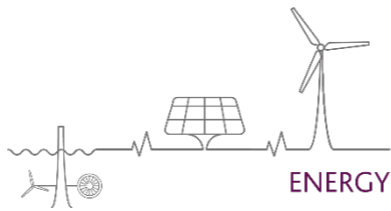
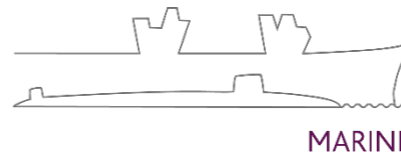


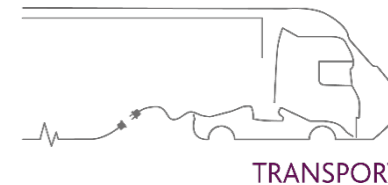
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ENERGY



MARINE



TRANSPORT

Designing and manufacturing unassailable 'fit and forget' moulded harness systems for hostile environments



PlastEthUrm cable technology: 10 year warranties on the central nervous system of submarine and surface fleets

PlastEthUrm
dual jacket - TPPU & PE



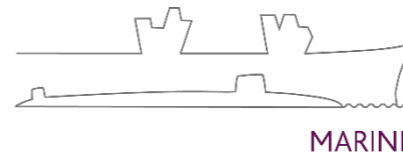
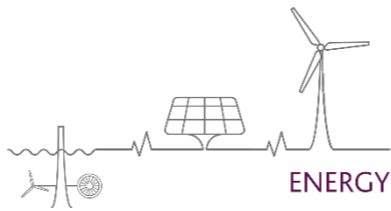
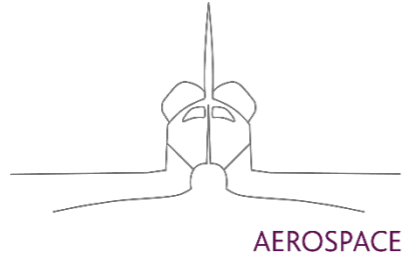
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Designing and manufacturing unassailable 'fit and forget' moulded harness systems for hostile environments

HIGHLIGHTS

- More than 10,000 installations - zero leaks
- 30 years as critical defence sector supplier
- 27 years – continuous MOD Capability Approval
- 25 years – Export Defence



PlastethUrm
dual jacket - TPU & PE

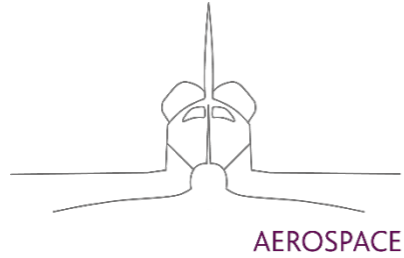


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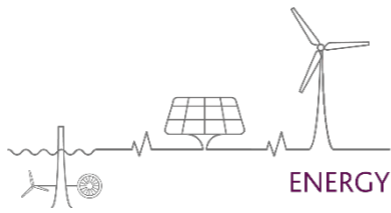
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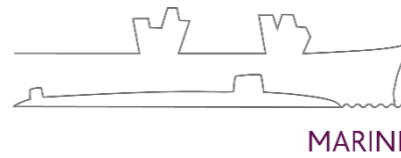
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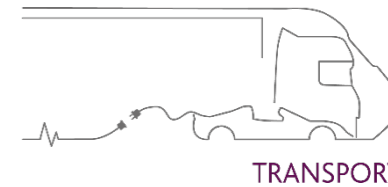
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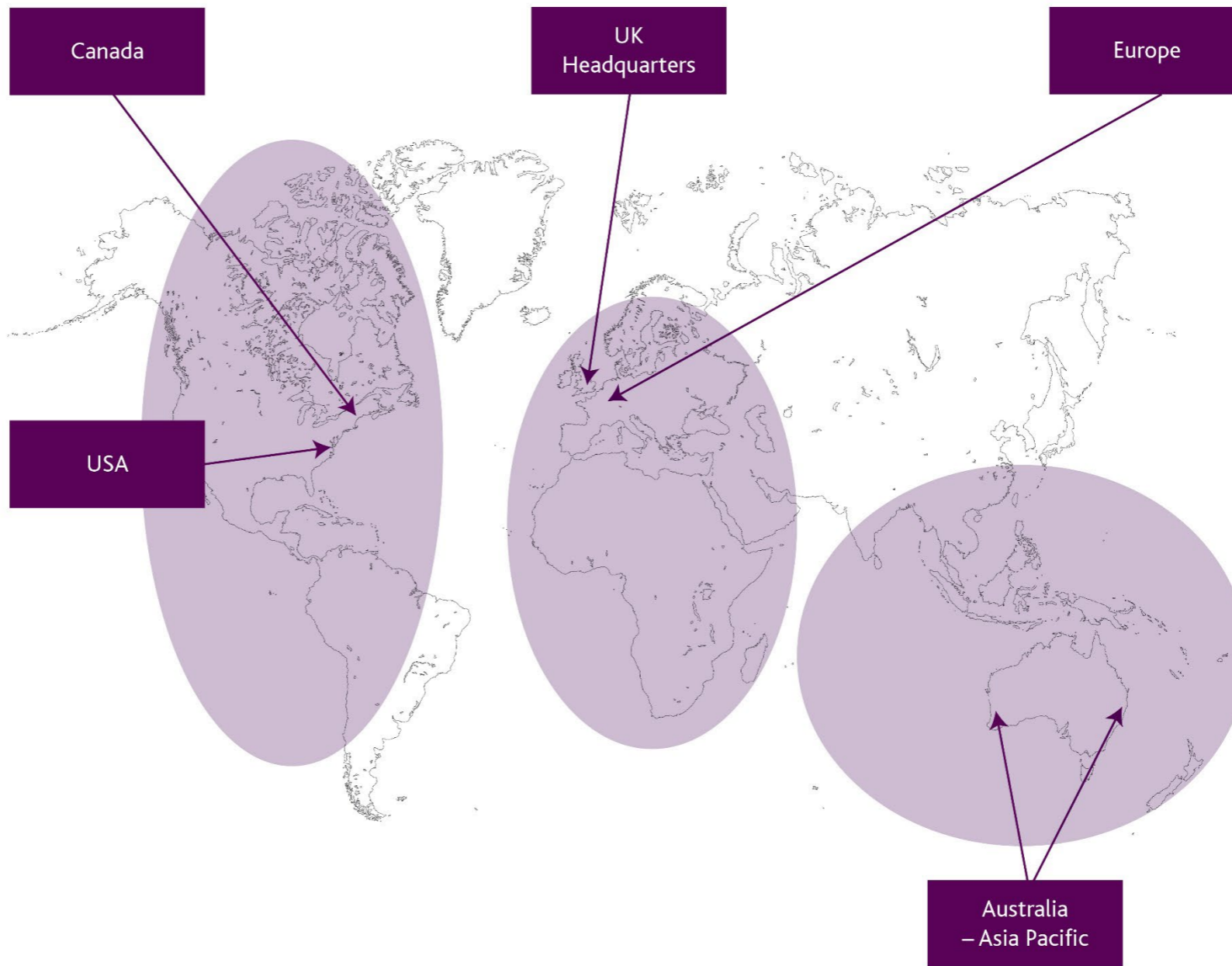
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OFFICES



