

<b>Summary of RTCA Meeting</b> <b>SC-220 7th Plenary Minutes</b> <b>RTCA Paper No. 121-10/SC220-018</b>	
<b>Meeting Location:</b> Bourbon Orleans Hotel New Orleans, LA	<b>Meeting Date:</b> July 13-15, 2010

All three days of this meeting were devoted to review and disposition of public comments to the FRAC version of the draft MOPS. The file is titled *SC220 MOPS Draft for FRAC.pdf*.

Tuesday, July 13

The first comment considered was a non-concur from AIR-130. Lou Volchansky apologized to the committee for not coordinating earlier within the FAA, but explained that the consolidated FAA view is that they could not use the draft as a basis for a MOPS. They feel the draft lacks essential performance standards, and that the environmental tests are unnecessarily onerous, among other things.

Brad Miller announced that he was the Designated Federal Official for today's meetings, and that that position would revert to Lee Nguyen for the remainder of the meetings. Brad gave a presentation (SC220\_DFO\_FRAC\_Briefing\_LRV.ppt) adding information to the FAA position. He stated the draft is too permissive and reads like an advisory circular, using the term "provide means" instead of "shall provide". He said the structure is too much like an advisory circular, and should be reordered based on the MOPS template. He requested that the environmental testing be simplified, but did not give details or examples. He stated that there has to be more common ground between fixed wing and rotorcraft, but did not provide examples or details, though he suggested the use of normative appendices to separate classes of aircraft. He requested the document to address RVSM performance requirements. He felt the document could be made acceptable through easy incremental changes.

Lars and Mitch asked how a manufacturer could reliably demonstrate compliance with performance requirements in a lab environment.

Sherif defended the current draft by giving a presentation showing how the current document evolved, (RTCA\_SC220\_7thPlenary\_NonConcurCommentsV2.ppt). He discussed the problems with demonstrating compliance to aircraft performance standards in a manufacturers lab, focused on obtaining accurate simulation models of an aircraft. Sherif mentioned that the FRAC MOPS has quantitative minimum performance standards (minimum engagement limits, minimum control limits (added back), servo actuating function) and many minimum performance standards that describe as a minimum how the equipment shall perform the function (e.g. by doing what or by having what). Brad said the FAA wants more "beef" in the document. Mitch mentioned the ground rule for the committee is to not touch AC25.1329-1B; adding performance standards appears to conflict with this.

Thierry described that simulations and wind models would need to be qualified, and involve flight test for mode performance. Brad said the FAA views on performance have also evolved into performance-based criteria; it is easier to characterize performance-based operations on succinct performance requirements. Lou asked about the TOR, there is a sentence that specifies performance characteristics. Sherif pointed out that when we considered adding performance number requirements, we would not add them because either there was no safety impact identified, or it could not be demonstrated on the bench or realistically demonstrated by simulation. Lou repeated the FAA needs more performance characteristics they can use. Ron asked for detailed examples of performance requirements Lou wants, and how it would be tested. Lou mentioned RVSM. Ron responded with the need for a standard simulation to demonstrate the standards,

and that RVSM requirements already exist, why repeat them, and that AFGCS/equipment performance in RVSM is installation issues. Mitch also pointed out that these are supposed to be minimum requirements that apply to all aircraft. Anil comment.....wants more performance requirements. Jim Brady said this is incrementally better than existing MOPS because it adds some requirements, he asked if we could walk through an example to see what we are missing. Brad said we could use the term “shall not” where needed. Anil says it may be better as a “general equipment” TSO. Jim said one way to address it is to require a concurrent STC/TSO. Ron commented ACOs often require a concurrent STC.

Sherif described how the ARAC committee discussed performance numbers, and decided they could not do it. He gave an example for altitude hold. Brad/Anil repeated they need performance requirements. Sherif described how different manufacturers implement it differently. Anil mentioned that a TSO'd box has to be able to work on different airframes. Brad proposed the MOPS include some basic requirements, with additional requirements for various categories and classes of aircraft. Anil asked whether the MOPS should include minimum modes. John said the committee approach had been to say if the mode is included, here are the minimum requirements. Brad cautioned if we get too detailed, we may get out of sync with TAD and other organizations. Mitch said he feels this would lead to four separate sections for everything. Anil asked why not require Heading Hold as a minimum feature? Someone mentioned the exhaustive discussions that the committee had on mode performance/numbers. Someone pointed out that performance numbers were included where the committee felt they would have a safety impact. If an accident had occurred due to AFGCS, the committee would add requirements to avoid that situation. Ron asked why autopilots for Part 23 without Heading Hold should be disallowed; Anil replied that might be a deviation. Someone expressed concern that one of the reasons for an updated MOPS is to reduce the number of deviations, but adding performance requirements may increase them. Lee suggested we add a statement that concurrent STC is required.

