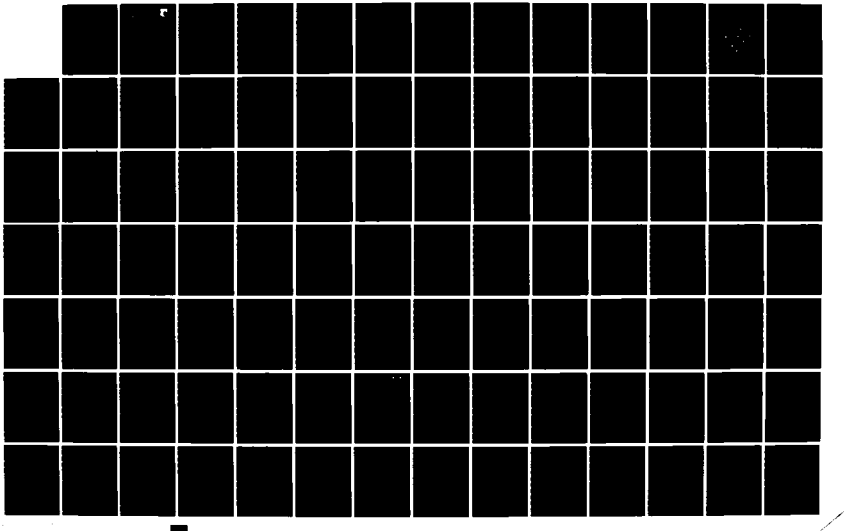
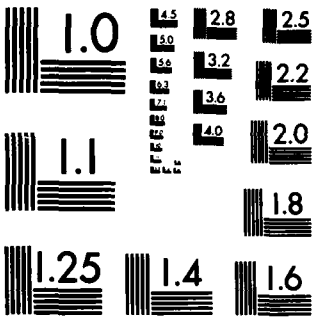
AD-A144 891 ICAM (INTEGRATED COMPUTER AIDED MANUFACTURING) CONCEPTUAL DESIGN FOR COMP..(U) LTV AEROSPACE AND DEFENSE CO DALLAS TX VOUGHT AERO PRODUCTS D.. R H WETTACH ET AL. 29 JUN 84 2-20150/4R-2 F/G 14/4 1/4 NL

UNCLASSIFIED





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

AFWAL-TR-84-4020

(12)

ICAM CONCEPTUAL DESIGN FOR COMPUTER-INTEGRATED MANUFACTURING

Volume IV, Part 6

Task D – Quality Assurance/Quality Control/Technical Requirement/Tasks

Quality Assurance Modeling and Analysis

Quality Assurance Program Management Standard Recommendations (ISP)

LTV Aerospace and Defense Company
Vought Aero Products Division
Post Office Box 225907
Dallas, Texas 75265

June 1984

Final Technical Report for Period
1 October 1981 – 29 June 1984

APPROVED FOR PUBLIC RELEASE

DISTRIBUTION UNLIMITED

Prepared for:

MATERIALS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This report has been revied by the Office of Public Affairs (ASD/PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

Richard R. Preston — July 25, 1984

RICHARD R. PRESTON, Captain USAF
Project Manager
Computer Integrated Manufacturing Branch
Manufacturing Technology Division

FOR THE COMMANDER:

N G Tupper — 25 July 84

NATHAN G. TUPPER
Chief
Computer Integrated Manufacturing Branch
Manufacturing Technology Division

"If your address has changed, if you wish to be removed from our mailing list, or if the addressee is no longer employed by your organization, please notify AFWAL/MLTC, Wright-Patterson AFB, Ohio 45433 to help us maintain a current mailing list."

Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

AD-A144 891

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS Export Control, Limited Dist., FEDD Clause
2a. SECURITY CLASSIFICATION AUTHORITY AFWAL/MLTC	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 2-20150/4R-2	5. MONITORING ORGANIZATION REPORT NUMBER(S) AFWAL-TR-84-4020 Vol. IV, Part 6 ISP110513000
6a. NAME OF PERFORMING ORGANIZATION General Electric Company Corporate Consulting Services 6b. OFFICE SYMBOL (If applicable) Bldg. 28EW	7a. NAME OF MONITORING ORGANIZATION Air Force Wright Aeronautical Laboratories
6c. ADDRESS (City, State and ZIP Code) 1285 Boston Amenue Bridgeport, CT. 06602	7b. ADDRESS (City, State and ZIP Code) Materials Laboratory (AFWAL/MLTC) Manufacturing & Technology Division Wright-Patterson AFB, OH. 45433
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Air Force Wright Aeronautical Laboratories 8b. OFFICE SYMBOL (If applicable) AFWAL/MLTC	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F33615-81-C-5119
8c. ADDRESS (City, State and ZIP Code) Materials Laboratory Manufacturing Technology Division Wright-Patterson AFB, Ohio 45433	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO.: 78011F PROJECT NO.: 112C779-2B111105 TASK NO.: 3010 WORK UNIT NO.: --
11. TITLE (Include Security Classification) ICAM Conceptual Design for (Cont'd. Blk. 16)	
12. PERSONAL AUTHOR(S) R. H. Wettach, B. R. Shepherd, W. D. Vinson	
13a. TYPE OF REPORT Final Report 13b. TIME COVERED FROM 1981 TO 1984	14. DATE OF REPORT (Yr., Mo., Day) 1984 June 29 15. PAGE COUNT
16. SUPPLEMENTARY NOTATION Computer-Integrated Manufacturing Task D - QA/QC Technical Requirements/Tasks Quality Assurance Modeling and Analysis QA Program Management Standard Recommendations Document.	

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB. GR.		
13	08		Quality Assurance	QA Recommendations
14	04		Quality Control	QA System Architecture
			Test Inspection and Evaluation	QA Modeling & Analysis

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

This document, Vol. IV, Part 6, of the Final Technical Report contains the Quality Assurance Program Management Standard Recommendations (ISP). This document presents recommendations for a new DoD Quality Assurance Standard and two alternative considerations for improving existing standards. Background rationale and other supporting material, including analysis approach and survey results are presented.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ OTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Richard R. Preston, Captain, USAF	22b. TELEPHONE NUMBER (Include Area Code) (513)255-6976 22c. OFFICE SYMBOL AFWAL/MLTC

DD FORM 1473, 83 APR EDITION OF 1 JAN 73 IS OBSOLETE.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

The Final Technical Report is organized as follows:

Volume I — *Project Overview and Technical Summary* FTR110510000U, 29 June 1984

Volume II — Establishment of the Factory of the Future Conceptual Framework

- Volume II, Part 1 — *Scoping Document* (SD), SD 110512000, 25 March 1982
- Volume II, Part 2 — Needs Analysis Document (NAD), NAD110512000, 10 May 1982
- Volume II, Part 3 — State-of-the-Art Document (SAD), SAD110512000, 20 September 1982
- Volume II, Part 4 — System Requirements Document (SRD), SRD110512000, 3 March 1983
- Volume II, Part 5 — System Specification Document (SS), SS 110512000, 14 October 1983
- Volume II, Part 6 — *Conceptual Framework Document*, MMR110512000, 10 February 1984

Volume III — Integrated Composite Center Requirements and Preliminary Design

- Volume III, Part 1 — Scoping Document (SD), SD 110511000, 30 June 1982
- Volume III, Part 2 — Needs Analysis Document (NAD), NAD110511000, 30 April 1982
- Volume III, Part 3 — System Environment Document (SED), SED110511000, 31 May 1982
- Volume III, Part 4 — State-of-the-Art Document (SAD), SAD110511000, 31 May 1982
- Volume III, Part 5 — System Requirements Document (SRD), SRD110511000, 31 July 1982
- Volume III, Part 6 — System Specification Document (SS), SS 110511000, 30 November 1982
- Volume III, Part 7 — System Design Specification Document (SDS), SDS110511000, 28 February 1983
- Volume III, Part 8 — Development Specification Document (DS), DS 110511000, 30 June 1983
- Volume III, Part 9 — System Test Plan Strategy (STP), STP110511000, 31 August 1983
- Volume III, Part 10 — Implementation Plan Strategy (IP), IP 110511000, 31 October 1983

Volume IV — Quality Assurance/Quality Control/Technical Requirements/Tasks Quality Assurance Modeling and Analysis

- Volume IV, Part 1 — Scoping Document (SD), SD 110513000, 28 January 1982
- Volume IV, Part 2 — Needs Analysis Document (NAD), NAD110513000, 24 June 1982
- Volume IV, Part 3 — System Environment Document (SED), SED110513000, 31 August 1983
- Volume IV, Part 4 — System Requirements Document (SRD), SRD110513000, 24 September 1982
- Volume IV, Part 5 — Architecture for Product Assurance, TTD110513000, 10 January 1984
- Volume IV, Part 6 — Quality Assurance Program Management Standard Recommendations (ISP), ISP110513000, 18 August 1982

Volume V — Benefits Tracking, Technology Transfer and Marketing Strategy for Factory of the Future Concepts, (TTD), TTD110510001, 29 June 1984

Volume VI — Recommendations for Factory of the Future Development Projects (TTD), TTD110510002, 29 June 1984

FOREWORD

This document contains the recommended Quality Assurance Program Management Standard and Alternatives as well as support material that outlines the approach used in its creation. This document was developed under Air Force Contract #F33615-81-C-5119, Project Priority 1105, entitled "ICAM Conceptual Design for Computer Integrated Manufacturing." This contract was sponsored by the Computer Integrated Manufacturing Branch, Manufacturing Technology Division, Materials Laboratory, Air Force Wright Aeronautical Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, 45433. This project was administered under the technical direction of Captain Richard R. Preston.

This document, Volume IV, Part 6, of the Final Technical Report, contains the Quality Assurance Modeling and Analysis Quality Assurance Program Management Standard Recommendations.

The results of this project have been achieved by a coalition of companies organized and managed under the leadership of the prime contractor, Vought Corporation, with Mr. Don L. Norwood providing primary overall contract leadership and management responsibility (TASK A). Other Task leaders were:

1. Mr. Robert L. Moraski, Vought Corporation, responsible for leadership and management of the Factory of the Future Conceptual Framework Thrust (TASK B).

2. Mr. Frank E. Sullivan, Northrop Corporation, responsible for leadership and management of the Integrated Composites Center Conceptual and Preliminary Designs (TASK C and TASK E).

3. Mr. Robert H. Wettach, General Electric Company, responsible for leadership and management of the Quality Assurance Modeling and Analysis Thrust (TASK D).

This effort was supported by a coalition team consisting of the following members:

Mr. T. R. Lee	Northrop Corporation
Mr. J. J. Page	Vought Corporation
Mr. B. R. Shepherd	General Electric Company
Mr. M. G. Stroud	Vought Corporation
Mr. W. D. Vinson	General Electric Company
Mrs. P. A. Waldrop	General Dynamics/Ft. Worth
Mr. J. P. Watkins	General Dynamics/Ft. Worth

In addition to the major coalition participants, the following companies and organizations have served as contributing and reviewing participants for this document:

INDUSTRY

Alvin M. Baughman-Consultant
Bendix Corporation
Boeing Aerospace Company
Boeing Commerical Airplane Company
Boeing Military Airplane Company
Cincinnati Milacron
General Dynamics/Ft. Worth
General Electric:
  Aerospace Electronic Systems, Utica
  Aircraft Engine, Evendale
  Simulation and Control Systems, Daytona Beach
  Ordnance, Pittsfield
  Military Electronic Systems, Syracuse
  Re-entry Systems, Philadelphia
  Aerospace Control Systems Binghamton
Grumman Aerospace
Honeywell, Inc.
Hughes
Lockheed Missiles & Space Company
Lockheed-Georgia
Martin Marietta
McDonnell Aircraft
Rockwell International
Sikorsky Aircraft
TRW, Inc.
Texas Instruments
United Technologies Corp.
Vought Corporation

MILITARY

AFPRO DET 27/General Dynamics, Ft. Worth
HQ-Air Force Logistics Command/QAA
HQ-Air Force Systems Command Aeronautical Systems Division/PMDQ
HQ-Air Force Systems Command Armament Division/ENP
HQ-Air Force Systems Command Arnold Engineering Development Center/PKQ
HQ-Air Force Systems Command Ballistic Missile Office/AWQ
HQ-Air Force Systems Command Contract Management Division/QA
HQ-Air Force Systems Command Space Division/PDQ
HQ-Defense Logistics Agency Cameron Station/DLA-QR
HQ-NASA, Office of Chief Engineer
HQ-Naval Air Systems Command
Office of the Secretary of Defense, Asst. for Quality
Office of the Undersecretary of Defense, Research and Engineering
USA DARCOM (DRXQA-Q)

Note that the number and date in the upper right corner of each page of this document indicates that this Document has been prepared according to the ICAM Configuration Management Life Cycle Document Requirements and is a designated configuration item.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

SECTION 1.0

EXECUTIVE SUMMARY

1.1 Overview

Landing men on the moon more than any other recent event emphasized the growing importance of quality. There is a continuing struggle to advance the capability of quality assurance systems to meet an ever increasing demand. Quantum improvements are needed. Changes in the basic philosophy and mechanisms for assuring quality must be made.

To meet this need, Task "D"-Quality Assurance/Quality Control, was established as a part of ICAM Project 1105, Conceptual Design for Computer Integrated Manufacturing. Project 1105 had two other major tasks:

- Task "B" - Establish Factory of the Future framework and
- Task "C"/"E" - Establish Integrated Composite Center Conceptual and Preliminary Designs

All three tasks were integrated, with the work of Task "D" becoming a part of both Task "B" and Task "C".

1.2 Approach

Task "D" included a review of the current Quality Assurance/Quality Control shortcomings which were identified and considered as a basis for the Quality Assurance Program Management Standard. Three paths were pursued in defining the requirements for the proposed Quality Assurance Program Management Standard: First, a thorough review of applicable, existing military and other government standards and specifications, as well as industry QA/QC publications, was accomplished. This background information came primarily from the list of documents shown in Section 2-Referenced Documents.

Second, the results of the initial phase of this contract-Understand the Problem-were examined for those elements in the current environment (the "As-Is" world) that have standards ramifications.

Finally, in order to gain an even broader perspective, the coalition solicited feedback from government and industrial sources on their current and anticipated future experience with MIL-Q-9858A and other military documents. Details of the feedback are provided in the Appendix.

Two figures are presented to enhance an understanding of the process:

- Figure 1-1 summarizes our approach pictorially, while
- Figure 1-2 displays it in an $IDEF_0$ (ICAM Definition method, function modeling version zero) format.

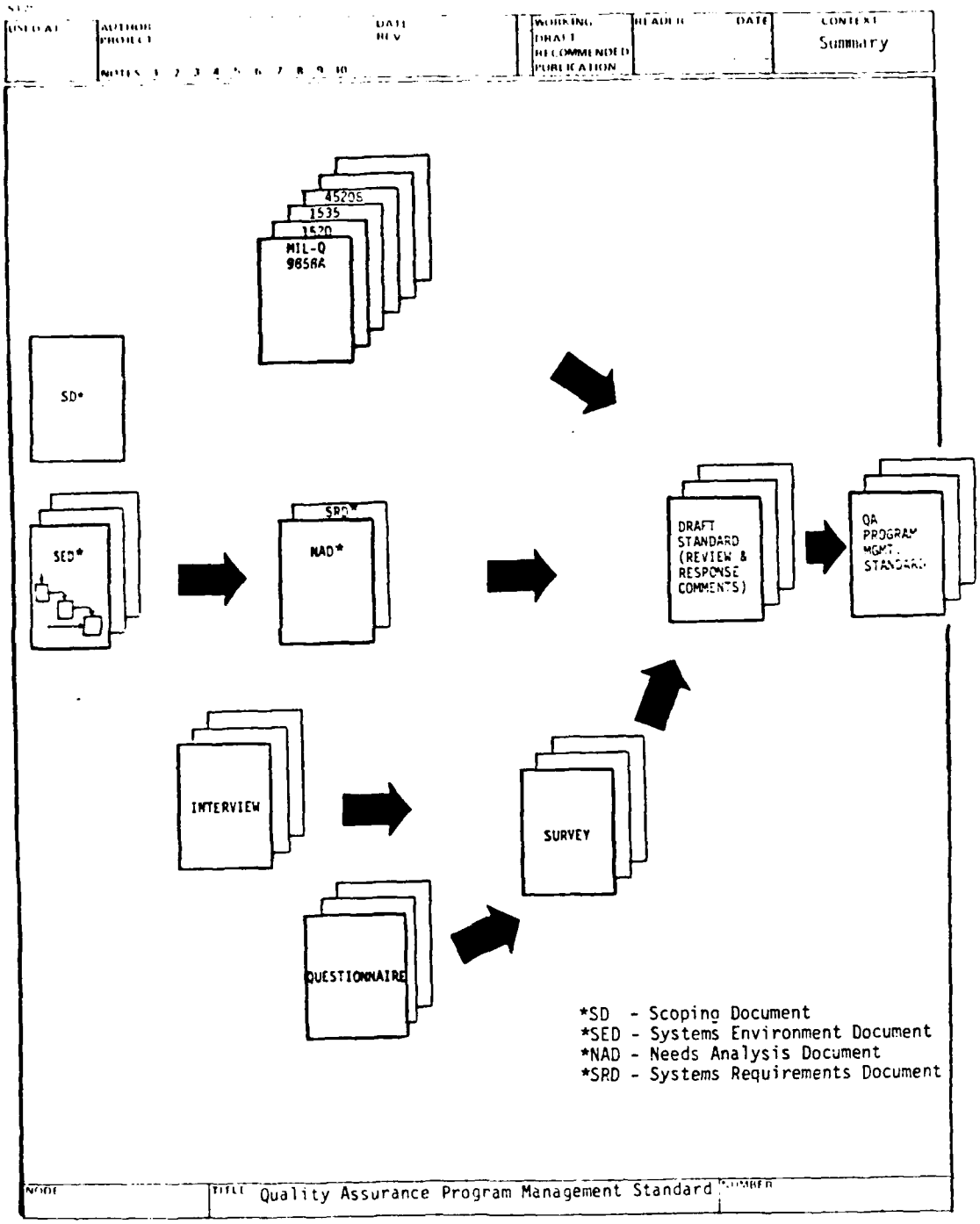

CONTEXT
Summary
45208
1535
1520
MIL-Q
9858A
SD*
SED*
NAD*
DRAFT
STANDARD
(REVIEW &
RESPONSE
COMMENTS)
QA
PROGRAM
INTERVIEW
SURVEY
QUESTIONNAIRE
*SD - Scoping Document
*SED - Systems Environment Document
*NAD - Needs Analysis Document
*SRD - Systems Requirements Document
Quality Assurance Program Management Standard

Figure 1-1

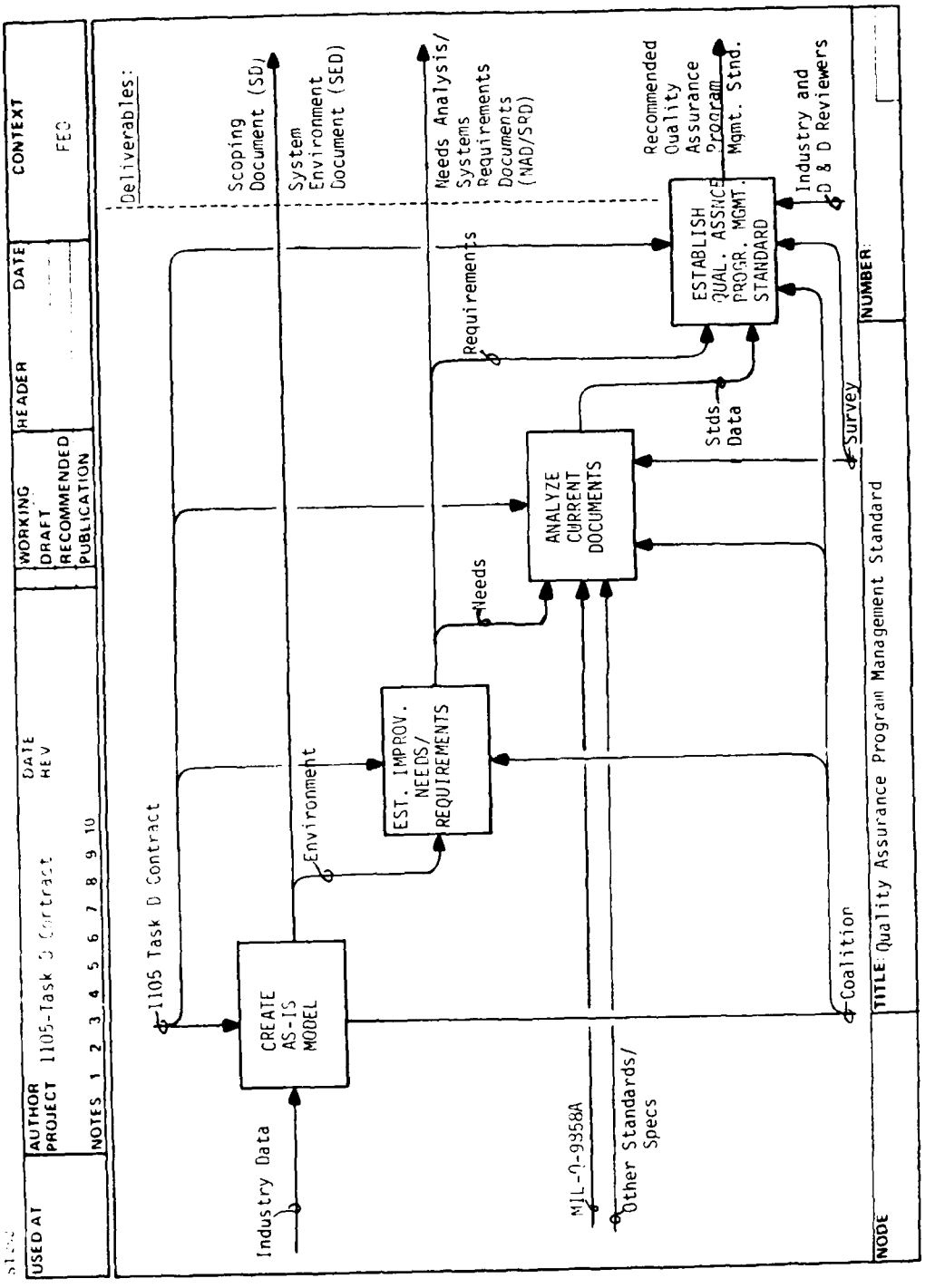

USED AT
AUTHOR
PROJECT 1105-Task D Contract
NOTES 1 2 3 4 5 6 7 8 9 10
DATE
REV
WORKING DRAFT
RECOMMENDED
PUBLICATION
HEADER
DATE
CONTEXT
FEC
Deliverables:
Scoping Document (SD)
System Environment Document (SED)
Needs Analysis/ Systems Requirements Documents (NAD/SRD)
Recommended Quality Assurance Program Mgmt. Stnd.
Industry and D & D Reviewers
1105 Task D Contract
Environment
Requirements
Needs
Stds Data
Survey
Coalition
Industry Data
MIL-Q-9858A
Other Standards/ Specs
CREATE AS-IS MODEL
EST. IMPROV. NEEDS/ REQUIREMENTS
ANALYZE CURRENT DOCUMENTS
ESTABLISH QUAL. ASSNCE PROGR. MGMT. STANDARD
NODE
TITLE: Quality Assurance Program Management Standard
NUMBER

Figure 1-2

1.3 Results

This work resulted in a recommended Quality Assurance Program Management Standard for use in the automated environment of the Factory-of-the-Future. The recommended standard applies equally well to the current factory environment and is designed to accommodate anticipated evolutionary changes.

In addition to developing a recommended Quality Assurance Program Management Standard, two alternative approaches have been included in this report. They are:

- MIL-STD-109 Additions, and
- MIL-Q-9858A Rewrite

All three approaches are presented in Section 3.0, Recommendations for Improved Quality Assurance Program Management Requirements.

This work is presented to fulfill the requirements of Task "D" - Quality Assurance/Quality Control, sub-task 4.4.4 - Establish Product Assurance Program Standard, which is a part of ICAM Project 1105.

SECTION 2.0

REFERENCED DOCUMENTS

2.1 Applicable Documents

Specifications:

MIL-Q-9858	Quality Program Requirements
MIL-I-45208	Inspection System Requirements
MIL-S-52779	Software Quality Assurance Program Requirements

Standards:

MIL-STD-1520	(USAF) Corrective Action and Disposition System for Nonconforming Material
MIL-STD-1535	(USAF) Supplier Quality Assurance Program Requirements
DoD-STD-480	Configuration Control
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-45662	Calibration System Requirements
MIL-STD-781	Reliability Testing for Development and Production Contracts
MIL-STD-785	Reliability Program for Systems and Equipment, Development and Production
MIL-STD-105	Sampling Procedures and Tables
MIL-STD-721	Definition of Terms for Reliability and Maintainability

Specifications: (cont'd)

MIL-STD-470	Maintainability Program Requirement
MIL-STD-471	Maintainability Prediction

Other Publications:

MIL-HDBK-334	Evaluation of a Contractor's Software Quality Assurance Program
AQAP-1	NATO Quality Control System Requirements for Industry
AQAP-6	NATO Measurement and Calibration System Requirements for Industry
AQAP-13	NATO Software Quality Control System Requirements
MIL-HDBK-472	Maintainability Prediction
AFSC publication	Quality 77 Report 7 October 1977
AFSC publication	Quality Horizons Final Report 15 November 1979
AFWAL-TR-81-4023	ICAM Architecture Part II Vol. IV & VII - Composite Function Model of "Manufacture Product" (MFGO) - June 1981
AFWAL-TR-81-4023	ICAM Architecture Part II Vol. VIII-Composite Function Model of "Design Product" (DESO) June 1981
IDS150120000	ICAM Documentation Standards 15 September 1983

Other Publications: (cont'd)

SD 110513000	ICAM Task "D" Quality Assurance/Quality Control/Technical Requirements/Task-Scoping Document 28 January 1982
NAD110513000	ICAM Task "D" Quality Assurance/Quality Control/Technical Requirements/Tasks-Needs Analysis Document 24 June 1982
SRD110513000	ICAM Task "D" Quality Assurance/Quality Control/Technical Requirements/Tasks-Systems Requirement Document Sept. 1982
SED110513000	ICAM Task "D" Quality Assurance/Quality Control/Technical Requirements/Tasks-Systems Environment Document August 1982
TTD110513000	Architecture for Product Assurance A USAF Manufacturing Technology Project
NATO (ARMP-1)	NATO Requirements for Reliability and Maintainability - Draft Proposal
MIL-HDBK-H50	Evaluation of a Contractor's Quality Program
MIL-HDBK-H51	Evaluation of a Contractor's Inspection System
MIL-HDBK-H52	Evaluation of a Contractor's Calibration System

Other Publications: (cont'd)

AFR 800-18	Air Force Reliability & Maintainability Program
JCMPO Instruction 4855.3	Product Assurance Program Reqmts. for Cruise Missile Contractors - Dec. 1982
DoD Directive 4155.1	Quality Program
DoD Directive 5000.40	Reliability & Maintainability
DoD Quality Design Review Handbook	

2.2 Terms and Abbreviations

FIRMWARE - Logic circuits in computer "read-only" memory that may be altered by software programming.

HARD COPY - A printed copy of machine output, a typed copy or a manually written copy in readable form. For example, reports, listings, documents, and summaries.

PRODUCT ASSURANCE (PA) - The planned, interdisciplinary and systematic establishment of all quality assurance, quality control, reliability and maintainability actions necessary to provide adequate confidence on an independent basis that: requirements are properly specified, that the design will achieve established requirements, that adequate test, inspection and evaluation systems are established to detect nonconformance and that the final product will perform the required function(s) for the designed life cycle.

QUALITY - The composite of all the attributes or characteristics including performance of an item or product.

QUALITY ASSURANCE - The planned and systematic establishment of all actions (management/engineering) necessary to provide adequate confidence that nonconformance prevention provisions and reviews are established during the design phase and performed throughout the product manufacturing and life cycle phases.

QUALITY CONTROL - The planned and systematic application of all actions (management/technical) necessary to control raw materials or products through the use of test, inspect, evaluate, and control of processes.

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) - Combine two definitions above.

QUALITY ASSURANCE PLAN - Describes the methods, policies, and procedures necessary to conduct quality assurance activities during the design, manufacturing and delivery phases.

QUALITY REQUIREMENTS - Quality standards on 1) major components /assemblies and final product characteristics, and 2) applicable QA/QC contract requirements not directly related to product application.

SOFT COPY - Data presented as a video image, in audio or any other form which is not hard copy.

SOFTWARE - A set of computer programs, procedures, rules, and possibly associated documentation concerned with the operation of a data processing system, e.g., compilers, library routines, manuals, and circuit diagrams.

SECTION 3.0

RECOMMENDATIONS FOR IMPROVED QUALITY ASSURANCE PROGRAM MANAGEMENT REQUIREMENTS

3.1 Quality Assurance Program Management Standard

3.1.1 Objective

To establish a Quality Assurance Program Management Standard flexible enough to accommodate both the automated and non-automated environments without changing the basic structure and requirements of MIL-Q-9858A. The recommended approach maintains consistency with current practices while recognizing essential interfaces with evolving production systems.

3.1.2 Standard

The following section contains the recommended Quality Assurance Program Management Standard.

RECOMMENDED

QUALITY ASSURANCE PROGRAM MANAGEMENT STANDARD

1. SCOPE

1.1 **Applicability.** This standard shall apply to all supplies (including equipments, subsystems and systems) or services when referenced in the item specification, contract or order.

1.2 **Contractual Intent.** This standard requires the establishment of a quality program by the contractor to assure compliance with the requirements of the contract. The program and procedures used to implement this specification shall be developed by the contractor. The quality program, including procedures, processes and product shall be documented in hardcopy, such as on paper, transparency or film, or in softcopy such as disc, cartridge or tape and shall be subject to review by the government representative. The contractor must make the documentation available to the Government Representative in a convenient useable form. The quality program is subject to the disapproval of the Government Representative whenever the contractor's procedures do not accomplish their objectives. The Government, at its option, may furnish written notice of the acceptability of the contractor's quality program.

1.3 **Summary.** An effective and economical quality program, planned and developed in consonance with the contractor's other administrative and technical programs, is required by this specification. Design of the program shall be based upon consideration of the technical and manufacturing aspects of production and related engineering design and materials. The program shall assure adequate quality throughout all areas of pre-contract, contract and post-contract performance; for example, proposal generation, design, development, fabrication, processing, assembly, inspection, test, maintenance, packaging, shipping, storage, site installation and data feedback from end users.

All supplies and services under the contract, whether manufactured or performed within the contractor's plant or at any other source, shall be controlled at all points necessary to assure conformance to contractual requirements. The program shall provide for the prevention and ready detection of discrepancies and for timely and positive corrective action. The contractor shall make objective evidence of quality conformance readily available to the Government Representative. Objective evidence may be in form of written material, graphs, charts and pictures either on paper, film or as a display on a computer terminal or video screen. Instructions and records for quality must be controlled.

The authority and responsibility of those in charge of the design, development, production, testing, and quality activities shall be clearly stated. The program shall facilitate determinations of the effects of quality deficiencies and quality costs on price. Facilities and standards such as drawings, engineering changes, measuring equipment and the like which are necessary for the creation of the required quality shall be effectively managed. The program shall include an effective control of purchased materials and subcontracted work. Design, development, manufacturing, fabrication, assembly, testing and inspection work conducted within the contractor's plant shall be controlled. The quality program shall also include effective implementation of responsibilities shared jointly with the Government or related to Government functions, such as control of Government property and Government source inspection.

1.4 **Relation to Other Contract Requirements.** This standard and any procedure or document executed in implementation thereof, shall be in addition to and not in derogation of other contract requirements. The quality program requirements set forth in this specification shall be satisfied in addition to all detail requirements contained in the statement of work or in other parts of the contract. The contractor is responsible for compliance with all provisions of the contract and for furnishing specified supplies and services which meet all the requirements of the contract. If any inconsistency

exists between the contract schedule or its general provisions and this specification, the contract schedule and the general provisions shall control. The contractor's quality program shall be planned and used in a manner to support reliability effectively.

1.5 **Relation to MIL-Q-9858A.** This standard may be used in place of MIL-Q-9858A.

1.6 **Tailoring.** In accordance with DOD principles governing the application and tailoring of specifications and standards to achieve cost effective acquisitions and life cycle ownership of defense material, this standard and its supporting documents shall be tailored to the specific program and program phase within the overall life cycle. This tailoring shall encompass the selection and application of methods, tables, sections, individual paragraphs and/or sentences to be placed on contract in order to impose only the essential needs to preclude unnecessary and unreasonable contract costs.

2. **SUPERSEDING, SUPPLEMENTATION AND ORDERING**

2.1 **Applicable Documents.** The following documents of the issue in effect on date of the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS

Military

MIL-I-45208A -- Inspection System Requirements
MIL-STD-45662A -- Calibration System Requirements
MIL-S-52779A -- Software Quality Assurance Program Requirements

2.2 **Amendments and Revisions.** Whenever this standard is amended or revised subsequent to its contractually effective date, the contractor may follow or authorize his subcontractors to follow the amended or revised document provided no increase in price or fee is required. The contractor shall not be required to follow the amended or revised document except as a change in contract. If the contractor elects to follow the amended or revised document, he shall notify the Contracting

Officer, in writing, of this election. When the contractor elects to follow the provisions of an amendment or revision, he must follow them in full.

2.3 **Ordering Government Documents.** Copies of specifications, standards and drawings required by contractors in connection with specific procurements may be obtained from the procuring agency, or as otherwise directed by the Contracting Officer.

3. QUALITY PROGRAM MANAGEMENT

3.1 **Organization.** Effective management for quality shall be clearly prescribed by the contractor. Personnel performing quality functions shall have sufficient, well-defined responsibility, authority and the organizational freedom to identify and evaluate quality problems and to initiate, recommend or provide solutions. Management regularly shall review the status and adequacy of the quality program. The term "quality program requirements" as used herein identifies the collective requirements of this specification. It does not mean that the fulfillment of the requirements of this specification is the responsibility of any single contractor's organization, function or person.

3.2 **Early Involvement of Quality.** The contractor shall include as part of his quality assurance program plan a defined strategy for the early integration of the functions of marketing, design, manufacturing, quality and the customer. The stategy shall provide for a review of the customer's requirements and expectations including the identification of the key program elements that are critical for program success. The plan shall make timely provisions for adequate processes, equipment, tooling, personnel skills and program controls to assure meeting the critical requirements and to assure overall product quality. This initial planning will recognize the need and provide for research, when necessary, to update inspection and testing techniques, instrumentation and correlation of inspection and test results with manufacturing methods and processes. This planning will also provide appropriate review and action to assure compatibility of manufacturing, inspection, testing and documentation. The early integration of the functional quality activities is essential.

3.3 **Prevention.** The quality assurance program plan shall focus on preventing quality problems. This should include early feedback of quality, reliability and maintainability data to engineering and manufacturing for design or process changes.

3.4 **Work Instructions.** The quality program shall assure that all work affecting quality (including such things as purchasing, handling, machining, assembling, fabricating, processing, inspection, testing, modification, installation, and any other treatment of product, facilities, standards or equipment from design and ordering of materials to dispatch of shipments) shall be prescribed in clear and complete documented instructions of a type appropriate to the circumstances. Work instructions may be in hard copy form such as written instructions on paper or film, or in soft copy form such as computer tapes and discs. Work instructions may be transmitted to an operator or directly to a machine. Such instructions shall provide the criteria for performing the work functions and they shall be compatible with acceptance criteria for workmanship. The instructions are intended also to serve for supervising, inspecting and managing work. The preparation and maintenance of and compliance with work instructions shall be monitored as a function of the quality program.

3.5 **Records.** The contractor shall maintain and use any records or data essential to the economical and effective operation of his quality program. These records, either as hard copy or as soft copy such as computer tapes or discs, shall be available for review by the Government Representative and copies of individual records shall be furnished him upon request. The requirement of furnishing the Government Representative copies of records shall be satisfied by furnishing a hard copy of the records or by furnishing a soft copy, such as a tape or disc, capable of being viewed at a computer terminal or a video screen. The requirement may also be satisfied by providing the Government Representative access to a computer terminal or a video screen where the information can be seen. Records are considered one of the principal forms of objective evidence of quality. The quality

program shall assure that records are complete and reliable. Inspection and testing records shall, as a minimum, indicate the nature of the observations together with the number of observations made and the number and type of deficiencies found. Also, records for monitoring work performance and for inspection and testing shall indicate the acceptability of work or products and the action taken in connection with deficiencies. The quality program shall provide for the analysis and use of records as a basis for management action.

3.6 **Software.** The contractor shall establish and implement a Software Quality Assurance Program for computer controlled automated processes and other computer related processes. This Program shall be documented and shall be subject to review and disapproval by the Government Representative whenever the contractor's procedures do not accomplish their objectives.

The software Quality Program shall be an integral part of the total Quality Assurance Program. For items specified for delivery on a contract MIL-S-52779A shall apply. This applies to either software alone or to software as a portion of a system or a subsystem. In this regard the term software also includes firmware.

For internal software used for process control and production MIL-S-52779A may be used with tailoring to meet specific requirements. At a minimum the process control Software Quality Program shall address:

- o A Program plan establishing strategy, authority and control
- o Documentation including procedures and work instruction
- o Design/code reviews including Quality participation
- o Configuration management including identification, control and records of change
- o Software security
- o Validation, verification and certification
- o Audit programs
- o Problem reporting and corrective action

The Software Quality Program shall be reviewed on an established periodic basis to assure applicability to the most current contract requirements.

3.7 **Corrective Action.** The quality program shall detect promptly and correct assignable conditions adverse to quality. Design, purchasing, manufacturing, testing or other operations which could result in or have resulted in defective supplies, services, facilities, technical data, standards or other elements of contract performance which could create excessive losses or costs must be identified and changed as a result of the quality program. Corrective action will extend to the performance of all suppliers and vendors and will be responsive to data and product forwarded from users. Corrective action shall include as a minimum:

(a) Analysis of data and examination of product scrapped or reworked to determine extent and causes;
(b) Analysis of trends in processes or performance of work to prevent nonconforming product; and
(c) Introduction of required improvements and corrections, an initial review of the adequacy of such measures and monitoring of the effectiveness of corrective action taken.

3.8 **Costs Related to Quality.** The contractor shall maintain and use quality cost data as a management element of the quality program. These data shall serve the purpose of identifying the cost of both the prevention and correction of nonconforming supplies (e.g., labor and material involved in material spoilage caused by defective work, correction of defective work and for quality control exercised by the contractor at subcontractor's or vendor's facilities). The specific quality cost data to be maintained and used will be determined by the contractor. These data shall, on request, be identified and made available for "on site" review by the Government Representative.

A cost-benefit analysis will be required as support for a request to "tailor" any part of this specification.

