



ADs 90-08-04 / 95-04-03
MSBs 53-2269 / 2360

Carry-Thru Spar Web Cracks
**American Bonanza Society/
ABS Air Safety Foundation**



Mandatory Service Bulletins

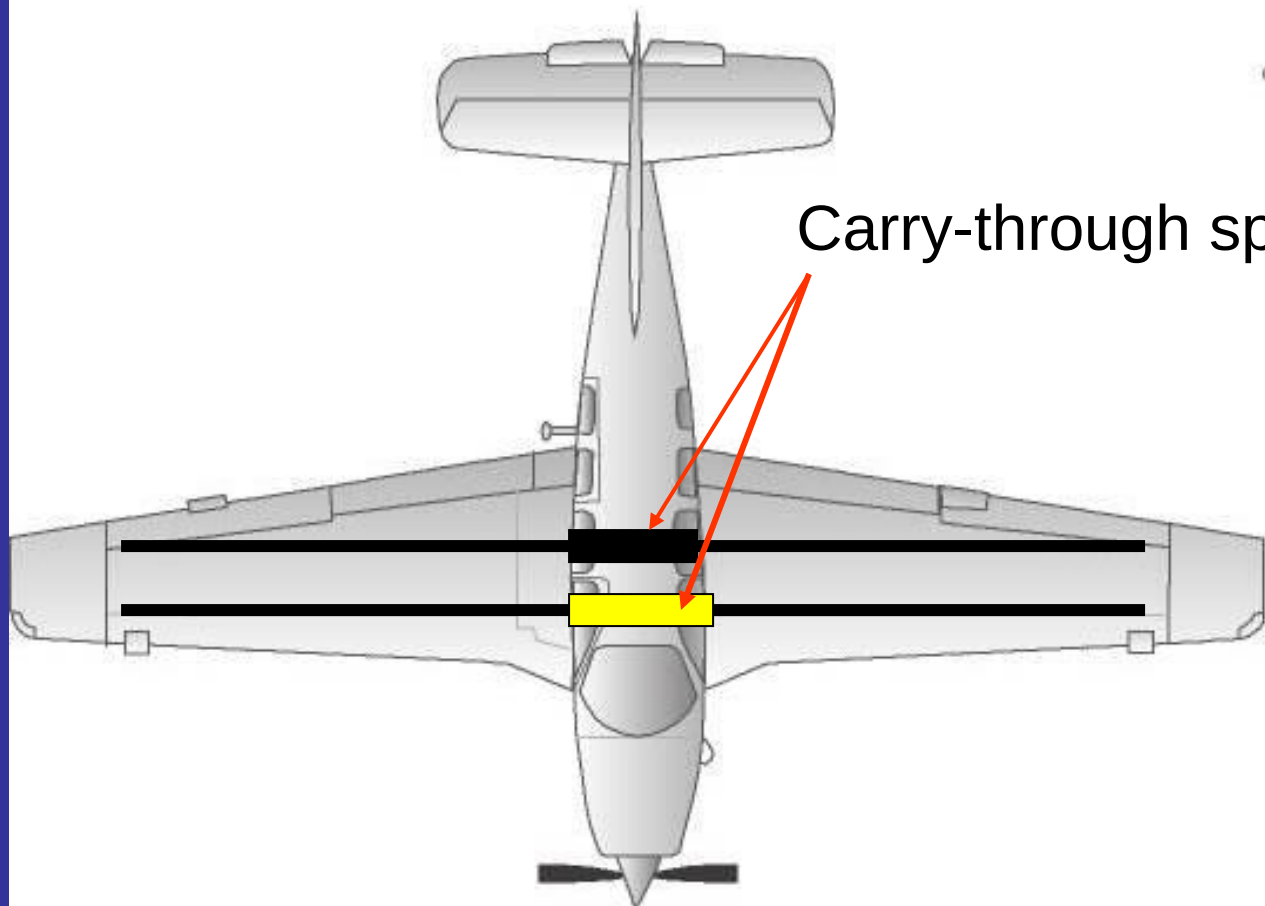
- MSB 2269 issued August 1989
 - Barons (except 58P and 58TC)
 - Travel Airs
- MSB 2360 issued November 1990
 - Bonanzas H35 and later
 - All Model 33 Debonairs/Bonanzas
 - All Model 36 Bonanzas



