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VIENNA VA 19 MAR 80 SBI-AD-E001 029 N00173-80-C-0014

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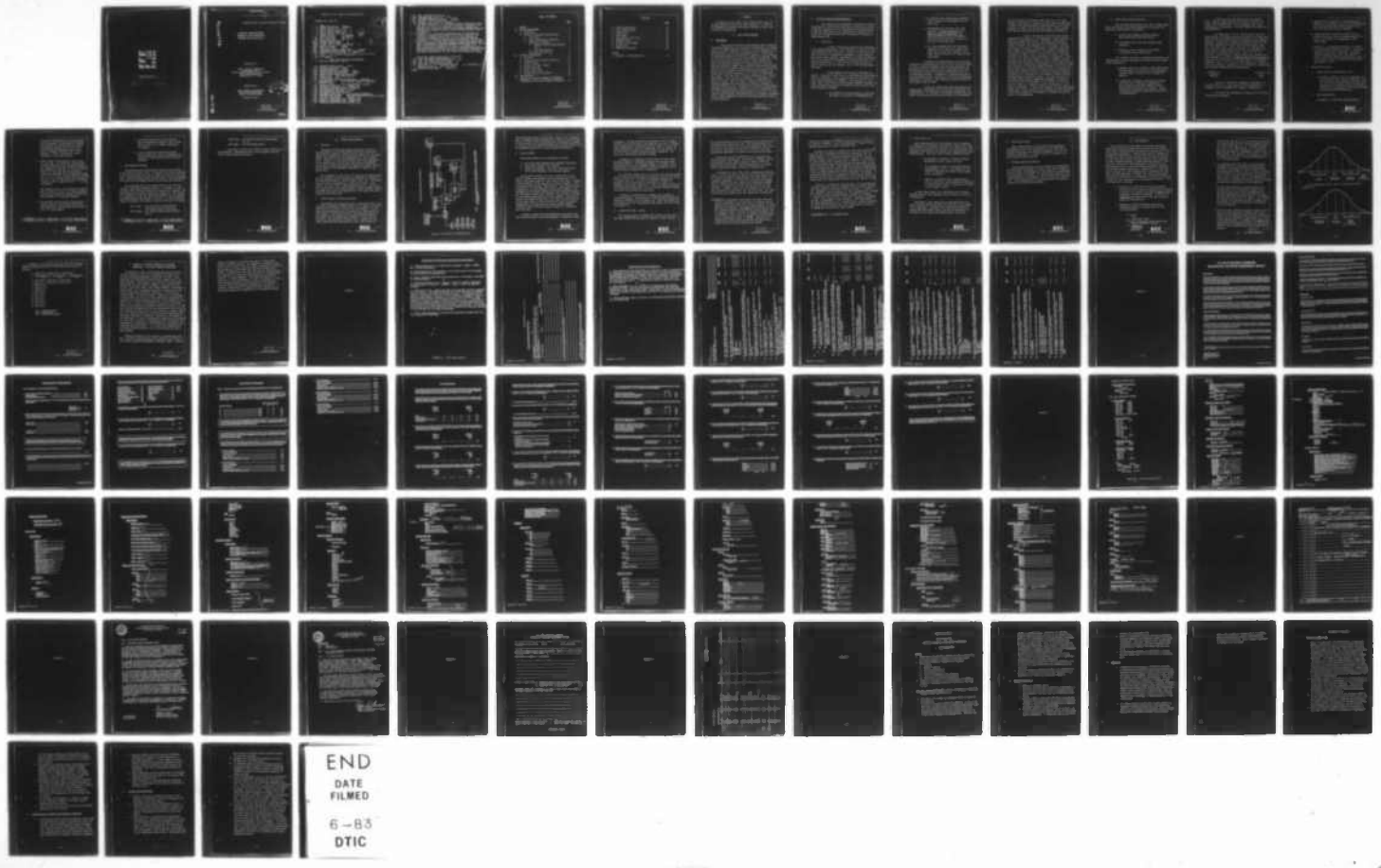

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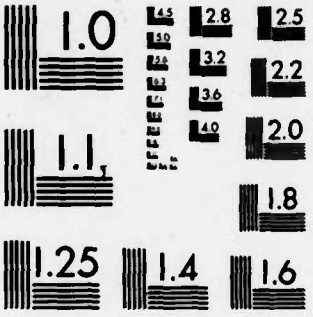

QUARTERLY PROGRESS REPORT
TECHNOLOGY DATA ACQUISITION
CONTRACT N00173-80-C-0014

Submitted to:

Head, Critical Technology
Assessment Office
Naval Research Laboratory (Code 1404)
4555 Overlook Avenue
Washington, D.C. 20375

Submitted by:

DATA SOLUTIONS CORPORATION
2095 Chain Bridge Road
Vienna, Virginia 22180

March 19, 1980

DSC
DATA SOLUTIONS CORPORATION

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Management Data (1473) Data

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--    1   OF    1
--    1 - AGENCY ACCESSION NO:    DN080080
--   12 - SUMMARY RECEIPT DATE:   30 NOV  82
--    2 - DATE OF SUMMARY:        01 OCT  82
--    3 - DATE OF PREV. SUMMARY:  15 FEB  82
--    4 - KIND OF SUMMARY:        COMPLETED
--    5 - SUMMARY SECURITY IS:    UNCLASSIFIED
--    6 - SECURITY OF WORK:       UNCLASSIFIED
--  8A1 - DIST. LIMITATION:       UNLIMITED
--   8B - CONTRACTOR ACCESS:      YES
--10A1 - PRIMARY PROGRAM ELEMENT:      0
--10A2 - PRIMARY PROJECT NUMBER:       0
--10A2A - PRIMARY PROJECT AGENCY AND PROGRAM:      0
--10A3 - PRIMARY TASK AREA:        NAVMAT
--10A4 - WORK UNIT NUMBER:         0334-01
--10C1 - CONTRIBUTING PROGRAM ELEMENT (2ND):       95 MISSI
--10C2 - CONTRIBUTING PROJECT NUMBER (2ND): DN/FUNCTION
--10C3 - CONTRIBUTING TASK AREA (2ND):       SUPPT
--   11 - TITLE:      (U)  CRITICAL TECHNOLOGIES  (Work unit title)
--  11A - TITLE SECURITY: U
--   12 - S + T AREAS:
--                  000400 ADMINISTRATION AND MANAGEMENT
--   13 - WORK UNIT START DATE:   OCT 79

--   14 - ESTIMATED COMPLETION DATE:   SEP 82
--  15A - PRIMARY FUNDING AGENCY:  NAVY
--   16 - PERFORMANCE METHOD:     CONTRACT
--17A1 - CONTRACT/GRANT EFFECTIVE DATE:    NOV 81
--17A2 - CONTRACT/GRANT EXPIRATION DATE:   NOV 82
--  17B - CONTRACT/GRANT NUMBER: N00173-80-C-0014
--  17C - CONTRACT TYPE:   COST-PLUS-FIXED-FEE
--  17E - KIND OF AWARD:   CON
--  17F - CONTRACT/GRANT CUMULATIVE DOLLAR TOTAL:     $ 97,000
--  19A - DOD ORGANIZATION:       NAVAL RESEARCH LABORATORY MANAGEMENT
--        INFORMATION DIV
--  19B - DOD ORG. ADDRESS:       CODE 1404 WASHINGTON, DC 20375
--  19C - RESPONSIBLE INDIVIDUAL:      WINSLOW, L M
--  19D - RESPONSIBLE INDIVIDUAL PHONE:  202-767-2887
--  19U - DOD ORGANIZATION LOCATION CODE:  1100
--  19S - DOD ORGANIZATION SORT CODE:  33632
--  19T - DOD ORGANIZATION CODE: 251950
--  20A - PERFORMING ORGANIZATION:     DATA SOLUTIONS CORPORATION
--  20B - PERFORMING ORG. ADDRESS:     2095 CHAIN BRIDGE ROAD VIENNA, VA 22180
--  20C - PRINCIPAL INVESTIGATOR:      PROCTOR, J  DR
--  20D - PRINCIPAL INVESTIGATOR PHONE:  703-893-1360
--  20F - ASSOCIATE INVESTIGATOR (1ST):  GOULD, R  DR
--  20U - PERFORMING ORGANIZATION LOCATION CODE: 5110
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-- 20N - PERF. ORGANIZATION TYPE CODE:  4
-- 20S - PERFORMING ORG. SORT CODE:   13748
-- 20T - PERFORMING ORGANIZATION CODE:      390728
-- 21E - MILITARY/CIVILIAN APPLICATIONS:    MILITARY
--  22 - KEYWORDS:  (U)  TECHNOLOGY TRANSFER      ;
--  23 - TECHNICAL OBJECTIVE:   (U)  TO PROVIDE TECHNICAL ASSISTANCE TO NRL
--     CODE 1404 IN ESTABLISHING A DATA BASE ON CRITICAL TECHNOLOGIES. DATA
--     SOLUTIONS CORP. (DSC) WILL CONCENTRATE ON METHODS TO IMPROVE THE
--     CREDIBILITY OF THE DATA AND INDENTITY QUESTIONNAIR PREVIOUSLY DEVELOPED
--     AT NAVMAT BY LES WINSLOW. DSC WILL AID IN THE ADMINISTRATION OF THE
--     QUESTIONNAIRE.
--  24 - APPROACH:  (U)  THE SUBJECT QUESTIONNAIRE WILL BE EVALUATED FOR
--     RELIABILITY OF RESPONSE AND CREDIBILITY OF RESULTS SINCE DSC IS AN
--     INDUSTRIAL PSYCHOLOGY ORIENTED FIRM. DSC WILL ALSO CORRELATE THE
--     QUESTIONNAIRE RESPONSES TO THE NRL CRITICAL TECHNOLOGY COMMITTEE.
--  25 - PROGRESS:  (U)  THE QUESTIONNAIRE HAS BEEN DISTRIBUTED. THE RESPONSE
--     RATES OF MORE THAN 75% HAVE BEEN ATTAINED AT NAVELEX AND NAVSEA. THE
--     INITAL DATA ANALYSIS OF THE QUESTIONNAIRE RESPONSES INDICATE THE PROCESS
--     WORKS. FURTHER WORK ON ANOMALOUS RESPONSES IS IN PROGRESS. THE
--     QUESTIONAIRE HAS BEEN ADMINISTERED TO NAVAIR, ONR NAMVAT AND THE NRL
--     CRITICAL TECHNOLOGY COMMITTEES. THE INITIAL VALIDATION STUDIES HAVE BEEN
--     COMPLETED AND INDICATE THE DATA BASE HAS A HIGH DEGREE OF VALIDITY. A
--     NEW CONTRACT WITH MAXIMUS, INC WILL CONTINUE FOR VALIDATION OF PRIOR

--
--     DATA ENTRIES UNDER THE DIRECTION OF DR. PROCTOR.
--  31 - RESP. ORG. INSTALLATION DIGRAPHS:  1404
-- 32A - RESP. INDIVIDUAL ORGANIZATION SYMBOL:    1404
-- 31A - RESP. ORG. INSTALLATION 1ST DIGRAPH:   14
-- 31B - RESP. ORG. INSTALLATION 2ND DIGRAPH:   04
--  37 - DESCRIPTORS:     (U)  TECHNOLOGY TRANSFER      ;(U)  RELIABILITY ;(U)
--     INDUSTRIAL PSYCHOLOGY   ;(U)  DATA BASES  ;
--  39 - PROCESSING DATE (RANGE):     25 AUG  82
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TABLE OF CONTENTS

EXHIBITS

I. GENERAL

As detailed in the report which follows, Task 1 and 2 of Contract #N00173-80-C-0014 have been completed. In addition, the appropriate activities and reports pursuant to Task 3 and 4 have been accomplished.

