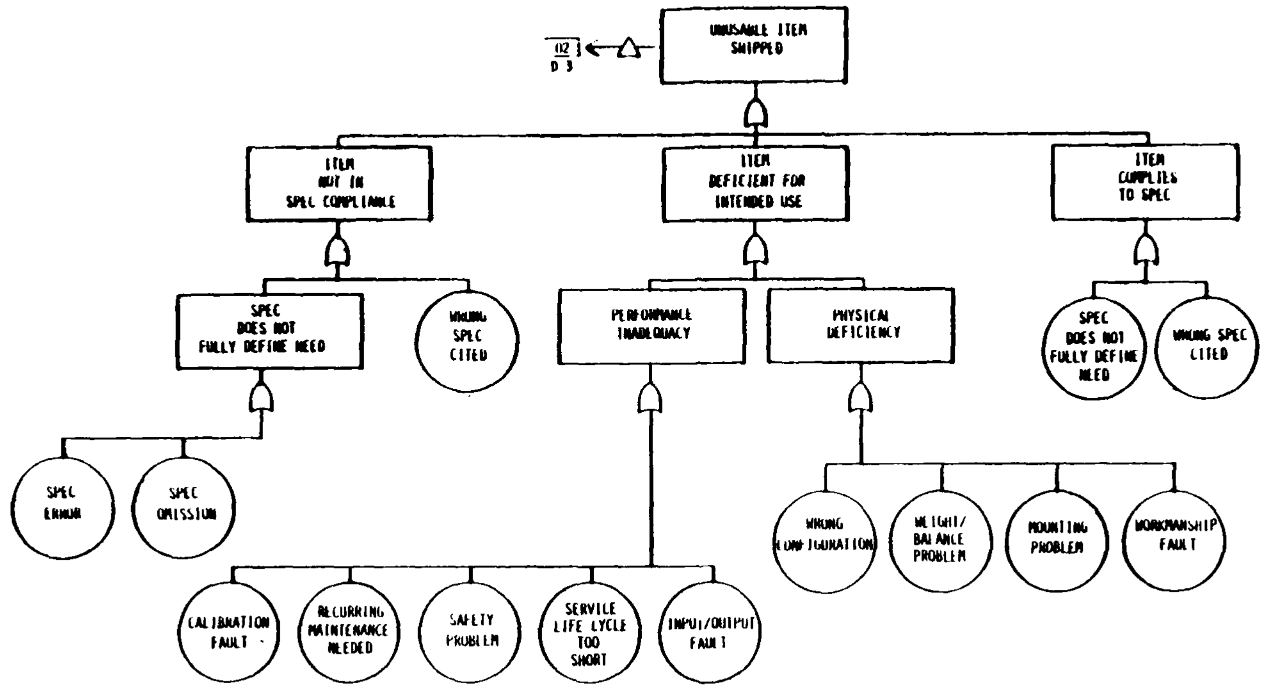


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
BAD ITEM OUT THE GATE
Top Level Undesired Event
PRIMARY FAILURE OF ITEM
PRIMARY FAILURE OF ITEM
SECONDARY FAILURE OF ITEM
Item Has Latent Defect
Item Has Patent Defect
-02
DEFECTIVE ITEM PRESENTED FOR SHIPMENT
DECISION MADE TO SHIP ITEM
UNUSABLE ITEM SHIPPED
-05
ACCEPT TEST SHOWS GOOD ITEM
DEFECTIVE ITEM EXISTS
-06
GOOD ITEM MANUFACTURED
DEFECT INDUCED BY ENVIRONMENT
03
PRESERVATION/PACKAGING FAILURE
WRONG PRESERVATION/PACKAGING
DEFECTIVE PRESERVATION &PACKAGING
PACKAGE INSPECTION FAULT
MANUFACTURING FAILURE
07
PROCUREMENT FAILURE
27
QUALITY SYSTEM FAILURE
33
INSPECTION SYSTEM FAILURE
38
TESTING FAILURE
-50
DOCUMENTATION FAILURE
58
ENGINEERING FAILURE
-63
PERSONNEL FAILURE
79
MANAGEMENT FAILURE
-83
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
Drawing 838AS162 consists of 88 sub level drawings. 838AS162 01 through 88
Last Drawing (838AS162-88) includes:
(1) Index of drawing numbers by titles
(2) Meanings of symbols used
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
BAD ITEM OUT THE GATE
Top Level Undesired Event
SIZE
C
CODE IDENT NO
838AS162 01
SCALE
SHEET OF


PRIMARY FAILURE OF ITEM
Item Has Patent Defect
ACCEPT TEST SHOWS BAD ITEM
DEFECTIVE ITEM SHIPPED
-04
(C-4)
WRONG DECISION MADE TO SHIP ITEM
INTENTIONAL DECISION TO SHIP BAD ITEM
UNINTENTIONAL DECISION TO SHIP BAD ITEM
ACCEPTED FOR LIMITED USE
CUSTOMER APPROVES SHIPMENT
SUPPLIER DECISION TO SHIP BAD ITEM
FAILURE IN DATA SYSTEM
ACCEPTANCE TESTING FAILURE
FINAL INSPECTION FAILURE
BAD ITEM MIXED INTO GOOD
TEST DATA FALSIFIED
INTENT TO DEFRAUD
DESIRE TO MEET DELIVERY DEADLINE
FINAL INSPECT CORRECTLY REJECTS BAD ITEM
EQUIPMENT FAILURE
PROCEDURE
PERSONNEL FAILURE
PROCEDURE FAILURE
FAIL TO CONTROL FLOW OF DISCREPANT ITEMS
FINAL INSP CORRECTLY REJECTS BAD ITEM
DESIRE TO CONCEAL ERROR
MAKE UP PRIOR LOSS
TO BOOK A SALE
MISUNDERSTANDING OF MANAGEMENT INTENT
PROFIT APPETITE
HIGHER MANAGEMENT PRESSURE
TO MEET QUOTA #
TO MEET QUOTA
-83
79
-79
DEFECTIVE UNITS MIXED WITH GOOD OR ALL DEFECTIVE
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
PRIMARY FAILURE OF ITEM
SIZE
C
CODE IDENT NO
83NAS162-02
SCALE
SHEET OF



SECONDARY FAILURE OF ITEM
GOOD ITEM MFGD
DEFECT INDUCED BY ENVIRONMENT
-01 C 2
INTRUSION OF DELETERIOUS ENVIRONMENT
SHOCK TEMPERATURE AGE COMBINATION
MOISTURE -- WATER, SALT AIR CONTAMINATING CHEMICAL
DEFECTIVE PRESERVATION & PACKAGING
INSPECTION FAILS TO DETECT DEFECT
-3R
DEFECTIVE MOISTURE PROTECTION
INEFFECTIVE PACKAGING
WRONG PACKAGE
DEFECTIVE PACKAGE SEAL
PACKAGE DAMAGED IN HANDLING
DEFECTIVE PACKAGE
DEFECTIVE PHYSICAL PROTECTION
FAILURE TO INCLUDE DESICCANT
DEFECTIVE MATERIAL PROCURED
DEFECTIVE DESICCANT USED
FAILURE TO STORE PROPERLY
INSUFFICIENT DESICCANT USED
PERSONNEL ERROR
DOCUMENT ERROR
CONTRACT ERROR
PROCEDURE ERROR
79
BAD MATERIALS PROCURED
INADEQUATE SEALING OF PACKAGE
WRONG MATERIALS PROCURED
Q SPEC CORRECT BUT OPERATOR DID NOT FOLLOW
Q SPEC WRONG AS TO PROTECTION AFFORDED -- OPERATOR FOLLOWS BLINDLY
COMPONENT OMITTED
PERSONNEL ERROR
-79
BAD MATERIALS PROCURED
WRONG ASSEMBLY
FAIL TO STORE PROPERLY
BAD PACKAGE DESIGN
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL -
MAJOR -
MINOR -
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
SECONDARY FAILURE OF ITEM
SIZE C
CODE IDENT NO
838AS162-03
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SCALE
SHEET OF



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

DEFECTIVE SHIPMENT

Product

- o Structural Flaw
- o Out-of-Spec Performance
- o Non conforming Configuration
- o Non-conforming Packaging
- o Non conforming I.D./Marking

Data & Documentation

- o Wrong I.D. Listed
- o Package Mislabeled
- o Errors in Insp/Test Data
- o Dwg/Spec Error

FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

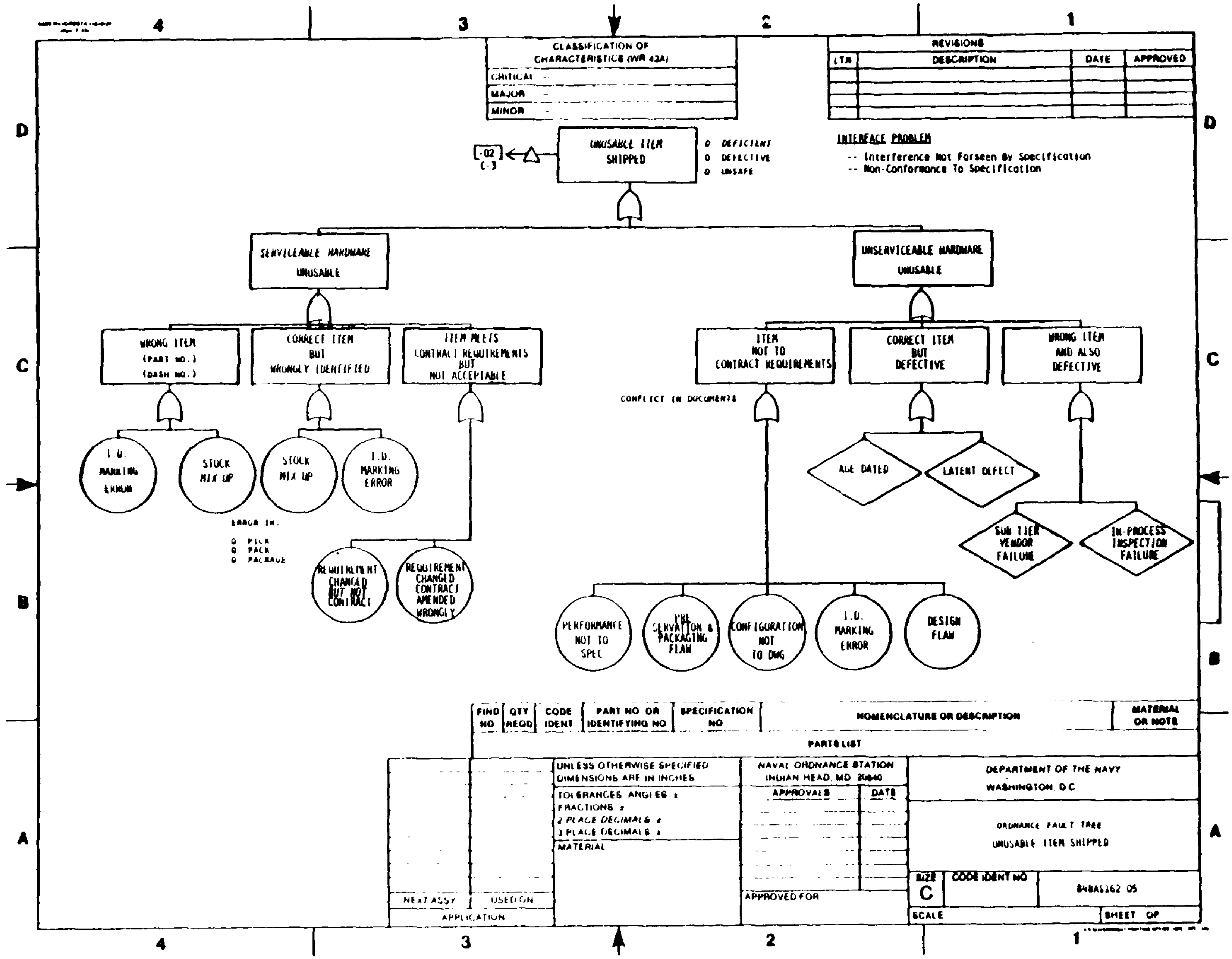
NEXT ASSY | USED ON
APPLICATION

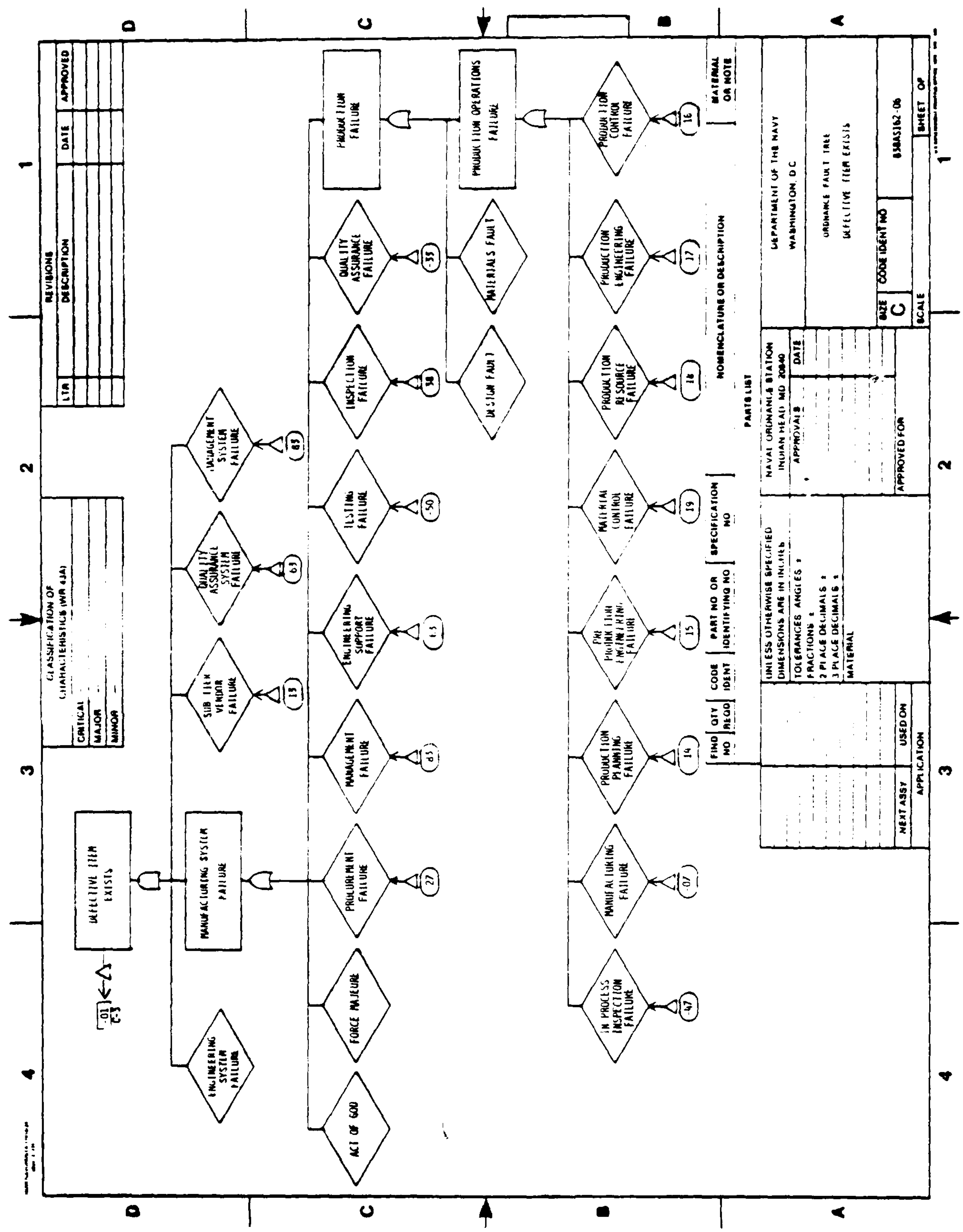
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS | DATE
APPROVED FOR

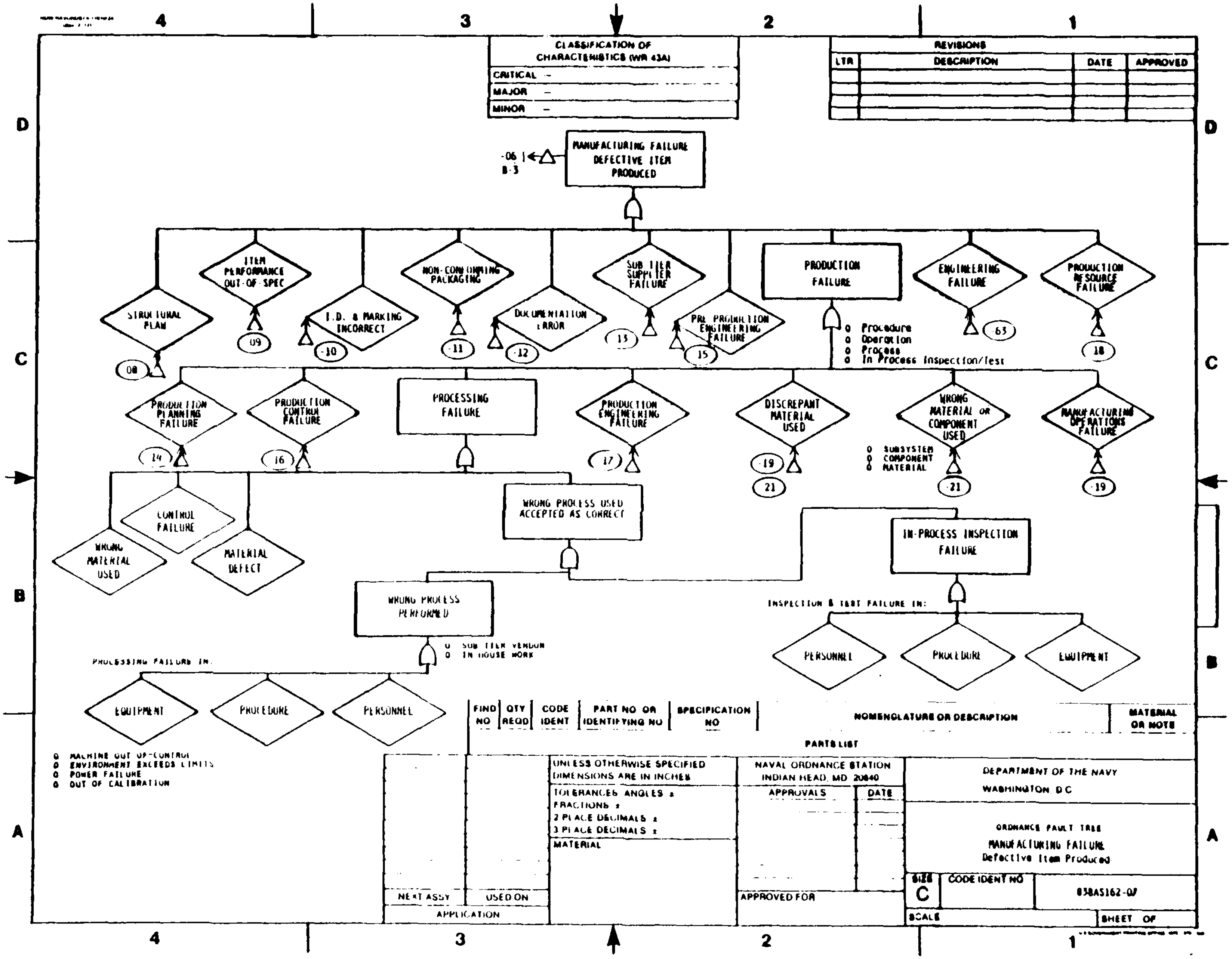
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.

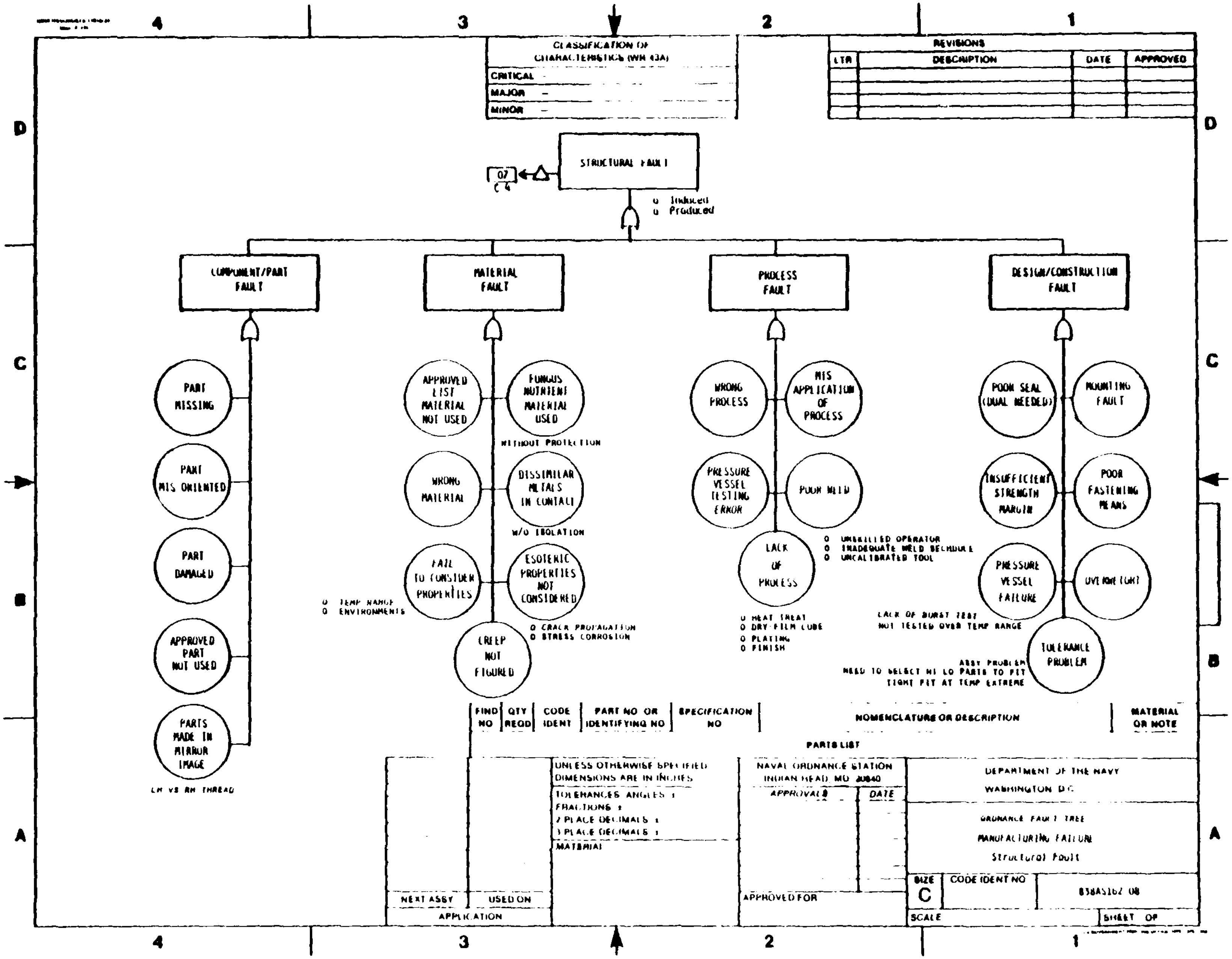
ORDNANCE FAULT TREE
DEFECTIVE ITEM SHIPPED

SIZE C | CODE IDENT NO | 83BAS162-04
SCALE | SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
UNUSABLE ITEM SHIPPED
o DEFICIENT
o DEFECTIVE
o UNSAFE
-02
C-3
INTERFACE PROBLEM
-- Interference Not Forseen By Specification
-- Non-Conformance To Specification
SERVICEABLE HARDWARE UNUSABLE
UNSERVICEABLE HARDWARE UNUSABLE
WRONG ITEM (PART NO.) (DASH NO.)
CORRECT ITEM BUT WRONGLY IDENTIFIED
ITEM MEETS CONTRACT REQUIREMENTS BUT NOT ACCEPTABLE
ITEM NOT TO CONTRACT REQUIREMENTS
CORRECT ITEM BUT DEFECTIVE
WRONG ITEM AND ALSO DEFECTIVE
CONFLICT IN DOCUMENTS
I.D. MARKING ERROR
STOCK MIX UP
STOCK MIX UP
I.D. MARKING ERROR
ERROR IN:
o PICK
o PACK
o PACKAGE
REQUIREMENT CHANGED BUT NOT CONTRACT
REQUIREMENT CHANGED CONTRACT AMENDED WRONGLY
AGE DATED
LATENT DEFECT
SUB TIER VENDOR FAILURE
IN-PROCESS INSPECTION FAILURE
PERFORMANCE NOT TO SPEC
PRESERVATION & PACKAGING FLAW
CONFIGURATION NOT TO DWG
I.D. MARKING ERROR
DESIGN FLAW
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY WASHINGTON DC
ORDNANCE FAULT TREE UNUSABLE ITEM SHIPPED
SIZE C
CODE IDENT NO
84BAS162 05
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

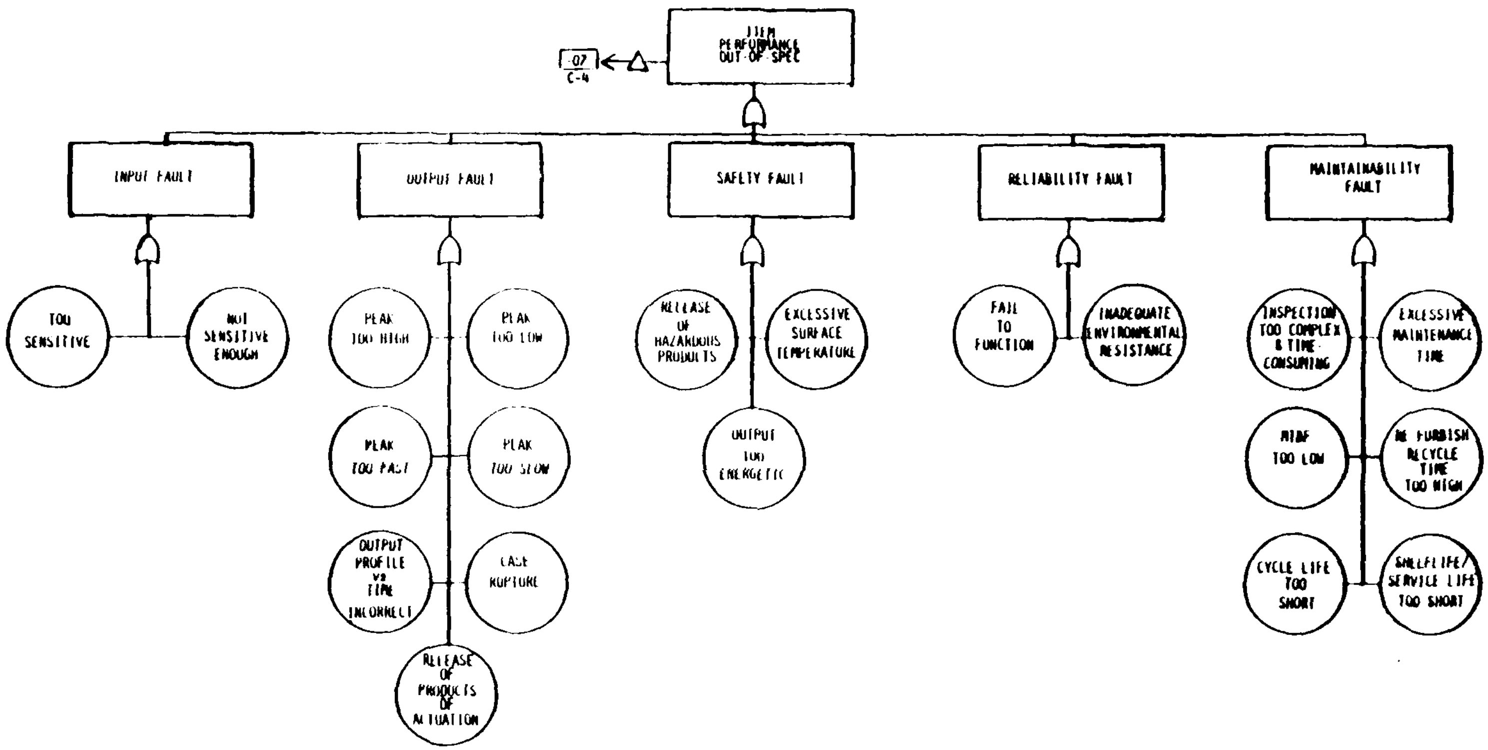

REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS
CRITICAL
MAJOR
MINOR
DEFECTIVE ITEM EXISTS
MANUFACTURING SYSTEM FAILURE
ENGINEERING SYSTEM FAILURE
SUB ITEM VENDOR FAILURE
QUALITY ASSURANCE SYSTEM FAILURE
MANAGEMENT SYSTEM FAILURE
ACT OF GOD
FORCE MAJEURE
PROCUREMENT FAILURE
MANAGEMENT FAILURE
ENGINEERING SUPPORT FAILURE
TESTING FAILURE
INSPECTION FAILURE
QUALITY ASSURANCE FAILURE
PRODUCTION FAILURE
PRODUCTION OPERATIONS FAILURE
MATERIALS FAULT
DESIGN FAULT
IN PROCESS INSPECTION FAILURE
MANUFACTURING FAILURE
PRODUCTION PLANNING FAILURE
PREPRODUCTION ENGINEERING FAILURE
MATERIAL CONTROL FAILURE
PRODUCTION RESOURCE FAILURE
PRODUCTION ENGINEERING FAILURE
PRODUCTION CONTROL FAILURE
MATERIAL OR NOTE
NOMENCLATURE OR DESCRIPTION
PARTS LIST
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
DEFECTIVE ITEM EXISTS
SIZE
C
CODE IDENT NO
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MANUFACTURING FAILURE DEFECTIVE ITEM PRODUCED
-06
B-3
STRUCTURAL PLAN
08
ITEM PERFORMANCE OUT-OF-SPEC
09
I.D. & MARKING INCORRECT
-10
NON-CONFORMING PACKAGING
-11
DOCUMENTATION ERROR
-12
SUB TIER SUPPLIER FAILURE
13
PRE PRODUCTION ENGINEERING FAILURE
15
PRODUCTION FAILURE
o Procedure
o Operation
o Process
o In Process Inspection/Test
ENGINEERING FAILURE
63
PRODUCTION RESOURCE FAILURE
18
PRODUCTION PLANNING FAILURE
14
PRODUCTION CONTROL FAILURE
16
PROCESSING FAILURE
PRODUCTION ENGINEERING FAILURE
17
DISCREPANT MATERIAL USED
-19
21
WRONG MATERIAL OR COMPONENT USED
o SUBSYSTEM
o COMPONENT
o MATERIAL
-21
MANUFACTURING OPERATIONS FAILURE
-19
CONTROL FAILURE
WRONG MATERIAL USED
MATERIAL DEFECT
WRONG PROCESS USED ACCEPTED AS CORRECT
IN-PROCESS INSPECTION FAILURE
INSPECTION & TEST FAILURE IN:
PERSONNEL
PROCEDURE
EQUIPMENT
WRONG PROCESS PERFORMED
o SUB TIER VENDOR
o IN HOUSE WORK
PROCESSING FAILURE IN:
EQUIPMENT
PROCEDURE
PERSONNEL
o MACHINE OUT OF CONTROL
o ENVIRONMENT EXCEEDS LIMITS
o POWER FAILURE
o OUT OF CALIBRATION
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Defective Item Produced
SIZE
C
CODE IDENT NO
038AS162-07
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
STRUCTURAL FAULT
o Induced
o Produced
COMPONENT/PART FAULT
MATERIAL FAULT
PROCESS FAULT
DESIGN/CONSTRUCTION FAULT
PART MISSING
PART MIS ORIENTED
PART DAMAGED
APPROVED PART NOT USED
PARTS MADE IN MIRROR IMAGE
LH VS RH THREAD
APPROVED LIST MATERIAL NOT USED
FUNGUS NUTRIENT MATERIAL USED
WITHOUT PROTECTION
WRONG MATERIAL
DISSIMILAR METALS IN CONTACT
W/O ISOLATION
FAIL TO CONSIDER PROPERTIES
ESOTERIC PROPERTIES NOT CONSIDERED
o TEMP RANGE
o ENVIRONMENTS
CREEP NOT FIGURED
o CRACK PROPAGATION
o STRESS CORROSION
WRONG PROCESS
MIS APPLICATION OF PROCESS
PRESSURE VESSEL TESTING ERROR
POOR WELD
LACK OF PROCESS
o UNSKILLED OPERATOR
o INADEQUATE WELD SCHEDULE
o UNCALIBRATED TOOL
o HEAT TREAT
o DRY FILM LUBE
o PLATING
o FINISH
POOR SEAL (DUAL NEEDED)
MOUNTING FAULT
INSUFFICIENT STRENGTH MARGIN
POOR FASTENING MEANS
PRESSURE VESSEL FAILURE
OVERWEIGHT
LACK OF BURST TEST
NOT TESTED OVER TEMP RANGE
TOLERANCE PROBLEM
ASSY PROBLEM
NEED TO SELECT HI LO PARTS TO FIT
TIGHT FIT AT TEMP EXTREME
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Structural Fault
SIZE
C
CODE IDENT NO
SCALE
SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY | USED ON
APPLICATION

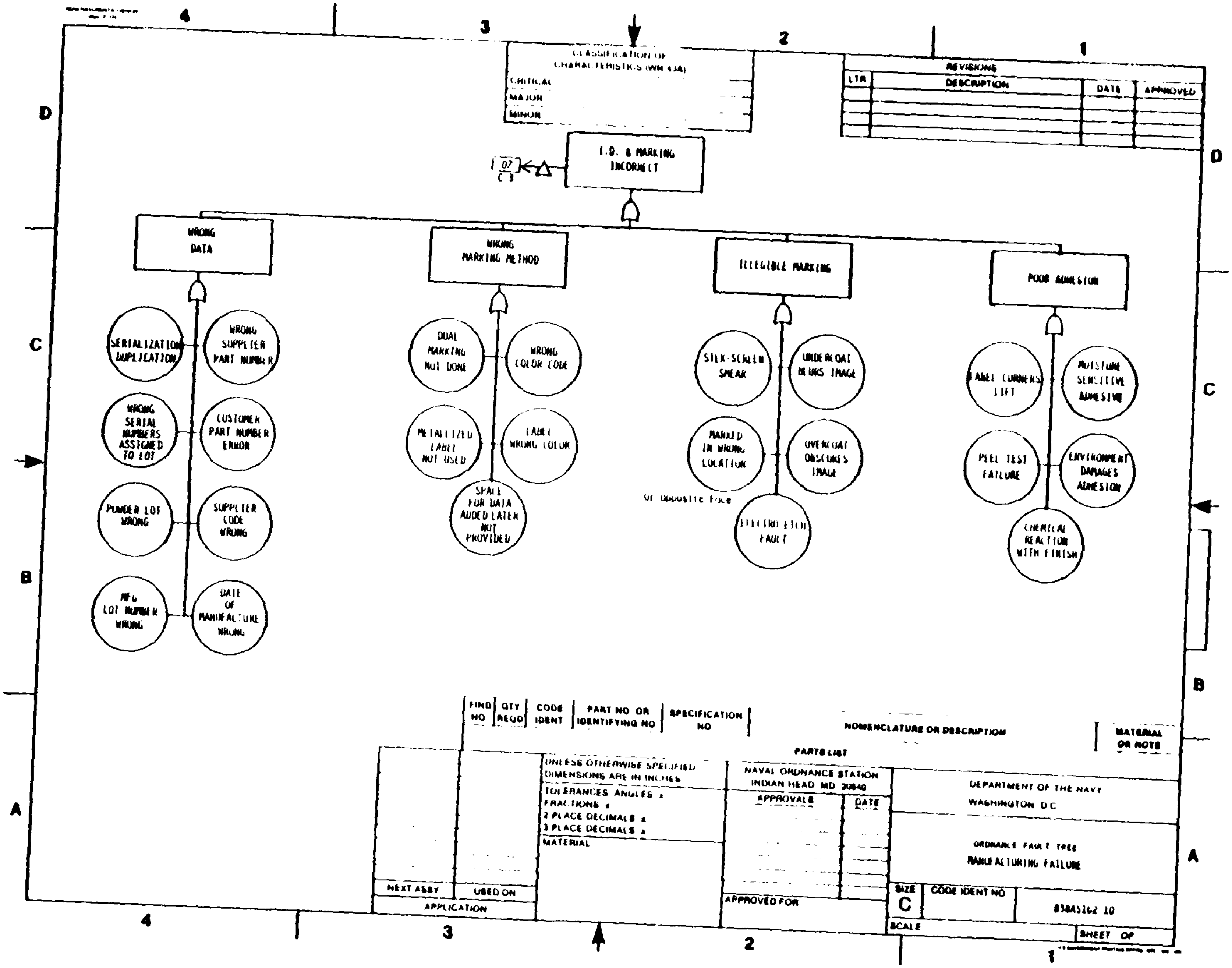
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

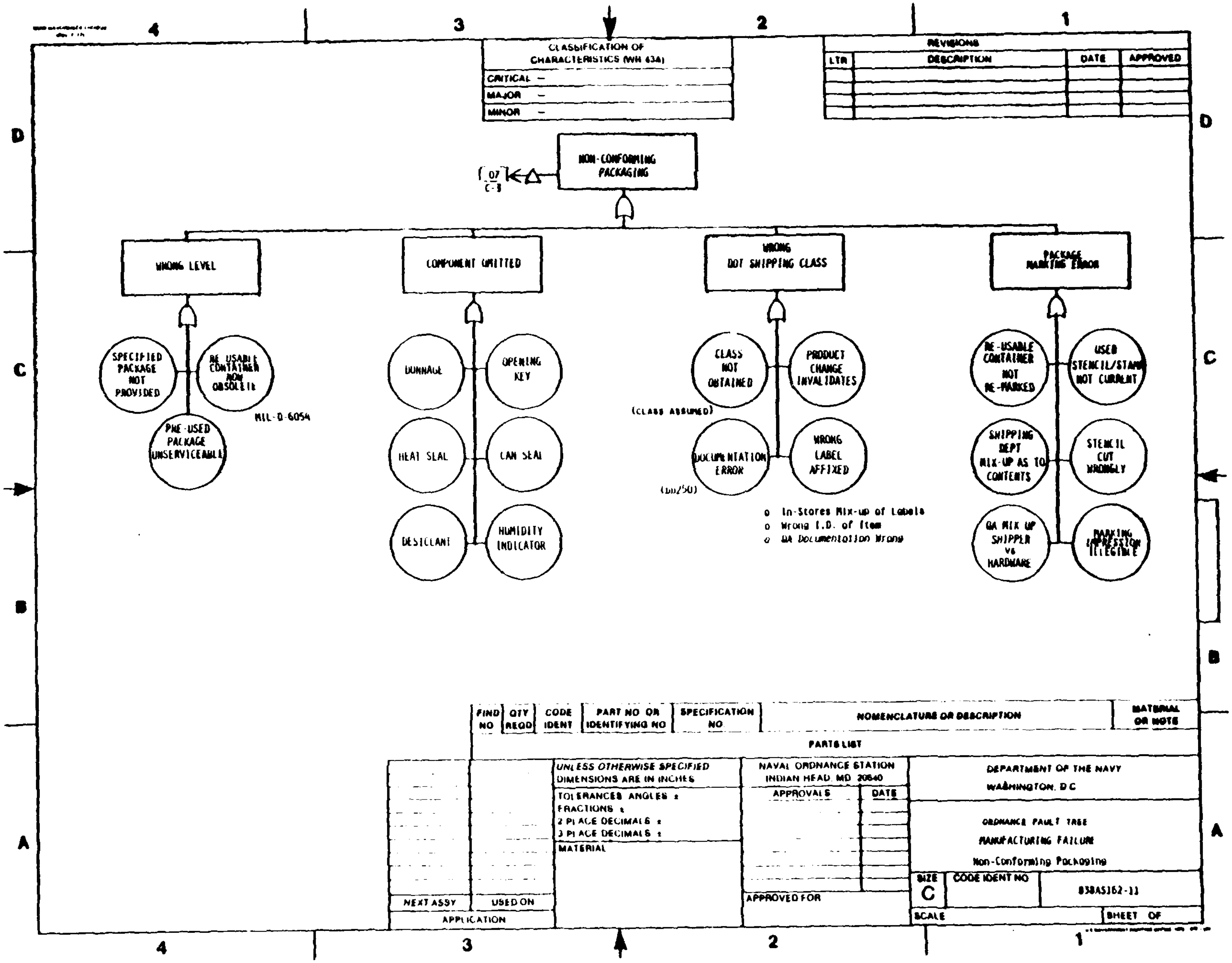
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS | DATE
APPROVED FOR

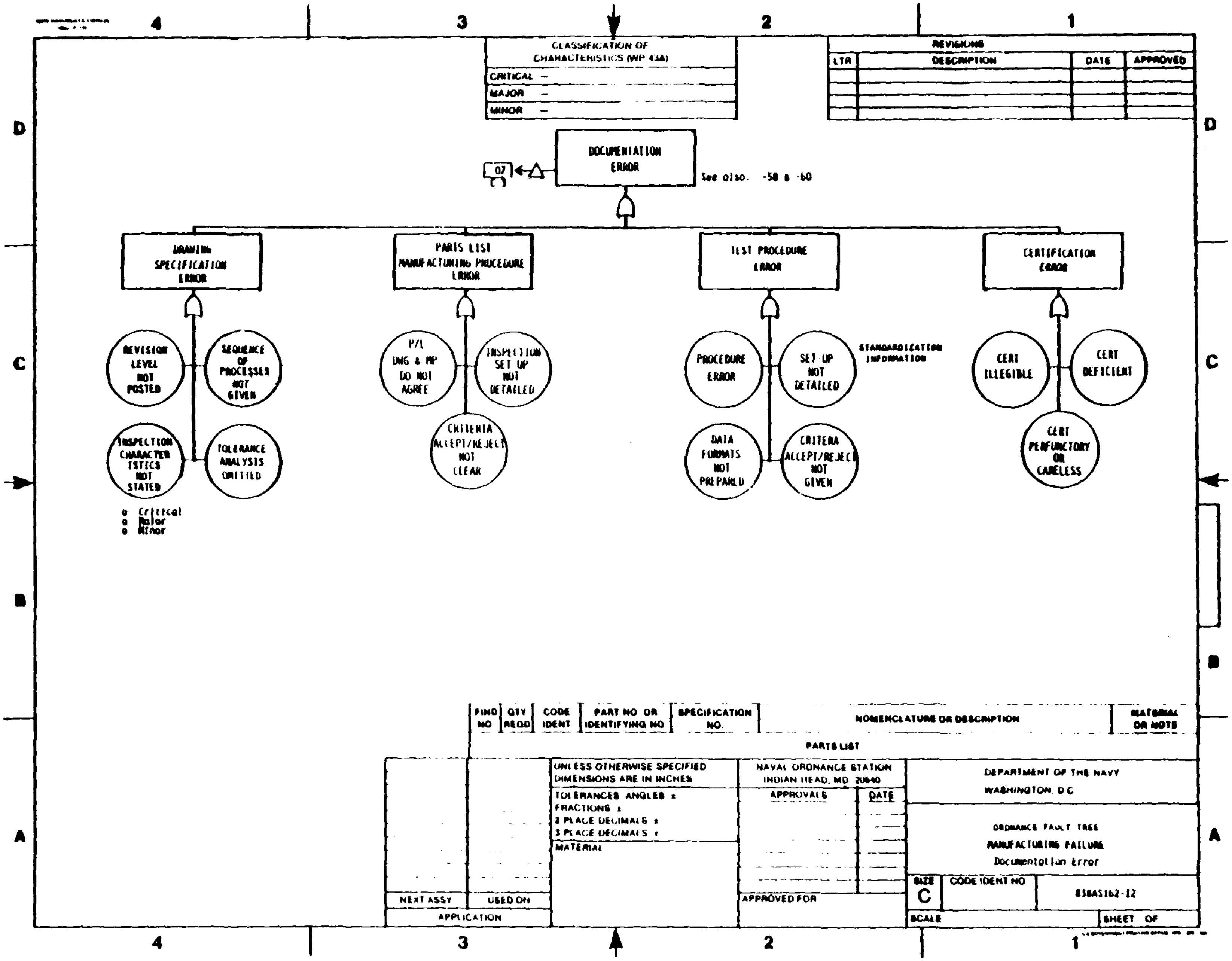
DEPARTMENT OF THE NAVY
WASHINGTON D C

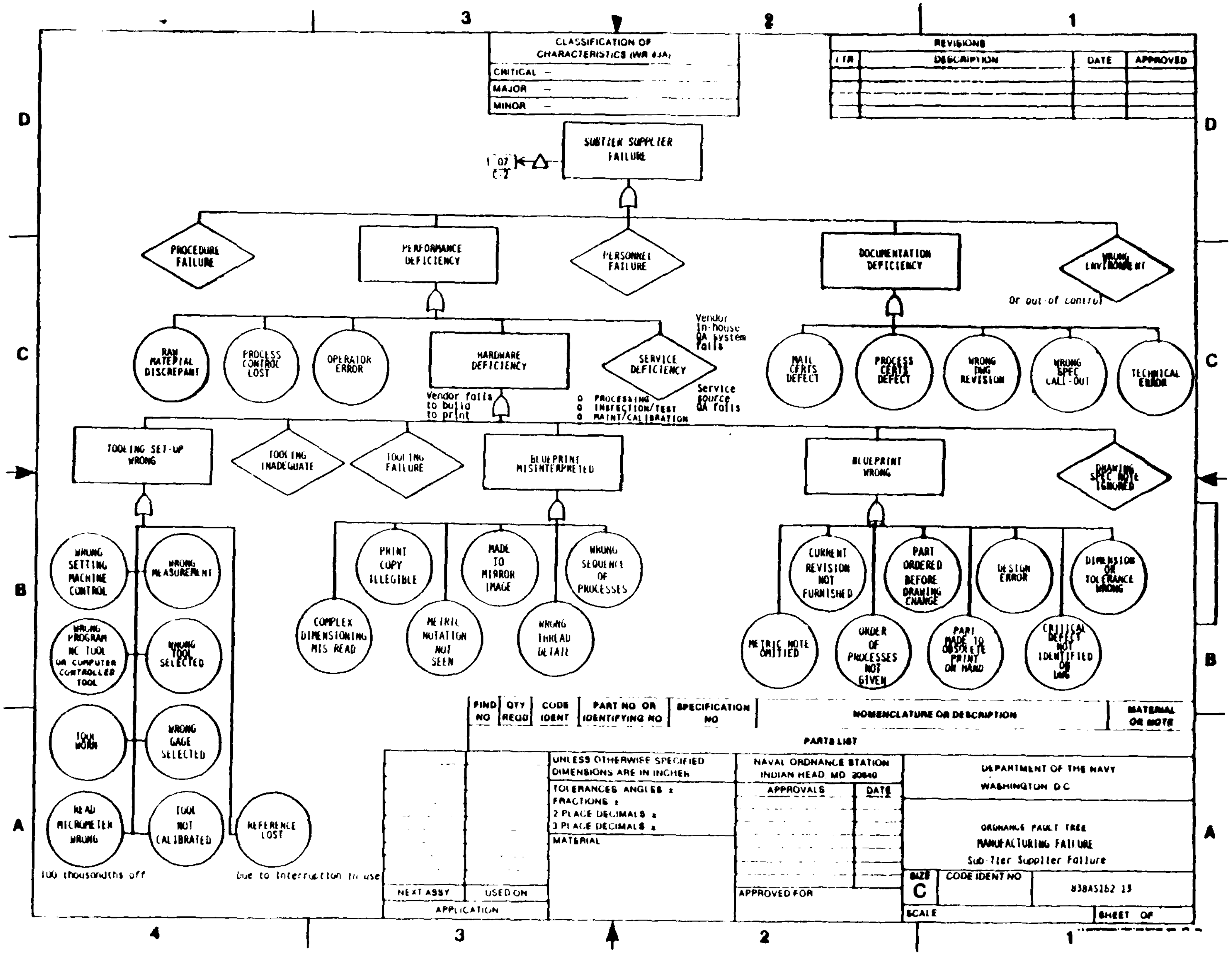
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Performance Out-of-Specification

SIZE C | CODE IDENT NO | 838AS162 09
SCALE | SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
I.D. & MARKING INCORRECT
07
WRONG DATA
SERIALIZATION DUPLICATION
WRONG SUPPLIER PART NUMBER
WRONG SERIAL NUMBERS ASSIGNED TO LOT
CUSTOMER PART NUMBER ERROR
POWDER LOT WRONG
SUPPLIER CODE WRONG
MFG LOT NUMBER WRONG
DATE OF MANUFACTURE WRONG
WRONG MARKING METHOD
DUAL MARKING NOT DONE
WRONG COLOR CODE
METALLIZED LABEL NOT USED
LABEL WRONG COLOR
SPACE FOR DATA ADDED LATER NOT PROVIDED
ILLEGIBLE MARKING
SILK-SCREEN SMEAR
UNDERCOAT BLURS IMAGE
MARKED IN WRONG LOCATION
OVERCOAT OBSCURES IMAGE
ELECTRO ETCH FAULT
POOR ADHESION
LABEL CORNERS LIFT
MOISTURE SENSITIVE ADHESIVE
PEEL TEST FAILURE
ENVIRONMENT DAMAGES ADHESION
CHEMICAL REACTION WITH FINISH
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY WASHINGTON DC
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SIZE C
CODE IDENT NO
838AS162 10
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WH 434)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
NON-CONFORMING PACKAGING
07
C-3
WRONG LEVEL
COMPONENT OMITTED
WRONG DOT SHIPPING CLASS
PACKAGE MARKING ERROR
SPECIFIED PACKAGE NOT PROVIDED
RE-USABLE CONTAINER NOW OBSOLETE
PRE-USED PACKAGE UNSERVICEABLE
MIL-D-6054
DUNNAGE
OPENING KEY
HEAT SEAL
CAN SEAL
DESICCANT
HUMIDITY INDICATOR
CLASS NOT OBTAINED
(CLASS ASSUMED)
PRODUCT CHANGE INVALIDATES
DOCUMENTATION ERROR
(DD250)
WRONG LABEL AFFIXED
o In-Stores Mix-up of Labels
o Wrong I.D. of Item
o QA Documentation Wrong
RE-USABLE CONTAINER NOT RE-MARKED
USED STENCIL/STAMP NOT CURRENT
SHIPPING DEPT MIX-UP AS TO CONTENTS
STENCIL CUT WRONGLY
QA MIX UP SHIPPER vs HARDWARE
MARKING IMPRESSION ILLEGIBLE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Non-Conforming Packaging
SIZE
C
CODE IDENT NO
83BAS162-11
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WP 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DOCUMENTATION ERROR
07
See also. -58 & -60
DRAWING SPECIFICATION ERROR
PARTS LIST MANUFACTURING PROCEDURE ERROR
TEST PROCEDURE ERROR
CERTIFICATION ERROR
REVISION LEVEL NOT POSTED
SEQUENCE OF PROCESSES NOT GIVEN
INSPECTION CHARACTER ISTICS NOT STATED
TOLERANCE ANALYSIS OMITTED
o Critical
o Major
o Minor
P/L DWG & MP DO NOT AGREE
INSPECTION SET UP NOT DETAILED
CRITERIA ACCEPT/REJECT NOT CLEAR
PROCEDURE ERROR
SET UP NOT DETAILED
STANDARDIZATION INFORMATION
DATA FORMATS NOT PREPARED
CRITERA ACCEPT/REJECT NOT GIVEN
CERT ILLEGIBLE
CERT DEFICIENT
CERT PERFUNCTORY OR CARELESS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO.
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Documentation Error
SIZE
C
CODE IDENT NO
83BAS162-12
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

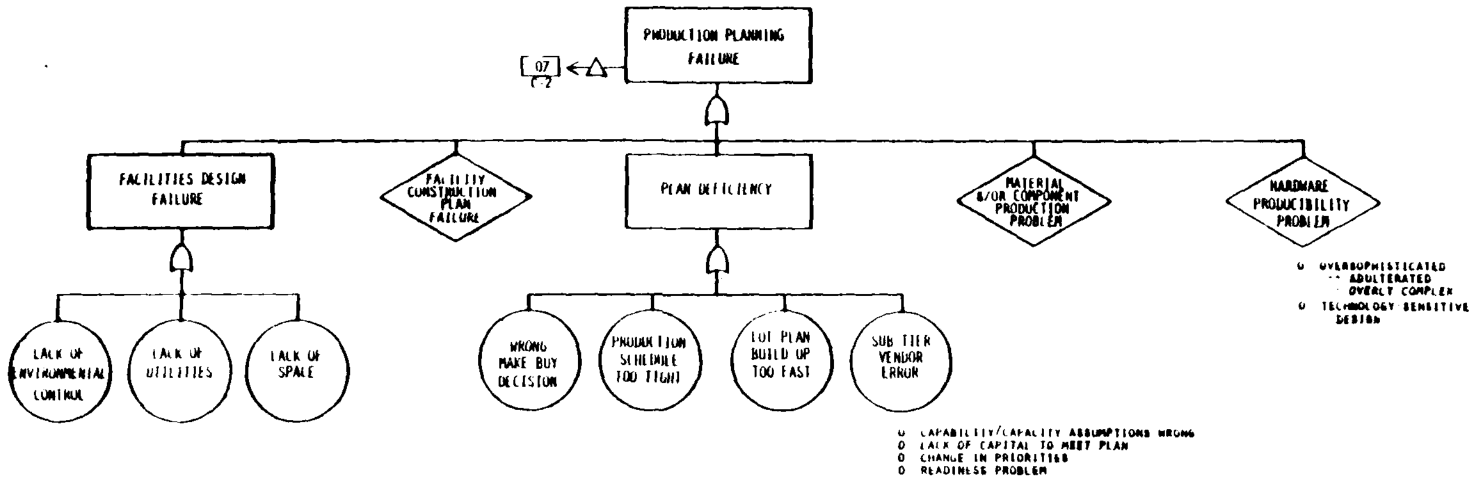

CLASSIFICATION OF CHARACTERISTICS (WR 8JA)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
SUBTIER SUPPLIER FAILURE
1.07
C.2
PROCEDURE FAILURE
PERFORMANCE DEFICIENCY
PERSONNEL FAILURE
DOCUMENTATION DEFICIENCY
WRONG ENVIRONMENT
Or out of control
RAW MATERIAL DISCREPANT
PROCESS CONTROL LOST
OPERATOR ERROR
HARDWARE DEFICIENCY
SERVICE DEFICIENCY
Vendor in-house QA system fails
Service source QA fails
Vendor fails to build to print
o PROCESSING
o INSPECTION/TEST
o MAINT/CALIBRATION
MAIL CERTS DEFECT
PROCESS CERTS DEFECT
WRONG DWG REVISION
WRONG SPEC CALL-OUT
TECHNICAL ERROR
TOOLING SET-UP WRONG
TOOLING INADEQUATE
TOOLING FAILURE
BLUEPRINT MISINTERPRETED
BLUEPRINT WRONG
DRAWING SPEC NOTE IGNORED
WRONG SETTING MACHINE CONTROL
WRONG MEASUREMENT
WRONG PROGRAM NC TOOL OR COMPUTER CONTROLLED TOOL
WRONG TOOL SELECTED
TOOL WORN
WRONG GAGE SELECTED
READ MICROMETER WRONG
TOOL NOT CALIBRATED
REFERENCE LOST
100 thousandths off
Due to interruption in use
PRINT COPY ILLEGIBLE
MADE TO MIRROR IMAGE
WRONG SEQUENCE OF PROCESSES
COMPLEX DIMENSIONING MIS READ
METRIC NOTATION NOT SEEN
WRONG THREAD DETAIL
CURRENT REVISION NOT FURNISHED
PART ORDERED BEFORE DRAWING CHANGE
DESIGN ERROR
DIMENSION OR TOLERANCE WRONG
METRIC NOTE OMITTED
ORDER OF PROCESSES NOT GIVEN
PART MADE TO OBSOLETE PRINT OR HAND
CRITICAL DEFECT NOT IDENTIFIED OR LOG
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Sub-Tier Supplier Failure
SIZE
C
CODE IDENT NO
838AS162 13
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

CLASSIFICATION OF CHARACTERISTICS (WR 43A)