Airworthiness Directives

- AD 90-08-14
 - Incorporates MSB 2269 (multiengine)
- AD 95-04-03
 - Incorporates MSB 2360 (single engine)

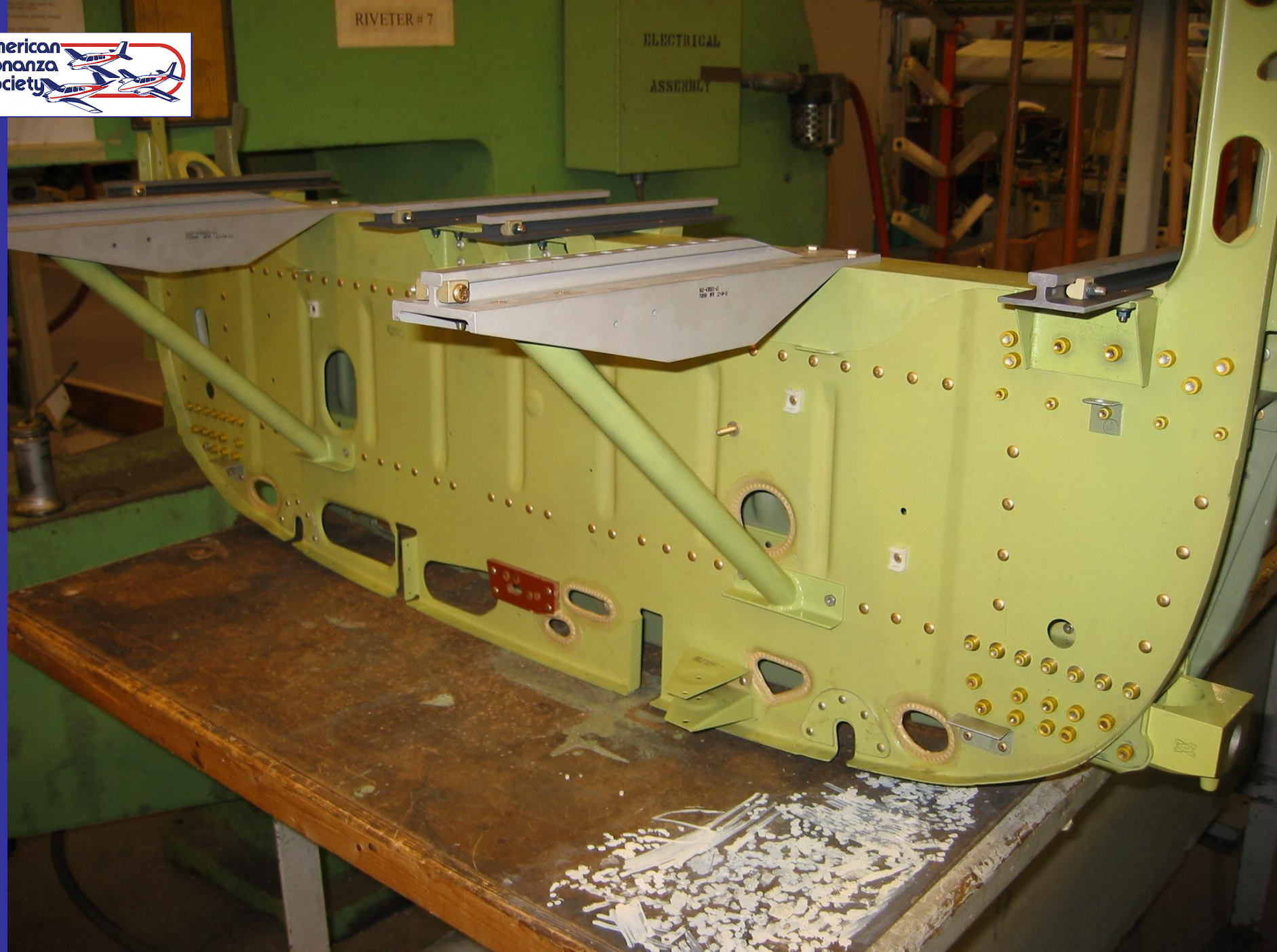
To date there have been NO reports of aircraft mishap or in-flight failure resulting from cracks in wing carry-through spar web structure.



