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From: Gregory A. Anderson ----------]
Sent: Sunday, December 05, 2010 11:33 AM
To: Struhsaker Jim
Cc: Keliher Zoe; Julius Chris
Subject: FW: Weaverville, Co-Pilot response

. **From:** Gregory A. Anderson ----------
Sent: Saturday, December 04, 2010 2:11 PM
To: NTSB
Subject: RE: Weaverville, SIC response

Mr. Struhsaker:

Here are Bill Coultas' comments. I have copied them verbatim but separated them out to address each point. Thank you for taking the time for these responses. Like most dedicated members of a flight crew in these circumstances, Bill is concerned that his statements are considered of equal weight. His comments are in red below. I hope they help.

-Greg Anderson

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From: Struhsaker Jim ----------
Sent: Tuesday, November 30, 2010 4:37 PM
To: ----------
Cc: Julius Chris; Keliher Zoe; Struhsaker Jim
Subject: Weaverville, Co-Pilot response

November 30, 2010

Dear Mr. Coultas,

I am writing in response to the questions you asked in your e-mail of November 16, 2010. Since some of your questions address areas of the investigation that are beyond the scope of Ms. Keliher's work as the operations group chairman, she requested that I respond to you. Before responding to your individual questions, I would like to inform you that the Board is scheduled to meet regarding this accident on December 7, 2010. At this meeting, the Board will discuss and adopt findings, probable cause and recommendations. The Board's final report on the accident will be issued about 1 month after the meeting. The report will contain the NTSB's analysis of the facts, conditions and circumstances of the accident. I am not at liberty to answer analytical questions prior to the release of the report. Therefore, my answers to your questions as given below include only factual information. All the documents that I refer to in my answers, as well as many more that pertain to the accident, can be found online at www.ntsb.gov. The majority of the documents are contained in the public docket for this accident investigation, located at:

http://www.ntsb.gov/Dockets/Aviation/LAX08PA259/default.htm

Jim:

Thank you for your efforts and the efforts of the entire NTSB investigative team. I am only asking these questions because I am looking for the truth of what happened. I hope the truth comes out.

Sincerely,

Bill Coultas

I encourage you to review the contents of the public docket in detail. I also encourage you to watch the webcast of the Board meeting on December 7th. The meeting begins at 9:30 am eastern standard time, and there will be a link on the homepage of the NTSB website (www.ntsb.gov) for the webcast. If you are not available at the time of the Board meeting, the webcast is archived so that you can view it at a later time.

1. Why is 32 degrees Celsius, 6103 feet pressure altitude and zero wind being used as the temperature, altitude and wind to compute actual conditions created by the NTSB's investigators. I specifically recall stating the actual temperature of 12 to 13 degrees cooler when asked by Roark while we were sitting on the ground at H-44. Also, the altitude at H-44 per the NTSB's own report is 5946 feet and per the CVR the wind call-out from the forest service personnel on the ground at H-44 was 3-5 knots out of the southeast. This is a serious concern because it specifically affects the performance of the helicopter and determines without doubt the aircraft had sufficient power to execute the takeoff.

   The temperature, pressure altitude, and wind speed at H-44 for the accident takeoff were estimated at 23° C (not 32°C); 6,106 feet; and calm, respectively. The details of how these estimates were made can be found in the Meteorology Factual Report and the addendum to that report, which are available in the public docket at the link given above. Additionally, there is an Approach and Landing Study in the docket which was conducted in order to accurately estimate the helicopter's altitude when the CVR recorded your statement that the OAT was 20°C.

The problem is with the term "estimate." You have actual and reliable data for exact measurements. Why use estimates?

I do not understand the term "pressure altitude" as you use it. That is altitude above sea level. Density altitude is based on the temperature and altitude. You don't need to estimate altitude. The survey shows 5946' at H-44, which is where we landed on this trip. The 32 degree reference was the planned temp for our preflight calculations. My apologies for the confusion. It was the reference point for our in-flight calculations. So when I call out we're "12, no 13 degree cooler" on

the CVR, I'm talking about 12-13 degrees under the reference/planning temp, while we were on the ground at H-44. So 19-20 C is the correct temp. We had 3-5 knots off the nose at the time of lift-off. We were experiencing a well known phenomena of up-slope wind because as of the time of the accident we still had cooling going on from very hot down-slope temperature. We were flying down-slope so the wind was on our nose (up-slope), and we observed it and the guy on the ground called it as well. Also, take a look at the photos post accident as to which way the smoke was blowing (up-slope), post accident. Typically, the change to an down-slope wind wouldn't occur this time of year until after 21:00 (SMT). As we fly water drops, we were experienced with the time of change from up-slope to down-slope. Winds aloft reports from remote (even a couple of miles) are useless. PIREPS or, what we had, a qualified and trained FS ground observer are the only useful information. What we felt, heard and saw is the only relevant data as to wind speed. Every knot of wind on our nose is @ 100 lbs of lift.
I do not understand using estimates for the temperature, altitude and wind speed when you've got the actual data. Why?

