

# Advanced HUMS Analysis

Requirement ✓ Solution ✓ Evaluation ✓ Implementation

Presentation to:  
Oil & Gas UK - Aviation Safety Technical Group Seminar

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# Background



imagination at work

# CAA research on Advanced HUMS Data Analysis



## Identified HUMS needs:

- Improved fault detection performance
  - e.g. Cracked AS332L MGB bevel pinion missed by HUMS
- Reduced false alarm rate
- CAA - issues requiring attention:
  - Improvement of warning time
  - Detection of build defects
  - Accommodation of unexpected indicator reactions
  - Accommodation of reducing indicator trends



## HUMS research program awarded to GE Aviation, with Bristow Helicopters

- Developed an advanced HUMS Anomaly Detection System

# CAA HUMS research program



1. Development of Anomaly Detection technology and system
2. Off-line demonstration on a historical database of Bristow Super Puma IHUMS data, plus CHC data for cracked MGB Bevel Pinion (completed May 06)
3. Six month live trial of Anomaly Detection System on Super Puma fleet by Bristow Helicopters at Aberdeen (completed Nov 06)
4. Follow-on development based on trial experience to further enhance system capabilities (completed Dec 07)
  - Bristow continued operating the system during this interim period
5. Six month trial extension period (started Jan 08)
6. Additional technology development and demonstration in parallel with trial extension period

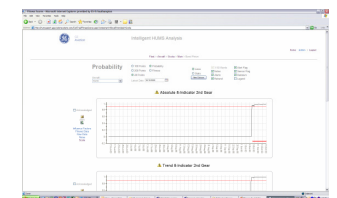
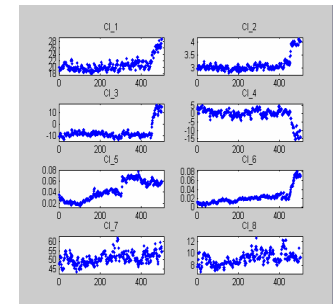
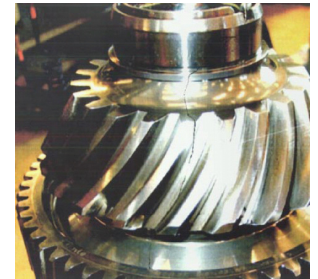
# Results (1)

An advanced HUMS anomaly detection system has been successfully developed and implemented.

This includes:

- A novel data modelling technique
- A 'Probability of Anomaly' output, allowing global thresholds
- 'Influence Factors', providing model diagnostic information

The outputs facilitate future developments such as the application of data mining and automated reasoning



# Results (2)

In-service trial has confirmed the system to be a significant advance in HUMS data analysis, resulting in improved fault detection performance:

- Highlighting anomalous data not seen by the HUMS
- Giving a clearer picture of anomalous data characteristics
- Corroborating most HUMS alerts, but suppressing some

The system is increasing HUMS effectiveness and usability.

It is achieving the goal of further exploiting HUMS data to:

- Increase aircraft airworthiness and availability
- Reduce aircraft operating and through-life costs

# What does it mean for the offshore industry?

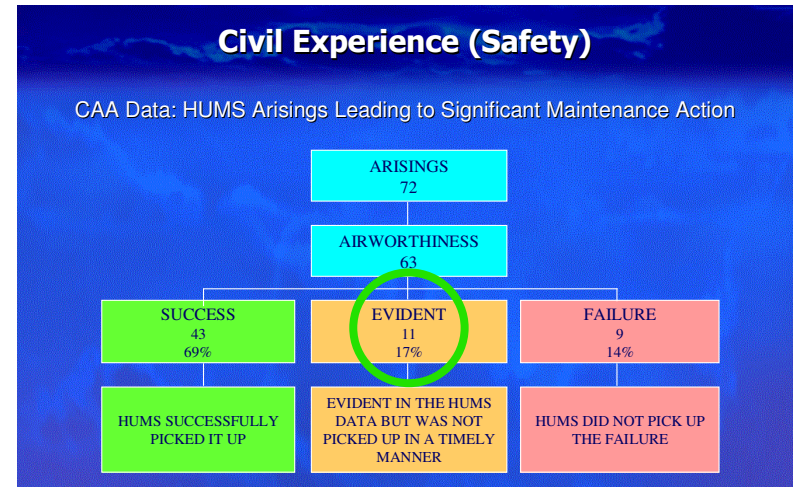
## Improves HUMS effectiveness

- Closes the 'gap' between 69% - 86%\*

\*CAA Data

## A generic solution

- Not just for GE HUMS



## Capitalises on previous HUMS investment made by the Oil & Gas industry

- Builds on current systems
- Doesn't impact on aircraft fit

} little extra \$ for a big gain

# Implementation for the UK Fleet

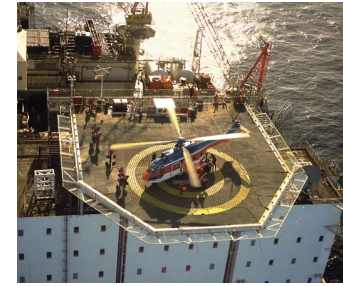


imagination at work

# Lessons from the trial

- Best achieved through a centralised service approach
  - Don't upgrade all individual HUMS systems – costly, inflexible
  - Fleet data required for anomaly modelling
  - Enables a common info system
- Is a positive experience for the operator
- Is a supplementary system
  - Does not currently replace or change existing formalised HUMS (systems or procedures)
- No change required to aircraft

# UK Fleet Implementation



The technical challenge has been met

- A solution has been working effectively for 2 years now.

Remaining challenge is commercial

- There is much recognition of the benefits, but implementation on the fleet will not happen without commitment & funding from the industry.

HUMS and HOMP faced and resolved this same challenge before their successful fleet-wide adoption.

# UK Fleet Implementation



## Proposal:

Create a level playing field

Replicate the approach taken for HOMP – an industry funded \$/hr for aircraft operators that adopt it

- Fixed for all HUMS types / aircraft types
- Increased in year 1 to cover set-up costs

# Summary

- A technical innovation to enhance HUMS effectiveness has been developed and proven.
- This safety enhancement is available 'today'.
- The commitment of the Oil & Gas industry is now needed for implementation on the UK fleet.