



## Service Bulletin

### BALANCE WEIGHT RECEPTACLE INSPECTION

**REASON:** Company testing has revealed the potential for the development of delaminations in the spar laminate of Van Horn Aviation 20633000-101 main rotor blades, serial numbers A012 through A104.

The 20633000-101 main rotor blade is a carbon composite sandwich structure with a foam core. A weight receptacle made from high pressure laminated glass fiber (GEE-F) contains a lump mass for added inertia and a pocket for adjustable span balance weights. The receptacle locally replaces the foam core near the tip of the blade and is sandwiched between the upper and lower spar laminates. In the area of the weight receptacle, the spar laminate consists of (14x) uni-directional carbon fiber plies. The (8x) outermost plies are oriented at 0° (along the length of the blade) and the (6x) innermost plies which interface to the receptacle are oriented at 90° (perpendicular to the length of the blade). A layer of epoxy film adhesive is used between the weight receptacle and the 90° plies to create a strong, structural bond.

The weight of the receptacle, lump mass, and balance weights in conjunction with the high rotational speed near the tip results in a large centrifugal force (CF) acting on the weight receptacle. This centrifugal force acts radially outward from the center of the hub and is reacted by the spar laminate via the film adhesive bond. This load is therefore acting perpendicular to the fiber direction of the 90° plies. The material is much weaker in this direction which causes the fibers to be pulled apart, resulting in a crack along the inboard edge of the weight receptacle. This crack extends through the thickness of the 90° plies (ref. Figure 1) until it reaches the interface to the 0° plies. Because of their orientation, the fibers in the 0° plies are aligned with the centrifugal load, making them much stronger and so they do not fail. Instead, the crack turns 90° and propagates outboard as a delamination between the 0° and 90° plies.

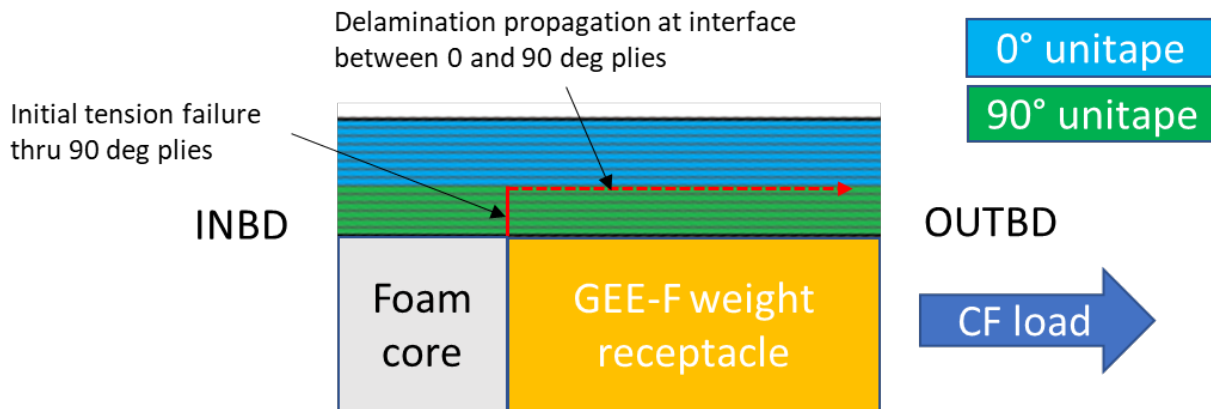


Figure 1 - Cross-Sectional Schematic of Failure and Damage progression (looking from TE toward LE)

Company testing has confirmed that the 90° plies fail in spanwise tension (normal to the fiber direction) at the inboard end of the weight receptacle near rotor blade station 186.0. A delamination then propagates outboard from rotor blade station 186.0 at the interface between the 0° and 90° plies (ref. Figure 3). Fatigue testing has shown that the delamination initiates almost immediately and progresses



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quasi-statically to a length of approximately 1-2 inches. Thereafter, the delamination grows more slowly in a stable, predictable manner and is readily detectable by conventional tap testing techniques. The delamination develops first on the lower (flat) surface and grows outboard from the inboard end of the weight receptacle and forward of the balance weight pocket (ref. Figure 2). After significant growth of the delamination on the lower surface (approximately 4 to 6 inches), a similar delamination becomes detectable growing from the inboard edge of the weight receptacle on the upper (curved) surface of the blade. Both delaminations continue to grow until they reach 8 to 10 inches in length, at which point static overload occurs and the receptacle would be expected to depart the blade.

