

The widest range of
mission-critical interconnect
technologies in the world

Space-Grade Optical Fibre Flex Circuits & Multi-Fibre Connectors for High-Speed Payload Datalinks

Davinder BASUITA, Business Development, Optical Fibre & RF, Glenair UK
Bertrand DAUCHELLE, Technical Support, Glenair France



MISSION-CRITICAL
INTERCONNECT
SOLUTIONS

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Glenair Overview

An interconnect industry leader since 1956

- Products
 - Connectors, complex cable assemblies, back shells, conduit, braid, tooling, and fibre optics
- Primary markets
 - Aerospace, avionics, space, deep sea (oil / gas) and nuclear
- More than 2.5 million square feet factory space world-wide, 7000 employees
- Privately owned, not beholden to any stock markets



Glenair UK, Mansfield, Notts.



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Glenair Harsh Environment Fibre Optic Interconnect Solutions



MIL-DTL-38999 Series III type



Glenair High Density (GHD)



ARINC 801



83526 GFOCA



Series 80 Mighty Mouse



Mil 28840



Glenair GFR Series
Front-Release



Mil PRF 64266 NGCON



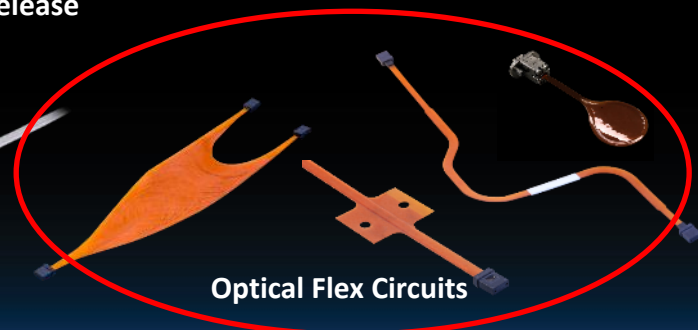
Eye-Beam GMA



SuperNine MT



Series 79 MT



Optical Flex Circuits

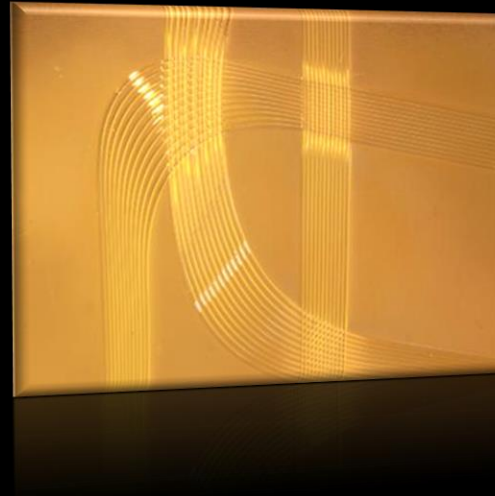
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- Desirable performance attributes
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Introduction

- Next generation space platforms are becoming increasingly reliant on high speed and high-density communications
 - Demand for bandwidth being driven by emerging data hungry protocols
 - ✓ 10G Ethernet, Fiberchannel, ARINC 818, sRIO, SpaceFibre, FPGAs with I/O rates up to 28Gbps and higher definition video formats.
- Such applications are driving the need for ultra-reliable and high-speed datalinks for both digital and RF signal transmission over optical fibre.
- This presentation details advances in fibre optic interconnects including optical flex circuits combined with multi-fibre array connectors for high density board to board and board to backplane applications.
 - These solutions are highly tolerant to the adverse environment of space applications and are key enablers for future high performance high data rate systems.

