



EASA
European Aviation Safety Agency

Risk Mitigation on **Standard Fasteners** in **Critical Locations**

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- Occurences
- Defects observed
- Analysis and likely root cause for drop in quality
- Mitigating actions requested from regulators side
- Conclusion



Introduction

- Group met to investigate safety risk posed by using simple hardware
 - TCCA, FAA, EASA, Industry experts involved
- Verdict:
 - further action required to address risk associated with **standard fasteners in critical locations**
 - Determine risks and associated corrective actions for in-service product
 - Eliminate unsafe usage in future designs



➤ Standard part

- Manufactured in conformity with an industry or government specification

➤ Critical Application

- Mechanical or structural assembly that includes fasteners whose failure could result in an unsafe condition.
 - Single fastener failure
 - Multiple fastener failure (due to common cause)



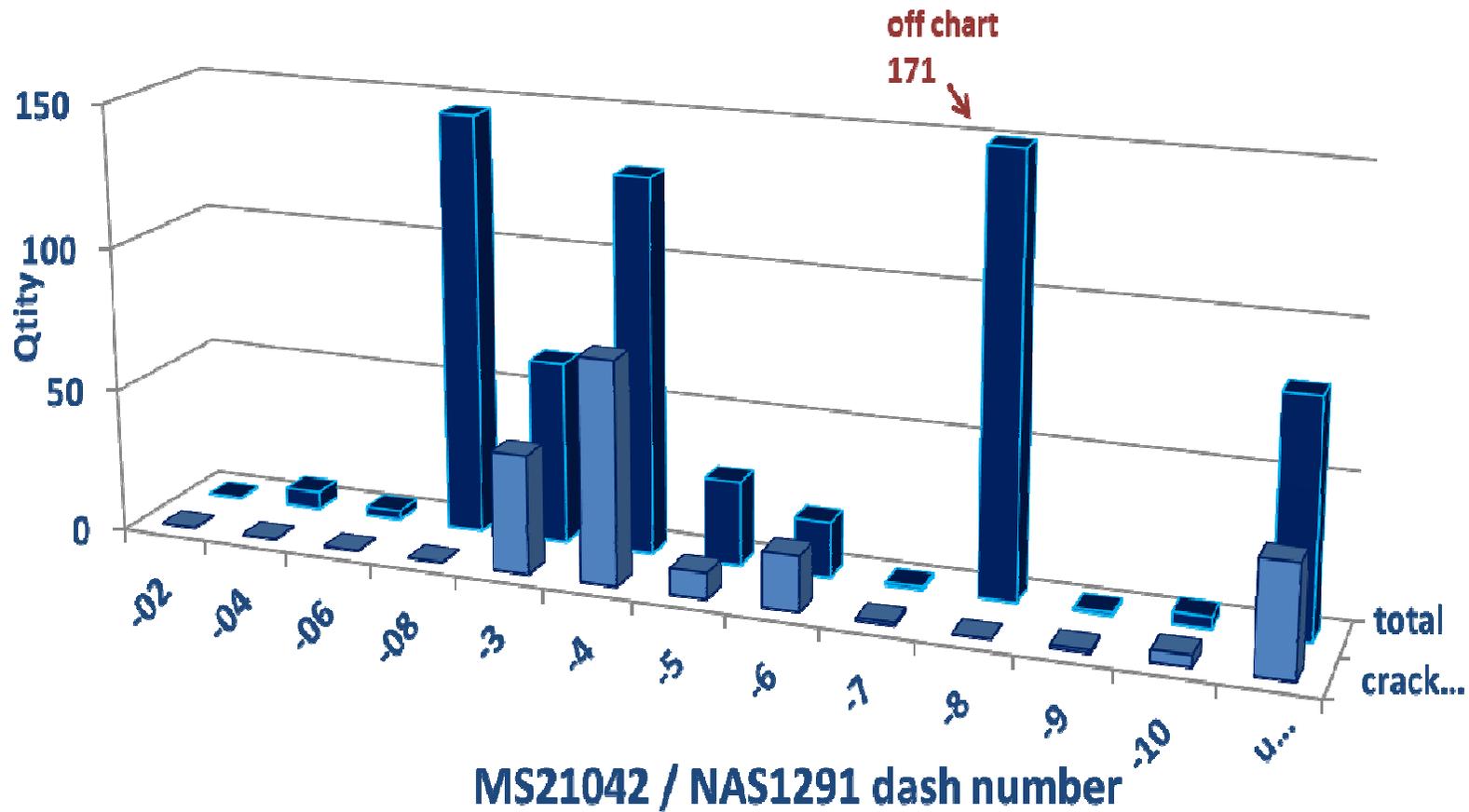
Analysis - classification

updated

	Large Airplane	General Aviation	Rotorcraft	Engine/ Props	ETSO	stock	total
visual		6				557	563
no lock	22	1	2	170			195
cracked	478	159	125	3	3	25	793
multiple	26					16	42
magnetic						20	20
missing	17	3	9				29
total	543	169	136	173	3	618	1642

