



EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

| 10TH ANNIVERSARY |

Reason for an AD

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Definition of the Reason

- The 'Reason' section of an AD contains descriptive text concerning the unsafe condition, justifying the issuance of the AD.
- If an AD can be compared with a mathematical problem, then the 'Reason' section describes the 'hypothesis' of the problem in some detail, and refers to existing instructions how (like a calculus methodology) the reader ('student') can solve problem and what the final result should be.



Reason structure in an AD

- The Reason section practically opens the window of AD understanding - therefore it must be:
 - Clear and concise
 - Unambiguous – no room for misinterpretation
 - Balanced in all necessary descriptive data



Summary of the Reason

- 1.** Description of the precipitating occurrence
- 2.** Results of technical investigation performed by the DA Holder
- 3.** Ultimate consequence related to the unsafe condition
- 4.** What the DA Holder has done to address the unsafe condition
- 5.** What this AD requires, phrase like: "For the reasons described above, this AD requires ..."

1. Description of the precipitating occurrence:

- ▶ How the problem was detected, e.g. through service reports, testing, analysis etc.

Examples

- ▶ Contains factual generic data related to what triggered (i.e. justifies) the AD action: e.g. an operational incident, finding deficiencies during maintenance, or engineering analysis results.

2. Results of technical investigation performed by the DA Holder usually:

- Contains suspected or known causes of the problem, e.g. stress, corrosion, fatigue (design related causes) or quality control problems (manufacturing / maintenance non-conformity related causes)

Examples

3. Ultimate consequence related to the unsafe condition:

- Refers to a description of how the problem could affect the overall airworthiness of the aircraft, clearly describing the ultimate consequences if the unsafe condition remains uncorrected
- This part of the paragraph is already known as starting with the phrase: "This condition if not (detected and) corrected could lead to ..."

Examples



Multitude of unsafe conditions

- There are a multitude of unsafe conditions:
 - Landing
 - Flight Controls
 - Fuel Fires
 - Fires
 - False Smoke Alarm
 - Electrical
 - Fatigue cracking
 - Part separation
 - Thrust reverser
 - Strut / Engines



Detect and correct" vs "prevent"

If the intent is to:	AD requires:
"detect and correct"	Inspection + Corrective action
"prevent"	Modification only
"detect, correct and prevent"	Inspection + Required Modification
"detect and correct"	Inspection + Optional Modification
Change "detect and correct" into "prevent" in the supersedure	Inspection + Optional Modification, later superseded by Inspection + Required Mod

4. What the DA Holder has done to address the unsafe condition:

- The TC Holder is currently developing a modification that will address the unsafe condition identified in this AD. Once this modification is developed, approved, and available, further mandatory actions might be considered.

Examples

- Corrective actions through implementation as described into an SB usually for the “in service” aeroplanes or by introducing a new MOD for the “production” aeroplanes.

5. What this AD requires, phrase like: "For the reasons described above, this AD requires"

- This is the last part of the Reason that practically summarises what is intended by applying this AD to address the unsafe condition

Examples

- The summary of this portion of the Reason doesn't contain ALL the mandatory requirements and actions but a run-down of the actions aimed to be mandated by the AD (sometimes it does only refer to an interim solution which is a preamble of the final solution)
- Sometimes the root cause of the unsafe condition is not known, therefore EASA prevents an "occurrence" by issuance of an AD until the clarification of the situation.



Additional examples

- Non-Compliance with applicable Airworthiness Requirements
 - Sometimes an unsafe condition exists because a part or a product does not meet the required criteria of the applicable airworthiness requirements. This resides mostly in manufacturing or production line of parts.
Example (Airbus AD)
- Similar Condition exists on other Types/Models
 - In this particular cases it should be mentioned through a simple sentence the similarity between the types and/or models.
Example (Boeing 737 and Fokker F28)



Additional examples

- ADs preventing operations beyond product's life limit unless additional actions are accomplished;
 - Extended Service Goal type of AD's
- Differences between Airworthiness Directive is a correction/revision/supersedure to a previous AD, it is necessary to state the reason for this correction/revision/supersedure



Reason “components” of an AD

Reason:

① During a fatigue cycling test on the hydraulic power (HP) accumulator, a failure occurred in an unusual, sudden rupture mode. The HP accumulator developed a fatigue crack on the full circumference (360°) starting at the electron beam (EB) weld root.

