May 12, 2010

Closure of Action Items

From NTSB Weaverville Progress Meeting July 30, 2009

1. Survival Factors Report – No. of Seats – Forest Service expressed concern about possible inconsistency with other reports regarding total number of passenger seats (16, 18, 19, 20). Forest Service to discuss directly with Nora Marshal and Cindy Keegan to clarify.

It was agreed at the progress meeting that there were 18 passenger seats installed in N612AZ.

2. Emergency Response Report – Review by Parties – A report was drafted by NTSB Courtney Liedler. Party coordinators would like to review draft copy. NTSB will distribute.

The draft Emergency Response Specialist's Factual Report was distributed to all party coordinators. Comments were received and reviewed by Ms. Liedler. The final Emergency Response Specialist's Factual Report has been placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/429285.pdf

3. PRV Filter Contamination – Accident Part. Carson would like to identify source of contaminants in PRV filter. Elemental identification already made by NTSB, but it would be nearly impossible to identify specific sources which these elements came, and relevancy of such information in regard to the investigation is not clear. Mike Hauf has asked Carson (Levi Phillips) for a sample of the fiberglass collector box, which is located in the fuel tanks. The Materials Lab is planning to look at it.

A sample from a fiberglass collector can was received from Carson and examined in the NTSB Materials Lab. The results of the examination are contained in Materials Laboratory Factual Report No. 08-121, which has been placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/430172.pdf

4. PRV Filter Contamination - Carson Parts – Carson has two disassembled FCUs and filters from 2 engine anomaly incidents. Would like NTSB to look at them. Carson has already had a lab look at them, and photos show very similar contamination as accident PRV. NTSB will consider this request. Mike has commented on this, i.e., we agree to review their report and look at some of their parts.

The NTSB reviewed the report provided by Carson. After careful consideration of Carson's request to examine parts from their previously disassembled FCUs, the NTSB declines to examine these parts. The NTSB cannot verify the origin and subsequent history of these parts independent of information provided by Carson. Since the conditions under which these FCUs were disassembled and stored cannot be verified, the possibility that any contamination found was introduced after disassembly cannot be excluded.

5. Review of other PRV Parts from Columbia – Carson requests NTSB to review paperwork of returned/repaired FCUs from Columbia, to see what their status is in terms of contamination, reason for removal, frequency, etc. Perhaps even examine parts at Columbia. NTSB will consider this request and is formulating actions to address this.

Since the July 2009 progress meeting, NTSB investigators have made two visits to Columbia Helicopters to conduct examinations of FCUs. See Action Item 7 for further information on these examinations. During these visits, the NTSB investigators had extensive verbal discussions with personnel at Columbia regarding their experience with these FCUs.

6. Canadian Report of Hayes Accident – This report cites the PRV contaminants as a contributing factor to a helicopter accident that experienced an engine anomaly. NTSB will review this report in detail.

The NTSB has reviewed in detail the Transportation Safety Board (TSB) of Canada's report (Aviation Investigation Report A02P0320) on the Hayes accident, which occurred on December 16, 2002, and involved a Sikorsky S-61N helicopter operated by Hayes Helicopter Services. The report indicates that during an engine check flight, there was a failure of the main gearbox #1 input pinion forward bearing, which caused the #1 engine to lose power due to loss of load, overspeed and shutdown. The #2 engine did not respond quickly enough to the increased load demand on it from the main rotor, which resulted in a hard autorotation landing on a road. According to the report, a combination of three factors prevented the #2 engine from assuming the total load: a misadjusted stator valve actuator, improper fuel control unit topping settings, and a sticking pressure regulating valve (PRV). Disassembly of the PRV revealed that it was jammed with contaminant, which was determined by the TSB to be comprised of particulates of chip board, bleached cellulose, paint, and metal.

