

Application of DASR to Ageing Aircraft WGCDR Adam Bowler (CENGR P-3, P-8) 05 Jul 18





- Do ageing fleets need special regulatory treatment?
 - Ageing aircraft provisions in DASRs and the role of the Regulator
- P-3 case study
- Platform Stewardship of ageing fleets
 - Measuring success of ageing aircraft programs and supporting appropriate program development

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Provisions in DASR

- Several references to ageing aircraft considerations
- Clear emphasis on compliance with type certification
- Of note
 - 21.A.44.c (MTCH Obligations): bestows an obligation to conduct periodic Aircraft Structural Integrity and Propulsion System Integrity assessments in the absence of an equivalent EASA or EMAR requirement
 - Pending release of EASA changes from NPA 2013–07
 - Some changes = regulatory catch up ('ensure' leading 'assure')

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RAAF AP-3C Orion

- 40 years into 15 year DSO
 - SD24, CAR4b with FAR25



- Ageing (Aged) program includes the usual suspects
 - Structural management plan based on mid-life FSFT
 - Maint program review
 - Updated corrosion prevention and control program
 - Ageing Aircraft Systems Audit including supplemental teardown and test
 - Repair audit and re-assessment program
 - Ageing wiring inspections
 - Service action review
 - International aircraft sustainment working group
- PLUS, incorporation of new technologies and research
 - New CIC, PAUT, cold spray, thermography, 3d visualisation, university sponsored structural research, retired aircraft teardown

P-3 SCC in Wing Plank Riser H-Clips





Typical Dimensions of H-Clip Installations

Crack Example From A09-752



STI-Orion 0828 Aggregation of Fleet Wide Inspection Data



• What about other systems?





- Consider performance measurement paradigms
 - Behaviours where statistical significance not possible
 - AD incorp. = minimum,
 - Leading AD identification and requirements development (good)
 - Retiring risk efficiently with early identification while risk remains compliant with level inherent in TCB, well before AD needed (v. good)

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Platform Stewardship

- Don't measure, don't manage
- Through dismantling comes understanding
- Tension with other sustainment program expectations...
 - on condition vs on condition
- Regulation offers support
 - Useful to consider some FAA thoughts to broaden regulatory genepool

Regulator Support to Platform Steward for Development of Optimal Ageing Aircraft Program

- Contextualised assessment to determine relative program risk
 - Can be applied to whole program, platform or platform subsystem
 - Ageing aircraft programs to support
- Should be coupled with a performance-based oversight framework that promotes appropriate behaviour
 - Intrinsically data intensive, forward looking and
 - Requires considerable regulatory resources applied by knowledgeable practitioners
- Aim is to inculcate an appropriate level of proactivity based on contextualised ageing aircraft risks

Conclusion

- DASR adaptation for consideration of the best methods of performance-based oversight of Ageing Aircraft Programs
 - Expansion of scope beyond ASI/PSI
 - Needs experienced practitioners as regulators
- Consideration for the tension associated with some positive technical behaviours
- Forecast and support the best behaviours and practices in future Platform Stewards



• QUESTIONS



• BACKUP SLIDES

P-8A CIC investigation

USN highly interested in impact of corrosion inhibiting compounds (CICs) on P-8A joints

- Small investment for (potential) high return
 - Fills vacuum left by DSTG pivot towards cyber
 - Solidifies ties to the South Australian Universities
 - Sustains students and provides meaningful engineering research experience
 - Using Defence Science Partnership agreements to increase student/University engagement
- Chance for Australia to provide knowledge input to P-8A CP
 - USN hesitant to adopt widespread CIC use without data
 - SRSPO positive experience with CorrosionX on AP-3C

P-8A CIC Investigation

Outcomes of 2017 Sponsored Final Year Project:

- Effects of Corrosion Inhibiting Compounds on Mechanical behaviour of Aircraft Fastened Lap Joints.



Findings point to effects of CIC application to lap joints...Further work required to determine the effects CICs have on other joint configurations strain distribution Work is progressing in 2018 through continuation of project and further grant work through the University and DST Group



Specimen 6 - Dry Specimen 10 - CIC Figure 7.13: Specimen 6 (Dry) vs Specimen 10 (CIC) Normal Strain - Y Direction





AP-3C Structural Research

Outcomes of 2017 AP-3C Research Program with Adelaid e Uni:

- Effect of SCC on wing panel strength:
 - Fleet wide MPTF for AP-3C SCC at H clips in Wing Panel Risers
 - AGAP Analysis using FEM techniques
 - Thesis examined problem using independently developed FE model, alternate FE software and access to Uni computing resources
 - Thesis challenged some AGAP assumptions and results particularly for larger cracks
 - Set up the need for additional checks in engineering reports
 - Highlighted the priority need for wing panel article tests to establish 'ground truth'
 - Test program joint SPO/AGAP/Uni effort
 - Preliminary results endorsed applied crack limits at locations