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dual jacket - TPPU & PE

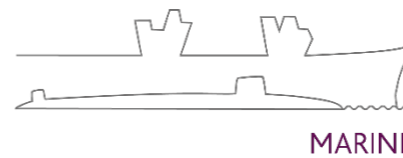
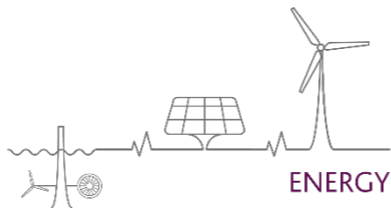
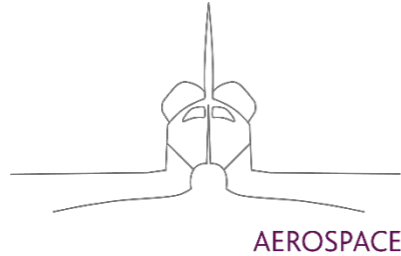


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Designing and manufacturing unassailable 'fit and forget' moulded harness systems for hostile environments

PROPOSITION

FOR CRITICAL INFRASTRUCTURE IN HOSTILE ENVIRONMENTS

- Reliability driven, 'fit and forget'
- Delivering Value for Money from lowest through-life cost
- Precise, bespoke, designed for purpose
- Respected Brands

SLIPstream
low profile fibre optics

Low profile, 90°, electro-optic harnesses

PlastEthUrm
dual jacket - TPPU & PE

Atomic bonding, dual TPPU & PE sealing - 10 Year Warranty

STAMP
SECURE THERMOPLASTIC AUTOMATED MOULDING PROCESS

Field and Platform Secure Manufacturing

PlastEthUrm
dual jacket - TPPU & PE

TelemetriX
data, delivered.

Sea-to-Screen assurance for Marine Defence

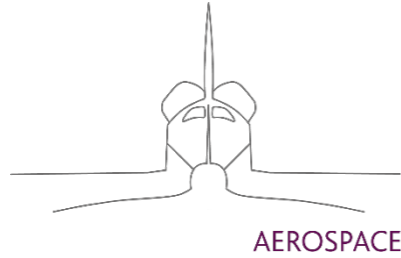
FIBREGENCE
optical intelligence subsea

Electro-optic hybrid connectivity for high data rates

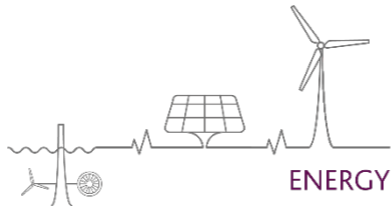


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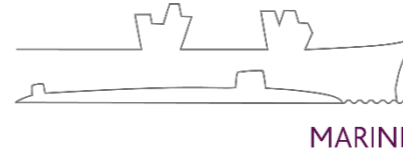
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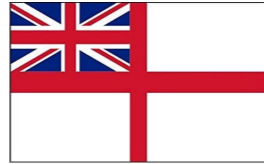
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GLOBAL NAVAL DEFENCE



Type-45



Type-23



Type-26



Trafalgar



Vanguard



Astute



Dreadnought



Victoria



Canadian Surface Combatant



Barracuda



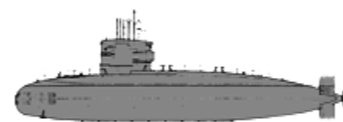
Scorpene



Collins



Hunter



Walrus



Walrus Replacement (Proposed)

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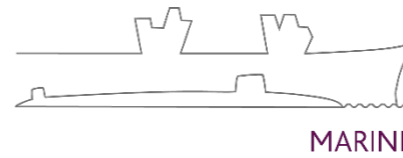
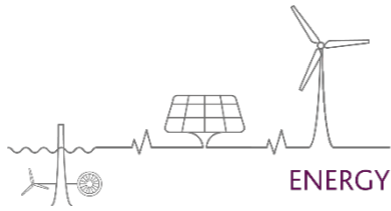
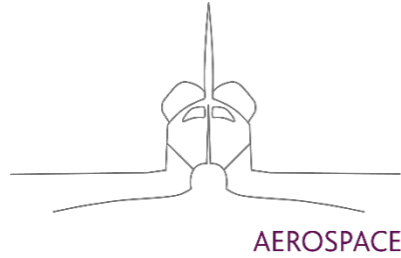
PlastethUrm dual jacket - TPU & PE



