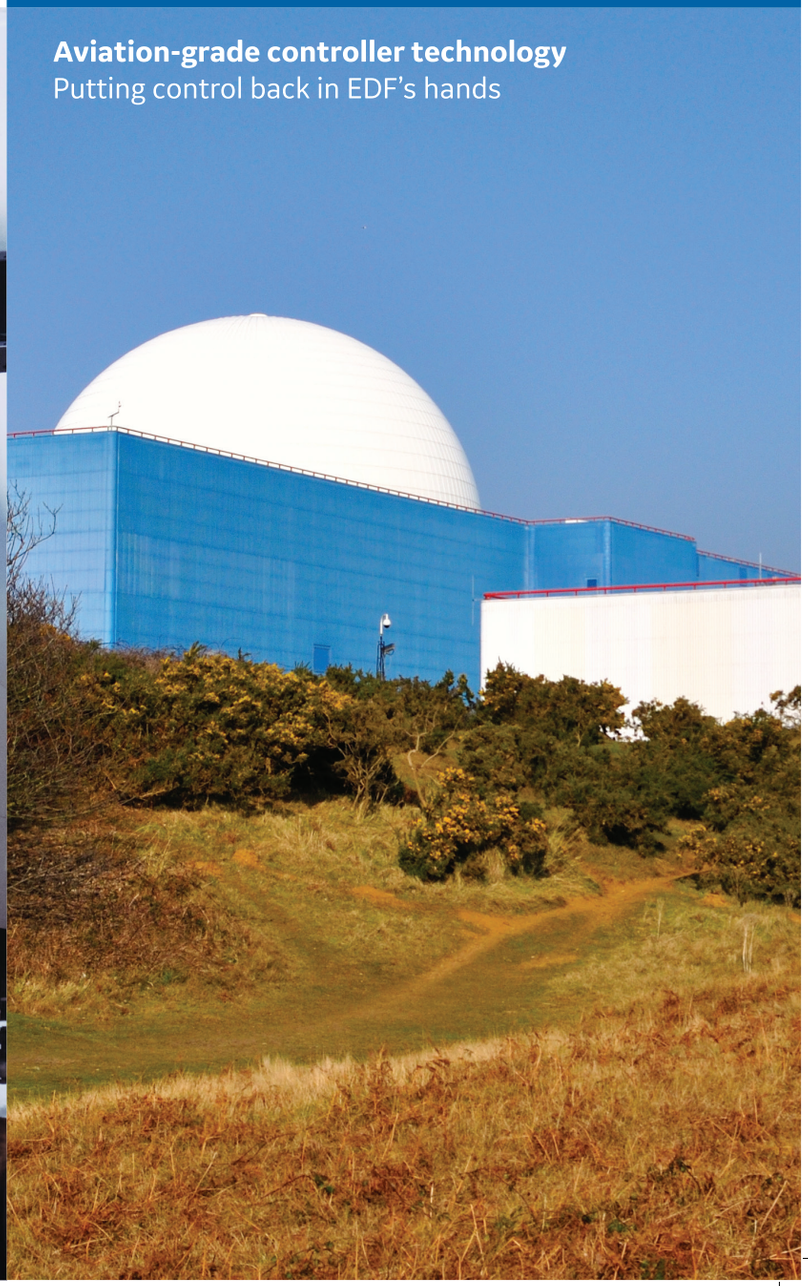
Obsolescence management is just **on the horizon ...**

Aviation-grade controller technology
Putting control back in EDF's hands



geaviation.com/edf

A single controller with a high level of safety qualification and flexibility

Qualified for a continuous operating temperature range of

-45°C to +71°C

Tested up to a test leve of

20g sustained

for 11ms in each axis whilst operational

EDF has a requirement for obsolescence replacement for high integrity control systems logic solvers and interfaces to sensors but cannot qualify applications to a high enough level using modern digital COTS equipment.

Introducing GE Aviation's Remote Interface Unit (RIU) technology, which has successfully passed EDF's emphasis process up to and including Class 2 systems. A product family of flexible, configurable platforms on which can be developed a variety of high integrity applications such as controllers and logic solvers and can also interface with existing sensor technology. Despite being developed for a variety of different use cases, the RIUs have one thing in common - providing ease of application qualification at a high level of criticality.

Why use aviation-grade controllers?

Aviation hardware is required to operate reliably in harsh usage environments and offering long-term (25-30 years) solutions for industry is not unusual. Above all, it needs to provide qualification for safety critical applications which require a continuation of function, developed on a detailed understanding of what safety conditions are required to be met.