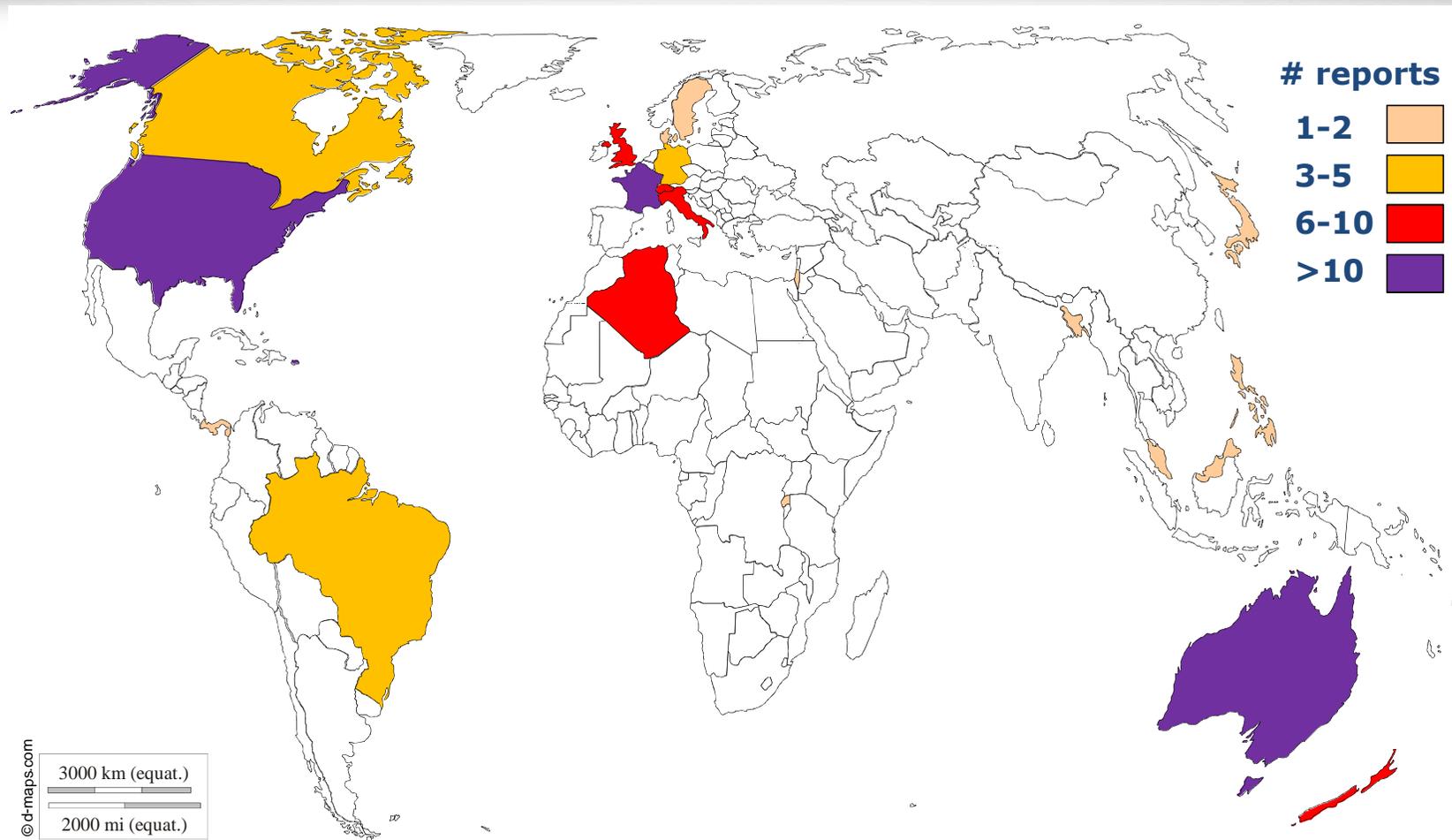


Analysis - sizes



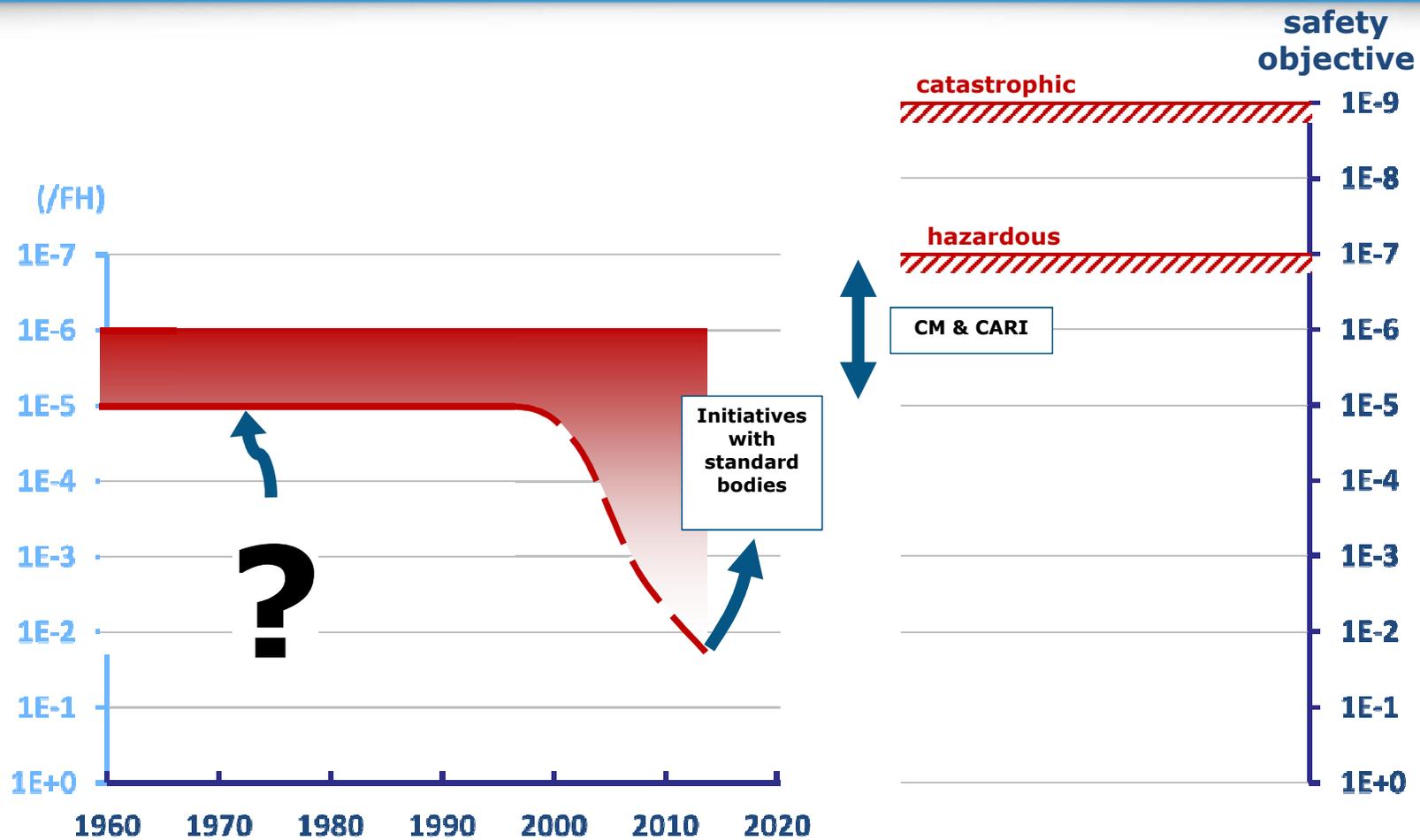


Analysis – origin of reports





Standard parts – in critical installations





Industry Actions requested (TCH, STC-H, Tier1 Supplier)

➤ Quality Assurance

- Supplier qualification, additional inspections
- Bulletins to operators

➤ Design Changes

- MS21042B
- NAS9926
- Replace MS21042 in production
- Replace MS21042 on delivered helicopters



MS21042 / NAS1291 nuts - Airworthiness Directives

➤ Mandatory Corrective actions – ADs

➤ General approach:

- **Inspect** installed hardware for condition (cracks, etc.) until
- **Replace** installed hardware with hardware not vulnerable to cracking (corrosion resistant steel)

