

# C-27J ASI Related Compliance Findings

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# 1. C-27J Design Genealogy (Simplified)

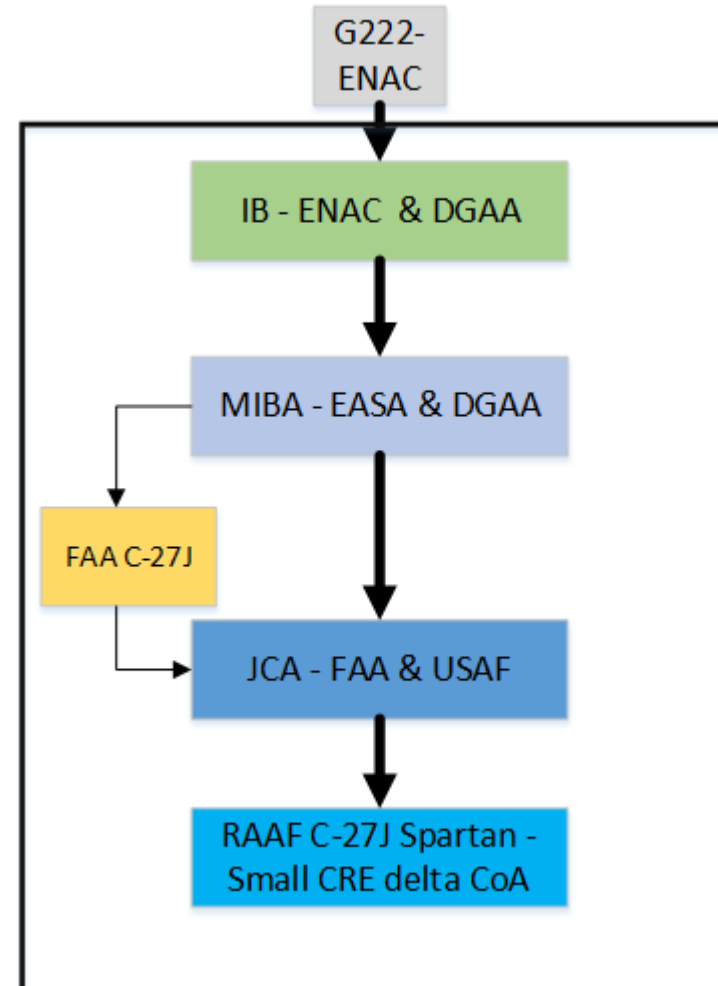
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- OEM
  - Leonardo
    - Alenia, Finmeccanica
  - Manufactured in many countries
- Nacelle OEM - GKN UK
- NLG OEM -Magnaghi Aeronautica S.p.A
- MLG OEM - APPH
- PME - L3



## 2. C-27J Certification Tree (Simplified)

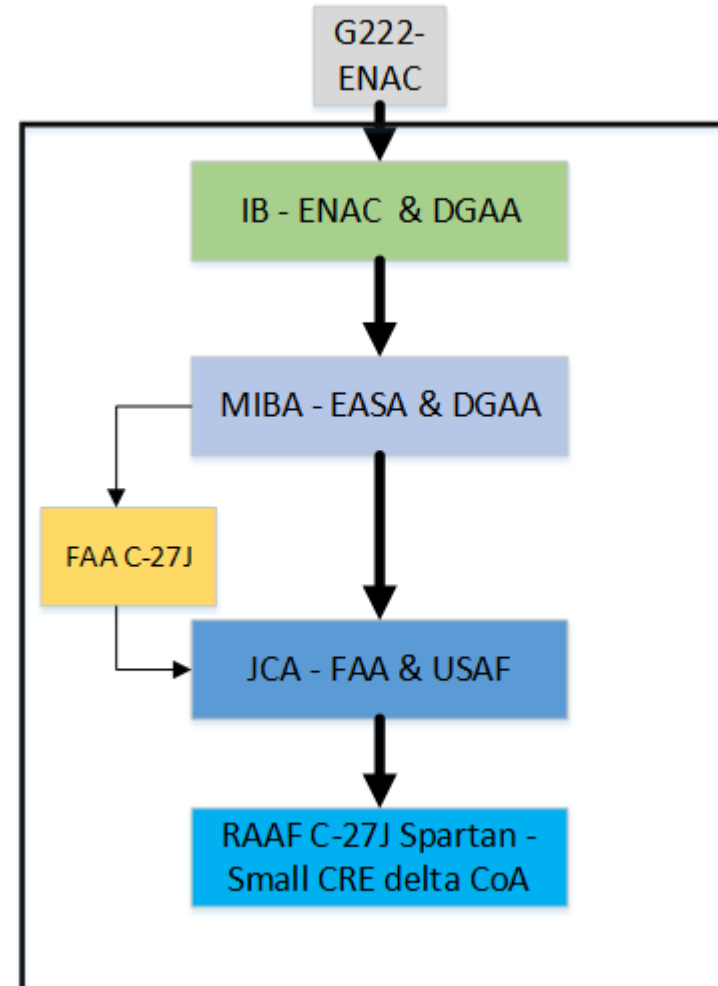
- ENAC- original certification JAR 25
  - Ente Nazionale per L'Aviazione Civile
- DGAA – MTC
  - Direzione Generale per gli Armamenti Aeronautici
  - Not a recognised NMAA for mutual recognition purposes
- EASA
  - Taken over issuing of TC from ENAC
- FAA
  - Required as part of JCA program



