AD-A130 681 MINUTES OF FSC 5935 CONNECTOR STANDARDIZATION PLANNING MEETING HELD AT DAYTON OHIO ON 25-27 AUGUST 1982(U) DEFENSE ELECTRONICS SUPPLY CENTER DAYTON OH 30 NOV 82 1/2

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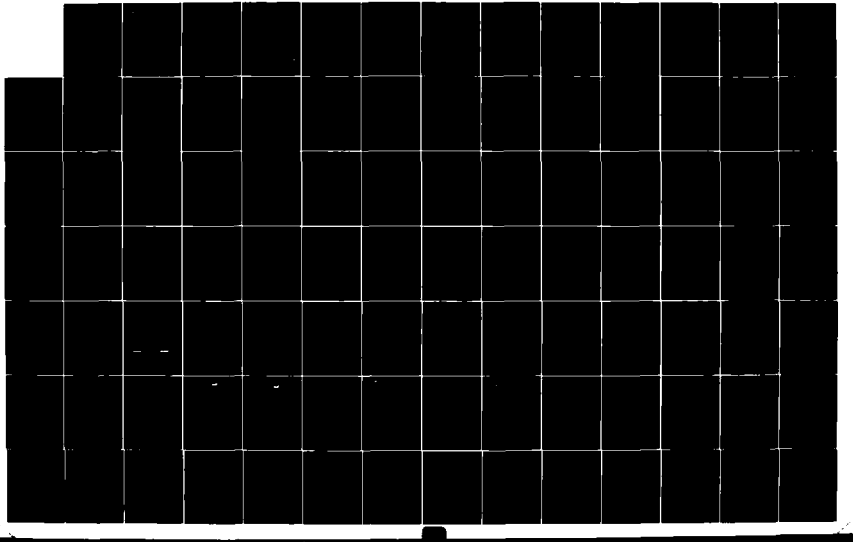
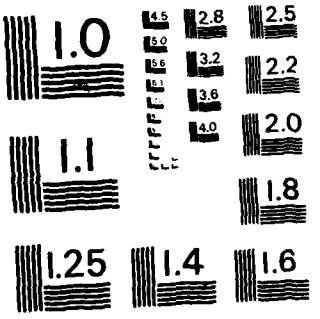




DEFENSE LOGISTICS AGENCY
DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OH 45444

IN REPLY REFER TO DESC-ESS (Mr. Marbais/(AV)850-5541/amb) 30 NOV 1982

SUBJECT: Minutes of FSC 5935, Connector Standardization Planning Meeting Held 25 - 27 Aug 82

TO: Industry Distribution

1. The minutes of the Electrical Connector Standardization Meeting held 25 - 27 Aug 82 are enclosed.

2. Agreements, as reported, will be included in the initial draft of the Standardization Program Analysis for Electrical Connectors, (FSC 5935), 1984 thru 1988.

FOR THE COMMANDER:

RICHARD V. MARBAIS
Chairman

22 Encl

cc:
Attendees

FSC 5935 STANDARDIZATION PLANNING MEETING MINUTES

25 - 27 August 1982

Dayton, Ohio

1. The meeting was opened at 1:00 p.m. by Mr. Richard Marbais, the Chairman.

2. Colonel Dalton Wirtanen, Director, DESC Directorate of Engineering Standardization, welcomed the attendees.

SESSION I - CIRCULAR CONNECTORS

1. Mr. W. L. Nesheim gave the Electronic Industries Association (EIA) G-11 Committee Report. See enclosure 1 for text. Mr. Nesheim can be reached at McDonnel Douglas, Box 516, St. Louis, MO 63147, phone: 314-232-2091.

2. Mr. Robert Pontone gave the EIA P-5.1 Committee Report. See enclosure 2 for text. Mr. Pontone can be reached at TRW Cinch, 1500 Morse Avenue, Elk Grove Village, Illinois 60007, phone: 312-981-6350.

3. Mr. Max Bellard gave the Society of Automotive Engineers, Inc. (SAE) A-2C Committee Report. See enclosure 3 for text. Mr. Bellard can be reached at the Society of Automotive Engineers, 64 Andrew Lane, Orange, Conneticut 06477, phone: 203-773-1000.

4. Mr. William D. O'Hirok gave the International Electrotechnical Commission (IEC) SC48B Subcommittee Report. See enclosure 4 for text. Mr. O'Hirok can be reached at ITT Cannon, 10550 Talbert Avenue, Fountain Valley, California 92708, phone 714-964-8385.

5. Mr. Dan Mullin gave the NATO Study Group 7 (AC/301) (SG/1) (STG/2) Report. See enclosure 5 for text. Mr. Mullin can be reached at the Naval Air Engineering Center, Code 9313, Lakehurst, New Jersey 08733, phone: 201-323-7438 or AUTOVON 624-7438.

6. PROBLEM NO. ES-82-5935-P-001. EUROPEAN STANDARDIZATION OF BENDIX SERIES SJT CONNECTORS.

NATO Document ASTAN P-3 has been developed covering SJT Connectors. Germany is the NATO Custodian. Both The United Kingdom and Germany endorse its usage. Other NATO Countries are split on its usage. The US NATO Representative has opposed the coverage of SJT connectors. No action is scheduled or recommended at this time.

7. PROBLEM NO. ES-79-5935-P-04. AN TYPE THREADED CONNECTORS.

It was reported that no action has been taken since the August 1981 Standardization Meeting. In July 1982, the Navy requested DESC-EMT not to initiate a study project until the Program Analysis Meeting. During the meeting discussion it was agreed to initiate a study project by the end of September 1982. DESC-EMT will conduct the study as Navy Agent. Project Number 5935-3339 was assigned on 17 September 1982. Scheduled completion is June 1983.

8. PROBLEM NO. ES-79-5935-P-05. ENVIRONMENTAL MIL-C-83723 CONNECTORS.

There was a general discussion on the inactivation for new design of MIL-C-83723 Series III. The Army and Navy have inactiviated MIL-C-83723 for new design of their equipment. Mr. Frank Dorfmeyer stated that the Air force would consider inactivation of MIL-C-83723 Series III sometime

after 1990. The Air Force will delete electroless nickel plating from MIL-C-83723. The Air Force has corrosion problems with electroless nickel MIL-C-83723 connectors in aircraft. Electroless nickel only lasts 130 hours in salt spray, but cadmium plating lasts 500 hours.

Mr. Carl Matthai, AFALD/PTES, will conduct an EP study to investigate connector and wire problems on the F-15 and F-16 aircraft. The Air Force feels that it does not have enough field information on Series III and IV of MIL-C-38999 at this time.

Mr. Richard Marbais stated that the Assignee Activitie's major concern was the duplicative and overlapping aspects of MIL-C-83723 and MIL-C-38999. If the Army and Navy can inactive MIL-C-83723 and use MIL-C-38999, why does the Air Force need both MIL-C-83723 and MIL-C-38999. We should standardize on a connector specification such as MIL-C-38999, which all three services use. We are not recommending the cancellation of MIL-C-83723, nor the immediate inactivation for new design of MIL-C-83723. We are looking for an orderly transition from MIL-C-83723 to MIL-C-38999. Deletion of MIL-C-83723 from the connector selection standard, MIL-STD-1553, would be the first step with inactivation a few years later. In addition, we see no reason to include Series III of MIL-C-38999 into the selection standard (MIL-STD-1553) if you keep MIL-C-83723 Series III in it also.

The Air Force has submitted an essential comment to the Navy requesting the addition of Series III, MIL-C-38999 to MIL-STD-1553. This would be done under Project No. 5935-3267. See Session VIII, Problem No. ES-83-5935-P-01.

Mr. Max Bellard, SAE, stated that we should think in terms of contacts first. They are used in multiple specifications and are standardized first in the aircraft - then the shells. We should

eliminate older contacts as appropriate. You should consider cost - the zones of usage in aircraft dictate that some connectors are required to meet less stringent requirements than others. It is not necessary to use a single expensive connector in all zones.

Mr. Bob McCurley, Texas Instruments, stated that he is not in favor of standardizing connectors by military service. Series I of MIL-C-38999 is the only connector they can use with more than one customer.

A letter from Mr. N. L. Hug, McDonnell Douglas Corp., was presented at the meeting. The letter is in favor of keeping series III MIL-C-83723 and gives a comparison of Series III, MIL-C-83723 and Series III, MIL-C-38999. See enclosure 6.

Additional letters received on this topic were from:

a. Mr. Robert Van Voris, Bendix, enclosure 7.

b. Mr. Ronald J. Caron, Sikorsky Aircraft, enclosure 8.

c. Mr. George Gresko, Vought Corp., enclosure 9.

IN SUMMARY

No final decision on the inactiviation of MIL-C-83723 series III was made. This program analysis problem will be continued. A new program analysis problem number will be developed on the Air Force study of connector failures in F-15 and F-16 aircraft.

9. PROBLEM NO. ES-82-5935-P-02. REVISION TO MIL-C-83723 SERIES III TO CHANGE GASKET SEAL.

DESC-EMT has forwarded the comments to the Air Force for disposition prior to military/industry circulation. Mr. Glen Babb stated that the comments on the o-ring located needed to be resolved. The disposition of comments should be completed by December 1982. A coordination meeting will probably not be needed. No new part numbers or insert patterns are being added.

10. PROBELM NO. ES-12-5935-P-03. STANDARD LANYARD RELEASE CONNECTOR.

All cable, contact and connector specifications were dated 24 August 1982. Since all action required has been completed, this problem will be deleted.

11. PROBELM NO. NEW. NAVY PROPOSED GENERAL PURPOSE ARMAMENT CONNECTOR.

The Navy (as preparing activity) was assigned a Tri-Service Project Number (5935-3325) on 26 July 82 to conduct a Tri-Service Engineering Practices (EP) Study. This study will investigate the possibility of developing a connector design that will meet the strigent requirements of the aircraft to weapon stores interface. The Navy distributed a design proposal on 3 August 1982 to the military, AIA, EIA and SAE ONLY. A copy of the design proposal is included as enclosure 10.

Engineering practices study projects are used to develop a planned approach to engineering standardization. The results of an engineering practices study project are documented in a report of findings including conclusions and recommendations. The report will include recommendations

for initiation of specific document projects. This report may also include drafts of specifications, standards and handbooks prepared to implement the report of findings. There is no specific format prescribed for engineering practices studies. Comments can be submitted in the same manner as a military specification. The assigning of a project number to conduct an EP study does not assure that a project number to develop a specification will also be assigned.

Mr. David Pielmeier, Naval Air Systems Command, gave a briefing on the study project and its status. The military is trying to challenge industry to give it their best shot. This is an attempt to determine the feasibility of a new armement connector. This is not an attack on MIL-STD-1760. We are looking for a whole new advanced armement connector for the 1985 timeframe. Comments on the design proposal are due on 4 October 1982, but this date will probably slip to 1 November. A formal proposal document will be released around first quarter FY 83. When the formal proposal is released, the study will be in a competitive stage between manufacturers. The design proposal was written in mil-spec format for ease of reference only.

This format will cover three series of connectors:

a. Manual coupling.

b. Manual coupling with lanyard release.

c. Rail launched.

We are hoping to have a specification by 1985 contingent on DESC and other approval. These requirements are not a wish list. Each requirement is based on an operational need within the Navy. One of the

key issues is that we are calling these devices Signal Power Transfer Devices (SPOTD) to convey that these devices will not be limited to pins and sockets. There are four classes of connectors.

a. Environmental resisting.

b. Hermetic receptacles.

c. Submersible receptacles (for use with air launched torpedos).

d. Flame resistant (connector subjected to missile plume).

Under testing, we are looking at an EMI test which is MIL-STD-1344 modified. We are adding a swept frequency requirement to the mode stir test. The Navy is considering testing anyone's connector free to prevent the need for building a special EMI test chamber. We are looking for a 1,000 hour salt spray test to provide a connector which will last the lifetime of the aircraft. The icing requirement is the same as that required on the rails and launchers. Durability is based on the actual number of mates and unmates required in the field. Fluid immersion is the same as required by the wire and cables. Exaust heat is based on the AV-8 aircraft takeoff heat. Environmental life cycle is based on the data developed at China Lake. We are permitting periodic cleaning and lubricating of the connector since this could be part of the maintenance schedule.

A big consideration will be retrofitting costs - can we afford it and to what degree. A royalty free license is a debatable point since this is a device peculiar to the military market. This point will be

answered prior to release of the formal proposal document. Comments of a proprietory nature will be accepted if needed to prevent excluding a design.

Mr. John Wilkinson, Amphenol: The Navy is asking for a good deal of investment money up front.

Mr. Pelmeier: The Navy is getting with its lawyers to decide if the Navy will spend development money.

Mr. Robert Franyen, General Dynamics: We are currently developing a missile under a tri-service program. How will this program affect the MIL-STD-1760 effort? We are concerned with interoperability criteria. This study could lead to definite problems in determining which connector should go into equipment delivered in the 1985 timeframe.

Mr. W. O'Hirok, ITT Cannon: Will this program supersede the MIL-STD-1760 effort or complement it?

Mr. Peilmeier: This program will require that the MIL-STD-1760 people review it and determine how it fits in. This study is looking at a family of connectors not one or two special designs.

Mr. Robert Van Voris, Bendix: Why is the Navy starting off with a whole new connector when you already have MIL-C-38999 connectors?

Mr. Peilmeier: The connector decided on may be a MIL-C-38999, we don't know yet. The Navy has voted for and approved the MIL-C-38999 Series III connector. The MIL-STD-1760 effort was in a short timeframe with no time to develop a new connector, we are now doing so.

Mr. Jack Kerr, Navy: Will the final report answer all questions raised at this meeting?

Mr. Peilmeier: A final report will be prepared downstream after receiving the final proposals and may then request project numbers for specs.

Mr. Marbais, DESC: The final report must show all military/industry comments and how they were resolved.

Mr. Kerr, Navy: The final report should show that it is feasible to produce this kind of connector.

Mr. Peilmeier: This study will be done in phases with a final report.

Mr. Bryce Sundstrom, Air Force, stated that Eglin Air Force Base is working on a small armament connector for simple stores such as iron bombs. Mr. Sundstrom agreed to provide more data for inclusion with the meeting minutes, see enclosure 11.

IN SUMMARY

a. A program analysis problem number will be developed on the Navy Tri-Service Study.

b. A program analysis problem number will be developed on the Air Force simple stores connector study. A project number will be offered to the Air Force to conduct an official Engineering Practices Study.

12. PROBLEM NO. ES-80-5935-P-04. CONNECTORS FOR NUCLEAR APPLICATIONS.

No action has been initiated as of 20 Aug 82. Manufacturers are developing data. The military requested that this problem be continued for an additional year.

13. NO PROBLEM NUMBER ASSIGNED. MIL-C-24368(SH), SHIPBOARD CIRCULAR POWER CONNECTOR.

Project Numbers 5935-N193, -1 thru -6 were initiated on 20 Oct 81 to revise MIL-C-24368(SH) and three specification sheets and to develop three new specification sheets. These actions were initiated to make editorial corrections and develop three specification sheets to cover inline and submarine-to-shore power connectors. Completion is scheduled within six months. For additional information contact:

Commander
ATTN: Sea 56Z33 (ATTN: J.E. Regan)
Naval Sea Systems Command
Washington, D.C. 20362
Phone: 202-692-6793
AUTOVON: 222-6793

No program analysis problem number will be generated on this topic.

14. PROBLEM NO. NEW. FILTER CONTACT CONNECTORS.

Mr. W. L. Nesheim, McDonnell Douglas, stated that the EIA G-11 Committee would like to propose coverage of filter contact connectors. These would be filter contacts with a narrow frequency range. They could be added as specification sheets to existing specification.

Mr. John Wilkinson, Amphenol: We are very receptive to initiating specification action in this area.

Mr. Jack Kerr, Navy: We should only talk about fixed contacts, possibly restricting usage to MIL-C-38999 Series I, standardize on the major usage area. Are we talking a single filter or a variety of bandwidths? If we are talking a single bandwith per connector, we can do something.

Mr. Bill O'Hirok, ITT Cannon: It makes sense to have an umbrella standard (covering all filter contact tests), then you could call out the insert configuration on a single specification sheet.

Mr. Dave Pielmeier, Navy: NAVAIR still opposes the standardization of filter pin connectors. Would still like to use them as non-standard parts.

The military requested that EIA G-11 develop a "strawman" specification with specification sheets. This would be reviewed by the military.

When asked by the military services, Mr. Joe Kobylack, DESC-EMT, stated that his office had the resources to accomplish this work.

A program analysis problem number will be developed on this area.

15. PROBLEM NO. ES-81-5935-P-02. NEW DESIGN BACKSHELLS, DUMMY STOWAGE RECEPTACLES, CAPS AND COVERS.

Project No. 5935-3110-01 and -02 has been initiated to develop caps and covers for MIL-C-38999 Series III connectors. The initial drafts were mailed out 12 Aug 82 with a 60 review period.

No action has been initiated on MIL-C-38999 Series IV caps or covers. The military is waiting on manufacturer's data.

EIA G-11 commented that we should include a reference to EMI resistant hardware that is being used. In addition, MS3437 should be inactivated.

16. PROBLEM NO. ES-82-5935-P-04. MOUNTING HARDWARD FOR CIRCULAR CONNECTORS.

NAVY-AS is developing the initial drafts. Initial drafts should be circulated in December 1982.

17. PROBLEM NO. ES-83-5935-P-01. BACKSHELL FINISHES.

The Air Force intends to have initial drafts out by January 1983. They will be circulated to full military and industry distribution.

An EIA G-11 member commented that under the current write-up, paragraphs b.1 and b.2 should be deleted.

Mr. Bill O'Hirok, ITT Cannon: Backshell finishes were discussed at the SAE-A2C, A2H and Air Force Meeting in May 1982. At that meeting, the military stated that their major concerns were logistics and corrosion resistance. Original Equipment Manufacturers (OEM's) noted that it was unfeasible to retrofit existing systems. One of the points made at the meeting was that those applicactions requiring conductivity could be effected. You may unknowingly lose the ground path. Suggestions made at the meeting were:

a. Inactivate all conductive finishes for new design except class W & N.

b. Non-conductive finishes be given new part numbers to prevent unintentional substitution in future design.

c. As now stated, Anodic conversion will not work on die cast components.

Mr. David Pielmeier, Navy: Navy-AS concurs in making existing designs inactive for new design.

Mr. Max Bellard, SAE: Any changes should be included in MIL-W-5088.

Mr. Rich Marbais, DESC: If we are able to standardize on Backshell finishes, we should be able to standardize on the same finishes for connectors.

18. PROBLEM NO. ES-83-5935-P-02. UNIVERSAL SEALING PLUGS.

Mr. Richard Marbais, DESC: The Assignee Activity position on the topic is as follows: We have not seen any difference in the performance of the two sealing plugs. Until there is some justification for having two styles, we will go with only one. We do not care which style the services choose.

Mr. Dan Mullen, Navy: The Navy, as Preparing Activity, has chosen the knob-on-end sealing plug. Initial drafts are being prepared.

Mr. Dave Pielmeier, Navy: Would it be possible to have all connectors require pigtails and remove the need for sealing plugs? Another possibility would be to go to a Class I, Class II concept.

Mr. Max Bellard, SAE: Pigtails would add a lot of weight to aircraft but would be very effective.

Mr. Bill O'Hirok, ITT Cannon: What is needed is a Tri-service policy on the application of all sealing plugs used in connectors. This should be done on a specification sheet (or MS sheet) by specification sheet basis.

Mr. Bob McCurley, Texas Instruments: Sealing plugs present a good deal of problems for us because of the confusion.

Mr. W. L. Nesheim, McDonnell Douglas: Proposed the development/use of plastic dummy contacts. See enclosure 1, EIA G-11 report.

After a brief discussion, the military decided that plastic dummy contacts would not be added to military specifications.

IN SUMMARY: On sealing plugs, the concerns and need for a policy statement will be added to the program analysis write-up. On plactic dummy contacts, no action will be taken.

19. NO PROBLEM NUMBER ASSIGNED. MIL-C-85049/68 HEAT SHRINK ELECTRICAL BOOTS.

MIL-C-85049/68 was developed to replace MS 3109 and MS 3117. The two MS sheets were in FSC 5970 while MIL-C-85049/68 is in FSC 5935. Defense General Supply Center (DGSC), the Assignee Activity for FSC 5970, disagrees with the cancellation of the MS sheets. No program analysis problem number will be developed. This will be resolved between Navy-AS (preparing activity) and DGSC.

END SESSION 1

SESSION II RECTANGULAR CONNECTORS

1. PROBLEM NO. ES-81-5935-P-10. REVISION B OF MIL-C-24308.

A coordination meeting was held 11-13 May 82. The meeting minutes were mailed on 8 Jul 82. The final draft is being prepared. Three new classes were added to the specification, including a class for aerospace applications.

2. PROBLEM NO. ES-80-5935-P-14. DUAL FLOAT MOUNT BUSHINGS IN MIL-C-24308.

No action has been initiated by 27 Aug 82. Mr. Jack Kerr, Navy: Our interest is to eliminate two single float mount bushings with a single dual float mount bushing. We need to determine the tolerance on the float, 31 mils is arbitrary. This will be handled quickly under a standardization project. Projects will be initiated within three weeks.

DESC-EMT requested that manufacturers submit data on tolerances to facilitate immediate change to MIL-C-24308.

3. PROBLEM NO. ES-82-5935-P-14. STANDARD ELECTRONIC MODULES, FORMAT B.

No action has been initiated as of 26 Aug 82. Format B modules have 100 contacts. The Navy is having problems with the contact tails when mounted on the printed circuit board. These problems will be resolved before adding Format B to MIL-C-28754.

4. NO PROBLEM NUMBER ASSIGNED. MIL-C-83503, CONNECTOR, FLAT CABLE.

The basic document and specification sheets are being revised. Projects were initiated in September 1981. A coordination meeting was held in Dayton, Ohio, 27 - 28 Jul 82. Meeting minutes will be out in September 1982. No program analysis problem number will be assigned.

5. NO PROBLEM NUMBER ASSIGNED. MIL-C-55544, CONNECTOR, FLAT CABLE.

This specification has no sources or stock numbers assigned to it. The basic document and all specification sheets are being cancelled. Initial drafts of the cancellation notices were circulated in June 1982. Comments were due 3 Aug 82. No decenting comments were received. Final drafts should be out by January 1983. Action is also being taken on MIL-C-55543, the flat cable used with MIL-C-55544. No program analysis problem will be developed on this item.

6. PROBLEM NO. NEW. BLIND MATING MIL-C-24308, CONNECTORS.

Mr. Tom Brellia, National Security Agency, gave a presentation on the need for a blind mating MIL-C-24308 connector. (See enclosure 12.) These connectors are being used on black boxes which are too small to use existing mating connectors. In addition, they are being mounted in blind locations.

Mr. Bill O'Hirok, ITT Cannon: Obtaining the blind mating feature could cause the loss of the scoop-proof characteristic.

Mr. Jim Hardman, AMP: Propose Mr. Tom Brellia work up a specification sheet proposal to be circulated by the MIL-C-24308 preparing activity.

Mr. Jack Kerr, Navy: The MIL-C-24308 preparing activity agrees.

Mr. Tom Brellia, NSA: Agreed to provide the preparing activity with a proposed draft.

A program analysis problem, will be developed on this agenda item.

7. PROBLEM NO. NEW. ARINC 600 RACK AND PANEL CONNECTOR.

Mr. Rich Marbais, DESC: The Air Force is developing a new rack and panel connector series based on the ARINC 600 connectors. There are two existing military specifications on similar connectors.

- MIL-C-81659 which defines an ARINC 400 type connector.

- MIL-C-83733 which defines an Air Force unique type connector.

This agenda item was requested by an O.E.M. The Air Force has not requested nor have they been issued a project number to conduct an Engineering Practices (EP) study in this area.

Mr. Glen Babb, Air Force: The ARINC 600 Design will eventually supersede MIL-C-83733. The Navy (Mr. John Kidwell, NAC) is participating in the Air Force study. AF-85 has received a proposed draft on the ARINC 600 from the study group. AF-85 intends to circulate it as a military spec initial draft. We are trying for a tri-service document with an initial draft circulation around January 1983. The Air Force is handling this area as a system.

A program analysis problem will be developed on this area. The Air Force will be offered a project number to conduct an EP study on this area.

8. PROBLEM NO. NEW. MIL-C-83513, CONNECTOR RECTANGULAR, MICROMINIATURE.

The Air Force announced that they are planning a major modification of the MIL-C-83513 test program. In addition, they will add electroless nickel finishes for space applications. An exact schedule has not been determined, but work should be started within one year. A new program analysis problem will be developed on this area.

9. PROBLEM NO. ES-83-5935-P-09. DIN CONNECTORS.

DIN Connectors are currently specified under MIL-C-55302. There are no projects to develop new military specifications or specification sheets on DIN Connectors at this time.

Mr. Richard Marbais, DESC: There has been some discussion on developing a seperate military specification on DIN Connectors. There are two basic problems that need to be resolved prior to project assignment. First, the DoD has a policy to adopt industry documents instead of developing military specifications. Where the industry document is not adequate, the adoption notice can include additions, exceptions, etc. We have not received sufficient justification for the development of a military specification in-lieu-of an adoption of an industry document. Second, the development of a seperate military specification on DIN Connectors would duplicate/overlap MIL-C-55302, MIL-C-24308 and MIL-C-83502. A decision would need to be made on what is preferred for new design and the inactivation for new design of MIL-C-55302, MIL-C-24308 and MIL-C-83503, in whole or in part.

Mr. Dennis Kelly, DESC: I am still in favor of preparing a seperate military specification for DIN Connectors. We see wide military usage and do not feel the industry documents will meet DoD requirements.

Mr. Jim Hardman, AMP: It is now appearing that DIN Connectors are defined differently. Some pin contacts are different. There should be a seperate military specification to standardize. Compliant contacts are critical to the need for the new connectors.

Mr. Tom Haack, DuPont/Berg: DIN Connectors are now available as printed circuit, insulation displacement, fiber optic and compliant contact connectors. The IEC Document is not even as complete as MIL-C-55302. A seperate military specification would be more appropriate.

Mr. Bill O'Hirok, ITT Cannon: A revision to IEC 130-14 could be eventually launched based upon a military specification.

Mr. Jack Kerr, Navy: How many versions of DIN are there? If there are different ones, we have problems. We need to be sure Europe is together before the U.S. takes a position on which one we specify. We need to ask Europe for a position.

Mr. Jim Hardman, AMP: Would like to propose that an all metric DIN Connector be developed.

Mr. Bill O'Hirok, ITT Cannon: We still have problems since the approved grid is .100 inch centers.

Mr. Tom Haack, DuPont/Berg: You will eventually lead to a situation where existing and metric connectors are not interchangeable.

Mr. Rich Marbais, DESC: If an unified military position is obtained on managing this area as a system and it is agreed to phase out existing documents on IDC, PC, etc. connectors we may be able to justify a new military specification.

Mr. Jack Kerr, Navy: We should determine if we are buying and using these connectors. If we are, a specification is needed to eliminate possible Diminishing Manufacturing Source (DMS) problems. If they are used in high quantity, check with MPCAG and determine the quantities, then decide on a specification. MIL-STD-1353 will govern the standards.

IN SUMMARY: No projects have been initiated to develop a new DIN specification. This problem will be kept in the program analysis thru FY 83.

10. NO PROBLEM NUMBER ASSIGNED. MIL-C-55302, REVISION D, PRINTED CIRCUIT BOARD CONNECTORS.

Project number 5935-3296 was assigned to revise MIL-C-55302. An initial draft was circulated on 31 May 82. The commenting period was extended to 1 Sep 82. No program analysis problem will be developed on this item.

11. PROBLEM NO. NEW. MIL-C-28859. CONNECTOR BACKPLANE, PRINTED WIRING.

Project number 5935-N204 has been assigned to add compliant contacts to MIL-C-28859. Projects were initiated in April 1982. Commenting period ends 24 Sep 82. The compliant contact is tied into the Standard Electronic Module (SEM) Connector. OEM's requested this action. A program analysis problem will be developed on this item.

END SESSION II

At the request of several meeting attendees, Mr. Robert Radeloff, DESC-E Deputy Director, gave a presentation on reciprocal qualification.

DESC-E has requested Mr. Sam Miller, DMSSO, to develop a U. S. position on reciprocal qualification which U. S. principal representatives to NATO could bring to NATO meetings.

Qualification of foreign companies should be maintained in the same manner as the U. S. manufacturers are required to meet (i.e. Group A, B and C testing). Reciprocal qualification can be obtained by shipping parts to the U. S. and having them tested or a foreign government can witness the testing within their country. If the foreign documents meet the quality levels of the U. S. specification, then it is determined to be equivalent. This evaluation is handled by DESC-EQ. If the foreign specification is not equivalent, then additional testing must be done.

The IECQ system appears to be some time off. Underwriters' Laboratories is handling some Federal Specification qualification testing and may be able to pick up the IECQ system, but we have not heard anything definite.

Mr. Bill O'Hirok, ITT Cannon: We should consider that if U. S. manufacturers are not given full qualification status in foreign countries, then companies from that country should not be given full qualification status here either. We have examples where we underbid the foreign companies and still did not get the contract.

Mr. Robert Radeloff, DESC: This problem should be approached with other government departments such as the State Department or Commerce Department. We are not able to resolve those type of problems at this meeting.

SESSION III - RADIO FREQUENCY CONNECTORS

1. Mr. S. J. Sumerset gave the EIA P-5.3 Committee Report, See enclosure 13 for text. Mr. Sumerset can be reached at Delta Electronics Mfg. Co., 93 Park St., Beverly, MA 01915, Phone: 617-927-1060.

2. Mr. C. W. Dreyer gave the EIA P-5.3 Task Group F Report. See enclosure 14 for text. Mr. Dreyer can be reached at Sealectro Corporation, 225 Hoyt St., Mamaroneck, NY 10543, Phone: 914-698-5600.

3. Mr. S. H. Jackson gave the EIA P 5.3/ANSI C83.3 Joint Task Group Report. See enclosure 15 for text. Mr. Jackson can be reached at Kings Electronics Co. Inc., 40 Marbledale Road, Tuckahoe, NY 10707, Phone: 914-793-5000.

4. Mr. John Wilkinson, Amphenol, gave the IEC SC46D Committee Report for Mr. N. J. Sladek who was unable to attend the meeting. See enclosure 16 for text. Mr. Sladek can be reached at Allied Corporation, Amphenol RF Operations, 33 East Franklin St., Danbury, CT 06810, Phone 203-743-9272.

5. Mr. Richard A. Thomas gave the NATO Study Group 7 (AC/301) (SG/1) (STG/7) Report. See enclosure 17 for text. Mr. Thomas can be reached at DESC-ESS, Dayton, OH 45444, phone: 513-296-5541, AUTOVON 850-5541.

6. PROBLEM NO. ES-81-5935-P-03. RF CONNECTOR STUDY.

Mr. Don Seeger, DESC-EMT: We expect to complete this study by November 1982. The final report will address all initial recommendations. I would like to thank EIA and all their members who put a lot of effort into this study. The final method of specifying

connector finish is still not decided. The addition of minimum test values to the basic document is also open for discussion. We are proposing putting the interface dimensions into a Military Standard. We feel this makes more sense than trying to control the interface in each specification or specification sheet. In addition, the revision of a single standard is much easier and quicker than changing a lot of specification sheets.

7. PROBLEM NO. ES-78-5935-P-04. TRI-AXIAL CONNECTORS.

The preparing activity (ARMY-CR) is waiting for data from the manufacturers. Projects should be initiated in October 1982 with scheduled completion in October 1983.

Mr. Sam Jackson, Kings Electronics: Why are the MIL-C-49142 specification sheets still showing proprietary cables?

Mr. Don Seeger, DESC: This is an area we need to look at.

Mr. Rich Marbais: We will develop a new program analysis problem on this to review and replace proprietary cables referenced in MIL-C-49142 specification sheets.

8. PROBLEM NO. ES-80-5935-P-07. STRIPLINE AND MICROSTRIPLINE CONNECTORS.

The final drafts have been forwarded to the preparing activity (AF-85) for dating. They should be dated in fourth quarter FY 82.

9. PROBLEM NO. ES-82-5935-P-05. MIL-C-83517 STRIPLINE TEST FIXTURE.

The EIA developed test fixture was incorporated into the MIL-C-83517 final draft. See ES-80-5935-P-07.

10. PROBLEM NO. ES-80-5935-P-16. SEALED RF CONNECTORS.

No action has been initiated to date. Action will be initiated within one year.

11. PROBLEM NO. ES-83-5935-P-03. MIL-C-49142 TRIAXIAL INTERFACE PROBLEMS.

No action has been initiated to date. If no action is undertaken within one year, this problem will be discontinued.

12. PROBLEM NO. ES-83-5935-P-04. TRIXIAL CONNECTORS FOR AVIONICS.

No action has been initiated to date. Army will circulate an initial draft by January 1983.

13. PROBLEM NO. ES-83-5935-P-05. CANCELLATION OF MIL-C-23329.

Cancellation notices have been coordinated. The notices should be dated by December 1982.

14. PROBLEM NO. ES-83-5935-P-10. MIL-C-39012 CATEGORY F NON-SOLDERED CONNECTORS FOR SEMI-RIGID CABLE.

No projects have been initiated to date. Amp Inc. submitted correction to the current writeup in the program analysis. See enclosure 18 for the Amp Inc. letter.

Mr. Jim Hardman, Amp Inc.: Amp Inc. is granting the military a Royalty Free License on the terminating tool.

Mr. Tom Rathfelder, Air Force: The Category F connector will reduce problems we are encountering during assembly. The Air Force intent is to leave the back end (cable termination) undefined and to use a military tool. The Air Force is requesting used-in-lieu-of documents to MIL-C-39012.