Sherif summarized the discussion by saying the committee would consider adding a requirement for concurrent STC on the first aircraft. John suggested that be modified to “first aircraft type”. Lars felt that airframe manufacturer not getting as much as before; Sikorsky relies on the TSO to help qualify a system before they consider it for installation on their aircraft. Anil felt that the second airframe would get the benefit. Jay said Avidyne had the same experience.

After a break, Brad said the concurrent TSO/STC is not always a clean path. He feels that some STC requirements (“recommended practices”) may be captured and added to the MOPS. Colin asked if the MOPS can require a demonstration aboard an aircraft. Sherif said a manufacturer should not be required to have a customer before they seek a TSO. Brad said they don't need customer, only an aircraft. Anil said that the MOPS should go beyond safety. He asked how the committee viewed the “performance” part of the TOR. Sherif gave an example for AP override and disengagement, and another example of delay time after power-up before AP can perform intended function. A further example was emergency descent – minimum requirement was to avoid overspeed. Anil asked how this would apply to different airframes. Jay described how the development might flow. John asked whether a MOPS could be made from SAE AS402A. Ron replied the committee has already added to that with requirements that should be common to all autopilots. The FAA repeated this is inadequate for a TSO. Brad still needs “more beef”, though he was unable to define the term. Anil says 402A is inadequate. Brad asked whether the deviations are common. Sherif replied we looked at that, and it is on SharePoint. He gave a brief recap of common autopilot TSO deviations, none of which cover mode performance.

The group decided to take an example and see how performance requirements might be chosen – altitude hold was selected. Anil suggests 10% of suggested altitude. Thierry mentioned 100 feet. Someone asked if it doesn't meet the requirement, should the pilot have to disengage? Someone else replied no – it is still helpful to the pilot. Anil asked whether the MOPS should address the failures. He also suggested that performance requirements be based on IFR operational requirements. Jim asked how we demonstrate compliance to a 100-foot altitude hold requirement. Ron suggested one way – if AP goes beyond it, show servo operates to counteract it. However, it would be a meaningless test. Dick pointed out that a simple, proportional control algorithm would pass the test but would oscillate.

Anil asked again why altitude hold performance is not included. Sherif said because he doesn't have a qualified simulator. Sherif said that including mode performance parameters for the TSO is not value added since they must be repeated for certification for installation of the TSO'd equipment on the same aircraft type or different aircraft type. Dick said we would need to establish the basis for performance requirements, and how they will be demonstrated. He asked if the basis for them would be consumer protection.

The group continued with the altitude hold example to discover the appropriate level of performance requirements. We read the latest draft for Altitude Hold 2.2.1.5. Anil suggested we add dynamic stability numbers, such as ½ cycle. Sherif suggested gain/phase margin. Ron added rise time and standoff. Lars pointed out that "adequate thrust" is a meaningless term for rotorcraft?

Lee summarized what he heard – dynamic performance needs to be demonstrated on the bench (DO-178B), plus inspection + analysis. Dick asked how the dynamic performance could be demonstrated on a bench; is a qualified simulator needed? Lars suggested that a certified simulator should be used. Sherif said that simulator development typically lags avionics development. Anil said it would be reasonable to allow the manufacturer to use negotiate with the ACO to establish what simulation is acceptable. Jay asked, and it was agreed, that flight test is also an acceptable method. Mitch read the draft MOPS definition of "demonstration" and pointed out it doesn't restrict flight vs. simulation. Ron asked whether the demo should address aircraft loading.

The group reached agreement that any performance requirements must be demonstrated, either on an aircraft, or by means of simulation approved by ACO. Back on the 2.2.1.5, we briefly removed then replaced a phrase that adequate power is provided (was "thrust"). Someone proposed "minimum damping ratio 0.5".