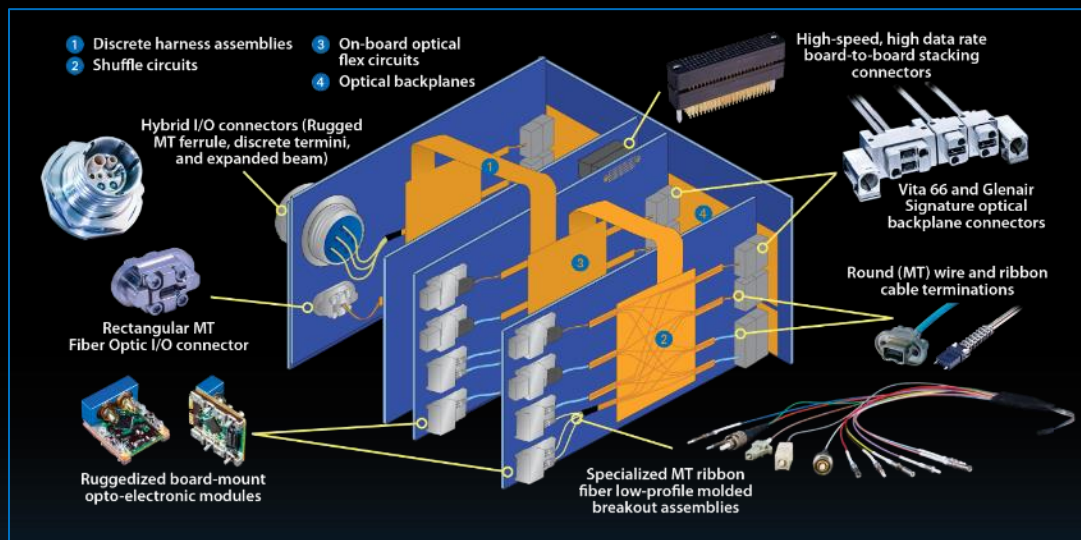
What is optical fibre flex?



Optical fibre flex circuits offer optimised complex fibre routing for high fibre counts and provide system layout designers with a new and real solution to managing growing fibre density problems.

Applications targeted for optical fibre flex interconnects in space equipment

- Short distance lines, intra-PCB
 - Eg optical transceiver to transceiver
- Optical transceiver to optical back-plane
- Board to board
 - Via optical backplane and blind mate connections



Optical fibre flex for space interconnects

Advantages

- Low outgassing
 - Regular multi-lane ribbon fibre is coated with a UV cured acrylate which outgases terribly
 - Glenair Kapton based fibre flex eliminates this problem.
- Operational
 - Reduced installation times
 - Eliminate wiring errors
- Reliable and repeatable termination
- Superior fibre management
- Less bulk
 - Complex fibre routes in minimal space
- Precisely controlled routing lengths
 - For low skew applications
- Controlled bend radius, increases reliability
- Optical circuit shapes are fully customisable to the mechanical requirements of the application



