

NATIONAL TRANSPORTATION SAFETY BOARD

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



March 1, 2019

MATERIALS LABORATORY FACTUAL REPORT

Report No. 19-006

A. ACCIDENT INFORMATION

Place : McDougal, Arkansas
Date : November 2, 2018
Vehicle : Hughes 369D, N5187S
NTSB No. : CEN19FA020
Investigator : Courtney Liedler, AS-CEN

B. COMPONENTS EXAMINED

Pieces of main rotor blade and hub assembly including 5 lead-lag bolts.

C. DETAILS OF THE EXAMINATION

An overall view of the submitted main rotor assembly pieces is shown in figure 1. As installed, the blades and corresponding hub attachment locations were referenced by color, and the color associated with each piece is shown labeled in figure 1. The blade pieces were attached to the hub pieces by a lead-lag bolt fastened with a nut. The lead-lag bolts in the submitted components appeared intact, and the nuts were attached with lock pins in place.

The part number and serial number was stamped on the head of each bolt, and the numbers for each bolt are listed in table 1. All five bolts were included in a list of bolts that had been processed through a repair to replace missing cadmium plating on the bolts. However, the maintenance manual does not authorize any repairs for missing cadmium plating on the lead-lag bolt, which is a critical life-limited part.

Table 1. Bolt Identification Markings

Blade Reference	Part Number	Serial Number
Red	369D21220	048765-0414
Yellow	369D21220	048765-0724
Blue	369D21220	048765-0953
White	369D21220	048765-1032
Green	369D21220	048765-1289

To facilitate removal of the lead-lag bolts for examination, the lock pins were removed from the nuts, and each hub and blade piece was held in a fixture. Torque was then applied using a 3-foot pipe extension on a breaker bar to remove each nut, and the lead-lag bolts were then removed from the hole. After removal, the bolts were cleaned

with an ultrasonic cleaner while submerged in a solution of Alconox detergent and warm water.

An overall view of the lead-lag bolts after cleaning is shown in figure 2. The nuts and washers that were removed from each lead-lag bolt attachment are also shown in figure 2. Varying numbers of washers with 2 different outer diameters had been installed at the attachment location. Nine washers with the larger diameter were installed on two lead-lag bolts with 7 installed on the red lead-lag bolt and 2 installed on the green lead-lag bolt. Washers with the smaller outer diameter were installed on all 5 bolts with 5, 2, 3, 4, and 3 installed on the red, white, blue, yellow, and green lead-lag bolts, respectively.

Each of the lead-lag bolts was examined closely using an optical stereomicroscope at magnifications up to 100 times. Particular attention was focused on the intersection between the head and the shank, edges of contact areas on the shank surface, and thread roots for the first 2 full threads adjacent to the shank. No evidence of cracks were detected on any of the lead-lag bolts.