Also, trying to use Sikorsky data in this context as to the helicopter's performance is useless. N612AZ did not have Sikorsky blades and their trim tabs. N612AZ had the composite Carson blades. They were the better performing rotor blades for our use. The Sikorsky charts don't show that. It makes no sense not to use actual vs. estimated data unless a particular outcome is desired. You have actual data. Please use the composite performance charts.
Why not load up an S-61N with composite blades and use the actual data and see if it will fly out of there with the same density altitude?

2. Why hasn't the NTSB focused on the finding of the #2 engine emergency throttle position? After I had ensured both engine throttles were at the full forward position and the rotor RPM was decreasing, I have memories that I grabbed the #2 emergency throttle and advanced it forward. Because I was unable to recall this with the same detail as other events, I did not want to assume those actions. However, on 9 November 2010 at 11:28 am local time I received a phone call from Roger Douglas. After some brief friendly conversation he asked how I was doing. I replied I was having a hard time trying to understand the direction the NTSB's investigation is going in light of all of the physical evidence. Evidence such as the NTSB's insistence of using 32 degrees not the actual 19-20 Celsius that I reference while on the ground at H-44. 6103 feet PA as the actual altitude and a zero wind condition when the actual temperature is clearly heard on the CVR.

Missing FCU parts, contaminates found in the #2 FCU; specifically the PRV. A 30% torque split between the #1 and #2 engines. A lack of FOD damage to the #2 engine and the position of the #2 engine emergency throttle. I then said that I wished that I could vividly recall moving the #2 engine emergency throttle with the same vivid memory of recalling the temperature of 19-20 Celsius. He replied, "wait, wait,!! When Deb and I came and seen you in the ICU after you woke up, you told me that you moved that #2 emergency throttle". I replied "I did"?, and Roger said "yes, you did". I then asked if he could recall in enough detail that conversation to testify, and he told me "yes". I told him to remember this conversation.

You are correct in stating that, as documented in the Airworthiness Group Chairman's Factual Report, the cockpit emergency throttles were found mismatched with the #2 advanced about halfway and the # 1 shut-off. However, you did not make note of the fact that the report also states that "this position may not be representative as [the emergency throttles] are friction-detented only." Further, the report also documents that when the FCUs were examined on scene both emergency throttles were found in the closed, or shut-off, position. (See pages 66 and 72 of the Airworthiness Group Chairman's Factual Report, which is available in the public docket.

The friction detent statement is not correct. The Emergency Throttles are in a notch-pressure gated configuration. It must be moved forcefully to the right on #2. To move the throttles out of the gate and start them towards opening them takes about seven to ten lbs. of pressure. There is no way it could open by something striking it upon impact, even if you assume that both Roger and I are remembering something that didn't happen. The cable linking the actual throttle lever to the FCU may have some play in it. I never said I knew the cable has been moved enough to actuate the FCU fuel flow. I only said I know I started to open it. But I do not see the Board's point. The issue is not whether the FCU actually bypassed the normal fuel delivery system and dumped fuel into the engine, the issue is the fact that whatever else was happening, in those few seconds after the nose dropped I reacted by trying to deliver more fuel to #2. The impact with the trees was very violent and I probably didn't get enough time to open it all the way. Also, throwing open the emergency throttle can do more harm than good. The accepted technique is to open it partially then as the engine reacts, slowly open it

more. We did not have that kind of time.

3. Why has there been no concern regarding the missing #2 FCU parts? Did the NTSB conduct an investigation after learning of the missing FCU parts? Who was responsible for the chain of custody of the engines and FCU's?