Anil says this approach is an improvement over current rules. They feel a TSO gives them more confidence in equipment quality prior to installing on an aircraft.

We discussed options for demonstration: analysis, inspection, test and demo. Ron asked whether hardware had to be in the loop. Lee said a TSO is a self-certification by the manufacturer; they need detailed test procedures. The procedures we're drafting don't address performance, or aircraft configuration, flight phase, etc. John thinks we could write them to require demonstration of only the worst-case conditions.

We went around the table to ask individual opinions on the subject of performance requirements (Brad was not present for this). Sherif stated it is too expensive to perform twice, and provides little added value. He repeated the ARAC committee chose to not include them in AC25.1329-1B since they did not address safety, and results vary widely between aircraft.

Jay said that we are planning to include performance requirements in the installation guidance recommendations. He insists that flight test is always an option to demonstrate compliance (as opposed to requiring a certified simulation).

Thierry feels that performance numbers a meaningless unless accompanied by detailed test procedures that address aircraft configuration (GWCG, flap setting, etc.) and maneuvering (turns, flap/gear extension, etc.).

Anil feels that performance requirements are necessary, but only to basic levels (no maneuvering, one configuration).

Lars would support adding performance requirements, but they would each need a realistic method of demonstrating compliance.

Ron feels that performance requirements are too much effort for marginal benefit, because any basic requirements won't make a significant discriminator.

Mitch had no opinion, but pointed out that the committee would need more time to add these requirements.

John is concerned that adding numbers would mean the MOPS would not get used. He also feels the committee often confuses the TSO with the installation guidance.

James doesn't believe performance requirements are meaningful without demonstration on an aircraft.

Jim doesn't believe we can write a meaningful set of performance requirements without a concurrent STC.

Colin feels whatever we decide, it should be simple and workable. He also pointed out that his subcommittee is planning to add performance requirements to the proposed installation guidance.

Larry feels that the TSO is being confused with the installation guidance. He also feels that operators need to have confidence in the performance of their systems.

Dick asked if a follow-on certification on another airframe would be performed on a Minor TSO change, and would it require a repeat of all the performance flight demonstrations; the group felt the answer is yes and yes.

Brad returned to the room. He said that the FAA Transport Air Directorate was meeting this week, so some people are not here who want an update on our progress. He said that some of them may not want to proceed with a MOPS. The group had a general discussion on how we get FAA feedback on what needs to be included, Brad repeated his original statement. Ron and Sherif feel we could simplify environmental specs. Brad repeated that without having performance numbers, the FAA will not write a TSO, regardless of whether the numbers were safety related. Without numbers, they would change this document to "design guidance". He said the "hinge factor" of Section 2.2 is that performance has to be added at the aircraft level.

Sherif asked Brad to provide names/contact info of FAA TAD members who want updates. Brad said he would.

Group agreed to complete work on the AHLD example tomorrow, including test procedures.

#### Wednesday, July 14

Brad was not present today, nor did anyone call into the speakerphone except as stated below.

Lee repeated Brad's statement that the FAA won't be able to use the document as a basis for TSO if it doesn't include performance parameters. Jim repeated he is not sure how much value this would add, but thinks we can add them without changing the intent of the document. Ron suggested we check with AIR-130 at the highest level to confirm their position. Sherif plans to discuss it with Bruce DeCleene and Tony Lambregts. He said he is aware that the TAD is against adding performance requirements to the MOPS. He said the committee plans to add those standards in the installation guidance for Parts 23, 27 and 29.

The group reviewed the non-concur comments received. They were contained in the file *TEAM Comments SC-220 MOPS for AFG&CS – FRAC 07-2010 Res. By SC-220rev1.doc*, along with a proposed response for each non-concur comment.

Ron took an **action** to rewrite Section 2.3, based on email from Lou. Lee has an **action** to pass out copies of all comments to committee members.

Anil suggested if we want to put the number in the installation guidance, we should draft the installation guidance to show how it would be addressed. Sherif reminded the group our plan was to have Section 2 replace C9c and C52b, and Section 3 would refer to the AC and Installation Guidance. John asked what we are planning to do next; Sherif wants to complete the Altitude Hold example. Ron suggested we follow a more general, overall organization (such as a basic AP checkout flight after maintenance – just a few modes) instead of going mode-by-mode. Ron suggested we table this and talk to Bruce DeCleene first.