Mr. Jack Kerr, Navy: NAVELEX concurs with the coverage of these type of devices.

Mr. Don Seger, Army representative: The Army will await preparation of the Air Force document before taking a position.

Mr. Sam Jackson, Kings Electronics: It will be costly to go to a new tool. Why not use an existing tool?

Mr. Tom Rathfelder, Air Force: The military tool draft will be circulated with the connector initial drafts. The military specification on the tool has not been completed yet.

It was agreed to expedite the processing of these devices.

15. PROBLEM NO. NEW. FINISHES FOR RF CONNECTORS.

This is a topic addressed under the MIL-C-39012 study (see ES-81-5935-P-03).

Jack Kerr, Navy: The Navy needs the silver finish in MIL-C-39012 this year. Some applications require non-ferrous connectors to prevent generation of spurious signals. This is a problem with satellites. We want a brass shell with silver plate, otherwise we have to use non-standard parts.

16. NO PROBLEM NUMBER ASSIGNED. MIL-C-21367 (SH), CONNECTORS AND ASSOCIATED FITTINGS FOR FLEXIBLE, SOLID DIELECTRIC, RF CABLES, 5935-N196.

Projects were initiated in November 1981. This is a general update to standardize on material, to more clearly define test requirements, increase the number of first article tests and convert several Navy drawings to specification sheets. For additional information contact:

Commander
ATTN: Sea 56Z33 (ATTN: J. E. Regan)
Naval Sea Systems Command
Washington, DC 20362
Phone: 202-692-6793
AUTOVON: 222-6793

No program analysis problem number will be generated on this topic.

17. PROBLEM NO. NEW. MILITARY STANDARD ON MIL-C-39012 INTERFACES.

This is a topic addressed under the MIL-C-39012 study (ES-81-5935-P-03).

Mr. Richard Marbais, DESC: Mr. Ron Gary, DESC-EMT, has proposed the development of a military standard to eliminate discrepancies between specification sheet interface drawings.

Mr. Sam Jackson, Kings Electronics: You have to consider the conveniene of the specification writers vs. the convenience of the users. The present system gives the user a single piece of paper to look at.

Mr. Tom Rathfelder, Air Force: I like the idea of a military standard, but it does cause some inspection problems. Considering the advantages and disadvantages, we are in favor of a military standard.

Mr. Jack Kerr, Navy: The Navy has no position at this time. It may be better to go to an appendix to control the dimensions, but that would be awkward if you also have to talk about connector backends.

Mr. Ralph Pickus, Sperry: I would like to recommend the use of a standard.

User Opinion, Texas Instrument: Standards are a little inconvenient, but you have to use inspection gages anyway so it won't make much difference.

A new program analysis problem will be developed to track this area.

18. PROBLEM NO. ES-78-5935-E-01. SELECTION OF RF CONNECTORS, MIL-HDBK-216.

No action has been initiated.

Mr. Jack Kerr, Navy: Change title, MIL-HDBK-216 is not an RF connector selection guide. It's only real value is as a reference to information that is not accessible anywhere else. Updating MIL-HDKB-216 is low priority, we should consider deleting the problem from the program analysis.

The Army and Air Force agreed. This problem will be deleted.

END SESSION III

SESSION IV - POWER CONNECTORS

1. PROBLEM NO. ES-82-5935-P-06. ISOLATED GROUND RECEPTACLES AND GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLES.

Projects have been completed. W-C-596/ 145 and /212 were dated 24 Mar 82. This problem has been resolved and will be deleted from the program analysis.

2. PROBLEM NO. ES-83-5935-P-06. 400 HZ AND 28 VOLT D.C. POWER CONNECTORS UNDER W-C-596.

Mr. Robert Rosell, Air Force: The Air Force has requested DESC to buy 2,000 of each 400 HZ and 28 Vdc connector. We expect the award to be made this year.

Mr. Rich Marbais, DESC: Once the connectors are available, we will contact the preparing activities of MIL-STD-1653 and MIL-R-2726 about updating their documents and adding the W-C-596 parts.

3. PROBLEM NO. ES-80-5935-P-01. AIRCRAFT GROUNDING PLUGS AND RECEPTACLES.

Revised initial drafts were circulated on 31 Dec 81 with comments due in March 1982. The agent is currently compiling comments. Comments are scheduled to go to the preparing activity in September 1982. Scheduled completion is within nine months.

4. PROBLEM NO. ES-81-5935-P-08. OBSOLETE BLADED POWER CONNECTORS.

Draft cancellation notices were circulated on 16 Mar 82. Three comments were received. Recommended disposition of comments were sent to the Preparing Activity on 17 Aug 82. Expected completion is second quarter FY 83.

5. PROBLEM NO. ES-81-5935-P-09. WATERPROOF POWER CONNECTORS, MIL-C-12520.

No action has been initiated to date. It was suggested that MIL-C-12520 be inactivated for new design and referring to MIL-C-5015 for new design. This problem will be continued for one year.

6. NO PROBLEM NUMBER ASSIGNED. W-C-596 REVISION F.

Projects were initiated in January 1982 to update the document and clarify some of the tests such as terminal strength, current overload etc. An initial draft was circulated on 3 Feb 82. The disposition of comments will be circulated in October 1982.

No program analysis problem will be developed.

7. PROBLEM NO. NEW. W-C-596 PLUG GROUND BLADE FAILURES.

Mr. Lynn Roberts, DESC: We have been having field failures with 15 and 20 Amp. non-locking plugs. The ground blades are receeding (pushed back) into the plug housing. We will circulate a proposed solution as a comment to Revision F of W-C-596.

A program analysis problem will be developed on this topic.

END SECTION IV

SECTION V - AUDIO AND TELECOMMUNICATION CONNECTORS

1. PROBLEM NO. ES-81-5935-P-06. ENVIRONMENTAL RESISTING AUDIO CONNECTORS.

No action has been initiated to date. This problem number will be continued for one year.

2. PROBLEM NO. ES-81-5935-P-07. TELEPHONE PLUGS AND RECEPTACLES.

No action has been initiated to date. This problem number will be continued for one year.

3. There are no additional existing problems. No new topics were submitted.

END SECTION V

SECTION VI - SOCKETS AND TEST POINTS

1. Mr. Robert Pontone, TRW Cinch, gave the EIA P-5.2 committee report for Mr. Robert E. Lumpp who was unable to attend the meeting. See enclosure 19 for text. Mr. Lumpp can be reached at TRW Cinch Connectors, 1500 Morse Ave., Elk Grove Village, IL 60007, phone: 312-981-6348.

2. Test Points.

Currently no program anlsysis problems exist on test point connectors. No new suggested action items were presented.

3. PROBLEM NO. ES-83-5935-P-07. MIL-S-12883 RELAY SOCKETS.

A coordination meeting was held in Dayton, Ohio on 9 -10 Aug 82. There are sources listed on the QPL for MIL-S-12883/40 and /41. Additional configurations were added in the coordination meeting, these are expected to be qualified. Scheduled completion is December 1982.

Mr. Robert Rosell, Air Force: The MIL-S-12883 basic document will be revised to update the test procedures. Projects will be initiated shortly.

4. PROBLEM NO. NEW. MIL-C-83502. CONNECTOR, SOCKET, PLUG IN.

Project numbers (5935-3274) were initiated in December 1981 to revise the basic document and six specification sheets. A coordination meeting was held in Dayton, Ohio on 12 Aug 82. Meeting minutes should be mailed out in September 1982. Scheduled completion is early 1983.

5. PROBLEM NO. NEW. MIL-S-83734. CONNECTOR, SOCKET, IC.

Project numbers (5935-3275) were initiated in December 1981 to revise the basic document and 15 specification sheets. A coordination meeting was held in Dayton, Ohio on 11 Aug 82. Meeting minutes should be mailed out in September 1982. Scheduled completion is early 1983.

6. NO PROBLEM NUMBER ASSIGNED. CANCELLATION OF MIL-C-12883 SPECIFICATION SHEETS.

A total of 20 MIL-C-12883 specification sheets are being circulated for cancellation. Initial drafts were mailed out on 7 May 82. Three

comments have been received and resolved. Final Drafts will be forwarded to the preparing activity for dating in October 1982. MIL-S-12883/22 and /25 are being retained pending additional input from the Army.

END SESSION VI

SESSION VII - CONTACTS

1. PROBLEM NO. ES-79-5935-P-17. CONTACTS FOR CONNECTORS.

All three services concur in cancelling the 17 MIL-C-39029 specification sheets. Action is scheduled for the first quarter of FY-83.

2. PROBLEM NO. ES-82-5935-P-08. CONTACT PLATING ACCEPTABILITY BASED ON PLATING LOT ACCEPTABILITY.

A proposed porosity test has been added to the draft revision of MIL-STD-1344.

Mr. Jack Kerr, Navy: It is a little premature to start Phase II at this time. None of the details have been determined, but we should be able to initiate action next year.

Mr. Robert Pontone, TRW Cinch: I concur with the Navy. The porosity test has been through ten revisions. After one more review, it is scheduled to be forwarded to EIA headquarters.

This problem will be continued. Coordination of Phase II will be rescheduled to fourth quarter FY-83.

3. PROBLEM NO. ES-82-5935-P-09. ALTERNATE PLATING ON WIREWRAP CONTACTS.

The Naval Avionics Center (NAC) report has been completed. No formal coordination is planned.

A copy of the report is available for the asking from:

Naval Avionics Center
Code B/442 (ATTN: Bert Reinersten)
6000 E. 21st Street
Indianapolis, IN 46218

This problem will be listed as completed in the Program Analysis.

4. PROBLEM NO. ES-82-5935-P-10. CONTACT LAYOUT REDUCTION.

Project Number 5935-3267 was assigned in September 1981 to develop Notice 1 to MIL-STD-1353. This Notice will add one insert pattern (Series I, MIL-C-38999) and delete seven insert patterns (Series I, MIL-C-38999). Except for high power inserts, the inserts retained in MIL-STD-1353 are based on high volume usage. High power inserts have low usage but are required. The initial drafts were circulated on 9 Mar 82 with comments due 9 Jun 82. Comments were received to include inserts for Series III, MIL-C-38999. Due to the number and type of comments received, a coordination meeting will be held.

5. PROBLEM NO. ES-82-5935-P-12. THERMOCOUPLE CONTACTS.

Final drafts should be sent to the Preparing Activity in September 1982. The services are attempting to get sources in lieu of cancellation at this time.

Mr. David Lee, NAC: The Navy has an urgent need for these items. They are used in engine trim applications.

Mr. Dan Mullin, NAEC: We should keep these items in the system for procurement of replacement parts.

Mr. O. Buzz Vetter, TRW Cylinrical Conn.: These items will still be used. It would be better to alter the requirements to gain qualified parts.

Mr. Joe Kobylack, DESC: This item is still essentially a commercial part so there is no need to keep a specification on it.

Mr. Glen Babb, Air Force: I suggest we conduct a study project.

Mr. Bill O'Hirok, ITT Cannon: We should consider qualification by similarity since these parts are too expensive for a manufacturer to qualify.

Mr. Richard Marbais, DESC: It is DoD policy to take action on zero source specifications.

Summary: The Air Force will sponsor an EP study on these contacts.

6. PROBLEM NO. ES-83-5935-P-08. CRIMP CONTACT BORE BARREL DEPTH AND CONTACT INSPECTION HOLE.

No projects have been initiated to date.

Mr. John Latham, Tri-Star: I have conducted an engineering study on worse case conditions. (See enclosure 20 for text.)

An EIA position is to be developed on this item by the end of October 1982.

Mr. Dan Mullin, NAEC: MS3190 is still active. It needs updating to cover contacts not included in MIL-C-39029.

Mr. Dave Lee, NAC: MS3190 conflicts with MIL-C-39029. Information on this should be sent to Mr. Max Bellard, SAE.

The military will review EIA and SAE reports on this. An EP study should be initiated in first quarter FY83.

7. PROBLEM NO. ES-82-5935-E-01. CONTACT PLATING POROSITY TEST.

This problem ties in with ES-82-5935-P-08, Contact Plating Acceptability.

An initial draft to revise Method 1017 of MIL-STD-1344, plating porosity, was circulated on 1 Feb 82. Due to the large number of comments received, a coordination meeting is planned.

EIA is working on another proposal/revision and should have the final verison available within one year.

8. PROBLEM NO. ES-83-5935-E-05. COMPLIANT CONTACT TEST STANDARDS

Initial drafts were mailed on 29 Jul 82, comments are due 24 Sep 82. DESC-EMT is acting as the NAVY-EC agent.

Mr. Jack Kerr, Navy: We are attempting to develop a test jig and inspection criteria used in identifying printed circuit holes damaged by compliant contacts. This system is not for use in the standard electronic module program, but a similar concept could be used.

END SESSION VII

SESSION VIII - STUDIES, STANDARDS AND HANDBOOKS

1. PROBLEM NO. ES-79-5935-E-02. CONNECTOR TEST METHODS.

Mr. David Lee, NAC: NAC is developing an in-house EMI test chamber. We also intend to revise test method 2019 based on comments received and NAC test data.

Mr. Rich Marbais, DESC: I would like to comment on a portion of tne current write-up. NAVAIR does not agree with the inclusion of RF Requirements/Tests and Filter Pin Requirements/Tests into MIL-STD-1344. They feel that MIL-STD-1344 should be retained for power contacts and a new test standard should be developed for RF and filter connectors. DLA-HQ and DMSSO have shown a concern over the number of test standards that exist in addition to MIL-STD-202. If we try to develop a new connector test standard in lieu of expanding MIL-STD-1344, we may have to justify the existance of MIL-STD-1344 (i.e. explain why it can not be incorporated into MIL-STD-202).

Mr. Jack Kerr, Navy: We don't want to combine MIL-STD-1344 and RF Testing. MIL-STD-202 was set up to cover common test methods only. There shouldn't be a problem for connectors.

In summary: It was agreed to leave the NAVAIR comment in the write-up.

2. PROBLEM NO. ES-83-5935-E-1. UPDATING THE CONNECTOR SELECTION STANDARD, MIL-STD-1353.

Projects were initiated in October 1981 to develop Notice 1 to MIL-STD-1353. Comments are being worked on prior to having a coordination meeting.

3. PROBLEM NO. ES-82-5935-E-02. ADDITION OF CLASS DJ BACKSHELLS TO MIL-STD-1353.

Mr. Jack Kerr, Navy: MIL-C-28840 will be added to MIL-STD-1353 for smaller size conductor cables, when sources are qualified. MIL-C-5015 DJ shells will also be added. Further long range plans for MIL-C-28840 are not identified at this time.

4. PROBLEM NO. ES-83-5935-E-04. ADDITION OF COMPLIANT CONTACT APPLICATION INFORMATION TO MIL-STD-1353.

Action is being taken to specify compliant contacts by military specification (see ES-83-5935-E-05). Once available as a military part, information should be added to MIL-STD-1353 to prevent their misapplication. No action is scheduled until completion of ES-83-5935-E-05.

5. PROBLEM NO. ES-80-5935-E-02. CODMIUM PLATING.

Alternate platings are constantly being assessed by industry, industry associations and the military. To date, no suitable alternative to cadmium has been found.

6. PROBLEM NO. ES-81-5935-E-03. GOLD PLATING.

Three additional specifications are being revised to incorporate the gold study findings, they are MIL-C-21097, MIL-C-26482 and MIL-C-55302.

Mr. Bill O'Hirok, ITT Cannon: Any effort to restrict the plating process instead of trying to define and test performance requirements would be a mistake at this time.

Mr. Tom Haack, DuPont/Berg: You should continue to support development of new plating techniques by not penalizing innovators.

The military services concurred with the above and will attempt to define tests and requirements wherever possible. The Air Force (Code 85) is willing to sponsor a plating standard to define contact engaging and termination areas and aid in avoiding specifying processes.

Mr. Robert Rosell, Air Force: We have a matrix which defines the type of plating permitted in each portion of the contact. This matrix covers MIL-C-83502 and MIL-C-83734. (See enclosure 21.)

7. PROBLEM NO. ES-82-5935-E-02. HIGH RELIABILITY CONNECTORS FOR SPACE APPLICATIONS.

During the last revision of MIL-C-24308, a class S series of connectors was added for space applications. MIL-C-26482 and MIL-C-81703 will be dropped from consideration at this time.

Mr. Jack White, Sunbank: Are you also considering backshells and backshell plating?

Mr. Dean Storm, Aerospace Corp.: No. The rule of no cadmium use is the only criteria. In addition, the aerospace class is acceptable for space applications.

8. Problem No. ES-82-5935-E-03. METRICATION PLAN.

Three E.P. Studies were initiated in October 1981, they are:

5935-D197-1 on R.F. Connectors
5935-D197-2 on Circular Connectors
5935-D197-3 on Rectangular Connectors.

These studies will develop a listing of non-government specifications which will be reviewed for metric documents. Scheduled completion is December 1982.

9. PROBLEM NO. NEW. STUDY ON PARTS WHICH CAN BE INACTIVATED FOR NEW DESIGN AS A RESULT OF SPECIFICATION COVERAGE OF DIN CONNECTORS.

There are several series or families of connectors under MIL-C-55302 which are functionally similar to the DIN connectors. These items could be inactivated for new design with preference in MIL-STD-1353 given to the DIN connectors. This study would do an initial screening for these parts. It was agreed to initiate the study in one to two years.

10. PROBLEM NO. ES-76-5935-5-02. ITEM REDUCTION STUDIES.

There are currently two item reduction studies in process. Study project 5935-3126 is in process, scheduled completion is fourth quarter FY83. Study project 5935-3293 has had it completion date rescheduled to fourth quarter FY84.

END SESSION VIII

CLOSING STATEMENTS

1. The next connector (FSC 5935) Standardization Planning Meeting will be held on 23 - 25 Aug 83. The meeting will be held at the Holiday Inn, Dayton Mall, 7999 Prestige Plaza Drive, Miamisburg, Ohio 45342-9985, phone: 513-434-8030.

2. The chairman thanked the military and industry attendees for their participation and adjourned the meeting.

Brian P. McNicholl
BRIAN P. McNICHOLL
Recorder

Richard V. Marbais
RICHARD V. MARBAIS
Chairman

Susan Westbeld
SUE WESTBELD
Engineering Aid

INDEX OF ENCLOSURES

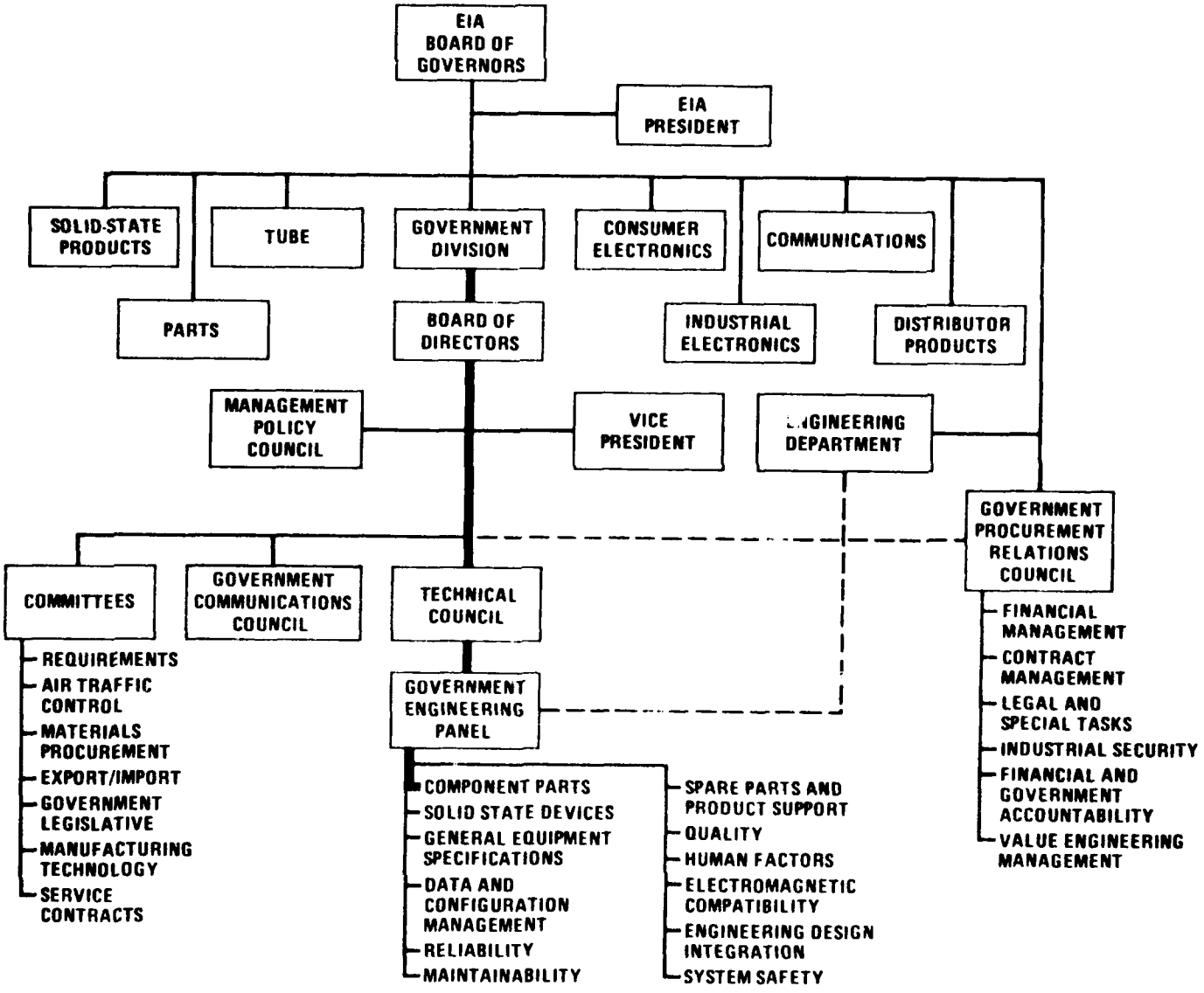
Enclosure No.	Subject
1	EIA G-11 Report
2	EIA P-5.1 Report
3	SAE A-2C Report
4	IEC SC48B Report
5	NATO SG7 (AC/301) (SG/1) (STG/?) Report
6	Letter from Mr. Hug, McDonnell Douglas Corp.
7	Letter from Mr. Van Vorris, Bendix
8	Letter from Mr. Caron, Sikorsky Aircraft
9	Letter from Mr. Gresko, Vought Corp.
10	Navy Design Proposal of an Armament Connector
11	Simple Store Interfact Task Group Meeting Minutes
12	Blind Mating MIL-C-24308 Proposal
13	EIA P-5.3 Report

14	EIA P-5.3 Task Group F
15	EIA P-5.3/ANSI C83.3 Joint Task Group
16	IEC SC46D Report
17	NATO SG7 (AC/301) (SG/1) (STG/7) Report
18	AMP, Inc. Letter on MIL-C-39012, Category F
19	EIA P-5.2 Report
20	Study on Bore Barrel Depth and Contact Inspection Hole.
21	Localized Finish Matrix
22	Attendance Roster

CONNECTOR TASK SPONSOR REPORT

W. L. MESHEIM
COMPONENT PARTS COMMITTEE
EIA-611

THE GOVERNMENT DIVISION WITHIN EIA



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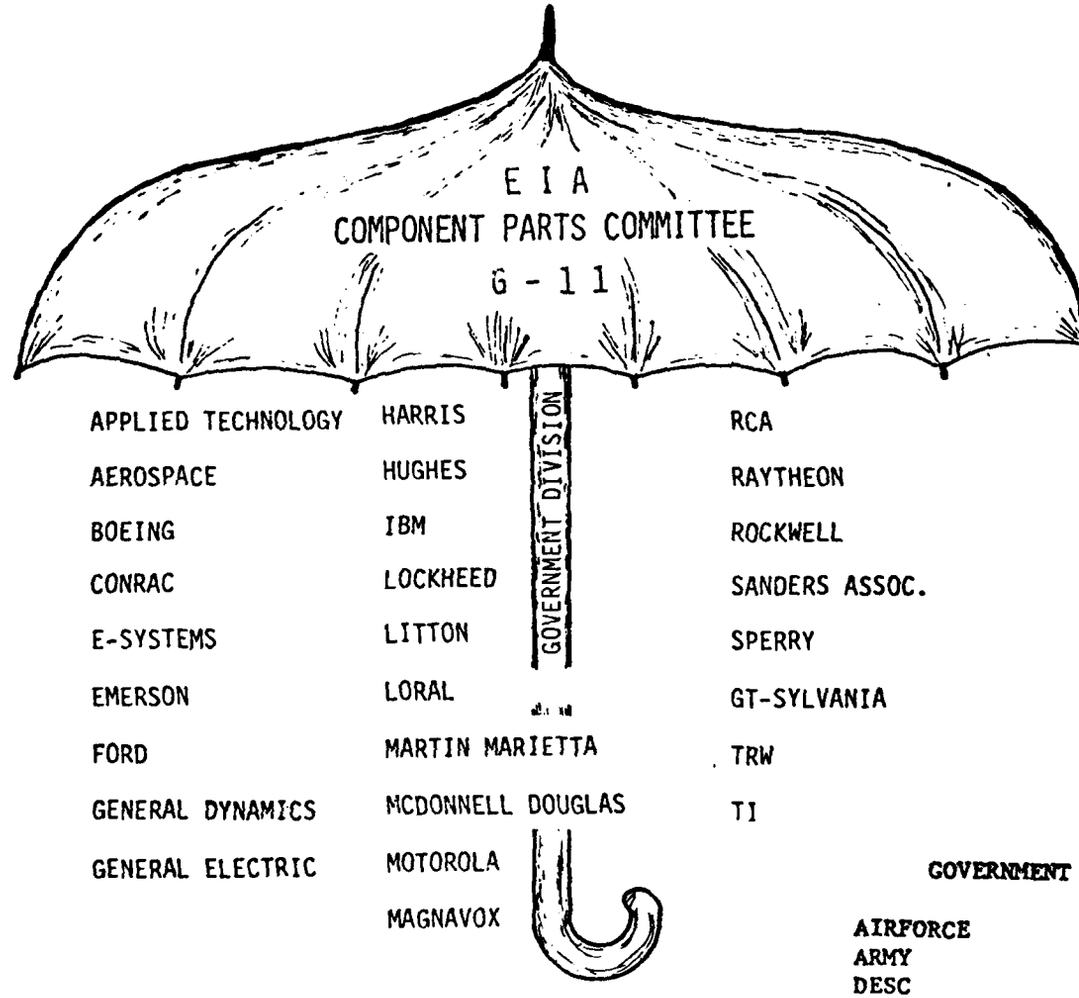


GOVERNMENT ASSOCIATES

AIRFORCE
ARMY
DESC
DMSSO
NASA
NAVY

ENCL 1

G-11 REPORT

1. AEROSPACE CONNECTOR STATUS
2. FILTER PIN CONNECTORS
3. UNUSED SOCKETS

ENCL 1

CONNECTORS

FOR

AEROSPACE APPLICATIONS

EIA-G11 TASK 06-80

W. L. NESHEIM
CONNECTOR TASK SPONSOR

47

ENCL 1

USER VIEWPOINT

TOO LITTLE IMPROVEMENT AT TOO GREAT A COST

- MIL-C-38999 SERIES I AND II
  IMPROVEMENT-SERIES III AND IV ?
- MIL-C-55302 130 + SLASH SHEETS

NO STANDARDIZATION - MULTI-SPECIFICATION/SINGLE SOURCE

NEW CONNECTORS ARE SIMPLY PROPRIETARY PRODUCTS SOLD UNDER GOVERNMENT SANCTIONED PROLIFERATION

EIA-G11-06-80

ENCL 1

HOW

- o DETERMINE THE NEED
- o IMPROVE EXISTING CONNECTORS
- o NEW TYPE, IF JUSTIFIED

  PREPARE SPECIFICATION
  DESIGN COMPETITION
  TEST CANDIDATES
  FIX WEAK AREAS
  RELEASE FOR PROCUREMENT

EIA-G11-06-80

ENCL 1

EIA-G11 TASK 06-80 AEROSPACE CONNECTOR

1. DRAFT SPECIFICATION IN USER CIRCULATION

2. RESPONSE:

   16 OEM
   6 GOV
   DESC SPECIAL DISTRIBUTION

3. COMMENTS:

   - o EXCELLENT - INTERESTED
   - o MOST GAVE DETAILED TECHNICAL
   - o A FEW PROVIDED GENERAL COMMENTS

ENCL 1

GENERAL COMMENTS:

- THE ATTACHED COMMENTS ARE THE RESULT OF OUR REVIEW OF YOUR PROPOSED MILITARY SPECIFICATION FOR AN AEROSPACE CONNECTOR. IN GENERAL, THE SPECIFICATION IS A GOOD START AND THESE COMMENTS ARE OFFERED TO HELP IMPROVE ITS CONTENT.

- THE SUBJECT SPECIFICATION IS ACCEPTABLE AS WRITTEN. THIS COMMAND RECOGNIZES POTENTIAL FOR APPLICATION OF SUBJECT SPECIFICATION, BUT HAS NO IMMEDIATE REQUIREMENTS.

- PRESENT MIL-SPEC CONNECTORS SATISFY OUR NEEDS ADEQUATELY. CREATING ANOTHER SPEC JUST ADDS CONFUSION TO AN ALREADY CONFUSING ARRAY OF CONNECTOR SPECS.

- PRACTICALLY ALL THE REQUIREMENTS IN THIS "TARGET SPEC" ARE ALREADY MET OR EXCEEDED BY MIL-C-38999. BY ADDING A FEW REQUIREMENTS (OUTGASSING, STRESS CORROSION, ETC.), WE HAVE THE CONNECTOR OF THE FUTURE.

- BEFORE A NEW GENERATION OF CONNECTORS IS DEVELOPED WE SHOULD BE SURE A CURRENT SERIES DOESN'T MEET THE REQUIREMENTS OR CAN'T BE UPGRADED TO FULFILL EXISTING AND FUTURE REQUIREMENTS.

ENCL 1

FILTER PIN CONNECTOR STANDARDIZATION

- DEAD??
- DOES IT FIT THE REQUIREMENT?
- WHAT ARE THE REQUIREMENTS?

ENCL 1

1. MULTIPLE USAGE

   MORE THAN 40 PROGRAMS

   F-5, F-15, F-16, F-18, AV8B,
   E2C, LAMPS .....

2. LONG TERM LOGISTICS

3. COST-RELIABILITY-LIFE CYCLE

4. NEW/CONTINUING/DYING TECHNOLOGY

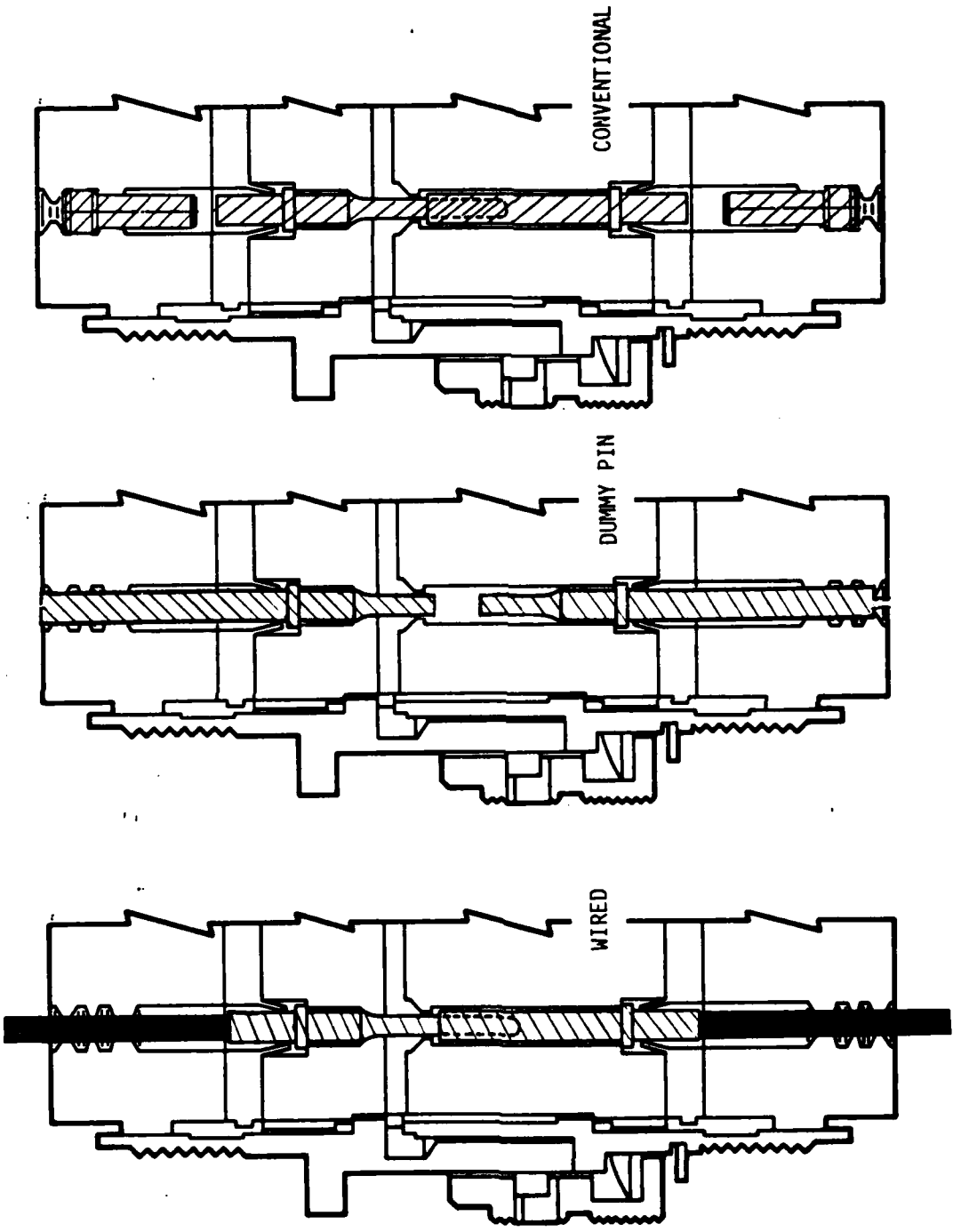
5. USE IN DESIGN/DESIGN FIX

ENCL 1

UN-USED SOCKETS

- SEALING PLUGS & CONTACTS
- SEALING PLUGS ONLY
- DUMMY PINS

ENCL 1



ENCL 1

E.I.A. P-5.1

CONNECTOR WORKING GROUP

ACTIVITIES REPORT

Robert M. Pontone
TRW CINCH CONNECTORS
Chairman P-5.1

During the past year, our work in P-5.1 has, for the most part, been directed at three major areas.