Serial numbers A105 and subsequent incorporated design changes which eliminate this failure mode and therefore do not require inspection.

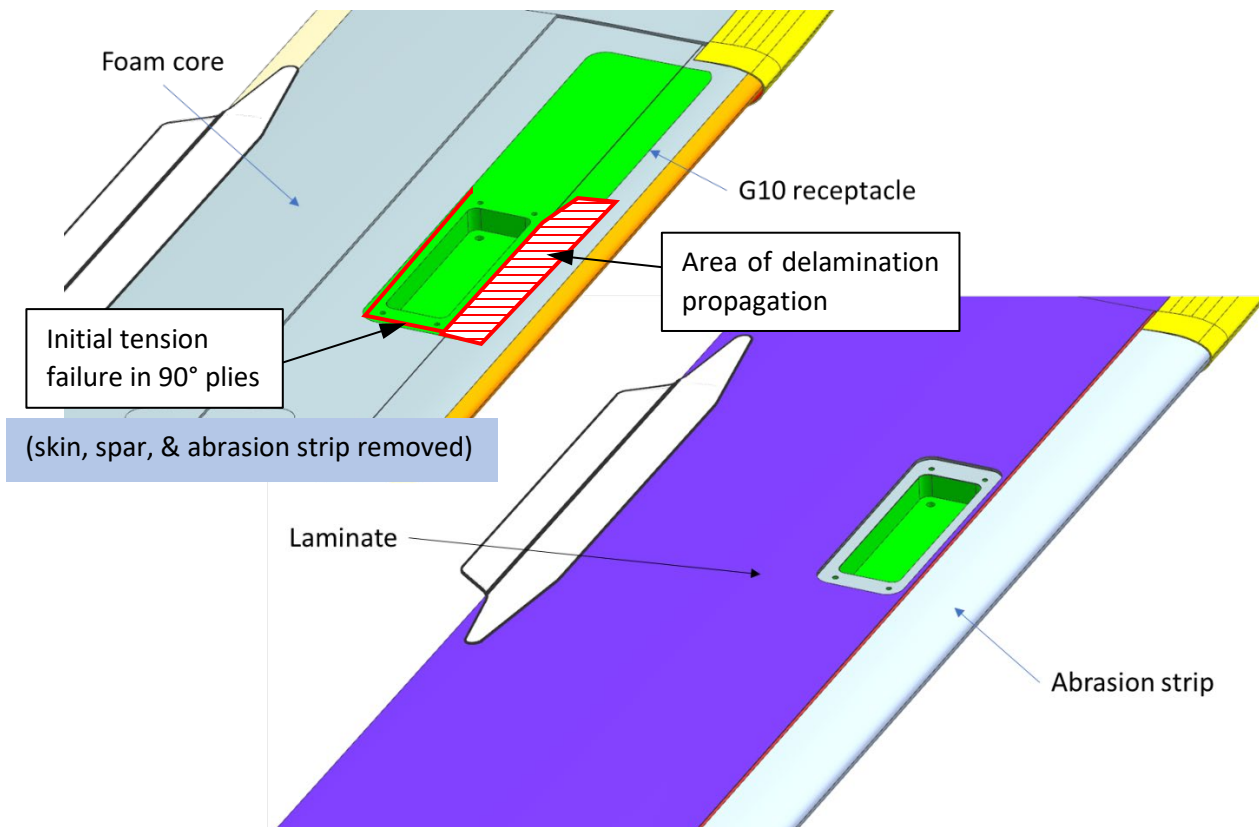


Figure 2 - Location of the Delamination on the Lower Surface and Internal Structure