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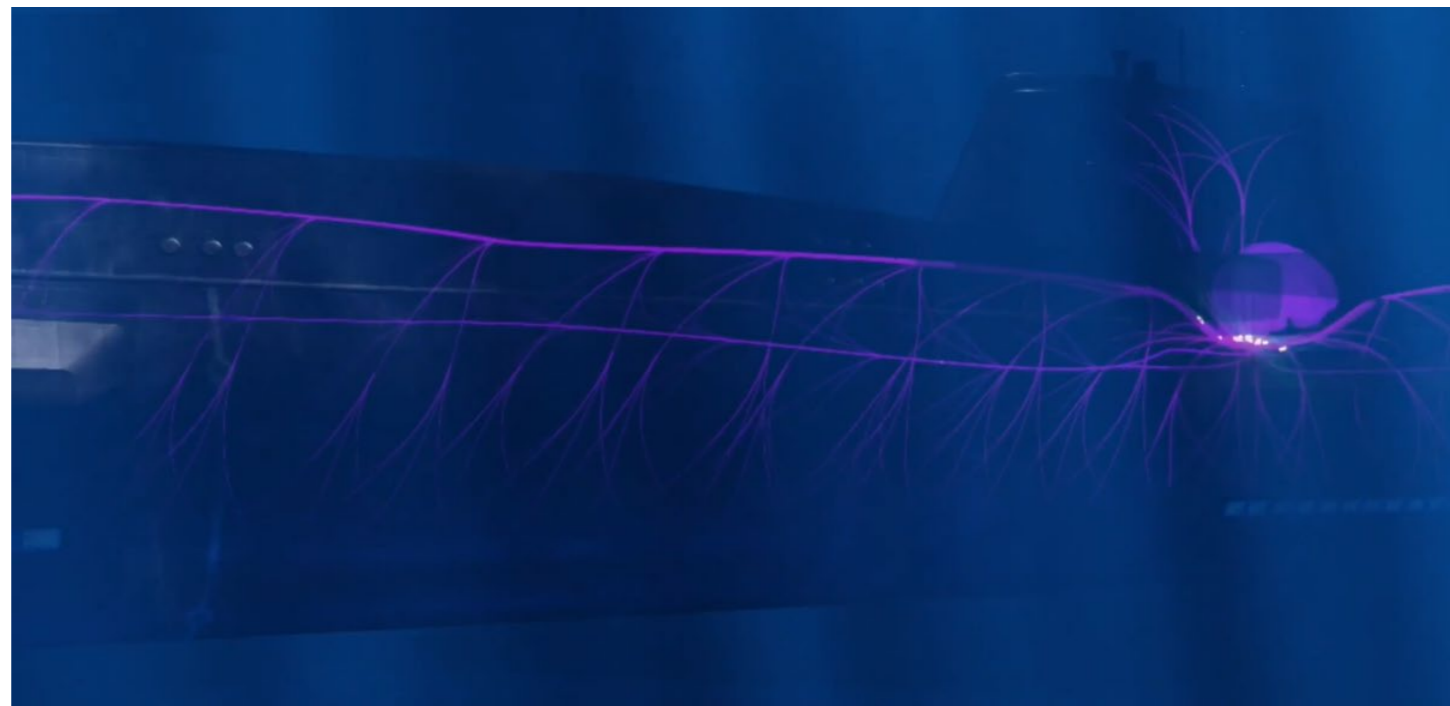
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Designing and manufacturing unassailable 'fit and forget' moulded harness systems for hostile environments

THE CHALLENGE

- Cable systems – not a commodity
- Combat, sonar or propulsion system only as good as the connecting infrastructure
- Cable architecture is the **Central Nervous System** of a platform
Critical for performance, reliability is essential.



PlastethUrm
dual jacket - TPPU & PE

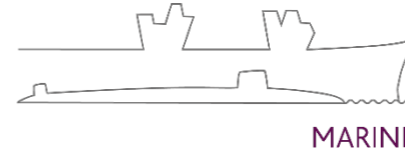
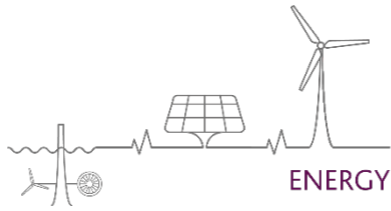
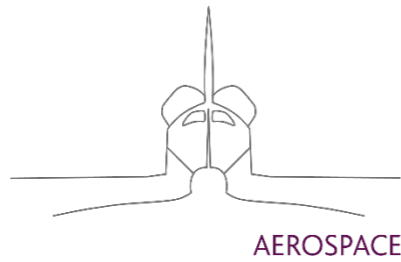


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THE RISK

- Over dependency on Design Life
- What does Design Life actually mean?
- 2020 Legal Precedent provides insight into this

PlastethUrm
dual jacket - TPU & PE

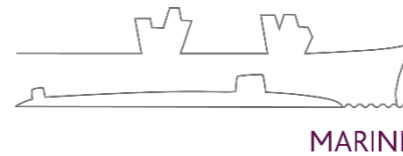
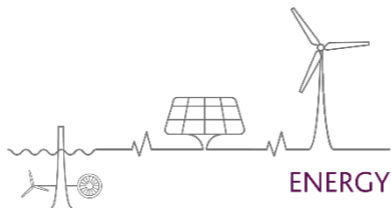
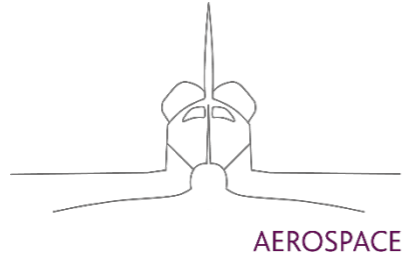