First and probably foremost has been our work in establishing an industry posture on gold reduction for electrical connectors.

The second has been the review and rewrite of the existing Test Procedures in E.I.A. Standard RS-364 for compatibility with the Test Procedures of the IEC Document #512 and MIL-STD-1344 and then to rewrite these documents into IEC format.

The third area of committee involvement relates to the preparation and development of new testing procedures for inclusion into RS-364.

With regard to gold reduction, our work under Phase I Gold Localization is complete and culminated with the revision of five military specifications and the planned revision of three more within the next year.

Revised Specification:

MIL-C-24308
MIL-C-28754
MIL-S-83502
MIL-C-83503
MIL-S-83734

Scheduled for Revision:

MIL-C-21097
MIL-C-39029
MIL-C-55302

P-5.1 has now embarked on Phase II of our originally scheduled approach to gold reduction.

ENCL 2

Under Phase II we will determine if a gold thickness of less than 50 microinches in thickness can meet the porosity test requirements of TP-53 and also satisfy the performance and environmental requirements of selected Military specifications.

Nine member companies have agreed to participate in this exercise. They will be evaluating products which they currently produce with varying thicknesses (50 microinches and less) of gold on the mating surfaces.

Results of this study will be reported at our next P-5.1, the week of October 18, 1982.

With the completion of Phase II our findings and the results of testing will be forwarded to Mr. Joseph Kobylack at DESC for coordination with the services.

The review and rewrite of all existing TP's in RS-364 is virtually complete. All existing TP's have been revised and written in IEC format. They are now being circulated for industry approval.

New Test Procedures currently being developed in committee are as follows:

TP-15 Pin Strength

The purpose of this procedure is to establish a method to determine the ability of a pin contact to withstand the application of a load applied perpendicular to the pin length without causing the pin to set or become permanently deformed beyond a specified limit. This test will be applicable to size 20 and smaller contact pins.

TP-44 Corona Testing Procedure

This procedure will establish a test method to assess the ability of an electrical connector to operate corona-free at working voltages up to the extinction voltages.

TP-46 Continuity Test Procedure for Electrical Connectors

This document was developed to define a method of detecting a continuity failure of 1.0 microseconds or longer in a mated electrical connector when the mated electrical connectors are being subjected to a dynamic stress such as shock or vibration.

ENCL 2

TP-48 Procedure for Plating Thickness Measurement

This procedure provides the requirements for determining plating thicknesses on electrical contacts. The procedure will cover all of the currently acceptable methods of determining plating thicknesses.

TP-52 Solderability Test

This Test Procedure is being developed to establish test methods for determining the solderability of contact terminations. The intent is to include four methods, hand soldering, pot (or dip) soldering, wave soldering and reflow soldering.

TP-56 Resistance to Soldering Heat

This Test Procedure will establish a test method to assess the effects of soldering heat, as generated by various soldering techniques, on electrical connectors.

TP-57 Bending Moment

This test will provide a uniform method for determining the ability of a wrapost and/or P.C. type pin or socket termination area to withstand a specified bending moment.

TP-58 Temperature Life under Electrical Loading

The purpose of this procedure will be to determine the effects on the electrical and mechanical characteristics of connectors when exposed to elevated temperatures while under electrical loading.

RS-XXX Temperature Rise, Electrical Contacts

This procedure will detail the requirements for determining the temperature rise of mated or unmated electrical contacts when carrying a specified current.

ENCL 2.

New Business and future planned work for P-5.1 during the next year will include:

A) Review and investigate the need for a Test Standard for "Compliant Pins" or "Press-Fit" contacts.

B) Develop a Test Procedure for an EMI Stirred Mode Test.

C) Review the feasibility of developing a testing procedure to determine if wire strands have been cut or broken when wire is terminated to I.D.C. contacts.

D) Determine the needs for establishing provisional connector specifictions for use within the new IEC-Q system.

E) Continued support to the various services as the need and occasions arise.

ENCL 2

SAE A-2C SUBCOMMITTEE
ELECTRICAL CONNECTORS

Max Bellard, Chairman

ACTIVITIES REPORT - Standardization Planning Meeting on Connectors (FSC 5935) 25-27 Aug. 1982

Gentlemen:

SAE A-2C is a technical committee whose function is to provide assistance to the Aerospace Industry & US Government in the area of electrical connectors related to the interconnect wiring system of an aerospace vehicle. It also, maintains close liaison with the Military, DESC, Airlines, EIA and the International Standards Organization (ISO) in this area.

A-2C members come from manufacturers of the connectors, its related components and tooling and from the military/commercial users community. Currently, we have 57 active members and 11 liaison reps from various military agencies and airlines.

Until recently, A-2C was a subcommittee of SAE A-2 Electrical/Electronic committee. A-2 has been restructured into three separate committees each reporting to the Aerospace Council of SAE. These are:

- AE-7 Aerospace Electrical Power & Equip. J. Frencho, Ch.
- AE-8 Aerospace Electrical Distribution Systems & Equip. R. Soloman, Ch.
- AE-9 Aerospace Avionics & Integration. A. Crossgrove, Ch.

Our area of interest will be under the AE-8 committee and will, most likely have a new designation.

LISTED BELOW ARE THE RESULTS OF A-2C's EFFORTS FOR THE PAST YEAR:

1 - Responding to a request from D. Hood, Chairman and US Principle member of NATO's A&C 301(SG-1) (STG-2) committee, we have converted the following NATO documents into Allied Standardization Publications:

NEPR 27,	MIL-C-26482 series 1	now	AstanP 3, Part 2,	Edition 1
NEPR 28,	MIL-C-5015	"	AstanP 3, Part 3,	"
NEPR 29,	MIL-C-24308	"	AstanP 3, Part 4,	"
NEPR 44,	MIL-C-22992	"	AstanP 3, Part 7,	"
NEPR 57,	MIL-C-39029	"	AstanP 3, Part 11,	"
NEPR 58,	MIL-C-22520	"	AstanP 3, Part 12,	"
NEPR 90,	MIL-C-81659	"	AstanP 3, Part 13,	"
NEPR 91,	MIL-C-26482 series 2	"	AstanP 3, Part 17,	"
NEPR 99,	MIL-C-38999	"	AstanP 3, Part 18,	"
NETR 7,	MIL-STD-1330	"	AstanP 4, Part 1,	"
NETR 9,	MIL-STD-1344	"	AstanP 4, Part 2,	"

NETR 7 & 9 were completed by EIA P-5.1 Group. All of these document were converted into the new format without any changes or updating from the originals.

2 - On Safety Wiring of connectors, our committee does not recommend that all threaded connectors be safety wired on an aircraft, but the ones that need to be should be safety wired and identified inthe appropriate maintenance/overhaul manuals. We also recom-

ENCL 3

mend that all threaded connectors located in a vibration environment have self locking features. This recommendation has been forwarded to A-2X for consideration.

3 - The uncoupling torques of MIL-C-38999, shell sizes 8,9,10,11,12 and 13 should be increased from 1 to 2 inch/pounds. Our recommendation on this item has been sent to the Air Force.

4 - We are attempting to establish a plan for the definition of shielded and double shielded contacts. There is need for a method of identifying shielded and double shielded contacts by gage size based on the outer diameter of the pin contact with reference to the cavity size where said contact is used, however, it does not appear that a redefinition is possible for existing contacts.

5 - The decision by the military to change MIL-C-85049 to eliminate all plating options except for anodic coating will create problems where conductivity is required. Chaired by Bill O'Hirok, users, manufacturers,and military personnel interested in this item met in a special session during our May meeting to resolve this problem. We expect the results of that meeting to be considered at this Standardization Analysis meeting for resolution.

6 - On the subject of Tooling - A-2C comments on MIL-I-81969/17B&/18B are being co-ordinated by Joan Jacobsen of Astro Tools.

Comments on MIL-I-81969/34, removal tool, were submitted to the Navy. Indications are that since the diameter has been opened up the conical tip is acceptable. A spherical tip was proposed to solve the problem of contact binding.

7 - We have looked into NAC's suggestion to modify the Probe Damage Apparatus of MIL-C-39029B. Further discussion by A-2C on this item is necessary before any recommendation can be submitted.

8 - We are looking into a Compression Force Test proposed by NAC. Comments on this item are being co-ordinated by our Norm Hug.

9 - Our proposed MS14197 Sealing Plug standard was not accepted. To satisfy all connectors with a straight plug, it generated 28 part numbers including the 7 knob-on-end type required for MIL-T-81714. Attempting to limit this item to 7 part numbers only, the Navy has circulated for comments a new knob-on-end design under MS27488 Rev. "J".
Although we are supportive of any action which will reduce proliferation, we do not know how the Navy intends to resolve the interference problem with back hardware, inserting the wrong end into the grommet or prevent the "head" of the plug from being pushed into the cavity below the surface of the grommet. This has been a constant nuisance with knob-on-end type plugs and one of the main reasons for us selecting a straight plug design.

10 - On the subject of contact reliability - A final report on Min/Max die closures is in the process of being completed. Our final conclusion will be that the only method to determine whether you have

ENCL 3

a loose joint (clicks) is one by feel. Electrical-mechanical tests conducted were not conclusive.
Since fretting corrosion of electrical contacts has been limited to a small number of connectors located in adverse vibration environments, we do not recommend any changes to MIL-C-39029 at this time. We feel that a new M39029/XXX contact should be prepared if and when service experience and usage justify the addition of a high force contact standard.

11 - We are conducting a study to determine if it is feasible to establish torque values for threaded connectors and connector back hardware. This is in response to an Air Force request.

12 - We have briefly reviewed the reasons for the existance of plastic installing/removal tools. Although we have no conclusions, this is an area that I feel needs to be further explored.

13 - We are supporting EIA P-5.1 Group in their work on Temperature Rise of Connectors, Connector Test Specifications and Contact Plating.

14 - We have formed within A-2C a Task Group dealing with ISO standards chaired by Hugh Kearney of Bendix. One of the documents reviewed and commented on is N410 and N411, High Temperature Miniature Electrical Connectors, Type 1. We are supporting the adoption of MIL-C-22520 for an ISO definition of crimping tools.

Gentlemen, this concludes my report and want to thank you for the opportunity to be here with you today.

Sincerely

Max Bellard

ENCL 3

IEC SC48B REPORT

W. D. O'HIROK ITT CANNON
TECHNICAL ADVISER USNC

The International Electrotechnical Commission (IEC) was founded in 1906 and consists of 43 countries including Eastern Europe (Poland, Hungary, Roumania, etc.), Russia, China (Mainland) and Japan amongst others. The Technical Committee (TC) responsible for electrical connectors is TC48 "Electromechanical Components" thru its sub-committee (SC) SC48B "Connectors". The United States holds the Secretariat for TC48 and SC48B. A. Champlin (Bendix) is Secretary of TC 48 and T. Economon (Grumman) is Secretary of SC48B. J. Gentry (Positronics) is Assistant Secretary of TC48 and SC48B. C. Ladstatter (Amphenol) is Secretary of the Working Group for Test Procedures that are contained in IEC Publication 512 and originally based upon MIL-STD-1344 and an EIA RS. IEC is important to us since NATO is obligated to adopt IEC documents wherever possible. Based on our NATO treaty agreements, our military is similarly obligated to revise their military specifications to be in accord with the NATO documents. As a result, it's most important that the U. S. fully support and participate in IEC to protect our interests.

I reported on the results of our last meeting of IEC TC48/SC48B in Montreux Switzerland June 1981 at the Five Year Program Analysis meeting in August 1981. In the interim, additional Test Procedures were reviewed and commented upon. We are also processing four documents which have been in the "mill" since the early 1970's. When we consider that EIA can be relatively quick in responding to the need of developing standards (ref. EIA, P-6 Report wherein they have issued approximately one Test Procedure per month since 1978 for Fiber Optics), and that the military usually takes longer because of the need for greater coordination, one can recognize why the IEC, attempting to reach agreement or coordinate amongst 43 nations, can take so much time. The four documents are:

1. Broadcast/audio/microphone connector (manufactured by ITT Cannon, Switchcraft, Ampheonol and others).

2. Entertainment/audio miniature phone plug connectors such as those used in transistor radios, tape recorders, etc. After considerable effort to combine (trade-off tolerances) the two leading most world-wide used connectors into one common standard, the result was a "kluge" wherein it would work in neither application. The decision, unique in IEC standardization, is to cover both the Japanese and U. S. designs in one common document and let the international market place dictate the de facto standard.

ENCL 4

3. The tab connectors required considerable coordination to recocile the metric/customry unit problem. This was accomplished and the document is in final draft for manuscript.

4. The trapezoidal or D-Subminiature connector was originally prepared as a solder type, revised to include crimp contacts per MIL-C-24308. The German delegation in particular opposed contact standardization on the basis that the Europeans only procure connectors with contacts and therefore there was no need to settle or agree to any one design. As a result, we revised the document to remove the requirement for crimp and reverted to an all solder version. The U. S. was totally opposed to standardization without defining the removable contact. The document also expanded the use of materials far beyond the limitations imposed by our MIL Spec. A final draft is currently being prepared.

The IECQ (The International Electrotechnical Commission Scheme for Qualification) went into effect 1 Jan 82. The IEA P-5.1 Working Group is preparing interim Generic, Sectional and Blank Detail Specifications to permit manufacturers to initiate qualification of connectors.

ENCL 4

Encl 5

NATO Report

By: Dan Mullin, Navy-AS

(1) Thanks to SAE A-2C for converting nine NATO Electronic Part Recommendations (NEPR's) to Allied Material Standards Publications (ASTANPs). This effort was headed by Conrad Ladstatter with John Wilkinson acting as chairman of the group.

(2) STANAG No. 4120 - NATO Electronic Parts Recommendations (AEtP-2) and NATO Electronic Technical Recommendations (AEtP-3) have been replaced or will be replaced by STANAG No. 4165, NATO Standardization Agreement (STANAG) Allied Material Standards Publications (Astan Ps).

(3) NATIONAL QUALIFIED PRODUCTS LISTS (Preferred Parts List)

(a) The AC/301 basis for the use of NEPRs and NETRs is that standardization and specification engineers use these internally standardized components when new projects are developed. The nations should use NEPRs and NETRs for selecting components. Germany suggested that the NEPRs and NETRs be changed to Allied Documents for international use. A discussion period followed, with each nation expressing what it desired, or the concern with the duplication of part numbers.

(b) The Chairman requested that the nations use MIL-C-24308 and NEPR No. 29 as a starting point, since every nation uses it.

(c) Each nation has parts lists peculiar to its own usage.

ENCL 5

France has a preferred list, which contains products which satisfy the needs of the three services. The services choose only these products. France also has a list of new developments which are untested or unqualified.

Germany has a qualified products list which is the preferred part. New types are used to gain experience and are tested, then qualified. There is also a list not to be used on new construction.

Italy has a list of preferred parts.

Netherlands has a list of preferred parts and a list of unqualified parts for future use.

The United Kingdom has three tables:

Table I - Qualified Products
Table II - Parts for spares and repairs
Table III - Not to use products

Denmark has a list of preferred parts, a list of non-standard parts and a guidance list.

The United States uses Military Standard parts for all services. Non-standard parts must be submitted to a Parts Control Board (PCB) for approval. Preferred items are listed in MIL-STD-1353 Electrical Connectors, Plug In Sockets and Associated Hardware, Selection and Use of.

Canada uses a qualified products list.

ENCL 5

(4) The STUDY GROUP:

(1) During the October 1981 meeting the members volunteered to accept tasks to begin in 1981 and with the completion dates being determined by the tasks.

TASK PLAN AND ASSIGNMENTS

TASK	TITLE STANDARDIZATION OF	CUSTODIAN	START DATE	INFORMATION DATE	COMPLETION DATE
1.	Wire	United States	1981	1982	1983
2.	Cable (Jackets)	Canada	1981	1982	1983
3.	Mono & Multiconductor Wire	Italy	1981	1982	1983
4.	Cable & Wire Screening (Plated & Unplated)	Germany	1981	1982	1983
5.	Mono & Multiconductor Signal Cable Assembly	Denmark	1981	-	-
6.	Mono & Multiconductor Power Cable Assembly	Netherlands	1981	-	-
7.	Testing Methods for Wire & Cable (Electrical, Mechanical & Environmental)	Canada	1981	-	-
8.	Testing Method for Wire & Cable Assemblies(Electrical, Mechanical and Environmental)	United Kingdom	1981	-	-
9.	Testing Methods for Contact to Conductor Connection	France	1981	1982	1983

ENCL 5

Defense Logistics Agency
Dayton, OH. 45444

July 20, 1982

Atten: DESC-E (ESS/Mr. Marbais)

Subject: STANDARDIZATION PROGRAM ANALYSIS FOR FSC 5935, CONNECTORS MEETING 25-27 AUGUST 1982, HOLIDAY INN, MIAMISBURG, OH

Reference: Problem No. ES-79-5935-P-05 Environmental Connectors; Paragraph 3.e.

Gentlemen:

Being a large volume user ($8 million min per year) of miniature circular connectors, I would like to comment pertaining to the last sentence of the above reference, "When series III and IV of MIL-C-38999 are put into MIL-STD-1353, MIL-C-83723, series III will also be inactiviated for Air Force new design". It is requested that MIL-C-83723 series III connectors not be made inactive.

It seems appropriate that the Military should be made aware of some facts of what is really happening from an OEM's point of view in the usage of MIL-C-83723 series III connectors as well as MIL-C-26482 connectors. A recent marketing analysis indicates that over 70% of the miniature circular connectors used are of the MIL-C-83723 series III and MIL-C-26482. MIL-C-26500 connectors is not included in part of the 70%. The analysis also indicates that connectors to MIL-C-83723 and to MIL-C-26482 are used in quantities three (3) times greater (number of units, not dollars) than all of MIL-C-38999, of all series combined. All of the commercial aircraft, including some new designs, as well as some of the existing and new Military aircraft have selected and are using miniature circular connectors to MIL-C-83723 and MIL-C-26482. All of the new ARINC 700 black boxes will be using the MIL-C-83723 connectors. The contacts are identical in the MIL-C-83723 series III and in the MIL-C-26482 series II which results in a very cost effective program of contact standardization. In addition, the contacts, size-for-size, cost less than the MIL-C-38999 contacts. This now becomes the foundation of a true and honest standardization program. Standardization programs have a difficult time of accomplishing its defined task if the defined standard item is of relative low volume and high cost when compared to other items that are acceptable, have a higher volume as well as a lower cost with equal performance.

The performance of the MIL-C-83723 series III, and in many instances the MIL-C-26482 series II connectors, will meet the requirements of MIL-C-38999 even though the MIL-C-83723 and MIL-C-26482 does not reflect these requirements. A large amount of satisfactory performance exists for the MIL-C-26482 and MIL-C-83723 series III connectors. I have not seen any factual data or evidence that MIL-C-38999 connectors have any better reliability. In fact, at the last SAE A-2C Connector meeting in Dayton, OH., there may be data that indicates less reliability.

ENCL 6

As an example of improved performance, the threaded MIL-C-83723 series III is available in aluminum or stainless steel shells with a self-locking coupling nut. The MIL-C-83723 series III threaded connector, without the high cost of requiring EMI/RFI grounding fingers, meets lightening, EMI and RFI requirements. No special adaptors are required to terminate the the overall metallic braid. Military aircraft are flying today with these improvements which results in lower cost by using MIL-C-83723 series III connectors.

A recent cost-weight study for a new aircraft using MIL-C-26482, series II and MIL-C-83723 vs. MIL-C-38999 series III was made and the weight would increase by 120 lbs. per aircraft and a cost increase (even with the recent price cutting) resulted in over $200,000 per aircraft if one used the MIL-C-38999 series III connector. Itmakes little sense to standardize and use a connector series that weighs and costs more when there are connectors manufactured and qualified to MIL-C-26482 and to MIL-C-83723 that provide adequate performance. These two specifications will be around for many many decades. As a matter of interest, the new MIL Specs for plug-in relay receptacles will be using the same MIL-C-83723 series III contacts. That is an example of real standardization.

There is an increasing number of OEM's and airlines that are recognizing the major advantages of using miniature connectors of MIL-C-83723 series III and MIL-C-26482 series II. The Military is urged to keep the Specs active and if necessary update the specifications to reflect the true connector performance. When this occurs the Military will truly have an effective foundation for a Standardization Program.

N. L. Hug

N. L. Hug
SAE A-2C Connector Subcommittee
Member

NLH;sr

DOUGLAS AIRCRAFT COMPANY
3855 Lakewood Boulevard, Long Beach, California 90846

N. L. Hug, C1-E22 (36-43)

MCDONNELL DOUGLAS CORPORATION

ENCL 6

Bendix
Electrical Components Division

Sidney, New York 13838
The Bendix Corporation

Mr. Richard Marbais
DESC-ESS
Defense Logistics Agency
Defense Electronics Supply Center
Dayton, OH 45444

October 29, 1982

SUBJECT: The Addition of MIL-C-38999 Series III into MIL-STD-1353 vs. MIL-C-83723 Series III

REFERENCE: 1. 1982 DESC Five Year Standardization Meeting
2. Problem #ES-83-5935-E-01
3. Problem #ES-79-5935-P-05

Dear Rich:

We appreciate the opportunity to have our comments relative to the referenced problems included in the minutes of the referenced meeting.

To compare the two connector series (83723 III and 38999 III) in terms of what one company uses, or what is not substantiated by accepted facts is subjective and places the government in a tedious position. Statements regarding weight, costs, etc. are not "proven" as a whole truth and may be totally refuted by other "sources".

I am attaching a comparison chart that picks performance or feature items from the two specifications. These are facts! They are in the specs! They are not claims but what we all know the manufacturer must warrantee and guarantee to meet.

Claims of "I could do this by changing that" etc. etc. are irrelevant and not pertinent to the problem analysis. Obviously, 38999 Series III is the highest rated performer. Either connector can physically be changed to enhance its performance. When this is done, you simply do not have the connector you had before. It's that simple.

One thing must be made clear. We recognize that 83723 Series III is necessary for retrofit or adequate for lower performance requirements than 38999 Series III. We also recognize the fact that it's in the Air Force system. Companies use them and there must be means to obtain them. That is not the issue. If newer systems need higher performance; i.e., scoop-proofing, you simply choose the higher performer.

The addition of 38999 Series III to MIL-STD-1353 isn't only desirable, it's necessary. It is not a "brand new" connector that is not in the military system or not what the specification dictates it must be. It's qualified!!!

If the two series can not coexist than why are new arrangements or upgrading necessary for an older connector? Are these "field proven" with years of acceptance in MIL-STD-1353? Of course not!

The question is not one of popularity. It is not a question of eliminating 83723 Series III. It is a question of whether Seires III of 38999 should be added to MIL-STD-1353. Of course it should. Unfortunately, the "threat" to 83723 Series III (whether real or imagined) has resulted in neglecting the facts.

I would urge you to provide a means for 83723 users an opportunity to obtain that connector, but to keep a superior connector from those wishing it (compare the specs) is not necessary.

Please remember, a physical upgrading is introducing "another connector", "another part number". Is it necessary? If so, fine, 38999 Series III should be upgraded also.

Thank you for your consideration to our remarks.

Sincerely,

Robert K. Van Voris

Robert K. Van Voris
Manager, Government Liaison

RKVV/lb
att.
cc: F. Dorfmeyer
D. Peilmeier
J. Kerr
J. Kobylack

ENCL 7

ENCL 7

FEATURE	38999 Series III (Rev. H)	83723 Series III (Rev. D)
Scoop-Proof	Yes	Nc
Hi-Density Insert Patterns	Yes	No
Wire Range	12 through 28	0 through 24
Electrolytic Erosion	Yes	No
Humidity After Temp. Life	Yes	No
Durability (With Ground Fingers)	500	250
Quick Coupling	1 Complete Turn	4 or More
High Impact Shock	Yes	No
External Bending Moment	1000 in/lb Max	500 in/lb Max
Locksmith Keying	Yes	No
Sine Vibration	60 G's - 36 hrs with weight, Temp Cycle (-65°F to +392°F)	No Specified Requirement
EMI Min (Electroless Nickel) 1,000 MHz 10,000 MHz	 85 dB 65 dB	 45 dB No Requirement
Random Vibration, Level J	@ Temp (392°F) With Weight	Ambient Temperature, No Weights
Random Vibration, AIR 1557	Yes	No Specified Requirement
Sure Start Thread	Yes	No
Accessory Thread Strength	100 to 250 in/lb	75 to 175 in/lb
Fail-Safe Breakaway	Yes	No
Reliability Assurance Program MIL-STD-790	Yes	No

UNITED TECHNOLOGIES SIKORSKY AIRCRAFT

North Main Street
Stratford, Connecticut 06601
(203) 386-4000

July 13, 1982

Mr. Richard V. Marbais
Defense Electronics Supply Center
Attention DESC-ESS
Dayton, Ohio 45444

Reference: Standardization Program Analysis Problem ES-79-5935-P-05

As an airframe manufacturer, Sikorsky Aircraft views recent revision activity on MIL-STD-1353 with increasing concern. The recent deletion of MIL-C-26482 Series II and the proposed inactivation of MIL-C-83723 Series III are steps which make compliance with MIL-STD-1353 difficult and costly.

It has been our experience that most newly developed aircraft make use of significant numbers of existing components. The former practice of developing newer generations of connectors that retained intermateability with previous ones, allowed users to employ the latest types on new models without necessarily modifying GFE and CFE equipment. This contributed to lower development costs and shorter lead times. In developing MIL-C-38999 Series III and IV this practice was departed from. Inactivation of MIL-C-26482 Series II and MIL-C-83723 Series III in favor of MIL-C-38999 leaves users with a choice of a very costly conversion program on existing equipment or non-compliance with the standard.

It is our view that the restraints of budget and lead time will force most manufacturers to continue using these types, thus making non-compliance with the standard a common practice. Our concern is that the subsequent weakening of the standard will result in the proliferation of a variety of connector types and arrangements in future years. We believe that if MIL-STD-1353 continues to include these types, connector standardization can effectively be accomplished in a manner consistent with minimum life-cycle costs.

Very truly yours,

UNITED TECHNOLOGIES CORPORATION

Ronald J. Caron

Ronald J. Caron
Electrical Detail Design Supervisor
SIKORSKY AIRCRAFT DIVISION

RJC/amm

cc: A. M. Bellard, Chairman
SAE Subcommittee A-2C
234 Church Street
Suite 804
New Haven, CT 06510

ENCL 8

VOUGHT CORPORATION

Post Office Box 225907 • Dallas, Texas 75265

9 July 1982

Defense Electronics Supply Center
Dayton, Ohio 45444

Attn: DESC-E(ESS/Mr. Marbais/513-296-5541/js)

Subject: Standardization Program Analysis
Draft for FSC 5935, Connectors

Gentlemen:

Problem No. ES-79-5935-P-05 as defined in the subject document on page 9 is of concern to Vought Corporation. Series III connectors are specified on GFE equipment for which Vought must provide mating connectors. Additionally, Test Equipment being designed must also contain connectors which can be mated with the GFE equipment. It is Vought's concern that the inactivation of Series III connectors would serve to restrict their availability, inflate costs and extend lead time. The impact of this action becomes more significant due to the absence of suitable intermateable replacement connectors.

It is requested that inactivation of these connectors be delayed until a suitable intermateable replacement is available.

Yours truly,

George Gresko
Engineer Specialist

GG/bm

copy to: Glenn Babb Air Force (85)
AFALD/PTES
Wright-Patterson AFB
Dayton, Ohio 45433

ENCL 9

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
NAVAL AIR SYSTEMS COMMAND HEADQUARTERS
WASHINGTON, DC 20361

IN REPLY REFER TO
AIR-54122A/DRB/amh

AUG 3 1982

Gentlemen:

Enclosure (1), a Navy design proposal document, is forwarded for your information and comment under Engineering Practices Study Project #5935-3325.

It is requested that your comments on the feasibility of the project and recommendations for the improvement of the document be sent to the Naval Air Systems Command, Washington, D.C. 20361, marked for the attention of Mr. D. M. Pielmeier (AIR-543A1A) and Mr. D. R. Ballard (AIR-54122A). Any response that contains company proprietary information should be so marked and will be treated accordingly.

It is requested that comments be received on or before 4 October 1982.

Sincerely,

Richard Backora
By Direction

Encl:
(1) NDP ***** Connector, Aircraft, Armament, General Purpose

ENCL 10

Distribution List:

Society of Automotive Engineers
400 Commonwealth Drive
Warrendale, PA 15096

Electronic Industries Association
2001 Eye Street N.W.
Washington, D.C. 20006

Aerospace Industries Association
1725 De Sales St., N.W.
Washington, D.C. 20036

ENCL 10

NDP - *****
2 Aug 1982

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*
* This Navy design proposal document is issued under *
* engineering practices study project number 5935-3325. *
* The six part specification format is used for ease of *
* reference only. *
*
****

CONNECTOR, AIRCRAFT, ARMAMENT, GENERAL PURPOSE

1. SCOPE

1.1 Scope. This document covers the performance requirements for 3 series of environment resisting quick disconnect shielded connectors. Connectors are intended for interfacing aircraft to stores and are rated for continuous operation from -55 DEG C to 200 DEG C. The upper temperature is the maximum internal hot spot temperature resulting from any combination of electrical load and ambient temperature. Connectors are also operational at an intermittent ambient of 350 DEG C.

1.2 Description.

a) All series are "scoop proof" and assure proper orientation and shell-to-shell continuity before circuit continuity.

b) Method of interfacing circuits need not be restricted to pins and sockets.

c) Two series are axial disconnect types. The third is rear-launched/shear disconnect.

d) One series of axial disconnect connector shall employ lanyard release capability.

e) All series shall be intermateable.

ENCL 10

1.3 Definitions.

1.3.1 Signal/Power Transfer Device (SPOTD). A device or technique that transfers a signal or power from a connector to its mated counterpart connector, e.g. pins and sockets.

1.4 Classification.

a) Series.

I. Manual coupling.

II. Manual coupling with lanyard release.

III. Rail launched.

b) Types.

Receptacles - Wall mounting, front and rear.

Plug Types - Straight.

c) Classes.

1) Environment resisting.

2) Hermetic receptacles.

3) Submersible receptacles.

4) Flame resistant.

d) SPOTD Styles. Styles shall be as required for mating counterpart connectors. Plugs and receptacles shall be capable of using any style.

2. APPLICABLE DOCUMENTS

2.1 Issues of Documents. The following documents of the issue in effect on date of this document, form a part of this document to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-N-290 - Nickel Plating (Electrodeposited).
QQ-A-367 - Aluminum Alloy Forgings.
QQ-P-416 - Plating, Cadmium (Electrodeposited).
QQ-S-763 - Steel Bars, Wires, Shapes, and Forgings, Corrosion-Resisting.

ENCL 10

MILITARY

MIL-C-17	- Cables, Radio Frequency, Flexible and Semirigid, General Specification for.
MIL-B-5087	- Bonding, Electrical, and Lightning Protection, for Aerospace Systems.
MIL-T-5624	- Turbine Fuel, Aviation, Grades JP-4 and JP-5.
MIL-S-7742	- Screw Threads, Standard, Optimum Selected Series, General Specification for.
MIL-T-7743	- Testing, Store Suspension and Release Equipment, General Specification for.
MIL-A-8625	- Anodic Coatings, for Aluminum and Aluminum Alloys.
MIL-T-10727	- Tin Plating, Electrodeposited or Hot-dipped for Ferrous and Nonferrous Metals.
MIL-C-22249	- Connector Sets, Electrical Hermetically Sealed, Submarine.
MIL-C-22520	- Crimping Tools, Terminal, Hand or Power Actuated Wire Termination, and Tool Kits, General Specification for.
MIL-W-22759	- Wire, Electric, Fluoropolymer-Insulated, Copper or Copper Alloy.
MIL-W-25038	- Wire, Electrical, High Temperature and Fire Resistant, Aircraft.
MIL-C-26074	- Coatings, Electroless Nickel, Requirements for.
MIL-C-39029	- Contacts, Electrical Connector, General Specification for.
MIL-G-45204	- Gold Plating, Electrodeposited.
MIL-A-46146	- Adhesive Sealants, Silicone, RTV, Non-Corrosive (For Use With Sensitive Metals and Equipment).
MIL-C-55330	- Connectors, Preparation for Delivery of.
MIL-W-81381	- Wire, Electric, Polymide-Insulated, Copper or Copper Alloy.
MIL-I-81969	- Installing and Removal Tools, Connector, Electrical Contact, General Specification for.

STANDARDS

FEDERAL

FED-STD-H28	- Screw-Thread Standards for Federal Services.

