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2
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Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW



Fiber Optic Splicing

JSWAG

DECEMBER 2025

Blayne Lum



OUTLINE



- **General Maintenance Practice**
- **Projects/ Efforts**
 - **AFRL**
 - **NAVAIR**
- **Aircraft Battle Damage Repair (ABDR)**





General Maintenance



- NA 01-1A-505-4
- P 013 01
 - Fusion splice is discussed as an approach to cable/ harness repair
- WP 013 02
 - Provides generic procedures for the M24623/7 mechanical splice
- M24



Qualified Products Database

Main Search Reports Help



Governing Spec: MIL-PRF-24823

This Qualified Product List for the following governing specification was last updated on 24 SEP 2024

QA	FSC	QPL Number	Governing Spec	Doc Date	Doc Status	Title	QPL Notes
SH	8080	QPL-24823	MIL-PRF-24823	08-SEP-2020	Active	Splitter Fiber Optic Cables, General Specification for (Metric)	Download Certificate

Search > QPL > Governing Parts > Manufacturer Parts

Based on the selected QPL above.

Filter for: Filter by:

Total part count = 1. Click on the appropriate link to view more. If no link, no qualified source.

QPL Code	Designator	NSN	Spec Stock	QPL	Notes
01	M24623/7	752011879625			

Based on the selected Governing Part in the left

Filter for: Filter by:

Green - Source is Certified, Yellow - Source is not for Certification, Red - Source is overdue for Certification. Contact QA for additional information. Click on the appropriate link to see more.

Part Designation	Source Name	QPL Code	Related Links
M24-3770	MILCO FIBER OPTICS INC 1711 AZALEA DRIVE RD NORFOLK, VA 23502-9900 USA info@milcofiberoptics.com Tel: 757-638-3100 3-603-2255-06	VEH08	



General Maintenance



Fiber Optic Repair Set (FORS)

P/N: 3881AS100-1 NIIN: 01-528-5511

- The FORS contains the tools for performing splice repairs on aircraft fiber optic cables. It is applicable for in-line splices as well as splicing of pre-terminated pigtails to replace cable or termini damage at the connectors. Fiber optic maintenance tools for prepping, splicing, and restoring the cable strength. Application for Battle Damage Repair (BDR) (Consumable components sold separately.)
- Technical Manual 19-1-579
- E-2CHE2K, E-2D, F/A18 E/F, E/A-18G and P-8





PROJECTS USAF



Problem

- Current Technical Orders (T.O.s) require damaged FO cables to be entirely replaced, from end-to-end regardless of length or installation region
 - *Note: Joint Manual 1-1A-14, "Installation and Repair Practices, Aircraft Electric and Electronic Wiring" allows electrical wire splices*
- Aircraft Battle Damage Repair (ABDR) Program located within the Air Force Sustainment Center (AFSC) identified the need to field repair fiber optic (FO) conductors to improve mission readiness
- The program requested Accelerated Materials & Processing Solutions branch (AFRL/RXNS) identify a solution for this need



PROJECTS USAF



What is a FO Fusion Splice?

*some steps omitted for clarity



Strip outer sleeve



Roll insulation back



Clean glass core



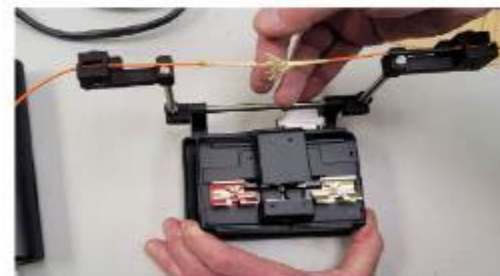
Cleave fiber ends



Align fibers



Fuse!



Roll insulation back

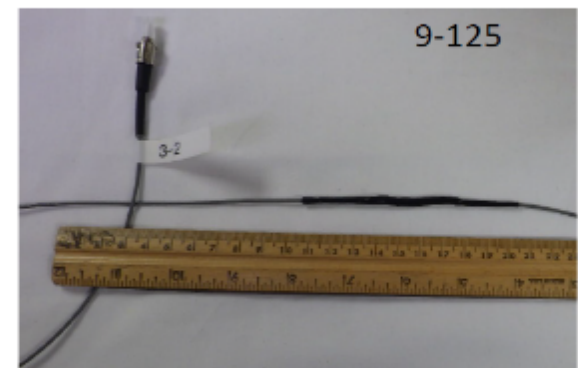
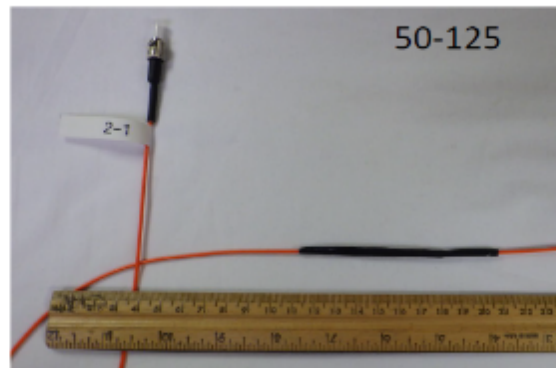
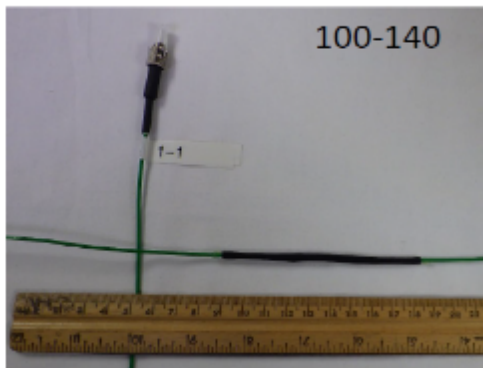


