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KAY & ASSOCIATES, INC.
FINAL REPORT
CONTRACT N60921-78-C-0014

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AVIATION ENGINEERING & SUPPORT

KAY AND ASSOCIATES, INCORPORATED

800 E. NORTHWEST HWY. MT. PROSPECT, IL. 60056 312-255-8210

EASTERN DIVISION
SUITE 610, 1745 JEFFERSON DAVIS HWY.
ARLINGTON, VA. 22202
703-892-4042

2. November 1979

Naval Surface Weapons Center
White Oak
Silver Spring, MD 20910

Attn: Code E1A

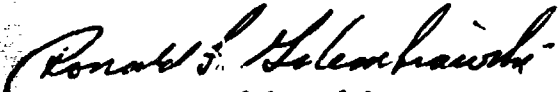
Ref: (a) NSWC White Oak ltr E1A:JHB:JRD Ser 3961 dtd 26 Oct 79

Encl: (1) Final Report of Contract N60921-78-C-0014

1. In accordance with reference (a), the enclosed final report is hereby submitted.

2. It is requested that Kay & Associates be advised as to the disposition of the attached final report.

Very truly yours,



R.F. Golembiowski
Program Manager

Copy to: w/enclosures
NSWC Code S-10 (1 copy)
NSWC Code X-21 (3 copies)
NASCHQ Code AIR-4112 (1 copy)

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15 N6921-78-C-14

TITLE:

6 CONTRACTOR REPORT.

PERFORMING ORGANIZATION:

KAY & ASSOCIATES, INC.
800 E. NORTHWEST HIGHWAY
MT. PROSPECT, IL 60056

DATE:

11 2 NOV 1979

TYPE REPORT:

9 FINAL REPORT. 5 Dec 77-28
Aug 79.

PREPARED FOR:

NAVAL SURFACE WEAPONS CENTER
WHITE OAK
SILVER SPRING, MD 20910

MONITORING AGENCY:

DCASMA CHICAGO
O'HARE INTERNATIONAL AIRPORT
CHICAGO, IL 60666

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| Attachment 4 | SHIP/ARMAMENT STUDY |
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UNCLASSIFIED

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER

N60921-78-C-0014

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Contractor Report

5. TYPE OF REPORT & PERIOD COVERED

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12-5-77 8-28-79

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Kay & Associates, Inc.
800 E. Northwest Highway
Mt. Prospect, IL 60056

8. CONTRACT OR GRANT NUMBER(s)

N60921-78-C-0014

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Kay & Associates, Inc.
800 E. Northwest Highway
Mt. Prospect, IL 60056

10. PROGRAM ELEMENT, PROJECT, TASK
AREA & WORK UNIT NUMBERS

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11. CONTROLLING OFFICE NAME AND ADDRESS

Naval Surface Weapons Center
White Oak, Silver Spring, MD 20910
Attn: Code CE-02

12. REPORT DATE

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Chicago, IL 60666

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16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release;
distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

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18. SUPPLEMENTARY NOTES

None

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

Seabased Air Study
Source, Maintenance & Recoverability (SM&R)
Instrument Repair Capability

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

→ This unclassified report contains information on the contractual effort of Kay & Associates, Inc. in support of the Naval Surface Weapons Center and the Naval Air Systems Command. The efforts encompassed a study concerning VSTOL vs LAMPS, Sea Based Air requirements, composition and configuration of future ship weapons, and screening of Source, Maintenance and Recoverability code changes. Additionally, this effort included the research and analysis of
(over) →

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candidate instrument repair facilities with a view toward selecting specific instruments for various weapons system for increased repair capability at the Intermediate Level of Maintenance. ←

The aforementioned task were in direct support of NSWC Code EIA and AIR-4112.