ENCL 10

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-202	- Test Methods for Electronic and Electrical Component Parts.
MIL-STD-454	- Standard General Requirements for Electronic Equipment.
MIL-STD-461	- Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
MIL-STD-790	- Reliability Assurance Program for Electronic Parts Specifications.
MIL-STD-810	- Environmental Test Methods.
MIL-STD-889	- Dissimilar Metals.
MIL-STD-1285	- Marking of Electrical and Electronic Parts.
MIL-STD-1344	- Test Methods for Electrical Connectors.
MIL-STD-1373	- Screw-Thread, Modified, 60 DEG, Stub, Double.
MIL-STD-1385	- Preclusion of Ordinance Hazards in Electromagnetic Fields, General Requirements for.
MIL-STD-1760	- Aircraft/Store Electrical Interconnection System.
MIL-STD-45662	- Calibration Systems Requirements.

2.2 Other Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise indicated, the issue in effect on date of this document shall apply.

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA RS-359	- EIA Standard Colors for Color Identification and Coding (ANSI C-83.1-1973).

(Application for copies should be addressed to the Electronic Industries Association, 2001 Eye Street, N.W., Washington, DC 20006.)

ENCL 10

INTERNATIONAL STANDARDS ORGANIZATION

ISO/R 68-1973 - ISO-Basic Profile for Triangular Screw Threads, 0.25 to 5 mm.
ISO/R 261-1973 - ISO-Metric Screw Threads, General Plan, 0.25 to 300 mm.
ISO/R 262-1973 - ISO-Metric Screw Threads for Screws, Bolts, and Nuts, 6 to 39 mm.
ISO/R 965-1973 -
Part 1 - ISO General Purpose Metric Screw Threads, Tolerances, Principals, and Basic Data.
Part 2 - ISO General Purpose Metric Screw Threads, Tolerances, Limits of Sizes for Medium Quality Commercial Screw and Nut Threads, 1.6 to 39 mm.
Part 3 - ISO General Purpose Metric Screw Threads, Tolerances and Deviations for Constructional Threads, 1 to 355 mm.

(Application for copies should be addressed to the American National Standard Institute, 1430 Broadway, New York, NY 10018.)

American Society for Testing and Materials D1141 - Substitute Ocean Water.

3. REQUIREMENTS

3.1 Item Requirements. The individual item requirements shall be as specified herein. The military standards and specifications cited in paragraph 2., herein shall be used as guidance only.

3.2 Inspection. Connectors furnished under this document shall be evaluated for their relative performance and ability to meet the requirements.

3.3 Materials.

3.3.1 Metals. Metals shall be of a type meeting the requirements of this document.

3.3.1.1 Dissimilar Metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided for the life of the connector. The use of dissimilar metals in contact, which tend toward active galvanic corrosion (particulary brass, copper, or steel used in contact with aluminum or aluminum alloy) is not acceptable. However, metal plating or metal spraying of dissimilar-base metals to provide similar or suitable abutting surfaces is permitted. The use of dissimilar metals separated by a suitable insulating material is also permitted. Dissimilar metals and compatible couples are defined in requirement 16 of MIL-STD-454 and MIL-STD-889.

ENCL 10

3.3.2 Nonmetals. All nonmetallic materials shall meet the requirements of this document.

3.3.2.1 Hydrolytic Stability. All nonmetallic material shall be selected to meet the hydrolytic reversion resistance requirements specified in requirement 47 of MIL-STD-454.

3.3.3 Fungus Resistance. Materials used in the construction of these connectors shall be fungus inert in accordance with requirement 4 of MIL-STD-454.

3.3.4 Nonmagnetic Materials. The relative permeability of the wired, assembled, and fully mated connector assembly shall be [illegible] than 2.0 when measured in accordance with 4.7.27.

3.4 Design and Construction Characteristics.

3.4.1 Signal/Power Transfer Devices. Any technique meeting the requirements of this document. Non-hermetic, non-submersible shall be removable and front release.

3.4.1.1 Minimum size of contacts, if used, shall be size 20. The termination end of the size 20 contact shall accept the following wire sizes: 20 and 22 AWG, or 24 and 26 AWG.

3.4.1.2 SPOTD Types. In general, SPOTDs are intended for electrical wire termination, although other types may be required by signal characteristics and insert design.

3.4.2 Insert Design. The insert design shall meet the requirements of this document.

ENCL 10

3.4.2.1 One insert configuration must be capable of interfacing the primary interface signal set of MIL-STD-1760 (see Table I).

TABLE I. MIL-STD-1760 Signal Set.

Signal Name	Characteristics
High Bandwidth 1	2 GHz Coax
High Bandwidth 2	2 GHz Coax
High Bandwidth 3	20 MHz Coax
High Bandwidth 4	20 MHz Coax
Mux Bus A	Twisted shielded pair
Mux Bus B	Twisted shielded pair
Audio	10 KHz Twisted shielded pair
Fiber Optics A	
Fiber Optics B	
Release Consent	28V 1 Amp
Interlock	28V 5 Amp
Interlock Return	28V 5 Amp
Address A4	28V 100 ma
Address A3	28V 100 ma
Address A2	28V 100 ma
Address A1	28V 100 ma
Address A0	28V 100 ma
Address Parity	28V 100 ma
Address Return	28V 100 ma
Ground	10 Amp
28 VDC Power 1	28V 10 Amp
28 VDC Return	28V 10 Amp
28 VDC Power 2	28V 10 Amp
28 VDC Return	28V 10 Amp
115 VAC 0A	115V 10A
115 VAC 0B	115V 10A
115 VAC 0C	115V 10A
115 VAC Return	115V 10A
270 VDC	270V 10A
270 VAC Return	270V 10A

ENCL 10

3.4.2.2 One insert shall be of a 3 pin cartridge configuration, each SPOTD capable of carrying 13 amps continuously.

3.4.2.3 One insert configuration shall be capable of use as an A7E master cable connector (see Table II). The signal set interfacing capability shall be compatible with a MIL-C-38999, shell size 25, insert 46 connector.

TABLE II. A7E Connector.

Number of Locations	Termination Size	Service Rating
2	8 Coax	Coax
4	16	I
40	20	I

3.4.3 Sealing. The front and rear of non-hermetic connectors shall be capable of being sealed to meet the environmental requirements of this specification regardless of the number of signal/power transfer devices utilized.

3.4.4 Shell. Shells may be of any shape.

3.4.4.1 Shell Inserts. Shells shall be designed to retain their inserts in one position, both axially and with respect to rotation.

3.4.4.2 Shell-to-Shell Continuity. Electrical contact between shells shall be achieved before SPOTD continuity.

3.4.4.3 Shell Size. Any size meeting the performance requirements of this document. Minimizing size and weight shall be a consideration.

3.4.5 Coupling.

3.4.5.1 Ease of Coupling. Counterpart connectors of any arrangement shall be capable of being quickly coupled and uncoupled in a normal and accessible location without the use of tools.

3.4.5.2 Locking. Mated connectors shall remain locked without uncoupling during the required testing in this specification.

ENCL 10

3.4.5.3 Positive Coupling Indication. A tactile indication of a mated and locked connector is mandatory. This indicator shall not be present until the connector is mated and locked.

3.4.5.4 Polarization of Connector Shells. Polarization of connector shells shall be provided. Polarization shall be accomplished before initiation of coupling. During axial engagement, SPOTDs shall not touch their mating counterparts or the insert face until polarization has been achieved.

3.4.5.5 Pin-to-pin Mating Prevention. If pin and sockets are utilized, connectors shall be designed to prevent a plug with pin contacts being mated with a receptacle with pin contacts.

3.4.5.6 Peelaway Prevention. Disconnection of all circuits shall be simultaneous within 1.0 microsecond.

3.4.6 Plating. Plating may be used to meet the performance requirements of this specification.

3.4.7 Lanyard. Mounting of the lanyard shall be such that rotation of the connector for engagement will not shorten the effective length of the lanyard.

3.4.7.1 Durability. The lanyard shall remain intact, without breaking, fraying, creasing, or separating for the life of the connector.

3.4.7.2 Release Angle. The connector shall be capable of release through lanyard pull over an angle up to 15 degrees from the center line.

3.4.8 Shield Termination. As an integral part of the design, the connector shall provide a means of cable shield termination.

3.4.9 Unmated Connector Protection. As an integral part of the design, the connector interface shall not be degraded by environmental exposure.

3.5 Workmanship. Attention shall be given during fabrication to neatness and the roughness of marking parts, plating, welding, soldering, riveting, staking and bending. The connectors shall be free from crazing, cracks, voids, pimples, chips, blisters, pinholes, sharp cutting edges, burrs and other defects that will adversely affect life, serviceability or appearance.

ENCL 10

3.6 Marking.

3.6.1 SPOTD Location Identification. SPOTD locations shall be marked and remain legible after all performance tests are completed.

3.7 Insulation Resistance.

3.7.1 Insulation Resistance at Ambient Temperature. When tested as specified in 4.7.3.1, the insulation resistance between any pair of signal/power transfer devices and between any signal/power transfer device and the shell, shall be greater than 5,000 megohms. Insulation resistance after altitude immersion shall be 1,000 megohms minimum. Insulation resistance after humidity shall be 100 megohms minimum.

3.7.2 Insulation Resistance at Elevated Temperature. When tested as specified in 4.7.3.2, the insulation resistance between any pair of SPOTDs and between any SPOTD and the shell, shall be greater than 1,000 megohms for environment resisting class connectors. Hermetic connectors shall be greater than 200 megohms.

3.8 Dielectric Withstanding Voltage. When tested as specified in 4.7.4, connectors shall show no evidence of flashover or breakdown.

3.9 Insertion Loss. All SPOTDs shall be tested as specified in 4.7.5.1. Test currents and maximum allowable voltage losses are stated in Table VII. In addition, RF cable terminations shall be tested as in 4.7.5.2. The maximum loss shall be 0.4 dB at 2 GHz.

3.10 Shell-to-shell Conductivity. When tested according to 4.7.6, measured resistance shall be less than 0.005 ohms.

3.11 EMI Shielding. When tested as specified in 4.7.7, the EMI shielding capabilities of mated shells shall not be less than that specified in Table III at the specified frequencies.

ENCL 10

TABLE III. EMI Shielding Effectiveness.

Frequency (MHz)	Leakage Attenuation (dB) Minimum	
	Submersible and Hermetic	Environment Resistant
200	86	86
300	86	86
400	86	86
800	86	86
1,000	86	86
1,500	86	86
2,000	86	86
3,000	86	86
4,000	86	86
6,000	86	86
10,000	86	86

3.12 Coupling Force. When tested as specified in 4.7.8, the coupling force for mating and unmating of counterpart connectors shall meet the requirements of Table IV.

TABLE IV. Coupling Force.

Interface Area (Sq In)	Shell Size	Force (Pounds)	Torque (Inch-Pounds)
0.25	9	1 to 12	1 to 17
0.52	13	2 to 18	2 to 18
0.89	17	4 to 28	4 to 28
1.35	21	6 to 34	6 to 34
1.92	25 or greater	7 to 40	7 to 40

3.13 Insert Retention. When tested as specified in 4.7.9, unmated connectors shall retain their inserts in their proper location in the shell, and there shall be no evidence of cracking, breaking, separation from the shell, or loosening of parts.

3.14 SPOTD Retention. When tested as specified in 4.7.10, the axial displacement of the SPOTD shall not exceed 0.012 inch (0.30 mm). No damage to SPOTDs or inserts shall result.

ENCL 10

3.15 Salt Spray. After testing as specified in 4.7.11, the connectors shall pass all succeeding tests.

3.16 Electrical Engagement. The SPOTDs shall not make contact with the shell of the mating connector when tested as in 4.7.12. Shell-to-shell conductivity shall be established before pin engagement.

3.17 Leakage (Hermetics and Submersible).

3.17.1 Air. When tested in accordance with 4.7.13.1, the air leakage shall be less than 1 cubic inch per hour.

3.17.2 Water. Submersible receptacles shall be tested as specified in 4.7.13.2. They shall show no water leakage, mechanical damage or insulation resistance damage (3.7.1, humidity conditions).

3.18 Lanyard.

3.18.1 Lanyard Retention. The lanyard, including all hardware and joints, shall withstand an axial tensile force of 150-pounds minimum.

3.18.2 Lanyard Connector Release Force. The lanyard release force shall be less than 50 pounds at ambient temperature or above, and less than 100 pounds at -55 DEG C. Tests shall be performed in the axial direction and 15 degrees on both sides of the center.

3.18.3 Peelaway. When tested as specified in 4.7.14, the time of disengagement between the first SPOTD to disengage and the last shall be less than 1.0 microsecond at release angles of 0 and +/- 15 degrees from axial center.

3.19 Maintenance Aging. Where maintainability of the connector is a requirement, the connector shall be capable of undergoing 10 maintenance cycles without degradation.

3.19.1 Pin and Socket Aging. When tested as specified in method 2002 of MIL-STD-1344, the contact installing and removal forces shall not exceed the requirements of Table V. The aged connector shall also meet the contact retention requirements of 4.7.10 and insulation resistance (4.7.3.1).

ENCL 10

TABLE V. Installing and Removal Forces.

Contact Size	Installing and Removal Forces (Maximum)	
	Pounds	Newtons
20	20	89
16	20	89
12	30	133

3.19.2 Other than Pins and Sockets. When removable SPOTDs are used, they shall be tested as specified in 4.7.15. The installation and removal forces shall not change by more than 20% between the first and last cycles. The connector shall meet the SPOTD retention tests of 4.7.10 and insulation resistance tests (4.7.3.1).

3.20 Accessory Mounting Strength. When tested as specified in 4.7.16, the accessory threads and portion of the connector that accepts cable clamps and "J" adapters shall be capable of withstanding the torque listed in Table IX.

3.21 External Bending Moment. When tested as specified in 4.7.17, connectors shall show no evidence of damage detrimental to their normal operation nor shall there be any interruption of electrical continuity.

3.22 Durability. When tested as specified in 4.7.18, the connectors shall show no defects detrimental to the operation of the connectors and shall meet the subsequent test requirements.

3.23 Vibration. When tested as specified in 4.7.19, there shall be no electrical discontinuity greater than 1.0 microsecond and there shall be no disengagement of the mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking, or loosening of parts.

3.24 Shock. When tested as specified in 4.7.20, there shall be no electrical discontinuity greater than 1.0 microsecond and there shall be no disengagement of the mated connectors, evidence of cracking, breaking, or loosening of parts. The specified acceleration is 300 g, half-sine wave.

ENCL 10

3.25 Ice Resistance. When tested as specified in 4.7.21, connectors shall pass succeeding tests in the qualification table. Uncoupling and recoupling force shall not exceed the values listed in Table IV by more than 25 percent.

3.26 Ozone Exposure. When tested as specified in 4.7.22, the connectors shall show no evidence of cracking of dielectric material or other damage due to ozone exposure that will adversely affect performance.

3.27 Fluid Immersion. When tested as specified in 4.7.23, the connectors shall meet the requirements for coupling force (see 3.9) and dielectric withstanding voltage (see 3.8).

3.27.1 Retention System Fluid Immersion. When tested as specified in 4.7.23.1, the insert assemblies shall meet requirements of SPOTD retention (see 3.14).

3.28 Sunlight. When tested as specified in 4.7.24, the item shall not show degraded mechanical or electrical performance.

3.29 Altitude Immersion (Except Hermetics and Submersibles). When tested as specified in 4.7.25, the mated connector shall meet a minimum insulation resistance of 1,000 megohms and the requirements of dielectric withstanding voltage as specified in 3.8.

3.30 Altitude - Low Temperature. When tested as specified in 4.7.26, the connectors shall meet the requirements of dielectric withstanding voltage at sea level specified in 3.8 and insulation resistance at ambient temperature specified in 3.7.1.

3.31 Thermal Shock. When tested as specified in 4.7.27, there shall be no damage detrimental to the operation of the connector.

3.32 Temperature Life. After testing in accordance with 4.7.28, the connector will not show evidence of physical damage and pass all subsequent tests.

3.33 Exhaust Heat. When tested as specified in 4.7.31.7, the connector shall not be mechanically damaged and shall pass further performance tests.

3.34 Electrolytic Erosion. When tested as specified in 4.7.30, the SPOTDs shall not show evidence of erosion to base metals.

ENCL 10

3.35 Environmental Life Cycle. Connectors shall undergo the tests specified in 4.7.31 without degradation of performance below values specified by the individual tests.

3.36 SPOTD Walkout. When SPOTDs that are free to rotate in the insert are tested as specified in 4.7.32, SPOTDs shall not become dislodged from their normal position.

3.37 Test Probe Damage. When tested as specified in 4.7.33, SPOTDs shall withstand the bending moment and depth of test probe insertion without evidence of damage that would interfere with the mechanical or electrical performance.

3.38 Flame. To be determined.

3.39 Dust (Fine Sand). When tested as specified in 4.7.6.2, connectors shall pass succeeding tests in the qualification table. Uncoupling and recoupling torque shall not exceed the values listed in Table IV by more than 25 percent.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibilty for Inspection. The contractor is responsible for the performance of all inspection requirements as specified herein. The contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this document where such inspections are deemed necessary to assure conformance to prescribed requirements.

4.1.1 Test Equipment and Inspection Facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the testing facility. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

4.1.3 Hydrolytic Stability. Certification of requirement 47 of MIL-STD-454 is required (see 3.3.1.2).

4.1.4 Fungus Resistance Certification. Certification of requirement 4 of MIL-STD-454 is required (see 3.3.3).

ENCL 10

4.2 Classification of Inspection. The examination and testing of connectors shall be classified as follows:

a) Performance inspection (see 4.4).

4.3 Inspection Conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-1344.

4.4 Performance Inspection. Performance inspection shall be performed at a laboratory acceptable to the Government on sample units.

4.5 Samples.

4.6 Performance Evaluation Tests. All tests shall be performed in the listed sequence for each group.

4.6.1 All Connector Types.

Group I Tests	Section	Section
Visual	None	4.7.1
Permeability	3.3.4	4.7.1
Coupling Force	3.12	4.7.6
Electrical Engagement	3.16	4.7.12
Maintenance Aging	3.19	4.7.15
Thermal Shock	3.31	4.7.27
Durability	3.22	4.7.19
Lanyard	3.18	4.7.14
Altitude Immersion	3.29	4.7.25
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Salt Spray	3.15	4.7.11
Coupling Force	3.12	4.7.6
Insertion Loss	3.9	4.7.5
Electrolytic Erosion	3.34	4.7.32
External Bending	3.21	4.7.17
Coupling Force	3.12	4.7.6
EMI	3.11	4.7.7
Visual	None	4.7.1

ENCL 10

4.6.2 All Connector Types.

Group II Tests	Section	Section
Visual	None	4.7.1
Maintenance Aging	3.19	4.7.15
SPOTD Retention	3.14	4.7.10
Altitude-Low Temperature	3.30	4.7.26
Durability	3.22	4.7.18
Fluid Immersion	3.27	4.7.23
Accessory Mounting Strength	3.20	4.7.16
Vibration	3.23	4.7.19
Shock	3.24	4.7.20
Shell-to-shell Conductivity	3.10	4.7.6
Temperature Life	3.32	4.7.28
Insulation Resistance-High Temperature	3.7	4.7.3
Dielectric Strength-All Altitudes	3.8	4.7.4
Coupling Force	3.12	4.7.8
Icing	3.25	4.7.21
Coupling Force	3.12	4.7.8
Lanyard Release	3.13	4.7.14
SPOTD Retention	3.14	4.7.10
Visual	None	4.7.1

4.6.3 Hermetics and Submersible.

Group III Tests	Section	Section
Visual	None	4.7.1
Leakage (Air/Water)	3.17	4.7.13
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Thermal Shock	3.31	4.7.27
Vibration	3.23	4.7.19
Shock	3.24	4.7.20
Leakage (Air/Water)	3.17	4.7.13
Visual	None	4.7.1

ENCL 10

4.6.4 Non-metallic Materials.

Group IV Tests	Section	Section
Visual	None	4.7.1
Ozone	3.26	4.7.22
Sunshine	3.28	4.7.24
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Retention System Fluid Immersion	3.27.1	4.7.23.1
SPOTD Walkout	3.36	4.7.32
SPOTD Retention	3.14	4.7.10
Probe Damage	3.37	4.7.33
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Insertion Loss	3.9	4.7.5
Coupling Force	3.12	4.7.8
Visual	None	4.7.1

4.6.5 Environmental Life Cycle.

Group V Tests	Section	Section
Environmental Life Cycle	3.35	4.7.31
Initial Tests	None	4.7.31.1
Visual	None	4.7.1
Coupling Force	3.12	4.7.8
Insert Retention	3.13	4.7.9
SPOTD Retention	3.14	4.7.10
External Bending Moment	3.21	4.7.17
Accessory Mounting Strength	3.20	4.7.16
Lanyard Release Force	3.18	4.7.14
Lanyard Retention	3.18	4.7.14
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Shell-to-shell Conductivity	3.10	4.7.6
Insertion Loss	3.9	4.7.5

ENCL 10

AD-A130 681 MINUTES OF FSC 5935 CONNECTOR STANDARDIZATION PLANNING MEETING HELD AT DAYTON OHIO ON 25-27 AUGUST 1982(U) DEFENSE ELECTRONICS SUPPLY CENTER DAYTON OH 30 NOV 82 2/2

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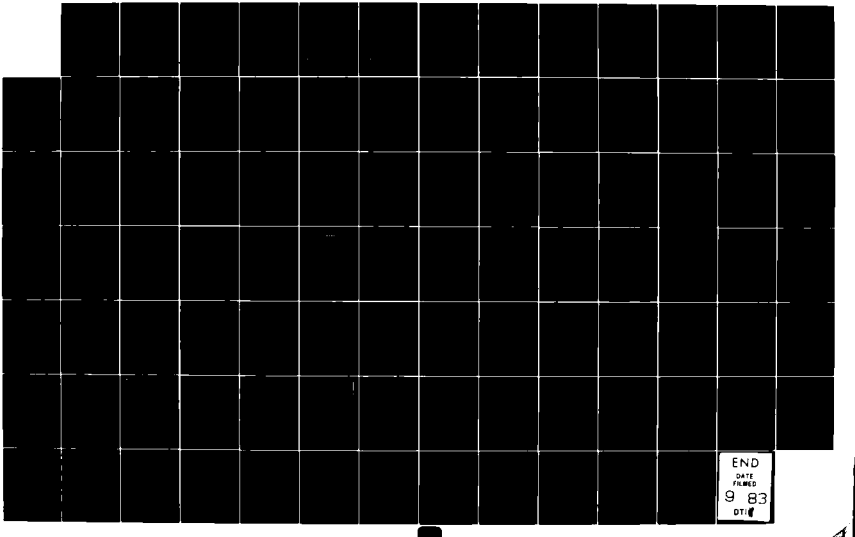

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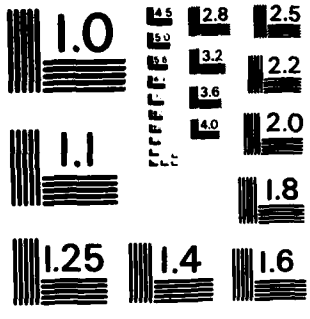


Sand and Dust	None	4.7.31.2
Durability	None	4.7.31.3
Fluid Immersion	None	4.7.31.4
Salt Spray	None	4.7.31.5
Temperature-Altitude, Humidity	None	4.7.31.6
Exhaust Heat	None	4.7.31.7
Sand and Dust	None	4.7.31.2
Durability	None	4.7.31.3
Fluid Immersion	None	4.7.31.4
Salt Spray	None	4.7.31.5
Temperature-Altitude, Humidity	None	4.7.31.6
Exhaust Heat	None	4.7.31.7
Cleaning	None	4.7.31.9
Sand and Dust	None	4.7.31.2
Durability	None	4.7.31.3
Fluid Immersion	None	4.7.31.4
Salt Spray	None	4.7.31.5
Temperature-Altitude, Humidity	None	4.7.31.6
Exhaust Heat	None	4.7.31.7
Shock	3.24	4.7.20
Vibration	3.23	4.7.19
Post Mechanical Tests	None	4.7.31.12
Visual	None	4.7.1
Coupling Force	3.12	4.7.8
Insert Retention	3.13	4.7.9
SPOTD Retention	3.14	4.7.10
External Bending Moment	3.21	4.7.17
Accessory Mounting Strength	3.20	4.7.16
Lanyard Release	3.18	4.7.14
Lanyard Retention	3.18	4.7.14
Altitude-Low Temperature	3.30	4.7.26
Post Electrical Tests	None	4.7.31.14
Insulation Resistance	3.7	4.7.3
Dielectric Strength	3.8	4.7.4
Shell-to-shell Conductivity	3.10	4.7.6
Insertion Loss	3.9	4.7.5
SPOTD Walkout	3.36	4.7.32
EMI	3.11	4.7.7

ENCL 10

4.7 *Methods of Inspection.*

4.7.1 Visual and Mechanical Examination.

4.7.1.1 Connectors. The connectors, accessories, and piece parts shall be visually and mechanically examined to ensure conformance with this document and the applicable military standards (see 3.1, 3.3, 3.4, 3.5, and 3.6).

4.7.2 Nonmagnetic Materials (See 3.3.4). Connectors shall be tested as specified in method 3006 of MIL-STD-1344.

4.7.3 Insulation Resistance (See 3.7).

4.7.3.1 Insulation Resistance at Ambient Temperature (See 3.7.1). Unmated connectors shall be tested as specified in method 3003 of MIL-STD-1344. The following details and exceptions apply:

a) The tolerance on the applied voltage shall be +/- 10 percent.

b) Connectors shall be mated when testing after altitude immersion.

4.7.3.2 Insulation Resistance at Elevated Temperature (See 3.7.2). Unmated connectors shall be tested as specified in method 3003 of MIL-STD-1344. The following details and exceptions shall apply:

a) The tolerance on the applied voltage shall be +/- 10 percent.

b) Applicable elevated temperature for 30 minutes: 200 DEG C +5, -0 DEG C.

c) Measurements shall be made while the connectors are still in the chamber at the specified temperature.

ENCL 10

4.7.4 Dielectric Withstanding Voltage (See 3.8). Wired, unmated connectors shall be tested in accordance with method 3001 of MIL-STD-1344. Connectors shall be mated when testing after altitude immersion, and altitude low temperature. The following details and exceptions apply:

a) The magnitude of the test voltage shall be as specified in Table VI.

b) Fifty percent of the SPOTDs available shall be tested, but in no case shall less than six dielectric withstanding voltage readings be taken.

c) The test voltage shall be maintained at the specified value for 2 seconds minimum.

d) Only the engaging faces of hermetic, submersible and bulkhead mounting receptacle connectors shall be subjected to the high altitude. The rear face shall be suitably protected.

e) The chamber shall be evacuated to each of the specified altitude pressure equivalents listed below.

TABLE VI. Test Voltages, AC RMS, 60 Hz.

	Service Rating	
Altitude	Mated	Unmated
Sea level	1800	1800
50,000 feet	1000	600
70,000 feet	1000	400
100,000 feet	1000	200

Altitude	Equivalent Pressure
50,000 feet	87 torr
70,000 feet	33 torr
100,000 feet	8 torr

ENCL 10

4.7.5 Insertion Loss (See 3.9).

4.7.5.1 DC Tests. SPOTDs of mated connectors shall be tested in accordance with method 3004 of MIL-STD-1344.

TABLE VII. D.C. Insertion Loss.

Termination Wire Size	Test Current	Voltage Loss
AWG	Amps	Millivolts
10	33.0	60
12	23.0	60
14	17.0	60
16	13.0	70
18	10.0	70
20	7.5	80
22	5.0	80
24	3.0	70
26	1.0	70

4.7.5.2 AC Tests. The connector shall be tested as shown in Figure 4. Insertion loss of a mated connector pair is defined as the increase of a loss due to insertion of a mated connector pair in a cable, this includes the reflection losses to the cable and the dissipating losses in the pair. First insert cable assembly #1 and tune out its input VSWR by means of tuner #4 and balance setup. Then insert the cable assembly #2 which includes the connector pair under test. With tuner #4 in the same position and the electrical length of the cable assembly the same as that of #1, record increase of insertion loss; add to this as a correction the cable loss of the removed section due to the length (delta L1 + delta L2) at this frequency. The sum of the increase and the correction is the insertion loss of the connector pair.

4.7.6 Shell-to-shell Conductivity (See 3.10). Mated connectors shall be subjected to the test specified in method 3007 of MIL-STD-1344.

4.7.7 EMI Shielding (See 3.11) (From 200 to 10,000 MHz). The EMI shielding effectiveness of mated connectors shall be measured using the mode-stirred technique specified in method 3008 of MIL-STD-1344. Frequencies and readings shall be swept rather than discrete.

ENCL 10

4.7.8 Coupling Force (See 3.12). Mating halves shall be coupled and uncoupled in accordance with method 2013 of MIL-STD-1344. The torque or force shall be applied at a rate recommended by the manufacturer.

4.7.9 Insert Retention (See 3.13). Unmated connectors shall be tested in accordance with method 2010 of MIL-STD-1344 with the following details and exceptions:

a) Pressure to be applied: 100 +/- pounds per square inch with a 25 pound minimum force.

b) Connectors may be wired.

4.7.10 SPOTD Retention (See 3.14). Unless otherwise specified, SPOTDs shall be tested to procedures I and II.

4.7.10.1 Procedure I. The SPOTD retention shall be tested as specified in method 2007 of MIL-STD-1344. The following details and exceptions shall apply:

a) Number of samples - The test shall be performed on 20 percent of the SPOTD complement; but not less than three SPOTDs in each connector half.

b) Applied axial load - Preload to 3 pounds maximum, (13.6 newtons). Apply load as specified in Table VIII.

c) Special requirements - Where the test sequence required maintenance aging prior to SPOTD retention, the SPOTDs which were subjected to maintenance aging shall also be selected for SPOTD retention testing.

d) Axial direction - The applicable forces shall be applied along the longitudinal axis of individual SPOTDs in the direction tending to displace the SPOTDs to the rear.

e) Only the SPOTDs to be tested need be installed in the connector.

4.7.10.2 Procedure II. The SPOTD retention shall be tested as specified in method 2007 of MIL-STD-1344. The following details and exceptions shall apply:

a) 4.7.10(a) through (c), and (e), apply.

b) Axial direction - Same as 4.7.10.1(d), except the direction shall tend to displace the SPOTDs to the front.

c) Only the SPOTDs to be tested need be installed in the connector.

ENCL 10

TABLE VIII. SPOTD Retention.

SPOTD Size	Load +/- 10 Percent	
	Pounds	Newtons
Less than 15 Amp Continuous	20	67
More than 15 Amp Continuous	30	111

4.7.11 Salt Spray (See 3.15). Perform the salt spray test method 1001 of MIL-STD-1344, test condition D. The following exceptions apply:

a) Replace NaCl with sea salt (see 4.7.31.5).

b) Sulfur dioxide may be added to allow testing concurrent with the environmental life cycle. (See 4.7.31.5).

c) The connector pair shall be mated for the first 900 hours. The pair will then be coupled and uncoupled 50 times, and tested in the unmated condition for the remainder of the test.

4.7.12 Electrical Engagement (See 3.16).

4.7.12.1 SPOTD Protection. The front edge of the shell of the plug connector shall be scooped as deep as possible within the front aperture made by the shell of the mating receptacle, without touching the SPOTDs.

4.7.12.2 Shell-to-Shell Engagement. The connector shall be visually examined to verify shell electrical engagement before SPOTD engagement. If this does not result in a firm conclusion, the SPOTDs and shell shall be wired and connected to equipment to monitor the initial contact during the engagement process. This test shall be repeated 10 times.

4.7.13 Fluid Leakage (See 3.17).

4.7.13.1 Air (Hermetics and Submersible). Connectors shall be mounted in an apparatus capable of providing the necessary conditions and test data. A 30 psi differential pressure shall be applied to one side of the connector and leakage rate measured over a 30 minute period. The pressure shall then be applied on the opposite face and leakage measured.

ENCL 10

4.7.13.2 Water (Submersible). An unmated receptacle shall be tested according to method 1006 of MIL-STD-1344, test condition 3. The following exceptions or additions shall apply:

a) Step 8 - Maintain the conditions of step 7 for 60 minutes.

4.7.14 Lanyard.

4.7.14.1 Lanyard Retention (See 3.18). The lanyard connector assembly shall be rigidly mounted. A force shall be applied to the lanyard at 15 degrees from the connector longitudinal axis at a rate of 25 pounds per second maximum until the required load is reached.

4.7.14.2 Lanyard Connector Release Force. A force shall be applied at a maximum rate of 20 pounds/second until connector release. The maximum force exerted on the lanyard shall be recorded. The test shall be performed at 0, +15, and -15 degrees from the longitudinal axis, also at temperatures of -55 DEG C, ambient, and 200 DEG C.

4.7.14.3 Peelaway. A minimum of 4 SPOTD locations dispersed as widely as possible around the connector perimeter and one near the center shall be tested. At least one of each style or size SPOTD will be included. If a connector contains less than 5 SPOTDs, all shall be tested. Electrical connections shall be made to appropriate equipment to record the relative time of circuit disconnection. The test shall be performed at angles of 15 degrees and -15 degrees from the longitudinal axis.

4.7.15 Maintenance Aging (See 3.19). A minimum of 20 percent, but not less than three SPOTDs of each connector, shall be tested. If there are more than one size SPOTD in a connector, at least one of each shall be tested.

4.7.15.1 Tools. Tools shall consist of those specified by the manufacturer for installation and removal. Equipment to measure force or torque is also required.

4.7.15.2 Procedure. The test shall consist of 10 insertion and removal cycles performed according to method 2002 of MIL-STD-1344 or manufacturer's specifications. Installation and removal forces or torque shall be measured on the first and tenth cycles.

