Airbus Defence & Space

A330 MRTT/FSTA occurrences management when green aircraft is affected.

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Airbus DS/Mil Aircrafts PS: Scope

- TCs Holder [illegible]1, C-212, CN-235, C-295, A400M
- STCs Holder [illegible] MRTT/FSTA, P[illegible]
- Eurofighter and UAVs [Atlante, Barracuda]
- Legacy aircrafts: Transall, Tornado.

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Comercial vs Military Transport Missions

- Aircraft Design is focused to comply with the intended purpose.
- It is based in the specification and the user performance requirements.

- ✓ Passenger & Load transport
- ✓ Entertainment and passenger comfort
- ✓ High Speed
- ✓ Fuel Tank Capacity
- ✓ Long range

- ✓ Multitransport aircraft
- ✓ Logistic & Tactical mission
- ✓ Aerial delivery
- ✓ Low Level Flight
- ✓ Unpaved runway operation
- ✓ Air to air refuelling

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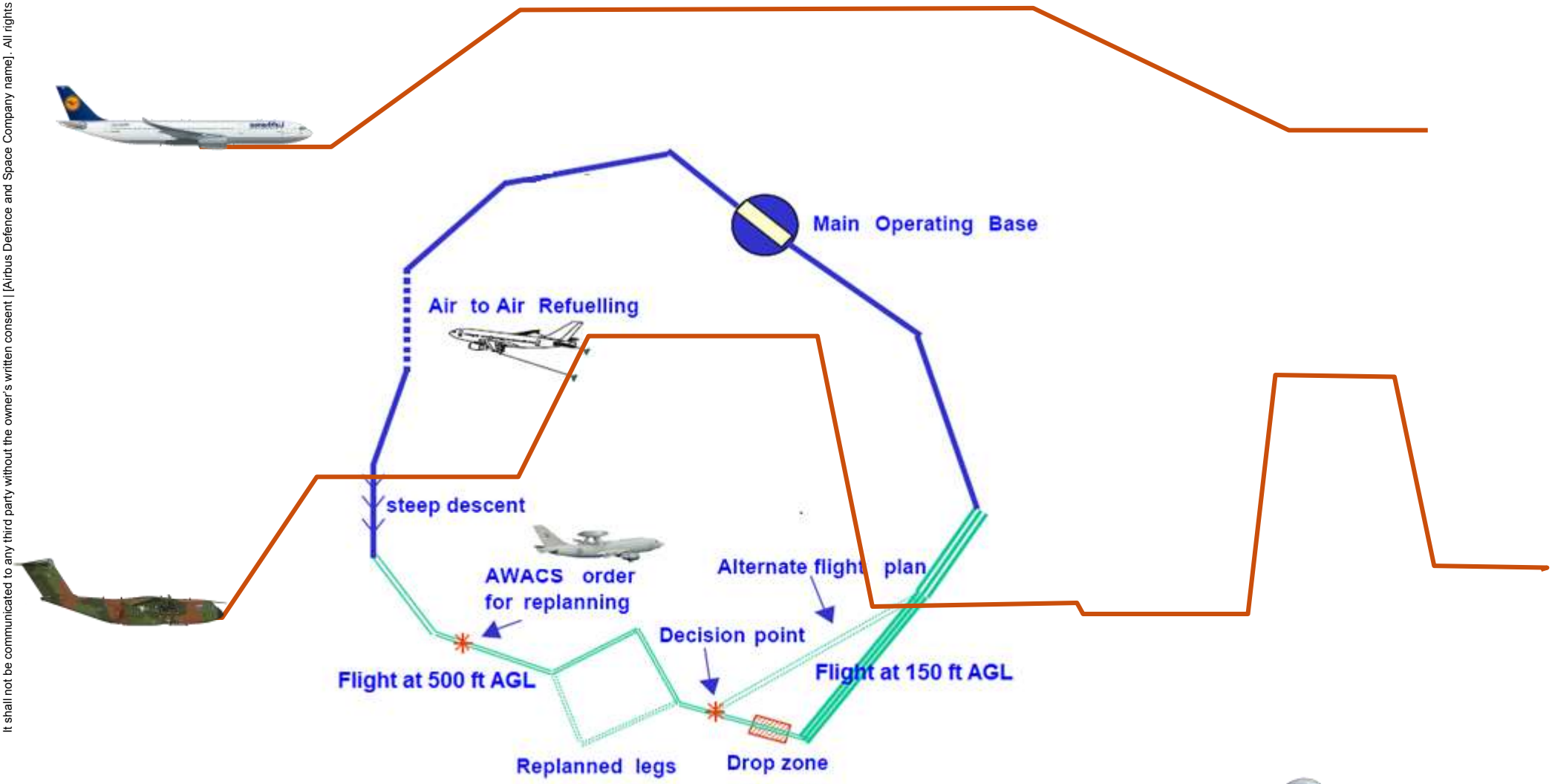
Comercial vs Military Flight Profiles