## 2. C-27J Certification Tree (Simplified)

### The Plan

- USAF
  - Majority of militarisation certification (delta between FAA, Military Ops, Military configuration)
  - Recognised NMAA
- CoA
  - Certification - Informed Recognition of Prior Acceptance (IRPA)
  - Small Configuration Role and Environment (CRE) delta between USAF mission profiles/ mix and environment
    - JCA to CoA

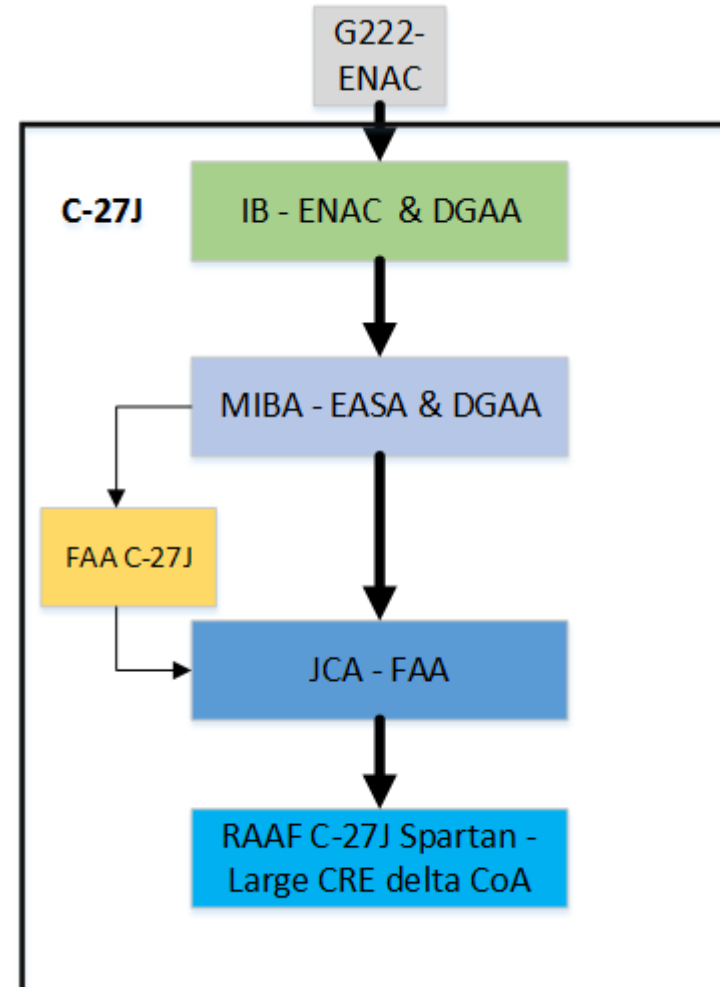


## 2. C-27J Certification Tree (Simplified)

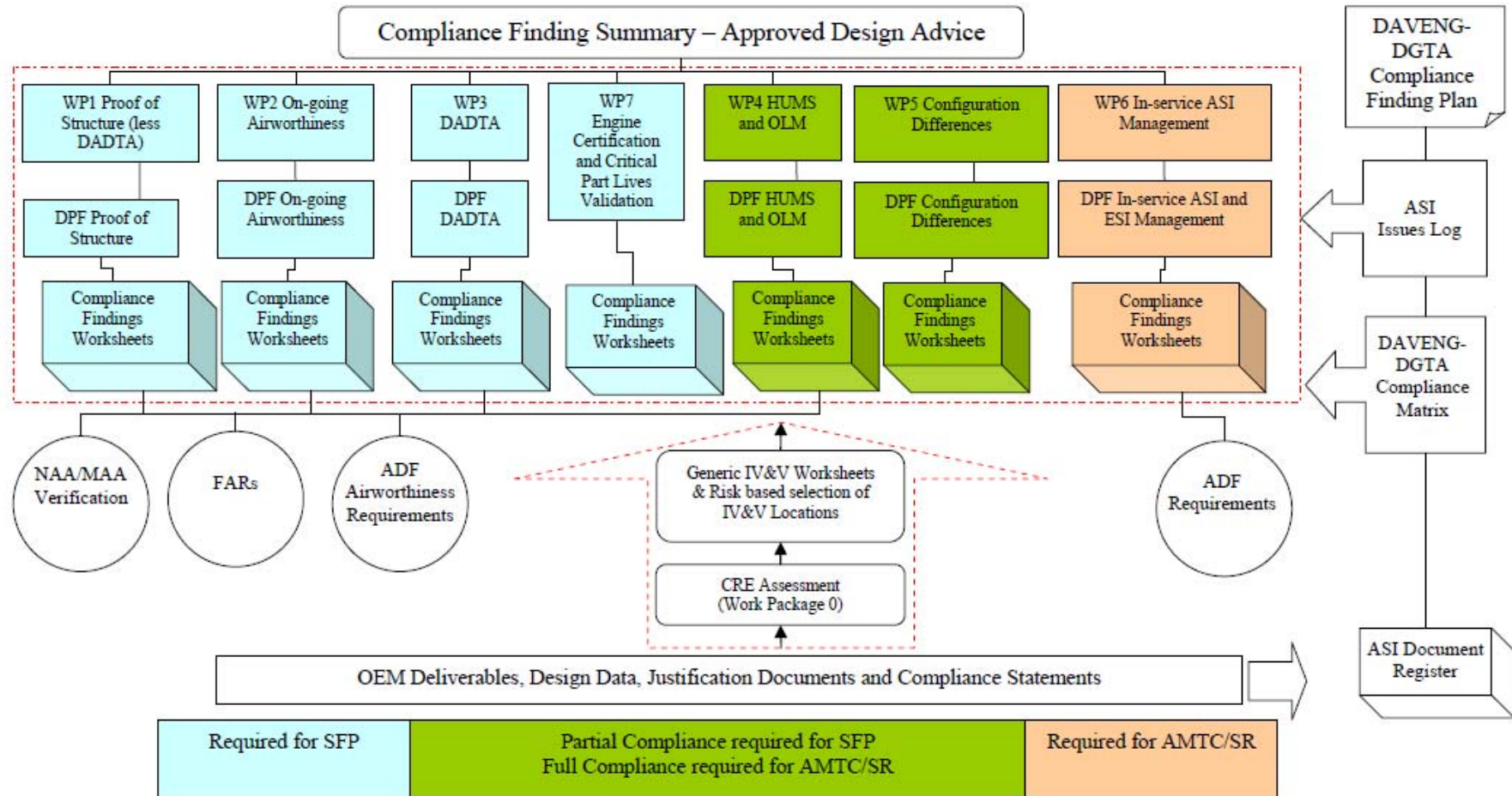
### USAF divesting the C-27J

- Large CRE delta between RAAF and FAA certified aircraft
  - Less IRPA
  - Significantly more CF activities in-country
- No fleet lead aircraft concept
  - AMI (Italian Air force) low ROE and severity
  - Expect RAAF will be world fleet leaders within 7-10 years

More risk mitigation activities required for unknowns



### 3. CF Plan





### 3. CF Plan

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- Many Work Packages
- Structural CRE Assessment
  - Falls within larger PO CRE assessment
- Many concurrent activities
  - Organisations and personnel
- Issues log
  - Questions to OEM
  - At one stage over 160 questions listed
  - Track recommendations from one report into later WP activities or ASIMP
- Technical serviced contracts set up with the OEM
  - Limited access to LG/ nacelle OEMs