II. TASK ACCOMPLISHMENTS

A. Background

The Critical Technology questionnaires were originally designed by NAVMAT with the intention of distribution and completion by the System Commands in the Navy for the examination and identification of critical and possibly critical technologies. The questionnaires were distributed by NAVMAT in July and August of 1979 among thirty pilot test participants from NAVELEX. Great effort was entailed in order to obtain a 100% response rate. This was eventually achieved and the questionnaire data was machine processed by NARDAC and a computer base was established. The pilot data was computer analyzed by the use of a model developed by Mr. Les Winslow, Critical Technology Assessment (CTA) Office, Naval Research Laboratory, as a means of establishing the "need", "can" and "how" to control assessments for critical technologies. Key output was, therefore, the assignment of a score for "need", "can" and "how" to control technical data, keystone equipment and end products according to responses on the pilot questionnaires. According to contractual requirements, essentially the same mode of analysis was to be implemented for the data resulting from the actual survey and, as such, the substance of the questions, and quantification of response categories were to remain essentially intact during questionnaire revision by Data Solutions.

B. Critical Technology Questionnaires

Data Solutions was contracted to assess and increase the potential validity and reliability of the pilot test questionnaires (Exhibits A) and to incorporate other improvements in both the questionnaire and administration technique to increase the response rate and facilitate machine processing of questionnaire data.

1. Pilot Test

In order to assess the validity and reliability of the questionnaire data, it was essential to review the pilot test conducted by the CTA Office. Whereas the CTA Office took care to brief pilot respondents subsequent to administration, and solicit their feedback, systematically obtained information was lacking concerning respondents reactions/criticisms of the survey instruments (e.g., item utility, instruction clarity, ease of response time to complete, etc.) or the administration technique.

In mid-December, Data Solutions undertook the task of re-tracing the pilot test, its methodology, participants, and data processing. This involved visits and interviews with pilot test participants at NAVELEX. A meeting with Mr. Tony Slaga, Head, International Program Office, NAVELEX, (December 11, 1979) uncovered the following information about the pilot test administration at NAVELEX:

- The selection for participation in the pilot was based on criterion of knowledgeability.

- An average of five people made recommendations of people at the systems level of technology.

- Knowledgeability criterion led to the selection of project engineers with a number of years of experience which equipped individuals with knowledge of past and present policies in regard to a particular technology area.

- Mr. Slaga suggested that the individual responsible for farming out case-by-case inquiries (in the case of NAVELEX - Mrs. Haden) would be most able to identify such individuals.

Following the NAVELEX meeting, Data Solutions consultants held meetings with four(4) pilot test participants. In order to optimize feedback about the questionnaires, the questionnaires were revised so that interviewees were asked for reactions to both the original questionnaires and the revised questionnaires. Furthermore, revised questionnaires were distributed during a briefing of the Critical Technology Assessment on January 4, 1980 including interested officials from NAVMAT, NRL, and ONR.

Pilot test interviewees reported problems with questionnaire terminology such as "critical technology" and "subdivisions". In addition, interviewees reported that they simply did not know for certain the answer to some questions

such as the extent of military lead of the U.S. over other nations or visa versa in relation to their specific technology. In these cases the participants often reported a "don't know" response, or simply left the question blank. Other problems were reported with instructions and background information.

A final, and crucial, aspect of pilot testing concerned the validation of the mathematical model employed to analyze the questionnaire data. The model, as presented in "Computer Analysis for Interim Policy Formulation of Export Control Policies", was designed by Mr. Les Winslow, the COTR. It provides, in general, a hierarchical weighting formulation which results in an assessment of the necessity, feasibility, and method of export control for each Navy system, subsystem, and device for which a data questionnaire is completed. After the pilot test had been completed (N=30) at NAVELEX, the COTR requested that three Navy technical experts with broad areas of cognizance and unquestioned knowledgeability individually assess the criticality of each Navy system included in the pilot test. This provided Data Solutions consultants with an opportunity to assess the convergent validity of the data analysis technique, by computing the correlation of the experts responses with the correspondent data analysis results. The mean correlation of the three expert judges' independent assessment of technical criticality with the assessment of the computer analysis was $r_{xy}=.52$, which is a significant positive correlation at $p<.01$ level of confidence. In sum, these findings conveyed significant support both to the validity of the mathematical model employed in the data analysis and the adequacy of computer analysis by which it was implemented.

2. Major Questionnaire Revisions

The following modifications were made to reduce ambiguity and thereby to encourage completion and increase the reliability and validity of responses:

- question and response category wordings were clarified and made more direct.
- instructions were clarified and added where necessary.
- definitions were included for significant or ambiguous survey terminology.

Two revisions were made to prepare questionnaire data immediately for machine processing and thereby greatly reduce manual preparation:

- response codes were included on the questionnaire and respondents instructed to circle appropriate response codes to indicate their response per question.
- columns were included on the questionnaires by each question to indicate to keypunchers in which column to punch each response and the associated column number per response, thereby incorporating keypunch instructions directly on the questionnaire.

At the same time this reduces edit and keypunch error. However, questionnaires will still be checked to be certain that response codes, not the response, are circled before going to keypunching. This will reduce both effort and time expenditure.

For questions 11, 20, 22, and 26 on the pilot Data Questionnaire, the response scales were modified to render them more sensitive while maintaining the integrity of the computer analysis. Specifically, a number of questions requiring highly subjective judgments had three point response scales: "yes", "no", and "don't know". Such a scale has low sensitivity because, short of being absolutely certain, the respondent will be inclined to respond "don't know". Thus, for four (4) questions in this category, response scales were modified such that respondents are asked to indicate their level of certainty concerning the item stem on a five point scale. For example, instead of "yes", "no", or "don't know" response to a question whose stem requires a judgment of U.S. technological superiority, the following response scale was substituted:

confident U.S. does not					confident U.S. does
1	2	3	4	5	

In sum, by requiring a judgment of confidence, responses at the 2 or 4 level provide for the equivalent of a "probably no" and "probably yes" response, respectively.

To clarify the questionnaire instruction, the following revisions were made:

- Instructions for specific or following specific questions or, following a part of the questionnaire, were included where they occurred rather than on the front page as originally designed.

- Instructions were outlined in blocks so as to stand out from the rest of the questionnaire and make it less likely for respondents to skip instructions.

- Formating: the questionnaires were color coded and instructions referred to colors to facilitate instructions and ease of response. The System Identity Questionnaire, Part I was printed in yellow, the System Identity Questionnaire, Part II was printed in green, and the Data Questionnaire was printed in blue.

3. Additional Revisions

a. Systems Identity Questionnaire, Part I

- We made an addition to Q1 for respondents to indicate which level they are responding. This will facilitate data processing and keep clear the level of the response both to individuals completing the questionnaires and those involved in processing questionnaire data.

b. Data Questionnaire

- Question 1: "Does this technology make a

significant contribution to the performance of a Navy system, its subsystem or devices?" This question was omitted from the revised questionnaire because all but one of the pilot respondents responded "yes" to this question. Since it carried very little variability, it has low utility.

- Column widths for Q14 and Q15* were originally two each. We changed the column widths for both questions to one, thereby eliminating the necessity of punching "Y" for one category and "N" for the other for both questions. Instead the responses will be keypunched either as a "A" or a "B" per question with the consideration of a "C" category, which would represent: "equally military...and commercial...", if this is possible.

  The intention here is to encourage the respondent to select "A" or "B" as a single response. Originally the design of response category was more conducive to a multiple response.

- Q19 and Q20** will be used as logic checks to indicate whether questionnaires should have been completed at the subsystem and/or device level of a given system.

* Questions 15 and 16, respectively, on the pilot questionnaire.
** Questions 20 and 21, respectively, on the pilot questionnaire.

- Clarified instructions for Q22 and Q23* where respondents are asked to rate 5 items with the sum = 10, to ensure consistency of response.

- A "yes" response for both Q19 and Q20** would indicate that there are embedded technologies for which questionnaires should be completed.

4. Questionnaire Printing

Questionnaires were finalized and ready for type setting by the first of January, 1980. On January 2, the final revision of the questionnaires was sent to Gumpert Printing for type setting. The questionnaires went back and forth a few times between Data Solutions and Gumpert before Data Solutions was satisfied.

Questionnaires were to be printed from the blue lines at the Navy, developed by Gumpert Printing. On January 11, questionnaire blue lines were presented to the Navy for copying. The Navy Research Lab could not handle the request for 5,000 copies, so a contractor at the Navy Yard was enlisted to do the copying. The questionnaires were copied onto 8½ by 11, on front and back sides of the paper, and stapled 3 times on the side, as follows:

white paper - for front page of questionnaire, instructions and the last page.
yellow paper - for Systems Identity Questionnaire, Part I.

* Questions 23 and 24, respectively, on pilot questionnaire.
** Questions 20 and 21, respectively, on pilot questionnaire.

green paper - for Systems Identity Questionnaire, Part II.

blue paper - for Data Questionnaire.

By January 18, all 5,000 copies of survey booklet had been produced. The questionnaires were delivered to the CTA Office, Naval REsearch Laboratory.

III. SURVEY ADMINISTRATION

A. Overview

The Critical Technology Transfer Assessment Survey has been designed to collect information about the criticality of technology or hardware for three levels of detail for any given system: the system level, the subsystem level and the device level. However, it is entirely possible that some respondents at the system level will not feel that there are subsystems within their system which should be examined for export control and the same for the subsystem respondents in regard to the device level.

The respondent at each level will identify the subdivisions for his equipment and the associated individuals to respond to the same questionnaire at the next lower level, etc. This means that the survey is essentially a three cycle survey. (See Figure 1 for flow chart of survey administration). This cycle will take place at each system command: NAVSEA, NAVELEX, NAVAIR, and NAVMAT with each cycle beginning with the system level and ending at the device level.

B. Identification of Survey Population

The systems level population will be identified from a list of systems developed by NAVMAT (Exhibit C) in addition to those identified by the point of contact for each command. In most cases the questionnaires will be routed to the head office for each system, at which point the most knowledgeable person for each system will be designated to complete a survey booklet. Originally, Data Solutions intention was to identify an individual associated with each system so that tight control of