CRITICAL –
MAJOR –
MINOR –

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED



FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

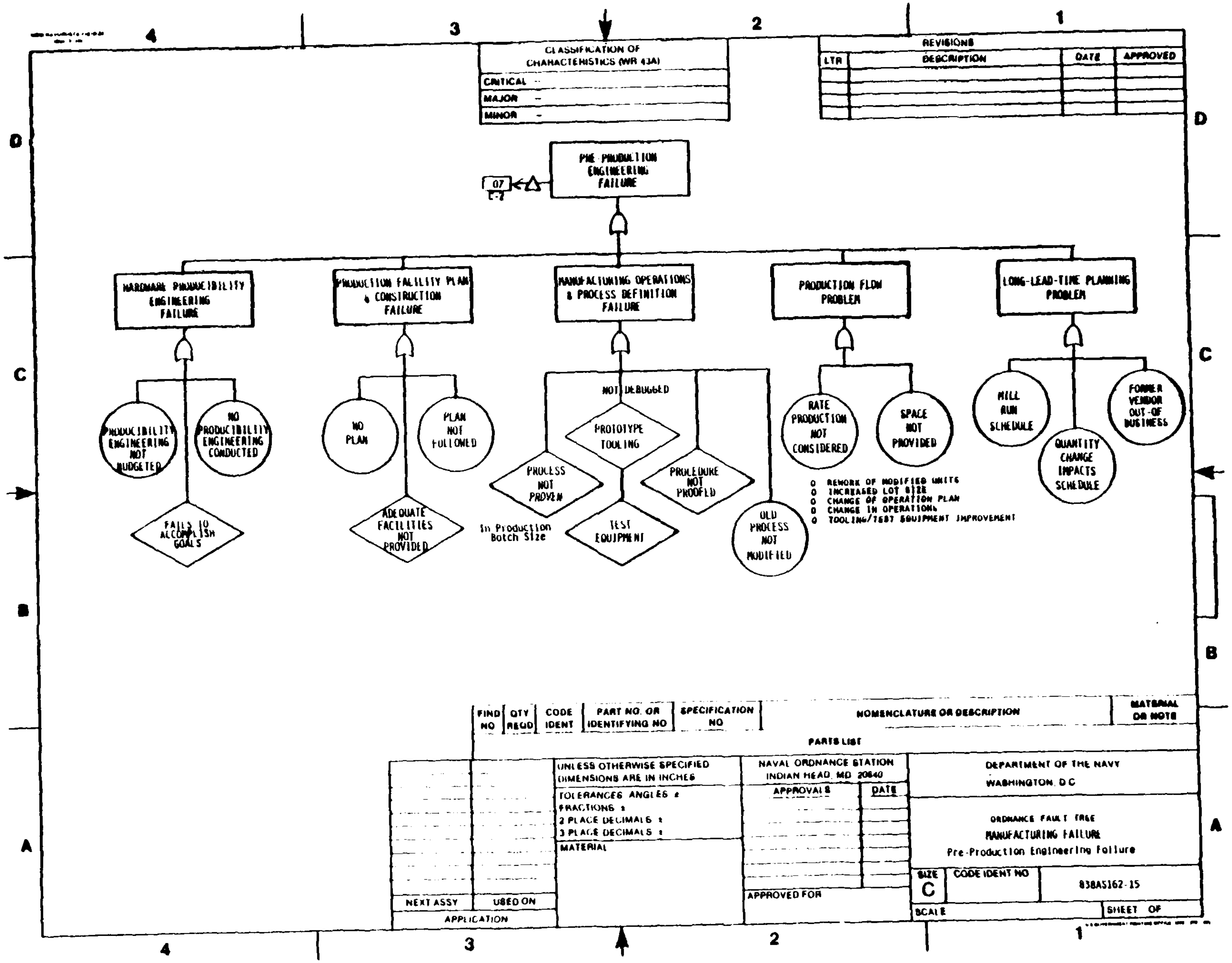
NEXT ASSY | USED ON
APPLICATION

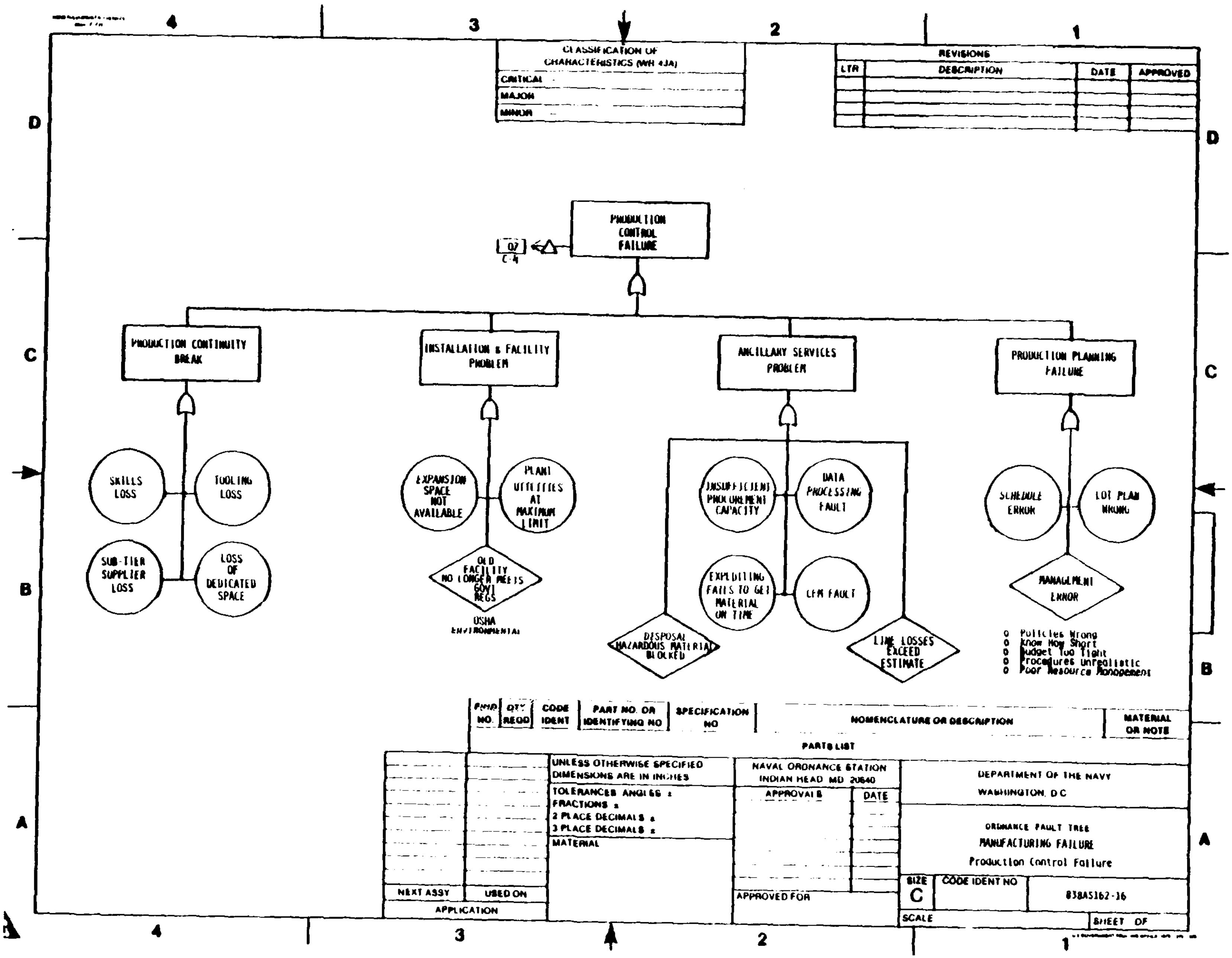
NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640
APPROVALS | DATE
APPROVED FOR

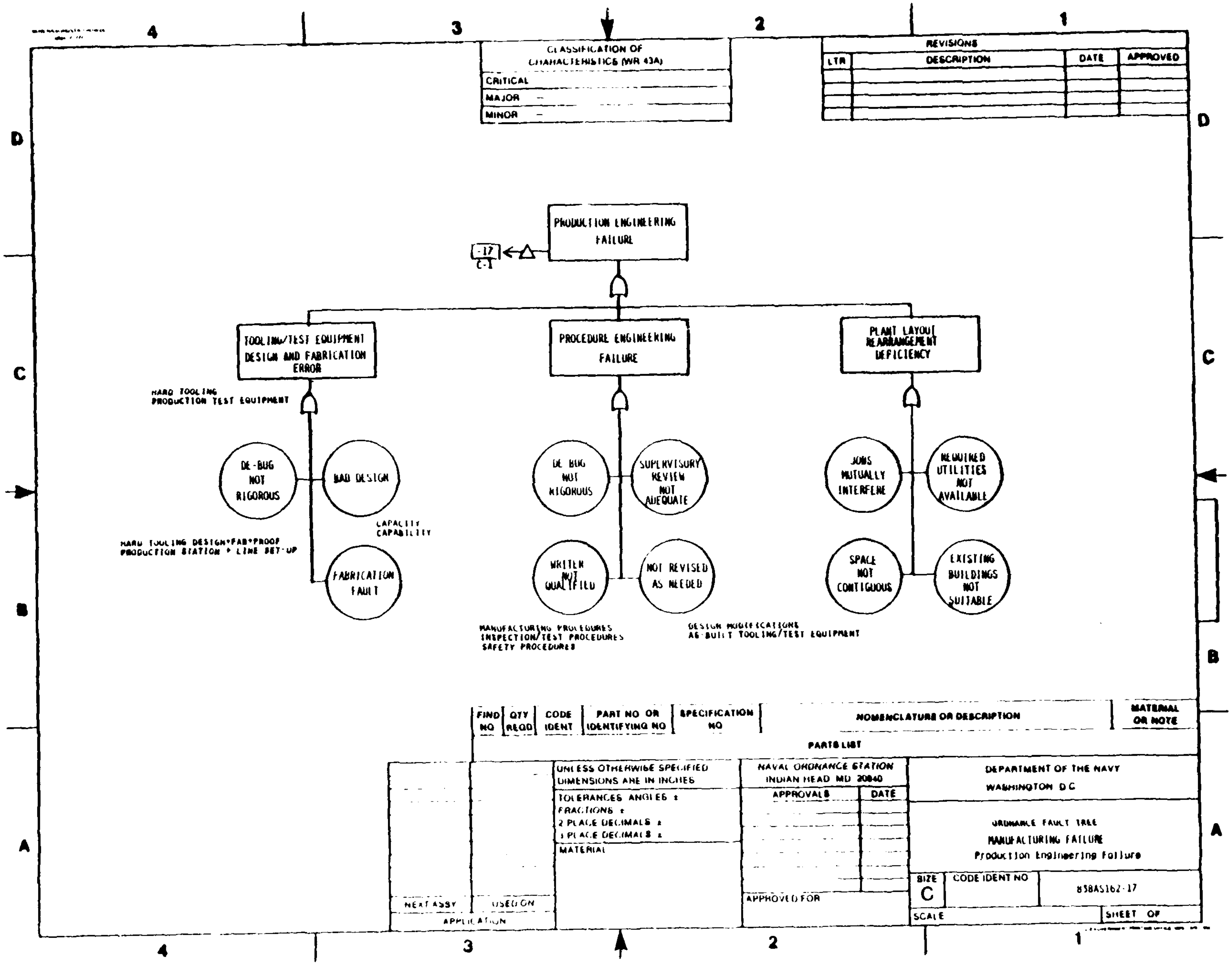
DEPARTMENT OF THE NAVY
WASHINGTON D C

ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Production Planning Failure

SIZE C | CODE IDENT NO | 858AS162-16
SCALE | SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PRE-PRODUCTION ENGINEERING FAILURE
07
C-2
HARDWARE PRODUCIBILITY ENGINEERING FAILURE
PRODUCTION FACILITY PLAN & CONSTRUCTION FAILURE
MANUFACTURING OPERATIONS & PROCESS DEFINITION FAILURE
PRODUCTION FLOW PROBLEM
LONG-LEAD-TIME PLANNING PROBLEM
PRODUCIBILITY ENGINEERING NOT BUDGETED
NO PRODUCIBILITY ENGINEERING CONDUCTED
FAILS TO ACCOMPLISH GOALS
NO PLAN
PLAN NOT FOLLOWED
ADEQUATE FACILITIES NOT PROVIDED
NOT DEBUGGED
PROTOTYPE TOOLING
PROCESS NOT PROVEN
In Production Batch Size
TEST EQUIPMENT
PROCEDURE NOT PROOFED
OLD PROCESS NOT MODIFIED
RATE PRODUCTION NOT CONSIDERED
SPACE NOT PROVIDED
O REWORK OF MODIFIED UNITS
O INCREASED LOT SIZE
O CHANGE OF OPERATION PLAN
O CHANGE IN OPERATIONS
O TOOLING/TEST EQUIPMENT IMPROVEMENT
MILL RUN SCHEDULE
QUANTITY CHANGE IMPACTS SCHEDULE
FORMER VENDOR OUT-OF BUSINESS
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Pre-Production Engineering Failure
SIZE
C
CODE IDENT NO
838AS162-15
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WH 4JA)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PRODUCTION CONTROL FAILURE
07
C-4
PRODUCTION CONTINUITY BREAK
INSTALLATION & FACILITY PROBLEM
ANCILLARY SERVICES PROBLEM
PRODUCTION PLANNING FAILURE
SKILLS LOSS
TOOLING LOSS
SUB-TIER SUPPLIER LOSS
LOSS OF DEDICATED SPACE
EXPANSION SPACE NOT AVAILABLE
PLANT UTILITIES AT MAXIMUM LIMIT
OLD FACILITY NO LONGER MEETS GOVT REGS
OSHA
ENVIRONMENTAL
INSUFFICIENT PROCUREMENT CAPACITY
DATA PROCESSING FAULT
EXPEDITING FAILS TO GET MATERIAL ON TIME
LFM FAULT
DISPOSAL HAZARDOUS MATERIAL BLOCKED
LINE LOSSES EXCEED ESTIMATE
SCHEDULE ERROR
LOT PLAN WRONG
MANAGEMENT ERROR
o Policies Wrong
o Know How Short
o Budget Too Tight
o Procedures Unrealistic
o Poor Resource Management
FIND NO.
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Production Control Failure
SIZE
C
CODE IDENT NO
838AS162-16
SCALE
SHEET OF

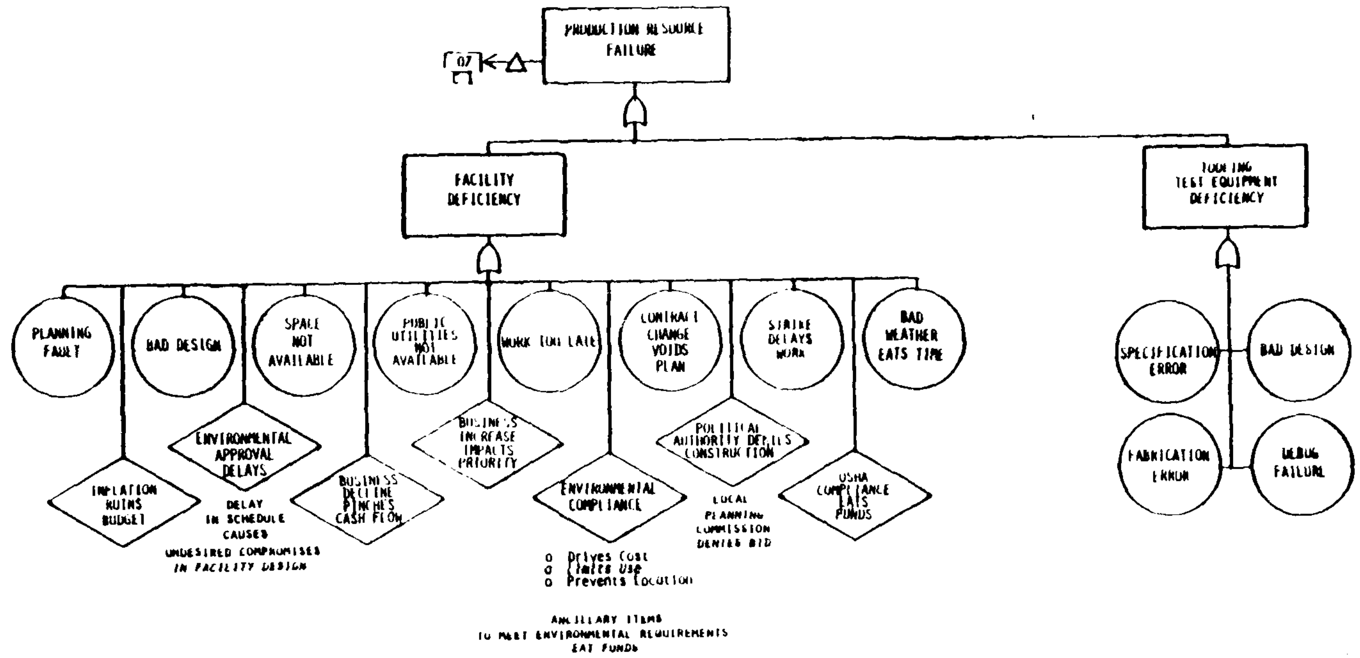

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR —
MINOR —
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PRODUCTION ENGINEERING FAILURE
-17
C-1
TOOLING/TEST EQUIPMENT DESIGN AND FABRICATION ERROR
PROCEDURE ENGINEERING FAILURE
PLANT LAYOUT REARRANGEMENT DEFICIENCY
HARD TOOLING
PRODUCTION TEST EQUIPMENT
DE-BUG NOT RIGOROUS
BAD DESIGN
CAPACITY
CAPABILITY
HARD TOOLING DESIGN+FAB+PROOF
PRODUCTION STATION + LINE SET-UP
FABRICATION FAULT
DE-BUG NOT RIGOROUS
SUPERVISORY REVIEW NOT ADEQUATE
WRITER NOT QUALIFIED
NOT REVISED AS NEEDED
MANUFACTURING PROCEDURES
INSPECTION/TEST PROCEDURES
SAFETY PROCEDURES
DESIGN MODIFICATIONS
AS-BUILT TOOLING/TEST EQUIPMENT
JOBS MUTUALLY INTERFERE
REQUIRED UTILITIES NOT AVAILABLE
SPACE NOT CONTIGUOUS
EXISTING BUILDINGS NOT SUITABLE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Production Engineering Failure
SIZE
C
CODE IDENT NO
858AS162-17
SCALE
SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WH 4.1A)

CRITICAL	
MAJOR	
MINOR	

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED



NOTE: FOLLOWING CONDITIONS CAN IMPACT PRODUCTION RESOURCES.

- o LABOR EFFICIENCY
- o SUPPLIER FINANCIAL CONDITION (BANK CREDIT)
- o PROCUREMENT PROBLEMS
- o PRICE OF LABOR AND MATERIALS (ACTUAL VS PLAN)
- o SIZE AND COMPLEXITY OF WORK
- o PLANT SPACE (REAL ESTATE) AVAILABLE
- o PLANT LOCATION -- ZONING & PERMIT PROBLEMS

FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION INDIAN HEAD MD 20640

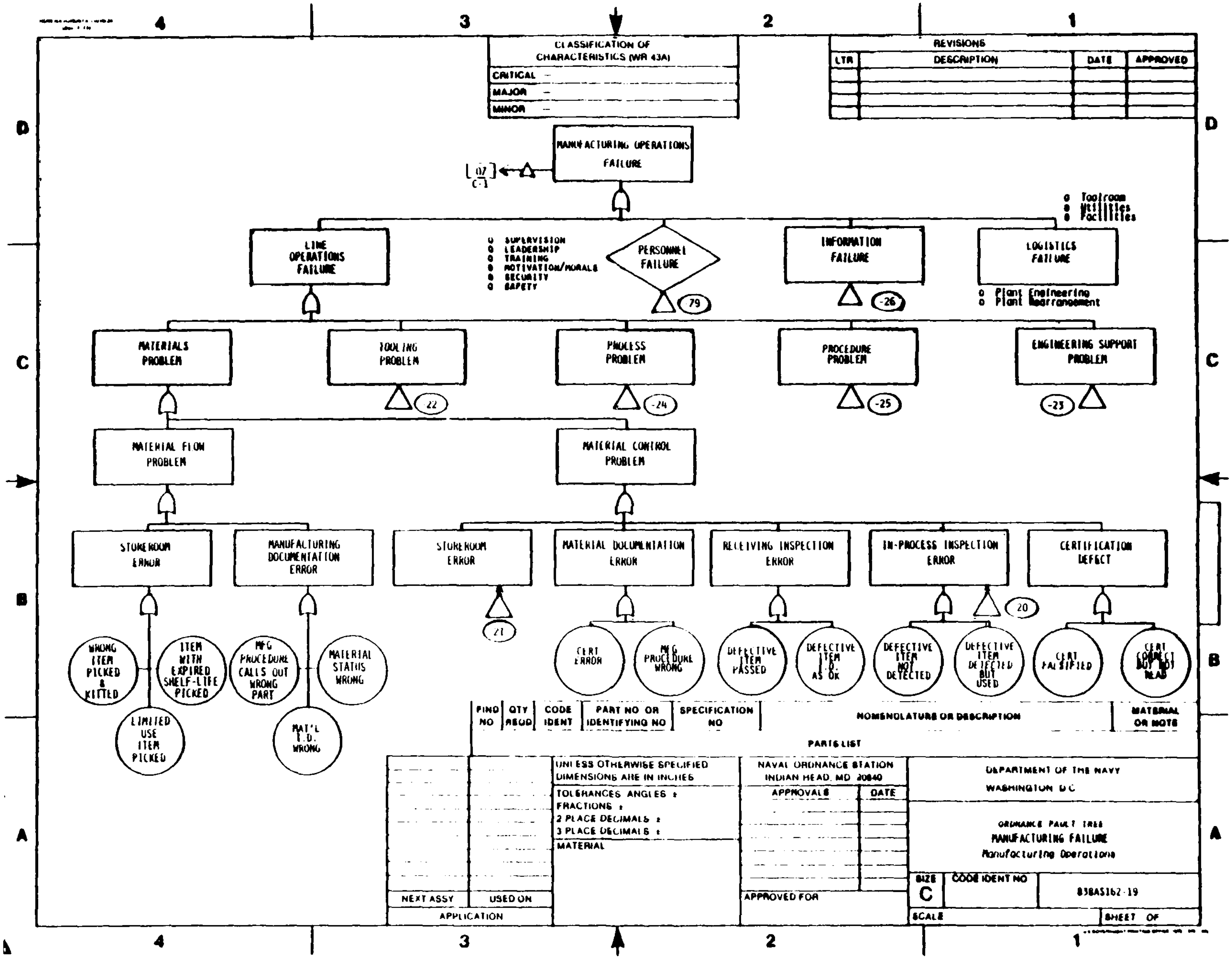
APPROVALS	DATE

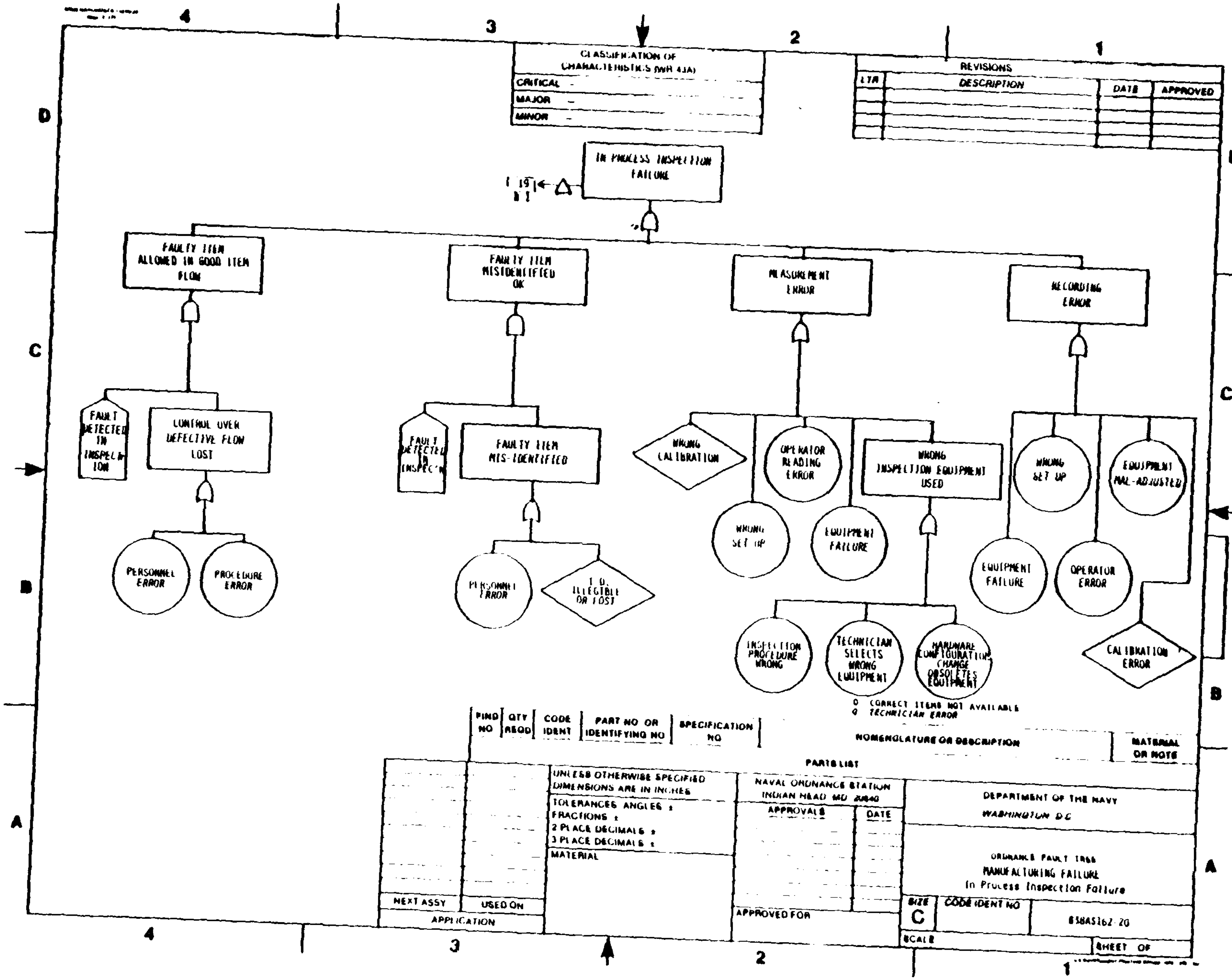
APPROVED FOR

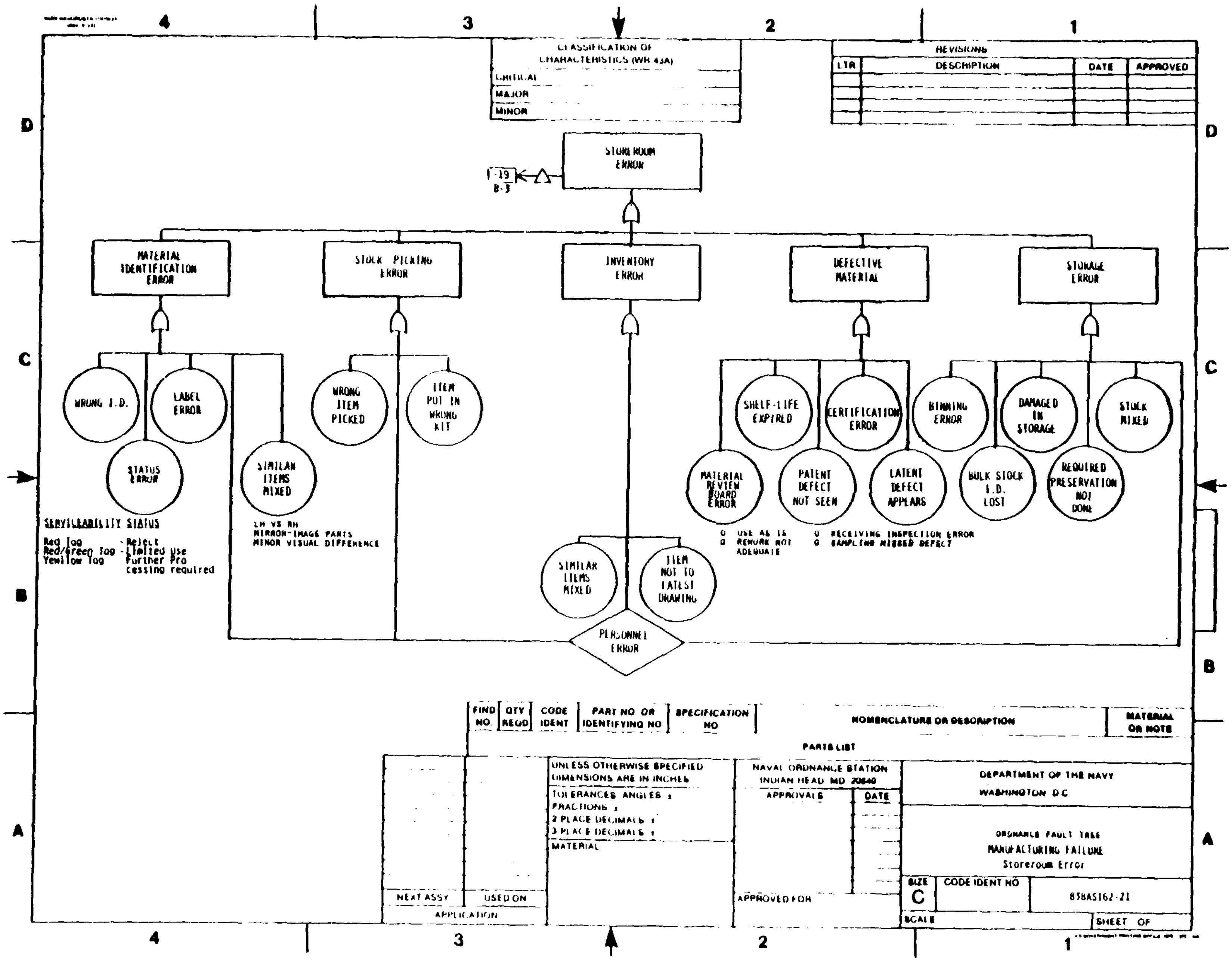
DEPARTMENT OF THE NAVY
WASHINGTON D C

ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Production Resource Failure

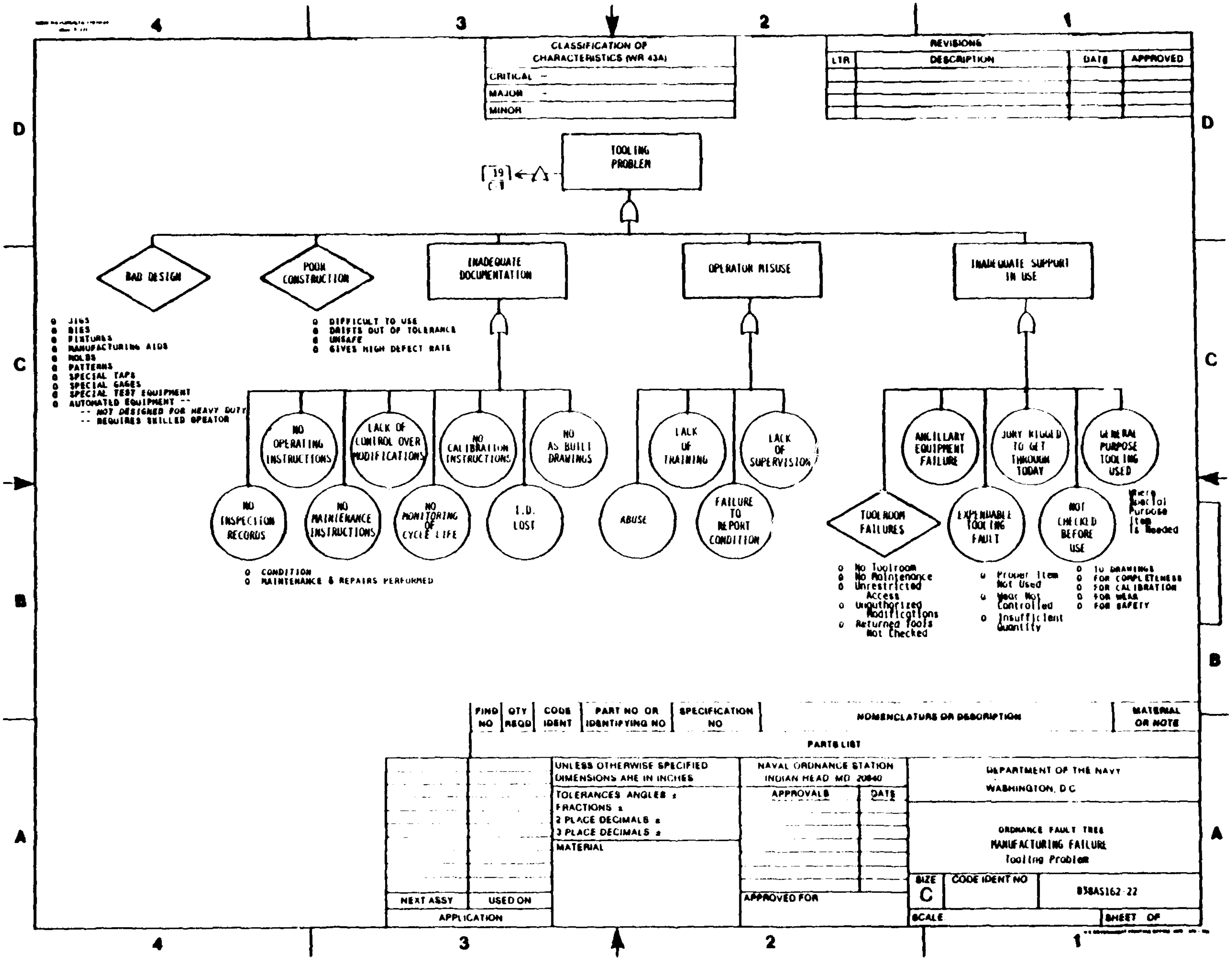
SIZE	CODE IDENT NO	
C		83BAS162-18
SCALE		SHEET OF

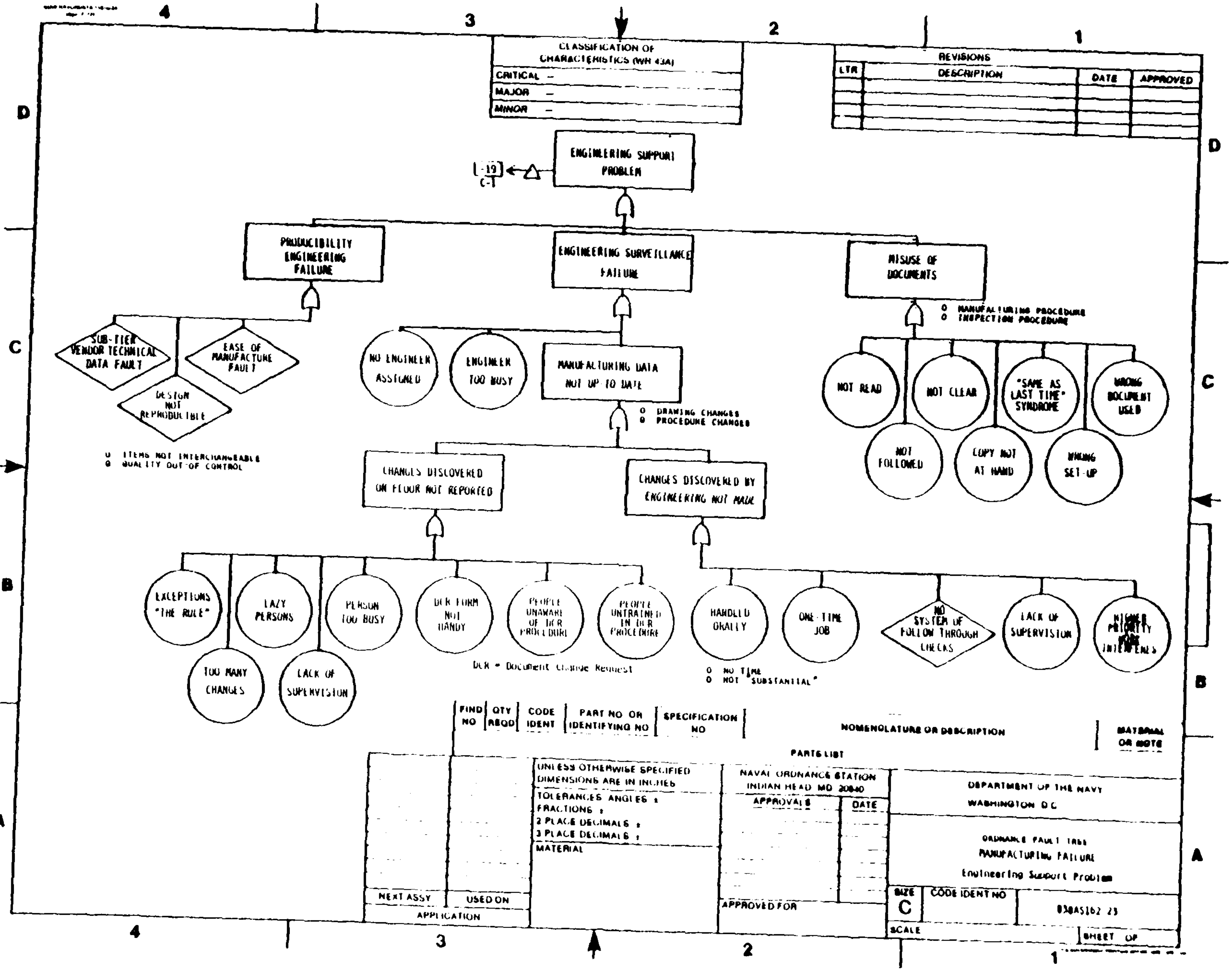

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MANUFACTURING OPERATIONS FAILURE
07
C-1
LINE OPERATIONS FAILURE
o SUPERVISION
o LEADERSHIP
o TRAINING
o MOTIVATION/MORALE
o SECURITY
o SAFETY
PERSONNEL FAILURE
79
INFORMATION FAILURE
-26
o Toolroom
o Utilities
o Facilities
LOGISTICS FAILURE
o Plant Engineering
o Plant Rearrangement
MATERIALS PROBLEM
TOOLING PROBLEM
22
PROCESS PROBLEM
-24
PROCEDURE PROBLEM
-25
ENGINEERING SUPPORT PROBLEM
-23
MATERIAL FLOW PROBLEM
MATERIAL CONTROL PROBLEM
STOREROOM ERROR
MANUFACTURING DOCUMENTATION ERROR
STOREROOM ERROR
21
MATERIAL DOCUMENTATION ERROR
RECEIVING INSPECTION ERROR
IN-PROCESS INSPECTION ERROR
20
CERTIFICATION DEFECT
WRONG ITEM PICKED & KITTED
ITEM WITH EXPIRED SHELF-LIFE PICKED
LIMITED USE ITEM PICKED
MFG PROCEDURE CALLS OUT WRONG PART
MATERIAL STATUS WRONG
MAT'L I.D. WRONG
CERT ERROR
MFG PROCEDURE WRONG
DEFECTIVE ITEM PASSED
DEFECTIVE ITEM I.D. AS OK
DEFECTIVE ITEM NOT DETECTED
DEFECTIVE ITEM DETECTED BUT USED
CERT FALSIFIED
CERT CORRECT BUT NOT READ
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY WASHINGTON D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Manufacturing Operations
SIZE C
CODE IDENT NO
838AS162-19
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

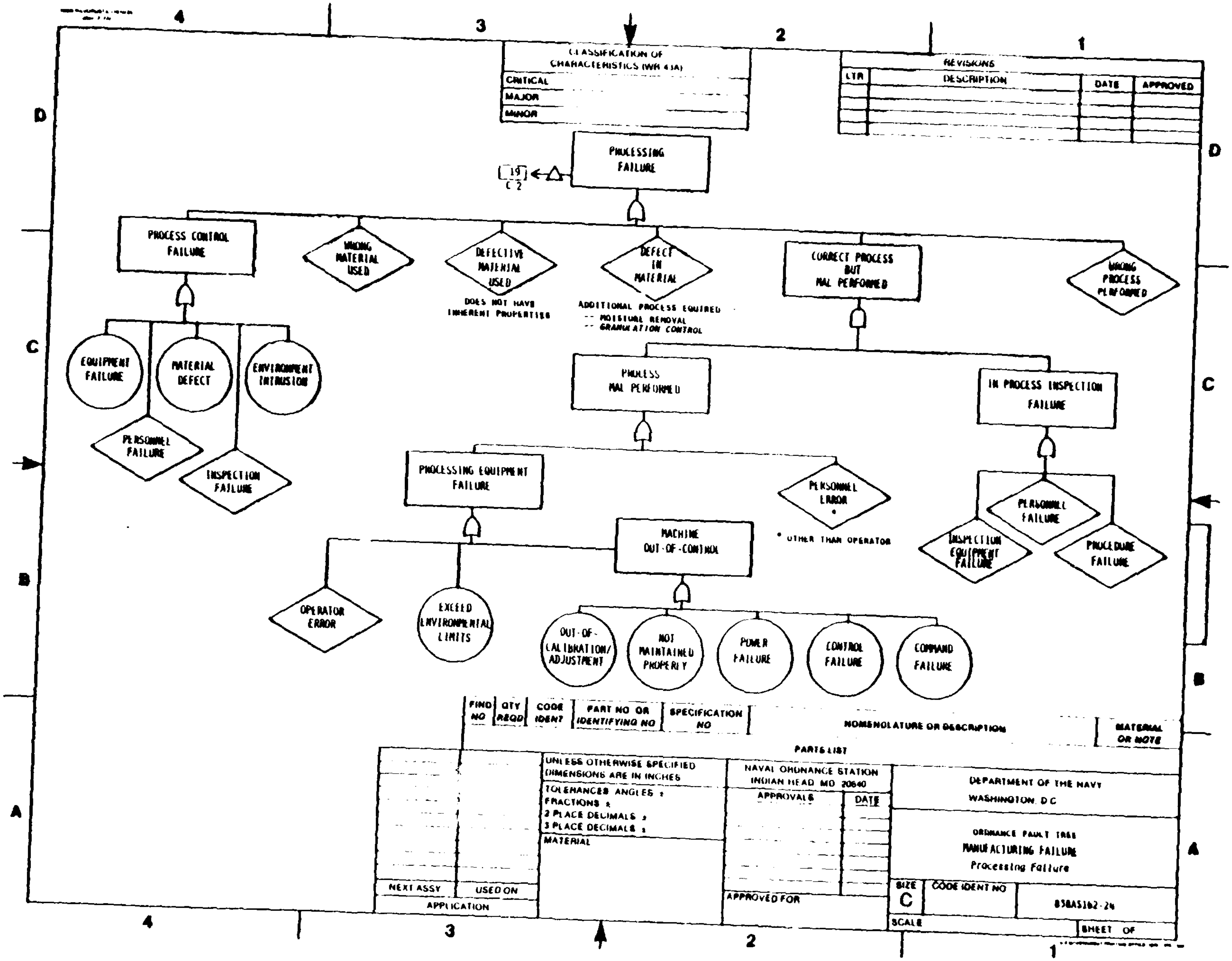

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
IN PROCESS INSPECTION FAILURE
FAULTY ITEM ALLOWED IN GOOD ITEM FLOW
FAULTY ITEM MISIDENTIFIED OK
MEASUREMENT ERROR
RECORDING ERROR
FAULT DETECTED IN INSPECTION
CONTROL OVER DEFECTIVE FLOW LOST
FAULT DETECTED IN INSPEC'N
FAULTY ITEM MIS-IDENTIFIED
WRONG CALIBRATION
OPERATOR READING ERROR
WRONG INSPECTION EQUIPMENT USED
WRONG SET UP
EQUIPMENT MAL-ADJUSTED
PERSONNEL ERROR
PROCEDURE ERROR
PERSONNEL ERROR
I.D. ILLEGIBLE OR LOST
WRONG SET UP
EQUIPMENT FAILURE
EQUIPMENT FAILURE
OPERATOR ERROR
INSPECTION PROCEDURE WRONG
TECHNICIAN SELECTS WRONG EQUIPMENT
HARDWARE CONFIGURATION CHANGE OBSOLETES EQUIPMENT
CALIBRATION ERROR
O CORRECT ITEMS NOT AVAILABLE
Q TECHNICIAN ERROR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY WASHINGTON D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
In Process Inspection Failure
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SIZE C
CODE IDENT NO
838AS162-20
SCALE
SHEET OF



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
STOREROOM ERROR
1-19 8-3
MATERIAL IDENTIFICATION ERROR
STOCK PICKING ERROR
INVENTORY ERROR
DEFECTIVE MATERIAL
STORAGE ERROR
WRONG I.D.
LABEL ERROR
STATUS ERROR
SIMILAR ITEMS MIXED
WRONG ITEM PICKED
ITEM PUT IN WRONG KIT
SHELF-LIFE EXPIRED
CERTIFICATION ERROR
MATERIAL REVIEW BOARD ERROR
PATENT DEFECT NOT SEEN
LATENT DEFECT APPEARS
BINNING ERROR
DAMAGED IN STORAGE
STOCK MIXED
BULK STOCK I.D. LOST
REQUIRED PRESERVATION NOT DONE
SERVICEABILITY STATUS
Red Tag - Reject
Red/Green Tag - Limited use
Yellow Tag Further Processing required
LH VS RH
MIRROR-IMAGE PARTS
MINOR VISUAL DIFFERENCE
O USE AS IS
O REWORK NOT ADEQUATE
O RECEIVING INSPECTION ERROR
O SAMPLING MISSED DEFECT
SIMILAR ITEMS MIXED
ITEM NOT TO LATEST DRAWING
PERSONNEL ERROR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Storeroom Error
SIZE C
CODE IDENT NO
838AS162-21
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
TOOLING PROBLEM
19
C-1
BAD DESIGN
POOR CONSTRUCTION
INADEQUATE DOCUMENTATION
OPERATOR MISUSE
INADEQUATE SUPPORT IN USE
o JIGS
o DIES
o FIXTURES
o MANUFACTURING AIDS
o MOLDS
o PATTERNS
o SPECIAL TAPS
o SPECIAL GAGES
o SPECIAL TEST EQUIPMENT
o AUTOMATED EQUIPMENT --
-- NOT DESIGNED FOR HEAVY DUTY
-- REQUIRES SKILLED OPERATOR
o DIFFICULT TO USE
o DRIFTS OUT OF TOLERANCE
o UNSAFE
o GIVES HIGH DEFECT RATE
NO OPERATING INSTRUCTIONS
LACK OF CONTROL OVER MODIFICATIONS
NO CALIBRATION INSTRUCTIONS
NO AS BUILT DRAWINGS
NO INSPECTION RECORDS
NO MAINTENANCE INSTRUCTIONS
NO MONITORING OF CYCLE LIFE
I.D. LOST
o CONDITION
o MAINTENANCE & REPAIRS PERFORMED
LACK OF TRAINING
LACK OF SUPERVISION
ABUSE
FAILURE TO REPORT CONDITION
ANCILLARY EQUIPMENT FAILURE
JURY RIGGED TO GET THROUGH TODAY
GENERAL PURPOSE TOOLING USED
Where Special Purpose Item Is Needed
TOOLROOM FAILURES
EXPENDABLE TOOLING FAULT
NOT CHECKED BEFORE USE
o No Toolroom
o No Maintenance
o Unrestricted Access
o Unauthorized Modifications
o Returned Tools Not Checked
o Proper Item Not Used
o Wear Not Controlled
o Insufficient Quantity
o TO DRAWINGS
o FOR COMPLETENESS
o FOR CALIBRATION
o FOR WEAR
o FOR SAFETY
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Tooling Problem
SIZE
C
CODE IDENT NO
838AS162-22
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

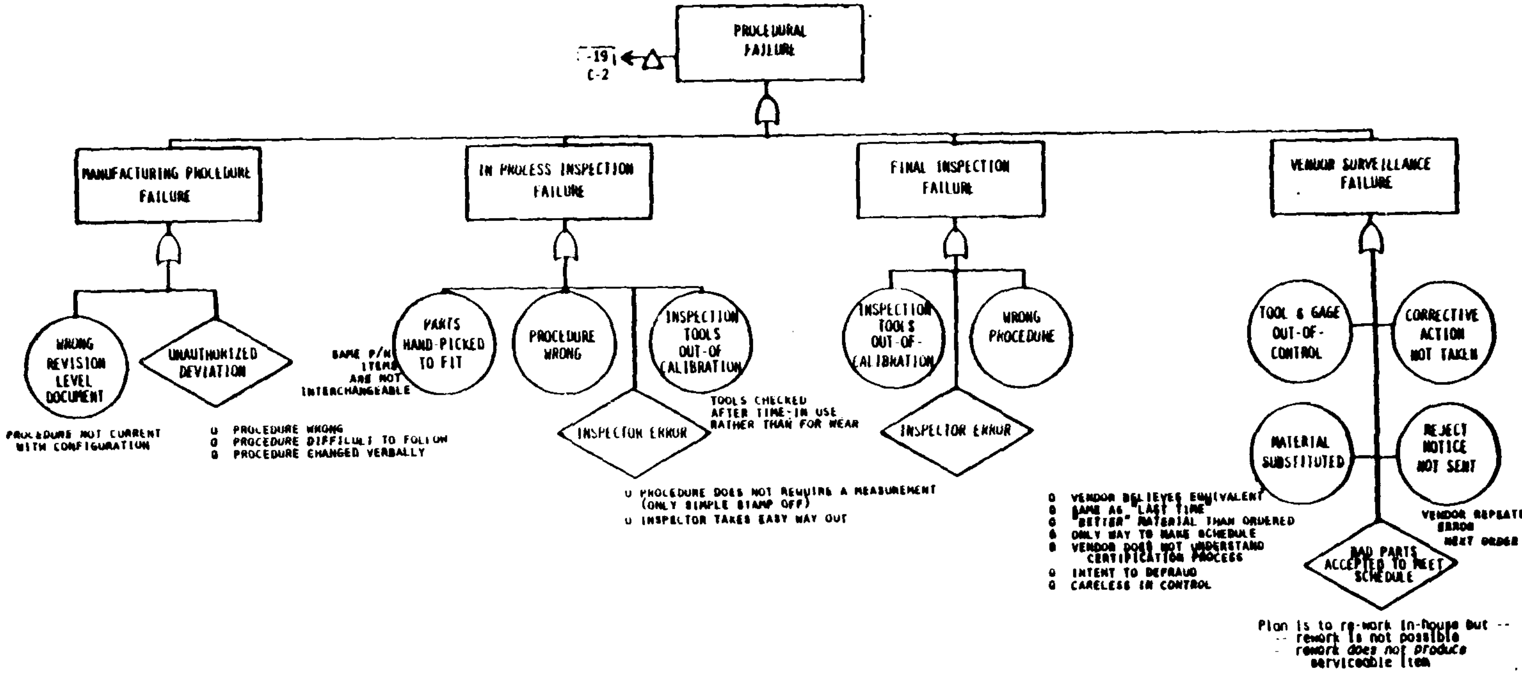

CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ENGINEERING SUPPORT PROBLEM
I-19
C-1
PRODUCIBILITY ENGINEERING FAILURE
ENGINEERING SURVEILLANCE FAILURE
MISUSE OF DOCUMENTS
O MANUFACTURING PROCEDURE
O INSPECTION PROCEDURE
SUB-TIER VENDOR TECHNICAL DATA FAULT
EASE OF MANUFACTURE FAULT
DESIGN NOT REPRODUCIBLE
O ITEMS NOT INTERCHANGEABLE
O QUALITY OUT OF CONTROL
NO ENGINEER ASSIGNED
ENGINEER TOO BUSY
MANUFACTURING DATA NOT UP TO DATE
O DRAWING CHANGES
O PROCEDURE CHANGES
NOT READ
NOT CLEAR
"SAME AS LAST TIME" SYNDROME
WRONG DOCUMENT USED
NOT FOLLOWED
COPY NOT AT HAND
WRONG SET-UP
CHANGES DISCOVERED ON FLOOR NOT REPORTED
CHANGES DISCOVERED BY ENGINEERING NOT MADE
EXCEPTIONS "THE RULE"
LAZY PERSONS
PERSON TOO BUSY
DCR FORM NOT HANDY
PEOPLE UNAWARE OF DCR PROCEDURE
PEOPLE UNTRAINED IN DCR PROCEDURE
TOO MANY CHANGES
LACK OF SUPERVISION
DCR = Document Change Request
HANDLED ORALLY
ONE-TIME JOB
NO SYSTEM OF FOLLOW THROUGH CHECKS
LACK OF SUPERVISION
HIGHER PRIORITY WORK INTERFERES
O NO TIME
O NOT "SUBSTANTIAL"
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON D.C.
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Engineering Support Problem
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SIZE
C
CODE IDENT NO
830AS162 23
SCALE
SHEET OF



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PROCESSING FAILURE
19 C2
PROCESS CONTROL FAILURE
WRONG MATERIAL USED
DEFECTIVE MATERIAL USED
DOES NOT HAVE INHERENT PROPERTIES
DEFECT IN MATERIAL
ADDITIONAL PROCESS EQUIRED
-- MOISTURE REMOVAL
-- GRANULATION CONTROL
CORRECT PROCESS BUT MAL PERFORMED
WRONG PROCESS PERFORMED
EQUIPMENT FAILURE
MATERIAL DEFECT
ENVIRONMENT INTRUSION
PERSONNEL FAILURE
INSPECTION FAILURE
PROCESS MAL PERFORMED
IN PROCESS INSPECTION FAILURE
PROCESSING EQUIPMENT FAILURE
PERSONNEL ERROR *
* OTHER THAN OPERATOR
PERSONNEL FAILURE
INSPECTION EQUIPMENT FAILURE
PROCEDURE FAILURE
MACHINE OUT-OF-CONTROL
OPERATOR ERROR
EXCEED ENVIRONMENTAL LIMITS
OUT-OF-CALIBRATION/ADJUSTMENT
NOT MAINTAINED PROPERLY
POWER FAILURE
CONTROL FAILURE
COMMAND FAILURE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Processing Failure
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SIZE
C
CODE IDENT NO
838AS162-24
SCALE
SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



FIND NO	QTY REQD	CODE IDENT	PART NO. OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640

APPROVALS	DATE

APPROVED FOR

DEPARTMENT OF THE NAVY
WASHINGTON, D.C.

