

Log 2299



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 8, 1992
In Reply, Refer to A-92-52 and -53

Honorable Thomas Richards
Administrator
Federal Aviation Administration
Washington, D. C. 20591

On August 7, 1990, an Aerospatiale SA-315B, Alouette III helicopter, N58000, lost engine power while hovering out of ground effect. The helicopter was conducting external lift operations utilizing a long-line when the power loss occurred. The rotorcraft was substantially damaged, and the pilot was seriously injured during the ensuing autorotative landing.

The Safety Board's investigation of the accident disclosed that the failure of the Turbomeca Artouste IIIB engine was caused by contaminated fuel even though the helicopter had an airframe fuel filter installed in the main fuel supply line. Subsequent examination of the fuel filter (PN 3160-S52-10-904) revealed that the filter element had been installed backward in the filter housing.

The fuel filter is common to all Alouette III helicopters. According to 1990 Federal Aviation Administration data, there are about 103 Alouette III helicopters registered in the United States. The improper fuel filter element installation allowed contaminated fuel to bypass the filter element and enter the engine fuel control. Reverse installation of the filter element also results in an inoperative "fuel filter clogged" warning light in the cockpit and prevents the pressure differential button on the filter housing from extending as a result of the passage of contaminated fuel through the filter.

A review of maintenance records indicated that the filter had been inspected and reinstalled 17 operating hours previous to the accident during a scheduled 100 hour inspection. This work was conducted by a pilot under the supervision of a qualified mechanic. The Safety Board subsequently examined the markings on the filter assembly and the installation procedure. The investigation found that the manufacturer had stenciled in French "haut" (top) and "bas" (bottom) on the filter element. A decal on the filter

housing illustrated proper installation. However, Safety Board investigators have learned that the decals become unreadable after a short period of operating time. The decal was missing on N58000 after the accident.

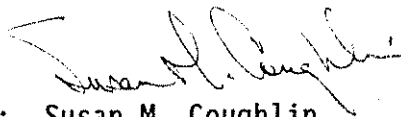
A redesign of the fuel filter element so that it could not be installed backward would have prevented the accident. Moreover, such a redesign would eliminate having to rely on the ability of English-speaking maintenance personnel to read possibly obscured installation markings in French. The Safety Board believes that the filter element and/or housing should be redesigned to prevent reverse installations. In the interim, the element should be removed and the top and bottom of the element suitably marked in English to ensure that it is installed correctly.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an Airworthiness Directive applicable to all models of the Aerospatiale Alouette III helicopter to require a one-time inspection for proper installation and the appropriate remarking in English of the top and bottom of the airframe fuel filter element. (Class II, Priority Action) (A-92-52)

Request that the French Director Generale de L'Aviation Civil require Aerospatiale or its suppliers to redesign the fuel filter/housing of the Aerospatiale Alouette III series helicopters to eliminate the possibility of reverse installation. As an interim measure, require the installation instructions decal on the housing be made more durable to withstand exposure to fuel, hydraulic fluid, and transmission oil. (Class III, Longer Term Action) (A-92-53)

Acting Chairman COUGHLIN, and Members LAUBER, KOLSTAD, HART, and HAMMERSCHMIDT, concurred in these recommendations.


By: Susan M. Coughlin
Acting Chairman

Brief of Accident

File No. - 1605 8/07/90 TOK,AK A/C Reg. No. N58000 Time (Lcl) - 1230 ADT

-----Basic Information-----

Type Operating Certificate-ON-DEMAND AIR TAXI Aircraft Damage SUBSTANTIAL Fatal 0 Serious 1 Minor 0 Injuries None
Type of Operation -OTHER WORK USE Fire NONE Crew 0 Pass 0 None 0
Flight Conducted Under -14 CFR 133
Accident Occurred During -HOVER

-----Aircraft Information-----

Make/Model - AEROSPATIALE SA-315B Eng Make/Model - TURBOMECA ARTOUSTE IIB ELT Installed/Activated - YES/NO
Landing Gear - SKID Number Engines - 1 Stall Warning System - NO
Max Gross Wt - 5070 Engine Type - TURBOSHAFTE Rated Power - 878 HP

