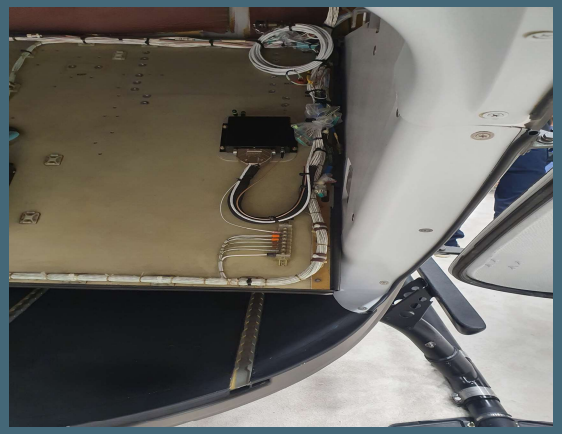

Why changes in aviation safety are needed - and other benefits that will occur.
8th Nov 2022
Dr Lesley Brealey
Managing Director
RMCI

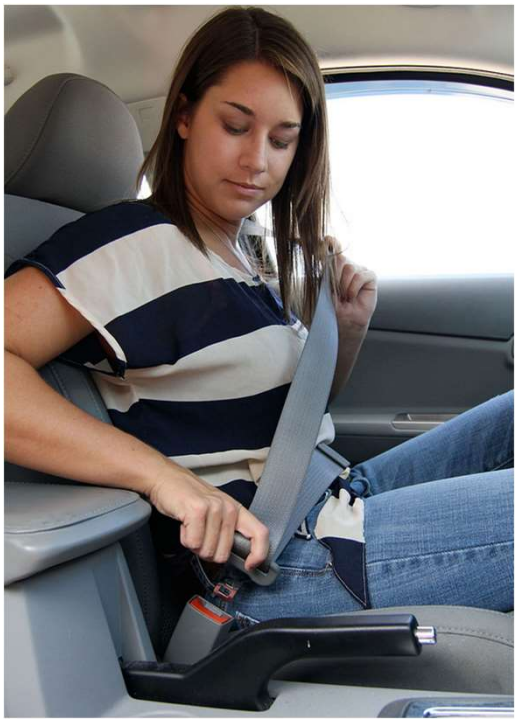

VICTORIA STATION
VICTORIA STATION 6
UKRI
Innovate UK
KTN

A major problem is that we now have a mixed array of old and new aircraft. Many of the older aircraft performing inland roles do not have the safety enhancements of the military or the offshore oil and gas ~~industries,~~ making them higher risk and with lower availability in these busy and important roles.

Part of the solution is enabled by technology

This has now been addressed by affordable advanced integrated HUMS and FDM (Flight data monitoring). These technologies can solve many of the safety issues faced by the aviation sector today, whilst at the same time providing significant real time data that can be used by both operators and authorities alike.





By State Farm - https://flickr.com/photos/40567541@N08/7838241314, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=47453167

When the UK first introduced legislation that it was mandatory to wear seatbelts in cars, unbelievably there was a lot of opposition to the new law. Now it seems second nature to wear a seatbelt. Both education and data proving that vehicle casualties were significantly reduced means that seatbelts are now regarded as essential, not something to be annoyed about!

Barrier to entry

The main barriers to entry for an operator to incorporate HUMS have always been lack of awareness, resistance to change and the perceived cost of the technology. Whilst awareness of such systems is increasing, there still seems to be some reluctance amongst operators to install them. Resistance to change is an obstacle that needs to be overcome. The the safety benefits that a good HUMS system can achieve, and that the cost will almost certainly be outweighed by the savings the technology can deliver. When presented with these facts, this should help to overcome the resistance to change and demonstrate that a HUMS system can reduce, not increase costs.