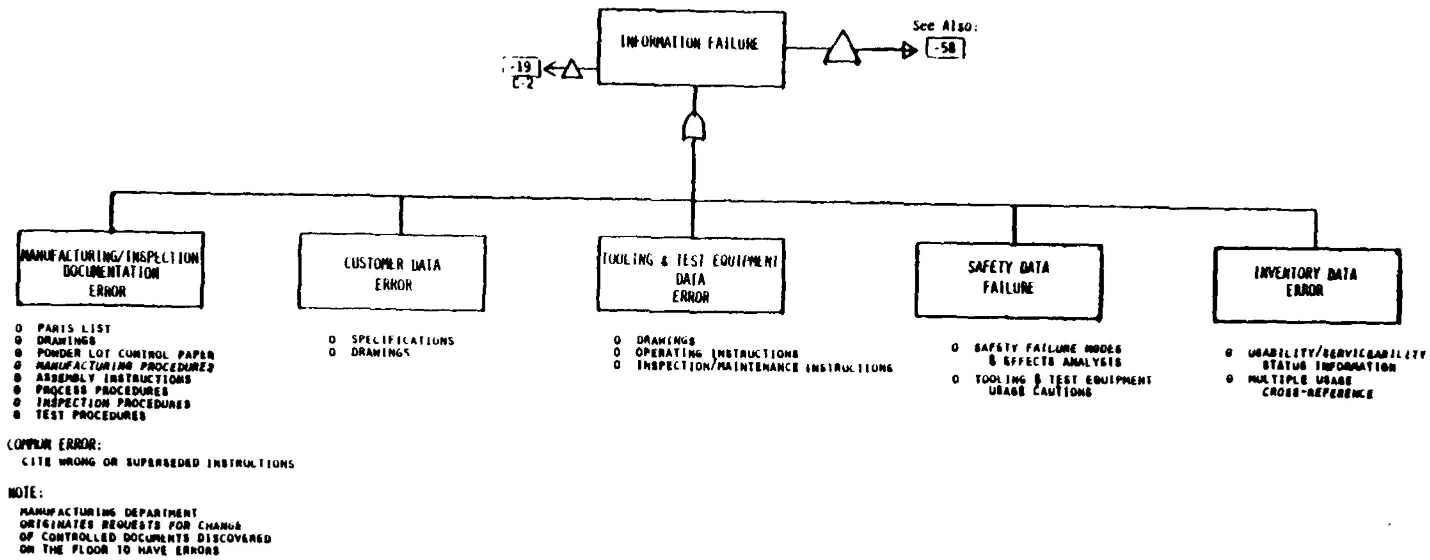
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Procedural Failure

SIZE	CODE IDENT NO	
C		838AS162-25
SCALE		SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)

CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



FIND NO.	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640

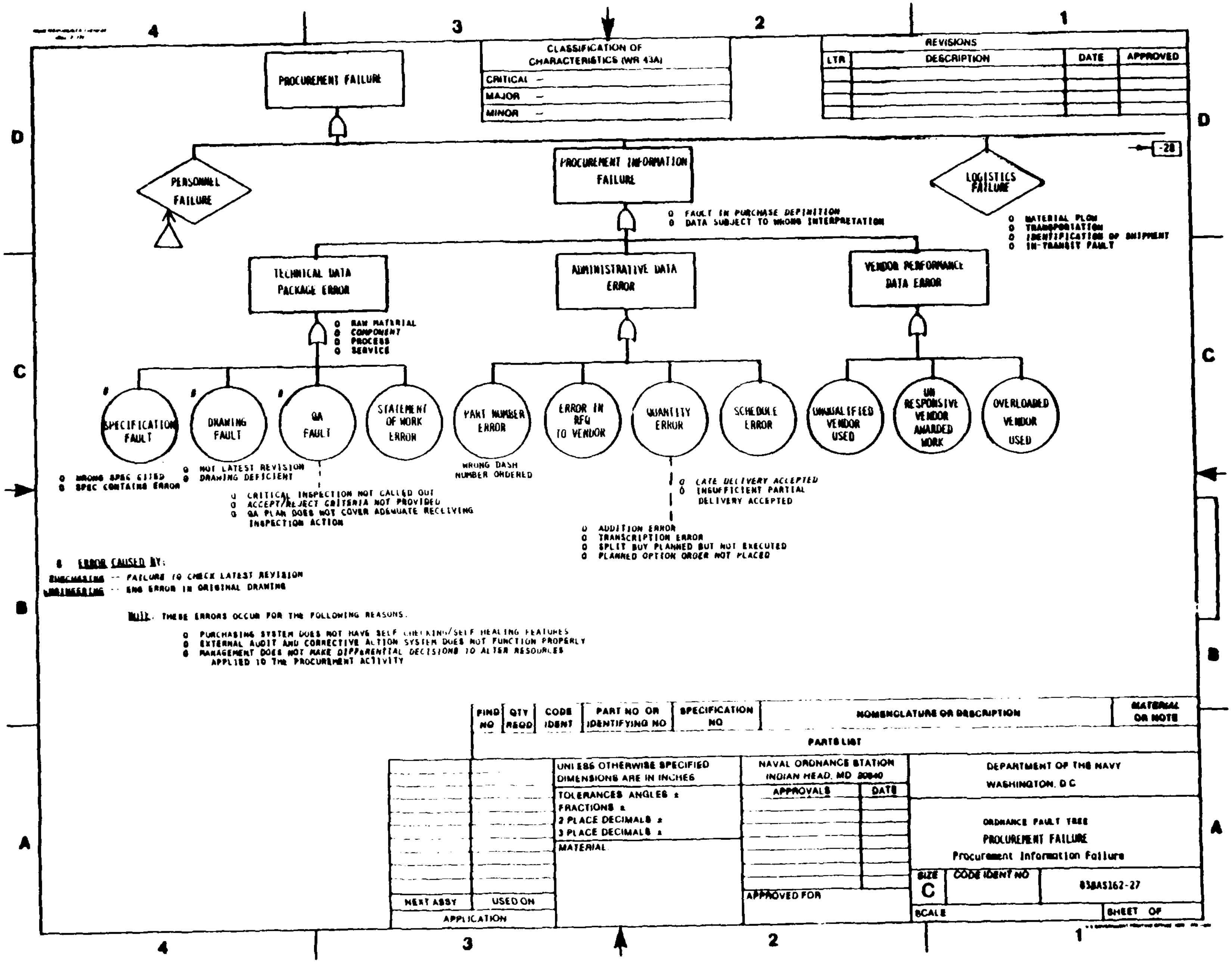
APPROVALS	DATE

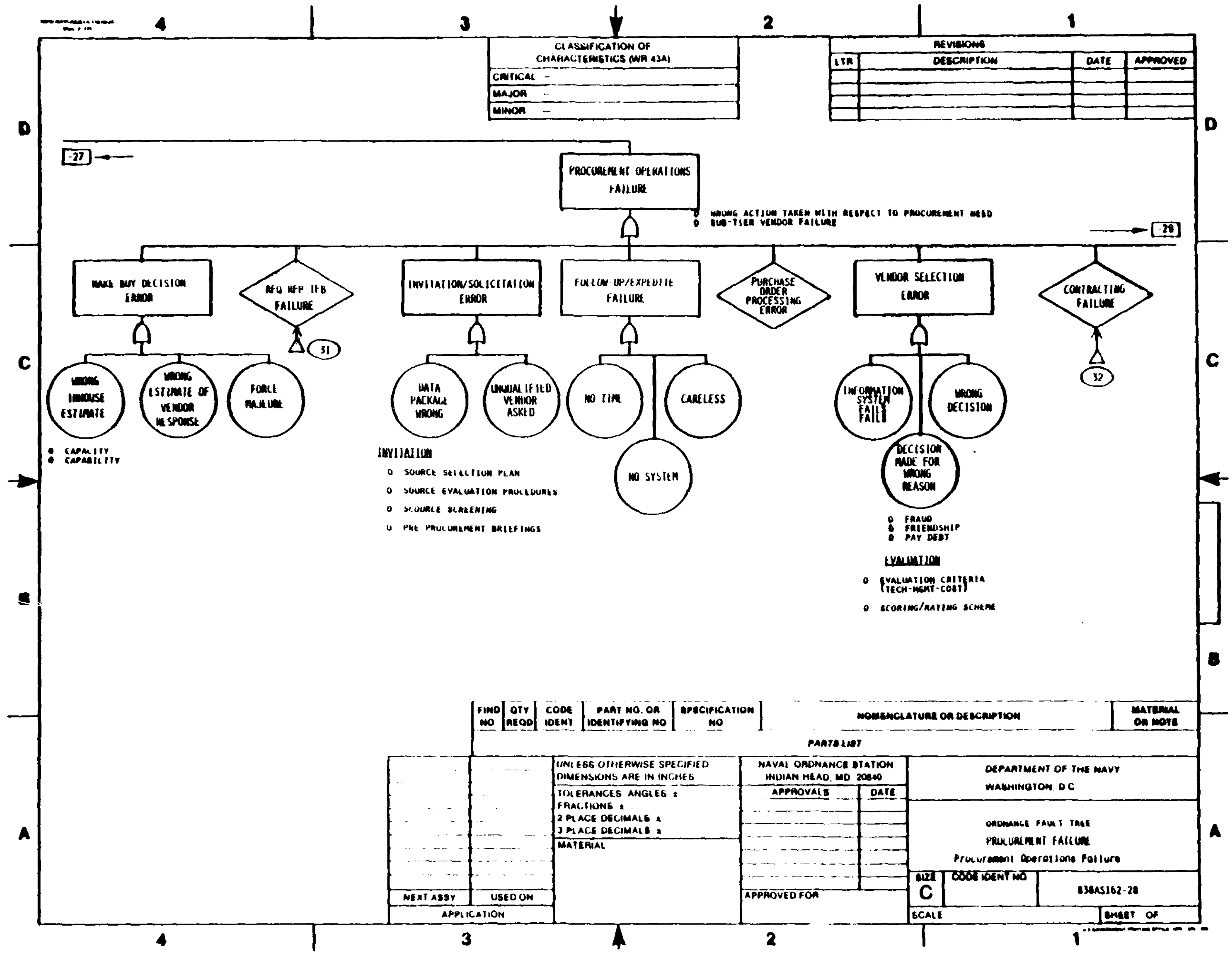
APPROVED FOR

DEPARTMENT OF THE NAVY
WASHINGTON, D C

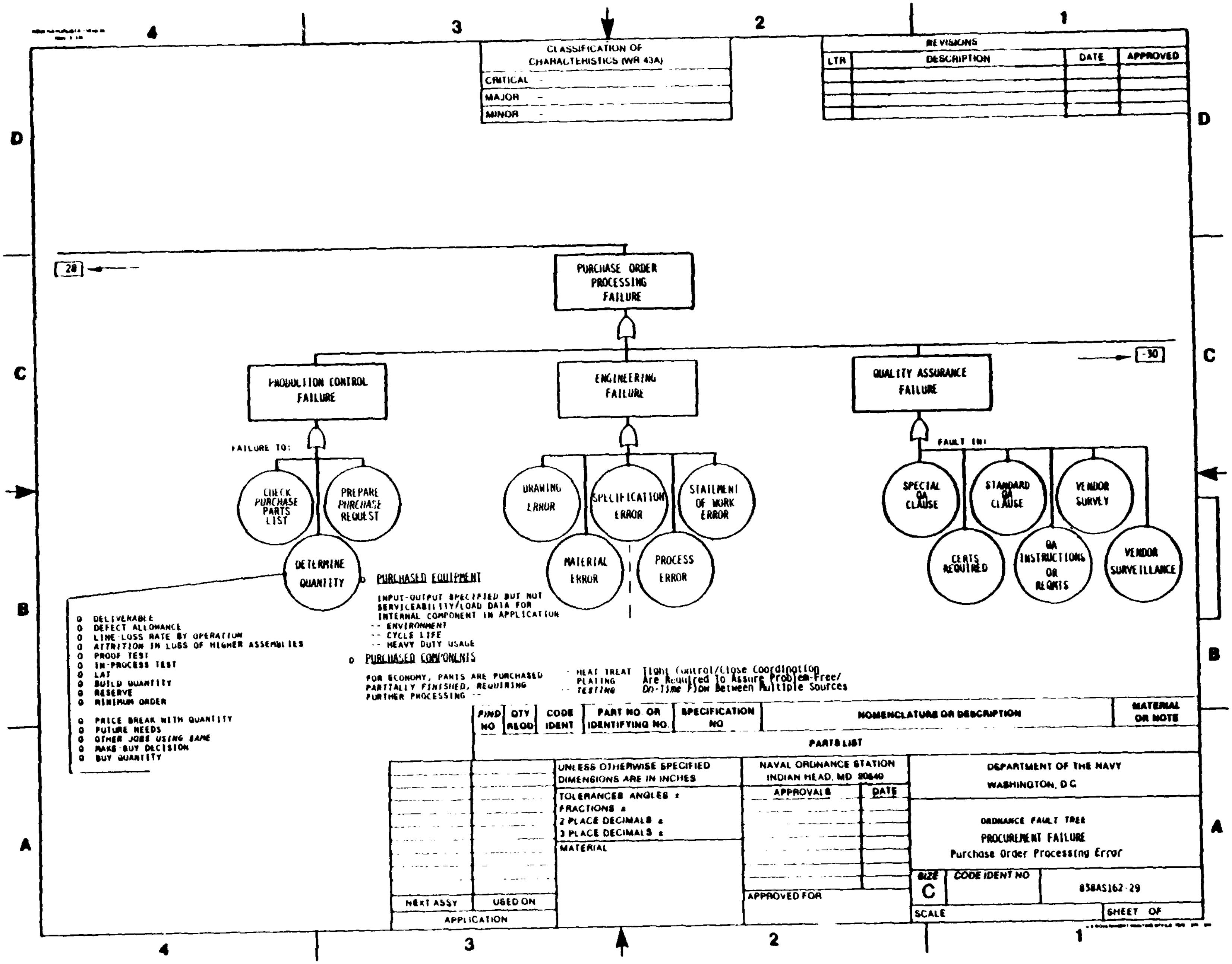
ORDNANCE FAULT TREE
MANUFACTURING FAILURE
Information Failure

SIZE C | CODE IDENT NO | 838AS162-26
SCALE | SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PROCUREMENT FAILURE
PERSONNEL FAILURE
PROCUREMENT INFORMATION FAILURE
LOGISTICS FAILURE
-28
o FAULT IN PURCHASE DEFINITION
o DATA SUBJECT TO WRONG INTERPRETATION
o MATERIAL FLOW
o TRANSPORTATION
o IDENTIFICATION OF SHIPMENT
o IN-TRANSIT FAULT
TECHNICAL DATA PACKAGE ERROR
ADMINISTRATIVE DATA ERROR
VENDOR PERFORMANCE DATA ERROR
o RAW MATERIAL
o COMPONENT
o PROCESS
o SERVICE
SPECIFICATION FAULT
DRAWING FAULT
QA FAULT
STATEMENT OF WORK ERROR
PART NUMBER ERROR
ERROR IN RFQ TO VENDOR
QUANTITY ERROR
SCHEDULE ERROR
UNQUALIFIED VENDOR USED
UNRESPONSIVE VENDOR AWARDED WORK
OVERLOADED VENDOR USED
o WRONG SPEC CITED
o SPEC CONTAINS ERROR
o NOT LATEST REVISION
o DRAWING DEFICIENT
o CRITICAL INSPECTION NOT CALLED OUT
o ACCEPT/REJECT CRITERIA NOT PROVIDED
o QA PLAN DOES NOT COVER ADEQUATE RECEIVING INSPECTION ACTION
WRONG DASH NUMBER ORDERED
o LATE DELIVERY ACCEPTED
o INSUFFICIENT PARTIAL DELIVERY ACCEPTED
o ADDITION ERROR
o TRANSCRIPTION ERROR
o SPLIT BUY PLANNED BUT NOT EXECUTED
o PLANNED OPTION ORDER NOT PLACED
ERROR CAUSED BY:
PURCHASING -- FAILURE TO CHECK LATEST REVISION
ENGINEERING -- ENG ERROR IN ORIGINAL DRAWING
NOTE. THESE ERRORS OCCUR FOR THE FOLLOWING REASONS.
o PURCHASING SYSTEM DOES NOT HAVE SELF CHECKING/SELF HEALING FEATURES
o EXTERNAL AUDIT AND CORRECTIVE ACTION SYSTEM DOES NOT FUNCTION PROPERLY
o MANAGEMENT DOES NOT MAKE DIFFERENTIAL DECISIONS TO ALTER RESOURCES APPLIED TO THE PROCUREMENT ACTIVITY
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
PROCUREMENT FAILURE
Procurement Information Failure
SIZE
C
CODE IDENT NO
83BAS162-27
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-27
PROCUREMENT OPERATIONS FAILURE
O WRONG ACTION TAKEN WITH RESPECT TO PROCUREMENT NEED
O SUB-TIER VENDOR FAILURE
-28
MAKE BUY DECISION ERROR
RFQ RFP IFB FAILURE
31
INVITATION/SOLICITATION ERROR
FOLLOW UP/EXPEDITE FAILURE
PURCHASE ORDER PROCESSING ERROR
VENDOR SELECTION ERROR
CONTRACTING FAILURE
32
WRONG INHOUSE ESTIMATE
WRONG ESTIMATE OF VENDOR RESPONSE
FORCE MAJEURE
O CAPACITY
O CAPABILITY
DATA PACKAGE WRONG
UNQUALIFIED VENDOR ASKED
INVITATION
O SOURCE SELECTION PLAN
O SOURCE EVALUATION PROCEDURES
O SOURCE SCREENING
O PRE PROCUREMENT BRIEFINGS
NO TIME
CARELESS
NO SYSTEM
INFORMATION SYSTEM FAILS
WRONG DECISION
DECISION MADE FOR WRONG REASON
O FRAUD
O FRIENDSHIP
O PAY DEBT
EVALUATION
O EVALUATION CRITERIA (TECH-MGMT-COST)
O SCORING/RATING SCHEME
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
PROCUREMENT FAILURE
Procurement Operations Failure
SIZE
C
CODE IDENT NO
838AS162-28
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL -
MAJOR -
MINOR -
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
28
30
PURCHASE ORDER PROCESSING FAILURE
PRODUCTION CONTROL FAILURE
ENGINEERING FAILURE
QUALITY ASSURANCE FAILURE
FAILURE TO:
CHECK PURCHASE PARTS LIST
PREPARE PURCHASE REQUEST
DETERMINE QUANTITY
DRAWING ERROR
SPECIFICATION ERROR
STATEMENT OF WORK ERROR
MATERIAL ERROR
PROCESS ERROR
FAULT IN:
SPECIAL QA CLAUSE
STANDARD QA CLAUSE
VENDOR SURVEY
CERTS REQUIRED
QA INSTRUCTIONS OR REQMTS
VENDOR SURVEILLANCE
o DELIVERABLE
o DEFECT ALLOWANCE
o LINE-LOSS RATE BY OPERATION
o ATTRITION IN LOSS OF HIGHER ASSEMBLIES
o PROOF TEST
o IN-PROCESS TEST
o LAT
o BUILD QUANTITY
o RESERVE
o MINIMUM ORDER
o PRICE BREAK WITH QUANTITY
o FUTURE NEEDS
o OTHER JOBS USING SAME
o MAKE-BUY DECISION
o BUY QUANTITY
o PURCHASED EQUIPMENT
INPUT-OUTPUT SPECIFIED BUT NOT SERVICEABILITY/LOAD DATA FOR INTERNAL COMPONENT IN APPLICATION
-- ENVIRONMENT
-- CYCLE LIFE
-- HEAVY DUTY USAGE
o PURCHASED COMPONENTS
FOR ECONOMY, PARTS ARE PURCHASED PARTIALLY FINISHED, REQUIRING FURTHER PROCESSING --
-- HEAT TREAT
-- PLATING
-- TESTING
Tight Control/Close Coordination Are Required to Assure Problem-Free/On-Time Flow Between Multiple Sources
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO.
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
PROCUREMENT FAILURE
Purchase Order Processing Error
SIZE
C
CODE IDENT NO
838AS162-29
SCALE
SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)

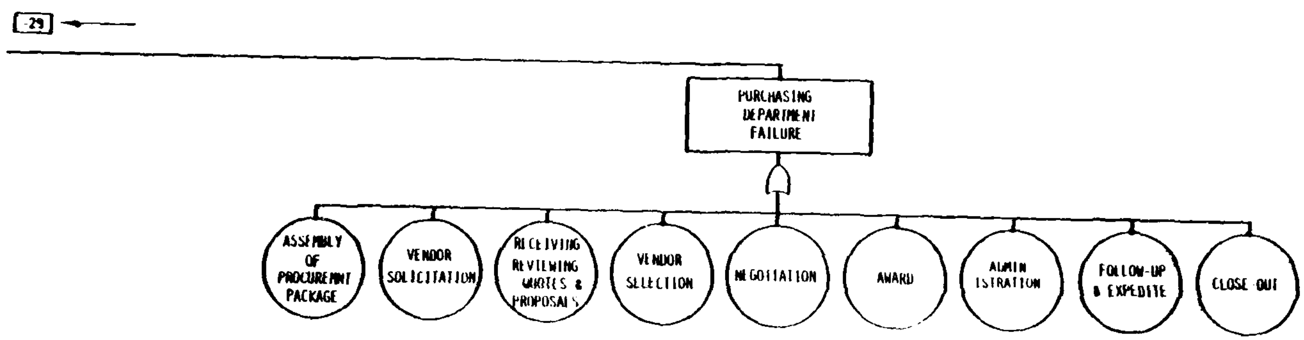
CRITICAL

MAJOR

MINOR

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED



FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ANGLES ±

FRACTIONS ±

2 PLACE DECIMALS ±

3 PLACE DECIMALS ±

MATERIAL

NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640

APPROVALS | DATE

APPROVED FOR

DEPARTMENT OF THE NAVY

WASHINGTON, D C

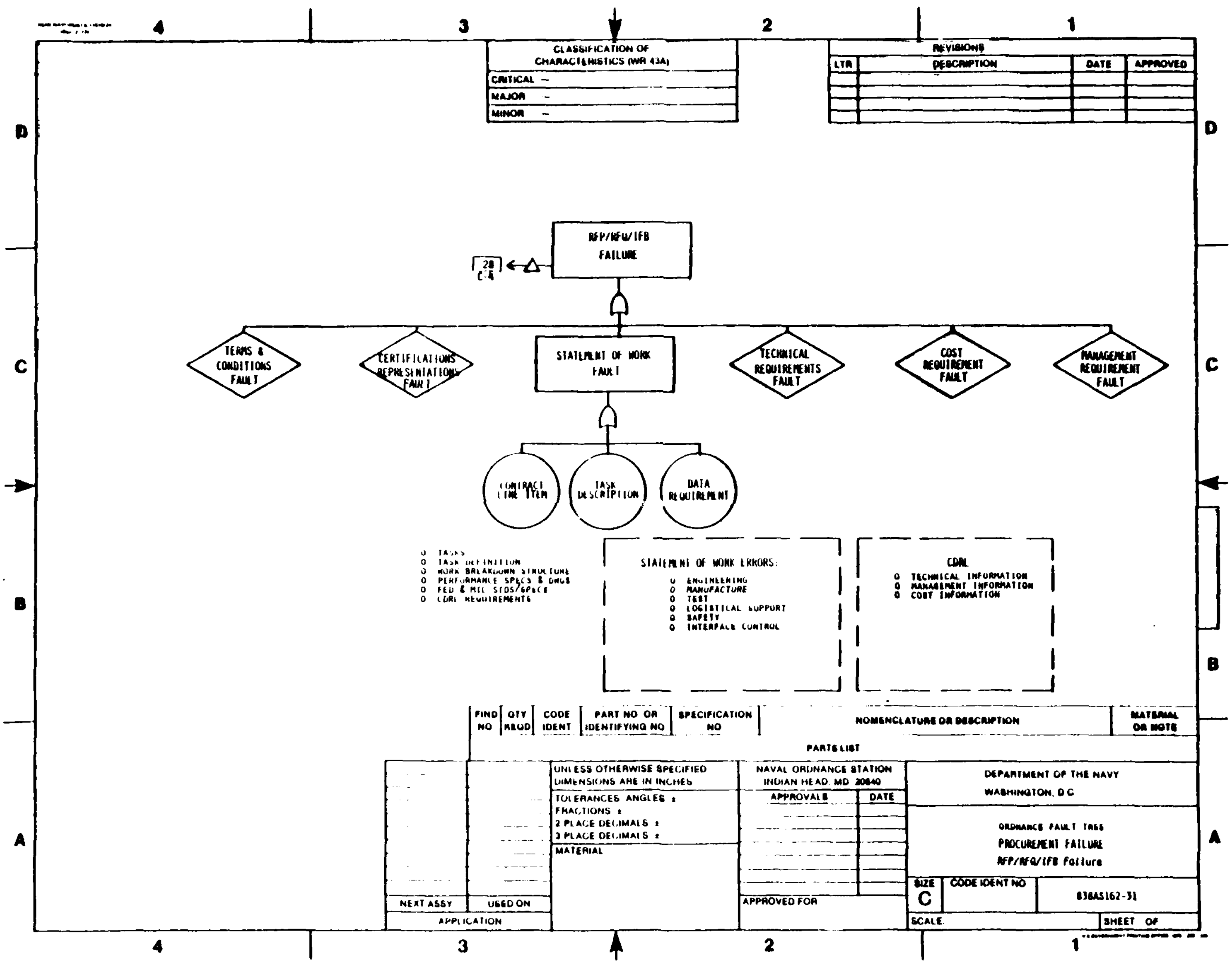
ORDNANCE FAULT TREE

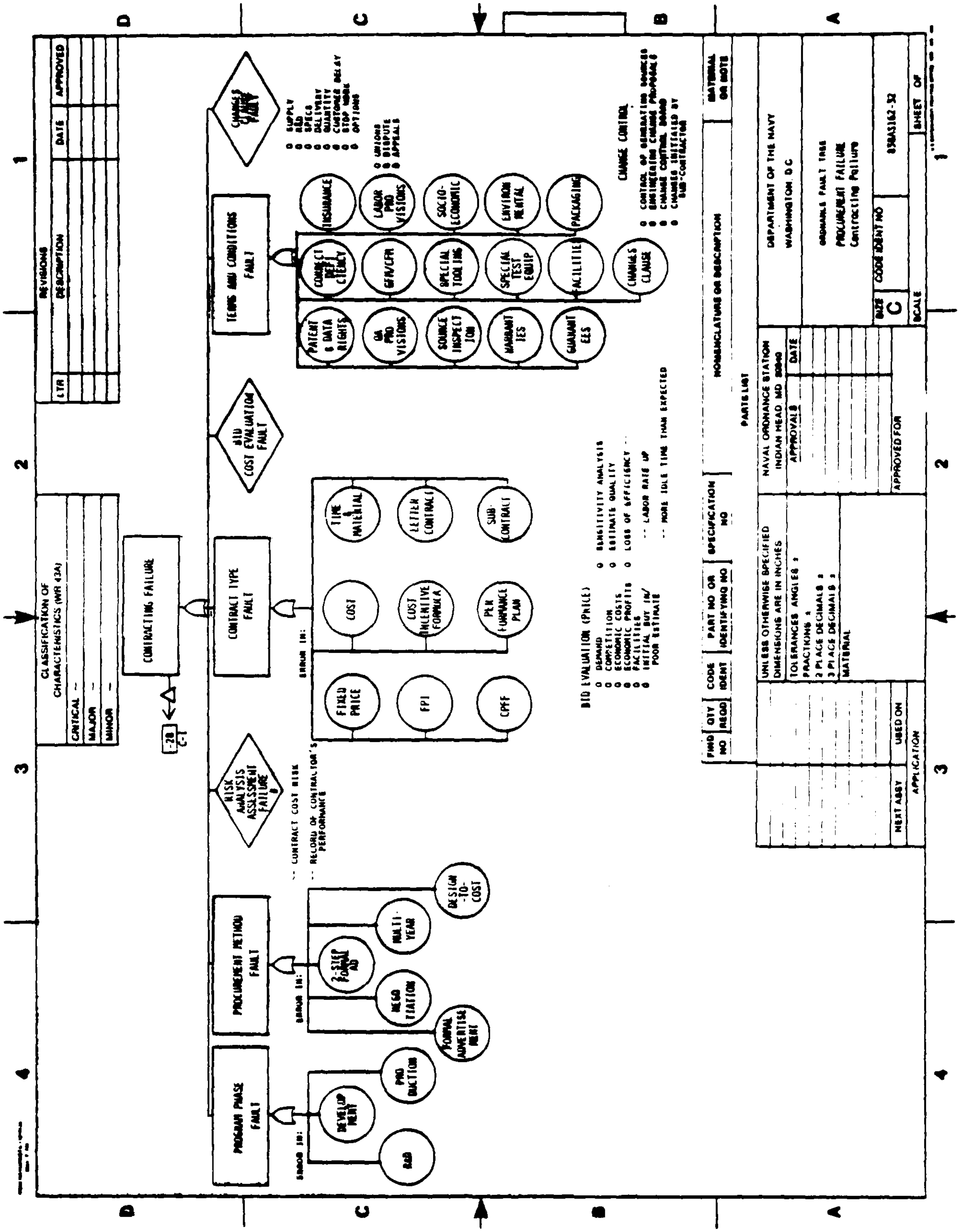
PROCUREMENT FAILURE

Purchasing Department Failure

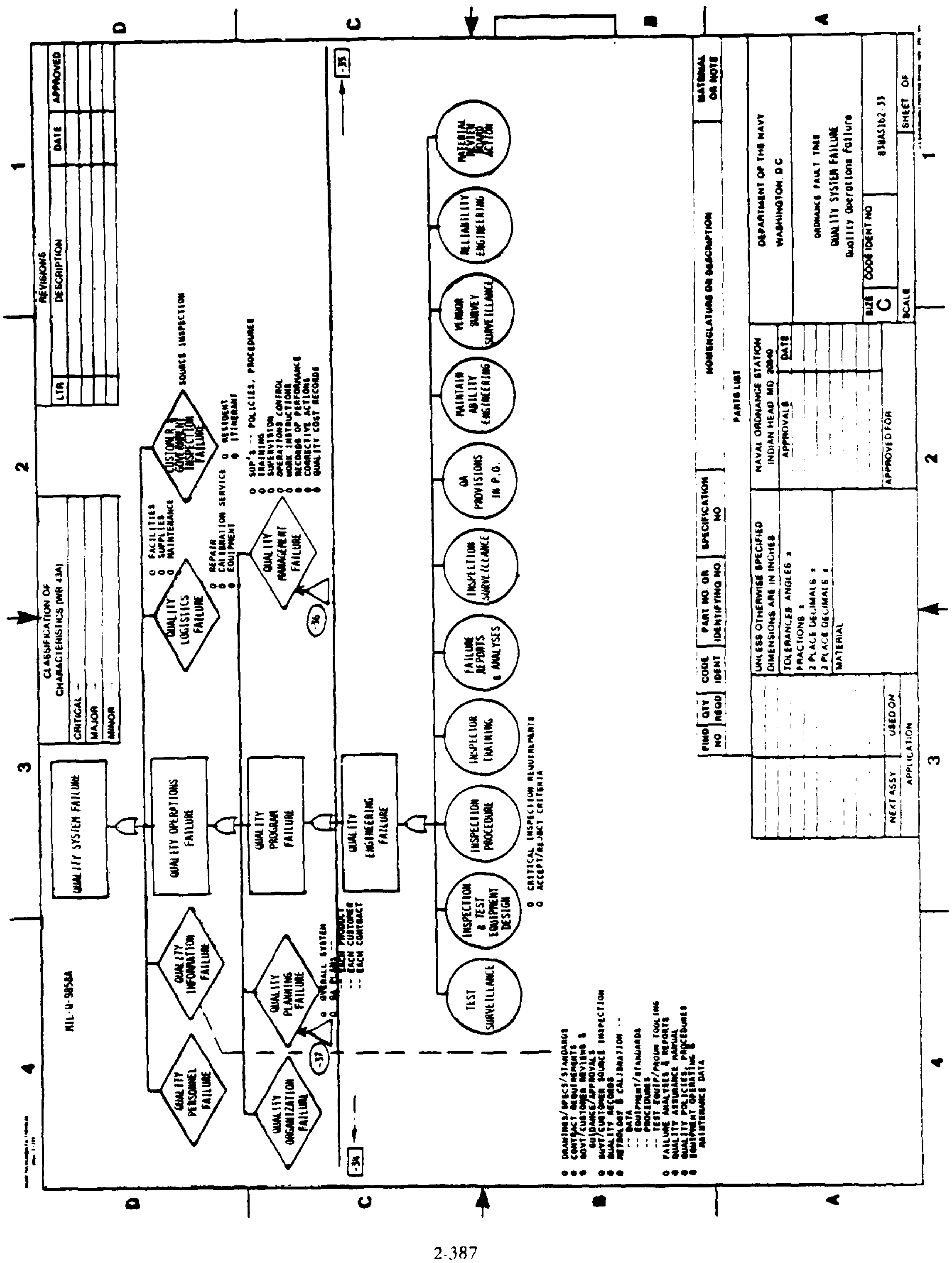
SIZE C | CODE IDENT NO | 838AS162-30

SCALE | SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
RFP/RFQ/IFB FAILURE
28 C-4
TERMS & CONDITIONS FAULT
CERTIFICATIONS REPRESENTATIONS FAULT
STATEMENT OF WORK FAULT
TECHNICAL REQUIREMENTS FAULT
COST REQUIREMENT FAULT
MANAGEMENT REQUIREMENT FAULT
CONTRACT LINE ITEM
TASK DESCRIPTION
DATA REQUIREMENT
O TASKS
O TASK DEFINITION
O WORK BREAKDOWN STRUCTURE
O PERFORMANCE SPECS & DWGS
O FED & MIL STDS/SPECS
O CDRL REQUIREMENTS
STATEMENT OF WORK ERRORS:
O ENGINEERING
O MANUFACTURE
O TEST
O LOGISTICAL SUPPORT
O SAFETY
O INTERFACE CONTROL
CDRL
O TECHNICAL INFORMATION
O MANAGEMENT INFORMATION
O COST INFORMATION
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
PROCUREMENT FAILURE
RFP/RFQ/IFB Failure
SIZE C
CODE IDENT NO
838AS162-31
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

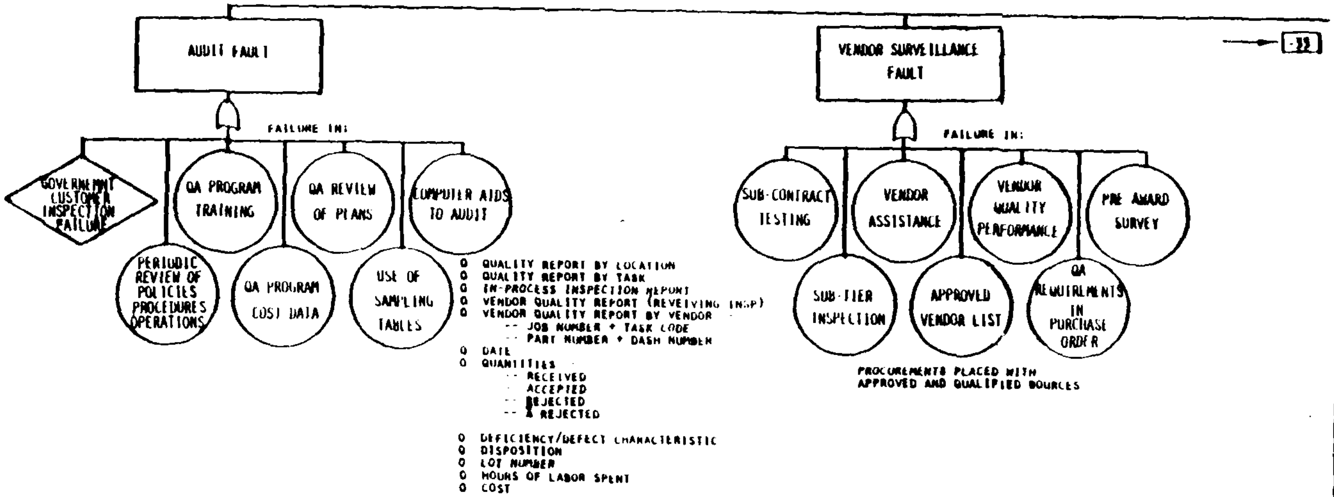


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
-28
C-1
CONTRACTING FAILURE
PROGRAM PHASE FAULT
ERROR IN:
R&D
DEVELOPMENT
PRODUCTION
PROCUREMENT METHOD FAULT
ERROR IN:
FORMAL ADVERTISEMENT
NEGOTIATION
2-STEP FORMAL AD
MULTI-YEAR
DESIGN-TO-COST
RISK ANALYSIS ASSESSMENT FAILURE
-- CONTRACT COST RISK
-- RECORD OF CONTRACTOR'S PERFORMANCE
CONTRACT TYPE FAULT
ERROR IN:
FIXED PRICE
FPI
CPFF
COST
COST INCENTIVE FORMULA
PERFORMANCE PLAN
TIME & MATERIAL
LETTER CONTRACT
SUB-CONTRACT
BID COST EVALUATION FAULT
BID EVALUATION (PRICE)
o DEMAND
o COMPETITION
o ECONOMIC COSTS
o ECONOMIC PROFITS
o FACILITIES
o INITIAL BUY IN/ POOR ESTIMATE
o SENSITIVITY ANALYSIS
o ESTIMATE QUALITY
o LOSS OF EFFICIENCY
-- LABOR RATE UP
-- MORE IDLE TIME THAN EXPECTED
TERMS AND CONDITIONS FAULT
PATENT & DATA RIGHTS
QA PROVISIONS
SOURCE INSPECTION
WARRANTIES
GUARANTEES
CONTRACT DEFICIENCY
GFM/CFM
SPECIAL TOOLING
SPECIAL TEST EQUIP
FACILITIES
CHANGES CLAUSE
INSURANCE
LABOR PROVISIONS
SOCIO-ECONOMIC
ENVIRONMENTAL
PACKAGING
o UNIONS
o DISPUTE
o APPEALS
CHANGES SCOPE FAULT
o SUPPLY
o R&D
o SPECS
o DELIVERY
o QUANTITY
o CUSTOMER DELAY
o STOP WORK
o OPTIONS
CHANGE CONTROL
o CONTROL OF GENERATING SOURCES
o ENGINEERING CHANGE PROPOSALS
o CHANGE CONTROL BOARD
o CHANGES INITIATED BY SUB-CONTRACTOR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
APPROVED FOR
NAVAL ORDNANCE STATION INDIAN HEAD MD
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON, D.C
ORDNANCE FAULT TREE
PROCUREMENT FAILURE
Contracting Failure
SIZE
C
CODE IDENT NO
SCALE
SHEET OF


MIL-Q-9858A
QUALITY SYSTEM FAILURE
QUALITY OPERATIONS FAILURE
QUALITY PERSONNEL FAILURE
QUALITY INFORMATION FAILURE
QUALITY LOGISTICS FAILURE
CUSTOMER & GOVERNMENT INSPECTION FAILURE
SOURCE INSPECTION
QUALITY ORGANIZATION FAILURE
QUALITY PLANNING FAILURE
QUALITY PROGRAM FAILURE
QUALITY MANAGEMENT FAILURE
QUALITY ENGINEERING FAILURE
TEST SURVEILLANCE
INSPECTION & TEST EQUIPMENT DESIGN
INSPECTION PROCEDURE
INSPECTOR TRAINING
FAILURE REPORTS & ANALYSES
INSPECTION SURVEILLANCE
QA PROVISIONS IN P.O.
MAINTAINABILITY ENGINEERING
VENDOR SURVEY SURVEILLANCE
RELIABILITY ENGINEERING
MATERIAL REVIEW BOARD ACTION
CRITICAL INSPECTION REQUIREMENTS
ACCEPT/REJECT CRITERIA
OVERALL SYSTEM
QA PLANS -- EACH PRODUCT
-- EACH CUSTOMER
-- EACH CONTRACT
FACILITIES
SUPPLIES
MAINTENANCE
REPAIR
CALIBRATION SERVICE
EQUIPMENT
RESIDENT
ITINERANT
SOP'S -- POLICIES, PROCEDURES
TRAINING
SUPERVISION
OPERATIONS CONTROL
WORK INSTRUCTIONS
RECORDS OF PERFORMANCE
CORRECTIVE ACTIONS
QUALITY COST RECORDS
DRAWINGS/SPECS/STANDARDS
CONTRACT REQUIREMENTS
GOVT/CUSTOMER REVIEWS & GUIDANCE/APPROVALS
GOVT/CUSTOMER SOURCE INSPECTION
QUALITY RECORDS
METROLOGY & CALIBRATION --
-- DATA
-- EQUIPMENT/STANDARDS
-- PROCEDURES
-- TEST EQUIP/PRODN TOOLING
FAILURE ANALYSES & REPORTS
QUALITY ASSURANCE MANUAL
QUALITY POLICIES, PROCEDURES
EQUIPMENT OPERATING & MAINTENANCE DATA
34
35
36
37
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
QUALITY SYSTEM FAILURE
Quality Operations Failure
SIZE
C
CODE IDENT NO
83BA5162-33
SCALE
SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION INDIAN HEAD MD 20640

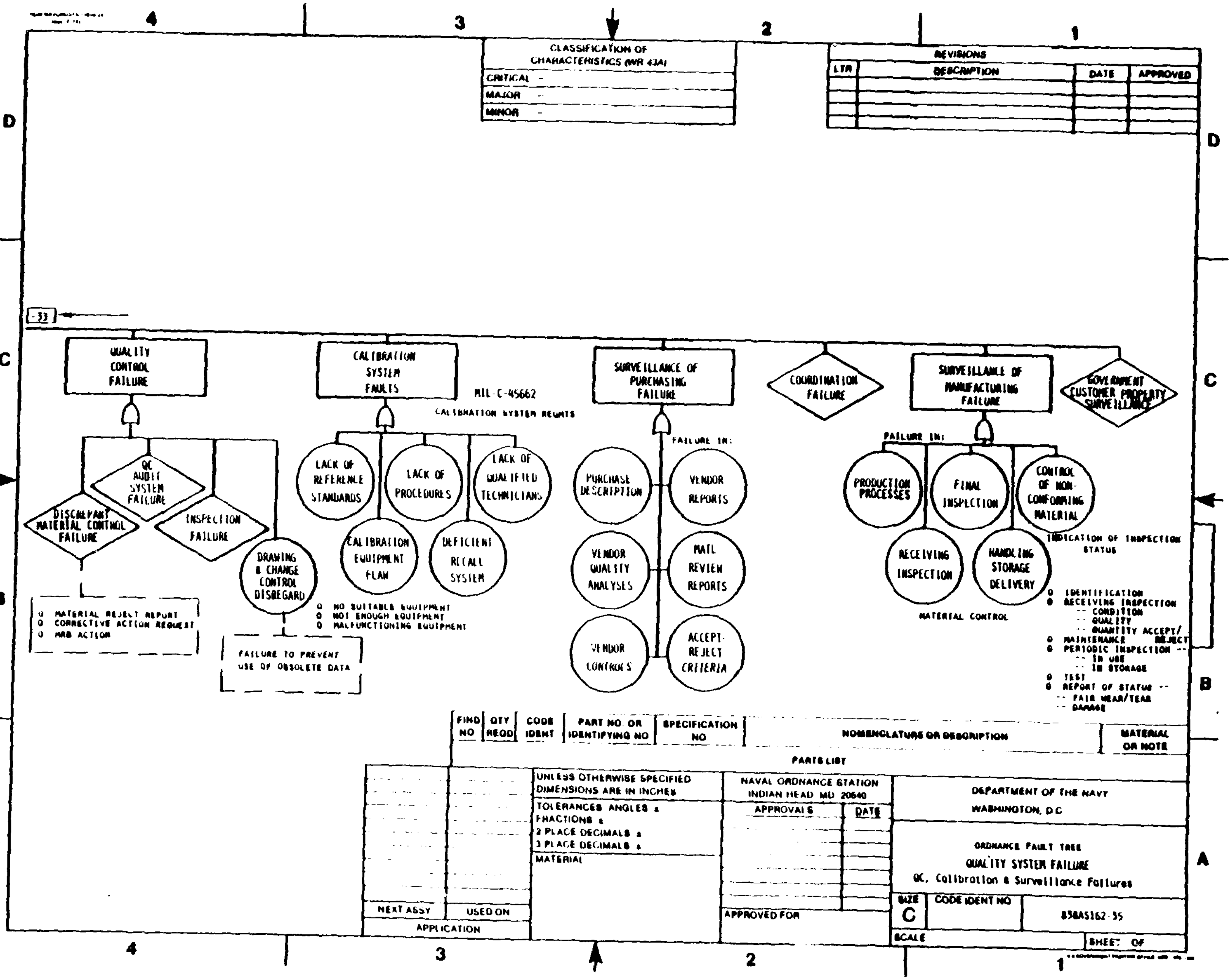
APPROVALS	DATE

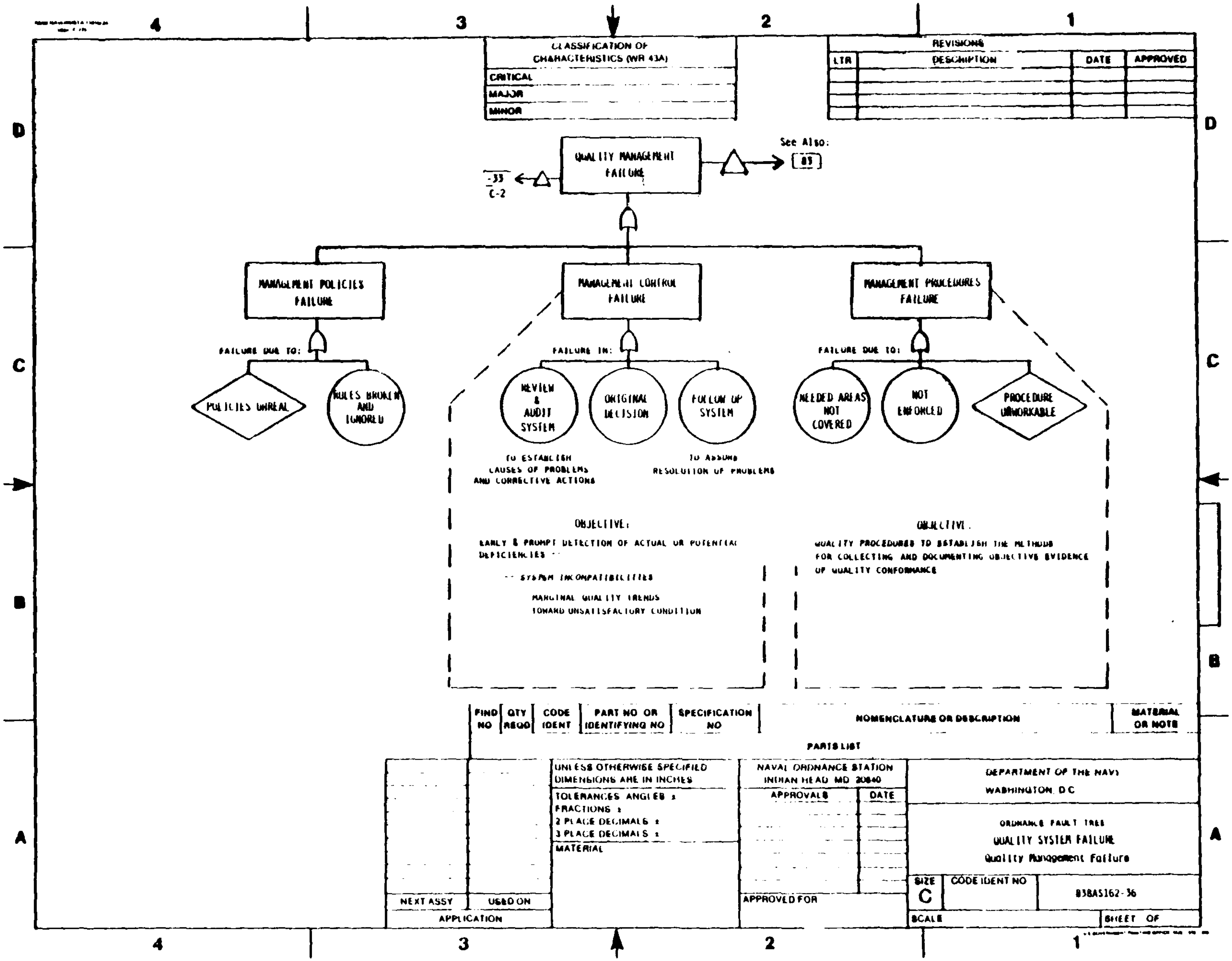
APPROVED FOR

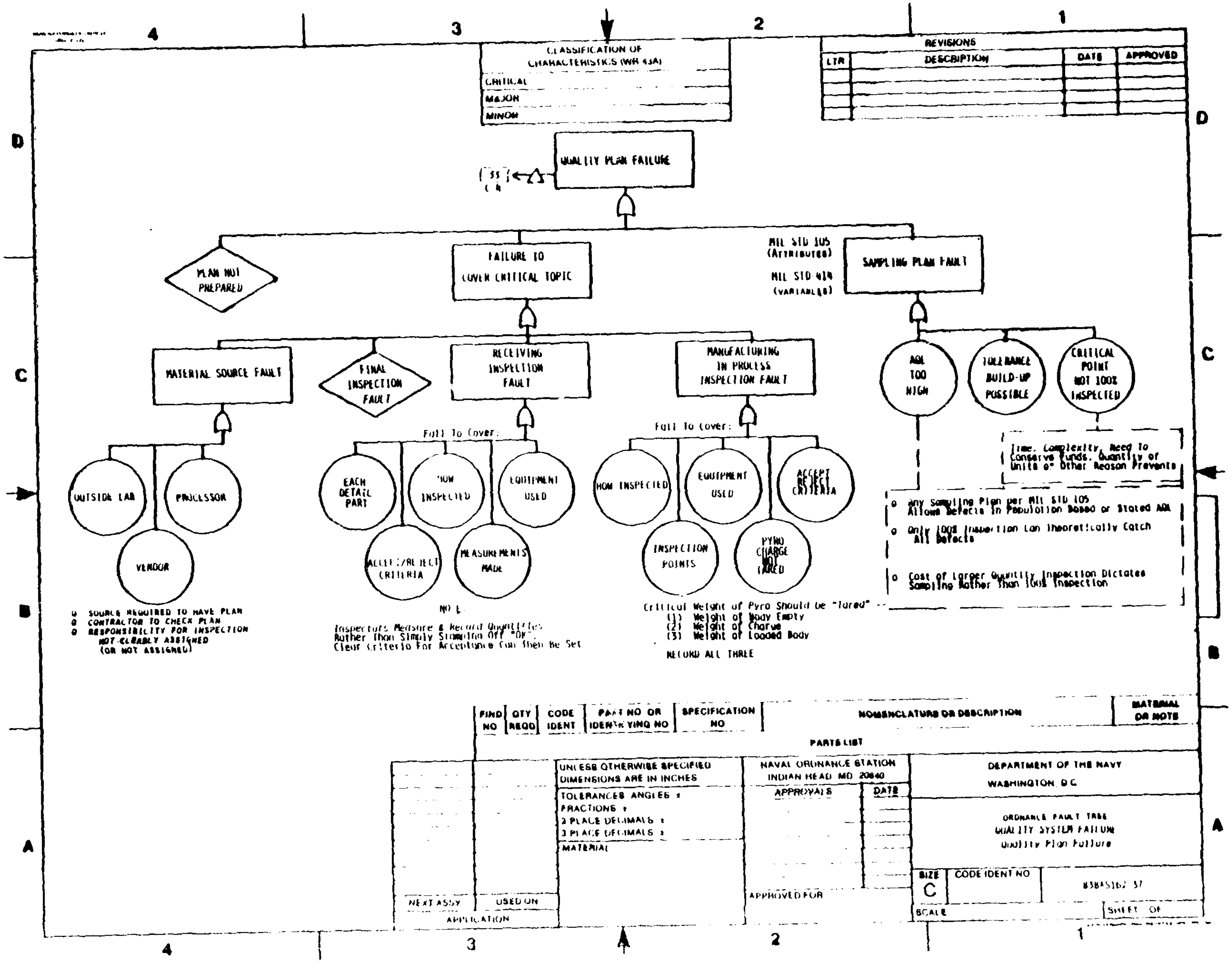
DEPARTMENT OF THE NAVY
WASHINGTON D C

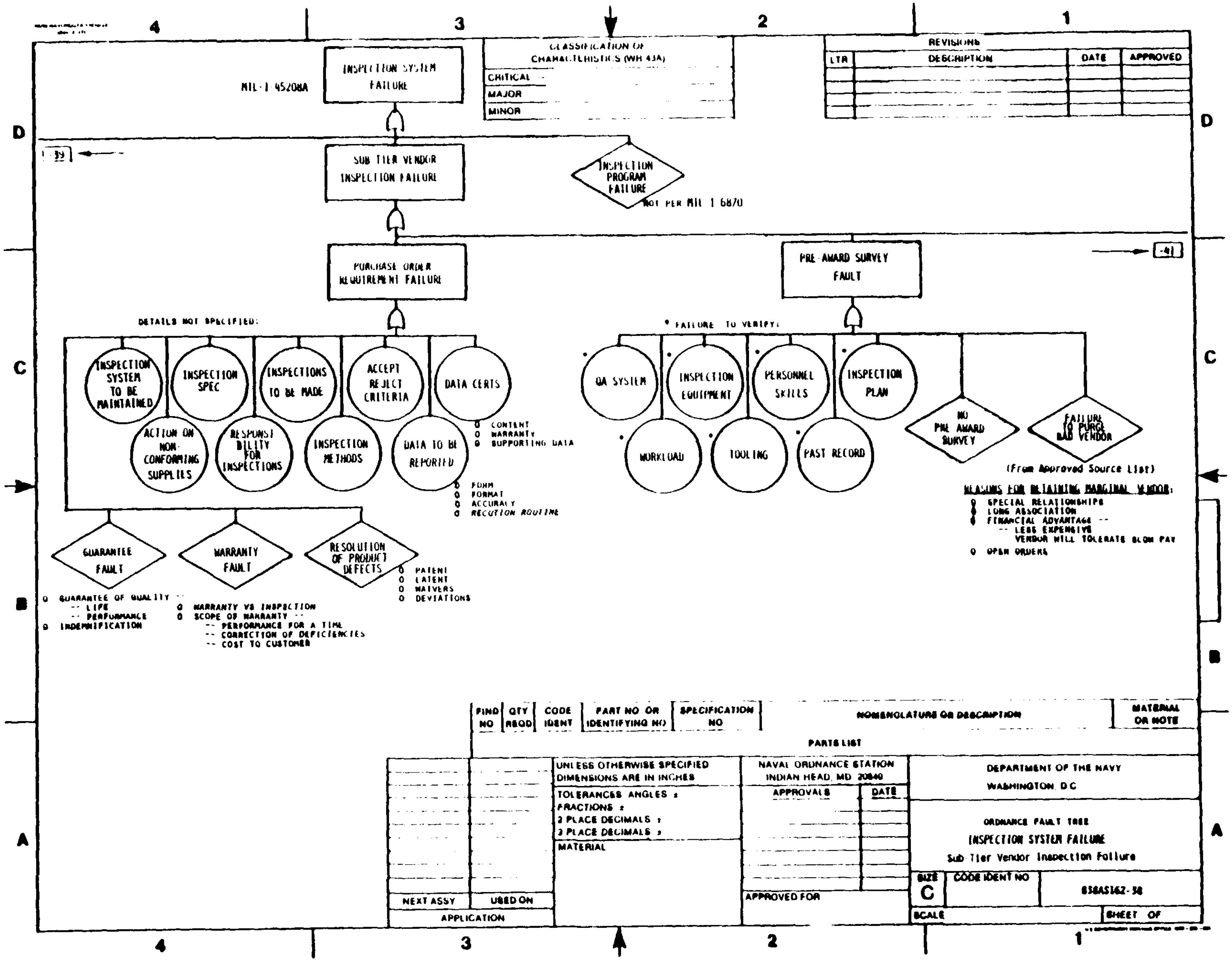
ORDNANCE FAULT TREE
QUALITY SYSTEM FAILURE
Audit Fault

SIZE	CODE IDENT NO	
C		858AS162-34
SCALE		SHEET OF

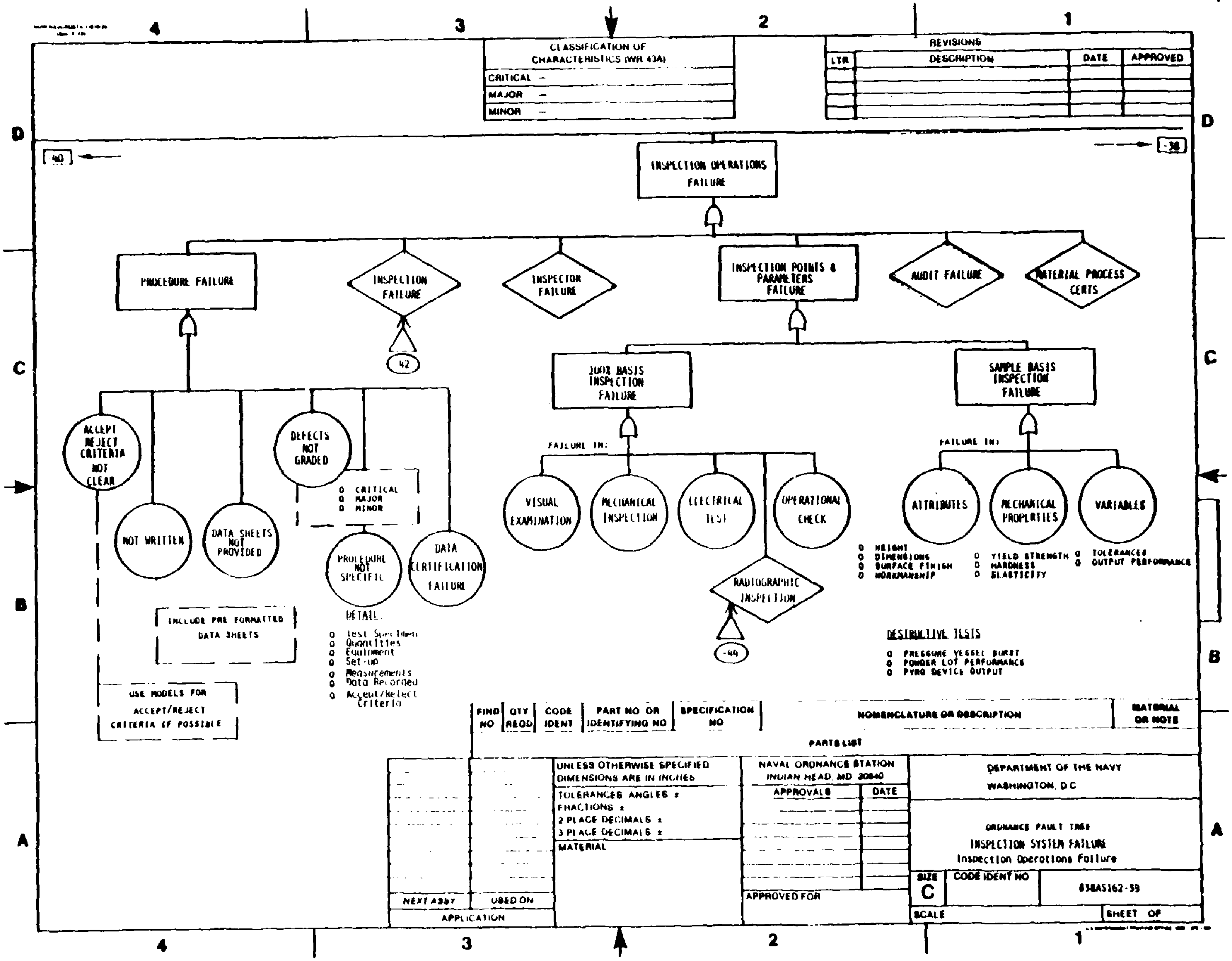

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL -
MAJOR -
MINOR -
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-33
QUALITY CONTROL FAILURE
QC AUDIT SYSTEM FAILURE
DISCREPANT MATERIAL CONTROL FAILURE
INSPECTION FAILURE
DRAWING & CHANGE CONTROL DISREGARD
o MATERIAL REJECT REPORT
o CORRECTIVE ACTION REQUEST
o MRB ACTION
FAILURE TO PREVENT USE OF OBSOLETE DATA
CALIBRATION SYSTEM FAULTS
MIL-C-45662
CALIBRATION SYSTEM REQMTS
LACK OF REFERENCE STANDARDS
LACK OF PROCEDURES
LACK OF QUALIFIED TECHNICIANS
CALIBRATION EQUIPMENT FLAW
DEFICIENT RECALL SYSTEM
o NO SUITABLE EQUIPMENT
o NOT ENOUGH EQUIPMENT
o MALFUNCTIONING EQUIPMENT
SURVEILLANCE OF PURCHASING FAILURE
FAILURE IN:
PURCHASE DESCRIPTION
VENDOR REPORTS
VENDOR QUALITY ANALYSES
MATL REVIEW REPORTS
VENDOR CONTROLS
ACCEPT-REJECT CRITERIA
COORDINATION FAILURE
SURVEILLANCE OF MANUFACTURING FAILURE
GOVERNMENT CUSTOMER PROPERTY SURVEILLANCE
FAILURE IN:
PRODUCTION PROCESSES
FINAL INSPECTION
CONTROL OF NON-CONFORMING MATERIAL
RECEIVING INSPECTION
HANDLING STORAGE DELIVERY
MATERIAL CONTROL
INDICATION OF INSPECTION STATUS
o IDENTIFICATION
o RECEIVING INSPECTION
-- CONDITION
-- QUALITY
-- QUANTITY ACCEPT/REJECT
o MAINTENANCE
o PERIODIC INSPECTION --
-- IN USE
-- IN STORAGE
o TEST
o REPORT OF STATUS --
-- FAIR WEAR/TEAR
-- DAMAGE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
QUALITY SYSTEM FAILURE
QC, Calibration & Surveillance Failures
SIZE
C
CODE IDENT NO
838AS162-35
SCALE
SHEET OF