## 4. CBD / TCB

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- CBD – FAR 25 Amdt 87
  - Limited number of JSSG 2006 requirements for specific items
  - HUMS
- Safety implications in using newer amendments
  - Most quantified during CF
  - Some offset by EASA certification to JAR 25 Change 14
  - FAR 25.571
    - Full scale fatigue test
    - LOV
    - No durability limits for RAAF CRE
    - AAP 7001.054 requires full scale fatigue testing
    - Greater reliance on full scale test results as no fleet lead aircraft



## 5. CRE Delta

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- Configuration
  - Small number of minor deltas
  - Rear observer station
  - Industrialisation Improvement Program (IIP)
    - Two sub fleets of 4 & 6 aircraft
    - EASA major change
- Role
  - DaDTA - mission profiles and mix
  - Static - outside the envelope
    - To accept requires a good understanding of FAR certification and limits at the certification envelope
  - FAR 25 Cat E, no passengers
- Environment
  - Altitude
  - Semi prepared runways



## 6. DaDTA

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- Mission profiles very different
  - OEM tactical missions more like a CoA logistic mission
  - CoA will accumulate damage at a faster rate
- OEM analysis backed by limited fatigue testing
  - G.222 fatigue testing (CRE delta)
  - No high life G.222 fleets – no in-service data
- Current intervals and life limits very restrictive
  - Based on factoring OEM ICA
- Structural Substantiation Program (SSP)
  - FLTP
  - Fatigue testing
  - DaDTA to provide long term intervals



Leonardo photo

## 6. DaDTA

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- SSP
  - Outcomes many years away
  - Interim fatigue management
  - SSP will not cover all structure
    - Long term FM can be developed now
- FLTP CF requirements
  - Mainly for fatigue test
  - Assist CF by
    - FEM validation
    - Loads for interim DaDTA
    - Loads for static - outside the envelope
    - Assist HUMS IV&V
    - UM Parameters and IATP



## 7. HUMS

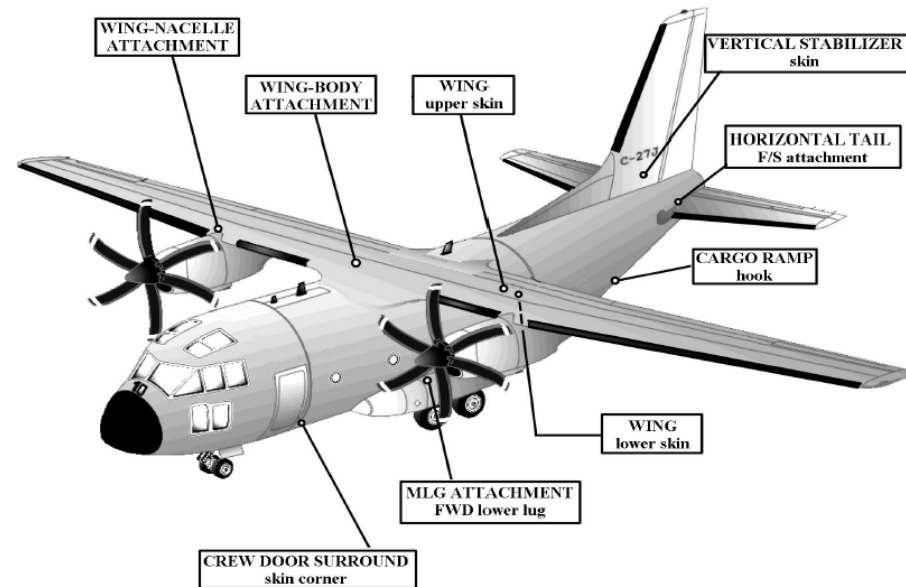
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- May move out of CBD/TCB with DASRs
- HUMSVP – ensures developed systems comply to regulatory and operational requirements
  - Regulatory -DASR, DEFLOGMAN Part 2 Volume 10 Chapter 18, AAP 7001.054
  - Operational - SAE ARP6461, MIL STD 1530D
  - SSP FLTP outputs will be used for more complex parameter validation
  - Compliance for all stages
- Keeping eye on the future
  - Develop with long term goals in mind
  - TLS
  - Available technology
  - Data from day 1
- “System in Evolution”



