

**Summary of the 13th Meeting
Special Committee 227
Standards of Navigation Performance**

The 13th Plenary Meeting of RTCA Special Committee 227 (SC-227) was held on March 16-20, 2015. This meeting was held at RTCA. Attendees, at meeting and via webex, included:

Dave Nakamura (Chairman SC-227)	Advanced PBN Solutions
Barry Miller (Designated Federal Official)	Federal Aviation Administration
Mike Cramer (WG1 Chairman)	The MITRE Corporation
Michael Gordon-Smith (WG2 Co-Chair)	Esterline CMC Electronics
Christopher Shehi (WG2 Co-Chair)	Honeywell International, Inc.
Mike Jackson (Secretary)	Honeywell International, Inc
John Barry	Federal Aviation Administration
Sophie Bousquet	RTCA
Alexandre Capodicasa	Esterline CMC Electronics
Guy Deker	Thales Avionics
Bob Gaul	Garmin
Tim Geels	Rockwell Collins, Inc.
Kendal Hershberger	Garmin
Dick Hess	Universal Avionics Systems Corp.
Hette Hoekema (on phone)	European Aviation Safety Agency
Ryan Howe-Veenstra (on phone)	Honeywell International, Inc.
Steven Jackson (on phone)	Federal Aviation Administration
Waldemar Krolak	Transport Canada
Gozde Kucukerdonmez	STM A.S
Ian Levitt	Federal Aviation Administration
Jeff Meyers	Federal Aviation Administration
Brad Miller	Federal Aviation Administration
Ron Renk	United Airlines, Inc
Lou Selk (on phone)	Consultant - Esterline CMC Electronics
John Studenny	Esterline CMC Electronics
Jiri Svoboda	Honeywell International, Inc.
Yauwu Tang	The MITRE Corporation
Nick Tallman (on phone)	Federal Aviation Administration
Don Walker (on phone)	Federal Aviation Administration
Michelle Yeh	FAA – Human Factors
Tom Yochum	The Boeing Company



In accordance with the Federal Aviation Advisory Committee Act, Barry Miller, Federal Aviation Administration, was the Designated Federal Official for this meeting.

RTCA SC-227, Standards of Navigation, March 16-20, 2015

- The 13th Plenary meeting of SC-227 was convened at 9:00 a.m. EST by Chair Dave Nakamura (Advanced PBN Solutions).
- Each person in attendance was invited to introduce themselves.
- Dave reviewed the agenda. He noted that the bulk of the weeks work would be oriented toward Working Group 2 change proposal reviews and discussion for the MOPS. The meeting agenda below was reviewed and approved.
- Dave stated that discussion with SC-186 regarding the addition of information on the data interface and functionality considerations for Interval Management has been taking place through an ad hoc working group with members from both committees. The SC-186 members have provided some material that will be discussed further in the ad hoc meeting. This material will be introduced at a discussion, now on Thursday. The committee can obtain this paper on the workspace if they haven't already. Dave expressed some concerns that the paper is more detailed than necessary. He stated his objective is to add a brief bit of information in the appendix to ensure equipment implementers understand that RNP equipment and its design may need to provide more capability than addressing the MOPS requirements. The ad hoc coordination will continue.
- Dave informed the committee that there is a patent that was brought to his attention recently. "Method and Device for Determining a Shifted Circular Segment" Emmanuel Dewas, et. al., Thales. Dave noted that the patent appears to be for a method that reflects the requirement that has existed in the MASPS since first publication, predating the patent itself. And given that this has come to the attention of the committee following the recent publication of DO-236C and Change 1, there is no immediate impact or issue for document publication. One purpose of this discussion was to ensure that the committee members and their companies are aware. This will also be discussed further with RTCA to determine a course of action and it's relevancy to SC-227. The Thales representative to SC-227 was not aware of this patent or patent application. Mike Cramer pointed out that this concept and method was disclosed at the ATA CNS Task Force 2 years prior to the application date of the patent, making it public information and knowledge. Dave closed the discussion noting this just illustrates the difficulty of standards development and member disclosure of relevant patents and intellectual property.