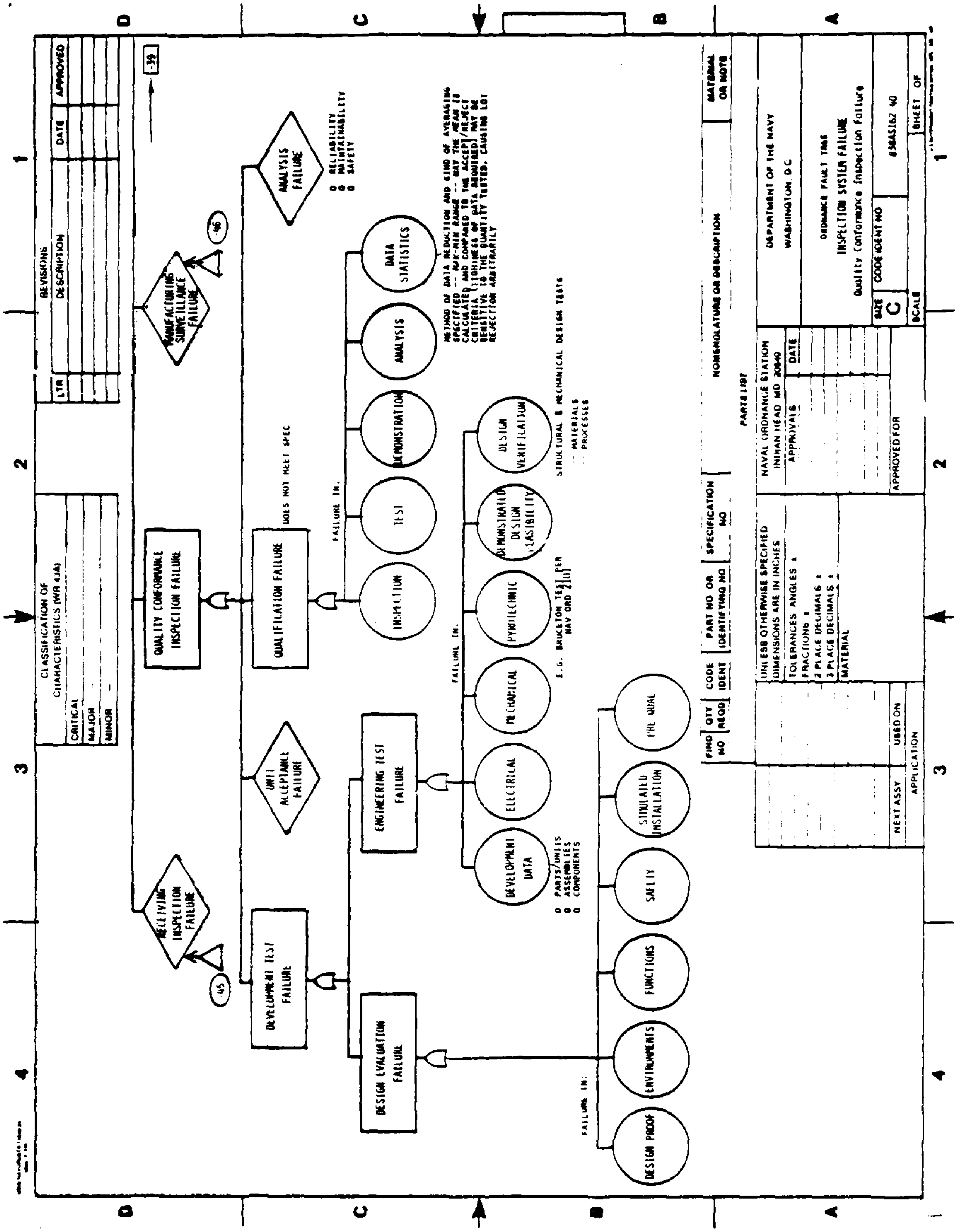

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
QUALITY MANAGEMENT FAILURE
See Also:
83
-33
C-2
MANAGEMENT POLICIES FAILURE
MANAGEMENT CONTROL FAILURE
MANAGEMENT PROCEDURES FAILURE
FAILURE DUE TO:
POLICIES UNREAL
RULES BROKEN AND IGNORED
FAILURE IN:
REVIEW & AUDIT SYSTEM
ORIGINAL DECISION
FOLLOW UP SYSTEM
TO ESTABLISH CAUSES OF PROBLEMS AND CORRECTIVE ACTIONS
TO ASSURE RESOLUTION OF PROBLEMS
FAILURE DUE TO:
NEEDED AREAS NOT COVERED
NOT ENFORCED
PROCEDURE UNWORKABLE
OBJECTIVE:
EARLY & PROMPT DETECTION OF ACTUAL OR POTENTIAL DEFICIENCIES --
-- SYSTEM INCOMPATIBILITIES
MARGINAL QUALITY TRENDS TOWARD UNSATISFACTORY CONDITION
OBJECTIVE:
QUALITY PROCEDURES TO ESTABLISH THE METHODS FOR COLLECTING AND DOCUMENTING OBJECTIVE EVIDENCE OF QUALITY CONFORMANCE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
QUALITY SYSTEM FAILURE
Quality Management Failure
SIZE
C
CODE IDENT NO
838AS162-36
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
QUALITY PLAN FAILURE
PLAN NOT PREPARED
FAILURE TO COVER CRITICAL TOPIC
MIL STD 105 (ATTRIBUTES)
MIL STD 414 (VARIABLES)
SAMPLING PLAN FAULT
MATERIAL SOURCE FAULT
FINAL INSPECTION FAULT
RECEIVING INSPECTION FAULT
MANUFACTURING IN PROCESS INSPECTION FAULT
AQL TOO HIGH
TOLERANCE BUILD-UP POSSIBLE
CRITICAL POINT NOT 100% INSPECTED
Time, Complexity, Need to Conserve Funds, Quantity of Units or Other Reason Prevents
o Any Sampling Plan per MIL STD 105 Allows Defects in Population Based on Stated AQL
o Only 100% Inspection Can Theoretically Catch All Defects
o Cost of Larger Quantity Inspection Dictates Sampling Rather Than 100% Inspection
OUTSIDE LAB
PROCESSOR
VENDOR
o SOURCE REQUIRED TO HAVE PLAN
o CONTRACTOR TO CHECK PLAN
o RESPONSIBILITY FOR INSPECTION NOT CLEARLY ASSIGNED (OR NOT ASSIGNED)
Fail To Cover:
EACH DETAIL PART
HOW INSPECTED
EQUIPMENT USED
ACCEPT/REJECT CRITERIA
MEASUREMENTS MADE
NOTE
Inspectors Measure & Record Quantities Rather Than Simply Stamping Off "OK". Clear Criteria For Acceptance Can Then Be Set
Fail To Cover:
HOW INSPECTED
EQUIPMENT USED
ACCEPT REJECT CRITERIA
INSPECTION POINTS
PYRO CHARGE NOT TARED
Critical Weight of Pyro Should be "Tared" --
(1) Weight of Body Empty
(2) Weight of Charge
(3) Weight of Loaded Body
RECORD ALL THREE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D.C.
ORDNANCE FAULT TREE
QUALITY SYSTEM FAILURE
Quality Plan Failure
SIZE
C
CODE IDENT NO
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

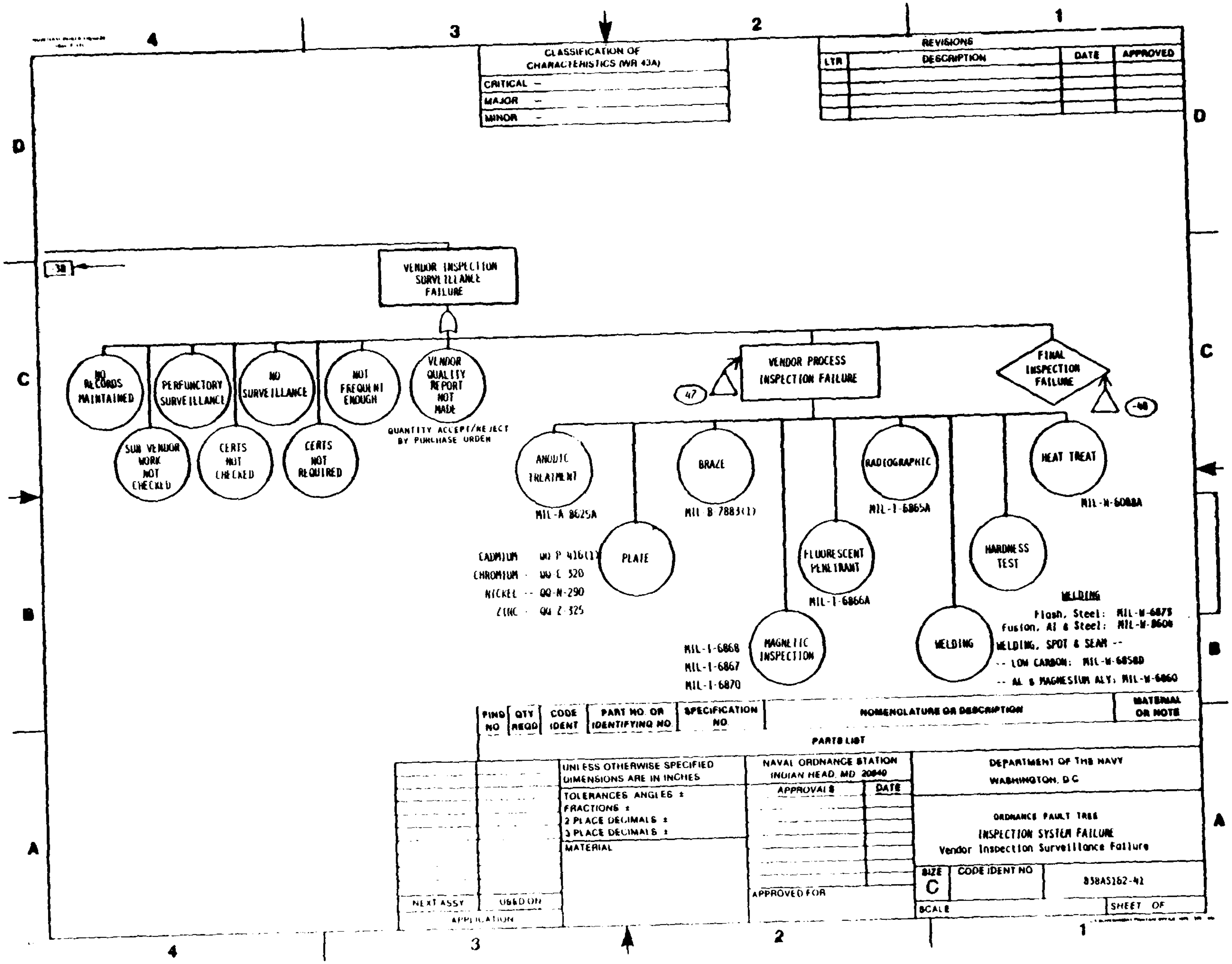


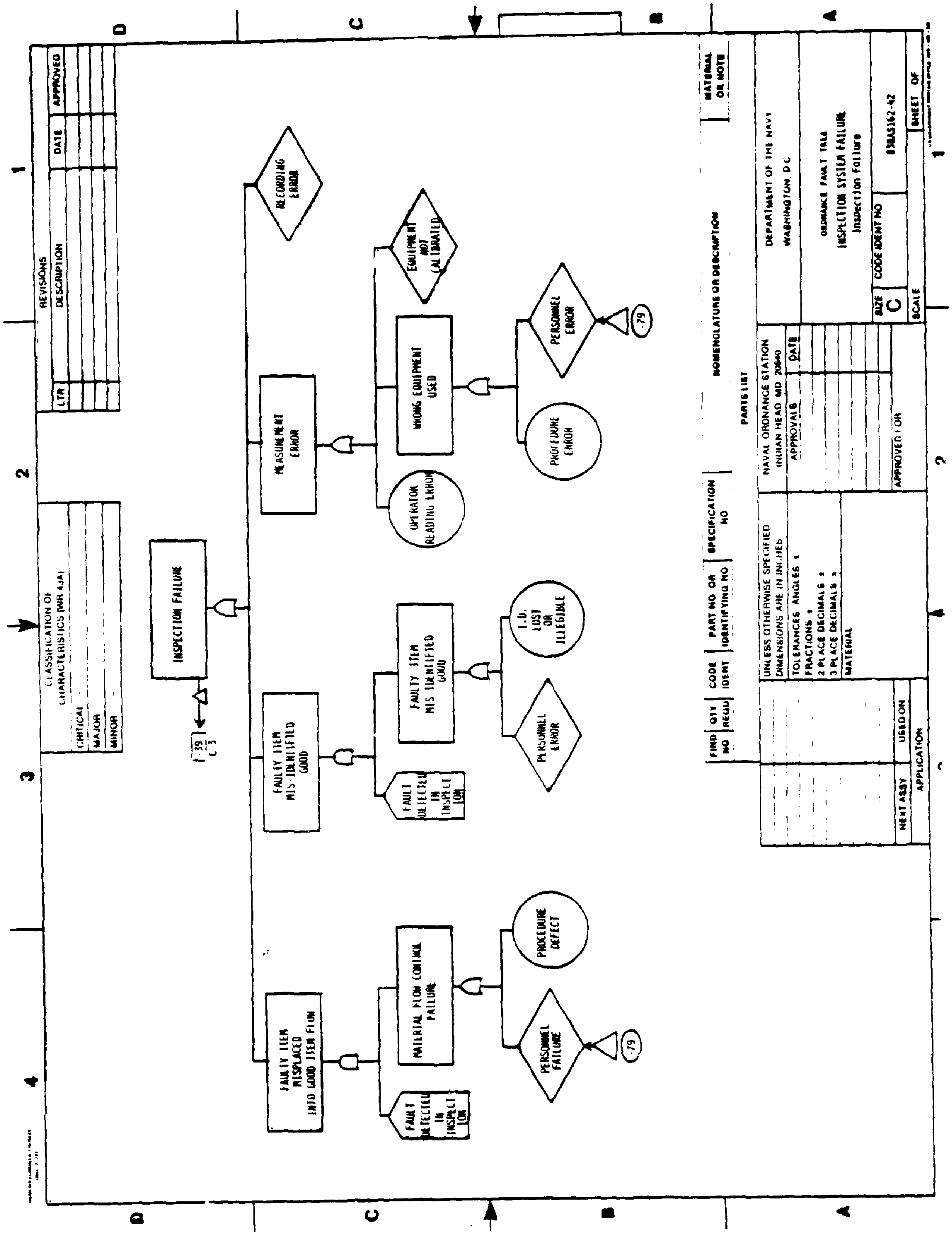
INSPECTION SYSTEM FAILURE
MIL-I-45208A
CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
39
SUB TIER VENDOR INSPECTION FAILURE
INSPECTION PROGRAM FAILURE
NOT PER MIL-I-6870
PURCHASE ORDER REQUIREMENT FAILURE
PRE-AWARD SURVEY FAULT
41
DETAILS NOT SPECIFIED:
INSPECTION SYSTEM TO BE MAINTAINED
INSPECTION SPEC
INSPECTIONS TO BE MADE
ACCEPT REJECT CRITERIA
DATA CERTS
ACTION ON NON-CONFORMING SUPPLIES
RESPONSIBILITY FOR INSPECTIONS
INSPECTION METHODS
DATA TO BE REPORTED
O CONTENT
O WARRANTY
O SUPPORTING DATA
O FORM
O FORMAT
O ACCURACY
O RECUTION ROUTINE
GUARANTEE FAULT
WARRANTY FAULT
RESOLUTION OF PRODUCT DEFECTS
O PATENT
O LATENT
O WAIVERS
O DEVIATIONS
O GUARANTEE OF QUALITY --
-- LIFE
-- PERFORMANCE
O INDEMNIFICATION
O WARRANTY VS INSPECTION
O SCOPE OF WARRANTY --
-- PERFORMANCE FOR A TIME
-- CORRECTION OF DEFICIENCIES
-- COST TO CUSTOMER
* FAILURE TO VERIFY:
QA SYSTEM
INSPECTION EQUIPMENT
PERSONNEL SKILLS
INSPECTION PLAN
WORKLOAD
TOOLING
PAST RECORD
NO PRE-AWARD SURVEY
FAILURE TO PURGE BAD VENDOR
(From Approved Source List)
REASONS FOR RETAINING MARGINAL VENDOR:
O SPECIAL RELATIONSHIPS
O LONG ASSOCIATION
O FINANCIAL ADVANTAGE --
-- LESS EXPENSIVE
VENDOR WILL TOLERATE SLOW PAY
O OPEN ORDERS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Sub Tier Vendor Inspection Failure
SIZE
C
CODE IDENT NO
838AS162-38
SCALE
SHEET OF

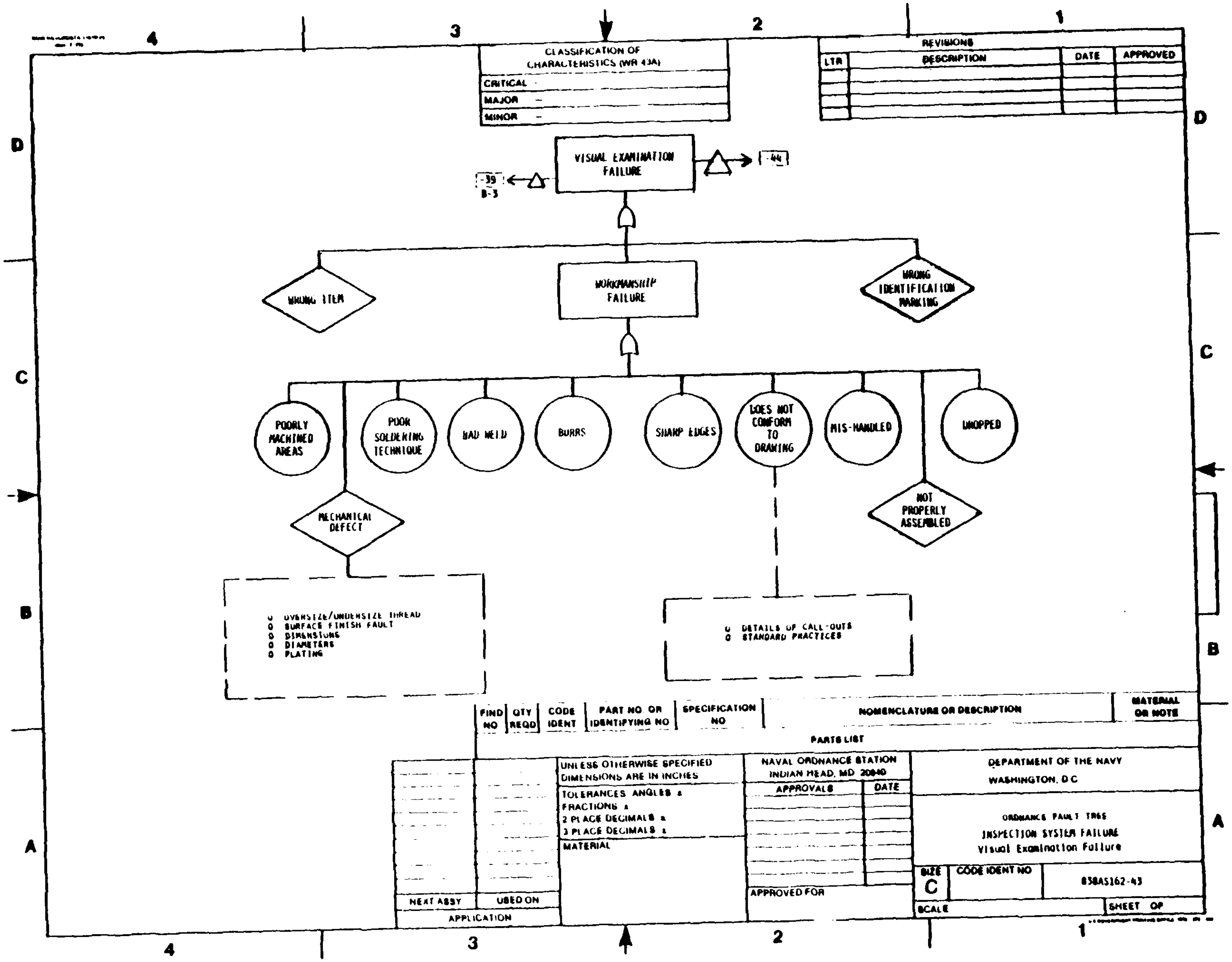

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
40
-38
INSPECTION OPERATIONS FAILURE
PROCEDURE FAILURE
INSPECTION FAILURE
42
INSPECTOR FAILURE
INSPECTION POINTS & PARAMETERS FAILURE
AUDIT FAILURE
MATERIAL PROCESS CERTS
100% BASIS INSPECTION FAILURE
SAMPLE BASIS INSPECTION FAILURE
ACCEPT REJECT CRITERIA NOT CLEAR
NOT WRITTEN
DATA SHEETS NOT PROVIDED
DEFECTS NOT GRADED
o CRITICAL
o MAJOR
o MINOR
PROCEDURE NOT SPECIFIC
DATA CERTIFICATION FAILURE
INCLUDE PRE FORMATTED DATA SHEETS
USE MODELS FOR ACCEPT/REJECT CRITERIA IF POSSIBLE
DETAIL
o Test Specimen
o Quantities
o Equipment
o Set-up
o Measurements
o Data Recorded
o Accept/Reject Criteria
FAILURE IN:
VISUAL EXAMINATION
MECHANICAL INSPECTION
ELECTRICAL TEST
OPERATIONAL CHECK
RADIOGRAPHIC INSPECTION
-44
FAILURE IN:
ATTRIBUTES
MECHANICAL PROPERTIES
VARIABLES
o WEIGHT
o DIMENSIONS
o SURFACE FINISH
o WORKMANSHIP
o YIELD STRENGTH
o HARDNESS
o ELASTICITY
o TOLERANCES
o OUTPUT PERFORMANCE
DESTRUCTIVE TESTS
o PRESSURE VESSEL BURST
o POWDER LOT PERFORMANCE
o PYRO DEVICE OUTPUT
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Inspection Operations Failure
SIZE
C
CODE IDENT NO
838AS162-39
SCALE
SHEET OF

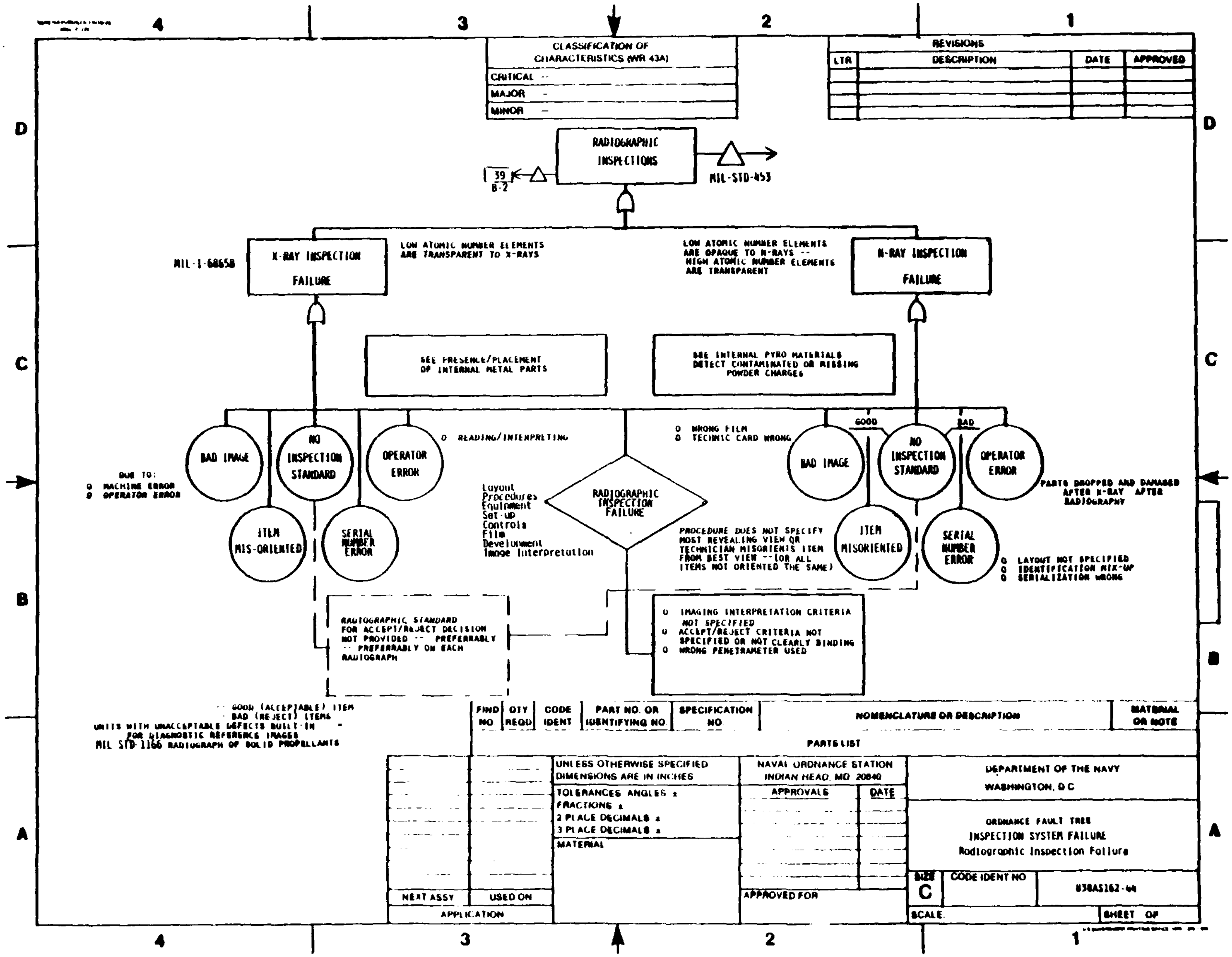


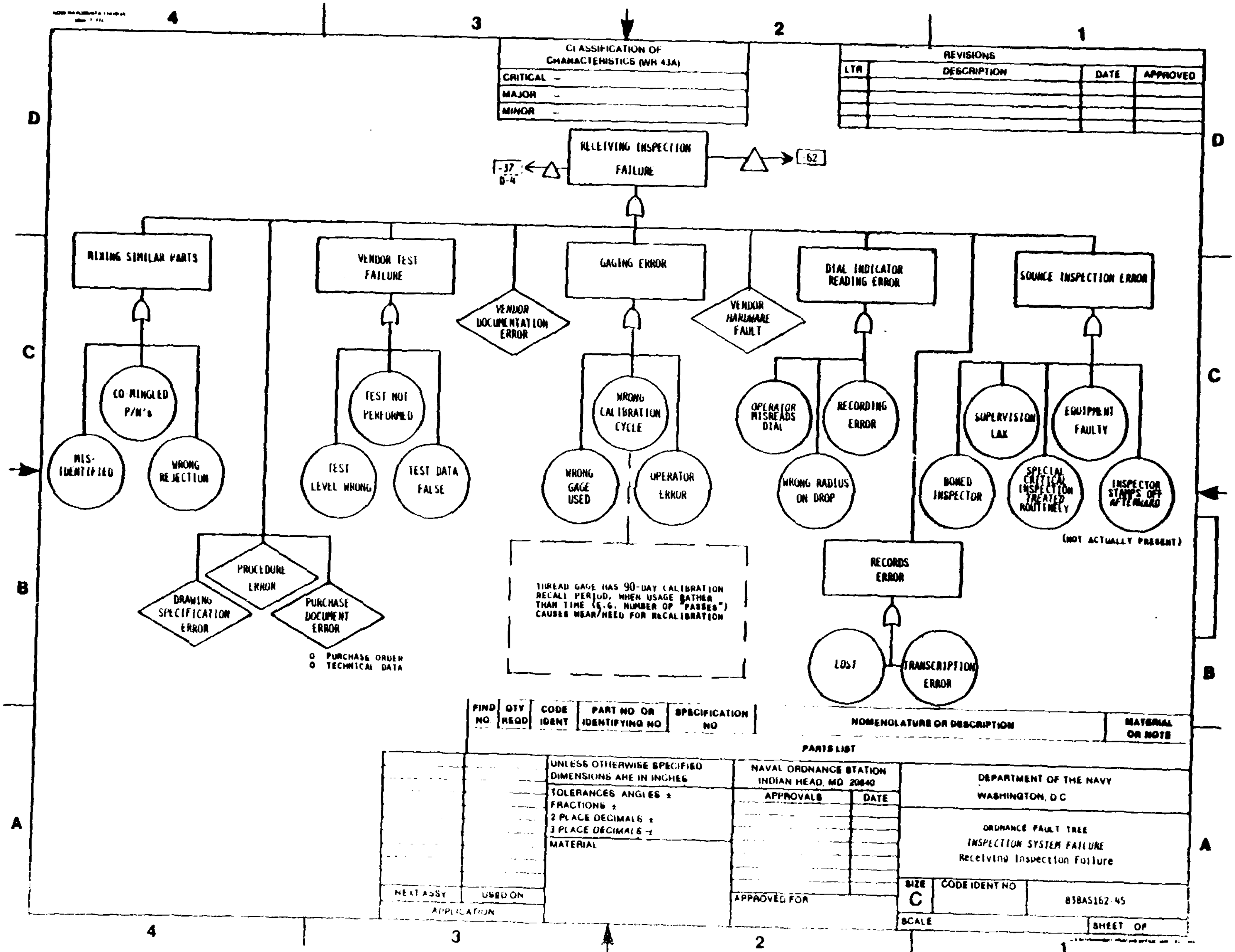
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
-39
RECEIVING INSPECTION FAILURE
45
MANUFACTURING SURVEILLANCE FAILURE
46
QUALITY CONFORMANCE INSPECTION FAILURE
DEVELOPMENT TEST FAILURE
UNIT ACCEPTABLE FAILURE
QUALIFICATION FAILURE
DOES NOT MEET SPEC
ANALYSIS FAILURE
O RELIABILITY
O MAINTAINABILITY
O SAFETY
DESIGN EVALUATION FAILURE
ENGINEERING TEST FAILURE
FAILURE IN:
INSPECTION
TEST
DEMONSTRATION
ANALYSIS
DATA STATISTICS
METHOD OF DATA REDUCTION AND KIND OF AVERAGING SPECIFIED -- MAX-MIN RANGE -- MAY THE MEAN IS CALCULATED AND COMPARED TO THE ACCEPT/REJECT CRITERIA (TIGHTNESS OF DATA REQUIRED) MAY BE SENSITIVE TO THE QUANTITY TESTED, CAUSING LOT REJECTION ARBITRARILY
FAILURE IN:
DEVELOPMENT DATA
ELECTRICAL
MECHANICAL
PYROTECHNIC
DEMONSTRATED DESIGN FEASIBILITY
DESIGN VERIFICATION
O PARTS/UNITS
O ASSEMBLIES
O COMPONENTS
E.G. BRUCETON TEST PER NAV ORD 2101
STRUCTURAL & MECHANICAL DESIGN TESTS
MATERIALS
PROCESSES
FAILURE IN:
DESIGN PROOF
ENVIRONMENTS
FUNCTIONS
SAFETY
SIMULATED INSTALLATION
PRE QUAL
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Quality Conformance Inspection Failure
SIZE
C
CODE IDENT NO
53645162 40
SCALE
SHEET OF

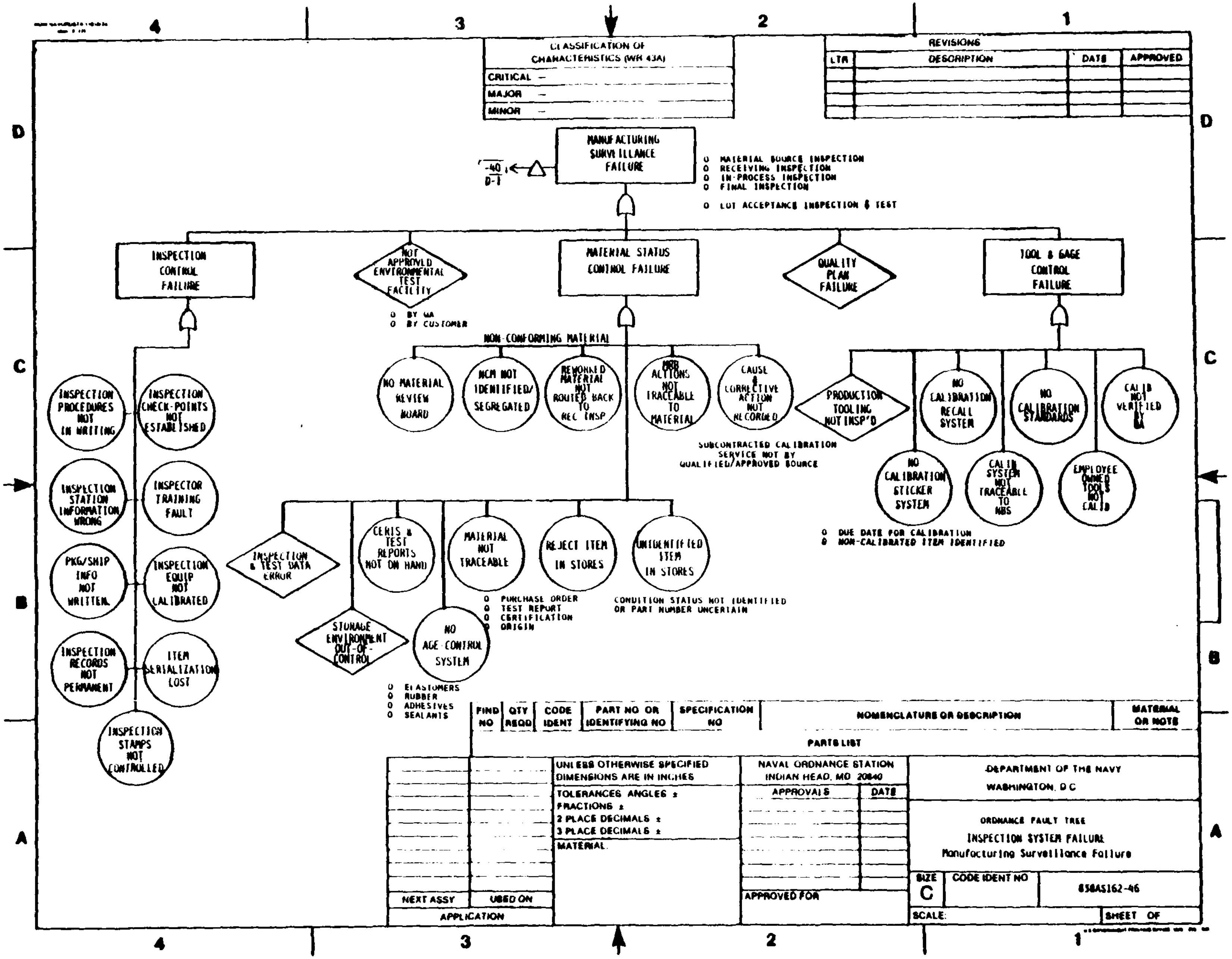

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
38
VENDOR INSPECTION SURVEILLANCE FAILURE
NO RECORDS MAINTAINED
SUB VENDOR WORK NOT CHECKED
PERFUNCTORY SURVEILLANCE
CERTS NOT CHECKED
NO SURVEILLANCE
CERTS NOT REQUIRED
NOT FREQUENT ENOUGH
VENDOR QUALITY REPORT NOT MADE
QUANTITY ACCEPT/REJECT BY PURCHASE ORDER
VENDOR PROCESS INSPECTION FAILURE
47
FINAL INSPECTION FAILURE
48
ANODIC TREATMENT
MIL-A 8625A
PLATE
CADMIUM QQ-P-416(1)
CHROMIUM QQ-C-320
NICKEL -- QQ-N-290
ZINC QQ-Z-325
BRAZE
MIL-B-7883(1)
MAGNETIC INSPECTION
MIL-I-6868
MIL-I-6867
MIL-I-6870
FLUORESCENT PENETRANT
MIL-I-6866A
RADIOGRAPHIC
MIL-I-6865A
WELDING
HARDNESS TEST
HEAT TREAT
MIL-H-6088A
WELDING
Flash, Steel: MIL-W-6873
Fusion, Al & Steel: MIL-W-8604
WELDING, SPOT & SEAM --
-- LOW CARBON: MIL-W-6858D
-- AL & MAGNESIUM ALY: MIL-W-6860
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Vendor Inspection Surveillance Failure
SIZE
C
CODE IDENT NO
838AS162-42
SCALE
SHEET OF

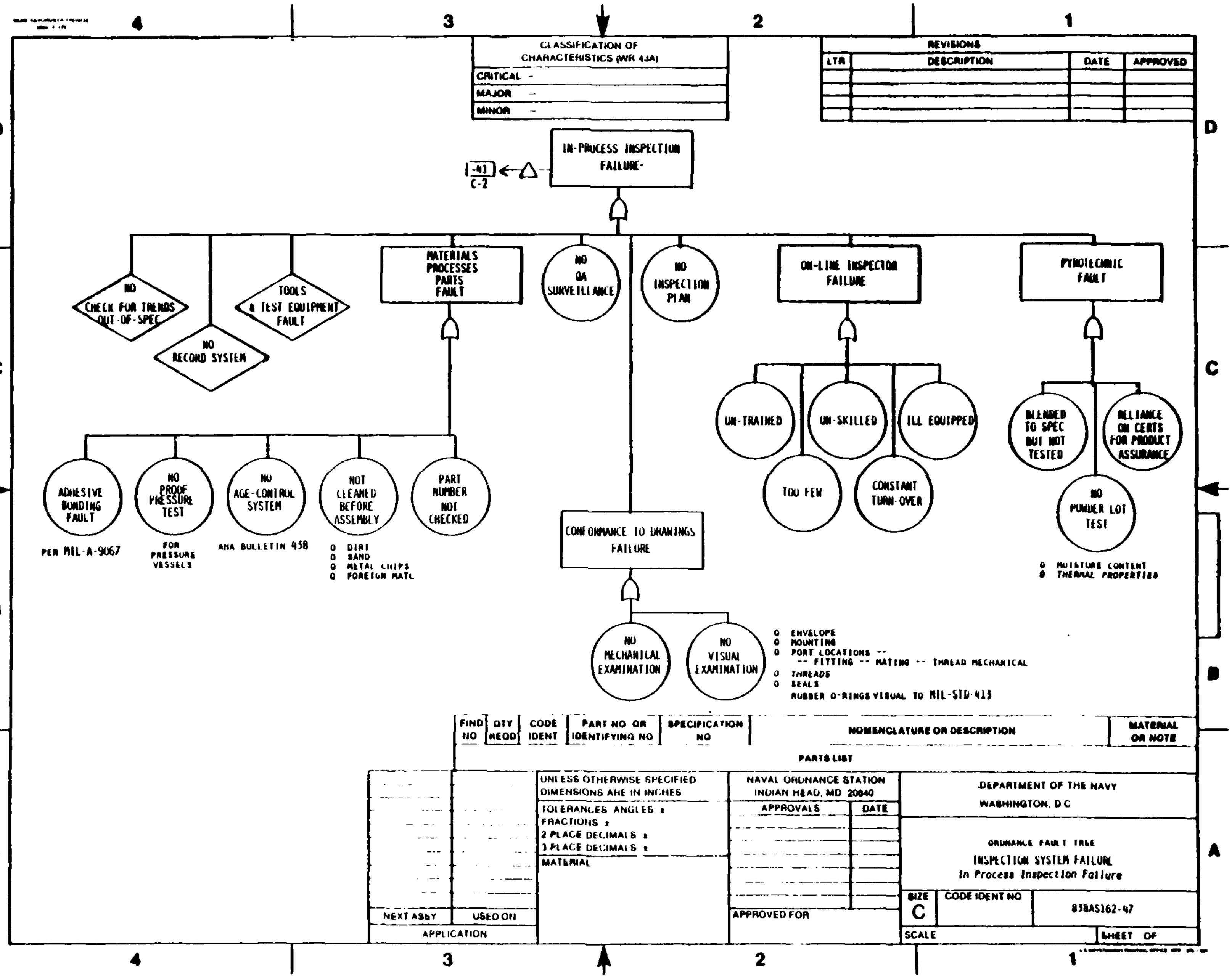

INSPECTION FAILURE
39
C-3
MEASUREMENT ERROR
FAULTY ITEM MIS-IDENTIFIED GOOD
FAULTY ITEM MISPLACED INTO GOOD ITEM FLOW
RECORDING ERROR
EQUIPMENT NOT CALIBRATED
WRONG EQUIPMENT USED
OPERATOR READING ERROR
PERSONNEL ERROR
PROCEDURE ERROR
79
FAULTY ITEM MIS IDENTIFIED GOOD
FAULT DETECTED IN INSPECTION
I.D. LOST OR ILLEGIBLE
PERSONNEL ERROR
MATERIAL FLOW CONTROL FAILURE
PROCEDURE DEFECT
PERSONNEL FAILURE
79
FAULT DETECTED IN INSPECTION
REVISIONS
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
PARTS LIST
NOMENCLATURE OR DESCRIPTION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Inspection Failure
SIZE C

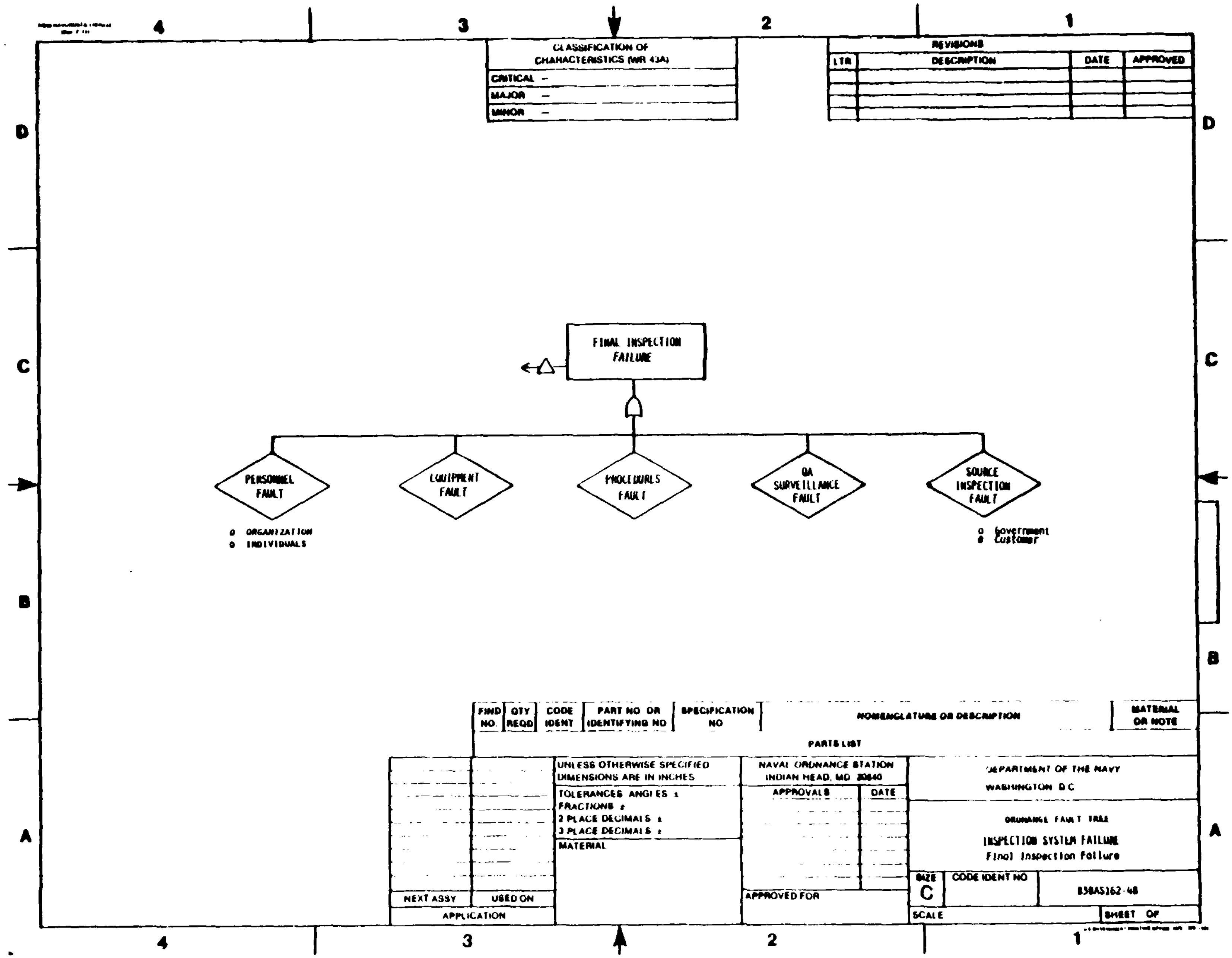

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
VISUAL EXAMINATION FAILURE
-39
B-3
-44
WRONG ITEM
WORKMANSHIP FAILURE
WRONG IDENTIFICATION MARKING
POORLY MACHINED AREAS
POOR SOLDERING TECHNIQUE
BAD WELD
BURRS
SHARP EDGES
DOES NOT CONFORM TO DRAWING
MIS-HANDLED
DROPPED
MECHANICAL DEFECT
NOT PROPERLY ASSEMBLED
o OVERSIZE/UNDERSIZE THREAD
o SURFACE FINISH FAULT
o DIMENSIONS
o DIAMETERS
o PLATING
o DETAILS OF CALL-OUTS
o STANDARD PRACTICES
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Visual Examination Failure
SIZE
C
CODE IDENT NO
838AS162-43
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL --
MAJOR -
MINOR --
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
RADIOGRAPHIC INSPECTIONS
39 B-2
MIL-STD-453
X-RAY INSPECTION FAILURE
MIL-I-6865B
LOW ATOMIC NUMBER ELEMENTS ARE TRANSPARENT TO X-RAYS
N-RAY INSPECTION FAILURE
LOW ATOMIC NUMBER ELEMENTS ARE OPAQUE TO N-RAYS -- HIGH ATOMIC NUMBER ELEMENTS ARE TRANSPARENT
SEE PRESENCE/PLACEMENT OF INTERNAL METAL PARTS
SEE INTERNAL PYRO MATERIALS DETECT CONTAMINATED OR MISSING POWDER CHARGES
BAD IMAGE
NO INSPECTION STANDARD
OPERATOR ERROR
ITEM MIS-ORIENTED
SERIAL NUMBER ERROR
O READING/INTERPRETING
DUE TO:
O MACHINE ERROR
O OPERATOR ERROR
O WRONG FILM
O TECHNIC CARD WRONG
GOOD
BAD
BAD IMAGE
NO INSPECTION STANDARD
OPERATOR ERROR
ITEM MISORIENTED
SERIAL NUMBER ERROR
PARTS DROPPED AND DAMAGED AFTER X-RAY AFTER RADIOGRAPHY
O LAYOUT NOT SPECIFIED
O IDENTIFICATION MIX-UP
O SERIALIZATION WRONG
Layout
Procedures
Equipment
Set-up
Controls
Film
Development
Image Interpretation
RADIOGRAPHIC INSPECTION FAILURE
PROCEDURE DOES NOT SPECIFY MOST REVEALING VIEW OR TECHNICIAN MISORIENTS ITEM FROM BEST VIEW -- (OR ALL ITEMS NOT ORIENTED THE SAME)
RADIOGRAPHIC STANDARD FOR ACCEPT/REJECT DECISION NOT PROVIDED -- PREFERABLY -- PREFERRABLY ON EACH RADIOGRAPH
O IMAGING INTERPRETATION CRITERIA NOT SPECIFIED
O ACCEPT/REJECT CRITERIA NOT SPECIFIED OR NOT CLEARLY BINDING
O WRONG PENETRAMETER USED
-- GOOD (ACCEPTABLE) ITEM
-- BAD (REJECT) ITEMS
UNITS WITH UNACCEPTABLE DEFECTS BUILT-IN FOR DIAGNOSTIC REFERENCE IMAGES
MIL-STD-1166 RADIOGRAPH OF SOLID PROPELLANTS
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO.
SPECIFICATION NO.
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Radiographic Inspection Failure
SIZE
C
CODE IDENT NO
838AS162-44
SCALE
SHEET OF

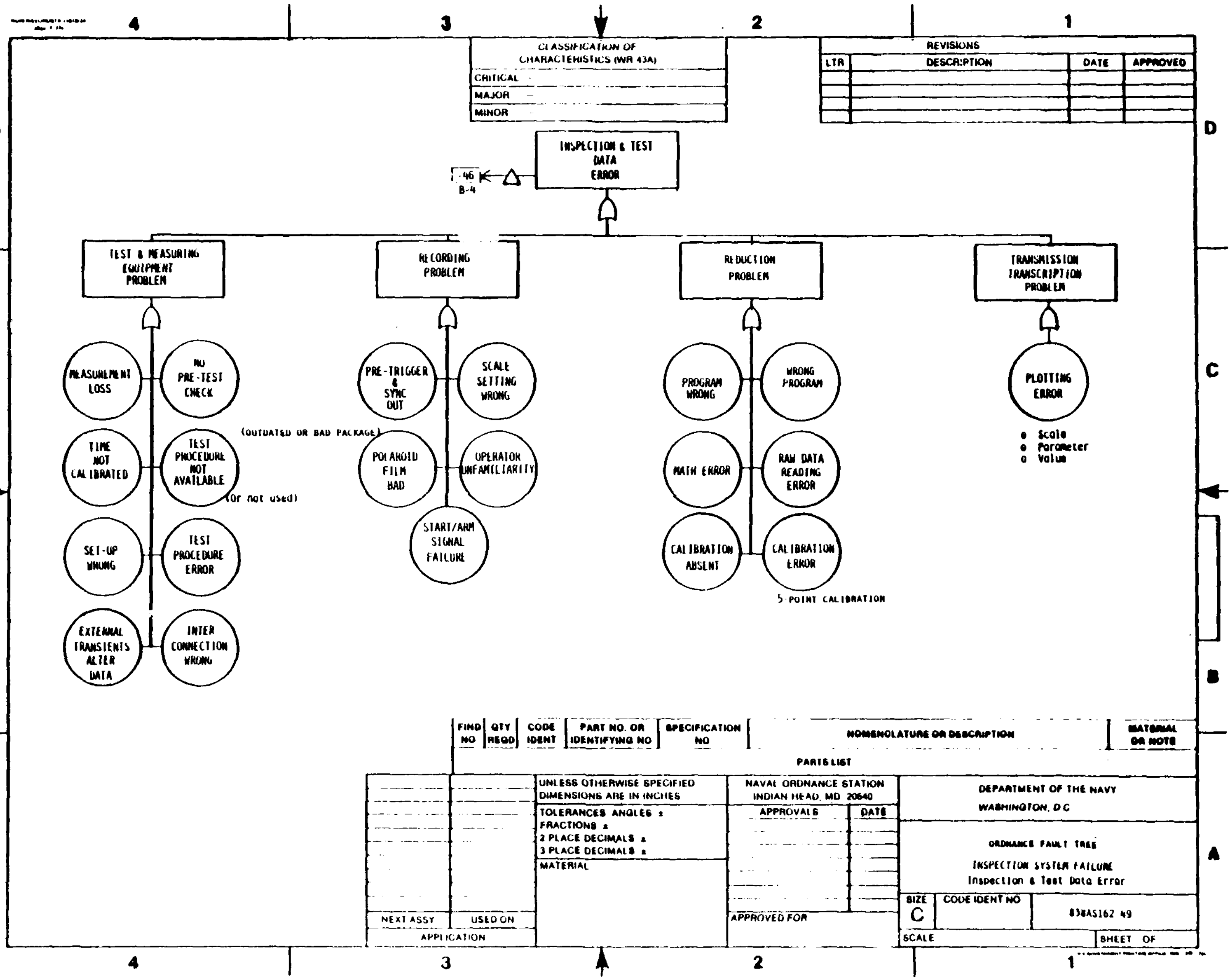

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
RECEIVING INSPECTION FAILURE
-37 D-4
-62
MIXING SIMILAR PARTS
CO-MINGLED P/N's
MIS-IDENTIFIED
WRONG REJECTION
VENDOR TEST FAILURE
TEST NOT PERFORMED
TEST LEVEL WRONG
TEST DATA FALSE
VENDOR DOCUMENTATION ERROR
GAGING ERROR
WRONG CALIBRATION CYCLE
WRONG GAGE USED
OPERATOR ERROR
VENDOR HARDWARE FAULT
DIAL INDICATOR READING ERROR
OPERATOR MISREADS DIAL
RECORDING ERROR
WRONG RADIUS ON DROP
SOURCE INSPECTION ERROR
SUPERVISION LAX
EQUIPMENT FAULTY
BORED INSPECTOR
SPECIAL CRITICAL INSPECTION TREATED ROUTINELY
INSPECTOR STAMPS OFF AFTERWARD
(NOT ACTUALLY PRESENT)
PROCEDURE ERROR
DRAWING SPECIFICATION ERROR
PURCHASE DOCUMENT ERROR
o PURCHASE ORDER
o TECHNICAL DATA
THREAD GAGE HAS 90-DAY CALIBRATION RECALL PERIOD, WHEN USAGE RATHER THAN TIME (E.G. NUMBER OF "PASSES") CAUSES WEAR/NEED FOR RECALIBRATION
RECORDS ERROR
LOST
TRANSCRIPTION ERROR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Receiving Inspection Failure
SIZE C
CODE IDENT NO
838AS162-45
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MANUFACTURING SURVEILLANCE FAILURE
-40 / D-1
O MATERIAL SOURCE INSPECTION
O RECEIVING INSPECTION
O IN-PROCESS INSPECTION
O FINAL INSPECTION
O LOT ACCEPTANCE INSPECTION & TEST
INSPECTION CONTROL FAILURE
NOT APPROVED ENVIRONMENTAL TEST FACILITY
O BY QA
O BY CUSTOMER
MATERIAL STATUS CONTROL FAILURE
QUALITY PLAN FAILURE
TOOL & GAGE CONTROL FAILURE
NON-CONFORMING MATERIAL
NO MATERIAL REVIEW BOARD
NCM NOT IDENTIFIED/ SEGREGATED
REWORKED MATERIAL NOT ROUTED BACK TO REC INSP
MRB ACTIONS NOT TRACEABLE TO MATERIAL
CAUSE & CORRECTIVE ACTION NOT RECORDED
SUBCONTRACTED CALIBRATION SERVICE NOT BY QUALIFIED/APPROVED SOURCE
PRODUCTION TOOLING NOT INSP'D
NO CALIBRATION RECALL SYSTEM
NO CALIBRATION STANDARDS
CALIB NOT VERIFIED BY QA
NO CALIBRATION STICKER SYSTEM
CALIB SYSTEM NOT TRACEABLE TO NBS
EMPLOYEE OWNED TOOLS NOT CALIB
O DUE DATE FOR CALIBRATION
O NON-CALIBRATED ITEM IDENTIFIED
INSPECTION PROCEDURES NOT IN WRITING
INSPECTION CHECK-POINTS NOT ESTABLISHED
INSPECTION STATION INFORMATION WRONG
INSPECTOR TRAINING FAULT
PKG/SHIP INFO NOT WRITTEN
INSPECTION EQUIP NOT CALIBRATED
INSPECTION RECORDS NOT PERMANENT
ITEM SERIALIZATION LOST
INSPECTION STAMPS NOT CONTROLLED
INSPECTION & TEST DATA ERROR
CERTS & TEST REPORTS NOT ON HAND
MATERIAL NOT TRACEABLE
REJECT ITEM IN STORES
UNIDENTIFIED ITEM IN STORES
STORAGE ENVIRONMENT OUT-OF-CONTROL
NO AGE CONTROL SYSTEM
O PURCHASE ORDER
O TEST REPORT
O CERTIFICATION
O ORIGIN
CONDITION STATUS NOT IDENTIFIED OR PART NUMBER UNCERTAIN
O ELASTOMERS
O RUBBER
O ADHESIVES
O SEALANTS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Manufacturing Surveillance Failure
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR
SIZE
C
CODE IDENT NO
638AS162-46
SCALE
SHEET OF

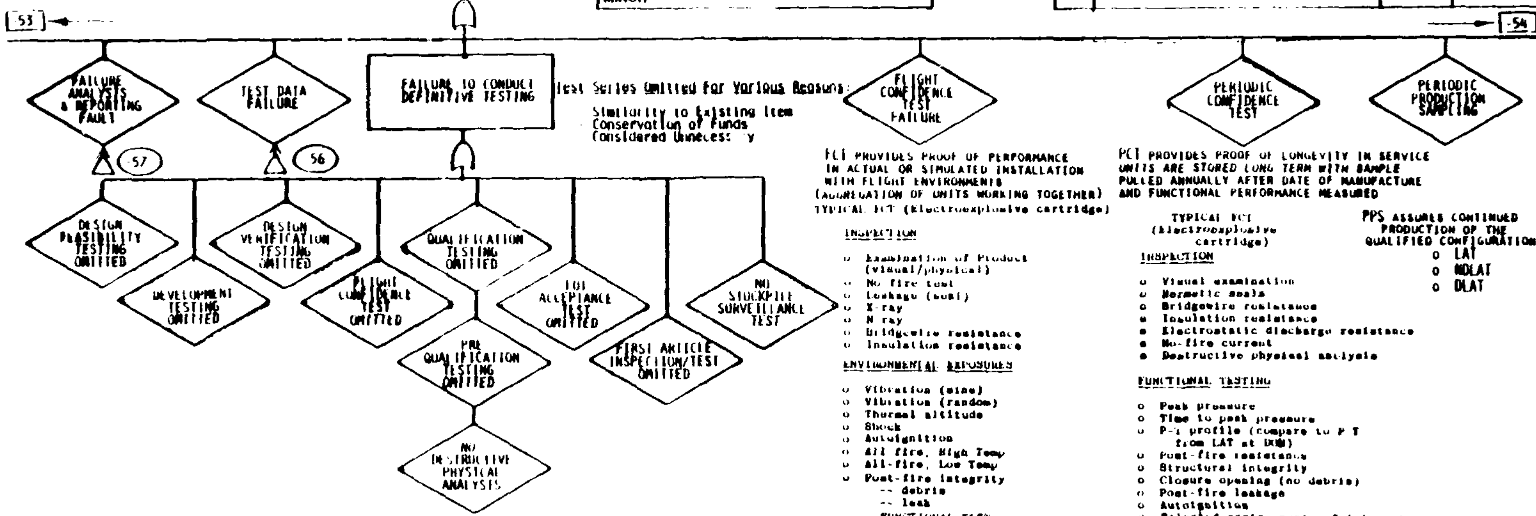

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL -
MAJOR -
MINOR -
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
IN-PROCESS INSPECTION FAILURE-
C-2
NO CHECK FOR TRENDS OUT-OF-SPEC
NO RECORD SYSTEM
TOOLS & TEST EQUIPMENT FAULT
MATERIALS PROCESSES PARTS FAULT
NO QA SURVEILLANCE
NO INSPECTION PLAN
ON-LINE INSPECTOR FAILURE
PYROTECHNIC FAULT
UN-TRAINED
UN-SKILLED
ILL EQUIPPED
TOO FEW
CONSTANT TURN-OVER
BLENDED TO SPEC BUT NOT TESTED
RELIANCE ON CERTS FOR PRODUCT ASSURANCE
NO POWDER LOT TEST
O MOISTURE CONTENT
O THERMAL PROPERTIES
ADHESIVE BONDING FAULT
PER MIL-A-9067
NO PROOF PRESSURE TEST
FOR PRESSURE VESSELS
NO AGE-CONTROL SYSTEM
ANA BULLETIN 438
NOT CLEANED BEFORE ASSEMBLY
O DIRT
O SAND
O METAL CHIPS
O FOREIGN MATL
PART NUMBER NOT CHECKED
CONFORMANCE TO DRAWINGS FAILURE
NO MECHANICAL EXAMINATION
NO VISUAL EXAMINATION
O ENVELOPE
O MOUNTING
O PORT LOCATIONS -- -- FITTING -- MATING -- THREAD MECHANICAL
O THREADS
O SEALS
RUBBER O-RINGS VISUAL TO MIL-STD-413
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
In Process Inspection Failure
SIZE
C
CODE IDENT NO
83BAS162-47
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL —
MAJOR —
MINOR —
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FINAL INSPECTION FAILURE
PERSONNEL FAULT
EQUIPMENT FAULT
PROCEDURES FAULT
QA SURVEILLANCE FAULT
SOURCE INSPECTION FAULT
o ORGANIZATION
o INDIVIDUALS
o Government
o Customer
FIND NO.
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Final Inspection Failure
SIZE
C
CODE IDENT NO
838AS162-48
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION



CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
INSPECTION & TEST DATA ERROR
-46
B-4
TEST & MEASURING EQUIPMENT PROBLEM
RECORDING PROBLEM
REDUCTION PROBLEM
TRANSMISSION TRANSCRIPTION PROBLEM
MEASUREMENT LOSS
NO PRE-TEST CHECK
TIME NOT CALIBRATED
TEST PROCEDURE NOT AVAILABLE
(OUTDATED OR BAD PACKAGE)
(Or not used)
SET-UP WRONG
TEST PROCEDURE ERROR
EXTERNAL TRANSIENTS ALTER DATA
INTER CONNECTION WRONG
PRE-TRIGGER & SYNC OUT
SCALE SETTING WRONG
POLAROID FILM BAD
OPERATOR UNFAMILIARITY
START/ARM SIGNAL FAILURE
PROGRAM WRONG
WRONG PROGRAM
MATH ERROR
RAW DATA READING ERROR
CALIBRATION ABSENT
CALIBRATION ERROR
5-POINT CALIBRATION
PLOTTING ERROR
o Scale
o Parameter
o Value
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
INSPECTION SYSTEM FAILURE
Inspection & Test Data Error
SIZE
C
CODE IDENT NO
83HAS162 49
SCALE
SHEET OF



CAUSES OF FAILURES:

- o Improper handling of item
- o Test environment exceeded
- o Test equipment failure
  - Failure induced by equipment
  - Malfunction causes measurement error
- o Operator failure
- o Units overstressed in environments
- o Test condition fault -
  - Wrong set up
  - Wrong equipment used
- o Test data failure -
  - Recording
  - Reduction
  - Analysis
- o Defective test item
- o Deficient design of test item

CLASSIFICATION OF CHARACTERISTICS (WR 43A)	
CRITICAL	
MAJOR	
MINOR	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640

APPROVALS	DATE

APPROVED FOR

DEPARTMENT OF THE NAVY
WASHINGTON D C

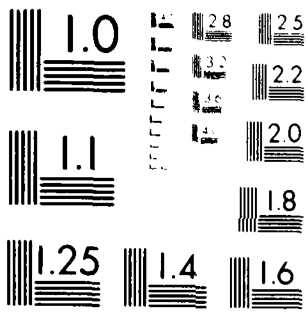
ORDNANCE FAULT TREE
TESTING FAILURE
Failure to Conduct Definitive Testing

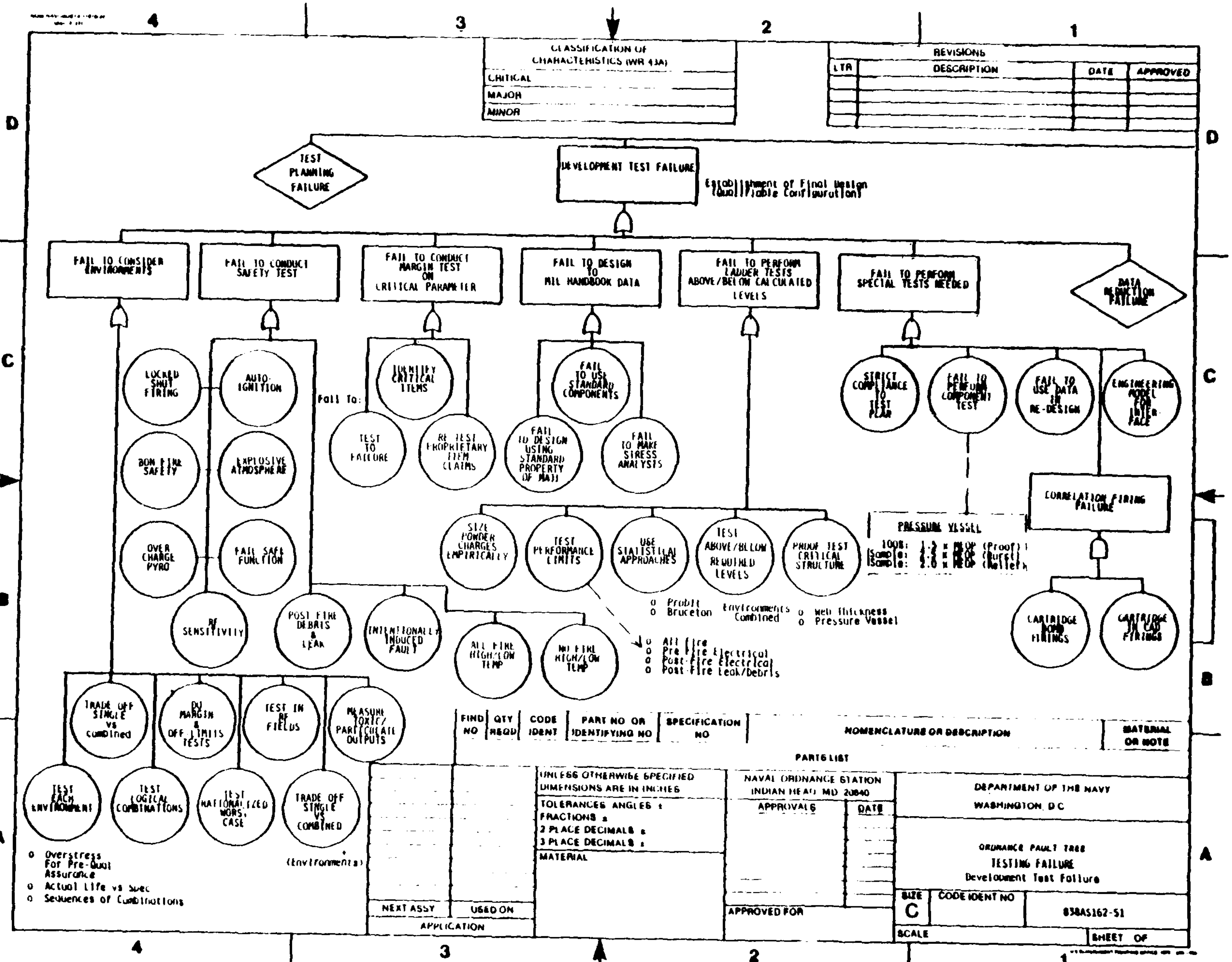
SIZE	CODE IDENT NO	
C		838AS162-50
SCALE		SHEET OF

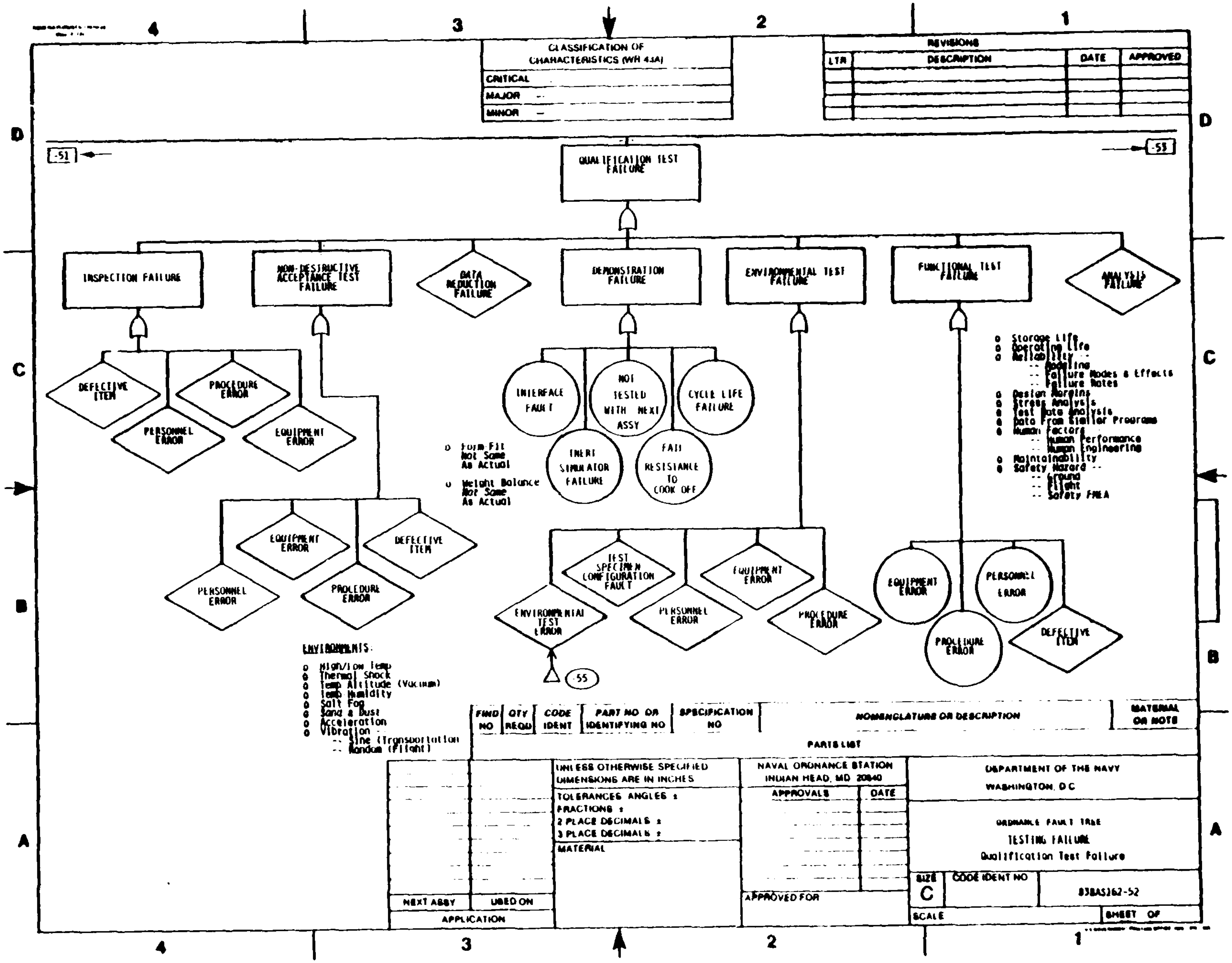
AD-A134 834 AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES VO..(U) NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY WASHINGTON DC C W STOKES ET AL. 5/5

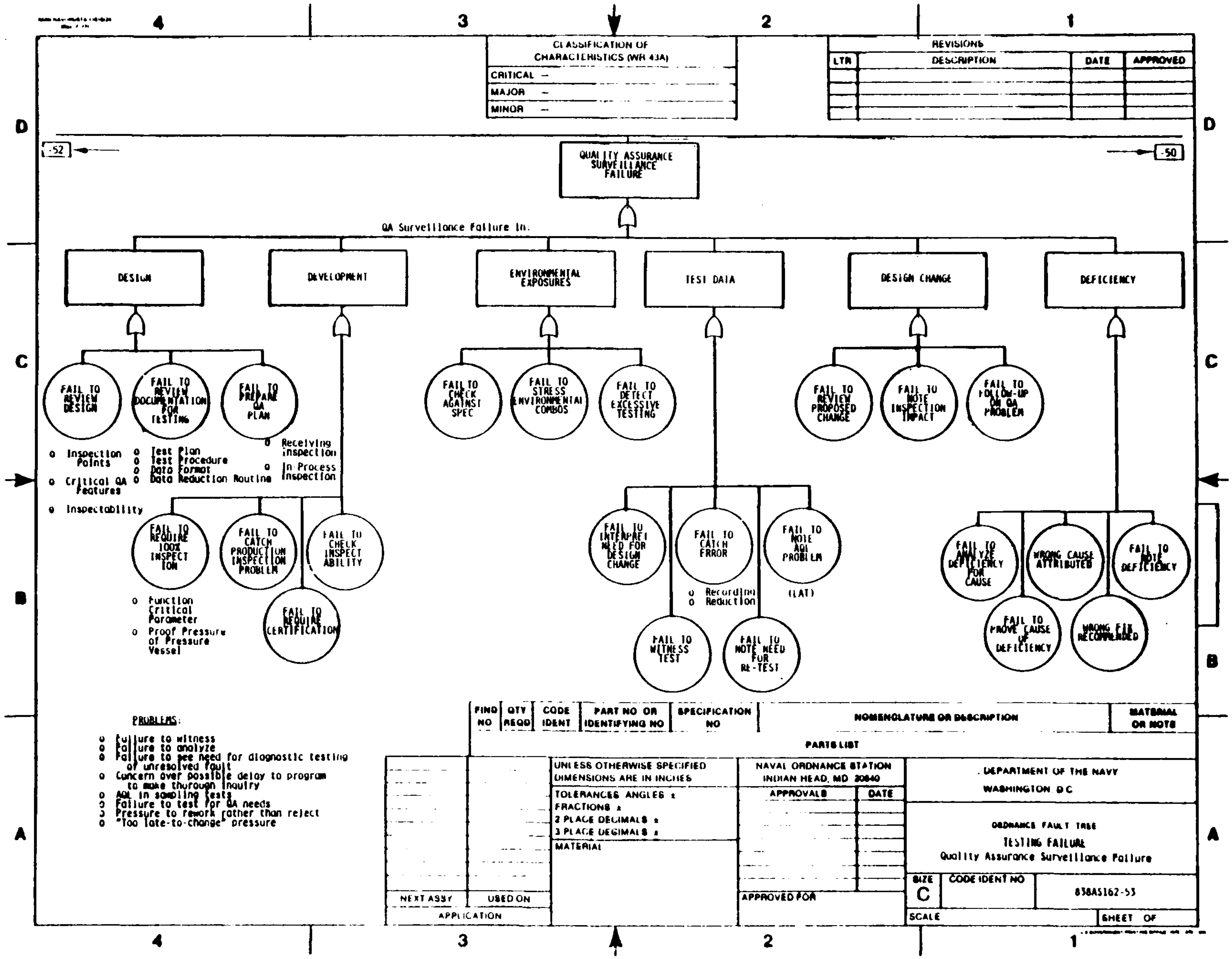
UNCLASSIFIED 05 NOV 83 NAVWESA-1-83-VOL-2 F/G 1/3 NL

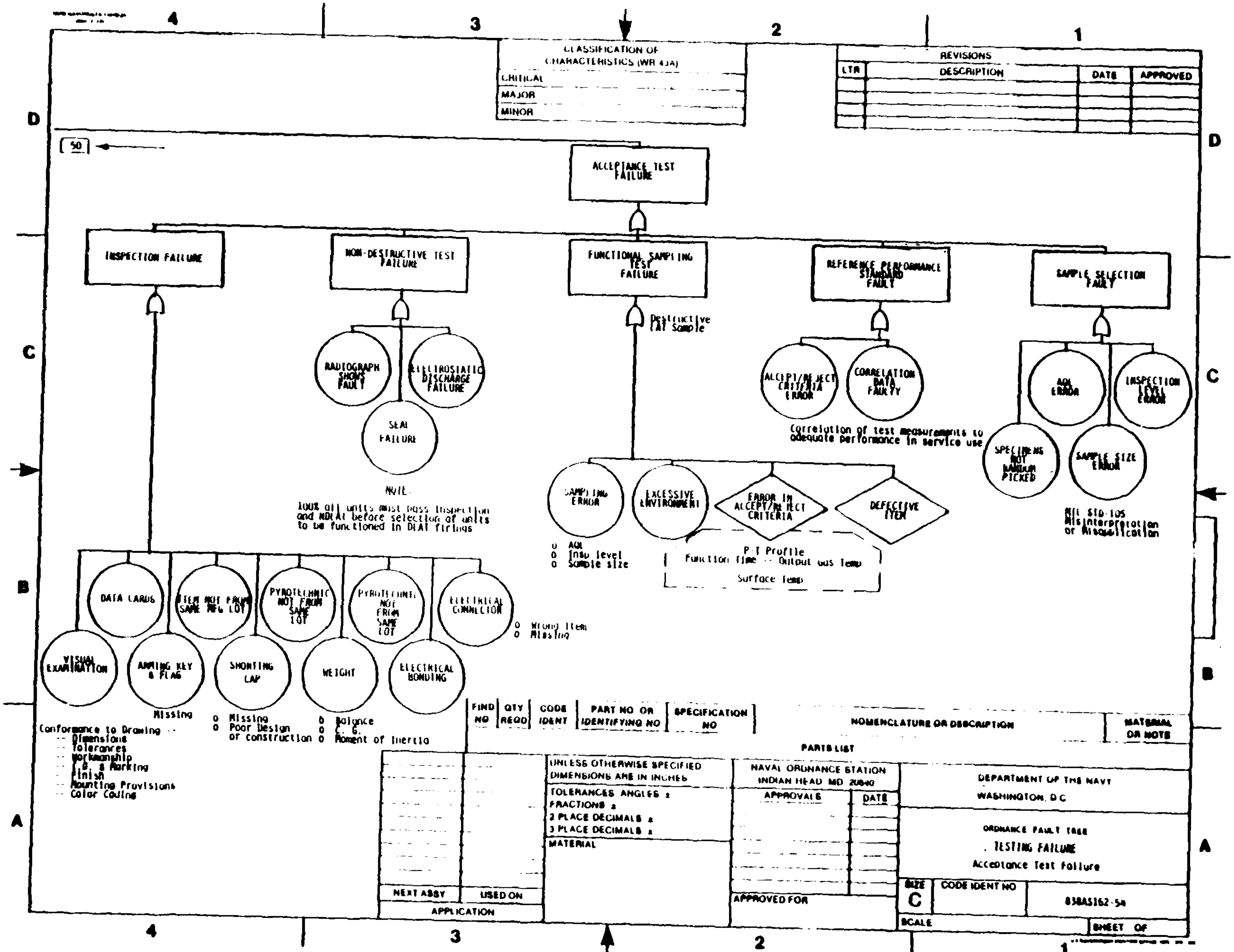
END
DATE
FILMED
12 83
DTIC

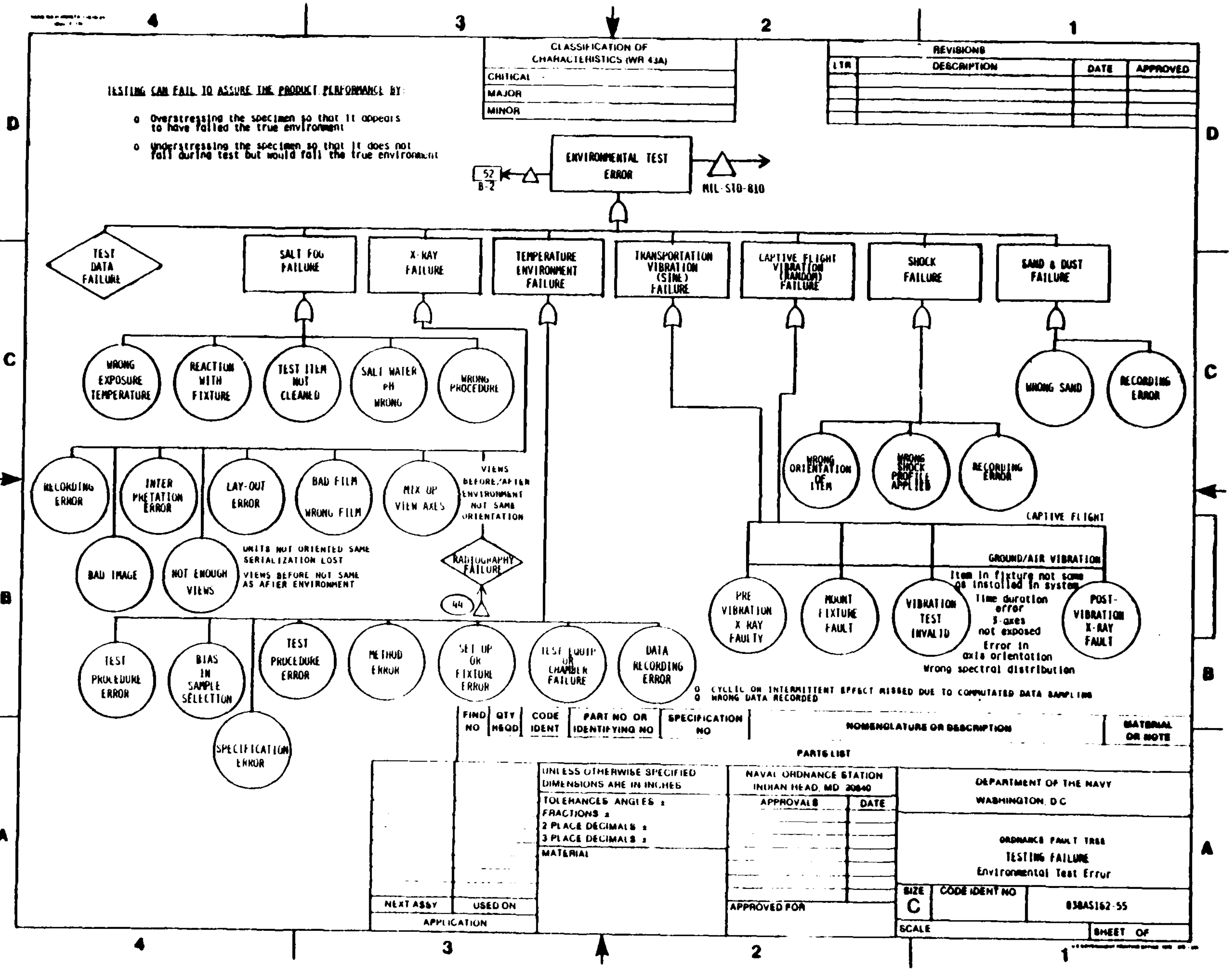

1.0
2.8
2.5
3.2
2.2
3.6
2.0
1.1
1.8
1.25
1.4
1.6

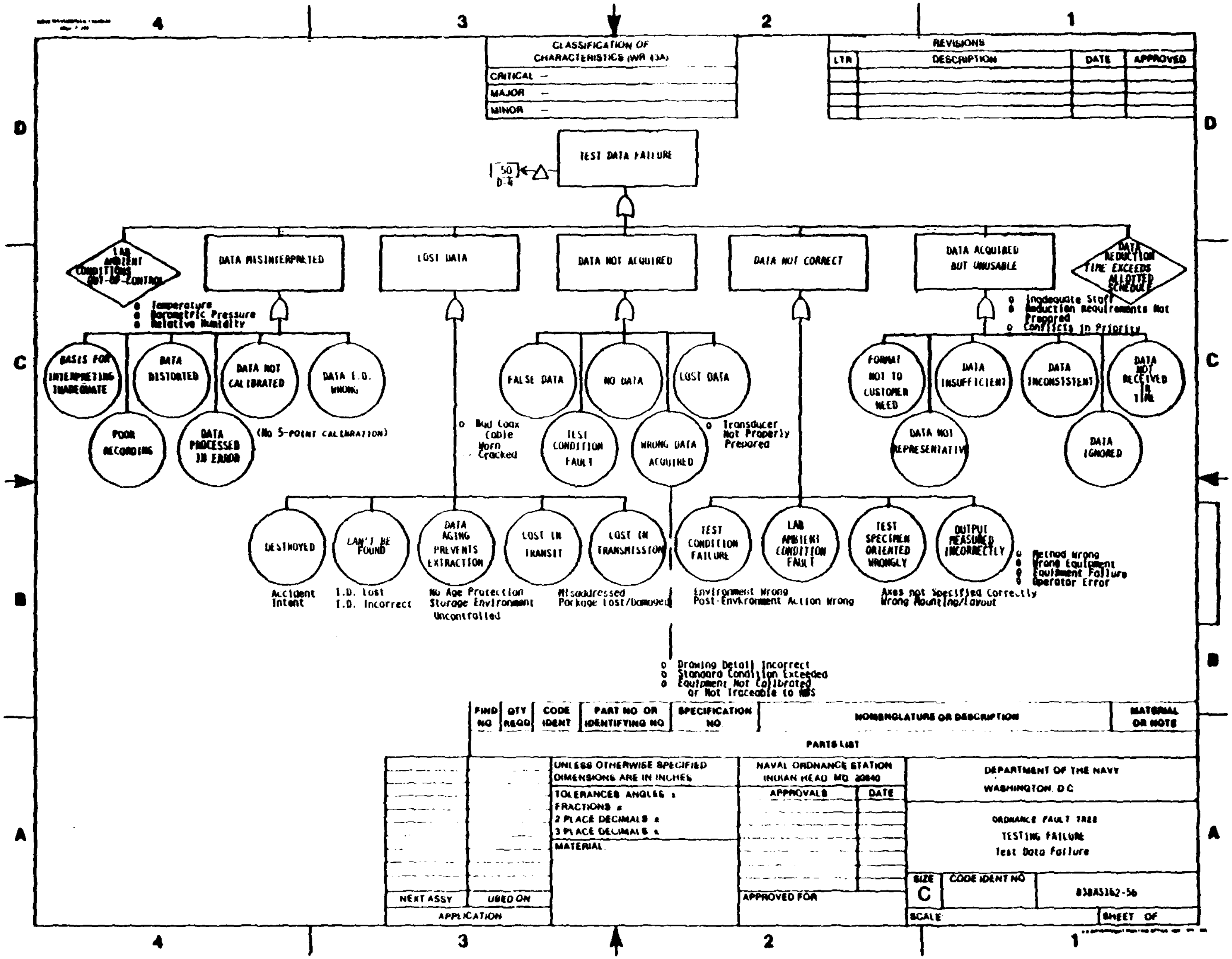

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
TEST PLANNING FAILURE
DEVELOPMENT TEST FAILURE
Establishment of Final Design (Qualifiable Configuration)
FAIL TO CONSIDER ENVIRONMENTS
FAIL TO CONDUCT SAFETY TEST
FAIL TO CONDUCT MARGIN TEST ON CRITICAL PARAMETER
FAIL TO DESIGN TO MIL HANDBOOK DATA
FAIL TO PERFORM LADDER TESTS ABOVE/BELOW CALCULATED LEVELS
FAIL TO PERFORM SPECIAL TESTS NEEDED
DATA REDUCTION FAILURE
LOCKED SHUT FIRING
AUTO-IGNITION
BON FIRE SAFETY
EXPLOSIVE ATMOSPHERE
OVER CHARGE PYRO
FAIL SAFE FUNCTION
RF SENSITIVITY
POST FIRE DEBRIS & LEAK
INTENTIONALLY INDUCED FAULT
ALL FIRE HIGH/LOW TEMP
NO FIRE HIGH/LOW TEMP
Fail To:
IDENTIFY CRITICAL ITEMS
TEST TO FAILURE
RE TEST PROPRIETARY ITEM CLAIMS
FAIL TO USE STANDARD COMPONENTS
FAIL TO DESIGN USING STANDARD PROPERTY OF MATL
FAIL TO MAKE STRESS ANALYSIS
SIZE POWDER CHARGES EMPIRICALLY
TEST PERFORMANCE LIMITS
USE STATISTICAL APPROACHES
TEST ABOVE/BELOW REQUIRED LEVELS
PROOF TEST CRITICAL STRUCTURE
o Probit
o Bruceton
Environments Combined
o Web Thickness
o Pressure Vessel
o All Fire
o Pre Fire Electrical
o Post-Fire Electrical
o Post-Fire Leak/Debris
STRICT COMPLIANCE TO TEST PLAN
FAIL TO PERFORM COMPONENT TEST
FAIL TO USE DATA IN RE-DESIGN
ENGINEERING MODEL FOR INTER-FACE
PRESSURE VESSEL
100%: 1.5 x MEOP (Proof)
Sample: 2.0 x MEOP (Burst)
Sample: 3.0 x MEOP (Bellefs)
CORRELATION FIRING FAILURE
CARTRIDGE BOMB FIRINGS
CARTRIDGE IN CAT FIRINGS
TRADE OFF SINGLE vs COMBINED
DU MARGIN & OFF LIMITS TESTS
TEST IN RF FIELDS
MEASURE TOXIC/ PARTICULATE OUTPUTS
TEST EACH ENVIRONMENT
TEST LOGICAL COMBINATIONS
TEST RATIONALIZED WORST CASE
TRADE OFF SINGLE VS COMBINED
(Environments)
o Overstress For Pre-Qual Assurance
o Actual Life vs Spec
o Sequences of Combinations
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
TESTING FAILURE
Development Test Failure
SIZE
C
CODE IDENT NO
838AS162-51
SCALE
SHEET OF

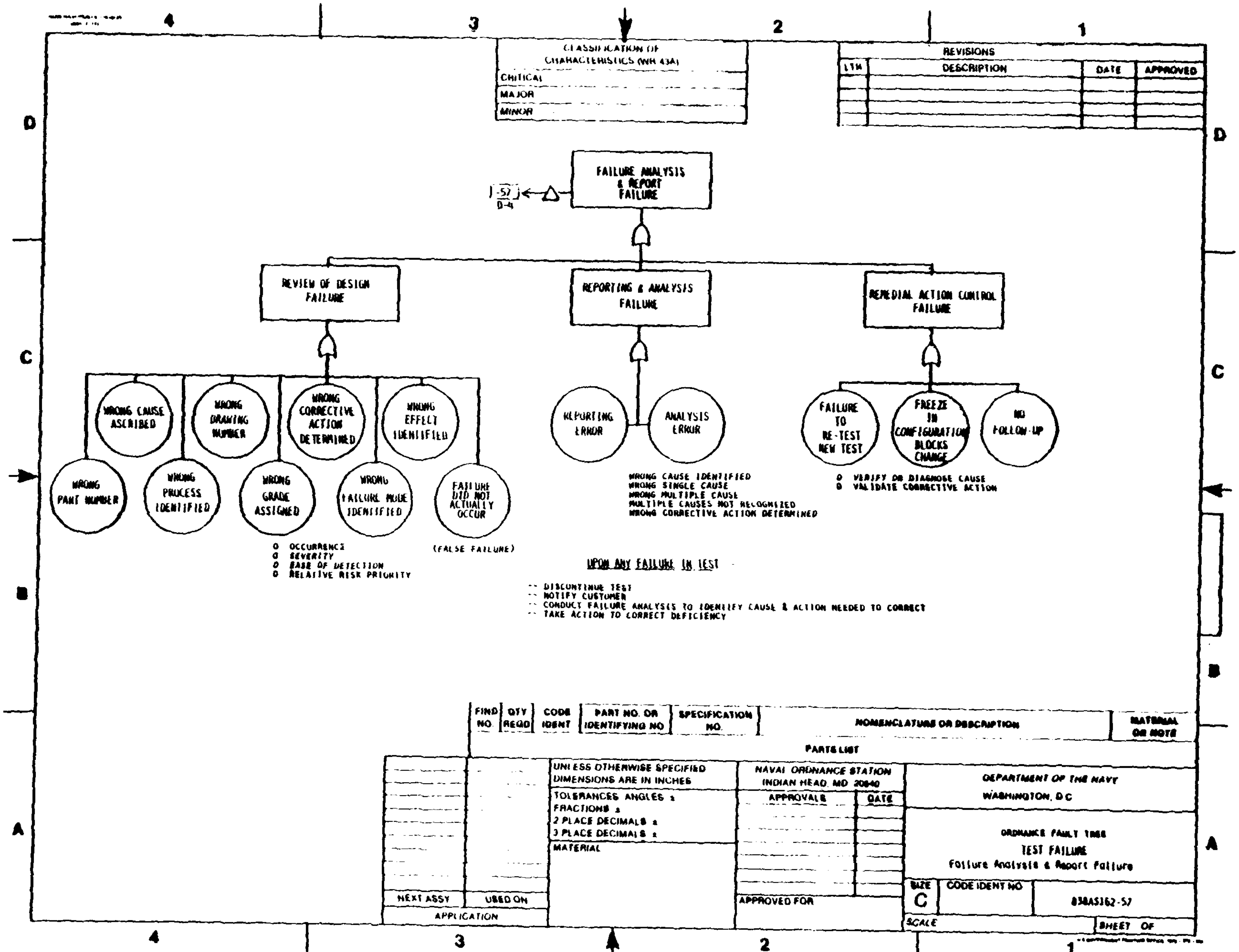

CLASSIFICATION OF CHARACTERISTICS (WH 4.4A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-51
-53
QUALIFICATION TEST FAILURE
INSPECTION FAILURE
NON-DESTRUCTIVE ACCEPTANCE TEST FAILURE
DATA REDUCTION FAILURE
DEMONSTRATION FAILURE
ENVIRONMENTAL TEST FAILURE
FUNCTIONAL TEST FAILURE
ANALYSIS FAILURE
DEFECTIVE ITEM
PROCEDURE ERROR
PERSONNEL ERROR
EQUIPMENT ERROR
INTERFACE FAULT
NOT TESTED WITH NEXT ASSY
CYCLE LIFE FAILURE
INERT SIMULATOR FAILURE
FAIL RESISTANCE TO COOK OFF
o Form Fit Not Same As Actual
o Weight Balance Not Same As Actual
o Storage Life
o Operating Life
o Reliability --
-- Modeling
-- Failure Modes & Effects
-- Failure Rates
o Design Margins
o Stress Analysis
o Test Data Analysis
o Data From Similar Programs
o Human Factors
-- Human Performance
-- Human Engineering
o Maintainability
o Safety Hazard --
-- Ground
-- Flight
-- Safety FMEA
EQUIPMENT ERROR
DEFECTIVE ITEM
PERSONNEL ERROR
PROCEDURE ERROR
TEST SPECIMEN CONFIGURATION FAULT
EQUIPMENT ERROR
ENVIRONMENTAL TEST ERROR
PERSONNEL ERROR
PROCEDURE ERROR
EQUIPMENT ERROR
PERSONNEL ERROR
PROCEDURE ERROR
DEFECTIVE ITEM
-55
ENVIRONMENTS:
o High/Low Temp
o Thermal Shock
o Temp Altitude (Vacuum)
o Temp Humidity
o Salt Fog
o Sand & Dust
o Acceleration
o Vibration --
-- Sine (Transportation)
-- Random (Flight)
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY WASHINGTON, D C
ORDNANCE FAULT TREE
TESTING FAILURE
Qualification Test Failure
SIZE C
CODE IDENT NO
83BAS262-52
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-52
-50
QUALITY ASSURANCE SURVEILLANCE FAILURE
QA Surveillance Failure In:
DESIGN
DEVELOPMENT
ENVIRONMENTAL EXPOSURES
TEST DATA
DESIGN CHANGE
DEFICIENCY
FAIL TO REVIEW DESIGN
FAIL TO REVIEW DOCUMENTATION FOR TESTING
FAIL TO PREPARE QA PLAN
o Inspection Points
o Critical QA Features
o Inspectability
o Test Plan
o Test Procedure
o Data Format
o Data Reduction Routine
o Receiving inspection
o In-Process Inspection
FAIL TO REQUIRE 100% INSPECTION
FAIL TO CATCH PRODUCTION INSPECTION PROBLEM
FAIL TO CHECK INSPECT ABILITY
FAIL TO REQUIRE CERTIFICATION
o Function Critical Parameter
o Proof Pressure of Pressure Vessel
FAIL TO CHECK AGAINST SPEC
FAIL TO STRESS ENVIRONMENTAL COMBOS
FAIL TO DETECT EXCESSIVE TESTING
FAIL TO INTERPRET NEED FOR DESIGN CHANGE
FAIL TO CATCH ERROR
FAIL TO NOTE AQL PROBLEM
o Recording
o Reduction
(LAT)
FAIL TO WITNESS TEST
FAIL TO NOTE NEED FOR RE-TEST
FAIL TO REVIEW PROPOSED CHANGE
FAIL TO NOTE INSPECTION IMPACT
FAIL TO FOLLOW-UP ON QA PROBLEM
FAIL TO ANALYZE DEFICIENCY FOR CAUSE
WRONG CAUSE ATTRIBUTED
FAIL TO NOTE DEFICIENCY
FAIL TO PROVE CAUSE OF DEFICIENCY
WRONG FIX RECOMMENDED
PROBLEMS:
o Failure to witness
o Failure to analyze
o Failure to see need for diagnostic testing of unresolved fault
o Concern over possible delay to program to make thorough inquiry
o AQL in sampling tests
o Failure to test for QA needs
o Pressure to rework rather than reject
o "Too late-to-change" pressure
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
TESTING FAILURE
Quality Assurance Surveillance Failure
SIZE
C
CODE IDENT NO
838AS162-53
SCALE
SHEET OF

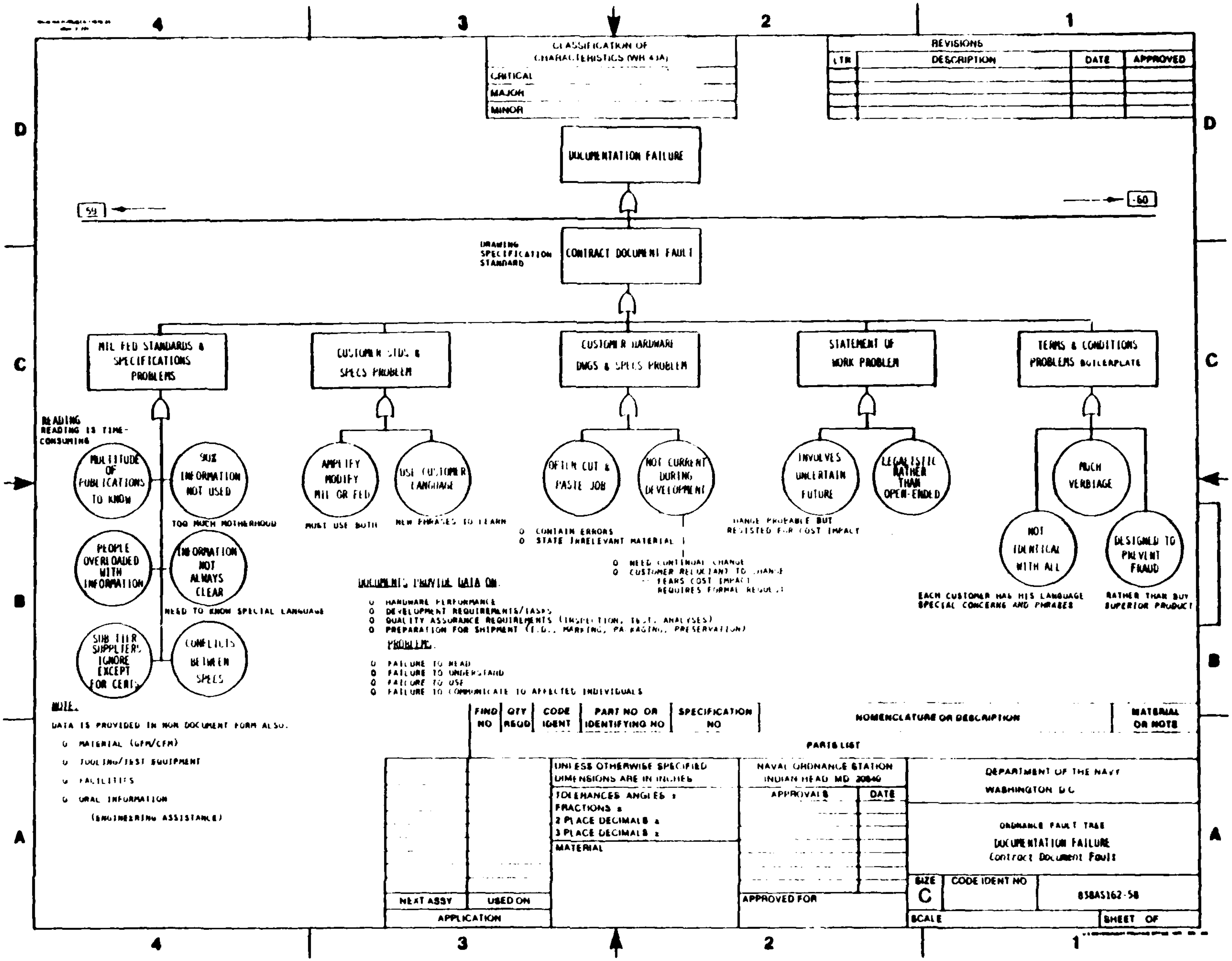

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
50
ACCEPTANCE TEST FAILURE
INSPECTION FAILURE
NON-DESTRUCTIVE TEST FAILURE
FUNCTIONAL SAMPLING TEST FAILURE
REFERENCE PERFORMANCE STANDARD FAULT
SAMPLE SELECTION FAULT
RADIOGRAPH SHOWS FAULT
ELECTROSTATIC DISCHARGE FAILURE
SEAL FAILURE
NOTE:
100% all units must pass inspection and NDEAT before selection of units to be functioned in DLAT firings
Destructive LAT Sample
SAMPLING ERROR
EXCESSIVE ENVIRONMENT
ERROR IN ACCEPT/REJECT CRITERIA
DEFECTIVE ITEM
o AQL
o Insp level
o Sample size
P-T Profile
Function Time -- Output Gas Temp
Surface Temp
ACCEPT/REJECT CRITERIA ERROR
CORRELATION DATA FAULTY
Correlation of test measurements to adequate performance in service use
AQL ERROR
INSPECTION LEVEL ERROR
SPECIMENS NOT RANDOM PICKED
SAMPLE SIZE ERROR
MIL STD 105
Misinterpretation
or Misapplication
DATA CARDS
ITEM NOT FROM SAME MFG LOT
PYROTECHNIC NOT FROM SAME LOT
PYROTECHNIC NOT FROM SAME LOT
ELECTRICAL CONNECTOR
o Wrong Item
o Missing
VISUAL EXAMINATION
ARMING KEY & FLAG
SHORTING CAP
WEIGHT
ELECTRICAL BONDING
Missing
o Missing
o Poor Design or construction
o Balance
o C. G.
o Moment of Inertia
Conformance to Drawing --
-- Dimensions
-- Tolerances
-- Workmanship
-- I.D. & Marking
-- Finish
-- Mounting Provisions
-- Color Coding
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
TESTING FAILURE
Acceptance Test Failure
SIZE
C
CODE IDENT NO
838AS162-54
SCALE
SHEET OF


TESTING CAN FAIL TO ASSURE THE PRODUCT PERFORMANCE BY:
o Overstressing the specimen so that it appears to have failed the true environment
o Understressing the specimen so that it does not fail during test but would fail the true environment
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ENVIRONMENTAL TEST ERROR
52 B-2
MIL-STD-810
TEST DATA FAILURE
SALT FOG FAILURE
X-RAY FAILURE
TEMPERATURE ENVIRONMENT FAILURE
TRANSPORTATION VIBRATION (SINE) FAILURE
CAPTIVE FLIGHT VIBRATION (RANDOM) FAILURE
SHOCK FAILURE
SAND & DUST FAILURE
WRONG EXPOSURE TEMPERATURE
REACTION WITH FIXTURE
TEST ITEM NOT CLEANED
SALT WATER pH WRONG
WRONG PROCEDURE
WRONG SAND
RECORDING ERROR
RECORDING ERROR
INTER PRETATION ERROR
LAY-OUT ERROR
BAD FILM WRONG FILM
MIX UP VIEW AXES
VIEWS BEFORE/AFTER ENVIRONMENT NOT SAME ORIENTATION
BAD IMAGE
NOT ENOUGH VIEWS
UNITS NOT ORIENTED SAME SERIALIZATION LOST
VIEWS BEFORE NOT SAME AS AFTER ENVIRONMENT
RADIOGRAPHY FAILURE
44
WRONG ORIENTATION OF ITEM
WRONG SHOCK PROFILE APPLIED
RECORDING ERROR
CAPTIVE FLIGHT
GROUND/AIR VIBRATION
PRE VIBRATION X RAY FAULTY
MOUNT FIXTURE FAULT
VIBRATION TEST INVALID
Item in fixture not same as installed in system
Time duration error
3-axes not exposed
Error in axis orientation
Wrong spectral distribution
POST-VIBRATION X-RAY FAULT
TEST PROCEDURE ERROR
BIAS IN SAMPLE SELECTION
SPECIFICATION ERROR
TEST PROCEDURE ERROR
METHOD ERROR
SET UP OR FIXTURE ERROR
TEST EQUIP OR CHAMBER FAILURE
DATA RECORDING ERROR
O CYCLIC OR INTERMITTENT EFFECT MISSED DUE TO COMPUTATED DATA SAMPLING
O WRONG DATA RECORDED
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY WASHINGTON, D C
ORDNANCE FAULT TREE
TESTING FAILURE
Environmental Test Error
SIZE C
CODE IDENT NO
838AS162-55
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION
APPROVED FOR

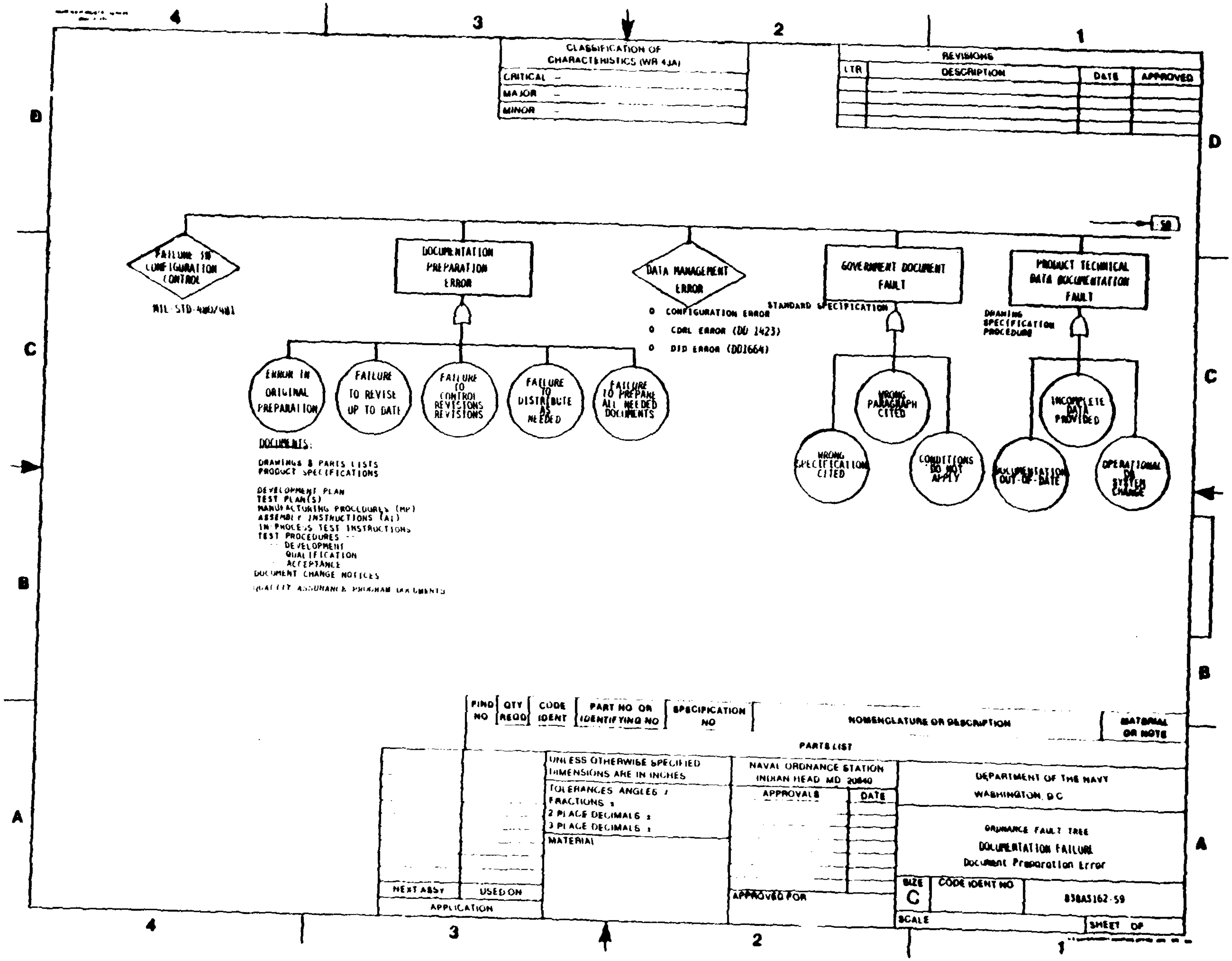

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
TEST DATA FAILURE
50
D-4
LAB AMBIENT CONDITIONS OUT-OF-CONTROL
DATA MISINTERPRETED
LOST DATA
DATA NOT ACQUIRED
DATA NOT CORRECT
DATA ACQUIRED BUT UNUSABLE
DATA REDUCTION TIME EXCEEDS ALLOTTED SCHEDULE
o Temperature
o Barometric Pressure
o Relative Humidity
o Inadequate Staff
o Reduction Requirements Not Prepared
o Conflicts in Priority
BASIS FOR INTERPRETING INADEQUATE
DATA DISTORTED
DATA NOT CALIBRATED
DATA I.D. WRONG
POOR RECORDING
DATA PROCESSED IN ERROR
(No 5-POINT CALIBRATION)
o Bad Coax Cable Worn Cracked
FALSE DATA
NO DATA
LOST DATA
TEST CONDITION FAULT
WRONG DATA ACQUIRED
o Transducer Not Properly Prepared
FORMAT NOT TO CUSTOMER NEED
DATA INSUFFICIENT
DATA INCONSISTENT
DATA NOT RECEIVED IN TIME
DATA NOT REPRESENTATIVE
DATA IGNORED
DESTROYED
CAN'T BE FOUND
DATA AGING PREVENTS EXTRACTION
LOST IN TRANSIT
LOST IN TRANSMISSION
TEST CONDITION FAILURE
LAB AMBIENT CONDITION FAULT
TEST SPECIMEN ORIENTED WRONGLY
OUTPUT MEASURED INCORRECTLY
o Method Wrong
o Wrong Equipment
o Equipment Failure
o Operator Error
Accident
Intent
I.D. Lost
I.D. Incorrect
No Age Protection
Storage Environment Uncontrolled
Misaddressed
Package Lost/Damaged
Environment Wrong
Post-Environment Action Wrong
Axes not Specified Correctly
Wrong Mounting/Layout
o Drawing Detail Incorrect
o Standard Condition Exceeded
o Equipment Not Calibrated or Not Traceable to NBS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D.C.
ORDNANCE FAULT TREE
TESTING FAILURE
Test Data Failure
SIZE
C
CODE IDENT NO
838A5362-56
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

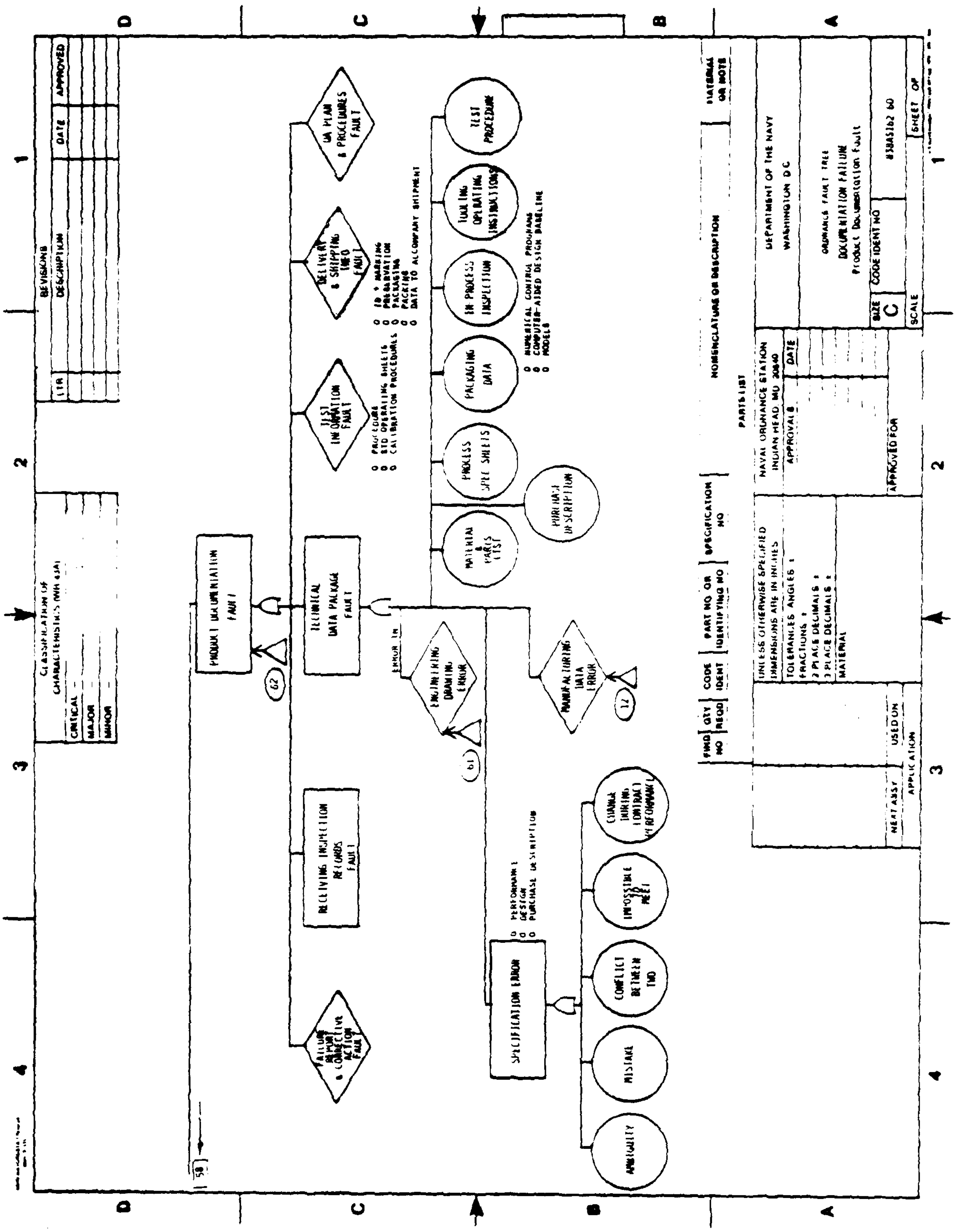


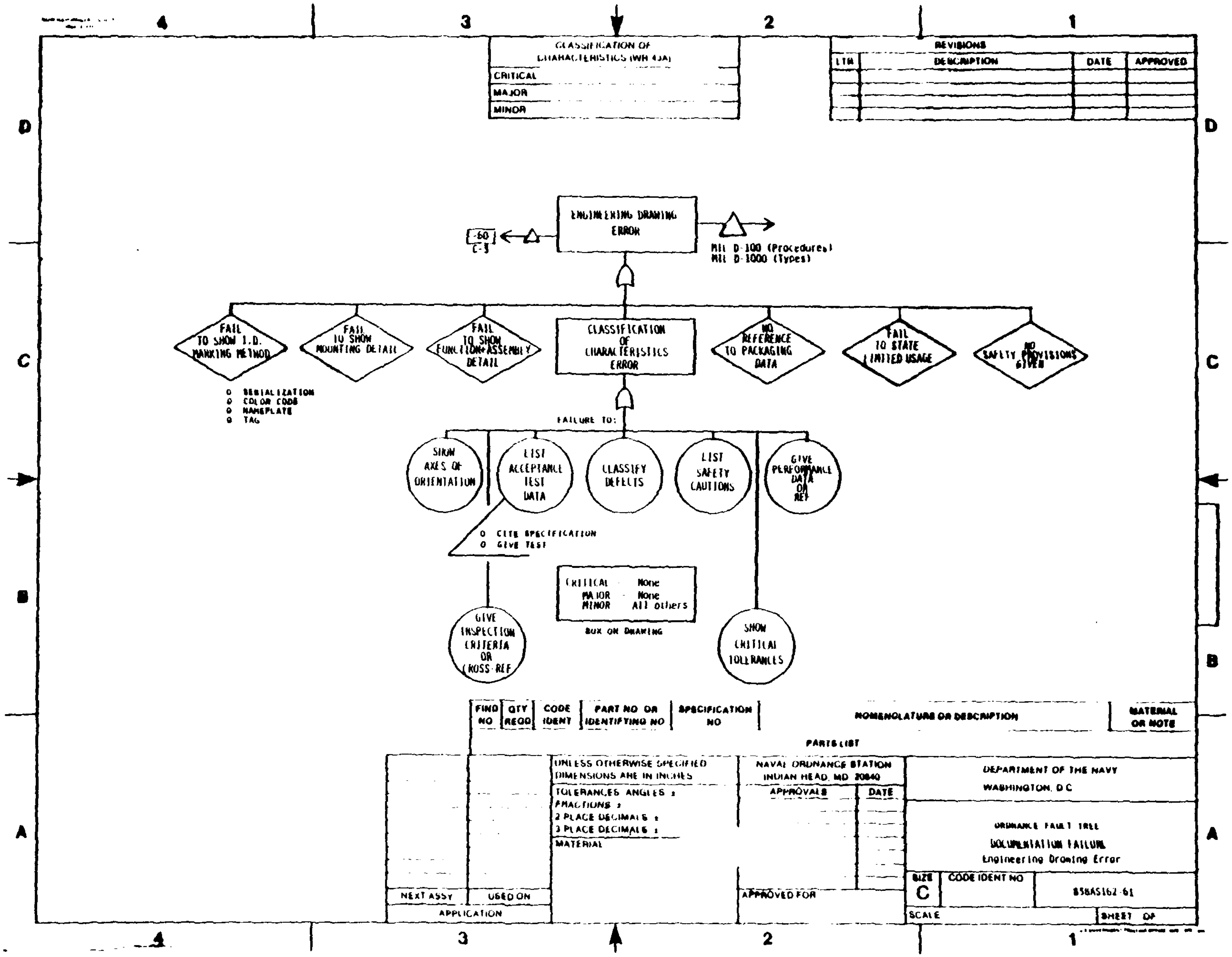
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FAILURE ANALYSIS & REPORT FAILURE
J-57 D-4
REVIEW OF DESIGN FAILURE
REPORTING & ANALYSIS FAILURE
REMEDIAL ACTION CONTROL FAILURE
WRONG CAUSE ASCRIBED
WRONG DRAWING NUMBER
WRONG CORRECTIVE ACTION DETERMINED
WRONG EFFECT IDENTIFIED
WRONG PART NUMBER
WRONG PROCESS IDENTIFIED
WRONG GRADE ASSIGNED
WRONG FAILURE MODE IDENTIFIED
FAILURE DID NOT ACTUALLY OCCUR
(FALSE FAILURE)
O OCCURRENCE
O SEVERITY
O EASE OF DETECTION
O RELATIVE RISK PRIORITY
REPORTING ERROR
ANALYSIS ERROR
WRONG CAUSE IDENTIFIED
WRONG SINGLE CAUSE
WRONG MULTIPLE CAUSE
MULTIPLE CAUSES NOT RECOGNIZED
WRONG CORRECTIVE ACTION DETERMINED
FAILURE TO RE-TEST NEW TEST
FREEZE IN CONFIGURATION BLOCKS CHANGE
NO FOLLOW-UP
O VERIFY OR DIAGNOSE CAUSE
O VALIDATE CORRECTIVE ACTION
UPON ANY FAILURE IN TEST
-- DISCONTINUE TEST
-- NOTIFY CUSTOMER
-- CONDUCT FAILURE ANALYSES TO IDENTIFY CAUSE & ACTION NEEDED TO CORRECT
-- TAKE ACTION TO CORRECT DEFICIENCY
FIND NO.
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO.
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D.C
ORDNANCE FAULT TREE
TEST FAILURE
Failure Analysis & Report Failure
SIZE C
CODE IDENT NO
838AS162-57
SCALE
SHEET OF