GE Aviation's RIU product family is certified to Design Assurance Level (DAL) A, meaning its safety critical components, hardware and software have undergone rigorous testing to ensure they meet airworthiness requirements.

Helping to secure Britain's power supply for decades to come

GE Aviation's RIU is so much more than a box. It's an investment in EDF's future.

Take advantage of reduced through-life costs with the RIU:

- Reduced maintenance costs (no wiring)
- Lower power consumption
- Significantly reduced cost of change with critical Safety Aviation compliance (changes required to configuration are enabled through GE's engineering expertise and toolchain – which can hold up to 31 configurations simultaneously).

Safety

RIU's benefit from multi-layer security and comprehensive internal diagnostics – giving EDF a high level of failure detection capability with the minimum of additional hardware.

Peace of mind also comes from knowing that GE Aviation's RIU's are certified to Safety Integrity Level (SIL) 2, ensuring EDF can depend on the reliability and performance of the product's safety functions to mitigate risk.

And with an average meantime between failure greater than 250,000 hours proven in aviation service, EDF can be assured of product continuity for years to come.

Configurable and flexible

Many integration decisions are made by balancing the cost of changing an already certified system with the need for additional functionality. With the RIU's software configurability, this trade is no longer required.

RIUs are 'functionally flexible' units which can be configured to perform different functional roles when installed in different locations or used by different applications. A comprehensive software toolset and proven engineering methodologies allows for new functions to be added, or existing functions to be modified using a controlled safety LiveCycle, with no impact on unit hardware design. This enables common RIUs to be used throughout the control system whilst maintaining one hardware part number, simplifying maintenance procedures and reducing spares inventories.

Mitigating long-term risk

Nuclear power plays a crucial role in providing low carbon energy – with plans for 25% of Britain's electricity to be supplied by nuclear power stations over the coming decade. However, mitigating and obsolescence risk in power stations that are looking to run for 30 plus years is an issue when dealing with COTS equipment, as it can be with aircraft design.

It's therefore imperative to secure EDF's infrastructure for the long-term, rather than the here and now, and the best solution for that is a maintained design.

GE Aviation will be there through to the end of the station's life; not just until the day the station closes, but throughout the defueling and re-risking process too.

Don't let today's solution become tomorrow's challenge.

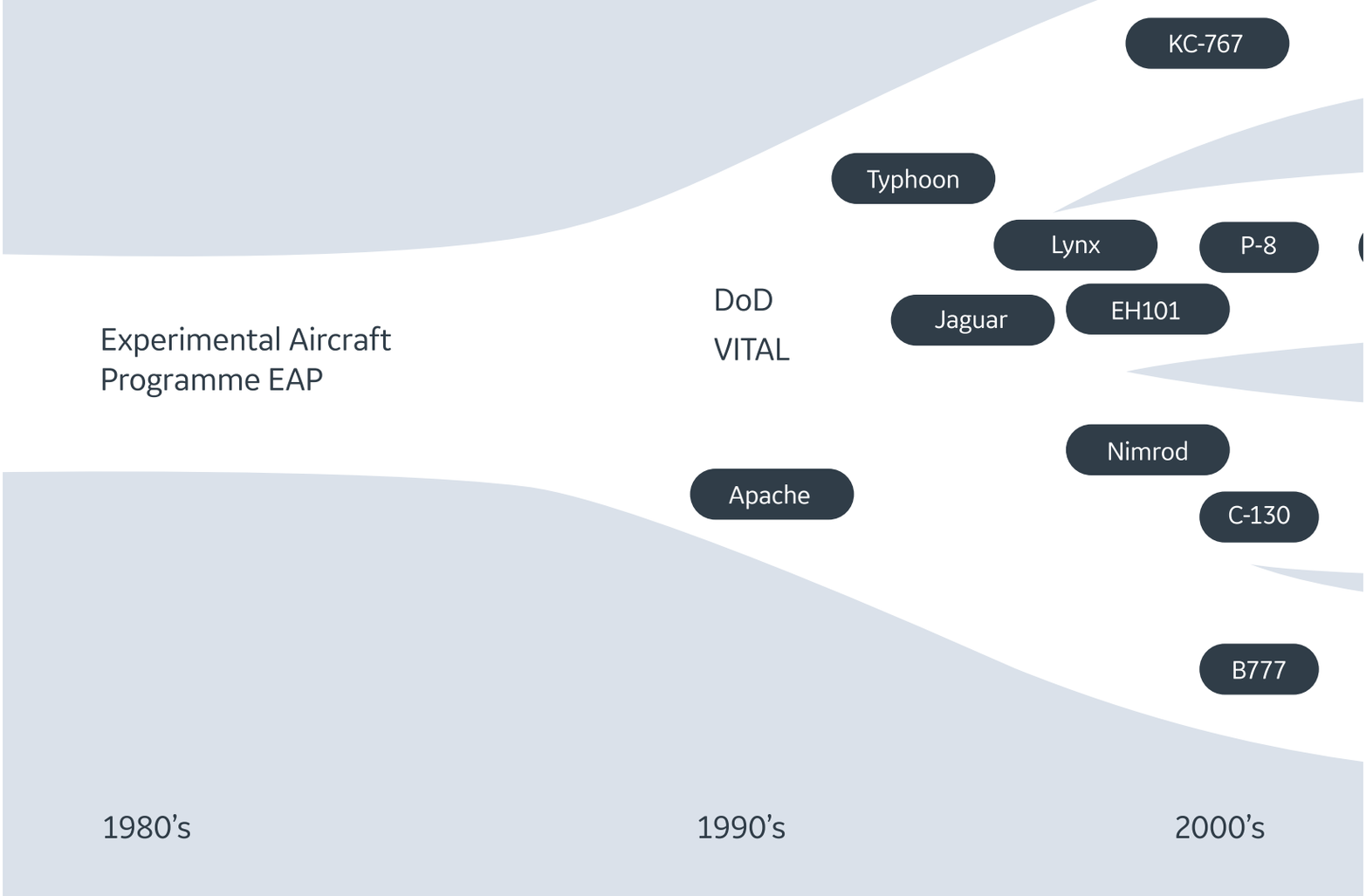
What does this mean for EDF?