EASA: 11

FAA: 7

ISRAEL: 1

TCCA: 1



MS21042 / NAS1291 nuts - Safety Alerts

➤ Corrective actions – non-mandatory

- Test for embrittlement before putting into stock ('torque test')
- Detailed visual inspection before installation
- Inspect installed hardware after installation for security and condition

CASA: AWB 14-002

EASA: SIB 2012-06

FAA: SAIB HQ-14-16

NZ CAA: CAN 14-001

TCCA: CASA-2013-04 and
2017-02



MS21042 / NAS1291 - next steps

- Rotorcraft & Transport Category OEMs are required to:
 - Confirm existing designs are not vulnerable
 - Take corrective action where this is not the case.

EASA: CARI 20-01

TCCA: NAC letter to DAOs

FAA: monitoring



Standard Fasteners – Next Steps

- Assure the safety of new designs by
 - Design review to ensure standard fastener risks are mitigated
 - Ensuring production and maintenance know how to prevent unsafe conditions

EASA:

- Cert. Memo CM-S-003,
- Project-specific Certification Review Items (CRIs)

TCCA: Plan in development – possibly advisory circular

FAA: monitoring



Conclusion/Recommendations

- ▶ Existing designs using MS21042/NAS1291
 - ▶ Review your in-service designs, modifications and repairs for vulnerability
- ▶ New designs, modifications and repairs
 - ▶ Don't use MS21042/NAS1291 where failure adversely affects safety
- ▶ Residual risks
 - ▶ Think about them, talk about them



Conclusion/EASA Reminder

➤ CARI 20/01 (Continued Airworthiness Review Item)

Title: Continued airworthiness of MS21042, NASM21042 and NAS 1291 standard fasteners (nuts) used in critical Installations.

Primary panel: Structures

Secondary panel: Hydromechanical Systems, Powerplant, Transmission

➤ Official EASA letter with CARI attached was send out to all TCH:

26th of September 2018 to the rotorcraft industry with request for comments on the CARI latest 6 month after the receipt of the letter.

=> Due date for sending comments to EASA is the **26th of March 2019!!**

➤ We need your cooperation!



EASA
European Aviation Safety Agency

Thank you for your attention!

Any questions ...



Your safety is our mission.

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Applicability and Intent of the CM

- CM applies to new certification projects and interpretation of the existing requirements in the knowledge of the current quality of standard fasteners.
- Further inform DAHs and applicants for design approvals of the issue.
- Provide guidance to help ensure that appropriate measures are considered for initial certification, including associated continued airworthiness aspects, to
- Minimise the risk that the use of standard fasteners might compromise the intended level of safety.



- EASA and other authorities have issued ADs in response to specific findings
- This approach does not address the much broader risk posed by some standard fasteners and the totality of their current critical applications
- The Agency is strongly considering the use of a CARI to anticipate and control the risk



CARI cont (1)

- In order to reduce the risk of critical locations/assemblies failing through the inadvertent use of defective standard fasteners, the Agency may request that TCHs perform a design review to ensure the risk posed by the continued use of standard parts is mitigated by:
 - Assessing the impact of the threats posed by standard fasteners to the aircraft systems and structures that may not have been foreseen during previous assessments.



CARI cont. (2)

- Creating a list of critical installations where only qualified standard fasteners (nuts and bolts) may be used. Redundancy of fasteners does not negate the need to qualify the fasteners as all the fasteners on a joint could originate from a common defective batch. Required double locking functions on fasteners may also need qualified standard fasteners to ensure the fail safe design philosophy is maintained in certain areas.
- Defining how the standard fastener is qualified wherever necessary.



CARI cont. (3)

- Clearly defining additional conformity checks as part of the design standard and specification requirements for approved suppliers and any other criteria necessary for acceptance and storage of standard fasteners that are appropriate for their use in the design.
- Ensuring through Maintenance Instructions that reuse of qualified and ordinary standard fasteners is controlled and that qualified standard fasteners can only be replaced by other qualified standard fasteners.



CARI cont. (4)

- Ensuring adequate precautions are taken when damaged fasteners are found; defining checks or replacement of adjacent fasteners and any other components that may have been overstressed.
- Considering introducing a part numbering system for qualified standard fasteners, at which point they would become aviation parts controlled under the POA. (Note: If such part numbering is implemented and further part marking is not feasible due to the part's size or for other reasons, other means such as regular appropriate batch controls should be established and documentation provided according to Part 21.A.804(b).)