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Department of Defense  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW



# Joint Services Wiring Action Group

## Firing Circuits

Date: 01 JUL 24



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# Outline



- Background
  - TPDR (Change Request) Firing Circuit
  - AS50881
  - NA 01-1A-505-1
- Current Status
- Path Forward



# Background



- Firing Circuit definition has been tribal knowledge between maintainers/ artisans for years
- As technology advances, firing systems have gotten more complex
- October 2023 a TPDR was submitted:
  - “Paragraph (8) subparagraph (b) states: Splices shall not be used on firing circuits associated with ordnance, or explosive subsystems. This statement has caused confusion in more than one instance. The 505 Series manual does not define or describe what a "firing circuit" actually is”
  - **Impact**
    - The words "firing circuit" can be misinterpreted by maintainers. If the definition of a firing circuit is misinterpreted, maintainers may be splicing wires where they should not be.



# Background



## SAE AS50881

- Aerospace Standard for Wiring in Aerospace Vehicles
- Covers all aspects in Electrical Wiring Interconnection Systems (EWIS) from the selection through installation of wiring and wiring devices and optical cabling and termination devices used in aerospace vehicles. Aerospace vehicles include manned and unmanned airplanes, helicopters, lighter-than-air vehicles, missiles, and external pods.
- Superseded the MIL-W-5088
- Engineering source document for NA 01-1A-505-1



# Background



## The NA 01-1A-505-1 (01-1A-14, TM 1-1500-323-24-1)

- To gather under one cover the recommended practices and techniques to be used for installing, repairing, and maintaining aircraft electrical wiring.
- Standardize techniques and methods so that electrical installations will be done in a uniform manner.
- Indoctrinate all personnel with the importance of good workmanship.
- Identify the failures which may result from poor workmanship.
- Promote safety by pointing out and prohibiting unsafe practices.

Precedence:

1. Platform Specific Manuals
2. OEM Drawings
3. NAVAIR 01-1A-505 Series

The continued airworthiness of the EWIS depends directly upon an effective, proactive, preventative approach to meet the aircraft's life cycle and mission requirements.



# Background

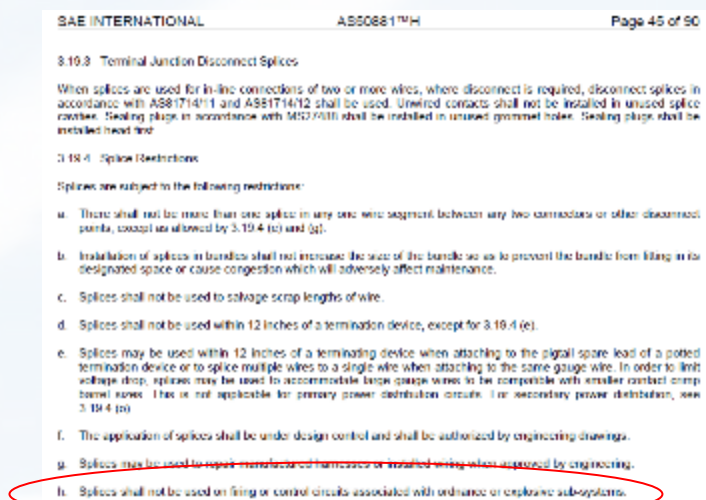


AS50881H States,

“Splices shall not be used on firing or control circuits associated with ordnance or explosive sub-systems.”

NA 01-1A-505-1 States,

“Splices shall not be used on firing circuits associated with ordnance, or explosive subsystems.”



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8. **SPLICE RESTRICTIONS.** The application of splices shall be under design control as authorized by engineering drawings. The installation of splices outside normal repair, to include the below listed restrictions (a through i), must be approved by the cognizant engineering authority. When this occurs, maintenance documentation shall be entered in the aircraft logbook, to ensure the wire is replaced not later than the next scheduled major maintenance cycle and include at a minimum: wire number, system and location (i.e. distance from closest termination device). For in-service applications, splices may be used to repair manufactured harnesses or installed wiring provided they meet the following restrictions:

a. Splices shall not be used inside fuel tanks, or within 12 inches of fuel tank entry.

b. Splices shall not be used on firing circuits associated with ordnance, or explosive subsystems.