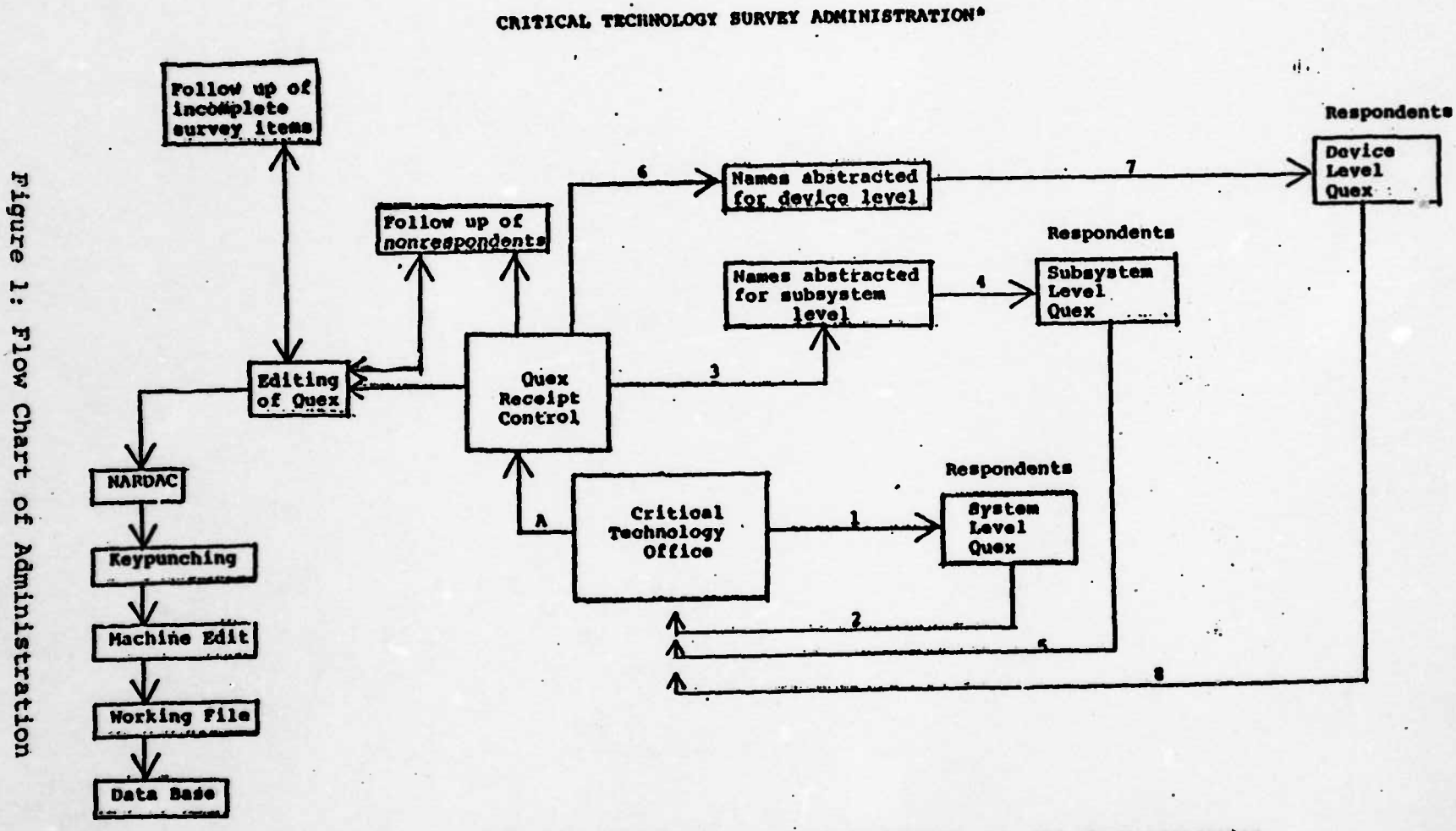

Figure 1: Flow Chart of Administration

*Where: 1 through 8 shows sequence of SURVEY MAILOUT and, "A" shows processing for all questionnaires so that "A" follows "2"; "A" follows "5" and, "A" follows "8".

field operations could be maintained. However, Mrs. Katherine Weick at NAVSEA strongly suggested that routing to head offices for each system is the most appropriate and expedient procedure to follow, since the individual completing a survey booklet will be designated directly by a closely associated superior.

C. Survey Packets

Each survey packet will be compiled as follows:

1. one route sheet completed and addressed (Exhibit D).
2. route sheet stapled to an envelope.
3. inside the envelope - one letter (see below) from the systems commander, and one questionnaire.

The original intention was that a survey letter from Admiral Whittle would accompany the questionnaires so as to greatly facilitate response. This did not take place. Instead, a letter (Exhibit E) was created and signed by Edward J. Otth, Chief Deputy Navy Material (Acquisition). This letter was sent on February 1, to the commander of each system command. The commander at each system command would then designate appropriate individuals within their command to be the point of contact for the survey administration at their command. Each point of contact will decide whether they will refer to the Otth letter on the route sheets, or send a letter from their own office. NAVSEA chose to include the Otth letter, whereas NAVELEX included a letter from their office (Exhibit F), drafted by Data Solutions.

In order to handle the field operations in Crystal City, Data Solutions hired a part-time employee to administer survey

procedures. The Data Solutions Field Operator went to NAVSEA following the initial meeting and completed our list of systems level respondents by consulting with Mrs. Weick to ensure that proper organization codes were associated with the systems on our list, and to resolve ambiguities about cognizance. Our final list included 365 systems at NAVSEA.

In addition to completing a route sheet for each system, the phone number for respondent questions was written inside each questionnaire. The telephone number is included on each questionnaire to handle respondent questions promptly, and to create uniform interpretation of questions.

The telephone numbers were not printed on the questionnaires, since it had not been determined at printing time who the points of contact would be. A record of respondent problems and questions will be maintained by each point of contact on a telephone record sheet (Exhibit G). This will ensure uniformity of resolutions and decisions, and also provide valuable information about any problems with the survey.

In addition, questionnaire ID numbers were written on each questionnaire. Questionnaire ID numbers were developed by sequencial numbering of the systems list. This same number was transcribed on to the corresponding route sheet, and the receipt log (Exhibit H).

D. Survey Cycle One: Status

The questionnaires for NAVSEA will be sent via the inter-Navy mail system from the point of contact's (POC's) Office. A

route sheet (Exhibit D) will be completed for each system with the appropriate organization code. The questionnaires will arrive at the top level for each such organization code and at such office, the questionnaires will be routed to the most appropriate individual to respond for each particular system.

Originally the POC for NAVSEA was Mrs. Katherine Weik, Foreign Liaison Program Head. By decision of NAVMAT, the POC was changed to be Mr. Stanley Marcus, Director, Office of Research and Technology[1/]. Actual administration of systems level questionnaires began the week of February 25th.

At NAVELEX, Mr. Tony Slaga, Head, International Programs Office is to be the point of contact, and George Driscoll will be the name included on questionnaires and route sheets for respondent questions. Mr. Slaga did not develop the systems list for NAVELEX from the original list developed by NAVMAT. Instead, he created his own list and gave the list to Data Solutions. However, only five of the systems on that list were included on our original list, and visa versa. Mr. Slaga checked over the original list and identified 30 additional

1/ Whereas the contractual requirements for Task 2 were completed on schedule in the sense that an effective survey administration was devised and logistical support for implementation was provided, the actual administration at two of four Systems Commands was delayed due to Navy difficulties in assigning a point of contact at NAVSEA and NAVAIR, and in providing a cover letter to accompany the questionnaire from an appropriate officer in NAVMAT. Details of the chronology of events that precipitated the delay are on record and will be made available upon request.

systems for cognizance at NAVELEX. This results in a total of 80 systems at NAVELEX. Actual administration of systems level questionnaire began the week of February 18th.

The point of contact at NAVAIR will be Mr. William Norris[2/]. There has been considerable difficulty in devising a list of NAVAIR systems. At a meeting attended by Mr. Norris, Mr. E.M. Tupman, Director, Security Division, Mr. Winslow, Mr. Donleavy, Dr. Gould (DSC) and Ms. Losonczy (DSC) on March 5, 1980, it was agreed that NAVAIR would be provided with an operational definition of systems and that a memo would be sent out to appropriate offices in NAVAIR which would include this definition and request a list of NAVAIR systems under Office cognizance be returned. An operational definition was supplied the same day, and further progress towards actual implementation of the administration procedure awaits the compilation of this list in Mr. Norris' office.

Finally, in consultation with the COTR, it was decided that cognizant technical experts at NAVMAT could also make a substantial contribution to the data collection process. A briefing was, therefore, held on February 26, 1980, attended by Mr. Winslow, Mr. Dunleavy, three targeted experts at NAVMAT (G. Schubert, J. Crane, and R. Young) and R. Gould and K. Losonczy, representing DSC. By agreement at this briefing, a DSC representative delivered questionnaires to G. Schubert and R. Young on February 28, 1980, and our further aid in the administration logistics at NAVMAT will be given upon their request.

2/ See Footnote 1, on preceding page.

E. Survey Cycle Two

After questionnaires from the systems level respondents are completed and returned to the points of contact, Mrs. Gwen Morsch of Data Solutions will abstract the name of persons and subsystems identified by the systems level respondents on their questionnaires. This will involve three consistency checks:

1. the response to question 8, Systems Identity questionnaire, Part I should be "yes".

2. for subsystems listed in the Systems Identity Questionnaire, Part II, a corresponding "yes" should be indicated for export control examination on question 1.

3. question 2, Systems Identity Questionnaire, Part II, should list those subsystems identified in question where "yes" is indicated for examination of export control.

In cases where there is an inconsistency in the above response pattern, the respondent will be contact to clear up the ambiguity.

Individuals' names abstracted as described above, will receive survey packets identical to those sent to the systems level respondents. Subsystem level questionnaires will go through the same receipt control and editing procedures as followed for the system level questionnaire, cycle one.

F. Survey Cycle Three

After questionnaires are received from the subsystem respondents, device level respondents will be identified in the same way as were the subsystem respondents, but from the subsystem respondents. A receipt log will be created, etc., as for cycle one and cycle two.

G. Receipt Control and Editing

As the questionnaires from the systems level respondents are received at the points of contact, they will be logged in by Mrs. Morsch, Field Operations, and checked for completeness and consistency of response. If there are any questions with a questionnaire, the respondent will be contact for clarification. Non-respondents will be followed up and encouraged to complete and return their responses.

IV. DATA ANALYSIS

Data Solutions was also tasked "to evaluate input data quality and validation procedures to assure that the mathematical model and computational procedures are appropriate to the problem being addressed". Whereas steps taken to validate the mathematical model for data analysis and to insure the quality of input data upon receipt have been detailed, Data Solutions has also proposed additional computational procedures to facilitate the correlation of the questionnaire findings with the deliberations of the Critical Technology Assessment Committees of the Naval Research Laboratory. Specifically, at a meeting held on January 28, 1980, attended by DSC representatives, the COTR, and representatives of NARDAC, DSC consultants proposed computational procedures to be employed to establish criticality criteria for the categorization of questionnaire measures. The following points were made:

- Selection of criteria for criticality measures from the DQ must be made by examining the variability of scores for any particular measure <u>across</u> systems, subsystems, and devices assessed. It is only by <u>comparison</u> with other scores that any particular rating can be meaningful.

- Measures of interest should be converted to standardized scores (z scores) by use of the following formula:

$$z = \frac{x - M}{s}$$

x = "normalized" score

M = mean "normalized" score across level (system, subsystem, device)

S = variance = $\sqrt{\frac{\Sigma (x_i - M)^2}{N}}$

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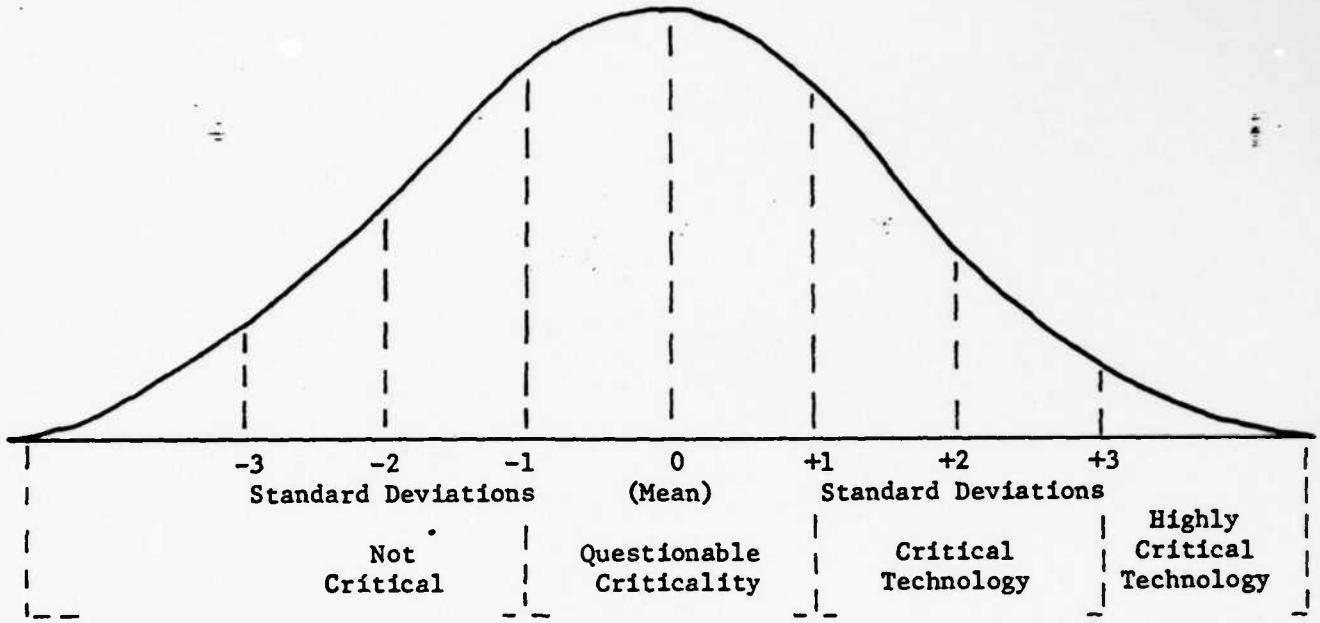
In this form, the mean (m) of the standarized scores will always equal zero (o), and the standard deviation will always equal one (1). Further, changing the scores in any distribution to "z" scores does not alter the shape (or mathematical form) for the distribution. The frequency of any given "z" score is exactly that of the "x" score corresponding to it in the distribution.