Matthew R. Fox, Ph.D.
Senior Materials Engineer

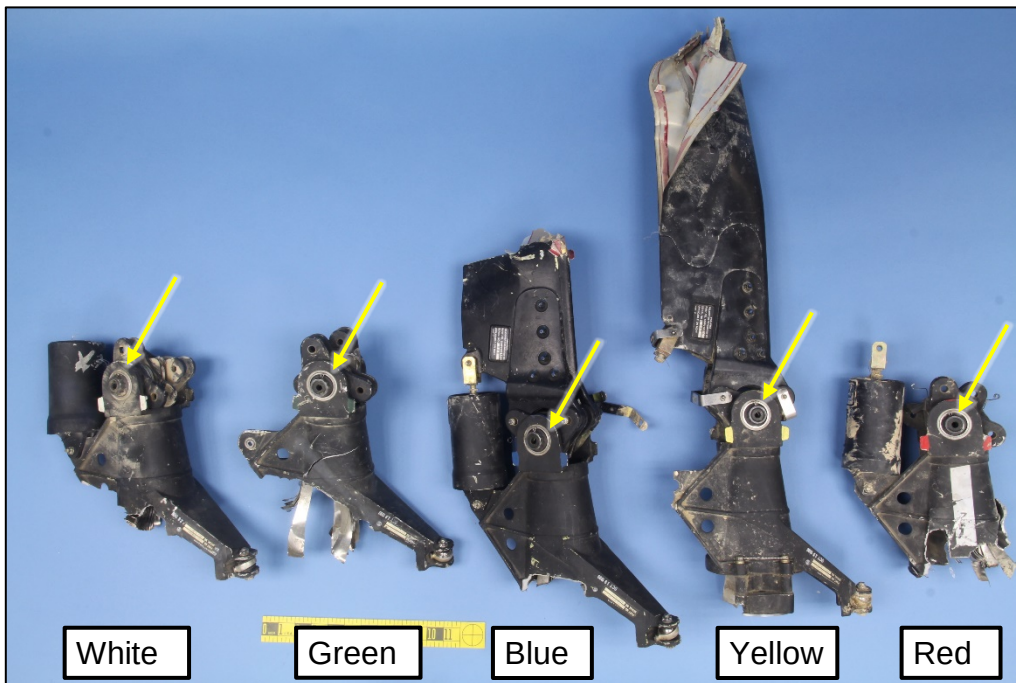


Figure 1. Overall view of the submitted main rotor assembly pieces. Unlabeled arrows indicate the lead-lag bolt attachment locations.

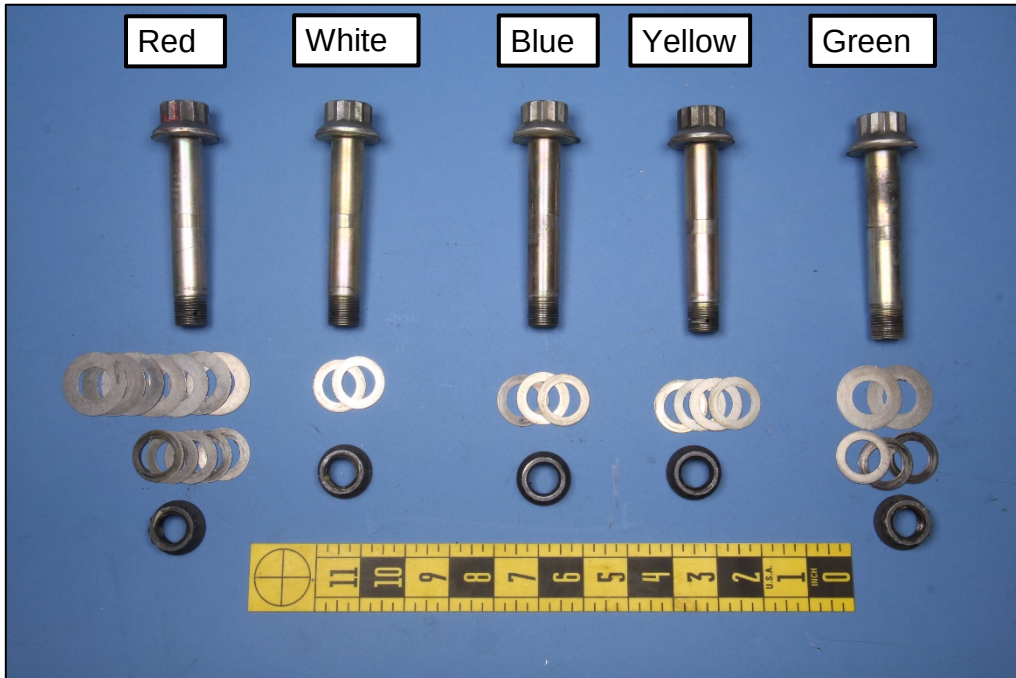


Figure 2. View of the intact lead-lag bolts, washers, and nuts after removal and after the bolts were cleaned for optical examination.