-----Environment/Operations Information-----

Weather Data Wx Briefing - NO RECORD OF BRIEFING Itinerary Airport Proximity
Method - N/A Last Departure Point TOK,AK OFF AIRPORT/STRIP
Completeness - N/A Destination LOCAL Airport Data
Basic Weather - VMC ATC/Airspace Runway Ident - N/A
Wind Dir/Speed- 220/010 KTS Type of Flight Plan - COMPANY (VFR) Runway Lth/Wid - N/A
Visibility - 50.0 SM Type of Clearance - NONE Runway Surface - N/A
Lowest Sky/Clouds - N/A Type Apch/Lndg - FORCED LANDING Runway Status - N/A
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

-----Personnel Information-----

Pilot-In-Command Age - 43 Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT
Certificate(s)/Rating(s) Biennial Flight Review Flight Time (Hours) Last 24 Hrs - 4
COMMERCIAL Current - YES Total - 13000 Last 30 Days- 98
SE LAND Months Since - 2 Make/Model- 5000 Last 90 Days- 265
HELICOPTER Aircraft Type - SA-315B Instrument- 75 Rotorcraft - 12600
Multi-Eng - UNK/NR

Instrument Rating(s) - AIRPLANE

-----Narrative-----

THE HELICOPTER WAS BEING USED IN AN EXTERNAL LOAD OPN TO CARRY CARGO WITH A 100 FT CABLE. WHILE HOVERING OUT OF GROUND EFFECT, THE ENG LOST PWR. A SUBSEQUENT HOVERING AUTOROTATION RESULTED IN A HARD LANDING. AN EXAM REVEALED THE LOSS OF POWER WAS DUE TO FUEL CONTAMINATION ALTHOUGH AN AIRFRAME FUEL FILTER WAS INSTALLED IN THE MAIN FUEL SUPPLY LINE. AN EXAM REVEALED THE FILTER ELEMENT HAD BEEN INSTALLED BACKWARD IN THE FILTER CANISTER. THIS ALLOWED CONTAMINATED FUEL TO BYPASS THE FILTER ELEMENT & ENTER THE ENG FUEL CTL UNIT. THE REVERSE INSTLN ALSO RESULTED IN AN INOP "FUEL FILTER CLOGGED" WARNING IGT & PREVENTED THE PRESSURE DIFFERENTIAL BUTTON ON THE FILTER HOUSING FM EXTGD. THE FILTER HAD BEEN INSPECTED & REINSTLD DRG A 100 HR INSPN. 17 FLT HRS BER THE ACDNT. THIS WORK WAS DONE BY A FLT UNDER SUPERVISION OF A MECHANIC. THE MECHANIC HAD NO PREV EXPERIENCE WITH THIS MAKE & MODEL OF HELICOPTER. "TOP" & "BOTTOM" WERE STENCILLED ON THE FILTER ELEMENT IN FRENCH. CONTAMINATED FUEL WAS ALSO FND IN THE FUEL TRUCK.

Brief of Accident (Continued)

File No. - 1605 8/07/90 TOK,AK A/C Reg. No. N58000 Time (Lcl) - 1230 ADT

Occurrence #1 LOSS OF ENGINE POWER(TOTAL) - NON-MECHANICAL
Phase of Operation HOVER

Finding(s)

1. FUEL SYSTEM, FILTER - OTHER
2. AIRCRAFT/EQUIPMENT, INADEQUATE DESIGN - MANUFACTURER
3. MAINTENANCE, INSTALLATION - IMPROPER - COMPANY MAINTENANCE PSNL
4. LACK OF FAMILIARITY WITH AIRCRAFT - COMPANY MAINTENANCE PSNL
5. FLUID, FUEL - CONTAMINATION

Occurrence #2 FORCED LANDING
Phase of Operation DESCENT - EMERGENCY

Finding(s)

6. AUTOROTATION - PERFORMED - PILOT IN COMMAND

Occurrence #3 HARD LANDING
Phase of Operation LANDING

-----Probable Cause-----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident was:
IMPROPER INSTALLATION OF THE FUEL FILTER ELEMENT IN THE AIRCRAFT BY COMPANY/MAINTENANCE PERSONNEL, AND SUBSEQUENT
CONTAMINATION OF THE FUEL SYSTEM BY UNFILTERED FUEL. FACTORS RELATED TO THE ACCIDENT WERE: INADEQUATE DESIGN OF THE
FUEL FILTER ASSEMBLY, WHICH ALLOWED THE IMPROPER INSTALLATION OF THE FILTER ELEMENT, THE MECHANICS LACK OF FAMILIARITY
WITH THE AIRCRAFT, AND FAILURE OF GROUND PERSONNEL TO INSURE THAT FUEL FROM THE FUEL TANKER WAS FREE OF CONTAMINATION.