4. FACILITIES AND STANDARDS

4.1 **Design Review.** Personnel from the contractor's engineering, manufacturing and quality assurance organizations shall conduct a continuing review of design and technical documentation and changes thereto, to determine their adequacy regarding design and function of the product, that all necessary information has been included, and that the requirements are clear and unambigious and conform to standard engineering practices. The quality assurance participant shall ensure that reviews are documented, deficiencies reported, and corrective action has been taken prior to document release. These reviews shall be used in subsequent quality planning for procurement, fabrication, inspection, and test.

4.2 **Design Drawings, Documentation and Changes.** The contractor shall assure the adequacy, completeness and currentness of design documents by establishing and implementing a configuration management plan. Design documents (drawings and specifications) include drawings and specifications either in hard copy form or in soft copy form with respect to computer tapes or discs. With respect to the currentness of design documents and changes, the contractor shall assure that requirements for the effectivity point of changes are met and that obsolete design documents and change requirements are removed from all points of issue and use. Some means of recording the effective points shall be employed and be available to the Government.

With respect to design documents, a procedure shall be maintained that provides for the evaluation of the engineering adequacy of proposed changes. The evaluation shall encompass both the adequacy in relation to state-of-the-art engineering and design practices and the adequacy with respect to the design and purpose of the product to which the drawing relates.

With respect to supplemental specifications, process instructions, production engineering instructions and work instructions relating to a particular design, the contractor shall be responsible for a review of their adequacy, currentness and completeness. The quality program must provide complete coverage of all information necessary to produce an article in complete conformity with requirements of the design.

The quality program shall assure that there is complete compliance with contract requirements for proposing, approving, and effecting of engineering changes. The quality program shall provide for monitoring effectively compliance with contractual engineering changes requiring approval by Government design authority. The quality program shall provide for monitoring effectively the design documentation changes of lesser importance not requiring approval by Government design authorities.

Delivery of correct design documentation and change information to the Government in connection with data acquisition shall be an integral part of the quality program. This includes full compliance with contract requirements concerning rights and data both proprietary and other. The quality program's responsibility for drawings and changes extend to the drawings and changes provided by the subcontractors and vendors for the contract.

4.2 Measuring and Testing Equipment. The contractor shall provide and maintain gages and other measuring and testing devices necessary to assure that supplies conform to technical requirements. These devices shall be calibrated against certified measurement standards which have known valid relationships to national standards at established periods to assure continued accuracy. The objective is to assure that inspection and test equipment is adjusted, replaced or repaired before it becomes inaccurate. The calibration of measuring and testing equipment shall be in conformity with military specification MIL-STD-45662A. In addition, the contractor shall insure the use of only such subcontractor and vendor sources that depend upon calibration systems which effectively control the accuracy of measuring and testing equipment.

4.3 **Production Tooling Used as Media of Inspection.** When production jigs, fixtures, tooling masters, templates, patterns and such other devices are used as media of inspection, they shall be proved for accuracy prior to release for use. These devices shall be proved again for accuracy at intervals formally established in a manner to cause their timely adjustment, replacement or repair prior to becoming inaccurate.

4.4 **Automated Equipment and Processes.** Automated equipment may be used as the media of inspection when the equipment or process assures conformance to requirements by the way it is designed and controlled. Completion of the automated operation may be accepted as objective evidence of conformance to requirements. When automated equipment or processes are used as the measure of conformance they shall be audited on a timely basis to assure the proper calibration and maintenance.

4.5 **Use of Contractor's Inspection Equipment.** The contractor's gages, measuring and testing devices shall be made available for use by the Government when required to determine conformance with contract requirements. If conditions warrant, contractor's personnel shall be made available for operation of such devices and for verification of their accuracy and condition.

4.6 **Advanced Metrology Requirements.** The quality program shall include timely identification and report to the Contracting Officer of any precision measurement need exceeding the known state of the art.

5. CONTROL OF PURCHASES

5.1 **Responsibility.** The contractor is responsible for assuring that all supplies and services procured from his suppliers (subcontractors and vendors) conform to the contract requirements. The selection of sources and the nature and extent of control exercised by the contractor shall be dependent upon the type of supplies, his supplier's demonstrated capability to perform, and the quality evidence made available. To assure an adequate and economical control of such material, the contractor

shall utilize to the fullest extent objective evidence of quality furnished by his suppliers. When the Government elects to perform inspection at a supplier's plant, such inspection shall not be used by contractors as evidence of effective control of quality by such suppliers. The inclusion of a product on the Qualified Products List only signifies that at one time the manufacturer made a product which met specification requirements. It does not relieve the contractor of his responsibility for furnishing supplies that meet all specification requirements or for the performance of specified inspections and tests for such material. The effectiveness and integrity of the control of quality by his suppliers shall be assessed and reviewed by the contractor at intervals consistent with the complexity and quantity of product. Inspection of products upon delivery to the contractor shall be used for assessment and review to the extent necessary for adequate assurance of quality. Test reports, inspection records, certificates and other suitable evidence relating to the supplier's control of quality should be used in the contractor's assessment and review. The contractor's responsibility for the control of purchases includes the establishment of a procedure for (1) the selection of qualified suppliers, (2) the transmission of applicable design and quality requirements in the Government contracts and associated technical requirements, (3) the evaluation of the adequacy of procured items, and (4) effective provisions for early information feedback and correction of nonconformances.

5.2 **Purchasing Data.** The contractor's quality program shall not be acceptable to the Government unless the contractor requires of his subcontractors a quality effort achieving control of the quality of the services and supplies which they provide. The contractor shall assure that all applicable requirements are properly included or referenced in all purchase orders for products ultimately to apply on a Government contract. The purchase order shall contain a complete description of the supplies ordered including, by statement or reference, all applicable requirements for manufacturing, inspecting, testing, packaging, and any requirements for Government or contractor inspections,

qualification or approvals. Technical requirements of the following nature must be included by statement or reference as a part of the required clear description: all pertinent design documentation, engineering design change orders, specifications (including inspection system or quality program requirements), reliability, safety, weight, or other special requirements, unusual test or inspection procedures or equipment and any special revision or model identification. The description of products ordered shall include a requirement for contractor inspection at the subcontractor or vendor source when such action is necessary to assure that the contractor's quality program effectively implements the contractor's responsibility for complete assurance of product quality. Requirements shall be included for chemical and physical testing and recording in connection with the purchase of raw materials by his suppliers. The purchase orders must also contain a requirement for such suppliers to notify and obtain approval from the contractor of changes in design of the products. Necessary instructions should be provided when provision is made for direct shipment from the subcontractor to Government activities.

6. MANUFACTURING CONTROL

6.1 **Materials and Materials Control.** Supplier's materials, process software, and products shall be subjected to inspection upon receipt to the extent necessary to assure conformance to technical requirements. Receiving inspection may be adjusted upon the basis of the quality assurance program exercised by suppliers. Evidence of the suppliers' satisfactory control of quality may be used to adjust the amount and kind of receiving inspection.

The quality program shall assure that raw materials to be used in fabrication or processing of products conform to the applicable physical, chemical, and other technical requirements. Laboratory testing shall be employed as necessary. Suppliers shall be required by the contractor's quality program to exercise equivalent control of the raw materials and software utilized in the production of the parts and items which they supply to

the contractor. Raw material awaiting testing must be separately identified or segregated from already tested and approved material but can be released for initial production, providing that identification and control is maintained. Material tested and approved must be kept identified until such time as its identity is necessarily obliterated by processing. Controls will be established to prevent the inadvertent use of material failing to pass tests.

6.2 **Production Processing and Fabrication.** The contractor's quality program must assure that all machining, wiring, batching, shaping and all basic production operations of any type together with all processing and fabricating of any type is accomplished under controlled conditions. Controlled conditions include documented work instructions, adequate production equipment, and any special working environment. Documented work instructions are considered to be the criteria for much of the production, processing and fabrication work. These documented work instructions may be hard copy or in the form of software such as computer tape or disc. They may be transmitted by hard copy, by a computer terminal or directly to the point of use. These instructions are the criteria for acceptable or unacceptable "workmanship". The quality program will effectively monitor the issuance of and compliance with all of these work instructions.

Physical examination, measurement or tests of the material or products processed must be conducted under controlled conditions. When automated equipment and processes are used conformance to requirements may be determined without physical examination. When this occurs the automated equipment and processes shall be monitored sufficiently to assure control. Both physical inspection and process monitoring shall be provided when control is inadequate without both,or when contract or specification requires both.

Inspection and monitoring of processed material or products shall be accomplished in any suitable systematic manner selected by the contractor. Methods of inspection and monitoring shall be corrected any time their unsuitability with reasonable evidence is demonstrated. Adherence to selected methods for inspection and monitoring shall be complete and continuous. Corrective measures shall be taken when noncompliance occurs.

Inspection by machine operators, automated gages, moving line or lot sampling, setup or first piece approval, production line inspection station, inspection or test department, roving inspectors -- any other type of inspection -- shall be employed in any combination desired by the contractor which will adequately and efficiently protect product quality and the integrity of processing.

Criteria for approval and rejection shall be provided for all inspection of product and monitoring of methods, equipment, and personnel. Means for identifying rejected product shall be provided.

Certain chemical, metallurgical, biological, sonic, electronic, and radiological processes are of so complex and specialized a nature that much more than the ordinary detailing or work documentation is required. In effect, such processing may require an entire work specification as contracted with the normal work operation instructions established in normal plant-wide standard production control issuances such as job operation routing books and the like. For these special processes, the contractors' quality program shall assure that the process control procedures or specifications are adequate and that processing environments and the certifying, inspection, authorization and monitoring of such processes to the special degree necessary for these ultraprecise and super-complex work functions are provided.

6.3 **Completed Item Inspection and Testing.** The quality program shall assure that there is a system for final inspection and test of completed products. Such testing shall provide a measure of the overall quality of the

completed product and shall be performed so that it simulates, to a sufficient degree, product end use and functioning. Such simulation frequently involves appropriate life and endurance tests and qualification testing. Final inspection and testing shall provide for reporting to designers any unusual difficulties, deficiencies or questionable conditions. When modifications, repairs or replacements are required after final inspection or testing, there shall be reinspection and retesting of any characteristics affected.

6.4 **Handling, Storage and Delivery.** The quality program shall provide for adequate work and inspection instructions for handling, storage, preservation, packaging, and shipping to protect the quality of products and prevent damage, loss deterioration, degradation, or substitution of products. With respect to handling, the quality program shall require and monitor the use of procedures to prevent handling damage to articles. Handling procedures of this type include the use of special crates, boxes, containers, transportation vehicles and any other facilities for materials handling. Means shall be provided for any necessary protection against deterioration or damage to products in storage. Periodic inspection for the prevention and results of such deterioration or damage shall be provided. Products subject to deterioration or corrosion during fabrication or interim storage shall be cleaned and preserved by methods which will protect against such deterioration or corrosion. When necessary, packaging designing and packaging shall include means for accommodating and maintain critical environments within packages, e.g., moisture content levels, gas pressures. The quality program shall assure that when such packaging environments must be maintained, packages are labeled to indicate this condition. The quality program shall monitor shipping work to assure that products shipped are accompanied with required shipping and technical documents and that compliance with Interstate Commerce Commission rules and other applicable shipping regulations is effected to assure safe arrival and identification at destination. In compliance with contractual requirements, the quality program shall include monitoring provisions for protection of the quality of products during transit.

6.5 **Nonconforming Material.** The contractor shall establish and maintain an effective and positive system for controlling nonconforming material, including procedures for its identification, segregation, and disposition. Repair of nonconforming material shall be in accordance with documented procedures acceptable to the Government. The acceptance of nonconforming supplies is a prerogative of and shall be as prescribed by the Government and may involve a monetary adjustment. All nonconforming supplies shall be positively identified to prevent unauthorized use, shipment and intermingling with conforming supplies. Holding areas or procedures mutually agreeable to the contractor and the Government Representative shall be provided by the contractor. The contractor shall make known to the Government upon request the data associated with the costs and losses in connection with scrap and with rework necessary to reprocess nonconforming material to make it conform completely.

6.6 **Statistical Quality Control and Analysis.** In addition to statistical methods required by the contract, statistical planning, analysis, test and quality control procedures may be utilized whenever such procedures are suitable to maintain the required control of quality. Sampling plans may be used when tests are destructive, or when the records, inherent characteristics of the product or the noncritical application of the product, indicate that a reduction in inspection or testing can be achieved without jeopardizing quality (critical and finite life items will normally be inspected 100%). The contractor may employ sampling inspection in accordance with applicable military standards and sampling plans (e.g., from MIL-STD-105D, MIL-STD-414, or Handbooks H 106, 107, 108). If the contractor uses other sampling plans, they shall be subject to review by the cognizant Government Representative. Any sampling plan used shall provide valid confidence and quality levels.

6.7 **Indication of Inspection Status.** The contractor shall maintain a positive system for identifying the inspection status of products. Identification may be accomplished by means of stamps, tags, routing cards,

move tickets, tote box cards, bar codes or other acceptable control devices. Such controls shall be of a design distinctly different from Government inspection identification.

6.8 **Audits.** The contractor shall maintain a quality audit plan to assure that products meet contract quality commitments and fulfill the customer's quality requirements. The audits shall cover the complete production process for which the contractor is responsible.

7. COORDINATED GOVERNMENT/CONTRACTOR ACTIONS

7.1 **Government Inspection at Subcontractor or Vendor Facilities.** The Government reserves the right to inspect at source supplies or services not manufactured or performed with the contractor's facility. Government inspection shall not constitute acceptance; nor shall it in any way replace contractor inspection or otherwise relieve the contractor of his responsibility to furnish an acceptable end item. The purpose of this inspection is to assist the Government Representative at the contractor's facility to determine the conformance of supplies or services with contract requirements. Such inspection can only be requested by or under authorization of the Government Representative. When Government inspection is required, the contractor shall add to his purchasing document the following statement:

> "Government inspection is required prior to shipment from your plant. Upon receipt of this order, promptly notify the Government Representative who normally services your plant so that appropriate planning for Government inspection can be accomplished."

When, under authorization of the Government Representative, copies of the purchasing document are to be furnished directly by the subcontractor or vendor to the Government Representative at his facility rather than through Government channels, the contractor shall add to his purchasing document a statement substantially as follows:

"On receipt of this order, promptly furnish a copy to the Government Representative who normally services your plant, or, if none, to the nearest Army, Navy, Air Force, or Defense Supply Agency inspection office. In the event the representative or office cannot be located, our purchasing agent should be notified immediately."

All documents and referenced data for purchases applying to a Government contract shall be available for review by the Government Representative to determine compliance with the requirements for the control of such purchases. Copies of purchasing documents required for Government purposes shall be furnished in accordance with the instructions of the Government Representative. The contractor shall make available to the Government Representative reports, either as hard copy, soft copy, or by access to the computer data base, of any nonconformance found on Government source inspected supplies and shall (when requested) require the supplier to coordinate with his Government Representative on corrective action.

7.2 **Government Property.**

7.2.1 **Government-furnished Material.** When material is furnished by the Government, the contractor's procedures shall include at least the following:

(a) Examination upon receipt, consistent with practicability to detect damage in transit;

(b) Inspection for completeness and proper type;

(c) Periodic inspection and precautions to assure adequate storage conditions and to guard against damage from handling and deterioration during storage;

(d) Functional testing, either prior to or after installation, or both, as required by contract to determine satisfactory operation;

(e) Identification and protection from improper use or disposition, and

(f) Verification of quantity.

7.2.2 **Damaged Government-furnished Material.** The contractor shall report to the Government Representative any Government-furnished material found damaged, malfunctioning, or otherwise unsuitable for use. In the event of damage or malfunctioning during or after installation, the contractor shall determine and record probable cause and necessity for withholding material from use.

7.2.3 **Bailed Property.** The contractor shall, as required by the terms of the Bailment Agreement, establish procedures for the adequate storage, maintenance and inspection of bailed Government property. Records of all inspections and maintenance performed on bailed property shall be maintained. These procedures and records shall be subject to review by the Government Representative.

8. **NOTES**

(The following information is provided solely for guidance in using this standard. It has no contractual significance.)

8.1 **Intended Use.** This standard will apply to complex supplies, components, equipments and systems for which the requirements of MIL-I-45208 are inadequate to provide needed quality assurance. In such cases, total conformance to contract requirements cannot be obtained effectively and economically solely by controlling inspection and testing. Therefore, it is essential to control work operations and manufacturing processes as well as inspections and tests. The purpose of this control is not only to assure that particular units of hardware conform to contractual requirements, but also to assure interface compatibility among these units of hardware/software when they collectively comprise major equipments, subsystems and systems.

8.2 **Exemptions.** This standard will not be applicable to types of supplies for which MIL-I-45208 applies. The following do not normally require the application of this specification.

(a) Personal services, and

(b) Research and development studies of a theoretical nature which do not require fabrication of articles.

8.3 **Order Data.** Procurement documents should specify the title, number and date of this standard.

Preparing Activity:

Air Force -- Hq USAF

Custodians:
Army -- Munitions Command
Navy -- Office of Naval Material
Air Force -- Hq USAF
DSA -- Hq DSA

3.2 MIL-STD-109 Additions - Alternative Approach

3.2.1 Objective

To establish improved flexibility with regards to the interpretation of Quality Assurance Program Management terminology. MIL-STD-109, which is the glossary for MIL-Q-9858A, is the recommended mechanism to provide this flexibility.

3.2.2 Glossary Additions/Revisions to MIL-STD-109

A review of MIL-Q-9858A reveals seven key words or phrases that when redefined would clarify the new automated environment. Those key words are:

- Objective Evidence
- Records
- Copies
- Drawings
- Work Instructions
- Identification of Inspection Status
- Reports

There are several ways to handle the definition of these key words. One would be to include a glossary as paragraph 1.6 in MIL-Q-9858A. The recommended approach, however, is to expand MIL-STD-109 to include the following additions and revisions.

3.2.2.1 Objective Evidence of Quality (Additions to Present Definitions are Underlined)

Any statement of fact, either quantitative or qualitative, pertaining to the quality of a product or services based on observations, measurements, or tests which can be verified. (Evidence will be expressed in terms of specific quality requirements or characteristics. These characteristics are defined in drawings, specifications, and other documents which describe the item, process, or procedure and may be presented on tapes, discs or other electronic media capable of being displayed on a computer terminal or video screen.)

3.2.2.2 Records (New)

Records are an official account of an activity kept for future use. They may on paper (hard copy) such as written material, drawings, pictures, sketches, charts, graphs, and similar data or they may be on film, tapes, discs, and other electronic media (soft copy) capable of being displayed on a computer terminal or video screen.

3.2.2.3 Copies (New)

The requirement of furnishing the Government Representative "copies" of records and other objective evidence shall be satisfied by furnishing a paper or hardcopy, or by furnishing a tape or disc (soft copy) capable of being viewed on a video screen. The requirement may also be satisfied by providing the Government Representative access to a computer terminal or video screen where the information can be seen.

3.2.2.4 Drawings (New)

Drawings are one part of design documentation. They relate to the design of a product, machine, tool, or similar device. The design may be documented through software stored on computer tape, disc, or other suitable media. In many cases the design documentation or drawing will be transmitted to the point of use without being transcribed on paper. In any case, drawings or design documentation will be controlled in such a way as to assure effective introduction points and the removal of all obsolete drawings from points of use.

3.2.2.5 Work Instructions (New)

Work Instructions are detailed descriptions of the manufacturing process or task. They may be in hard copy form or in software form such as computer tapes or discs. Work Instructions may be transmitted to an operator for use or transmitted directly to a machine. Storage of Work Instructions may be either as hardcopy or as software.

3.2.2.6 Identification of Inspection Status (New)

The contractor is required to maintain a system for identifying the inspection status of all production materials and products.

This identification may be accomplished by means of stamps, tags, routing cards, move tickets, tote box cards, bar codes, or other acceptable techniques. The identification may also be accomplished through automated routing or other automated control of material movement.

3.2.2.7 Reports (New)

Reports may be either in hardcopy or software form. If the report is in software form the contractor must make the report available to the Government Representative as a tape, disc, or other suitable device, or the Government Representative must be able to view the report at a suitable computer terminal or video screen.

3.3 MIL-Q-9858A Rewrite - Alternative Approach

3.3.1 Objective

To establish an incremental improvement that will assure product quality while maintaining the integrity of MIL-Q-9858A requirements. Because of the wide acceptance of MIL-Q-9858A throughout industry and the DoD, any initiatives for drastic change would be an unacceptable approach for improvement. The following changes are deemed appropriate for this approach.

3.3.2 MIL-Q-9858A Rewrite

The following section contains a recommended rewrite of MIL-Q-9858A for the evolutionary improvement of Quality Assurance Program Management. Recommended additions are underlined.

ISP110513000
18 AUGUST 1983

RECOMMENDATIONS FOR CHANGES IN MIL-Q-9858A

TO MEET NEEDS OF AUTOMATED MANUFACTURING ENVIRONMENTS

MILITARY SPECIFICATIONS

QUALITY PROGRAM REQUIREMENTS

1. SCOPE

1.1 **Applicability.** This specification shall apply to all supplies (including equipments, subsystems and systems) or services when referenced in the item specification, contract or order.

1.2 **Contractual Intent.** This specification requires the establishment of a quality program by the contractor to assure compliance with the requirements of the contract. The program and procedures used to implement this specification shall be developed by the contractor. The quality program, including procedures, processes and product shall be documented in whatever manner is appropriate and shall be subject to review by the government representative. The quality program is subject to the disapproval of the Government Representative whenever the contractor's procedures do not accomplish their objectives. The Government, at its option, may furnish written notice of the acceptability of the contractor's quality program.

1.3 **Summary.** An effective and economical quality program, planned and developed in consonance with the contractor's other administrative and technical programs, is required by this specification. Design of the program shall be based upon consideration of the technical manufacturing aspects of production and related engineering design and materials. The program shall assure adequate quality throughout all areas of contract performance; for example, design, development, fabrication, processing, assembly, inspection, test, maintenance, packaging, shipping, storage, and site installation.

All supplies and services under the contract, whether manufactured or performed within the contractor's plant or at any other source, shall be controlled at all points necessary to assure conformance to contractual requirements. The program shall provide for the prevention and ready detection of discrepancies and for timely and positive corrective action. The contractor shall make objective evidence of quality conformance readily available to the Government Representative. Objective evidence may be in form of written material, graphs, charts and pictures either on paper, film or as a display on a computer terminal or video screen. Instructions and records for quality must be controlled.

The authority and responsibility of those in charge of the design, production, testing, and inspection of quality shall be clearly stated. The program shall facilitate determinations of the effects of quality deficiencies and quality costs on price. Facilities and standards such as drawings, engineering changes, measuring equipment and the like which are necessary for the creation of the required quality shall be effectively managed. The program shall include an effective control of purchased materials and subcontracted work. Manufacturing, fabrication and assembly work conducted within the contractor's plant shall be controlled completely. The quality program shall also include effective execution of responsibilities shared jointly with the Government or related to Government functions, such as control of Government property and Government source inspection.

1.4 Relation to Other Contract Requirements. This specification and any procedure or document executed in implementation thereof, shall be in addition to and not in derogation of other contract requirements. The quality program requirements set forth in this specification shall be satisfied in addition to all detail requirements contained in the statement of work or in other parts of the contract. The contractor is responsible for compliance with all provisions of the contract and for furnishing specified supplies and services which meet all the requirements of the

contract. If any inconsistency exists between the contract schedule or its general provisions and this specification, the contract schedule and the general provisions shall control. The contractor's quality program shall be planned and used in a manner to support reliability effectively.

1.5 **Relation to MIL-I-45208.** This specification contains requirements in excess of those in specification MIL-I-45208, Inspection System Requirements, inasmuch as total conformance to contract requirements is obtained best by controlling work operations, manufacturing processes as well as inspections and tests.

2. SUPERSEDING, SUPPLEMENTATION AND ORDERING

2.1 **Applicable Documents.** The following documents of the issue in effect on date of the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-I-45208 -- Inspection System Requirements
MIL-STD-45662 -- Calibration System Requirements

2.2 **Amendments and Revisions.** Whenever this specification is amended or revised subsequent to its contractually effective date, the contractor may follow or authorize his subcontractors to follow the amended or revised document provided no increase in price or fee is required. The contractor shall not be required to follow the amended or revised document except as a change in contract. If the contractor elects to follow the amended or revised document, he shall notify the Contracting Officer, in writing, of this election. When the contractor elects to follow the provisions of an amendment or revision, he must follow them in full.

2.3 **Ordering Government Documents.** Copies of specification , standards and drawings required by contractors in connection with specific procurements may be obtained from the procuring agency, or as otherwise directed by the Contracting Officer.

3. QUALITY PROGRAM MANAGEMENT

3.1 **Organization.** Effective management for quality shall be clearly prescribed by the contractor. Personnel performing quality functions shall have sufficient, well-defined responsibility, authority and the organizational freedom to identify and evaluate quality problems and to initiate, recommend or provide solutions. Management regularly shall review the status and adequacy of the quality program. The term "quality program requirements" as used herein identifies the collective requirements of this specification. It does not mean that the fulfillment of the requirements of this specification is the responsibility of any single contractor's organization, function or person.

3.2 **Initial Quality Planning.** The contractor, during the earliest practical phase of contract performance, shall conduct a complete review of the requirements of the contract to identify and make timely provision for the special controls, processes, test equipments, fixtures, tooling and skills required for assuring product quality. This initial planning will organize the need and provide for research, when necessary, to update inspection and testing techniques, instrumentation and correlation of inspection and test results with manufacturing methods and processes. This planning will also provide appropriate review and action to assure compatibility of manufacturing, inspection, testing and documentation.

3.3 **Work Instructions.** The quality program shall assure that all work affecting quality (including such things as purchasing, handling, machining, assembling, fabricating, processing, inspection, testing, modification, installation, and any other treatment of product, facilities, standards or equipment from the ordering of materials to dispatch of shipments) shall be prescribed in clear and complete documented instructions of a type appropriate to the circumstances. Work instructions may be in hard copy form such as written instructions on paper or film, or in soft copy form such as computer tapes and discs. Work instructions may be transmitted to an operator or directly to a machine. Such instructions

shall provide the criteria for performing the work functions and they shall be compatible with acceptance criteria for workmanship. The instructions are intended also to serve for supervising, inspecting and managing work. The preparation and maintenance of and compliance with work instructions shall be monitored as a function of the quality program.

3.4 Records. The contractor's quality assurance program documentation and planning shall focus on preventing quality problems. These records, either as hard copy or as soft copy such as computer tapes or discs, shall be available for review by the Government Representative and copies of individual records shall be furnished him upon request. The requirement of furnishing the Government Representative copies of records shall be satisfied by furnishing a hard copy of the records or by furnishing a soft copy, such as a tape or disc, capable of being viewed at a computer terminal or a video screen. The requirement may also be satisfied by providing the Government Representative access to a computer terminal or a video screen where the information can be seen. Records are considered one of the principal forms of objective evidence of quality. The quality program shall assure that records are complete and reliable. Inspection and testing records shall, as a minimum, indicate the nature of the observations together with the number of observations made and the number and type of deficiencies found. Also, records for monitoring work performance and for inspection and testing shall indicate the acceptability of work or products and the action taken in connection with deficiencies. The quality program shall provide for the analysis and use of records as a basis for management action.

3.5 Corrective Action. The quality program shall detect promptly and correct assignable conditions adverse to quality. Design, purchasing, manufacturing, testing or other operations which could result in or have resulted in defective supplies, services, facilities, technical data, standards or other elements of contract performance which could create excessive losses or costs must be identified and changed as a result of the quality program. Corrective action will extend to the

performance of all suppliers and vendors and will be responsive to data and product forwarded from users. Corrective action shall include as a minimum:

(a) Analysis of data and examination of product scrapped or reworked to determine extent and causes;
(b) Analysis of trends in processes or performance of work to prevent nonconforming product; and
(c) Introduction of required improvements and corrections, an initial review of the adequacy of such measures and monitoring of the effectiveness of corrective action taken.

3.6 **Costs Related to Quality.** The contractor shall maintain and use quality cost data as a management element of the quality program. These data shall serve the purpose of identifying the cost of both the prevention and correction of nonconforming supplies (e.g., labor and material involved in material spoilage caused by defective work, correction of defective work and for quality control exercised by the contractor at subcontractor's or vendor's facilities). The specific quality cost data to be maintained and used will be determined by the contractor. These data shall, on request, be identified and made available for review by the Government Representative.

4. FACILITIES AND STANDARDS

4.1 **Drawings, Documentation and Changes.** A procedure shall be maintained that concerns itself with the adequacy, the completeness and the currentness of design documents and with the control of changes in design. Design documents include drawings and specifications either in hard copy form or in software form such as computer tapes or discs. With respect to the currentness of design documents and changes, the contractor shall assure that requirements for the effectivity point of changes are met and that obsolete design documents and change requirements are removed from all points of issue and use. Some means of recording the effective points shall be employed and be available to the Government.

With respect to design documents, a procedure shall be maintained that shall provide for the evaluation of their engineering adequacy of proposed changes. The evaluation shall encompass both the adequacy in relation to standard engineering and design practices and the adequacy with respect to the design and purpose of the product to which the drawing relates.

With respect to supplemental specifications, process instructions, production engineering instructions and work instructions relating to a particular design, the contractor shall be responsible for a review of their adequacy, currentness and completeness. The quality program must provide complete coverage of all information necessary to produce an article in complete conformity with requirements of the design.

The quality program shall assure that there is complete compliance with contract requirements for proposing, approving, and effecting of engineering changes. The quality program shall provide for monitoring effectively compliance with contractual engineering changes requiring approval by Government design authority. The quality program shall provide for monitoring effectively the design documentation changes of lesser importance not requiring approval by Government design authorities.

Delivery of correct design documentation and change information to the Government in connection with data acquisition shall be an integral part of the quality program. This includes full compliance with contract requirements concerning rights and data both proprietary and other. The quality program's responsibility for drawings and changes extend to the drawings and changes provided by the subcontractors and vendors for the contract.

4.2 **Measuring and Testing Equipment.** The contractor shall provide and maintain gages and other measuring and testing devices necessary to assure that supplies conform to technical requirements. These devices shall be calibrated against certified measurement standards which have known valid relationships to national standards at established periods to assure continued accuracy. The

objective is to assure that inspection and test equipment is adjusted, replaced or repaired before it becomes inaccurate. The calibration of measuring and testing equipment shall be in conformity with military specification MIL-STD-45662. In addition, the contractor shall insure the use of only such subcontractor and vendor sources that depend upon calibration systems which effectively control the accuracy of measuring and testing equipment.

4.3 **Production Tooling Used as Media of Inspection.** When production jigs, fixtures, tooling masters, templates, patterns and such other devices are used as media of inspection, they shall be proved for accuracy prior to release for use. These devices shall be proved again for accuracy at intervals formally established in a manner to cause their timely adjustment, replacement or repair prior to becoming inaccurate.

4.4 **Use of Contractor's Inspection Equipment.** The contractor's gages, measuring and testing devices shall be made available for use by the Government when required to determine conformance with contract requirements. If conditions warrant, contractor's personnel shall be made available for operation of such devices and for verification of their accuracy and condition.

4.5 **Advanced Metrology Requirements.** The quality program shall include timely identification and report to the Contracting Officer of any precision measurement need exceeding the known state of the art.

5. **CONTROL OF PURCHASES**

5.1 **Responsibility.** The contractor is responsible for assuring that all supplies and services procured from his suppliers (subcontractors and vendors) conform to the contract requirements. The selection of sources and the nature and extent of control exercised by the contractor shall be dependent upon the type of supplies, his supplier's demonstrated capability to perform, and the quality evidence made available. To assure an adequate and economical control of such material, the contractor shall utilize to the fullest extent objectives evidence

of quality furnished by his suppliers. When the Government elects to perform inspection at a supplier's plant, such inspection shall not be used by contractors as evidence of effective control of quality by such suppliers. The inclusion of a product on the Qualified Products List only signifies that at one time the manufacturer made a product which met specification requirements. It does not relieve the contractor of his responsibility for furnishing supplies that meet all specification requirements or for the performance of specified inspections and tests for such material. The effectiveness and integrity of the control of quality by his suppliers shall be assessed and reviewed by the contractor at intervals consistent with the complexity and quantity of product. Inspection of products upon delivery to the contractor shall be used for assessment and review to the extent necessary for adequate assurance of quality. Test reports, inspection records, certificates and other suitable evidence relating to the supplier's control of quality should be used in the contractor's assessment and review. The contractor's responsibility for the control of purchases includes the establishment of a procedure for (1) the selection of qualified suppliers, (2) the transmission of applicable design and quality requirements in the Government contracts and associated technical requirements, (3) the evaluation of the adequacy of procured items, and (4) effective provisions for early information feedback and correction of nonconformances.

5.2 **Purchasing Data.** The contractor's quality program shall not be acceptable to the Government unless the contractor requires of his subcontractors a quality effort achieving control of the quality of the services and supplies which they provide. The contractor shall assure that all applicable requirements are properly included or referenced in all purchase orders for products ultimately to apply on a Government contract. The purchase order shall contain a complete description of the supplies ordered including, by statement or reference, all applicable requirements for manufacturing, inspections, testing, packaging, and any requirements for Government or contractor inspections, qualification or approvals. Technical requirements of the following

nature must be included by statement or reference as a part of the required clear description: all pertinent design documentation, engineering design change orders, specifications (including inspection system or quality program requirements), reliability, safety, weight, or other special requirements, unusually test or inspection procedures or equipment and any special revision or model identification. The description of products ordered shall include a requirement for contractor inspection at the subcontractor or vendor source when such action is necessary to assure that the contractor's quality program effectively implements the contractor's responsibility for complete assurance of product quality. Requirements shall be included for chemical and physical testing and recording in connection with the purchase of raw materials by his suppliers. The purchase orders must also contain a requirement for such suppliers to notify and obtain approval from the contractor of changes in design of the products. Necessary instructions should be provided when provision is made for direct shipment from the subcontractor to Government activities.

6. MANUFACTURING CONTROL

6.1 **Materials and Materials Control.** Supplier's materials and products shall be subjected to inspection upon receipt to the extent necessary to assure conformance to technical requirements. Receiving inspection may be adjusted upon the basis of the quality assurance program exercised by suppliers. Evidence of the suppliers' satisfactory control of quality may be used to adjust the amount and kind of receiving inspection.

The quality program shall assure that raw materials to be used in fabrication or processing of products conform to the applicable physical, chemical, and other technical requirements. Laboratory testing shall be employed as necessary. Suppliers shall be required by the contractor's quality program to exercise equivalent control of the raw materials utilized in the production of the parts and items which they supply to the contractor. Raw material awaiting testing must be separately identified or segregated from already tested and approved material but can be released for initial

production, providing that identification and control is maintained. Material tested and approved must be kept identified until such time as its identity is necessarily obliterated by processing. Controls will be established to prevent the inadvertent use of material failing to pass tests.

6.2 **Production Processing and Fabrication.** The contractor's quality program must assure that all machining, wiring, batching, shaping and all basic production operations of any type together with all processing and fabricating of any type is accomplished under controlled conditions. Controlled conditions include documented work instructions, adequate production equipment, and any special working environment. Documented work instructions are considered to be the criteria for much of the production, processing and fabrication work. These documented work instructions may be hard copy or in the form of software such as computer tape or disc. They may be transmitted by hard copy, by a computer terminal or directly to the point of use. These instructions are the criteria for acceptable or unacceptable "workmanship". The quality program will effectively monitor the issuance of and compliance with all of these work instructions.

Physical examination, measurement or tests of the material or products processed is necessary for each work operation and must also be conducted under controlled conditions. If physical inspection of processed material is impossible or disadvantageous, indirect control by monitoring processing methods, equipment and personnel shall be provided. Both physical inspection and process monitoring shall be provided when control is inadequate without both,or when contract or specification requires both.

Inspection and monitoring of processed material or products shall be accomplished in any suitable systematic manner selected by the contractor. Methods of inspection and monitoring shall be corrected any time their unsuitability with reasonable evidence is demonstrated. Adherence to selected methods for inspection and monitoring shall be complete and continuous. Corrective measures shall be taken when noncompliance occurs.

Inspection by machine operators, automated gages, moving line or lot sampling, setup or first piece approval, production line inspection station, inspection or test department, roving inspectors -- any other type of inspection -- shall be employed in any combination desired by the contractor which will adequately and efficiently protect product quality and the integrity of processing.

Criteria for approval and rejection shall be provided for all inspection of product and monitoring of methods, equipment, and personnel. Means for identifying approved and rejected product shall be provided.

Certain chemical, metallurgical, biological, sonic, electronic, and radiological processes are of so complex and specialized a nature that much more than the ordinary detailing or work documentation is required. In effect, such processing may require an entire work specification as contracted with the normal work operation instructions established in normal plant-wide standard production control issuances such as job operation routing books and the like. For these special processes, the contractors' quality program shall assure that the process control procedures or specifications are adequate and that processing environments and the certifying, inspection, authorization and monitoring of such processes to the special degree necessary for these ultraprecise and super-complex work functions are provided.

6.3 **Completed Item Inspection and Testing.** The quality program shall assure that there is a system for final inspection and test of completed products. Such testing shall provide a measure of the overall quality of the completed product and shall be performed so that it simulates, to a sufficient degree, product end use and functioning. Such simulation frequently involves appropriate life and endurance tests and qualification testing. Final inspection and testing shall provide for reporting to designers any unusual difficulties, deficiencies or questionable conditions. When modifications, repairs or replacements are required after final inspection or testing, there shall be reinspection and retesting of any characteristics affected.

6.4 **Handling, Storage and Delivery.** The quality program shall provide for adequate work and inspection instructions for handling, storage, preservation, packaging, and shipping to protect the quality of products and prevent damage, loss deterioration, degradation, or substitution of products. With respect to handling, the quality program shall require and monitor the use of procedures to prevent handling damage to articles. Handling procedures of this type include the use of special crates, boxes, containers, transportation vehicles and any other facilities for materials handling. Means shall be provided for any necessary protection against deterioration or damage to products in storage. Periodic inspection for the prevention and results of such deterioration or damage shall be provided. Products subject to deterioration or corrosion during fabrication or interim storage shall be cleaned and preserved by methods which will protect against such deterioration or corrosion. When necessary, packaging designing and packaging shall include means for accommodating and maintain critical environments within packages, e.g., moisture content levels, gas pressures. The quality program shall assure that when such packaging environments must be maintained, packages are labeled to indicate this condition. The quality program shall monitor shipping work to assure that products shipped are accompanied with required shipping and technical documents and that compliance with Interstate Commerce Commission rules and other applicable shipping regulations is effected to assure safe arrival and identification at destination. In compliance with contractual requirements, the quality program shall include monitoring provisions for protection of the quality of products during transit.

6.5 **Nonconforming Material.** The contractor shall establish and maintain an effective and positive system for controlling nonconforming material, including procedures for its identification, segregation, and disposition. Repair or rework of nonconforming material shall be in accordance with documented procedures acceptable to the Government. The acceptance of nonconforming supplies is a prerogative of and shall be as prescribed by the Government and may involve a monetary adjustment. All

nonconforming supplies shall be positively identified to prevent unauthorized use, shipment and intermingling with conforming supplies. Holding areas or procedures mutually agreeable to the contractor and the Government Representative shall be provided by the contractor. The contractor shall make known to the Government upon request the data associated with the costs and losses in connection with scrap and with rework necessary to reprocess nonconforming material to make it conform completely.