ENCL 10

4.7.16 Accessory Mounting Strength (See 3.20). The mated connector shall be mounted as in normal service to a rigid panel. The torque wrench shall be attached as shown on Figure 2. After mating the plug and receptacle connectors, a torque shall be applied to the accessory end of the plug at a rate of approximately 10 inch-pounds per second until the required torque is achieved. The applied load shall be held for 1 minute, then the load shall be released. The test shall then be repeated on the accessory end of the receptacle. The item shall be inspected for the effects of the test.

TABLE IX. Accessory Mounting Strength.

Interface Area (Sq In)	Shell Size	Inch-Pounds	Newton-Meters
0.25	9	100	11.3
0.37	11	100	11.3
0.52	13	150	17.0
0.69	15	150	17.0
0.89	17	200	22.6
1.11	19	200	22.6
1.35	21	250	28.3
1.62	23	250	28.3
1.92	25 or greater	250	28.3

4.7.17 External Bending Moment (See 3.21). The receptacle connector shall be mounted as in normal service to a rigid panel. Before mating the plug connector to the receptacle, an adapter or test torque arm shall be attached as shown on Figure 3. After mating the plug and receptacle connectors, the distance "L" from the point of load application "P" to the mounting panel shall be determined. The load to be applied at point "P" shall then be determined as the bending moment listed in Table X divided by the level arm "L". This load shall be applied at a rate of approximately 10 pounds per second until the required load is achieved. The applied load shall be held for 1 minute, then the load shall be released. Continuity of the circuits shall be monitored during the test. The test circuit used to monitor this shall be capable of detecting a discontinuity in excess of 1 microsecond.

ENCL 10

TABLE X. External Bending Moment.

Interface Area (Sq In)	Shell Size	Inch-Pounds	Newton-Meters
0.25	9	75	8.5
0.37	11	230	26.0
0.52	13	310	35.0
0.69	15	380	42.9
0.89	17	450	50.9
1.11	19	500	56.5
1.35	21	530	59.9
1.62	23	650	73.5
1.92	25 or greater	650	73.5

4.7.18 Durability (See 3.22).

4.7.18.1 General. The life test is performed to determine if the connector is constructed to withstand an extended number of releases. The number of releases is not to be considered indicative of the design or service life of the item. Any maintenance operation during testing that is required to keep the unit operational will be reported. The item shall be tested to assure that it functions as required.

4.7.18.2 Procedure.

4.7.18.2.1 Manual Release. Two thousand releases of the item shall be made at room temperature in accordance with method 2016 of MIL-STD-1344. The time interval between releases shall be sufficient to prevent overheating of the release unit. The cumulative releases conducted under all tests shall not exceed the totals specified under durability test. The coupling force (4.7.8) and insertion loss (4.7.5) shall be recorded after the following:

a) 1st and 40th release.

b) 500th release.

c) 1000th release.

d) 1500th release.

e) 2000th release.

ENCL 10

4.7.18.2.2 In-Flight Release. For those connectors with in-flight release, the test specified in 4.7.18.2.1 shall be conducted, except that 1000 releases shall be made using the in-flight mechanism, starting with release 501. The coupling force and insertion loss shall be recorded after the following:

a) 540th release.

b) 740th release.

c) 1000th release.

4.7.18.2.3 Visual. The item shall be visually inspected after each of the conditions above for damage due to durability testing.

4.7.19 Vibration Test (See 3.23).

4.7.19.1 General. A vibration test shall be performed on mated connectors to determine if the connectors are constructed to withstand expected dynamic vibrational stresses and to ensure that performance degradation or malfunctions will not be produced by the service vibration. The connector shall be tested to assure that it functions as required. The tests shall be performed in each of three mutually perpendicular axes in any order. All testing shall be completed in one axis prior to testing in the next axis.

4.7.19.2 Procedure.

4.7.19.2.1 Test Item Operation. The item shall be checked for release and in-flight operation during application of vibration (resonance dwell, cycling and random vibration), so that the effects caused by these tests may be evaluated. At the conclusion of each test axis, the test item shall again be checked for release and in-flight operation, and the results shall be compared with data obtained prior to the vibration testing. If the item has no method of in-flight release, the manual ground service release will be operated at the conclusion of each test axis and the results shall be compared with the requirements as specified.

ENCL 10

4.7.19.2.2 Continuity. Each electrical circuit of the item shall be continuously monitored to check its continuity in order to see if inadvertent stepping or chatter occurs.

4.7.19.2.3 Mounting Techniques. The test item shall be attached to the vibration exciter table by its normal in-service mounting, by means of a rigid fixture capable of transmitting the vibration conditions specified herein. Precautions shall be taken in the establishment of mechanical interfaces to minimize the introduction of undesirable responses in the test setup. Whenever possible, the fixture weight shall be distributed uniformly on the vibration exciter table in order to minimize effects of unbalanced loads. The fixture shall be such that the transverse motion at the input monitoring point(s) shall be minimized, and should be limited to 10% percent of the input motion.

4.7.19.2.4 Release. Connectors capable of in-flight release shall be released during the specified vibration tests using a device capable of measuring the release force.

4.7.19.2.5 Samples. The test samples shall be divided equally among sizes and classes into two groups. One group will undergo the sine vibration of 4.7.19.4, the other will undergo random vibration (4.7.19.5).

4.7.19.3 Test Requirements.

4.7.19.3.1 Sinusoidal Vibration. Vibration shall be applied along each of the three mutually perpendicular axes of the test item. The vibratory acceleration levels or double amplitudes of the specified curve shall be maintained on the fixture at the test item support points.

4.7.19.3.2 Random Vibration, Control. Control accelerometers shall be located on the fixture at the support points. Control accelerometers shall be mounted near or on one connector adjacent to the lowest interface with the suspended store. All control accelerometers shall be oriented with their sensitive axis parallel to the applied vibration.

ENCL 10

4.7.19.3.2.1 Random Vibration Test. The instantaneous random acceleration peaks may be limited to three times the RMS acceleration level. The power spectral density (PSD) of the test control signal shall not deviate from the specified requirements by more than +100, -50 percent (+/- 3 decibels (dB)) between 20 Hz and 2,000 Hz, except that deviations as large as +300, -75 percent (+/- 6 dB) shall be allowed over a cumulative bandwidth of 100 Hz, maximum, between 500 and 2,000 Hz.

4.7.19.4.1 Sinusoidal Vibration, Search. The fixture shall be vibrated for a maximum period of one-half hour, and the existence of all resonances or complex motions of the connector system within the frequency range of 10 to 500 Hz shall be determined. The speed of the sweep through the frequency range shall be one octave per minute or less. The test levels shall be according to the specified curve from method 2005, condition II of MIL-STD-1344.

4.7.19.4.2 Sinusoidal Vibration, Resonance Dwell. The test item shall be vibrated along each axis at the resonant frequencies determined in 4.7.3.4.1. Each resonant frequency shall be vibrated for a period of 15 minutes. If more than four significant resonant frequencies are found for any one axis, the four most severe resonant frequencies shall be chosen for the dwell test. If a change in the resonant frequency occurs during the test, its time of occurrence shall be recorded and immediately the frequency shall be adjusted to maintain the peak resonance condition. The final resonant frequency shall be recorded.

4.7.19.4.3 Release at Resonance. For flight releasable connectors, a minimum of two releases shall be made at each of the loaded resonant conditions to ensure that the release mechanisms operate satisfactorily. If no resonance was observed during the resonant search, the two releases shall be made at a frequency of 50 Hz. In addition, the item shall be subjected to a 5-minute period of vibration at each resonant point after which the vibration shall be stopped and a manual release accomplished to ensure that the vibration has not caused the connector to jam.

4.7.19.4.4 Sinusoidal Cycling Vibration. The test item shall be vibrated along each axis for a period of one and one-half hours less the time spent at resonant dwells in 4.7.3.4.2. The frequency of applied vibration shall be swept at 1 octave per minute between 10 and 2000 Hz at a test level of 60 g's at ambient temperature. The cycling test will be repeated in each axis for 1 hour at -55 DEG C and 200 DEG C.

ENCL 10

4.7.19.5 Random Test Procedure.

4.7.19.5.1 Vibration. The test item shall be vibrated for 120 minutes at ambient, 90 minutes at -55 DEG C and 90 minutes at 200 DEG C in each of 3 mutually perpendicular axis. The test spectrum shall be according to method 2005, test condition VI-J of MIL-STD-1344.

4.7.19.5.2 Release. Where applicable, two in-flight releases shall be made during the final 5 minutes of vibration at each temperature, in each axis to ensure that the releases operate satisfactorily. In addition, a manual release test for coupling and uncoupling forces shall be made after each of the above cases.

4.7.19.5.3 Functional. Perform the SPOTD retention tests (3.14), coupling force test (3.12), and insulation resistance tests (3.7).

4.7.20 Shock Test (See 3.24).

4.7.20.1 General. The shock test is performed to determine if the connector is constructed to withstand expected shock stresses. Tests specified herein are established for items which may be used in a variety of military applications. The support points shall be subjected to the required acceleration in both directions along the three principal axes. The connector shall be tested to assure that it functions as required. The shock test shall be conducted in the following order.

4.7.20.2 Procedure.

4.7.20.2.1 Test Item Operation. At the conclusion of each test axis, the test item shall be checked and the results compared with data obtained prior to the shock testing. If the item has no method of in-flight release except explosive ejection, the manual ground service release will be performed at the conclusion of each test axis and the results shall be in accordance with 3.6.

4.7.20.2.2 Mounting Techniques. The test item shall be attached to the shock table by its normal in-service mounting by means of a rigid fixture capable of transmitting the shock conditions specified herein. Precautions shall be taken in the establishment of mechanical interfaces to minimize the introduction of undesirable responses in the test setup. Whenever possible, the item weight shall be distributed uniformly on the shock table in order to minimize effects of unbalanced loads. Shock amplitudes and durations shall be measured by techniques that will not significantly affect test item input control or response.

ENCL 10

4.7.20.2.3 Common Test Techniques. In each of the following tests, the item shall be subjected to the acceleration encountered when the support points are subjected to the specified acceleration when the item is mounted as in 4.7.20.2.2. The peak applied values of the accelerations shall be within a +/-5 percent of the values specified and shall reach peak value in a time of 0.015 to 0.60 seconds. The waveform of acceleration shall resemble a half-sine wave.

4.7.20.2.4 Functional. Manual coupling and uncoupling forces shall be recorded for all connectors (see 3.12) and in-flight release forces shall be recorded where applicable (3.18).

4.7.20.2.5 Visual. The item shall be visually inspected after each of the conditions above for damage due to shock.

4.7.21 Icing Test (See 3.25).

4.7.21.1 General. The item shall be tested to assure that it functions under icing conditions. The intent of the icing tests is to determine whether rapid change from altitude to sea level conditions or freezing rain/snow will cause equipment to malfunction. The tests are divided into two categories: 1 - Flight Release, 2 - Manual Release.

4.7.21.2 Procedure. Flight release.

4.7.21.2.1 The primary in-flight release method of the connector shall be used with the connector mounted for normal use. Do not exceed 200% of the specified release force (3.48).

4.7.21.2.1.1 First Freeze. The item shall be exposed to the test environment in the connected condition. The temperature of the item shall be reduced to -55 DEG C (-70 DEG F), or the item shall be placed in a chamber at -56 DEG C (-70 DEG F) and the temperature stabilized. The item shall be placed in an atmosphere having a temperature of 37.8 DEG C (100 DEG F) and a relative humidity of 90 percent until all evidence of frost has disappeared. Retaining all the condensation practicable, the temperature of the item shall be reduced to -55 DEG C (-70 DEG F) or the item shall be placed in a chamber at -55 DEG C (-70 DEG F) and the temperature stabilized. The connector shall be uncoupled using the in-flight mechanism and release force and peelaway recorded.

ENCL 10

4.7.21.2.1.2 Second Freeze. The fixture shall be loaded with the required connector and the fixture placed in an atmosphere having a temperature of 37.8 DEG C (100 DEG F) and a relative humidity of 90 percent, until all evidence of frost has disappeared. Retaining all the condensation practicable, the temperature of the item shall be reduced to -55 DEG C (-70 DEG F) or the item shall be placed in a chamber set at -55 DEG C (-70 DEG F) and the temperature stabilized. The tests specified in 4.7.21.2.1.1 shall be repeated. After all tests have been completed, the item shall be dried.

4.7.21.2.1.3 Freezing Rain. Mated connectors shall be immersed in tap water for 1 minute then placed in an ambience of -55 DEG C for 1 hour. A minimum of three such cycles shall be performed until the connector surfaces are glazed over. The tests of 4.7.21.2.1.1 shall be performed at the low ambience.

4.7.21.2.2 Visual. The connectors shall be visually inspected after each of the conditions above to ensure the item has not been damaged due to the freezing or icing conditions.

4.7.21.3 Procedure - Manual Release.

4.7.21.3.1 Environment. The connector plug shall be mated with a receptacle mounted on an appropriate fixture. The mated connector pair shall be subject to the freeze-thaw procedure of 4.7.21.2.1 three times. No tests shall be performed at the end of each cycle. Before the last cold period, the connector shall be dipped in tap water precooled to a temperature below 40 DEG F for five seconds.

4.7.21.3.2 Operational Test. At the end of the third cycle (the fourth cold period), the chamber ambient temperature shall be raised to -10 DEG C (15 DEG F). The connector uncoupling and coupling forces shall be measured.

4.7.21.4 Test Criteria.

4.7.21.4.1 Operating Forces. For in-flight releases, the forces shall not exceed those in 3.48 by more than 25 percent. For manual release, the forces shall not exceed those in Table IV by more than 25 percent.

4.7.21.4.2 Visual. Testing shall not cause SPOTDs, inserts, clamps, plating, rings, nuts, etc., to peel, chip, loosen, break or discolor, as applicable. There shall be no damage to the connectors as a result of the test.

4.7.22 Ozone Exposure (See 3.26). Wired, mated connectors shall be subjected to the test specified in method 1007 of MIL-STD-1344.

ENCL 10

4.7.23 Fluid Immersion (See 3.27). Connector samples shall be subjected to the test specified in method 1016 of MIL-STD-1344 (one sample per fluid). Following the fluid immersion cycles, the connectors shall be tested for coupling force as specified in 4.7.6 and dielectric withstanding voltage at sea level as specified in 4.7.10.1 within 3 hours. Samples shall be subjected to the following fluids from MIL-W-22759/35.

TABLE XI. Fluid Immersion.

Fluid	Immerse		Drain	Cure	Cycles
	Time	Temp	Rm Temp	6 Hr	
a) MIL-H-5606	5 min	85 C	1 hr	100 C	7
b) Hydraulic Fluid (M2V Chevron STO145L30001)	5 min	85 C	1 hr	100 C	7
c) MIL-T-5624 (5P-5)	5 min	25 C	1 hr	55 C	7
d) MIL-L-7808	5 min	120 C	1 hr	125 C	7
e) MIL-L-23699	5 min	120 C	1 hr	125 C	7
f) MIL-A-8243		65 C	1 hr	100 C	7
g) MIL-L-25769 (diluted for cleaning)		65 C	1 hr	100 C	7
h) MIL-C-43616 (diluted for cleaning)		50 C	1 hr	50 C	7
i) MIL-H-83306		35 C	1 hr	100 C	7
j) MIL-G-3256 Type I (gasoline)		25 C	24 hr	None	5
k) TT-I-735 - 1 part plus 3 parts TT-T-291 (alcohol plus mineral spirits)		25 C	24 hr		5
l) 1-1-1 Trichloroethane		25 C	24 hr		
m) Azeotrope of trichlorotrifluoroethane and methylene chloride (Freon TMC)	5 min	25 C	24 hr	None	5
n) TT-S-735 Type I		25 C	24 hr	None	5
o) TT-S-735 Type II		25 C	24 hr	None	5
p) TT-S-735 Type III		25 C	24 hr	None	5
q) TT-S-732 Type VII		25 C	24 hr	None	5
r) Dielectric coolant, synthetic silicate ester (Coolanol 25)	1 min	24 C	1 hr	None	1
s) MIL-P-7254 Nitric acid	1 min	25 C	1 hr		1
t) MIL-P-26536 hydrazine	1 min	25 C	1 hr		1
u) MIL-P-26539 Nitrogen tetroxide	1 min	25 C			1
v) MIL-P-27402 Dimethyl hydrazine	1 min	25 C			1

ENCL 10

4.7.23.1 Retention System Fluid Immersion (See 3.27.1). Unmated connectors with SPOTDs removed shall be immersed in fluid (a) through (r) listed in Table XI (one sample per fluid) for 2 hours at room temperature. After removal, excess fluid shall drain from the connectors for 4 hours and the SPOTDs re-installed. Following the test, the connectors shall be subjected to SPOTD retention as specified in 4.7.19.

4.7.24 Sunshine (See 3.28).

4.7.24.1 General. The sunshine test is conducted to determine the effect of solar radiation on non-metallic components. Items with parts made of rubber, cloth, plastic, etc., are generally those affected by this type of test. The item shall be tested to assure that it functions as required.

4.7.24.2 Procedure.

4.7.24.2.1 General. The test chamber volume shall be a minimum of ten times that of the envelope volume of the test item. The chamber's simulated solar radiation source area shall be a minimum of 125 percent of the horizontal area projection of the test item.

For the purposes of this test, the following spectral distribution of solar radiation is acceptable: 533 to 775 watts per square meter (50 to 72 watts per square foot) of infrared (wavelengths above 7,300 angstrom units), 43 to 75 watts per square meter (4 to 7 watts per square foot) of ultraviolet (wavelengths below 3,800 angstrom units), and the balance visible. The radiation source shall be located at least 76.2 centimeters (30 inches) away from any outer surface of the test item. (Lamp vendor's spectral distribution curves may be used in establishing the spectral distribution within the above specified limits. U.S. Bureau of Standards traceability of this vendor data is waived.)

Tests which are conducted for degradation and deterioration of materials may use one of the following acceptable radiation sources: (1) mercury vapor lamps (internal reflector type only), (2) combination of incandescent spot lamps (including infrared filters) together with tubular type mercury vapor lamps with external reflector, (3) combination of incandescent spot lamps (including infrared filters) together with mercury vapor lamps with internal reflectors (with filters as required), (4) carbon arc lamps with suitable reflectors, or (5) mercury-xenon lamps with suitable reflectors (with filters as required).

4.7.24.2.2 Test Item. The test item shall be placed in the test chamber in its unmated condition. Expose unit to radiant energy at the rate of 1,076 to 1,292 watts per square meter (100 to 120 watts per square foot) or as specified in the equipment specification. The period of the test shall not be less than 48 hours, during which time the chamber temperature shall be maintained at 45 DEG C (113 DEG F).

ENCL 10

4.7.24.2.3 Post-Sunshine Tests. After removal from the test chamber, the item shall be subjected to the following tests:

a) Coupling force (3.12).

b) Insulation resistance (3.7).

c) SPOTD retention (3.14).

4.7.24.2.4 Visual. The item shall be visually inspected after removal from the test chamber for damage caused by the sunshine test.

4.7.25 Altitude Immersion (Except Hermetics and Submersibles) (See 3.29). Mated connectors shall be subjected to the test of method 1004 of MIL-STD-1344. At the end of the third cycle while the connectors are still submerged, insulation resistance and dielectric strength tests (3.7 and 3.8) shall be performed.

4.7.26 Altitude - Low Temperature (See 3.30). Perform test method 1011 of MIL-STD-1344 on the mated connector assembly.

4.7.27 Temperature Shock (See 3.31).

4.7.27.1 General. The temperature shock test is performed to determine the effects on items of sudden changes in the temperature of the surrounding atmosphere. The item shall be tested to ensure that it functions as required.

4.7.27.2 Procedure.

4.7.27.2.1 Test Cycle. Mated connectors shall be subject to method 1003 of MIL-STD-1344, test condition A with the following exceptions:

a) Steps 2 and 4 shall be less than 2 minutes.

b) The temperature of step 3 shall be 200 DEG C.

4.7.27.2.2 Post-Temperature Shock Tests. After removal from the test chamber, the item shall be subjected to the following tests:

a) Coupling force (3.12).

b) Insulation resistance (3.7).

c) SPOTD retention (3.14).

ENCL 10

4.7.27.2.3 Visual. The item shall be visually inspected after removal from the test chamber for damage caused by the temperature shock test.

4.7.28 Temperature Life (See 3.32). A mated connector pair shall be subject to method 1005 of MIL-STD-1344, test condition 7-D. The connectors shall not be electrically loaded.

4.7.29 Flame Test - To be determined.

4.7.30 Electrolytic Erosion (See 3.34). The wired receptacle half of the connector containing the recessed insert face, shall be firmly mounted in a vertical postition, SPOTDs facing up. A salt-water solution (5 percent salt by weight) shall be poured onto the interface until the solution level just reaches the tops of the SPOTDs. The solution shall remain in the connector for a minimum of 30 seconds and then poured out, lightly shaking excesses from the connector. The counterpart plug shall immediately be mated with the receptacle. One cell pattern, with all SPOTDs adjacent to a central SPOTD at a positive polarity and the center SPOTD at a negative polarity, shall be set up at a location giving the most uniform distribution of SPOTDs adjacent to the center SPOTD. A potential of 60 volts DC shall be applied between the SPOTDs adjacent to the center SPOTD. The SPOTDs shall be energized for 40 hours. Following this, with the voltage disconnected, the connectors shall be unmated and the SPOTDs removed. The SPOTDs shall be examined using 3X magnification for erosion to base metal.

4.7.31 Environmental Life Cycle (See 3.35). A group of connectors from each series and class shall be submitted to all of the life cycle tests in the given sequence. Any maintenance actions required to continue testing shall be performed and recorded.

4.7.31.1 Initial tests to ensure connector operability at start.

4.7.31.1.1 Mechanical. Perform the following tests:

a) Visual and mechanical examination.

b) Coupling force (3.12).

c) Insert retention (3.13).

d) SPOTD retention (3.14).

e) External bending moment (3.21).

f) Accessory mounting strength (3.20).

g) Lanyard release force (3.18).

h) Lanyard retention force (3.8).

ENCL 10

4.7.31.1.2 Electrical Tests. Perform the following tests:

a) Insulation resistance (ambient temperature) (3.7).

b) Dielectric withstanding voltage (sea level) (3.8).

c) Shell to shell conductivity (3.10).

d) Insertion loss (3.9).

4.7.31.2 Sand and Dust. Perform the sand and dust test according to Method 110A of MIL-STD-202 with the following specifications or changes:

a) The connectors shall be unmated and oriented with the insert face downward.

b) AC coarse dust shall be used.

c) Adjust the air velocity to 10,500 +/- 500 f/m for 10 minutes during step 1.

d) Prior to step 2, moisten the surfaces of the connector assembly.

4.7.31.3 Durability. Perform the durability test of 4.7.22 except limit the cycles to 250. For in-flight releasable connectors, the last 50 cycles will be flight released.

4.7.31.4 Fluid Immersion. Subject the unmated connector assembly to the fluid immersion test, Method 1016 of MIL-STD-1344 with the following specifications or exceptions:

a) Each connector shall be exposed to all fluids for two cycles maximum.

b) Utilize the fluids, time and temperature from Table XI fluids (a) through (r) excluding MIL-L-25769 (g).

c) Exclude measurement of the coupling torque.

ENCL 10

4.7.31.5 Salt Spray. Perform the salt spray test, Method 1001, MIL-STD-1344, 200 hours on mated connectors with the following exceptions:

a) Replace NaCl with the following mixture of salts:

Salt	Percent by Weight
NaCl	70
MgCl2.6(H2O)	15
Anhydrous Na2SO4	11
Anhydrous CaCl2	4

Adjust the pH of the solution to 8.2 using anhydrous sodium hydroxide (NaOH) solution.

b) Administer sulfur dioxide (SO2) gas in a concentration of 900 parts per billion.

c) The connector sample will not undergo post test cleaning and examination.

4.7.31.6 Temperature-Altitude-Humidity. Apply the following test to the mated connector assembly:

a) Administer ozone at the reduced pressure phase or perform Method 1007 of MIL-STD-1344 prior to temperature-altitude-humidity test.

b) Step 1 - At standard ambient pressure, adjust the temperature to 38 DEG C (100 DEG F) and humidity to 95% R.H. Maintain these conditions for 6 hours.

c) Step 2 - Reduce chamber pressure at a rate of 200 ft/sec to 60,000 ft altitude while decreasing temperature to -40 DEG C (-40 DEG F) within 30 minutes. Maintain these conditions for 2.5 hours. Apply ozone according to 4.7.31.6(a).

PRELIM

ENCL 10

d) Step 3 - Raise the chamber pressure to standard ambient at a rate of 200 ft/sec while increasing the temperature to 38 DEG C (100 DEG F) and humidity to 95% R.H. Maintain for 2.5 hours.

e) Step 4 - Within 10 minutes, increase temperature to 71 DEG C (160 DEG F). Reduce humidity to less than 5 percent. Maintain these conditions for 10 hours.

f) Repeat steps (1) through (4) three more times for a total of 4 cycles.

4.7.31.7 Exhaust Heat (See 3.33). Mated connectors shall have the surrounding ambient temperature raised to 350 DEG C (637 DEG F) within 5 seconds. This temperature shall be maintained for an additional 10 seconds, then returned to room ambient within 5 seconds. The connector shall be allowed to cool to ambient. This cycle shall be repeated 600 times.

4.7.31.8 Cycling. Repeat steps 4.7.31.2 through 4.7.31.7.

4.7.31.9 Cleaning. Clean the connector assembly with MIL-L-25769 cleaning fluid. Lubricate the coupling assembly if required.

4.7.31.10 Repeat steps 4.7.31.2 through 4.7.31.7. The connector assembly shall have gone through steps 4.7.31.2 through 4.7.31.7 a total of 3 times.

4.7.31.11 Mechanical Environment. Perform the following tests:

a) Shock (3.24).

b) Vibration (3.23).

4.7.31.12 Mechanical Evaluation. Perform the mechanical tests in step 4.7.31.1.1.

4.7.31.13 Altitude - Low Temperature (See 3.30).

4.7.31.14 Electrical Evaluation. Perform the electrical tests of 4.7.31.2 plus contact walkout (3.36) and EMI shielding test (3.11).

ENCL 10

4.7.32 SPOTD Walkout (See 3.36). Two SPOTDs in each plug and receptacle shall be tested. The SPOTDs shall be terminated to stranded steel cable of an appropriate size and installed in the connector. The unmated connector shall be mounted in a test fixture as shown on Figure 1. A 3-pound load shall be applied to the cable. One 360 DEG rotation of the fixture with the connector mounted shall constitute one cycle. The connector shall be subjected to 100 cycles at a rate of 10 to 20 cycles per minute.

4.7.33 Test Probe Damage (See 3.37). One SPOTD of each size shall be tested in accordance with method 2006 of MIL-STD-1344. Probe depths shall be 1/2 and full depth. Where this method does not apply, the SPOTDs shall be evaluated for susceptibility to damage by probing by a reasonably skilled technician.

4.7.34 Flame Test. To be determined.

ENCL 10

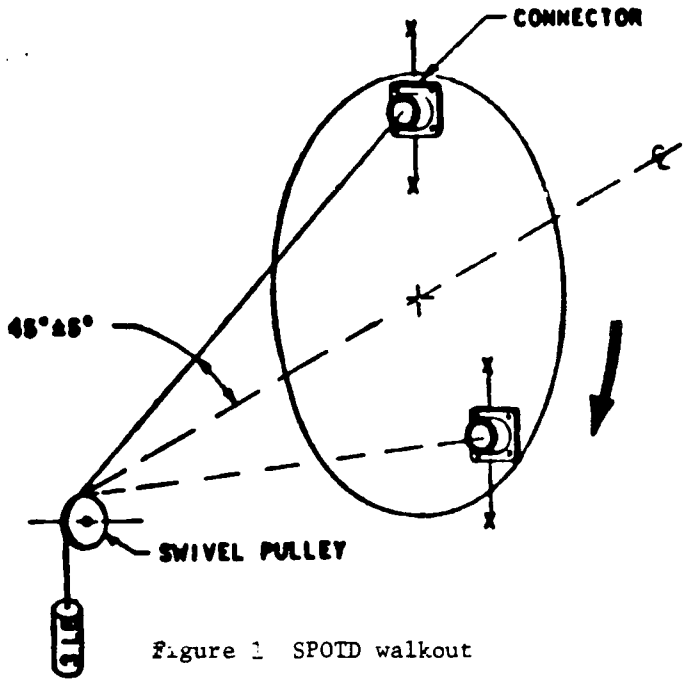


Figure 1 SPOTD walkout

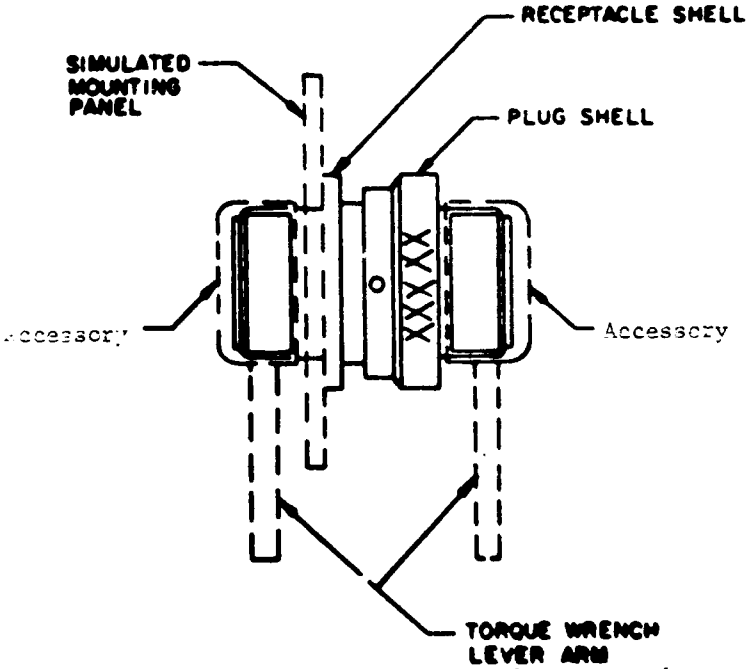


Figure 2 Accessory mounting strength

ENCL 10

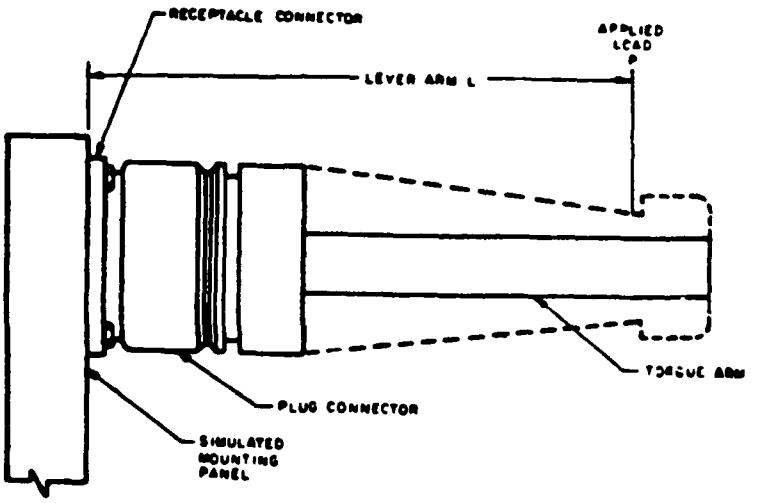


FIGURE 3 External bending moment test set-up.

ENCL 10

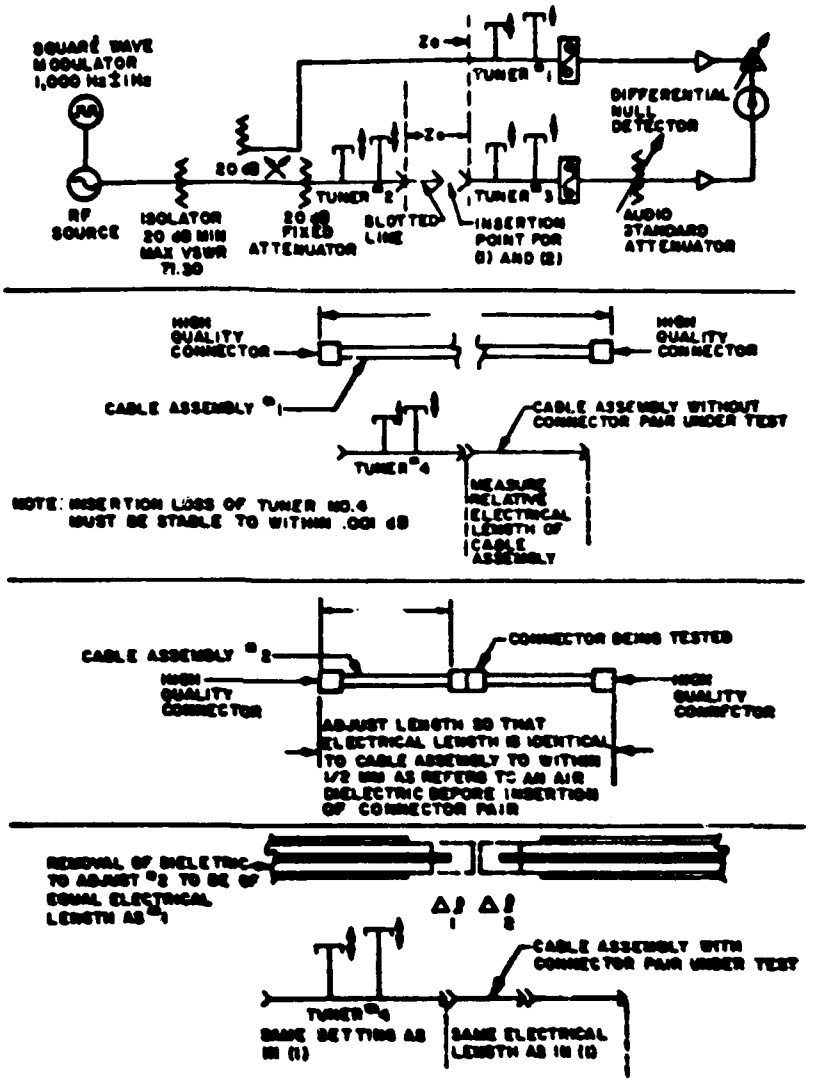


Figure 4 R F Insertion loss

ENCL 16

MINUTES OF SIMPLE STORE INTERFACE TASK GROUP MEETING
25-26 May 1982

1. The first meeting of the Simple Store Interface Task Group was held at Eglin AFB, Florida on 25 and 26 May 1982. The meeting was conducted by the task group chairman, Mr. Fred Benedick of AFATL/DLJA.