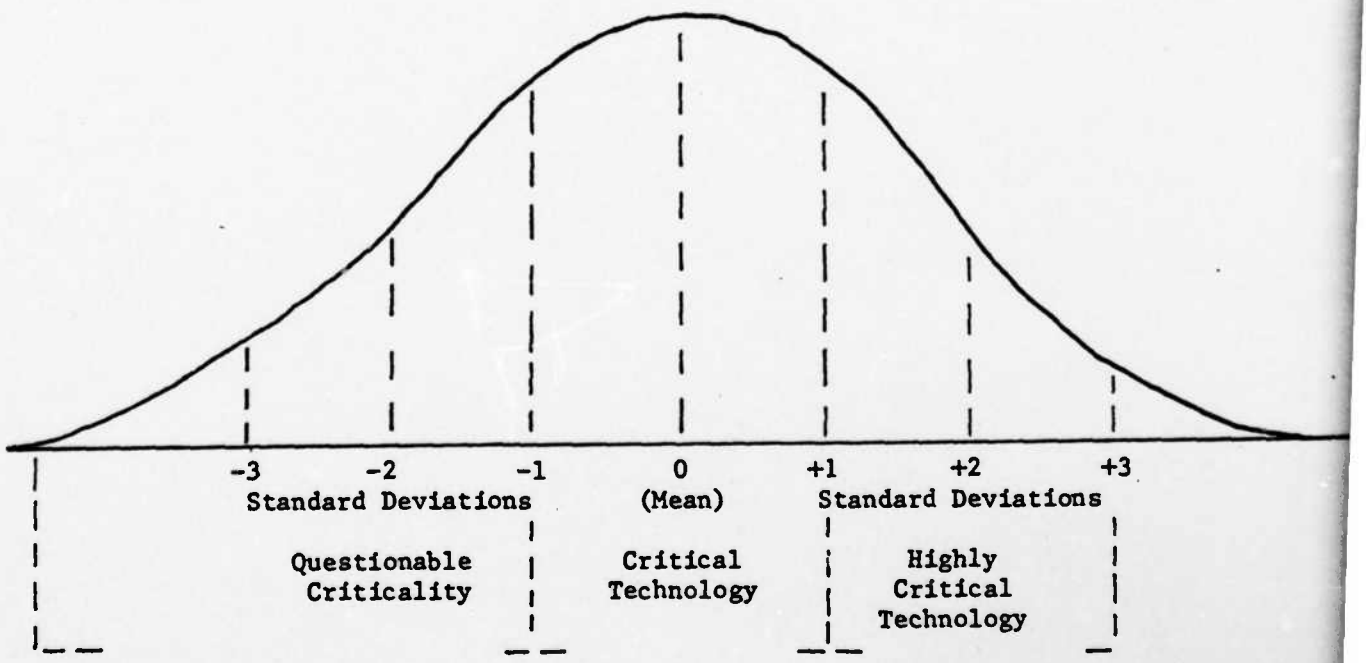
- Our suggestion that each level of the DQ (system, subsystem, device) be standardized independently is based on the assumption that the form of these distributions will vary, or that at least the latter two will differ from the system level distribution. This is due to the fact that at the subsystem and device levels, equipment has a priori been identified as potentially containing critical technology.

  To check this assumption, we would suggest that the distribution of "normalized" scores also be plotted for each level, and the hypothesis that the mean subsystem and device score will be higher than the mean system score be checked. (An analysis of variance for unequal Ns as given in Winer, 1971 may be used to check for statistical significance if this is desired).

- The final step, selecting criterion values of criticality for each measure of interest, may then be based on the standard deviation, and the criticality category may be assigned as appropriate to the level of the questionnaire. For example, the system level distribution of standardized scores for the measure "Need to Control-Technical Data" may be depicted as follows:



At the subsystem or device level, the categories may be altered; e.g.:



In addition, in conjunction with the COTR, DSC presented NARDAC representatives with the following priority list for analysis:

1. Need (T.D.) x Need (E.P.) x Need (K.E.)
2. (Need+Can+How) x (Need+Can+How) x (Need+Can+How)
   T.D. E.P. K.E.
3. Can (T.D.) x Can (E.P.) x Can (K.E.)
4. How (T.D.) x How (E.P.) x How (K.E.)
5. Need (T.D.)
6. Need (E.P.)
7. Need (K.E.)
8. Can (T.D)
9. Can (E.P.)
10. Can (K.E.)
11. How (T.D.)
12. How (E.P.)
13. How (K.E.)

T.D. = Technical Data
E.P. = End Product
K.E. = Keystone Equipment

V. METHODS OF CRITICAL TECHNOLOGY ASSESSMENT COMMITTEES OF THE NAVAL RESEARCH LABORATORY

On January 21, 1980, an orientation meeting was held at the MIC Building at NRL for key individuals involved in the Critical Technology Assessment process for the Navy. Data Solutions was represented by John Proctor, Robert Gould, and Kathy Losonczy. Key personnel from the Navy included Captain Fred Hueber and Jack Dunleavy (NAVMAT), Captian Richard Coe (OP-62), Les Winslow (NRL), Carla Askins (NARDAC), and approximately thirty (30) individuals selected to participate in the Critical Technology Assessment Committees. At this meeting Captain Hueber, the keynote speaker, summarized the chronology of events that have led to the Navy approach to systematically respond to the Export Administration Act (1979) mandate to provide a list of critical technologies and critical technology experts to be listed in the Federal Register by January 10, 1980, and outlined the method by which the contribution of the Navy to the technology Working Groups of the Institute of Defense Analysis. Mr. Winslow presented a detailed briefing concerning the formation, breakdown, coordination, scheduling, and outputs of the committees. He then introduced DSC consultants and described our dual role in relation to questionnaire data collection and transmission to committees, and the provision of guidelines for committee operating methods. Dr. Proctor then commented and elaborated on Data Solutions role in facilitating the committees' efforts.

Through the efforts of Mr. Winslow, in consultation with DSC, a series of three meetings were planned for the Chairs of the Critical Technology Assessment Committees (CTAC). The pur-

detailed information concerning the goals, available data resources, desired products, and schedules of committee interaction, and to solicit input from Chairs concerning the methods and guidelines by which committee operations would be performed. In addition to Drs. Gould and Proctor, these meetings were attended by a Data Solutions specialist in organizational behavior, Dr. Harry Ammerman. These meetings were held on February 10, 1980 and February 11, 1980. On February 14, 1980 Data Solutions submitted a draft version of Guidelines for Critical Technology Assessment Committees to Mr. Winslow. A slightly revised version of these Guidelines (Exhibit I) is now being prepared for dissemination to all Committee Chairs.

EXHIBIT A

Instructions to Technology Identification Questionnaire

1. Program Designation is for identification purposes. Example: NAVSEA 652 - Surveillance System.

2. System Designation and Manufacture is for specification of the equipment being described on the questionnaire.

3. Level, indicates which level of the subdivision of the system is described in the questionnaire.

4. Sublevel Designation and Manufacturer; specify the specific subdivision of the equipment by name and manufacturer. Example: Amplitron, QKS-8129 Raytheon.

5. Subdivision of (3). Specify the name of the subsystem, device or component and its function. Indicate the technology which best describes the important aspects of the specific subdivision being discussed. The technology may be design or fabrication; it may be a solid state device, a component or material. Does the system contain a technoloy or end product which provides a unique capability which the Navy should protect (answer yes or no). If the answer is affirmative, designate someone in the Navy to answer the Data Questionnaires, and this Technology Identification Questionnaire. Forward blank copies of the instructions and the questionnaires to that Designated Individual. (If desired two or three levels of the questionnaire can be completed by the same individual if the individual has the required knowledge).

6. Return completed copies to the person who completed the system level TIQ, for forwarding to NAVMAT 08D2.

EXHIBIT A: Pilot Questionnaire

EXHIBIT A (cont'd)

code & phone no._____

Technology Identification Questionaire

1. Program Designation _____
2. System Designation _____ Mfr. _____
3. Level: System, Subsystem, Device, Component, Material (circle one)
4. Sublevel Designation _____ Mfr. _____
5. Subdivision of level (3).

	Name of Subdivision	Function	Candidate	Name of technology (used in this level)	ignated Personnel for Candidate Tec
A)					
B)					
C)					
D)					
E)					
F)					

6. Please provide a brief description of the capabilities of this level (not subdivision) and the technologies which provide the capability.

_____

_____

_____

_____

Candidate Technologies are those in which this subdivision, or a subsequent subdivision, has a technology or end product you believe should be protected from enemy acquisition. Answer yes or no.

Instructions to Data Questionnaire

1. The questions in this questionaire are selected to allow the categorizatio of technologies which may require added protection from enemy acquisition. The questions are related to military capabilities, security classifications, manufacturing characteristics, funding, and new technologies. The answers will be subjective by necessity so don't mind putting a "don't know" if you don't have the answer. The questionaire should be completed in about ten (10) minutes.

2. This questionaire is complementary to the Technology Identification Questionaire (TIQ). One of these should be completed for each level and subdivision of that questionaire (TIQ). Blank copies of this Data Questionaire should be forwarded to the Designated Individual to be completed and returned to NAVMAT.

3. Return completed copies, along with the Technology Identification Questionaire to NAVMAT 06D2.

EXHIBIT A (cont'd)

EXHIBIT A (cont'd)

ID # _____

Data Questionnaire
(Please answer questions in sequence)

PM _____
System _____
Level _____
Subject _____
Person _____

	Yes	No	Don't Know
1. Does this technology make a significant contribution to the performance of a Navy system, its subsystems, or devices?			
2. Does the U.S. have a lead of 3 or more years in military capability over one or more members of the following group of nations?			
(a) NATO			
(b) WARSAW Pact			
(c) PRC			
(d) Third World			
3. Do you believe the Warsaw Pact/PRC would replace their equipment or technology with ours if they had full data on how to make our equipment?			
4. Does this technology support a revolutionary growth in military capability?			
5. Would compromise of operational or performance information about this equipment seriously degrade its military utility?			

(Note: Answer questions 6 & 7 only if specific equipments are involved.)

	Yes	No	Don't Know
6. Is this equipment software classified? If yes, indicate security level _____.			
7. Is this equipment hardware classified? If yes, indicate security level _____.			