Carry-through spars

RIVETER #7

ELECTRICAL
ASSEMBLY



Tie Plates

- Carry loads between ends of carry-thru in Huck bolt area
- Potential damage to tie plates and internal C-channels make stop drilling hazardous in this area
- ABS' contract engineers feel there are techniques to get around this problem

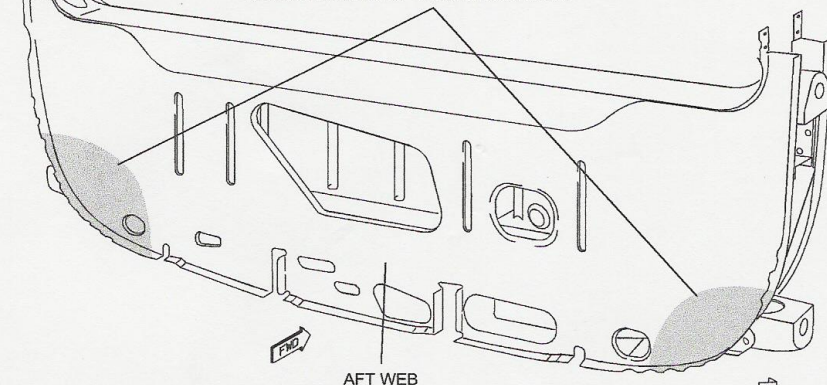


Tie Plates

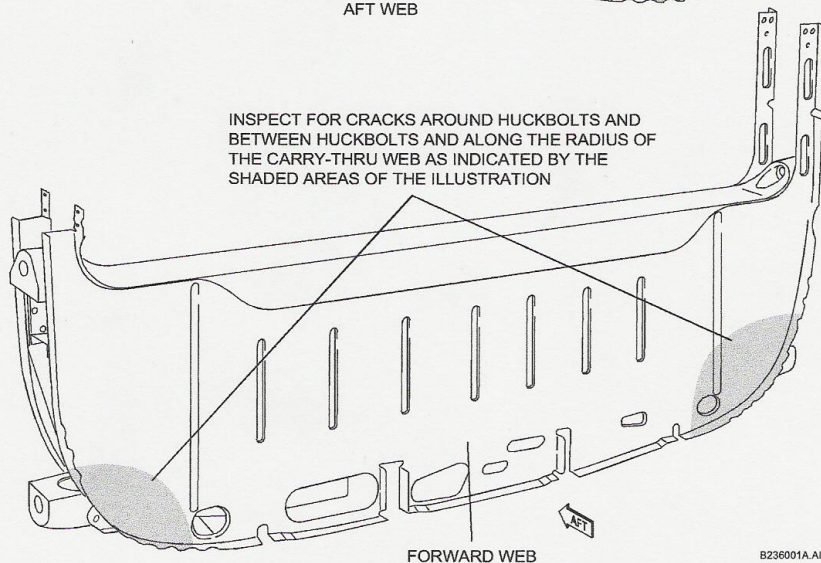
- Tie plates may carry the load
- Lower material may not carry carry-thru loads
- Tie plates differ in different models
- Need to further investigate the design

Current AD Inspection

INSPECT FOR CRACKS AROUND HUCKBOLTS AND BETWEEN HUCKBOLTS AND ALONG THE RADIUS OF THE CARRY-THRU WEB AS INDICATED BY THE SHADED AREAS OF THE ILLUSTRATION



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B236001A.AI

Inspection for Cracks in the Wing Forward Spar Carry-Thru Structure Forward and Aft Frames

- Initial inspection @1500TT
- No cracks: every 500 hours thereafter

Current AD Inspection (continued)

If cracks in web near/through huck bolts:

- <1.0 inch:
 - reinspect at annual/every 200 hours
- >1.0 inch or connecting two huck bolt holes or cracks on forward and aft side of web on same side of aircraft:
 - Install Beech doubler repair kit

Cannot stop drill through web: damage beneath



Current AD Inspection (continued)

Cracks in the flange radius:

- <2.25 inch:
 - Stop drill crack
 - Reinspect every 200 hours thereafter
- 2.25 – 4.0 inch
 - Install Beech doubler repair kit within 100 hours
- >4.0 inch
 - Install Beech doubler repair kit prior to flight

Doubler Installation





RAC Communiqué 103

Issued October 2003:

- “The FAA no longer allows aircraft operation with known cracks....”
- RAC “is in the process of revising both service bulletins to remove any reference to continued flight with cracks in the spar web. The revised service bulletins...will require repair of any crack found during inspection of the spar web regardless of size.”