② The result of the subsequent investigation revealed that a change occurred in the HP accumulator manufacturing process in May 2009, which led to narrower accumulator weld width. The accumulator manufacturer (XYZ) introduced a new inspection procedure to prevent delivery of HP accumulators with narrowed weld width. However, for some parts with part number (P/N) 299000-1, manufactured since 2009, the original cyclic life can no longer be supported.

③ This condition, if not corrected, could lead to accumulator burst and consequent fuselage structure damage, possibly resulting in decompression of the aeroplane and injury to occupants.

④ To address this unsafe condition, XYZ issued a Service Bulletin (SB) XYZ-29-8018 to provide instruction for replacement of affected HP accumulator.

⑤ For the reasons described above, this AD requires the replacement of the affected HP accumulator before the compliance time as identified by this AD.



Precipitating event

Reason:	During <u>fatigue tests (EF3)</u> on an A-XYZ-YXZ aeroplane, multiple damage was found in the upper side shell structure at skin and frame (FR) 84 and 85 interface, from stringer 6 to 15 Left-Hand (LH) and Right Hand (RH). This damage occurred between 58 341 and 72 891 simulated flight cycles (FC).
Reason:	Wing <u>fatigue tests</u> carried out by XYZ revealed cracks on the vertical web of the rear spar between Ribs 1 and 2. Similar cracks in the same area were reportedly found by XYZ aeroplane operators. In all cases, the cracks ran from the tip of the build slot to the nearest adjacent bolt hole.
Reason:	TC Holder has received <u>reports of in-service failure</u> of the Main Landing Gear (MLG) shock absorber lower attachment pin. Investigation results have shown that these pin failures were due to corrosion.
Reason:	<u>Reports</u> have been received that rivets with insufficient shear (about 50% shear allowable) were delivered from the supplier to the TC Holder. Investigations revealed that the faulty rivets were already installed in various airframes and spare parts during the production process.

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Results of technical investigation

Reason:	<p>Some Trimmable Horizontal Stabilizer Actuators (THSA), Part Number (P/N) XY have been found with corrosion, affecting the ballscrew lower splines between the tie bar and the screw-jack.</p> <p>The results of the technical investigations have identified that the corrosion was caused by a combination of:</p> <ul style="list-style-type: none">- <u>Contact/friction</u> between the tie bar and the inner surface of the ballscrew ...- <u>Humidity ingress</u> initiating surface oxidation ..., and- <u>Water retention</u> in THSA lower part leading to corrosion ...
Reason:	<p>During flight controls rigging after helicopter maintenance, a failure due to <u>corrosion</u> was reportedly found on one of the two turnbuckles installed on the yaw flight control cables of the tail rotor.</p>
Reason:	<p>Structural <u>fatigue</u> testing of the XYZ aeroplane carried out for an extension of the Major Structural Inspection (MSI) interval has shown that the <u>fatigue strength</u> of the aft main spar in the cabin area does not ensure unlimited lifetime.</p>

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Ultimate consequence

Reason:	<p>... Wings – (MLG) Support Rib 5 Fitting – Inspection / Modification</p> <p><u>This condition, if not detected and corrected</u>, could affect the structural integrity of the aeroplane.</p>
Reason:	<p>... during XYZ Final Assembly Line flight tests, Angle of Attack (AoA) data from two different aeroplanes was found inaccurate ...</p> <p><u>This condition, if not corrected</u>, could lead to erroneous AoA information and consequent delayed activation or non-activation of the AoA protection systems which, if during flight at a high angle of attack, could result in reduced control of the aeroplane.</p>
Reason:	<p>... during overhaul of a XYX engine, it has been discovered that installation of an air guide tube had been omitted during the build of the engine,</p> <p><u>This condition, if not detected and corrected</u>, could lead to failure of the central oil tube and oil leakage into the LPT, possibly resulting in uncontained LPT failure and consequent damage to, and reduced control of the aeroplane.</p>