6.6 **Statistical Quality Control and Analysis.** In addition to statistical methods required by the contract, statistical planning, analysis, test and quality control procedures may be utilized whenever such procedures are suitable to maintain the required control of quality. Sampling plans may be used when tests are destructive, or when the records, inherent characteristics of the product or the noncritical application of the product, indicate that a reduction in inspection or testing can be achieved without jeopardizing quality. The contractor may employ sampling inspection in accordance with applicable *military standards and sampling plans* (e.g., form MIL-STD-105, MIL-STD-414, or Handbooks H 106, 107, 108). If the contractor uses other sampling plans, they shall be subject to review by the cognizant Government Representative. Any sampling plan used shall provide valid confidence and quality levels.

6.7 **Indication of Inspection Status.** The contractor shall maintain a positive system for identifying the inspection status of products. Identification may be accomplished by means of stamps, tags, routing cards, move tickets, tote box cards, bar codes or other acceptable control devices. Such controls shall be of a design distinctly different from Government inspection identification.

7. COORDINATED GOVERNMENT/CONTRACTOR ACTIONS

7.1 **Government Inspection at Subcontractor or Vendor Facilities.** The Government reserves the right to inspect at source supplies or services not manufactured or performed with the contractor's facility. Gove·nment inspection shall not constitute acceptance; nor shall it

in any way replace contractor inspection or otherwise relieve the contractor of his responsibility to furnish an acceptable end item. The purpose of this inspection is to assist the Government Representative at the contractor's facility to determine the conformance of supplies or services with contract requirements. Such inspection can only be requested by or under authorization of the Government Representative. When Government inspection is required, the contractor shall add to his purchasing document the following statement:

> "Government inspection is required prior to shipment from your plant. Upon receipt of this order, promptly notify the Government Representative who normally services your plant so that appropriate planning for Government inspection can be accomplished.."

When, under authorization of the Government Representative, copies of the purchasing document are to be furnished directly by the subcontractor or vendor to the Government Representative at his facility rather than through Government channels, the contractor shall add to his purchasing document a statement substantially as follows:

> "On receipt of this order, promptly furnish a copy to the Government Representative who normally services your plant, or, if none, to the nearest Army, Navy, Air Force, or Defense Supply Agency inspection office. In the event the representative or office cannot be located, our purchasing agent should be notified immediately."

All documents and referenced data for purchases applying to a Government contract shall be available for review by the Government Representative to determine compliance with the requirements for the control of such purchases. Copies of purchasing documents required for Government purposes shall be furnished in accordance with the instructions of the Government Representative. The contractor shall make available to the Government Representative reports, either as hard copy, software, or by access to the computer data base, of any

nonconformance found on Government source inspected supplies and shall (when requested) require the supplier to coordinate with his Government Representative on corrective action.

7.2 **Government Property.**

7.2.1 **Government-furnished Material.** When material is furnished by the Government, the contractor's procedures shall include at least the following:

(a) Examination upon receipt, consistent with practicability to detect damage in transit;

(b) Inspection for completeness and proper type;

(c) Periodic inspection and precautions to assure adequate storage conditions and to guard against damage from handling and deterioration during storage;

(d) Functional testing, either prior to or after installation, or both, as required by contract to determine satisfactory operation;

(e) Identification and protection from improper use or disposition, and

(f) Verification of quantity.

7.2.2 **Damaged Government-furnished Material.** The contractor shall report to the Government Representative any Government-furnished material found damaged, malfunctioning, or otherwise unsuitable for use. In the event of damage or malfunctioning during or after installation, the contractor shall determine and record probable cause and necessity for withholding material from use.

7.2.3 **Bailed Property.** The contractor shall, as required by the terms of the Bailment Agreement, establish procedures for the adequate storage, maintenance and inspection of bailed Government property. Records of all inspections and maintenance performed on bailed property shall be maintained. These procedures and records shall be subject to review by the Government Representative.

8. NOTES

(The following information is provided solely for guidance in using this specification. It has no contractual significance.)

8.1 **Intended Use.** This specification will apply to complex supplies, components, equipments and systems for which the requirements of MIL-I-45208 are inadequate to provide needed quality assurance. In such cases, total conformance to contract requirements cannot be obtained effectively and economically solely by controlling inspection and testing. Therefore, it is essential to control work operations and manufacturing processes as well as inspections and tests. The purpose of this control is not only to assure that particular units of hardware conform to contractual requirements, but also to assure interface compatibility among these units of hardware when they collectively comprise major equipments, subsystems and systems.

8.2 **Exemptions.** This specification will not be applicable to types of supplies for which MIL-I-45208 applies. The following do not normally require the application of this specification.

(a) Personal services, and

(b) Research and development studies of a theoretical nature which do not require fabrication of articles.

8.3 **Order Data.** Procurement documents should specify the title, number and date of this specification.

Preparing Activity:

Air Force -- Hq USAF

Custodians:
Army -- Munitions Command
Navy -- Office of Naval Material
Air Force -- Hq USAF
DSA -- Hq DSA

APPENDIX A

QUALITY ASSURANCE PROGRAM MANAGEMENT STANDARD

DATA COLLECTION

Appendix A contains the presentation given at fact-finding visits and was used to explain the QA/QC project before asking for a response to the questionnaire or having a general discussion on what should be included in a new quality assurance standard for the automated environment of the Factory of The Future.

ICAM

INTEGRATED COMPUTER-AIDED MANUFACTURING

QUALITY ASSURANCE/QUALITY CONTROL

GENERAL ELECTRIC COMPANY

ISP110513000
18 AUGUST 1983

WHY ARE WE HERE?

- TO SOLICIT YOUR AID IN ENHANCING QA/QC MILITARY STANDARDS AND SPECIFICATIONS BY:

  - REVIEWING AIR FORCE QUALITY ASSURANCE/ QUALITY CONTROL PROGRAM, AND

  - DISCUSSING QA/QC SYSTEM PROBLEMS AND OPPORTUNITIES

ISP110513000
18 AUGUST 1983

ICAM

Integrated Computer-Aided Manufacturing

- SPONSORED BY: COMPUTER INTEGRATED MANUFACTURING BRANCH
  MATERIALS LABORATORY
  AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
  WRIGHT-PATTERSON AIR FORCE BASE, OHIO

- TECHNICAL DIRECTOR: NATHAN G. TUPPER, CHIEF
  COMPUTER INTEGRATED MANUFACTURING BRANCH

ISP110513000
18 AUGUST 1983

ICAM

TASK D

- PRIME CONTRACTOR: VOUGHT CORPORATION
- SUB CONTRACTOR (FOR TASK D): GENERAL ELECTRIC COMPANY
- COALITION FOR TASK D:
  GENERAL DYNAMICS - FORT WORTH
  NORTHROP - HAWTHORNE
  VOUGHT - DALLAS

ISP11051300O
18 AUGUST 1983

ICAM

- 5-YEAR, $100 MILLION EFFORT
- OVERALL OBJECTIVES:
  - PROVIDE MECHANISM FOR ICAM TECHNOLOGY TRANSFER.
  - IMPROVE LONG-TERM COMPETENCE, EFFICIENCY AND RESPONSIVENESS TO DEFENSE NEEDS.
  - APPLY COMPUTER-AIDED MANUFACTURING IN DEFENSE SYSTEMS.
  - DEMONSTRATE ICAM COST SAVINGS BENEFITS AND FLEXIBILITY.
- WILL DEMONSTRATE WITH THE INTEGRATED SHEET METAL CENTER

ISPI10513000
18 AUGUST 1983

ICAM

- PRIME CONTRACT: CONCEPTUAL DESIGN FOR COMPUTER-INTEGRATED MANUFACTURING
  PROJECT PRIORITY - 1105

- AIR FORCE PROJECT MANAGER: CAPTAIN RICHARD R. PRESTON

- THREE MAJOR TASKS:

  1) TASK B - VOUGHT - ESTABLISH FACTORY-OF-THE-FUTURE FRAMEWORK.

  2) TASK C - NORTHROP - ESTABLISH INTEGRATED COMPOSITE CENTER CONCEPTUAL REQUIREMENTS.

  3) TASK D - GENERAL ELECTRIC - QUALITY ASSURANCE/QUALITY CONTROL/ TECHNICAL REQUIREMENTS/TASKS.

ISP110513000
18 AUGUST 1983

TASK D

OBJECTIVES OF TASK D:

- ESTABLISH "AS-IS" ARCHITECTURE OF QUALITY ASSURANCE/ QUALITY CONTROL FUNCTIONS

- INTEGRATE QA/QC ARCHITECTURE WITH MANUFACTURING ARCHITECTURE

- ESTABLISH QA/QC FUNCTIONS AS AN INTEGRAL PART OF TASKS B AND C

ISP110513000
18 AUGUST 1983

TASK D

TASK D HAS THREE SUB-TASKS:

1) UNDERSTAND THE PROBLEM

2) ESTABLISH QUALITY ASSURANCE MANUAL

3) ESTABLISH A PRODUCT ASSURANCE PROGRAM STANDARD

ISPL10513000
18 AUGUST 1983

TASK D

COALITION TEAM MEMBERS PARTICIPATED BY:

- DEVELOPING "FACTORY VIEW" MODELS
- REVIEWING "COMPOSITE VIEW" MODELS
- REVIEWING "LIFE CYCLE" DOCUMENTS

GENERAL ELECTRIC:

- DEVELOPED COMPOSITE MODELS
- DEVELOPED LIFE CYCLE DOCUMENTS
- PROVIDED TEAM LEADERSHIP

ISP110513000
18 AUGUST 1983

ICAM METHODOLOGY

TASK D - UNDERSTAND THE PROBLEM

PRODUCED FOUR SPECIFIC DOCUMENTS:

- SCOPING DOCUMENT
  - REFINED CONTRACTUAL EFFORT AND FIT TO OTHER ICAM ARCHITECTURES
- SYSTEM ENVIRONMENT DOCUMENT
  - INVESTIGATED "AS-IS" QA/QC SYSTEM
  - DEVELOPED IDEF MODELS
  - ESTABLISHED ARCHITECTURE INTERFACES
- NEEDS ANALYSIS DOCUMENT
  - INVESTIGATED "AS-IS" QA/QC SYSTEM
  - DEFINED SPECIFIC NEEDS
- SYSTEM REQUIREMENTS DOCUMENT
  - TRANSLATED "NEED" INTO SYSTEM REQUIREMENTS
  - IDENTIFIED IMPROVEMENT CONCEPTS

ICAM METHODOLOGY

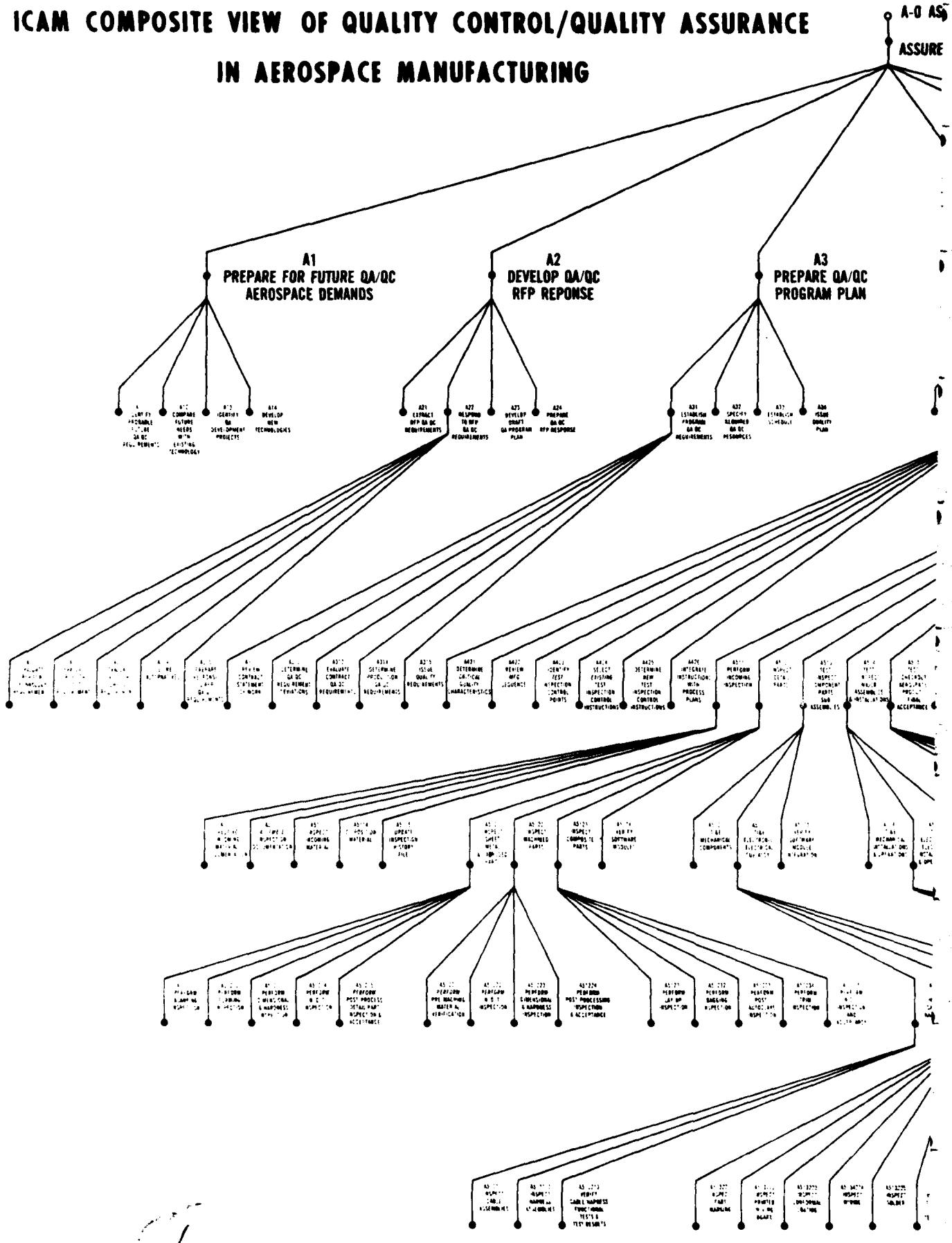
ICAM LIFE CYCLE DOCUMENTATION

SYSTEM ENVIRONMENT DOCUMENT

- FOCUSED ON UNDERSTANDING THE PROBLEM
- CONTAINS IDEF MODELS

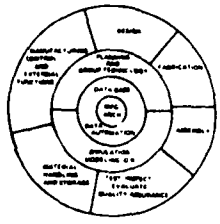
ISP110513000
18 AUGUST 1983

ICAM COMPOSITE VIEW OF QUALITY CONTROL/QUALITY ASSURANCE IN AEROSPACE MANUFACTURING



ICAM
INTEGRATED
COMPUTER-AIDED MANUFACTURING

A-0 ASSURE PRODUCT QUALITY (CONTEXT)
A0
ASSURE PRODUCT QUALITY

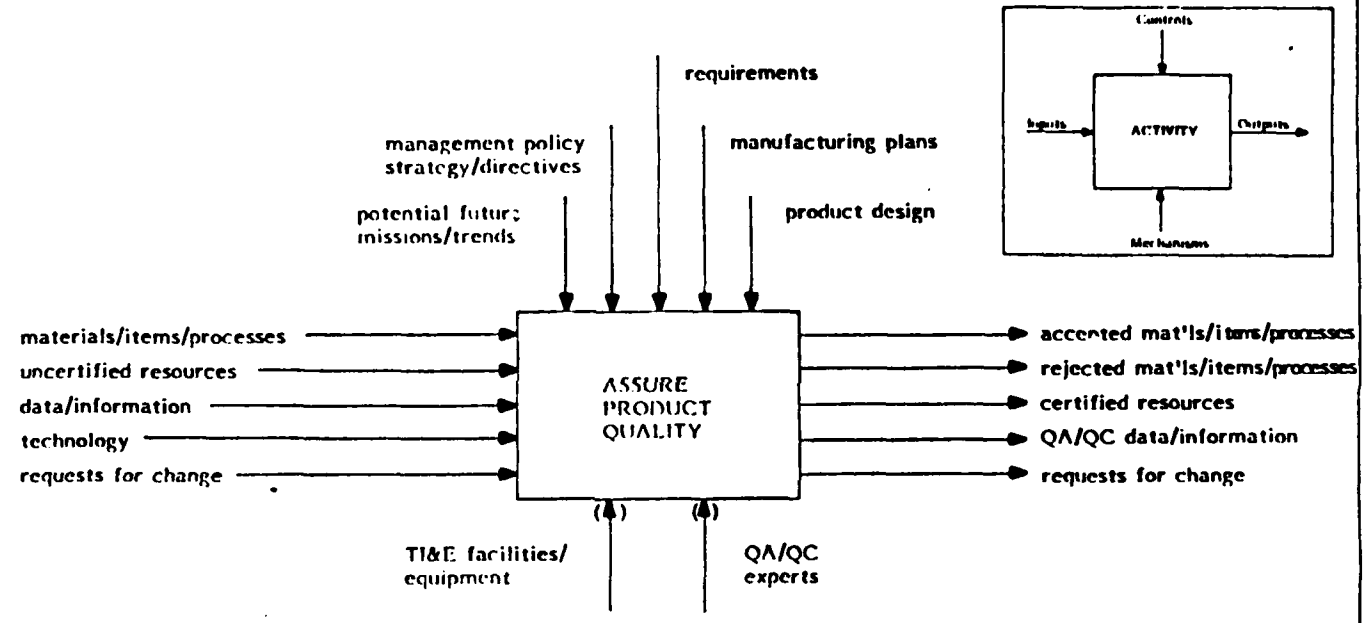


A4
IMPLEMENT QA/QC
PROGRAM PLAN

A5
PERFORM TO QA/QC
PROGRAM PLAN

A6
EVALUATE QA/QC
EFFECTIVENESS

USED AT	AUTHOR / PROJECT / DATE / REV / NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT / RECOMMENDED / PUBLICATION	READER	DATE	CONTEXT

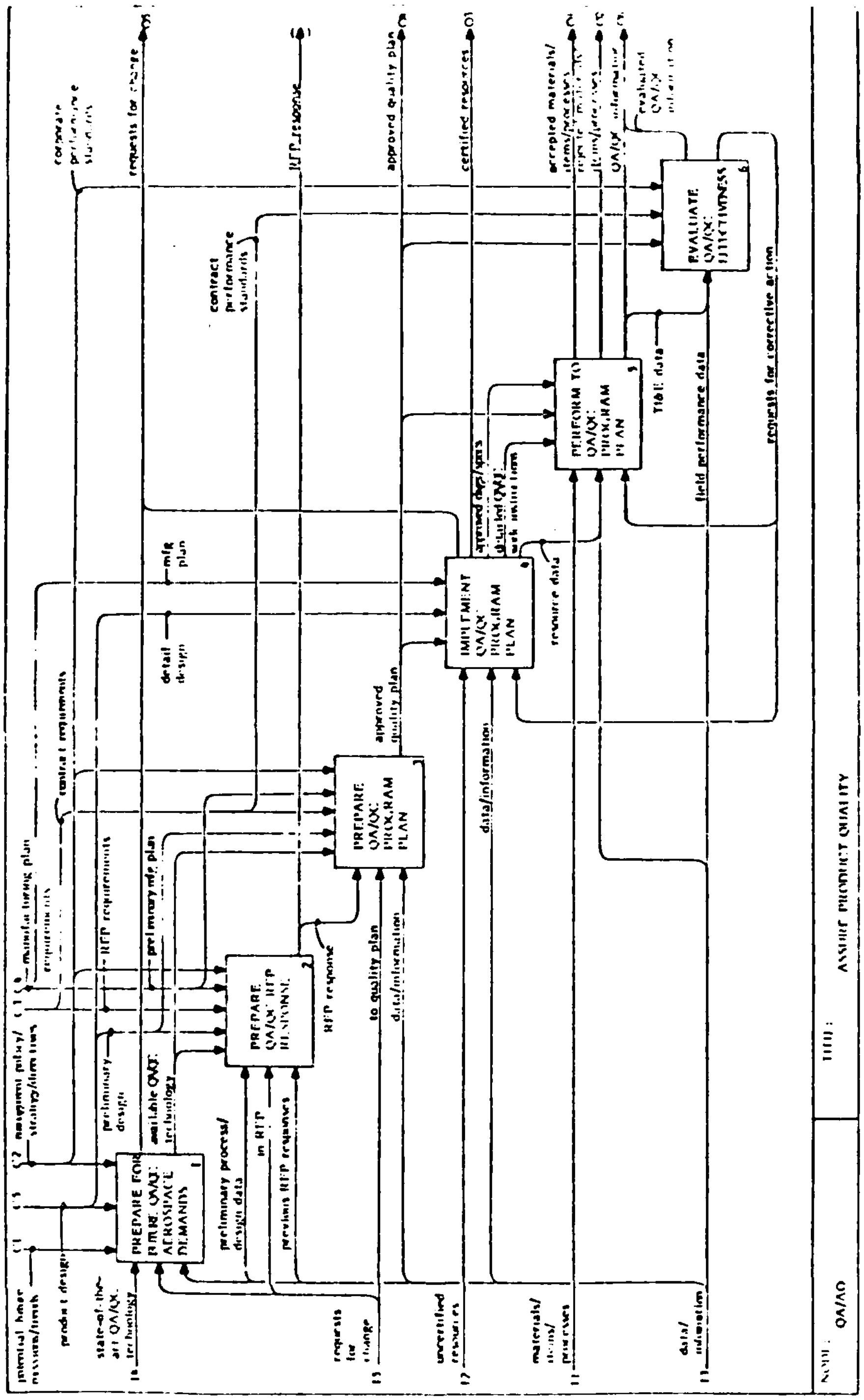


Purpose: To describe the "As-Is" activities and interfaces of assuring product quality in aerospace products.

Viewpoint: From the perspective of Task D Coalition QA/QC Project/Program Managers.

NODE	TITLE:	NUMBER:
QA/A-O	ASSURE PRODUCT QUALITY (CONTEXT)	

ISP11051300O
18 AUGUST 1983


PREPARE FOR FUTURE QA/QC AEROSPACE DEMANDS
PREPARE QA/QC RFP RESPONSE
PREPARE QA/QC PROGRAM PLAN
IMPLEMENT QA/QC PROGRAM PLAN
PERFORM TO QA/QC PROGRAM PLAN
EVALUATE QA/QC EFFECTIVENESS
requests for change
RFP response
approved quality plan
certified resources
contract performance standards
requests for corrective action
field performance data
resource data
detail design
mfg plan
data/information
uncertified resources
materials/items/processes
NODE: QA/A0
TITLE: ASSURE PRODUCT QUALITY

TASK D

- ICAM LIFE CYCLE DOCUMENTATION

  - NEEDS ANALYSIS

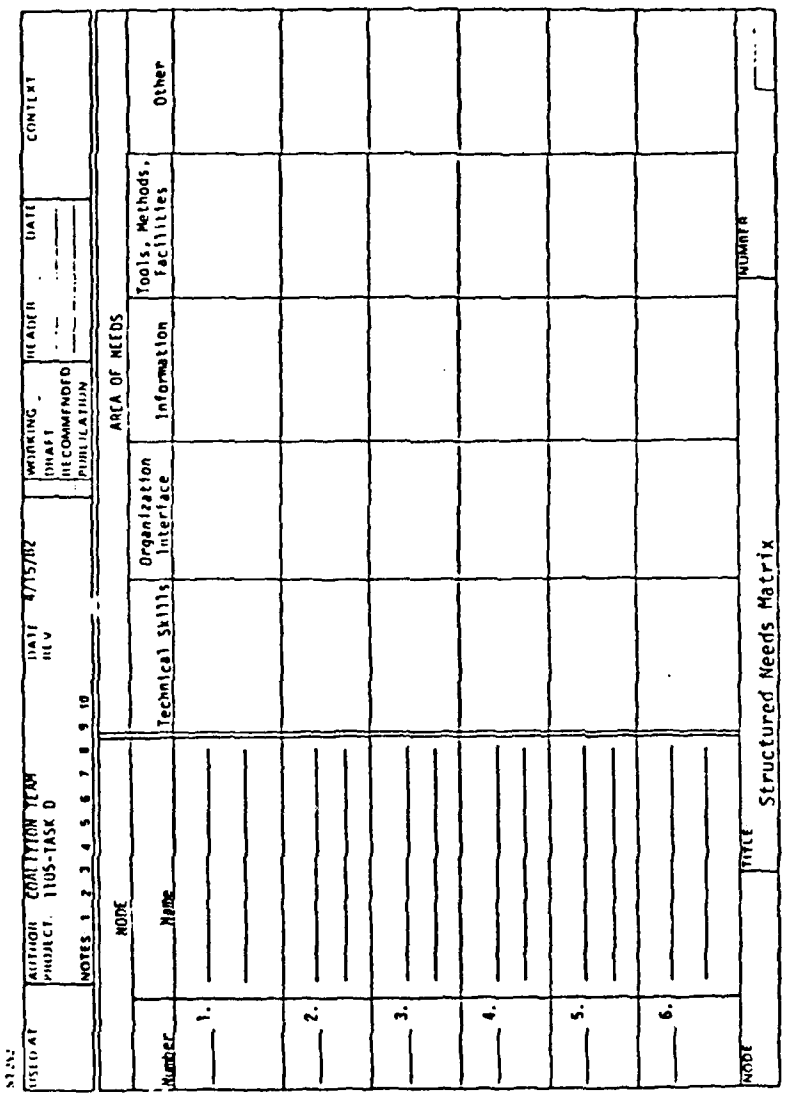
ISP110513000
18 AUGUST 1983

TASK D

HOW KEY NEEDS WERE DEFINED

- TWO FORMS DEVISED FOR CONSISTENT AND ORGANIZED DATA COLLECTION
  - STRUCTURED NEEDS MATRIX
  - NEEDS IDENTIFICATION SURVEY SHEET
- NEEDS IDENTIFIED BY COALITION TEAM
- BENEFITS ESTIMATED IF NEED SATISFIED
- NEEDS GROUPED AND RANKED

ISP110513000
18 AUGUST 1983


ISSUED AT
AUTHOR COALITION TEAM
PROJECT 1105-TASK D
DATE 4/15/82
REV
WORKING
DRAFT
RECOMMENDED
PUBLICATION
HEADER
DATE
CONTEXT
NOTES 1 2 3 4 5 6 7 8 9 10
NODE
AREA OF NEEDS
Number
Name
Technical Skills
Organization Interface
Information
Tools, Methods, Facilities
Other
1.
2.
3.
4.
5.
6.
NODE
TITLE
Structured Needs Matrix
NUMBER

USED AT	AUTHOR: TASK D COALITION PROJECT: ICAM 1105 NOTES: 1 2 3 4 5 6 7 8 9 10	DATE 6/15/82 REV	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT

NODE NUMBER: _____ SOURCE: _____

PROBLEM: _____

NEED: _____

COST DRIVERS: _____

HUMAN FACTOR CONSIDERATIONS (Positive & Negative) _____

BENEFITS SOUGHT:
Tangible: _____

Intangible: _____

NODE:	TITLE: NEEDS IDENTIFICATION - SURVEY SHEET	NUMBER:

ISPI10513000
18 AUGUST 1983

ST252

USED AT	AUTHOR: COALITION TEAM PROJECT: 1105-TASK D	DATE 4/15/82 REV	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT
	NOTES: 1 2 3 4 5 6 7 8 9 10				

NODE		AREA OF NEEDS				
Number	Name	Technical Skill's	Organization Interface	Information	Tools, Methods, Facilities	Other
A1 1.	PREPARE FOR FUTURE QA/QC AEROSPACE DEMANDS		3.3.2.1.1 Early Prevention/ Detection of Quality Problems		3.3.2.1.2 QA/QC Technology Compatible with Future Design Concepts and F-O-F Manufacturing Innovations	
A2 2.	DEVELOP QA/QC RFP RESPONSE	3.3.2.1.5 Reduce QA/QC Resource Inefficiencies Associated with Project Organizations		3.3.2.3.4 Submit Quality Plan in Response to RFP Using Demonstrated Strengths 3.3.2.3.7 Automate Repetitious QA/QC Data		
A3 3.	PREPARE QA/QC PROGRAM PLAN	3.3.2.4.2 Provide Closer Match Between QA/QC Personnel & Position Skill Rqmts	3.3.2.1.4 Early Availability of Design/Manufacturing Rqmts for Inspection and Test Planning			3.3.2.5 Software Quality Assurance Needs
A4 4.	IMPLEMENT QA/QC PROGRAM PLAN	3.3.2.4.1 Provide or Reduce Need for QA/QC Skills Where They are in Short Supply		3.3.2.3.5 Programs for NC-type Test 3.3.2.3.6 Current Relevant Inspection Data to Shop Floor	∠ Test/Inspection of: 2.1 Composite Integrity 2.2 Composite Dimensions 2.3 Machined Parts 2.4 Wire Harness 2.5 Sheet Metal 2.6 Electronic Circuit	3.3.2.5 Software Quality Assurance Needs
A5 5.	PERFORM TO QA/QC PROGRAM PLAN		3.3.2.1.3 Utilize Present Quality Problem Data in Future Designs and Change Proposals	3.3.2.3.2 Improve Flow of Shop Floor Inspection Data 3.3.2.3.3 Secure Useful Incoming Inspection Data		3.3.2.5 Software Quality Assurance Needs
A6 6.	EVALUATE QA/QC EFFECTIVENESS	3.3.2.4.3 Provide QA Audit Measuring the Adequacy of System to Assure Product Quality		3.3.2.3.1 Provide QA/QC Field Information for Early Problem Identification and Solution		3.3.2.5 Software Quality Assurance Needs

NODE:	TITLE	NUMBER:
QA/AO	Completed QA/AO Structured Needs Matrix	

ISP110513000
18 AUGUST 1983

TASK D

AREAS OF NEEDS - AS RANKED BY COALITION

		PERCENT OF POTENTIAL BENEFIT
1)	INTEGRATION OF ASSURANCE OF QUALITY	34%
2)	QUALITY INFORMATION HANDLING	25%
3)	QUALITY ASSURANCE/QUALITY CONTROL EQUIPMENT	21%
4)	SOFTWARE QUALITY ASSURANCE	16%
5)	TECHNICAL SKILLS	4%
		100%

ISP11051300O
18 AUGUST 1983

TASK D

- ICAM LIFE CYCLE DOCUMENTATION

  - SYSTEM REQUIREMENTS

ISP110513000
18 AUGUST 1983

TASK D

SYSTEM REQUIREMENTS DOCUMENT

- APPROACH - QUESTIONS ASKED:
  - WHAT IS REQUIRED TO FULFILL THE NEED?
  - HOW CAN EACH REQUIREMENT BEST BE MET?
  - WHAT IS CURRENT STATE-OF-THE-ART?

- OUTPUT
  - IMPROVEMENT CONCEPTS ADDRESSING THE INTEGRATED FACTORY QA/QC ENVIRONMENT
  - THE SYSTEM REQUIREMENT THAT MUST BE SATISFIED
  - A BASIS FOR TRACKING IMPLEMENTATION

ISPI10513000
18 AUGUST 1983

TASK D

SYSTEM REQUIREMENTS

	PERCENT OF POTENTIAL BENEFIT
1) TIMELY TRANSMISSION OF DATA	30%
2) EARLY INTEGRATION	29%
3) FAST, RELIABLE INSPECTION	22%
4) ADDITIONS TO "AS IS" QUALITY SYSTEM	17%
5) MORE EFFECTIVE PERSONNEL PRACTICES AND RESOURCE ALLOCATION	2%
	100%

ISP110513000
18 AUGUST 1983

TASK D

NEXT PROGRAM STEPS

- ENHANCEMENTS TO PRESENT QA/QC PROGRAM STANDARDS
  - INPUTS FROM OTHERS - DoD AND INDUSTRY
  - CONSOLIDATION
- AIR FORCE PROGRAM MANAGEMENT OFFICE WILL SUBMIT TO HEADQUARTERS AND DoD WITH RECOMMENDATIONS FOR USE.

DISCUSSION

1) WHAT PROBLEMS HAVE YOU ENCOUNTERED AS A RESULT OF COMPLYING TO GOVERNMENT/MILITARY QUALITY STANDARDS SUCH AS MIL-Q-9858A?

2) WHAT CHANGES WOULD YOU RECOMMEND TO CURRENT GOVERNMENT/MILITARY QUALITY STANDARDS?

3) WHAT CHANGES DO YOU PERCEIVE AS NECESSARY TO GOVERNMENT/MILITARY QUALITY STANDARDS WITH THE ADVENT OF INCREASED AUTOMATION?

4) WHAT DO YOU SEE AS THE MAJOR QUALITY SYSTEM ISSUES?

5) HOW WILL QUALITY ASSURANCE BE DIFFERENT IN THE AUTOMATED FACTORY?

6) WHAT HAS BEEN OVERLOOKED?

APPENDIX B

GOVERNMENT/INDUSTRY SURVEY

This appendix contains the results of the Government/Industry Survey. The first part (B.1 through B.3) summarizes both the approach and the responses to a questionnaire that was used to gather information. Section B.4 presents the conclusions derived from this effort.

Following this, Section B.5 contains all of the responses to the questionnaire. As decribed in Section B.2.1, the questionnaire is broken into two sections. The first section contains the Quality Assurance Ratings. In this section, the respondent is asked to provide a rating from "high" to "low" to a set of four questions arrayed against the six nodes of the QA/A-O Assure Product Quality model. The second section is the Quality Assurance Questionnaire. This section contains seven broad questions covering present experience and forecasted needs in the automated environment of the Factory-of-the-Future.

Finally, Section B.6 contains the minutes from each information gathering meeting. The sources for this information are given in Section B.2.2.

B.1 Introduction

After completing the major work on Task 4.4.2 - Understand the Problem (the initial phase in the ICAM Life Cycle which defines the system environment, needs and requirements), our attention was directed to the last phase of the program, Task 4.4.4 - Establish Quality Assurance Program Management Standard. As part of Task 4.4.2, a Needs Analysis Document and a System Requirements Document were developed. These documents provided a great deal of insight for Task 4.4.4 but from a limited point of view. Our coalition had focused on Quality Assurance in airframe manufacturing and that focus was from the point of view of a Quality Program/Project Manager. We felt it was necessary to expand our focus in two ways.

First, we wanted to gather data from other Air Force contractors such as those supplying electronics. In addition, we wanted data from other DoD contractors who provided Army and Navy supplies. And of course, we wanted input from the Air Force and the Department of Defense.

Second, we wanted to hear from the very highest ranking Quality Assurance officers in industry and in the military. We wanted to combine data from the "policy makers" with the working level data already accumulated.

In addition to simply expanding our data base, we wanted to get responses to questions directed specifically at a new Quality Assurance Program Management Standard.

B.2 Approach

Our approach to meeting these objectives was to develop a questionnaire, shown in Figures B-1 through B-3, and to establish a series of data gathering meetings.

B.2.1 Questionnaire

The questionnaire is broken into two sections. The first section contains the Quality Assurance Ratings. In this section the respondent is asked to provide a rating from "high" to "low" to a set of four questions arrayed against the six nodes of the QA/A-O Assure Product Quality model. The second section is the Quality Assurance Questionnaire. This section contains seven broad questions covering present experience and forecasted needs in the automated environment of the Factory-of-the-Future.

B.2.2 Contacts

Data and information was collected from the following sources:

Industry:
Vought Corporation
General Dynamics
Grumman
Hughes
McDonnell Douglas
Bendix
Texas Instruments
Boeing
Honeywell*
Lockheed Georgia*
Martin Marietta*
TRW*
United Technologies*
General Electric:
- Aerospace Electronic Systems, Utica
- Aircraft Engine, Evendale
- Simulation and Control Systems, Daytona Beach
- Ordnance, Pittsfield
- Military Electronic Systems, Syracuse
- Re-entry Systems, Philadelphia
- Aerospace Control Systems, Binghamton

Military/Government:
WPAFB:
- HQ-Air Force Systems Command - QA Office
- HQ-Aeronautical Systems Division/EN/PMDQ
- HQ-Air Force Logistics Command/QAA

Office of the Secretary of Defense, Asst. for Quality

HQ-NASA, Officer of Chief Engineer

*Responded to questionnaire only as part of AIA/NSIA Air Force Liaison Panel's joint response.

In some instances, we received a response to the questionnaire without a face-to-face meeting and some of the meetings did not result in a questionnaire response. In summary, we conducted 14 meetings and received 23 responses to the questionnaire.

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
↓	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?							
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?							
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?							
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?							

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

Figure B-1

ISP11051300
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	

Figrue B-2

ISP11051300
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	
Please identify position/title of individual completing this questionnaire: _____	

ISP110513000
18 AUGUST 1983

Figure B-3

B.3 Responses

The data obtained from our questionnaire and our meetings are summarized below:

B.3.1 Quality Assurance Rating

The responses to the Quality Assurance Rating are summarized in Figures B-4 through B-7. Each question will be discussed.

1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?

   The purpose of this question was to get a better understanding of how well MIL-Q-9858A was addressing all phases of the Program Life Cycle.

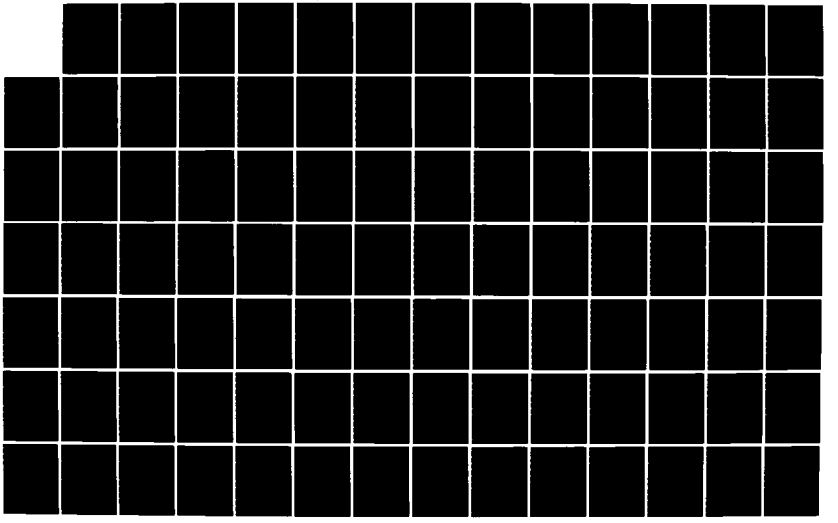
   The Needs Analysis data had already indicated that the present quality programs were weakest at the front end and the back end of the Program Life Cycle and strongest in the middle. The response to this question bears out the same data. Note that a number of respondents felt that MIL-Q-9858A didn't apply to Pre-Proposal, Proposal and Post-Production. MIL-Q-9858A is thought to be moderately adequate for Design and Development and highly adequate in Pre-Production and Production.