Summary Agenda:

1. Welcome/Introductions/Administrative Remarks
2. Agenda Overview
3. Overview of Planned Work Program for the Week
 - a. Working Group 2 MOPS Change Proposals
 - b. MOPS Draft Review
 - c. SC-186 proposed addition to MASPS Appendix (Thursday)
4. Plenary Review/Discussion
 - a. Planned Work Schedule (Note, schedule subject to change)
 - b. MOPS Change Proposals for Incorporation into draft MOPS
 - c. New tasking: Update to DO-257A, Electronic Map MOPS
5. Technical Requirements Breakout Sessions (as needed)
6. Other Business
7. Adjourn

Work Plan:

Dave stated that the work process for the week would be that there would be a short plenary each morning as needed. This would provide the opportunity for any plenary discussions and decisions. After, the plenary would be adjourned to the Working Group 2 breakout. The initial program for the week would be as shown below, but the order will be adjusted as needed to leverage availability of participants. And since this effort represents a working session, no item by item details of the discussions are contained herein.

	Monday 16 th	Tuesday 17 th	Wednesday 18 th	Thursday 19 th	Friday 20 th
MORNING/AFTERNOON	<u>SC-227 Plenary:</u>	<u>SC-227 Plenary:</u>	<u>SC-227 Plenary:</u>	<u>SC-227 Plenary:</u>	<u>SC-227 Plenary:</u>
	<u>WG-2 Breakout:</u>	<u>WG-2 Breakout:</u>	<u>WG-2 Breakout:</u>	<u>WG-2 Breakout:</u>	<u>WG-2 Breakout:</u>
	Preliminary discussions	[M12-01] NDB DQR [M1-08] Temp Comp [M11-03] HFE (App F)	- VNAV Performance [M10a-03] Descent Path Appendix	Draft MOPS review (cont'd):	Draft MOPS review (cont'd):
	[M9a-04] SC 186 CNS-IM (App G)	[M12-05] App K	Draft MOPS review:		Action Items Timeline, next steps
	[M12-06] TTA	[M9a-03] A-RNP			
	[M8a-05] [M12-03] ETA Performance and Test	[M5-02] Equipment Classes [M7a-01] Requirements / Class / Test Cross-ref			<u>SC227 Plenary Wrap Up</u> Schedule, New Business & next Meetings
	[M10a-06] TOAC (N) less ETA	[M13-01] Alt RNP Hold			
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Active MOPS Proposals:

[M1-02c]	VNAV Performance	[M10a-04]	Section 1 Assumptions Update
[M1-08]	Temperature Compensation (Appendix H)	[M10a-05]	Glossary Update
[M5-02]	Equipment Classes	[M10a-06]	TOAC Appendix (N)
[M7a-01]	Requirements/Class/Test Cross Reference	[M11-02]	Section 4 Update
[M8a-04]	Section 1 Update	[M11-03]	HFE Updates (App F&K)
[M8a-05]	Estimated Time of Arrival	[M12-01]	NDB DQR
[M9a-02]	RNAV Appendix (I) (<i>tbid</i>)	[M12-02]	Section 3 Update
[M9a-03]	Advanced RNP	[M12-03]	ETA Performance & Test
[M9a-04]	SC186 CNS-IM (Appendix G)	[M12-04]	Section 1 Ref Docs Update
[M10a-03]	Descent Path Appendix	[M12-05]	Appendix K Update
		[M12-06]	TTA Update
		[M13-01]	Alternative RNP Hold

Update of RTCA DO-257A, Electronic Map MOPS

The topic of DO-257A being out of date was raised and discussed.

DO-257A was last updated in 2003, and it is not consistent with the direction now being taken with the MASPS and MOPS with regard to minimum RNP standards e.g. capability to display RF, FRT, map scaling, deviation scaling, etc. While it is a minimum standard, it was initially thought that the MOPS is not invoked by any TSO. It turns out that it is invoked by a TSO (C165A) but that the TSO is not widely used. The result has been that manufacturers have been free to use all, part or none of the requirements in guiding their implementation choices. The lack of application of the MOPS for compliance leads to equipment differences, and poor standardization, and standardization is one goal of PBN.

Discussion focused on determining the value of an update to DO-257A, with the expected action to be one of the following:

- If update needed, then update TORs, noting that the committee understands that an update is not a trivial task.
- If not needed, note reasons for the record and move on.