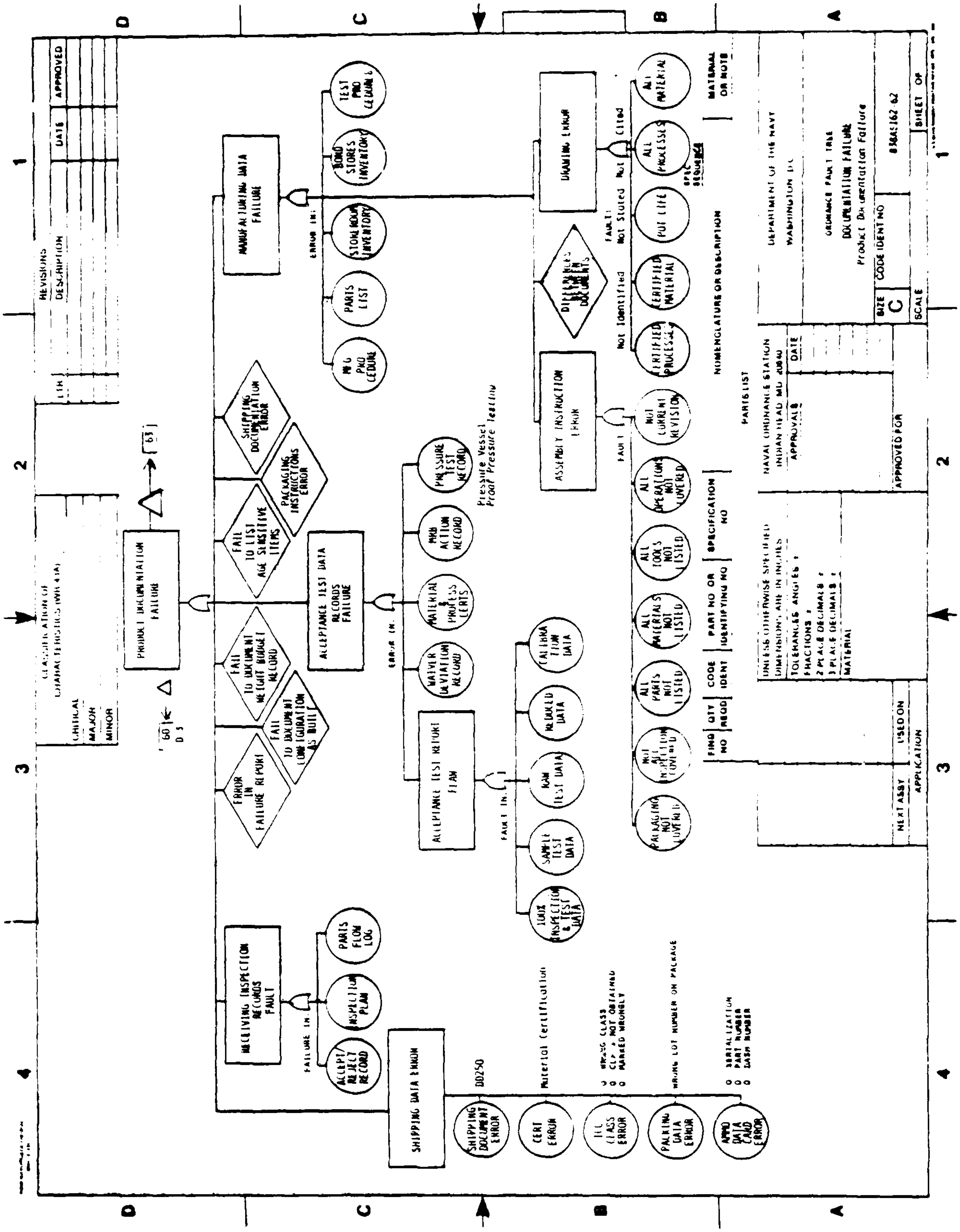


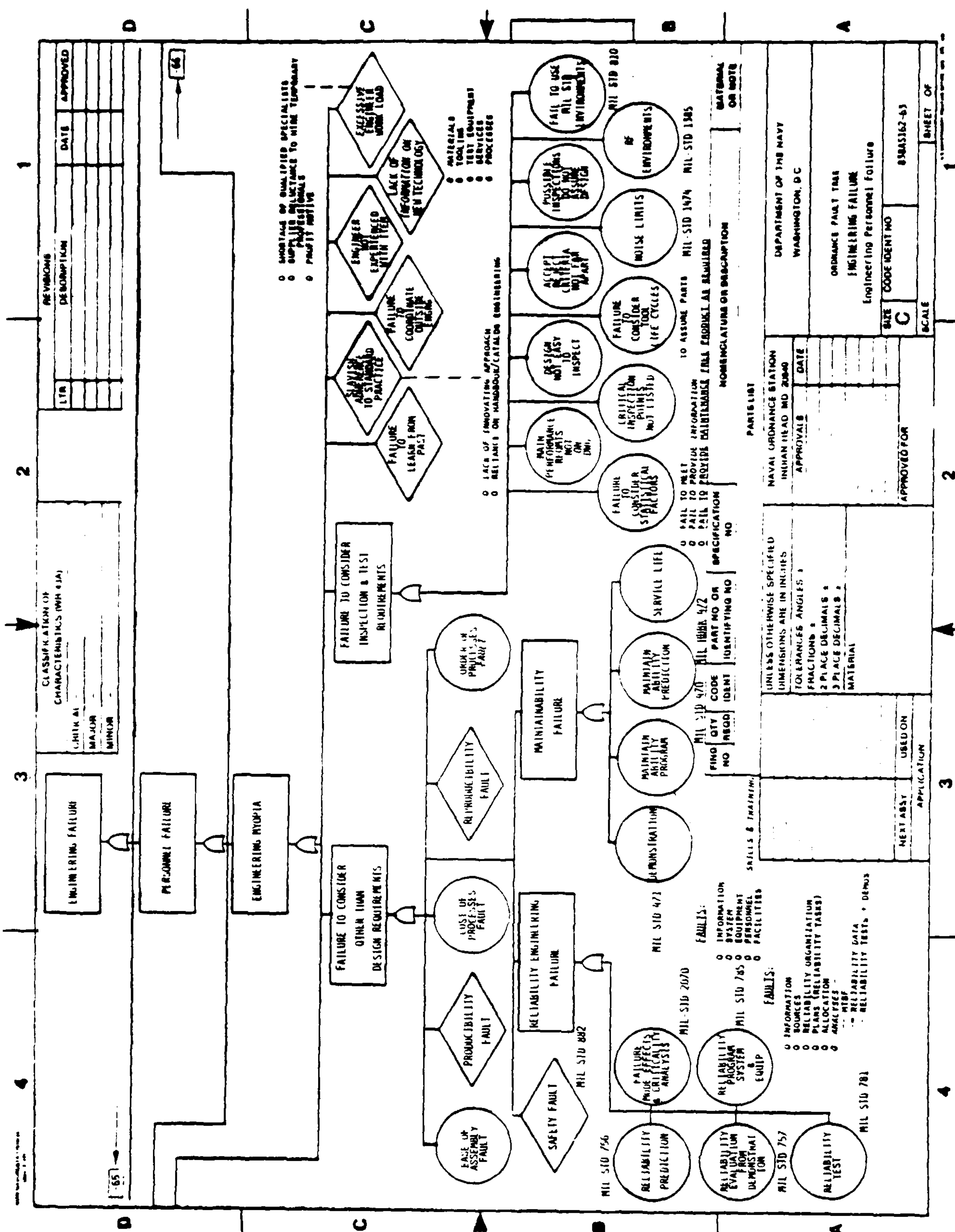
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DOCUMENTATION FAILURE
59
60
DRAWING SPECIFICATION STANDARD
CONTRACT DOCUMENT FAULT
MIL FED STANDARDS & SPECIFICATIONS PROBLEMS
CUSTOMER STDS & SPECS PROBLEM
CUSTOMER HARDWARE DWGS & SPECS PROBLEM
STATEMENT OF WORK PROBLEM
TERMS & CONDITIONS PROBLEMS BOILERPLATE
READING
READING IS TIME-CONSUMING
MULTITUDE OF PUBLICATIONS TO KNOW
90% INFORMATION NOT USED
TOO MUCH MOTHERHOOD
PEOPLE OVERLOADED WITH INFORMATION
INFORMATION NOT ALWAYS CLEAR
NEED TO KNOW SPECIAL LANGUAGE
SUB TIER SUPPLIERS IGNORE EXCEPT FOR CERTS
CONFLICTS BETWEEN SPECS
AMPLIFY MODIFY MIL OR FED
MUST USE BOTH
USE CUSTOMER LANGUAGE
NEW PHRASES TO LEARN
OFTEN CUT & PASTE JOB
O CONTAIN ERRORS
O STATE IRRELEVANT MATERIAL
NOT CURRENT DURING DEVELOPMENT
O NEED CONTINUAL CHANGE
O CUSTOMER RELUCTANT TO CHANGE
-- FEARS COST IMPACT
REQUIRES FORMAL REQUEST
INVOLVES UNCERTAIN FUTURE
CHANGE PROBABLE BUT RESISTED FOR COST IMPACT
LEGALISTIC RATHER THAN OPEN-ENDED
MUCH VERBIAGE
NOT IDENTICAL WITH ALL
EACH CUSTOMER HAS HIS LANGUAGE SPECIAL CONCERNS AND PHRASES
DESIGNED TO PREVENT FRAUD
RATHER THAN BUY SUPERIOR PRODUCT
DOCUMENTS PROVIDE DATA ON:
O HARDWARE PERFORMANCE
O DEVELOPMENT REQUIREMENTS/TASKS
O QUALITY ASSURANCE REQUIREMENTS (INSPECTION, TEST, ANALYSES)
O PREPARATION FOR SHIPMENT (I.E., MARKING, PACKAGING, PRESERVATION)
PROBLEMS:
O FAILURE TO READ
O FAILURE TO UNDERSTAND
O FAILURE TO USE
O FAILURE TO COMMUNICATE TO AFFECTED INDIVIDUALS
NOTE:
DATA IS PROVIDED IN NON DOCUMENT FORM ALSO.
O MATERIAL (GFM/CFM)
O TOOLING/TEST EQUIPMENT
O FACILITIES
O ORAL INFORMATION
(ENGINEERING ASSISTANCE)
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
DOCUMENTATION FAILURE
Contract Document Fault
SIZE
C
CODE IDENT NO
838AS162-58
SCALE
SHEET OF

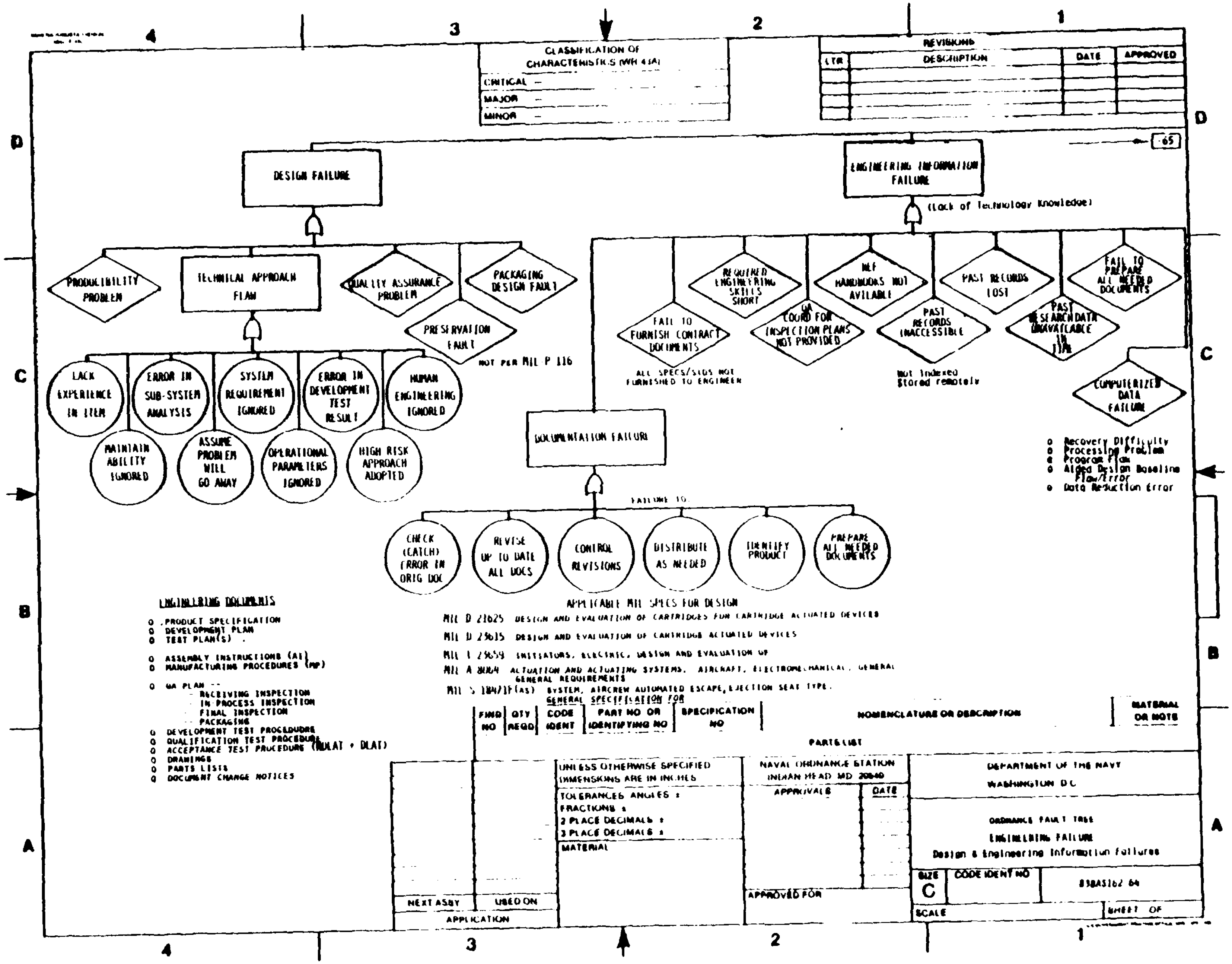

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FAILURE IN CONFIGURATION CONTROL
MIL-STD-480/481
DOCUMENTATION PREPARATION ERROR
DATA MANAGEMENT ERROR
o CONFIGURATION ERROR
o CDRL ERROR (DD 1423)
o DID ERROR (DD1664)
GOVERNMENT DOCUMENT FAULT
STANDARD SPECIFICATION
PRODUCT TECHNICAL DATA DOCUMENTATION FAULT
DRAWING SPECIFICATION PROCEDURE
58
ERROR IN ORIGINAL PREPARATION
FAILURE TO REVISE UP TO DATE
FAILURE TO CONTROL REVISIONS REVISIONS
FAILURE TO DISTRIBUTE AS NEEDED
FAILURE TO PREPARE ALL NEEDED DOCUMENTS
WRONG SPECIFICATION CITED
WRONG PARAGRAPH CITED
CONDITIONS DO NOT APPLY
DOCUMENTATION OUT-OF-DATE
INCOMPLETE DATA PROVIDED
OPERATIONAL OR SYSTEM CHANGE
DOCUMENTS:
DRAWINGS & PARTS LISTS
PRODUCT SPECIFICATIONS
DEVELOPMENT PLAN
TEST PLAN(S)
MANUFACTURING PROCEDURES (MP)
ASSEMBLY INSTRUCTIONS (AI)
IN-PROCESS TEST INSTRUCTIONS
TEST PROCEDURES --
-- DEVELOPMENT
QUALIFICATION
ACCEPTANCE
DOCUMENT CHANGE NOTICES
QUALITY ASSURANCE PROGRAM DOCUMENTS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, DC
ORDNANCE FAULT TREE
DOCUMENTATION FAILURE
Document Preparation Error
SIZE C
CODE IDENT NO
83BA5162-59
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

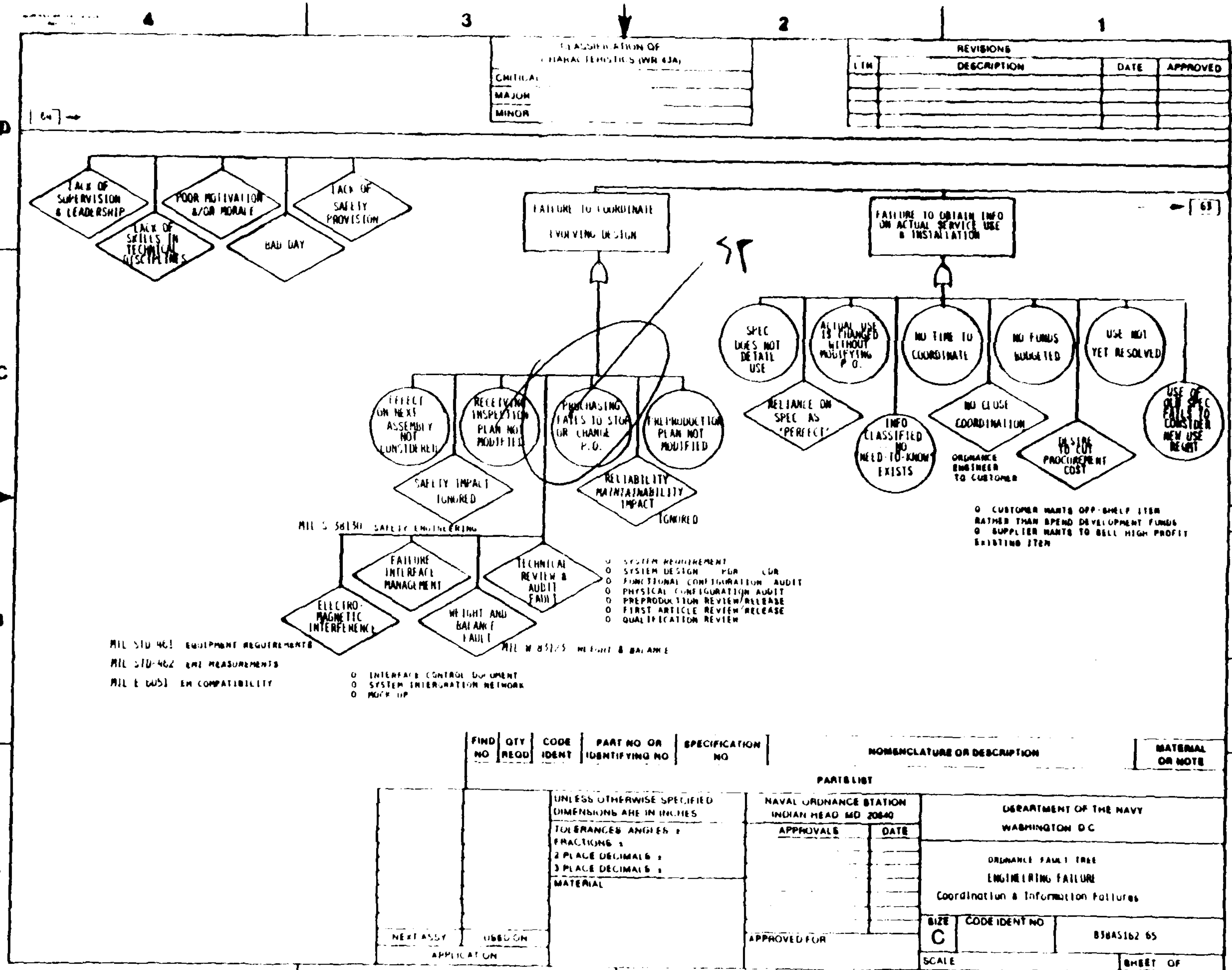

REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS
CRITICAL
MAJOR
MINOR
PRODUCT DOCUMENTATION FAULT
TECHNICAL DATA PACKAGE FAULT
RECEIVING INSPECTION RECORDS FAULT
FAILURE REPORT & CORRECTIVE ACTION FAULT
TEST INFORMATION FAULT
DELIVERY & SHIPPING INFO FAULT
QA PLAN & PROCEDURES FAULT
PROCEDURE
STD OPERATING SHEETS
CALIBRATION PROCEDURES
ID & MARKING
PRESERVATION
PACKAGING
PACKING
DATA TO ACCOMPANY SHIPMENT
MATERIAL & PARTS LIST
PURCHASE DESCRIPTION
PROCESS SPEC SHEETS
PACKAGING DATA
IN PROCESS INSPECTION
TOOLING OPERATING INSTRUCTIONS
TEST PROCEDURE
NUMERICAL CONTROL PROGRAMS
COMPUTER-AIDED DESIGN BASELINE
MODELS
ENGINEERING DRAWING ERROR
MANUFACTURING DATA ERROR
SPECIFICATION ERROR
PERFORMANCE
DESIGN
PURCHASE DESCRIPTION
AMBIGUITY
MISTAKE
CONFLICT BETWEEN TWO
IMPOSSIBLE TO MEET
CHANGE DURING CONTRACT PERFORMANCE
62
61
12
58
PARTS LIST
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
NOMENCLATURE OR DESCRIPTION
SPECIFICATION NO
MATERIAL OR NOTE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
DOCUMENTATION FAILURE
Product Documentation Fault
SIZE
C
CODE IDENT NO
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ENGINEERING DRAWING ERROR
-60
C-3
MIL D-100 (Procedures)
MIL D-1000 (Types)
FAIL TO SHOW I.D. MARKING METHOD
FAIL TO SHOW MOUNTING DETAIL
FAIL TO SHOW FUNCTION+ASSEMBLY DETAIL
CLASSIFICATION OF CHARACTERISTICS ERROR
NO REFERENCE TO PACKAGING DATA
FAIL TO STATE LIMITED USAGE
NO SAFETY PROVISIONS GIVEN
o SERIALIZATION
o COLOR CODE
o NAMEPLATE
o TAG
FAILURE TO:
SHOW AXES OF ORIENTATION
LIST ACCEPTANCE TEST DATA
CLASSIFY DEFECTS
LIST SAFETY CAUTIONS
GIVE PERFORMANCE DATA OR REF
o CITE SPECIFICATION
o GIVE TEST
CRITICAL - None
MAJOR - None
MINOR - All others
BOX ON DRAWING
GIVE INSPECTION CRITERIA OR CROSS-REF
SHOW CRITICAL TOLERANCES
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
DOCUMENTATION FAILURE
Engineering Drawing Error
SIZE
C
CODE IDENT NO
858AS162-61
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION

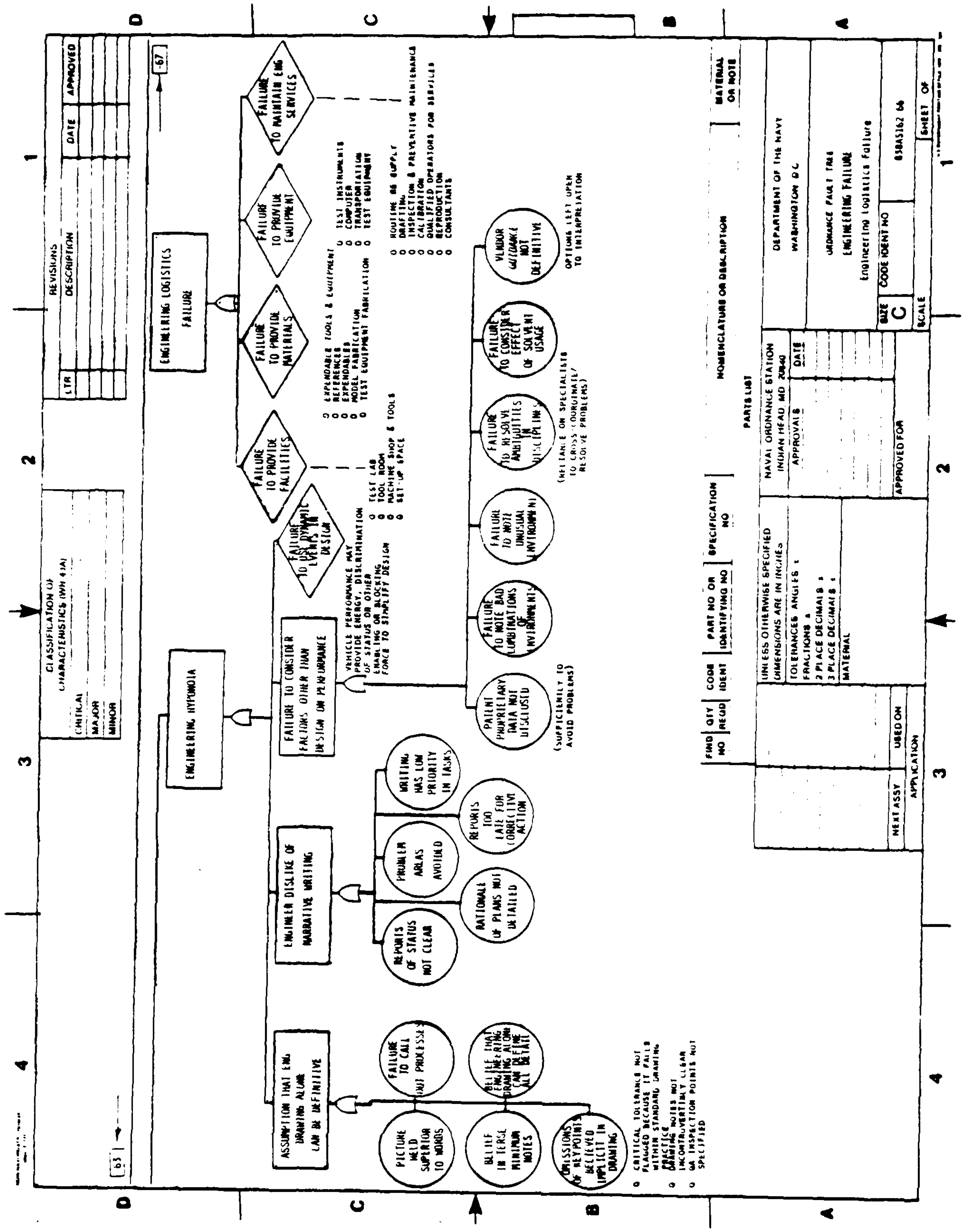

PRODUCT DOCUMENTATION FAILURE
RECEIVING INSPECTION RECORDS FAULT
ACCEPT/REJECT RECORD
INSPECTION PLAN
PARTS FLOW LOG
ERROR IN FAILURE REPORT
FAIL TO DOCUMENT CONFIGURATION AS BUILT
FAIL TO DOCUMENT WEIGHT BUDGET RECORD
FAIL TO LIST AGE SENSITIVE ITEMS
PACKAGING INSTRUCTIONS ERROR
SHIPPING DOCUMENTATION ERROR
ACCEPTANCE TEST DATA RECORDS FAILURE
WAIVER DEVIATION RECORD
MATERIAL & PROCESS CERTS
MRB ACTION RECORD
PRESSURE TEST RECORD
Pressure Vessel Proof Pressure Testing
ACCEPTANCE TEST REPORT PLAN
100% INSPECTION & TEST DATA
SAMPLE TEST DATA
RAW TEST DATA
REDUCED DATA
CALIBRATION DATA
MANUFACTURING DATA FAILURE
MFG PROCEDURAL
PARTS LIST
STOREROOM INVENTORY
BOND STORES INVENTORY
TEST PROCEDURAL
ASSEMBLY INSTRUCTION ERROR
DIFFERENCES BETWEEN DOCUMENTS
DRAWING ERROR
PACKAGING NOT COVERED
NOT ALL INSPECTION COVERED
ALL PARTS NOT LISTED
ALL MATERIALS NOT LISTED
ALL TOOLS NOT LISTED
ALL OPERATIONS NOT COVERED
NOT CURRENT REVISION
CERTIFIED PROCESSES
CERTIFIED MATERIAL
POT LIFE
ALL PROCESSES
ALL MATERIAL
SHIPPING DATA ERROR
SHIPPING DOCUMENT ERROR
CERT ERROR
ICC CLASS ERROR
PACKING DATA ERROR
APPD DATA CARD ERROR
DD250
Material Certification
WRONG CLASS
CLP & NOT OBTAINED
MARKED WRONGLY
WRONG LOT NUMBER ON PACKAGE
SERIALIZATION
PART NUMBER
DASH NUMBER
DEPARTMENT OF THE NAVY
WASHINGTON DC
NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640
ORDNANCE FAULT TREE
DOCUMENTATION FAILURE
Product Documentation Failure
PARTS LIST
NOMENCLATURE OR DESCRIPTION


ENGINEERING FAILURE
PERSONNEL FAILURE
ENGINEERING MYOPIA
FAILURE TO CONSIDER OTHER THAN DESIGN REQUIREMENTS
FAILURE TO CONSIDER INSPECTION & TEST REQUIREMENTS
EASE OF ASSEMBLY FAULT
PRODUCIBILITY FAULT
COST OF PROCESSES FAULT
REPRODUCIBILITY FAULT
SAFETY FAULT
RELIABILITY ENGINEERING FAILURE
MAINTAINABILITY FAILURE
RELIABILITY PREDICTION
RELIABILITY EVALUATION FROM DEMONSTRATION
RELIABILITY TEST
RELIABILITY PROGRAM SYSTEM & EQUIP
FAILURE MODE EFFECTS & CRITICALITY ANALYSIS
DEMONSTRATION
MAINTAINABILITY PROGRAM
MAINTAINABILITY PREDICTION
SERVICE LIFE
MIL STD 756
MIL STD 757
MIL STD 781
MIL STD 785
MIL STD 882
MIL STD 2070
MIL STD 471
MIL STD 470
MIL HDBK 472
MIL STD 1474
MIL STD 1385
MIL STD 810
FAULTS:
INFORMATION
SYSTEM
EQUIPMENT
PERSONNEL
FACILITIES
FAILURE TO LEARN FROM PAST
SLAVISH ADHERENCE TO STANDARD PRACTICE
FAILURE TO COORDINATE OUTSIDE ENGRG
ENGINEER NOT EXPERIENCED WITH ITEM
LACK OF INFORMATION ON NEW TECHNOLOGY
EXCESSIVE ENGINEER WORK LOAD
SHORTAGE OF QUALIFIED SPECIALISTS
SUPPLIER RELUCTANCE TO HIRE TEMPORARY PROFESSIONALS
PROFIT MOTIVE
MATERIALS
TOOLING
TEST EQUIPMENT
SERVICES
PROCESSES
LACK OF INNOVATING APPROACH
RELIANCE ON HANDBOOK/CATALOG ENGINEERING
FAILURE TO CONSIDER STATISTICAL FACTORS
MAIN PERFORMANCE POINTS NOT ON DWG
CRITICAL INSPECTION POINTS NOT LISTED
DESIGN NOT EASY TO INSPECT
FAILURE TO CONSIDER TOOL LIFE CYCLES
ACCEPT REJECT CRITERIA NOT FAR APART
NOISE LIMITS
POSSIBLE INSPECTIONS DO NOT ASSURE DESIGN
RF ENVIRONMENTS
FAIL TO USE MIL STD ENVIRONMENTS
FAIL TO MEET
FAIL TO PROVIDE INFORMATION
FAIL TO PROVIDE MAINTENANCE
TO ASSURE PARTS
FILL PRODUCT AS REQUIRED
SKILLS & TRAINING
DEPARTMENT OF THE NAVY
WASHINGTON, D C
NAVAL ORDNANCE STATION
INDIAN HEAD MD 20640
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Engineering Personnel Failure
PARTS LIST
NOMENCLATURE OR DESCRIPTION
REVISIONS
CLASSIFICATION OF CHARACTERISTICS
CRITICAL
MAJOR
MINOR
65

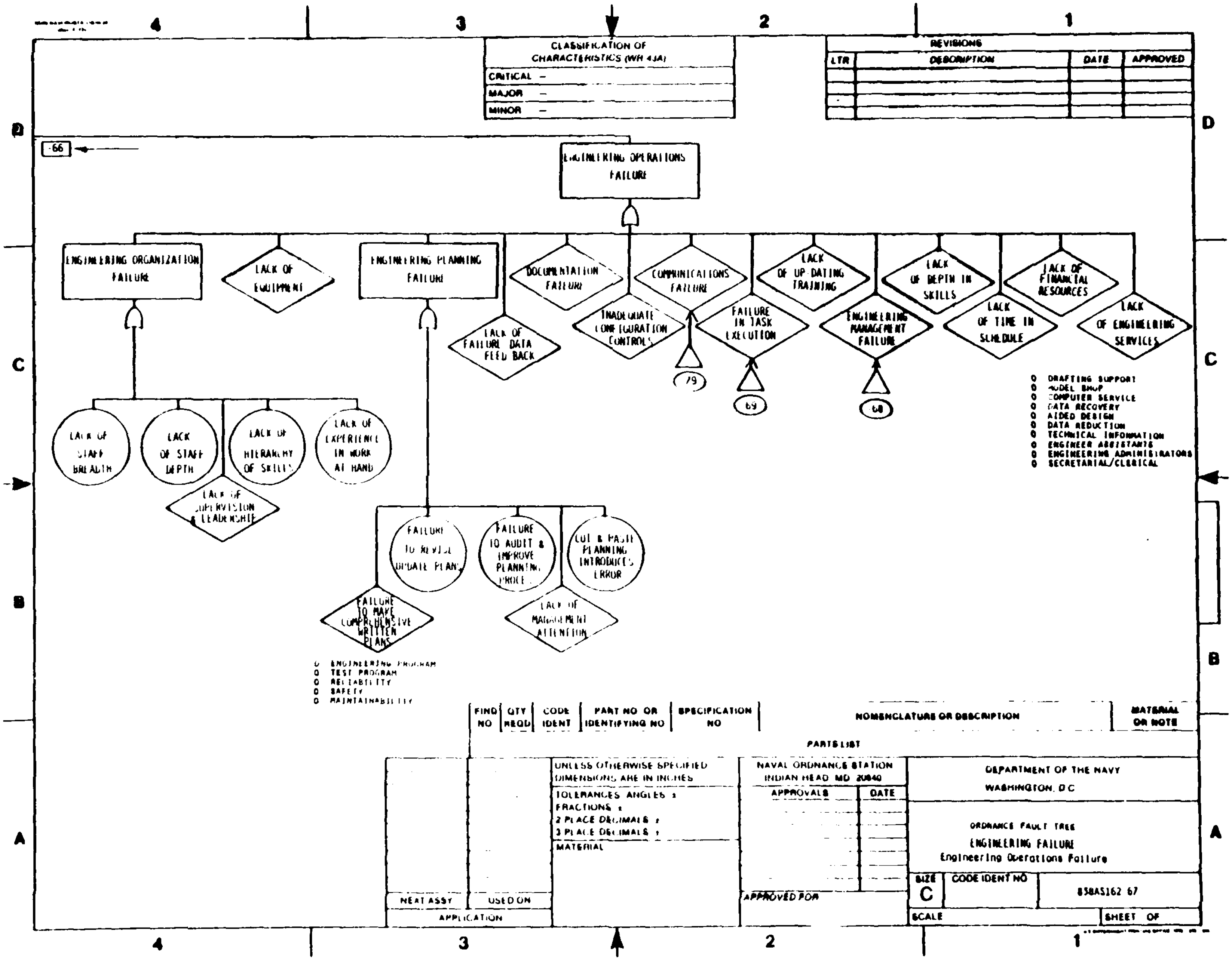

CLASSIFICATION OF CHARACTERISTICS (WH 41A)
CRITICAL —
MAJOR —
MINOR —
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
65
DESIGN FAILURE
ENGINEERING INFORMATION FAILURE
(Lack of Technology Knowledge)
PRODUCIBILITY PROBLEM
TECHNICAL APPROACH FLAW
QUALITY ASSURANCE PROBLEM
PACKAGING DESIGN FAULT
PRESERVATION FAULT
NOT PER MIL P 116
LACK EXPERIENCE IN ITEM
ERROR IN SUB-SYSTEM ANALYSIS
SYSTEM REQUIREMENT IGNORED
ERROR IN DEVELOPMENT TEST RESULT
HUMAN ENGINEERING IGNORED
MAINTAINABILITY IGNORED
ASSUME PROBLEM WILL GO AWAY
OPERATIONAL PARAMETERS IGNORED
HIGH RISK APPROACH ADOPTED
FAIL TO FURNISH CONTRACT DOCUMENTS
ALL SPECS/STDS NOT FURNISHED TO ENGINEER
REQUIRED ENGINEERING SKILLS SHORT
QA COORD FOR INSPECTION PLANS NOT PROVIDED
MLF HANDBOOKS NOT AVILABLE
PAST RECORDS INACCESSIBLE
Not Indexed
Stored remotely
PAST RECORDS LOST
PAST RESEARCH DATA UNAVAILABLE IN TIME
FAIL TO PREPARE ALL NEEDED DOCUMENTS
COMPUTERIZED DATA FAILURE
o Recovery Difficulty
o Processing Problem
o Program Flaw
o Aided Design Baseline Flaw/Error
o Data Reduction Error
DOCUMENTATION FAILURE
FAILURE TO:
CHECK (CATCH) ERROR IN ORIG DOC
REVISE UP TO DATE ALL DOCS
CONTROL REVISIONS
DISTRIBUTE AS NEEDED
IDENTIFY PRODUCT
PREPARE ALL NEEDED DOCUMENTS
ENGINEERING DOCUMENTS
o PRODUCT SPECIFICATION
o DEVELOPMENT PLAN
o TEST PLAN(S)
o ASSEMBLY INSTRUCTIONS (AI)
o MANUFACTURING PROCEDURES (MP)
o QA PLAN --
- RECEIVING INSPECTION
- IN PROCESS INSPECTION
- FINAL INSPECTION
- PACKAGING
o DEVELOPMENT TEST PROCEDURE
o QUALIFICATION TEST PROCEDURE (NDLAT + DLAT)
o ACCEPTANCE TEST PROCEDURE
o DRAWINGS
o PARTS LISTS
o DOCUMENT CHANGE NOTICES
APPLICABLE MIL SPECS FOR DESIGN
MIL D 21625 DESIGN AND EVALUATION OF CARTRIDGES FOR CARTRIDGE ACTUATED DEVICES
MIL D 23615 DESIGN AND EVALUATION OF CARTRIDGE ACTUATED DEVICES
MIL I 23659 INITIATORS, ELECTRIC, DESIGN AND EVALUATION OF
MIL A 8064 ACTUATION AND ACTUATING SYSTEMS, AIRCRAFT, ELECTROMECHANICAL, GENERAL GENERAL REQUIREMENTS
MIL S 18471F(AS) SYSTEM, AIRCREW AUTOMATED ESCAPE, EJECTION SEAT TYPE, GENERAL SPECIFICATION FOR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Design & Engineering Information Failures
SIZE
C
CODE IDENT NO
838AS162 64
SCALE
SHEET OF

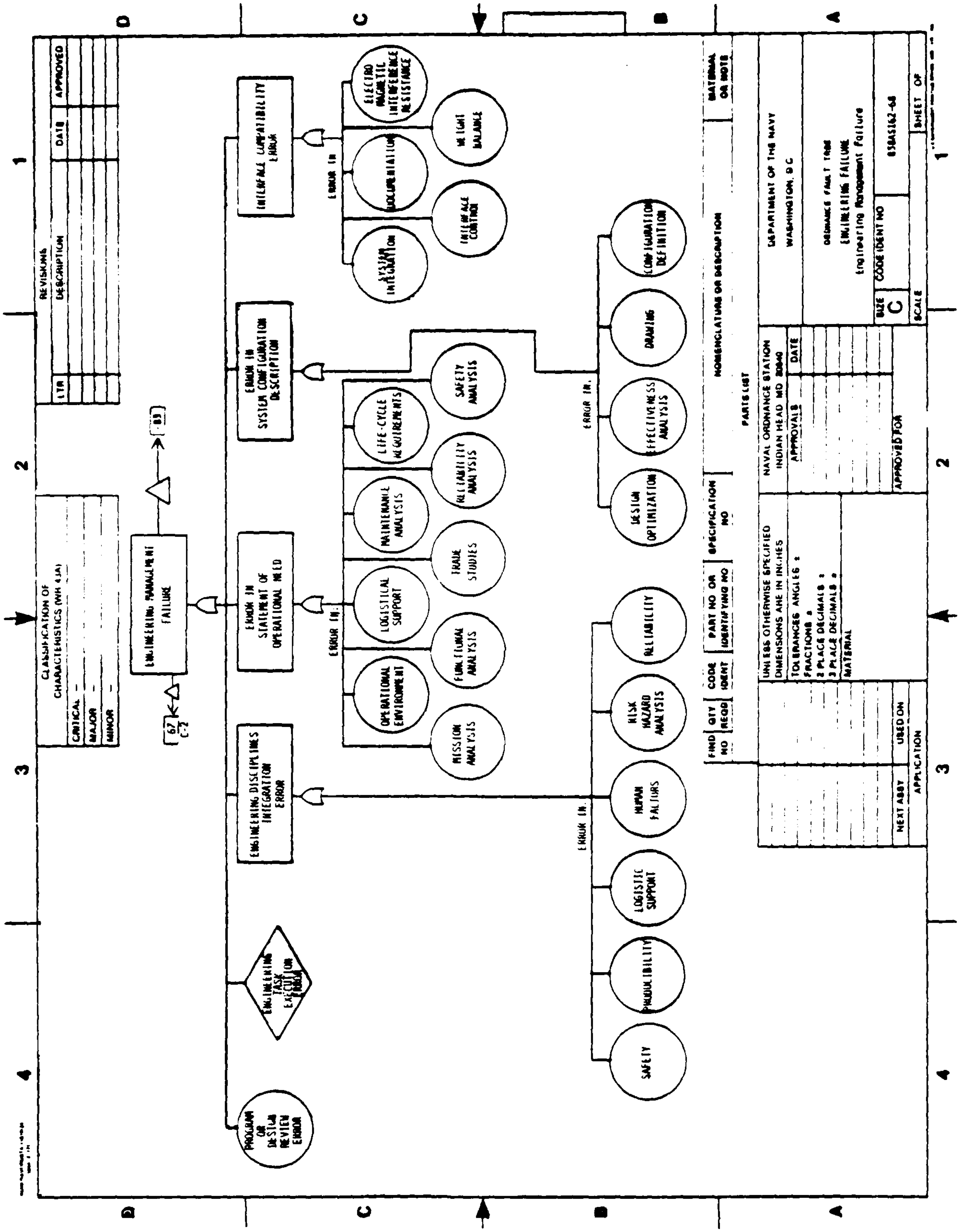


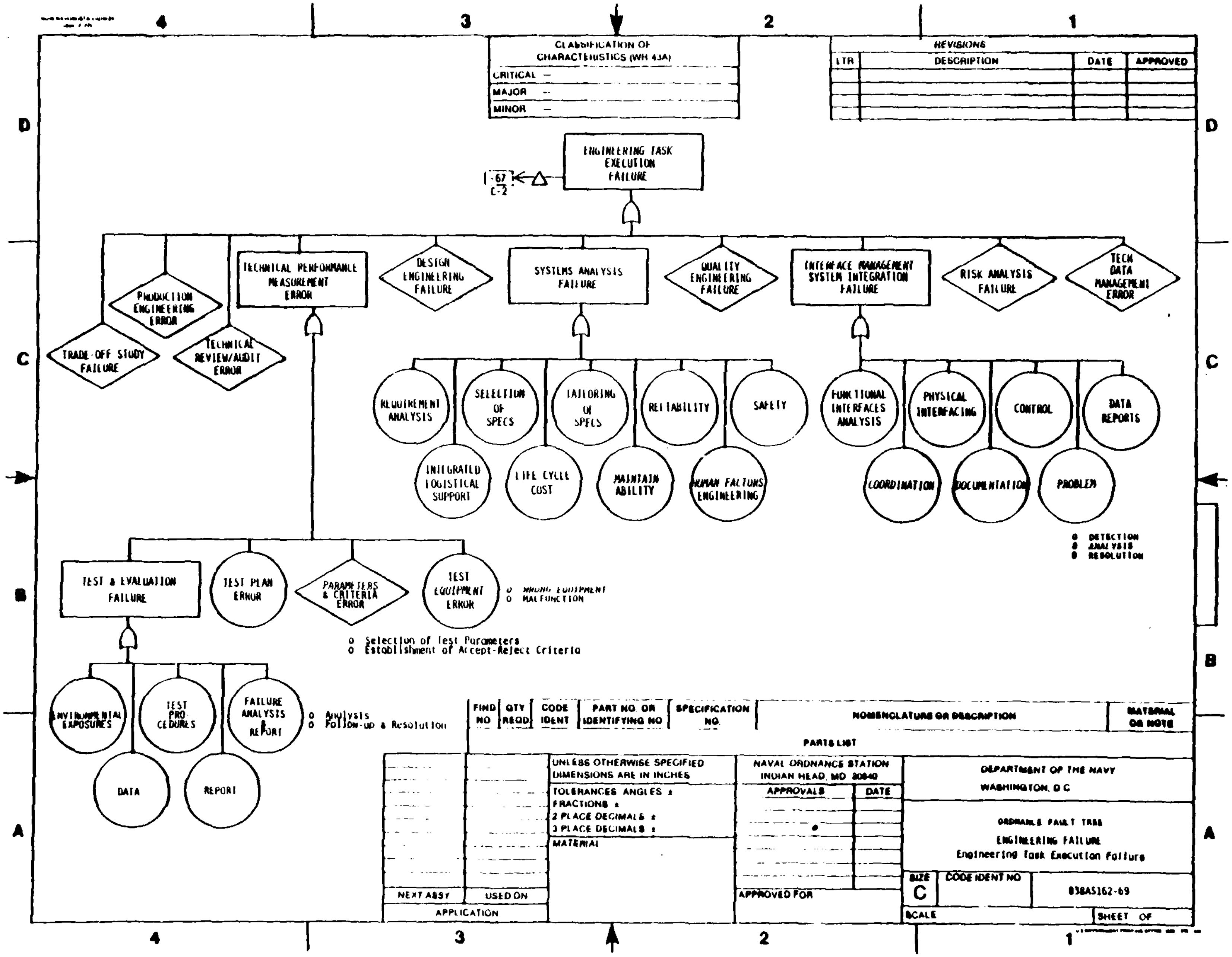
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
64
63
LACK OF SUPERVISION & LEADERSHIP
LACK OF SKILLS IN TECHNICAL DISCIPLINES
POOR MOTIVATION &/OR MORALE
BAD DAY
LACK OF SAFETY PROVISION
FAILURE TO COORDINATE EVOLVING DESIGN
FAILURE TO OBTAIN INFO ON ACTUAL SERVICE USE & INSTALLATION
52
EFFECT ON NEXT ASSEMBLY NOT CONSIDERED
RECEIVING INSPECTION PLAN NOT MODIFIED
PURCHASING FAILS TO STOP OR CHANGE P.O.
PREPRODUCTION PLAN NOT MODIFIED
SAFETY IMPACT IGNORED
RELIABILITY MAINTAINABILITY IMPACT IGNORED
MIL S 38130 SAFETY ENGINEERING
FAILURE INTERFACE MANAGEMENT
TECHNICAL REVIEW & AUDIT FAULT
ELECTRO-MAGNETIC INTERFERENCE
WEIGHT AND BALANCE FAULT
MIL W 83125 WEIGHT & BALANCE
O SYSTEM REQUIREMENT
O SYSTEM DESIGN PDR CDR
O FUNCTIONAL CONFIGURATION AUDIT
O PHYSICAL CONFIGURATION AUDIT
O PREPRODUCTION REVIEW/RELEASE
O FIRST ARTICLE REVIEW/RELEASE
O QUALIFICATION REVIEW
MIL STD 461 EQUIPMENT REQUIREMENTS
MIL STD 462 EMI MEASUREMENTS
MIL E 6051 EM COMPATIBILITY
O INTERFACE CONTROL DOCUMENT
O SYSTEM INTERGRATION NETWORK
O MOCK UP
SPEC DOES NOT DETAIL USE
ACTUAL USE IS CHANGED WITHOUT MODIFYING P.O.
NO TIME TO COORDINATE
NO FUNDS BUDGETED
USE NOT YET RESOLVED
RELIANCE ON SPEC AS "PERFECT"
INFO CLASSIFIED NO NEED-TO-KNOW EXISTS
NO CLOSE COORDINATION
ORDNANCE ENGINEER TO CUSTOMER
DESIRE TO CUT PROCUREMENT COST
USE OF OLD SPEC FAILS TO CONSIDER NEW USE REQMT
O CUSTOMER WANTS OFF-SHELF ITEM RATHER THAN SPEND DEVELOPMENT FUNDS
O SUPPLIER WANTS TO SELL HIGH PROFIT EXISTING ITEM
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D.C.
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Coordination & Information Failures
SIZE C
CODE IDENT NO
83BAS162 65
SCALE
SHEET OF

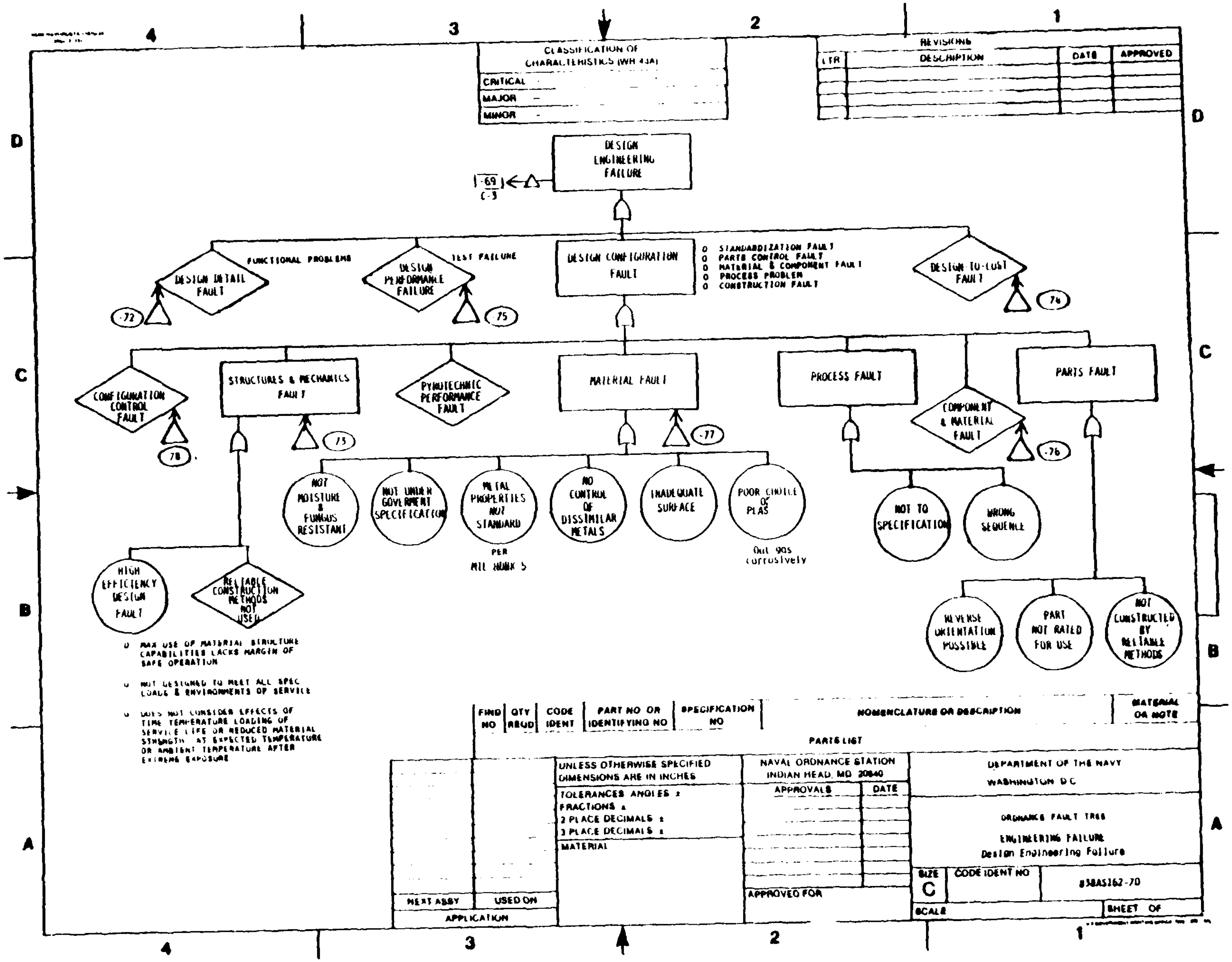


ENGINEERING LOGISTICS FAILURE
FAILURE TO PROVIDE FACILITIES
FAILURE TO PROVIDE MATERIALS
FAILURE TO PROVIDE EQUIPMENT
FAILURE TO MAINTAIN ENG SERVICES
TEST LAB
TOOL ROOM
MACHINE SHOP & TOOLS
SET-UP SPACE
EXPENDABLE TOOLS & EQUIPMENT
REFERENCES
EXPENDABLES
MODEL FABRICATION
TEST EQUIPMENT FABRICATION
TEST INSTRUMENTS
COMPUTER
TRANSPORTATION
TEST EQUIPMENT
ROUTINE RE SUPPLY
DRAFTING
INSPECTION & PREVENTIVE MAINTENANCE
CALIBRATION
QUALIFIED OPERATORS FOR SERVICES
REPRODUCTION
CONSULTANTS
ENGINEERING HYPOXIA
FAILURE TO CONSIDER FACTORS OTHER THAN DESIGN ON PERFORMANCE
FAILURE TO USE DYNAMIC EVENTS IN DESIGN
VEHICLE PERFORMANCE MAY PROVIDE ENERGY, DISCRIMINATION OF STATUS OR OTHER ENABLING OR BLOCKING FORCE TO SIMPLIFY DESIGN
PATENT PROPRIETARY DATA NOT DISCLOSED
(SUFFICIENTLY TO AVOID PROBLEMS)
FAILURE TO NOTE BAD COMBINATIONS OF ENVIRONMENTS
FAILURE TO NOTE UNUSUAL ENVIRONMENT
FAILURE TO RESOLVE AMBIGUITIES IN DISCIPLINES
(RELIANCE ON SPECIALISTS TO CROSS-COORDINATE/ RESOLVE PROBLEMS)
FAILURE TO CONSIDER EFFECT OF SOLVENT USAGE
VENDOR GUIDANCE NOT DEFINITIVE
OPTIONS LEFT OPEN TO INTERPRETATION
ENGINEER DISLIKE OF NARRATIVE WRITING
REPORTS OF STATUS NOT CLEAR
RATIONALE OF PLANS NOT DETAILED
PROBLEM AREAS AVOIDED
REPORTS TOO LATE FOR CORRECTIVE ACTION
WRITING HAS LOW PRIORITY IN TASKS
ASSUMPTION THAT ENG DRAWING ALONE CAN BE DEFINITIVE
PICTURE HELD SUPERIOR TO WORDS
BELIEF IN TERSE MINIMUM NOTES
OMISSIONS OF KEY POINTS BELIEVED IMPLICIT IN DRAWING
FAILURE TO CALL OUT PROCESSES
BELIEF THAT ENGINEERING DRAWING ALONE CAN DEFINE ALL DETAIL
CRITICAL TOLERANCE NOT FLAGGED BECAUSE IT FALLS WITHIN STANDARD DRAWING PRACTICE
DRAWING NOTES NOT INCONTROVERTIBLY CLEAR
QA INSPECTION POINTS NOT SPECIFIED
63
67
CLASSIFICATION OF CHARACTERISTICS (WH 41A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PARTS LIST
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Engineering Logistics Failure
SIZE C
CODE IDENT NO
85BAS162 66
SCALE
SHEET OF