8. Which of the following relates to the most important aspect of the technology transfer at this level? (Check only one)
   (a) Data (operational or technical) _____
   (b) End product susceptible to reverse engineering _____
   (c) Processing equipment _____

EXHIBIT A (cont'd)

	Yes	No	Don't Kn
9. (a) Is this technology most closely related to device or system integration? (Check one only)	____		
or (b) Is the technology of this equipment based on a fabrication/ manufacturing capability?	____		
or (c) Is the essence of this technology/equipment principally the managerial skills and/or engineering that allow for successful design, engineering, and fabrication?	____		
10. Is unique keystone equipment (equipment that is absolutely essential for economcally viable production) essential for manufacture of this equipment?	____	____	____
11. Do you believe it would take more than 3 years for the following nation to acquire the manufacturing capability of this technology upon acquisition of a unit of this equipment?			
(a) NATO	____	____	____
(b) WARSAW Pact	____	____	____
(c) PRC	____	____	____
(d) Third World	____	____	____
12. Is this technology at this level based on highly trained personnel for			
(a) Design of production equipment	____	____	____
(b) Operation of production/processing equipment	____	____	____
(c) Operation of testing/calibration equipment	____	____	____
13. Does the design of the system depend greatly on the fabrication of the			
(a) Subsystems	____	____	____
(b) Devices	____	____	____
(c) Components	____	____	____
(d) Materials	____	____	____

14. How would you classify the technology category of this level of this equipment? (Check one only)

(a) Older technology, equivalent substitute available ____
(b) Older technology, no substitute, little growth forecast ____
(c) Older technology, substantial growth forecast ____

EXHIBIT A (cont'd)

	Yes	No	Don't Kno
15. Is the technology base primarily driven by commercial R&D or military R&D funding? Commercial _____ Military _____			
16. Is the technology base primarily driven by commercial sales or military sales? Commercial _____ Military _____			
17. Is there a useful distinction between the technology exploited by the military versus the civil sector?	_____	_____	_____
18. Is there a lag in military application of this technology behind civilian application of this technology?	_____	_____	_____
19. Are the manufacturing sources for commercial products different than the manufacturing sources for military products?	_____	_____	_____
20. Are there key components or subassemblies found within this equipment that may merit export control due to their military utility upon removal?	_____	_____	_____
21. Are there extractable technologies contained within key components or subassemblies of this equipment that may merit export control?	_____	_____	_____
22. Is there a manufacturing methods program directly applicable to this technology?	_____	_____	_____
23. Rate the relative importance of the following technical processes of this technology. (Rate 1 to 10 where summation of ratings equals 10.)			
(a) Design	_____		
(b) Fabrication	_____		
(c) Processing	_____		
(d) Materials	_____		
(e) Testing	_____		
24. Rate the relative importance of this technology to the following levels. (Rate 1 to 10 where summation of ratings equals 10.)			
(a) Tactical	_____		
(b) System	_____		
(c) Subsystem	_____		

EXHIBIT A (cont'd)

	Yes	No	Don't Kn
25. Does this equipment use technologies or components developed since 1960?	____	____	____
26. Are there new, emerging or competing mature technologies which may replace this technology level within 5 years?	____	____	____
27. Is there equipment now under manufacture or in advanced development that will replace the equipment being discussed in this questionnaire?	____	____	____
28. Is the equipment in the civilian sector more advanced or equivalent to this equipment?	____	____	____
29. Is the technology base primarily found (mark one)			
(a) in industry (with non-military funding)	____		
(b) in industry (with military funding)	____		
(c) in military or other government labs	____		
(d) in academic institutions	____		
30. Is there a useful distinction between the equipment used in civilian applications versus military applications?	____	____	____
31. Is the equipment in the civilian sector more advanced or equivalent to that equipment that is the standard for the U.S. Navy?	____	____	____
32. Is the equipment in the civilian sector more advanced or equivalent to that equipment that has been most recently deployed by the U.S. Navy?	____	____	____

EXHIBIT B

U.S. NAVY MATERIAL COMMAND
TECHNOLOGY TRANSFER ASSESSMENT SURVEY

BACKGROUND

The Export Administration Act - 1979 and OPNAVINST 5510.156 mandate that the control of design and manufacturing know-how, in addition to critical military end products of technology, is absolutely vital to the maintenance of U.S. technological superiority. In this regard, the Department of Defense has been urged to aid in maintaining the U.S. strategic technology lead by developing policy objectives and strategies for the export control of critical technologies.

In order to achieve this goal it is essential that specific critical technologies be systematically identified and assessed with regard to the necessity, feasibility, and method of export control to foreign countries. Toward this purpose the Critical Technology Assessment Office, under the auspices of the Navy Material Command, is conducting the TECHNOLOGY TRANSFER ASSESSMENT SURVEY.

Your contribution to this assessment is vital and will be greatly appreciated as your knowledge and judgment is the major source of data for this study. As a participant you are asked to respond to the enclosed SYSTEMS IDENTITY QUESTIONNAIRE and DATA QUESTIONNAIRE.

The data you supply will be computer analyzed by a pre-tested mathematical model, and the results will be integrated by panels of leading experts from government, industry, and academia. The final outcome of this process will be a computer supported data-base, amenable to updating, which lists specific critical technologies, assesses optimal methods for the control of their export, and provides a roster of cognizant technical experts.

SURVEY INSTRUMENTS

This survey booklet includes three parts: a SYSTEMS IDENTITY QUESTIONNAIRE, PART I (yellow pages), a SYSTEMS IDENTITY QUESTIONNAIRE, PART II (green pages) and a DATA QUESTIONNAIRE (blue pages). The questionnaires have been designed for ease of response; the majority of questions require a multiple choice answer.

The SYSTEMS IDENTITY QUESTIONNAIRE, PART I (yellow pages) asks you to identify the technology or hardware about which you are completing this survey booklet and, to ascertain whether sub-systems or devices exist which you feel should be evaluated for export control.

The SYSTEMS IDENTITY QUESTIONNAIRE, PART II (green pages) asks you to provide identifying information about subsystems or devices which you feel should be examined for export control and to name an appropriate individual to respond to a survey booklet for each such subsystem or device.

The DATA QUESTIONNAIRE (blue pages) asks questions about the characterisics of the technology/hardware that you identified in the SYSTEMS IDENTITY QUESTIONNAIRE, (yellow pages) so that necessity and feasibility of export control can be evaluated.

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* Additional background for the present study may be found in "An Analysis of Export Control of U.S. Technology — A DOD Perspective", ODDRE, 4 February 1976.

HEAD, CRITICAL TECHNOLOGY
ASSESSMENT OFFICE
NAVAL RESEARCH LABORATORY
WASHINGTON D C 20375

FORM #

PLEASE GO TO NEXT PAGE

SURVEY METHODOLOGY

The TECHNOLOGY TRANSFER ASSESSMENT SURVEY has been designed to collect data for a given technology or hardware system at the system level, subsystem level and device level as follows:

system level — one survey booklet should be completed for *every* technology/hardware system in the survey.

subsystem level — a survey booklet should be completed for every subsystem of a technology/hardware system which the respondent at the system level feels should be examined for export control.

device level — a survey booklet should be completed for every device of a subsystem which the respondent at the subsystem level feels should be examined for export control.

If you are knowledgeable about a given technology/hardware at more than one level then it is acceptable for you to complete a survey booklet for each subsystem or device.

IF YOU HAVE ANY QUESTIONS THAT YOU NEED TO ASK IN REGARD TO THIS SURVEY, PLEASE CALL _____

DEFINITIONS

critical technology

This is the "know how" whose acquisition by another nation would significantly enhance the military operational capability of such nation, irrespective of whether such technology is acquired directly from the United States or indirectly through another recipient, or whether the declared end-use intentions by the recipient are for military or nonmilitary purposes.

keystone equipment

This is the manufacturing, inspection or automatic test equipment which can significantly contribute in and of themselves to the transfer of critical technology because they 1) embody extractable critical technology, or 2) are equipment which completes a process line and allows it to be fully utilized.

technical data

This means that information of any kind which can be used, or adapted for use, in the design, production, manufacture, utilization, testing, maintenance or reconstruction of articles or materials. The data may take a specific form such as, a model, prototype, blueprint, or an operating manual, or flow in less tangible forms such as technical services or interactions.

technology

Technology is the "know how" used in the design, production, manufacture, testing, utilization or maintenance of materials.

export control

Export control refers to control of transfer of U.S. technology to foreign countries in order to protect critical technologies from enemy acquisition.

PLEASE GO TO NEXT PAGE

SYSTEMS IDENTITY QUESTIONNAIRE

PART I: Identification of the technology/hardware subject.

1. Name of person completing questionnaire: _____ (10-39)
   organization/code _____ (20-49)
   area code and telephone number _____ (50-61)

   level of your response: (CIRCLE EITHER 1, 2, or 3 to INDICATE LEVEL OF DETAIL AT WHICH YOU ARE RESPONDING)

   system level 1
   subsystem level . 2 (62)
   device level..... 3

2. Identify the system in which the technology/hardware is embedded, which is the subject of this questionnaire, and give a brief description (10-15 words) of the function of that system. Include the subsystem name or device name according to the level of your response:

   system name: _____ (63-82)
   system function: _____ (83-142)
   _____
   _____
   _____
   subsystem name: _____ (143-172)
   device name: _____ (173-202)

COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE AND THE FOLLOWING DATA QUESTIONNAIRE (BLUE PAGES) FOR THE LEVEL YOU INDICATED IN QUESTION 1 ABOVE.

3. Enter the name of the manufacturer of the technology/hardware at the level of your response:

   _____ (203-232)

4. Give a brief description (10-30 words) of the function of the technology/hardware described above. If you are responding at the system level, this will be the same as system function above, otherwise enter function for the appropriate level:

   _____ (233-432)
   _____
   _____
   _____

PLEASE GO TO NEXT PAGE

5. Indicate the technology areas which best represent the technology/hardware described in this questionnaire: (CIRCLE EITHER ONE OR UP TO FOUR CODES TO INDICATE YOUR RESPONSE)

computer network	01	microwave componentry	11	(433-434)
large computer system	02	military turbine engine	12	(435-436)
software technology	03	fiber and advanced optics	13	(437-438)
automated real-time control	04	sensor technology	14	(439-440)
materials, structure, fabrication	05	undersea system	15	
directed energy	06	nuclear	16	
LSI-VLSI design and manufacturing	07	chemical	17	
military instrumentation	08	cryptography	18	
telecommunications	09	E.W./radar	19	
guidance and control	10			

6. Is this equipment, or a close derivative sold under Foreign Military Sales? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (441)
no ..... N

7. Are there different names of commercial derivatives of this equipment that are sold either commercially or under foreign military sales? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (442)
no ..... N

name(s) of commercial derivatives if "yes" above:_____ (443-802)

ANSWER QUESTION 8 IF YOU ARE RESPONDING AT THE SYSTEM OR SUBSYSTEM LEVEL. IF YOU ARE RESPONDING AT THE DEVICE LEVEL GO TO DATA QUESTIONNAIRE (BLUE PAGES).

8. Do you believe there are technologies embedded in the level described in this questionnaire that should be evaluated for export control? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (803)
no ..... N

IF YOU ANSWERED "YES" FOR QUESTION 8 GO TO PART II OF SYSTEMS IDENTITY QUESTIONNAIRE (GREEN PAGES) OTHERWISE IF YOU ANSWERED "NO" SKIP GREEN PAGES AND GO DIRECTLY TO TO DATA QUESTIONNAIRE (BLUE PAGES).

SYSTEMS IDENTITY QUESTIONNAIRE

PART II: Identification of subdivisions of the technology/hardware identified in PART I of this questionnaire.

1. Identify the subdivisions of the technology/hardware described at the lowest level of detail in PART I of this questionnaire. If you are responding at the system level; then subdivision refers to subsystem, or if you are responding at the subsystem level; subdivision refers to device. Indicate if each subdivision should be examined for export control. (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

Name of subdivision		Examine for export control yes / no		
A. _____	(804-833)	Y	N	(834)
B. _____	(835-864)	Y	N	(865)
C. _____	(866-895)	Y	N	(896)
D. _____	(897-926)	Y	N	(927)
E. _____	(928-957)	Y	N	(958)

IF YOU IDENTIFY MORE THAN FIVE SUBDIVISIONS THEN USE AN ADDITIONAL SHEET OF PAPER AND ATTACH. INCLUDE QUESTION 2 INFORMATION FOR EACH ADDITIONAL SUBDIVISION WHICH YOU BELIEVE SHOULD BE EXAMINED FOR EXPORT CONTROL.

IF YOU INDICATED "YES" IN QUESTION 1 FOR EXPORT CONTROL OF ANY SUBDIVISION, COMPLETE QUESTION 2 FOR EACH SUCH CASE. OTHERWISE LEAVE QUESTION 2 BLANK AND GO TO DATA QUESTIONNAIRE (BLUE PAGES).

2. Give information below for the subdivisions identified in QUESTION 1, PART II of this questionnaire which you believe should be examined for export control. "Name of contact" refers to the name of the individual who will complete a SYSTEMS IDENTITY QUESTIONNAIRE and a DATA QUESTIONNAIRE for that subdivision.

