

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: October 4, 1971

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 23rd day of September 1971

FORWARDED TO:)
Honorable John H. Shaffer)
Administrator)
Federal Aviation Administration)
Washington, D. C. 20591)

SAFETY RECOMMENDATION A-71-46 & 47

Our investigation of a recent fatal accident involving a Helio Courier H-295, N6348V, indicates that corrective action is necessary to reduce the possibility of similar accidents occurring in the future.

The Helio Courier was operated on floats by the Alaska Lumber & Pulp Company. It crashed on August 21, 1971, at Appleton Cove, near Sitka, Alaska. The pilot and two passengers received fatal injuries.

Our field investigation of the accident indicated that the aircraft crashed after an in-flight separation of the left wing. A subsequent examination of the parts involved in the wing separation by our metallurgists showed that a fatigue fracture had occurred in the left wing lower attachment fitting (P/N 391-030-4072), an extremely critical component of the wing attachment. Multiple fatigue cracks had originated in the inside surface of the fitting along the line where the inner wall changes from a cylindrical to a conical surface near the closed end of the tubular section. This area is at the bottom of a longitudinal 1.25-inch diameter drilled hole. The fatigue cracks had propagated through the wall thickness and across approximately 40 percent of the cross sectional area of the tubular section before the fitting failed completely.

The points where the fatigue fracture originated were in a rough drilled surface where the edge of the drill had left a sharp corner at the change in section thickness near the bottom of the hole. A copy of the manufacturing drawing for the fitting shows a requirement for a 0.062-inch radius (1962 change) in this area. Our examination, however, indicated that no attempt

to form a true radius or improve the surface finish had been made after the drilling operation on either the failed fitting or the corresponding fitting from the right side of the aircraft. This discrepancy probably contributed to the cause of the fatigue fracture. The radius requirement was in effect when N6348V was manufactured in 1968 and maintenance records indicated that the original fittings were still on the aircraft when the accident occurred.

An electron fractographic study of the fatigue fracture indicated that very shallow stress corrosion cracks may have contributed to the initiation of the fatigue cracks. Thus, the operating environment could have been an important factor in the cause of the failure of the fitting. It should be noted that N6348V was operated on floats in salt water areas during about 2,140 hours of the 2,156 total time on the aircraft.

Our laboratory staff has been in frequent contact with a representative of your staff, FS-120, regarding this problem. We are aware of the difficulties involved in the inspection of the wing attachment fittings and know that the Central Region is planning corrective action as soon as a reasonable solution of the inspection problem can be worked out. However, we believe that the safety implications are serious enough to justify a statement of our views.

We believe that the highest priority for corrective action should be directed toward aircraft that are operated on floats. However, we do not believe that the available information justifies confining such action to float operated aircraft. In our opinion the surface roughness and lack of an adequate fillet radius found in the two fittings from N6348V could eventually make the fittings susceptible to fatigue failure in almost any type of operating environment. Other fittings now in service may have the same kind of internal surface finish and inadequate fillets as the two fittings we have examined. This appears to be true even though drawing requirements for a better surface finish and improved fillets have been in effect since 1962.

We also feel that a design improvement could be made to lower the stress intensity in the critical area. A simple design change, such as a decrease in the depth of the 1.25-inch hole to move the 0.062-inch radius inboard of the first 0.562-inch hole, would greatly increase the structural integrity of the fitting in the area of critical tension and bending stresses.

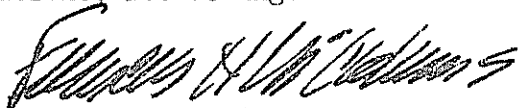
After studying the factors mentioned above, we recommend that:

1. All Helio lower wing attachment fittings of the same design as those found in N6348V be inspected for cracks, adequate internal fillets, and surface roughness in the internal fillet area at the earliest practical time by an FAA-approved method. Highest priority for these inspections should be given to aircraft operated on floats and high time aircraft. All fittings containing cracks should be removed from service. All fittings that do not comply with the present manufacturing drawing requirements for internal fillet radius (0.062-inch) and internal surface finish (125 microinch RMS) should be either reworked or removed from service.
2. Replacement fittings with an improved design be made available to the operators at the time of the inspection if possible. If this is not possible, consideration should be given to reworking fittings of the present design to provide adequate internal fillets and a good surface finish while retaining the required thickness. Consideration should also be given to shot peening the internal fillet area of the reworked fittings.

We appreciate the efforts members of the FAA staff are making to solve this problem. Our technical staff is available for any further assistance they may be able to provide.

These recommendations will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Laurel, McAdams, Thayer, and Burgess, Members, concurred in the above recommendations. Reed, Chairman, was absent, not voting.


By: Francis H. McAdams
Acting Chairman