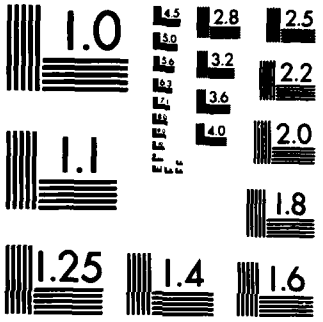
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the Factory-of-the-Future in each area of the Program Life Cycle?

   The purpose of this question was to get feedback on how well people thought MIL-Q-9858A would apply in the automated environment of the future.

   Once again, a number of respondents feel MIL-Q-9858A doesn't apply for Pre-Proposal, Proposal or Post-Production. Now the data is skewed to the left compared to the responses to question number one. Similarly the data has moved to the left for Design and Development, Pre-Production and Production indicating that there is a general feeling that MIL-Q-9858A won't be as adequate in the

AD-A144 891 ICAM (INTEGRATED COMPUTER AIDED MANUFACTURING) 2/4
CONCEPTUAL DESIGN FOR COMP..(U) LTV AEROSPACE AND
DEFENSE CO DALLAS TX VOUGHT AERO PRODUCTS D..
UNCLASSIFIED R H WETTACH ET AL. 29 JUN 84 2-20150/4R-2 F/G 14/4 NL





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

Factory-of-the-Future as it is now. Note, however, that 13 of the 23 respondents still feel MIL-Q-9858A will be highly adequate in the Factory-of-the-Future.

3) What will be the level of impact of the increased usage of computers and automation in the Factory-of-the-Future in each area of the Program Life Cycle?

The purpose of this question was to get a feeling for how much change is coming with the introduction of greater computer usage.

The results are skewed (very strongly) to the right indicating that the impact will be high. The Pre-Proposal area is a mild exception with relatively flat data indicating not much change is anticipated.

4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/military quality assurance standards?

The purpose of this question was to ascertain the improvement in quality assurance with new and improved standards and specifications.

The most interesting thing about this data is its ambivalence. Just about as many respondents feel there isn't much opportunity as feel that there is.

Task 4.4.4-Summary Of Responses To Questionnaire

"1" = Low
"5" = High
NA = Not Applicable

1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?

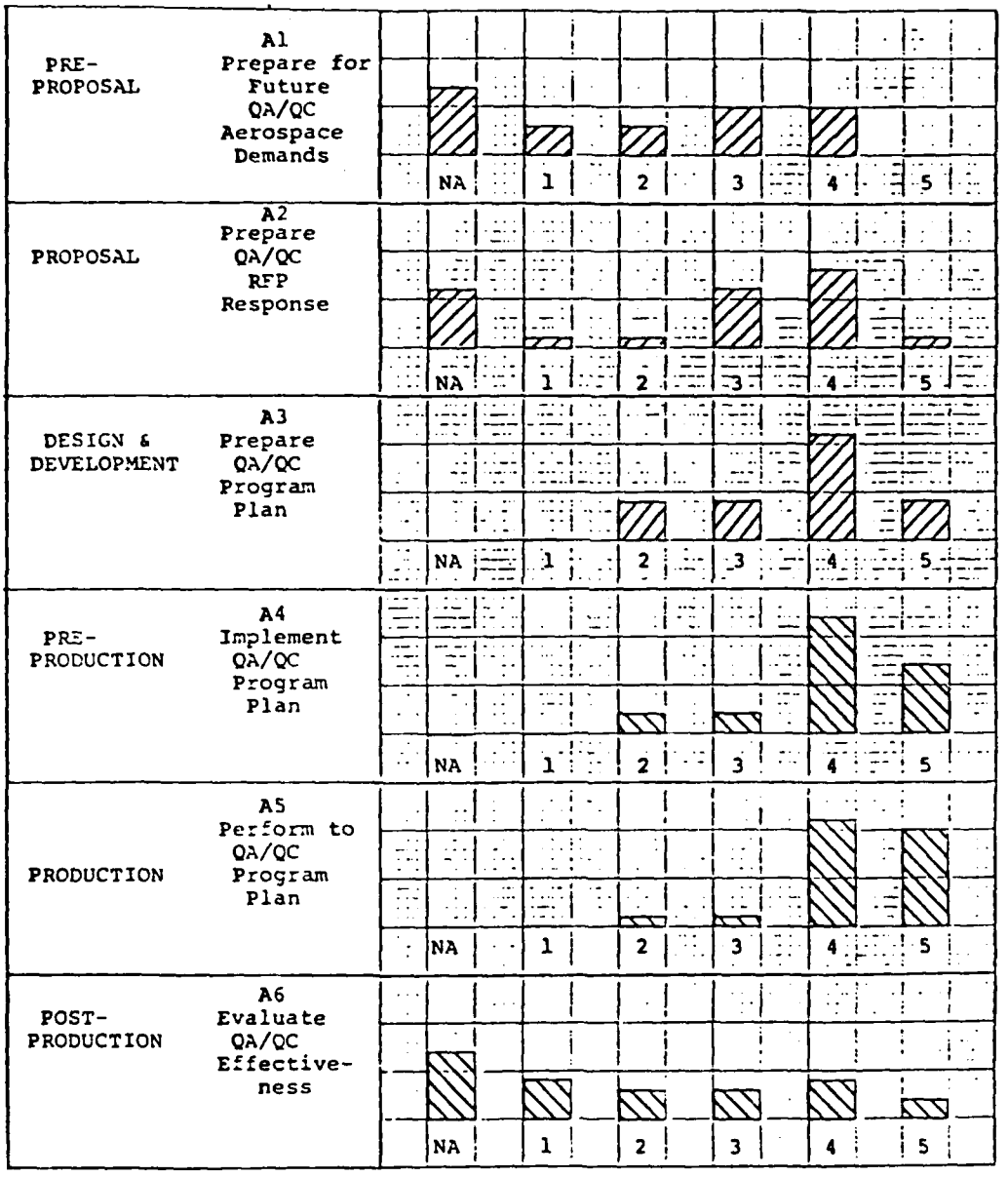


Figure B-4

Task 4.4.4-Summary Of Responses To Questionnaire

"1" = Low
"5" = High
NA = Not Applicable

2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?

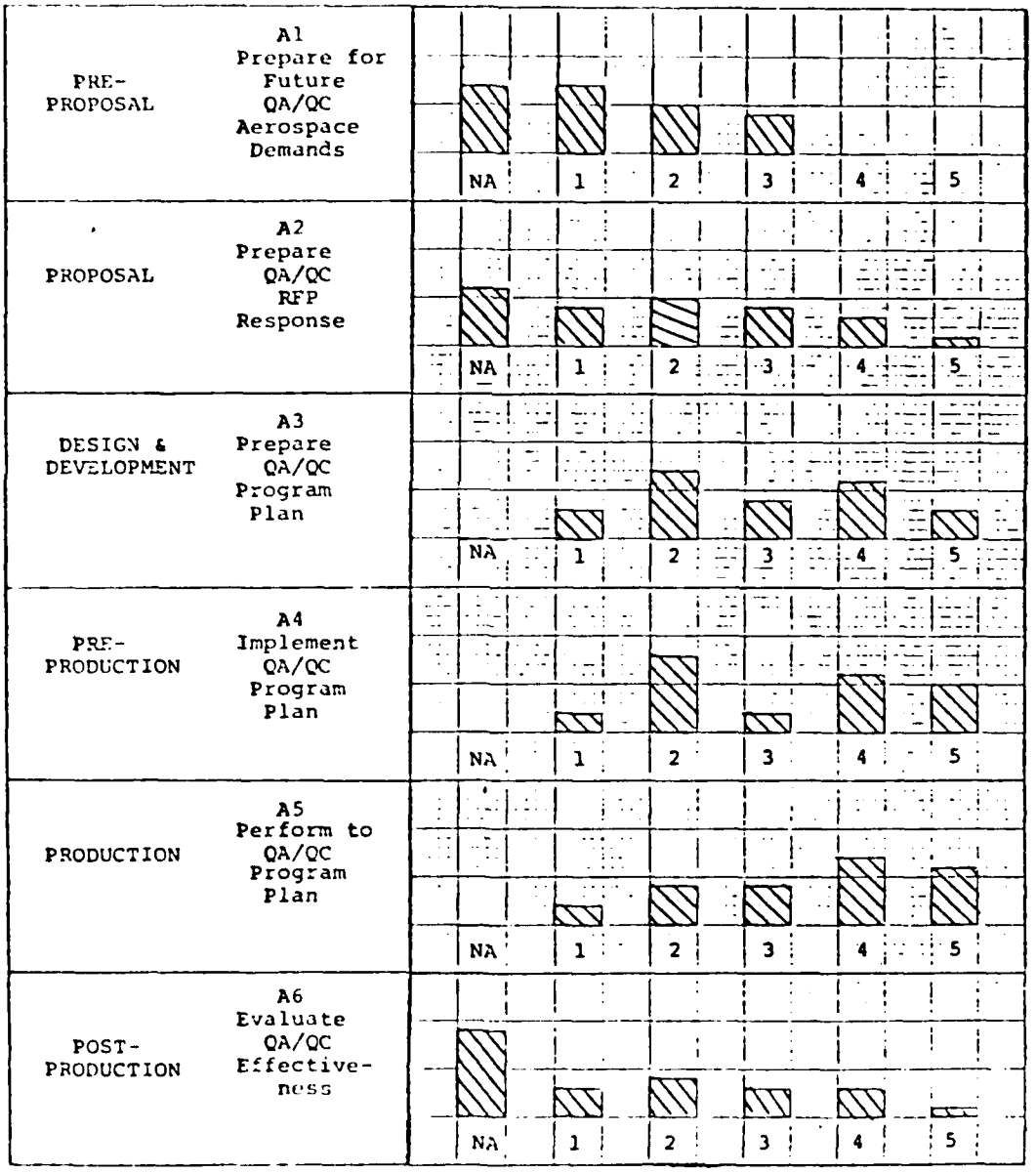


Figure B-5

Task 4.4.4-Summary Of Responses To Questionnaire

"1" : Low
"5" : High
NA : Not Applicable

3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?

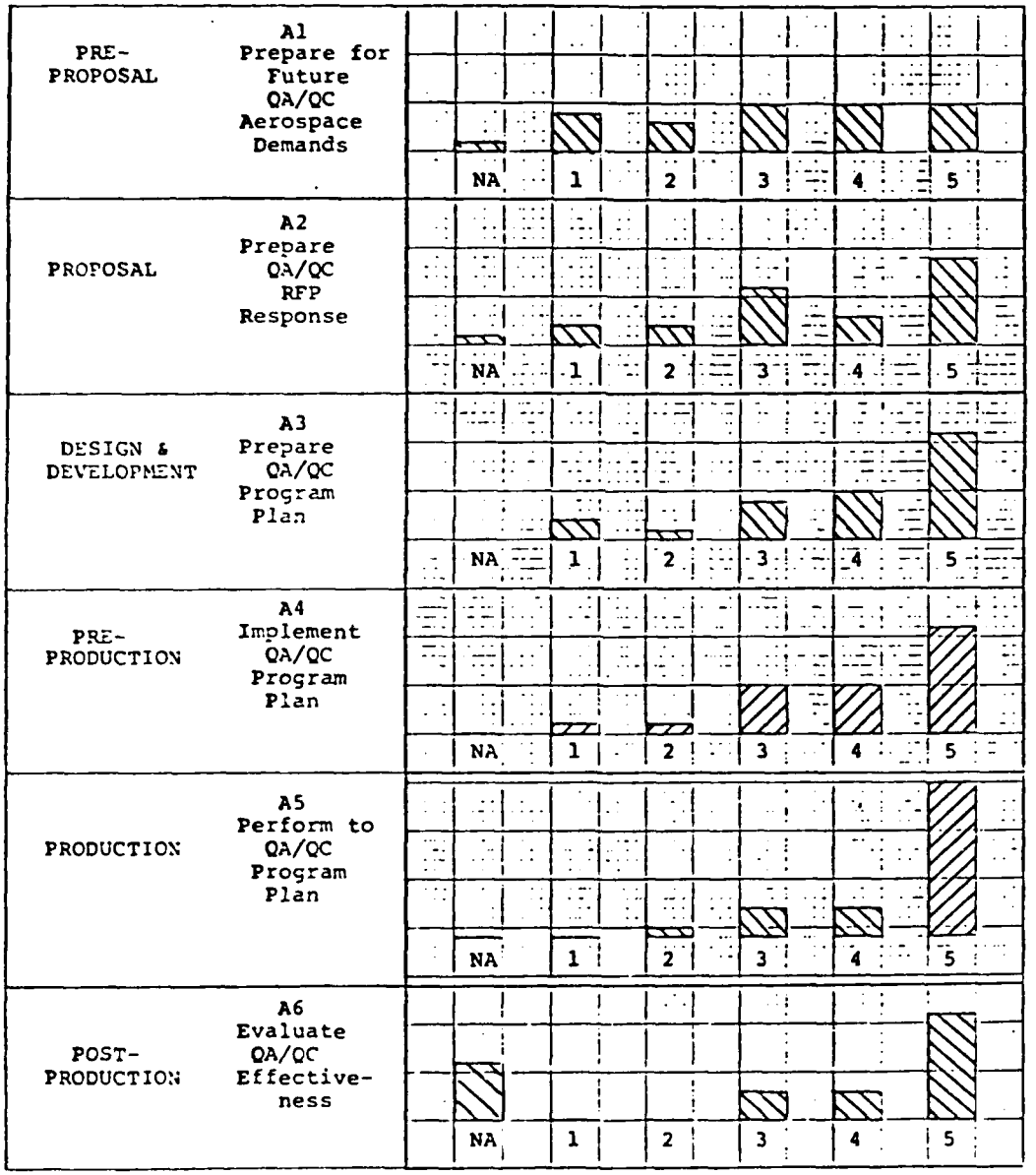


Figure B-6

Task 4.4.4-Summary Of Responses To Questionnaire

"1" = Low
"5" = High
NA = Not Applicable

4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?

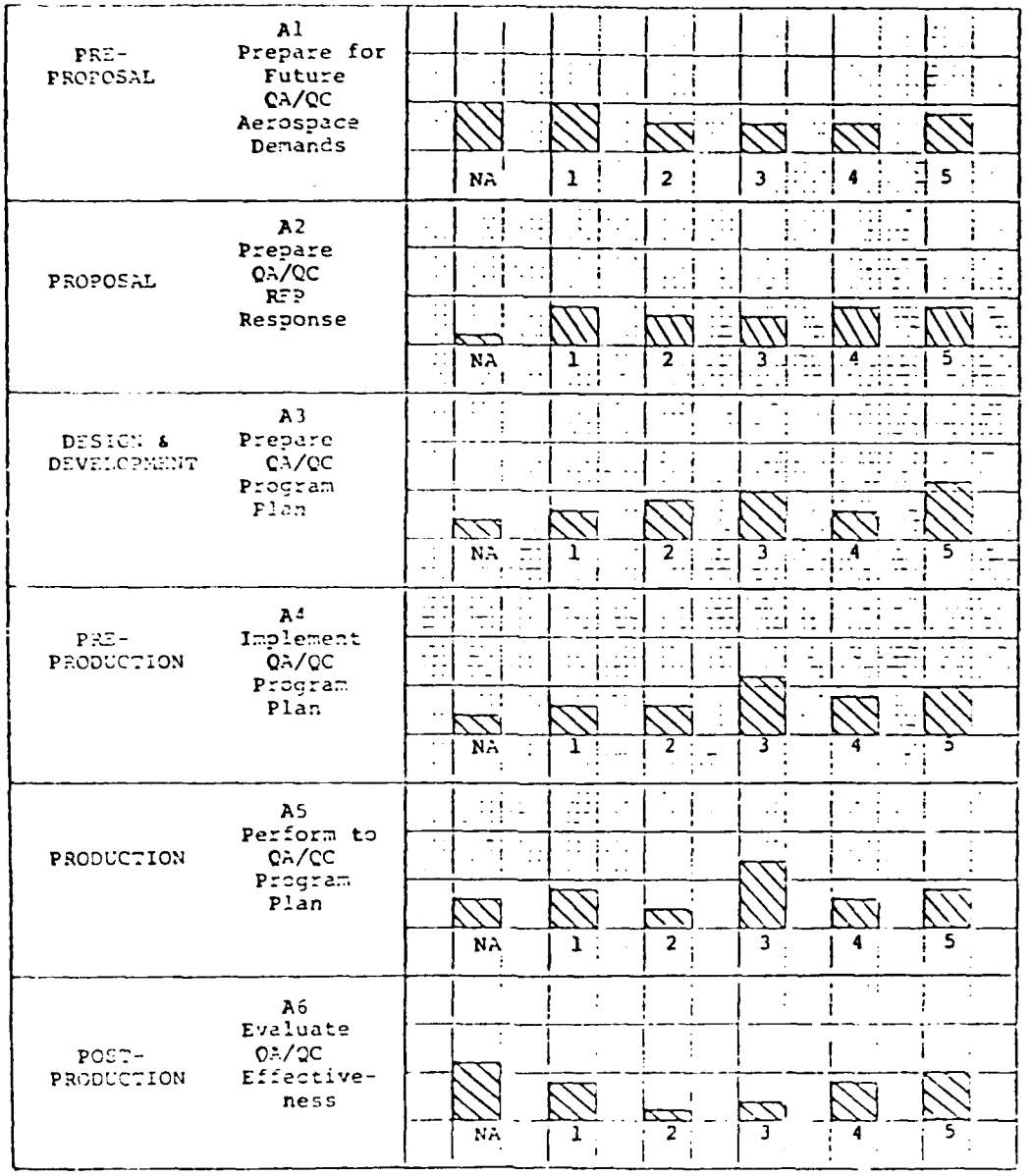


Figure B-7

B.3.2 Quality Assurance Questionnaire

The second part of the questionnaire sought a written response to specific questions having to do with the current application of MIL-Q-9858A and other government specifications, as well as questions concerning the automated environment of the Factory-of-the Future. The responses were extremely varied but we have tried to capture the essence of the comments in the summaries that follow:

1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?

The purpose of this question was to get specific comments on the current application of MIL-Q-9858A.

The overwhelming response was favorable with comments such as:

- Excellent document
- Serves purpose well
- Understood
- High comfort level
- Flexible
- Doesn't need changing

On the other hand, the areas for improvement mentioned most frequently were:

- Weak in design and development
- Doesn't address detailed software issues
- Needs greater emphasis on process control
- Needs more on cost performance measurements
- Needs broader definition of "objective evidence"

A concern was voiced for the increased risk of misunderstanding if MIL-Q-9858A were changed.

2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?

The purpose of this question was to learn what specifications are now causing problems and what might be done about it.

The response was very uniform to this question. The specifications that cause a problem, and thereby increase the cost, are the ones that cover "how to". The contractors want specifications that tell clearly "what" the requirements are but leave the "how to" to the contractors. Most frequently mentioned were:

- MIL-STD-1520, Nonconforming Material
- MIL-STD-1535, Procurement
- MIL-C-45662, Calibration System Requirement

A response from the Air Force indicates that all three of these specifications are being reviewed for clarification and improvements.

3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?

The purpose of this question was to generate suggestions for areas that should be addressed in a standard or specification covering increased automation.

The opportunities and the impediments appear to be the same thing only viewed 180° apart. Therefore, we will only focus on the opportunities. The ones most often mentioned by the respondents were:

- Reduce the total number of separate specifications
- Prepare for paperless documentation
- Provide for flexibility and don't try to standardize on a specific automation system
- Provide for real time process control
- Provide for product traceability and identification of acceptance status while in process
- Provide for software control
- Recognize automated product acceptance
- Changes will be gradual -- evolution not revolution
- Provide for new and fast-moving technology
- Need for education and training for contractor and Air Force personnel

4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?

The purpose of this question was very similar to the previous question. We were looking for recommendations for the automated factory.

Some of the items mentioned in response to question three were repeated. But, some new thoughts emerged such as:

- Need new definitions for key words such as "design documentation"
- More emphasis needs to be placed on process control with less on inspection
- Need to break down software control into two pieces:

  o Shippable/deliverable
  o Process control

- Greater need for flexibility
- Must develop new audit routines

5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?

The purpose of this question was to explore further the areas of reliability and maintainability. Also, there was evidence from the Needs Analysis that the measurement of the quality assurance program effectiveness was an area needing more attention.

The respondents jumped on this question indicating a universally bad experience in getting data back from the field for quality evaluation. One study showed the data itself was accurate less than 50 percent of the time. Some of the comments were:

- Only reliable data comes from Company Field Representatives
- The AFM 66-1 routine is not suitable for collection of quality data
- Each branch of the service is different
- Problem is not fault of MIL-Q-9858A

The basic conclusion from the data we received is that this is a major area requiring attention and study. Our limited scope in Task 4.4.4 doesn't permit the effort needed to get at this extremely important quality issue.

6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?

The purpose of this question was to address the particular quality assurance issue which would be brought about by a "paperless factory".

Many of the responses were duplicates of earlier responses with the following items being mentioned most often:

- The ability to "tailor" the specification will be very important
- Need for flexibility especially in the software system requirements
- Real time process control
- Must accommodate "evolution"
- Automated measurement of compliance
- Elimination of "Inspector Stamps"
- Acceptance of electronic media for data and part status

7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?

The purpose of this question was to solicit general comments that may not have been made in response to the other questions.

The comments touched on many different areas and opinions varied widely. "Make no changes" to MIL-Q-9858A was mentioned as well as a statement about industry's "violent emotional resistance" to any changes. Items specifically mentioned include:

- More upfront involvement by quality assurance is needed. More integration with other functions. Involvement in pre-proposal activities
- Need new approach for configuration management of software
- Consider impact of multi-year subcontract
- Consider international acquisitions and co-producers
- Need for orientation and training
- Tie incentives to demonstrated quality performance
- Develop stronger corrective action routines

B.3.3 Quality Assurance Meeting Summaries

The third area for gathering information was our face-to-face discussions with key Quality Managers in the aerospace industry and the Department of Defense. These meetings were conducted from January through May of 1983. The feedback from these meetings can be broken into two parts. The first part concerns specifications as they impact at present and the second part concerns the impact of specifications on the Factory-of-the-Future.

B.3.3.1 The Present

Although many different comments were made, these four were the most universal.

1. Leave MIL-Q-9858A alone

   The document is well understood and doesn't present any serious problems as it is written. Most people felt current problems were traceable to local interpretation of the document and were not the problem of the document itself. MIL-Q-9858A has flexibility but if there is a weakness in the document it comes about from the document being written more to cover production programs than research and development programs.

2. "How to" specification cause problems

   The specifications that support MIL-Q-9858A were frequently considered problems. The experience in industry is that these are the ones that drive up costs without a commensurate benefit. The specifications mentioned most frequently were:

   - MIL-STD-1520, Nonconforming Material
   - MIL-STD-1535, Procurement

   It was felt that these specifications get too specific in "how to" rather than in defining "what" is required and allowing the contractor to determine how to meet the requirements.

3. Field data is a major void

We heard comments, and all with deep concern, from every visit about the failure to receive reliable data from field operations. Much of the data that does come back to the contactors is incorrect. Root causes of problems are seldom identified. Most of the beneficial field data is coming back to the contractors through their Field Representatives.

The most promising approach recommended to solve this problem was to establish a few, possibly three, bases or field locations as an experimental group and do whatever is necessary to get a useful flow of quality information back to the contractors from these locations. The feedback from these three locations would then be analyzed to determine corrective action needs for the programs involved. Following this an assessment would be made to determine future action needed to assure good field data feedback.

4. Software quality assurance is a major concern

MIL-STD-52779 primarily addresses software to be shipped and many people felt that it would not be practical for process control software. In general, two major points were made:

- o Separate guidelines are needed for shippable software and process control software
- o The software requirements should be a part of MIL-Q-9858A or its replacement

B.3.3.2 The Future

In discussing the future, there was much discussion about MIL-Q-9858A and whether or not it could be applied successfully in the automated environment of the Factory-of-the-Future. Some felt it would be completely inadequate while others felt it had all the flexibility needed and, with proper interpretation and a good understanding with the local AFPRO, would serve the future factory very

well. In fact, one company has a highly automated factory operating now with MIL-Q-9858A and there are no problems with the document. The AFPRO has access to the quality data through a computer terminal in the Air Force office. More than half, and probably 75 percent, of the Quality Managers we talked to felt that MIL-Q-9858A would work satisfactorily for them in a more automated environment. When discussing the Factory-of-the-Future, the major issues were:

1. Local interpretation of the specifications

   The need for training and orientation will be great. This will apply to both the contractors and the local Air Force representatives. In general, people felt that how the document was interpreted was more important than how it was written. And, finally many companies said their own in-house regulations, practices and procedures were already more stringent than the government requirements so it didn't make too much difference what the government did with their specifications as long as the contractors continued using their in-house documents.

2. Evolution not revolution

   As the environment becomes more automated the new specifications will have to remain flexible enough to cover both the automated and the non-automated factory. Flexibility with some freedom of choice becomes even more important than it is today. The point was made that major programs can last for 10 to 20 years and the quality specification will have to be adaptable for both new and old programs.

3. Prevention and upfront quality

Much was said during our discussions about the need for more attention to quality in the early phases of a program. This would involve an integration of the Quality function with Marketing, Engineering and Manufacturing in both the Pre-Proposal and Proposal phase of the program life cycle. This would involve an early understanding of the customer's desires and expectations. In addition, much more attention will need to be placed on process control in order to prevent quality problems from occurring. With greater attention on process control and prevention, the need for inspection activities will be reduced.

4. Software

The successful control of software is a vital key to the success of an automated factory. The major points mentioned about software were:

- o Security of data
- o Configuration control
- o Shippable versus process control software
- o Lack of traditional "objective evidence"
- o Access to data

5. Built-in quality

With self-adjusting automated equipment, the very fact that material has been processed may mean that it is in control. Calibration routine will need to be modified and criteria for acceptance will change.

B.4 Conclusions

What, then, are the conclusions from the surveys that will be important in developing a new Quality Assurance Program Management Standard? There are many but these ten are the ones we felt most important and each was considered as the Quality Assurance Program Management Standard was developed.

1. Early involvement of quality assurance in the product life cycle
2. Emphasis on prevention
3. Allow for evolution, flexibility and tailoring
4. Emphasis on process control
5. Define "what" not "how to"
6. Software control
7. Electronic audit routines
8. Automated measurement of compliance
9. Quality data and part status from electronic media
10. Quality cost performance measurements

B.5 Quality Assurance Questionnaire

This section contains all the responses to the Quality Assurance Questionnaire.

B.5 Quality Assurance Questionnaire

This section contains all the responses to the Quality Assurance Questionnaire.

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1)	What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	4	4	4	5	5	1
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	1	1	1	1	1	1
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	2	2	3	3	4	3
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	1	1	1	1	1	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Adequate. General nature - both a strength and weakness. Needs: matrix tailoring for each program phase is a way to correct this.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Biggest problem is management recognition of different requirements, especially during proposal phases.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	Recognition of automated aspects of inspection of acceptance of same as "proof" of acceptance.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	See above.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Field QA at Vought is covered by Vought developed QA Instructions (Manual) for use by field. In most parts government standards are weak in this area.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Very limited need for inspection stamp objective evidence of acceptance. Need another system.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	All of the above.

Please identify position/title of individual completing this questionnaire: Manager QA Testing
Vought Corporation

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		4	4	Adv Dev 1 / Eng Dev 4	4	4	1
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	1	1	1	1	1
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		5	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		1	1	1	1	1	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP1105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858A serves very well as a guide for what an effective QA program needs to address except in the areas of advanced engineering development when a "full-up" system is not reasonable and in the post production cycle where no guidance is given.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Most government standards are trending toward over specifying the "how to" as opposed to establishing guidelines; i.e., MIL-STD-1520's latest revisions get much more definite in what you must include in "cost of nonconformance" rather than focusing on trend analysis. The new MIL-STD-45662 gets more restrictive in what your system must do rather than giving guidelines for system needs.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	Guidelines must be broadened and concentrate what is required rather than "how to". Interpretation of "objective evidence" and documentation requirements are going to have to address what is required in a "paperless" factory.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Definition of what "work instructions", "documented evidence", etc. means when there is no paperwork.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Totally inadequate - government collecting/reporting structure built around replaceable systems/spares support. Cannot be translated into adequate data to trace responsibility into shop environment for problem solution. Only useable (?) to assess "are we very good -- or very bad?"
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Chaos. Based on past experience, government standards will trend toward dictating what every system in every plant must look like. Cost of accommodation will be astronomical. Tell us what basic system must cover -- let us decide how.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Define objective criteria for measurement of performance. Tie profit incentives for demonstrated performance that meets the criteria. Prove to us that quality carries the same weight as schedule and cost.

Please identify position/title of individual completing this questionnaire: Manager, Q&RA Management Services
Vought Corporation

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		1	4	4	4	4	0
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	3	4	4	4	0
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		3	3	3	5	5	1
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		3	3	5	5	5	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	It is adequate. Its weakness is that interpretation of its requirements change over the years to conform to what customers want -- not what it says. Its strength is that it is well known and we are comfortable with it.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	MIL-STD-1535. Procurement gets too deeply in contractor business. Leaves little room for creative management.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	All military/government standards tend to be several years behind the technology they are controlling. This is particularly true for Quality Assurance Standards. This is because they generally are based on history, i.e., how we have done things in the past. I have no recommendations for changes.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	The only field data collection system I am aware of is used for provisioning purposes and is inadequate for determining quality or reliability of delivered products.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Control of software will be a big issue. Current software controls focus on deliverable software/hardware. In a paperless factory, these controls will be required upstream in the manufacturing and control cycles.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	

Please identify position/title of individual completing this questionnaire: Norris Rogers
Q&RA Engineering Manager
Vought Corporation

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effective-ness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		3	3	3	4	5	4
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	1	1	2	3	3
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		5	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/military quality assurance standards?		5	5	5	5	5	5

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Adequate, our total Quality System concept is based on it. Hasn't kept pace with evolving Software QA requirements, doesn't address computer data base as objective records of QA actions. Understood and implemented by DoD, contractors, NATO, etc. to the point of becoming sacred. None.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Minimal. MIL-STD-1520, too many layers of data reviews to arrive at cost effective corrective actions, i.e., PR, Disposition, MRB, CAB plus Customer Reviews. Eliminate unwarranted cost drivers such as new standards that only amplify MIL-Q requirements.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	Many DoD standards will become obsolete whenever QA efforts are made to relate them to computers/software, others will continue to be valid for hardware shops. Software QA disciplines must be developed and implemented for cost effectiveness.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	They should address controls for computer data base, systems, standards, concepts acceptable in lieu of paper/records as objective evidence.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	No set standard for collection of data/needs. No. Program/product oriented. Establish standards to level desired.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Minimal. Revised to accept electronic data in lieu of paper/reports.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	QA must get involved upfront whenever any product related data base is utilized for some of the following reasons: o Responsibility o Change Controls o Security Controls o Traceability o Customer Relations o Cost Prevention o Corrective Actions o Storage o Calibration, plus all other QA elements

Please identify position/title of individual completing this questionnaire: Manager, Quality Systems
General Electric

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effective-ness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		3	3	4	4	4	N/A
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		3	3	2	2	2	N/A
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		2 •Regression Analysis •Tech thrust for new prod.	4 • ADP Quoting	5 CAD	3 CAT	5 CAT/CAM QIS	4 QIS QIS ADP
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		N/A	The level of Product Quality is primarily determined by the quality of the quality system establisned by a company and its adherence, thereof.				

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	o Adequate to good o Weaknesses: 1. Sometimes subject to *interpretation* 2. Vague in areas of process definition 3. MRB definition 4. *Software QA* 5. Documentation requirements o Strengths: Assisted in establishing standard for *Quality Systems* o Changes: MRB procedures
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Some confusion relative to MRB MIL-STD-480 (Configuration Control - Engineering Changes, Deviations and Waivers) vs. MIL-STD-1520 (Corrective Action and Disposition System for Non-Conformal Material).
3) What *impediments* do you foresee as a result of current military/government standards for *Quality Assurance in moving* to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	o Provisions needed to recognize automated process control procedures. o As we continue to drive to a "paperless factory", requirements for DWG control must translate into "Program Control". Records to be reviewed must allow CRT display presentation in lieu of hard copy. Similar comments pertain to documents and quality instructions.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	o Must address Software QA activities as we replace more and more paper with additional software. o DWG requirements must accommodate N/C programming. o Similar response as #3 above.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	"Field" QA results provide information for Product Reliability-Analysis, including failed part analysis, to permit corrective action. Standards appear okay, but implementation weak. Data collection is dependent upon contractual requirements. Present method is manual data collection. Recommend additional techniques to improve efficiencies.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	o Lot/part traceabililty will need to be addressed; may use "barcoding". o Read access to electronic media. o Approvals via electronic media. o Response similar to #3 above.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	o More clearly defined requirements, responsibilities, etc. o Specifications which have measurable vs. interpretive requirements, words or phrases like "effective, economical, ready detection, adequacy, promptly, completeness, acceptable to the Government" are very subjective. o New level of expertise (ADP) demanded by approval agencies.

Please identify position/title of individual completing this questionnaire: R. E. Smith,
Manager-Product Assurance
SCSD - Daytona Beach, FL
General Electric

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

CSO
Rockwell
GE

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		2	4	2	3	5	1
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	4	2	3	5	1
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		1	3	4	3	4	1
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		4	4	3	3	1	4

RATINGS: Use ratings from "1" for very_low to "5" for very_high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858A covers the hardware quality arena very well - not because of its "words" but due to industry interpretation and the disciplines implemented. Weaknesses design stage control, new elements such as software control.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Problems - only those of ordinary negotiation to gain adequate funding. Some requirements are non-productive.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	If the government would pull back to a results-oriented requirement rather than a "how to" specification, there would be no problem. Unlikely to occur.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Get more up-to-date with technology available. More involvement in the process aspects. Same as whatever industry is doing.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Overall Impression - Government (DoD/Measurements) are very inadequate and do not help industry to improve results. There are exceptions.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Not much - With proper interpretation. But !! unlikely.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Specs per se do not define requirements - inventory is tougher on industry than DoD is (i.e., Application/ Interpretation). Stay away from "how to".

Please identify position/title of individual completing this questionnaire: _____

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effective-ness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		1	3	3	4	4	N/A
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	2	2	3	3	N/A
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		1	3	2	3	3	N/A
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		1	1	3	3	3	5

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Covers QA needs quite well. Does not address SW control both deliverable and internal test SW. Its interpretation and meaning have been hammered out by government and industry so a common base of understanding exists. Also, it states requirements without prescribing how to do something. Should address SW control.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Overspecification. Specs not only specify requirements but how they will be met. MIL-STD-1520B on NC Material and CA and MIL-STD-1535A on control of vendors. These are much too specific. For example, MESO has a very good CA system but does not have a CA Board prescribed in 1520B making MESO's system unacceptable. Eliminate these two specs and enforce MIL-Q-9858A. Punish violators who do not effectively control NC material or their vendors, not the whole industry.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	No impediments are seen in the specs themselves. Impediments are expected to arise from the literal interpretation of specs by government monitoring personnel that do not comprehend the automated world. Many of them are lost without handwritten or typed test results that clearly state limits that are fixed. In many phased array radar/sonar applications, individual element test results are not conclusive and whole array data must be reduced through Fourier Analysis using computer techniques that are not understood by gov't reps responsible for acceptance.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Need to prescribe requirements for controlling non-deliverable SW used in the manufacture, inspection and test of products to be delivered on a contract.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Very poor feedback from the Field. Usually limited to negative feedback only. Have not researched adequacy of specs so can't comment. If MESO's Field Program people are involved, a reporting system exists to get data back to the in-house Quality people. We seldom get any feedback when GE field programs are not involved. Without having researched the adequacy of specs, can't make recommendations.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Some means must be established to reflect appraisal status of the product. This could include stamping the product itself. Standards should clarify, in view of the many ways that inspection/test results are captured, stored, reduced, etc., what constitutes acceptable evidence of inspection/test.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	As specs and standards are introduced/revised, the prime objective should be to clearly state what the requirements are and not how they will be met. Because of the broad spectrum of products and technology involved in government procurements, the manner in which requirements will be met are going to vary from one company to another. The gov't should stop proliferating specs because of the non-responsiveness of some contractors and enforce the ones they already have on the books.

Please identify position/title of individual completing this questionnaire:

Actg. Mgr.-Qual. Engg.
E. Chase
Mgr., R&AP
MESO - Syracuse, NY
General Electric

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		3	4	4	4	4	NA see *5 (???)
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		2	4	4	4	4	
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		1	1	1	2	2	
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		2	2	2	2	2	

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP110513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	The MIL-Q in it's current state handles our needs very well. I would recommend no changes.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	None.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	No changes required. The basic specs cover "what" is to be done. "How to" do it is left up to the contractor and is the area affected most by the increased automation and computer usage.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	None.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	This area needs attention. All contractors have difficulty getting past buy off failure and reliability data from the customer/user agencies. This is not a shortcoming of 9858A. A new spec should be written to cover customer reporting to the contractors.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	None.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	None except 5) above.

Please identify position/title of individual completing this questionnaire: J. Canfield
Manager, QA&T
RSO - Philadelphia
General Electric

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS → / RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	PRE-PROPOSAL: A1 Prepare for Future QA/QC Aerospace Demands	PROPOSAL: A2 Prepare QA/QC RFP Response	DESIGN & DEVELOPMENT: A3 Prepare QA/QC Program Plan	PRE-PRODUCTION: A4 Implement QA/QC Program Plan	PRODUCTION: A5 Perform to QA/QC Program Plan	POST-PRODUCTION: A6 Evaluate QA/QC Effectiveness
1)	*What is the current level of adequacy of* MIL-Q-9858A in each of the Program Life Cycle areas?	2	2	3	4	4	2
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	2	2	3	4	4	2
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	3	4	4+	4+	4	3
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/military quality assurance standards?	2	2	2	2	2	2

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858A adequately covers current Quality Assurance needs. The weaknesses is that MIL-Q-9858A is primarily limited to the production phase of a program and does not adequately cover the proposal and post production phases. MIL-Q-9858 is adequate, but could be updated to make reference to major subsidiary specifications.
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	The most significant problem is when the government changed MIL-C-45662 to MIL-STD-45662 without adequate notice. The practice of changing specification content and limiting re-identification to changes from MIL-C to MIL-STD creates confusion. DON'T DO THIS.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	The impact should be minimal once the government representatives understand how the computers are being used and controlled.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	None

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Accurate field data is difficult to obtain. Our experience dictates that on new programs you must have "on-site" representation. Each failure/removal must be reviewed with your customer or the government representative for disposition, failure classification and corrective action. For mature programs the government 3M or 66-1 data system are used, but for trends only. These are less than accurate.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	No Impact - No modification required.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Why a new Product Quality Assurance Standard?

Please identify position/title of individual completing this questionnaire: Manager - RCQA
GE

Quality Assurance Ratings

General Comment: MIL-Q-9858A is considered "Quality Program Requirements" for programs with hardware as a product. A spec. like MIL-S-52779A or MIL-STD-1679 are required to control the quality requirements of software as a product.

