

RTCA Paper No. 280-17/SC135-716
October 25, 2017

SUMMARY OF THE SIXTY-NINTH MEETING

RTCA SPECIAL COMMITTEE 135
ENVIRONMENTAL CONDITIONS AND TEST
PROCEDURES FOR AIRBORNE EQUIPMENT

The Sixty-Ninth meeting of RTCA/SC-135 was held April 25th through 27th at the RTCA Headquarters in Washington, D.C.

The following were in attendance:

Bradley Green, SC-135 Chairman	Honeywell International, Inc.
Gary Smith, SC-135 Secretary	Honeywell International, Inc.
Rebecca Morrison, Program Director	RTCA, Inc.
Doug Ballard	L-3 Communications
Jerry Barofsky	L-3 Communications
Susan Beard	Rockwell Collins, Inc.
Michael Boersma	GE Aviation
Erik Borgstrom	Environ Laboratories
David Common	Applied Technical Service
Nick Conquest	NIAR
Steve Davidson	UTC Aerospace
Mike Falzone	Garmin Ltd.
Justine Galbraith	Kopp Glass
Pat Hall*	Elite Electronic Engineering
Jim Hatlestad	The Boeing Company
Terri He*	The Boeing Company
David Jennings*	Rockwell Collins, Inc.
Howard Jordan	Textron Aviation Beechcraft
David Kerr	Garmin Ltd.
Donald MacDonald*	Gables Engineering, Inc.



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Lee Nguyen
Marc Poncon
Paul Scott
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Randy Tsuchiyama
Jacob VanDyke
Merrill Vaughan
David Walen*
Ken Webb
Mario Rinaldi

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Airbus
Rockwell Collins, Inc.
FAA
Airbus
Electronics Test Ctr
NIAR
Rockwell Collins, Inc.
Thales Group
Teledyne Control
Honeywell International, Inc.
The Boeing Company
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Rockwell Collins, Inc.
United Technologies Corporation

* via Conference Bridge

In Accordance with the Federal Advisory Committee Act, Mr. Lee Nguyen of the Federal Aviation Administration was the Designated Federal Official for this meeting.

The agenda for the meeting was as follows:

1. Chairmen’s Opening Remarks, Introductions.
2. Approval of Summary from the Sixty-Eighth Meeting – (RTCA Paper No. 026-17/SC-135-711)
3. Review Working Group Summaries.
 - Roadmap on IMA, Volcanic Ash, Carbon Dust, Hail
4. Review Schedule
5. New / Unfinished Business
 - Presentation by Stephen Vantrees (FAA) on Request from SC228 to work White Paper on Environmental Test Recommendations on Ground based equipment.

Errata Discussion – more items need to be added

6. Establish date for next SC-135 Meetings.
7. Closing.

(**Note:** The following report is organized by Agenda Item, although some sections were conducted out of sequence in order to accommodate some members' schedules.)

Agenda Item 1 **Chairman's opening remarks, Introductions, Recognize Federal Representative**

The plenary session of the Sixty-eighth meeting of RTCA/SC-135 was called to order at 9:06 AM on the 27th of April, 2017. Chairman Brad Green opened the meeting by welcoming those in attendance. Lee Nguyen was introduced as the FAA designated Federal Official for SC-135. Rebecca Morrison reviewed the RTCA Proprietary Information and membership policies, and made some general announcements. Mr. Green reviewed the agenda for the meeting, and invited attendees in the room and those attending by conference bridge to introduce themselves.

Lee Nguyen (FAA) read the Public Meeting Announcement declaring that this advisory meeting was open to the public.

Agenda Item 2 **Approval of the Summary from the Sixty-Eighth Meeting**

SC-135 Secretary Gary Smith read the previous meeting's minutes, RTCA Paper No. 026-17/SC135-711. It was noted that the attendance list incorrectly identified Howard Jordan's affiliation, which will be corrected. A motion was made and seconded to accept the minutes as amended, and the motion was approved unanimously.

