International Military Airworthiness Regulation Conference

Harmonised International Military Airworthiness Regulation – an engine maker’s view

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Introduction

• Harmonising engine regulations:
  – It is a good idea, it is happening
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• Harmonising engine regulations:
  – It is be a good idea, it is happening
  • lets just get on with it!
The military engine regulatory landscape

• Current common engine standards
  – UK: Def Stan 00-970 part 11 (was 00-971)
  – US: JSSG 2007 (descended from Mil E 5007)
  – Europe:
    • EJ200 designed to Mil Spec derived document.
    • TP400 – civil certified to CS-E plus add on
    • Adour, US, or UK derived depending on version
EMAR 21

• Europe *is* harmonising
  – EMAR21
    • “As civil as possible, as military as necessary”
    • Derived from EASA CS-E
    • Agreed and issued – now implementing
  – Def Stan 00-970 pt 11: very close to CS-Es and hence EMAR21
Harmonisation success

- Fuels:
  - E.g. ASTM D1655 and the UK MoD Def Stan 91-91. Both cover AVTUR (Jet A /A-1).
  - RR integrated in the ASTM Aviation Fuel Committees.
  - RR uses this Industry consensus approach to specify approved fuels for our engines
    - E.g. partially synthetic, and FAME for example
Fuel – a success story

• Adour customer asked for clearance to operate on part synthetic fuel in US
  – Fuel new to them, standard in US (i.e. in D1655)
  – Old way: specific clearance, slow and costly
  – We were able to respond in days, minor administrative change to clearance paperwork
Birds:

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Birdstrike requirements

• Pretty universal in all requirements:
  – Large: ‘please fail tidily and don’t damage the aircraft’
  – Small (usually multiple): minimal effect
  – Medium: ‘there will be some effect’, but ‘limit it and recover to a reasonable thrust quickly’
Birdstrike: some way to go

- Positive: some alignment in Specs:
  - 1. Performance recovery time and requirements for CS-E/00-970 combine the old 971 standard and new US JSSG standard
  - 2. Permissible post-ingestion thrust/power levels
Birdstrike: Example

- Adour Mk951 (later BAeS Hawk) – current examples requirements:
  - Mass: 2x0.45kg, vs. 2 x 1kg.
  - Aim point: detail difference
  - Thrust recovery: differs, but guidance similar
Birdstrike: Actual Adour Mk 951 clearance

• Self-certified to a Def Stan 00-971 spec:
  – 1x1.5lb (0.7kg) bird
  – Bird velocity, target and engine conditions as determined by analysis to ascertain the most arduous impact conditions likely to be expected for the installed engine, interpreted to be two tests, one at take-off and one at approach conditions.
The future of Engine Requirements

• I expect: EMAR 21 adoption to expand
  • Already underway in UK, Belgium, France, Norway, Australia, Spain...
  • Shortly implementing in Germany, Italy, maybe Netherlands and Sweden...
    – Will drive further convergence on civil standards in much of the world.
    – US integration?
The future of Engine Requirements

• The role of other legislation:
  – Product liability law:
    • Driven by 3\textsuperscript{rd} party risk
  – Health and Safety in the workplace:
    • The cockpit is the pilot’s place of work
  – Risks need to be as low as is reasonably practical. Regulations are a help but not a sufficient end.
Engine Requirements from an engine maker

Thank you