Dick said the committee has not required a minimum mode set in order to allow a wing leveler to obtain a TSO, but Brad indicated he wanted the MOPS to specify a minimum set of modes and performance parameters. John said we should give the FAA time to consolidate its opinion. Jay still wants to go through one item as an example. John agreed to finish one example. James asked what we would assume for a test bed, Thierry suggested we assume flight test only. Anil asked what manufacturers do today; James clarified that the hardware is tested for mfr defects, the software is tested in a simulator. Anil asks why we can't document that in the MOPS. Sherif said we already discussed this, and asked that we get back to the example. John asked where the requirement is to test to DO-178B and DO-254, Lee says it is already in the draft MOPS. Colin asked where the performance numbers used for flight test come from, and why can't we use the same numbers. We discussed testing at nominal conditions only - mid-weight, mid-cg, calm air, etc.

Mitch pointed out that section 1.9 of the draft already covers alternatives to the specified test procedures, and that we required lab tests to be completed before flight test, and suggested we need to change this section. It doesn't allow aircraft-based tests before aircraft-based tests are completed.

We began work on the altitude hold example. In paragraph 2.2.1.5, we replaced "means" with "display, or interface to external display" to satisfy one of Brad's comments.

We discussed +/-100 feet as a performance requirement for altitude hold. There are many factors that could cause an airplane to exceed the limit. We added "in absence of disturbances" to 2.2.1.5. We made a minimum damping ratio of 0.5 a requirement. We removed the assumption that DO-178B be completed before flight test. We deleted the word "capture" to clarify this requirement applies to tracking only.

Jim described a return-to-service maintenance procedure for AP. We discussed a proposal to distinguish between rate-based (low altitude only) and attitude-based system, but did not do so.

Jim described a typical a return-to-service flight test procedure for consideration as a MOPS test:

- "Engage AP, verify no porpoising in attitude hold mode;
- override to 30 degrees, verify wings level in one cycle;
- manual trim until autotrim runs, verify level flight in one cycle.
- AHLD, trim straight and level, verify holds altitude one cycle, no porpoising,
- Reduce power, verify autotrim runs.
- Verify Heading Hold mode holds heading without drifting.
- Ninety degree HDG change, verify std rate turn. Note bank is within two deg, left and right turns.
- Verify Course intercept is smooth.
- Perform ILS approach, disconnect, verify no objectionable pitch change.

Anil drafted a proposed test procedure. Lars asked why the procedure duplicates certification tests, just to TSO. Anil asked how a mfr could develop an AP without human factors engineers on staff. Sherif said most team members are EEs. Jay said the first STec AP was built without control law engineers; thousands were sold for Class 1 and 2 airplanes. MOPS can't be written to exclude APs developed without benefit of Aero engineers.

We changed the term "trim condition" to "level attitude" which is more meaningful for rotorcraft, but still not perfect. We discussed how to specify the bank angle to generate a vertical disturbance; we settled on a 20-degree bank or standard rate turn at the option of the manufacturer.

Lars pointed out that if the AFGCS doesn't pass a stability test, the manufacturer may question stability of the aircraft. Jay/Sherif said that in their experience, some airframes might need modification.

We added "...in absence of configuration/power changes" to the requirement. Mitch pointed out that the bank angle test is a disturbance. Mitch says one GWCG configuration is inadequate. The committee decided to forward example as is, and point out all the factors not considered in the test, and see if this is what AIR-130 has in mind.

With the example completed, Sherif said we would review and resolve FAA comments. We read Sherif's draft response to the first FAA non-concur. Members agreed. Anil said he did not agree with the statement, but feels his opinion is in the minority.

The second comment is that Figure 1.4-1 is too complex. Sheriffs' replied the reason we made the diagram, and that we propose to draft a higher-level diagram, and retain both in the document. John took an **action** to draft the higher-level diagram.

Bill Nolte called in and said Honeywell will not agree to adding mode performance numbers in the MOPS. He recommends that he and Sherif get back to the FAA and assure their opinion is coordinated.

There were questions on the difference between hazard level and DAL. Sherif said the Terms of Reference do not allow us to alter the hazard levels stated in AC20-28D and various other advisory circulars.