DA ITEM DESCRIPTION

2. IDENTIFICATION NO. 01

AGENCY NUMBER

Navy (OS) UDI-A-20522A

4. APPROVAL DATE

5. OFFICE OF PRIMARY RESPONSIBILITY

OS (NOL)

6. DOC REQUIRED

N/A

8. APPROVAL LIMITATION

OS & AS Ordnance (NOL)

9. REFERENCES (Mandatory as cited in block 10)

MIL-STD 847 (Latest revision applies)

WECS NUMBER

1. TITLE
 Technical Reports
 (Letter, Progress, Special & Final Reports)

3. DESCRIPTION/PURPOSE
 Technical Reports (TRs) are issued periodically when technical information is suitable for dissemination, or when the effort is complete to describe the precise nature and results of technical effort expended in completing the contract objectives. They are used to evaluate progress or determine the technical merit of the item being developed, the analysis being performed or investigation being conducted and to disseminate current scientific and/or technical information.

7. APPLICATION/INTERRELATIONSHIP
 This data item is applicable whenever a scientific or technical report is required by the contract as a product of the research, development, test and evaluation effort.

10. PREPARATION INSTRUCTIONS

Prepare documentation of the results of the efforts in technical reports as follows:

a. Letter, progress, and special reports, when required, shall document the efforts and results of the period and at the date specified on DD Form 1423. This type of report shall contain brief statements on the status of the project, the objectives and procedures performed, data and results obtained to date and proposed program for the next reporting period. The report documentation page DD Form 1473 shall be made a part of each copy of such reports when they are to be distributed externally. When these reports are to be submitted as permanent records to the Defense Documentation Center, they must be prepared in accordance with MIL-STD 847.

b. A final technical report shall document all efforts and results on the project and be delivered as specified on DD Form 1423. The format of the report shall be in accordance with MIL-STD 847.

2. A distribution list must be included for all technical reports.

3. Page size option for all technical reports: a. 8 x 10 1/2
 b. 8 1/2 x 11

THIS PAGE IS BEST QUALITY PAPER

ATCH NO. TO EXHIBIT A
 TO CONTRACT/PM N60921-78-C-0014

CONTRACT DATA REQUIREMENTS LIST
 CATEGORY S Technical Reporting

ORGANIZATIONAL & INTERMEDIATE
 Level Maintenance Program
 SYSTEMS

CONTRACTOR Kay & Associates, Inc.

| 1. REQUIREMENT NUMBER | 2. TITLE OR DESCRIPTION OF DATA | 3. CONTRACT REFERENCE | 4. TECHNICAL OFFICE | | 10. FREQUENCY AS OF DATE | 12. DATE OF 1ST SUBMISSION | 13. DATE OF SUBSEQUENT SUBMISSION | 14. DISTRIBUTION AND ADDRESSES (Address - Regular Copies/Spec Copies) |
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| | | | 7. FORM CODE (AI) | 8. INPUT (AI) | | | | |
| A301 | Monthly Progress Reports | | NSWC/WO | CE-02 | MTHLY | 30 DAC | | NSWC/CE-02 NSWC/WS-13 |
| | UDI-A-20522A | | NSWC/WO | CE-02 | | | | |
| A002 | Final Report | | NSWC/WO | CE-02 | OTIME | * | | NSWC/CE-02 NSWC/WS-10 NSWC/WX-21 |
| | UDI-A-20522A | | DD | A* | | | | AIR 4112 (Regelson) |
| 16. REMARKS: Report will be in accordance with the work statement. Follow MIL-STD 847A to complete DD 1473. For additional guidance in completing blocks 10 & 11 of DD 1473 refer to attached sample. | | | | | | | | |
| 17. REMARKS: *A draft copy of the final report will be submitted to NSWC for review and approval 360 DAC. 1473, the distribution statement, will be supplied by NSWC after review and approval of the draft of the final report by CE-02 & CC-12. *Final report to be submitted 30 days after approval of the draft copy. | | | | | | | | |
| 18. REMARKS: | | | | | | | | |
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PREPARED BY LAURA A. KNOTT, TECH DATA MANAGER
 DD FORM 1423 5/78 1423

DATE 10/18/77

APPROVED BY [Signature]