- Different mission implies different flight profile.



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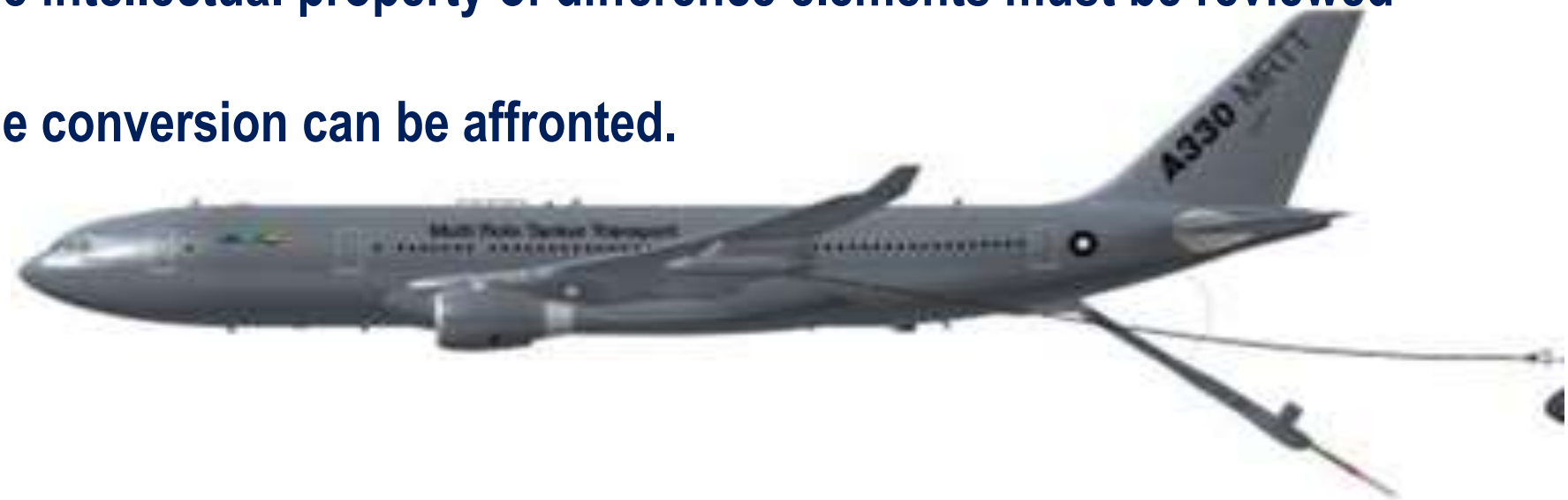
Military Aircraft Derived from Comercial

- The delta between the basic “green” aircraft and the final military product must be analysed.
- The effort to convert the commercial aircraft in a specific military aircraft must be evaluated.
- The intellectual property of difference elements must be reviewed
- The conversion can be affronted.