MSB Revisions June 2004

- “At the request of the FAA....”
- Eliminates option of continued flight with identified spar web cracks (and accelerated inspections)
- Not “mandatory,” but may be required under Part 135 and for some foreign-registered airplanes

ABS Comparison sheet

ABS Investigation

- Initial contact with FAA and RAC to confirm moving toward “no cracks” in “primary load-bearing structure”
- January 2004: Dick Wilson calls ABS with opposing view
- Engineering study grew from an independent “peer review” of Wilson

Engineering Reports

Probable cause of spar web cracking

- Low-intensity, frequently repeated loads from normal operation
- Primarily driven by nose gear loads during landing and ground handling
- Longitudinal stresses directed around the fuselage skin wing spar cutouts



Cracks

J
Stringer

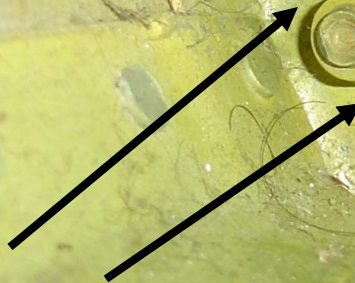
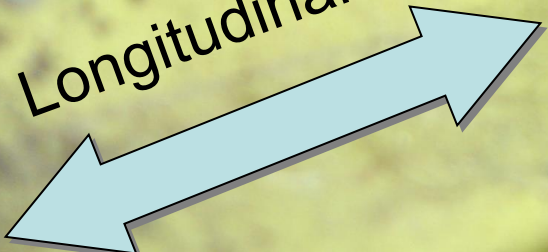
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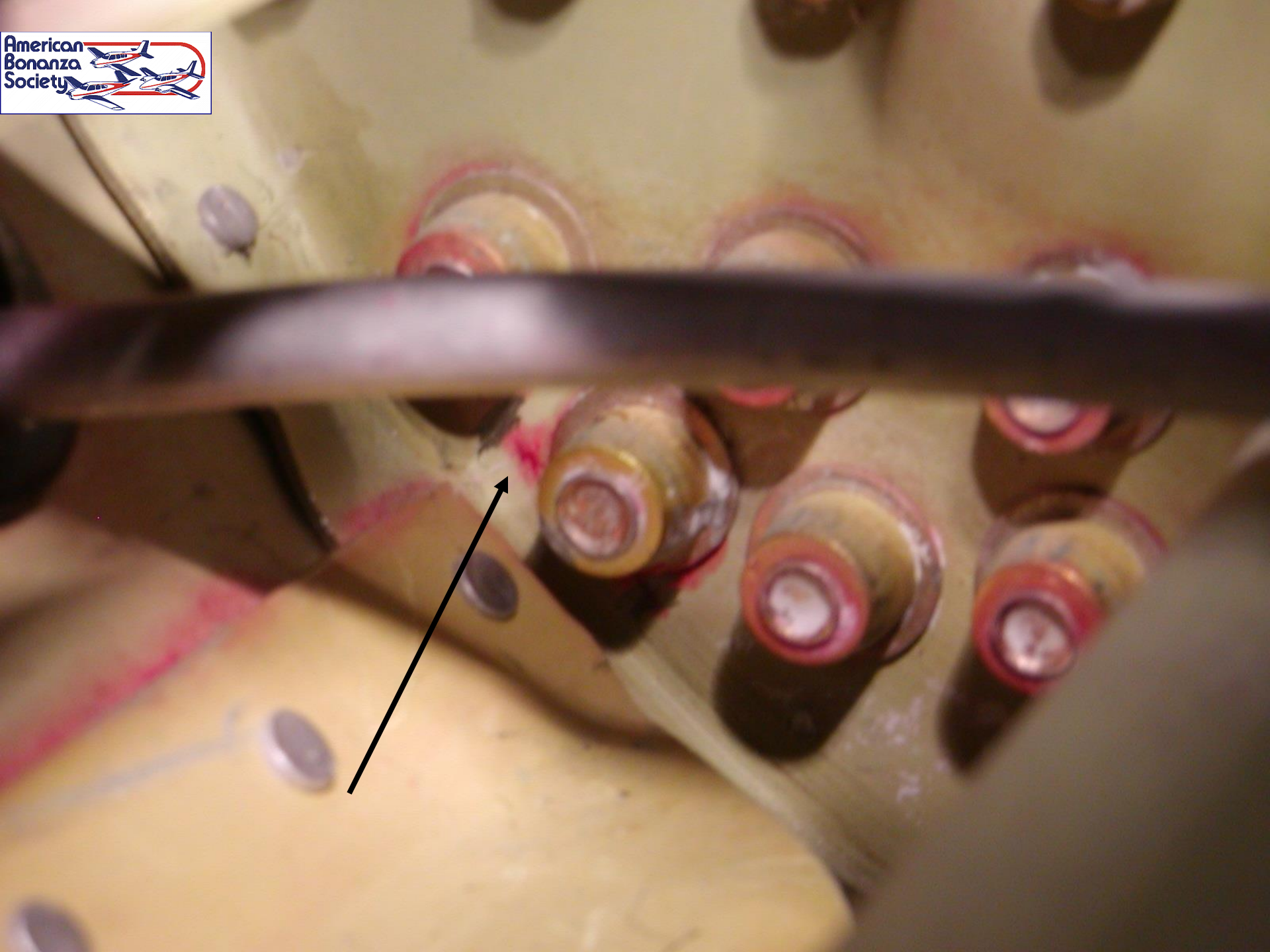
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View of Right hand, forward face