DD FORM 1423 5/78 1423

BODY OF REPORT

This section of the report will individually itemize the efforts accomplished by Kay and Associates, Incorporated under contract N60921-78-C-0014. Each task will be addressed separately and sub-categorized as follows:

- Task Title
- Objective
- Procedure Utilized
- Results Achieved
- Conclusions/Recommendations

TASK TITLE: V/STOL vs LAMPS

OBJECTIVE:

To determine the feasibility of utilizing the V/STOL or LAMPS Weapon System to support surface ships. To provide a preliminary study of maintenance procedures, methodology, logistics support and operational readiness problems incident to the deployment of LAMPS and V/STOL aircraft in existing/projected cruiser/destr per type ships.

PROCEDURES UTILIZED:

Interviews were conducted with knowledgeable LAMPS personnel at the Naval Aviation Logistics Center (NALC). These personnel had just been involved in vendor and fleet oriented LAMPS investigations. Technical data was researched from the libraries of NOL Dalgren and NSWC White Oak to determine ship configuration and compatability for LAMPS/V/STOL. The following documents/reports were furnished NSWC White Oak to support Kay & Associates recommendations/conclusions:

- V/STOL, Technology Maintenance Features Report
- V/STOL, Supporting Technology, Summary and Assessment
- V/STOL, Other Applicable Technologies, Assessments and Projections
- V/STOL, Proposed Technologies, Assessment and Projections
- V/STOL, Advanced Aircraft Electrical System (AAES) Integrated Logistics Support Plan
- Naval Aviation Logistics Command Management Information System (NALCOMIS) Volume I
- Revised LAMPS MK I Integrated Logistics Support Plan
- Naval Aviation Maintenance Program, (NAMP) Volumes I, II, III, and IV, OPNAVINST 4790.2A
- Maintenance Requirements Cards (MRC decks) for the HH-2D, SH-2D, SH-2F Helicopters:

- a. Periodic maintenance
 - b. Phased maintenance
 - c. Daily servicing/special maintenance
 - d. Turnaround/servicing check list
- Automatic Information Display System (AIDS) Block Diagram from NADC's Bill Mulley

RESULTS ACHIEVED:

Due to the nature of the information involved, excerpts from a report furnished NSWC White Oak will be paraphrased to indicate areas of resultant achievements for this task effort. (Refer to Kay & Associates, Inc. report dated 14 June 1978 for details)

Efforts were largely confined to data gathering with a view to exploring the following areas of interest:

- Improvement in areas of support, methods, and procedures that currently exist for:
 - a. Software
 - b. ATE, VAST, BITE
 - c. Calibration and repair
 - d. Maintenance concepts
 - e. Equipment such as connector, cables, etc.
 - f. Aircraft launch and recovery
 - g. Weapons loading
- Improvement of existing maintenance/supply information retrieval in the areas of:
 - a. Compaction
 - b. Real-time, inflight delays
 - c. Standardization
 - d. Ship/aircraft/shore base interface
 - e. Site oriented MIS compatibility with other Navy/DOD programs

- Schedule of LAMPS detachments
- Ship retrofit to accept LAMPS
- Devotion of LAMPS to ASW
- Compliment of LAMP personnel requirements
- Supply support
- LAMPS - V/STOL similarities
- LAMPS management information systems
- Delineation of existing problem areas

RECOMMENDATIONS:

A. That Kay & Associates commence an in-depth review of the existing 3-M system data-flow procedures, and its attendant compatability with the proposed NALCOMIS, with particular emphasis on aircraft to ship to shore real time displays.

B. That Kay & Associates conduct a concurrent study of LAMPS MK III GFE/CFE compatability with proposed built-in test equipments. This effort will include, but not limited to, developing improved electrical/avionics connectors, test leads, harnesses, and associated equipments.

C. That Kay & Associates investigate and analyze the aforementioned problem areas with a view to making valid recommendations for changes and/or modifications to the various LAMPS host ship classes.