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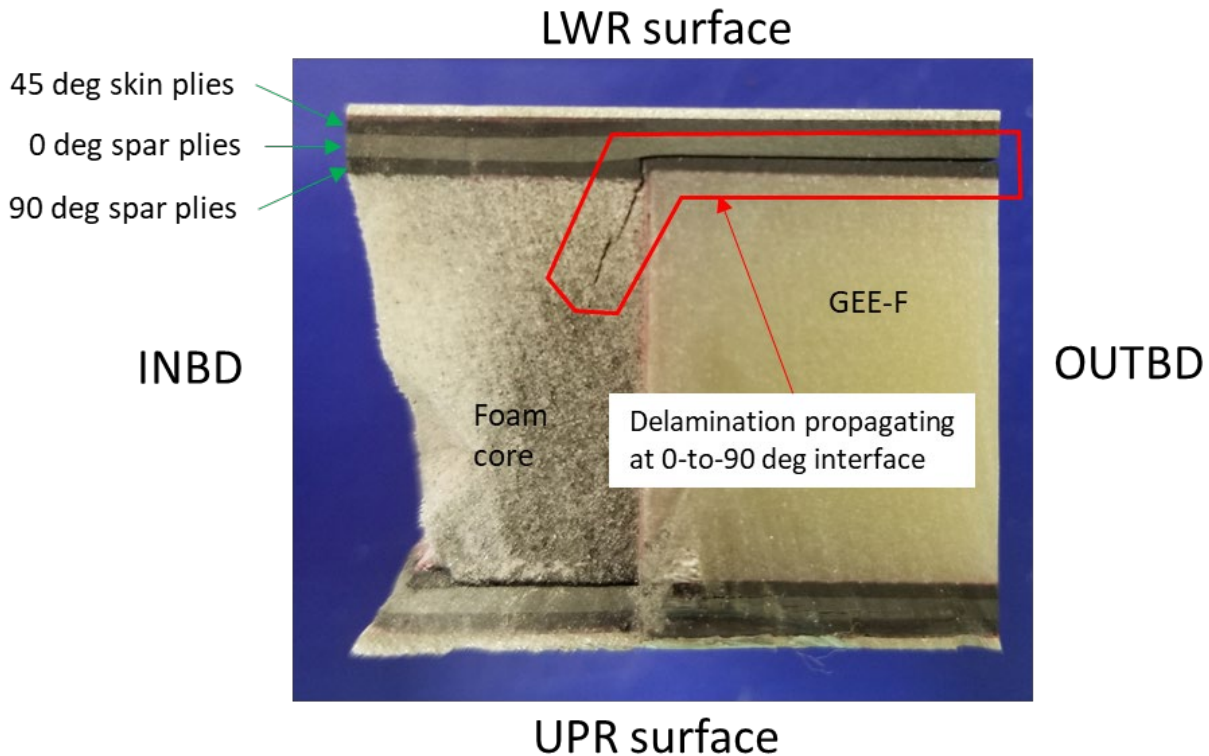


Figure 3 - Test Specimen Cross-Section Showing Damage Progression

**SAFETY INTENT:** The safety intent of this service bulletin is to prevent departure of the balance weight receptacle from 20633000-101 main rotor blades assemblies, which would result in excessive vibration and likely loss of control. This will be accomplished through periodic visual and tap inspections of the area around the weight receptacle to monitor the growth of the delamination, and if necessary, retirement of the blade(s) when damage exceeds safe limits.

**PART NUMBERS AND SERIAL NUMBERS AFFECTED:** 20633000-101 blade assemblies (FAA STC No: SR 02684LA, Transport Canada STC SH18-69, Brazil ANAC Supplemental Type Certificate STC 2018S11-11, India Validation DGCA-27014/36/2020-AED, Indonesia Validation SR029) with serial numbers A012 through A104.

**HELICOPTER MODELS AFFECTED:** Bell Helicopters, Inc. Models 206L, 206L-1, 206L-3, 206L-4.

**TIME OF COMPLIANCE:** A visual and tap test inspection shall be conducted in the area of the weight pocket as described below upon reaching 400 flight hours or 2,400 engine starts, whichever occurs first, since new blades were installed on the aircraft. If the time accrued on the blades has already surpassed those intervals, then upon notification of the service bulletin, a visual and tap test inspection of the weight pocket area shall be conducted at the next 100 hour inspection interval. Perform subsequent tap



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inspections at intervals of 2,400 engine start cycles or 400 flight hours, whichever comes first. Document the size and location of the delaminated area along with the number of flight hours and/or engine starts since new blades were installed and report findings to Van Horn Aviation.

**MANPOWER:** Compliance with this bulletin on a single main rotor blade assembly will require approximately 0.5 man-hours. The man-hour estimate is based on the skill level of an experienced mechanic using a tap inspection hammer.