PROJECTS USAF



Solution

- Team worked with Aurora Optics, Inc. to modify this commercial kit to work with DoD cables:
 - 100/140 Simplex Fiber Optic Cable Multimode
 - 50/125 Duplex Optical Multimode 50 μm core (OM2)
 - 9/125 single mode fiber cable





PROJECTS USAF



Solution

- Team identified a commercially-available FO fusion splice kit offered by Aurora Optics, Inc.



- Kit designed for fusion splicing BMS13-71T03C01GA, commercial simplex fiber optic cables (Boeing commercial a/c)
- Optical performance of this kit was tested to be outstanding:
 - Avg. insertion losses < 0.03 dB
 - Back reflections < -60 dB
 - Changes in attenuation < 0.2 dB (thermal shock) or 0.05 dB (all other tests)



PROJECTS USAF



Benefits

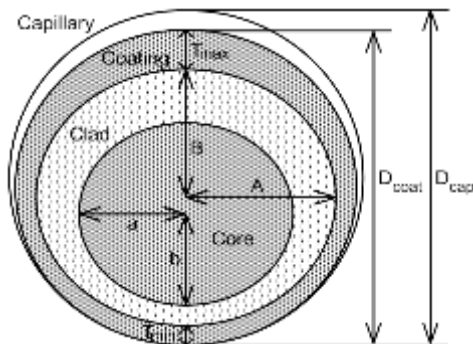
- Affords an organic ABDR or Depot Field Team capability of repairing these systems on-site
- Scalable for a field level repair capability
 - Process can be used as a permanent peace time repair on most fiber cables (after approval)
- Reduce Repair Cycle Time
 - Less disruptive to the other systems in the aircraft versus end-to-end replacement
- Ease requirement for spares
 - Save money by not having to purchase pre-fabricated cable for replacement or ordering from OEM



PROJECTS US NAVY (NAVAIR)



- NAVAIR has leveraged results from three NAVAIR SBIR/STTR programs and two Naval Innovative Science and Technology (NISE) programs to develop fiber optic cable splicing capability
- NAVAIR PMA-260 has a Fiber Optic Repair Set (FORS) program of record
- Navy was awarded 3 U.S. Patents in 2020. 1) Method for Assembling a Fiber Optic Splice, 2) Apparatus for Assembling a Fiber Optic Splice, and 3) Fiber Optic Mechanical Splice



Fiber Optic Splice
SBIR
N04-002



Fiber Optic Tip Shaper
STTR
N05-T031



Light Curable
Index Matching Resin
SBIR
N112-125
(ongoing Phase II.5)



PROJECTS US NAVY (NAVAIR)



- **In 2023, the Air Force 1-1H-39 has allowed Fusion splicing for ABDR**
- **Navy ABDR 1-1A-39**
 - **Last Change was 15 Feb 1993**
- **In March 2025, Navy leadership identified a need to use Fiber Optic Splicing for ABDR**
 - **A working group was established**
 - **Fusion Splicer qualified for Explosive Atmosphere**



US NAVY (NAVSEA)



Built in accordance with NAVSEA Dwg# 7344573/NSN 6080-01-659-2034

- The Shipboard Casualty Restoration kit is designed to quickly (typically <10 mins for all four fibers!) restore a completely severed section of Navy shipboard fiber optic cable.
- Contains eight (100foot) plug and play pre-terminated low smoke zero halogen jumper cables: 4 multimode (62.5um), 4 singlemode.
- An anaerobic epoxy system based field termination kit with shipboard approved COTS ST connectors.
- Cable and fiber stripping tools, Kevlar® shears, alcohol impregnated cleaning wipes, crimp tool, cleave tool, polishing puck and polishing paper.
- Also includes inspection equipment: hand held microscope and visual fault locator.
- And safety equipment, including safety glasses, head-band light and fiber disposal container.



Simple to use with basic fiber skills!



PATH FORWARD



- **Procure/Borrow a fusion splicer for evaluation**
- **Procure splicing consumables for evaluation**
- **Build up samples**
 - **Develop splicing repair methods**
 - **Testing of samples**
- **Setup FRC and fleet evaluation**
 - **Evaluate splicing methods**
 - **Incorporate Feedback**
- **Draft and Release CIDs and Kit Drawings**
- **Fleet deployment**



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