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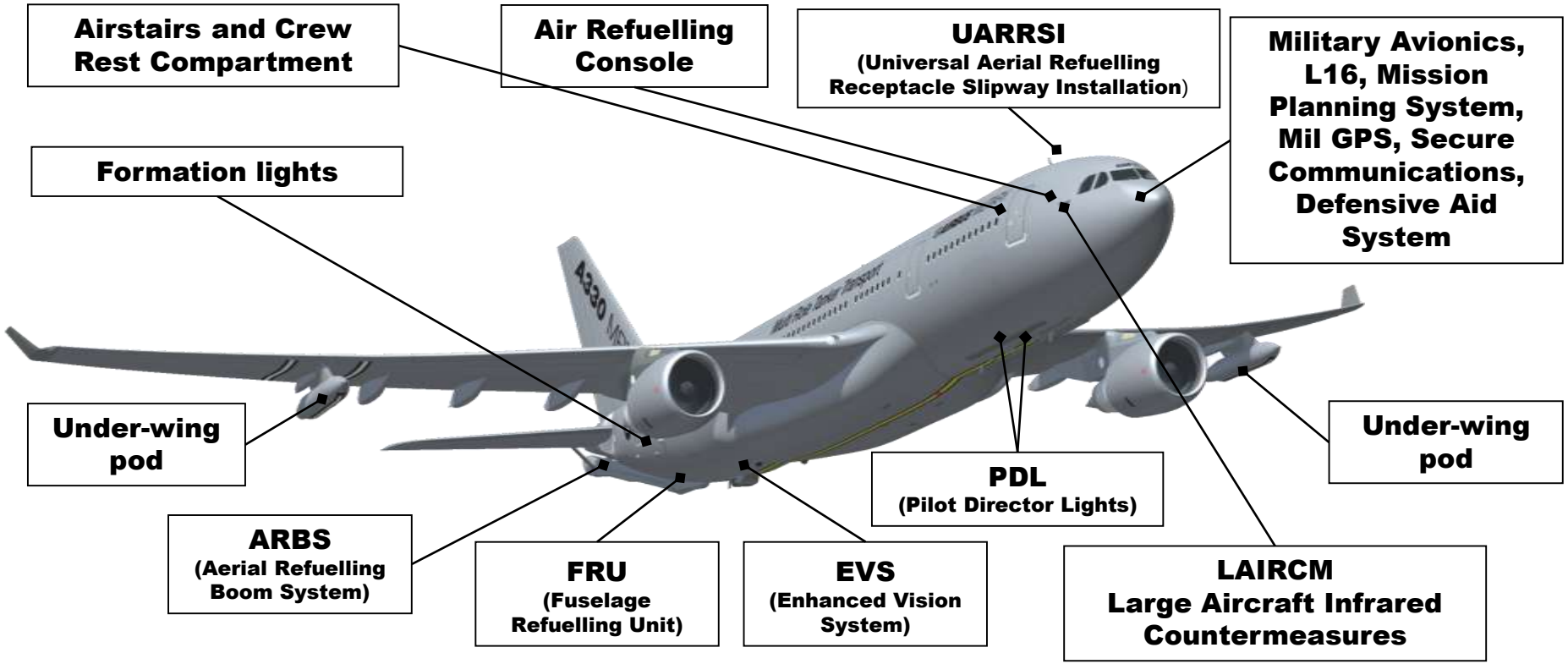
A330-MRTT/FSTA Conversion



450 new wiring harnesses - 58,5 Km of new wiring

1700 connectors – structural mods: 2000 parts – systems mods: 5500 parts - 250 special tools

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A330-MRTT/FSTA Conversion

- ATA 11: Placards and Markings
- ATA 21: Air conditioning System
- ATA 22: Auto Flight
- ATA 23: Communication
- ATA 24: Electrical distrib. and generation
- ATA 25: Equipment / Furnishing
- ATA 26: Fire Protection
- ATA 27: Flight Controls
- ATA 28: Fuel
- ATA 29: Hydraulics
- ATA 31: Indicating/Recording Systems
- ATA 33: Lights System
- ATA 34: Navigation

- ATA 35: Oxygen
- ATA 36: Pneumatic System
- ATA 38: Water/Waste
- **ATA 43: Tactical Communications**
- ATA 46: Mission System
- **ATA 48: Air-to-Air Refuelling System**
- ATA 52: Doors
- ATA 53: Fuselage
- ATA 55: Stabilizers
- ATA 57: Wings
- ATA 92: Electric and electronic common installation
- **ATA 99: Defensive Aids System**