Several FAA representatives and Transport Canada expressed interest in updating this document. No strong objections were raised from manufacturers at this first introduction of the topic. Besides the RNP update, there is also overlap in criteria between DO-257A and other documents, and removing this overlap may simplify the document. The WG2 chairman expressed concern that it may delay the MOPS by adding to the workload of the committee. Dave pointed out that the phasing of the work would be such that the priority and emphasis up to the DO-283 MOPS FRAC will be on WG2 activity. The committee agreed that a DO-257 update task for SC-227 was something that should be undertaken. Dave will propose to the PMC next week to add update of DO-257A to the ToRs for SC-227, and propose a schedule for approval. A DO-257A MOPS update will become the foundation for a new revision to TSO-C165A.

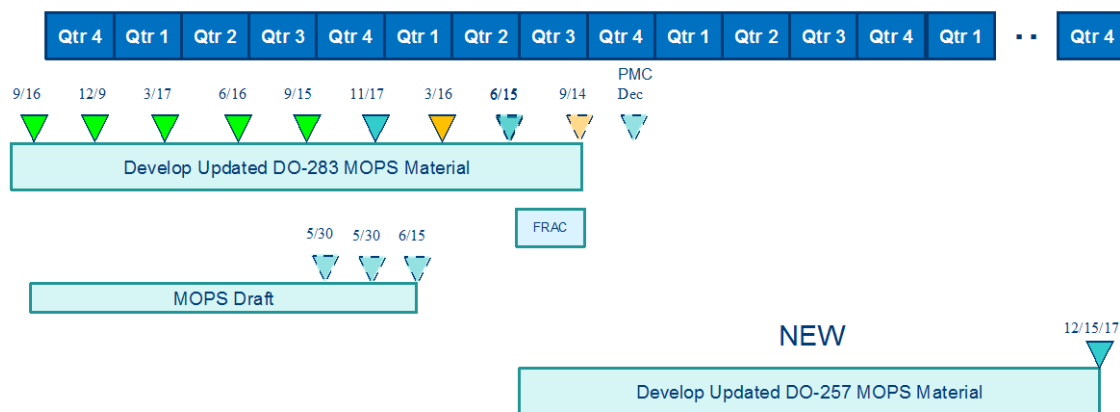
Update of RTCA DO-201A, Aeronautical Information

It was pointed out that SC-217 met last week and discussed the issue that DO-201A is out of date. They want to rewrite DO-201A in the mold of their recent documents. While understandable, this will increase the amount of work and time needed over an update of the existing material. DO-201A contains many requirements especially those relevant to data integrity that reflect the requirements of the RNP MASPS. It was pointed out that DO-201A was created to help define RNP procedure design and data needed to support the RNP system in the MASPS, and that over time many elements of DO-201A are addressed and managed elsewhere, e.g. ICAO Annex 15. Waldo Krolak suggested that we might end DO-201A, but others raised concern that if we advocated this then AC20-138 would have to reference a variety of other documents and it would be more appropriate to ensure DO-201 is updated. However, given the connection of DO-201 with the RNP MASPS and MOPS, the update activity by SC-217 should be closely coordinated with SC-227. SC-217 has the lead on the update of DO-201. However, SC-227 should stay involved and coordinate with SC-217 to ensure that the work is done with consistency to DO-236 and DO-257. This is very important given the few, if any, members of SC-217 who were involved in the last update to DO-201A.

Proposed Schedule, subject to PMC review



SC-227 Top Level Plan - Proposed Plan & Schedule





Status of TORs

Dave presented the group a draft of the revised Terms of Reference to include update of DO-257A. This document will be presented to the PMC next week. The deliverable for DO-257A revision is set for Dec 2017. Includes discussion of update of DO-201A will be done by SC-217 in coordination with SC-227. The updated MOPS will become the foundation

SC-186 CNS-IM (Appendix G)

Ian Levitt from SC186 reviewed a draft addition to Appendix G (CNS-ATM System Considerations) for consideration in the ad hoc working group, as the basis for additional information with regard to the RNP equipment functional support for interval management. The considerations fall in 6 areas:

