FACTUAL REPORT – ATTACHMENT 5

Denver ACO – NTSB Meeting Summary

AIRWORTHINESS

ERA21FA233

Denver ACO-NTSB Meeting Minutes

Wednesday, July 7, 2021
2:46 PM

Attendees:

NTSB	Van McKenny
NTSB	Dan Boggs
AVP100	Matt Rigsby
Den ACO	Matt Bryant
FAA Flight test Branch	Kevin Greene
Den ACO	Ana Hueto
Den ACO	Jerry Ramos
Den ACO	Glenn Lan
Den ACO	Penelope Trease
AIR-360	Luke Walker
AVP-100	Pat Hempen

A summary of the accident circumstances was described by Mr McKenny and Mr Boggs. A Blackhawk Mission Equipment LLC fully approved STC (SR00933DE) of a production model fire tank and snorkel system that fits in the cabin of an H-60 helicopter (restricted category), with the snorkel hanging from the left side of the tank and extending below the helicopter. The helicopter was doing functional checks of the tank, which had just been installed. The test flight consisted of a right-hand circuit in which the helicopter takes on water from a nearby lake and drops the water along the airport infield and then returns to the lake for a reload. The helicopter had done 6 successful drops, and on the 7th it was noticed by the ground crew that the snorkel was no longer behaving in its normal stable condition but swinging excessively. The helicopter performed its drop and during the climb out the excessive swinging of the end of the snorkel swung up into the rotor disk and contacted a main rotor blade, which initiated the accident sequence.

Members of the FAA explained the overall approach and philosophy of the STC approval process. An applicant for an STC approaches the FAA with a proposed certification plan (PSCP). In that plan they describe what it is, what they are going to do, and the cert basis of the actual TC'd aircraft and the regulations they are going to show compliance to. The ACO manager forms a team consisting of different disciplines and project lead, project manager, and project engineer. Different systems are defined and assigned; structural, electrical systems, mechanical systems, flight test pilot, flight test engineer, and ASE's (Aviation Safety Engineer) who will be assigned to review the PSCP. This is what occurred in this specific case. For the 1st 25%-30% Penelope Trease was the lead, and the last 75% Matt Bryant was the lead. Each ASE reviews the PSCP for acceptability, along with coordination of the FAA standards staff. The applicant must show compliance to the various regulations defined in the PSCP thru

various means, test, analysis, design review, flight testing, ground testing, etc. Additionally, conformity is verified to ensure the aircraft is in appropriate configuration for testing. The FAA reviews and provided comments to the PSCP and eventually approves it to go forward. The applicant is responsible to review the comments and make adjustments to their plan. For this case, the final version was a Rev-D. It had been thru rev-A comments, Rev-B comments, Rev-C, and then Rev-D. For each system, the applicant has to state who the delegated DER (Delegated Engineering Representative) is or the entire engineering team, and the designated airworthiness representative which was the conformity person.

Towards the end of the project COVID restrictions were implemented in March-April. Functional ground test and EMI ground test were company accomplished and approved. One of the persons (DER) for that test was also to witness the official FAA ground test, and he had recommended approval of the test plan. Because of COVID the DER was not able to attend the FAA ground test. Because of that constraint, it was requested and approved that the original test be reviewed and accepted by the FAA, which it was.

Essentially, the DER or DER team is hired by the applicant to assist in identifying compliance with appropriate regulations, provide the FAA with required documentation, and represent the FAA during certification testing. The DER's are not paid by the FAA, however, DER's each have a FAA advisor, and undergo a yearly review by the FAA in order to retain their DER credentials. Part of the ASE's job is to review the DER's that the applicant is proposing to use. Included in the DER review is to identify what each DER has been approved to do, has the appropriate credentials, and what their capabilities are. In the PSCP there is a matrix that lists the regulations, the means of compliance, which DER will find compliance, and what documents will be used to show compliance (test plan, analysis report, etc.). Overall, this DER team was an experienced team. The ASE decision will retain the findings of a test or to delegate a DER to do it on behalf of the FAA. In the end the final approval of a project is a finding of compliance to the regulation.