MODIFIED COMPUTERS

FMGEC (Flight Management, Guidance and Envelope Computer)
FCU (Flight Control Unit)
EIS (Electronic Instrument System)
MCDU (Multipurpose Control & Display Unit)
FCPC (Flight Control Primary Computer)
FWC (Flight Warning Computer)
SDAC (System Data Acquisition Concentrator)
FCMC (Fuel Control and Managing Computer)

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Continuous Airworthiness

Two organizations are involved in the aircraft continuous airworthiness :

- The manufacturer of the green aircraft who is the Civil Type Certificate holder. (Airbus Civil)
- The manufacturer of the conversion into military aircraft who is the Civil Supplementary Type Certificate holder and the Military Certificate holder. (Airbus DS)

An Event that occurs on civil registered A/C may affect also A330 MRTT/FSTA.

An Event that occurs on A330 MRTT/FSTA may affect also civil A/C.

An Event may induce different Dissemination Means on both fleets

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Conversion Affected/Not Affected Areas

Affected Areas are any aeroplane item (component, equipment…) where the STC applicant shall demonstrate compliance with the applicable requirements

- New/modified by the STC applicant (physically modified, internally),
- Unmodified but affected because:
  - it is not functioning as intended by the TC holder (new function, modification to performance features, modified loading…),
  - it is not working in the environment intended by the TC holder,
  - its safety level is degraded and could have an impact on the airworthiness

Airbus DS, as STC holder, shall undertake the responsibilities for the Conversion and Affected Areas by the STC. Airbus Civil, as TC holder, shall undertake the responsibilities for the non Affected Areas, for which the Airbus Civil approved documentation is applicable."

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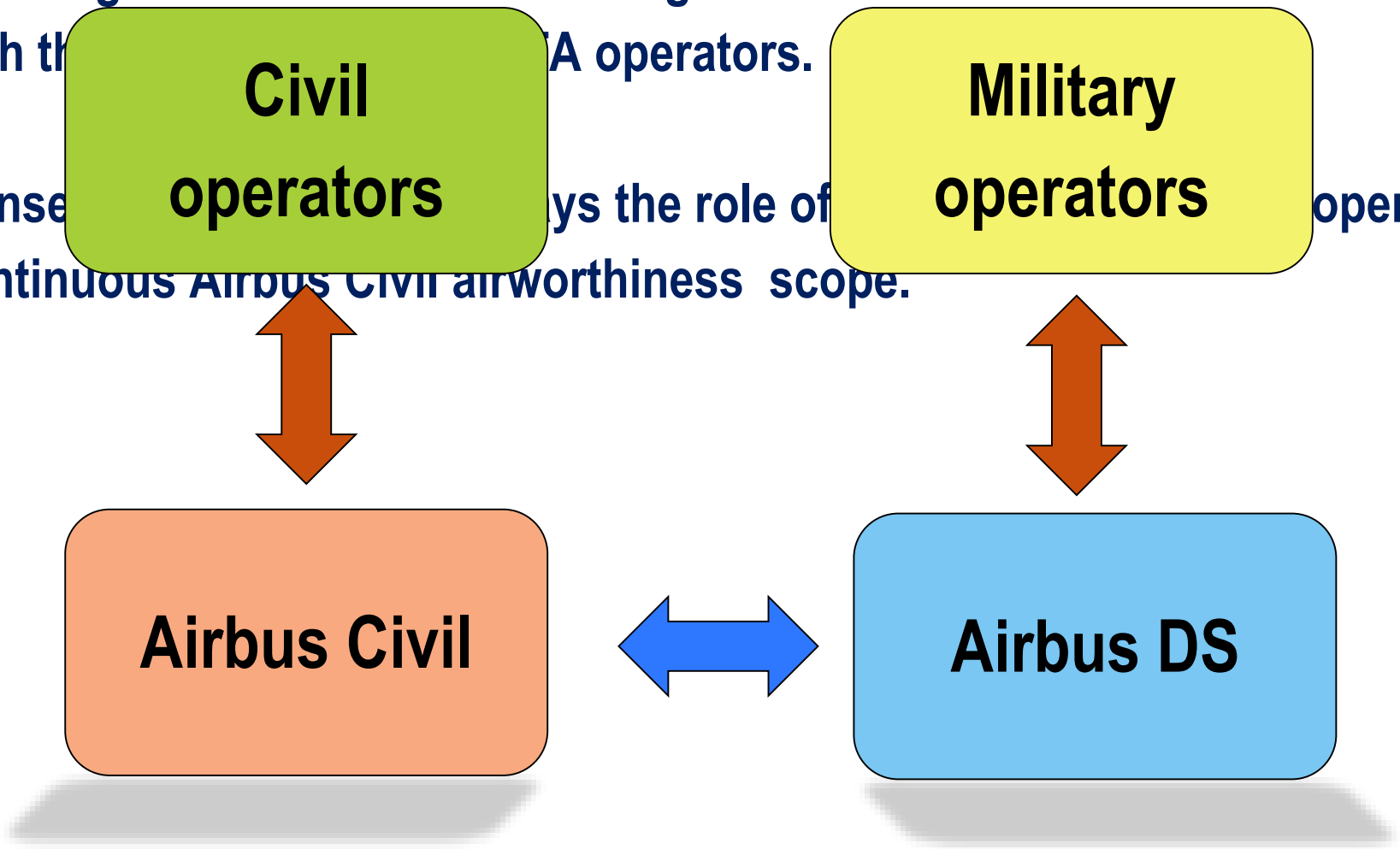
Relationship with Operators