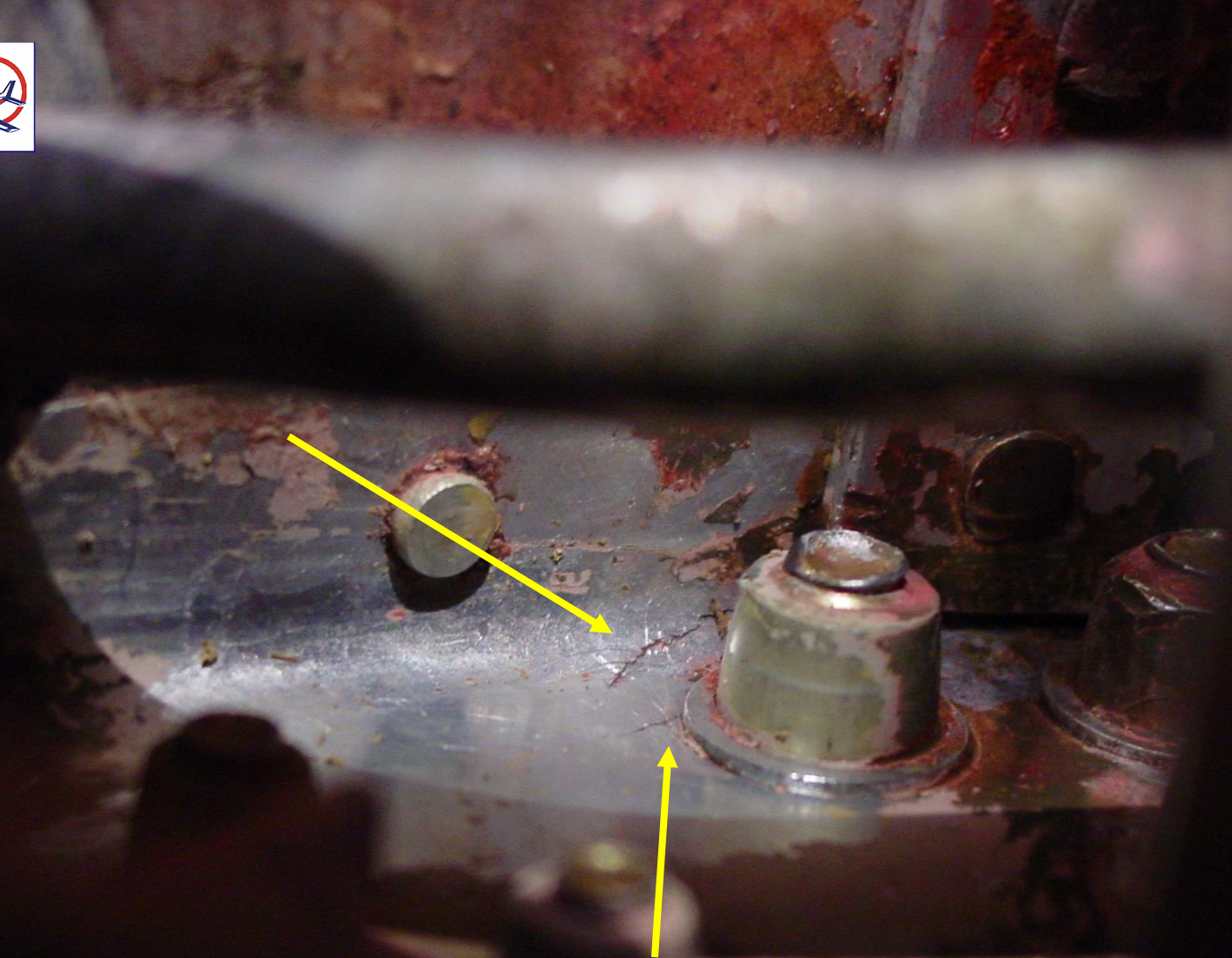


Longitudinal flexing









Engineering Reports *(continued)*

Probable cause of spar web cracking

- Initial Huck bolt-area cracks allow flexing that develops to bend radius cracks
- The engineers “doubt the validity” of Wilson’s work and “cannot agree with his conclusion that the cracking will not potentially cause safety problems.”



Engineering Reports *(continued)*

Current MSB effectiveness

- Kit repairs cracks locally but does “very little for the fore and aft loads that are the cause of cracks seen to date.”
- Kit increases stiffness and therefore increases web stresses
- Kit in conjunction with “a robust external doubler to the fuselage skin should cause no harm.”



Engineering Reports *(continued)*

Engineers' recommendations

- It is vital to obtain all available information
- A Finite Element Analysis is “essential to...validate any proposed repair....”



Other ABS Actions

- Regular FAA and Raytheon contacts
- Airworthiness Concern Sheet, September 2004
- AOPA meeting November 4, 2004
- GAMI meeting November 8, 2004
- National Institute for Aviation Research
- T-34, Twin Cessna, Twin Beech, T-6 issues



ABS Member Survey

- 1770 responses
 - 32% of ABS members with affected airplanes
 - estimated ~14% of remaining affected fleet
- 110 aircraft (5.9%) MSB-defined crack
- 52 aircraft (2.9%) require doubler under existing rules
- 60 aircraft (3.3%) cracked but do not currently require doubler



ABS Member Survey *(continued)*

H35 – K35	0 reports
M35 – P35	1 report