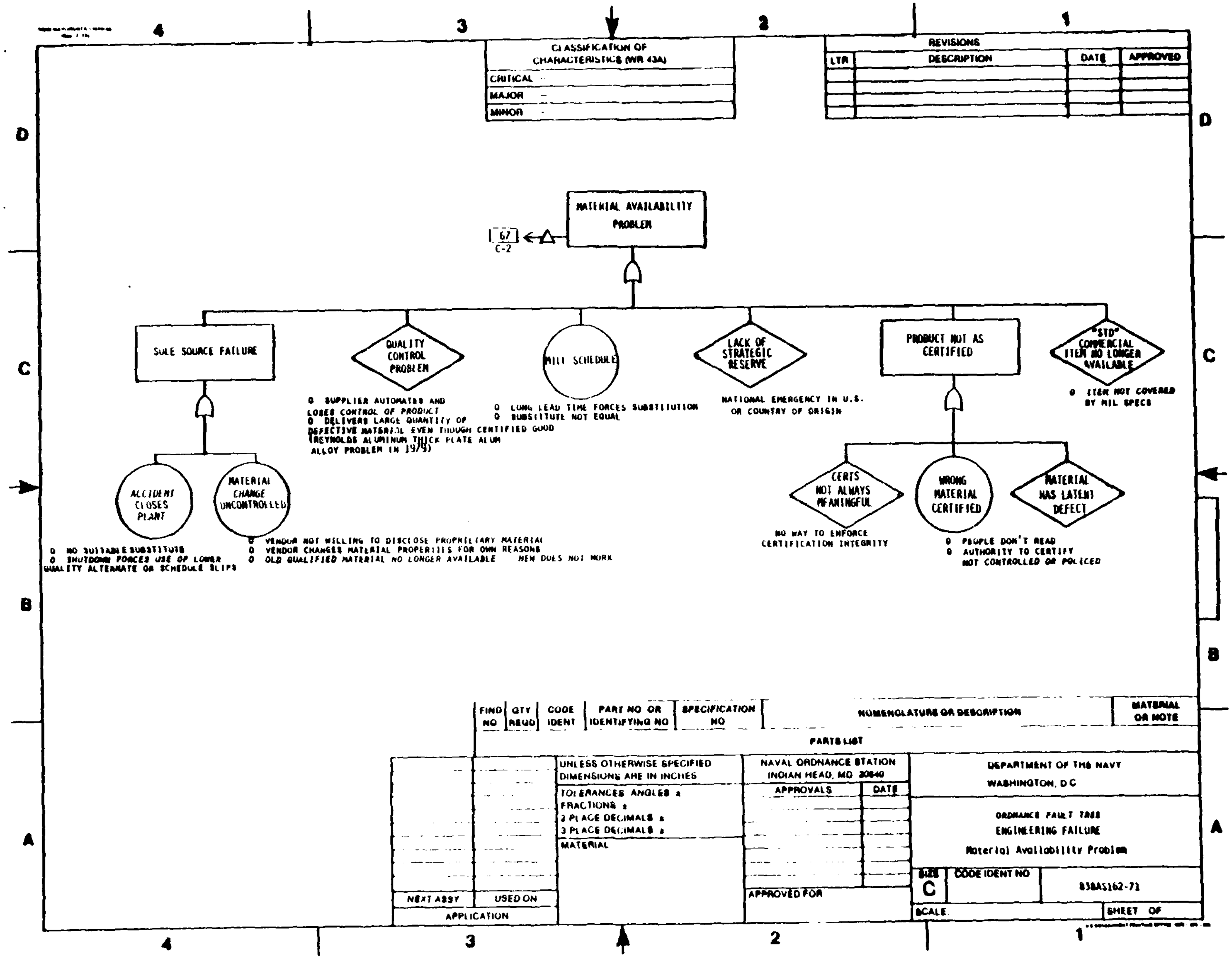

CLASSIFICATION OF CHARACTERISTICS (WR 4JA)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
66
ENGINEERING OPERATIONS FAILURE
ENGINEERING ORGANIZATION FAILURE
LACK OF EQUIPMENT
ENGINEERING PLANNING FAILURE
DOCUMENTATION FAILURE
COMMUNICATIONS FAILURE
LACK OF UP DATING TRAINING
LACK OF DEPTH IN SKILLS
LACK OF FINANCIAL RESOURCES
LACK OF FAILURE DATA FEED BACK
INADEQUATE CONFIGURATION CONTROLS
FAILURE IN TASK EXECUTION
ENGINEERING MANAGEMENT FAILURE
LACK OF TIME IN SCHEDULE
LACK OF ENGINEERING SERVICES
79
69
68
O DRAFTING SUPPORT
O MODEL SHOP
O COMPUTER SERVICE
O DATA RECOVERY
O AIDED DESIGN
O DATA REDUCTION
O TECHNICAL INFORMATION
O ENGINEER ASSISTANTS
O ENGINEERING ADMINISTRATORS
O SECRETARIAL/CLERICAL
LACK OF STAFF BREADTH
LACK OF STAFF DEPTH
LACK OF HIERARCHY OF SKILLS
LACK OF EXPERIENCE IN WORK AT HAND
LACK OF SUPERVISION & LEADERSHIP
FAILURE TO REVISE UPDATE PLANS
FAILURE TO AUDIT & IMPROVE PLANNING PROCE
CUT & PASTE PLANNING INTRODUCES ERROR
FAILURE TO MAKE COMPREHENSIVE WRITTEN PLANS
LACK OF MANAGEMENT ATTENTION
O ENGINEERING PROGRAM
O TEST PROGRAM
O RELIABILITY
O SAFETY
O MAINTAINABILITY
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Engineering Operations Failure
SIZE
C
CODE IDENT NO
858AS162 67
SCALE
SHEET OF

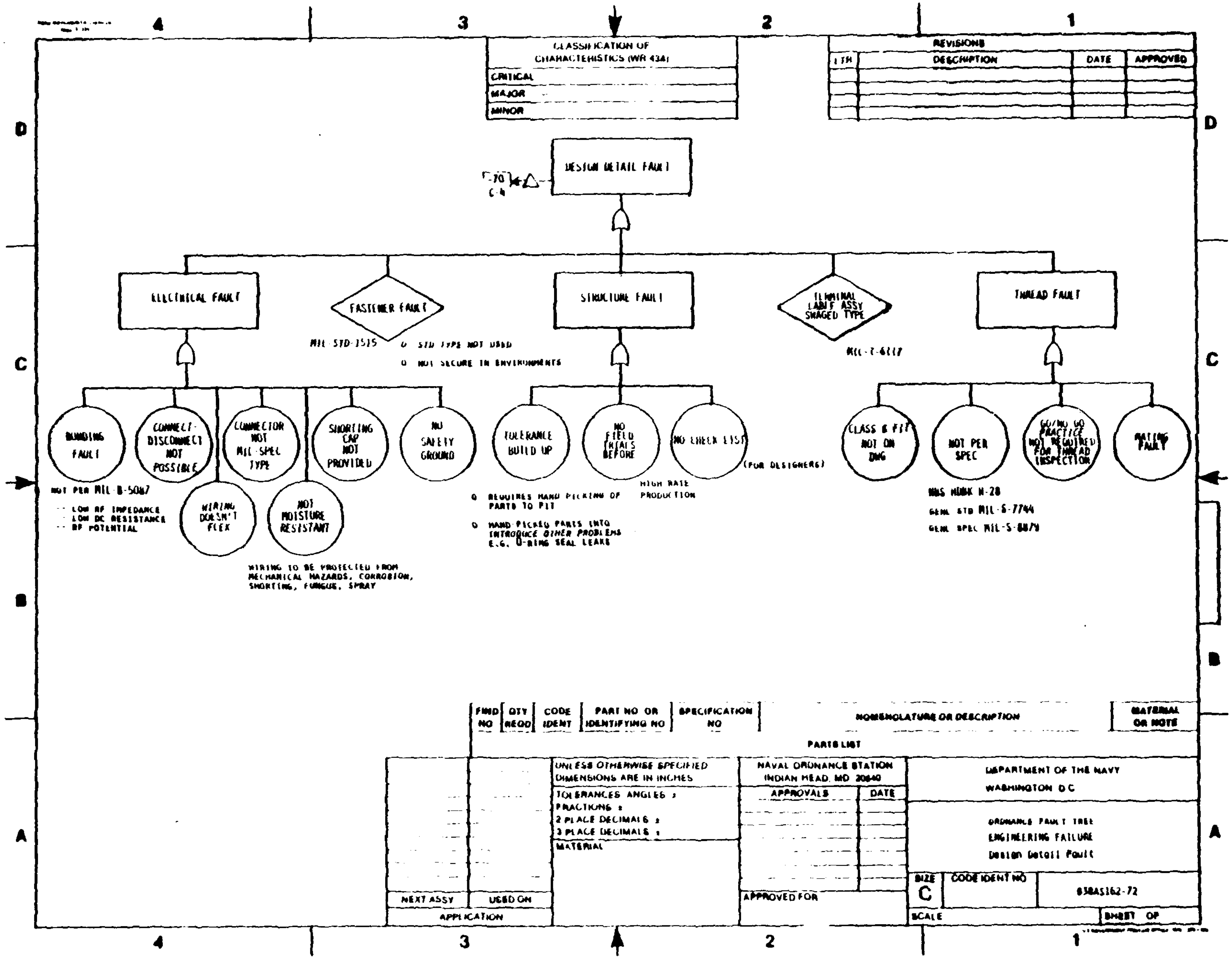

REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
ENGINEERING MANAGEMENT FAILURE
67
C-2
83
PROGRAM OR DESIGN REVIEW ERROR
ENGINEERING TASK EXECUTION ERROR
ENGINEERING DISCIPLINES INTEGRATION ERROR
ERROR IN STATEMENT OF OPERATIONAL NEED
ERROR IN SYSTEM CONFIGURATION DESCRIPTION
INTERFACE COMPATIBILITY ERROR
ERROR IN
MISSION ANALYSIS
OPERATIONAL ENVIRONMENT
FUNCTIONAL ANALYSIS
LOGISTICAL SUPPORT
TRADE STUDIES
MAINTENANCE ANALYSIS
RELIABILITY ANALYSIS
LIFE-CYCLE REQUIREMENTS
SAFETY ANALYSIS
SYSTEM INTEGRATION
DOCUMENTATION
ELECTRO MAGNETIC INTERFERENCE RESISTANCE
INTERFACE CONTROL
WEIGHT BALANCE
ERROR IN
SAFETY
PRODUCIBILITY
LOGISTIC SUPPORT
HUMAN FACTORS
RISK HAZARD ANALYSIS
RELIABILITY
ERROR IN
DESIGN OPTIMIZATION
EFFECTIVENESS ANALYSIS
DRAWING
CONFIGURATION DEFINITION
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Engineering Management Failure
SIZE
C
CODE IDENT NO
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL —
MAJOR —
MINOR —
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ENGINEERING TASK EXECUTION FAILURE
1-67 C-2
TRADE-OFF STUDY FAILURE
PRODUCTION ENGINEERING ERROR
TECHNICAL REVIEW/AUDIT ERROR
TECHNICAL PERFORMANCE MEASUREMENT ERROR
DESIGN ENGINEERING FAILURE
SYSTEMS ANALYSIS FAILURE
QUALITY ENGINEERING FAILURE
INTERFACE MANAGEMENT SYSTEM INTEGRATION FAILURE
RISK ANALYSIS FAILURE
TECH DATA MANAGEMENT ERROR
REQUIREMENT ANALYSIS
SELECTION OF SPECS
TAILORING OF SPECS
RELIABILITY
SAFETY
INTEGRATED LOGISTICAL SUPPORT
LIFE CYCLE COST
MAINTAIN ABILITY
HUMAN FACTORS ENGINEERING
FUNCTIONAL INTERFACES ANALYSIS
PHYSICAL INTERFACING
CONTROL
DATA REPORTS
COORDINATION
DOCUMENTATION
PROBLEM
o DETECTION
o ANALYSIS
o RESOLUTION
TEST & EVALUATION FAILURE
TEST PLAN ERROR
PARAMETERS & CRITERIA ERROR
TEST EQUIPMENT ERROR
o WRONG EQUIPMENT
o MALFUNCTION
o Selection of Test Parameters
o Establishment of Accept-Reject Criteria
ENVIRONMENTAL EXPOSURES
TEST PROCEDURES
FAILURE ANALYSIS & REPORT
o Analysis
o Follow-up & Resolution
DATA
REPORT
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Engineering Task Execution Failure
SIZE
C
CODE IDENT NO
838AS162-69
SCALE
SHEET OF



CLASSIFICATION OF CHARACTERISTICS (WH 4JA)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DESIGN ENGINEERING FAILURE
69
C-3
DESIGN DETAIL FAULT
FUNCTIONAL PROBLEMS
-72
DESIGN PERFORMANCE FAILURE
TEST FAILURE
-75
DESIGN CONFIGURATION FAULT
O STANDARDIZATION FAULT
O PARTS CONTROL FAULT
O MATERIAL & COMPONENT FAULT
O PROCESS PROBLEM
O CONSTRUCTION FAULT
DESIGN TO COST FAULT
74
CONFIGURATION CONTROL FAULT
78
STRUCTURES & MECHANICS FAULT
73
PYROTECHNIC PERFORMANCE FAULT
MATERIAL FAULT
-77
PROCESS FAULT
COMPONENT & MATERIAL FAULT
-76
PARTS FAULT
NOT MOISTURE & FUNGUS RESISTANT
NOT UNDER GOVERMENT SPECIFICATION
METAL PROPERTIES NOT STANDARD
PER MIL HDBK 5
NO CONTROL OF DISSIMILAR METALS
INADEQUATE SURFACE
POOR CHOICE OF PLAS
Out gas corrosively
NOT TO SPECIFICATION
WRONG SEQUENCE
HIGH EFFICIENCY DESIGN FAULT
RELIABLE CONSTRUCTION METHODS NOT USED
O MAX USE OF MATERIAL STRUCTURE CAPABILITIES LACKS MARGIN OF SAFE OPERATION
O NOT DESIGNED TO MEET ALL SPEC LOADS & ENVIRONMENTS OF SERVICE
O DOES NOT CONSIDER EFFECTS OF TIME TEMPERATURE LOADING OF SERVICE LIFE OR REDUCED MATERIAL STRENGTH AT EXPECTED TEMPERATURE OR AMBIENT TEMPERATURE AFTER EXTREME EXPOSURE
REVERSE ORIENTATION POSSIBLE
PART NOT RATED FOR USE
NOT CONSTRUCTED BY RELIABLE METHODS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Design Engineering Failure
SIZE
C
CODE IDENT NO
838AS162-70
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MATERIAL AVAILABILITY PROBLEM
67
C-2
SOLE SOURCE FAILURE
QUALITY CONTROL PROBLEM
MILL SCHEDULE
LACK OF STRATEGIC RESERVE
PRODUCT NOT AS CERTIFIED
"STD" COMMERCIAL ITEM NO LONGER AVAILABLE
O SUPPLIER AUTOMATES AND LOSES CONTROL OF PRODUCT
O DELIVERS LARGE QUANTITY OF DEFECTIVE MATERIAL EVEN THOUGH CERTIFIED GOOD (REYNOLDS ALUMINUM THICK PLATE ALUM ALLOY PROBLEM IN 1979)
O LONG LEAD TIME FORCES SUBSTITUTION
O SUBSTITUTE NOT EQUAL
NATIONAL EMERGENCY IN U.S. OR COUNTRY OF ORIGIN
O ITEM NOT COVERED BY MIL SPECS
ACCIDENT CLOSES PLANT
MATERIAL CHANGE UNCONTROLLED
CERTS NOT ALWAYS MEANINGFUL
WRONG MATERIAL CERTIFIED
MATERIAL HAS LATENT DEFECT
O NO SUITABLE SUBSTITUTE
O SHUTDOWN FORCES USE OF LOWER QUALITY ALTERNATE OR SCHEDULE SLIPS
O VENDOR NOT WILLING TO DISCLOSE PROPRIETARY MATERIAL
O VENDOR CHANGES MATERIAL PROPERTIES FOR OWN REASONS
O OLD QUALIFIED MATERIAL NO LONGER AVAILABLE NEW DOES NOT WORK
NO WAY TO ENFORCE CERTIFICATION INTEGRITY
O PEOPLE DON'T READ
O AUTHORITY TO CERTIFY NOT CONTROLLED OR POLICED
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Material Availability Problem
SIZE
C
CODE IDENT NO
838AS162-71
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 434)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DESIGN DETAIL FAULT
TO C-4
ELECTRICAL FAULT
FASTENER FAULT
STRUCTURE FAULT
TERMINAL LABEL ASSY SWAGED TYPE
THREAD FAULT
MIL-STD-1515
O STD TYPE NOT USED
O NOT SECURE IN ENVIRONMENTS
MIL-T-6117
BONDING FAULT
CONNECT-DISCONNECT NOT POSSIBLE
CONNECTOR NOT MIL-SPEC TYPE
SHORTING CAP NOT PROVIDED
NO SAFETY GROUND
WIRING DOESN'T FLEX
NOT MOISTURE RESISTANT
TOLERANCE BUILD UP
NO FIELD TRIALS BEFORE
NO CHECK LIST
(FOR DESIGNERS)
HIGH RATE PRODUCTION
CLASS & FIT NOT ON DWG
NOT PER SPEC
GO/NO GO PRACTICE NOT REQUIRED FOR THREAD INSPECTION
MATING FAULT
NOT PER MIL-B-5087
-- LOW RF IMPEDANCE
-- LOW DC RESISTANCE
-- RF POTENTIAL
WIRING TO BE PROTECTED FROM MECHANICAL HAZARDS, CORROSION, SHORTING, FUNGUS, SPRAY
O REQUIRES HAND PICKING OF PARTS TO FIT
O HAND PICKED PARTS INTO INTRODUCE OTHER PROBLEMS E.G. O-RING SEAL LEAKS
NBS HDBK H-28
GEN STD MIL-S-7742
GEN SPEC MIL-S-8879
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
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NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
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ORDNANCE FAULT TREE
ENGINEERING FAILURE
Design Detail Fault
SIZE C
CODE IDENT NO
83BAS162-72
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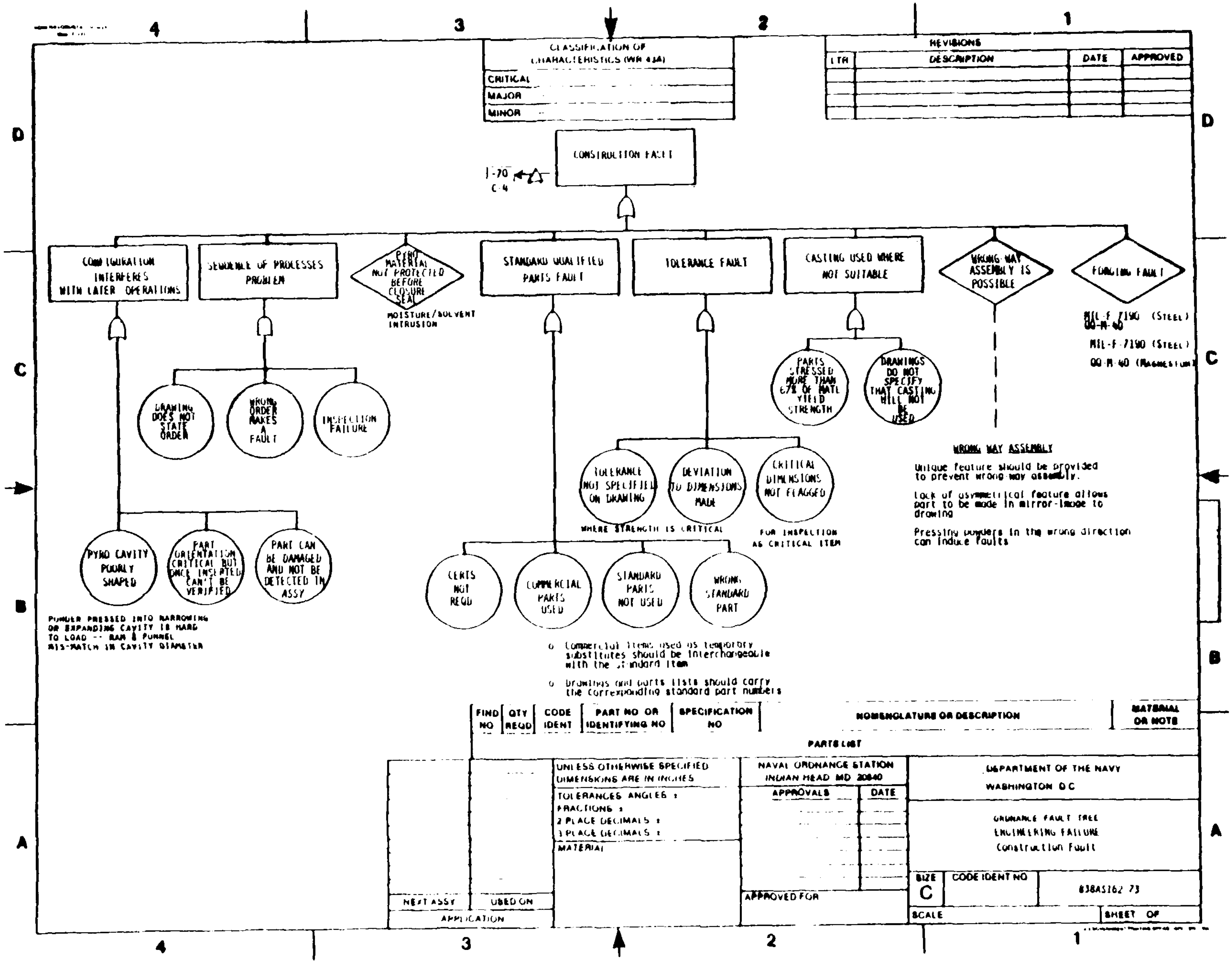
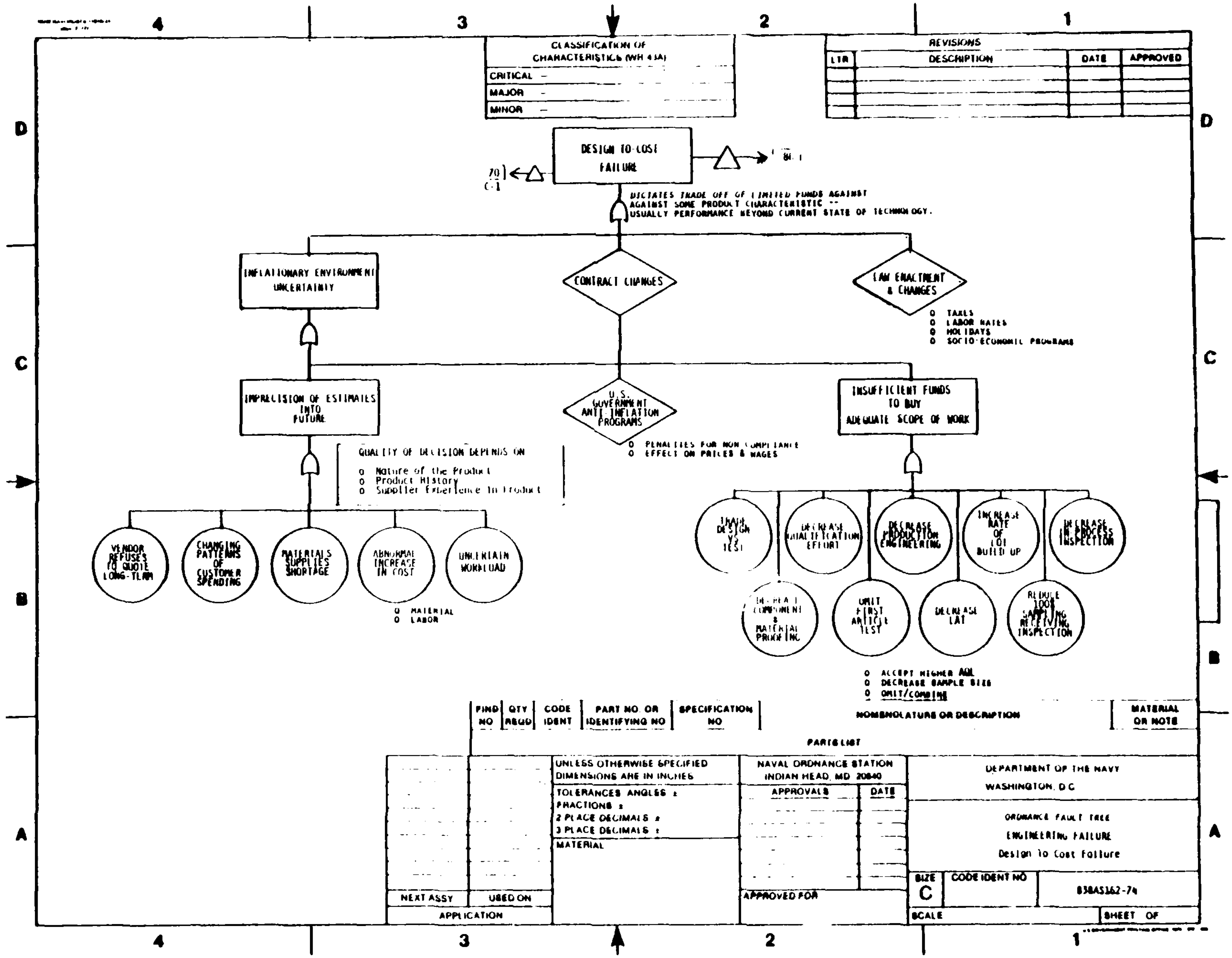
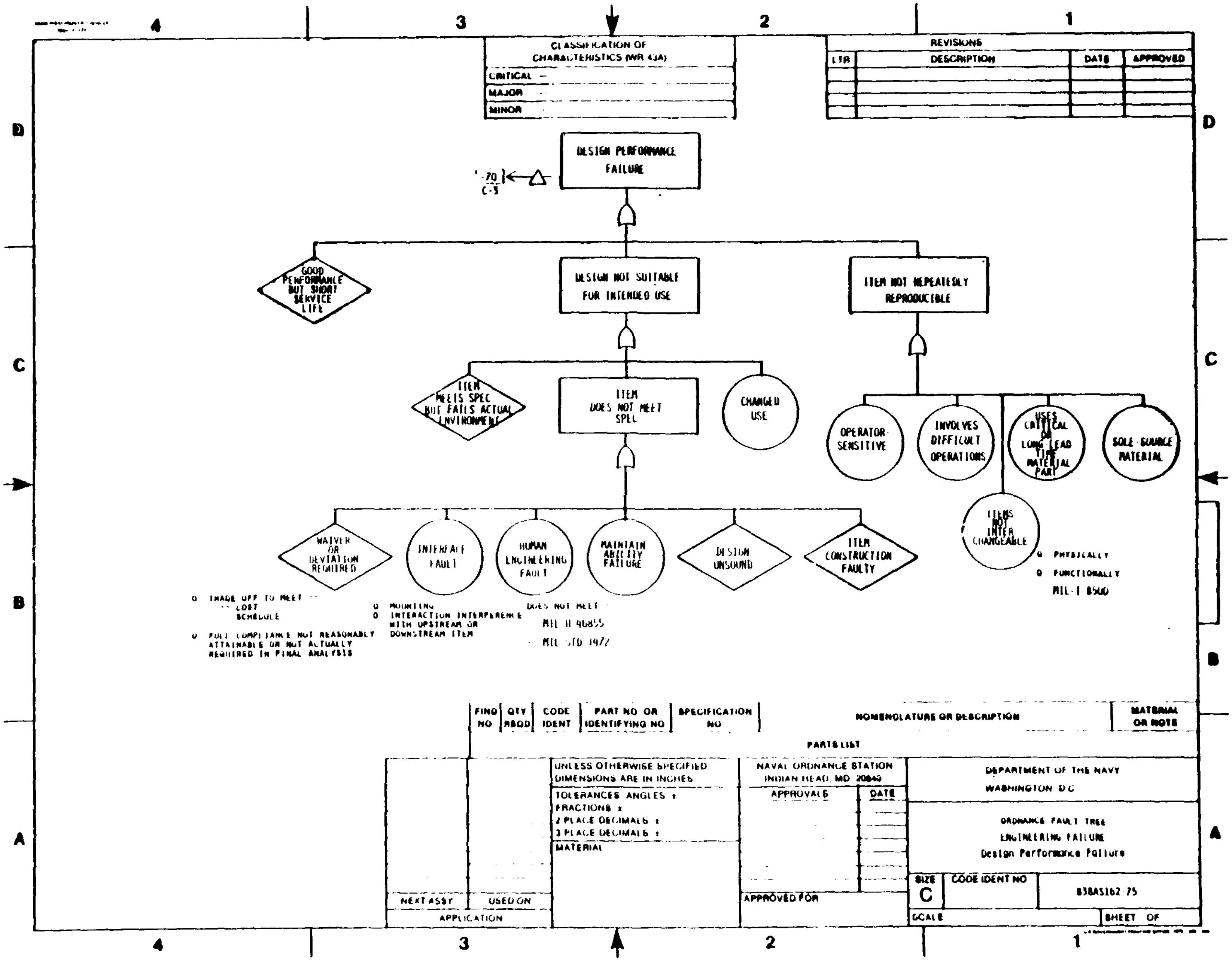
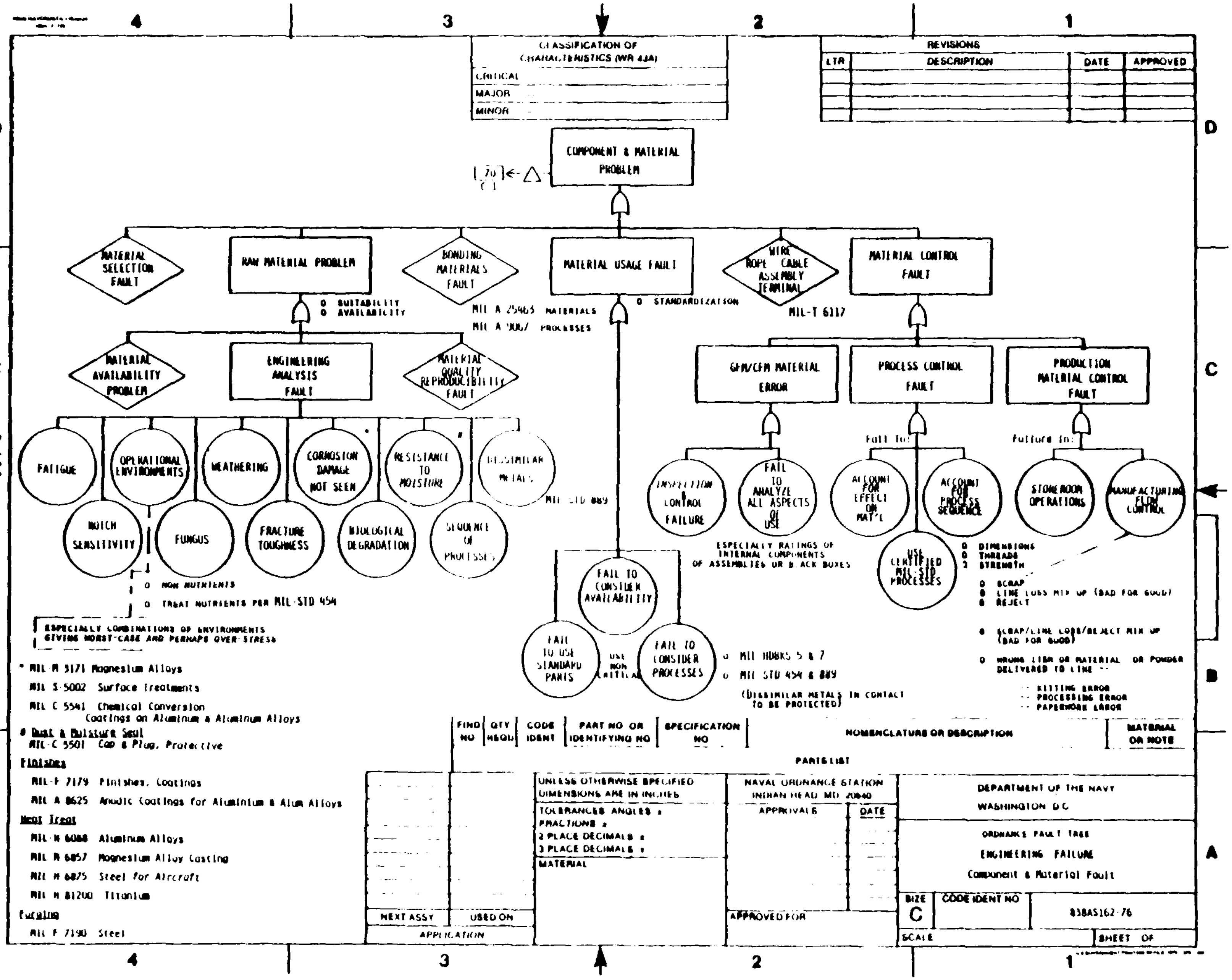
APPLICATION

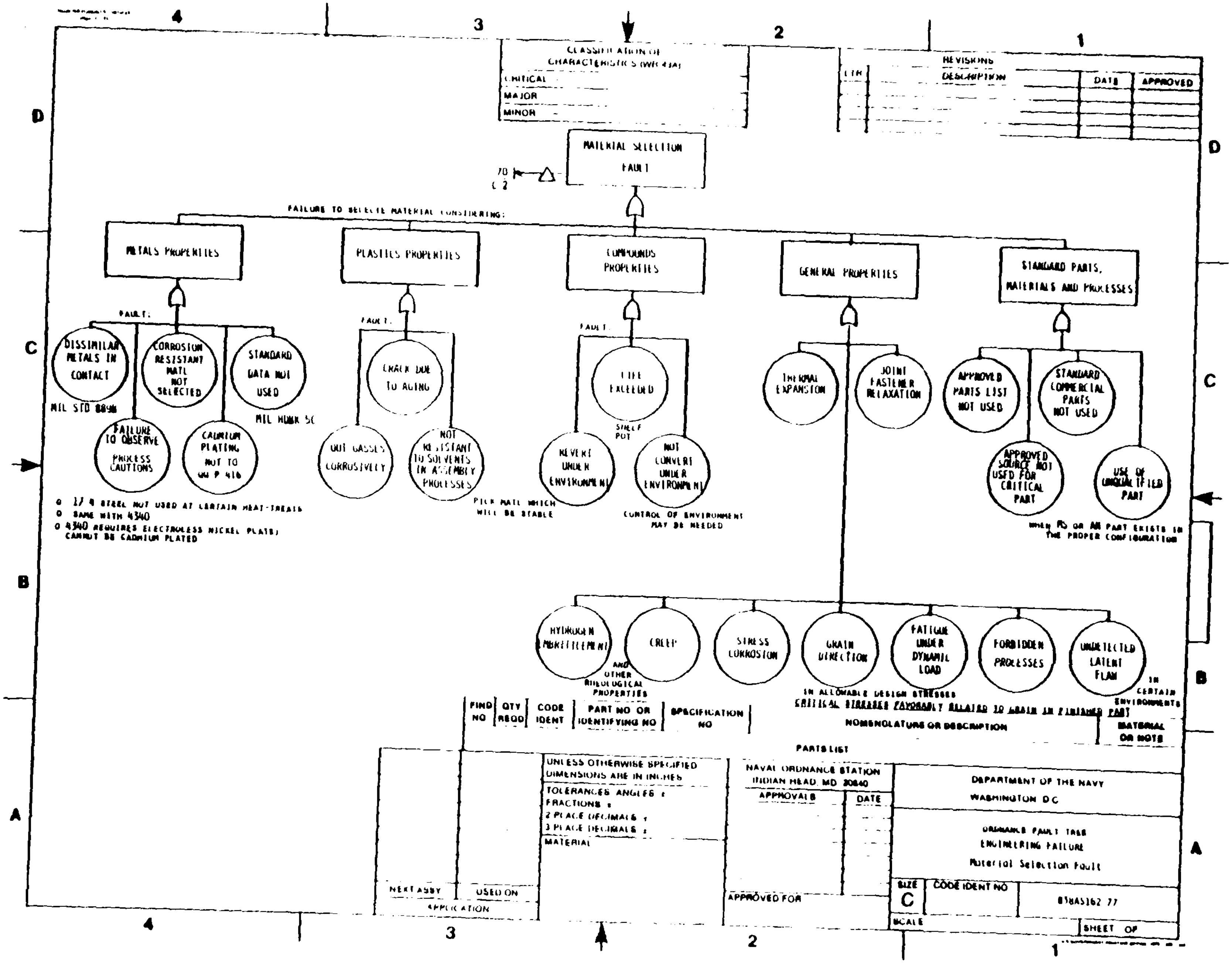

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CONSTRUCTION FAULT
J-70
C-4
CONFIGURATION INTERFERES WITH LATER OPERATIONS
SEQUENCE OF PROCESSES PROBLEM
PYRO MATERIAL NOT PROTECTED BEFORE CLOSURE SEAL
MOISTURE/SOLVENT INTRUSION
STANDARD QUALIFIED PARTS FAULT
TOLERANCE FAULT
CASTING USED WHERE NOT SUITABLE
WRONG WAY ASSEMBLY IS POSSIBLE
FORGING FAULT
MIL-F-7190 (STEEL)
QQ-M-40
MIL-F-7190 (STEEL)
QQ-M-40 (MAGNESIUM)
DRAWING DOES NOT STATE ORDER
WRONG ORDER MAKES A FAULT
INSPECTION FAILURE
PARTS STRESSED MORE THAN 67% OF MATL YIELD STRENGTH
DRAWINGS DO NOT SPECIFY THAT CASTING WILL NOT BE USED
WRONG WAY ASSEMBLY
Unique feature should be provided to prevent wrong way assembly.
Lack of asymmetrical feature allows part to be made in mirror-image to drawing
Pressing powders in the wrong direction can induce faults
TOLERANCE NOT SPECIFIED ON DRAWING
DEVIATION TO DIMENSIONS MADE
CRITICAL DIMENSIONS NOT FLAGGED
WHERE STRENGTH IS CRITICAL
FOR INSPECTION AS CRITICAL ITEM
PYRO CAVITY POORLY SHAPED
PART ORIENTATION CRITICAL BUT ONCE INSERTED CAN'T BE VERIFIED
PART CAN BE DAMAGED AND NOT BE DETECTED IN ASSY
POWDER PRESSED INTO NARROWING OR EXPANDING CAVITY IS HARD TO LOAD -- RAM & FUNNEL MIS-MATCH IN CAVITY DIAMETER
CERTS NOT REQD
COMMERCIAL PARTS USED
STANDARD PARTS NOT USED
WRONG STANDARD PART
o Commercial items used as temporary substitutes should be interchangeable with the standard item
o Drawings and parts lists should carry the corresponding standard part numbers
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Construction Fault
SIZE
C
CODE IDENT NO
638AS162 73
SCALE
SHEET OF

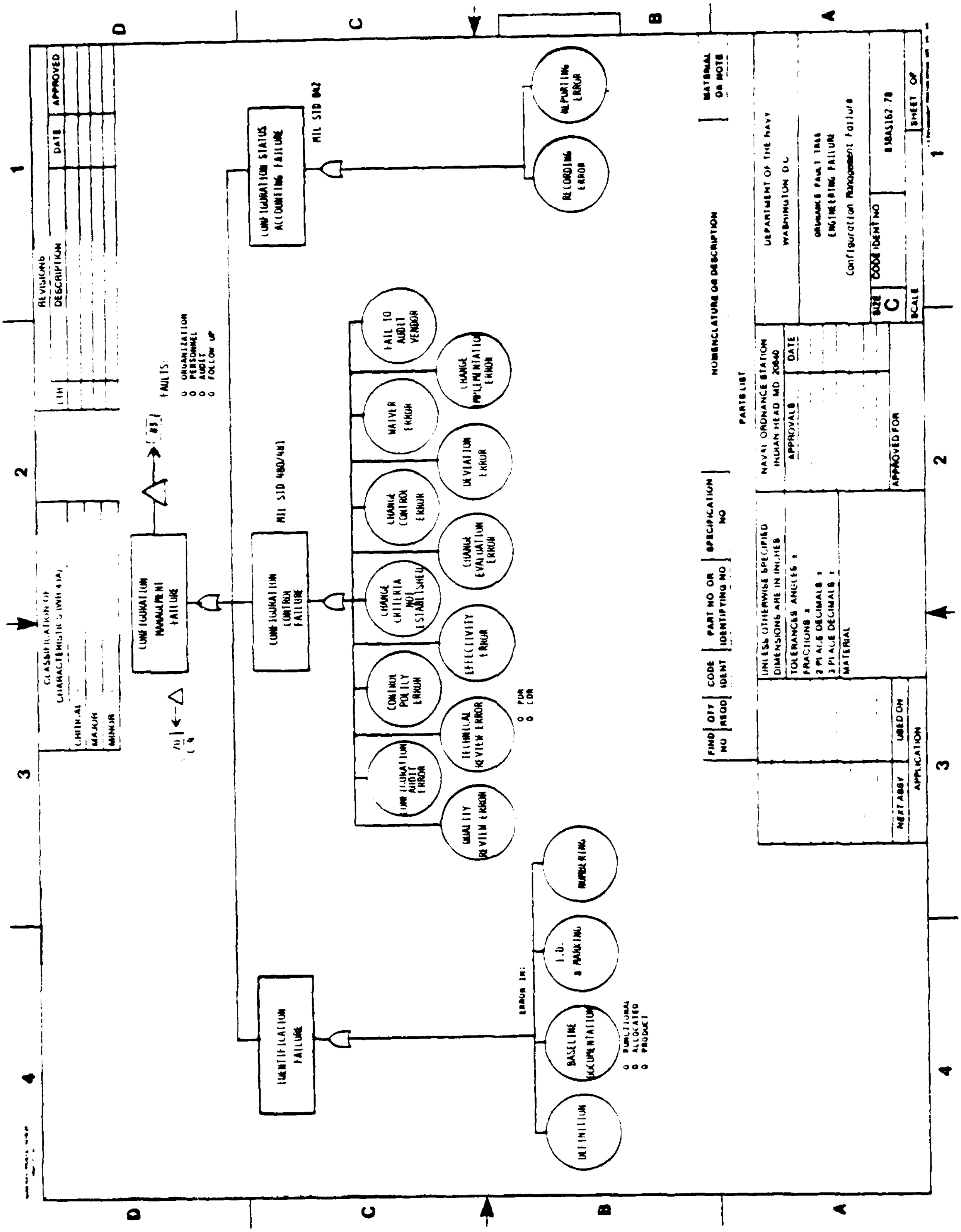


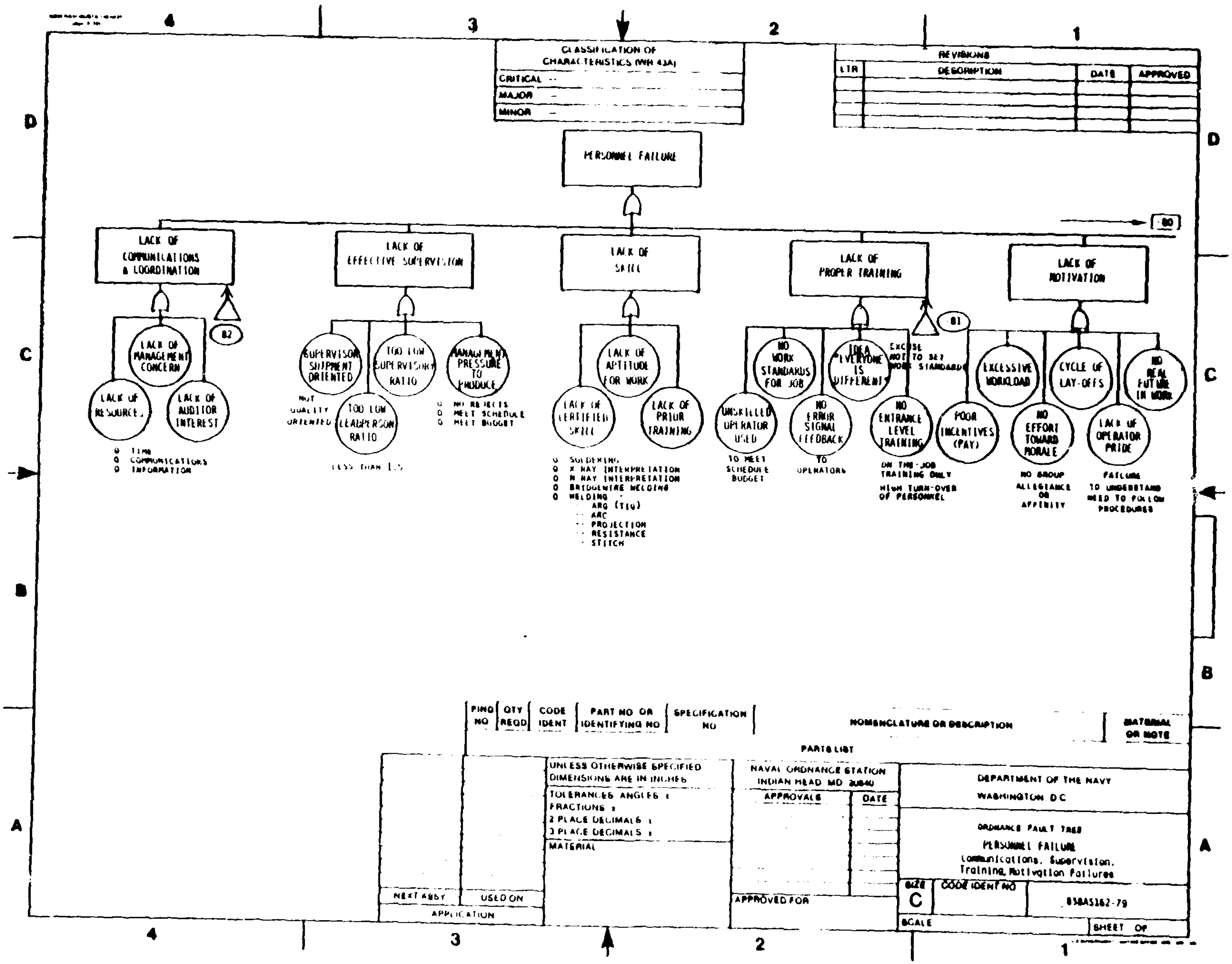
CLASSIFICATION OF CHARACTERISTICS (WH 4 1A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DESIGN TO COST FAILURE
70
C-1
DICTATES TRADE OFF OF LIMITED FUNDS AGAINST AGAINST SOME PRODUCT CHARACTERISTIC -- USUALLY PERFORMANCE BEYOND CURRENT STATE OF TECHNOLOGY.
INFLATIONARY ENVIRONMENT UNCERTAINTY
CONTRACT CHANGES
LAW ENACTMENT & CHANGES
O TAXES
O LABOR RATES
O HOLIDAYS
O SOCIO-ECONOMIC PROGRAMS
IMPRECISION OF ESTIMATES INTO FUTURE
U.S. GOVERNMENT ANTI INFLATION PROGRAMS
O PENALTIES FOR NON COMPLIANCE
O EFFECT ON PRICES & WAGES
INSUFFICIENT FUNDS TO BUY ADEQUATE SCOPE OF WORK
QUALITY OF DECISION DEPENDS ON
o Nature of the Product
o Product History
o Supplier Experience in Product
VENDOR REFUSES TO QUOTE LONG-TERM
CHANGING PATTERNS OF CUSTOMER SPENDING
MATERIALS SUPPLIES SHORTAGE
ABNORMAL INCREASE IN COST
O MATERIAL
O LABOR
UNCERTAIN WORKLOAD
TRADE DESIGN VS TEST
DECREASE QUALIFICATION EFFORT
DECREASE PRODUCTION ENGINEERING
INCREASE RATE OF LOT BUILD UP
DECREASE IN PROCESS INSPECTION
COMPONENT & MATERIAL PROOFING
OMIT FIRST ARTICLE TEST
DECREASE LAT
REDUCE 100% SAMPLING RECEIVING INSPECTION
O ACCEPT HIGHER AQL
O DECREASE SAMPLE SIZE
O OMIT/COMBINE
FIND NO
QTY REQD
CODE IDENT
PART NO. OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Design To Cost Failure
SIZE
C
CODE IDENT NO
838AS162-74
SCALE
SHEET OF

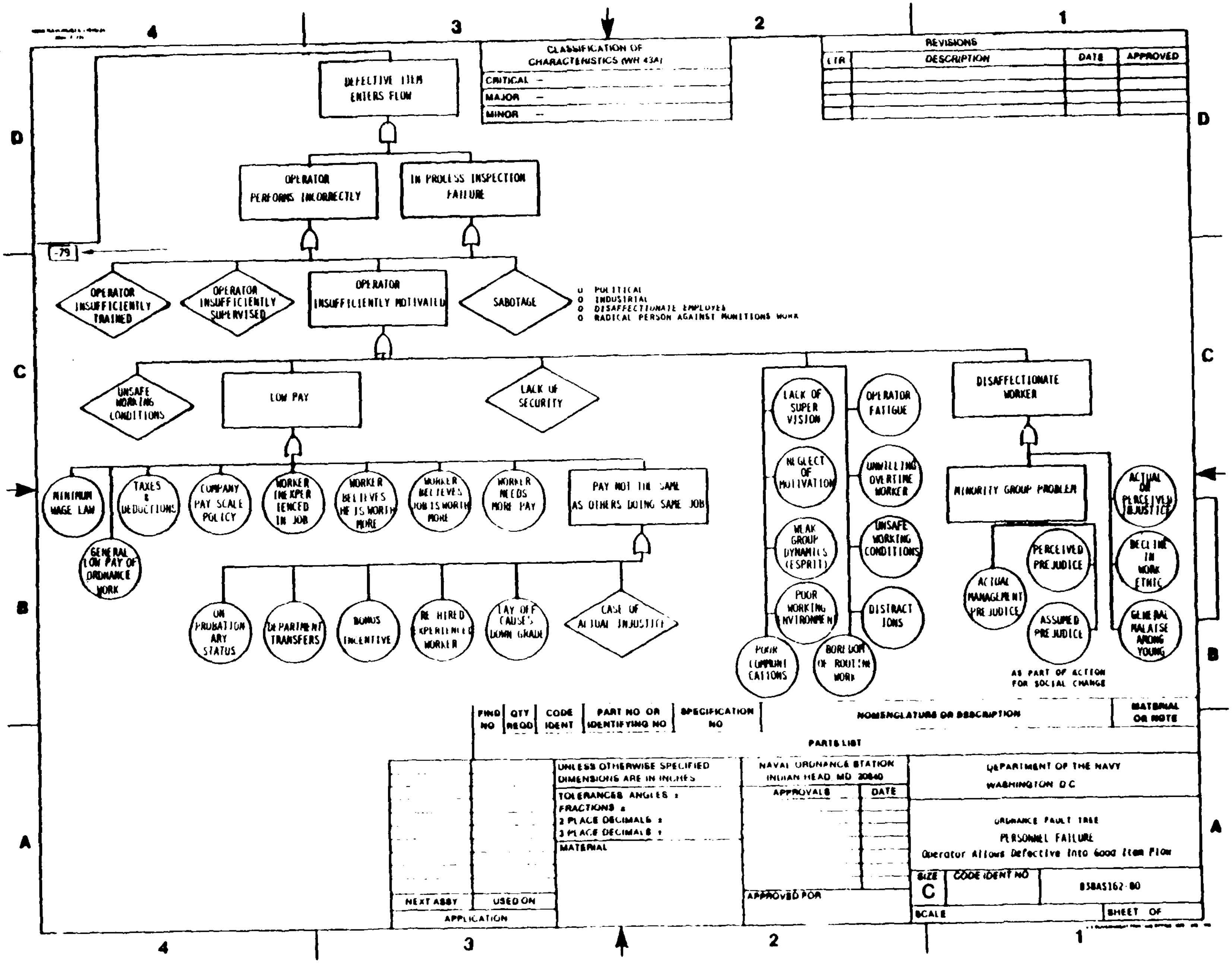

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DESIGN PERFORMANCE FAILURE
70
C-3
GOOD PERFORMANCE BUT SHORT SERVICE LIFE
DESIGN NOT SUITABLE FOR INTENDED USE
ITEM NOT REPEATEDLY REPRODUCIBLE
ITEM MEETS SPEC BUT FAILS ACTUAL ENVIRONMENT
ITEM DOES NOT MEET SPEC
CHANGED USE
OPERATOR SENSITIVE
INVOLVES DIFFICULT OPERATIONS
USES CRITICAL OR LONG LEAD TIME MATERIAL PART
SOLE SOURCE MATERIAL
ITEMS NOT INTERCHANGEABLE
o PHYSICALLY
o FUNCTIONALLY
MIL-I-8500
WAIVER OR DEVIATION REQUIRED
INTERFACE FAULT
HUMAN ENGINEERING FAULT
MAINTAINABILITY FAILURE
DESIGN UNSOUND
ITEM CONSTRUCTION FAULTY
o TRADE OFF TO MEET
COST
SCHEDULE
o FULL COMPLIANCE NOT REASONABLY ATTAINABLE OR NOT ACTUALLY REQUIRED IN FINAL ANALYSIS
o MOUNTING
o INTERACTION INTERFERENCE WITH UPSTREAM OR DOWNSTREAM ITEM
DOES NOT MEET
MIL H 46855
MIL STD 1472
FIND NO
QTY RQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Design Performance Failure
SIZE
C
CODE IDENT NO
838AS162-75
SCALE
SHEET OF

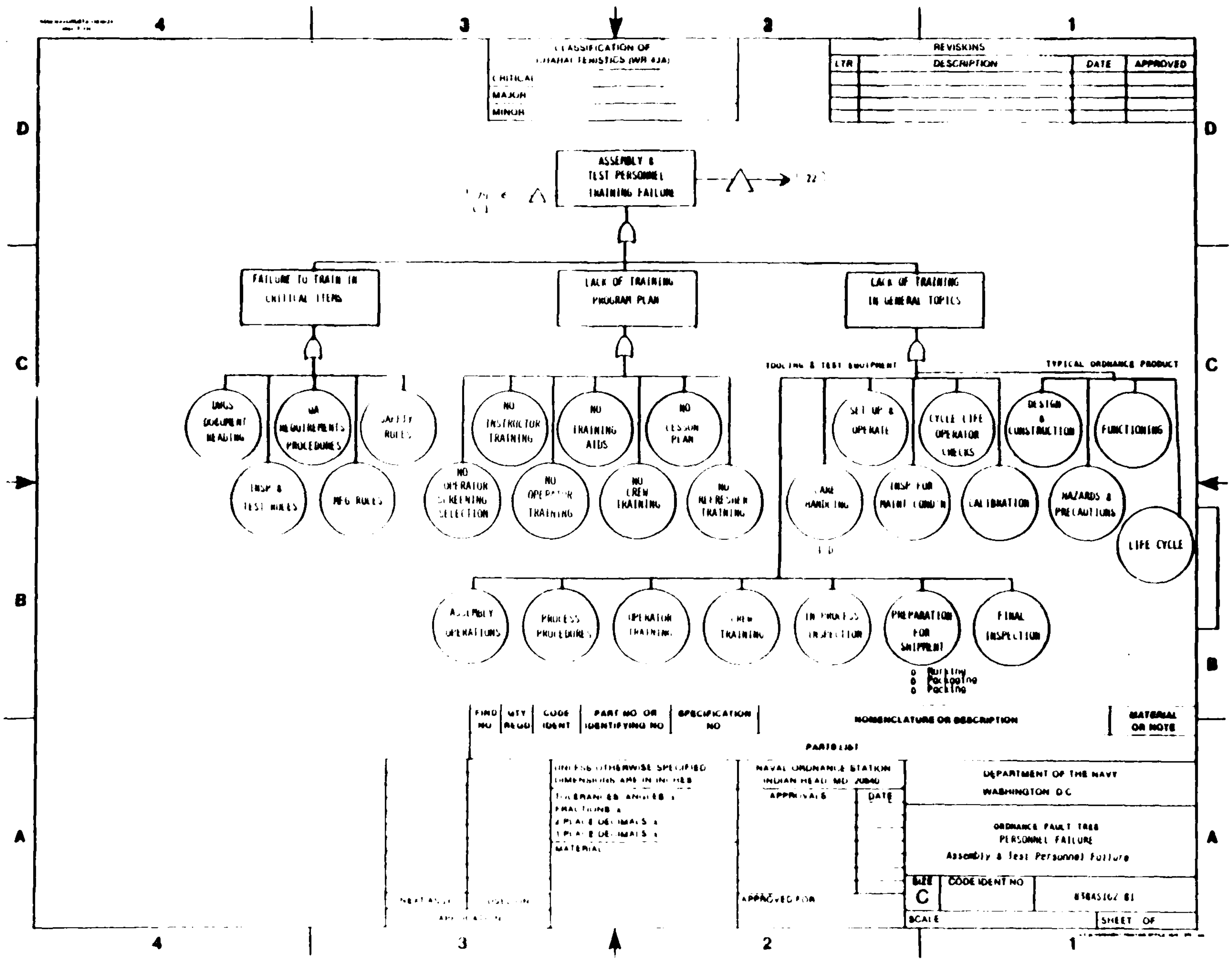

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
COMPONENT & MATERIAL PROBLEM
MATERIAL SELECTION FAULT
RAW MATERIAL PROBLEM
O SUITABILITY
O AVAILABILITY
BONDING MATERIALS FAULT
MIL A 25463 MATERIALS
MATERIAL USAGE FAULT
O STANDARDIZATION
WIRE ROPE CABLE ASSEMBLY TERMINAL
MIL-T 6117
MATERIAL CONTROL FAULT
MATERIAL AVAILABILITY PROBLEM
ENGINEERING ANALYSIS FAULT
MATERIAL QUALITY REPRODUCIBILITY FAULT
GFM/CFM MATERIAL ERROR
PROCESS CONTROL FAULT
PRODUCTION MATERIAL CONTROL FAULT
FATIGUE
OPERATIONAL ENVIRONMENTS
WEATHERING
CORROSION DAMAGE NOT SEEN
RESISTANCE TO MOISTURE
NOTCH SENSITIVITY
FUNGUS
FRACTURE TOUGHNESS
BIOLOGICAL DEGRADATION
SEQUENCE OF PROCESSES
O NON NUTRIENTS
O TREAT NUTRIENTS PER MIL-STD 454
ESPECIALLY COMBINATIONS OF ENVIRONMENTS GIVING WORST-CASE AND PERHAPS OVER STRESS
INSPECTION & CONTROL FAILURE
FAIL TO ANALYZE ALL ASPECTS OF USE
ESPECIALLY RATINGS OF INTERNAL COMPONENTS OF ASSEMBLIES OR BLACK BOXES
Fail to:
ACCOUNT FOR EFFECT ON MAT'L
ACCOUNT FOR PROCESS SEQUENCE
USE CERTIFIED MIL-STD PROCESSES
O DIMENSIONS
O THREADS
O STRENGTH
Failure in:
STOREROOM OPERATIONS
MANUFACTURING FLOW CONTROL
O SCRAP
O LINE LOSS MIX UP (BAD FOR GOOD)
O REJECT
O SCRAP/LINE LOSS/REJECT MIX UP (BAD FOR GOOD)
O WRONG ITEM OR MATERIAL OR POWDER DELIVERED TO LINE --
-- KITTING ERROR
-- PROCESSING ERROR
-- PAPERWORK ERROR
FAIL TO CONSIDER AVAILABILITY
FAIL TO USE STANDARD PARTS
USE NON CRITICAL
FAIL TO CONSIDER PROCESSES
O MIL HDBKS 5 & 7
O MIL STD 454 & 889
(DISSIMILAR METALS IN CONTACT TO BE PROTECTED)
* MIL-M 3171 Magnesium Alloys
MIL S 5002 Surface Treatments
MIL C 5541 Chemical Conversion Coatings on Aluminum & Aluminum Alloys
Dust & Moisture Seal
MIL-C 5501 Cap & Plug, Protective
Finishes
MIL-F 7179 Finishes, Coatings
MIL A 8625 Anodic Coatings for Aluminium & Alum Alloys
Heat Treat
MIL-H 6088 Aluminum Alloys
MIL H 6857 Magnesium Alloy Casting
MIL H 6875 Steel for Aircraft
MIL H 81200 Titanium
Fueling
MIL F 7190 Steel
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Component & Material Fault
SIZE
C
CODE IDENT NO
838AS162-76
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WR-43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
MATERIAL SELECTION FAULT
TO C 2
FAILURE TO SELECT MATERIAL CONSIDERING:
METALS PROPERTIES
PLASTICS PROPERTIES
COMPOUNDS PROPERTIES
GENERAL PROPERTIES
STANDARD PARTS, MATERIALS AND PROCESSES
FAULT:
DISSIMILAR METALS IN CONTACT
MIL STD 889B
CORROSION RESISTANT MATL NOT SELECTED
STANDARD DATA NOT USED
MIL HDBK 5C
FAILURE TO OBSERVE PROCESS CAUTIONS
CADMIUM PLATING NOT TO QQ-P-416
o 17-4 STEEL NOT USED AT CERTAIN HEAT-TREATS
o SAME WITH 4340
o 4340 REQUIRES ELECTROLESS NICKEL PLATE; CANNOT BE CADMIUM PLATED
CRACK DUE TO AGING
OUT GASSES CORROSIVELY
NOT RESISTANT TO SOLVENTS IN ASSEMBLY PROCESSES
PICK MATL WHICH WILL BE STABLE
LIFE EXCEEDED
SHELF POT
REVERT UNDER ENVIRONMENT
NOT CONVERT UNDER ENVIRONMENT
CONTROL OF ENVIRONMENT MAY BE NEEDED
THERMAL EXPANSION
JOINT FASTENER RELAXATION
APPROVED PARTS LIST NOT USED
STANDARD COMMERCIAL PARTS NOT USED
APPROVED SOURCE NOT USED FOR CRITICAL PART
USE OF UNQUALIFIED PART
WHEN PD OR AN PART EXISTS IN THE PROPER CONFIGURATION
HYDROGEN EMBRITTLEMENT
CREEP
AND OTHER RHEOLOGICAL PROPERTIES
STRESS CORROSION
GRAIN DIRECTION
IN ALLOWABLE DESIGN STRESSES
CRITICAL STRESSES FAVORABLY RELATED TO GRAIN IN FINISHED PART
FATIGUE UNDER DYNAMIC LOAD
FORBIDDEN PROCESSES
UNDETECTED LATENT FLAW
IN CERTAIN ENVIRONMENTS
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Material Selection Fault
SIZE
C
CODE IDENT NO
83BAS162 77
SCALE
SHEET OF

