

Lightning II – New Generation Capability

by Wg Cdr Jim Schofield – Lightning Project Team

This was a joint IMechE/RAeS lecture on a topic of broad interest, as the F-35 Lightning II Joint Strike Fighter (JSF) will be at the forefront of UK airborne operations conducted by the Royal Air Force and the Royal Navy for several decades hence. The presenter was the MoD Project Requirement Manager working alongside an RN counterpart (formerly a Harrier weapons instructor) in the Lightning II Project Office, and as a qualified test pilot the presenter has taken part in the flight-test programme to evaluate the aircraft's capability with regard to future UK joint service operational needs. He took on board the task of presenting a brief history of the project, the entry to service programme, insight of the UK requirements for the type, and to show what has been achieved.

In reviewing the project's history, the original US JSF evaluation of competing aircraft was described, which concluded with selection in October 2001 of the Lockheed-Martin design. The UK decided soon afterwards to join the programme as there was common interest in a short take-off and vertical landing (STOVL) and supersonic front-line combat aircraft to meet its Joint Combat Aircraft (JCA) requirement. As the only Level 1 partner, 15 per cent of all F35's production by value will be sourced in the UK. There are three variants of the basic aircraft (A, B and C), all with a high proportion of commonality. The F35B version is shown below.



RAF MOD UK Photograph

F35B being purchased for the UK

UK interest is focussed on the F-35B STOVL aircraft and as production rate ramps up (over 100 delivered already), deliveries for UK training in the US have already commenced. Aircraft will begin arriving at the sole UK base, RAF Marham, in 2018. Queen Elizabeth Class aircraft carriers, currently under construction, will accommodate the UK's aircraft when embarked. In 2012 the UK government announced an initial buy of 48 aircraft with the final number to be confirmed in the 2015 Defence Review. The RAF will use the aircraft alongside Typhoon, and plan to discontinue Tornado operations in 2019. The RN will use the F-35B to replace the Sea Harriers that were taken out of service in 2010.

Wg Cdr Schofield provided a first-hand description of his evaluations of the technology that interfaces the single crew member with data from a wide-range of sensors. The 'fusion' of the numerous components – radar, data-link, electro-optics and camera-based 'distributed aperture systems' (DAS) - is central to display and control technologies. The displays include a large touch-screen that occupies almost the whole main panel area, and a helmet-vision system that is currently into the third – and

expected to be final - 'generation.' The latter presents external-views wherever the crew member looks. He exemplified how looking down – through the cockpit floor – the pilot can see, even at night, roads and vehicles that would be out of sight to conventional aircraft crews. The control philosophy has kept all mission-critical actions based on specific hardware, but generic functions, such as tuning a radio, are voice-activated. Weapons trials have been conducted with the Advanced Medium-Range Air-to-Air Missile(AMRAAM) and the Paveway Laser Guided Bomb(LGB), both released from the two internal bomb bays. The Advanced Short Range Air-to-Air Missile(ASRAAM) will be fired from wing-tip pylons. The UK also has the option to purchase a belly-mounted gun installation.



Lockheed-Martin photograph

F-35 development aircraft during trials in USA

Pressed on specific technical aspects of the aircraft, the presenter justified what he could within security constraints. The degree to which the design is 'stealthy' ensures that it is invisible enough to have a clear advantage over any adversary not equivalently configured, and regarding speed he stressed that the aircraft is truly supersonic, but not a Mach 2 performer. He offered the assurance that a major positive outcome of the trials programme has been the attainment of UK-specified combat range capability, and his exposition of operational capability was supported by films of weapons-release trials, aircraft performing high angle-of-attack manoeuvres, and numerous carrier-deck launches and recoveries. He also emphasised the significant benefits to UK industry in the years to come as a result of the UK's participation in the JSF project. The UK weapons fit will include AMRAAM, the Paveway LGB and ASRAAM. and, at a later date, belly mounted gun. Additionally, future UK weapons are being procured to make the most of the aircraft's ability to attack from long range.

It was a very wide-ranging and information-packed presentation, in which the speaker injected many anecdotal and well-humoured comments. This encouraged the audience to ask many questions, and invariably his responses presented even more information. The lecture had attracted over 240 people, and the author of these notes was left to present a vote of thanks that reflected positively on the quality and quantity of information we had received: a feeling that was shared throughout when additional appreciation was requested from the floor.

Lecture notes by Mike Hirst