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DESIGN LIFE



Blackpool BC v VolkerFitzpatrick 2020

2011 New Tram Depot Completed with 50 Year contractual Design Life

2015 Blackpool BC discovered that parts of the structure had corroded and claimed that Volkerfitpatrick had failed to meet the contractual design life

2020 High Court ruled Design Life of 20-25 years applied

PlastethUrm
dual jacket - TPPU & PE

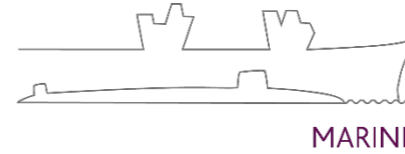
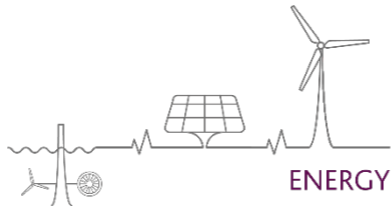
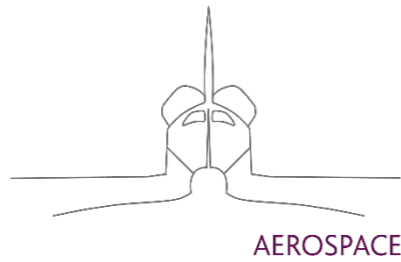


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Both parties claim to have “won” this case

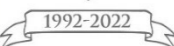
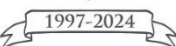
DESIGN LIFE

‘Design life’ was not defined in the contract in *Blackpool*.

The types of maintenance that fall into ‘anticipated’ maintenance and the parts of the structure covered by the design life obligation hinge on the terms of the contract.

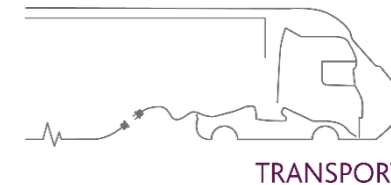
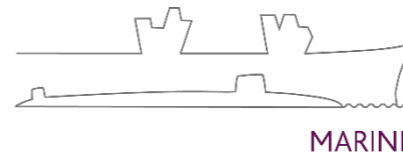
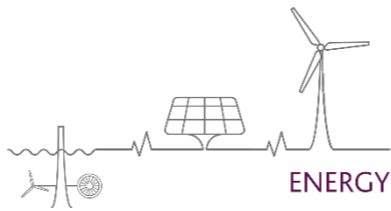
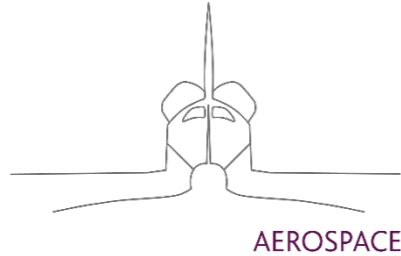
Risk lies with parties, and their insurers, to thoroughly craft and understanding the contract terms before agreeing to them.

If Design Life is unreliable why not transfer the risk to supply chain and demand long term warranties



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WARRANTY
ASSURANCE

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dual jacket - TPPU & PE



PlastEthUrm
dual jacket - TPPU & PE

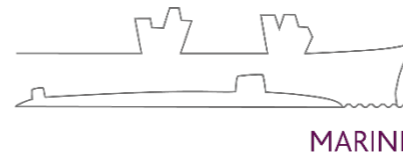
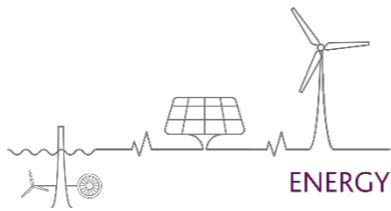
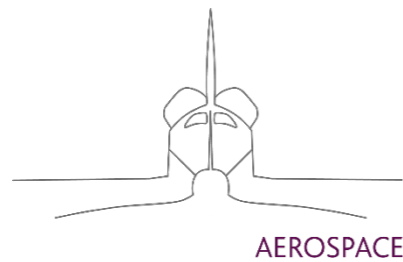


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THE COMPROMISE OF CABLE JACKET SELECTION

Polyethylene (PE) vs Polyurethane (PU)

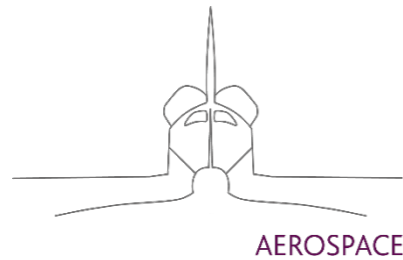
- TS Polyurethane TSPU - no amalgamation, relies on adhesion
lower mechanical properties
hygroscopic absorption >4% – very low IR
- TP Polyurethane TPPU - more robust, hardest wearing visco-elastic
hygroscopic absorption <1% – low IR
shorter life – replacement as often as every 7-9 years
- Polyethylene PE (TP only) - best electrical & sealing performance 400+GΩ IR
proven 40+ year life in sea water (global pollution!)



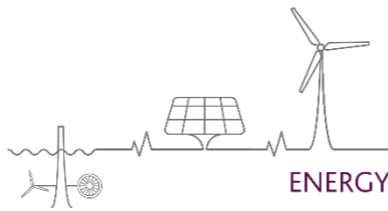
*“When specifying or selecting a jacket material foresight should be given to the termination procedure... the bonding procedure should be established.”
A G Berian 2001*

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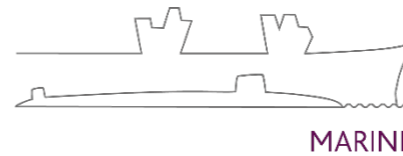
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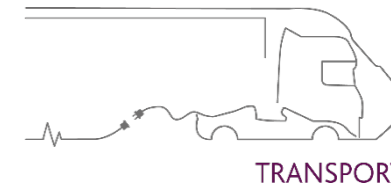
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BONDING TECHNOLOGY

Black Magic or Complex Chemistry?

