National Transportation Safety Board

Washington, D.C. 20594

Response to Petition for Reconsideration

Date: JAN 0 4 2012

Mr. Franklin Carson, Petitioner
President
Carson Helicopters, Inc.
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Perkasie, Pennsylvania 18944

In accordance with 49 *Code of Federal Regulations* 845.41, the National Transportation Safety Board (NTSB) has reviewed the March 11, 2011, petition for reconsideration and modification of the findings and probable cause in the helicopter accident involving a Sikorsky S-61N, N612AZ, on August 5, 2008 (LAX08PA259), near Weaverville, California. On the basis of this review, the NTSB hereby denies the petition in its entirety.

On August 5, 2008, about 1941 Pacific daylight time, a Sikorsky S-61N helicopter, N612AZ, impacted trees and terrain during the initial climb after takeoff from Helispot 44 (H-44), located at an elevation of about 6,000 feet in mountainous terrain near Weaverville, California. The pilot-in-command, the safety crewmember, and seven firefighters were fatally injured; the copilot and three firefighters were seriously injured. Impact forces and a postcrash fire destroyed the helicopter, which was being operated by the U.S. Forest Service (USFS) as a public flight to transport firefighters from H-44 to another helispot. The USFS had contracted with Carson Helicopters, Inc. (CHI) of Grants Pass, Oregon, for the services of the helicopter, which was registered to CHI and leased to Carson Helicopter Services, Inc. (CHSI) of Grants Pass. Visual meteorological conditions prevailed at the time of the accident, and a company visual flight rules flight plan had been filed.

The findings and probable cause elements adopted on December 7, 2010, and pertinent to this petition were as follows:

Findings

7. The incorrect information—the empty weight and the power available chart—provided by Carson Helicopters and the company procedure of using above-minimum specification torque misled the pilots to believe that the helicopter had the performance capability to hover out of ground effect with the manifested payload when, in fact, it did not.
8. The efficiency of the engines' compressors was not compromised, and the stator vanes functioned normally throughout the accident flight.

9. The trace contaminants found within the fuel control units (FCU) did not affect their operation, and both FCUs functioned normally throughout the accident flight.

10. Both engines were operating normally throughout the accident flight.

11. The accident takeoff was unsuccessful because the helicopter was loaded with more weight than it could carry in a hover out of ground effect given the ambient conditions.

13. The lower-than-actual empty weights recorded by Carson Helicopters on the Chart B weighing records for the accident helicopter and 8 of Carson's other 10 helicopters created the appearance of higher payload capabilities; at their actual weights, the accident helicopter and 5 of the other helicopters would not have met the contractual payload specifications.

Probable Cause

The National Transportation Safety Board determines that the probable causes of this accident were the following actions by Carson Helicopters: 1) the intentional understatement of the helicopter's empty weight, 2) the alteration of the power available chart to exaggerate the helicopter's lift capability, and 3) the practice of using unapproved above-minimum specification torque in performance calculations that, collectively, resulted in the pilots relying on performance calculations that significantly overestimated the helicopter's load-carrying capacity and did not provide an adequate performance margin for a successful takeoff; and insufficient oversight by the U.S. Forest Service and the Federal Aviation Administration.

The petitioner and owner of CHI and CHSI, Mr. Carson, claims that the NTSB's findings and probable cause are incorrect. Specifically, Mr. Carson contends that "there is new and additional information regarding contaminants in the fuel system" and that "the Board was not given complete and accurate performance information for review in reaching its findings regarding aircraft flight performance."

To support his claims regarding fuel system contamination, Mr. Carson asserts that "clear physical evidence was brought forth that showed significant physical pieces of foreign contamination were present in the left engine fuel control unit (FCU)." He indicates that the report incorrectly reflects the amount of contamination in the pressure regulating valve (PRV) assembly. He further states that the NTSB's conclusion that the contamination in the FCU was not enough to affect operation of the PRV within the FCU is incorrect. To support this claim, the petitioner quotes a 2004 e-mail from Hamilton Sunstrand's Engineering Manager to GE, which states that "any contaminant in the size range 0.0004 to 0.001 in. could potentially cause erratic behavior/seizure of the PRV if the contaminant finds its way into the diametrical clearance of the valve." He then concludes that contaminants of the size found in the PRV of the left engine FCU "can and do affect pilot valves, stator vane operation, and fuel metering, which in turn can affect

power available to the helicopter rotor transmission; in a free turbine engine, that can happen regardless of full engine rpm (N_g[1] at 102%)."

