JOINT SERVICES WIRING ACTION GROUP

Summer 2015 Edition **JSWAG Newsletter** *Vol. 7, Issue 3*

http://www.navair.navy.mil/jswag/

Announcements

The Spring 2016 JSWAG/JFOWG Technical Interchange Meeting will be held 14-17 March in San Diego, CA. For more information as it becomes available, please visit the JSWAG website.

Resources

- Aircraft Wiring Systems Awareness DVD- Defense Imagery PIN #806881
- Fiber Optic Awareness DVD- Defense Imagery PIN #806707
- Joint Services Wiring Manual Maintenance Techniques DVD- Defense Imagery PIN #806994
- Heatless Splice Application Video- https://www.youtube.com/watch?v=Op1YMaz454E&feature=youtu.be
- MIL-HDBK-522- Guidelines for Inspection of Aircraft Wiring Interconnect Systems- http://quicksearch.dla.mil
- MIL-HDBK-525- Electrical Wiring Interconnect System (EWIS) Integrity- http://quicksearch.dla.mil
- Need help locating information on connectors, contacts or accessories? If so, email us at jswag@navy.mil.

Newsletter Contact

JSWAG Coordinator

jswag@navy.mil

MIL-HDBK-516 Revision C Update

MIL-HDBK-516C is a multiservice handbook used to assess airworthiness of new or modified air vehicle systems. It lists criteria against which a system must be evaluated, standards that define appropriate requirements, and methods of compliance used to demonstrate requirements have been met. Criteria are grouped into categories such as structures, flight technology, propulsion, crew systems, avionics, and the electrical system, each of which has its own section of the handbook. Section 12 covers the electrical system, and is broken into two subsections: 12.1 *Electric power generation system* and 12.2 *Electrical wiring system, including power distribution*. Revision C of MIL-HDBK-516 was released on 12 December 2014 and is available at: http://quicksearch.dla.mil/. This revision emphasizes the need to evaluate airworthiness of unmanned aircraft system ground control stations in addition to the air vehicles themselves. The fifteen EWIS airworthiness criteria listed in subsection 12.2 are summarized below, with Revision C additions distinguishable by blue font. The majority of these criteria are evaluated primarily against the standard of "good design practice, as defined in SAE AS50881 for aircraft and NFPA 70 for ground stations."

1. Electrical wiring and electrical system components must be suitable for their physical environment, and bonding and grounding must be implemented as required to protect personnel from shock hazard.
2. Wiring must be sized properly for the required current handling capability and voltage drop.
3. Power distribution wiring must have proper circuit protection.
4. Redundant circuits provided for safety must be sufficiently isolated.
5. Where redundant functions are integrated within an electronics enclosure, wiring must be designed to avoid the possibility of introducing single point failures.
6. The wiring system installation must be adequate for all planned operating conditions.
7. Wiring in areas containing explosive vapors and/or flammable fluids must be protected to avoid introducing an ignition source due to damage from installation, environment, or aging.
8. No single failure (open or shorted/crossed circuits) in a wiring harness may result in loss or degradation of safety-critical functions.
9. Positive separation must be maintained between wiring and all fluid or gas carrying lines, flight controls or other mechanical controls, and heat sources. Electrical power wiring must be routed separately from flight control and avionics wiring.

see Summer 2015, page 2

Summer 2015 from page 1

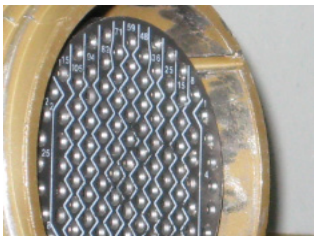
10. Wire routing design and installation procedures must prevent chafing conditions.
11. Primary and secondary support must be provided for wiring throughout the installation.
12. Wiring must be routed and installed in such a way as to minimize the risk of damage to wiring by cargo, crew and maintenance personnel.
13. Maintainability must be a factor in the design and installation of EWIS. Wiring and components must be properly identified in a manner that does not adversely affect their performance or life.
14. All equipment and equipment racks must be designed for proper electrical bonding and grounding.
15. Care must be taken to avoid compromising existing wiring, such as by introducing cracking or chafing conditions, when a modification is performed in the area.

MIL-HDBK-522 Updates (EWIS Inspection)

The NAVAIR Wiring Systems Team (AIR-4.4.5.3) working with the JSWAG updated the military handbook designed specifically for use by aircraft electrical maintenance professionals for the inspection of the Electrical Wiring Interconnect System (EWIS). It is a quick and easy-to-use guide showing specific acceptable and unacceptable examples of EWIS component installations. The entire handbook was updated to keep abreast of new technology and to integrate improvements learned from various studies, research efforts and end-user inputs. There are 13 brand new Guidelines which focus various EWIS components, increasing the handbook by about 30%. Key new Guidelines focused on:

4. Polyimide Insulated Wire
13. Critical Clamp Marker
24. Contact Fretting
26. Cold Applied Terminal Lug
30. Cold Applied Splice
31. Heatless Splice
32. C-Wrap Wire Insulation Repair
34. Composite Connector
35. Connector EMI Finger Ring/Seal
40. Corrosion Preventative Compound
46. Large Gauge Terminal Lug

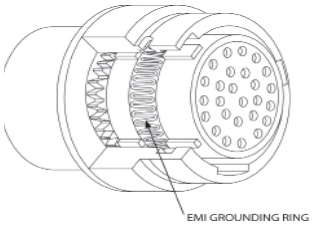
Some sections of new ones are shown in Figure 1, showing composite connector details and Figure 2, showing Connector EMI finger ring/seal details. The newly updated MIL-HDBK-522, "Guidelines for Inspection of Electrical Wiring Interconnect Systems Handbook", was initially created through a JSWAG action chit proposed by fleet aircraft maintainers looking for easier, more efficient ways to perform their work. They simply wanted a "one stop shop" to look for and find some of the most common inspection criteria and practices. It is available for download at: http://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=277535.



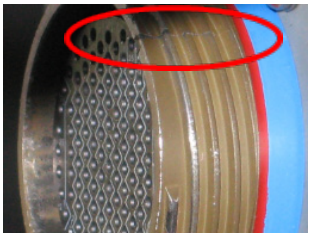
UNACCEPTABLE

Excessive plating wear (upper) and cracked connector (lower)

Figure 1. Composite Connector Damage

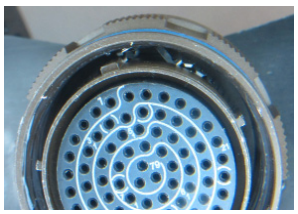


Connector Plug with EMI Finger Seal



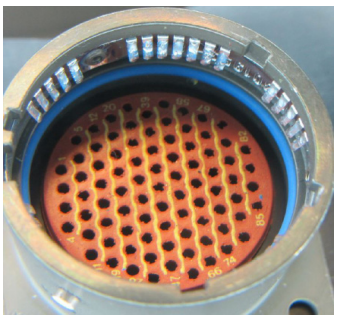
UNACCEPTABLE

Multiple broken EMI seal fingers



UNACCEPTABLE

Missing and broken EMI seal fingers



ACCEPTABLE

MIL-DTL-38999 Series II conenctor with EMI fingers missing at bayonet pins

Figure 2. Connector EMI Finger Seal Damage