- Moulding technology - Successfully produced in UK for 30 years
- PE expertise lost from the industry
- Many manufacturers consider it too difficult

Bonding rather than adhesion

- Chemical bonding requires high temperature & high pressure
- Electron transfer (metal/plastic) or sharing (plastic/plastic)

Chemical bond is stronger than the weaker of the two materials and orders of magnitude greater than any mechanical joint.

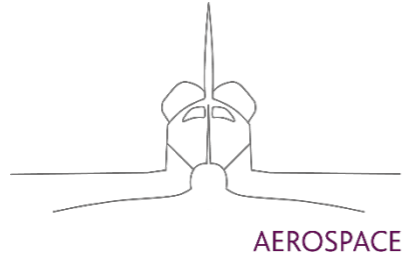


"Cable seal failure after a design has been adequately tested and proven can be traced invariably to poor bonding." R F Haworth 1973

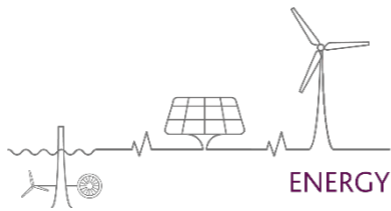


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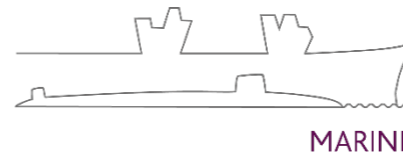
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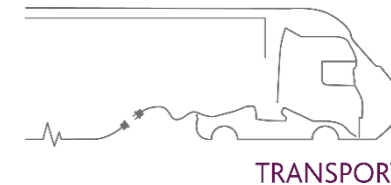
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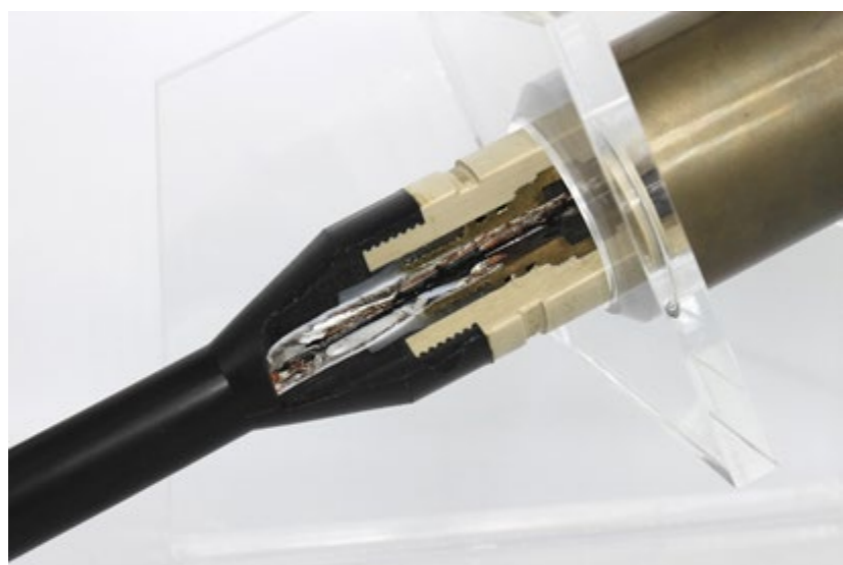
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PLASTETHURM

Dual Jacket Sealing (PE + TPPU)

- best combined hostile environment protection
- robust to meet unspecified construction conditions
- two independently moulded and sealed jackets
- water blocked, non cross-hosing
- cathodic protection can be integrated



PlastEthUrm
dual jacket - TPPU & PE

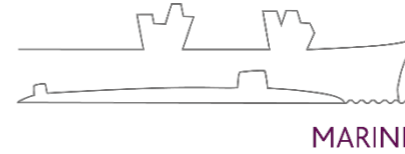
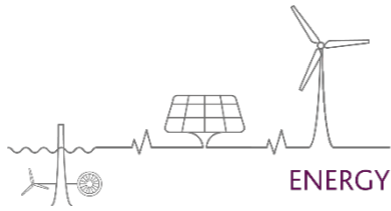
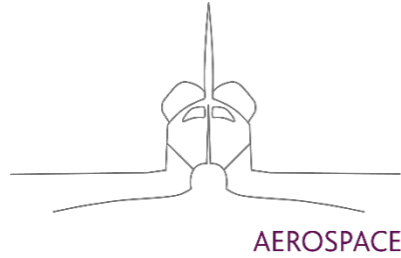