Conventional 4 fibre interconnect

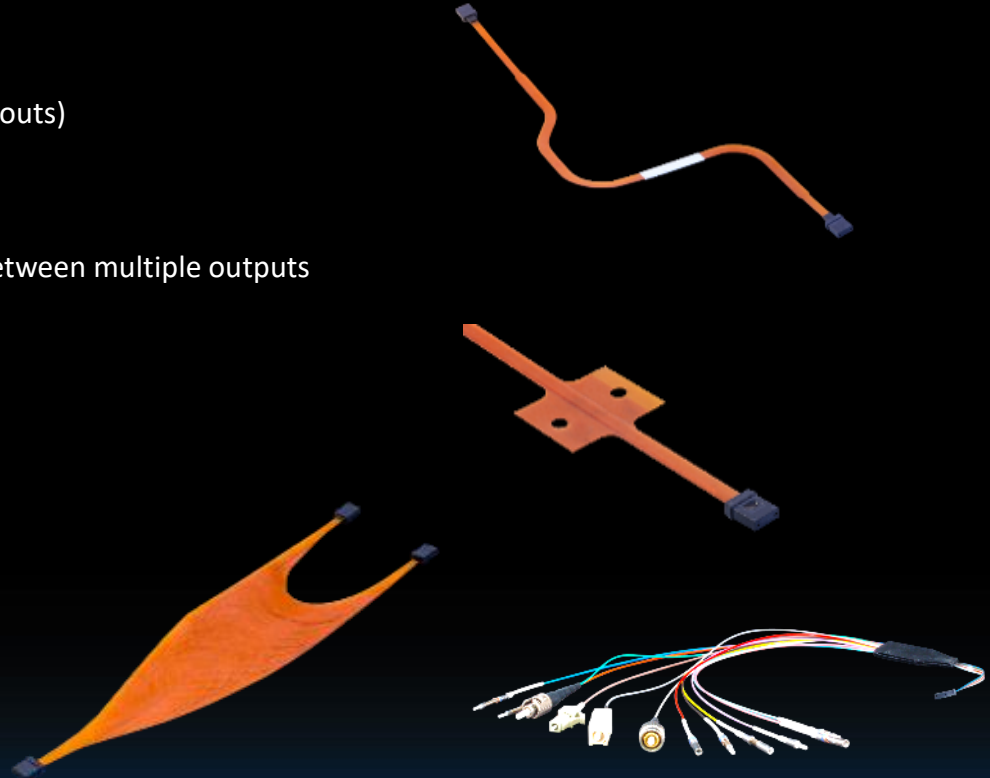


Fibre optic flex equivalent

Typical optical flex circuit configurations

Ruggedized Kapton assemblies with integrated optical fibre

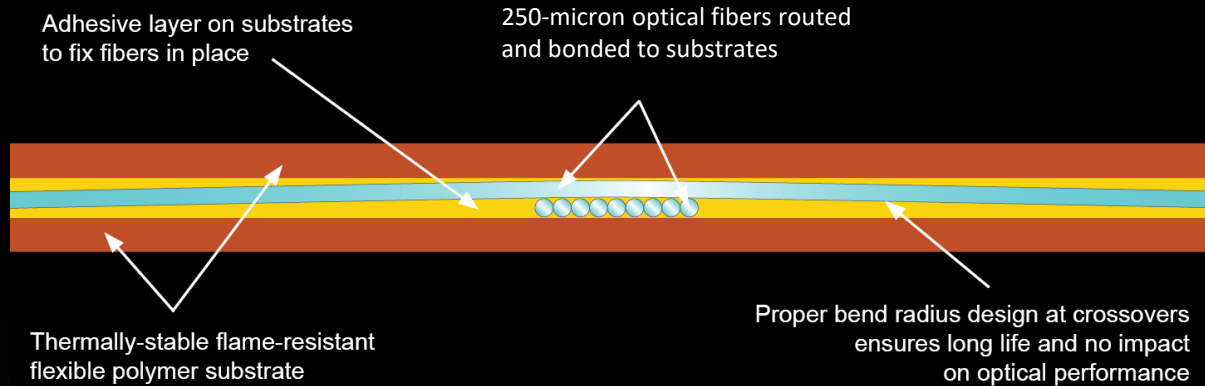
- Point-to-point
 - Discrete equivalents to simple A to B connections
 - Multi-fibre flex to breakout to individual lines (fanouts)
 - Multi-branch assemblies
- Shuffle
 - Interconnect patterns involving shuffling inputs between multiple outputs
 - Eases implementation of multiple optical circuits
- Customised on-board fibre distribution
 - Bridging between high-speed optical transceivers
 - Linking optical transceivers via optical backplane



Fibre Optic Flex

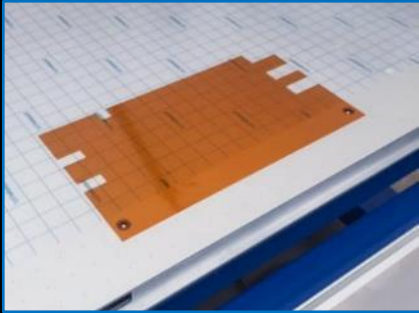
Construction

- Optical fibre bonded to a polyimide (Kapton) substrate
 - Kapton is flame resistant (UL-V1), low outgassing
 - Already widely deployed in space applications
- High densities possible - fibre to fibre spacing 250um
- Environmentally sealed construction - conformally coated



Fibre Optic Flex

Fabrication



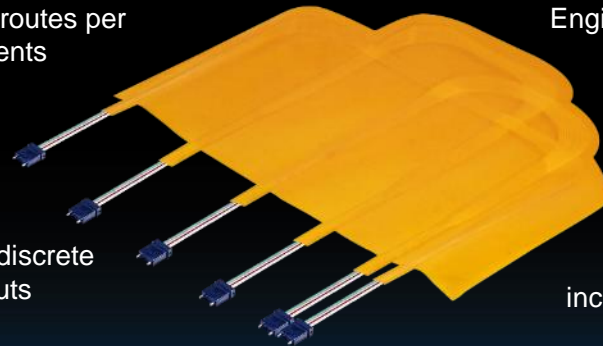
CAD build to print per user specifications



