

CASE STUDY

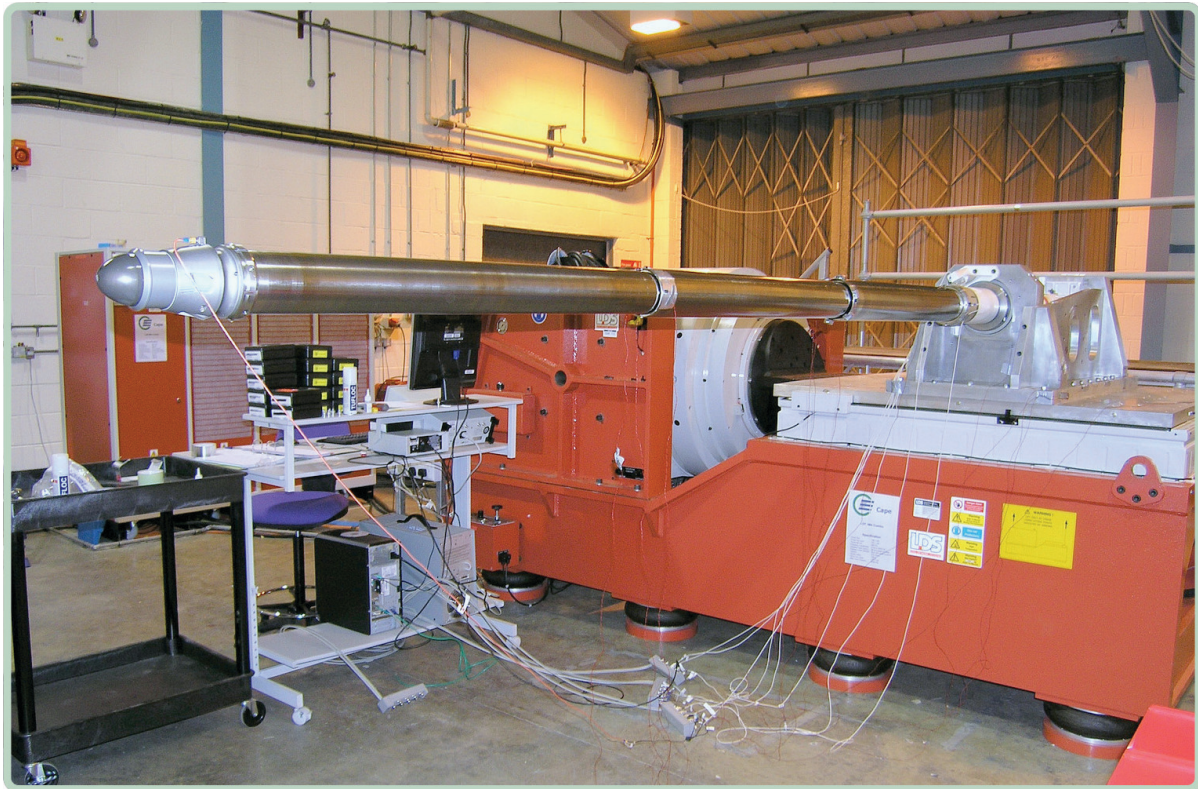
TRaC UK – LDS V984 Vibration Testing of Fuel Probes for the V22 Osprey

UK
Aerospace & Defence
LDS Shakers

TRaC, UK provides test, regulatory and compliance services to the military, aerospace and commercial markets. LDS products were used for demanding qualification testing on Cobham's refuelling probe for the V22 Osprey, a multimission, military, tilt rotor aircraft.

Photos courtesy of TRaC and Cobham plc

Having reached its fifth anniversary in August, 2009, the environmental test partnership between TRaC and Cobham plc's Cobham Mission Equipment, has proven to be a remarkable success for both parties, and has become a TRaC benchmark for excellence in environmental test partnerships.