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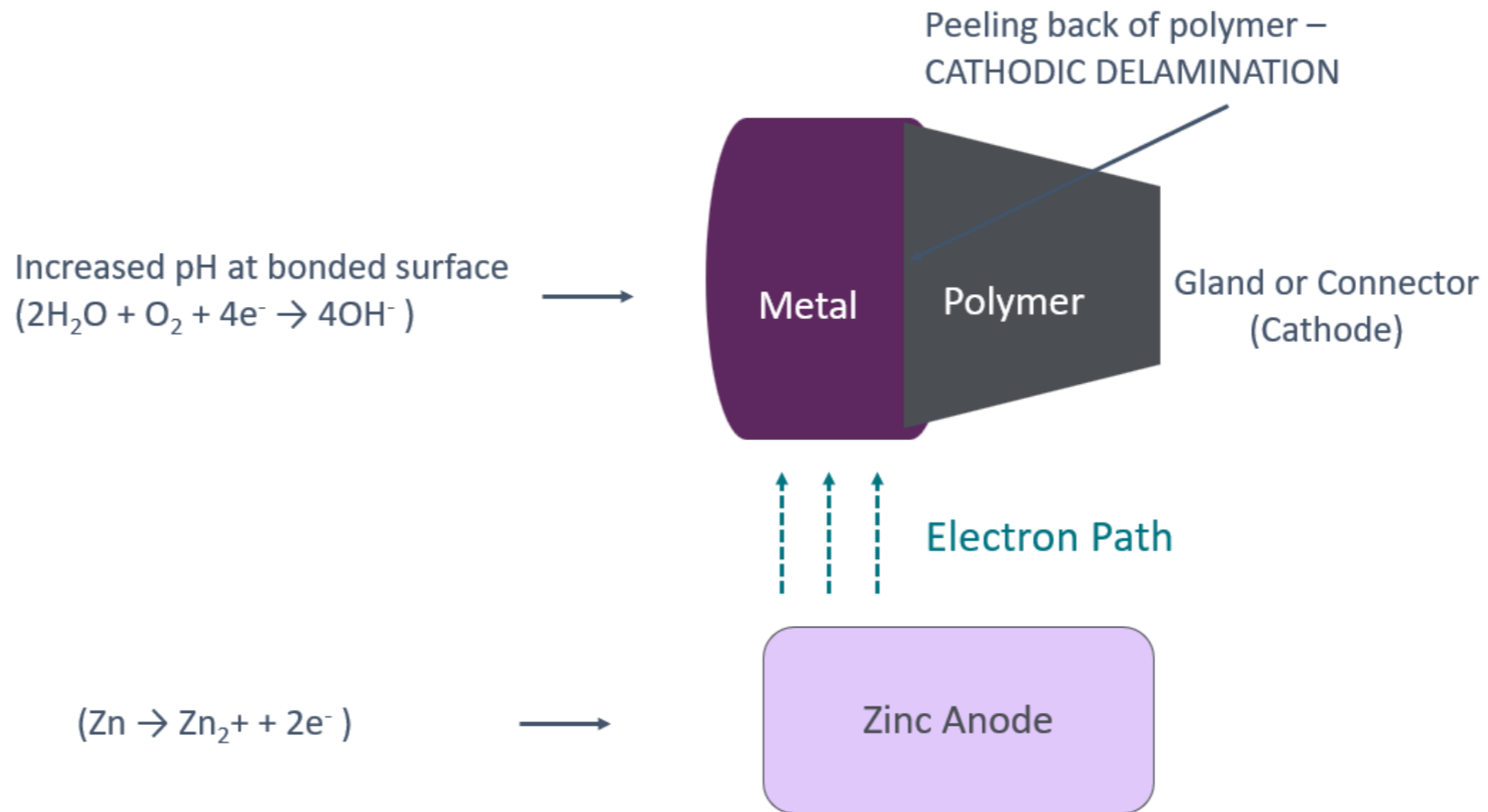


unassailable 'fit & forget' pressure moulded harness systems for hostile environments

BONDING TECHNOLOGY

Cathodic Protection

- prevents cathodic delamination
- should be designed in to gland or connector mouldings
- essential if installed in proximity to zinc anodes



PlastethUrm
dual jacket - TPPU & PE

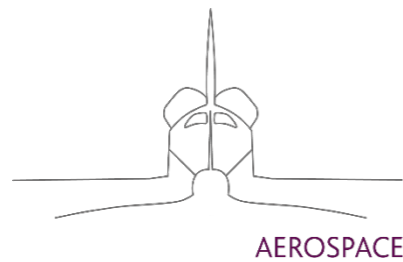


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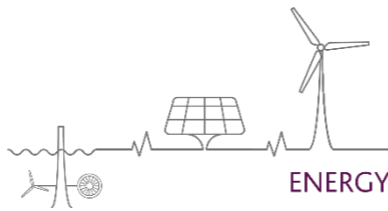
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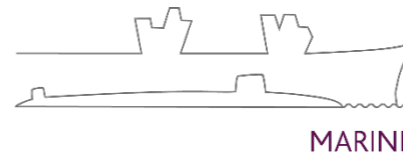
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ACHIEVING
WARRANTY

Pedigree – 30 years of thermoplastic moulding bonding technology

Accreditation – 27 years Continuous Capability Approval

Testing – Qualification
In –Process
Accelerated Life Testing

PlastEthUrm
dual jacket - TPPU & PE

Inspection – Radiography

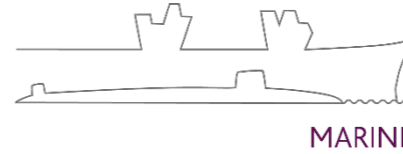
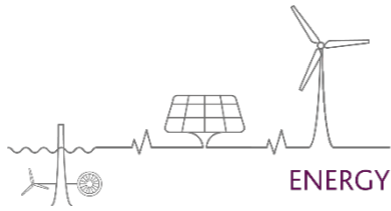
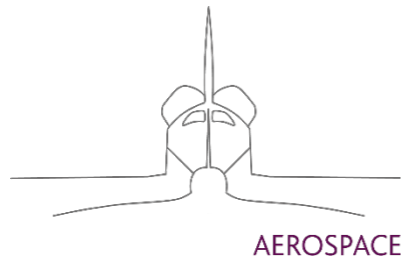