All the testing for this STC was done thru DER's, no FAA ASE witnessed any of the tests or inspections, or flight tests. The flight testing had an approved TIA. The flight test ASE reviewed the company flight test report and found it very detailed. The FAA has the option of accepting the applicant’s findings if they (FAA) determine that all the appropriate regulations have been met and documented by the applicant. The FAA also has the option to pick and choose which tests they would like repeated or added. The DER that did the flight testing and wrote the report did a very good job and the fight test ASE was happy with the findings in the flight test report and accepted the report.

Regulatory guidance is contained in Part 21.35, Part 21.33, and 8110.4C contains guidance on how to comply with the regulation.

The snorkel assembly was not considered an external load as defined under Part 29.865. Part 29.865 relates an external load as either non-human cargo or human cargo. This snorkel was not considered to be either one of those. Though it was an external device such as a FLIR. The applicant did not include it in their PSCP and the FAA didn’t request that they do. However, the Standards Branch did request to review the PSCP, and the review did not mention the need to include 29.865. When compared to another PSCP for a similar snorkel configured STC, part 29.865 was not included in that PSCP either.

The design was not considered novel or unusual and part 21.101 was determined not to be applicable in this case.

In evaluating this design, the FAA had knowledge of other snorkel systems and relied heavily on the flight tests to determine performance in many phases of flight. Flight tests went from hover out to 1.1Vne, a very broad range of speed. However, the flight test pilots did not try to induce a snorkel oscillation or intentionally excite the snorkel in flight. The flight test was focused on the certified envelope, vibration/buffeting, and handling qualities. Flight tests showed that the hose was relatively stable out to Vne, and the closes the hose got to the fuselage was 5 feet.

No off-nominal conditions were considered (i.e.: damaged hose, turbulence, separation of the pump, etc.). Only the intended function is evaluated. Part 29.1309 requires the loss of the function and installation failures to be evaluated, as it relates to picking up and dropping water. For example, what are the impacts if water could not be picked up or released. This is done through the safety assessment process. Structures are treated differently than systems. Structures are subject to load factors and they either pass or don't. Systems use the system safety process, evaluate potential failures, effect of failures. Since the hose was considered structural it would not have been part of the system safety assessment.

For the case of the hose getting caught and pulled back, and that effect on the tank nozzle structure would have been part of the structural review. Analysis for the tank were based on samples of the tank materials.

The flight test report documented angle of banks up to 30°, however, that would not be considered a limitation in the RFM Sup. It is required to test up to 30° aob and to show acceptable performance, and if it passes then via extrapolation the entire flight envelope is considered acceptable. Testing is focused and flown in an operationally relevant manor. For external hoses such as this STC the main limiting factor has been shown to be airspeed that defines stability, and angle of bank has not been a limiting factor.

The system safety process has 2 aspects, functional failure (loss of function), and installation aspects (wiring, EMI, etc.). The safety analysis was done by a DER and the FAA was involved. A report was done by the DER. There was a electrical DER, lightning DER, and mechanical systems DER. FAA accepted the DER's results. Dragging the pump thru the water or having the pump stuck ON was probably not part of the safety assessment. Video and witnesses do not indicate any aggressive aircraft maneuvers.

There were questions about the hose pull test such as where did the hose release from?, was the tank part of the test?, was the lightning cable included in the test? The ACO representative said that he would review the test and try to answer those questions.

The standards branch did state that the applicant needed to comply with lightning. The lightning DER was brought on to do the approval. It was not known if the lighting cable was included in the pull test. Examination of the wreckage showed that the hose had remained attached to both the pump housing and the tank nozzle, and the lighting cable had parted at a mid-point on the hose.

Regarding the RFM Supplement, it didn't include normal operational procedure to approach a water source and load water into the tank using the pump-snorkel system. The reason for this was that the RFM Sup is a certification document that is part of type design and its designed to provide only that which is required by Part 29 regulation. There are an approved and unapproved sections. Operational procedures in not part of what a RFM Sup is intended for unless it might result in a limitation. The RFM Supliment would describe the actual operation of the system. Operational use of the integrated system,

if it exists, would be contained in an operator's OpsSpecs, Part 133 for the case of firefighting operations.

The NTSB will provide an official request for the following information:

1. PCSP Rev D document
2. System Safety Assessment Document
3. Snorkel pull test - were the loads on the tank and the lightning cable included in the testing?