

# The Aircraft Lightweight Radial Tyre (ALWRT)

*Dunlop Aircraft Tyres Limited, Airbus*

Birmingham-based Dunlop Aircraft Tyres (Dunlop) has completed a £1.5 million ATI-funded project to develop and test next-generation aircraft tyres that are lighter and more robust.

Dunlop collaborated with Airbus to develop main-wheel radial tyres for the current and latest neo versions of the A320 family of aircraft. Airbus provided the technical specification.

Globally, the aviation sector is expanding. Passenger demand doubles every 15 years, so safeguarding aviation's economic and social sustainability is crucial, but as aviation continues to grow, it brings with it an increasing responsibility to ensure that its environmental impact is kept to a minimum. Airframers are therefore keen to find new ways to safely reduce aircraft weight. Component manufacturers such as Dunlop have a crucial role to play in this drive.

The project had six key objectives:

- Develop new technologies for the design of next generation of aircraft radial tyres
- Develop manufacturing processes for radial tyres
- Develop new materials required for the radial tyres
- Develop finite element analysis (FEA) modelling capability
- Test and qualify an A320 main landing gear radial tyre to the Airbus specification
- Integrate the tyre with wheel/brake and aircraft systems

The first five of these objectives were achieved in full, and work is ongoing to complete the sixth objective following the completion of the project.

Dunlop is currently proceeding on a commercial basis with Airbus to certify and approve the radial aircraft tyres for the Airbus A320 main landing gear.

*Table 1: Summary of the project grant details*

Project	Funding	Lead Partner	No. of Partners	Partner Composition	Duration
ALWRT	Total: £2.5m Grant: £1.5m	Dunlop Aircraft Tyres Limited	2	2 Large companies	Apr 2012-Sep 2016

*Table 2: Summary of the project focus areas*

ATI Value Streams		ATI Enablers		ATI Attributes		Strategic Horizon	
Whole Aircraft		Aerodynamics		Safety		Secure	x
Structures		Manufacturing	x	Cost	x	Exploit	
Propulsion		Materials	x	Environment		Position	
Systems	x	Infrastructure		Fuel Burn	x		
		Process and Tools	x	Operational Needs	x		
				Passenger Experience			

### Technology Achievements:

The project followed a phased process during which Dunlop Aircraft Tyres innovated with new materials and developed competency with Finite Element Analysis (FEA) modelling techniques before designing a new product. The company invested in new manufacturing and testing equipment ahead of developing the first prototype tyres.



Dunlop's innovation with materials demonstrated an improved strength-to-weight ratio, enhanced resistance to foreign object damage and increased landings per tread life.

"This project has enabled us to develop a product which we are confident will offer a credible alternative to existing products on the market" said Steve Barlow, Dunlop's product development director who led the project for Dunlop.

*Table 3: Summary of the technology achievements*

Project	Performance Improvements	TRL Progression
ALWRT	Developed next generation aircraft radial tyres Increased tyre performance by 100%	Technology matured to TRL6 ready for commercial application

### Economic Impact:

The project has delivered a positive impact for Dunlop Aircraft Tyres which turns over around £50m per year and employs approximately 500 people in the UK and a further 100 people across its global retread, customer service and distribution centres in America and Asia.

Both Dunlop's volume sales and manufacturing employment are expected to increase in the next few years and the finite element analysts appointed during the project are now an integral part of the design team.

Technology read-across to other platforms has accelerated product development; yielding impressive results which will be supportive of continued growth and competitiveness.

### Next Steps:

Dunlop Aircraft Tyres clearly believe that manufacturing has a bright future in the UK. It has doubled its revenues in five years and exports more than 80 per cent of the products it makes in Birmingham.

On award of the grant, Ian Edmondson, now the company's executive chairman said "This grant signals the UK government's commitment to helping smaller businesses to prosper in the global aerospace industry. We have a history spanning more than 100 years, but it is only through research that Dunlop Aircraft Tyres aims not just to keep pace with but to be ahead of its competitors."

To cater for the increased demand associated with these new products Dunlop Aircraft tyres have invested in a multi-million pound new radial tyre building machine and is collaborating with Safran and others on another ATI initiative to provide tyre modelling data to facilitate the design of future revolutionary lighter weight longer lasting landing gear targeted at wide bodied aircraft.

And now as the project nears completion, Gordon Roper, managing director concluded that "Dunlop has for many years executed a clear strategy to expand through geographic expansion, product range development and modernisation. This project ticked all of these boxes and will help assure our competitiveness for many years to come."

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