The petitioner then provides an analysis of the fibers found in the FCUs. He states that an electron microscope and spectral analysis of a synthetic coating (E-poly), which is used to restore fuel system part wall thickness, "contains long fiber particles and irregular flat particles that have ...physical characteristics that are nearly identical with the particles found in the FCU of N612AZ." The petitioner then states that "the pieces subject to this coating are located in the fuel system AFTER the airframe filter and thus a finer micron filter will have no remedial effect on limiting potential contamination in the FCU from these sources."

After review of the original case material, the petitioner's evidence regarding FCU contamination, and party comments on the petition, the NTSB concludes that Mr. Carson's claims that the contamination in the FCU caused a loss of engine power are not persuasive. The effect of contamination on engine performance was explored thoroughly during the investigation. The amount of contamination actually present in the left engine FCU PRV during its postcrash examination was considered to be small. The trace contaminants were located within the circumferential balance grooves of the piston, and no particles were found between the piston and sleeve of the PRV that could have caused the PRV to momentarily bind or seize. Although a small amount of contamination was present in the left FCU, the evidence from the cockpit voice recorder (CVR) sound spectrum analysis indicates that the engines were running at their topping[2] speed and that, consequently, the FCUs were providing the maximum fuel flow possible to the engines; no valve seizure occurred. Also, the fuel filter system contains a bypass feature that ensures sufficient fuel will always be available. However, the amount of debris in the fuel filter was so low that the bypass feature would not have been needed. Other components of the fuel system, such as the pilot valve, were found to be free of contaminants.

In addition, comments on the CVR from the first officer regarding what he saw on the engine torque gauge during the accident flight indicate that both engines were operating normally and delivering the expected torque to the rotor system, thereby ruling out any loss of power from either engine. Although the petitioner's contention that power available to the rotor transmission could be lessened even with an N_g reading of 102% is technically true, the undetectable loss of power would be small. If one engine had started losing power, the opposite engine's N_g would have increased to compensate for the lack of power being produced by the anomalous engine. The NTSB's sound spectrum analysis revealed no evidence that this occurred. In fact, both engines were operating at maximum power, and neither could produce more power. Further, as stated by GE – Aviation in its comments on the petition, contaminants in the FCU would cause the PRV to stick, which would only be seen if there were a change in power demand; with the engines operating at maximum power, there would be no impact from a sticking PRV. Even with maximum power in both engines, the helicopter was not able to transition out of ground effect because it was severely overweight by 3,437 lbs,[3] and no safety margin existed. Had the accident helicopter been operating at the correct weight for the ambient

[1] N_g is the gas generator speed.

[2] "Topping" refers to operating at the maximum gas generator speed limit (N_g), corresponding to the maximum power output of the engines.

[3] The overestimated weight came from three components: 1,437 lbs for the incorrect empty weight + 1,200 lbs for the altered power available chart + 800 lbs for the use of above-min spec torque = 3,437 lbs.

conditions, a safe departure would have been possible, even if one engine did experience a power loss.

While the petitioner does introduce new evidence that the contamination found in the FCUs was E-poly material, the NTSB has determined that the type of material is irrelevant because, as stated previously, the FCUs were providing the maximum fuel flow to the engines. Further, GE – Aviation contacted the manufacturer of E-poly, Interface Air Repair, Inc. (IAR), and IAR stated that E-poly does not contain silica or fibers; it wears in a fine powder form typically of 10 microns or less, with no long strand fibers. Based on this information, the contaminant likely was not E-poly. The petitioner states that a finer micron filter would not prevent the E-poly material from migrating to the FCUs based on the filter's location; this is accurate but is not relevant to this case. In addition, the recommendation made by the NTSB to require finer mesh micron filters was not related to this accident but was based on a finding that minimizing the amount and size of debris in the fuel supplied to the FCU would reduce the risk of sticking or seizure.