Additional information about the PRV from the Hayes accident was obtained from a report prepared by Hamilton Sundstrand (Report FI-04-56 dated November 10, 2004). According to this report, a "considerable amount of debris" had collected in the four balance grooves of the spool and at the diaphragm end of the spool. Photographs included in the report indicate that the debris was plainly visible to the naked eye. Chemical analysis of a sampling of the debris by Hamilton Sundstrand revealed mainly abrasive mineral oxides measuring about 25 microns in size, as well as silica (glass) fibers roughly 2.5 microns in diameter, iron-base fines, aluminum alloy fines and scattered organic material.

7. Exam of Parts from Recent Croman Helicopter Accident – Request to see if the FCUs from these engines display similar signatures/contamination as accident engine. NTSB to ensure NTSB investigator to preside over exam on these parts, along with Forest Service, sometime within the next 1-2 weeks.

The FCUs from the Croman helicopter accident (NTSB No. WPR09TA353) were examined under NTSB supervision. Additionally, an FCU from another S-61 that was involved in an incident in August 2009 was examined under NTSB supervision. Three reports describing the findings of these examinations were prepared (Addendum 1 to Airworthiness Factual Report, Materials Laboratory Factual Report No. 09-094, and Materials Laboratory Factual Report No. 10-002) and are available in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/434143.pdf
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/434634.pdf
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/434633.pdf

8. Provide all Photographs of Post-Accident Smoke Plume – Some people have only 3 photos. Others have six. NTSB will collect any and all such photos, and make them available to all parties.

A total of 15 photos of the smoke plume were collected by the NTSB. Copies of the photos were provided to all parties, and copies of all the photos have been placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/430579.pdf and
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/430401.pdf to 430415.pdf

9. Revise Meteorological Report with Additional Data – Temperature and wind data from 3 other sources have been requested to be cited in NTSB Meteorological Report. This includes CVR, Carson reports of weather, and a temperature spread.

An Addendum to the Meteorological Factual Report has been prepared and placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/430552.pdf

10. Aircraft Performance Hover Study – Request was made to not display firm conclusions about one temperature and wind input for performance. The next draft of the Hover Study will include a sensitivity study, showing a "matrix" with a range of temperature and wind data, so that reader can go into the matrix and get several solutions.

Although the Hover Study continues to display the nominal conditions for the accident takeoff as 23° C and calm winds, it was revised to incorporate a sensitivity study. The Hover Study has been placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/426604.pdf

11. NTSB Flight Testing – Carson offered helicopter and facilities to NTSB to perform dedicated flight testing to prove performance of helicopter in overloaded condition. NTSB reluctant to initiate this effort, due to safety concerns, time and complexity involved in setting up a valid test, and also due to the fact that it may not add value to the investigation. However, NTSB will consider the offer.

The NTSB declined Carson's offer to conduct a specific flight test in support of this investigation, because flight-test-based performance data for the S-61N with Carson blades were already available in the form of the approved Rotorcraft Flight Manual performance charts. On November 18, 2009, Mr. Frank Carson stated in a letter to Chairman Hersman that Carson had independently conducted a flight test which indicated that under conditions similar to the accident conditions, an S-61N with Carson blades "could hover out of ground effect, fly and climb at a weight of 19,400 lbs." This reported performance exceeds the performance predicted by the approved Rotorcraft Flight Manual performance charts. On January 15, 2010, the NTSB received a report prepared by Whipple Aviation Services on flight testing conducted for Carson Helicopters. The NTSB is in the process of reviewing the report, which has been placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/438758.pdf

12. Forest Service Contract Regarding Engine Performance – Disagreement regarding the Forest Service requirements for min spec engine performance. "Bidding" versus "Performing". Forest Service to provide contract excerpts and their written views, Carson to also provide written views and other documentation such as previous Forest Service letters and judicial reviews. NTSB will review.

Both the USFS and Carson submitted detailed responses to this item. Carson's response referred to a September 2004 USFS briefing paper that was addressed to the operators of Kaman Kmax helicopters. According to Carson, the paper stated that "the Forest Service does not have an issue with Kmax operators using the FAA certified performance charts in conjunction with power assurance checks to obtain actual engine performance while conducting fire operations." Carson's response concluded that "although [the briefing paper] is in reference to Kmax helicopters, [the USFS] obviously cannot discriminate among aircraft for using actual engine performance in the field as long as it is a manufacturer and FAA approved procedure." Carson suggested that the NTSB request a copy of the briefing paper from the USFS.