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Non-Compliance with applicable AW Requirements

Reason:	<p>During a fatigue cycling test on the hydraulic power (HP) accumulator, a failure occurred in an unusual, sudden rupture mode. The HP accumulator developed a fatigue crack on the full circumference (360°) starting at the electron beam (EB) weld root.</p> <p>The result of the subsequent investigation revealed that <u>a change occurred</u> in the HP accumulator <u>manufacturing process</u> in May 2009, which led to narrower accumulator weld width. The accumulator manufacturer introduced a new inspection procedure to prevent delivery of HP accumulators with narrowed weld width. However, for some parts with part number (P/N) 299000-1, manufactured since 2009, the original cyclic life can no longer be supported.</p> <p>This condition, if not corrected, could lead to accumulator burst and consequent fuselage structure damage, possibly resulting in decompression of the aeroplane and injury to occupants.</p>
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Similar conditions for different types / models

Reason:	<p>Following an accident with a <u>Boeing 737-800</u> aeroplane on final approach, the investigating body determined that an important contributing factor to the accident was an erroneous reading of -7 to -8 feet from the left Radio Altimeter (RA) ...</p> <p><u>Fokker Services</u> conducted an evaluation of the effects of unflagged erroneous low RA system indications in response to the recommendations in the investigator's report. The result of the evaluation was a new "ERRONEOUS RADIO ALTIMETER INDICATION" abnormal procedure in the Airplane Flight Manual (AFM) ...</p> <p>In order to prevent an unsafe condition, <u>similar to</u> the one that contributed to the accident described above, this AD requires incorporation of the new abnormal procedure in the AFM and installation of the new yellow RA circuit breaker identification collars.</p>
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TC Holder solution

Reason:	<p>An incident was reported where a XYZ aeroplane experienced an un-commanded rudder input and yaw after landing gear retraction, followed by restricted rudder travel ...</p> <p>Prompted by this event, XYZ Industries issued Mandatory Service Bulletin (MSB) 42-099 / MSB 42NG-035, including Work Instruction (WI) WI-MSB-42-099 / WI-MSB 42NG-035 providing instructions to identify and modify the affected NLG actuators, which includes installation of a new rod end bearing and safety washer.</p>
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Reason:	<p>Occurrences were reported of finding an electrical shorting of main cable loom behind the left-hand (LH) instrument panel of some Grob G115E aeroplanes ...</p> <p>To address this potential unsafe condition, XYZ Aircraft published Mandatory Service Bulletin (MSB) MSB1078-191/1, providing instructions to inspect and correct the cable routing behind the cockpit instrument panel.</p>
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Summary of what an AD requires

Reason:	<p>During overhaul of a XYZ engine, it has been discovered that installation of an air guide tube had been omitted during the build of the engine ...</p> <p>For the reasons described above, this AD requires a one-time inspection to determine what standard of phonic ring is installed and, depending on findings, corrective action.</p>
Reason:	<p>During fatigue testing of the XYZ body landing gear (BLG), the retraction actuator pin collar failed on several occasions ...</p> <p>For the reasons described above, this AD requires the replacement of the retraction actuator pin collar fitted on both Left Hand (LH) and Right Hand (RH) BLG with a new design retraction actuator pin collar, which restores the aeroplane to a condition that meets the Design Service Goal.</p>
Reason:	<p>An XYZ aeroplane experienced a blockage of all Angle Of Attack (AOA) probes during climb leading to Autopilot (AP) disconnection and activation of the alpha protection when Mach number increased ...</p> <p>For the reasons described above, this AD retains the requirements of EASA AD 2012-XXYY-E which is superseded, and requires installation of AoA probe flat plates, after which the AFM operational procedure must be removed.</p>

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3 This condition, if not corrected, could lead to accumulator burst and consequent fuselage structure damage, possibly resulting in decompression of the aeroplane and injury to occupants.

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