## 7. HUMS

- OEM IATP
  - Not operationally useful
  - OEM has provided some validation documentation
  - Outputs still to be verified
    - Some concerns
- RMM – Probably the long term basis of UM data
  - V&V of limited RMM parameters



## 7. HUMS

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### Initial Operations

- Aircraft in CONUS, Australia
- Majority of CONUS data captured (RMM and 781 Form data)
- 781 used in lieu of EE-360
  - Contract requirement
- Some Leonardo testing / delivery / ferry RMM and paper based data
- CONUS/ delivery operations backfilled as single line in CAMM2

### Current System in country

- Paper based (EE360)
- RMM
- CAMM2
- FM based on a very limited number of parameters (FH and Landings)
  - Against factored OEM ICA limits



## 7. HUMS

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In progress changes

- CAMM2 FDR – mid 2017
  - Already developed and tested, reports to be completed
    - EE360
  - CAMM2 FDR requirements long term depend on if all parameters can be obtained from RMM
    - Airdrop weights
- CAMM2 FDR designed to capture data
  - Still requires a long term UM repository



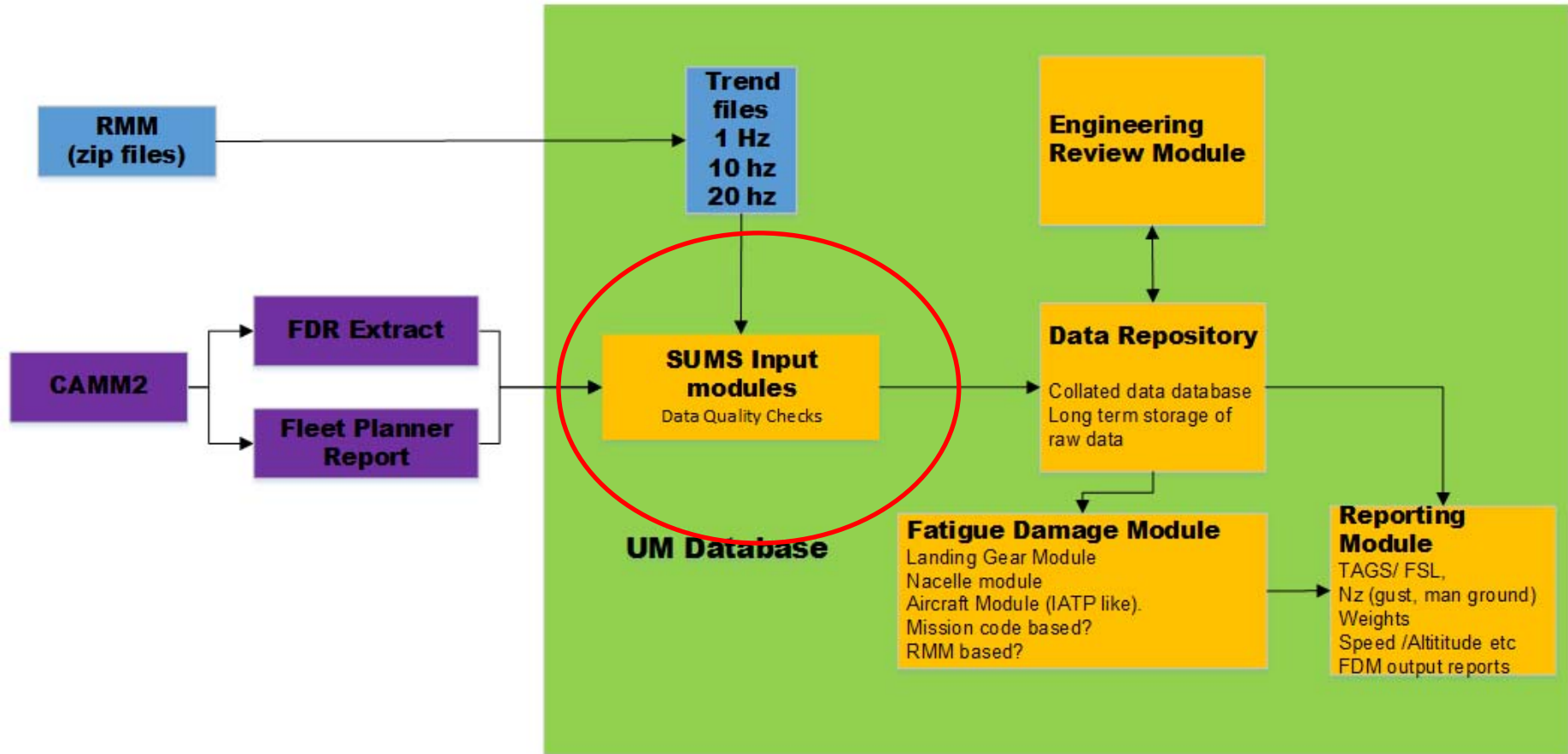
## 7. HUMS

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### In progress changes

- Long term RMM repository – A work in progress
  - Collect and collate relevant RMM parameters
  - Required to characterise the fatigue accrual