We deleted the 2<sup>nd</sup> paragraph of 1.5 because it didn't seem to add anything. We noted that the TOR requires us to consider hazard levels of AC's.

The third NC comment on 1.5 is that "these functions should be described as a subset of the overall intended function, which is absent in 1.5". Draft reply is to list the intended functions already included under the referenced paragraph. We modified the reply to address increased stability as an intended function.

The next N comment was that "equivalent to pilot" should be specific. We read the reply; no one had any issues with it.

The next comment was on 2.2.1. We reviewed the reply, no one had any issues with it.

The next comment was on section 2.3, that DO-160 tests are onerous. Many committee members stated that these DO-160 tests are necessary. Bill Nolte (in absence) and Lee proposed how to simplify the DO-160 tests if the committee wants to simplify. Ron has an **action** to review these tests and simplify if possible. Lars asked about DO-160 tests are performed. Lee described how tests are selected. Lars said sometimes TSO boxes are only tested for TSO functions, but other functions don't work on the aircraft.

The next comment was Thierry's on TCAS. Steve Plummer called in to participate. Thierry gave a presentation on TCAS to describe his concern. The file name is *AFGC Speed Protection 3.ppt*. A jet transport must be capable of +/-2500 fpm to satisfy a TCAS resolution advisory; guidance exists on how to demonstrate this. External input to TCAS will inhibit steep climb, and triggers TCAS to request an alternate RA maneuver. AFGCS speed protection might be conservative relative to TCAS; that is, TCAS might assume a climb maneuver up to the edge of stall, where an autopilot might enter speed protection mode well in advance of that. Some autopilots disconnect due to low speed alert. The "forbidden zone" on PFD indicates where collision may occur, but doesn't consider speed protection. The draft MOPS proposes AFGCS supports the input to TCAS to trigger alternate escape guidance. Thierry and Sherif feel that the guidance is based on the assumption that the AFGCS can predict entry into speed protection mode, but in reality, it would need a performance database, not just AOA. N comment is because the cited paragraph specifies a design, because it specifies the AFGCS provides the discrete; it could be another box. Airbus implemented the ability for pilot to intervene in this case. Lee says FAA disagreed because pilot may not have time to respond; they concur with the drafted requirement. Thierry thinks maybe it is better to climb at the aircraft capability, instead of possibility of pilot maneuvering in opposite direction of RA. He says if AFGCS needs speed protection, it should be stated more clearly. Steve considers ARINC 429 input for dynamic inputs, discretized are configuration straps that indicate aircraft climb ability.

Steve Plummer says Proposal 1 on page 18 of the presentation is "flat out not appropriate". Steve does not believe Proposal 2 is appropriate for RTCA, and the alternate wording was not acceptable to him. He will try to call in again tomorrow for further discussion.

Thursday, July 15

We reviewed a comment from Anil. Sherif explained how Collins takes credit for bench testing. The committee discussed Anil's first comment that the minimum performance of autopilot/flight director functions (for example, Altitude Acquire or Heading hold) should be quantified, where some deviation from target is acceptable. The MOPs as written only focuses on Engagement /Disengagement /Alerts and mode (Altitude Acquire) logics without tracking accuracy. Anil agreed with the committee's resolution of his first comment that the Altitude Acquire mode minimum performance requirements, together with detailed bench test procedures describes how the autopilot captures the target altitude at the right time, even though it does not include mode tracking accuracy parameters, are value added since they ensure that the application is capturing the right reference at the right time. The committee said that they will add to the MOPS document minimum performance standards that they drafted in a similar manner to the Altitude Acquire for several other modes. Anil also withdrew his minority position to the draft resolution of FAA first non-concur.

Next, Anil explained his view that we should delete servo requirements. Dick explained that they were written assuming they could be stamped with the TSO or not. Lee said if we don't write requirements for it, manufacturers will have to ask for non-TSO applications. The FAA has received many TSO-C9c deviation requests for autopilot servos, indicating that there were high interests in TSO'd for servo. Sherif thinks the few requirements we added are better than what we have today. Dick asked why servo backlash matters to the customer or FAA if the system meets the performance requirements. Anil seems to feel that the MOPS should address interoperability. Jim said the TSO does not support interoperability. Jay said the purpose of the TSO is to support the manufacturers need to start production. Sherif gave Anil an **action** to support his argument and provide his proposed additional requirement.