Agenda Item 3 **Review Working Group Activities, Review New Change Proposals**

The Working Group discussions were centered on the Change Proposals submitted for Revision H.

The Change Coordinators described Change Proposals which were reviewed and dispositioned in their respective group meetings. The level of detail in the Plenary session discussions precludes accurate reporting here, so only change proposals creating significant discussion are noted. The actual Change Proposals and any dispositions are found on the SC-135 Workspace and tracked in the Change Proposal Tracking Log, also found on the Workspace.

Sections 1, 2 and 3 – David Kerr, Change Coordinator.

Change Proposals submitted regarding language and definitions were discussed.

Sections 4, 5 and 6 – Jake Vandyke, Change Coordinator.

Change Proposals to fix cross-references and correct temperature tolerance statements. A CP regarding testing at the low survival temperature was recommended for the User Guide instead of DO-160.

Sections 7 and 8, Merrill Vaughan, Change Coordinator.

A Change Proposal regarding the shock pulses in Section 7 was accepted; a CP to address the “NA” in the sustained acceleration loads Table was approved.

CPs to delete the obsolete analog controller specs and to delete Aircraft Type 6 were accepted.

A list of requirements for minimum test report contents was discussed and uploaded to the Workspace.

Sections 9, 10, 11 and 14 – Harlan Sharpe, Change Coordinator.

Section 9 will need to be overhauled; help will be needed in order to complete the work in time for the scheduled release of Rev H.

Section 11 – discussion about changes to the list of fluids. Also, some errors appear in the Notes which were not addressed in the Errata.

Section 16 – Joe Marotta, Change Coordinator.

Summary of Section 16 WC group meeting:

4 Change proposals were discussed.

3 Change proposals were accepted as modified

1 Change proposal was deferred.

The deferred CP had was discussed for over one hour. The topic was Inrush Current. The group agreed that this test can be run at Min and Max NORMAL line conditions.

It is preferred to use ONE resistor for the test. The resistor value should be as is.

Sections 15 and 18 – Ken Webb, Change Coordinator.

No Change Proposals for Section 15.

Eight CPs for Section 18 were discussed.

Sections 19 and 20 – Jim Hatlestad, Change Coordinator.

Discussion on LISNs:

Several change proposals discussed including whether LISNs could be removed from power lines for large AC equipment (e.g. motors), and applicable circuit representations of LISN. Future working group planned to globally address LISN change proposals.

Discussion on testing of 3-phase power:

The working group noted that because some 3-phase power equipment have potentially susceptible circuits on a single phase, testing of individual phases and bundles 3-phase bundles can be appropriate. Disposition pending general agreement in future working group.

Discussion on disconnecting test equipment:

Working group agreed that while a single calibration should not be used when test equipment is disconnected between test programs, some disconnection of the test equipment within a single program is necessary and economically desirable. Working group will re-draft the change proposal for future disposition.

Section 21 – Nick Conquest, Change Coordinator.

2 Change Proposals regarding the section figures were accepted.

Some guidance from RTCA is needed regarding the use of test setup figures. Since DO-160 content is copyright protected, can the setup figures be used in non-RTCA test procedures?

Section 22 – Erik Borgstrom, Change Coordinator.

Round-robin tests were run at NIAR, Elite, DLS and Rockwell-Collins. Good results for WF1 on low-impedance (shielded) bundle, all generators hit current limits. Also good results on high-impedance (unshielded) bundle, all generators hit cal limit and core-wire voltage was consistent. The scatter for core-wire voltage on low-impedance bundles was more than we would like. Addition round-robin testing is coming.

There is a new generator calibration procedure for Cable Bundle.

15 Change Proposals were worked, with 8 accepted, 1 withdrawn, 1 rejected and 5 deferred.

Round-robin test results, Task Group minutes and all Change Proposals will be uploaded to the AE-2 and RTCA websites. Monthly Working Group meetings will continue until further notice.

Erik concluded by announcing that he was stepping down as Change Coordinator for Section 22 at the end of this year.

