NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

May 12, 2006

MATERIALS LABORATORY FACTUAL REPORT Report No. 06-042

A. ACCIDENT

Place	:	Miami, Florida
Date	:	December 19, 2005
Vehicle	:	Grumman G-73T Mallard, N2969
NTSB No.	:	DCA06MA010
Investigator	:	Brian Murphy, AS-40

B. COMPONENTS EXAMINED

Rear Z-stringer from the lower skin of the wing box beam from left wing station 43 to 56 sectioned from a Grumman G-73T Mallard (N632SS).

C. DETAILS OF THE EXAMINATION

Overall views of the submitted foot-long section of rear Z-stringer are shown in figures 1 and 2. The submitted rear Z-stringer was cut from a Grumman G-73T Mallard, N632SS, which was manufactured in the same year as the accident airplane. The pieces were sectioned from the rearmost of three Z-stringers in the lower skin panel of the wing box beam for the left wing. The Z-stringer had a fracture located approximately 1.5 inches outboard of the rib at left wing station (WS) 48[1]. The fracture intersected the slosh hole in the web of the Z-stringer.

A closer view of the fracture area of the rear Z-stringer is shown in figure 3. Corrosion was observed in the area and was particularly severe in the web and flange areas above the slosh hole. In the upper portion of the web and the upper flange, exfoliation[2] was present both forward and aft of the fracture location, and layers of material were missing.

Views of the fracture surfaces are shown in figures 4 and 5. No clear fracture features were observed above the slosh hole. Fracture features in this area were

[1] Wing station numbers correspond to the distance in inches outboard from the airplane centerline. For more information regarding the wing construction of Grumman G-73 airplanes, see *Materials Laboratory Factual Report 06-010*.

[2] Exfoliation is corrosion that extends from an initiation site preferentially attacking along planes parallel to the surface and is characterized by a layered appearance in the corroded area.

obliterated by exfoliation, surface corrosion, and post-fracture contact damage. Fracture features were present in the web and lower flange below the slosh hole. The fracture was relatively flat and perpendicular to the Z-stringer surface, and faint crack arrest marks were observed, features consistent with fatigue. A closer view of the fracture surface below the slosh hole after cleaning with soap water and a brush is shown in figure 6. Crack arrest marks were observed across most of the fracture surface shown in figure 6, and unlabeled arrows indicate examples of arrest marks at 2 locations. No specific origin could be identified, but fatigue features generally emanated downward in the web portion of the fracture and aft in the lower flange portion as indicated with unlabeled arrows in figures 4 and 5.

Matthew R. Fox
Senior Materials Engineer

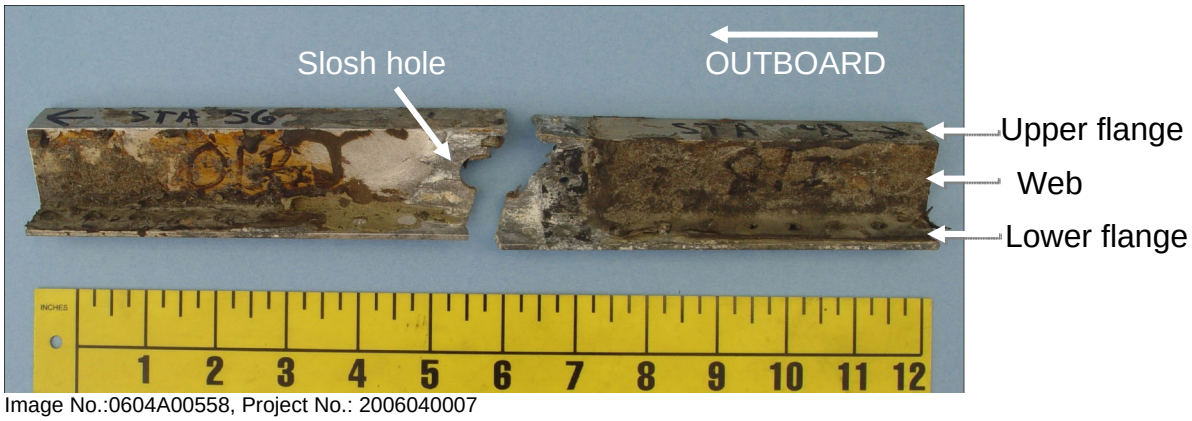

Image No.:0604A00558, Project No.: 2006040007

Figure 1. View of the rear Z-stringer section looking forward and slightly downward.