Questionnaire (continued)

1.e) action requirements (paragraph 3.6 and 3.5).

5) o Data is not usually used by the operational areas. GAC receives the data in the form of typical reports used by the customer and raw data that can be sorted and tabulated by GAC. The data is of a nature that it does give insight into the total aircraft/system.
   o The data is used for identifying problems and taking corrective action, for readiness and provision planning.
   o The recommendation regarding Gov't. standards are oriented towards limiting the human interface of data entry or providing for more dedicated personnel or a more stable work force.

J. Mule'
Supervisor Q.E.
Statistical/Automated Systems

WPAFB
4/7/83

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		2	1	5	5	5	3
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		2	1	5	5	5	3
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		4	4	1	1	3	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		1	1	3	3	3	5

RATINGS: Use ratings from "1" for very_low to "5" for very_high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	I believe MIL-Q-9858A is an excellent document. It is flexible enough to be adopted to almost any plant environment, including ICAM. If it is deficient in any area, it probably would be in quality measures (i.e., cost of quality). The automated factory would lend itself to new uses of Quality Assurance data in management. MIL-Q-9858 could be more specific in this area.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Our contractors have objected to MIL-STD-45662 and MIL-STD-1535A (Registered Components). There is a change in process which should remove the objections to MIL-STD-45662. The objections to MIL-STD-1535A can be resolved with a minor change in wording.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer?	None. I think the current standards are flexible enough to accommodate the Factory of the Future. If there is a problem, it probably is in educating government people on enforcing the requirements in an automated Factory.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	None are necessary. They could be refined a bit in the area of quality measures.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	I believe that contractors, as a rule, do a good job in collecting R&M data. They, however, often fail to communicate the data analysis results back to their organizations responsible for design and/or manufacturing.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	There should be no impact. The standards are flexible enough to be adopted to most in-plant environments.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	None.

Please identify position/title of individual completing this questionnaire: *Air Force QA Staff Spec.*

WPAFB
4/7/83

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		1	3	4	4	4	2
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		1	2	3	2	4	2
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		2	2	4	4	5	4
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		1	3	5	5	3	4

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	It is a good document. Although written in 1963, it is still a valid approach -- and flexible enough (with intelligent interpretation) to be applied in a wide variety of acquisitions and in different phases (i.e., FSD and Production). It is weak in the area of *quality-in-design, also software QA.* Any change should pick up MIL-STD-1520, MIL-STD-1535, MIL-S-52779 so that only one requirement could be cited. Any new standard should probably be "tailorable".
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	MIL-STD-1535: Concept of "registered components" misunderstood. This "term" should be eliminated in next revision. MIL-STD-1520: Intent still not clear to many contractors. Not seen as a way to drive down costs; but rather as a cost driver.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	9858 not very clear on application of statistical process control. In Factory of the Future: some formal process capability demonstration, statistically-based, should be included for the FOF. Software QA requirements (i.e., MIL-S-52779) still immature. Need much work.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Combining quality, reliability, maintainability, parts control, configuration management, producibility into a single "product assurance" program requirement would make sense and is consistent with the FOF idea. (See Navy's Cruise Missile document.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	PPFS and SEDS directed at this area. A big challenge.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Good point! Getting away from hard copy "objective evidence" could be hard to do without a lot of re-education of all parties (government and contractor QA). We seem to be doing this now, with respect to ATE where "test procedures" (work instructions) and test data are really pure software QA issues.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Violent emotional resistance of the industrial community.

Please identify position/title of individual completing this questionnaire:

George J. Thielen
Chief, QA Division
Directorate of Mfg.
United States Air Force
Aeronautical Systems
Division (AFSC)

ISP110513000
18 AUGUST 1983

[illegible]
[illegible]/83

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	[illegible]ST-[illegible]
PROGRAM LIFE CYCLE AREAS ——▷	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	[illegible]ST-[illegible]
RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY ——▷	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 [illegible] /QC [illegible] ness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	N/A	N/A	2	3	3	N/A
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	N/A	N/A	2	2	2	N/A
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	5	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/military quality assurance standards?	5	5	3	3	3	5

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	a) MIL-Q-9858A does not cover SQA b) Does not address the QA & QC role in an environment where automation is having a greater and greater influence c) Should have stronger Control of Purchases paragraphs (5.0, 5.1, 5.2) including seller Quality Ratings and selection/exclusion of sellers based on past quality performance in the applicable material classes. d) Should be more definitive regarding process control for automated and non-automated manufacturing processes (paragraph 6.2) e) Should have more definitive performance measurement and corrective
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	None, however we plan to better meet the intent of MIL-STD-1520A with a Quality Information Management System that will help CAC move toward automated process control using statistical techniques and having greater visibility into problem areas so that more effective corrective action can be taken.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Impediments - present requirements seem to favor 100% inspection of each product at each work operation, rather than process control. It does not take into account computer aided design or Manufacturing, Automated Manufacturing and the capability of the computer to perform automated data entry, data analysis and artificial decision making regarding product acceptance and corrective action. Multi-year procurements could be a problem.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Military/Gov't. standards must take into account that existing product acceptance methods will no longer be applicable. Future requirements should account for the shrinking role of the inspector as presently known, and the moving of product acceptance to the left, i.e. by monitoring the process, greater use of the computer to analyze more data and take advantage of that extra knowledge to perform product acceptance. Military/Gov't. standards should also require quality controls that are aimed at minimizing life-cycle rather than delivered costs.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	GAC becomes involved with "field" problems essentially at the discretion of the customer through - UR's (Unsatisfactory Reports) requiring GAC response - ECP's requesting change redesign o "Field" data system is considered very good and comprehensive, however the human element of data entry is a problem - data fields are missing, data is inconsistent and arithmetic errors are often made in tabulation fields. o Gov't./Military top standards are sufficient, but lower level procedures may have to be improved.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Gov't./Military standards that include documentation requirements may have to change to accomodate automated outputs. Other changes will have to evolve as industry and government gain experience.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	o The emergence of automation as the standard method of operation in most areas o Greater awareness of life cycle costs o The effects of multi-year contracts on quality o Stronger standards on control of seller quality o The shifting of emphasis from Quality Control to Quality Assurance or shifting of how product acceptance is performed.
Please identify position/title of individual completing this questionnaire: Chairman	

Hughes I/C
9/12/83

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

What manner of product?

Sequence doesn't fit acquisition cycle à la 5000.1

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS → / RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	PRE-PROPOSAL: A1 Prepare for Future QA/QC Aerospace Demands	PROPOSAL: A2 Prepare QA/QC RFP Response	DESIGN & DEVELOPMENT: A3 Prepare QA/QC Program Plan	PRE-PRODUCTION: A4 Implement QA/QC Program Plan	PRODUCTION: A5 Perform to QA/QC Program Plan	POST-PRODUCTION: A6 Evaluate QA/QC Effectiveness (in what way?)
1)	What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas? assume Hard-tooled, long-term production of complex items			3	5	5	
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?			5	5	5	
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?			5	5	5	
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/military quality assurance standards?			<1	<1	<1	

RATINGS: Use ratings from "1" for very_low to "5" for very_high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Well. Doesn't describe partial applications for phase of acquisition or hardware type. Understood by all. Describes good business. None.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	21549/AR92/AQAP-1/8200.1. I suggest sticking with 9858.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	Lack of software assurance requirements. Add software as an integral part of standard documents.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Development of standardized (software) requirements to accommodate the automated environment.
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Stardards in this area?	Not good -- matter of fact, bad and late! No. Received and disbursed by control agency who prepare responses based on inputs from concerned program/division. Needs concentrated study -- long-term.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	None. Added treatment of automation controls, v.z. software.

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	This assumes new standards are required. Who says?

Please identify position/title of individual completing this questionnaire: _____

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1)	What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	NA	5	4	5	5	NA
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	NA	5	4	5	4	NA
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	1 (May be higher)	1	4	4	5	NA
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	1	1	1	1	1	NA

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ESD-TR-83-300
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task 0 - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	9858A is well understood and presents us no major problems in any current program phase. Minor problems arise from time to time and are resolved locally. Any changes made would risk having to develop new understandings and result in more problems than they fixed.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Standards which describe visual inspection criteria for workmanship, i.e., appearance of solder joints may not reflect more modern techiques to automatically inspect.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Recognize trend toward process control in real time which results in fewer examples of "objective evidence" such as inspection records, control charts, yield reports, etc.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Recognize trend toward process control in real time which results in fewer examples of "objective evidence" such as inspection records, control charts, yield reports, etc.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Military field reporting systems are totally inadequate. We need specific information on confirmed failures to the part level. Currently we get a mixture of secondary failures, maintenance induced, could not deuplicate, cannibalization and etc. The fault is not in "Quality Assurance" standards, but in Field Data Systems.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Recognize trend toward process control in real time which results in fewer example of "objective evidence" such as inspection records, control charts, yield reports, etc.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	With the variety of factory systems in use, spanning the range of automation, PQA standards must be flexible and general enough so that contractors can develop their own approaches. Issues include real time self calibrations, factory software, computerized records.

Please identify position/title of individual completing this questionnaire: TI

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓ / PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effective-ness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	4	4	4	4	4	3
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	3	3	3	2	3	2
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	3	3	4	5	5	4
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	3	4	4	4	4	3

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI 105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858 covers our current Quality Assurance needs quite satisfactorily. It is weakest in the areas of software controls and cost of quality. Its strength lies with the fact that requirements are stated in a way that allows the necessary latitude for implementation. We would recommend revision to include appropriate references to software control, data storage on terminals, methods to measure compliance without the subjectivity of a DCAS audit.
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	The requirements of some standards are so rigid that compliance prevents adaptation to the contractor's established methods of operation. MIL-STD-1520, MIL-STD-1535, Navy OD21549 and certain NASA specifications are examples of this problem. We recommend revision to eliminate or significantly reduce unnecessary Government controls.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Current requirements that accepting data and records be committed to paper (specified forms) as opposed to use of information readily available from computer terminals. There should be gradual (staged) changes in requirements to accomodate the transition from present practice to future automation. Alternate quality methods must be allowed for automated lines. Standards should be upgraded to recognize the state-of-the-art technology. Emphasis should be on overall operations control in lieu of hardware inspection.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Earlier Government involvement in defining the controls. The standards must specify joint ownership at the lowest possible subassembly level. Process control techniques must be emphasized instead of inspection methods.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

ESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Relevant field data is difficult to acquire and nearly impossible to interpret or relate to specific conditions. Every "service" has different methods and priorities for obtaining, distributing and acting on the data. Establish common recording/reporting/feedback techniques responsive to suppliers' needs.
What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Primarily in requiring revision (upgrading) to incorporate new concepts and methods for data collection, storage, retrieval and review. Control of computerized systems, assuring correct inputs, and software audits will be emphasized.
What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Orientation and training of both industry and government quality personnel to keep pace with the changing technology. Strengthen corrective action cycle and audit for effectiveness. Concentrate on prevention.

Please identify position/title of individual completing this questionnaire: R.A. Rajcic, Manager Quality Assurance

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

Lockheed-Georgia

QUESTIONS ↓ / PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	N/A	N/A	4	4	5	3
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	N/A	N/A	4	4	5	3
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	4	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	N/A	N/A	2	2	1	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP1105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task 0 - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

ESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	See attachment
What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	See attachment
What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	See attachment
What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory envirdnment?	See attachment

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	See attachment
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	See attachment
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	See attachment

Please identify position/title of individual completing this questionnaire: QUALITY ENGINEER

ATTACHMENT # 1

(1) MIL-Q-9858A adequately highlights QA involvement in all areas except Design Review. One of its strengths is that it allows some flexibility in implementation. One weakness is that it is very broad and open to different interpretations.

(2) MIL-STD-52779A overlaps MIL-Q-9858A dealing with software rather than hardware. Examples of other overlaping documents are MIL-STD-45662 and MIL-STD-980.

(3) Government standards should focus on functions of end product, emphasizing control and adequacy. Machine control rather than workman control must be recognized.

(4) Most of the changes should occur in standards relative to software Quality Assurance. Software Q.A. must keep up with the state-of-the-art in producing software. Changes should also occur in the controls of processes and equipment. Answers in 6a and 6b also apply to this question.

(5) Field data is often incomplete. Various Military Bases do not report QA data in the same manner.

(6) Changes will have to be made to allow for:
   a) Inspector code numbers in lieu of stamps.
   b) Objective evidence of inspections and work performed will be through magnetic tapes/discs.
   c) Security and duplication of data must be addressed.
   d) Back-up system in case of power failure.

(7) More statistical sampling should be used. QA involvement in Design Review should be emphasized for complex systems.

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1)	What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	(NA)	(NA)	2	2	4	2
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	(NA)	(NA)	2	2	3	1
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	Lessons Learned 4	5	5	4	5	5
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	5	(NA) 5	5	4	3	4

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP1105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task 0 - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858A has been fairly adequate but with the advent of automation, and life cycle cost growth, early identification and evaluation of producibility, maintainability, and quality issues/parameters must be considered
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Tailoring and methods to tailor ill defined. MIL-S-52779 - need specific definition or requirement for contract to specify non-deliverable and firmware controls. Make a tie-in between 9858A and 52779. Where contracts have SAMSO STD 73-5B and 1520B tailor properly (i.e., prevention, retest, etc., and scrap, rework repair).
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Need to change application of specification methodology to require tailoring of standards to product families or criticality. Factory of 1990's requires real time data recognition to evaluate trends/occurrences real time to keep pace with Engineering and production speed.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Same as direction 3. Future specification must address embedded software, firmware and non-deliverable software.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Field data trends to be raw data with no ability to normalize to determine significant impact data versus insignificant. No standardization of field data required by standard procedure. No detail provided in field data to evaluate personal contact required to understand impact.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Require computerized quantitative data with sufficient detail for analysis. Basic thinking of management must change. Accept Go/No-Go computer evaluations. Use of automated tools to report compliance or exception report data. Impose adequate security requirements for computer data.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Non-deliverable and firmware software controls. Security of Software Data. Traceable Quality acceptance of Quality Data. Traceable measurements used for acceptance including measurement assurance programs through statistical comparison techniques. Enhance Quality requirements for upfront preproposal (design and development) involvement. In-process - Configuration Management of Software programs and data.

Please identify position/title of individual completing this questionnaire: Martin Marietta

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		NA	NA	5	5	5	5
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		3	3	3	4	4	4
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		3	3	3	3	3	3
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		NA	NA	NA	NA	NA	NA

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISPI10513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Adequately. Does not cover software. Deals with paper objective evidence only and does not consider computer stored information. General approach to quality program is the main strength. Deal with the non-paper records.
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	MIL-STD-1520. Quality costs too restrictive. Technical standards such as soldering and testing are too specific and therefore too restrictive for some applications. Allow appropriate tailoring of these specifications without real or implied penalty.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Requirements tend to be too specific thus driving up the costs, e.g., MIL-STD-1520. Change the content and the emphais to make the standards compatible with the new factory, i.e., automated equipment, robotics, extensive use of software, "paperless documentation."
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	A recognition that we need a difference approach to Quality Assurance for mass production and one-of-a-kind and state-of-the-art items. In the latter, need more reliance on the contractors systems and methodologies.

QUALITY ASSURANCE QUESTIONNAIRE
Task 0 - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Our principal field experience is basically within orbit spacecraft performance and thus, we do not require Military specifications or standards for maintainability guidance.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Objective evidence media will have to be changed, redefined, and recognized. Control of the evidence will need to be established. Define requirements, make them easily tailorable and accept contractor's methodologies.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Software Quality Assurance and Configuration Management. Quality Assurance activities relating to other related disciplines such as Reliability, System Safety, Configuration Management, Parts Materials and Processes, ought to be established.
Please identify position/title of individual completing this questionnaire:	Director of Product Assurance TRW

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		3	3	4	4	4	4
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		2	2	2	2	2	2
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		3	3	3	4	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		3	3	3	3	3	3

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	See Attachment A
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	MIL-510-1520 for control of nonconforming material review is a growing concern because its cost is a very significant amount of quality man-power and dollars. The document needed to be more specific and leave the methods of control to the Contractor. Present guidance regarding costs, appraisal costs and failure is vague. MIL-STD-1535A in many cases creates excessive Quality Assurance requirements and redundant auditing. Flow down of tailoring concept should encompass tailoring requirements.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	See Attachment B
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	Recognize hardware, software, and systems control for computerized controls and computer data. Define specific requirements such as objective evidence/documentation for computer controlled drawings, tooling, manufacturing acceptance and military involvement.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	See Attachment C
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	There will be a significant impact of a paperless factory on government/military standards. A whole new approach will be required for system, hardware and software controls for in-process inspection, planning, tooling, documentation, material control, final acceptance, sub-contractor control, and etc. The design and implementation must be evolutionary and not revolutionary in nature. In addition they must be designed to be compatible with existing business structure.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Formulation of a system for quality cost-effectiveness. How can a system be realistically measured in terms of parameters familiar to everyone? Consideration should be given to the new international acquisitions and Co-producers. The requirements placed on Contractors in the various countries must be considered since a large number of these products become a part of a weapons system.

Please identify position/title of individual completing this questionnaire: J. E. Mayhen
Director, Product Assurance

ATTACHMENT A

QUESTION 1): How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?

COMMENTS: MIL-Q-9858A is not a stand-alone document. This specification requires a number of companion specifications such as MIL-STD-1520, MIL-STD-1535A, MIL-STD-45662, MIL-STD-480A, MIL-I-6870E and MIL-S-52779A. This universal document does provide a reasonably high degree of quality discipline controls.

There is no one predominate problem with this specification, but rather numerous areas that attention should be directed. The specification is based primarily on philosophy and general objectives and therefore is open to reinterpretation by both parties to a contract. The use of this DOD single-wide application should include a broad tailoring mechanism which recognizes the basic nature of the producing industry. This form of tailoring could be in a Quality Assurance Plan. This approach is especially significant in a developmental program.

MIL-STD-9858A should be considered with the other documents supporting objectives of the DOD and the implementing approach since they are so closely allied. Contractual requirements must be specific and priceable. Such detail requirements can only be defined in Quality Assurance Plans and associated work statements.

The specification should include controls for software as well as hardware.

Recommend that the contractor be certified in many of the quality areas. This system can sizably reduce the manpower and provide a more efficient operation.

QUESTION 3): What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?

COMMENTS: Both economic and technology changes will nave a definite impact on the usefulness of the military specification referencing practices. There is a need for improved accept and reject methology such as in-process inspection, certification of processes, certification of employees and computer programming validation. Quality role should be shifted from appraisal to prevention.

The role of Quality Assurance in the area of computer software will require a fully defined document. The current MIL-S-52779A, Army document used by the Air Force, will not be adequate.

More emphasis should be placed on the early Quality Assurance involvement in programs. Use of CAD/CAM technology can be useful for early program data documentations. Failure mode effects analyses could be used for determining critical quality requirements. Quality records and data will need a change for collecting, reporting, storage and etc.

ATTACHMENT C

QUESTION 5): What has been your experience with "Field" Quality Assurance especially as related to Reliability/ Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?

COMMENTS: The last time General Dynamics AFM audited AFM 66-1 data in detail was in June 1981; the results were as described below. There has been some improvement, but the problems are the same. In order to assess the validity/accuracy of the AFM 66-1 data, the December 1980 Unscheduled Maintenance Report was used as a benchmark.

There were more than 4,000 LRU maintenance actions recorded. From these, 378 (less than 10 percent) has the part number entered into the data. In 165 of those 378 part number entries, the part number matched the Work Unit Code. This gives an accuracy of 43.6 percent. In the other 56.4 percent of the cases, an error had been made in entering either or both the part number and the Work Unit Code.

This means that less than half of the problems recorded in the AFM 66-1 data are even attributed to the right equipment. If the same degree of inaccuracy is extrapolated across the remaining entries, the 43.6 percent which is correct has the wrong problem entered in more than half the cases and again more than half the corrective action entries are wrong.

In addition to the above, there is a bias in the data. Some items experience naturally higher attention levels. Personnel recording the activity become accustomed to that higher exposure, and recognition/ recording improves. The data, therefore, serves to highlight established problems while it confuses and obscures new or emerging problems. For example, the Engine Oil Pressure Switch, had to cause multiple NORS conditions, even with over 100 spares delivered before it became recognized as a major problem. The AFM 66-1 data entries had not highlighted the item. After the item got the attention it warranted, it became a major item in the AFM 66-1 data.

Since Work Unit Code, Part Number, How Malfunction, and Corrective Action are key data elements in problem research, the voluminous AFM 66-1 data with a high degree of error in these fields will not be easy to use. Problem research projects utilizing the AFM 66-1 data as source data will be very time consuming.

CONCLUSIONS:

1. The AFM 66-1 data is a reliable source in ranking established problem hardware.
2. The AFM 66-1 data is reasonably usable as a source of problem detail information for established problem hardware.

COMMENTS: (continued)

3. The AFM 66-1 data needs more discipline.

4. The current undisciplined AFM 66-1 data is inadequate as a source of ranking or research information regarding new or emerging problem hardware.

Other field quality data is received through company and Air Force Discrepancy Reports (DR) and Parts Failure Service Reports (PFSDR). These reports provide quality trend data and also attention to some of the significant problems. Again, the system provides a certain amount of judgment required in both the need for a report and the data furnished for adequate follow-up and corrective action.

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		4	N/A	5	5	5	4
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		3	N/A	4	5	5	4
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		4	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		N/A	?	?	?	?	?

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP110513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	1) Basic elements are adequately covered. Details for specific or program special requirements are included in product specification(s) as they should be. MIL-Q-9858A requirements form the foundation from which to start. No particular weakness is known. No specific changes are proposed.
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	2) Problems are usually related to local interpretations.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	3) The systems used in the factory of the 1990's may be more complex and require considerable time and effort to understand from an "audit" viewpoint. The guidelines used to evaluate government/military standard compliance should recognize the complex nature of the factory system and encourage a joint contractor/government auditor review.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	4) Same as 3) above.

QUALITY ASSURANCE QUESTIONNAIRE
Task 0 - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	5) System does not provide user friendly information. MIL-Q-9858A really does not cover customer usage/data requirements; and shouldn't. USAF 66-1 doesn't suffice for meaningful corrective action effort.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	6) Records - What will satisfy objective evidence?
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	7) Relationship of MIL-Q-9858A to software.

Please identify position/title of individual completing this questionnaire: Director, Quality Assurance
MDEC

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1)	What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?	3	3	2	2	2	1
2)	What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?	2	2	2	2	2	1
3)	What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?	4	5	5	5	5	6
4)	What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?	4	4	5	5	5	5

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP1105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

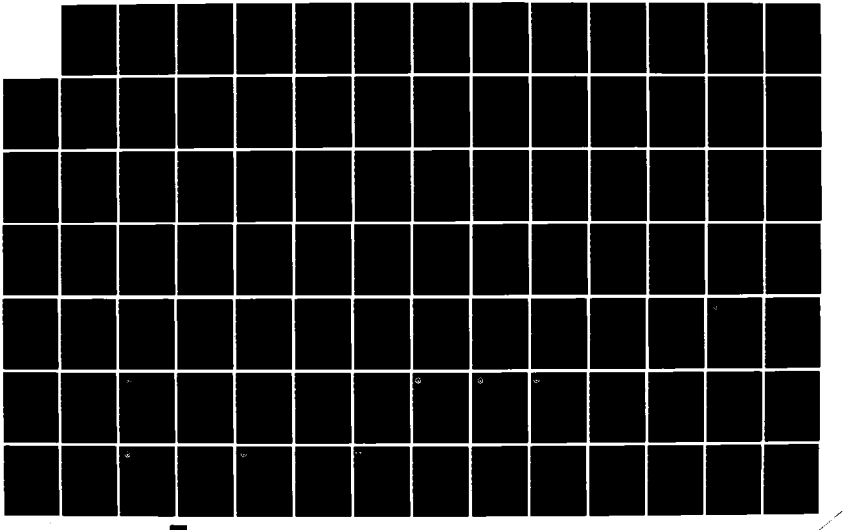
QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	Principal weakness is that it is vague in its use of "motherhood" language, but the real requirements regarding compliance are contained in HBK H-50, AFCMDR 178-1, AFSCP74-3 and similar "non-contractual" documents. Recommend/demand realistic "tailoring" of QA/QC/reliability requirement for the various phases of contract activity.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Principal problem is related to the various interpretations of the QA/QC specifications - recommend same as for 1), i.e., realistic tailoring. Other problems are the satisfying of spec requirements just because the spec requires something - whether it is useful or not.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/ military standards be changed to accommodate increased automation and computer usage?	The principal problem I see is the standardization of automation systems. I see an attempt to establish requirements that do not account for differences in types of operations, types of product, types of contracts, etc.

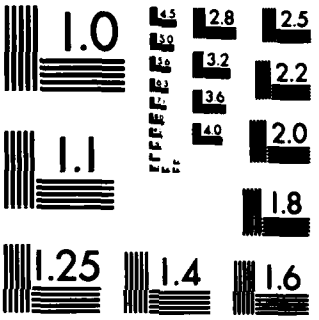
QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	I see the need (at least at the beginning) to conduct surveys of data obtained. In a sense, we will be double checking results shown by automated means - until we really believe in it. (Many tab runs have unnecessarily been screened for errors - should continue but with common sense -- not disbelief.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Too little experience to reply.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	See answers to 3) and 4).

AD-A144 891 ICAM (INTEGRATED COMPUTER AIDED MANUFACTURING) CONCEPTUAL DESIGN FOR COMP..(U) LTV AEROSPACE AND DEFENSE CO DALLAS TX VOUGHT AERO PRODUCTS D.. R H WETTACH ET AL. 29 JUN 84 2-20150/4R-2 F/G 14/4 3/4 NL

UNCLASSIFIED





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

QUALITY ASSURANCE QUESTIONNAIRE
Task "D" - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	A principal that would require specific acceptance criteria - but exclude the detailed data of control characteristics (those that must be met to arrive at acceptance criteria) for purposes of accepting product.

Please identify position/title of individual completing this questionnaire: QA-Manager
United Technology

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		N/A	N/A	5	5	5	5
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		N/A	4	5	5	5	5
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		5	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		N/A	N/A	1	1	1	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP110513000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	We feel MIL-Q-9858A is adequate.
2) What problems have you encountered as a result of complying with other government/ military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	Other MIL-Specs contain too much "How" and we feel the military customer should specify the "What". The customer could evaluate the contractor's system and validate it, if it meets customer objectives, examples are MIL-STD-1520 and MIL-STD-45662.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	Same as Item 2. In addition, we need less military specifications. Only those necessary to meet customer objectives should be retained.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	May need a new interpretation as to what constitutes "objective evidence" in a paperless environment. The area of "Software" needs to be segregated into "Deliverable" and "Non-Deliverable" hardware. Too costly to treat "All" software the same. Suggest Air Force get industry opinion before release of additional specs.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Engineering will provide an answer to this item.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	As I noted in Item 4 there needs to be an interpretation of what will constitute "objective evidence" in a paperless environment.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	Reference Item #2

Please identify position/title of individual completing this questionnaire: Hubert Harris and Fred Oaks
Supervisor Staff Group — Q. A. Manager Staff and Lab.
Boeing

QUALITY ASSURANCE RATINGS
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS ↓	PROGRAM LIFE CYCLE AREAS →	PRE-PROPOSAL	PROPOSAL	DESIGN & DEVELOPMENT	PRE-PRODUCTION	PRODUCTION	POST-PRODUCTION
	RELATED NODES IN ICAM MODEL OF ASSURE PRODUCT QUALITY →	A1 Prepare for Future QA/QC Aerospace Demands	A2 Prepare QA/QC RFP Response	A3 Prepare QA/QC Program Plan	A4 Implement QA/QC Program Plan	A5 Perform to QA/QC Program Plan	A6 Evaluate QA/QC Effectiveness
1) What is the current level of adequacy of MIL-Q-9858A in each of the Program Life Cycle areas?		N/A	N/A	4	4	4	4
2) What do you anticipate will be the level of adequacy of MIL-Q-9858A in the automated environment in the factory-of-the-future in each area of the Program Life Cycle?		N/A	N/A	4	4	4	4
3) What will be the level of impact of the increased usage of computers and automation in the factory-of-the-future in each area of the Program Life Cycle?		5	5	5	5	5	5
4) What is the level of opportunity for improvement in Quality Assurance in each area of the Program Life Cycle as a result of changes or additions to government/ military quality assurance standards?		2	2	2	3	3	1

RATINGS: Use ratings from "1" for very low to "5" for very high. Use "NA" if you feel the question or the Life Cycle area does not apply.

ISP1105130000
18 AUGUST 1983

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
1) How well does MIL-Q-9858A cover your current Quality Assurance needs? What are its weaknesses? What are its strengths? What changes would you recommend?	MIL-Q-9858A covers current Quality Assurance needs fairly well. o Weaknesses include: a) tends to view cost vs. quality as adversaries b) Section 5.1 - QPL o Strengths - broad ranged in scope, allows for flexibility o Possible Changes - allow more emphasis for quality improvements, cost incentives.
2) What problems have you encountered as a result of complying with other government/military Quality Assurance Standards? Identify the Standard and discuss. What changes would you recommend?	o There has been a difficulty in demonstrating that, at BMAC, engineering quality (product) assurance is for the most part performed by the Engineering organization not the Q. A. organization. o Recent change to CAL-CERT spec 45662 o A general notification of specification changes should be made to the contractor prior to contract.
3) What impediments do you foresee as a result of current military/government standards for Quality Assurance in moving to the factory of the 1990's? How should government/military standards be changed to accommodate increased automation and computer usage?	o Compliance with current specs & standards tends to stifle innovation in some instances. Software specs are currently not broad based enough and do not differentiate between deliverable vs. nondeliverable software. Also, embedded specifications are hard to deal with. There is a general uncertainty about what will constitute objective evidence under new Q. A. standards. The standards should speak of information and traceability rather than just written records.
4) What do you perceive as necessary changes to government/military Quality Assurance Standards with the advent of the new automated factory environment?	o With the advent of new automated techniques in production and inspection, there may be a need for increased flexibility in Q. A. standards.

QUALITY ASSURANCE QUESTIONNAIRE
Task D - QA/QC/Technical Requirements/Tasks
ICAM Project Priority 1105

QUESTIONS:	COMMENTS: (Please be specific. Give examples. Use additional sheets if necessary.)
5) What has been your experience with "Field" Quality Assurance especially as related to Reliability/Maintainability data collection? Are the government/military standards sufficient? How is this data collected, distributed and acted upon? What recommendations do you have for improving government/military Quality Assurance Standards in this area?	Note: At BMAC the Q. A. organization does not handle the maintainability and reliability effort. o Future government/military standards should provide a data collection system that provides more meaningful data than presently available.
6) What will be the impact of a paperless factory on government/military standards? How should the standards be modified to accommodate a paperless environment?	Fast changes, though documented, will outpace present approval mechanisms. Standards must allow more contractor flexibility and media independency for record keeping.
7) What are other Quality Assurance issues that should be addressed in the development of new Product Quality Assurance Standards?	

Please identify position/title of individual completing this questionnaire: Engineer / Man Tech - Q. A. R&D
Boeing

B.6 Information Gathering Meeting Minutes

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Vought Corporation, Dallas, Texas

Date: 8 February 1983

Attendees:

H. L. Henson, V	N. Rogers, V
L. J. Johnston, V	J. J. Ryan, V
R. Neal, V	N. E. Sharp, V
D. L. Norwood, V	B. R. Shepherd, GE
D. L. Orth, V	R. H. Wettach, GE
A. Reingold, V	

Meeting Minutes:

1. Internal (factory) quality information gathering is an area of need not directly addressed in Needs Analysis (actually incorporated within "Early detection/prevention of quality problems" - Need #1).

2. Inspection technology has not kept pace with manufacturing technology.

3. Needs #4 and 5 are one and the same (#4. New QA/QC technology compatible with Factory-of-the-Future). (#5. New inspection techniques for internal integrity of composites).

4. A system requirement should be the elimination of inspection.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

5. A preface to any new Product Assurance Program Standard should indicate that the current contract did not include a study of a potential "To-Be" Factory-of-the-Future environment vis-a-vis Quality Assurance.

6. MIL-S-1520 and 1535 are too specific - difficult to comply with - specify "how" to do things, not just "what" should be done.

7. MIL-S-52779 is ambiguous - no unified interpretation available.

8. Field quality information system totally inadequate.

9. Organization structure gets in the way of early detection of QA problems.

10. Software Control

    - What type of document will replace work instructions?
    - How do you verify going from CAD to CAM?
    - What gets controlled - a vault full of tapes?
    - How can I prove agreement with engineering documentation?

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: General Dynamics, Fort Worth, Texas

Date: 9 February 1983

Attendees:

B. Bedell, GD	A. Reingold, V
L. Clark, GD	B. R. Shepherd, GE
B. Hurren, GD	P. C. Waldrop, GD
P. Laury, GD	J. P. Watkins, GD
J. Mayben, GD	R. H. Wettach, GE
L. McNulty, GD	P. Wooten, GD

Meeting Minutes:

1. Any new Product Assurance Program Standard should be tailorable to a specific program.

2. Use consistency in applying military standards on large as well as small manufacturers.

3. Why is Technical Skills block blank in Needs Analysis matrix vs. QA_O node A1 and A5? We have needs in both these areas.

4. "Early detection/prevention of quality problems" (Need #1) is "motherhood".

5. Re "benefits tracking" - how can you track benefits if your project doesn't address implementation.

6. 6% reduction in overall (theoretical) program cost too conservative - e.g. Systems Requirement #1 - "Early integration of functional activities" - if really done right could result in much more.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

7. 9858A "grossly inadequate" for the Factory-of-the Future e.g. paragraph 3.3 - Work Instructions - how does this apply in terms of robotically controlled inspections?

8. Cannot effectively utilize 9858 in a Flexible Machining System.

9. Where will Product Assurance Program Standard go? (Ans. HQ-USAF).

10. How can benefits be tracked if you don't implement?

11. An invitation was extended to include us on the AIA/NSIA liaison panel meeting in Washington, March 8, 1983 -- opportunity to introduce our project and solicit additional feedback.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: General Electric Company, Utica, New York
Aerospace Electronics System Department

Date: 17 February 1983

Attendees:

A. Agnone, GE	N. Pelletier, GE
R. Caine, GE	T. Poyer, GE
J. Gardner, GE	N. Scianna, GE
R. Pell, GE	B. R. Shepherd, GE

Meeting Minutes:

1. "Buy a function" - do not worry about all intermediate specifications.

2. Combine specifications - there are too many now.

3. 9858 is as applicable to the Factory-of-the-Future as it is to today's environment.

4. "You should be aware of all the activity in the AIA/NSIA in terms of standards".

5. "I do not see quality costs anywhere in your Needs Analysis?"

6. Take the inspection of composites out of Needs Analysis - it's too specialized.

7. Technical people are too conservative - hence we tend to over-inspect.

8. Utica will send a consolidated view of questionnaire.

ISPI10513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Joint AIA/NSIA Air Force
Liaison Panel Meeting
Washington, D.C.

Date: 8 March 1983

Attendees:
L. Bauer, AIL/Eaton Corp.
L. Baugher, Harris Govt. Systems
Maj. J. R. Baumgart, HQ USAF/RDCM
F. Behegan, Westinghouse
Col. P. Brown, HQ AFLC/QA
A. Davis, Aerojet Strategic Propulsion
J. Dean, Lear Siegler
I. J. Epstein, ODS
R. A. Fajcic, Honeywell Avionics
C. H. Garner, Jr., HQ USAF/RDCM
T. Gibson, HQ AFSC/ALK
R. E. Hannum, Martin Marietta
T. Hart, Westinghouse
Capt. G. Herd, HQ AFSC/ALK
H. Henson, Vought
E. Kuhlmann, McDonnell Douglas
L. O. Langlois, Hughes Aircraft
J. Leslie, Texas Instruments
D. L'Italien, HQ USAF/RDCM
J. Lutz, Fairchild Industries
J. Mayben, General Dynamics/Ft. Worth
E. Mazzanti, AFCMD/QA
J. McDermott, Pratt & Whitney
B. Neff, HQ AFSC/ALK
E. R. Phillips, HQ AFSC/ALK
O. D. Samuals, Jr., HQ AFCMC/QMA
W. Weitner, AIA Staff
R. H. Wettach, General Electric
L. A. Wilson, Lockheed Georgia
B. S. Yolken, TRW

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

1. GE made presentation of Task "D".

2. Panel agreed to send out questionnaire to its member so that the panel could provide an integrated response.

   Note: Responses received from:

   - Honeywell
   - Lockheed-Georgia
   - Martin Marietta
   - TRW
   - United Technology

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.1 - Product Assurance Program Standard

Information Gathering Meetings

Location: General Electric Company, St. Petersburg, Florida
Meeting of GE Aerospace Quality Managers

Date: 16 March 1983

Attendees:

E. M. Bohan, GE	J. E. Neese, G.E.
J. N. Canfield, GE	B. R. Shepherd, GE
R. Daw, GE	R. Simon, GE
R. Gordon, GE	R. T. Simpson, GE
J. A. Griffith, GE	R. E. Smith, GE
E. H. Halpin, GE	D. D. Ward, GE
D. Hardy, GE	R. H. Wettach, GE
D. Katucki, GE	

Meeting Minutes:

1. Extract from official meeting minutes.

"Bruce Shepherd and Bob Wettach discussed the work they have been doing for GE the past year on the Quality Assurance Task supporting the US Air Force's Integrated Computer-Aided Manufacturing (ICAM) Program. Working with General Dynamics, Northrup and Vought, and using ICAM modeling techniques, the team has learned a great deal about how Quality Assurance is currently being done in the air frame industry. The purpose of the next phase of the program is to obtain additional information to verify and add to the data base so that a Quality Assurance Program Management Standard can be developed for the automated environment expected in the Factory of the Future. This Quality Assurance Program Standard would potentially supplement or replace MIL-Q-9858A and similar specifications in the automated factory. Bruce and Bob encouraged us to complete and return a three-page questionnaire to them."

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

2. Notes relating to Quality Assurance Program Management Standard:

   2.1. No problems with 9858A.

   2.2. AQAP is not satisfactory from US (and UK) viewpoint.

   2.3. 9858 is broad, flexible, comprehensive enough - if you have a problem it's not due to 9858.

   2.4. Weaknesses at front and aft end of life cycle. Interpretations are made that take care of this, however.

   2.5. Field data collection is a problem.

   2.6. MIL-STD-1535 vendor certifications -- costs too much for value received.

   2.7. Deliverable software is the issue (re: standards, specs).

   2.8. Independent evaluation of software - against it (new proposal).

   2.9. Local tailoring of 9858A is all that is required.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.1.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: WPAFB, Dayton, Ohio

Date: 7 April 1983

Attendees: G. Cleveland, ASD/EN
L. Johnson, AFLC/QAA
R. R. Preston, AFWAL/MLTC
B. R. Shepherd, GE
G. J. Thielen, ASD/PMDQ
J. Carl, Lt. Col./ASD/EN

Meeting Minutes:

1. ASQC/ANSI Std. 3.15 1979 "Generic Guidelines" for Quality Systems" - is a well-written document - better than MIL-Q-9858A in many respects.