**WARRANTY POLICY:** None

**WEIGHT AND BALANCE:** Weight and balance is unaffected by accomplishment of this service bulletin.

**INSPECTION:**

Tools and Equipment	
Nomenclature	Source
Hammer, Tap Test	Commercial
Ladder	Commercial
Permanent marker	Commercial

**NOTE:** If any aspect of this service bulletin is unclear, or if difficulties arise while implementing any of the instructions, contact VHA for additional support before proceeding any further with the work.

**A. TAP INSPECT BALANCE RECEPTACLE**

Use this procedure to tap inspect the area around the balance weight pocket on the upper and lower surfaces of the blade:

- (1) Do not remove the weight receptacle cover plate. The cover plate does not affect the results of the tap inspection.
- (2) Use a permanent marker and draw inspection Zone 1 on the upper surface of the blade, and draw inspection Zone 2 on the lower surface of the blade as shown in Figure 4. Draw parallel lines from the inboard end of the inspection zones to the outboard end of the inspection zones with the lines spaced 0.5 inches apart.
- (3) Do a visual inspection within Zone 1 and Zone 2 to look for any changes to the contour of the blade surface. Look for cracks, splits or bulges. Report any discrepancies to VHA for disposition.
- (4) Use a tap hammer and tap inspect the area within each inspection zone. Start from the outboard end of each inspection zone and tap repeatedly along a parallel line while moving inboard. A change in the sound of the tap from a solid response to a flat, deadened tone indicates the presence of a delamination. Mark the location where the delamination starts. Repeat the tap inspection along the adjacent lines until the entire area is inspected and the full extent of the delamination is marked.



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- (5) **NOTE:** The delamination on the lower surface originates from the inboard, aft corner of Zone 2 near the inboard end of the weight pocket cover and grows forward and outboard from there. On the upper surface, delamination initiates near the center of the inboard edge of Zone 1 and grows outboard. Delamination on the upper surface will likely not be detectable until a significant delamination has already developed on the lower surface. Also, a significant tone change will be heard if tapping is continued farther inboard of the inspection area where the weight receptacle ends and the internal material changes to foam core. This should not be noted as a delamination.
- (6) Connect the marks indicating the delamination location and measure the length at the farthest point from the inboard end of the inspection area.
- (7) Record on the Bulletin Completed Record (ref. page 7) the location and size of any delamination(s) as well as the total time on the blades and number of engine starts since new blades were installed.
- (8) Once the delamination has reached a size of 6.0 inches on the lower surface, remove the blade from service and contact VHA for disposition.
- (9) **NOTE:** It is expected that a delamination length of approximately 2" may be present at the first inspection. This DOES NOT mean that 1/3 of the blade life has been consumed. As discussed above, growth progresses more slowly after the initial delamination is developed.

### **B. RECORDING AND COMPLIANCE**

- (1) It is the responsibility of the user of these instructions to comply with all local and national airworthiness regulations prior to returning the VHA 20633000-101 Main Rotor Blade Assembly to service.
- (2) Record compliance to this service bulletin in the HISTORY OF INSPECTION, OVERHAUL, REPAIR AND APPLICATION OF TECHNICAL BULLETIN, SERVICE BULLETIN, AIRWORTHINESS DIRECTIVES, ETC. section of the rotor blade Historical Service Record.
- (3) Complete the Bulletin Completed Record and FAX the form to VHA at +1 (480) 483-4204 or email to [info@vanhornaviation.com](mailto:info@vanhornaviation.com).
- (4) Inform VHA of any change in ownership of VHA 20633000-101 Main Rotor Blade Assemblies with serial numbers A012 through A104 so that the current owner can receive updates and revisions pertaining this service bulletin.



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### C. POINTS OF CONTACT

- (1) For further information or assistance, contact Van Horn Aviation at +1 (480) 483-4202, FAX +1 (480) 483-4204 or email [info@vanhornaviation.com](mailto:info@vanhornaviation.com).
- (2) This current revision of this service bulletin can be accessed on the VHA website: <https://vanhornaviation.com/service/service-posts-and-bulletins/>.