Image No.:0604A00559, Project No.: 2006040007

Figure 2. View of the rear Z-stringer section looking aft and slightly upward.

Image No.:0604A00562, Project No.: 2006040007

Figure 3. Close view of the fractured ends of the rear Z-stringer.

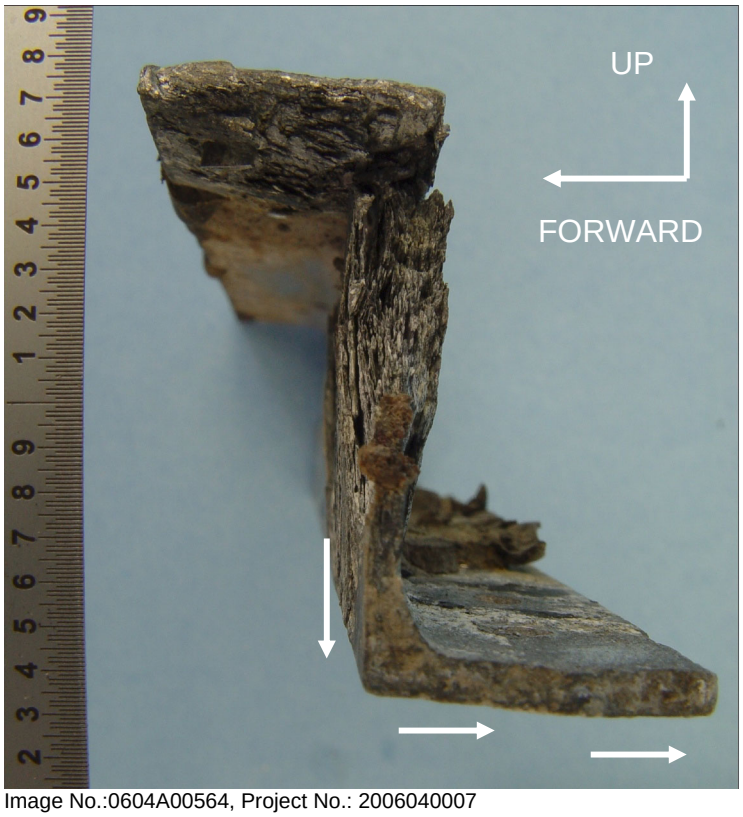

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Figure 4. View of the inboard side of the rear Z-stringer fracture. Unlabeled arrows indicate the general direction of fatigue propagation in areas where fracture features were observed.