The USFS's initial response to the NTSB stated that it "remains firm that power assurance checks, which are required by the contract, are used as an engine trend indicator and shall not be used to gain additional power for performance planning." When the NTSB informed the USFS of Carson's response and requested a copy of the September 2004 briefing paper, the USFS provided a copy of the paper and stated that the paper "only applied to the Kmax helicopter" and "could not be understood to apply to the S-61 or any other helicopter."

The Carson and USFS responses were reviewed and considered by the NTSB before the final version of the Operations Factual Report was completed and placed in the public docket.
http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/426753.pdf

13. Single-engine Sea Level Data – Zoe requests a letter that Carson mentioned in the meeting. Carson to provide letter. NTSB to review.

Carson responded to this item by providing an explanation stating that during the progress meeting, their representatives were objecting to a statement in the draft Operations Factual Report which read: "RFMS 8, Figure 1, Power Available 2.5 Minute Power (100-percent NR), is the chart used to show the maximum specification torque available when one engine is inoperative; only single engine operation (OEI) limits are shown." Carson stated that "this chart is not a specific OEI chart. It is not labeled as an OEI chart. As long as maximum torque from the two engines together does not exceed 206%, this chart can be used for two engine operation at elevations above sea level, because the aircraft is transmission limited." The final version of the Operations Factual Report, which has been placed in the public docket, retains the original statement, and a paragraph describing Carson's position has been added.

14. Documented Weights of Carson's Fleet – Some documentation indicates weights in decimals (tenths of a pound), but Carson's scales do not read out into decimals. Also, weights of entire fleet have a difference of exactly 80 pounds between the left landing

gear, and the right landing gear. Carson to investigate and attempt to provide an explanation.

This item related to anomalies found when NTSB investigators reviewed the weight and balance documents submitted by Carson to the USFS as part of its bid package for the 2008 contracts. Documents were submitted for 11 helicopters, one of which was the accident helicopter. Investigators verified that the documents submitted for the accident helicopter were the same as those used by the accident pilots for performance planning. During the review, it was noted that for 8 of the 11 helicopters, including the accident helicopter, the forms providing scale weighing data (Chart Bs) had scale weights recorded to the nearest tenth of a pound, a precision which the scales used were not capable of measuring. It was further noted that the weight difference between the left main gear and the right main gear scale readings for all 8 of these helicopters was exactly 80 pounds, and the same individual prepared all 8 Chart Bs.

Carson provided an explanation concerning the recording of weights to the nearest tenth of a pound and the consistent 80 pound weight differences in an e-mail dated October 29, 2009. The e-mail stated, in part: "Based on our investigation, we are of the opinion that the contract bid weight information was calculated using a formula that would yield the information based on an overall aircraft weight and CG, so the bid weights were not all obtained from actual weighings of the aircraft involved." The e-mail further stated that Carson believed one of their employees "used a formula to calculate the estimated weights at the individual jack/weighing points rather than actual scale reading data for each aircraft."

15. "Off Shore" Records regarding Accident Ship Weight - Carson to provide these to Zoë.

Carson purchased the accident helicopter from CHC, a Canadian company, on June 20, 2007. According to CHC records, when the helicopter was sold to Carson it had an empty weight of 13,279 pounds. In comments on a draft of the Operations Factual Report, Carson stated that after acquiring the helicopter, changes were made "to the landing gear, seats, cargo hook, interior, and removal of overwater equipment." The reference to "off shore" records refers to a request by Ms. Zoe Keliher, the Operations Group Chairman, that Carson provide records documenting the specific equipment removed immediately after Carson received the helicopter.