I believe you are referring to components of the #1 FCU's T2 bellows assembly. Following the examination at the Columbia Helicopters' facility, both FCUs were stored at Columbia Helicopters and then shipped to the NTSB headquarters in Washington, DC. Upon opening the shipping containers, the NTSB conducted an inventory of the hardware, which revealed that the following components of the #1 FCU's T2 bellows assembly were not present: aluminum dust cover, snap retainer ring, spring retainer cap, spring, and bellows. A review of a video recording taken by Columbia Helicopters personnel of the packaging of the FCU parts determined that the missing parts were not present at the time of packaging and therefore were not packaged and shipped to the NTSB. The NTSB did conduct an investigation into the disappearance of these parts. It can be found at:
http://www.ntsb.gov/Info/FOIA-2009-00249%20release.pdf

It clearly identifies Columbia as responsible for the reassembly and packaging of the FCUs in Aurora. The conclusion section does not comment on the loss of parts as being caused by Columbia. Why not? As I read the record, the NTSB clearly understood that Columbia's business was refurbishment and maintenance of the CT58 fuel systems and that the CT58 fuel systems had been identified as a possible cause of the accident by Carson from the start, even before the Aurora inspection. If the FCUs weren't a possible factor, why examine them to this extent? But if it was a potential factor, and Columbia obviously a potentially responsible party, why let Columbia reassemble and pack the critical parts? The Board suggested that Carson might have tampered with prior FCUs it submitted because the NTSB wasn't there for the disassembly. That is not fair or objective. Why assume that one potentially responsible party is more "trustworthy" than another from the outset?

Doesn't basic chain-of-evidence procedure require the NTSB to make sure the parts are not subject to any "further inspection" or even cleaning by Columbia before they get to the lab back east? Why wasn't there a seal on the package at Aurora by the NTSB to be broken only in Washington? I

thought that's why the engines were locked and sealed in the trip from Weaverville to Aurora.
The investigation doesn't talk about any of that, why not? The conclusion section says the parts don't matter, but the CT58 won't run without them and they could have had evidence of contamination. I'm not an A&P mechanic but when you reassemble an engine component and parts are left over like a Christmas Eve bike, something's wrong. Was the NTSB there to supervise this and if not, why not? Why wasn't the amount of blockage measured immediately upon the first disassembly in Aurora? Wouldn't that be the critical time given the chance some of the contaminants and blockage could become dislodged from the first time the FCU was opened to the time the filters and PRV were closely examined?
Also, the record shows minimal FOD damage to #2, while #1 had extensive FOD damage (the air inlets are 24" apart). Number 1 was on the ground but Carson suggested that #2 wasn't running because of the lack of FOD damage. The investigative report dismissed this because #2 wasn't on the ground. What? A ten ton aircraft hits the ground from a height of 100' and the theory is the debris went up 12" but stopped before it reached 24"?
These engines suck in huge amounts of air when they are pulling max power. If #2 was running , there would be the same amount of FOD damage to #2 as to #1, or close to it.
If both engines were at max power, there would be significant damage to both compressor sections. Any other conclusion is either ignorant or someone is looking for an excuse. The only logical conclusion is that #2 was spooling down when it hit the ground. The NTSB must have some prior historical data for this type of situation.

4. Why was contaminate removed from the FCU fuel filter prior to determining the percentage of blockage? Why was that blockage test not performed per the manufacturers procedures?

As described in the Errata Sheet for Materials Laboratory Report 08-121, which is available in the public docket, prior to performing the light examination with a magnifying glass and estimating the amount of plugging of available open area on each screen filter, sample particles were removed with carbon double-sided adhesive tape from the screen filters. The amount of plugging of available open area was determined later using an adjacent area of the screen where particles were not removed with double adhesive tape.

As described in Materials Laboratory Report 08-121, the inspection procedure used was as follows: Fiber optic light was inserted inside a screen filter. When viewed from outside the screen with a 12.5X glass, the available open areas were estimated by the amount of light that passed the inner 40 micrometer screen. The estimate takes into account the available open areas all around the circumference of the filter. The permanent and removable filters were inspected separately (disassembled from each other).

The response doesn't really answer my question. What level of blockage is acceptable? Were any of the contaminants removed prior to the light and any other blockage tests? Why wasn't the blockage study done in Aurora? Why was it done 14 months after the accident? Was it done before or after the contaminate was removed for testing, and was there still significant blockage, considering total area? Was the amount of blockage consistent with prior incidents/crashes where the filter size was questioned? Has there been any analysis of the effect of this level of filter blockage on engine performance? The tolerance for the stator vanes and fuel flow are less than 10 microns (actually slightly less than 5 microns). That is a fact. It doesn't take more than a couple of pieces of debris to block the fuel flow and stick the PRV. These are facts. Where are they in the investigation?

5. Why was the PRV contaminate study withdrawn before it was completed?

Materials Laboratory Report 08-121 was completed, and it is available in the public docket.

It is not, it is on a website but not part of the official docket accessible to the public. I only got it from my lawyers after looking for it on www.ntsb.gov/foia-2009-00249%20release.pdf. Try finding it on your home computer. That is not fair. Why is it on a separate website?