2. 9858A "words" are tailored to a manual system. There is a need to tailor the words to an automation environment.

3. 9858A is not a QC document, it is a Management Systems document.

4. Tooling as media of inspection must be addressed in a new standards.

5. There is a requirement for documentation of a sensor's calibration in an automation environment.

6. How can a software-controlled machine - tool be certified?

7. How do you verify that software-controlled test is adequate? (Software verification).

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

8. MIL standards, specifications are a result of successful cases in the past.

9. How do we verify that a product truly meets the requirements in a software environment?

10. "Inspector-of-the-Future" will be a computer validator.

11. Qualify the process, not the product.

12. USAF puts "how to" on, but will take it off if contractor can show a better way.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Grumman Aerospace Corporation, Bethpage, New York

Date: 12 April 1983

Attendees: J. P. Kingfield, G
J. J. Lombardi, G
J. Mule, G
B. R. Shepherd, GE
J. Stigers, G
R. H. Wettach, GE
A. F. Weyhreter, G

Meeting Minutes:

1. In F-O-F inspection not necessarily function of "inspector".

2. In F-O-F need more emphasis on prevention than presently in 9858.

3. In F-O-F will need "auditing" built into software-like banks do now.

4. Changes to F-O-F will come slowly due to long run nature of products. Therefore, need flexibility.

5. In F-O-F need control over Engineering and other functions beside Manufacturing.

6. Take a look at FAA certification procedures. Will they give us some ideas?

7. For software need configuration control and library control.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

8. Need more government involvement at front end of contract (product life cycle) instead of only contact being "contract administration".

9. Include customer in "integration of quality".

10. If necessary, put special "how to" instructions in the contract and eliminate them from the quality specifications.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Hughes Aircraft Company, El Segundo, California

Date: 13 April 1983

Attendees: R. R. Nieves, H
B. R. Shepherd, GE
R. E. Tracy, H
R. H. Wettach, GE

Meeting Minutes:

1. John C. Morey, Corporate Manager of Quality Assurance had been called to Washington so we met with R. E. Tracy, Corporate Manager of Reliability Assurance.

2. Feedback from users is a major void.

   - Only system that works is Tech Reps.

   - Military feels contractor is only one responsible.

   - Military frequently uses data without understanding it - focuses on symptoms, not root causes.

3. Military and contractor should have mutual objective and incentives.

   - Evaluate like hell.

   - Then become team members.

4. Need flexibility and freedom.

5. Government contract writers frequently don't understand the "flow down" of other specifications when a specification callout is made.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: McDonnell Douglas Corporation
St. Louis, Missouri

Date: 14 April 1983

Attendees: R. E. Anderson, MD
R. D. Bruenger, MD
B. R. Shepherd, GE
H. C. Todt, MD
R. H. Wettach, GE

Meeting Minutes:

1. To use MIL-Q-9858A for F-O-F redefine meaning of key words without changing the document.

2. Consider 9858 a statement of philosophy requiring a Quality Plan to support.

3. To improve field data problem, focus on two to three bases for collection of data. Use Product Support (Tech. Reps.) people. Try to get military to fund.

4. Question! Should Air Force have direct access to computer data files?

5. Performance is emphasized to the detriment of manufacturing, support, etc. Therefore, need more front end integration.

6. Software Quality Assurance people from military are doing a good job of getting involved.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

7. Quality costs should not be part of a quality requirements document.

8. Requirements of 66-1 are designed for a Maintenance Management System and not for a Quality System. Therefore, don't try to use it for something it wasn't intended to do.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Office, Secretary of Defense
Pentagon, Washington, DC

Date: 21 April 1983

Attendees: D. Burchfield, DoD
T. Diamond, NASA
R. R. L'Italien, USAF
R. R. Preston, USAF
B. R. Shepherd, GE
R. H. Wettach, GE

Meeting Minutes:

1. Purpose of meeting was to review the Task D effort with Mr. Del Burchfield, Assistant for Quality, Office, Secretary of Defense.

2. National Bureau of Standards is putting together a very informative exhibit on the Factory-of-the-Future. Will be complete in November and should be worth seeing.

3. Specifications governing automation are needed now. MIL-Q-9858A needs to be slanted in wording to address the automated environment.

4. Areas recommended for change in MIL-Q-9858A include:

   - Design Control
   - Design Change Control
   - Quality Audit
   - Quality Cost Control
   - Process Control

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

5. Other standards requiring changes:

   - MIL-STD-1521 Design Review

6. Philosophy of being able to tailor a control document to meet the need of a specific program was reinforced. However, the contractor should not be able to "tailor out" any part of the requirements.

7. Leave MIL-Q-9858A alone, but start a new document which would apply only to people who have an automated environment.

8. Factory-of-the-Future will be evolutionary but need to establish program controls now.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: The Bendix Corporation
Arlington, Virginia

Date: 21 April 1983

Attendees: J. W. Comish, B
B. R. Shepherd, GE
R. H. Wettach, GE

Meeting Minutes:

1. Recommend a review with Dr. Richard Stimson.

2. Real problem will be how QAR's (Quality Assurance Representatives for government) respond.

3. Does not like - 1520 (MRB) or 1535 (Vendor Control) as they allow the government to get too involved.

4. Further inspections will be done by machines, not people. QA data will be automatically collected. QA/QC departments will be very small.

5. Predicts QA/QC departments will get smaller. As contractor's QA/QC departments decrease, what will government do? Will government QA/QC offices also get smaller?

6. Who will train government people?

7. Government will have to make a commitment to accept less paperwork.

8. Dr. Stimson's objective with the CODSIA project is to eliminate as much paperwork and documentation as possible that does not contribute to product quality.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: 1) Texas Instruments, Dallas, Texas
2) Texas Instruments, Sherman, Texas

Date: 22 April 1983

Attendees:

1)
T. Cooney, TI
A. Herbert, TI
J. P. Leslie, TI
A. Reingold, V
P. Waldrop, GD

2)
M. Gilliam, TI
R. Green, TI
W. Grimes, TI
S. Stephenson, TI
A. Reingold, V
P. Waldrop, GD

Meeting Minutes:

1. This presentation was well attended by QA, Manufacturing Engineering and I.E. personnel. Interest in the presentation was high and the discussions and questions were pertinent, particularly about the role of QA in the Factory of the Future.

2. It was the consensus that MIL-Q-9858 was broad enough that it in itself should not pose a problem in the Factory of the Future, that is under a computerized system of quality and process control. It was pointed out that their inspection records were stored in the computer and that the military monitors totally approved this system.

3. The prime concern of the applicability of MIL-Q-9858 to future QA systems was not with the document but with the interpretations placed upon the provisions by the government. Their opinion was that MIL-Q-9858 was fine as it stands, however, that the supporting specifications and standards such as: MIL-STD 1520 and MIL-STD 45662 were far too detailed and might pose a problem with future QA/QC procedures and systems.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.1.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

4. Another concern was the security and validity of electronic storage and information systems. The possibility that the security at such systems may be broached would definitely concern the government and that measures must be taken to develop "unbreakable" security along with the development of future electronic systems.

5. The final recommendation was that the detail must be taken out of the various specifications and standards pertaining to the Quality Assurance aspects of manufacturing and that visual inspection inferred in MIL-I-45208 not be a requirement in future contracts. Their ideas are that manual inspection be replaced by certification of the various machines that produce parts such that as long as the machine tool is functioning properly, quality products will result. Thus, only the machine tools and process will be controlled. Along with such automation, the need for corrective action will greatly diminish since it may well be cheaper to scrap the discrepant part and replace it with good parts.

ISPI10513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Office, Secretary of Defense
Pentagon, Washington, DC

Date: 6 May 1983

Attendees: F. E. Doherty, DoD
R. R. Preston, USAF
B. R. Shepherd, GE
R. A. Stimson, DoD
R. H. Wettach, GE

Meeting Minutes:

1. Meeting was held to provide a review of Task D for Dr. Richard A. Stimson, Director, Industrial Productivity, Office, Secretary of Defense.

2. Needs Analysis - Early Integration Issue: Quality should be the integrator.

3. AIA/NSIA is being asked for conceptual ideas for changes to MIL-Q-9858A, not merely language changes.

4. AQAP document is more restrictive, less tailorable than 9858A.

5. Government should impose performance requirements only. Thrust is reducing the "How-to" specifications making any new documents easier to "tailor".

6. Government needs to reduce restrictions on contractor.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

7. Attitudinal/Behavioral issues are biggest potential problems to a Factory-of-the-Future concept.

8. Nobody is looking across all the military standards and specifications to see how they all "play together".

9. Results of the QA/QC fact-finding questionnaire were requested for OUSDRE(AM)IP.

ISP110513000
18 AUGUST 1983

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Location: Boeing Military Aircraft Company
Wichita, Kansas

Date: 25 May 1983

Attendees:
B. Becker, AFPRO
M. A. Bein, Boeing
J.V. Burleigh, Boeing
J. E. Foster, Boeing
C. Hamlin, AFPRO
R. Henpolsheimer, AFPRO
H. Janis, Boeing
R. Kjehn, Boeing
H. R. Macy, Boeing
M. McGee, Boeing
L. Meyer, Boeing
K. Neaschaefer, Boeing
F. Oaks, Boeing
R. R. Preston, USAF
J. Ritter, Boeing
L. Wagner, Boeing
R. H. Wettach, GE

Meeting Minutes:

1. MIL-Q-9858A is adequate. Changes would not improve it for Boeing.

2. Supplemental documents dealing with "How To" cause the problems.

3. MIL-STD 45662 is a problem with the requirement to be able to trace products that may have been checked/made with a gage or tool found to be out of tolerance.

4. Concerned about relation of MIL-S-52779A (Software) to:

   - MIL-Q-9858A
   - MIL-STD-1520 (Corrective Action)

   Need to separate requirements for shippable software from requirements for in-house control of software.
   Requirements are too expensive for in-house software.

ICAM PROJECT 1105

Task D - Quality Assurance/Quality Control

WBS 4.4.4 - Product Assurance Program Standard

Information Gathering Meetings

Meeting Minutes: (cont'd)

5. Feel need for earlier, up-front participation from Quality function in design of Reliability Testing.

6. Field Data Feedback is very poor. Analysis difficult since real reason for removal doesn't get reported. Cause codes are not accurate and not reported correctly.

   Actually, system wasn't designed to feed back quality data, but rather to report on manpower loading and spares replacement.

7. See rapid changes in products as a result of rapid changes in technology. Examples are:

   - Just-in-Time (Lot size of 1)
   - Flexible Manufacturing

   Will force faster turn around on corrective action.

APPENDIX C

INDUSTRY AND DoD REVIEW COMMENTS

C.1 Introduction

The matrix on the following page (Figure C-1) displays a summary of the written comments received after the draft Quality Assurance Program Management Standard was circulated throughout industry and various Department of Defense agencies. As can be seen, the majority of the respondents preferred no change be made to MIL-Q-9858A. Although seven respondents made no major recommendations that fit into one of the four categories, in many cases they made specific recommendations that also proved valuable and were incorporated in our final Quality Assurance Management Standard. In all cases, each comment was carefully considered before either including or excluding it from the final Standard. The initial draft of the Quality Assurance Program Management Standard has been included to provide the reader with the initial version of the document addressed by the review letters in Section C.2.2. The authors gratefully acknowledge all those who took the time to review and respond to our work.

SUMMARY OF WRITTEN COMMENTS

RECEIVED FROM REVIEWERS OF DRAFT QUALITY ASSURANCE PROGRAM MANAGEMENT STANDARD

	Make No Change To MIL-Q-9858	Make Glossary Additions to MIL-STD-109	Rewrite MIL-Q-9858	Publish New Quality Assurance Program Mgmt Std	No Major Recommendations
INDUSTRY	7	1	1	1	3
DoD	4	2	0	2	4
TOTALS	11	3	1	3	7

Figure C-1

ISP1105300
18 AUGUST 1983

C.2 Draft Standard/Responses

Section C.2.1 contains a copy of the draft standard circulated throughout Industry and the DoD. Section C.2.2 contains copies of the response made to the draft. The reader may use these two sections to correlate responses to recommendations, if desired.

C.2.1 Draft Quality Assurance Program Management Standard

The following section contains the initial draft Assurance Program Standard.

INITIAL DRAFT

ISP110513000
18 AUGUST 1983

PROPOSED

PRODUCT ASSURANCE PROGRAM STANDARD

1. SCOPE

1.1 **Applicability.** This specification shall apply to all supplies (including equipments, subsystems and systems) or services when referenced in the item specification, contract or order.

1.2 **Contractual Intent.** This specification requires the establishment of a quality program by the contractor to assure compliance with the requirements of the contract. The program and procedures used to implement this specification shall be developed by the contractor. The quality program, including procedures, processes and product shall be documented in hardcopy, such as on paper, transparency or film, or in softcopy such as disc, cartridge or tape and shall be subject to review by the government representative. The contractor must make the documentation available to the Government Representative in a convenient useable form. The quality program is subject to the disapproval of the Government Representative whenever the contractor's procedures do not accomplish their objectives. The Government, at its option, may furnish written notice of the acceptability of the contractor's quality program.

1.3 **Summary.** An effective and economical quality program, planned and developed in consonance with the contractor's other administrative and technical programs, is required by this specification. Design of the program shall be based upon consideration of the technical manufacturing aspects of production and related engineering design and materials. The program shall assure adequate quality throughout all areas of pre-contract, contract and post-contract performance; for example, proposal generation, design, development, fabrication, processing, assembly, inspection, test, maintenance, packaging, shipping, storage, site installation and data feedback from end users.

All supplies and services under the contract, whether manufactured or performed within the contractor's plant or at any other source, shall be controlled at all points necessary to assure conformance to contractual requirements. The program shall provide for the prevention and ready detection of discrepancies and for timely and positive corrective action. The contractor shall make objective evidence of quality conformance readily available to the Government Representative. Objective evidence may be in form of written material, graphs, charts and pictures either on paper, film or as a display on a computer terminal or video screen. Instructions and records for quality must be controlled.

The authority and responsibility of those in charge of the design, development, production, testing, and inspection of quality shall be clearly stated. The program shall facilitate determinations of the effects of quality deficiencies and quality costs on price. Facilities and standards such as drawings, engineering changes, measuring equipment and the like which are necessary for the creation of the required quality shall be effectively managed. The program shall include an effective control of purchased materials and subcontracted work. Design, development, manufacturing, fabrication, assembly, testing and inspection work conducted within the contractor's plant shall be controlled. The quality program shall also include effective implementation of responsibilities shared jointly with the Government or related to Government functions, such as control of Government property and Government source inspection.

1.4 **Relation to Other Contract Requirements.** This specification and any procedure or document executed in implementation thereof, shall be in addition to and not in derogation of other contract requirements. The quality program requirements set forth in this specification shall be satisfied in addition to all detail requirements contained in the statement of work or in other parts of the contract. The contractor is responsible for compliance with all provisions of the contract and for furnishing specified supplies and services which meet all the requirements of the

contract. If any inconsistency exists between the contract schedule or its general provisions and this specification, the contract schedule and the general provisions shall control. The contractor's quality program shall be planned and used in a manner to support reliability effectively.

1.5 **Relation to MIL-Q-9858A.** This specification may be used in place of MIL-Q-9858A.

1.6 **Tailoring.** In accordance with DOD principles governing the application and tailoring of specifications and standards to achieve cost effective acquisitions and life cycle ownership of defense material, this standard and its supporting documents shall be tailored to the specific program and program phase within the overall life cycle. This tailoring shall encompass the selection and application of methods, tables, sections, individual paragraphs and/or sentences to be placed on contract in order to impose only the essential needs to preclude unnecessary and unreasonable contract costs.

1.7 **Flexibility.** Contractors shall be provided maximum flexibility in establishing efficient and effective quality programs within specified contractual requirements. A contractor's existing practice shall be considered acceptable when it can be shown to achieve the basic intent of this product assurance document.

2. SUPERSEDING, SUPPLEMENTATION AND ORDERING

2.1 **Applicable Documents.** The following documents of the issue in effect on date of the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-I-45208A -- Inspection System Requirements
MIL-C-45662A -- Calibration System Requirements
MIL-S-52779A -- Software Quality Assurance Program Requirements

2.2 **Amendments and Revisions.** Whenever this specification is amended or revised subsequent to its contractually effective date, the contractor may follow or authorize his subcontractors to follow the amended or revised document provided no increase in price or fee is required. The contractor shall not be required to follow the amended or revised document except as a change in contract. If the contractor elects to follow the amended or revised document, he shall notify the Contracting Officer, in writing, of this election. When the contractor elects to follow the provisions of an amendment or revision, he must follow them in full.

2.3 **Ordering Government Documents.** Copies of specifications, standards and drawings required by contractors in connection with specific procurements may be obtained from the procuring agency, or as otherwise directed by the Contracting Officer.

3. QUALITY PROGRAM MANAGEMENT

3.1 **Organization.** Effective management for quality shall be clearly prescribed by the contractor. Personnel performing quality functions shall have sufficient, well-defined responsibility, authority and the organizational freedom to identify and evaluate quality problems and to initiate, recommend or provide solutions. Management regularly shall review the status and adequacy of the quality program. The term "quality program requirements" as used herein identifies the collective requirements of this specification. It does not mean that the fulfillment of the requirements of this specification is the responsibility of any single contractor's organization, function or person.

3.2 **Early Involvement of Quality.** The contractor shall include as part of his quality assurance program a plan for the early integration of the functions of marketing, design, manufacturing, quality and the project office. The plan shall provide for a review of the customer's requirements and expectations including the identification of the key program elements that are critical for program success. The plan shall make timely provisions for adequate processes, equipment, tooling,

personnel skills and program controls to assure meeting the critical requirements and to assure overall product quality. This initial planning will organize the need and provide for research, when necessary, to update inspection and testing techniques, instrumentation and correlation of inspection and test results with manufacturing methods and processes. This planning will also provide appropriate review and action to assure compatibility of manufacturing, inspection, testing and documentation. The early integration of the functional activities may take place before a contract is signed to clarify how critical requirements of the contract are going to be defined and met.

3.3 **Prevention.** The quality assurance program plan shall focus on preventing quality problems. This may include the use of automated equipment for test and inspection. It may also provide for inspection and test functions to be performed by production operators providing an audit plan is maintained by the quality assurance organization.

3.4 **Work Instructions.** The quality program shall assure that all work affecting quality (including such things as purchasing, handling, machining, assembling, fabricating, processing, inspection, testing, modification, installation, and any other treatment of product, facilities, standards or equipment from the ordering of materials to dispatch of shipments) shall be prescribed in clear and complete documented instructions of a type appropriate to the circumstances. Work instructions may be in hard copy form such as written instructions on paper or film, or in soft copy form such as computer tapes and discs. Work instructions may be transmitted to an operator or directly to a machine. Such instructions shall provide the criteria for performing the work functions and they shall be compatible with acceptance criteria for workmanship. The instructions are intended also to serve for supervising, inspecting and managing work. The preparation and maintenance of and compliance with work instructions shall be monitored as a function of the quality program.

3.5 Records. The contractor shall maintain and use any records or data essential to the economical and effective operation of his quality program. These records, either as hard copy or as soft copy such as computer tapes or discs, shall be available for review by the Government Representative and copies of individual records shall be furnished him upon request. The requirement of furnishing the Government Representative copies of records shall be satisfied by furnishing a hard copy of the records or by furnishing a soft copy, such as a tape or disc, capable of being viewed at a computer terminal or a video screen. The requirement may also be satisfied by providing the Government Representative access to a computer terminal or a video screen where the information can be seen. Records are considered one of the principal forms of objective evidence of quality. The quality program shall assure that records are complete and reliable. Inspection and testing records shall, as a minimum, indicate the nature of the observations together with the number of observations made and the number and type of deficiencies found. Also, records for monitoring work performance and for inspection and testing shall indicate the acceptability of work or products and the action taken in connection with deficiencies. The quality program shall provide for the analysis and use of records as a basis for management action.

3.6 Software. The contractor shall establish and implement a Software Quality Assurance Program. This Program shall be documented in a Software Quality Program Plan which is subject to the procuring agency's approval for compliance with the requirements of this specification and the contract. The contractor shall ensure that the personnel performing the activities required by this plan have the expertise and organizational freedom to evaluate software development activities and to initiate or recommend corrective action.

The software Quality Program Plan shall be an integral part of the total Quality Assurance plan. For items specified for delivery on a contract MIL-S-52779A shall apply. This applies to either software alone or to software as a portion of a system or a subsystem. In this regard the term software also includes firmware.

For internal software used for process control and production MIL-S-52779A may be used with tailoring to meet specific requirements. At a minimum the process control Software Quality Program Plan shall address:

- o A Program plan establishing authority and control
- o Documentation including procedures and work instruction
- o Design/code reviews including Quality participation
- o Configuration management including identification, control and records of change
- o Software security
- o Validation, verification and certification
- o Audit programs
- o Problem reporting and corrective action

The Software Quality Program Plans shall be reviewed on an established periodic basis to assure their applicability to the most current contract requirements.

3.7 **Corrective Action.** The quality program shall detect promptly and correct assignable conditions adverse to quality. Design, purchasing, manufacturing, testing or other operations which could result in or have resulted in defective supplies, services, facilities, technical data, standards or other elements of contract performance which could create excessive losses or costs must be identified and changed as a result of the quality program. Corrective action will extend to the performance of all suppliers and vendors and will be responsive to data and product forwarded from users. Corrective action shall include as a minimum:

(a) Analysis of data and examination of product scrapped or reworked to determine extent and causes;
(b) Analysis of trends in processes or performance of work to prevent nonconforming product; and
(c) Introduction of required improvements and corrections, an initial review of the adequacy of such measures and monitoring of the effectiveness of corrective action taken.

3.8 **Costs Related to Quality.** The contractor shall maintain and use quality cost data as a management element of the quality program. These data shall serve the purpose of identifying the cost of both the prevention and correction of nonconforming supplies (e.g., labor and material involved in material spoilage caused by defective work, correction of defective work and for quality control exercised by the contractor at subcontractor's or vendor's facilities). The specific quality cost data to be maintained and used will be determined by the contractor. These data shall, on request, be identified and made available for "on site" review by the Government Representative.

A cost-benefit analysis will be required as support for a request to "tailor" any part of this specification.

4. FACILITIES AND STANDARDS

4.1 **Drawings, Documentation and Changes.** The contractor shall assure the adequacy, completeness and currentness of design documents by establishing and implementing a configuration management plan. Design documents include drawings and specifications either in hard copy form or in software form such as computer tapes or discs. With respect to the currentness of design documents and changes, the contractor shall assure that requirements for the effectivity point of changes are met and that obsolete design documents and change requirements are removed from all points of issue and use. Some means of recording the effective points shall be employed and be available to the Government.

With respect to design documents, a procedure shall be maintained that shall provide for the evaluation of the engineering adequacy of proposed changes. The evaluation shall encompass both the adequacy in relation to standard engineering and design practices and the adequacy with respect to the design and purpose of the product to which the drawing relates.

With respect to supplemental specifications, process instructions, production engineering instructions and work instructions relating to a particular design, the contractor shall be responsible for a review of their adequacy, currentness and completeness. The quality program must provide complete coverage of all information necessary to produce an article in complete conformity with requirements of the design.

The quality program shall assure that there is complete compliance with contract requirements for proposing, approving, and effecting of engineering changes. The quality program shall provide for monitoring effectively compliance with contractual engineering changes requiring approval by Government design authority. The quality program shall provide for monitoring effectively the design documentation changes of lesser importance not requiring approval by Government design authorities.

Delivery of correct design documentation and change information to the Government in connection with data acquisition shall be an integral part of the quality program. This includes full compliance with contract requirements concerning rights and data both proprietary and other. The quality program's responsibility for drawings and changes extend to the drawings and changes provided by the subcontractors and vendors for the contract.

4.2 **Measuring and Testing Equipment.** The contractor shall provide and maintain gages and other measuring and testing devices necessary to assure that supplies conform to technical requirements. These devices shall be calibrated against certified measurement standards which have known valid relationships to national standards at established periods to assure continued accuracy. The objective is to assure that inspection and test equipment is adjusted, replaced or repaired before it becomes inaccurate. The calibration of measuring and testing equipment shall be in conformity with military specification MIL-C-45662A. In addition, the contractor shall insure the use of only such subcontractor and vendor sources that depend upon calibration systems which effectively control the accuracy of measuring and testing equipment.

4.3 **Production Tooling Used as Media of Inspection.** When production jigs, fixtures, tooling masters, templates, patterns and such other devices are used as media of inspection, they shall be proved for accuracy prior to release for use. These devices shall be proved again for accuracy at intervals formally established in a manner to cause their timely adjustment, replacement or repair prior to becoming inaccurate.

4.4 **Automated Equipment and Processes.** Automated equipment may be used as the media of inspection when the equipment or process assures conformance to requirements by the way it is designed and controlled. Completion of the automated operation may be accepted as objective evidence of conformance to requirements. When automated equipment or processes are used as the measure of conformance they shall be audited on a timely basis to assure the proper maintenance of control.

4.5 **Use of Contractor's Inspection Equipment.** The contractor's gages, measuring and testing devices shall be made available for use by the Government when required to determine conformance with contract requirements. If conditions warrant, contractor's personnel shall be made available for operation of such devices and for verification of their accuracy and condition.

4.6 **Advanced Metrology Requirements.** The quality program shall include timely identification and report to the Contracting Officer of any precision measurement need exceeding the known state of the art.

5. **CONTROL OF PURCHASES**

5.1 **Responsibility.** The contractor is responsible for assuring that all supplies and services procured from his suppliers (subcontractors and vendors) conform to the contract requirements. The selection of sources and the nature and extent of control exercised by the contractor shall be dependent upon the type of supplies, his supplier's demonstrated capability to perform, and the quality evidence made available. To assure an adequate and economical control of such material, the contractor shall utilize to the fullest extent objectives evidence

of quality furnished by his suppliers. When the Government elects to perform inspection at a supplier's plant, such inspection shall not be used by contractors as evidence of effective control of quality by such suppliers. The inclusion of a product on the Qualified Products List only signifies that at one time the manufacturer made a product which met specification requirements. It does not relieve the contractor of his responsibility for furnishing supplies that meet all specification requirements or for the performance of specified inspections and tests for such material. The effectiveness and integrity of the control of quality by his suppliers shall be assessed and reviewed by the contractor at intervals consistent with the complexity and quantity of product. Inspection of products upon delivery to the contractor shall be used for assessment and review to the extent necessary for adequate assurance of quality. Test reports, inspection records, certificates and other suitable evidence relating to the supplier's control of quality should be used in the contractor's assessment and review. The contractor's responsibility for the control of purchases includes the establishment of a procedure for (1) the selection of qualified suppliers, (2) the transmission of applicable design and quality requirements in the Government contracts and associated technical requirements, (3) the evaluation of the adequacy of procured items, and (4) effective provisions for early information feedback and correction of nonconformances.

5.2 **Purchasing Data.** The contractor's quality program shall not be acceptable to the Government unless the contractor requires of his subcontractors a quality effort achieving control of the quality of the services and supplies which they provide. The contractor shall assure that all applicable requirements are properly included or referenced in all purchase orders for products ultimately to apply on a Government contract. The purchase order shall contain a complete description of the supplies ordered including, by statement or reference, all applicable requirements for manufacturing, inspections, testing, packaging, and any requirements for Government or contractor inspections, qualification or approvals. Technical requirements of

the following nature must be included by statement or reference as a part of the required clear description: all pertinent design documentation, engineering design change orders, specifications (including inspection system or quality program requirements), reliability, safety, weight, or other special requirements, unusually test or inspection procedures or equipment and any special revision or model identification. The description of products ordered shall include a requirement for contractor inspection at the subcontractor or vendor source when such action is necessary to assure that the contractor's quality program effectively implements the contractor's responsibility for complete assurance of product quality. Requirements shall be included for chemical and physical testing and recording in connection with the purchase of raw materials by his suppliers. The purchase orders must also contain a requirement for such suppliers to notify and obtain approval from the contractor of changes in design of the products. Necessary instructions should be provided when provision is made for direct shipment from the subcontractor to Government activities.

6. MANUFACTURING CONTROL

6.1 **Materials and Materials Control.** Supplier's materials and products shall be subjected to inspection upon receipt to the extent necessary to assure conformance to technical requirements. Receiving inspection may be adjusted upon the basis of the quality assurance program exercised by suppliers. Evidence of the suppliers' satisfactory control of quality may be used to adjust the amount and kind of receiving inspection.

The quality program shall assure that raw materials to be used in fabrication or processing of products conform to the applicable physical, chemical, and other technical requirements. Laboratory testing shall be employed as necessary. Suppliers shall be required by the contractor's quality program to exercise equivalent control of the raw materials utilized in the production of the parts and items which they supply to the contractor. Raw material awaiting testing must be separately identified or segregated from already tested

and approved material but can be released for initial production, providing that identification and control is maintained. Material tested and approved must be kept identified until such time as its identity is necessarily obliterated by processing. Controls will be established to prevent the inadvertent use of material failing to pass tests.

6.2 Production Processing and Fabrication. The contractor's quality program must assure that all machining, wiring, batching, shaping and all basic production operations of any type together with all processing and fabricating of any type is accomplished under controlled conditions. Controlled conditions include documented work instructions, adequate production equipment, and any special working environment. Documented work instructions are considered to be the criteria for much of the production, processing and fabrication work. These documented work instructions may be hard copy or in the form of software such as computer tape or disc. They may be transmitted by hard copy, by a computer terminal or directly to the point of use. These instructions are the criteria for acceptable or unacceptable "workmanship". The quality program will effectively monitor the issuance of and compliance with all of these work instructions.

Physical examination, measurement or tests of the material or products processed must be conducted under controlled conditions. When automated equipment and processes are used conformance to requirements may be determined without physical examination. When this occurs the automated equipment and processes shall be monitored sufficiently to assure control. Both physical inspection and process monitoring shall be provided when control is inadequate without both,or when contract or specification requires both.

Inspection and monitoring of processed material or products shall be accomplished in any suitable systematic manner selected by the contractor. Methods of inspection and monitoring shall be corrected any time their unsuitability with reasonable evidence is demonstrated. Adherence to selected methods for inspection and monitoring shall be complete and continuous. Corrective measures shall be taken when noncompliance occurs.

Inspection by machine operators, automated gages, moving line or lot sampling, setup or first piece approval, production line inspection station, inspection or test department, roving inspectors -- any other type of inspection -- shall be employed in any combination desired by the contractor which will adequately and efficiently protect product quality and the integrity of processing.

Criteria for approval and rejection shall be provided for all inspection of product and monitoring of methods, equipment, and personnel. Means for identifying rejected product shall be provided.

Certain chemical, metallurgical, biological, sonic, electronic, and radiological processes are of so complex and specialized a nature that much more than the ordinary detailing or work documentation is required. In effect, such processing may require an entire work specification as contracted with the normal work operation instructions established in normal plant-wide standard production control issuances such as job operation routing books and the like. For these special processes, the contractors' quality program shall assure that the process control procedures or specifications are adequate and that processing environments and the certifying, inspection, authorization and monitoring of such processes to the special degree necessary for these ultraprecise and super-complex work functions are provided.

6.3 **Completed Item Inspection and Testing.** The quality program shall assure that there is a system for final inspection and test of completed products. Such testing shall provide a measure of the overall quality of the completed product and shall be performed so that it simulates, to a sufficient degree, product end use and functioning. Such simulation frequently involves appropriate life and endurance tests and qualification testing. Final inspection and testing shall provide for reporting to designers any unusual difficulties, deficiencies or questionable conditions. When modifications, repairs or replacements are required after final inspection or testing, there shall be reinspection and retesting of any characteristics affected.

6.4 **Handling, Storage and Delivery.** The quality program shall provide for adequate work and inspection instructions for handling, storage, preservation, packaging, and shipping to protect the quality of products and prevent damage, loss deterioration, degradation, or substitution of products. With respect to handling, the quality program shall require and monitor the use of procedures to prevent handling damage to articles. Handling procedures of this type include the use of special crates, boxes, containers, transportation vehicles and any other facilities for materials handling. Means shall be provided for any necessary protection against deterioration or damage to products in storage. Periodic inspection for the prevention and results of such deterioration or damage shall be provided. Products subject to deterioration or corrosion during fabrication or interim storage shall be cleaned and preserved by methods which will protect against such deterioration or corrosion. When necessary, packaging designing and packaging shall include means for accommodating and maintain critical environments within packages, e.g., moisture content levels, gas pressures. The quality program shall assure that when such packaging environments must be maintained, packages are labeled to indicate this condition. The quality program shall monitor shipping work to assure that products shipped are accompanied with required shipping and technical documents and that compliance with Interstate Commerce Commission rules and other applicable shipping regulations is effected to assure safe arrival and identification at destination. In compliance with contractual requirements, the quality program shall include monitoring provisions for protection of the quality of products during transit.

6.5 **Nonconforming Material.** The contractor shall establish and maintain an effective and positive system for controlling nonconforming material, including procedures for its identification, segregation, and disposition. Repair or rework of nonconforming material shall be in accordance with documented procedures acceptable to the Government. The acceptance of nonconforming supplies is a prerogative of and shall be as prescribed by the Government and may involve a monetary adjustment. All

nonconforming supplies shall be positively identified to prevent unauthorized use, shipment and intermingling with conforming supplies. Holding areas or procedures mutually agreeable to the contractor and the Government Representative shall be provided by the contractor. The contractor shall make known to the Government upon request the data associated with the costs and losses in connection with scrap and with rework necessary to reprocess nonconforming material to make it conform completely.

6.6 **Statistical Quality Control and Analysis.** In addition to statistical methods required by the contract, statistical planning, analysis, test and quality control procedures may be utilized whenever such procedures are suitable to maintain the required control of quality. Sampling plans may be used when tests are destructive, or when the records, inherent characteristics of the product or the noncritical application of the product, indicate that a reduction in inspection or testing can be achieved without jeopardizing quality. The contractor may employ sampling inspection in accordance with applicable military standards and sampling plans (e.g., form MIL-STD-105D, MIL-STD-414, or Handbooks H 106, 107, 108). If the contractor uses other sampling plans, they shall be subject to review by the cognizant Government Representative. Any sampling plan used shall provide valid confidence and quality levels.

6.7 **Indication of Inspection Status.** The contractor shall maintain a positive system for identifying the inspection status of products. Identification may be accomplished by means of stamps, tags, routing cards, move tickets, tote box cards, bar codes or other acceptable control devices. Such controls shall be of a design distinctly different from Government inspection identification.

6.8 **Audits.** The contractor shall maintain a quality audit plan to assure that products meet contract quality commitments and fulfill the customer's quality requirements. These audits shall cover the complete product life cycle from the establishment of requirements, through design and production, to the post-production review of operational data.

7. COORDINATED GOVERNMENT/CONTRACTOR ACTIONS

7.1 **Government Inspection at Subcontractor or Vendor Facilities.** The Government reserves the right to inspect at source supplies or services not manufactured or performed with the contractor's facility. Government inspection shall not constitute acceptance; nor shall it in any way replace contractor inspection or otherwise relieve the contractor of his responsibility to furnish an acceptable end item. The purpose of this inspection is to assist the Government Representative at the contractor's facility to determine the conformance of supplies or services with contract requirements. Such inspection can only be requested by or under authorization of the Government Representative. When Government inspection is required, the contractor shall add to his purchasing document the following statement:

> "Government inspection is required prior to shipment from your plant. Upon receipt of this order, promptly notify the Government Representative who normally services your plant so that appropriate planning for Government inspection can be accomplished.."

When, under authorization of the Government Representative, copies of the purchasing document are to be furnished directly by the subcontractor or vendor to the Government Representative at his facility rather than through Government channels, the contractor shall add to his purchasing document a statement substantially as follows:

> "On receipt of this order, promptly furnish a copy to the Government Representative who normally services your plant, or, if none, to the nearest Army, Navy, Air Force, or Defense Supply Agency inspection office. In the event the representative or office cannot be located, our purchasing agent should be notified immediately."

All documents and referenced data for purchases applying to a Government contract shall be available for review by the Government Representative to determine compliance

with the requirements for the control of such purchases. Copies of purchasing documents required for Government purposes shall be furnished in accordance with the instructions of the Government Representative. The contractor shall make available to the Government Representative reports, either as hard copy, software, or by access to the computer data base, of any nonconformance found on Government source inspected supplies and shall (when requested) require the supplier to coordinate with his Government Representative on corrective action.

7.2 **Government Property.**

7.2.1 **Government-furnished Material.** When material is furnished by the Government, the contractor's procedures shall include at least the following:

(a) Examination upon receipt, consistent with practicability to detect damage in transit;

(b) Inspection for completeness and proper type;

(c) Periodic inspection and precautions to assure adequate storage conditions and to guard against damage from handling and deterioration during storage;

(d) Functional testing, either prior to or after installation, or both, as required by contract to determine satisfactory operation;

(e) Identification and protection from improper use or disposition, and

(f) Verification of quantity.

7.2.2 **Damaged Government-furnished Material.** The contractor shall report to the Government Representative any Government-furnished material found damaged, malfunctioning, or otherwise unsuitable for use. In the event of damage or malfunctioning during or after installation, the contractor shall determine and record probable cause and necessity for withholding material from use.

7.2.3 Bailed Property. The contractor shall, as required by the terms of the Bailment Agreement, establish procedures for the adequate storage, maintenance and inspection of bailed Government property. Records of all inspections and maintenance performed on bailed property shall be maintained. These procedures and records shall be subject to review by the Government Representative.

8. NOTES

(The following information is provided solely for guidance in using this specification. It has no contractual significance.)

8.1 Intended Use. This specification will apply to complex supplies, components, equipments and systems for which the requirements of MIL-I-45208 are inadequate to provide needed quality assurance. In such cases, total conformance to contract requirements cannot be obtained effectively and economically solely by controlling inspection and testing. Therefore, it is essential to control work operations and manufacturing processes as well as inspections and tests. The purpose of this control is not only to assure that particular units of hardware conform to contractual requirements, but also to assure interface compatibility among these units of hardware when they collectively comprise major equipments, subsystems and systems.

8.2 Exemptions. This specification will not be applicable to types of supplies for which MIL-I-45208 applies. The following do not normally require the application of this specification.

(a) Personal services, and

(b) Research and development studies of a theoretical nature which do not require fabrication of articles.

8.3 Order Data. Procurement documents should specify the title, number and date of this specification.

Preparing Activity:

Air Force -- Hq USAF

Custodians:
Army -- Munitions Command
Navy -- Office of Naval Material
Air Force -- Hq USAF
DSA -- Hq DSA

C.2.2 Responses to Draft Standard

This section contains copies of the responses made to the draft.