Both organizations achieved the agreement that Airbus DS is the only interface with th A operators.

Conse ys the role of operator in the continuous Airbus Civil airworthiness scope.



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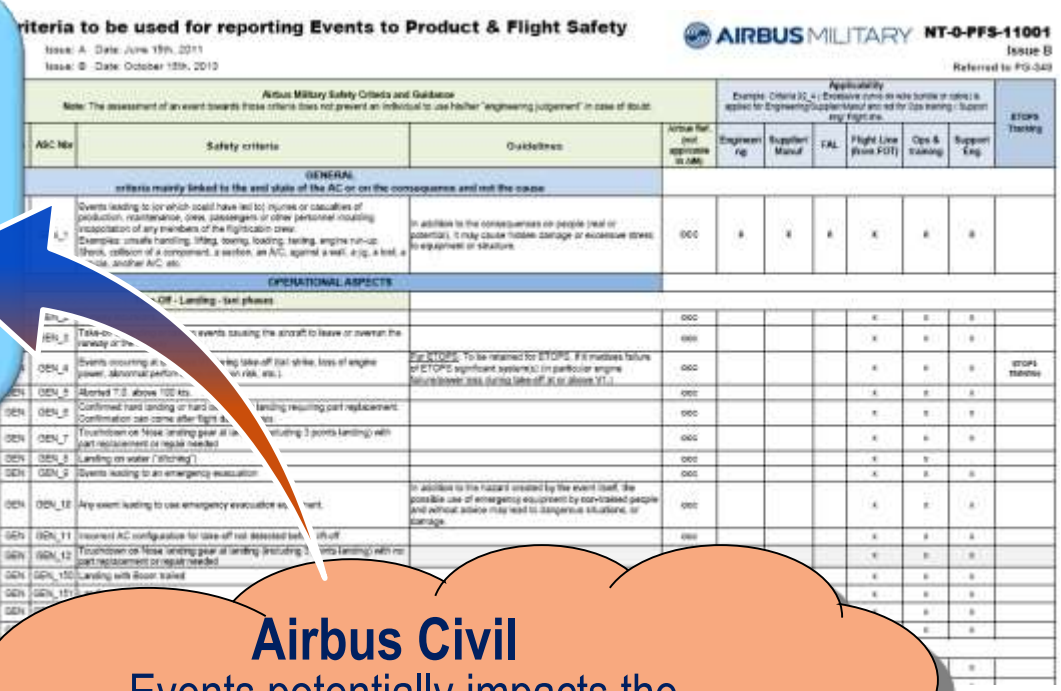
Continuous Airworthiness - Process