Have there been any tests to determine what happens to fuel flow and performance when the filter has significant blockage? Those photos look pretty conclusive to me. What happens if those contaminants reach the PRV? What happened in the prior events involving S-61Ns and PRV issues? Is there any way to compare the effects of fuel blockage in those accidents with the blockage here? Have you looked at what happens with a sticky PRV caused by contamination? It's in the GE service manual and my lawyers tell me that GE admitted that the engine won't be producing power if it doesn't get fuel , regardless if the compressor is at max rpm (you need T5 and Nf). I did not see that in the report.

The cite is to a website, not to the NTSB official record docket. That's contrary to the established NTSB procedures. And by the way, neither me, nor my lawyers or

the investigators could access this website. Have you tried?
My main concern is that there was no scientific examination of the PRV and filter upon initial tear down in Aurora. Why do I have to point this out? I am not a party to this, but no one asked me as the surviving member of the flight crew about this. You tell me there were contaminates, but don't tell me what they actually are. Also, and pardon me but my military background as a Army 2nd LT up to Major, flying Blackhawks and Hueys, (I was also a tail gunner for a B-52 in the Air Force before I transferred), and so I'm always interested in how the Navy and Marines (whom I believe used the S-61 more than the other services) handled the fuel issues. They switched to 10 micron in the early '90's and from what I can tell, they haven't had these problems. Where is this analysis?

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6. Why the focus on the 2.5 minute power charts when the flight lasted ninety seconds? We obviously never held power at any level between 2.5 and 5 minutes. We'd crashed by then.

   The discussion of 2.5 minute power charts and 5 minute power charts in the Operations Factual Report pertains to their use in preflight load calculations.

I still do not understand the significance of this to the power to weight ratio? We did not plan to reach topping, and from what I saw, felt and heard we did not. The flight ended after 90 seconds, so we neither planned nor achieved the 2.5 min to 5 min. power that I understand to be the concern. Even if the sound spectrum analysis indicates we reached topping power, we would have held it only for 90 seconds. The power charts are there to make sure we don't overstress the engines. That wasn't a factor in time of flight so I do not see how Carson's substitution of 5 min. for 2.5 min. power has any relevance to a weight and balance issue. If load is the issue, why not load up a comparable S-61 and fly it up to the same density altitude and see if she'll lift it out of ground effect? If an S-61 is overloaded she'll hold, then sink as you get out of ground effect. She'll settle right down. You can feel it too when you are in ground effect. If we felt it, we would have never moved out of H-44 landing area as there is no place else to go. The power loss was after we transitioned to forward flight and moved so far away from H-44 that backing up wasn't even a possibility. We were down the mountain when the nose dropped. We were at 12-15 knots before the nose dropped. This should be on the CVR.

7. If the sound spectrum analysis is so accurate, where on the analysis is the four plots that represent the rotor blade impacts to the four known trees found during the post-crash investigation?

The sound spectrum analysis was conducted to document significant rotor system and engine sounds that could be heard during the flights. No attempt was made to identify sounds correlating with blade strikes, although such sounds may have been recorded.

The lack of FOD damage to the compressor section of #2 doesn't support the theory of topping power at impact. It doesn't support the sound spectrum theory of GE.
The data regarding tree strikes can give further confirmation to what I've been saying about the flight path, time and sudden dip of the nose before any impact with the trees. I actually saw the first impact by the blades with the trees and can tell you the sudden nose drop had nothing to do with the aircraft striking the trees, either on the belly or the blades. We had transitioned to forward flight and left the H-44 area when this occurred. It is important for the Board to understand that the nose drop was significantly after we had left hover and brought the nose up for level flight. The plotting of the strikes, and the type of strikes should prove this conclusively.
The significant changes to the rotor rpm calculations in the Errata to the Sound Spectrum Study is puzzling. The error in determining the correct rotor rpm required a change of frequency from 663.1 Hz to 659.76 Hz. The Errata states, "Using the new number results in an overall increase in approximately 1.00506% in the rotor system values depicted on the original plots." However, this is not reflected in new Charts 13 nor 14. These summary graphs illustrate that the maximum Nr, when compared to the original charts, is not uniformly raised 1%. Is this another error? As the original plots supposedly indicate that there was a degradation in maximum rotor rpm on each successive take-off, this seems like a significant change. From what I read in the manuals, this indicates that contaminant particles affected the correct operation of the FCU, PRV, and variable position stator vanes. Why hasn't there been a recalculation and revision of Charts 13 and 14?
Also, I am concerned as to how a conclusion can be reached regarding topping power without an analysis of T5 and/or Nf? Without those you cannot conclude #2 was at full power. The compressor blades may be at full rpm but that does not make for topping power.
I think it is very important that the NTSB has not isolated the Nf rpm, T5 temp. or analyzed the remaining FDR data. GE says that it is entirely possible to reach max compressor speed without reaching maximum power. Why isn't this discussed? I would also like to know how any conclusions as to degradation of performance on successive flights can be analyzed without evaluating the additional 70 hours of data?