SAFETY BENEFITS

THE KEY SAFETY IMPROVEMENTS ARE THE ACCURATE IDENTIFICATION OF POTENTIAL FAULTS PRIOR TO CATASTROPHIC FAILURE, INFORMED DECISION MAKING, RISK MITIGATION AND AVOIDANCE, MINIMISING THE RISK OF FAILURE IN FLIGHT, AND DECREASED NEED FOR EMERGENCY LANDINGS. THIS ENHANCED LEVEL OF SAFETY WHEN INSTALLED ON U.S. ARMY HELICOPTERS HAS ALREADY AVOIDED 4 CLASS A MISHAPS AND COULD AVOID 11% (OR 40) MATERIAL-RELATED MISHAPS OF ALL CLASSES PER YEAR. (SOURCE: U.S. ARMY)

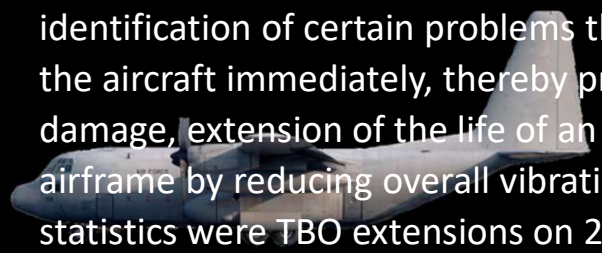
Maintenance Benefits

A good HUMS system results in more efficient maintenance, troubleshooting and diagnosis of potential faults, deferment, or elimination of certain maintenance inspection intervals and diagnosis of problems before they cause collateral damage.

This was quantified by the US Army by a reduction of 343,278 maintenance man hours/year with 4,958 maintenance events eliminated. Optimized maintenance practices resulted in over 50 AWRs and 127 improved maintenance procedures.

Readiness Benefits

Demonstrable reduction in downtime for unscheduled maintenance events, proactive maintenance, allowing aircraft downtime to be a scheduled and anticipated event rather than an unexpected inconvenience, resulting in increased platform availability and readiness (up to 11.8% increase) and up to 11.3% non-mission-capable for maintenance reduction. Experienced 1 less mission abort per 100 flights hours.



Operations and Support Cost Benefits

These include increased useful life and efficiency; identification of certain problems that warrant grounding the aircraft immediately, thereby preventing further damage, extension of the life of an aircraft's avionics and airframe by reducing overall vibration on the aircraft. Proven statistics were TBO extensions on 22 CBM+ monitored parts, a 5.8% reduction in maintenance test flights (MTFs) and a CBM+ CBA projection that Mean Time between Failure cost avoidance was in the region of $25.7M/Year.

A further recent example has been use of data by a customer when a part began to fail within the first 100 hours of operation. This resulted in a successful warranty claim which in turn gave the customer a 200% return on investment.

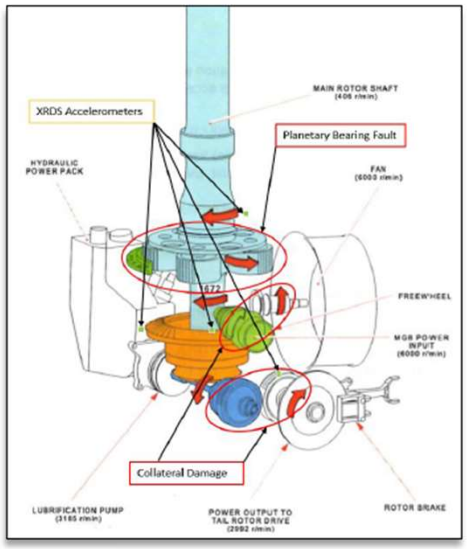


Figure 1: XRDS Main Gearbox Accelerometer Locations

Event Summary:

The expandable rotorcraft diagnostic system (XRDS) was installed on this aircraft.

The (XRDS) identified a fault and notified the operator on July 27. The main gearbox was removed from service following chip indicators on October 5th and 17th.

Teardown analysis revealed the source of metal generation was from a planetary bearing. Collateral damage led to replacement of parts throughout main gearbox.

Figure 2 : Metal indentations as well as heavy spalling and pitting found on bearing races

CONCLUSION

HEALTH AND USAGE MONITORING MUST BECOME AN ESSENTIAL COMPONENT OF AVIATION GOING FORWARDS, NO LONGER BEING CONSIGNED TO A LUXURY PRODUCT, BUT A VITAL PRODUCT TO ENHANCE AVIATION SAFETY, REDUCE COSTS AND PROVIDE DATA TO HELP LEGISLATE THE FUTURE OF AVIATION.

RMCI