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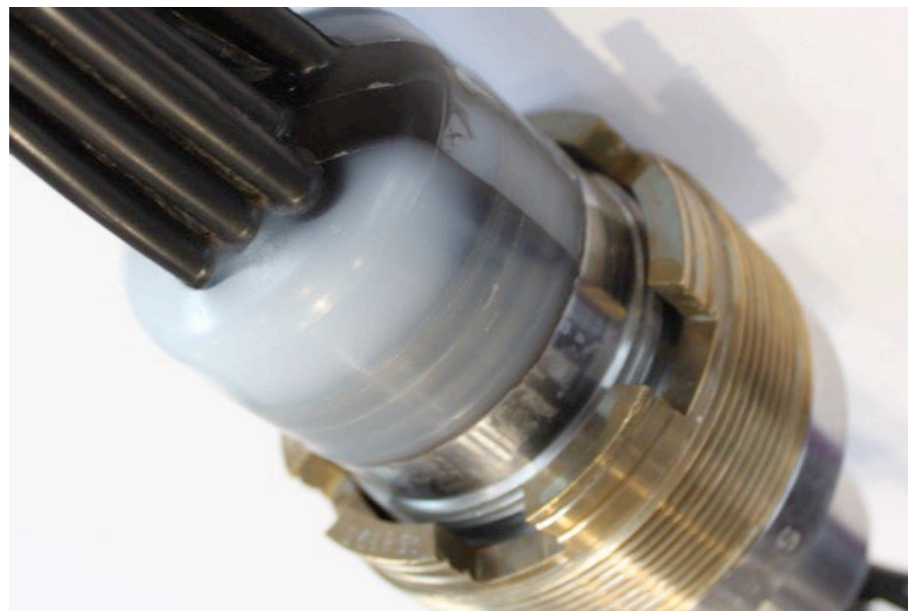
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PEDIGREE

High temperature and high pressure process introduced sufficient energy to set up chemical reaction.

Thermoplastic moulding - complete amalgamation of the injected material with the material of the cable sheath
-more difficult with Polyethylene

Bonding of the injected material with the metal substance (or technical polymer) of the gland/connector body



PlastethUrm
dual jacket - TPPU & PE

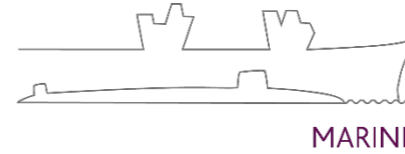
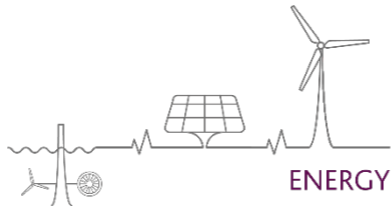
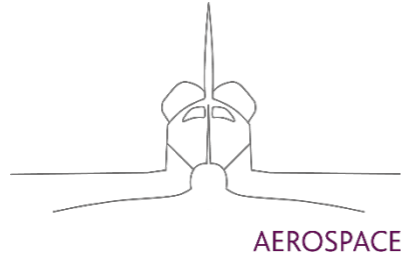


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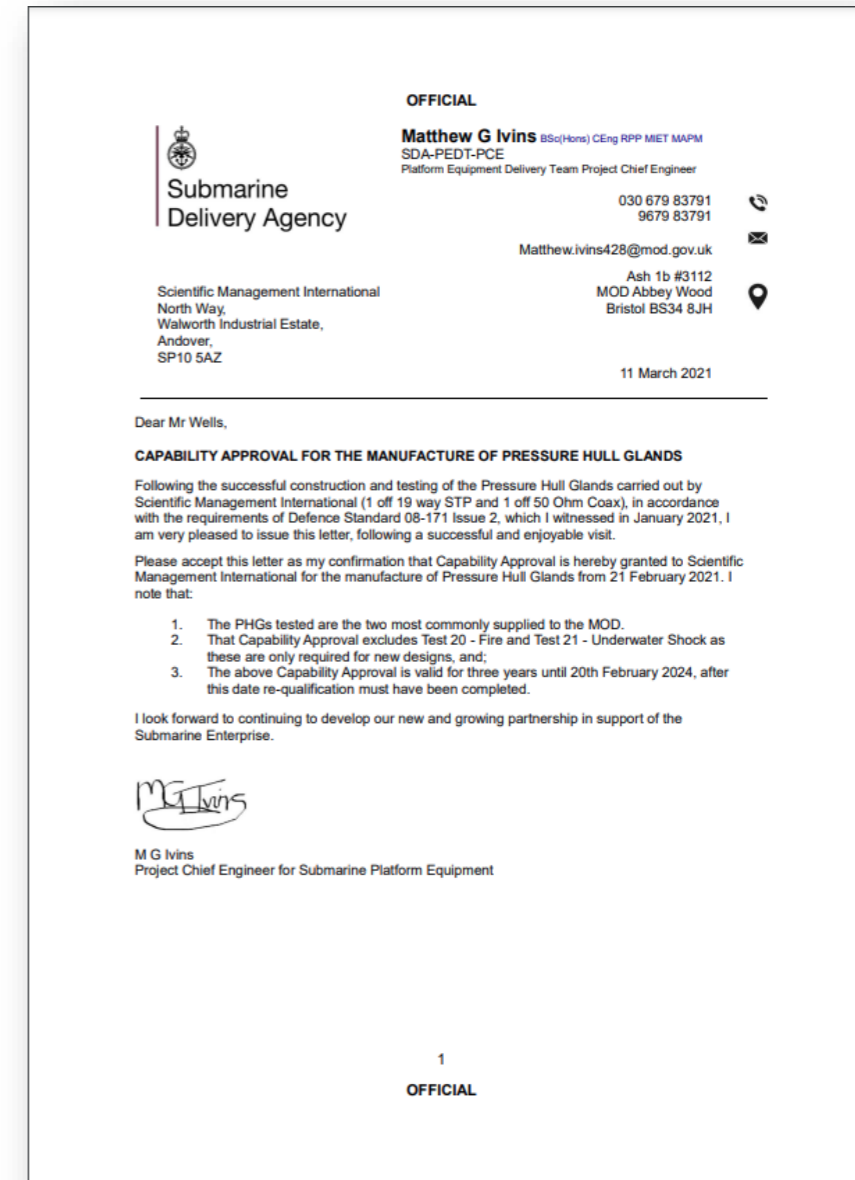
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ACCREDITATION

...the ONLY company worldwide to hold 27 years continuous MoD capability approval ...