VIDEO: Automated precise fibre placement

Custom circuit shapes and routes per application requirements

Engineered bend radius ensures optimal performance



Ribbonised or discrete fibre outputs

Industry standard MT optical ferrules easily incorporated into ruggedised connectors or MTPs

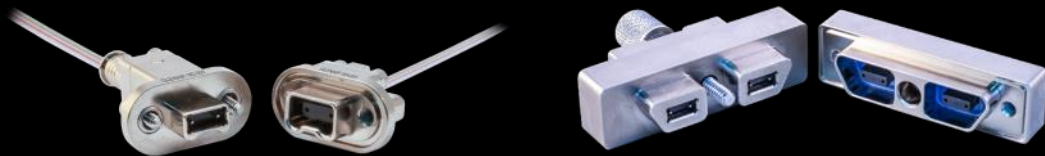
Fibre Optic Flex

Key Specifications

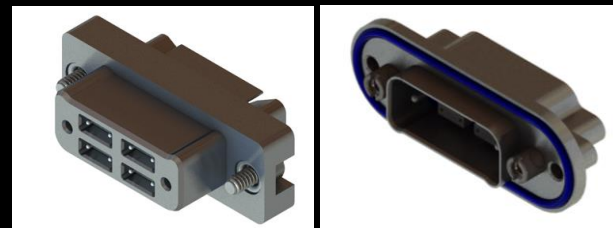
- High-density fiber-to-fiber spacing: 250 μm
- Multimode, singlemode or specialty fibre
- Environmentally-sealed conformal coating
- Dimensions
 - 12" x 12" migrating in the near future to 40" x 40"

PhotonicFlex Parameters	
Optical Fiber Nominal OD	250 μm
Fiber Types	Singlemode / Multimode
Connector Terminations	Ribbonized MT and discrete fiber FC, GC, SC, LC, and others
Operating Temperature	-40°C to +100°C
Typical Minimum Bend Radii	0.5 inch
Circuit Thickness	0.6 mm
Substrate	Kapton
Flat and 3D Designs	Yes
Flame Resistance	UL-V1 or Better
Ribbonized Leads	Yes, up to 2 meters
Shuffle Circuits	Yes

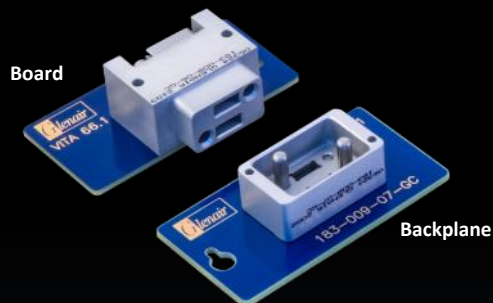
Fibre Optic Flex Connectorisation



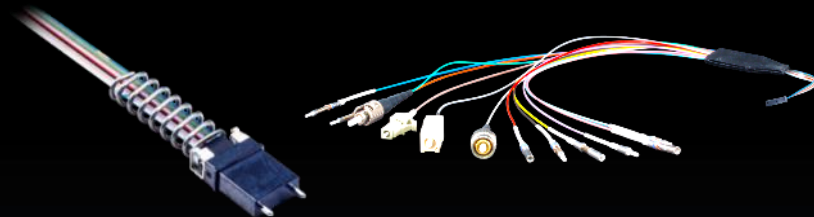
Glenair Series 79 – single, dual and quad MT ferrule versions



(Under development)



VITA 66.1 blind mate



MT ferrule only and other commercial connectors eg MPO

Optical Fibre Flex

Summary

- Next generation space platforms are becoming increasingly reliant on high speed and high-density communications.
- Glenair optical fibre flex combined with Glenair ruggedised connector solutions shows considerable promise as the technology of choice for high density optical interconnects for space equipment.
- The reliability of these solutions has been verified, with deployment of these optical flex solutions in orbit today.
- **Glenair is seeking collaboration with you as a member of EPIC to address space your optical interconnect challenges.**

For more information...

- Davinder BASUITA
dbasuita@glenair.co.uk
- Bertrand DAUCHELLE
bdauchelle@glenair.fr



Thanks for your attention!