  - Needs to consider what the long term fatigue damage model parameter requirements
  - Parameters also required to validate fatigue accrual
  - Integrate with maintenance records (CAMM2) to calculate EFH since last inspections/ date off entry into service
    - Will not directly alter maintenance ICA

# 7. HUMS



Multiple FDM possible for different structure

# 7. HUMS

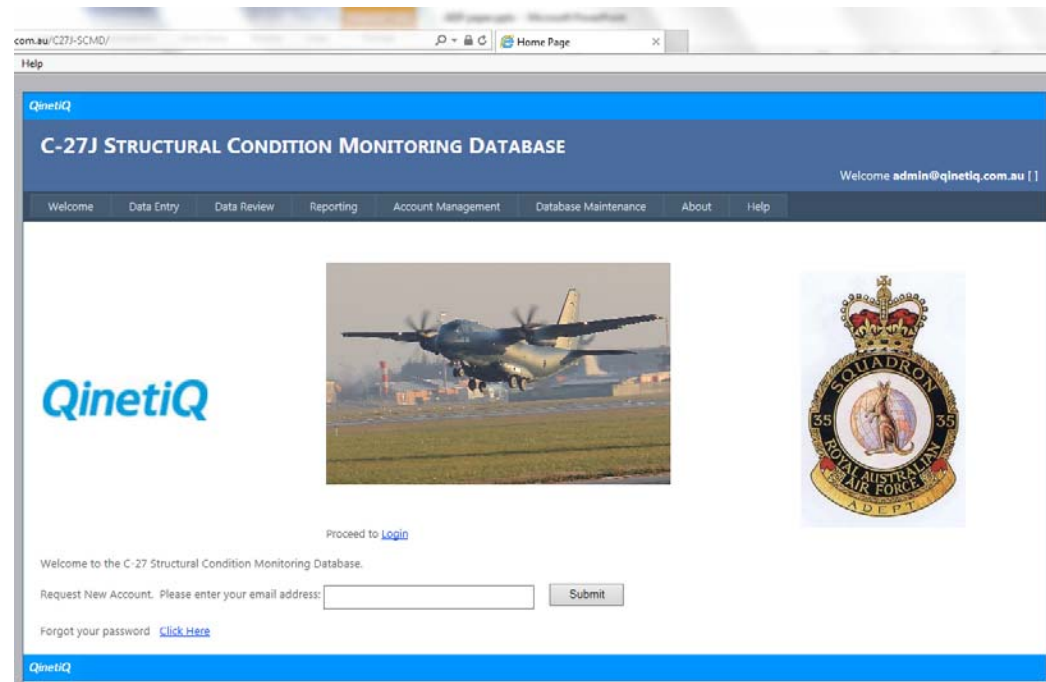
## Practical Considerations

- Higher fidelity data allows more UM options but at what cost?
- How many parameters are really required?
- What frequency?
  - Data storage costs
  - Data processing times and costs
  - Need for V&V
- Ideally capture all parameters from one source
  - Matching multiple data sources flight by flight is difficult
  - More complex use of parameters
    - Normal acceleration during taxi to monitor runway type
      - C-17 runway normal acceleration RMS



## 8. In-service

- SCM database complete
  - Production deviations being back filled
  - Data from day 1
- Other aspects of SCM and EDM to be developed
  - Outputs from CF will influence these programs
  - Issue log



## 9. Summary

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CF activities in progress

Need for OEM access

- In-service
  - Capture UM from day 1 with most likely UM source
  - Capture SCM data from day 1
  - Allow long term systems to have the data they need

Questions



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