Section 23 – Steve Cook, Change Coordinator.

Steve is working on digital camera use for this section.

Agenda Item 4

Review Schedule

Chairman Green addressed the schedule for working on the revisions to DO-160 and DO-357. Based on the amount of work yet to be done and the request from SC-228 (see Agenda Item 5), Brad recommended revising the schedule to delay the release of these revised documents for 2 years. This will require a request of the Program Management Committee (PMC) to change the Terms of Reference. Brad asked for a motion for a change in schedule; the motion was made, seconded and approved.

Agenda Item 5

New/Unfinished Business

- Stephen Van Trees (FAA) from SC-228 (Minimum Operational Performance Standards for Unmanned Aerial Systems) gave a presentation about engaging SC-135 to work on developing environmental qualification requirements for surface-based equipment. This would include command and control link, detect and avoid, and pilot control station equipment. An Inter-SC Requirements and Agreements (ISRA) document will need to be created and approved by the PMC.
- Ken Webb gave a presentation on the TOR action regarding “aligning Audio Susceptibility requirements to that of MIL STD-461 and to bridge the frequency gap between audio frequency susceptibility and RF frequency susceptibility.” A working group of 8 people contributed to the effort. The detailed requirements between CS101 and Section 18 and CS114 and Section 20 were compared, as were AF and RF susceptibility. The following summarizes the group’s work:
 - 500mV has been seen on aircraft up to 150kHz
 - Section 19 only goes to 32kHz max, depending on category
 - Possibly move CE testing to below 150kHz
 - Equipment has been susceptible on a limited number of appliances
 - Asked for CP’s to address issues
 - No further action for the ToR at this time
- Marc Ponçon related the EUROCAE/WG-14 discussion on carbon and volcanic ash.
 - carbon dust as a test medium is difficult to procure, and it will be hard to standardize on a test
 - volcanic ash is focused on engine effects, and chemical effects with sulfur is a consideration
 - there is no information on hail
 - these issues are not considered closed at this time

- It was noted that several inter-Section references exist which need to be verified as still current and validated for making sense. Discussion followed regarding the sequence of tests. One suggestion was to add a statement at the beginning of each section to read Sections 1, 2 and 3 first, since individual sections are frequently used as stand-alone documents. Another suggestion was made to delete any references to test sequences except in Section 3.
- Errata Discussion. More errata have been found since the Errata were published. Secretary Gary Smith reminded the group that the decision was made that any errors found after the Errata were published (in May, 2016) would be addressed in Revision H and no new Errata released.
- The matter of acceptance of Change Proposals at the Working Group level versus review by the full SC-135 was raised, along with the need for a “marathon” review of all CPs to date at the next Plenary meeting. Dave Walen stated this was not necessary, as the FRAC (Final Review and Comment) is the appropriate vehicle to disapprove of any CPs. He stated that only “controversial” CPs needed to come before the full SC-135 for discussion.
- Integrated Modular Avionics: an ad hoc Working Group has considered the need for special test requirements for IMAs. Ken Webb reported that the current proposal is to create a white paper on the subject rather than adding a section to the User Guide (DO-357). Ken noted that IEEE 1688-2015 addresses EMI testing for IMAs, and that there is a relevant SAE ARP (Aerospace Recommended Practice).

Agenda Item 6 **Establish Date for Next SC-135 Meeting**

Brad Green started the discussion by recommending 2 full days for the Plenary session as well as 2 days for the Working Groups. Candidate locations for the meeting were RTCA headquarters in Washington, Honeywell in Morris Plains, NJ, or NIAR in Wichita. With a show of hands, NIAR in Wichita was chosen, and the date was set for October 24-27.

Agenda Item 7 **Closing and Adjourn**

Brad Green asked for a motion to adjourn the meeting. A motion was offered, seconded, and unanimously approved. The meeting was adjourned at 4:08 PM on Thursday, April 27th, 2017.

Certified as a true and accurate summary of the meeting.

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