A. name of subdivision: _____ (659-688)
function of technology/
hardware of subdivision: _____ (689-738)
name of contact: _____ (739-758)
organization code of contact: _____ (759-778)
telephone number and area code of contact: _____ (779-790)

B. name of subdivision: _____ (791-820)
function of technology/
hardware of subdivision: _____ (821-870)
name of contact: _____ (871-890)
organization code of contact: _____ (891-910)
telephone number and area code of contact: _____ (911-922)

C. name of subdivision: _____ (823-852)
function of technology/
hardware of subdivision: _____ (853-1002)
name of contact: _____ (1003-1022)
organization code of contact: _____ (1023-1042)
telephone number and area code of contact: _____ (1043-1054)

D. name of subdivision: _____ (1055-1084)
function of technology/
hardware of subdivision: _____ (1085-1134)
name of contact: _____ (1135-1154)
organization code of contact: _____ (1155-1174)
telephone number and area code of contact: _____ (1175-1186)

E. name of subdivision: _____ (1187-1216)
function of technology/
hardware of subdivision: _____ (1217-1266)
name of contact: _____ (1267-1286)
organization code of contact: _____ (1287-1306)
telephone number and area code of contact: _____ (1307-1318)

DATA QUESTIONNAIRE

The questions in this questionnaire were selected to allow for the categorization of technologies which require added protection from enemy acquisition. The questions are related to military capabilities, security classifications, manufacturing characteristics, funding, and new technologies.

1. Of the following group of nations indicate which ones the U.S. has a lead of three or more years in military capability in regard to this technology. (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE FOR EACH GROUP)

	Confident that U.S. does not				Confident that U.S. does	
NATO	1	2	3	4	5	(1319)
WARSAW PACT	1	2	3	4	5	(1320)
PEOPLES REPUBLIC OF CHINA	1	2	3	4	5	(1321)
THIRD WORLD	1	2	3	4	5	(1322)

2. Do you believe the WARSAW PACT/PEOPLES REPUBLIC OF CHINA would replace their equipment or technology with ours if they had full data on how to make our equipment? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that they would not				Confident that they would	
1	2	3	4	5	(1323)

3. Does this technology support a revolutionary growth in military capability? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that it does not				Confident that it does	
1	2	3	4	5	(1324)

4. Would compromise of operational or performance information about this equipment seriously degrade its military utility? (CIRCLE ONE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that it would not				Confident that it would	
1	2	3	4	5	(1325)

ANSWER QUESTION 5 and 6 ONLY IF SPECIFIC EQUIPMENTS ARE INVOLVED, AS OPPOSED TO TECHNOLOGICAL KNOW-HOW, OTHERWISE GO TO QUESTION 7.

5. Is either of this equipment's software technical manuals or applications software classified? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1326)
no ..... N

If "yes" above indicate security level _____ (1327-1336)

6. Is this equipment's hardware classified? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1337)
no ..... N

If "yes" above indicate security level _____ (1338-1347)

7. Which of the following relates to the most important aspect of the technology transfer at this level? (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

data (operational or technical) ..... A (1348)
end product susceptible to reverse engineering ..... B
fabrication and/or material processing C

8. Indicate which of the following best describes this technology: (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

the technology is most closely related to device or system integration ..... A (1349)
the technology of this equipment is based on a fabrication/ manufacturing capability ..... B
the essence of this technology is principally the managerial skills and/or engineering that allow for successful design engineering, and fabrication C

9. Is unique keystone equipment (equipment that is absolutely essential for economically viable production) essential for manufacture of this equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1350)
no ..... N

10. Do you believe that it would take more than three years for the following nations to acquire the manufacturing capability of this technology upon acquisition of a unit of this equipment? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE FOR EACH GROUP)

	Confident that it would not				Confident that it would	
NATO	1	2	3	4	5	(1351)
WARSAW PACT	1	2	3	4	5	(1352)
PEOPLES REPUBLIC OF CHINA	1	2	3	4	5	(1353)
THIRD WORLD	1	2	3	4	5	(1354)

11. For the technology at this level indicate whether it is based on highly trained personnel for each of the following: (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

	Yes	No	
design of production equipment	Y	N	(1356)
operation of production/processing equipment	Y	N	(1356)
operation of testing/calibration equipment	Y	N	(1357)

12. Does the design of the system depend greatly on the fabrication of each of the following? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

	Yes	No	
subsystems	Y	N	(1358)
devices	Y	N	(1359)
components	Y	N	(1360)
materials	Y	N	(1361)

13. How would you classify the technology category of the level of this equipment? (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

older technology, equivalent substitute available	A	(1362)
older technology, no substitute, little growth forecast	B	
older technology, substantial growth forecast	C	
long term emerging technology	D	
near term emerging technology	E	

14. Indicate whether the technology is primarily driven by commercial R&D or by military R&D funding: (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

commercial R&D funding	A	(1363)
military R&D funding	B	

15. Indicate whether the technology base is primarily driven by commercial sales or by military sales: (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

commercial sales	A	(1364)
military sales	B	

16. Is there a useful distinction between the type of technology exploited by the military versus that exploited by civil sector? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes	Y	(1365)
no	N	

17. Is there a lag in military application of this technology behind civilian application of this technology? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1366)
no .....N

18. Are the manufacturing sources for commercial products different than the manufacturing sources for military products? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1367)
no .....N

19. Are there key components or subassemblies found within this equipment that merit export control due to their military utility upon removal? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that there are not				Confident that there are	
1	2	3	4	5	(1368)

20. Are there extractable technologies contained within key components or subassemblies on this equipment that merit export control? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1369)
no .....N

21. Is there a manufacturing methods program directly applicable to this technology? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that there are not				Confident that there are	
1	2	3	4	5	(1370)

22. Rate the relative importance of the following technical processes of this technology: (RATE 1 to 10 WHERE SUMMATION OF RATINGS EQUALS 10)

design _____ (1371-1372)
fabrication _____ (1373-1374)
processing _____ (1375-1376)
materials _____ 1377-1378)
testing _____ (1379-1380)
sum = 10

23. Rate the relative importance of this technology to the following levels: (RATE 1 to 10 WHERE SUMMATION OF RATINGS EQUALS 10)

tactical _____ (1381-1382)
system _____ (1383-1384)
subsystem _____ (1385-1386)
device _____ (1387-1388)
material _____ (1389-1390)
sum = 10

24. Does this equipment either use technologies or components developed since 1968? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1391)
no ..... N

25. Are there either new, emerging or competing mature technologies which may replace this technology level within five years? (CIRCLE NUMBER ON SCALE BELOW TO INDICATE YOUR RESPONSE)

Confident that there are not ... Confident that there are

1 ..... 2 ..... 3 ..... 4 ..... 5 (1392)

26. Is there equipment now under manufacture or in advanced development that will replace the equipment being discussed in this questionnaire? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1393)
no ..... N

27. Is the equipment in the civilian sector either more advanced or equivalent to this equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes ..... Y (1394)
no ..... N

28. Within which of the following is the technology base primarily found? (CIRCLE ONE CODE TO INDICATE YOUR RESPONSE)

industry (with non-military funding) ..... A (1395)
industry (with military funding) ..... B
military or other government labs C
academic institutions ..... D

29. Is there a useful distinction between civilian applications of equipment versus military applications of equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1896)
no .....N

30. Is the equipment in the civilian sector either more advanced or equivalent to standard U.S. Navy equipment? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1897)
no .....N

31. Is the equipment in the civilian sector either more advanced or equivalent to equipment which has been most recently deployed by the U.S. Navy? (CIRCLE EITHER "Y" OR "N" TO INDICATE YOUR RESPONSE)

yes .....Y (1898)
no .....N

THANK YOU FOR YOUR TIME AND PARTICIPATION. THE IMPORTANCE OF YOUR CONTRIBUTION CANNOT BE OVER-EMPHASIZED. PLEASE LOOK OVER YOUR RESPONSES AND PLACE THIS BOOKLET IN ENVELOPE PROVIDED, AND RETURN IT TO_____

EXHIBIT C

ORGINIAL SYSTEMS LIST

Active homing missiles

Condor
AGM 53A
Condor Dual Mode
Harpoon
AGM-84A

SHIP AND SUBMARINE SYSTEMS

Surveillance

SPS-29E	(62X)
SPS-32	(62X)
SPS-37A	(62X)
SPS-40B	(62X)
SPS-43A	(62X)
SPS-49	(62X)
SPS-58	(62X)
TAS Radar Auto	(62Z5)

3D Air Search.

SPS-30A	(62X)
SPS-33	"
SPS-39A	"
SPS-42	
SPS-48A(V)	"
SPS-48(ATD)	"
SPS-52	"
SPS-52B	"
SPS-52C	"
SPY-1A (AEGIS)	(62X)

Surface Search

SPS-10F	(62X)
SPS-55	(62X)

Submarine Search

BPS-5A-C	(62X)
BPS-9A,C	"
BPS-12	"
BPS-13	"
BPS-14	"
BPS-15	(62X)

TV

VIMS	(6111)
BXQ-3/Type 15 Periscope	(6111)
Type 18 Periscope	(6111)

EXHIBIT D: Original Systems List

C

FLIR

SIRIS
SIRED (Sub Infra Red Exploitation Device)
MK 68 62Y2
QRC FLIR
(AAS-28A Mod)
MK 68
Impr. EOSS
MK 86
Impr. EOSS - 62Y22

TARTAR - MK 74 Fire Control

SPG-51B
SPG-51C
SPG-51D } 62Z21
MK 2 Mod 0 TV
MK 5 Mod 0 TV

TERRIER - MK 76 Fire Control

SPG-55A } 62Z21
SPG-55B
SPG-55 "M" (Digital, CWAT, Track Mod.)

TALOS - MK 77 Fire Control

SPG-49A/B } 62Z21
SPW-2B

BPDSMS Fire Control

MK 115 6224

NATO Sea Sparrow Fire Control

MK 91/0 6225
MK 91/1 6225 ~~X5.1305~~

Gun Fire Control

MK 13/0
MK 25/3
MK 25/5
MK 26/3.4
MK 35/2
SPG-24
SPG-50
SPG-52
SPG-53 62Y2
53A, 1st
53B, C, D, E 2nd 3rd 4th 0 ~~60~~
MK 68 EOSS
SPG-60
~~SPQ-9A~~

EXHIBIT D (cont'd)

RF Detection Systems

WLR-1 in fleet thru 1985 - 35 counter/ measure no
WLR-1 DART
WLR-3 obsolete
WLR-6(V) 0444 — Wavelex
* WLR-8(V)2 0449
* WLR-8(V)4 0447 6
WLR-11 (Mod. incl. WLR-1, SLR-12)
SLR-12
SLR-13
SLQ-21
BLA-4
WSQ-( )
BLR-12
BLR-13
BRD-7
IDPS (Interfer. DF Sys.)
APR-25 Mod no
Low-Cost EW Sys. (Design-to-Price) same as AN/SLQ-32
Starling
SSQ-72 (incl. Outboard)
Classic Outrigger
TAC-105
WLR-14 PME N7-1

EO Detection Systems

Fisheye
VANVIS
WLR-13 PME 107-1

Acoustic Systems

Hull Mounted

SQS-23/Steel Dome, TRAM, MIP — 63R
SQS-23/Steel Dome, TRAM, MIP, LORA — 63R
SQS-23/Steel Dome, TRAM, MIP, LORA, SST - 63R
SQQ-23/Rubber Dome (2 domes) - 63R
SQQ-23/Rubber Dome (2 domes), SST - 63R
SQS-26 CX/Rubber Dome + Prairie Masker - 63R
SQS-26 CX/Steel Dome - 63R
SQS-53/Rubber Dome + Prairie Masker - 63R
SQS-53/Steel Dome - 63R
SQS-56 - 63R

Variable Depth

SQS-35 - 63R

EXHIBIT D C (cont'd)

Passive Towed Arrays

IETAS (Interim ETAS) – 63R

ETAS (Escort Towed Array) – 63R.

SUBMARINE

Search/Track

BQG-2B – 63R

BQR-7 – 63R.