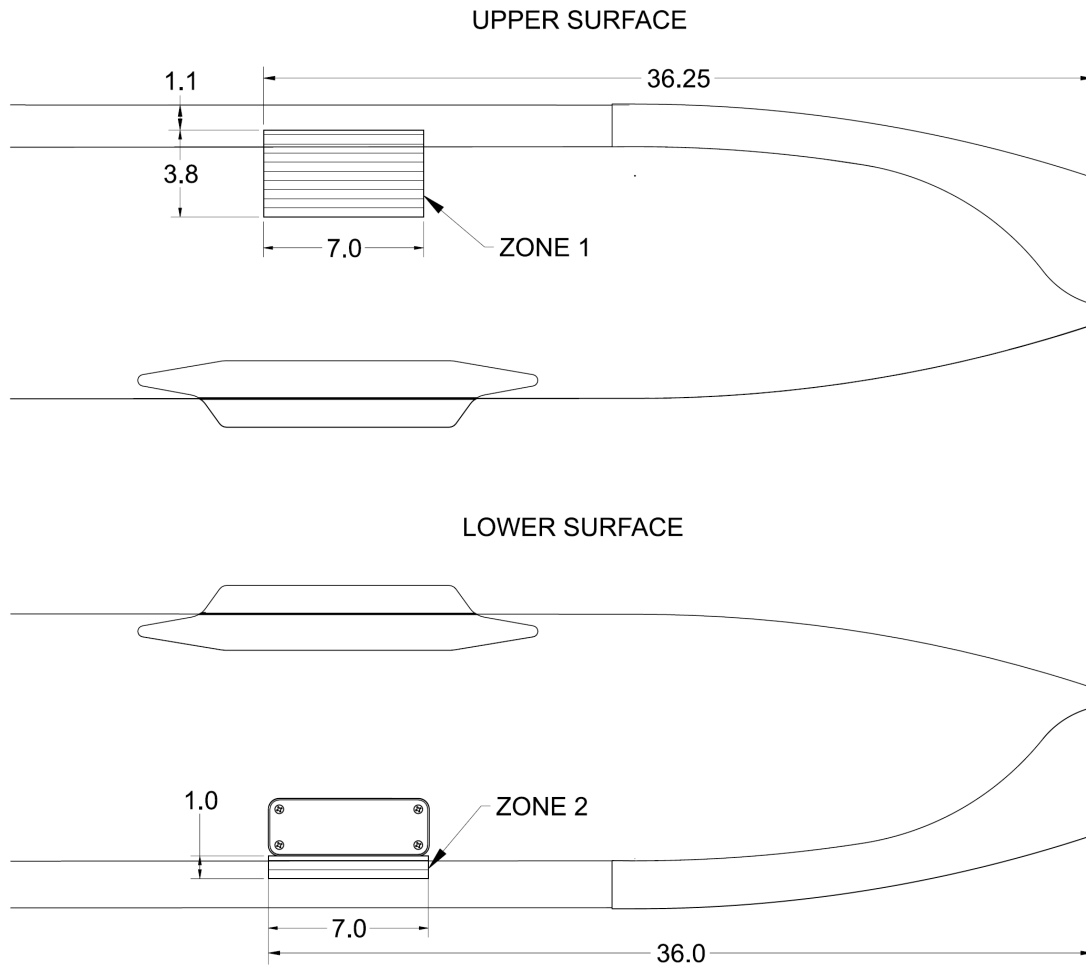


Figure 4 – Tap Inspection Locations with Grid Markings (Zone 1 & Zone 2)



**Van Horn Aviation, LLC**  
 1510 W Drake Drive  
 Tempe, Arizona 85283

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**DATE:** 3 August 2021  
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### Bulletin Completed Record

#### RECURRING 400 HOUR INSPECTION OF SPAN BALANCE WEIGHT RECEPTACLE

FAX or email this record to +1 (480) 483-4204 or info@vanhornaviation.com

<b>Owner/Operator:</b>	
_____	
<b>Address:</b>	<b>Blade Serial Number:</b>
_____	_____
_____	<b>Blade Total Time:</b>
_____	_____
_____	<b>Engine Starts Since</b>
_____	<b>New Blades Installed:</b>
_____	_____
_____	<b>Upper Surface</b>
_____	<b>Delamination Length:</b>
_____	_____
_____	<b>Lower Surface</b>
_____	<b>Delamination Length:</b>
_____	_____
<b>Phone:</b>	<b>Date Complete:</b>
_____	_____
<b>Email:</b>	_____
_____	_____

This bulletin completed by: \_\_\_\_\_  
 (Print Name)

\_\_\_\_\_  
 (Signature)

\_\_\_\_\_  
 (Title)