8. Why has the NTSB not determined the source of the fiberglass fibers found in the #2 FCU PRV? Are these fibers consistent with the plating material that Columbia Helicopters, Inc. applied during the FCU overhaul? Or, are these fibers from the aircrafts center tank collector can? Why has there been no focus on this contaminates source? This lack of concern is disturbing.

The microscopic particles found in the PRV from the #2 FCU were not fiberglass. As detailed in Materials Laboratory Report 08-121, energy dispersive spectroscopy (EDS) of the microscopic particles found in the PRV from the #2 FCU showed elemental peaks of carbon and oxygen, which indicated the particles were not fiberglass. However, EDS of the microscopic particles found in the PRV from the #1 FCU showed elemental peaks of silicon, aluminum and calcium, which indicated that these particles were fiberglass.

Report 08-121 also details the results of examination of a sample of the wall portion from a collector can that was submitted to the NTSB Materials Laboratory by Carson Helicopters. The diameter of the straight rod fibers from the collector can measured between 8 and 10 micrometers, similar to the diameter of the fibers found in the PRV from the #1 FCU. EDS analysis of a straight rod fiber from the collector can produced a spectrum that contained major elemental peaks of silicon, aluminum and calcium with minor elemental peaks of magnesium, oxygen, carbon, consistent with silicate glass fiber such as E-glass.

Are you saying that the actual 40 micron filters for #2 contained no fiberglass particles or residue or that other parts of the #2 FCU contained no fiberglass particles? Do I understand you correctly that fiberglass, specifically E-glass, were found in the PRV for # 1 but not #2? I'm finding it hard to believe a specific type of contaminate would be found in one fuel system and not the other. The lab results, backed up by photos show blockage in #2 filter, and that was after the FCU had been handled extensively during the initial tear down in Aurora and then reassembled and packed by Columbia for shipment to DC, and the first blockage testing was done. Did the filter show significant blockage even after some of the material was removed for analysis? When is too much blockage? The investigation shows the cross-feed closed at the time of the crash. To transfer fuel to the aft tank feeds #2. The forward tank feeds #1. The center tank is used to feed both tanks as balance requires. When the center tank feeds either engine, it goes through the fiberglass collector in the center tank. I find it remote in the extreme that fiberglass could only be found in the fuel system for #1 given the fact that the fuel is mixed on almost every flight from the center tank to keep the aircraft balanced.

In Doc 426650, page 72, para D.6.6.2, it clearly states that fiber strands were resting in the second balance groove from the metering end of the spool. This is referencing the number 2 FCU PRV. So, what is this fiber material? I correlate this to fiberglass. How can you have one set of particulates in one side and not the

other? This is coming from the same fuel system. This leads me to suspect that this fiberglass material is coming from the center collector can. Your thoughts?

Again, I urge you to review the documents in the public docket and listen to the Board meeting. If you have further questions, please feel free to contact me directly.

Sincerely,

I would like to talk to you directly or speak with the entire Board. In the NTSB docket 426746 on page 8. it states, "the FDR recording contained approximately 77 hours of data." It further states, "It was concluded...[that]...the accident aircraft's FDR was recorded at some unknown time prior to the accident flight. No determination could be made to establish exactly when the recording was made." Why isn't the recovered FDR data published in the NTSB docket? How was it determined (and by whom) that the data was not relevant? Where's the analysis, or study, that established it is not relevant data? The Board should be aware that we were flying four or more hours almost every day the two weeks prior to the accident. That means that the 77 hours would give the Board a history of N612AZ leading up to the accident. I want the 77 hours analyzed.

I was not made a party to this investigation, even though I'm paying more of a price than anyone except Roark, Jim and the firefighters. To me, and I'm only a pilot, it looks like the NTSB made up its mind pretty early and looked at the data to support an initial conclusion. There is no other reason to use estimates over actual data. I hope you keep an open mind to what I have to say. If the Board thinks Roark and I would move that helicopter out of a recoverable position if we were even close to overweight, it is dead wrong. We knew our aircraft.

Sincerely, Bill Coultas

James F. Struhsaker
Investigator-In-Charge
Senior Air Safety Investigator
National Transportation Safety Board

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