TASK TITLE: Instrument Repair

OBJECTIVE:

Perform analyses, conduct investigations, and determine the requirements necessary to establish and support instrument repair facilities at selected Intermediate Maintenance Activities. Evaluate the economic impact of applying the expanded instrument repair capabilities to additional Aircraft Intermediate Maintenance Departments (AIMD's).

PROCEDURES UTILIZED:

Site visits were conducted at NAS Jacksonville (P-3, H-3), NAS Cecil Field (S-3, A-7), and NAS Oceana (F-4, A-6) to determine their existing instrument repair capabilities. These efforts were concentrated on the 5lxxx series Work Unit Codes (WUC's) for each weapon system. The following procedures were utilized to ascertain the feasibility of authorizing the activity expanded capabilities;

- Identify actual instruments listed in the 5lxxx series of WUC manual
- Locate a part number and alternates for each instrument nomenclature, i.e. angle of attack. (Reference: Illustrated Parts Breakdown)
- Identify the NSN for each part number (Reference: C0006)
- Locate Source, Maintenance and Recoverability Code (SM&R) (Reference: P2300/P2310)
- Identify Maintenance Manual for each part number (Reference: 00-500 Publications Index)
- Identify Common Ground Support Equipment/Peculiar Support Equipment for each instrument part number (Reference: NA 05/03 Maintenance Manuals)
- Identify AIMD's current capability, (Reference: Individual Component Repair List ICRL)
- Identify departments support equipment requirement, (Reference: Individual Material Readiness List IMRL)
- Ascertain level of training of onboard technicians, (Manpower Authorization)

The aforementioned data was then entered on a chart to be used in determining the need for expanded repair capability on an instrument by instrument basis.

The Maintenance Support Office (MSO) reports were utilized to ascertain Mean Time Between Failures (MTBF) to determine the feasibility of repairs for economic reasons. Additionally, 3M source data was screened to identify how a particular instrument's failure rate affected Not Operationally Ready (NOR) status.

RESULTS ACHIEVED:

The information was forwarded to AIR-4112 for review and approval. The Aircraft Intermediate Maintenance Departments at NAS, Jacksonville and Oceana were subsequently granted interim authorization to perform expanded repair of selected instruments within the 51xxx series WUC's for their weapon system.

The new maintenance plan for the A-6 aircraft is currently under review by NASC and field activities which designates selected instruments to be repaired to a greater degree.

RECOMMENDATIONS:

It is readily apparent that expanding the level of repair for aircraft instruments would greatly enhance the current supply and demand posture for certain instruments. The main criteria to be utilized in determining what instruments should be repaired at the "I" level are as follows:

- Mean Time Between Failures
- Impact on NORS/NORM
- Acquisition Cost
- Supply Assets
- Bit and Piece Support
- Personnel Qualifications

It is strongly recommended that an instrument repair manual be prepared that addresses repair of both sealed and unsealed components. The manual should indicate:

- Repair Procedures
- Required Bit and Piece Support
- Required CGSE/PGSE

TASK TITLE: Source, Maintenance and Recoverability Codes (SM&R)

OBJECTIVE:

Conduct an analysis and make recommendations on Source, Maintenance and Recoverability Code (SM&R) Changes originating from NASC HQ or field activities. To eliminate the backlog of SM&R request for AIR-4112 (Avionics).

PROCEDURES UTILIZED:

On 15 September 1978, Kay & Associates assumed the avionics SM&R program in support of AIR-4112. A total of 235 outstanding NAVAIR control numbers (NACN) were forwarded to Kay & Associates for processing. To ensure complete evaluation of each part number involved, the following research procedures were established:

- Ensure completeness and validity of each SM&R change request
- Identify those change request that were duplicates or duplicated part numbers on other request
- Eliminate the request that had been previously completed
- Establish a flow procedure for completed correspondence
- Establish research and analysis guidelines to insure screening of each request

The following procedures were established to determine the necessity of the requested SM&R Code Change:

- Validate the P/N and NSN
- Validate current SM&R code (P-2300)
- Evaluate the rationale of the request
- Ascertain the mean time between failures
- Recognize the need for ASO COG or fund code change
- Determine the requirement for a maintenance plan change
- Ascertain the current acquisition cost

RESULTS ACHIEVED:

Kay & Associates personnel processed, on the average, 3 to 6 completed NACN controlled documents per week. The number processed per week was dictated by the depth of research required and the number of part numbers per change request. Over 300 change request have been completed and forwarded to the Aviation Supply Office for cognizant action. The 300 NACN controlled requests processed encompassed over 400 separate part numbers for various weapon systems.