BQS-13 – 63R

MPS Mod of BQS-13 (DIMUS) – 63R

BQQ-5 (DIMUS) – 63R

BQS-14 – 62R

BQS-15 – 63R

BQR-20/STASS – 63R

BQH-5(V)/TUBA I – 63R

TUBA I Upgrade – 63R

BQH-4/TUBA II – 63R

BSQ-3A Intrepid – 63R

Classification

BQQ-3 – 63R

Intercept

WLR-9A

WLR-12

BLR-14 (SAWS)

C

EXHIBIT P (cont'd)

Command and Control Systems

Data Systems

- NTDS Improved – C I 2
- Datacorts – C I 2
- DDG – TDS – C I 2
- Teletype Data Integrated Display (TIDY) – C I 2
- Adv. Data Display group – C I 2
- Task Force Command Center – C I 2
- Escort Command and Control Center – C I 2
- Commanding Officers TDS (COTDS) – C I 2
- SIAC – Phase I – C I 2
- SIAC – Phase II – C I 2
- SIAC – Phase III – C I 2

Weapons Direction Systems

WDS

- MK 2/1 (DE MK 8)
- MK 4/0
  - 4/1
  - 4/2
  - 4/4
  - 4/5
- MK 5/0
  - 5/2
- MK 6/0
  - 6/1
  - 6/2
  - 6/3
- MK 7/0
  - 7/3

C I 2

EXHIBIT D (cont'd)

WSC-2(V)2
Small Ship SHF
Submarine SHF
WSC-3

IFF

MK 12

Link Security

KG-40
KY-8
KY-28
NESTOR
PARK HILL
PLATO
VALLOR
Digit. Data

Navigation Systems

Gyrocompass

MK 19 Gyro — 6132
MK 23 Gyro — 6132
MK 27 Gyro — 6132
Adv. Stabilization Gyrocompass (ASG) — 6132
PL-41 Gyro — 6132

Inertial Navigation

SINS MK 2 — 6132
SINS MK 3/MSR — 6132
Dual Miniature Inertial Nav. Sys. (DMINS) 6132
Elec. Susp. Gyro Nav. (ESGN) — 6132

Velocity Mensurement

EM Log — 6132

External Reference - Depth Measurement

UQN-1, 4 — 6132
UQN-4A — 6132
BQN-17 — 6132

Absol. Position

LORAN C (SRN, BRN)

Omega (SRN-12, BRN-7)

Transit (SRN-9)

Stellar Nav.

NAVSTAR Global Positioning System — 6132

NAVSTAR

EXHIBIT D (cont'd)

Relative Posit.

TACAN - SRN-6
- URN-20B

RDF

URD-4

Carrier Landing Assist

Navelex —
SPN-6 — 6x
SPN-10, 42 L 2x
SPN-12, 44 — Elec
SPN-35, 35A — Elec
SPN-41 — Lx
SPN-43 — Elec

Countermeasures

Signature Reduction

Stack IR Shielding

Stonegate

Deception

ULQ-6A
ULQ-6B / Prelim
ULQ-6C
ULQ-6/O-1331
SLQ-30 (ULQ-6 TRUMP)
SLQ-17
SLQ-19
SLQ-22
SLQ-23
SLQ-24
SLQ-26
SLQ-27 (Shortstop)
SLQ-28
SLQ-29
Low Cost EW SLQ-32 duplicate

Noise Jammer

ULQ-10
SLT-8
SLQ-12

RF Decoys

ICAD/RF
SLQ-13
ALQ-98/102
Spinner
Pinata (Deployed inflatable radar alt. ext. corn.)

EXHIBIT D (cont'd)

Tethered Balloon
Chaffroc (MK 84) + Launch Equipment
≥RBOC MK 33
Super RBOC (MK 36-1)
Stovepipe (stack chaff)
(SLE-1)
Sailwing

IR Decoys — MK 36 MK 18 — ~~WIFLEX~~

NAVO

SEA GNAT
SOID
Hydrocarbon Canister
Torch MK 18b mod 0 — PME 107-5 MR AL ritter K22231
BIRD (Balloon IR Decoy)
IRAD (Infrared Area Decoy)

Acoustic Silencing

Surface Ship

Prairie-Masker — 63R

Submarine

Machinery Silencing — 65H
Moisture Detector — 65H
Skewed Prop. — 65H
Damped Prop. — 65H
Target Strength Reduction — 65H
Anti-radiation Coating — 65H
Torpedo Tube Noise Red. — 65H

Cover and Deception

ADDs
Expendable
Recoverable
SQS Simulator — 63R

ICAD
Towed Simulator
STADD

Surface Ship Defense

ETC-2 63R
NAE
5-In. Device
T-MK 6
SLQ-25 (NIXIE)

Submarine Defense

NAE MK 3 Mod 2
NAE MK 3 Mod 3 — 63R
ETC-1
Five Inch Evasion Device (FED) + Launchers

EXHIBIT D (cont'd)

Mobile Sub Simul (MOSS)
Adaptive Mobile Torpedo Decoy 63K
Low Freq. Tonal Masker
Multi-Freq. Spot Jammer
Broadband Jammer

Weapons

Missile FCS

MK 74/0
/1
/2
/4
/5

MK 76/1
/3-8

MK 77/0
/2
/3
/4

BPDSMS

NSSMS

IPDSMS

MK 99

Gun FCS

MK 34

MK 37

MK 38 62K

MK 51

MK 52

MK 54

EXHIBIT D (cont'd)

GUNFES

MK 56

MK 57

MK 63/14
/23, 24, 28, 29

MK 67

MK 68/1.5
/3, 4, 6, 8, 11, 13
/9, 10
/12
/14

MK 68 Improved

MK 70

MK 86/3
/4
/5

MK 87

MK 92/2
/1

MK 94

Phalanx, MK 90/0

Missile Launchers

MK 7/0

MK 12/0

MK 9/0

MK 10/0
10/1
10/2
10/3 & 4
10/5 & 6
10/7
10/8

EXHIBIT D (cont'd)

MK 11/0

MK 13/0
13/1
13/2
13/3

MK 22

MK 26/0 2223
26/1
26/2

MK 25/1

MK 29/0

ISSM Box

~~Harpoon Box~~

ASROC
MK 112

Guns and Projectiles

20 mm

MK 29
Mach. Gun

PHALANX CIWS 2243
~~20 mm~~

30 mm

Ex 30
Mach. Gun

40 mm

MK 3 Mod 4

3 in/50 cal

MK 22
MK 26
MK 33/0
MK 33/13
MK 34/0
MK 34/5

76 mm/62 cal

MK 75 (OTO-Melara Compact) 6211

5 in/38 cal (Twin)

MK 24
MK 30L
MK 30H

C

MK 32 1024
MK 38 1024

5"in/54 cal.

MK 42 Mod 7 (Hi frag)
MK 42 Mod 9
MK 45 Mod 0

8 in/55 cal 1024

MK 71

Guided Missiles and Projectiles

RIM-8G
RIM-8J
SM-1 (ER) 62232
RIM-67A
SM-2 (ER) RIMS 420
RIM-67B
SM-1A (MR)
RIM-66A 62232
SM-1 (MR)
RIM 66B
SM-2 (MR) RIMS-420
RIM-66C

BPDSMS
Sea Sparrow 6224
RIM-7

NATO
Sea Sparrow
RIM-7H 6225

5" Guided Proj. - Passive IR 6224

TALOS ARM
RGM-8H

SM-1 (ER)
RIM-67A

SM-2 (ER)
RIM-67B

SM-1 (MR) 622
RIM-66B

SM-2 (MR)
RIM-66C

STD-SSM
Semi-Active

STD-SSM-ARM
RGM-66D-2

EXHIBIT D (cont'd)

~~STD-SSM-Active~~
RGM-66F-1 AIR

Harpoon
RGM-84A (Ship)
UGM-84 (Sub) AIR

5" Guided Proj. S/A Laser

8" Guided Proj. S/A Laser

Underwater Transit Weapons

MK 37/0
MK 37/1 } 63221
MK 37/2
MK 37/3
MK 44/1 - obsolete
MK 45/2
MK 46/2 - 6322
MK 46
NEARTIP 63223

ALWT -
(Adv. Lt. Wt. Torpedo

MK 48/1
MK.48 Imp -
SUBROC - 63X21
ASROC/NUC
ASROC/MK 46 } 6324
B-57 - AIR

LAND BASED SYSTEMS

Command and Control

Integrated Command Support Center - 612

Ocean Surveillance Intelligence System (OSIS) - 612

ASW Command Control System (ASWCCS) - 612

Communications

Long Range Point to Point (RF)

ELF
Sanguine

VLF
Fleet Broadcast
FRT-3-87 10481

LF/MF
Fleet Multichannel Broadcast NK

EXHIBIT D (cont'd)

Satellite Network

LES-6 (Lincoln Exp. Sat.)
TACSAT-I
DSCS Phase I
DSCS Phase II
GAPFILLER
FLTSATCOM

} NAVELEX

Navigation Systems

RAYDIST-T – 6132
LORAN A – 6132
LORAN C – 6132
OMEGA – 6132
TRANSIT (NAVSAT) – 6132
NAVSTAR
Global Positioning System (GPS) 6132

Mines – PMS-407

MK 25
Mod 0

MK 52
Mod 1
Mod 2
Mod 3
Mod 4
Mod 5
Mod 6

MK 55
Mod 1
Mod 2
Mod 3
Mod 4
Mod 5
Mod 6
Mod 7
Mod 8

DST MK 36 — MK36 → Navelex
Mod 1
Mod 2
Mod 3
Mod 4
Mod 5

DST MK 40
Mod 1
Mod 2
Mod 3
Mod 4
Mod 5

EXHIBIT D (cont'd)

Quick Strike PMS 407

MK 61
Mod 0
Mod 1

MK 62
Mod 0

MK 63
Mod 0
Mod 1

MK 64
Mod 0
Mod 1

MK 65
Mod 0
Mod 1

MK 56
Mod 0

MK 57
Mod 0

CAPTOR (mk 60) - PMS-407

MK 53
Mod 0
Sweep Obstructor

Mobile Mines

MK 27
Mods 2, 4
Mods 3, 5

MK 37 Torpedo Conversion - Slim } PMS-407

PRAM (propelled ascent mine)

IWD - Intermediate Water Depth Mine

EXHIBIT D (cont'd)

EXHIBIT D

ROUTE SLIP AND OFFICE MEMO
NAVELEX 5216/1 (Rev. 9-68)

DO NOT DETACH FROM OFFICIAL CORRESPONDENCE.
WRITE OR PRINT LEGIBLY IN INK.

CONTROL NO.	REPLY DUE BY			
	ASAP			
ORIGINATOR (Code, and Extension when applicable)	SERIAL	DATE	SUBJECT CLASS.	CROSS REF.
ELEX 09F, OX23525/84				

ROUTE TO CODE	SYMBOL	RELEASED: INITIAL	RELEASED: DATE MON.	DAY	YEAR

SUBJECT
U.S. NAVY MATERIAL COMMAND/TECHNOLOGY TRANSFER ASSESSMENT

ENCLOSURE
SURVEY

SIGNATURE, EXT. CODE AND DATE ARE TO FOLLOW COMMENTS.
SYMBOLS: A - Action, C - Comment, I - Information, P - Prepare Reply, R - Retain Copy

system for which inclosed questionnaire is to be completed:

questionnaire ID#

A. J. SLAGA

HEAD, INTERNATIONAL PROGRAMS OFFICE

IF YOU HAVE ANY QUESTIONS ABOUT THIS QUESTIONNAIRE PLEASE CONTACT: GEORGE DRISCOLL, INTERNATIONAL PROGRAMS OFFICE X23525/84

ELEX 09FD

FILE — UNLESS THIS MATERIAL IS TO BE FURTHER ROUTED RETURN TO FILE BY DATING AND INITIALING.

INITIAL	DATE

EXHIBIT E

DEPARTMENT OF THE NAVY
HEADQUARTERS NAVAL MATERIAL COMMAND
WASHINGTON, D. C 20360

IN REPLY REFER TO

1 FEB 1980

From: Chief of Naval Material

Subj: Technology Transfer Assessment Survey

1. The Export Administration Act of 1979 and OPNAVINST 5510.156 mandate that the control of design and manufacturing know-how, in addition to critical military end products of technology, is absolutely vital to the maintenance of U. S. technological superiority. In this regard, the Department of Defense has been urged to aid in maintaining the U. S. strategic technology lead by developing policy objectives and strategies for the export control of critical technologies.