The Partnership

Founded in 1934 as Flight Refuelling Limited (FRL), Cobham plc is a British manufacturing company based in Wimborne Minster, Dorset, England. It is organised into four core technology divisions – Mission Systems, Defence Systems, Avionics and Surveillance, and Aviation Services. The Cobham Mission Systems Division claims to be the world market leader for air-to-air refuelling, and provides a comprehensive range of weapons carriage and release equipment. Cobham Mission Systems also specialises in life support and personal survival equipment for aviators and astronauts.

COBHAM



TRaC is a market leading UKAS accredited test company comprising three Centres of Excellence and three regional test laboratories in the UK and a partner facility in Japan. TRaC offers unrivalled testing, regulatory and compliance services to the defence and commercial sectors.

TRaC UK Test a V22 Fuel Probe

Cobham's Dorset facility is the market leader for air refuelling, providing innovative fourth generation solutions to defence customers around the world. With a heritage in air refuelling spanning 70 years and with over 1000 systems delivered to date, Cobham provides a nose to tail refuelling capability, encompassing state-of-the-art refuelling systems and integration. In 2004, as one of the largest users of vibration and shock testing facilities across the UK, Cobham's Wimborne site required a flexible, cost-effective supplier to meet their increasing reliance on external test house availability.

An in-house environmental test facility was initially considered, but would have consumed a considerable proportion of the capital expenditure budget on a non-core speciality, coupled with the specialist vibration skill-set required to run the facility and the intricacies of quality accreditation.

TRaC in Warwick is the environmental test division of TRaC, providing test, regulatory and compliance services to the military, aerospace and commercial markets. TRaC's core expertise includes vibration and shock testing as well as in-field vibration measurement – all of which is complemented by an in-house finite element analysis group that specialises in vibration and fatigue analysis. TRaC's solution was to invest in the creation of a complete vibration test facility on Cobham's Wimborne site, offering total control of development, pre-qualification and full qualification test planning.

TRaC equipped the new facility with vibration, shock, and climatic test capabilities, including a 160 kN LDS V984 electromagnetic shaker with slip-table, an LDS V875, and a range of M&P controllers. Damon Close, one of TRaC's most experienced vibration test engineers, was placed in the role of Test Laboratory Manager. Damon's responsibilities include the hands-on management of testing at Cobham's Wimborne site, and he provides a single point of contact for all environmental requirements, ranging from fixture design to building bespoke vibration and fatigue test solutions.

The Challenge

One of the most technically challenging aspects of Cobham's vibration testing is the physical size of the equipment under test, where hardware can be in excess of 5 m long, 1 m in diameter and weigh up to 650 kg. The large overturning moments and off-centred masses of refuelling probes do not lend themselves to straightforward vibration test setups. By their very geometry, the dynamic response to vibration is an inherent issue that not only requires careful consideration by Cobham during design phase, but requires significant consideration by TRaC prior to and during testing. To overcome these difficulties, TRaC initially designs and analyses bespoke aluminium alloy fixtures to replicate in-service mounting. These fixtures need to be designed with sufficient structural rigidity to overcome the large bending moments and the effects of the vibration regime itself. However, they are sufficiently lightweight that the vibration capacity of the shaker is not compromised. Secondly, horizontal-axis testing is performed on an LDS 9-bearing, guided slip-table, specified by TRaC at the investment phase, which is capable of reacting to the high overturning moments associated with test hardware of this size.



Fig. 1
The American Bell-Boeing V-22 Osprey is a multimission, military, tilt rotor aircraft with both a vertical and short takeoff and landing capability. It combines the functionality of a conventional helicopter with the long range, high-speed cruise performance of a turboprop aircraft

During recent, similarly demanding qualification testing on Cobham's refuelling probe for the V22 Osprey, TRaC also utilised a variety of techniques to monitor the response of the refuelling probe during vibration. These included conventional accelerometers located at various points in the system, coupled with a high-speed video camera to track the motion at the tip of the probe.

For further information on TRaC testing, measurement and vibration analysis capabilities, please contact test@tracglobal.com or visit www.tracglobal.com.