R

RECEIVED JAN 31 1984 AFWAL/MLTC

RECEIVED JAN AFWAL/MLTC

DRXQA-Q (19 Dec 83) 1st Ind
SUBJECT: Quality Assurance Management Standard Review

USA DARCOM Product Assurance & Test Fld Activity, Lexington, KY 40511 27 J

TO: Project Manager, Air Force Wright Aeronautical Laboratories,
ATTN: AFWAL/MLTC, Wright-Patterson AFB, OH 45433

1. Attachment 1 to the basic letter has been reviewed in depth. Many of the previously recommended changes to MIL-Q-9858A are included in the report.

2. Some of the references listed on page 3 of the study are out of date. Recommend in the future that the revision letter suffix be deleted to preclude a requirement for update of documents when a reference is revised.

3. The draft MIL-Q-9858 and the draft product assurance program standards in attachment 1 to the basic were reviewed with respect to each other, the rest of the report, and MIL-Q-9858A. We believe those concepts outlined in the basic letter as being established under the project "Conceptual Design for Computer Integrated Manufacturing" can best be served with a minimum of military standards and specifications.

4. We recommend that a MIL-Q-9858B be published to include the requirements of your draft product assurance standard and revised as shown in the changes on the enclosed DA Form 2028. This will allow for both automated and non-automated manufacturing processes to be controlled by the contractor under the same military specification without further publications. We realize that MIL-Q-9858 revisions have been delayed because of industry's reluctance to change, and their voiced opposition to OSD. However, the need to make changes in MIL-Q-9858A must be emphasized rather than publish additional documents.

5. Your letter of 20 January 1984 with the document, Architecture for Product Assurance, is being reviewed. It appears that many of the recommended changes to procedures are contained in that document. I will let you know shortly, by separate memorandum, as to the distribution of the Architecture for Product Assurance that will be desirable in this Command.

6. If I can be of further assistance, please let me know.

Del Burchfield

D. D. BURCHFIELD
Chief, DARCOM Product Assurance
and Test Field Activity

1 Encl
wd encl 1
Added 1 encl
2. DA Forms 2028

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 310-1, the proponent agency is the US Army Adjutant General Center.

Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)

DATE: 27 Jan 84

TO: *(Forward to proponent of publication or form) (Include ZIP Code)*
Air Force, Wright Aeronautical Lab
ATTN: Richard R. Preston
Wright Patterson AFB, OH 45433

FROM: *(Activity and location) (Include ZIP Code)*
Chief, DARCOM Prod Assur & Test Fld Actv
ATTN: DRXQA-Q
Lexington, KY 40511

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION FORM NUMBER	DATE	TITLE
Product Assurance Program Standard	August 1983	ICAM Conceptual Design for Computer-Integrated Manufacturing

ITEM NO.	PAGE NO	PARAGRAPH	LINE NO *	FIGURE NO	TABLE NO	RECOMMENDED CHANGES AND REASON *(Exact wording of recommended change must be given)*
1.						Assign the number MIL-Q-9858B and the title Quality Program Requirements.
2.	51	1.2				Add new para 1.2. 1.2. Definitions: 1.2.1. Firmware - Software instructions or data that is stored in a fixed or "firm way". 1.2.2. Hard copy - A printed copy of machine output, a typed copy or a manually written copy in readable form. For example, reports, listings, documents, and summaries. 1.2.3. Soft copy - Data presented as a video image, in audio or any other form which is not hard copy. 1.2.4. Software - A set of computer programs, procedures, rules, and possibly associated documentation concerned with the operation of a data processing system, e.g., compilers, library routines, manuals, circuit diagrams.
3.	51	1.3	5			Renumber present para 1.2 through the end of section 1.
4.	51	1.3	5			Sentence should read: Design of the program shall be based upon consideration of the technical and manufacturing... Reason: To agree with previous MIL-Q-9858
5.	52	1.5				Change to read: 1.6. Relation to MIL-I-45208. This specification contains requirements in excess of those in specification MIL-I-45208, Inspection System Requirements, inasmuch as total conformance to contract requirements is obtained best by controlling work operations, manufacturing processes as well as inspections and tests.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
JOSEPH WOODBERRY, QA Spec	AUTOVON 745-3180	Joseph W Woodberry

DA FORM 1 FEB 74 2028 REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

Encl 2

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1, the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)	DATE
TO: (Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION FORM NUMBER	DATE	TITLE

ITEM NO	PAGE NO	PARAGRAPH	LINE NO *	FIGURE NO	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
						Reason: If this is published as MIL-Q-9858B, this would be appropriate.
6	54	3.2	12			Change organize to recognize. Reason: To correct sentence meaning.
7	54	3.2				Delete last sentence: The early integration of the functional activities may take place before a contract is signed.... Reason: Legal ramifications. Although the intent of the sentence is reasonable, it could be misconstrued by some contracting officers or by some contractors.
8	55	3.5	4			Delete "... such as computer tapes or disks..." Reason: Soft copy is defined in item 1 above new para 1.2.
9	54	3.6	2			Change sentence to read: "... a software quality assurance program for computer controlled automated processes and other computer related processes." Reason: Because MIL-Q-9858B will be all encompassing, not all contracts will require software.
10.	56	3.6				Add new line at bottom. 0 Analysis of scrap, rework, and repair costs. Reason: To reinforce para 3.8.
11.	57	4.1	6			Change to read: "... in soft copy form. With respect..." Reason: The word soft copy is defined in new para 1.2 (item 1 above).
12.	57	4.1	7			Change the word standard to state-of-the-art. Reason: What has been recognized as standard engineering and design practices will change with state-of-the-art.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 1 FEB 74 2028 REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

REGOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1, the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)	DATE
TO: (Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION FORM NUMBER	DATE	TITLE

ITEM NO	PAGE NO	PARAGRAPH	LINE NO *	FIGURE NO	TABLE NO	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
13.	58	4.4				Change to read: 4.4. Automated Equipment and Processes. All items manufactured by automated equipment or processes will be inspected by automated methods throughout the process by test equipment which produces objective evidence of conformance to design. Automated production equipment may be used as the media of inspection when the equipment or process assures conformance to requirements by the way it is designed and controlled. Completion of the automated operation may be accepted as objective evidence of conformance to requirements. When automated production equipment or processes are used as the measure of conformance they shall be audited on a timely basis to assure the proper maintenance of control.
14.	60	5.2	top			Change word inspections to inspecting. Reason: Grammar.
15.	60	5.2	9			Change: unusually to unusual. Reason: Grammar.
16	63	6.6	10			Change to read: "...without jeopardizing quality (critical and finite life items will normally be inspected 100%). The contractor..." Reason: This expands the sentence to give positive requirement.
17	63	6.6	12			Change form to from. Reason: Wrong word
18.	64	6.8				Change to read: Audits. The contractor shall maintain a quality audit plan to assure that products meet contract quality commitments. The audits shall cover the complete production process for which the contractor is responsible.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 1 FEB 74 2028 REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 310-1, the proponent agency is the US Army Adjutant General Center.

Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)

DATE

TO: (Forward to proponent of publication or form) (Include ZIP Code)

FROM: (Activity and location) (Include ZIP Code)

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION FORM NUMBER	DATE	TITLE

ITEM NO	PAGE NO	PARAGRAPH	LINE NO *	FIGURE NO	TABLE NO	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
						Reason: As written in the draft standard, the other requirements are not usually covered by the contract.
19.	64	7.1	21			Change ellipsis to period so that the statement reads ...inspection can be accomplished. Reason: No more is required in the sentence.
20.	65	7.1	9 from top			Change software to soft copy. Reason: See item 1.
21.	66	8.1	13			Change to read: ...hardware/software when the collectively...

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 1 FEB 74 2028

REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

GENERAL ELECTRIC

CORPORATE
ENGINEERING &
MANUFACTURING

GENERAL ELECTRIC COMPANY
ONE RIVER ROAD
SCHENECTADY, NEW YORK 12345

(518) 385-2994

Bldg. 36-639

January 5, 1984

Richard R. Preston, Capt. USAF
Project Manager
Computer Integrated Manufacturing Branch

Subject: Quality Assurance Management Standard Review

Dear Rick:

The proposed standard modifications relating to the use of computerized information in lieu of "hard copy" are required in an automated manufacturing environment. I am in basic agreement with what is presented in the document.

Jack Draffen

JD:wc:4704B

BOEING MILITARY AIRPLANE COMPANY
Wichita, Kansas 67210 • Seattle, Washington 98124

January 26, 1984
3-7258-84-020

AFWAL/MLTC (513-255-6976)

Attention: Richard R. Preston, Capt., USAF
Project Manager
Computer Integrated Mfg. Branch

Subject: Comments on Task D/QA Draft Product Assurance Program Standard

Dear Captain Preston:

The following comments are offered after completing the review of Project Priority 1105 Task D/QA Draft Product Assurance Program Standard.

1. The conclusions in Section 3.2.4 are useful considerations for evolving an increasingly automated factory and quality system. It is my opinion, however, that more Air Force and industry experience with quality needs in a highly automated factory is required before attempting to establish those quality considerations important enough to be made specification requirements.

2. Based on this opinion, I would select your first alternative for a near term change to MIL-Q-9858A. The Glossary Addition addresses the paperless environment common to all advanced factory concepts without adding quality requirements whose impacts are not sufficiently understood.

3. Staff members of the BMAC Quality Assurance Organization reviewed the document and concluded that the best alternative is to make no changes to MIL-Q-9858A.

Sincerely,

Maurice C McGee

Maurice McGee
Advanced Technology
Boeing Military Airplane Company
Mail Stop K76-86
Phone (316) 526-7196

ALVIN M. BAUGHMAN

CONSULTANT

Quality Improvement • Quality Technology • Product Assurance • Quality Control

1120 Deckside Drive • Oxnard, CA 93030 • (805) 984-2795

13 January 1984

Richard R. Preston, Capt., USAF
Air Force Wright Aeronautical Labs
Wright-Patterson AFB, OH 45433

Subject: Draft Product Assurance Program Standard

Dear Rich:

1. Per your request, I have reviewed the Draft Product Assurance Program Standard package. My comments are as follows:

   a. Do not attempt to change MIL-Q-9858A. The document is well understood by most producers of military products and will continue to have a place in the manufacturing arena for some time to come.

   b. The Product Assurance Standard is the better way to go for the factory of the future. However the title is not correct, nor proper since it does not follow the definition of Product Assurance shown on page 6, para. 2.2. A better title would be "Quality Assurance Program Standard," because throughout the document the words "quality program" appear since it was patterned after MIL-Q-9858A. In any case, we should not lose the "quality assurance" name which is known and used internationally. Therefore, recommend quality assurance be used in place of product assurance.

   c. The new standard should contain the same titles and paragraph numbers as MIL-Q-9858A since most of us in Quality Assurance remember subjects by paragraph numbers. When new paragraphs must be added such as para. 3.3 Prevention, they should not be inserted in existing paragraph numbers, but appear at the end of that reading. Such as:

	3.3	Work Instructions
	3.4	Records
	3.5	Corrective Action
	3.6	Cost Related to Quality
then add	3.7	Prevention
	3.8	Software
	3.9	Etc.

d. Reference page 53, para. 21 Applicable Documents: Change MIL-C-45662A to read, "MIL-STD-45662A". Title was changed 10 June 1980.

e. Reference page 54, para. 3.3 Prevention: Second line, delete word "quality". New sentence to read, "The quality assurance program plan should focus on preventing problems." There is no such thing as a "quality problem." It is an engineering problem, a design problem, a manufacturing problem, etc., but it is not a quality problem. (Reference definition of quality).

f. Reference pages 51, 52, 53, para. 1.1, 1.2, 1.4, 1.5, 2.1, 2.2: Delete the word "specification" in these paragraphs and if the word appears elsewhere such as paragraphs 8.0, 8.1, 8.2 and 8.3, page 66, delete also. This is a standard and not a specification.

2. The above comments were the results of a very rapid review due to time constraints. Please accept these comments in the same good faith that they were prepared. Your task in creating the factory of the future and it's related quality checks and balances is no easy job. I wish to congratulate you on your success thus far. I am also very pleased that you have the Quality Assurance Task D so far along. If you recall, it was my original request that started you in this effort.

3. I would be happy to participate in any future reviews you might wish to undertake. If I can be of further assistance, please let me know.

Sincerely,

Alvin M. Baughman

Alvin M. Baughman
Professional Engineer
State of California #QU1256

AMB/rh

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS BALLISTIC MISSILE OFFICE (AFSC)
NORTON AIR FORCE BASE CALIFORNIA 92409

13 JAN 1984

REPLY TO
ATTN OF AWQ

SUBJECT Quality Assurance Management Standard Review (Yr ltr of 19 Dec 83)

TO AFWAL/MLTC

1. I appreciate the opportunity to review the material you provided. The views held by the various Military/Government and Industry personnel were particularly interesting.

2. I've attached my comments against the alternative documents in your "Task D" project. These comments take into consideration that MIL-Q-9858A is only one part of the overall program to acquire quality products. In effect MIL-Q-9858A (or any alternative) is a single management system embedded in many other management systems. The influence of any new document on the future factory, is tempered by the policies and regulations of the different Military Departments and Agencies, by the experience and training of the work force (Government and Industry) and by its acceptability to all concerned. Requirements of management standards like MIL-Q-9858A vary depending upon; (1) the funding provided by the Program Office to establish or maintain the quality system; (2) the necessary adaption by the contractor to the products produced and the business systems used; and (3) interpretation by the Contract Administration Office. Quality systems developed under MIL-Q-9858A vary from contractor to contractor today although this specification was published over 20 years ago. Any project to develop concepts for the future factory should certainly look at the overall acquisition picture as well as contractual quality system requirements.

Albert W. Fry

ALBERT W. FRY
Chief, Quality Assurance Division

1 Atch
Comments

Comments

MIL-Q-9858A Glossary Addition

1. Although certainly the easiest solution to the problem, this is also the least satisfactory. MIL-Q-9858 is geared to a production effort. It may suffice by itself in some situations for the early program phases with liberal interpretation and a lot of understanding. With the glossary changes we will still have a document ill fitted for anything other than late Full Scale Engineering Development and subsequent acquisition phases. Further because of perceived problems in the past under the terms of MIL-Q-9858A, a number of companion document (e.g., MIL-STD-1520) have been created. The glossary approach would have to be extended to these other documents as well as to maintain any kind of system integrity.

2. The actual definitions in the glossary are reasonable. One change in para 3.3.2.1.4 is recommended. Replace the third sentence with the following: "The design may be documented through software stored on a computer tape, disc or other suitable media."

Rationale - As written the sentence implies that the storage media is software.

Proposed Additions to MIL-Q-9858A

For all practical purposes this approach is the same as the Glossary Addition and the same comments apply.

Product Assurance Program Standard

1. Of the three alternatives, this is the best. It is questionable, however, to call this a product assurance standard. The term product assurance" is often used to define a combined Reliability, Maintainability and Quality Assurance effort. The proposed standard is essentially a quality assurance document.

2. Para 2.1 - Revise MIL-C-45662A to MIL-STD-45662.

Rationale - MIL-STD 45662A is obsolete.

3. Para 3.2 calls for a plan to integrate disciplines, etc. A Contract Data Requirements paragraph should be added to the standard to provide for delivery of contractor plans for quality.

Rationale - Decisions early in the program influence the entire course of the program. An efficient vehicle is needed to document decisions, agreements and interpretations for all involved parties.

4. Para 3.3 The second and third sentences are written as if the contractor is being given permission to use automated equipment, etc. The thrust of the paragraph should be changed to task the contractor e.g. "The quality program shall plan for the economical use of automated equipment for inspection and test."

5. Para 3.~~8~~6 Delete the words "on site" from the fourth sentence.

Rationale - Current contract terms provide for disclosure of a wide variety of sensitive cost data which range from scrap costs which must be identified in proposals to Contractor Performance Reports. The "on-site" proscription unnecessarily restricts effective use of quality data.

6. Para 4.2 Change MIL-C-45662A to MIL-STD-45662

7. Para 4.6 Delete

Rationale - If an actual need exceeds the state of the art, this amount to a question involving impossibility of performance. This really isn't a proper area for the contractor's quality program to address.

8. Add a new paragraph to section 4 to provide for participation in design reviews as follows.

Design Review. Personnel from the contractor's engineering, manufacturing and quality assurance organizations shall conduct a continuing review of design and technical documentation and changes thereto, to determine their adequacy regarding design and function of the product, all necessary information has been included, and requirements are clear and unambiguous and conform to standard engineering practices. Checklists shall be used in conducting the review which shall include, but is not limited to, the following:

a. Use of materials and processes.

b. Location, mounting, and interconnection of parts.

c. Failure mode analysis of the design.

d. Physical layout with regard to elimination of single-point failure modes.

e. Appropriateness and accumulation of tolerances.

f. Producability and inspectablity of equipment.

g. Quality history of similiar designs.

The quality assurance participant shall ensure that reviews are documented, deficiencies reported, and corrective action has been taken prior to document release. These reviews shall be used in subsequent quality planning for procurement, fabrication, inspection, and test.

9. Add a new paragraph to section 6 to provide for nondestructive inspection as follows:

Designs shall be evaluated to identify those product characteristics which require verification by nondestructive inspection methods over and above visual examination e.g. magnetic particle or radiography. Design margin of safety, stress, material fracture and fatigue properties, and product application should be considered as a minimum in this evaluation. The quality program must assure that adequate nondestructive inspection methods are identified and properly applied to detect conditions detrimental to the product. Particular attention will be directed toward processes which must be stringently controlled, e.g. welding and bonding, to assure product integrity.

JAN 25 1984

AFWAL/MLTC

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARMAMENT DIVISION (AFSC)
EGLIN AIR FORCE BASE, FLORIDA 32542

20 JAN 1984

REPLY TO
ATTN OF: ENP

SUBJECT: Quality Assurance Management Standard Review (AFWAL/MLTC Ltr dated 19 Dec 1983)

TO AFWAL/MLTC

1. We have reviewed the proposed rewrite of MIL-Q-9858A, the proposed draft product assurance standard and the related material as requested. Our comments and recommendations are the following:

a. General comments:

(1) It appears that both draft documents are essentially MIL-Q-9858A with changes made primarily to permit quality documentation to be stored, transmitted and used in other than "hardcopy" form. We concur with the concept provided controls to prevent unauthorized changes are also required.

(2) The reduction of paper is certainly worthwhile but it will not substantially improve quality of products. This effort does not really address the tremendous potential for automating statistical process controls (see comments below on paragraph 6.6).

(3) Several of our comments below are aimed at eliminating even the implication that the government must or will approve quality plans. Contractors are supposed to be responsible for quality of their products but they are virtually all eager to share this responsibility with the customer. One of the easiest ways to share the responsibility for quality is to have the customer dictate how you will do everything.

b. Specific comments:

(1) Page 32, Para 3.3.2.1.1. The proposed definition of objective evidence does not define objective evidence, it defines the methods of presenting it. This definition should be concerned primarily with the substance of objective evidence. What is acceptable objective evidence? The methods used to record or present it are relatively unimportant as long as there is some system that ensures authenticity.

(2) The proposed "rewrite" of MIL-Q-9858A appears acceptable if there is some means of assuring that quality documents and data maintained on computer tapes or discs is authentic, that it is controlled and that it can be traced to a responsible individual.

(3) Proposed Product Assurance Program Standard

(a) The title "Quality Assurance Program Standard" would be more appropriate since this document does not address areas of product assurance other than quality.

(b) Paragraphs 1.6 and 1.7. Recommend deletion of paragraphs 1.6 and 1.7. It is understood that tailoring of standards to program needs is required and it is not necessary or desirable to reemphasize the requirement in a contractual document. Likewise, it is not necessary to reemphasize the policy that contractors should be allowed maximum flexibility. It is also inappropriate to require in a standard that the government consider contractor practices to be acceptable if he shows them to meet the "basic intent" of the proposed document. If anything should be emphasized it should be the contractor's responsibility for quality of his product. The government should assume none of the responsibility for adequacy of contractors' practices whether they meet "basic intents" or not.

(c) Paragraph 2.1. MIL-C-45662A should be MIL-STD-45662.

(d) Paragraph 3.2. The government should not be interested in the contractor's marketing function or how he integrates it with his other functions. The last sentence should be deleted since it can be interpreted as direction to perform work before a contract actually exists.

(e) Paragraph 3.3. This paragraph requires a quality assurance program plan. MIL-Q-9858 requires only that the quality program be documented. This does not mean it has to be in a single document or plan although some contractors choose to do so. It is not clear what automated inspection and test or inspection and test by production operators have to do with prevention. We do not believe the last two sentences are needed. Suggest the first sentence be changed to read:

The contractor's quality assurance program documentation and planning shall focus on preventing quality problems.

(f) Paragraph 3.6. Recommend the second sentence be revised to read:

This program shall be documented and shall be subject to review and disapproval by the Government Representative whenever the contractor's procedures do not accomplish their objectives.

Recommend deletion of the third sentence since it is unnecessary and redundant. Recommend revision of the fourth sentence to read:

The software quality program shall be an integral part of the total quality assurance program.

Recommend deletion of the word "plan" in the last sentence.

(g) Paragraph 4.1. For consistency, all references to "drawings" should be changed to "design documents".

(h) Paragraph 4.2. MIL-C-45662A should be MIL-STD-45662.

(i) Paragraph 6.6. The tone and substance of this paragraph (although it is identical to 6.6 of MIL-Q-9858) is not consistent with the modern concept of statistical quality control. This paragraph was apparently written primarily to allow but limit sampling for acceptance - the assumption apparently being that 100% inspection provides "good" quality. This paragraph needs a complete reorientation to encourage or, perferably, require statistical process controls with the objective to virtually eliminate the need for acceptance sampling through automation of statistical process controls.

2. Questions about the above comments may be directed to Mr. Carl Towery (AUTOVON 872-8652).

JASPER L. GLOVER
Director of Product Assurance
Deputy for Engineering

TEXAS INSTRUMENTS
INCORPORATED
POST OFFICE BOX 226015 • DALLAS, TEXAS 75266
Equipment Group

Mail Station 368

January 16, 1984

Richard R. Preston
Captain, USAF
Project Manager
Computer Integrated Mfg Branch
Wright-Patterson Air Force Base, Ohio 45433

Dear Captain Preston:

Having completed a review of the material enclosed with your letter of December 19, 1983, "QA Management Standard Review", I would like to offer the following suggestions and comments.

1. Obviously a great deal of work has gone into the project to date, and a lot of good information has been collected.

2. The general consensus seems to be that MIL-Q-9858A, with proper interpretation, is adequate to encompass factory of the future.

3. The suggested revisions (additions) to MIL-Q-9858A as presented in the report are acceptable and should not cause any problems with currently accepted interpretations. However, it is suggested that any further consideration of revision of MIL-Q-9858A be discussed with appropriate members of the DOD Quality Council and/or OUSD, since there is currently effort underway to evaluate adequacy of MIL-Q-9858A and since industry, through the CODSIA organization has recently submitted comments on this subject.

4. We cannot support the development or issue of a new Product Assurance standard such as proposed by this project. As indicated in our response, and borne out by the consensus of other participants, MIL-Q-9858A is adequate to encompass ICAM concepts. A new standard is unncessary, and would upset existing quality systems which have evolved for many years around MIL-Q-9858A, resulting in significant cost impact, and little impact on product quality.

5. Whatever is eventually done, must be done as a uniform, tri-service program. Contractors who supply DOD must not be forced to maintain separate quality systems satisfying individual service requirements.

13510 NORTH CENTRAL EXPRESSWAY • DALLAS • 214-995 2011 • TELEX 7 3324 • TWX 910 867 4702 • CABLE TEXINS
INTERNATIONAL TELEX NUMBER 470900

We appreciate the opportunity to comment and would be glad to respond to any questions you many have.

Sincerely,

John P. Leslie
Manager, QRA Services
Audits and Liaison

JPL:jw

L-1

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
NAVAL AIR SYSTEMS COMMAND HEADQUARTERS
WASHINGTON DC 20361

IN REPLY REFER TO
AIR-5162/REM
Ser 11
1 FEB

RECEIVED
FEB 23 1984
AFWAL/MLTC

From: Commander, Naval Air Systems Command
To: Department of the Air Force, Air Force Wright Aeronautical Laboratories (AFSC) Wright-Patterson Air Force Base, Ohio 45433

Subj: Quality Assurance Management Standard Review

Ref: (a) Air Force Wright Aeronautical Laboratories ltr AFWL/MLTC (513-255-6976) of 19 Dec 1983

1. The Quality Assurance Branch of the Naval Air Systems Command has reviewed the subject document submitted by reference (a) and concurs with the need for the project to determine the adequacy of present quality documents for use in the factory of the future. In general, the comments from industry and the government are rational and constructive. Most feel that MIL-Q-9858A will be adequate with some modification owing to the fact that the factory of the future will basically be machine/computer controlled with very little human inspection and less paperwork, i.e., records, data, etc. We agree with this concept, however, although most of the big industry will probably become fully automated many of the smaller contractors will continue to operate as they do presently. Therefore, we should not make drastic changes to present quality documentation to accomodate automation and forget the "little guy". We feel that with the reduction of human effort to control quality in the factory of the future a great deal of training and coordination will be required by the Government and industry.

[illegible] J. PAUL
By Direction

DEFENSE LOGISTICS AGENCY
HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

IN REPLY REFER TO DLA-QR

SUBJECT: Quality Assurance Management Standard Review

TO: Commander
Air Force Wright Aeronautical Laboratories (AFSC)
Wright-Patterson AFB, OH 45433

1. Thank you for the opportunity to review and comment on the proposed Quality Assurance Management Standard. I have asked my Executive Directorate of Quality Assurance to conduct the review for me and respond directly to you. This interim reply will be followed by specific comments from them.

2. Let me know if I can be of further assistance in this matter.

Joseph H. Connelly

JOSEPH H. CONNELLY
Major General, USAF
Deputy Director
(Acquisition Management)

DEFENSE LOGISTICS AGENCY
HEADQUARTERS
CAMERON STATION
ALEXANDRIA VIRGINIA 22314

IN REPLY REFER TO DLA-QR

30 JAN 1984

SUBJECT: Quality Assurance Management Standard Review

TO: Commander
Air Force Wright Aeronautical Laboratories (AFSC)
ATTN: AFWAL/ML
Wright-Patterson AFB, OH 45433

1. References:

a. AFWAL/MLTC letter, 26 Dec 83, subject as above.

b. DLA-DD(AM) letter, 20 Jan 84, subject as above.

2. My staff has reviewed the subject standard and our comments are at enclosure 1. Since the proposed standard has not been formally submitted to DoD for adoption, the comments are offered in the same vein - preliminary and subject to additions/revisions when and if a formal submittal occurs.

3. The three alternative proposals as a Quality Assurance Management Standard indicate that the AFWAL contractor(s) relied on information from industry and Government as the primary source for what should constitute the standard. Studying the "factory of the future" to determine its specific needs in the area of product/quality assurance standards and then comparing them to existing documentation, requirements, and/or systems to see if the needs are satisfied would have been a more viable approach. The data, as presented in the reference suggests that the effort was started from a position that MIL-Q-9858A was inadequate for future needs and should be revised.

4. The Military Services and DLA have not agreed that there is a need for revising MIL-Q-9858A. The Council of Defense and Space Industries Associations (CODSIA), which represents Aerospace Industries Association, Electronics Industries Association, National Security Industries Association, and Shipbuilders Council of America, made a recommendation at the 11 Aug 83 DoD Quality Assurance Council that MIL-Q-9858A not be revised. The Council, at its 13 Sep 83 meeting, determined that a DoD Council task team should be formed to determine what, if any, efforts should be accomplished to improve quality, reduce costs, and build discipline into the current system. Any formal AFWAL proposal for revision to quality documents should be submitted to HQ USAF for presentation to the DoD QA Council and subsequently the task team.

5. Unnecessary changes to a system which is working only serves to create additional problems. Prior to pursuing efforts on the subject standard, you should evaluate other DoD initiatives to ensure that economical and effective quality programs are in use from the earliest phases of the life cycle.

FOR THE DIRECTOR:

Kendrick S. Coryell

1 Encl

KENDRICK S. CORYELL
Colonel, USAF
Acting Deputy Executive
Director
Quality Assurance

DLA COMMENTS

QUALITY ASSURANCE MANAGEMENT STANDARD

A. General Comments on the Proposed Alternatives:

1. There are three proposed alternatives:

a. MIL-Q-9858A plus a glossary of definitions.

b. MIL-Q-9858A with the definitions incorporated.

c. MIL-Q-9858A with the definitions incorporated, some minor rewording, additional paragraphs on Tailoring, Flexibility, Prevention, Software, Automated Equipment and Processes, Audits, and a name change to Product Assurance Program Standard.

2. Data presented in the study does not support recommending changes to MIL-Q-9858A. Most of the respondents felt the document is adequate for the factory of the future.

3. No substantive difference exists between the three alternatives. They are essentially aimed at incorporating software terminology/software products into various definitions and ensuring the involvement of various functions within a company during the earliest stages of a program or product. Both are areas with a potential for improvement. This has been recognized and is being pursued within DoD through efforts such as:

a. A draft DoD Quality Design Review Handbook is currently being tested by the Military Services. If adopted for use, this document will ensure early involvement of quality, both Government and industry, in all phases of the Systems Acquisition Cycle.

b. Development of a new software quality assurance document. This joint Service document will satisfy most, if not all, proposed changes to MIL-Q-9858A in the area of software, deliverable as well as nondeliverable.

B. Specific Comments:

1. Reference Task D Report, paragraph 3.3.2.1, page 32-34.

a. The definitions should be revised to reflect that "reviewing documentation on a CRT screen will, in some circumstances, satisfy the requirement for providing copies, making available, etc., documentation to the Government Representative." The requirement for hard copy, however, will still exist in certain circumstances, such as a disagreement, dispute, request for data from contracting officer or technical activity, etc. Recommend that the requirement for hard copy be left as an option if this approach is selected.

Encl 1

b. If software/software products are to be used then a requirement for software/Software System Validation and System Integrity and Protection must also be created. This section of the report does not propose such controls.

2. Reference Task D Report, paragraph 3.3.2.2, pages 35-49.

a. Same as comments in paragraph 1a and b above.

3. Reference Task D Report, paragraph 3.3.2.3, pages 50-66.

a. Same as comments in paragraph 1a and b above.

b. Change the name of the standard to Quality Assurance Program Standard or identify it for what it really is - a revision to MIL-Q-9858A. There are no requirements in the standard which encompass such areas of product assurance as reliability, maintainability, and availability. The name should not reflect product assurance unless it covers the full spectrum of Product Assurance.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

RECEIVED
FEB 1 1984
AFWAL/MLTC

31 JAN 1984

REPLY TO ATTN OF: PMDQ

SUBJECT: Quality Assurance Management Standard Review (Your letter 19 Dec 83, same subject)

TO: AFWAL/MLTC

The following is a list of comments on subject draft QA Management Standard:

a. MIL-Q-9858A Glossary Addition, Paragraph 3.3.2.1.5, Work Instructions.

Work instructions should not be considered a form of objective evidence.

Rationale: The MIL-STD-109B definition of objective quality evidence reads, "Any statement of fact, either quantitative or qualitative, pertaining to the quality of a product or service based on observations, measurements, or tests which can be verified." Work instructions don't fit this definition.

b. MIL-Q-9858A Rewrite, Paragraph 2.1.

Change MIL-C-45662 to MIL-STD-45662.

c. Product Assurance Standard.

Paragraph 1.6, Tailoring.

Recommend that this paragraph be deleted.

Rationale: A document that is self tailorable is preferred. MIL-Q-9858A is considered by most QA professionals to be self tailorable. By this we mean, tailorable in its application by the contractor and its enforcement by the Government. (i.e., requirements only apply if they fit the product or service being procured and the contractors manufacturing processes.) This standard should be self tailorable, in the same sense, as written. Tailoring may still be done but only in exceptional cases.

Paragraph 1.7, Flexibility.

Recommend that this paragraph be deleted.

Rationale: We believe that contractors are provided flexibility with MIL-Q-9858A. Under current practices the proof of conformance to contract QA requirements rests with the contractor. This is the only

practical way for the Government to operate. The alternative to this would require the Government to prove an impact on product in order to get contractors to change their QA systems. This usually cannot be done until it is to late. (i.e., The product is already nonconforming.) This paragraph weakens the current practice of requiring contractor proof of compliance.

Paragraph 2.1, Applicable Documents.

Change MIL-C-45662A to MIL-STD-45662.

Paragraph 3.3, Prevention.

Recommend this paragraph be rewritten.

Rationale: What you describe in this paragraph is not prevention, it is merely another form of detection. Prevention includes efforts intending to show, motivate or teach how to do the job right the first time. Included, for example would be efforts such as preparing and reviewing work instructions, establishing process controls and training or motivating workers. Controlling automated equipment in a fashion to eliminate or reduce nonconforming material is prevention, however, any form of inspection or test is not.

Paragraph 3.6, Software.

Recommend this paragraph be rewritten as follows:

"The contractor shall establish and maintain a Software Quality Assurance (SQA) Program that is consistent with MIL-S-52779A, Software Quality Assurance Program Requirements. This program shall be integral with other quality assurance programs, and shall be documented in a plan that may stand alone, or be incorporated into other, related plans, e.g., the CPDP.

This SQA Program applies to deliverable, non-deliverable, and support software whether purchased as part of an overall system or as stand-alone software.

In all instances tailoring of MIL-S-52779A will be considered to ensure appropriate, cost-effective, controls appropriate to the specific purchase. All such tailoring will be reflected in the contract statement of work."

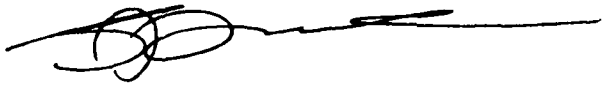
Rationale: MIL-S-52779A, as currently written, will handle non-deliverable, support software. The only caveat is that it must be tailored for the specific application. This is in accordance with soon to be published guidelines from AFSC/ALK.

Paragraph 4.2, Measuring and Testing Equipment.

Change MIL-C-45662A to MIL-STD-45662.

Paragraph 6.8, Audits.

The words "to the post-production review of operational data" need to be clarified. It is unclear how a contractor's audit system would cover this area. Without major changes to the DOD contracting and field data collection systems, the contractors role is limited to responding to field complaints and analyzing data provided by the the user.



GEORGE J. THIELEN
Chief, Quality Assurance Division
Directorate of Manufacturing/Quality Assurance

RECEIVED

FEB 1 1984

AFWAL/MLTC

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE DIVISION (AFSC)
LOS ANGELES AIR FORCE STATION, PO BOX 92960, WORLDWAY POSTAL CENTER
LOS ANGELES, CA 90009

27 JAN 1984

REPLY TO ATTN OF: PDQ

SUBJECT: Quality Assurance Management Standard Review (Your Ltr, 19 Dec 83)

TO: AFWAL/MLTC

We have reviewed the draft Quality Assurance Standards. In paragraph 3.6 of the draft Product Assurance Program Standard we suggest that the requirement for a Software Quality Assurance Program Plan be deleted or made optional. The wording of this paragraph 3.6 implies that this plan somehow becomes a compliance document. We recommend that this paragraph state that if a plan is necessary that it clearly not take precedence over the software quality requirements (i.e. MIL-S-52779A) in the Statement of Work of the contract. This is consistent with AFSC policy and may avoid the problems we have experienced when plans are perceived as being compliance documents rather than information data items.

ALDO F. LORIA
Chief, Product Assurance Division
Directorate of Productivity

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT CENTER (AFSC)
ARNOLD AIR FORCE STATION, TENNESSEE 37389

RECEIVED

JAN 31 1984

AFWAL/MLTC

REPLY TO ATTN OF: PKQ

26 Jan 1984

SUBJECT: Quality Assurance Management Standard Review

TO: AFWAL/MLTC

1. The Quality Directorate at Arnold Air Force Station, TN wishes to thank AFWAL for the opportunity to review and comment on the subject standard.

2. The Quality Directorate finds the proposed additions to MIL-Q-9858A beneficial in reducing the implicit or commonly interpreted requirements of the current version of MIL-STD-9858A.

3. The proposed Product Assurance Program Standard (PAPS) is lengthy, but very explicit in defining the requirements of a Quality Assurance program. The additions of the early involvement paragraph, software paragraph, automatic equipment and processes paragraph, as well as the audit paragraphs, are much needed additions to quality program management directives.

4. There are two recommendations for consideration: (1) throughout the PAPS there is reference to specific documents and revision numbers, (i.e., MIL-I-45208A, MIL-S-52779A, etc...). Deletion of revision identifiers would reduce the need for administrative updates. Second, paragraph 1.5 Relation to MIL-Q-9858A, should be explicit in stating at no time would both MIL-Q-9858 and PAPS be used on the same contract.

L. E. MITCHELL, JR., Major, USAF
Director of Quality Assurance

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON D.C. 20301

RESEARCH AND
ENGINEERING

RECEIVED

FEB 3 1984

AFWAL/MLTC

30 JAN 1984

Captain Richard R. Preston
Air Force Wright Aeronautical Laboratories
Code: AFWAL/MLTC,
Wright-Patterson AFB, OH 45433

Dear Captain Preston:

As requested, we have reviewed the report, and the draft of a new Product Assurance Program Standard and overall find the report both interesting and useful. It is not surprising that your report recommends leaving MIL-Q-9858A alone since the same industry representatives worked both on your study and CODSIA's review for the DoD Quality Assurance Council.

The DoD Quality Assurance Council has recommended that no immediate action be taken on MIL-Q-9858A, however, a working group chaired by the Navy has been charged with identifying problem areas that impact on quality, list them, rank them, and report back to the Council. A copy of your draft report will be forwarded to the Navy chairman of this working group for their use.

At this time, OUSD's position on MIL-Q-9858A, is that the document does not need change since it offers the flexibility needed for application within the current and future industrial setting. The beauty of the current document is that it describes the elements required for a quality program without specifically stating how these requirements will be documented. In other words, 9858A does fit the paperless environment now existing in some facilities. Perhaps, the recommended changes would better fit into H50 which gives guidance in evaluating a contractors quality program. Since there is no glossary in 9858A, namely because MIL-STD-109 is the glossary of quality terms, the proposed list of terms should be submitted to the Air Staff (proponents of MIL-STD-109) for inclusion in the current revision now in process.

Defense standardization program policy, as well as the rationale in the previous paragraph, negates a new parallel document to MIL-Q-9858A as proposed in your report. However, if we do decide to revise or replace 9858A, your proposal will be considered.

We appreciate the effort of your team. While we cannot adopt your rewrites of the documents at this time, your efforts confirm that the approach taken by DoD does reflect the latest thinking within both government and industry.

Richard A. Stimson, PhD
Director
Industrial Productivity

BCS BOEING COMPUTER SERVICES COMPANY
A Subsidiary of The Boeing Company
BMAC - SD
3801 SOUTH OLIVER, WICHITA, KANSAS 67210

February 2, 1984

Richard R. Preston, Capt., USAF
Project Manager
Computer Integrated Mfg. Branch
Department of the Air Force
Air Force Wright Aeronautical Lab. (AFSC)
Wright-Patterson Air Force Base, Ohio 45433

ATTN: AFWAL/MLTC (513-255-6976)

SUBJECT: QUALITY ASSURANCE MANAGEMENT STANDARD REVIEW

Per your request, I have reviewed the draft Product Assurance Program Standard and have no changes to recommend. The proposal changes to support the automated manufacturing environment appear to be very adequate.