Mr. Carson also asserts that the GenHel flight simulation and data set "is badly flawed and should not have been used for any CMRB [composite main rotor blade]-S61 flight simulation purposes, let alone determining the probable flight path of the accident helicopter." He states that the NTSB incorrectly relied on computer flight simulations utilizing a Sikorsky GenHel flight simulation program to determine accident aircraft flight performance, stating that the GenHel program was "developed for handling qualities, load predictions, and flight control development. Performance analysis is not described as a design goal of the program." Mr. Carson adds that GenHel "does not have the capability to accurately predict power required for a given lift, and thus requires severe 'corrections' to approximate conclusions."

Mr. Carson states that the flight data used in the GenHel computer program "was acquired with inferior, experimental CMRB blades and ignored FAA [Federal Aviation Administration] procedures." He elaborates that the faulty dataset was derived from flight tests in which Sikorsky used a U.S. Navy NVH-3A short-body S-61 helicopter, not a commercial long-body S-61N equipped with an external fire suppressant tank like the accident airplane, and a set of CMRBs with large added trim tabs, even though the standard CMRB is manufactured without trim tabs, and external wire strain gauges, which doubled the vibration level and affected lift and speed.

Mr. Carson concludes that "it would be impossible for Sikorsky to accurately address the substantial differences in performance between the two configurations in a flight simulation." He further states that this information is likely new to the Board members because it was not discussed in the public meeting or in the final report.

After review of the material presented by the petitioner regarding the simulation, the NTSB concludes that Mr. Carson's claims regarding the computer simulation are unfounded. Furthermore, Mr. Carson provides no new information. During the investigation, staff thoroughly reviewed the GenHel model and inputs to the program to allow for tailoring the model to specific aircraft and changing the main rotor geometry, hover download, and other relevant parameters. Using GenHel, with proper program modifications, is an industry-accepted

method of simulating helicopter flight. Also, the results of Sikorsky's Navy NVH-3A flight tests indicated that the effect of deflected trim tabs and strain gauge instrumentation on one main rotor blade was very minor and a negligible factor in the determination of hover performance. As stated by Sikorsky,

> the correlation of the hover performance prediction (based on a model derived from NVH-3A flight test data with blades with trim tabs and one instrumented blade) with the S-61A hover 'spot check' data (acquired with blades without trim tabs or instrumentation) verifies that the trim tabs and instrumentation have a negligible impact on hover performance.

Thus, the effect of the adjustable trim tab and blade instrumentation was not a source that might corrupt the quality of the rotor performance. The NTSB believes that the GenHel computer simulation was an accurate way to determine the hover performance of the helicopter.

The NTSB notes that the Board members were aware of the GenHel model inputs and the modifications made for conducting the computer simulations during the investigation. This information is documented in the public docket, which was reviewed by the Board members before the December 7, 2010, Board meeting. In addition, Sikorsky responded to almost identical claims from the petitioner on November 16, 2010, and this information was provided to the Board members at that time.

As stated in this accident's probable cause, the failure of the accident helicopter to take off is directly the result of it being severely overweight. The severely overweight condition grew principally from two sources: (1) the alteration of the weight data and (2) the intentionally altered performance chart. Both actions resulted in the helicopter being operated without any safety margin. Additionally, the pilot-in-command followed a company procedure that was not approved by the USFS and used above-min spec power in performing the load calculations. These discrepancies resulted in the helicopter's maximum allowable payload being overestimated by 3,437 lbs.

It is evident from the findings of the investigation that, had CHI/CHSI provided the flight crew with the correct weight information for the accident helicopter and the correct engine performance charts, the flight crew would have had to remove a substantial payload of passengers and fuel to safely take off from the accident location. Additionally, had the helicopter been operated at the correct weight (3,437 lbs less than the weight at the failed takeoff), the flight crew could have made a successful departure even with a substantial loss of power from one engine.

The NTSB concludes that the petition for reconsideration does not introduce new evidence relevant to the findings and probable cause established on December 7, 2010. Although Mr. Carson believes that E-poly was the likely contaminant in the FCU, this is unlikely given the material properties of E-poly that were provided by the manufacturer. Additionally, because there was no loss of engine power, the exact identification of the contaminant is immaterial to the cause of the accident. Therefore, the petition involving Sikorsky S-61N, N612AZ, at Weaverville, California, on August 5, 2008, is denied in its entirety.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in the disposition of this petition for reconsideration.