



# **Update to March Meeting Questions**

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**Continued Operational Safety**

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**FAA Public Meeting**

**Cessna 400 Series Wing Spar Safety Concern**

**Downtown Kansas City Marriott**

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# History of Failed Spar Airplanes

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- Spar Cap Material
- Airplane Usage
- Operational, Maintenance and Incident History

# History of Failed Spar Airplanes



| <b>A/C SN</b> | <b>Flight Hrs<br/>@ failure</b> | <b>Year of<br/>failure</b> | <b>History</b>                                |
|---------------|---------------------------------|----------------------------|---|
| 402-0046      | 8373                            | 1973                       | Engine fire @ 1830 hrs<br>Short hops - Hawaii |
| 402-0295      | 8057                            | 1978                       | Deregistered 1983<br>Grand Canyon tour time   |
| 402A-0043     | 13824                           | 1990                       | Grand Canyon tours since '79                  |
| 402-0101      | 16000                           | 1992                       | Grand Canyon tour time                        |
| 402A-0080     | 13773                           | 1992                       | Grand Canyon tours since '81                  |
| 402-0216      | 9012                            | 1992                       | Deregistered 1995<br>Grand Canyon tour time   |

# Spar Cap Material



## Were the failed spars of defective material?

- L/H & R/H spars machined from same stock extrusion
- All manufactured between 1967 and 1969
- Supplier (Harvey Aluminum) met alloy requirements per QQ-A-200/11 (7075-T6)
  - ▶ Quantitative Chemical Analysis
  - ▶ Tensile Strength
  - ▶ Yield Strength
  - ▶ Elongation
  - ▶ Conductivity
  - ▶ Hardness
- Cessna conducted metallurgical evaluations on 3 spars
  - ▶ 402-0101, A-0080, 402-0046\*
  - ▶ All tests met specification (\*prior to fire)

# Airplane Usage



What was the usage of the failed spar airplanes?

Cessna surveyed owners about usage at time of failure:

| <b>A/C SN</b> | <b>Ave. Flight Length</b> | <b>Ave. Cruise Alt.</b> | <b>Ave. T.O. Weight</b> | <b>Location</b> |
|---------------|---------------------------|-------------------------|-------------------------|-----------------|
| 402-0046      | 22 min.                   | 500-4000 ft.            | 5200 lbs.               | Hawaii          |
| 402-0295      | 64 min.                   | 9000 ft.                | 6000 lbs.               | Grand Canyon    |
| 402A-0043     | 132 min.                  | 7000 ft.                | 6100 lbs.               | Grand Canyon    |
| 402-0101      | 132 min.                  | 7000 ft.                | 6100 lbs.               | Grand Canyon    |
| 402A-0080     | 132 min.                  | 7000 ft.                | 6100 lbs.               | Grand Canyon    |
| 402-0216      | 132 min.                  | 7000 ft.                | 6100 lbs.               | Grand Canyon    |

# Operational, Maintenance and Incident History



What was the maintenance & incident history of the failed spar airplanes?

| A/C SN    | History   |
|-----------|---|
| 402-0046  | <p>One owner, R/H wing fire @1830 hrs. Cracked spar due to fatigue of reduced strength mat'l. Cracked WS75 side brace rib found. No other wing damage found from Cessna teardown.</p> <p>L/H MLG collapse @2476 hrs. – L/H wing tip damage. Wheels up landing @ 5874. – minor fuse. damage.</p> <p>Good inspection, corrosion programs.</p> |
| 402-0295  | Deregistered 1983. No maintenance or owner history available.   |
| 402A-0043 | Multiple owners, Grand Canyon '79-'90. No repairs/alterations to wings.   |
| 402-0101  | No maintenance or owner history available.  |
| 402A-0080 | Multiple owners, Grand Canyon '81-'92. No repairs/alterations to wings.   |
| 402-0216  | Deregistered 1995. No maintenance or owner history available.   |

# Wing Spar Test History

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## What testing indicates a wing spar problem?

- Cessna 1974 fatigue test results:
  - ▶ Blocked twin general usage spectrum
  - ▶ Failure 14,000 hrs at SW 66.7
  - ▶ Repaired local area, continued testing
  - ▶ Three other spar cap cracks during 63,000 hrs
  - ▶ Spar cap material properties within spec.

# Individual Airplane Usage

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Can I get “credit” for flying my airplane less severely than that used for these evaluations?

- Evaluations based on industry standard practice engineering assumptions regarding fleet usage
  - ▶ Necessarily conservative to cover fleet usage
  - ▶ Total history of usage must be determined
  - ▶ Fleet surveys indicate many A/C fly severe environment
- If total A/C usage history can be documented, FAA will consider AMOC

# Wing Strength with Strap

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If I do the strap mod, why do I have to inspect the spar and replace it if it's cracked?

- Valid point; this issue needs further study
  - ▶ Cessna mod kit requires inspections and replacement if cracked
  - ▶ FAA will consider documented alternatives
  - ▶ Any alternative must demonstrate static and fatigue strength capability with spar cracked

# FAA Conclusions

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- FAA has determined that an unsafe condition exists
- FAA must act to eliminate the unsafe condition
- Cessna modification addresses the condition
- FAA is evaluating alternative solutions