

Propulsion Systems

The Propulsion Systems program will provide scientific and technological support to production and through-life management for current and future defence air platforms.

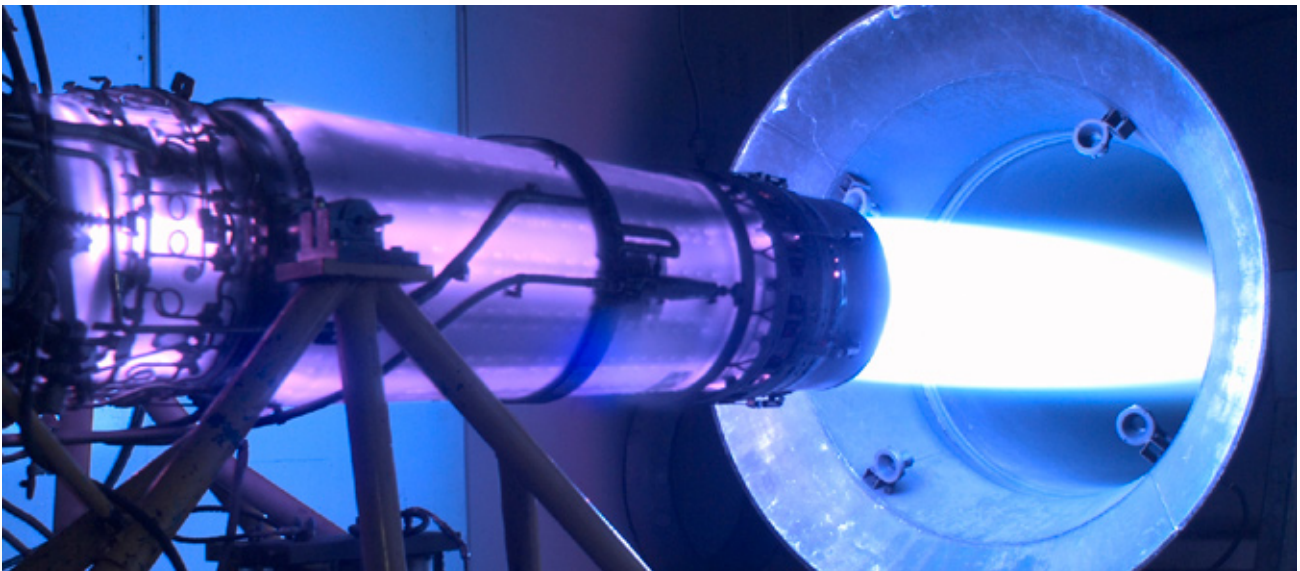
Program research will explore and develop advanced surface engineering and repair technologies capable of enhancing or restoring structural and component performance, assess and certify the technologies for aircraft structures and engine components, and provide acquisition advice about new materials such as metal matrix composites and ceramic matrix composites.

Projects in this program will target turbine blade replacement and airfoil repair in gas turbine engines for the next generation of military aircraft such as the Joint Strike Fighter, which has adopted integrally bladed rotors or blisks (blade disks) that are high value engine components. If a single blade on a blisk is irreparably damaged by a foreign object during engine operation the whole blisk may need replacing. This significantly increases the cost of asset ownership and effectively reduces military readiness.

Additional activities will investigate new materials capable of withstanding extended exposure to the high temperature hypersonic propulsion environment.

Propulsion Systems will assess the ability of laser based surface repair technologies to heal cracks on blisk and single crystal blades and vanes to extend the life of these components, and explore severe surface plastic deformation.

Damage mechanisms caused by mechanical and thermal fatigue that lead to degradation of new materials and designs will be investigated so new repair technologies can be developed in preparation for purchasing new generation fighters. These characteristics will be tested at temperatures typical of service to inform predictions of interfacial and surface damage. In the short-term, repair technologies for blisk replacement and airfoil repair will be investigated.



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Project example:

Repair technologies will be developed and validated in a laboratory environment. Prototypes will be built to demonstrate performance in an end-to-end environment. Selected technologies that demonstrate actual system completeness will be demonstrated and certified.

Program Benefits:

- Development of new technologies to restore and enhance structures and components
 - Experience with new materials such as metal matrix composites and ceramic matrix composites
 - Involvement in Joint Strike Fighter development
 - Extension of the life of components
 - Improved asset reliability, availability, maintainability
 - Improved operational efficiency
 - Lower cost of asset ownership
- Development of new repair technologies for hypersonic flight projects
 - Development of capability to repair components in situ resulting in improved service readiness
 - Reduced cost of maintenance to durable rocket thrust vectoring vanes and hypersonic leading edges
 - Development and testing of advanced ultra-high temperature coatings
 - Optimise the value of through-life support planning and delivery
 - Improved readiness for service
 - Substantially lengthen the duration of hypersonic flight