In an e-mail dated October 21, 2009, the Carson party coordinator stated that he "was not certain we have complete records or have adequately accounted for everything that may have been added or removed from the aircraft during configuration changes." On November 5, 2009, the party coordinator reported that Carson had retrieved from a storage warehouse and weighed two life rafts and several seats that were removed from the helicopter when it was received from CHC. He further reported that these items as well as others had been removed from the helicopter before it was inspected by a designated airworthiness representative for type certificate conformity, and no maintenance records had been found to show the removal of these items.

16. Carson Documents to Support 13,440 lbs Empty Weight – NTSB does not have the records, nor the understanding, as to Carson's submission of this weight. Carson to send specific documents with clear explanation to Zoë.

In response to this item, on September 16, 2009, the Carson party coordinator provided Ms. Keliher with three estimates of the helicopter's empty weight at the time of the accident. These estimates were in the form of build-up weights constructed by starting with a specific weighing of the helicopter and adding and subtracting equipment to arrive at the accident configuration. Using weighing records from August 15, 2007, December 26, 2007, and January 4, 2008, Carson estimated the accident empty weight as 13,640 pounds, 13,443 pounds, and 13,419 pounds, respectively. The NTSB clearly understands how Carson calculated these estimates.

However, it should be noted that the NTSB's estimate of the helicopter's empty weight at the time of the accident of 13,845 pounds does not agree with any of these estimates. For further information about the methodology the NTSB used to estimate the helicopter's weight, refer to the Operations Group Report, which has been placed in the public docket.

17. Report of Carson Forensic Investigation of Document Revisions – NTSB to submit written request to Mr. Frank Carson for a copy of this report.

In an e-mail dated November 16, 2009, the party coordinator for Carson reported that "the forensic investigation was not conducted by Carson, but by a consultant working under the direction of our outside counsel." The e-mail further stated that "the consultant's work was not completed and that its draft reports are privileged documents that cannot be shared outside of Carson because they are subject to the attorney-client and work product privileges." The party coordinator provided the NTSB IIC with contact information for attorneys at the law firm that conducted the investigation. The NTSB IIC sent an email to one of the attorneys asking the following: "During the forensic investigation, did you find any e-mails, memoranda, or other written communications which discussed or mentioned the alternation of the performance charts? If so, when were they sent and by whom? What was the nature of the discussion?" The response received was that "all emails, memoranda and documents that are responsive" had previously been provided to the NTSB and that they were identified in the Operations Group Report.

18. Breakout Group to Review Weight and Balance Documents – If needed, NTSB to meet in person with Carson, and invite parties, to a meeting to clarify and reconcile all pertinent maintenance records and other documents to determine accident ship weight.

The NTSB does not see any value in further reviewing or discussing the helicopter's weight and balance documents in a meeting with the parties. The available maintenance records and documents pertaining to the helicopter's weight and balance have already been thoroughly reviewed and discussed by the parties.

19. Effect of "106-108 % Unloaded Rotor Blade" on Lift Performance – Carson to provide written explanation of their concern in this area, and specifically, their reasoning

as to why they believe the transient peak Nr values when engine power is first applied with the blades at flat pitch is related to, or is an indication of, the health and maximum power capabilities of the engines.

Carson responded to this item by stating that "the flat pitch setting is a physical stop and that it should have the same Nf [power turbine speed] reading at each takeoff in flat pitch prior to collective engagement." The response further stated that "the CVR spectrum shows that there is degradation in this setting on each takeoff from H44, whether it is measured from the transient peak or the brief flat pitch reading immediately after the peak." Additionally Carson indicated that "the Nf/Nr values are changing on almost every takeoff" and that they did not "feel that this fluctuation in the flat pitch reading is normal and is most likely indicative of a malfunctioning or improperly operating FCU, which controls power turbine speed." Carson did not provide an explanation of the mechanics by which an FCU anomaly would affect the flat pitch Nr, or of what range of variation in the flat pitch Nr values could be considered "normal."