It is worthy to note that the SM&R effort encompasses the logistics area assigned AIR-411 which includes 7 logistics managers. The NAVAIR control numbers are assigned from a central point (AIR-4111B1) for all branches in 04 directorate: i.e. 411, 413 417 etc. Approximately 60% of the assigned NACN's are directed to AIR-4112 (Avionics). With the initiation of the "NIP" conferences, the amount of logistics workload has increased immeasurably and consequently increased the workload in the SM&R arena. Therefore, the accomplishments of Kay & Associates personnel has greatly attributed to the AIR-4112 logistics effort as a whole in supporting fleet requirements.

CONCLUSIONS/RECOMMENDATIONS:

It has become obvious that the SM&R code change effort will not, for sometime, decrease in volume and importance. With the advent of the "NIP" review conference being conducted on multiple weapon systems and sub-systems, the logistics managers will become inundated with an increased SM&R workload. This increased workload will naturally be in addition to their other normally assigned duties.

Due to ceiling limitations imposed, AIR-4112 will require continued support of this effort to provide quick response to all fleet needs in the area of avionics logistic support. It is recommended that the SM&R effort not only be continued, but expanded to absorb the additional workload produced from the "NIP" reviews.

In-house and field generated SM&R change request have increased prior to the NIP conference reviews. Therefore, failure to expand contractor support of the effort would have an obvious adverse affect on fleet operational readiness.

TASK TITLE: Ship Armament Study

OBJECTIVE: Provide the Naval Surface Weapons Center with ship/armament capability information for year 2000 design. Determine dimension, weight, and quantity of weapons and magazine area required to support the weapon load for DD's, DLG's, FFTG's. Provide a complete profile on various armament systems as assigned by the Naval Surface Weapons Center.

PROCEDURES UTILIZED:

A team of three Kay & Associates analyst gathered data from existing technical manuals to ascertain the following information:

- Current armament utilized on DD's, DLG's, and FFTG's
- Size, weight and quantity of projectiles currently in the Navy inventory
- Required support equipment/handling equipment for each weapon
- Support personnel required for conditions I, II, and III
- Compatibility of different fire control systems
- Maintenance requirements/intervals for each weapon

RESULTS ACHIEVED:

Kay & Associates, Incorporated prepared a study for NSWC encompassing twenty one (21) different missiles, projectiles, gun mounts, and five control systems. Additionally, an analysis was conducted on four (4) types of vessels with a view to determine future systems compatibility with existing magazine facilities. An analysis of the logistics of the ships/weapons were provided and included personnel requirements, by rate structure, to support the weapon both ashore and afloat. Maintenance practices were explored and recommendations made to upgrade the state of the art on existing support equipment to include BIT/BITE and ATE. The completed study was supplied to NSWC code EA.

RECOMMENDATIONS:

Increased emphasis be placed on technologies to improve weapon support in the field of computerized fire control systems, digital test equipment, and diversified personnel training. Review of current maintenance procedures to include rewrite of technical manuals to ensure comprehension by fleet technicians.