Anil asked whether trim servos should be addressed. Sherif said "No", we don't consider them as primary control. Lars/James said in helicopters, they are considered primary as they keep the actuator from saturation, and in that sense they fly the aircraft. The trim actuator is also the "autopilot servo". Mitch said any actuator that aids AP functions is considered an AP servo. Anil will propose additional requirements, for instance, override requirements. Jay feels that the proposals are mainly focused on contractual issues instead of safety/performance. Jay commented that Anil has tried at this meeting to have the committee put into the MOPS what the OEM typically describes in its procurement specification to its suppliers. He said that this is the first time that Anil attend our meeting. Jim agreed. So did Mitch.

The next comment is a suggestion to remove "trim" from paragraph 2.2.8.c such that it applies to all servos. Mitch interprets this to mean that paragraph c should be moved to the general servo section. We considered that the NTSB wants us to address trim specifically, so the requirement was written to address trim, but it really applies to all actuators. Dick mentioned that the references to 1309 means that if the actuator doesn't meet the safety requirement, then the requirement is for annunciation when a fault occurs. We agreed to rewrite the requirement.

The next comment was regarding the AP engage envelope. Lars said that it was written partly to assure that the aircraft does not have to be level before SAS is engaged.

We discussed status of the rotorcraft installation subgroup. Colin said they are working towards a white paper format. They would like to put performance numbers in the install white paper, unless they get added to the MOPS. Jay says the Part 23 group is based on AC25.1329-1B. Lee said don't use the MOPS format, please follow the AC format. Colin never received the AC format, so Lee took an **action** to provide it. Colin said it won't be hard to go back to an AC format. Colin said if they add numbers, they will have to rename the modes for rotorcraft. Lee said that would be acceptable. Sherif said LPV approaches already have their own AC's to address these. Lee feels these AC's address fixed wing only. Colin intends to restart the monthly telecons. Jay plans to restart the Part 23 telecons. Sherif wants the MOPS group to return to the small group it was before so the installation groups can make more progress.

Jay gave a presentation on the Part 23 progress. Division of responsibility between MOPS and Install Guidance has been a problem. There has been no progress since January due to MOPS work. They plan to

restart in September. Performance numbers are planned. Mitch asked if we follow the model of AC 25.1329, where do numbers belong. Thierry says we also need to specify acceptable ways to demonstrate it. Jay indicated his intent is to demonstrate any numbers specified. Jay wants to set middle performance numbers. Jim agrees, but what does it mean to “track an ILS”? Opinions vary. Jay says in his experience, he hasn’t had trouble getting Cat 2 approvals using his methods. Jay will email an example to Thierry. Thierry’s experience is that without specific procedures, arguments ensue about acceptable procedures. Lee pointed out that RVSM needs standards for demonstrating performance, also RNP to some extent. They plan to address FBW in Part 23, steep approach, and other operations. Colin suggested these go in an appendix. 70% of new helicopters are still old analog systems.

Lee asked Sherif to discuss his plan to continue to address FAA non-concur comments. Sherif said he and Bill will work with the FAA to ensure they have a unified position. They will send the altitude hold example to them. Lee said AIR-130 continues work to consolidate FAA position. He will report the group’s views to his management. He restated the current FAA position that the FAA will not use this document as a TSO without performance parameters.