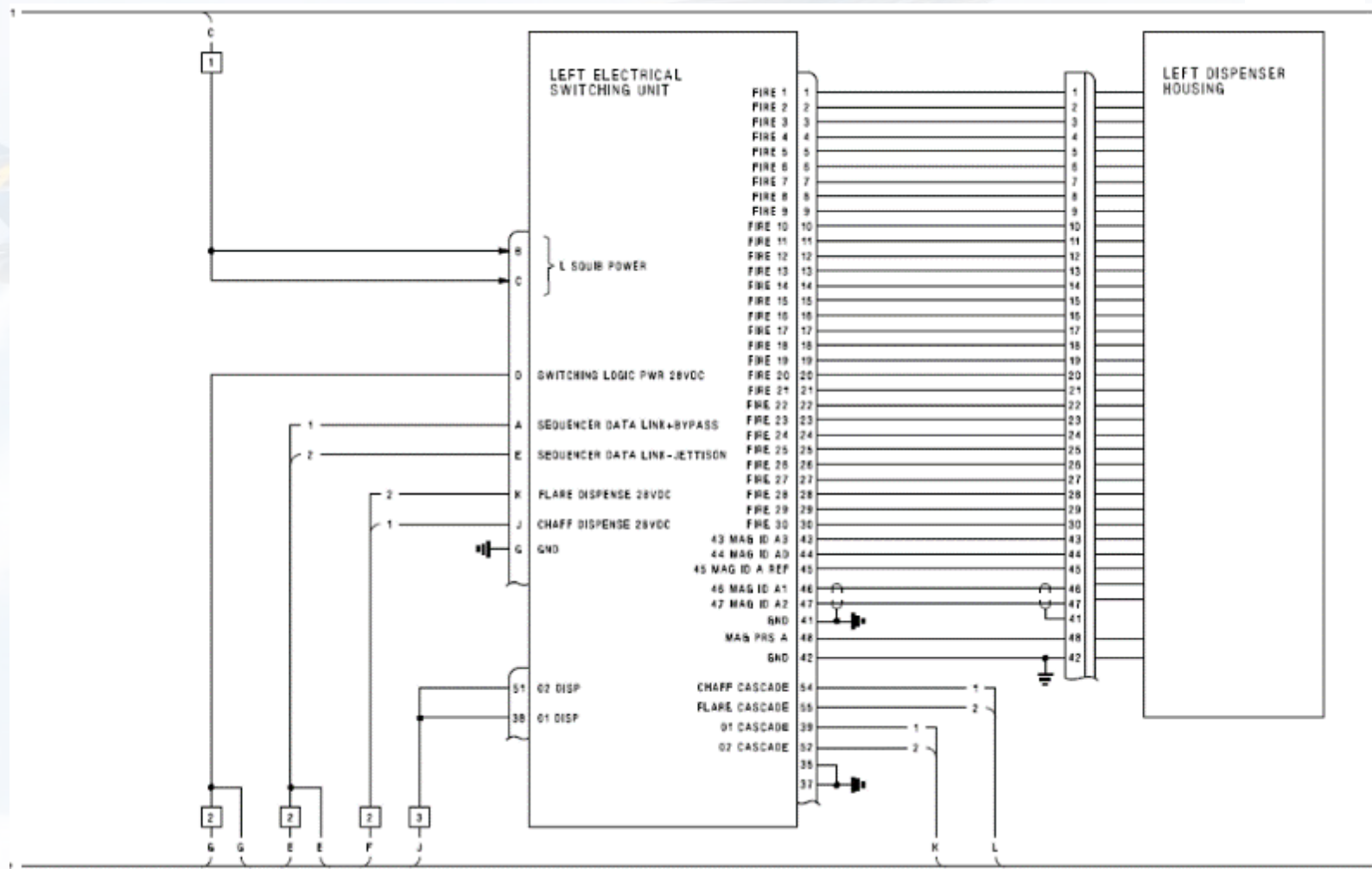
j. (Navy) The correct usage of Malfunction Code and Work Unit Code will be entered on the Optimized Organizational Maintenance Activity (OOMA) work order (WO) or maintenance action form (MAF).

k. (Navy) A detailed splice location will be added in the corrective action block of the MAF/ OOMA WO anytime wire splices are installed that are not identified by aircraft maintenance manuals, diagrams or engineering drawings. Documenting the location of installed splices allows T/M/S aircraft Cognizant Engineering Authority (e.g. ISSC and FST) to determine whether wire segment replacement is required during future rework to restore wire harnesses to original configurations. Details should include: wire number (when available), associated system, and the physical location of the splice (e.g. wire harness #, fuselage station, rib number, panel number, etc.).

l. (Navy) Conditional or temporary wire splicing



# Background





# Current Status



- Firing Circuit: A circuit composed of an output circuit, a control circuit, and/or a monitoring circuit. Firing circuits provide the electrical signal required to fire or discharge the applicable system. This circuit also prevents accidental fire or discharge of the applicable system. Examples include but not limited to the following: jettison, ordnance firing, store release, fire extinguishing bottle firing, and guillotine devices.