TASK TITLE: AMRIP Logistics Support

OBJECTIVE: To provide logistics liaison and technical support to all activities certified to perform micro/minature repair of electronic module/circuit assemblies utilizing AMRIP procedures. This includes initial outfitting and subsequent material support; to provide supply and logistic support for the NAVAIR AMRIP Field Team performing certification and recertification of all activities designated with AMRIP capability; to provide supply and logistic support, printed circuit boards, and discrete components for NAVAIR AMRIP micro/miniature schools held at various overseas activities as requested by COMNAVAIRLANT/PAC, Washington D.C. as directed by NAVAIR, and instructor training and special training schools as directed by NAVAIR; to receive, store, and assemble micro/mini repair stations for distribution to AMRIP activities as directed by NAVAIR. This station consists of a solder extractor, handtool power supply, mechanical drive, stereo-zoom microscope, drill press/fused eyeletter, eyeletter power supply, plating system, hi-intensity lamp, and tool chest consisting of an assortment of special tools required for AMRIP repair. This tool chest consists of 158 line items; to maintain financial OPTAR records for funds provided by NAVAIR to support the AMRIP field team, schools, and related functions; to requisition thru the Naval supply system AMRIP related material to provide interim and emergency support for designated and emergency support for designated AMRIP activities; to provide supply and logistic liaison with other activities involved with the AMRIP program. These activities include but are not limited to NWC China Lake, CA, NDSC San Diego, Ca, NSWC White Oak, NAMTRAGRU Millington, Tn, NAVSEA, NAVELEX, and NAVAIR; to establish liaison with the Defense Property Disposal Office and the Defense Industrial Plant Equipment Center to screen for excess and surplus printed circuit boards and discrete electronic components to be utilized for training DOD personnel in the art of micro/mini repair.

PROCEDURES UTILIZED:

The task is located at NAS Oceana, Va with the NAVAIR AMRIP field office under the direction of a civil service (GS-12) technician on detachment from NWC, China Lake. Standard naval supply procedures are utilized to identify, requisition, receive, and distribute AMRIP related material and equipment. Standard naval financial procedures are utilized to account for OPTAR funds provided by NAVAIR for AMRIP related functions. Standard naval transportation procedures are utilized for delivery of AMRIP related equipment and supplies to fleet and training activities. Procedures established by the DPDO and DIPEC are utilized in screening, requisitioning, and delivery of DOD excess and surplus material utilized in classroom

training and annual personnel recertification at AMRIP designated activities.

Procedures established by NWC China Lake are utilized in the preparation and assembly of micro/mini repair stations. Procedures established by NAVAIR are utilized in distribution of AMRIP repair stations to designated AMRIP activities. Local procedures established by NAS Oceana, Va are utilized for local support of the NAVAIR field team.

RESULTS ACHIEVED:

Continuous logistic liaison being provided to 58 shorebased AIMDs (including 8 reserve AIMDs), 18 afloat AIMDs, 17 Marine IMAs, 29 squadrons, TSLs, CAL LABS, and other miscellaneous activities.

Retrofit of new AMRIP repair stations for 10 NAMTRA DETS are currently in process. Numerous requests for interim and/or emergency support provided along with providing technical advice and guidance to fleet activities regarding AMRIP related equipment support. Retrofit of numerous fleet activities with new AMRIP equipment currently in progress. Supply and logistic support provided to NAVAIR classroom training in support of 378 miniature students, 110 micro/miniature students, and 16 AMRIP instructors during calendar year 79. Continuously screening of DPDD's and DIPEC's for DOD excess surplus printed circuit boards and discrete components utilized for classroom training of DOD personnel has resulted in substantial monetary savings of government funds. Assumed responsibility from NWC China Lake for providing initial outfitting and subsequent logistic support to fleet and training activities for AMRIP related equipment and supplies.

Established a central base for fleet and training activities to contact to resolve technical problems related to supply and logistic support of AMRIP equipment.

RECOMMENDATIONS:

The task should be continued in order to provide continuity for the AMRIP program regarding supply and logistic support. A NAESU task should be established to perform this function. A provisioning conference should be held to provide standard supply support through the naval supply system. ASO should assume the inventory control point function for the major AMRIP equipment. (i.e. solder extractor, handtool power supply, mechanical drive, drill press, fused eyeletter, plating system, and microscope). A formal configuration control system should be established in order to maintain equipment integrity.