The party coordinator for GE, the manufacturer of the engines, was asked by the NTSB IIC to provide an explanation for the observed variation in flat pitch Nr. GE's response pointed out that the brief transient peak values of Nr that occur during throttle advancement should not be used to determine flat pitch Nr; rather the Nr should be read after the main rotor has stabilized following throttle application and before collective is applied. GE stated that "due to variations in when collective was applied and lack of Nr and Ng [gas generator turbine speed] stabilization, it was not possible to compare a stabilized flat pitch Nr for each of the 7 takeoffs" recorded on the CVR. However, during all three H-44 takeoffs, there were brief periods of time (2-4 seconds) during which flat pitch steady state Nr may have been achieved.

The steady state Nr values achieved were 107% for about 2 seconds, 107% for about 4 seconds, and 107.2% for about 4 seconds on the first, second and third H-44 takeoffs, respectively. These Nr values were read from Chart 13, "Main Rotor Speed Comparison of H44 Takeoffs" in the Sound Spectrum Study Errata dated April 9, 2010. According to the Sikorsky S-61N RFM, the flat pitch Nr should be 107-109%. It should be noted that Carson's comments were based on Nr data taken from the Sound Spectrum Study dated May 21, 2009. On April 9, 2010, a Sound Spectrum Study Errata was issued that provided corrected values for Nr.

20. Use of the term "Passengers" versus "Qualified Non-Crewmembers" -- Carson asserts that the use of the term "passengers" throughout the report is not appropriate or accurate. They cite (1) FAA AC 00-1.1; (2) Forest Service Contract; and (3) A letter from Pat of the Forest Service prohibiting the term. Others disagree. Carson and Forest Service to provide documents and written viewpoints. NTSB to discuss with AS senior management and NTSB General Council, and will make a determination.

Carson objected to the use of the term "passengers" in the draft Operations Group Report. The USFS and Carson submitted detailed responses to this item. Both agree that the accident flight was a public aircraft flight. By definition (Title 49 U.S.C. Section 40125), a public aircraft cannot be used to carry persons other than a crewmember or a qualified non-crewmember, and a qualified non-

crewmember is a person whose presence is required to perform, or is associated with the performance of, a governmental function (i.e. firefighting). Therefore, in this case, the firefighters being transported by the helicopter are considered to be qualified non-crewmembers. The final version of the Operations Factual Report, which has been placed in the public docket, does not refer to the persons being transported as passengers. As explained in a footnote on the first page of the report, the term "firefighters" is used in place of qualified non-crewmembers.

21. Use of the term "CHI" and "CHSI" – Carson indicates that NTSB draft reports do not accurate portray the name of the two Carson entities (Carson Helicopters Inc, and Carson Helicopter Services Inc). Carson has already provided letter to NTSB in this regard. Forest Service to provide their view with documents, and NTSB will review and make a determination.

As noted, Carson addressed this item in a letter to the NTSB dated August 6, 2009. In the letter, under the heading "Operational control issues," Carson stated that CHI was the contractor to the USFS, and the USFS was "the sole operator of this aircraft as per the FAA and the terms of our contract with the USFS." Further, Carson stated that "there were no Part 135 operations conducted by CHI or CHSI under the USFS contract. CHSI's FAA Part 135 Operations Specifications did not apply for any flight operations conducted by this aircraft for the USFS."

The USFS submitted its response to this item in a letter to the NTSB dated September 17, 2009. The USFS acknowledged that it "has operational control when conducting public aircraft operations" and stated that "although this was a public aircraft flight, Carson was nevertheless required to comply with Part 135 and the other FARs." The USFS contract states that contractors shall be currently certificated to meet 14 CFR 133, 135, and 137 as applicable to the operation being bid. The contract further states that "regardless of any status as a public aircraft operation, the Contractor shall operate in accordance with their approved FAA Operations Specifications and all portions of 14 CFR 91 (including those portions applicable to civil aircraft) and each certification required under this Contract unless otherwise authorized by the CO (Contracting Officer)."

The Carson and USFS responses were reviewed and considered by the NTSB before the final version of the Operations Factual Report was completed and placed in the public docket.