A long-term, cost-effective product support strategy for EDF's nuclear power plants and peace of mind for plant performance and safety that comes from the reliability, performance and longevity of the RIU. A practical solution to managing obsolescence at EDF.

Performance you can trust

GE Control and Interface Products

Provider of customer configurable I/O systems to support functionally integrated and physically distributed architectures

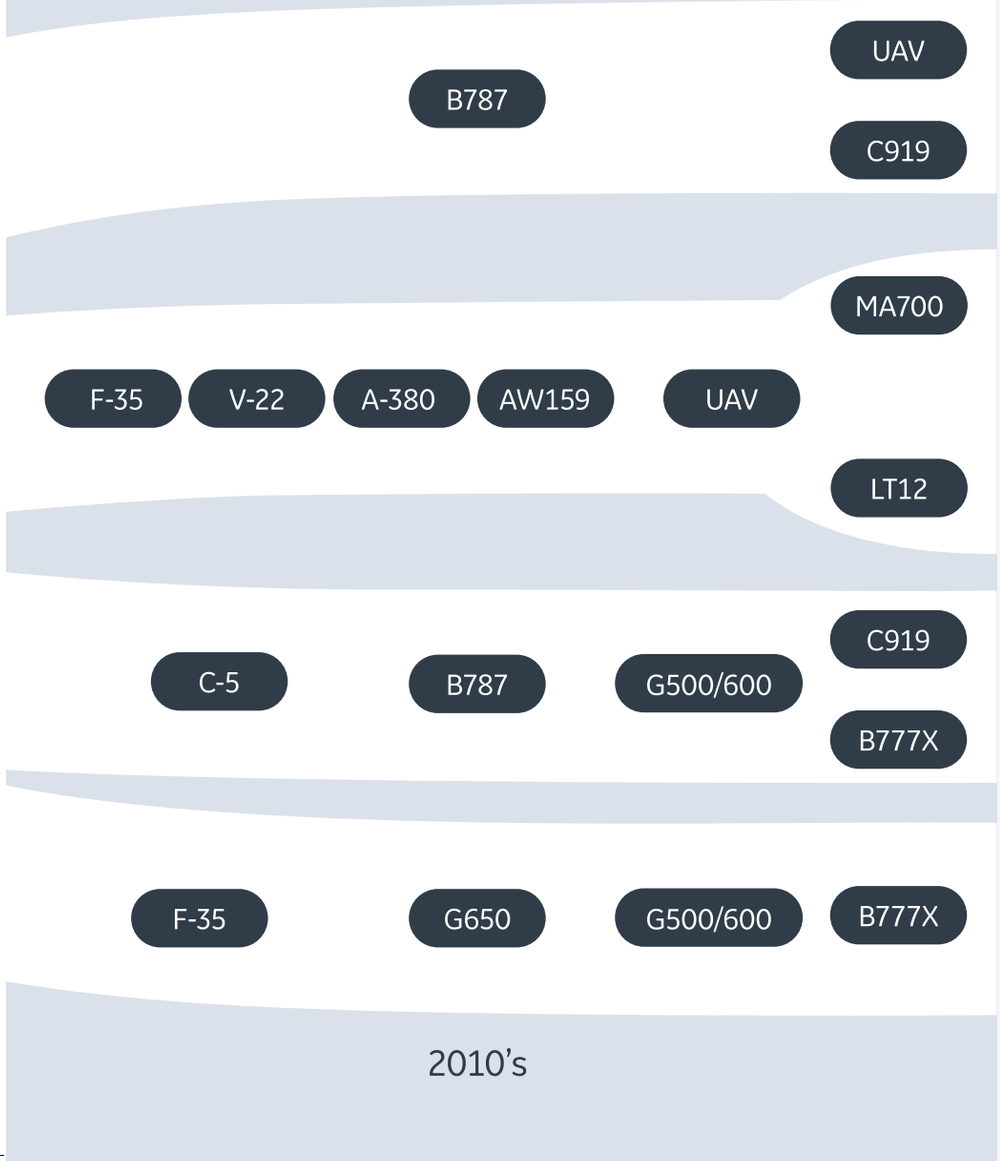


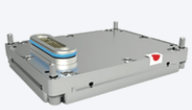
40+

Years' experience in I/O interface design - backed by the global GE Aviation network

20k

RIU controllers in service today





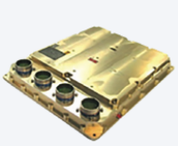
REU
High Integrity Closed Loop

PEC
Propeller Control

RIU
Flexible I/0

IRIU
Industrial Adjacencies

RDC
Networked Data Concentration



RDC
Distributions and I/O

AW201

Functional flexibility

A single hardware part number with a single software item has been developed incrementally over time to provide Leonardo Helicopters with a single product that can be used on four aircraft types and for each in either two or four locations, giving rise to six functional variants in all. This is a powerful demonstration of the functional flexibility of the RIU product line. Without flexibility either six unique parts would have needed to be designed, or else a single “one-size-fits-all” solution (i.e., less tailored) would have needed to anticipate all future needs up front.

AW159/Wildcat

A flexible systems integration solution

GE Aviation supplied a Digital Cockpit Display System for the AW159 Wildcat Helicopter for installation on a legacy analogue aircraft, Super Lynx 100. The challenge was to integrate a new glass cockpit based on what had been produced for new-build AW159’s into legacy airframes, replacing dedicated cockpit instruments but without replacing the sensors and equipment that drove the legacy cockpit instruments.

The solution? Reuse RIU solutions previously developed for the AW159 cockpit display system and add two further RIUs to interface the legacy sensors and equipment with the new displays. This facilitated the cockpit upgrade and extended the life and usability of the AW159 while minimising the impact on the rest of the aircraft’s systems and avoiding costly display and navigation changes.