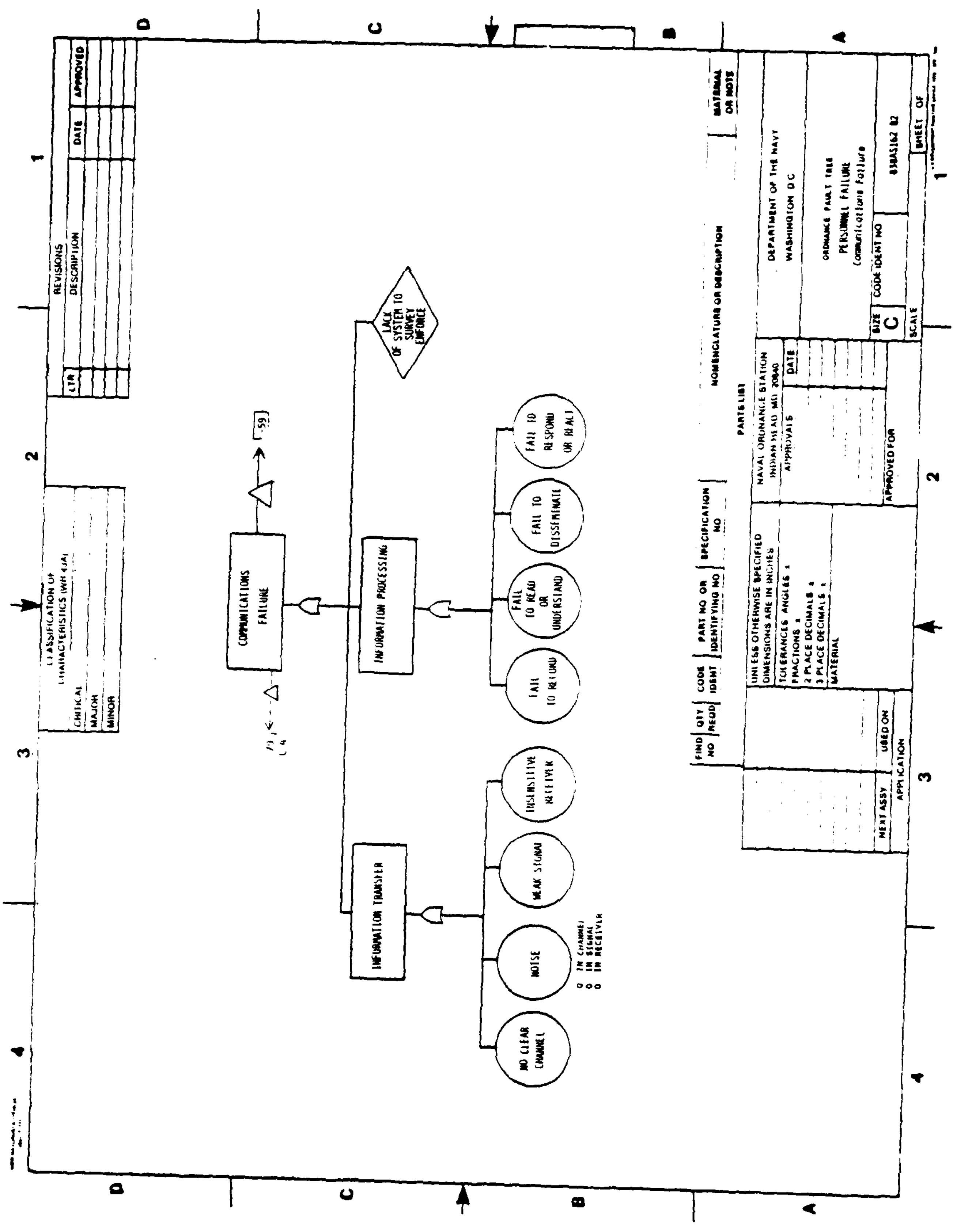

CONFIGURATION MANAGEMENT FAILURE
FAULTS:
O ORGANIZATION
O PERSONNEL
O AUDIT
O FOLLOW UP
IDENTIFICATION FAILURE
CONFIGURATION CONTROL FAILURE
MIL STD 480/481
CONFIGURATION STATUS ACCOUNTING FAILURE
MIL STD 842
CONFIGURATION AUDIT ERROR
CONTROL POLICY ERROR
CHANGE CRITERIA NOT ESTABLISHED
CHANGE CONTROL ERROR
WAIVER ERROR
FAIL TO AUDIT VENDOR
QUALITY REVIEW ERROR
TECHNICAL REVIEW ERROR
O PDR
O CDR
EFFECTIVITY ERROR
CHANGE EVALUATION ERROR
DEVIATION ERROR
CHANGE IMPLEMENTATION ERROR
ERROR IN:
DEFINITION
BASELINE DOCUMENTATION
O FUNCTIONAL
O ALLOCATED
O PRODUCT
I.D. & MARKING
NUMBERING
RECORDING ERROR
REPORTING ERROR
CLASSIFICATION OF CHARACTERISTICS (WR 41A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
ENGINEERING FAILURE
Configuration Management Failure
SIZE
C
CODE IDENT NO
838AS162-78
SCALE
SHEET OF

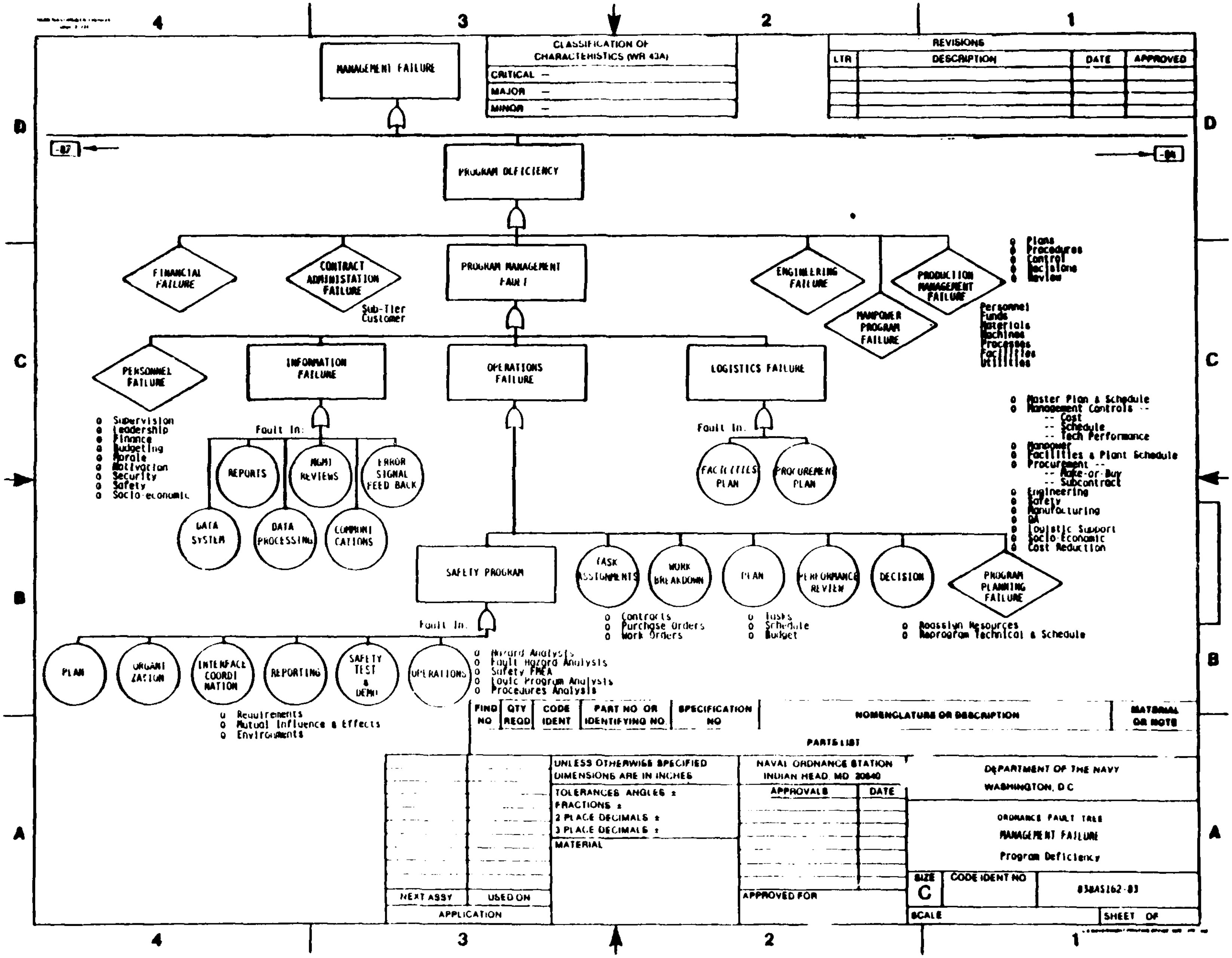

CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PERSONNEL FAILURE
LACK OF COMMUNICATIONS & COORDINATION
LACK OF EFFECTIVE SUPERVISION
LACK OF SKILL
LACK OF PROPER TRAINING
LACK OF MOTIVATION
B0
B1
B2
LACK OF MANAGEMENT CONCERN
LACK OF RESOURCES
LACK OF AUDITOR INTEREST
TIME
COMMUNICATIONS
INFORMATION
SUPERVISOR SHIPMENT ORIENTED
NOT QUALITY ORIENTED
TOO LOW SUPERVISORY RATIO
TOO LOW LEADPERSON RATIO
LESS THAN 1:5
MANAGEMENT PRESSURE TO PRODUCE
NO REJECTS
MEET SCHEDULE
MEET BUDGET
LACK OF APTITUDE FOR WORK
LACK OF CERTIFIED SKILL
LACK OF PRIOR TRAINING
SOLDERING
X RAY INTERPRETATION
N RAY INTERPRETATION
BRIDGEWIRE WELDING
WELDING
ARC (TIG)
ARC
PROJECTION
RESISTANCE
STITCH
NO WORK STANDARDS FOR JOB
IDEA EVERYONE IS DIFFERENT
EXCUSE NOT TO SET WORK STANDARDS
UNSKILLED OPERATOR USED
TO MEET SCHEDULE BUDGET
NO ERROR SIGNAL FEEDBACK
TO OPERATORS
NO ENTRANCE LEVEL TRAINING
ON THE-JOB TRAINING ONLY
HIGH TURN-OVER OF PERSONNEL
POOR INCENTIVES (PAY)
EXCESSIVE WORKLOAD
NO EFFORT TOWARD MORALE
NO GROUP ALLEGIANCE OR AFFINITY
CYCLE OF LAY-OFFS
LACK OF OPERATOR PRIDE
FAILURE TO UNDERSTAND NEED TO FOLLOW PROCEDURES
NO REAL FUTURE IN WORK
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NEXT ASSY
USED ON
APPLICATION
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
PERSONNEL FAILURE
Communications, Supervision, Training, Motivation Failures
SIZE
C
CODE IDENT NO
858AS162-79
SCALE
SHEET OF

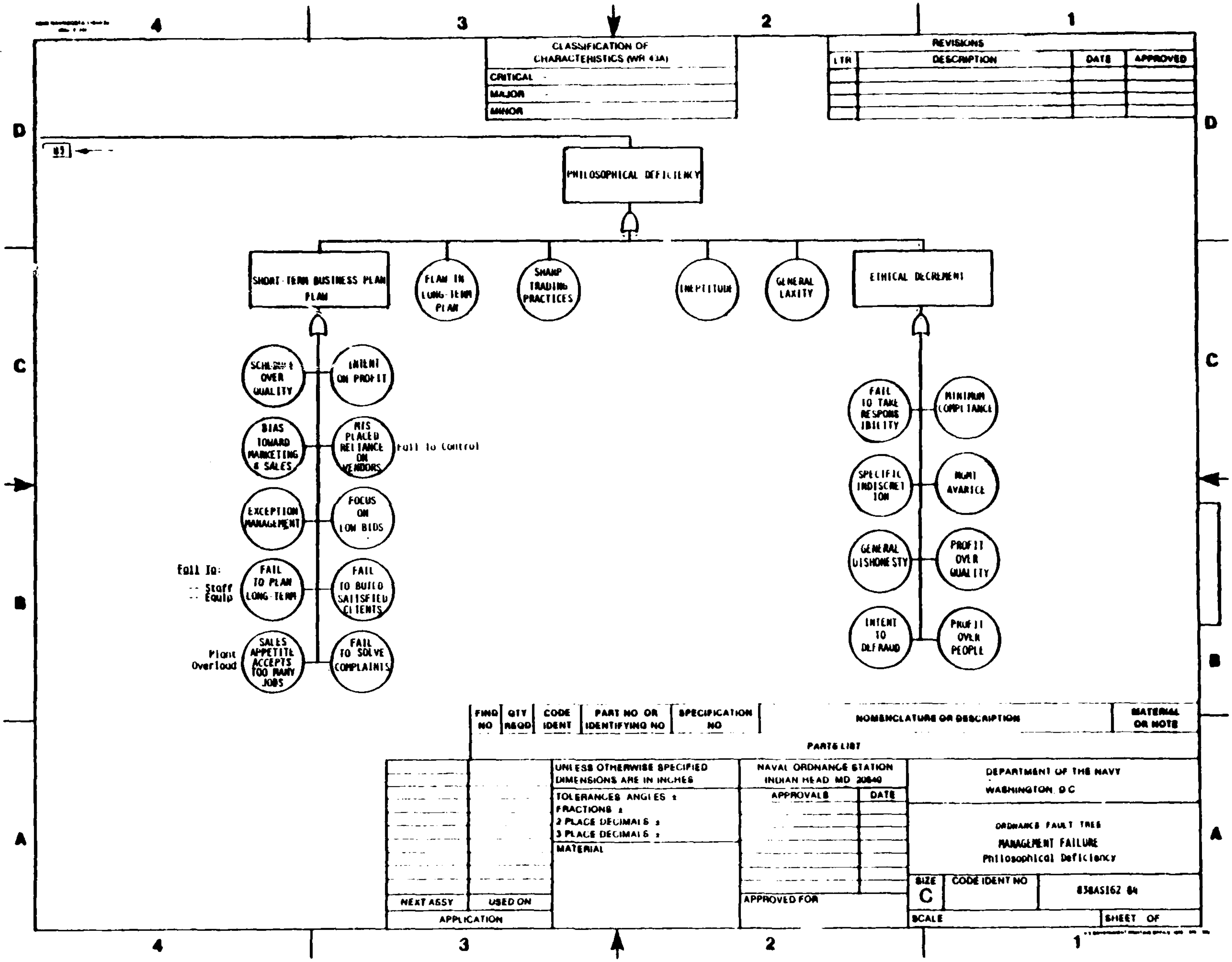

CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DEFECTIVE ITEM ENTERS FLOW
OPERATOR PERFORMS INCORRECTLY
IN PROCESS INSPECTION FAILURE
-79
OPERATOR INSUFFICIENTLY TRAINED
OPERATOR INSUFFICIENTLY SUPERVISED
OPERATOR INSUFFICIENTLY MOTIVATED
SABOTAGE
O POLITICAL
O INDUSTRIAL
O DISAFFECTIONATE EMPLOYEE
O RADICAL PERSON AGAINST MUNITIONS WORK
UNSAFE WORKING CONDITIONS
LOW PAY
LACK OF SECURITY
DISAFFECTIONATE WORKER
MINIMUM WAGE LAW
GENERAL LOW PAY OF ORDNANCE WORK
TAXES & DEDUCTIONS
COMPANY PAY SCALE POLICY
WORKER INEXPERIENCED IN JOB
WORKER BELIEVES HE IS WORTH MORE
WORKER BELIEVES JOB IS WORTH MORE
WORKER NEEDS MORE PAY
PAY NOT THE SAME AS OTHERS DOING SAME JOB
ON PROBATIONARY STATUS
DEPARTMENT TRANSFERS
BONUS INCENTIVE
RE HIRED EXPERIENCED WORKER
LAY OFF CAUSES DOWN GRADE
CASE OF ACTUAL INJUSTICE
LACK OF SUPERVISION
NEGLECT OF MOTIVATION
WEAK GROUP DYNAMICS (ESPRIT)
POOR WORKING ENVIRONMENT
POOR COMMUNICATIONS
OPERATOR FATIGUE
UNWILLING OVERTIME WORKER
UNSAFE WORKING CONDITIONS
DISTRACTIONS
BOREDOM OF ROUTINE WORK
MINORITY GROUP PROBLEM
ACTUAL MANAGEMENT PREJUDICE
PERCEIVED PREJUDICE
ASSUMED PREJUDICE
ACTUAL OR PERCEIVED INJUSTICE
DECLINE IN WORK ETHIC
GENERAL MALAISE AMONG YOUNG
AS PART OF ACTION FOR SOCIAL CHANGE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
PERSONNEL FAILURE
Operator Allows Defective Into Good Item Flow
SIZE
C
CODE IDENT NO
838AS162-80
SCALE
SHEET OF

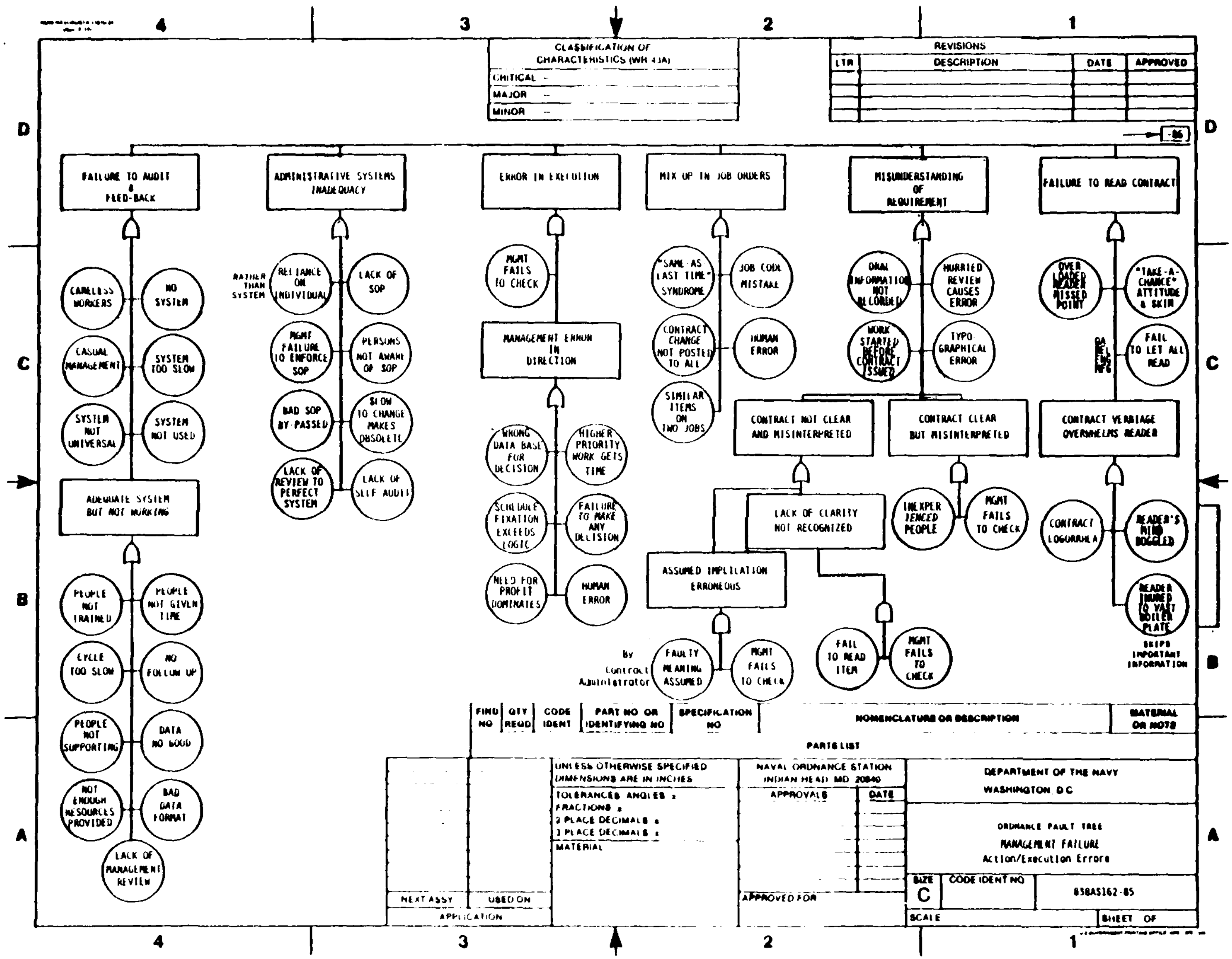


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ASSEMBLY & TEST PERSONNEL TRAINING FAILURE
FAILURE TO TRAIN IN CRITICAL ITEMS
LACK OF TRAINING PROGRAM PLAN
LACK OF TRAINING IN GENERAL TOPICS
TOOLING & TEST EQUIPMENT
TYPICAL ORDNANCE PRODUCT
DWGS DOCUMENT READING
QA REQUIREMENTS PROCEDURES
SAFETY RULES
INSP & TEST RULES
MFG RULES
NO INSTRUCTOR TRAINING
NO TRAINING AIDS
NO LESSON PLAN
NO OPERATOR SCREENING SELECTION
NO OPERATOR TRAINING
NO CREW TRAINING
NO REFRESHER TRAINING
SET UP & OPERATE
CYCLE LIFE OPERATOR CHECKS
DESIGN & CONSTRUCTION
FUNCTIONING
CARE HANDLING
INSP FOR MAINT COND'N
CALIBRATION
HAZARDS & PRECAUTIONS
LIFE CYCLE
ASSEMBLY OPERATIONS
PROCESS PROCEDURES
OPERATOR TRAINING
CREW TRAINING
IN PROCESS INSPECTION
PREPARATION FOR SHIPMENT
FINAL INSPECTION
o Marking
o Packaging
o Packing
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON D C
ORDNANCE FAULT TREE
PERSONNEL FAILURE
Assembly & Test Personnel Failure
SIZE
C
CODE IDENT NO
SCALE
SHEET OF

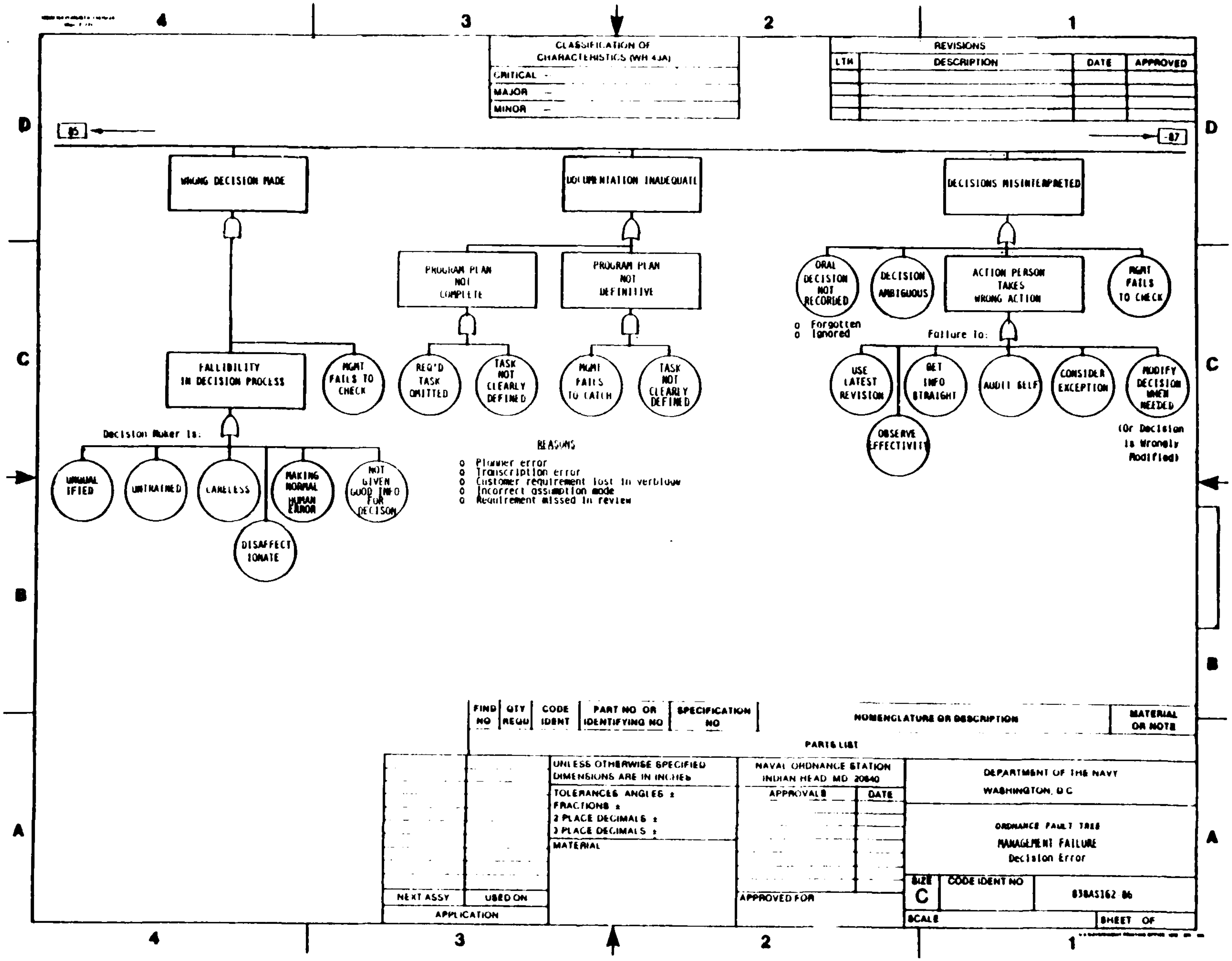

COMMUNICATIONS FAILURE
INFORMATION PROCESSING
INFORMATION TRANSFER
LACK OF SYSTEM TO SURVEY ENFORCE
FAIL TO RESPOND OR REACT
FAIL TO DISSEMINATE
FAIL TO READ OR UNDERSTAND
INSENSITIVE RECEIVER
WEAK SIGNAL
NOISE
NO CLEAR CHANNEL
IN CHANNEL
IN SIGNAL
IN RECEIVER
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
CLASSIFICATION OF CHARACTERISTICS
CRITICAL
MAJOR
MINOR
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES
FRACTIONS
2 PLACE DECIMALS
3 PLACE DECIMALS
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
PERSONNEL FAILURE
Communications Failure
SIZE
C
CODE IDENT NO
SCALE
SHEET OF
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION

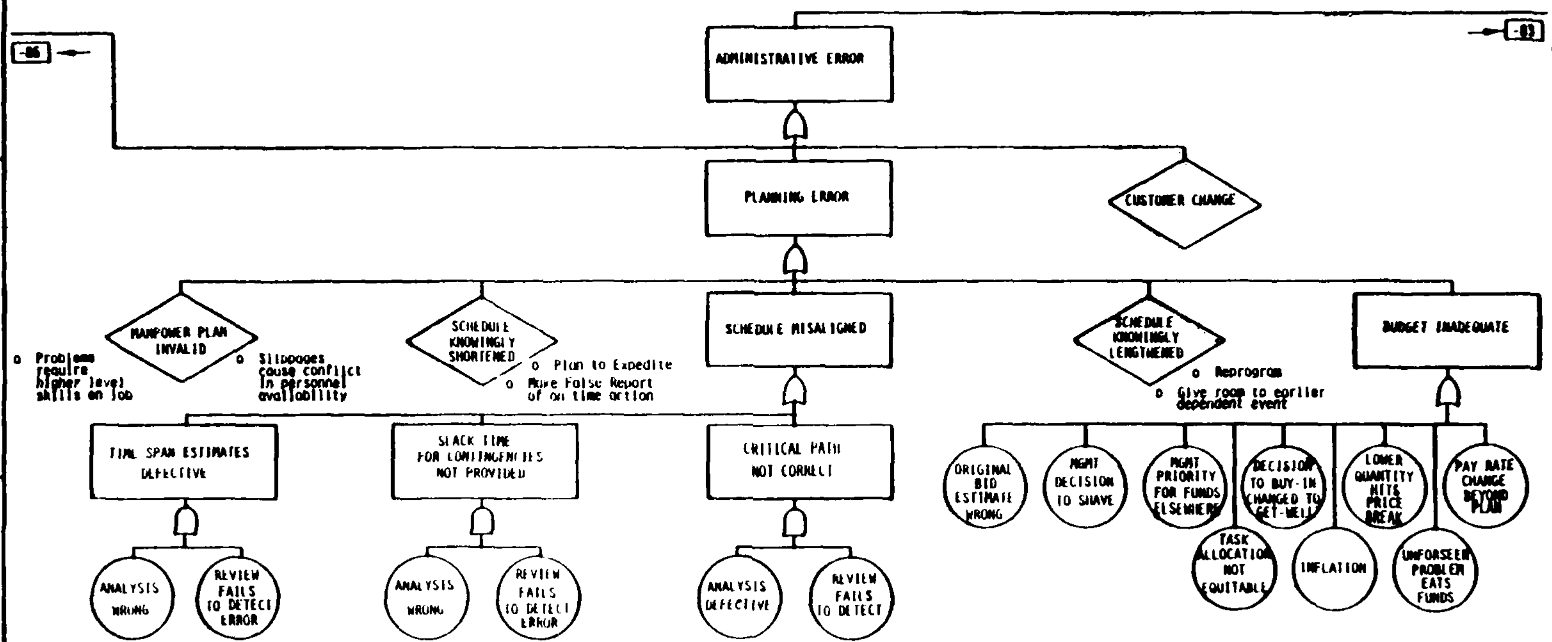

MANAGEMENT FAILURE
CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PROGRAM DEFICIENCY
FINANCIAL FAILURE
CONTRACT ADMINISTRATION FAILURE
Sub-Tier Customer
PROGRAM MANAGEMENT FAULT
ENGINEERING FAILURE
MANPOWER PROGRAM FAILURE
PRODUCTION MANAGEMENT FAILURE
o Plans
o Procedures
o Control
o Decisions
o Review
Personnel
Funds
Materials
Machines
Processes
Facilities
Utilities
PERSONNEL FAILURE
o Supervision
o Leadership
o Finance
o Budgeting
o Morale
o Motivation
o Security
o Safety
o Socio-economic
INFORMATION FAILURE
Fault In:
REPORTS
MGMT REVIEWS
ERROR SIGNAL FEED BACK
DATA SYSTEM
DATA PROCESSING
COMMUNI CATIONS
OPERATIONS FAILURE
LOGISTICS FAILURE
Fault In:
FACILITIES PLAN
PROCUREMENT PLAN
o Master Plan & Schedule
o Management Controls --
-- Cost
-- Schedule
-- Tech Performance
o Manpower
o Facilities & Plant Schedule
o Procurement --
-- Make-or-Buy
-- Subcontract
o Engineering
o Safety
o Manufacturing
o QA
o Logistic Support
o Socio-Economic
o Cost Reduction
SAFETY PROGRAM
TASK ASSIGNMENTS
WORK BREAKDOWN
PLAN
PERFORMANCE REVIEW
DECISION
PROGRAM PLANNING FAILURE
o Contracts
o Purchase Orders
o Work Orders
o Tasks
o Schedule
o Budget
o Reassign Resources
o Reprogram Technical & Schedule
Fault In:
PLAN
ORGANIZATION
INTERFACE COORDINATION
REPORTING
SAFETY TEST & DEMO
OPERATIONS
o Hazard Analysis
o Fault Hazard Analysis
o Safety FMEA
o Logic Program Analysis
o Procedures Analysis
o Requirements
o Mutual Influence & Effects
o Environments
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD, MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D.C.
ORDNANCE FAULT TREE
MANAGEMENT FAILURE
Program Deficiency
SIZE
C
CODE IDENT NO
83AAS162-83
SCALE
SHEET OF
NEXT ASSY
USED ON
APPLICATION


CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
PHILOSOPHICAL DEFICIENCY
SHORT-TERM BUSINESS PLAN PLAN
FLAW IN LONG-TERM PLAN
SHARP TRADING PRACTICES
INEPTITUDE
GENERAL LAXITY
ETHICAL DECREMENT
INTENT ON PROFIT
BIAS TOWARD MARKETING & SALES
MIS PLACED RELIANCE ON VENDORS
Fail to Control
EXCEPTION MANAGEMENT
FOCUS ON LOW BIDS
Fail To:
-- Staff
-- Equip
FAIL TO PLAN LONG-TERM
FAIL TO BUILD SATISFIED CLIENTS
Plant Overload
SALES APPETITE ACCEPTS TOO MANY JOBS
FAIL TO SOLVE COMPLAINTS
FAIL TO TAKE RESPONS IBILITY
MINIMUM COMPLIANCE
SPECIFIC INDISCRET ION
GENERAL DISHONESTY
PROFIT OVER QUALITY
INTENT TO DEFRAUD
PROFIT OVER PEOPLE
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON DC
ORDNANCE FAULT TREE
MANAGEMENT FAILURE
Philosophical Deficiency
SIZE
C
CODE IDENT NO
838AS162 84
SCALE
SHEET OF



CLASSIFICATION OF CHARACTERISTICS (WH 43A)
CRITICAL –
MAJOR –
MINOR –
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-86
FAILURE TO AUDIT & FEED-BACK
CARELESS WORKERS
NO SYSTEM
CASUAL MANAGEMENT
SYSTEM TOO SLOW
SYSTEM NOT UNIVERSAL
SYSTEM NOT USED
ADEQUATE SYSTEM BUT NOT WORKING
PEOPLE NOT TRAINED
PEOPLE NOT GIVEN TIME
CYCLE TOO SLOW
NO FOLLOW UP
PEOPLE NOT SUPPORTING
DATA NO GOOD
NOT ENOUGH RESOURCES PROVIDED
BAD DATA FORMAT
LACK OF MANAGEMENT REVIEW
ADMINISTRATIVE SYSTEMS INADEQUACY
RATHER THAN SYSTEM
RELIANCE ON INDIVIDUAL
LACK OF SOP
MGMT FAILURE TO ENFORCE SOP
PERSONS NOT AWARE OF SOP
BAD SOP BY-PASSED
SLOW TO CHANGE MAKES OBSOLETE
LACK OF REVIEW TO PERFECT SYSTEM
LACK OF SELF AUDIT
ERROR IN EXECUTION
MGMT FAILS TO CHECK
MANAGEMENT ERROR IN DIRECTION
WRONG DATA BASE FOR DECISION
HIGHER PRIORITY WORK GETS TIME
SCHEDULE FIXATION EXCEEDS LOGIC
FAILURE TO MAKE ANY DECISION
NEED FOR PROFIT DOMINATES
HUMAN ERROR
MIX UP IN JOB ORDERS
"SAME AS LAST TIME" SYNDROME
JOB CODE MISTAKE
CONTRACT CHANGE NOT POSTED TO ALL
HUMAN ERROR
SIMILAR ITEMS ON TWO JOBS
MISUNDERSTANDING OF REQUIREMENT
ORAL INFORMATION NOT RECORDED
HURRIED REVIEW CAUSES ERROR
WORK STARTED BEFORE CONTRACT ISSUED
TYPO-GRAPHICAL ERROR
CONTRACT NOT CLEAR AND MISINTERPRETED
CONTRACT CLEAR BUT MISINTERPRETED
INEXPERIENCED PEOPLE
MGMT FAILS TO CHECK
LACK OF CLARITY NOT RECOGNIZED
ASSUMED IMPLICATION ERRONEOUS
By Contract Administrator
FAULTY MEANING ASSUMED
MGMT FAILS TO CHECK
FAIL TO READ ITEM
MGMT FAILS TO CHECK
FAILURE TO READ CONTRACT
OVER LOADED READER MISSED POINT
"TAKE-A-CHANCE" ATTITUDE & SKIM
FAIL TO LET ALL READ
CONTRACT VERBIAGE OVERWHELMS READER
CONTRACT LOGORRHEA
READER'S MIND BOGGLED
READER INURED TO VAST BOILER PLATE
SKIPS IMPORTANT INFORMATION
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
NEXT ASSY
USED ON
APPLICATION
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
MANAGEMENT FAILURE
Action/Execution Errors
SIZE
C
CODE IDENT NO
83BAS162-85
SCALE
SHEET OF


CLASSIFICATION OF CHARACTERISTICS (WH 4JA)
CRITICAL -
MAJOR -
MINOR -
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
85
87
WRONG DECISION MADE
FALLIBILITY IN DECISION PROCESS
MGMT FAILS TO CHECK
Decision Maker is:
UNQUALIFIED
UNTRAINED
CARELESS
MAKING NORMAL HUMAN ERROR
NOT GIVEN GOOD INFO FOR DECISON
DISAFFECTIONATE
DOCUMENTATION INADEQUATE
PROGRAM PLAN NOT COMPLETE
PROGRAM PLAN NOT DEFINITIVE
REQ'D TASK OMITTED
TASK NOT CLEARLY DEFINED
MGMT FAILS TO CATCH
TASK NOT CLEARLY DEFINED
REASONS
o Planner error
o Transcription error
o Customer requirement lost in verbiage
o Incorrect assumption made
o Requirement missed in review
DECISIONS MISINTERPRETED
ORAL DECISION NOT RECORDED
o Forgotten
o Ignored
DECISION AMBIGUOUS
ACTION PERSON TAKES WRONG ACTION
MGMT FAILS TO CHECK
Failure To:
USE LATEST REVISION
OBSERVE EFFECTIVITY
GET INFO STRAIGHT
AUDIT SELF
CONSIDER EXCEPTION
MODIFY DECISION WHEN NEEDED
(Or Decision is Wrongly Modified)
FIND NO
QTY REQD
CODE IDENT
PART NO OR IDENTIFYING NO
SPECIFICATION NO
NOMENCLATURE OR DESCRIPTION
MATERIAL OR NOTE
PARTS LIST
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL
NAVAL ORDNANCE STATION INDIAN HEAD MD 20640
APPROVALS
DATE
APPROVED FOR
DEPARTMENT OF THE NAVY
WASHINGTON, D C
ORDNANCE FAULT TREE
MANAGEMENT FAILURE
Decision Error
SIZE
C
CODE IDENT NO
838AS162 86
SCALE
SHEET OF



ANALYSIS WRONG

- Analyst Inexperienced
- Analyst Estimates Wrongly
- Data Bases for Analysis Wrong
- Data Processing Error
- Transcription Error

REVIEWS FAIL TO DETECT ERROR:

- o Review Inadequate
- o Review Action Not Performed --
  - -- Management Decision to Skip
  - -- Management Inadvertent Omission
  - -- Time Ran Out
- o Topic Not On Agenda
- o Information Not Available for Decision
- o Available Information Wrong

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL
MAJOR
MINOR

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640
APPROVALS | DATE
APPROVED FOR

DEPARTMENT OF THE NAVY
WASHINGTON D C

ORDNANCE FAULT TREE
MANAGEMENT FAILURE
Administrative Error

SIZE C | CODE IDENT NO | 83BAS162 87
SCALE | SHEET OF

CLASSIFICATION OF CHARACTERISTICS (WR 43A)
CRITICAL –
MAJOR –
MINOR –

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

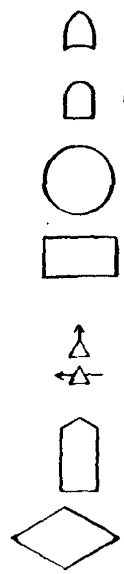
ORDNANCE FAULT TREE DRAWING INDEX

DRAWING NUMBER	TITLE
838AS162-00	ORDNANCE FAULT TREE
01	BAD ITEM OUT THE GATE — Top Undesired Event
02	PRIMARY FAILURE OF ITEM
03	SECONDARY FAILURE OF ITEM
-04	DEFECTIVE ITEM SHIPPED
05	UNUSABLE ITEM SHIPPED
-06	DEFECTIVE ITEM EXISTS
	MANUFACTURING FAILURE
-07	Defective Item Produced
08	Structural Fault
-09	Performance out of Specification
-10	I.D. & Marking Incorrect
-11	Non-Conforming Packaging
-12	Documentation Error
-13	Sub Tier Supplier Failure
-14	Production Planning Failure
-15	Pre Prodn Engr Failure
16	Prodn Control Failure
-17	Prodn Engr Failure
-18	Prodn Resource Failure
-19	Manufacturing Operation
-20	In Process Inspection
-21	Storeroom Error
-22	Tooling Problem
-23	Engr Support Problem
24	Processing Failure
-25	Procedural Failure
26	Information Failure
	PROCUREMENT FAILURE
27	Procurement Info Failure
28	Procurement Opns Failure
29	Purchase Order Processing
30	Purchasing Dept Failure
31	RFP/RFQ/IFB Failure
32	Contracting Failure
	QUALITY SYSTEM FAILURE
33	Quality Operations Failure
34	Audit Failure
35	QC, Calibration & Surveillance
36	Quality Management Failure
-37	Quality Plan Failure
	INSPECTION SYSTEM FAILURE
38	Sub-Tier Vendor Inspection
39	Inspection Operations
40	Quality Conformance Inspection
41	Vendor Inspection Surveillance
42	Inspection Failure
43	Visual Examination Failure
44	Radiographic Inspection Failure
45	Receiving Inspection Failure
46	Manufacturing Surveillance
47	In Process Inspection
48	Final Inspection
49	Inspection & Test Data Error

DRAWING NUMBER	TITLE
	TESTING FAILURE
838AS162-50	Fail to Conduct Definitive Test
51	Development Testing Failure
52	Qualification Testing Failure
53	QA Surveillance Failure
54	Acceptance Failure
[illegible]	Environmental Failure
[illegible]	Test Data Failure
[illegible]	Failure Analysis & Report
	DOCUMENTATION FAILURE
[illegible]	Contract Document Fault
[illegible]	Document Preparation Error
[illegible]	Product Documentation Fault
61	Engineering Drawing Error
62	Product Documentation Failure
	ENGINEERING FAILURE
63	Engr Personnel Failure
64	Design & Engr Info Failures
65	Coordination & Info Failures
66	Engr Logistics Failure
67	Engr Operations Failure
68	Engr Management Failure
69	Engr Task Execution Failure
70	Design Engineering Failure
71	Material Availability Failure
72	Design Detail Fault
73	Construction Fault
74	Design to Cost Fault
75	Design Performance Fault
76	Component & Material Fault
77	Material Selection Fault
78	Configuration Mgmt Failure
	PERSONNEL FAILURE
79	Commo, Supervsn, Tng, Motivation
80	Operator Error
81	Assembler/Tester Error
82	Communications Failure
	MANAGEMENT FAILURE
83	Program Deficiency
84	Philosophical Deficiency
85	Action/Execution Error
86	Decision Error
87	Administrative Error
88	INDEX, SYMBOLOGY & NOTES

FAULT TREE SYMBOLOGY

EVENT RELATIONSHIPS -- Logic Gates.



OR Gate -- Logical Union

Event above the gate occurs if one or more of the inputs occur

AND Gate -- Logical Intersection

Event above the gate occurs if, and only if, all the inputs occur

PRIMARY EVENT

The basic fault requiring no further development. It is a primary event, failure or primary cause.

GATE EVENT

Events above the gate are caused logically as defined by the gate below. Events which have a more basic cause are shown as rectangles.

TRANSFER SYMBOLS

Transfer In

Transfer Out

The rectangle with dash number cites the fault tree drawing involved in the transfer in or out

22

C 3

The alpha-numeric digit below the drawing rectangle indicates the coordinates of the transfer in

NORMALLY OCCURRING EVENT -- Normal Input to AND Gates

This event must occur or is expected to occur

UNDEVELOPED EVENT -- Events not deduced further at this point.

FIND NO	QTY REQD	CODE IDENT	PART NO OR IDENTIFYING NO	SPECIFICATION NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
MATERIAL

NAVAL ORDNANCE STATION
INDIAN HEAD, MD 20640

APPROVALS	DATE
APPROVED FOR	

DEPARTMENT OF THE NAVY
WASHINGTON, D.C.

ORDNANCE FAULT TREE
INDEX, SYMBOLOGY & NOTES

SIZE	CODE IDENT NO	
C		83BAS162-88
SCALE		SHEET OF

INTRODUCTORY NOTES

BIOGRAPHICAL SKETCHES OF AUTHORS AND RESEARCHERS

Many and diverse are the individuals and their skills, experience and knowledge required to form a good team capable of achieving difficult objectives, overcoming the many physical obstacles which always present themselves and the many extreme frustrations encountered. Also true in any team effort, is that most team members labor in relative anonymity while performing the much needed and often hardest part -- the support services -- without which the team could not achieve its objectives.

These conditions hold true for the team conducting the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-Service Usage Data Analysis Project. Without the many individuals with their particular skills, experience and knowledge who have continuously provided the necessary support, even when at times it must have seemed to more than one of them that the individual requesting yet another approach to the data, which already had been cut, sliced and approached in a multitude of ways, knew not what he was doing, how he was doing it and where he was headed. Nonetheless, that necessary support always has been there.

It is appropriate therefore, not only to demonstrate this team's credentials, but especially to assure a degree of recognition for each of the individual team contributors, that each team member be identified along with a brief biographical sketch and a brief description of the individual's responsibilities and contributions to the team's effort.

JOHN VETTER

Education: B.A., Fairleigh Dickinson University - Mathematics (1970)
M.A., American University - Mathematical Statistics (1975)

Mr. Vetter currently serves as Head of the Analytical Systems Division, Naval Weapons Engineering Support Activity. The division provides computer and analytical support services for the Navy's Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis program.

Mr. Vetter has been active since 1970 in analytical efforts for the Navy. His experience includes the use of applied statistics, mathematics and operations research in these efforts. In the past, he had been engaged as statistical analysis consultant for the AAES/ALSS Equipments In-service Usage Data Analysis program and currently continues in that capacity on a part-time basis. Mr. Vetter is a member of the American Statistical Association.

CHARLES R. GEIBERGER

Charles R. Geiberger attended the University of California (U.C.), Berkeley, while a member of the U.S. Navy and received a Bachelor of Applied Sciences (Wartime) Degree in Electrical Engineering in 1946 and was commissioned as an Ensign. Upon completion of his tour of duty with the Navy, he returned to U.C., Berkeley, and earned a Bachelor of Science Degree in Mechanical Engineering in 1948.

Mr. Geiberger has been with the Naval Weapons Engineering Support Activity since 1971 as a General Engineer specializing in Reliability and Maintainability Engineering. He was assigned to the AAES/ALSS Equipment In-service Usage Data Analysis project in July 1982 and has taken on the responsibilities of the project leader. Major activities in this capacity include scheduling workloads to assure program objectives are met on schedule and managing program funds and contracts.

Mr. Geiberger came to the government from General Dynamics, Convair Division, where he served as a Thermodynamics Engineer, a Senior Flight Test Engineer, a Senior Research Engineer and a Senior Reliability Engineer. Participated in the following major development programs: the F-102, the F-106 and the F-111 fighters and the Atlas and Centaur missile systems.

Mr. Geiberger is a member of the American Society of Mechanical Engineers and is a registered professional engineer in Mechanical Engineering in California.

CHARLES W. STOKES, III

Attended Howard University School of Engineering in Washington, D.C., for 2 years. Earned B.S. Degree in Business and Management with minor in Computer Science at the University of Maryland, College Park, Maryland.

Has served as the Naval Weapons Engineering Support Activity (NAVWESA) computer systems analyst and long range computer systems designer/planner for the Navy AAES/ALSS Equipments In-Service Usage Data Analysis Program since December 1980 after joining the project in April of that year. At present, a major portion of his time is expended in examining data obtained from other ADP systems to ensure data compatibility with NAVWESA computer systems and to integrate such newly acquired data into the AAES/ALSS data base. He has been a civilian employee of the Navy since 1969. First, as a computer programmer and later as an analyst, working on such programs as the Light Airborne Multi-Purpose Systems (LAMPS) study, the Navy Airlift Study, the Navy Oil Analysis Program (NOAP), and the Navy Depot Level Maintenance Study. Areas of responsibility have included data analysis, simulation modeling, long range planning models, and data base management systems.

Mr. Stokes is a member of the Data Processing Management Association (DPMA) and holds a Certificate in Data Processing from the Institute for Certification of Computer Professionals (ICCP).

MYRTICE MOODY ROBERSON

Attended Albany State College in Georgia and Howard University in the District of Columbia as an undergraduate Social Science Major.

Employed by the Naval Weapons Engineering Support Activity (NAVWESA) in Washington, D.C., as a mathematician technician. For the past four years has aided in integrating AAES/ALSS data into the NAVWESA computer systems, in learning and defining how to access and use that data and in performing and aiding in various analyses concerning Naval aircraft equipped with aircrew automated escape systems (AAES).

LANNY MOFFETT

EDUCATION: B.S. Computer Science, University of Maryland, College Park, 1982
B.S. Electrical Engineering, University of Maryland, College Park, 1976

Mr. Moffett has over seven years experience as a computer programmer/analyst. He has been employed for the past five years by the Naval Weapons Engineering Support Activity in Washington, D.C. During that time he has provided computer support to the Jet Engine Data Analysis project and more recently to the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis project. This support has included computer programming, systems analysis and computer graphics.

Mr. Moffett is a member of the Institute of Electrical and Electronic Engineers (IEEE) and the Computer Society of the IEEE.

ROBERT M. COX II

Mr. Robert M. Cox II is a graduate of Southern Oregon State College with a B.S. in Political Science and minors in Computer Sciences, Communications, and Business.

Mr. Cox is employed by the Institute of Modern Procedures on contract to Naval Weapons Engineering Support Activity as a Computer Programmer/Analyst, assigned to provide programming support to the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis program. This support has included both the programming for immediate responses for requested short-term analyses as well as programming for meeting the longer range objectives of this program, establishing standardized, highly automated and, where feasible, "user friendly" programs intended to permit Crew Systems Division personnel and associated field activity personnel having limited or no computer experience direct, safe, defined step-by-step, on-site access to the data banks.

Thomas W. Henke

Currently attending the University of Maryland as an undergraduate Computer Science major.

Employed by Evaluation Research Corporation and assigned to the Naval Weapons Engineering Support Activity (NAVWESA ESA-31) in the Washington Navy Yard, Washington, D.C. He has two years of experience as a Data Technician in retrieving, tabulating, and analyzing data as well as in creating computerized tables of Medical Officer's Report data for use in preparation of reports showing incidence of injuries associated with Naval aircrew ejection systems. Presently working as a Computer Programmer creating reports and designing utility systems for the NAVWESA Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis project.

JOYCE HAYNES-ROY

Mrs. Roy is currently studying Computer Science at Charles County Community College. For the past four years she has worked on the Jet Engine Data Analysis project and the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis project at the Naval Weapons Engineering Support Activity. In support of these projects, Mrs. Roy has performed programming on mini and graphic computer systems.

FREDERICK C. GUILL

Education: U.S. Coast Guard Academy 1955-1959
University of Washington 1959-1961 (B.S. in M.E. 1961)
George Washington University 1961-1966 (M.E.A. 1966)

Employed in Crew Systems Division, Naval Air Systems Command, Washington, D.C., as a senior technical assistant to the Assistant Director of the Division. Mr. Guill has over 22 years experience in Navy aircrew escape systems, primary, and also in aircrew life support systems. Served as project engineer, directing several programs to incorporate escape systems into Navy aircraft, including YANKEE in A-1H/J, MK GRU7A in F-14, ESCAPAC ID-1 in X-22A, and SIIIS-3 in AV-8A. Authored MIL-S-18471B through F and MIL-E-9426B through F; specifications for U.S. Navy ejection type AAES and for evaluating and testing those systems, respectively, and MIL-STD-2067 establishing AAES reliability and maintainability (R/M) requirements. Currently the NAVAIR project engineer for the Aircrew Automated Escape Systems (AAES) and Aircrew Life Support Systems (ALSS) Equipments In-service Usage Data Analysis program.

Mr. Guill conceived the initial concept for, and developed the initial and subsequent tasking assignments for, the Aircrew Automated Escape Systems (AAES) In-service Usage Data Analysis project. As the project sponsor of this project for the Crew Systems Division, he has guided the development and growth of the project, including its recent expansion to include all aircrew life support systems (ALSS) equipments and the conceptualization and development of many of the analytical tools now, or soon to be, under development.

Mr. Guill is a member of the American Society of Mechanical Engineers, American Society for Metals, Human Factors Society, and SAFE.

JAMES F. PALMER

James F. (Felix) Palmer received his bachelor's degree (B.S. in Bacteriology) from the Louisiana Polytechnic Institute (Louisiana Tech University), Ruston, Louisiana in 1965. He received his master's degree (M.S. in Biology-Marine Biochemistry) from the University of Alabama, Tuscaloosa, Alabama in 1970.

He has been employed in various areas of research since receiving his bachelor's degree; Southern Research Institute in Birmingham, Alabama; National Parachute Test Range in El Centro, California; and Naval Aerospace Medical Research Laboratory, Pensacola, Florida; and Pacific Missile Test Range in Pt. Mugu, California.

Mr. Palmer has been an active member of the U.S. Navy in both an enlisted and commissioned status since 1969. His duty stations have included recruit training at RTC Orlando, Florida; hospital corpsman training at Hospital Corps School, Great Lakes, Illinois; Laboratory technician at the Naval Regional Medical Center in Jacksonville, Florida; student aerospace physiology training at the Naval Aerospace Medical Institute in Pensacola, Florida; research aerospace physiologist at the National Parachute Test Range in El Centro, California; staff aerospace physiologist at the Naval Aerospace Medical Institute in Pensacola, Florida; research aerospace physiologist and director of planning and programming at the Naval Aerospace Medical Research Laboratory in Pensacola, Florida; and serves currently as the Head of the Crew Systems Branch, Pacific Missile Test Center, Pt. Mugu.

Lieutenant Commander Palmer is an associate member of the Aerospace Medical Society, Aerospace Physiology Society, and SAFE Association.

G. RONALD HERD

Education: B.A., 1947, University of Kansas
M.A., 1949, University of Kansas
Ph.D., 1956, Iowa State University

Dr. Herd has had over 30 years of experience in the application of statistical and mathematical techniques to a wide spectrum of engineering problems. This experience has included applications in life testing, experimental design, quality control, and exploratory data analysis and has covered such areas as mathematical modeling, reliability analysis and test design for hardware systems ranging from tractors and automobiles to engines, aircraft, and weapon systems.

Dr. Herd currently is president of Applied Science Group, Incorporated, and in the past has served on the Advisory Group on the Reliability of Electronic Equipment (AGREE); Bureau of Weapons Industry Maintenance Reliability Advisory Board (BIMRAD); and the U.S. Air Force Industry Advisory Committee on Weapon System Effectiveness. He participated in a review of the biological warfare R&D effort for the U.S. Army and was the Technical Director of an industry study group for the assessment of HA EMP impact on SENTINEL communications for the Army. He participated in the study of nuclear testing requirements (Project Defender). He has also served as a consultant on reliability to Centre National d'Etudes Spatiales; to the Director of Reliability and Quality Assurance, NASA, on Mercury, Gemini, Apollo and OAO programs; and to several major industrial firms including GE, IBM, Deere, GM, RCA, as well as others.

Dr. Herd served as an Associate Editor of Operations Research from 1960 to 1970 and has published more than 35 papers in technical journals. He is a member of the American Statistical Association, the Operations Research Society of America, and Sigma Xi.