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Table 1 EWIS Inspection Checklist Guide (Cont.)

| Item                  | Inspect for  | Corrective Action  | Discrepancy | See WP |
|-----------------------|--|--|-------------|--------|
| Routing (cont.)       |  |  |             |        |
| Flammable Fluid Lines | When wiring must be routed parallel to flammable lines for short distances, maintain as much fixed separation as possible, six inches or more.   | When a six inch clearance cannot be maintained, the bundle and flammable line shall be clamped so that there will be no relative motion between them. The minimum clearance shall be 1/2 inch. |             | 010 00 |
| Splices               | (1) Splices shall not be used inside fuel tanks, or within 12 inches of fuel tank entry.<br>(2) Splices shall not be used on firing circuits associated with ordnance, or explosive subsystems.<br>(3) Splices shall not be used in flight control systems. (For Air Force only).<br>(4) Splices shall not be used in areas in which flexing may occur during operations or maintenance.<br>(5) Splices shall not be located under clamps.<br>(6) Splices shall not be installed in conduit or within 3 inches of the conduit openings.<br>(7) There shall not be more than two splices in any one wire segment between any two termination devices. |  |             | 014 00 |

continued

2. Splices shall not be used on firing or control circuits associated with ordnance or explosive sub-systems. Examples include but not limited to the following: jettison, ordnance firing, store release, fire extinguishing bottle firing, and guillotine devices.



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**8. SPLICE RESTRICTIONS.** The application of splices shall be under design control as authorized by engineering drawings. The installation of splices outside normal repair, to include the below listed restrictions (a through i), must be approved by the cognizant engineering authority. When this occurs, maintenance documentation shall be entered in the aircraft logbook, to ensure the wire is replaced not later than the next scheduled major maintenance cycle and include at a minimum: wire number, system and location (i.e. distance from closest termination device). For in-service applications, splices may be used to repair manufactured harnesses or installed wiring provided they meet the following restrictions:

- a. Splices shall not be used inside fuel tanks, or within 12 inches of fuel tank entry.
- b. Splices shall not be used on firing circuits associated with ordnance, or explosive subsystems.
- c. (For Air Force only) Splices shall not be used in flight control systems.
- d. Splices shall not be used in areas in which flexing may occur during operations or maintenance.
- e. Splices shall not be located under clamps.

j. (Navy) The correct usage of Malfunction Code and Work Unit Code will be entered on the Optimized Organizational Maintenance Activity (OOMA) work order (WO) or maintenance action form (MAF).

k. (Navy) A detailed splice location will be added in the corrective action block of the MAF/ OOMA WO anytime wire splices are installed that are not identified by aircraft maintenance manuals, diagrams or engineering drawings. Documenting the location of installed splices allows T/M/S aircraft Cognizant Engineering Authority (e.g. ISSC and FST) to determine whether wire segment replacement is required during future rework to restore wire harnesses to original configurations. Details should include: wire number (when available), associated system, and the physical location of the splice (e.g. wire harness #, fuselage station, rib number, panel number, etc.).

l. (Navy) Conditional or temporary wire splicing in restricted areas must be performed per the Fleet Engineering Disposition (FED) process. The FED must include wire number, harness part number, physical location, and directed wire replacement interval (such as, no later than 100 flight hours, or next Phase inspection, or next Depot rework).

b. Splices shall not be used on firing or control circuits associated with ordnance or explosive sub-systems. Examples include but not limited to the following: jettison, ordnance firing, store release, fire extinguishing bottle firing, and guillotine devices.



# Path Forward



- TPDR has been Approved
  - WP 03 00 Definition will be updated in next change
  - WP 04 01 Table 1 will be updated in next change
  - WP 014 00 Paragraph 8 (b) will be updated in next change
- The NA 01-1A-505 is a general document, it is recommended that each platform (Type, Model, Serial) specifically identify:
  - Firing Circuits
  - Splice Restrictions for the “Firing Circuits” IAW AS50881



# Questions



## Questions?

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