1. Loading IM clearance from ATN
 - a. Autoload route changes from IM function to RNAV RNP equipment.
2. Exchange Nav clearance information
 - a. Able to receive route clearance via ATN datalink and output predicted trajectory via ATN datalink, including turn centers, turn radii
3. Information needs in IM
 - a. Output of predicted trajectory, including predicted winds, turn centers, turn radii
4. Handling speed constraints
 - a. The RNP RNAV equipment should allow deviation from AT speed constraints
5. ETA calculations for IM
 - a. Using current position and speeds, not speed intent
 - b. Cleared route
 - c. Predicted winds
 - d. Allowed to deviate from speed constraints on current leg
 - e. The ETA calculation should be updated as a result of trigger events such as wind errors and airspeed changes.
6. Coupling IM speeds to Autothrottle and Autoflight systems
 - a. The IM function should be able to provide speed commands to the autothrottle and autoflight system to reduce delays.

Concern was raised that several of the functional requirements requested by the IM team are inconsistent with the MASPS that is already published. The concern is both operational and technical.

From an operational standpoint, SC-227 has concerns that the behavior of interval management to adjust speed up/down from the published speed constraints by the proposed +/-10-15% would not be compatible with aircraft operating TOAC. The MASPS require TOAC to strictly obey the speed constraints which results in a biasing of the planned airspeed profile below the speed constraint value to allow control actions to reject disturbances. This issue was discussed extensively by SC-227 in November 2012, and it was proposed at that to consider the time constraints to be higher priority than



speed constraints, or to allow some buffer around speed constraints for maneuvering (such as +/- 10-15% like IM) and both of these proposals were rejected by the committee – there were enough operational issues around this approach that it is was deemed to be not workable for controllers. The group decision in 2012 was that if the controllers wanted to allow an aircraft with TOAC to adjust speed above the published speed constraint, then the controller could remove or modify the speed constraint in the route clearance. In this fashion, the controller and pilot always have a clear agreement on the limits of the speed control actions that the aircraft is cleared to perform. Interoperability with aircraft in front or behind flying the same published procedure using IM and adjusting speed essentially arbitrarily (+/-15% airspeed is about the size of the full aircraft speed envelope) is not viewed as workable.

From a technical standpoint, asking the RNAV RNP system to treat the speed constraint differently depending upon the source of the speed target (treating speeds from the IM system different from FMS modes including TOAC) would create complexity and confusion in both the system design and the human factors regarding the pilot interface. The group agreed that treatment of the speed constraint should be consistent between TOAC and IM. For the moment the published MASPS will remain the basis for speed constraint response.

MOPS Change Proposal Review

Michael Gordon-Smith presented a summary on Friday of the MOPS white paper discussions for the week. The Powerpoint “**M13 WG-2 Summary 150320 v1.pptx**” contains the full details.

The following table shows the timetable for the discussions as they occurred after modifications to the discussion order based on availability of participants and results of action items assigned during the week.



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The MOPS change proposals and DO-283 draft document have been edited as a result of the weeks work. An updated draft containing the changes agreed to by the committee, along with other editorial tweaks will be posted on the RTCA workspace on May 26th. In the mean time, the revisions to the change proposals and any notes/actions discussed will be posted to the committee work space.

All writing action items are due back to Michael Gordon Smith by April 3rd for incorporation into the draft MOPS. MGS will provide an internal draft to Dave Nakamura by April 18th to support April 27th HF subgroup meeting.

Closing Plenary

Dave pointed out that the next PMC meeting will be next week. Dave walked through the presentation update that will be shown to the PMC. It shows an update to the ToRs in response to the interaction with the PMC. Among the highlighted points are:

The committee recognizes that the success of implementation of systems capability and operations also needs consistent application of updated criteria and guidance for aeronautical data and interfacing systems. Specifically,

- DO-201A – besides updates for the RNP system, there is an impact for VNAV based upon the data, information and guidance. SC-217 has an action to take on the update of DO-201A.



- DO-257A – the minimum display requirements are not consistent with supporting A-RNP and D-RNP, e.g. turn radius and RNP value. We agree that SC-227 take on the update of DO-257A.

Next meeting is June 15th at RTCA. This meeting will blend plenary, Work Group 2 and breakout work sessions as necessary to finalize draft material for the MOPS.

CERTIFIED as a true and accurate summary of the meeting.

Mike Jackson, Secretary

Dave Nakamura, Chairman