2. After introductory remarks, Mr. Claude Connell, Air Force program manager for the Aircraft Armament Interoperable Interface (A^2I^2) program, gave a presentation on MIL-STD-1760 (Aircraft/Store Electrical Interconnection System). He discussed the background of MIL-STD-1760, the efforts for continued development of the standard, and the role of the simple store interface. Mr. Benedick then made a short presentation on the overall concept of a simple store interface for MIL-STD-1760.

3. The scope of the effort to be conducted by the group was then discussed. It was agreed that a draft of an electrical interface for simple stores suitable for incorporation into MIL-STD-1760 will be produced. Also, the supporting rationale for the interface will be documented. Two basic philosophical principles to be followed during the course of the effort were established:

a. Functional requirements for the Simple Store Interface will be driven by the needs of high usage stores.

b. Mechanical issues associated with the Simple Store Interface such as the use of arming wires will be identified, but will be referred to another more appropriate group for resolution.

The following general criteria for the Simple Store Interface were also established:

a. Should be inexpensive.

b. Should be expendable.

c. Should use a connector significantly smaller than the size 25 connector that is planned for use with the MIL-STD-1760 primary signal set.

d. Should satisfy all of the interface functional requirements of simple stores that are to be accomplished by electrical means.

4. Since digital fuze requirements are an important consideration in the development of the Simple Store Interface, members of the digital fuze community were asked to discuss work going on in that area. Presentations were made by Mr. Walt Smith of AD/DLJF, Mr. Larry Brauer of NWC, and Mr. George Briggs of NSWC. Mr. Brauer pointed out that many of the fuze interface requirements can be determined from the requirements for the FMU-139, a recently developed electronic fuze intended for use by both the Air Force and Navy. During his presentation, Mr. Briggs described an interfacing scheme for surface launched projectiles that uses an inductively coupled link rather than connector contacts for passage of data and power to the weapon. There was significant interest among the group for investigating the use of a similar

ENCL 11

scheme for the simple store interface. Mr. Jack Watts of General Dynamics also gave a short presentation on the interface that is being implemented on the AFTI F-16 to accommodate testing for the Standard Avionics Integrated Fuze (SAIF) Program. It is basically a fourteen pin subset of the MIL-STD-1760 primary signal set, and uses a dual redundant MIL-STD-1553B data bus as the data communication link. After the presentations were concluded, Mr. Briggs summarized what he believes to be the interface functional requirements for stores with digital fuzes. These are:

a. ID and partial BIT prior to launch.

b. Initiation of function prior to launch.

c. Intent to launch and confirmation of separation.

d. Arm time or distance.

e. Functions time or options.

f. Confidence in message of 10^{12} power

5. A discussion of how to proceed with the effort of the group was held. Mr.Benedick listed the following sequence of major tasks that must be performed to accomplish the objectives of the group:

a. List stores or projected stores which meet the criteria for simple stores, i.e., low cost, high volume, expendable stores.

b. List functional requirements of the electrical interface for these stores.

c. Determine what interfacing schemes are potentially viable solutions for meeting the interface requirements.

d. Select an interfacing scheme based on merit factors such as cost, complexity, standardization benefits, ease of implementation, etc.

e. Write a draft standard for the Simple Store Interface.

f. Circulate the draft standard to appropriate organizations in government and industry and revise it as necessary.

g. Make a recommendation to the A^2I^2 program and the A-2K Subcommittee on the Simple Store Interface.

Mr. Don Lautner of Vought suggested that three smaller working groups be formed within the task group to address specific areas associated with the interface development. These areas and specific issues associated with each area are as follows:

a. COST ANALYSIS

1) What is cost of a reduced 1760 signal set with projected 1990 technology (in 1982 dollars). Assume interface contains:

ENCL 11

- 28 VDC power

- Full Redundant 1553 and Address discretes

- Store Interlock discretes

- Structure ground

  (Plus store receptacle)

2) What is the absolute maximum (in dollars or percent of store cost) that a "low cost" store can afford for an electrical interface?

3) What is the cost of an alternate signal set:

- Power

- Bidirectional data link (point-to-point)
  (plus store receptacle or induction coil)

b. FUNCTION REQUIREMENTS

What are the functional (electrical) requirements for a low cost store interface?

- Power quantity
- Data rate and quantity
- *Bi-directional required?*
- Reliability level
- EMI/EMP etc
- Release consent function?
- *Store interlock function?*

c. DATA LINK IMPLEMENTATIONS

What are the performance requirements/characteristics for:

- "Low Speed" Serial Digital

- Reduced Capability 1553
  (no mode codes, no bus, no address, non-redundant, loose line characteristics)

- Induction Link (bi-directional)

Mr. Lautner's suggestion was accepted by the group and the three working groups were formed. The groups are as follows:

Group 1 - Cost Analysis

*Don Lautner
Craig Burgess
John Slivinski
Larry Brauer

ENCL 11

Kal Prost
George Briggs
Manvel Geyer

Group 2 - Functional Requirements

*Walt Smith
Dave Cooper/John Haney
Larry Brauer
Kal Prost
Jack Watts
Don Lautner
George Briggs
Fred Benedick

Group 3 - Data Link Implementations

*Fred Benedick
Craig Burgess
Walt Smith
Manvel Geyer
Jack Watts
Don Lautner
Dave Cooper

*Working Group Chairman

6. It was pointed out that issues relative to selection of a connector for the Simple Store Interface will arise during the effort. Since a connector working group already exists to address issues associated with the primary MIL-STD-1760 connector, it was decided to ask that group for assistance with connector issues. Since Mr. Bryce Sundstrom and Mr. John Haney are also members of the connector working group, they agreed to act as liaisons to that group.

7. In order to provide a baseline on which to proceed, it was decided that Group 1 should provide an answer to issue 1) in the cost analysis area at the next meeting. It was also decided that all cost figures should be based on the use of MIL-38510 Class B components. Additionally, a decision was made that Group 2 should provide a list of existing or projected stores that potentially fall into the simple store category along with the interface functional requirements for these stores.

8. The final order of business was to select a location and date for the next meeting. NSWC and Vought both volunteered to host the meeting. A vote was held and the decision was to hold the next meeting at NSWC in White Oak, Maryland. After discussing potential meeting dates, it was decided to hold the meeting on 13-15 July.

Fred L. Benedick
FRED L. BENEDICK
Task Group Chairman

ENCL 11

MINUTES OF SIMPLE STORE INTERFACE TASK GROUP MEETING
13-14 July 1982

1. The second meeting of the Simple Store Interface Task Group was held at the Naval Surface Weapons Center in White Oak, Maryland on 13 and 14 July 1982. The meeting was conducted by Mr. Fred Benedick of AFATL/DLJA, the task group chairman.

2. Mr. Don Ellis and Mr. Frank Woodall of Teledyne Brown were at the meeting to discuss contractual work they are doing for the Air Force on a MIL-STD-1760 Implementation Strategy. Mr. Ellis, who is also chairman of the SAE-A2K Subcommittee, the parent organization for this task group, briefly discussed the reorganization of the A-2K Subcommittee into the AE-9 Aerospace and Avionics Integration Committee and invited interested members of the task group to participate in other activities of that committee. Mr. Woodall then presented an overview of the work on the MIL-STD-1760 implementation strategy and invited inputs from the group.

3. Working Groups 1 and 2 then presented information regarding cost analysis and functional requirements respectively of the Simple Store Interface. The information presented by Group 1 addressed the use of both single and dual channel MIL-STD-1553B (1553) data links as well as a low cost serial digital data link for communication to simple stores. Their analysis showed that except for general purpose bombs with electronic fuzes such as the MK-80 series, the electrical interface has an insignificant impact on total store cost. For the general purpose bombs the increase in store cost is approximately two percent for the low cost serial link, five percent for a single channel 1553 link, and ten percent for a dual channel 1553 link. Representatives of Data Device Corporation (DDC) were present and stated the cost of a 1553 interface for simple stores could possibly be reduced even more if certain limitations were placed on the capability of the interface. Working Group 2 discussed the functional requirements of the Simple Store Interface and pointed out that the following signals in the primary MIL-STD-1760 signal set are definitely not needed for simple stores:

- Video Signals
- RF Signals
- Audio Signal
- 115 VAC Power
- 270 VDC Power
- Fiber Optics

It was also pointed out that for ease of implementation the Simple Store Interface needs to be a direct subset of the primary MIL-STD-1760 signal set, or as close to a direct subset as possible.

4. Groups 1 and 2 then held separate working sessions. Much of the discussion in Group 1 was with DDC about which capability reductions would reduce the cost of a 1553 interface. Restrictions such as no RT-to-RT capability, no bus controller capability, limited or no mode codes, and specific message formats were identified as limitations that would aid significantly in reducing the interface cost. Group 2 identified specific interface alternatives that would meet the known requirements of the Simple Store Interface to be used as a basis for further cost analysis. A summary of the Group 2 discussion is included in Appendix A. Mr. Dave Cooper of Booz-Allen also provided a summary of the

ENCL 11

umbilical/connector requirements for the Simple Store Interface. This is included as Appendix B.

5. The task group agreed that the future course of action would be to obtain more detailed cost information based on the interface options identified by Group 2. Though several members of the group felt that even a minimum capability 1553 data link might still be too expensive, they agreed to proceed with a limited 1553 link as the baseline for the present time. ASD agreed to set up a meeting at Wright-Patterson AFB with various 1553 device manufacturers to discuss in detail the cost implications of the various potential 1553 capability combinations. The results of that meeting should be available at the next task group meeting.

6. Two presentations were made to the group by NSWC personnel on programs in which data links for digital fuzes had been implemented. The first presentation described an inductive data link for surface launched projectiles which sent both power and 1 khz data to the fuze electronics by turning a 100 khz carrier on and off. There was some discussion of how high the data rate could be with such a scheme, and though an exact figure for the upper limit was not known, it was agreed that the rate could be increased substantially above the present 1 khz. The second presentation dealt with a prototype low speed serial data link for airborne weapons in which power and data were transferred to the store over the same wire pair.

7. The action items to be accomplished prior to the next task group meeting were identified and listed. These items and the responsible organizations are as follows:

ASD

. Present candidate 1553 implementations to 1553 device manufacturers

. Set up a meeting with the device manufacturers to discuss the cost implications of the various possible implementations.

AFATL/DLJA

. Ask the 1760 Connector Working Group to begin work on a connector for simple stores as soon as possible.

. Write a draft specification of a minimum capability 1553 data link for the Simple Store Interface.

. Try to find anticipated rates of production of simple weapons (iron bombs, dispensers, etc.) over the next few years.

AFATL/DLJF

. Get cost data on existing fuzes.

General Dynamics

. Get data on 1553 bus failure rates in operational aircraft.

Naval Surface Weapons Center

ENCL 11

. Get a copy of a fuze requirements document that is being produced by the Joint Fuze Managers.

8. A decision was made to hold the next task group meeting at Vought Corporation in Dallas sometime in September. Members will be informed of the exact dates several weeks prior to the meeting.

Fred L. Benedick

FRED L. BENEDICK
Task Group Chairman

ENCL 11

APPENDIX A

Group 2 - Functional Requirements

The functional requirements group met on 13 July 1982 with Mr. Jack Watts as acting group chairman. Mr. Walt Smith will resume chairmanship at the next meeting.

I. General Discussion

The simple store interface requirements will be limited to:

(1) 28 VDC power

(2) Serial digital data link: MIL-STD-1553B or some subset

(3) Store interlock signal

II. Detail Discussion

Each of the interface items were discussed in detail with the following results.

(1) 28 VDC Power

The 28 VDC power will be limited to the requirements of one 28 VDC power interface as defined in MIL-STD-1760 (e.g., 10 amperes maximum and MIL-STD-704 conditioning).

(2) Serial Digital Data Link

The full dual channel MIL-STD-1553B is desired by the Group 2 members; however, due to cost considerations, a simplified version of MIL-STD-1553B may be required. The simplification would be limited to configurations using the combinations of 1) single or dual data link channels, 2) 4 or 15 mode codes, and 3) 8 or 32 data words. The following table defines eight configurations for cost estimates.

TABLE OF CONFIGURATIONS

CONFIGURATION	CHANNELS		MODE CODES		DATA WORDS	
	SINGLE	DUAL	4	15	8	32
1		X		X		X
2		X	X			X
3		X		X	X	
4		X	X		X	
5	X			X		X
6	X		X			X
7	X			X	X	
8	X		X		X	

Configuration 1 is the full dual channel serial digital data link described in MIL-STD-1553B. The other configurations are a simplification of configuration 1.

ENCL 11

A 9th cost estimation is also requested to determine the cost delta for configuration 8 with and without the address lines (7 signals). If these address lines are deleted, the aircraft will require hardware modifications in the RIU (or SIU) to add a point-to-point interface to the store (i.e., no bus). An alternative to the hardware modification would be to assign the store an address in a data word upon applying 28 VDC to the store. This software method of assigning store addresses will require non-volatile memory in the store electronics. The software method of assigning store addresses may not be suitable for implementation.

(3) Store Interlock Signal

The store interlock signal (and return) may be needed for proper SMS and/or store logic, it also may be the best source to start the store's clock for fuze timing. Note: The store interlock signal will n be used as the sole logic to start the fuze timing functions. If proper SMS and store logic operation, along with an adequate timing initialization, can be accomplished by other means, this interface may be deleted.

III. Straw Man Electrical Interface

Cost estimates for the previously listed configurations will aid in defining the exact electrical interface; however, a straw man electrical interface was defined for use in planning and study purposes with the understanding that the straw man interface may change. The straw man electrical interface is defined as shown in the table below:

STRAW MAN ELECTRICAL INTERFACE

PIN NUMBER	SIGNAL
1	Mux bus high
2	Mux bus Iow
3	28 VDC power
4	28 VDC power return
5	Structure ground
6	Interlock
7	Interlock return
8-14	Address lines + Parity + return

This straw man configuration is a single channel data link. The second channel will be added to the electrical interface if the cost estimate for these items is not prohibitive.

ENCL 11

APPENDIX B

Simple Store Interface Umbilical/Connector Requirements

The connector and wire bundle for simple stores should be selected to minimize costs yet meet minimum performance requirements for noise and environmental protection. Bendix indicated that connectors could be point designed to meet our exact requirements because of the quantities involved (20-50 K per month). Their estimate for a full MIL-STD-1760 connector cost was approximately $350 to $400 with a receptacle cost of $50. The cost drivers were the lanyard release mechanism, the shell size and the number of coax or triaxial contacts. If no coax or triax contacts are used, and a conductive composite material can be used for the connector, the mated pair costs can be reduced to approximately $25 to $50 per mated pair. This, however, is not a hermetically sealed plug. If hermetic sealing is required, the price goes up.

A suggestion was made to include the wire bundle and disposable plug as a part of the fuze. The rack receptacle would be separate from the full -1760 signal set connector and would be retained on the carriage store. This brings up mechanical release questions which must be resolved but are not within the purview of this group.

Action Items

(1) Determine the minimum noise and environmental protection requirements.

(2) Obtain an estimate for a plug and receptacle so that:

(a) The plug is disposable

(b) The receptacle is reusable

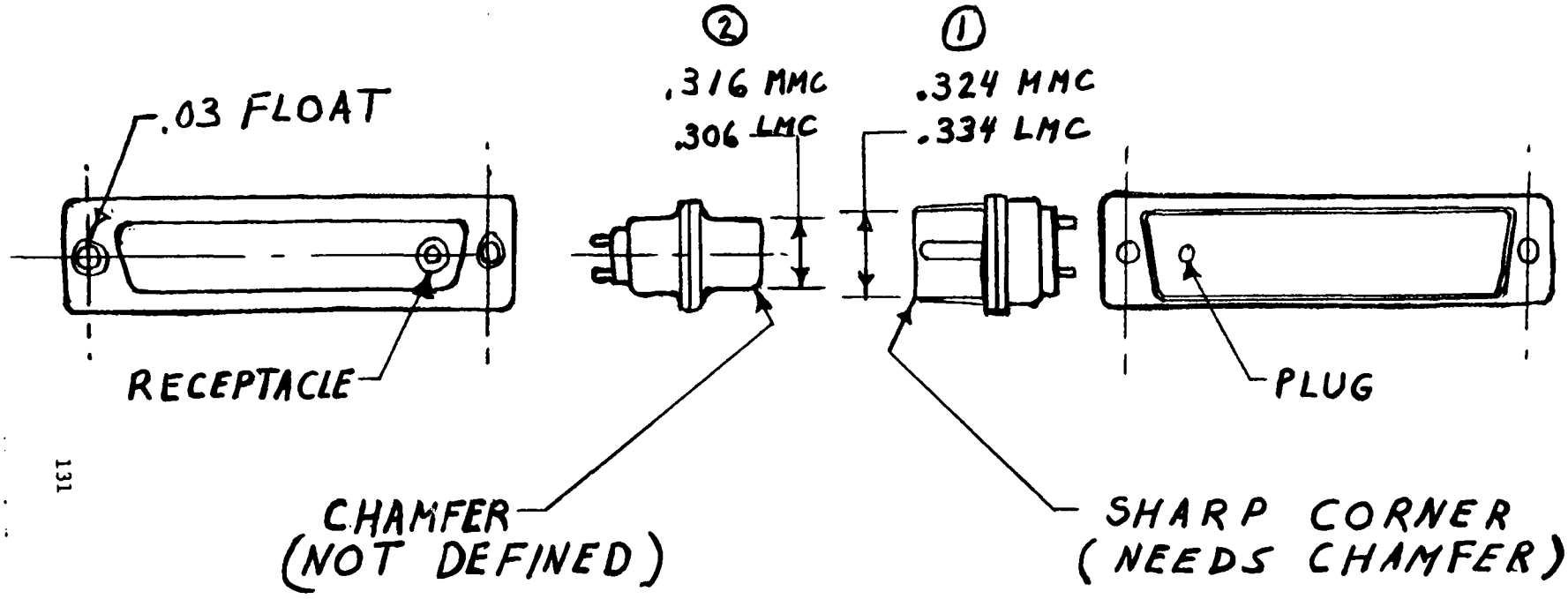
(c) The connector has 9 to 12 16-gage pins

(d) The connector has a conductive shell

(e) Minimum noise and environmental requirements for the connector are met.

ENCL 11

MIL-C-24308 NOW NOT FOR BLIND MATING



① .324 MMC PLUG

②-.316 MMC RECEPTACLE

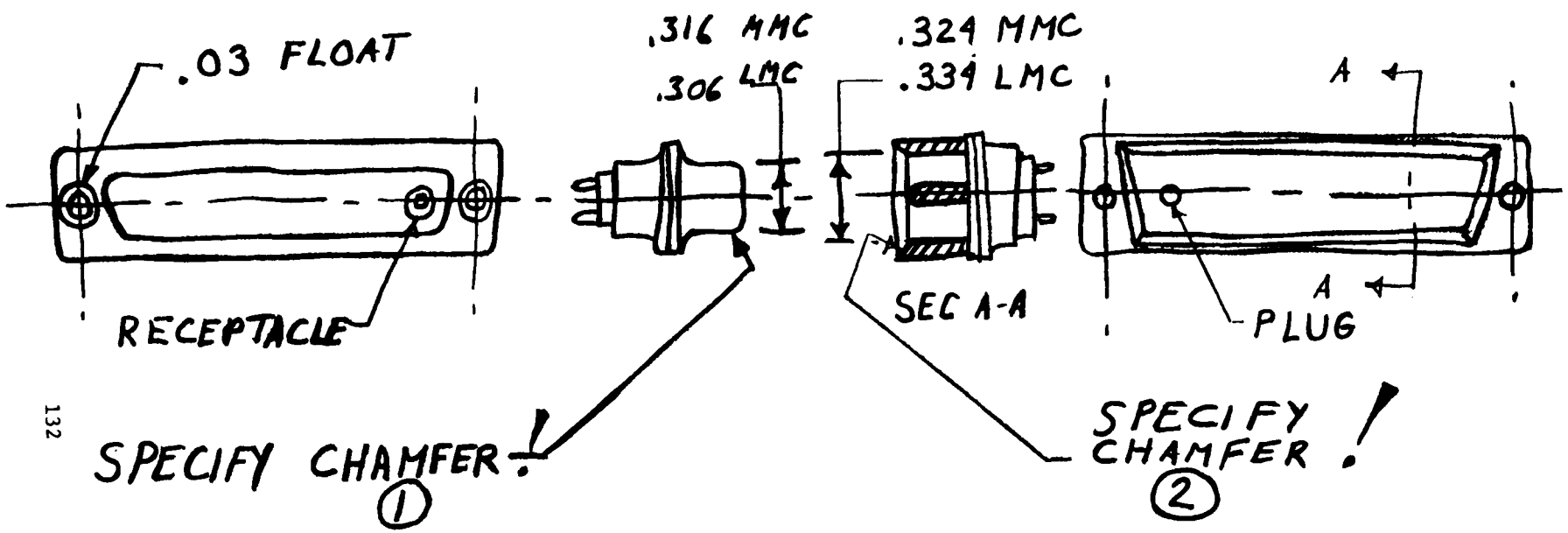
.008 ALLOWANCE @ MMC

∴ POS. TOL = .004 PLUG @ MMC
AND
.004 RECEPTACLE @ MMC.

131

ENCL 12

MIL-C-24308 PROPOSED FOR "BLIND MATING"



PT. FOR PLUG AND RECEPTACLE IS STILL .001 EACH, BUT:

CHAMFER ① + CHAMFER ② MUST BE EQUAL TO OR GREATER THAN .03 FLOAT + DROOP + WIRE BUNDLE SKEW.

ENCL 12

EIA P-5.3 WORKING GROUP ON RF CONNECTORS

Report Presented At Standardization Planning Meeting
Dayton, Ohio August 26, 1982

Presented By: S. J. Somerset, Chairman

The EIA P-5.3 Working Group on RF Connectors is committed to working closely with the Military in the proposal, preparation and finalization of new coaxial connector specifications as well as the review and revision of existing ones. Working Group P-5.3 has played a significant role in producing many specifications such as MIL-C-39012, MIL-A-55339, MIL-C-49142 and most recently, MIL-C-83517. We are currently involved in several tasks:

1. Development of category F Connector specifications for semi-rigid cable applications.
2. Development of test fixtures for testing strip transmission line connectors listed in MIL-C-83517.
3. Development of specifications for 18GHz type N and TNC connectors for semi-rigid cables.
4. Resolution of discrepancies between MIL-C-39012 and MIL-C-17.

Tasks 1 thru 3 have been undertaken by our Task Group "F" chaired by Charles Dreyer while task 4 is being handled by a joint P-5.3/C83.3 task group chaired by Sam Jackson. Both gentlemen are here today and will report on their group's activities in detail.

The P-5.3 Working Group meets once a year. It oversees the work of the various Task Groups and assigns tasks or establishes new groups as situations warrant.

Our last meeting was held on December 7, 1981. During that meeting in addition to reviewing the accomplishments of Task Group "F" and the Joint P-5.3/C83.3 and receiving a report on the activities of S46D/IEC and DESC connector projects we accomplished the following:

1. Agreed to try to compile unit weights of MIL-C-39012, category A Connectors for AFLD.
2. Agreed to put off any further effort on SSMA, SSMB and SSMC connectors pending issuance of the IEC Central Office documents. The Military could then use these documents as a basis for Military specifications at a later date.
3. Turned down an AFLD request to revise MIL-C-39012 to require transmission loss and VSWR tests following vibration and shock tests because the cost would be prohibitive and the results would be inconclusive for the connector under test. We recommend that these tests be included in a cable assembly specification.

ENCL 13

4. Since we could not see any requirements for class I connectors at this time we recommended that the definition be deleted from MIL-C-39012.

5. Task Group "F" was requested to investigate increasing the frequency ranges of N and TNC Connectors to 18 GHz when used with semi-rigid cables.

In conclusion I would like to take this opportunity to thank the Military, particularly Mr. Marbais, Mr. Segar and Mr. Rathfelder and many others for their continuing assistance in our undertakings. It is our earnest desire that this fine spirit of cooperation will continue for many years to come.

ENCL 13

P-5.3 Task Group F

Miniature R.F. Connectors for semi-rigid cable and strip transmission lines

Chairman: C. W. Dreyer

Report given at the Standardization Planning meeting on connectors (FSC) Class 5935, August 25, 26, 27, 1982.

The P-5.3 Task Group F Committee is basically concerned with R.F. connector specifications Mil-C-39012, Mil-C-83517 and Mil-A-55339. The three specifications are closely related. Meetings are held 4 to 6 times a year with most of the work being done between meetings.

1. The committee completed work on the TNC and "N" connectors for semi-rigid cables for inclusion in Mil-C-39012. Cables stripping tools have not been specified. The P-5.3 main committee met in December (1981) and discussed resuming work on Class I "N" and TNC connectors. A decision was made to upgrade the present Class II "N" and TNC semi-rigid cable connectors for use from D.C. to 18 GHz instead of creating Class I connectors. The task was assigned to Task Group F. Following meetings uncovered many problems. This was not the easy task that it appeared to be. Some of the problems have been resolved. The outer conductor material and design (slotted and un-slotted) has not been determined. A decision will be made at the next meeting and the remaining work completed as soon as possible.

2. The edited version of Mil-C-83517 was reviewed. The committee is still working on transmission loss and V.S.W.R. specifications. Several test fixtures were made and tested but no testing of the connectors has been performed. Temporary figures will be given to the Air Force to expedite the release of the specification. Changes will be made later if necessary. Mil-C-83517 is a new, up-to-date specification that can be used to improve other connector specifications.

3. The Task Group discussed the proposed changes in Mil-C-39012 slash sheets adding Category F. Comments were sent to the Air Force and the Air Force responded. The committee will discuss the response and the results of the Category F discussion at this planning meeting.

4. The next P-5.3 Task Group F meeting is scheduled for September 21, 1982, at the Barbizon Plaza Hotel in New York City.

C. W. Dreyer
8/23/82

ENCL 14

E.I.A. P5.3/C83.3 Joint Task Group Report

(For presentation at FSC5935 Standardization Planning Meeting Aug. 25,1982)

1. The P5.3/C83.3 Joint Task Group for RF Cables and Connectors met five times during the past year. We have continued our work on the electrical characteristics common to MIL-C-39012 and MIL-C-17. The guiding principal is that neither cable nor connectors are independent components. They are almost invariably used together as cable assemblies. The Joint Task Group is rewriting the applicable specification paragraphs to support this viewpoint.

2. Since the 1981 Planning Meeting we have agreed on final drafts for revision of the cable and connector basic documents for:

   a. Corona Extinction Voltage
   b. Insulation Resustance

3. A major task has been to update the procedures for Standing Wave Ratio/ Structural Return Loss. The proposed revisions will incorporate RF bridge techniques as alternative to the present swept slotted line procedure. This will permit testing over a lower frequency range than now practical. We expect SWR/SRL to be completed this fall.

4. Proposals have been developed by Task Group members for RF Transmission Loss which will replace the present cable attenuation and connector insertion loss requirements. This should be completed in early 1983.

5. Future efforts of P5.3/C83.3 will be addressed to a general review of the detail specification sheets in MIL-C-17 and MIL-C-39012 in regard to the following:

   a. Changes needed to support the revised requirement and test method paragraphs.
   b. Frequency discrepancies between connectors and their specified cables.
   c. Dimensional incompatibilities between cables specified for use with the same connector

   The Joint Task Group will develop guide lines for revision of the connector and cable slash sheets in those three areas by DESC.

6. Again, I take the opportunity to thank those who, in spite of the many demands on their time, continue to participate actively in the Joint Task Group. The work of P5.3/C83.3 is possible only through the pooling of their individual efforts and technical expertise.

S. H. Jackson
Chairman
P5.3/C83.3

ENCL 15

united states national committee
of the international electrotechnical commission

RF Connector International Standards
IEC SC-46D

Reported by: N. J. Sladek
Technical Advisor SC46D/USNC
August 1982

In October 1981, an International Meeting of SC46D (Connectors for RF Cables) was held in Dubrovnik, Yugoslavia. Final draft standards were agreed dealing with the following connectors which are of specific interest to the USA:

Type N
SMB

In the arena of test methods and procedures, agreements were concluded dealing with reflection factor measurements and revisions to Part 1: General requirements and measuring methods of IEC Publication 169-1 Radio-frequency connectors.

The two connector types and test methods will issue as IEC publications in the near future, probably in 1982 or 1983.

* * * * *

Work continues on:

TWBNC (called BNO in the IEC lexicon)
Type F
Type SC [both the earlier US version (circa 1960) and the MIL-C-39012 version]
Type SSMA
Type SSMB
Type SSMC

Screening Effectiveness - Several methods were proposed and countries were invited to verify the methods, in particular those suitable for use above 100 MHz.

3.5mm Precision Airline Mounting Dimensions

* * * * *

Proposals for work were made in the areas of:

- Cable assembly standardization considerations coordinated with SC46A
- Higher order moding studies
- 'Life expectancy' of test connectors
- Power handling/rating
- 2-pole screw (.750-20 UNEF) coupled connectors for shielded balanced cables

* * * * *

ENCL 16

The following people make up the SC46D Technical Expert Advisory Group for the USA and have given generously of their time and talent:

Tore Anderson/Consultant
Alex Brishka/Sabritec
Dave DeChamp/ITT Cannon
Jim Flanagan/Sealectro
Ed Forney/AMP
Sam Jackson/Kings
Ramon Jesch/NBS, Boulder
Jack Kerr/Naval Electronics Systems Cmd.
Jim Kubota/Omni-Spectra
Rich Marbais/DESC-ESS
Mario Maury/Maury Microwave
John Morelli/Automatic Connector
Tom Rathfelder/AFALD-PTESP
Don Seger/DESC-EMT
Norb Sladek/Allied-Amphenol RF
"Red" Somerset/Delta Electronics
Ross Strait/Times Fiber Communications

ENCL 16

NATO REPORT

BY DICK THOMAS, DESC-ESS

25-27 AUG 82

GOOD AFTERNOON LADIES AND GENTLEMEN. I HAVE RECENTLY ASSUMED THE RESPONSIBILITIES OF BRANCH CHIEF OF THE ASSIGNEE ACTIVITY, AND WILL BE THE U.S. REPRESENTATIVE TO NATO STUDY GROUP 7, SUB-GROUP I OF AC301. THIS WORKING GROUP IS RESPONSIBLE FOR TRANSMISSION DEVICES, RF CONNECTORS, AND FIBER OPTICS; AND INVOLVES SUCH COUNTRIES AS ENGLAND, FRANCE, GERMANY, DENMARK, NETHERLANDS, AND CANADA.

WE ARE CONVERTING NEPRs AND NETRs, WHICH ARE THE NATO ELECTRONICS PARTS AND TEST RECOMMENDATIONS, TO ALLIED STANDARDIZATION PUBLICATIONS AS SOON AS WE CAN GET TO THEM.

NATO ELECTRONICS PARTS RECOMMENDATION (NEPR)-70, WHICH COVERS RF CONNECTORS, IS BEING UPDATED BY ENGLAND AND A REVISED DRAFT SHOULD BE SENT BY THE END OF THIS YEAR TO STUDY GROUP I FOR APPROVAL.

NETR-23, WHICH IS THE DRAFT NATO BASIC TEST SPECIFICATION, IS SUBJECT OF CONTINUOUS STUDY. AN INITIAL STUDY OF THIS DOCUMENT HAS SHOWN THAT IT IS OBSOLETE AND THERE IS LITTLE LIKELIHOOD THAT FULL AGREEMENT COULD BE REACHED ON THE TEST METHODS. FRANCE IS NOW STUDYING IEC DOCUMENT 169-1 FOR POSSIBLE ADOPTION.

THE NEXT STUDY GROUP 7 MEETING WILL BE HELD AT NATO HEADQUARTERS IN BRUSSELS FROM 29 NOV TO 3 DEC 82.

ENCL 17

AMP
INCORPORATED

CORPORATE APPROVALS DIVISION

HARRISBURG PENNSYLVANIA 17105 • PHONE 717-564-0100 TWX 510-657-4110

August 4, 1982

Defense Logistics Agency
Defense Electronics Supply Center
Dayton, OH 45444

ATTN: Lt. Col. Dalton N. Wirtanen
DESC-E

SUBJ: Standardization Program Analysis for FSC 5935,
Electrical Connectors dated 30 June 1982

Dear Colonel Wirtanen:

We have just reviewed the subject and note a serious error on Problem No. ES-83-5935-P-10 on page 29.

The statements made in the Problem are not correct and we desire that a correction be made prior to the meeting on August 25, 26 and 27.

You reference that AMP Incorporated owns the patent and will not grant the Air Force a royalty free license. This statement is totally incorrect.

1. There is no patent issued as yet on the connector design. There is a patent pending.

2. The area of the connector that has a patent pending does not require disclosure on the Military Specification Sheets (MIL-C-39012/79, /81, /82, /83 and /92). The only area defined on these sheets are the interface dimensions so as to insure intermateability of various manufacturers. None of the dimensions shown on the Specification Sheets requires any changes.