S35 – V35B	15 reports
33 (IO-470)	4 reports
33A/C	7 reports
36	32 reports



ABS Member Survey *(continued)*

Travel Air	1 report
55/56TC	29 reports
58	14 reports



ABS Member Survey *(continued)*

- Best information is that this limited response is indicative of fleet as a whole
- Still does not account for RAC's report it has sold 2000 spar repair kits
- Post-AD airplanes
- Information on cracks that have propagated into upper web

ABS Position

Given that:

- Beechcraft spar web cracking has been a “known problem” for well over a decade;
- In that time there has been no aircraft failure or mishap attributed to spar web cracking;
- Current AD procedures have prevented mishaps



ABS Position *(continued)*

ABS therefore requests that:

- Current Airworthiness Directive procedures should not be revised until such time as additional, detailed analysis determines the true nature of stresses and spar web crack development;

Aging Aircraft



Safety by Retirement (SBR)

From FAA T-34 Public Meeting slide, February 2005

- “Run and retire”
- Pre-emptive replacement/modification at an established time regardless of condition
- Typical approach for small airplanes, rotorcraft and engines
- Success depends on retiring/modifying all parts early enough to address even those of lower fatigue quality

Safety by Retirement (SBR)

From FAA T-34 Public Meeting slide, February 2005

- Vast majority of parts will be retired/modified with life remaining
- May be used whether or not cracks are detectable before they become critical

Aging Aircraft