Collection & Notification → Initial Assesment → Safety Analysis → Dissemination Means

- Collect the events of the military product.
- Assess if it is an occurrence according to criteria table for reporting events.
- Notify the occurrance
- **Asses if the occurrence is related with non affected parts.**



Airbus Civil

Events potentially impacts the A330-200 MRTT/FSTA specific operations but not the civil operations according to the list of relevant events.

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Continuous Airworthiness - Process

Collection & Notification → **Initial Assesment** → Safety Analysis → Dissemination Means

- Initial assessment is held in the first 72 hours
- Evaluation Team decides the classification : green, yellow or amber.
- Mitigation actions (AOT, FOT, SIL...)
- Airworthiness Authorities reporting
- **Assess Airbus reporting for affected areas with potential impact on civil fleet.**

Airbus Civil.

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Continuous Airworthiness - Process

Collection & Notification → Initial Assesment → **Safety Analysis** → Dissemination Means

- Engineering performs the Risk Assessment of the occurrences classified as yellow or amber.
  - ✓ Impact on safety and reliability.
  - ✓ Review SSA if needed.
  - ✓ Establish the root cause and contributing factors.
- Corrective actions derived from Risk Assessment.
- **Impact of civil in-service occurrences on military product.**

Airbus Civil

Risk assessment of all occurrences classified as amber or affecting relevant areas.

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Continuous Airworthiness - Process

Collection & Notification → Initial Assesment → Safety Analysis → **Dissemination Means**

- Inspections and verifications on in-service aircraft.
- Information to temporarily modify actions or operational procedures.
- Changes or modifications to the aircraft .
- Transmit equivalent requirements issued by a Supplier.
- **Analyze, adapt and transmit corrective & mitigations actions for not affected areas.**

Information
- OIT
- FOT
- SIL
- COM

Instructions
- AOT
- OEB
- SB

OPERATORS FEEDBACK

Agreement Required

Airbus Civil
Disseminate corrective / mitigating actions to Operators

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Keys to keep the process efficiently

- **Maintain List of relevant events updated.**

- **Maintain List of relevant areas updated.**

- **Monitor the Continuous Airworthiness Process in place**
  - ✓ Facilitate the interface between Airbus Civil and Military Aircraft relevant organizations contributing to Continuous Airworthiness
  - ✓ Ensure that the demarcation between Not-Affected Areas / Affected Areas are respected in accordance with reference document in-force
  - ✓ To propose Process improvements if deemed necessary