Steve Plummer called in again to discuss Thierry’s comment. Thierry revised the wording of Proposal 2 to allow alternate means of meeting the requirement. Steve read it and still did not agree. He feels the proposal would result in TCAS being unaware if the AP will attain the requested speed. The right thing to do is tell TCAS that as soon as possible. Thierry believes they can show they meet the requirement. Steve believes it is the wrong thing to do to put a crew in this “predicament”. Thierry says experienced flight crews find this acceptable. Steve says it has not been accepted by Seattle ACO. Sherif asked whether Steve’s opinion is based on flight test; Steve replied he is not aware that it has been done in flight; “devil is in the details”, will be implemented in future designs. Sherif says Airbus is already flying it, they only want to allow future systems to have freedom to innovate. Steve doesn’t think it would be hard for the AFGCS to provide this signal. Sherif said in order to provide the signal, the right way is to have a performance computer that looks at temperature, flaps, weight, engine performance, etc. AFGCS does not have all this data available. Steve says this is not sufficient justification. He does not think his idea is the only way it can be done, but that the information needs to be provided. Sherif says the revised proposal is an attempt to find middle ground. Lee says that the main requirement is for the AP-coupled TCAS RA system to perform the RA maneuver as expected at airplane performance limiting conditions. Sherif asked if the wording could be changed to make it acceptable. Steve says the fundamental issue is that TCAS needs the information. “The information needed for TCAS to respond (for it to always comply) needs to be provided to TCAS”. “That can be the applicant’s position”. Lee described the proposal as it was discussed; Steve says he believes that wording he suggested is already in the FRAC version. He restated his opinion that the aircraft performance limiting information be provided to TCAS unless the airplane is capable of performing the TCAS RA in all conditions. Steve feels it would be inappropriate to water down the requirement. Lee drafted new wording as discussed, Steve and Thierry read it and said it was OK. Steve says the only thing accomplished is to not require the information to come from the AFGCS. The non-concur comment from Airbus on Appendix C (AP/FD/AT coupled TCAS RA) was successfully resolved. For Steve’s comment on Airbus Minor FRAC comment, Steve says it was not his intent that he works with the committee to resolve the issue by email. He said that the committee should resolve that Minor comment by themselves.

Thierry asked how we will resolve Airbus significant and minor comments. Sherif says a significant comment should warrant discussion in this forum. Thierry want to discuss MUH. He questioned the wording for MUH. Thierry says the wording in AC25.1329 is slightly different from the draft MOPS, and wonders why. Helicopters use MUH differently (minimum hover). Thierry will talk to Guy Thiel directly for further explanation. Lars says his definition for rotorcraft is already at the FAA in white papers.

Lee and Sherif will mail out all comments to the committee members. Sherif will schedule a telecon (tentatively within a month) based on results of FAA discussions. We have received no comments from the TAD. Sherif, Bill, and Thierry will provide the committee with their draft suggested resolutions of all significant and major comments received. The committee will discuss these resolutions via Webex/telecon.

Lee shared an email from Brad indicating once again that the FAA will not use this document as a MOPS unless it includes hard performance requirements with parameters. Sherif emphasized that this is an

industry committee, here to put forth industry recommendations. If we don't include hard performance requirements, the FAA may write their own. Sherif has no problem with putting such requirements in a non-normative appendix, and pointing out that the mode performance numbers are addressed by the installation guidance documents. This would be putting the same information twice in the MOPS and Installation Guidance. Jim says that we should include whatever an airframer would expect as a minimum for a box. It may be as little as proving the output of the box responds to altitude error in the right direction. Mitch suggests the TSO applicant provide the intended performance standards and prove their system meets them.

Sherif closed the meeting with his thanks to the participants.

Several participants continued discussions after the general meeting was closed. They started reviewing section 2.2 minimum performance standards and the section 2.4 test procedures. They proposed some changes for clarification. For example, in §2.2.1.1.2a Autopilot Disengagement, they proposed a test for autopilot quick disconnect with a pass/fail criteria of disengagement within 500 milliseconds.

Actions Summary

- Bill Nolte and Sherif Ali to coordinate with the FAA to assure that the FAA comments represent a consolidated FAA position.
- Ron Tesdal to rewrite Chapter 3 to simplify it according to Brad Miller comment.
- Lee Nguyen to forward copies of all comments to committee members.
- John VanHoudt to simplify Figure 1.4-1 according to Brad Miller comment.
- Anil Mehra to forward arguments for removing servo requirements to co-chairs.
- Lee Nguyen to provide AC format to Colin Henry.
- Brad Miller to provide to Sherif a list of TAD members who wish to be kept informed on progress.

Following Meetings

Jay Hardymon offered to host the next plenary in Wichita, and suggested October. Dick Hess suggested Seattle. No decision was reached.

Certified as a true and accurate summary of the meeting.

Sherif Ali/s/	Co-Chair	Date	7/21/10
Brad Miller/s/	Designated Federal Official Tuesday	Date	7/21/10
Lee Nguyen/s/	Designated Federal Official Wed/Thursday	Date	7/20/10

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The following people attended for part of the meetings by speakerphone:

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- Lou Volchansky/FAA
- Steve Plummer/FAA
- Steve Ramdeen/FAA
- Roger Sultan/United Airlines