3. AMP Incorporated is granting the Government a royalty free license on the tool to assemble the connector. A statement to this affect will be included on the Specification Sheets defined under MIL-C-22520 for the tool.

ENCL 18

As you can see the above three points do clarify the problem more realistically. AMP Incorporated is extremely concerned about the problem as stated. Our previous letter dated June 2, 1982 (copy attached) does in fact state that AMP Incorporated will not grant the Government a royalty free license on the specific area of the connector that has patent pending status.

Since this area of the connector does not have to be defined on the individual specification sheets mentioned above, the reference to AMP Incorporated not granting the Government a royalty free license as stated in the Problem is unfounded.

We therefore strongly request that a modification to the present Problem as stated be issued prior to the meeting to correct this serious discrepancy.

Regards,

AMP Incorporated

James R. Hardman

James R. Hardman
Assistant Director
Corporate Approvals Division

JRH/cas

Enclosure

cc: Frank Dorfmeyer, AFALD/PTS
Richard Marbais, DESC-ESS
John LaRue, Patent Counsel, AMP Inc.
David Henschel, Legal Counsel, AMP Inc.

ENCL 18

ELECTRONIC INDUSTRIES ASSOCIATION P-5.2

WORKING GROUP - SOCKETS - 1982 AUGUST

Robert E. Lumpp - Chairman

During 1982, this group has released the following projects to Recommended Standards:

P/N 1264 to RS-489 - Sockets, Plug-in Electronic Components, Round Style

P/N 1353 to RS-444A- Lead Socket panels for use with Integrated Circuits

P/N 1354 to RS-486 - Solder Wicking Test Procedure for Socket, Plug-in Electronic Components

P/N 1357 to RS-488 - Sockets, Individual Lead Types (for Electrical and Electronic Components)

The group is presently getting ready to release P/N 1265 on Leadless Chip Carrier Sockets. It is now in the final correction period within the group, prior to release to Headquarters for preliminary release.

We are updating RS-415 (P/N 1444) and should release this document in the near future.

We have an ad hoc group working on P/N 1603 which is a document for "Edge Clips for Chip Carriers".

Our future plans include investigations into the following areas:

A. Grid Array Sockets

B. Pad Grid Array Sockets

C. Zero Insertion Force D.I.P. Sockets

D. Sockets for .020 and .025 centers - Leadless Chip Carriers

E. S.I.P. Sockets for inclusion in RS-415

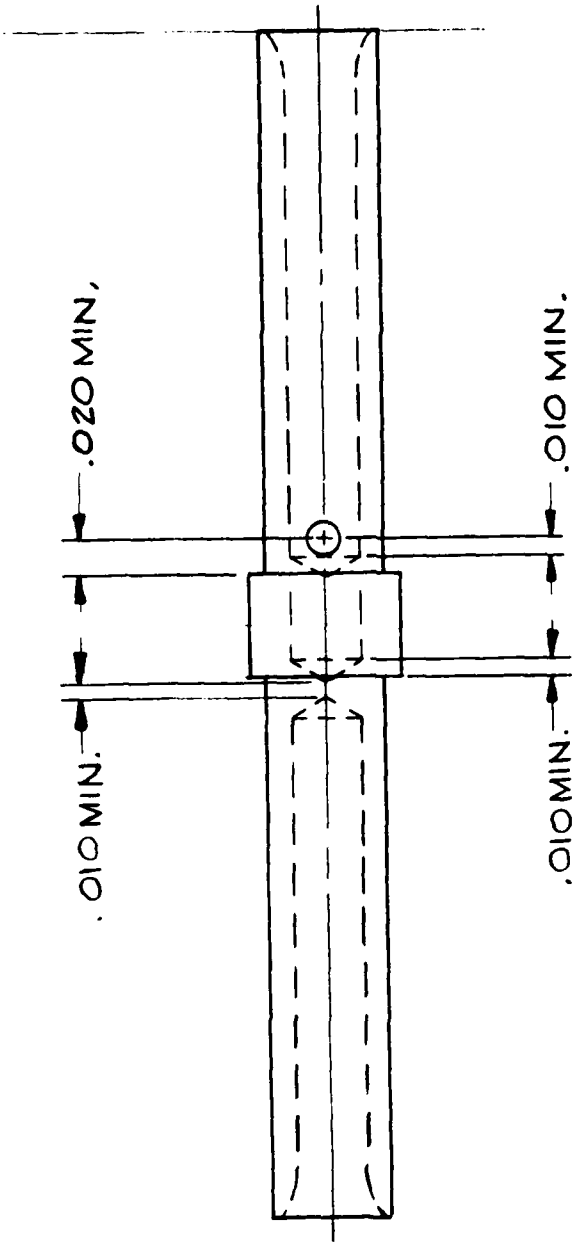
F. Compliant Pin

G. Relay Sockets in Conjunction with MIL-S-12883

/js

ENCL 19

ENGINEERING BASE THIS STUDY ON WORST CONDITIONS.



ENCL 20

CURRENT

CRIMP BARREL BORE DEPTH DIMENSIONS

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
1- 100	22	.157/.186	.029	5- 115	20	.157/.186	.029	11- 146	16	.250/.290	.040
1- 101	20	.157/.186	.029	5- 116	16	.250/.284	.034	11- 147	12	.250/.290	.040
1- 102	16	.250/.281	.031	5- 117	20	.250/.284	.034				
1- 103	12	.250/.281	.031	5- 118	12	.250/.284	.034	12- 148	22	.135/.165	.030
1- 507	220	.141/.157	.016	5- 119	16	.250/.284	.034	12- 149	20	.150/.190	.040
								12- 150	16	.250/.290	.040
2- 104	22	.160/.191	.031	9- 132	20	.157/.186	.029	12- 151	12	.250/.290	.040
2- 105	20	.160/.208	.047	9- 133	20	.157/.186	.029				
2- 106	16	.250/.281	.031	9- 134	20	.157/.186	.029	15-	22	.160/.175	.015
				9- 135	20	.157/.186	.029	15-	22	.160/.175	.015
3- 107	22	.160/.191	.031	9- 136	20	.157/.186	.029	15-	20	.160/.165	.015
3- 108	20	.160/.191	.031					15-	16	.160/.175	.015
3- 109	16	.250/.281	.031	10- 138	20	.157/.186	.029				
				10- 139	20	.157/.186	.029	16- 166	28	.145/.155	.010
4- 110	20	.157/.186	.029	10- 141	20	.157/.186	.029	16- 167	22	.145/.155	.010
4- 111	16	.250/.284	.034	10- 142	20	.157/.186	.029	16- 168	20	.185/.195	.010
4- 112	20	.250/.284	.034					16- 169	16	.185/.195	.010
4- 113	12	.250/.284	.034	11- 144	22	.135/.165	.030	16- 170	12	.216/.232	.016
4- 114	16	.250/.284	.034	11- 145	20	.150/.190	.040				

144

ENCL 20

CURRENT
CRIMP BARREL BORE DEPTH DIMENSIONS

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
17- 171	28	.145/.155	.010	30- 217	16	.250 min.		31- 236	12	.236/.281	.045
17- 172	22	.145/.155	.010	30- 218	16	.250 min.		31- 237	12	.236/.281	.045
17- 173	20	.185/.195	.010	30- 219	12	.250 min.		31- 238	12	.236/.281	.045
17- 174	16	.185/.195	.010	30- 220	8	.485 min.		31- 239	12	.236/.281	.045
17- 175	12	.216/.232	.016	30- 221	4	.485 min.		31- 240	20	.267/.298	.031
				30- 222	-0-	.580 min.		31- 241	20	.267/.298	.031
18- 176	28	.145/.155	.010					31- 448	20	.267/.298	.031
18- 177	22	.145/.155	.010	31- 224	20	.250/.270	.020				
18- 178	20	.185/.195	.010	31- 225	20	.250/.270	.020	32- 242	20	.250 min.	
18- 179	16	.185/.195	.010	31- 226	20	.250/.270	.020	32- 243	20	.250 min.	
18- 180	12	.216/.232	.016	31- 227	20	.250/.270	.020	32- 244	20	.250 min.	
				31- 228	16	.236/.281	.045	32- 245	20	.250 min.	
29- 212	16	.250 min.		31- 229	16	.236/.281	.045	32- 246	20	.250 min.	
29- 213	12	.250 min.		31- 230	16	.236/.281	.045	32- 247	16	.236 min.	
29- 214	8	.485 min.		31- 231	16	.236/.281	.045	32- 248	16	.236 min.	
29- 215	4	.485 min.		31- 232	16	.236/.281	.045	32- 249	16	.236 min.	
29- 216	-0-	.580 min.		31- 233	16	.236/.281	.045	32- 250	16	.236 min.	
				31- 234	12	.236/.281	.045	32- 251	16	.236 min.	
				31- 235	12	.236/.281	.045	32- 252	16	.236 min.	

145

ENCL 20

CURRENT

CRIMP BARREL BORE DEPTH DIMENSIONS

ash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
2- 253	12	.236 min.		33- 270	12	.276/.296	.020	44- 287	22		
2- 254	12	.236 min.						44- 288	16	.073/.079	.006
2- 255	12	.236 min.		34- 271	20	.245/.265	.020	44- 289	16	.073/.079	.006
2- 256	12	.236 min.		34- 272	22	.245/.265	.020	44- 290	12	.073/.079	.006
2- 257	12	.236 min.		34- 273	16	.245/.265	.020	44- 291	8	.084/.094	.010
2- 258	12	.236 min.		34- 440	22	.125/.145	.020	44- 292	4	.084/.094	.010
2- 259	20	.267 min.						44- 293	-0-	.084/.094	.010
2- 260	20	.267 min.		35- 274	20	.245/.265	.020				
2- 449	20	.267 min.		35- 275	20	.245/.265	.020	45- 294	22		
				35- 276	16	.245/.256	.020	45- 295	16	.073/.079	.006
33- 261	28	.215/.235	.020	35- 441	22	.125/.145	.020	45- 296	16	.073/.079	.006
33- 262	28	.215/.235	.020					45- 297	12	.073/.079	.006
33- 263	22	.215/.235	.020	36- 277	20	.322 min.		45- 298	8	.084/.094	.010
33- 264	22	.215/.235	.020	36- 278	16	.322 min.		45- 299	4	.084/.094	.010
33- 265	20	.256/.276	.020	36- 442		.322 min.		45- 300	-0-	.084/.094	.010
33- 266	20	.256/.276	.020								
33- 267	16	.266/.286	.020	37- 279	20	.322 min.		46- 301	28	.190/.201	.011
33-268	16	.266/.286	.020	37- 280	16	.322 min.		46- 302	28	.190/.201	.011
33-269	12	.276/.296	.020	37- 442		.322 min.		46- 303	22	.190/.201	.011
ENCL 20											

CURRENT
CRIMP BARREL BORE DEPTH DIMENSIONS

lash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
46- 304	22	.190/.201	.011	48- 317	6	.750/.781	.031	49- 334	2/0	.750/.781	.031
46- 305	20	.241/.252	.011	48- 318	6	.750/.781	.031	49- 335	4/0	.750/.781	.031
46- 306	20	.241/.252	.011	48- 319	6	.750/.781	.031				
46- 307	16	.246/.257	.011	48- 320	4	.750/.781	.031	56- 348	22D	.141 min.	
46- 308	16	.246/.257	.011	48- 321	4	.750/.781	.031	56- 349	22M	.141 min.	
46- 309	12	.246/.257	.011	48- 322	4	.750/.781	.031	56- 350	22	.141 min.	
46- 310	12	.246/.257	.011	48- 323	1	.750/.781	.031	56- 351	20	.209 min.	
				48- 324	1	.750/.781	.031	56- 352	16	.209 min.	
47- 311	28	.190/.201	.011	48- 325	20	.750/.781	.031	56- 353	12	.209 min.	
47- 312	28	.190/.201	.011	48- 326	20	.750/.781	.031				
47- 313	20	.190/.201	.011	48- 327	4/0	.750/.781	.031	57- 354	22D	.141 min.	
47- 314	22	.190/.201	.011	48- 328	4/0	.750/.781	.031	57- 355	22M	.141 min.	
47- 315	20	.241/.252	.011					57- 356	22	.141 min.	
47- 316	20	.241/.252	.011	49- 329	6	.750/.781	.031	57- 357	20	.209 min.	
47- 336	16	.246/.257	.011	49- 330	6	.750/.781	.031	57- 358	16	.209 min.	
47- 337	16	.246/.257	.011	49- 331	4	.750/.781	.031	57- 359	12	.209 min.	
47- 338	12	.246/.257	.011	49- 332	4	.750/.781	.031				
47- 339	12	.246/.257	.011	49- 333	1	.750/.781	.031	58- 360	22D	.141/.157	.016
								58- 361	22M	.141/.157	.016
ENCL 20											

CURRENT
CRIMP BARREL BORE DEPTH DIMENSIONS

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
58- 362	22	.141/.157	.016	84- 452	22	.160/.208	.048	86- 469	12	.250 min.	
58- 363	20	.209/.229	.020	84- 453	28	.160/.208	.048				
58- 364	16	.209/.229	.020					87- 470	20	.209/.229	.020
58- 365	12	.209/.229	.020	85- 454	16	.250 min		87- 471	20	.209/.229	.020
				85- 455	16	.250 min		87- 472	20	.209/.229	.020
63- 368	20	.290/.310	.020	85- 456	16	.250 min.		87- 473	20	.209/.229	.020
				85- 457	16	.250 min.		87- 474	20	.209/.229	.020
64- 369	20	.150/.185	.035	85- 458	12	.250 min.		87- 475	20	.209/.229	.020
				85- 459	12	.250 min.		87- 476	20	.209/.229	.020
69- 384	24	.484/.504	.020	85- 460	12	.250 min.		87- 477	20	.209/.229	.020
69- 385	20	.484/.504	.020	85- 461	12	.250 min.		87- 478	20	.209/.229	.020
69- 386	16	.484/.504	.020					87- 479	20	.209/.229	.020
				86- 462	16	.250 min.		87- 480	20	.209/.229	.020
70- 387	24	.516/.522	.006	86- 463	16	.250 min.		87- 481	20	.209/.229	.020
70- 388	20	.516/.522	.006	86- 464	16	.250 min.					
70- 389	16	.516/.522	.006	86- 465	16	.250 min.		88- 482	22D	.209/.229	.020
				86- 466	12	.250 min.		88- 483	22D	.209/.229	.020
83- 450	22	.160/.208	.048	86- 467	12	.250 min.		88- 484	22D	.209/.229	.020
83- 451	28	.160/.208	.048	86- 468	12	.250 min.		88- 485	22D	.209/.229	.020

ENCL 20

CURRENT
CRIMP BARREL BORE DEPTH DIMENSIONS

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
88- 486	20	.209/.229	.020	89- 505	16	.209/.229	.020				
88- 487	20	.209/.229	.020								
88- 488	20	.209/.229	.020	90- 508	22D						
88- 489	20	.209/.229	.020	90- 509	20						
88- 490	16	.209/.229	.020								
88- 491	16	.209/.229	.020	91- 514	22D						
88- 492	16	.209/.229	.020	91- 515	20						
88- 493	16	.209/.229	.020								
89- 494	22D	.209/.229	.020								
89- 495	22D	.209/.229	.020								
89- 496	22D	.209/.229	.020								
89- 497	22D	.209/.229	.020								
89- 498	20	.209/.229	.020								
89- 500	20	.209/.229	.020								
89- 501	20	.209/.229	.020								
89- 502	16	.209/.229	.020								
89- 503	16	.209/.229	.020								
89- 504	16	.209/.229	.020								

ENCL 20

CURRENT

INSPECTION HOLE TOLERANCES

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
1- 100	22	.063/.057	.006	5- 115	20	.035/.025	.010	11- 146	16	.083/.069	.014
1- 101	20	.063/.057	.006	5- 116	16	.035/.025	.010	11- 147	12	.083/.069	.014
1- 102	16	.079/.073	.006	5- 117	20	.035/.025	.010				
1- 103	12	.079/.073	.006	5- 118	12	.035/.025	.010	12- 148	22	.161/.132	.029
1- 507	22D	.120/.122	.002	5- 119	16	.035/.025	.010	12- 149	20	.069/.054	.015
								12- 150	16	.083/.069	.014
2- 104	22	.059/.053	.006	9- 132	20	.035/.025	.010	12- 151	12	.083/.069	.014
2- 105	20	.059/.053	.006	9- 133	20	.035/.025	.010				
2- 106	16	.079/.073	.006	9- 134	20	.035/.025	.010	15-	22	.145/.139	.006
				9- 135	20	.035/.025	.010	15-	22	.145/.139	.006
3- 107	22	.059/.053	.006	9- 136	20	.035/.25	.010	15-	20	.145/.139	.006
3- 108	20	.063/.057	.006					15-	16	.145/.139	.006
3- 109	16	.079/.073	.006	10- 138	20	.035/.025	.010				
				10- 139	20	.035/.025	.010	16- 166	28	.145/.139	.006
4- 110	20	.035/.025	.010	10- 141	20	.035/.025	.010	16- 167	22	.145/.139	.006
4- 111	16	.035/.025	.010	10- 142	20	.035/.025	.010	16- 168	20	.165/.159	.006
4- 112	20	.035/.025	.010					16- 169	16	.165/.159	.006
4- 113	12	.035/.025	.010	11- 144	22	.161/.132	.029	16- 170	12	.196/.190	.006
4- 114	16	.035/.025	.010	11- 145	20	.069/.054	.015				

150

ENCL 20

CURRENT

INSPECTION HOLE TOLERANCES

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
17- 171	28	.145/.139	.006	30- 217	16	.079/.073	.006	31- 236	12	.079/.073	.006
17- 172	22	.145/.139	.006	30- 218	16	.079/.073	.006	31- 237	12	.079/.073	.006
17- 173	20	.165/.159	.006	30- 219	12	.079/.073	.006	31- 238	12	.079/.073	.006
17- 174	16	.165/.159	.006	30- 220	8	.094/.084	.010	31- 239	12	.079/.073	.006
17- 175	12	.196/.190	.006	30- 221	4	.094/.084	.010	31- 240	20	.063/.053	.010
				30- 222	-0-	.124/.084	.040	31- 241	20	.063/.053	.010
18- 176	28	.145/.139	.006					31- 448	20	.063/.053	.010
18- 177	22	.145/.139	.006	31- 224	20	.063/.053	.010				
18- 178	20	.165/.159	.006	31- 225	20	.063/.053	.010	32- 242	20	.063/.053	.010
18- 179	16	.165/.159	.006	31- 226	20	.063/.053	.010	32- 243	20	.063/.053	.010
18- 180	12	.196/.190	.006	31- 227	20	.063/.053	.010	32- 244	20	.063/.053	.010
				31- 228	16	.079/.073	.006	32- 245	20	.063/.053	.010
29- 212	16	.079/.073	.006	31- 229	16	.079/.073	.006	32- 246	20	.063/.053	.010
29- 213	12	.079/.073	.006	31- 230	16	.079/.073	.006	32- 247	16	.079/.073	.006
29- 214	8	.094/.84	.010	31- 231	16	.079/.073	.006	32- 248	16	.079/.073	.006
29- 215	4	.094/.084	.010	31- 232	16	.079/.073	.006	32- 249	16	.079/.073	.006
29- 216	-0-	.124/.084	.040	31- 233	16	.079/.073	.006	32- 250	16	.079/.073	.006
				31- 234	12	.079/.073	.006	32- 251	16	.079/.073	.006
				31- 235	12	.079/.073	.006	32- 252	16	.079/.073	.006

ENCL 20

CURRENT

INSPECTION HOLE TOLERANCES

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
32- 253	12	.079/.073	.006	33- 270	12	.257/.246	.011	44- 287	22		
32- 254	12	.079/.073	.006					44- 288	16		
32- 255	12	.079/.073	.006	34- 271	20	.545/.525	.020	44- 289	16		
32- 256	12	.079/.073	.006	34- 272	22	.545/.525	.020	44- 290	12		
32- 257	12	.079/.073	.006	34- 273	16	.545/.525	.020	44- 291	8		
32- 258	12	.079/.073	.006	34- 440	22	.510/.490	.020	44- 292	4		
32- 259	20	.063/.053	.010					44- 293	-0-		
32- 260	20	.063/.053	.010	35- 274	20	.545/.525	.020				
32- 449	20	.063/.053	.010	35- 275	20	.545/.525	.020	45- 294	22		
				35- 276	16	.545/.525	.020	45- 295	16		
33- 261	28	.201/.190	.011	35- 441	22	.350/.330	.020	45- 296	16		
33- 262	28	.201/.190	.011					45- 297	12		
33- 263	22	.201/.190	.011	36- 277	20	.542		45- 298	8		
33- 264	22	.201/.190	.011	36- 278	16	.542		45- 299	4		
33- 265	20	.252/.241	.011	36- 442		.542		45- 300	-0-		
33- 266	20	.252/.241	.011								
33- 267	16	.257/.246	.011	37- 279	20	.542		46- 301	28	.301/.290	.011
33-268	16	.257/.246	.011	37- 280	16	.542		46- 302	28	.301/.290	.011
33-269	12	.257/.246	.011	37- 442		.542		46- 303	22	.301/.290	.011

EXCL 20

CURRENT

INSPECTION HOLE TOLERANCES

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
46- 304	22	.301/.290	.011	48- 317	6	.094/.084	.010	49- 334	2/0	.094/.084	.010
46- 305	20	.252/.241	.011	48- 318	6	.094/.084	.010	49- 335	4/0	.094/.084	.010
46- 306	20	.252/.241	.011	48- 319	6	.094/.084	.010				
46- 307	16	.246/.246	.011	48- 320	4	.094/.084	.010	56- 348	22D	.129/.122	.007
46- 308	16	.257/.246	.011	48- 321	4	.094/.084	.010	56- 349	22M	.129/.122	.007
46- 309	12	.257/.246	.011	48- 322	4	.094/.084	.010	56- 350	22	.129/.122	.007
46- 310	12	.257/.246	.011	48- 323	1	.094/.084	.010	56- 351	20	.078/.072	.006
				48- 324	1	.094/.084	.010	56- 352	16	.088/.082	.006
47- 311	28	.201/.190	.011	48- 325	20	.094/.084	.010	56- 353	12	.088/.082	.006
47- 312	28	.201/.190	.011	48- 326	20	.094/.084	.010				
47- 313	20	.201/.190	.011	48- 327	4/0	.094/.084	.010	57- 354	22D	.129/.122	.007
47- 314	22	.201/.190	.011	48- 328	4/0	.094/.084	.010	57- 355	22M	.129/.122	.007
47- 315	20	.252/.241	.011					57- 356	22	.129/.122	.007
47- 316	20	.252/.241	.011	49- 329	6	.094/.084	.010	57- 357	20	.078/.072	.006
47- 336	16	.257/.246	.011	49- 330	6	.094/.084	.010	57- 358	16	.088/.082	.006
47- 337	16	.257/.246	.011	49- 331	4	.094/.084	.010	57- 359	12	.088/.082	.006
47- 338	12	.257/.246	.011	49- 332	4	.094/.084	.010				
47- 339	12	.257/.246	.011	49- 333	1	.094/.084	.010	58- 360	22D	.129/.122	.007
								58- 361	22M	.129/.122	.007

ENCL 20

CURRENT

INSPECTION HOLE TOLERANCES

lash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
58- 362	22	.129/.122	.007	84- 452	22	.063/.057	.006	86- 469	12	.079/.073	.006
58- 363	20	.078/.072	.006	84- 453	28	.063/.057	.006				
58- 364	16	.088/.082	.006					87- 470	20	.078/.072	.006
58- 365	12	.088/.082	.006	85- 454	16	.079/.073	.006	87- 471	20	.078/.072	.006
				85- 455	16	.079/.073	.006	87- 472	20	.078/.072	.006
63- 368	20	.055/.049	.006	85- 456	16	.079/.073	.006	87- 473	20	.078/.072	.006
				85- 457	16	.079/.073	.006	87- 474	20	.078/.072	.006
64- 369	20	.055/.049	.006	85- 458	12	.079/.073	.006	87- 475	20	.078/.072	.006
				85- 459	12	.079/.073	.006	87- 476	20	.078/.072	.006
69- 384	24	.024/.016	.008	85- 460	12	.079/.073	.006	87- 477	20	.078/.072	.006
69- 385	20	.024/.016	.008	85- 461	12	.079/.073	.006	87- 478	20	.078/.072	.006
69- 386	16	.020/.016	.008					87- 479	20	.078/.072	.006
				86- 462	16	.079/.073	.006	87- 480	20	.078/.072	.006
70- 387	24	.024/.016	.008	86- 463	16	.079/.073	.006	87- 481	20	.078/.072	.006
70- 388	20	.024/.016	.008	86- 464	16	.079/.073	.006				
70- 389	16	.024/.016	.008	86- 465	16	.079/.073	.006	88- 482	22D	.078/.072	.006
				86- 466	12	.079/.073	.006	88- 483	22D	.078/.072	.006
83- 450	22	.063/.057	.006	86- 467	12	.079/.073	.006	88- 484	22D	.078/.072	.006
83- 451	28	.063/.057	.006	86- 468	12	.079.073	.006	88- 485	22D	.078/.072	.006

EXCL 20

CURRENT

INSPECTION HOLE TOLERANCES

Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta	Slash-BIN	Gauge	Dimension	Delta
88- 486	20	.078/.072	.006	89- 505	16	.078/.072	.006				
88- 487	20	.078/.072	.006								
88- 488	20	.078/.072	.006	90- 508	22D	.129/.122	.007				
88- 489	20	.078/.072	.006	90- 509	20	.078/.072	.006				
88- 490	16	.078/.072	.006								
88- 491	16	.078/.072	.006	91- 514	22D	.129/.122	.007				
88- 492	16	.078/.072	.006	91- 515	20	.078/.072	.006				
88- 493	16	.078/.072	.006								
89- 494	22D	.078/.072	.006								
89- 495	22D	.078/.072	.006								
89- 496	22D	.078/.072	.006								
89- 497	22D	.078/.072	.006								
89- 498	20	.078/.072	.006								
89- 500	20	.078/.072	.006								
89- 501	20	.078/.072	.006								
89- 502	16	.078/.072	.006								
89- 503	16	.078/.072	.006								
89- 504	16	.078/.072	.006								

ENCL 20

COMPILATION OF COMMENTS	COMMENT NUMBER	PROJECT NUMBER

COMMENTOR
IND NAME OR CODE Tri-Star Electronics

☐ A ☐ N ☐ AF ☐ ESSENTIAL ☒ SUGGESTED
☐ MFR ☐ USER ☐ IND ASSOC ☐ DESC ☐ CAMESA

RECOMMENDATION
☐ ACCEPTANCE ☐ NON-ACCEPTANCE - SEE REASON
☐ MODIFY ☐ WITHDRAW ☐ DISCUSS

Dimensions from M39029 specification sheets (crimp barrel bore depth)

We find that there are inconsistencies in the dimensions of the crimp barrel bore depth. They range from the .010 dimension or in other cases a .050 tolerance to unilateral tolerances of .250 minimum, .236 minimum, .209 minimum and .141 minimum. We suggest the standardization of these dimensions to effect uniformity within connector family groups and/or crimp barrel sizes.

DISPOSITION. ☐ ACCEPTED ☐ NON-ACCEPTED ☐ WITHDRAWN ☐ MODIFIED

DESC FORM 153
FEB 74

PREVIOUS EDITION WILL BE USED

COMPILATION OF COMMENTS	COMMENT NUMBER	PROJECT NUMBER

COMMENTOR
IND NAME OR CODE Tri-Star Electronics

☐ A ☐ N ☐ AF ☐ ESSENTIAL ☒ SUGGESTED
☐ MFR ☐ USER ☐ IND ASSOC ☐ DESC ☐ CAMESA

RECOMMENDATION
☐ ACCEPTANCE ☐ NON-ACCEPTANCE - SEE REASON
☐ MODIFY ☐ WITHDRAW ☐ DISCUSS

The location of the inspection hole is dimensioned from three different points on M39029 military specification sheets. Dimensions are shown from the back of the crimp barrel to the centerline of the inspection hole; from the back of the shoulder to the centerline of the inspection hole and from the front of the shoulder to the centerline of the inspection hole. We feel that this should be standardized. In addition, we find that this dimension, wherever measured from, varies from .002 inches up to .029 inches. Furthermore the tolerances appear arbitrarily assigned and we feel that standardization in this particular area would enhance consistency in manufacturing.

DISPOSITION. ☐ ACCEPTED ☐ NON-ACCEPTED ☐ WITHDRAWN ☐ MODIFIED

DESC FORM 153
FEB 74

PREVIOUS EDITION W 156 ISED

ENCL 20

CRIMP BORE DEPTH

1. ALL SLASH SHEETS WERE GIVEN ±.022 TOLERANCES EXCEPT:

   A. /29 & /30

   B. /85 & /86

   DUE TO BREAKTHROUGH ON SOCKET CONTACTS, THESE SLASH SHEETS WERE GIVEN ±.015 TOLERANCES.

   C. /15

   DUE TO BREAKTHROUGH, THIS SLASH SHEET WAS GIVEN ±.0075 TOLERANCES

   D. /90 & /91 WILL BE ADDED AT A LATER DATE

INSPECTION HOLE

DIMENSIONS FOR ALL PARTS ARE FROM THE FRONT OF THE SHOULDER TO THE CENTER LINE OF THE INSPECTION HOLE.

TOLERANCES ARE ±.008 WITH THESE EXCEPTIONS:

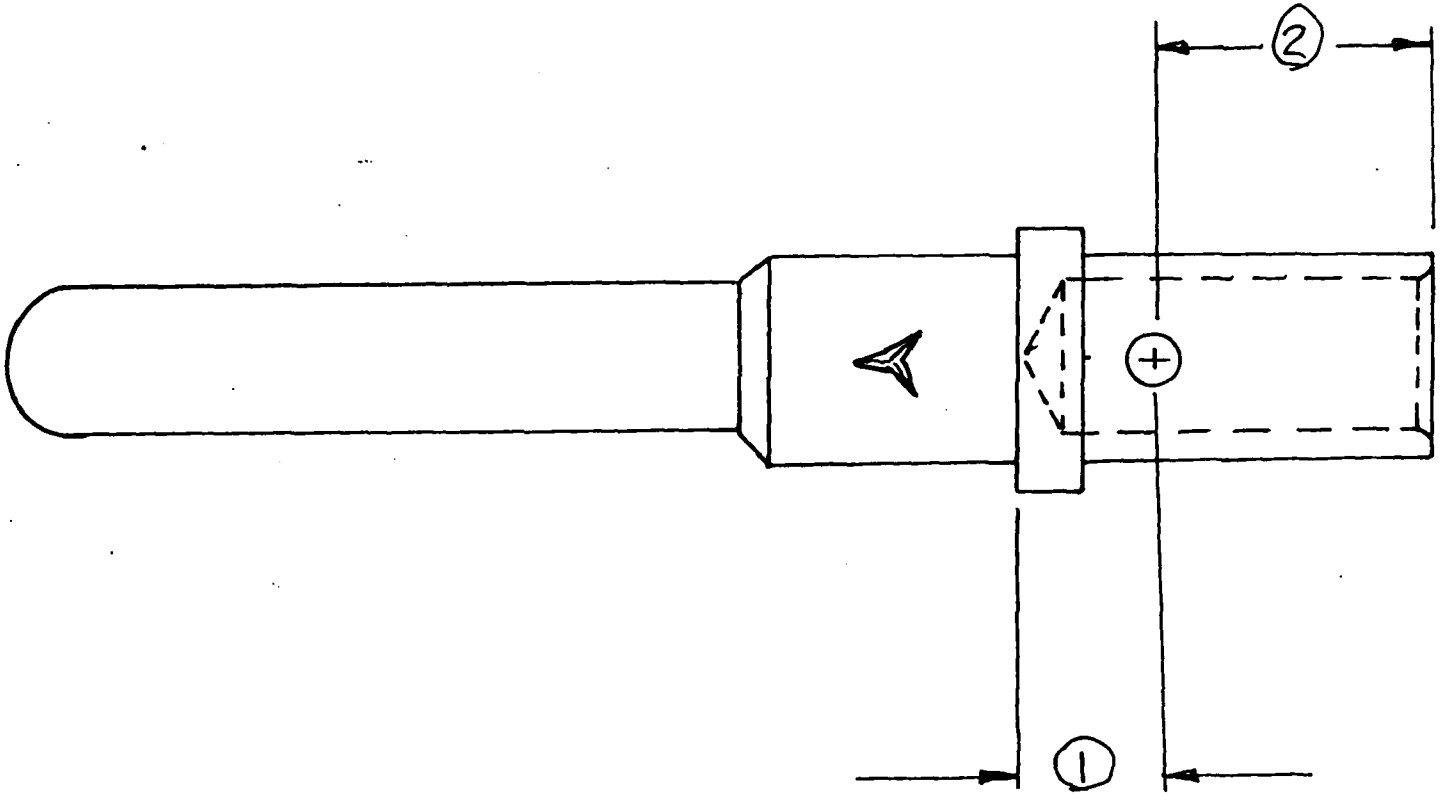
A. SHOULDERLESS CONTACTS /33, /34, /35 ARE MEASURED FROM THE FRONT END OF THE CRIMP BARREL TO THE CENTER LINE OF THE CONTACT.

BY STANDARDIZING THESE DIMENSION LINES AND TOLERANCES, WE WILL ENHANCE MANUFACTURING AND THE COST OF CONTACTS.