2. In order to achieve this goal it is essential that critical technologies be systematically identified and assessed with regard to the necessity, feasibility, and method of export control to foreign countries. Toward this purpose, MAT 08D and the NRL Critical Technology Assessment Office, under my auspices, are conducting a TECHNOLOGY TRANSFER ASSESSMENT SURVEY.

3. Your contribution to this assessment is vital and will be greatly appreciated as the knowledge and judgment of your people is the major source of data for this study. As a participant you will be asked to respond to a SYSTEMS IDENTITY QUESTIONNAIRE AND DATA QUESTIONNAIRE which will be provided to a designated central point of contact within each command. It is envisioned that these central points of contact will distribute the questionnaire to each Program Manager within their Command.

4. The data your staff supplies will be computer analyzed by a pre-tested mathematical model, and the results will be integrated by panels of leading experts from government, industry, and academia. The final outcome of this process will be a Navy computer supported data-base, amenable to updating, which lists specific critical technologies, assesses optimal methods for the control of their exports, and provides a roster of cognizant technical experts.

5. Your support in the successful completion of this survey is strongly encouraged and I request that you designate your command point of contact to MAT 08D2 (Mr. J. Dunlavey, 692-3127/28) prior to 11February 1980.

Edward J. Otth

EDWARD J. OTTH
Deputy Chief of Naval
Material (Acquisition)

Distribution:
(See page two)

EXHIBIT F

DEPARTMENT OF THE NAVY
NAVAL ELECTRONIC SYSTEMS COMMAND
WASHINGTON, D.C. 20360

IN REPLY REFER TO
ELEX 09F:ats
Ser 43/09F

18 FEB 1980

MEMORANDUM

From: ELEX 09F
To: Distribution

Subj: U.S. Navy Material Command Technology Transfer Assessment Survey

Encl: (1) Questionnaire

1. The NRL Critical Technology Assessment Office under the auspices of RADM Edward J. Otth, Deputy Chief of Naval Material (Acquisition) is now conducting the Technology Transfer Assessment Survey as mandated by the Export Administration Act of 1979 and OPNAV Instruction 5510.156. The purpose of this study is the assessment of export control and identification of critical technologies (see enclosure (1) for more information).

2. You have been identified by this office as the individual most knowledgeable about the subsystem named on the accompanying route sheet. As such, you are receiving a copy of the Technology Transfer Assessment Questionnaire (enclosure (1)) with this memorandum asking you about that subsystem. If you have any questions about this questionnaire or assessment, do not hesitate to contact Mr. George Driscoll, ELEX 09FD1, 692-3525/84, who is the designated ELEX point of contact.

3. The success of this survey process hinges on your expeditious completion and return of this questionnaire to this office. The significance of your contribution to this assessment cannot be overstated, and will be greatly appreciated.

4. Thank you for your time and effort.

Ryan L. Hanson

RYAN L. HANSON
Head, International Programs Office (Acting)

EXHIBIT G

U.S. NAVY MATERIAL COMMAND
TECHNOLOGY TRANSFER ASSESSMENT SURVEY

telephone record sheet date: your initials:

For # on questionnaire (ask Respondent, appears on front of questionnaire and on route sheet):

Respondent's question or problem:

Action (check one): a. answered question or dealt with problem____
b. referred call to DATA SOLUTIONS ____
c. referred call to Les Winslow ____

Response given to respondent or action taken other than referal to DATA SOLUTIONS or to Les Winslow:

DATA SOLUTIONS: (703) 893-1360
Kathy Losonczy or Rob Gould

CRITICAL TECHNOLOGY OFFICE, NRL:
(201) 767-2887 Les Winslow

Telephone Sheet

EXHIBIT H

NAVSEA - SYSTEMS LEVEL

Ship and Submarine Systems

	QUEX ID #	NAVSEA CODE	SYSTEM NAME	DATE SENT	STATUS	DATE RECEIVED
Surveillance	0001	62x	SPS-29E			
	0002	62x	SPS-32			
	0003	62x	SPS-37A			
	0004	62x	SPS-40B			
	0005	62x	SPS-43A			
	0006	62x	SPS-49			
	0007	62x	SPS-58			
	0008	62x	TAS Radar Auto			
3D Air Search	0009	62x	SPS-30A			
	0010	62x	SPS-33			
	0011	62x	SPS-39A			
	0012	62x	SPS-42			
	0013	62x	SPS-48A (V)			
	0014	62x	SPS-48A (ATD)			
	0015	62x	SPS-52			
	0016	62x	SPS-52B			
	0017	62x	SPS-52C			
	0018	62x	SPY-1A (Aegis)			
Surface Search	0019	62x	SPS-10F			
	0020	62x	SPS-55			
Submarine Search	0021	62x	BPS-5A-C			
	0022	62x	BPS-9A			
	0023	62x	BPS-9C			
	0024	62x	BPS-12			
	0025	62x	BPS-13			
	0026	62x	BPS-14			
	0027	62x	BPS-15			

EXHIBIT I

DRAFT/REVISION I

GUIDELINES FOR

CRITICAL TECHNOLOGY ASSESSMENT COMMITTEES

I. ADMINISTRATION

A. Fiscal

1. Committees are provided funding for their activities by the Navy Material Command via NRL Code 1404.
2. Legitimate committee expenditures include:
   a. copying
   b. computer search
   c. library information
   d. long distance calls
   e. travel arrangements and expenses
   f. time spent on committee function
3. Inquiries concerning the reimbursement of academic, industry, and others should be directed to the CTA Office.

B. Committee Membership Guides (Chair, Alternative, Technology Working Group Representative)

1. The Chair will select an alternate Chair to serve in his absence.
2. The Chair will select committee members. Criteria for selection includes balance of member backgrounds, training, and representation of Navy systems and labs (uniformed military technical experts should be included where possible and appropriate), industry and

academia representation. Selection of committee members should be based not only on the breadth and depth of their knowledge of the technologies involved, but also on their ability to identify specialized experts in these areas. Also, in the case of system or subsystem committees, Chair should be cognizant of subcommittees in related areas so as to avoid redundancy of expertise in committee member selection.

3. Committee size at discretion of Chair, but not so large a group as to be unwieldy in terms of logistics, deliberation, and available resources.
4. Committee members should have security clearance on a par with the level dictated by the technology areas involved.
5. Names of alternate committee members (in instances of multiple nominations) should be held for future consideration as "validation committee" members.

C. Meeting Logistics

1. These are informal goals.
2. Frequency and duration of meetings is dependent on nature of task and time frame of committee goals and milestone, and this will be determined by the Chair.
3. Matters formally submitted should not necessarily represent the conclusions of a quorum of committee members or alternates (quorum=majority of members). A minority opinion is recommended.
4. Meetings should be located at office of Chair, or at any location which members agree will facilitate useful discussion. A conference room is available

in Room 211 of Building 33A.

5. Chair has responsibility for obtaining sufficient clerical personnel to adequately support the needs of meetings. This may include notes, recordings, secretarial assistance, meeting arrangements and notifications, copying, and other needs of this sort.
6. If secretarial services are unavailable, contact Shirley Cohee (x72887) for directions in obtaining aid.

D. Security

1. Classified and proprietary information acquired by committees and individual participants should be handled by established procedures within each office. This applies to hardcopy, transcripts, notes, voice recordings, and notes of conversations. The Chair of each committee is expected to determine that appropriate procedures are being followed, consistent with the particular needs of that committee's efforts. Comparable procedures for lending such information to others (other committees or expert panels used in evaluating a technology) should also follow established control processes to assure security of the information.

2. All formal queries coming from outside sources to committees should be directed to the CTA Office (such as from Congressional staffers, other agencies within Navy committees, DOD/IDA Working Group.

Within each committee a single point of contact should be appointed to receive these queries through the CTA Office. This, in most instances, is likely to be the Chair.

II. INFORMATION HANDLING

A. Inputs to Committees

1. Chair is responsible for disseminating to committee members information that is to be provided from the CTA Office (this includes the CoCoM lists, the Navy Critical Technology Area List, the Critical Technology Assessment Survey Results, and various reports and instructions) and the timing of availability of these resources. For example, after potential items list (interim list of critical technologies) is submitted, CTA Office will send information to ONR and NISC for evaluations of availability of technologies to friendly foreign nations and potential adversaries, respectively, and these evaluations will be disseminated to committees in their deliberations regarding the "penultimate list" of critical technologies.
2. Strategies, formats, and timing for the solicitation of inputs from experts to committees is at the discretion of the Chair and committee members. Inputs may be solicited in the form of independent analyses and evaluations, or in the form of revised evaluations/ critiques of committee analyses.
3. It is suggested that the Chair and committee members use the resources provided by the CTA Office (e.g. the Bucy Report) to establish a framework and guidelines for their efforts, tailoring the information provided as appropriate to the committees' area of concern.
4. Chair and committee members should be cognizant of lag time between request and delivery of information.

In this regard, letters soliciting points of contact for expert involvement or directly to experts should be sent as early as possible in the deliberation process.

5. Solicitation of technical expert contribution for technical information may be from Navy System Command, Navy laboratories, academia, industry, professional or trade associations. For funding purposes, it is preferable that they be currently involved in serving in Navy-related efforts.
6. Appropriate protocol should be followed in soliciting technical expert input; including agreement to serve from the individual and informing his superior (which may also involve a formal agreement). Security clearance for the individual need only be to the level appropriate to the technology area of concern.
7. Solicitation of agreement by an expert to appear on the "register of expert" list should follow appropriate formal protocol.
8. Input on task goals and milestones will be provided periodically by CTA Office.

B. Inter-committee Interaction/Information Exchange

1. Chairs should share with other committee Chairs lists of technology area domains determined by their committees. Each committee should review and assess the relevancy of other committee domains to their own. The CTA Office will coordinate these reviews and determine where overlaps necessitate either domain alterations as opposed to necessary redundancy.

2. Committee members should feel free to exchange information to members of other committees as they deem appropriate. In this regard, all committees should have periodically updated lists of current committee membership, phone numbers, and schedules. This may be coordinated through the CTA Office.
3. Other committees should be made aware of strategies being followed for both input to, and output from, committee deliberations.
4. When information is exchanged between committee Chairs, an information copy should be submitted to the CTA Office.

C. Outputs From Committees

1. Copies of notices of committee meetings, and a notation of attendees, should be forwarded to the CTA Office after each meeting.
2. Committees should submit preliminary lists of critical technologies and register of experts in such a manner as to make possible evaluation in regard to completeness and utility by the CTA Office.
3. Each committee is responsible for determining strategies for constructing preliminary lists and for validating those lists subsequent to further input. Committees may choose, for instance, to hold out a list of experts who will later serve as an independent review panel for the validation of the committees interim lists. Alternately, use

may be made of already existing advisory groups to serve this purpose.

4. Nominees for the Register of Experts should be transmitted to the CTA Office.
5. If committee members hold conflicting positions concerning issues related to critical technology assessment, these conflicts should be documented (perhaps as majority and minority positions) in output reports.
6. After the preliminary list of critical technologies has been submitted, committees will receive the results of the Critical Technology Assessment Survey. These results will be in the form of evaluations of the criticality of Navy equipments at the system, subsystem, and device level. Output reports from committees should document the degree of utility of these results and areas of agreement and disagreement. The CTA Office will provide a format for these evaluations, which provides a means for them to be fed into the Navy critical technology database.
7. Provision of output information to TWGs should be coordinated through the CTA Office. Over time the CTA Office will provide guidance as to the format of output reports to facilitate ease of review, output sharing with other committees and integration of output with other souces (e.g. the Critical Technology Assessment Survey database). One major goal of this process will be to assist in the evolution of a common basis for categorizing technologies. This common basis would transcend all disciplinary boundaries, and serve as a foundation for future assessment efforts.