No software was changed in the display system and with a config table update only the RIU was able to convert multiple different analogue signals and recreate multiple digital databases required to realise all of the flight deck functionality.

The same LRU was also used to translate legacy digital databuses into their modern counterparts, allowing the existing navigation computer to remain on the aircraft, removing the need for a costly replacement and the RIU was used as the bridge between a legacy computer and a modern glass cockpit.

Gulfstream G500 and G600

Embedded function capability reducing change time from months to days

GE's RIU-303 was used to translate legacy digital data-busses and analogue sensor signals into their modern counterparts allowing legacy systems to be installed on the aircraft. The same LRU was also used to provide math and logic building blocks that Gulfstream could configure to create embedded functions capable of performing a wide range of tasks.

Gulfstream learned early on that the embedded function capability of the RIU-303 could be used to address many of the issues uncovered during aircraft level integration and verification testing. A configuration table update in the RIU303 reduced the time for a fix from months to days and alleviated the need for costly changes to legacy systems.

B777 ELMS

Timely solution to upcoming obsolescence problems

Early in the 2000's it was recognised that the inherent functionality, focus and functional flexibility of the RIU core design made it suitable as a basis for replacing the previous generation of embedded electronic controllers in the B777 ELMS power distribution systems. Building replacement electronic controllers based on RIU technology resulted in solutions that significantly reduced the size weight and cost of the electronics element of the systems, and also pre-emptively addressed risk of component-level obsolescence. The result was a technology refresh that took advantage of advances in electronics technology, paid for itself by taking cost out of the system, and addressed obsolescence before it could give rise to cost escalation.

For more information about GE Aviation's RIU product family, visit geaviation.com/edf