- **Regular meetings**

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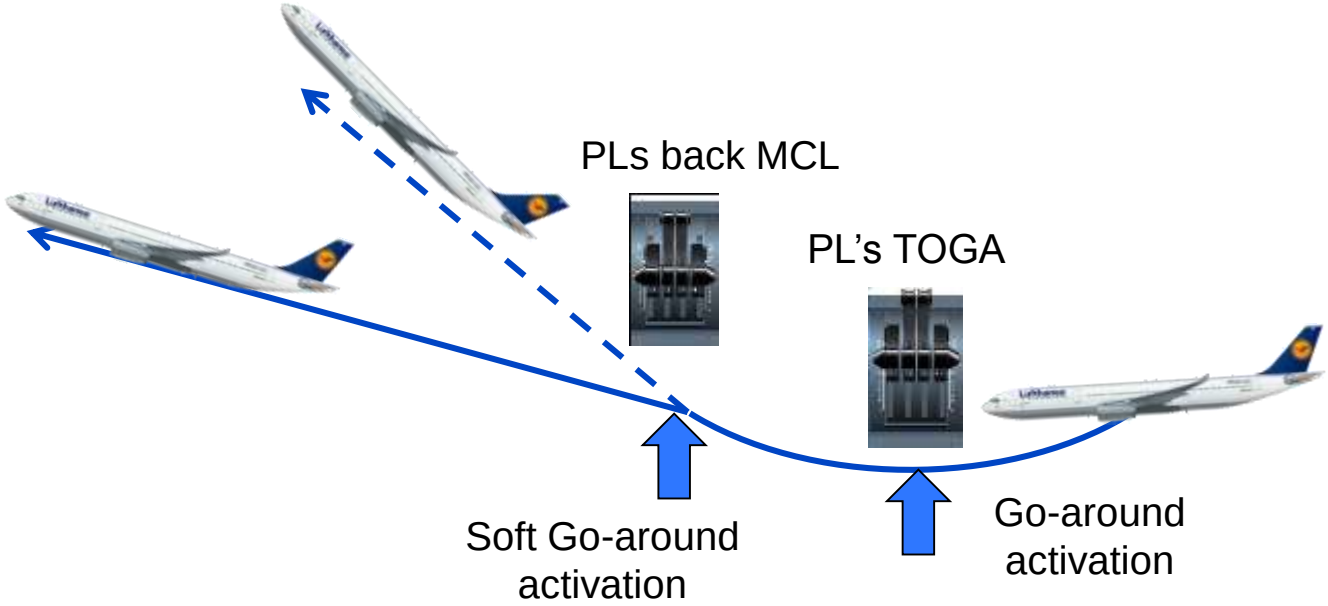
Soft Go around on Commercial aircrafts

- **Soft Go-Around is a new function allowing the flight crew to easily adapt the thrust setting to the actual operational conditions during Go-Around maneuver in order to:**
  - ✓ reduce flight crew workload and spatial disorientation
  - ✓ to improve passenger comfort.
- **Maximum thrust may not be necessary for all lightweight aircraft go-around maneuvers.**
- **New manual thrust mode GA SOFT leads to a positive vertical speed of 2000 ft/min (+/- 300 ft/min) whatever the aircraft configuration**



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Soft Go around – Civil & Military Conflict

- **New FMGEC (Flight Management Guidance and Envelope Computer) computers determine the appropriate thrust level to achieve the 2000ft/min target taking into account:**
  - ✓ Slat and Flap configurations
  - ✓ Aircraft GW and CG
  - ✓ Aircraft speed, altitude ISA deviation.
- **The military FMGEC developed for A330 Derivatives uses the same channel of FMGEC for the Tanker Law activation logic that Airbus Civil uses for the new Soft GA functionality.**

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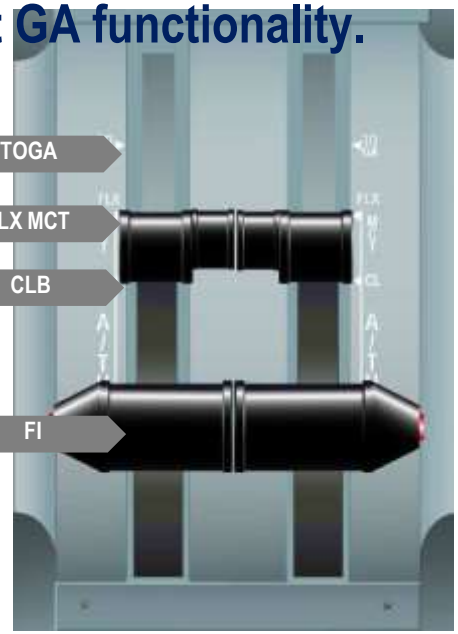
- **As a** … **nctionality, A33** … **GA activ**
  - ✓ Tanker Law is active
  - ✓ A/THR is engaged
  - ✓ One or both thrust levers are placed above CL and up to MCT detent (inclusive).