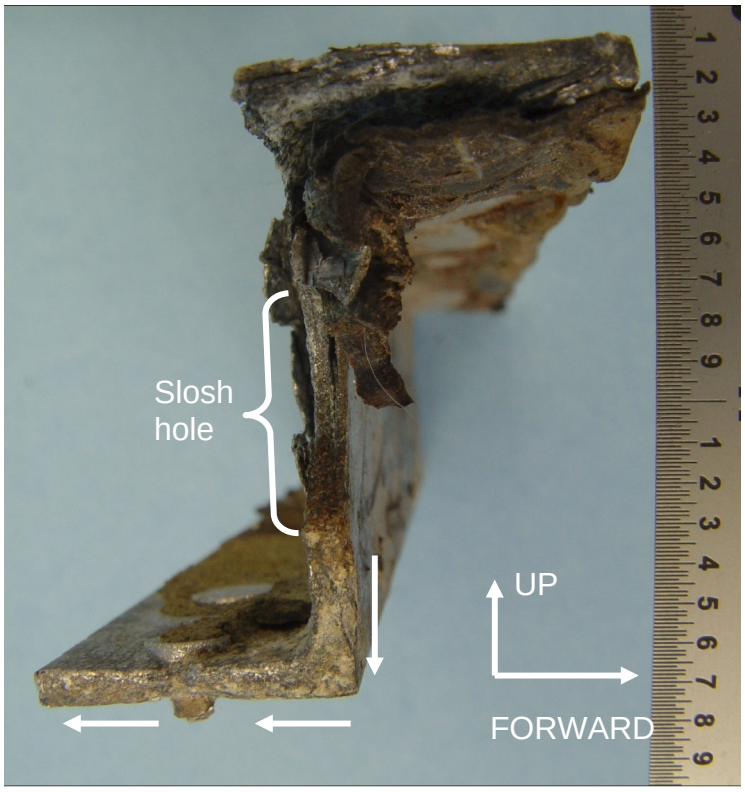

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Figure 5. View of the outboard side of the rear Z-stringer fracture. Unlabeled arrows indicate the general directions of fatigue propagation in areas where fracture features were observed.

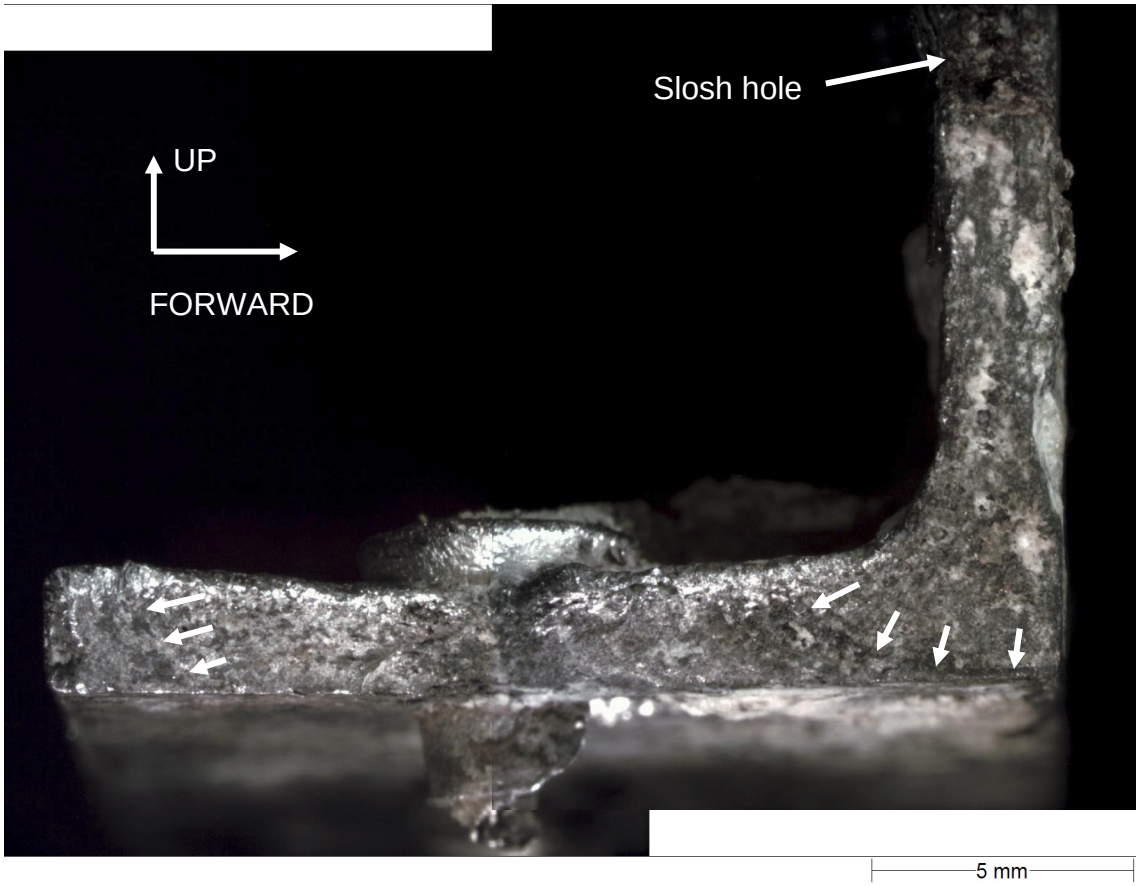

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Figure 6. Closer view of the outboard side of the rear Z-stringer fracture surface below the slosh hole after cleaning. Unlabeled arrows indicate examples of crack arrest lines observed across the fracture surface.