I appreciate the opportunity of reviewing this document and would like to receive a finalized copy.

R. E. Speers

GENERAL DYNAMICS
Fort Worth Division
P.O. Box 748, Fort Worth, Texas 76101 • 817-732-4811

31 January 1984
271-0-34

Captain Richard R. Preston
Project Manager
Computer Integrated Manufacturing Branch
Department of The Air Force
Air Force Wright Aeronautical Laboratories (AFSC)
Wright Patterson Air Force Base, OH 45433

Attention: AFWAL/MLTC

Subject: Quality Assurance Management Standard Review

Dear Captain Preston:

We have reviewed the proposed Product Assurance Program Standard draft. The proposed changes provide the necessary flexibility to meet the needs of industry as the evoluation of emerging technology improvements occur in design, manufacturing and quality assurance of products. The standard addresses both the Factory-of-the-Future as well as current systems.

Procurements involving an FSD phase must provide provisions for tailoring MIL-Q-9858A into a flexible program plan. The resulting plan and the associated work statement must form the basis for cost estimates and pricing. The agreed plan must be the overriding contractual requirement with provisions for dynamic changes based on day-to-day results.

It should be recognized that the current MIL-Q-9858A format is deeply imbedded by reference into many government and industrial documents and industry has resisted any changes as reflected by the recent CODSIA case relative to a proposed "B" revision.

The urgency of incorporating the proposed changes is vital because of the fundamental differences which exist in today's environment characterized by sophisticated technology changes being introduced into defense systems and new/improved manufacturing methods.

Your ICAM committee is commended for the objective assessment of MIL-Q-9858A and the effort expended in proposing the necessary changes for supporting the automated manufacturing environment.

We would appreciate receiving a finalized copy of the proposed document.

J. E. Mayben, Director
Product Assurance

Grumman Aerospace Corporation
Bethpage, New York 11714
(516)575-2606

JOSEPH P. KINGFIELD
vice president

CQS-VP-84-209
2 February 1984

Captain Richard R. Preston, USAF
Air Force Wright Aeronautical Laboratories
Wright-Patterson Air Force Base
Ohio 45433

Subject: Quality Assurance Management Standard Review

Reference: (a) AFWAL/MLTC letter dated 19 December 1983

Dear Captain Preston:

Grumman Aerospace Corporation has reviewed the subject document and forwards the following comments for your consideration:

1. Of the three alternatives presented in paragraph 3.3.2 of the attachment to reference (a) for developing a new Product Assurance Program Standard, the one we found most acceptable is the MIL-Q-9858A Rewrite.

2. The Rewrite accomplishes the same result as adding a glossary to MIL-Q-9858A, but in a more meaningful and less obtrusive manner.

3. The proposed Product Assurance Standard, which is still basically MIL-Q-9858A, adds a few paragraphs which will tend to create more confusion as to when, and under what circumstances, it is to be applied. It would be more appropriate that the Software specification, MIL-S-52779, remain a stand-alone document.

Only recently the Office of the Under Secretary of Defense (R&E) concurred with industry that a rewrite of MIL-Q-9858A was not needed at this time. Any proposed rewrite, of MIL-Q-9858A for the purpose of providing for the computer controlled "factory of the future" should be coordinated with that office to prevent any appearance of inconsistency.

Grumman Aerospace Corporation appreciates the opportunity to review the Quality Assurance Management Standard and if I can be of further service please do not hesitate to contact me.

Sincerely yours,

GRUMMAN AEROSPACE CORPORATION

J. P. Kingfield, Vice President
Corporate Quality and
Safety Operations

JPK/jm

BOEING COMMERCIAL AIRPLANE COMPANY
P.O. Box 3707
Seattle, Washington 98124

A Division of The Boeing Company

February 3, 1984
A-2020-32-154

Richard R. Preston, Capt., USAF
Project Manager
Computer Integrated Manufacturing Branch
AFWAL/MLTC
Wright-Patterson Air Force Base, Ohio 45433

Dear Captain Preston:

We have reviewed the draft document Product Assurance Management Standard as requested in your letter of 19 December 1983.

Boeing Military Aircraft Company - Wichita participated in the questionnaire and information gathering meeting during document development. Because of that involvement we provided BMAC a draft copy and suggested they respond directly to you.

The Boeing Commercial Airplane viewpoint is that the standard appears to be essentially a restatement of existing MIL-Q-9858A in broader terms. The standard does not appear to offer many advantages for subcontractors over the marked-up version of MIL-Q-9858 which was recently reviewed. Since we already comply with MIL-Q-9858 in its present form and the proposed changes of the standard are minimal, we would prefer the proposed version of MIL-Q-9858.

Sincerely,

G. B. Foster

G. B. Foster, Supervisor
Flexible Manufacturing,
Controls and Simulation
Mfg. Research & Development
A-2020 931-4310 5H-36

BOEING

Lockheed-Georgia Company
A Division of Lockheed Corporation
Marietta, Georgia 30063

9 February 1984

Capt. Richard R. Preston, USAF
Project Manager - AFWAL/MLTC
Computer Integrated Mfg. Branch
Wright-Patterson AFB, Ohio 45433

SUBJ: QUALITY ASSURANCE MANAGEMENT STANDARD REVIEW

Ref.: Letter dated 19 December 1983, AFWAL/MLTC to Joseph Tulkoff, Same subject

Dear Captain Preston:

We have reviewed your draft Product Assurance Program Standard. Our comments, which follow, note several needed corrections.

First, in section 2.1, Applicable Documents, the current standard used for Calibration System Requirements should be MIL-STD-45662. Second, in Figure 3-1 p.8, document 4528 should be labeled 45208. Third, in Figure 3-9, para. 4, "...changes of additions..." should read "...changes or additions...".

In general we agree with the "overwhelming response" that MIL-Q-9858A is an excellent document, it serves its purpose well, and should not be changed. We also agree with the first part of summary statement 4) on Software Quality Assurance (p.27 para. 3.2.3.3.1); separate guidelines for shippable and non-shippable software should be used. That is, MIL-STD-52779 should not be applied to process control software. However, we do not agree that MIL-Q-9858A should be revised or replaced to accomplish this.

The changes noted in the rewrite of MIL-Q-9858A are not significant enough to warrant the cost of replacing the existing standard. The same results can be accomplished through interpretation of the current version of MIL-Q-9858A.

The Product Assurance Program Standard does cover some aspects not covered by MIL-Q-9858A and has some good features, such as the tailoring provision. However, it is still very similar to MIL-Q-9858A, and it is

questionable if its implementation would be cost effective, as much of what has been added could still be inferred from interpretation of MIL-Q-9858A.

Thank you for the opportunity to review this document. If we can be of further assistance, please let me know.

Very truly yours,

LOCKHEED-GEORGIA COMPANY

Dennis C Taylor

for J. Tulkoff, Director of
Manufacturing Technology

JT:pm

LTV Aerospace and Defense Company

2-49000/4L-01

25 January 1984

To: USAF, AFSC, Wright-Patterson Air Force Base, Ohio 45433

Attn: Captain Richard R. Preston, Project Manager, Computer Integrated Mfg. Branch

Subj: Quality Assurance Management Standard Review

Ref: AFWAL/MLTC (513-255-6976) dtd 19 Dec 1983

1. In response to your request, Vought Quality Assurance has reviewed the proposed Product Assurance Program Standard and submits the following observations.

a. Our preference is to leave MIL-Q-9858A as currently published with a second preference of adding the definitive phrases which will define a paperless system in lieu of the proposed Product Assurance Program Standard.

b. The need for a Product Assurance Program Standard is not justified, in our opinion, and runs counter to previous industry agreement that specifications should not dictate "how to" but should state requirements. Some of the specific objections to the Product Assurance Program Standard are listed.

(1) The Product Standard violates the general opinion of industry that "how to" wording should be left out of specifications. There are long descriptions of how we will satisfy requirements in several paragraphs. A few examples are: 3.2, 3.3, 3.4, 3.5, 3.6, 4.4, and 6.2 the last paragraph. Again, the specification should state minimum requirements and let the contractors decide how to best comply in their environment.

(2) The Tailoring Clause (paragraph 1.6), while desirable, is generally going to be ignored unless the standard is issued in 1, 2, or 3 level requirements. It may even need to have separate specification numbers. The reason for this is that most Procurement Officers always invoke the entire specification and resist "tailoring."

2. In summary, we maintain that MIL-Q-9858A is acceptable as a workable document in the near term and future factory environment.

Respectfully,

for L. J. Johnston, Manager
QA Management Services
(214) 266-4502
M/S 49-36

BOEING MILITARY AIRPLANE COMPANY
A Division of The Boeing Company Wichita, Kansas 67210

January 26, 1984
3-4801-6-84-5

AFWAL/MLTC (513-255-6976)

Attention: Richard R. Preston, Capt., USAF
Project Manager
Computer Integrated Mfg. Branch

Subject: Comments on Task D/QA Draft Product Assurance Program Standard

Captain Preston:

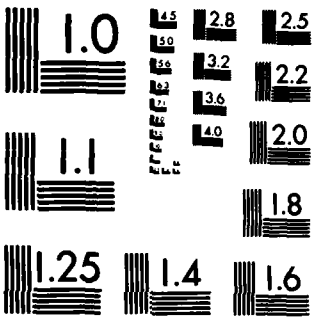
The Quality Assurance Organization has reviewed the Project Priority 1105 Task D/QA Draft Product Assurance Programs Standard and it is our firm belief that MIL-Q-9858 should remain unchanged.

John Watts
Manager, Quality Assurance Lab & Support
Boeing Military Airplane Company
M.S. K44-36

JW/KM/ml

AD-A144 891 ICAM (INTEGRATED COMPUTER AIDED MANUFACTURING) CONCEPTUAL DESIGN FOR COMP..(U) LTV AEROSPACE AND DEFENSE CO DALLAS TX VOUGHT AERO PRODUCTS D.. 4/4

UNCLASSIFIED R H WETTACH ET AL. 29 JUN 84 2-20150/4R-2 F/G 14/4 NL



HOWARD C TODT
Staff Vice President
Quality Assurance

MCDONNELL DOUGLAS CORPORATION

QA-84-4L
25 January 1984

Ref: AFWAL/MLTC Ltr dated 19 Dec 1983
"Quality Assurance Management
Standard Review"

RECEIVED
FEB 2 1984
AFWAL/MLTC

Mr. Richard R. Preston, Capt., USAF
Project Manager
Computer Integrated Mfg Branch
Department of the Air Force
Air Force Wright Aeronautical Laboratories (AFSC)
Wright-Patterson Air Force Base, Ohio 45433

Dear Captain Preston:

McDonnell Douglas Quality Assurance has reviewed the data pertaining to "Conceptual Design For Computer-Integrated Manufacturing - Task D" as transmitted and requested by your letter of 19 December 1983. We are pleased to be provided the opportunity to comment on the various alternatives for clarifying existing Quality Program requirements and/or for establishment of new regulations.

In 1983, the Council of Defense and Space Industry Association (CODSIA) established Case 9-83. Basically, this CODSIA Case focused on the development of a questionnaire which was subsequently distributed to Industry members soliciting information on the current use and status of MIL-Q-9858A. The resultant data was evaluated by the CODSIA Case Committee to determine as well as examine the Associations' position on the need for a MIL-Q-9858A revision. This review included any perceived need for specific change to MIL-Q-9858A with regard to the advent of the automated factory environment (e.g., CAD, CAM, Robotics, etc.). CODSIA Case 9-83 has just recently been concluded. The consensus was that MIL-Q-9858A is basically a sound document and revision to the document would not improve product quality. There was also the prevailing position that MIL-Q-9858A clarification and interpretation problems, which were noted by a few members, could best be corrected by a revision to Handbook H50. As for the "paperless factory" or "factory of the future", these were considered at best creative terms which describe a different manufacturing environment but one which is not defined. To establish at this time specific requirements for a still unknown method of operation is neither wise or beneficial. The adequacy or inadequacy of existing MIL-Q-9858A requirements for future application was considered by most subjective.

P. O. Box 516, Saint Louis, Missouri 63166

We support the study findings of CODSIA Case 9-83. However, it is equally obvious that a considerable amount of good constructive thinking has been applied to your project and its proposals, so it is not suggested that they be totally abandoned. As an alternative, and in keeping with the CODSIA Case conclusions, it would be more suited to revise Handbook H50. The revision could include a glossary of words and phrases, similar to that proposed by your project, along with corresponding clarification changes if needed in the "Application" and "Criteria for Evaluation" sections.

Sincerely,

Howard C. Todt
Staff Vice President
Quality Assurance
McDonnell Douglas Corporation

Lockheed Missiles & Space Company, Inc.
1111 Lockheed Way, Sunnyvale, California 94086

3 February 1984

F. B. Allderdice
O/71-01, B/103
1111 Lockheed Way
Sunnyvale, CA 94086

Richard P. Preston, Capt. USAF
Project Mgr.
Computer Integrated Mfg. Branch
Department of the Air Force
Wright-Patterson Air Force Base, Ohio 45433

Dear Captain Preston:

The Review Comments for the Quality Assurance Management Standards--Draft and the System Test Plan, Task E are enclosed. Lockheed Missiles & Space Company comments for the Implementation Plan, Task E will be mailed to you shortly.

Please add Lockheed Missiles & Space Company to the mailing list for the final version of the Quality Assurance Management Standards document.

Very truly yours,

AF Bowhall for

F. B. Allderdice
SSD Manufacturing
Lockheed Missiles & Space Company, Inc.

/s
Enc:

COMMENTS FOR SYSTEM ENVIRONMENT DOCUMENT
TASK 'D'

In an era of rapid and complex technology change, the approach the coalition took on preparing the Draft Product Assurance Program Standard was formidable. The coalition is to be commended on its proposed new standard, and the standard will serve as a good base for those companies implementing new strategies as we approach the factory of 1995. As we evolve from integrated human aided manufacturing factory to a integrated computer aided manufacturing factory, this new standard will afford us stability in what we will be doing to manufacture quality products as we cope with the dynamically changing how we will be manufacturing quality products.

ICAM SYSTEM TEST PLAN TASK 'E' COMMENTS

ICAM System Test Plan Task 'E' document is acceptable as written. However, it was observed in Appendix A, that Fig. A-11 and Fig. A-16 are duplicates, as well as Fig. A-9 and Fig. A-17.

GENERAL ELECTRIC

AIRCRAFT ENGINE BUSINESS GROUP
GENERAL ELECTRIC COMPANY ● 1 NEUMANN WAY ● CINCINNATI, OHIO 45215 ● (513) 243-2000

February 3, 1984

Captain R.R. Preston
USAF
Computer Integrated Manufacturing Branch
AFWAL/MLTC
Wright-Patterson AFB, Ohio 45433

SUBJECT: Review of ICAM Documents Tasks B & D

I know that I'm deliquent with these comments, but a number of items associated with the start of the new year have interferred with my response.

As I've said previously, we in GE recognize the substantial amount of high quality work represented by these program documents. Our comments are intended to provide inputs to enhance the interpretation and usefulness of the documents, and should not be interpreted to degrade the work effort represented. We appreciate the chance to review these documents for that purpose.

Task B - FoF Conceptual Framework

As I indicated early last month, most of our comments on this document may not be totally appropriate due to the different nature of the engine manufacturing business from the approach normally used in the airframe industry.

General Comments

Overall, the document provides a large list that could be used as "thought joggers." The impression is, however, that many of the elements and solutions are repetitive.

The Technology Voids identified in each section are brief and not descriptive. The lack of detail would present system designers and vendors, trying to fill the voids, with little from which to work.

Although a business strategy is mentioned and discussed, beginning on pg. 3-30, more could have been said; e.g. do we start from existing islands of automation in existing factories, or.. "greenfield" plants. What elements of the business strategy relate to the automation strategy?

Cost justification of CAM is a big problem. Although mentioned on pg. 3-93, no real answers or suggestions are given. Just having financial data on a data-base and being able to manipulate it, will still not answer the cost justification question. Other factors must be addressed here other than the normally considered financial considerations.

Two (2) statements on pg. 3-87 and pg. 3-88 are contradictory. One can't strive for "economic order quantities" and "Just-In-Time" (JIT) techniques simultaneously.

The term "automatic guided vehicles" (AGV) should be substituted for "robocarriers" on pg. 3-89. AGV seems to be the more widely accepted generic terminology.

After reading the section on Human Resources, (Sec. 3-5), it is not clear as to where we are going to get the number of skilled people U.S. Industry will need. The premise that we can retrain non-professionals to be professionals in 1995 plants, (p. 3-68, first line) is difficult to envision. This whole section implies a large number of people working in 1995 factories, which may not be the case nor is it the objective that the automation and CAM people are aiming for.

In summary, a great deal of the concept to the 1995 factory seems to rest on the building of massive data bases, group technologies and artificial intelligence, etc. This document covered superficially various system characteristics but did not expand to the degree we would have liked. Although these are good "motherhood" type of thoughts, it would seem that there are areas where these components of the Factory of the Future cannot bridge the large gap between today's world and that of the distant future. It is recommended that some expansion be given to filling the gap in between. What will the data base provide, to whom and how? How will artificial intelligence benefit the FoF and what are the areas where it would be inappropriate? What are the systems layouts, and priorities so future factory does not become totally burdened in dealing with these future massive data bases and information transfers.

Task D - Product Assurance Program Standard Specific Comments

Page 3 - Suggest replacing MIL-STD-1520A with MIL-STD-1520B. Also, MIL-STD-45662 is not an A revision that we know of.

Page 6 - Definition of Quality Control. Add control of processes.

Page 41 - Para. 4.2. - Replace MIL-C-45662 with MIL-STD-45662.

Page 53 - Para. 2.1. - Replace MIL-C-45662A with MIL-STD-45662.

Page 54 - Para. 3.3 - Delete the phrase "providing an audit plan is maintained by the Quality Assurance organization."

Page 55 - Para. 3.6 - Paragraph seems much too detailed by defining "how to information" rather than stating the requirement.

Page 58 - Para. 4.2 - Replace MIL-C-45662A with MIL-STD45662A with MIL-STD-45662.

Page 59 - Para. 5.1.1 - Line 10 - Delete the "s" from objectives.

Page 60 - Line 12 - change "inspection" to "assurance".

Page 60 - Para. 6.1 - Delete 1st paragraph. It is already covered in Para. 5.1.

Page 61 - Para. 6.2 - 1st Paragraph - Delete all after line 8. It is covered in Para. 3.4.

Page 63 - Para. 6.5 - Line 5, delete "and rework".

Page 63 - Para. 6.5 - Line 7, change the sentence "The acceptance of non-conforming supplies into DoD inventory is a prerogative of an ....."

Page 63 - Para. 6.7 - Recognize use of computer to maintain status.

Page 66 - Para. 8.1 - Add provision that when MIL-Q-9858A is applied to a total contract, MIL-I-45208 control may be adequate for parts or components associated with the contract.

In addition, the following general comments are provided.

1. The proposed modifications to MIL-Q-9858A that allow for the use of disc, tape, and video display media for the transmittal QA information is a welcome addition. The additions proposed should be adequate for a general specification of this nature for the foreseeable future.

2. The proposed Product Assurance Program Standard appears to cover all aspects of a general nature for preparing and maintaining a QA program without putting unreasonable restraints on a contractor. It allows for the contractor to devise an adequate QA program utilizing the best and most modern facilities available to them. Any complaints in the past of inadequate attention to software QA appear to be addressed adequately to permit a contractor to devise a software plan. There is a reference to MIL-S-52779A, Software Quality Assurance Program Requirements, that we do not have ready access to, that probably should also be reviewed. This specification may also need updating to make it current with the present state-of-the-art in software design and documentation methodology.

Please contact me if you have any further questions regarding these comments.

Very truly yours,

GENERAL ELECTRIC COMPANY

E. E. Weismantel, Manager
Manufacturing Technology Programs

/caf

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS AIR FORCE CONTRACT MANAGEMENT DIVISION (AFSC)
KIRTLAND AIR FORCE BASE, NEW MEXICO 87117

RECEIVED

MAR 2 [illegible]

AFWAL/MLTC

27 FEB 1984

REPLY TO ATTN OF: QA

SUBJECT: Quality Assurance Management Standard Review (Your Ltr, 19 Dec 83)

TO: AFWAL/MLTC

1. The technical report, ICAM Conceptual Design for Computer-Integrated Manufacturing, Task "12" Quality Assurance/Quality Control/Technical Requirements/Tasks, have been reviewed and the following comments are provided:

a. The Government/Industry survey appeared as the most interesting part of this technical report. Many of the comments we can agree with as stated.

(1) The first section of the survey results are about what we would expect from contractors under our cognizance.

(2) The Quality Assurance questionnaire of seven questions for the present and factory-of-the-future environment are addressed separately as follows:

a. Current application of MIL-Q-9858A: We agree with all comments except the last comment "Doesn't need changing". We are of the opinion that MIL-Q-9858A could use some refinement for today - as well as for future application. Some of which have been touched upon in this report.

b. Problems of compliance with specifications/standards: We don't totally agree with the results of this question. Many times the referenced specifications/standards are used as an excuse not to accomplish good sound management practices, also they are used as excuses to increase costs, even when contractors have a system in full compliance with the specifications/standards.

c. Impediments/opportunities for the factory of the future: Most of the comments listed can be accomplished as they occur within the scope of the existing specifications/standards. Two of these statements are of interest when tied together: "Prepare for paperless documentation" and "provide for product traceability and identification of acceptance status while in process". They could be a real cost savings to the government as well as the contractor. However, somewhere documentation printouts, mitrofish, etc., must be accomplished.

d. Perceived necessary changes to specifications/standards: The additional thoughts don't appear to have any significant impact to warrant changes to present documents for an automated factory.

e. Reliability/maintainability feedback: While this is a big "Q" total MIL-Q-9858A multifunctional Quality Program specification, it doesn't mean that it is a quality functional problem. This may need further attention in the typical AFPRO engineering documents.

f. Impact of paperless factory: The so called paperless factory could be implemented using the existing Quality Program/system specifications/ standards without changes. The specialty specifications/standards that contain quality requirements will require changes as the paperless factory becomes a reality. Acceptance of electronic media for data and part status including support equipment maintenance/calibration has been utilized under control of existing specifications/standards. Tailoring of specifications/ standards has proven over the years, for the most part, a beneficial technique for various phases of a weapon system acquisition contract. Inspection stamps as we know them may disappear. However, we expect to see some type of a code system that would replace stamps.

g. Development of a new Product Quality Assurance Standard: These comments appear to be appropriate; "make no change" to the existing Quality Assurance specifications/standards. The seven indicated statements are presently in effect or under evaluation by the appropriate Air Force Office for further implementation.

(3) Quality Assurance Meeting Summaries:

a. The present: Basically our comments above address this part of the report. An approach to the field data reporting problems could be to contract with the private sector to perform an evaluation on the existing approach and provide recommendation on how to best obtain this needed data.

b. The future: We see evolution as the approach to the future factory. Again, I want to emphasize that we are not against constructive changes to the existing Quality Assurance specifications/standards. Emphasis must be placed on establishing terms/definitions for the plant-of-the-future. Assure training is conducted relating the new terms/definitions to existing Quality Assurance specifications/standards for the future factories. This would include the more advanced self-adjusting automated equipment.

(4) Conclusions (page 30):

a. Our conclusions are quite different than those 10 listed. While each of the 10 conclusions have certain impact on contractor-government cost they still have some merit. However, even they alone are not justification to generate new or modify the major existing Quality Assurance Program/Systems specification standards.

b. Our conclusions and/or recommendations are as follows:

(1) Stop and reassess your overall approach to this task.

(2) MIL-Q-9858A can be applied successfully in the automated environment for factories of the future.

(3) Recommend updating some of the specialized specification/ standards such as MIL-STD-109, Quality Assurance Terms and Definitions.

(4) Recommend updating DOD industry/government wide accepted Handbooks for Evaluation of Contractors Quality Program/Systems, such as H-50, H-51, H-52, etc. This is where the payoff could really take place. It would allow for the future plant layout diagrams, terms, options on how to accomplish a requirement.

2. Based on our review and evaluation of this technical report leading up to page 31, para 3.3, Product Assurance Program Standard, I see no reason to attempt an exhaustive review and evaluation of the proposed rewrite of MIL-Q-9858A or the draft Product Assurance Program Standard.

3. Please keep me informed of your progress on this difficult task. Let me know if I can be of further assistance on this project. Thank you for including us in your review.

DAVID L. JONES, Chief
Performance and Evaluation Division
Directorate of Quality Assurance

DEPARTMENT OF THE AIR FORCE
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPLY TO ATTN OF: MLTC (G. Hays, 57371) 29 May 1984

SUBJECT: ICAM CDCIM Task "D"

TO: AFWAL/MLTC (Capt R. Preston)

Overall this document is very good. I do have two comments that are "nits".

1. Inputs from Manufacturing and Design Engineering need to be considered.

2. Contractor should be required to use "Quality Cost Data" as a management element of the production program - not just the quality program.

Gilbert A. Hays

GILBERT A. HAYS
Manufacturing Engineer
HQ AFCMD/PDP Collocated
Computer Integrated Mfg Branch

APPENDIX D

AN APPROACH TO REQUIREMENTS DEFINTION ENHANCEMENTS

The following Appendix outlines an approach that might be used to enhance the definition of requirements for a Quality Assurance Program Management Standard. The recommended approach is to create a "To-Be" model of Quality Assurance in the automated environment of the future and use this model to verify that the "future" Quality Assurance Program Management Standard effectively addressed the perceived requirements of the "future" automated factory.

It is a truism that in the future factory how things will be done will be different, to various degrees, from how they are being done today. In IDEFo function modeling, the how can be considered analogous to a mechanism. Furthermore, standards and specifications are imposed (again to various degrees) on an activity in order to establish a measure of conformity, thereby avoiding chaos and confusion in the execution of that activity. In IDEFo modeling standards and specification can be analogous to the controls which limit or constrain the activity. If one assumes that the inputs and outputs of a factory of the future will remain relatively constant vis-a-vis today's factory (in the broad sense - raw materials will still be inputs, finished goods will still be outputs, for example) then an examination of tomorrow's anticipated mechanisms can be used as a guide to defining tomorrow's anticipated controls. Another way of expressing the same thought is as follows:

"Today's" standards and specifications (MIL-Q-9858A, e.g.) were "driven by" the need to control "today's" methods, equipment, paperwork, etc. (mechanisms). The requirements for "tomorrow's" standards and specifications (new Quality Assurance Program Management Standard, e.g.) will be driven by the need to control "tomorrow's" automated methods, automated equipment, computerized data systems, etc. Pictorially, that is illustrated in Figure D-1.

Figure D-2 shows that with the development of a "To-Be" model for QA/QC the requirements for a proposed new Quality Assurance Program Management Standard could be examined against the backdrop of the probable future tools (mechanisms) of the automated factory and the results of this examination could be used to modify the Quality Assurance Program Management Standard where appropriate.

It is recommended that an IDEFo "To-Be" model of Quality Assurance be developed and used to further enhance the Quality Assurance Program Management Standard presented in this document.

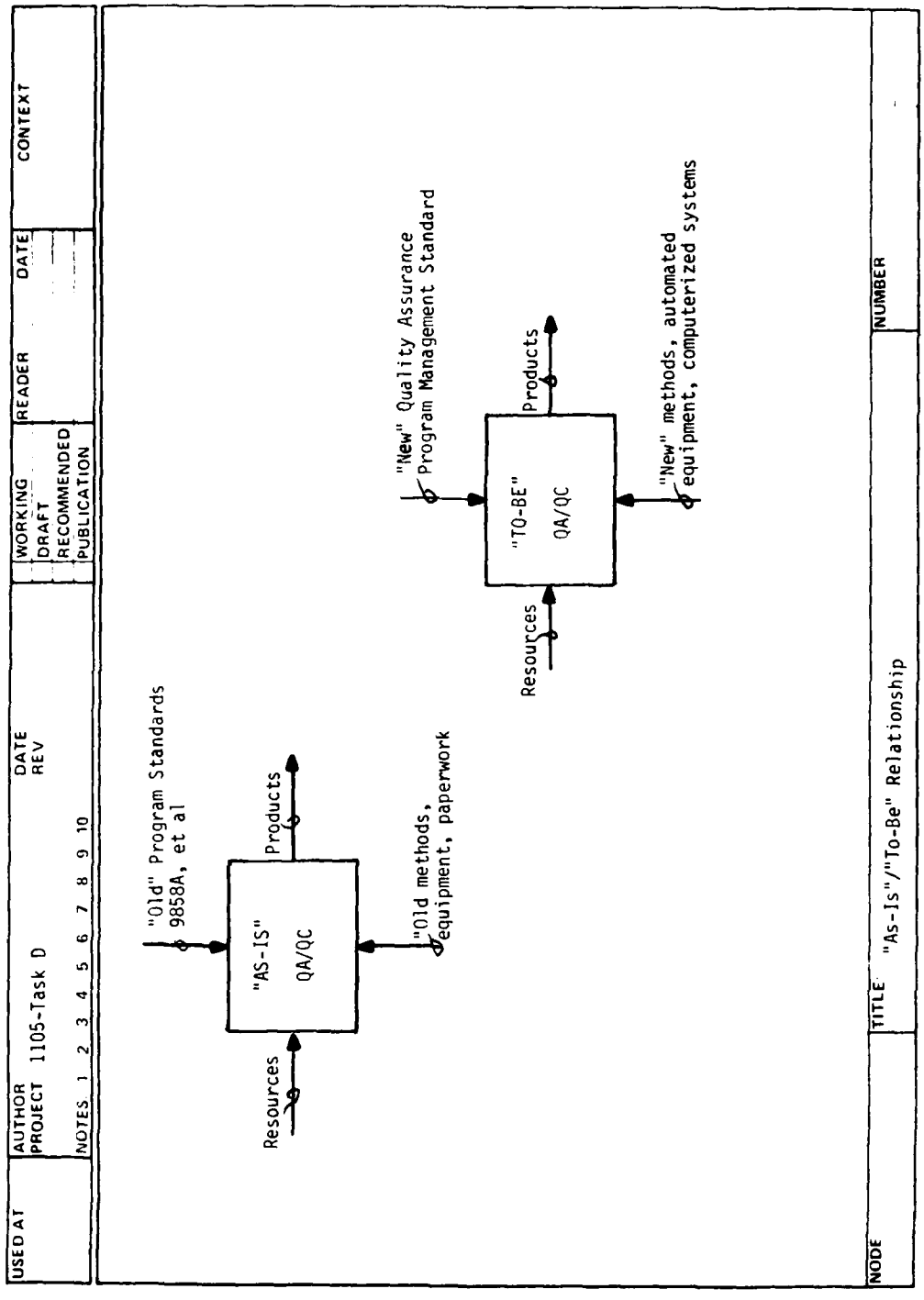

USED AT
AUTHOR
PROJECT 1105-Task D
DATE
REV
NOTES 1 2 3 4 5 6 7 8 9 10
WORKING DRAFT
RECOMMENDED PUBLICATION
READER
DATE
CONTEXT
"Old" Program Standards 9858A, et al
"AS-IS" QA/QC
Resources
Products
"Old methods, equipment, paperwork
"New" Quality Assurance Program Management Standard
"TO-BE" QA/QC
Resources
Products
"New" methods, automated equipment, computerized systems
NODE
TITLE "As-Is"/"To-Be" Relationship
NUMBER

Figure D-1

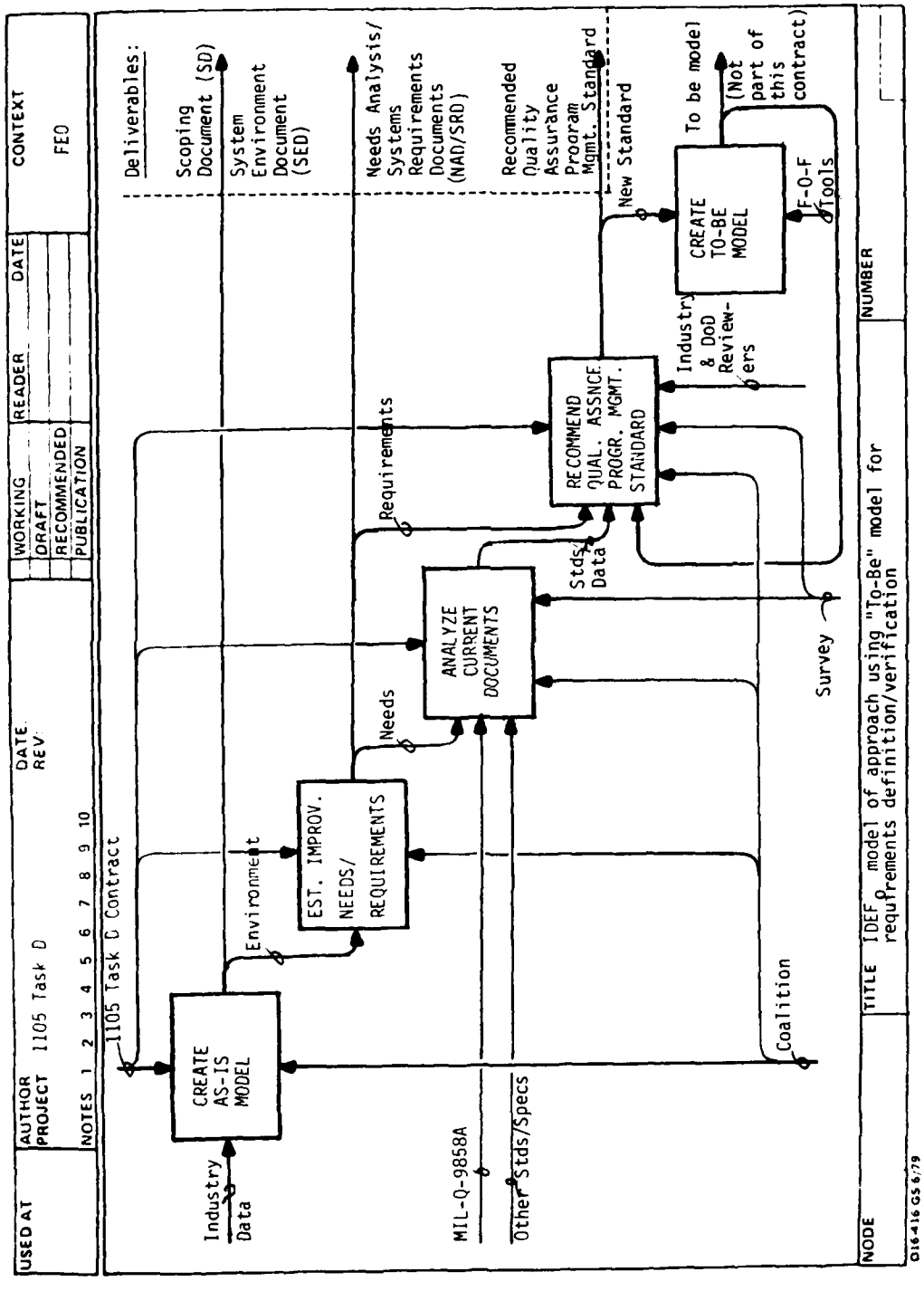
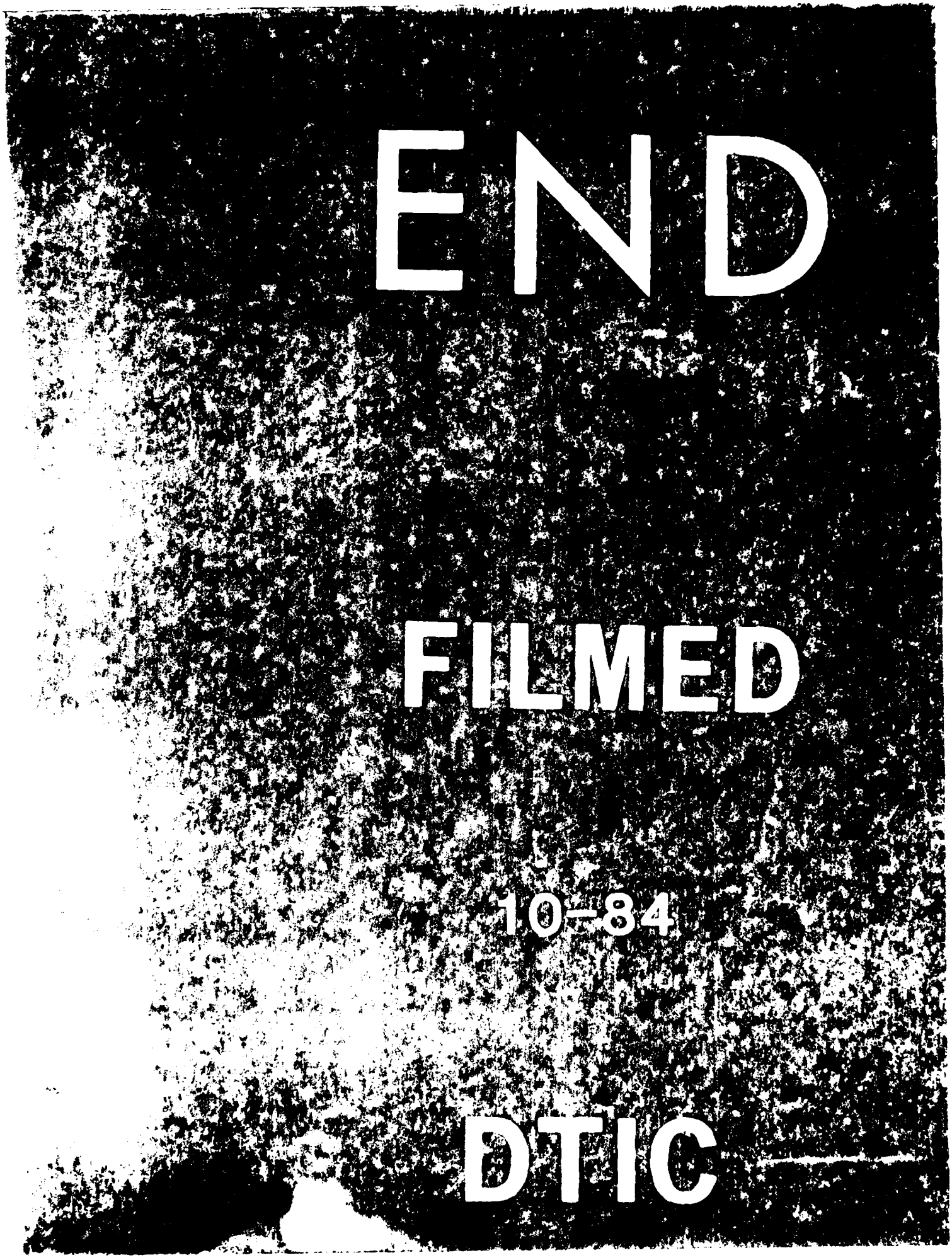


Figure D-2

*U.S.Government Printing Office: 1984 -- 759-062/968


END
FILMED
10-84
DTIC