Engine thrust is limited to Maximum Climb



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Soft Go around – Military Safety Assessment

- **An occurrence was opened in the Airbus DS Product & Flight Safety process.**
- **Initial assessment stablished a potential safety impact during the AAR operations when the Tanker Laws are activated. Two sceneries were considered the most critical:**
  - Engine failure where it is requested to advance PLs to MCT.
  - Breakaway maneuver and the pilot inadvertently position the thrust lever in MCT instead of TOGA
- **Simulator sessions were performed and Risk Assessment concluded classifying the occurrence no more than MAJOR (Yellow in the process) based on:**
  - ✓ The undesired SGA activation can only occur when the tanker law is activated,
  - ✓ Normal behavior is recovered when the thrust lever is moved either to CL notch (or below) or to TOGA, or if tanker law is selected off.
  - ✓ The engine thrust obtained further to an undesired Soft GA activation remains close to the one commanded by the crew (MCLB instead of MCT),

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Soft Go around – Mitigation Actions

- Risk Assessment concluded there was no impact on fleet airworthiness.
- FOT was published with crew operational recommendations about how to identified Soft GA activation and how to deactivate it.
- Next FMGEC standard will solve the confilct.

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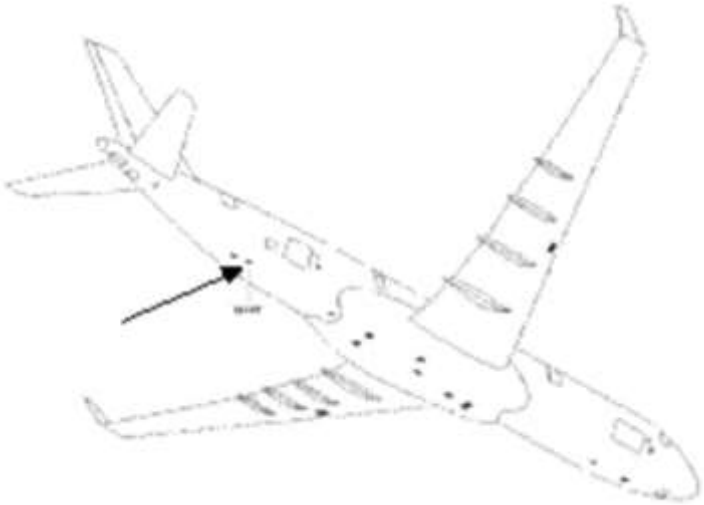
Parts Departing Aircraft (PDA)

- **Long history of missing access panels on commercial aircraft attributed to hinge failures due to excessive wear.**
- **Several cases were reported in which A330/A340 water service panel doors were lost during flight.**
- **Potencial Unsafe condition:**
  - ✓ Impact on Tail Horizontal Stabilizer may lead a fuel leakage.
  - ✓ Impact on THS may lead to cause structural damage..



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PDA Mitigation actions

- **Probable root causes:**
  - ✓ Inside water accumulation compatible with ice formation.
  - ✓ Hinge wearing.
  - ✓ Insufficient latching mechanism.

- **Mitigation actions:**
  - ✓ New design provides machined hinge parts with reinforced flanges and the installation of an extended bolt.
  - ✓ Improve the panel drainage to decrease the water accumulation which could lead to ice formation
  - ✓ New design to improve the latching mechanism adding a 3rd latch.
  - ✓ Retrofit for in-service aircraft by Service Bulletins. **(RECOMMENDED)**

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PDA in Air to Air Refueling Operation

- New criteria was taken into account during the risk assessment
- New potential unsafe condition was identified during AAR.
- The consequences of this detachment may have an effect on the receiver aircraft during AAR boom operations, and remotely in hose ones.

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PDA AAR Additional Mitigation Actions

- **AOT to define the instructions to be followed by the operators:**
  - Implement SB within a lower time frame than the one defined for the civil fleet.
  - Perform inspections of the water panel until the SB is accomplished on the aircraft.

- **Airworthiness Directive Recommendation Letter (ARL) was published by Military Spanish Airworthiness Authority (INTA) to confirm this AOT and stablish the operational limitations.**

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Aviation Safety goes beyond Airworthiness

Safety Data is more than occurrences:

- **Similar designs can get benefit of product safety enhancement.**
- **Learning lessons can apply to different designs.**
- **Safety Recommendations raised during an investigation can apply commercial and military aircrafts.**
- **Safety Recommendations from investigation boards can impact different products.**
- **Major corporate safety decisions an implementation means must be shared.**

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