...to reduce the dangers to personnel and damage to equipment all Polyethylene Moulded Cable Glands and Products must be manufactured by a company holding a current Capability Letter for the Authority.



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dual jacket - TPPU & PE

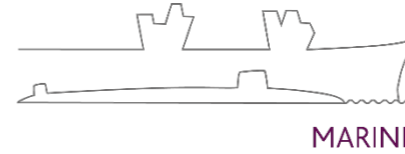
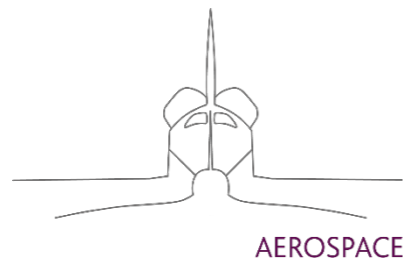


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TESTING

Tests have been designed to show a high level of integrity for safety and reliability

- Chemical, mechanical materials testing
- Ultrasonic, dye penetrant testing
- Insulation resistance @1000 VDC
- Circuit resistance
- Ionisation at 2000 VDC
- FO insertion loss measurement
- Thermal cycling
- Pneumatic pressure test
- Hydrostatic pressure testing including cycling
- Open ended destructive pressure test
- Fire tests simulating surface and submerged
- Underwater explosive shock tests
- Radiography
- Additional tests are added to cover application specific requirements i.e. attenuation, characteristic impedance, return loss, load current

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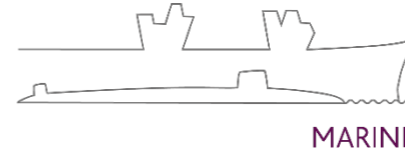
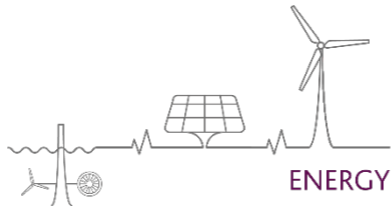
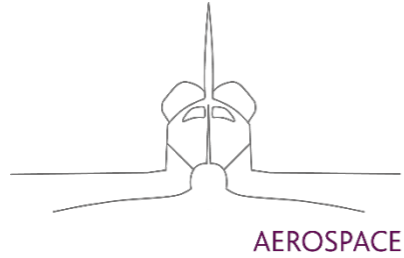


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INSPECTION

Routine radiographic inspection of mouldings is industry best practice

3 plane non-destructive inspection shots with 60° rotation of each moulding

Radiographic contrast shows defects or cracks from the surrounding metal or polymer background area, voids or bond failures as shadow



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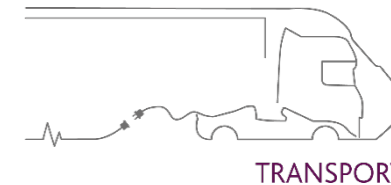
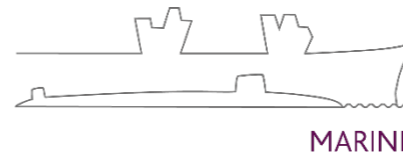
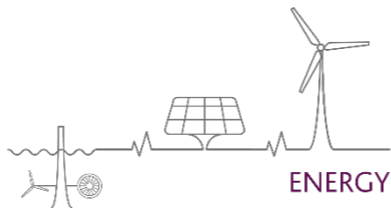
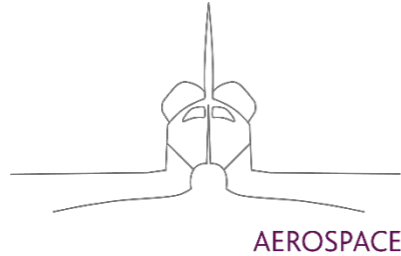


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WARRANTY
ASSURANCE

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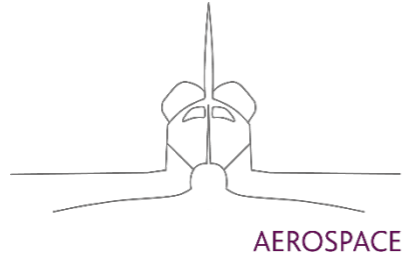


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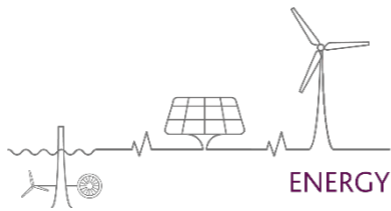
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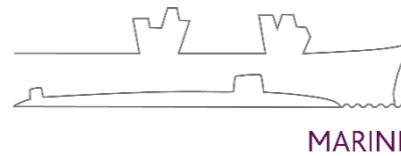
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AEROSPACE



ENERGY



MARINE



TRANSPORT

Designing and manufacturing unassailable 'fit and forget' moulded harness systems for hostile environments



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If you have any questions about this presentation, please contact a member of the SMI Team

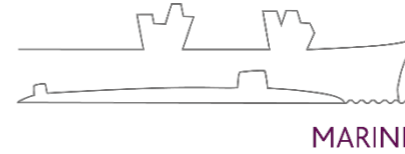
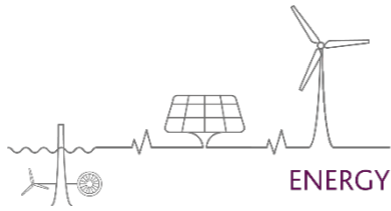
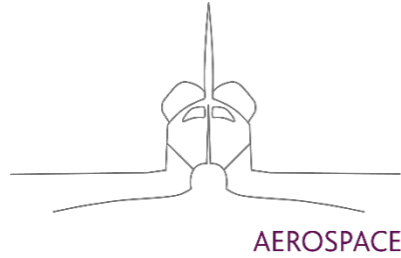


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