ENCL 20

INSPECTION HOLE TOLERANCES

PROPOSED

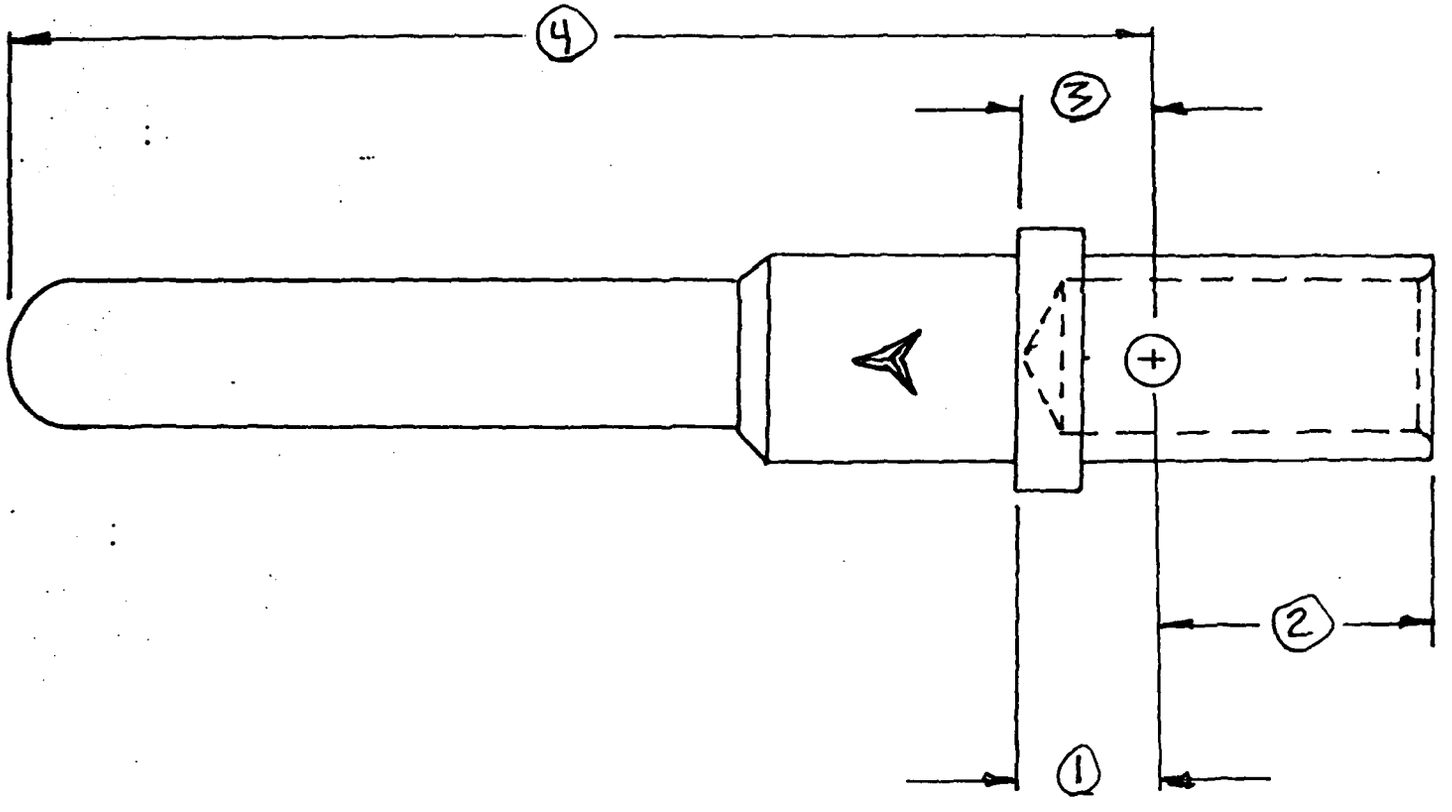


M 39029 PIN & SKT CONTACTS

ENCL 20

INSPECTION HOLE TOLERANCES

CURRENT



M 39029 PIN & SKT CONTACTS

ENCL 20

PROPOSED

INSPECTION HOLE LOCATION DIMENSION

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
1-100	22	084/068	9-132	20	073-057	15-	22	048/032
1-101	20	084/068	9-133	20	073/057	15-	22	048/032
1-102	16	084/068	9-134	20	073/057	15-	20	048/032
1-103	12	084/068	9-135	20	073/057	15-	16	048/032
1-507	22	138/122	9-136	20	073/057			
						16-166	28	214/198
2-104	22	074/058	10-138	20	073/057	16-167	22	214/198
2-105	20	074/058	10-139	20	073/057	16-168	20	124/108
2-106	16	084/068	10-140	20	073/057	16-169	16	099/083
			10-141	20	073/057	16-170	12	085/069
3-107	22	202/158	10-142	20	073/057			
3-108	20	202/158				17-171	28	189/145
3-109	16	294/250	11-144	22	145/161	17-172	22	189/145
			11-145	20	075/059	17-173	20	229/185
4-110	20	073/057	11-146	16	084/068	17-174	16	229/185
4-111	16	084/068	11-147	12	084/068	17-175	12	276/232
4-112	20	084/068						
4-113	12	084/068	12-148	22	145/161	18-176	28	111/095
4-114	16	084/068	12-149	20	075/059	18-177	22	111/095
			12-150	16	084/068	18-178	20	086/078
5-115	20	073/057	12-151	12	084/068	18-179	16	086/078
5-116	16	084/068				18-180	12	067/051
5-117	20	084/068						
5-118	12	084/068						
5-119	16	084/068						

ENCL 20

PROPOSED

INSPECTION HOLE LOCATION DIMENSION

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
29-212	16	085/069	31-237	12	085/069	33-261	28	203/187
29-213	12	085/069	31-238	12	085/069	33-262	28	203/187
29-214	8	100/084	31-239	12	085/069	33-263	22	203/187
29-215	4	100/084	31-240	20	066/050	33-264	22	203/187
29-216	0	124/084	31-241	20	066/050	33-265	20	246/230
			31-448	20	066/050	33-266	20	246/230
30-217	16	085/069				33-267	16	256/240
30-218	16	085/069	32-242	20	084/068	33-268	16	256/240
30-219	12	085/069	32-243	20	084/068	33-269	12	259/243
30-220	8	100-084	32-244	20	084/068	33-270	12	259/243
30-221	4	100-084	32-245	20	084/068			
30-222	0	124/084	32-246	20	084/068	34-271	20	237/221
			32-247	16	085/069	34-272	22	237/221
31-224	20	084/068	32-248	16	085/069	34-273	16	237/221
31-225	20	084/068	32-249	16	085/069	34-440	22	115/099
31-226	20	084/068	32-250	16	085/069			
31-227	20	084/068	32-252	16	085/069	35-274	20	237/221
31-228	16	085/069	32-252	16	085/069	35-275	20	237/221
31-229	16	085/069	32-253	12	085/069	35-276	16	237/221
31-230	16	085/069	32-254	12	085/069	35-441	22	
31-231	16	085/069	32-255	12	085/069			
31-232	16	085/069	32-256	12	085/069	36-277	20	301/285
31-233	16	085/069	32-257	12	085/069	36-278	16	301/285
31-234	12	085/069	32-258	12	085/069	36-442		
31-235	12	085/069	32-259	12	085/069			
31-236	12	085/069	32-260	12	085/069			
			32-449	12	085/069			

ENCL 20

PROPOSED
INSPECTION HOLE LOCATION DIMENSION

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
37-279	20	301/285	47-311	28		49-331	4	097/081
37-280	16	301/285	47-312	28		49-332	4	097/081
37-442			47-313	20		49-333	1	097/081
			47-314	22		49-334	2/0	097/081
44-287	22	084/068	47-315	20		49-335	4/0	097/081
44-288	16	084/068	47-316	20				
44-289	16	084/068	47-336	16		56-348	22D	155/139
44-290	12	084/068	47-337	16		56-349	22M	155/139
44-291	8	097/081	47-338	12		56-350	22	155/139
44-292	4	097/081	47-339	12		56-351	20	087/071
44-293	0	097/081				56-352	16	093/077
			48-317	6	097/081	56-353	12	093/077
45-294	22	084/068	48-318	6	097/081			
45-295	16	084/068	48-319	6	097/081	57-354	22D	155/139
45-296	16	084/068	48-320	4	097/081	57-355	22M	155/139
45-297	12	084/068	48-321	4	097/081	57-356	22	155/139
45-298	8	097/081	48-322	4	097/081	57-357	20	087/071
45-299	4	097/081	48-323	1	097/081	57-358	16	093/077
45-300	0	097/081	48-324	1	097/081	57-359	12	093/077
			48-325	20	097/081			
46-301	28		48-326	20	097/081	58-360	22D	155/139
46-302	28		48-327	4/0	097/081	58-361	22M	155/139
46-303	22		48-328	4/0	097/081	58-362	22	155/139
46-304	22					58-363	20	087/071
46-305	20		49-329	6	097/081	58-364	16	093/077
46-306	20		49-330	6	097/081	58-365	12	093/077
46-307	16							
46-308	16							
46-309	12							
46-310	12							

ENCL 20

PROPOSED

INSPECTION HOLE LOCATION DIMENSION

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
63-368	20	069/054	86-462	16	084/068	88-485	22D	090/074
			86-463	16	084/068	88-486	20	090/074
64-369	20	069/054	86-464	16	084/068	88-487	20	090/074
			86-465	16	084/068	88-488	20	090/074
69-384	24	NOT	86-466	12	084/068	88-489	20	090/074
69-385	20	possible	86-467	12	084/068	88-490	16	090/074
69-386	16	to	86-468	12	084/068	88-491	16	090/074
		locate	86-469	12	084/068	88-492	16	090/074
		hole						
70-387	24	from				88-493	16	090/074
70-388	20	dims						
70-389	16	given	87-470	20	090/074	89-494	22D	090/074
			87-471	20	090/074	89-495	22D	090/074
83-450	22	074/068	87-472	20	090/074	89-496	22D	090/074
83-451	28	074/068	87-473	20	090/074	89-497	22D	090/074
			87-474	20	090/074	89-498	20	090/074
84-452	22	074/068	87-475	20	090/074	89-499	20	090/074
84-453	28	074/068	87-476	20	090/074	89-500	20	090/074
			87-477	20	090/074	89-501	20	090/074
85-454	16	084/068	87-478	20	090/074	89-502	16	090/074
85-455	16	084/068	87-479	20	090/074	89-503	16	090/074
85-456	16	084/068	87-480	20	090/074	89-504	16	090/074
85-457	16	084/068	87-481	20	090/074	89-505	16	090/074
85-458	12	084/068						
85-459	12	084/068	88-482	22D	090/074	90-508	22D	
85-460	12	084/068	88-483	22D	090/074	90-509	20	
85-461	12	084/068	88-484	22D	090/074			
						91-514	22D	
						91-515	20	

ENCL 20

PROPOSED

CRIMP BARREL BORE DEPTH

SLASH/ BIN	BORE	DIMS	SLASH/ BIN	BORE	DIMS	SLASH/ BIN	BORE	DIMS
1-100	22	201/157	9-132	20	201/157	15-	22	175/160 (1)
1-101	20	201/157	9-133	20	201/157	15-	22	175/160 (1)
1-102	16	281/237	9-134	20	201/157	15-	20	175/160 (1)
1-103	12	281/237	9-135	20	201/157	15-	16	175/160 (1)
1-507	22	185/141	9-136	20	201/157			
						16-166	28	189/145
2-104	22	202/158	10-138	20	201/157	16-167	22	189/145
2-105	20	202/158	10-139	20	201/157	16-168	20	229/185
2-106	16	294/250	10-140	20	201-157	16-169	16	229/185
			10-141	20	201-157	16-170	12	276/232
3-107	22	202/158	10-142	20	201-157			
3-108	20	202/158				17-171	28	189/145
3-109	16	294/250	11-144	22	180/136	17-172	22	189/145
			11-145	20	194/150	17-173	20	229/185
4-110	20	201-157	11-146	16	294/250	17-174	16	229/185
4-111	16	294-250	11-147	12	294/250	17-175	12	276/232
4-112	20	294/250						
4-113	12	294/250	12-148	22	180/136	18-176	28	189/145
4-114	16	294/250	12-149	20	194/150	18-177	22	189/145
			12-150	16	294/250	18-178	20	214/170
5-115	20	201/157	12-151	12	294/250	18-179	16	214/170
5-116	16	294/250				18-180	12	260/216
5-117	20	294/250						
5-118	12	294/250						
5-119	16	294/250						

ENCL 20

PROPOSED

CRIMP BARREL BORE DEPTH

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
29-212	16	280/250	31-236	12	280/236	32-259	20	311/267
29-213	12	280/250	31-237	12	280/236	32-260	20	311/267
29-214	8	529/485	31-238	12	280/236	32-449	20	311/267
29-215	4	529/485	31-239	12	280/236			
29-216	0	624/580	31-240	20	311/267	33-261	28	259/215
			31-241	20	311/267	33-262	28	259/215
30-217	16	294/250	31-448	20	311/267	33-263	22	259/215
30-218	16	294/250				33-264	22	259/215
30-219	12	294/250	32-242	20	294/250	33-265	20	300/256
30-220	8	529/485	32-243	20	294/250	33-266	20	300/256
30-221	4	529/485	32-244	20	294/250	33-267	16	266/210
30-222	0	624/580	32-245	20	294/250	33-268	16	266/210
			32-246	20	294/250	33-269	12	276/220
31-224	20	294/250	32-247	16	280/236	33-270	12	276/220
31-225	20	294/250	32-248	16	280/236			
31-226	20	294/250	32-249	16	280/236	34-271	20	289/245
31-227	20	294/250	32-250	16	280/236	34-272	22	289/245
31-228	16	280/236	32-251	16	280/236	34-273	16	289/245
31-229	16	280/236	32-252	16	280/236	34-440	22	169/125
31-230	16	280/236	32-253	12	280/236			
31-231	16	280/236	32-254	12	280/236	35-274	20	289/245
31-232	16	280/236	32-255	12	280/236	35-275	20	289/245
31-233	16	280/236	32-256	12	280/236	35-276	16	289/245
31-234	12	280/236	32-257	12	280/236	35-441	22	169/125
31-235	12	280/236	32-258	12	280/236			

ENCL 20

PROPOSED

CRIMP BARREL BORE DEPTH

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
36-277	20	366/322	46-304	22		48-323	1	794/750
36-278	16	366/322	46-305	20		48-324	1	794/750
36-442			46-306	20		48-325	20	794/750
37-279	20	366/322	46-307	16		48-326	20	794/750
37-280	16	366/322	46-308	16		48-327	4/0	794/750
37-442			46-309	12		48-328	4/0	794/750
44-287	22	294/250	46-310	12				
44-288	16	294/250				49-329	6	794/750
44-289	16	294/250	47-311	28		49-330	6	794/750
44-290	12	294/250	47-312	28		49-331	4	794/750
44-291	8	534/480	47-313	20		49-332	4	794/750
44-292	4	534/580	47-314	22		49-333	1	794/750
44-293	0	690/630	47-315	20		49-334	2/0	794/750
			47-316	20		49-335	4/0	794/750
45-294	22	294/250	47-336	16				
45-295	16	294/250	47-337	16		56-348	22D	185/141
45-296	16	294/250	47-338	12		56-349	22M	185/141
45-297	12	294/250	47-339	12		56-350	22	185/141
45-298	8	534/480				56-351	20	253/209
45-299	4	534/480	48-317	6	794/750	56-352	16	253/209
45-300	0	690/630	48-318	6	795/750	56-353	12	253/209
			48-319	6	794/750			
46-301	28		48-320	4	794/750	57-354	22D	185/141
46-302	28		48-321	4	794/750	57-355	22M	185/141
46-303	22		48-322	4	794/750	57-356	22	185/141

ENCL 20

PROPOSED
CRIMP BARREL BORE DEPTH

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
58-360	22D	185/141	85-454	16	280/250	87-476	20	250/206
58-361	22M	185/141	85-455	16	280/250	87-477	20	250/206
58-362	22	185/141	85-456	16	280/250	87-478	20	250/206
58-363	20	253/209	85-457	16	280/250	87-479	20	250/206
58-364	16	253/209	85-458	12	280/250	87-480	20	250/206
58-365	12	253/209	85-459	12	280/250	87-481	20	250/206
			85-460	12	280/250			
63-368	20	194/150	85-461	12	280/250	88-482	22D	250/206
						88-483	22D	250/206
64-369	20	194/150	86-462	16	280/250	88-484	22D	250/206
			86-463	16	280/250	88-485	22D	250/206
69-384	24	NOT	86-464	16	280/250	88-486	20	250/206
69-385	20	possible	86-465	16	280/250	88-487	20	250/206
69-386	16	to	86-466	12	280/250	88-488	20	250/206
		locate	86-467	12	280/250	88-489	20	250/206
70-387	24	bore	86-468	12	280/250	88-490	16	250/206
70-388	20	from	86-469	12	280/250	88-491	16	250/206
70-389	16	dims				88-492	16	250/206
		given	87-470	20	250/206	88-493	16	250/206
83-450	22	204/160	87-471	20	250/206			
83-451	28	204/160	87-472	20	250/206	89-494	22D	250/206
			87-473	20	250/206	89-495	22D	250/206
84-452	22	204/160	87-474	20	250/206	89-496	22D	250/206
84-453	28	204/160	87-475	20	250/206	89-497	22D	250/206

ENCL 20

PROPOSED
CRIMP BARREL BORE DEPTH

SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS	SLASH/ BIN	BORE GAGE	DIMS
89-498	20	250/206						
89-499	20	250/206						
89-500	20	250/206						
89-501	20	250/206						
89-502	16	250/206						
89-503	16	250/206						
89-504	16	250/206						
89-505	16	250/206						
90-508	22D							
90-509	20							
91-514	22D							
91-515	20							

ENCL 20

MIL-S-83502/MIL-S-83734 SOCKET CONTACTS

LOCALIZED FINISHES MATRIX

Developed by:
Robert Rossell, AF-85

AREA	SOLDERLESS WRAP	WAVE SOLDER TAIL
Contact (See 3.1)	Gold Tin-Lead 1/ 3/	Gold Tin-Lead 2/ 3/
Termination	Gold Tin-Lead 1/	Gold Tin-Lead 2/
Non-Functional	Nickel Gold Tin-Lead 1/	Nickel Gold Tin-Lead 2/

Overall

Gold
Tin-Lead - 1/ for solderless wrap
- 2/ for wave solder tail

Gold - In accordance with MIL-G-45204, Type II, Grade C, Class 0 (.00003 inch thick, min).

Tin-Lead 1/ - In accordance with MIL-P-81728, .0001 inch thick, min., 5% min. lead.

Tin-Lead 2/ - In accordance with MIL-P-81728, .0001 inch thick, min., 50 to 70% tin.

Nickel - In accordance with QQ-N-290, Class 2, .00003 to .000150 inch thick. All finishes shall have this as an under plate. (Also applies to non-functional areas.)

3/ - Not applicable for MIL-S-83502.

ENCL 21

ATTENDANCE ROSTER

ELECTRICAL CONNECTOR STANDARDIZATION PLANNING MEETING

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Glenn Babb	Air Force AFALD	AFALD/PTSP Gentile Air Force Station Dayton, OH 45444	513-296-5571 (AV) 850-5571
Tony Ciancio	Air Force RADC	RADC/RBES Griffiss AFB, NY 13441	315-330-2101 (AV)587-2101
William Crawford	Air Force AFLC	HQ AFLC/CASO Federal Center Battle Creek, MI 49016	616-962-6511 x 9381 (AV)369-6511 x 9381
Frank Dorfmeyer	Air Force AFALD	AFALD/PTSP Gentile Air Force Station Dayton, OH 45444	513-296-5571 (AV)850-5571
John Gillispie	Air Force AFLC	HQ AFLC/CASO Federal Center Battlecreek, MI 49016	616-962-6511 x 9381 (AV)369-6511 x 9381
Tom Rathfelder	Air Force AFALD	AFALD/PTSP Gentile Air Force Station Dayton, Ohio 45444	513-296-5571 (AV)850-5571

ENCL 22

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Robert Rosell	Air Force AFALD	AFALD/PTSP Gentile Air Force Station Dayton, OH 45444	513-296-5571 (AV)850-5571
F. Sellers	Air Force AFALD	AFALD/PTST Gentile AFS Dayton, OH 45444	513-296-5570 (AV)850-5570
Bryce M. Sundstrom	Air Force AD/AFATL/DLJA	Eglin Air Force Base Eglin AFB, FL 32542	904-882-2201 (AV)872-3633
Sid Caswell	Canadian Military	Dept. of National Defense 101 Colonel By Drive Ottawa K1A 0K2	613-995-1340
Robert Radeloff	DESC-E	1507 Wilmington Pike Dayton, OH 45444	513-296-6531 (AV)850-6531
Col. Dalton N. Wirtanen	DESC-E	1507 Wilmington Pike Dayton, OH 45444	513-296-6531 (AV)850-6531
Pete Zimbran	DESC-EM	1507 Wilmington Pike Dayton, OH 45444	513-296-5213 (AV)850-5213

ENCL 22

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Lt. Col. John P. Stokes	DESC-ES	1507 Wilmington Pike Dayton, OH 45444	513-296-5086 (AV)850-5086
Randy Larson	DESC-EMM	1507 Wilmington Pike Dayton, OH 45444	513-296-6511 (AV)850-6511
Ron Gary	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391
Joe Kobylack	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391
Lynn Roberts	DESC-EMT	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5391 (AV)850-5391
Terry A. Rockfield	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391
Don Seeger	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391

172

ENCL 22

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Leonard Smith	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391
James Day	DESC-EQP	1507 Wilmington Pike Dayton, OH 45444	513-296-5012 (AV)850-5012
David Mott	DESC-EQP	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5012 (AV)850-5012
Richard Marbais	DESC-ESS	1507 Wilmington Pike Dayton, OH 45444	513-296-5541 (AV)850-5541
Brian McNicholl	DESC-ESS	1507 Wilmington Pike Dayton, OH 45444	513-296-5541 (AV)850-5541
Richard Thomas	DESC-ESS	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5541 (AV)850-5541
W. Roy Wood	DESC-ESS	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5541 (AV)850-5541
Robert L. Moore	DESC-SDA	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5465 (AV)850-5465

173

ENCL 22

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Edward Hiffner	DESC-STG	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5165 (AV)850-5165
Dan Mullin	Naval Air Engineering Center	NAEC/ESSD Code 9313 Lakehurst, NJ 08733	201-323-7438 (AV)624-7438
Dave Pielmeier	NAV AIR SYSCOM HQ	AIR-543A1A Washington, DC 20361	202-692-0752 (AV)222-0752
David A. Lee	Naval Avionics Center	NAC B/916 6000 E. 21 st Street Indianapolis, IN 46218	317-353-7285 (AV)724-7285
Mike Rund	Naval Avionics Center	NAC B/916 6000 E. 21 st Street Indianapolis, IN 46218	317-353-3274 (AV)724-3274

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Leonard Smith	DESC-EMT	1507 Wilmington Pike Dayton, OH 45444	513-296-5391 (AV)850-5391
James Day	DESC-EQP	1507 Wilmington Pike Dayton, OH 45444	513-296-5012 (AV)850-5012
David Mott	DESC-EQP	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5012 (AV)850-5012
Richard Marbais	DESC-ESS	1507 Wilmington Pike Dayton, OH 45444	513-296-5541 (AV)850-5541
Brian McNicholl	DESC-ESS	1507 Wilmington Pike Dayton, OH 45444	513-296-5541 (AV)850-5541
Richard Thomas	DESC-ESS	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5541 (AV)850-5541
W. Roy Wood	DESC-ESS	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5541 (AV)850-5541
Robert L. Moore	DESC-SDA	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5465 (AV)850-5465

EXCL 22

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
Edward Hiffner	DESC-STG	1507 Wilmington Pike Dayton, Ohio 45444	513-296-5165 (AV)850-5165
Dan Mullin	Naval Air Engineering Center	NAEC/ESSD Code 9313 Lakehurst, NJ 08733	201-323-7438 (AV)624-7438
Dave Pielmeier	NAV AIR SYSCOM HQ	AIR-543A1A Washington, DC 20361	202-692-0752 (AV)222-0752
David A. Lee	Naval Avionics Center	NAC B/916 6000 E. 21 st Street Indianapolis, IN 46218	317-353-7285 (AV)724-7285
Mike Rund	Naval Avionics Center	NAC B/916 6000 E. 21 st Street Indianapolis, IN 46218	317-353-3274 (AV)724-3274

NAME	GOVERNMENT AGENCY	MAILING ADDRESS	PHONE
J. M. Kerr	Naval Electronics Sys. Comm.	Elex 81342 Washington, DC 20360	202-692-7227 (AV)222-7227
T. Berilla	National Security Agency	ATTN: SZ64 Ft. Meade, MD 20755	301-688-6084 (AV)235-6084
Thomas J. Brooks	National Security Agency	ATTN: T-25 Ft. George G. Meade, MD 20755	301-688-7052 (AV)253-7052

175

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
Alan Betaux	ABCO Enterprises	21W246 Corouet Lawbard, IL 60148	312-953-0077
Lester Geisel	ADC	4900 W. 78th St. Minneapolis, MN 55435	612-893-3230
John Schnepf	Aero-Electric	22119 1/2 S. Vermont Torrance, CA 90502	213-618-1275
Dean C. Storm	Aerospace Corp.	M4/991 200 No. Aviation El Segundo, CA 90245	213-648-6010
C. S. Blichasz	AMP Inc.	3711 Paxton Harrisburg, PA 17105	717-652-9014
Dick Farrell	AMP, Inc.	P. O. Box 3608 Harrisburg, PA 17105	717-780-8623
Edgar Forney	AMP Inc.	P. O. Box 3608 Harrisburg, PA 17105	717-780-6023
Jim Hardman	AMP Inc.	P. O. Box 3608 Harrisburg, PA 17105	717-780-8359

176

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
Carlton Johnson	AMP, Inc.	8052 Pantano Pl. Alexandria, VA 22309	202-4814-9596
W. L. Schumacher	AMP, Inc.	P. O. Box 3608 Harrisburg, PA 17105	717-780-6034
T. Byk	Amphenol/Allied	2875 South 25th Ave. Broadview, IL 60153	312-345-9000
John Koys	Amphenol/Allied	2875 South 25th Ave. Broadview, IL 60153	312-345-9000
Conrad Ladstatter	Amphenol/Allied	1830 S. 54 Ave. Cicero, IL 60650	312-345-9000
J. E. Wilkinson	Amphenol/Allied	3131 S. Dixie Dr. Dayton, OH 45439	513-294-0464
Bill Kubin	Appleton Electronics Inc.	2205 12th Ave. S. Milwaukee, WI 53172	414-764-7200

177

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
Atso Savisaar	Arinc Research	2551 Riva Road Annapolis, MD 21401	301-266-4823
John Jagoford	Balmar Crimp Tool	6169 Cyril Ave. Orlando, FL 32809	305-851-4041
Robert K Van Voris	Bendix Electrical Components Div.	Sidney, NY 13838	607-563-5323
Dwayne Jennings	Boeing Military Airplane	MS K76-67 3801 S. Oliver Wichita, KS 67210	316-526-7271
L. Franchi	Bryant/West	3507 Brian Dr. Trenton, OH 45067	513-867-8076
R. Johnson	Bryant/West	500 Sylvan Ave. Bridgeport, CT 06606	
Hal Martin	Buchanan Amerace Corp.	1065 Floral Ave. Union, NJ 07060	201-289-1665
Arthur Fallier	Dayton T. Brown	55 Church St. Bohemia, NY 11716	516-589-6300

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
S. J. Somerset	Delta Electronics	93 Park St. Beverly, MA 01915	617-927-1060
H. Comeau	Deutsch	1925 E. Merled W. Covina, CA 91791	213-919-2198
Cliff La Croix	Deutsch	1361 Cottonwood Banning, CA 92220	714-849-5854
Dan Dircksen	Dircksen & Assoc.	P. O. Box 22, Dabel Station Dayton, OH 45420	513-256-0351
T. J. Haack	DuPont/Berg Electronics	30 Hunter Land Camp Hill, PA 17011	717-975-2453
Stan Sullwold	Electronic Prod/3M	Bldg. 207-1W 3M Center St. Paul, MN 55144	612-733-4972
Clair Madsen	Fabri-tek Inc.	9210 Science Center Dr. Minneaplis, MN 55428	612-533-3533

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
R. Hough	G&H Technology	1649 17th St. Santa Monica, CA 90404	213-450-5604
Timothy Land	G&H Technology	1649 17th St. Santa Monica, CA 90404	213-450-0561
Don Chin	General Connector	80 Bridge St. Hewton, MA 02158	617-244-5706
Ed Pierce	General Connector	80 Bridge St. Hewton, MA 02158	617-244-5706
Robert T. Franzen	General Dynamics Convair	P. O. Box 80847 San Diego, CA 92138	714-277-8900 Ext. 3430
Mark Zuby	General Dynamics	25999 Lawrence Center Line, MI 48015	313-497-0378
H. Featherstone	G. E. Evendale	GE E-186 Neumann Way Cincinnati, OH 45215	513-243-4992

180

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
John E. Merrell	Glenair Inc.	1211 Airway Glendale, CA 91201	213-247-6000
Jim Wittmann	Hughes Aircraft Co.	17150 Von Karman Ave. Irvine, CA 92714	714-660-5758
Max Moore	ITT Cannon	2123 Marlboro Drive Alexandria, VA 22304	703-370-5733
W. D. O'Hirok	ITT Cannon	10550 Talbert Ave. Fountain Valley, CA 92708	714-964-8385
S. H. Jackson	Kings Electronics	40 Marbledale Rd. Tuckanoe, NY 10707	914-793-5000
Warren Anderson	Magnetic Controls	4900 W. 78th St. Mpls, MN 55435	612-835-6860
Biu Chamberlin	Malco/Microdot	12 Progress Dr. Montgomery, PA 18936 Raritan, NJ 08869	215-699-5323

181

EXCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
R. F. Toy Wells	Martin Marietta Aerospace Denver	P. O. Box 179 MS 0540 Denver, CO 80201	303-977-6488
Jim Beck	Matrix Science	435 Maple Ave. Torrance, CA 90503	213-328-0271
Phil Binderman	Matrix Science	7315 Wiscon Ave (727 E) Bethesda, MD 20014	301-652-8810
W. L. Nesheim	McDonnell Douglas	Box 516 St. Louis, MO 63147	314-232-2091
Irv Triner	Methode	7447 W. Wilson Ave. Chicago, IL 60656	
Nat Kronstadt	NKA, Inc.	8905 Fairview Rd. Silver Spring, MD 20910	301-585-6141
W. Ward	Pfizer	96 S Turnpike Road Wallingford, CT 06492	203-265-7781

182

EXCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
R. C. Wood	Plaskon Prods	2829 Glendale Ave. Toledo, OH 43614	419-389-5600
Jack Gentry	Positronic Ind.	208 W. Center Rogersville, MO 65472	417-753-2851
Robert N. Mayne	Precicontact, Inc.	241 Southview Rd. Dayton, OH 45419	513-298-8492
G. Greenwood	Pyle-National	1334 N. Kostner Chicago, IL 60651	312-342-6300
Richard C. Hughes	Pyle-National	15020 Sherwood Dr. Strongsville, OH 44136	216-621-6894
Roger N. Smith	R.N. Smith Company for Plessey Connectors Ltd.	1377 E. Stroop Rd. Suite 302 Kettering, OH 45429	513-299-4598
Dave Mang	Rowe Ind.	P. O. Box 68177 Toledo, OH 43612	419-729-9761

183

EWCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
A. M. Bellard	SAE A-2C	64 Andrew Lane Orange, CT 06477	203-773-1000
C. W. Dreyer	Sealectro Corp.	225 Hoyt St. Mamaroneck, NY 10543	914-698-5600
Jim Dawson	Sealtron Inc.	9705 Reading Rd. Cincinnati, OH 45215	513-232-3076
Darwin Stuckey	Sealtron Inc.	9705 Reading Rd. Cincinnati, OH 45212	513-531-2933
R. DeGoardi	Souriau, Inc.	25158 Standford Ave. Valencia, CA 91355	805-257-4830
R. Huggins	Specialty Connector Co.	2620 Endress Place Greenwood, IN 46142	317-535-5353
Ralph Pickus	Sperry	MS 1A15 Great Neck, NY 11020	516-574-3225

184

ENCL 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
Dan D'Amico	Star-Tron Corp.	58 Curtis St. Providence, RI 02909	401-274-5090
Lou Holland	Sunbank Electronics	1740 Comerce Way Paso Robles, CA 93446	805-238-2840
Jack White	Sunbank Electronics	1740 Commerce Way Paso Robles, CA 93446	805-238-2840
Claude Rodriquez	Symtron	4190 Billy Mitchell Addison, TX 75001	214-233-8991
Myron G. Bloom	T&B /Ansley	920 Route 202 Raritan, NJ 08869	201-469-4000
Steve O'Malley	Texas Instruments	145 Hillside Ave. Rehoboth, MS 02769	617-252-4589
Bob McCurley	Texas Instruments	P. O. Box 226015 MS 366 Dallas, TX 75266	214-340-2750

185

Encl 22

NAME	COMPANY NAME	MAILING ADDRESS	PHONE
John Latham	Tri-Star	320 Main St. Venice, CA 90291	213-823-5779
Bob Pontone	TRW - Cinch	1500 Morse Ave. Elk Grove, IL 60007	312-981-6350
Robert Tlapa	TRW Cinch	1501 Morse Ave. Elk Grove Village, IL 60007	312-981-6073
O. Buzz Vetter	TRW Cylinrical Conn.	8821 Science Center Dr. Minneapolis, MN 55428	612-537-2545
Bill Warner	TRW Cylindrical Conn.	8821 Science Center Drive New Hope, MN 55428	612-537-1010
Sam Langham	Viking Connector	21001 Nordhoff St. Chatsworth, CA 91311	213-341-4330

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