TERMS OF REFERENCE

Special Committee (SC) 227
Standards of Navigation Performance

[Revision 20]

SC LEADERSHIP:

Position	Name	Affiliation	Telephone	email	Change
Chair	Ms. Ellen McGaughy	Collins Aerospace	319-899-4209	Ellen.mcgaughy@collins.com	
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Secretary	Ad Hoc				

BACKGROUND:

Since the 2013-2014 publication of RTCA DO-236C and Change 1, *Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation*, and 2015 publication of DO-283B, *Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation*, and the publication in 2018 of DO-257B, *Minimum Operational Performance Standards for the Depiction of Navigational Information on Electronic Maps*, the Federal Aviation Administration (FAA) has utilized these standards as the basis for new regulatory guidance that define the system and functional requirements for aircraft and flight crew enabling Performance Based Navigation (PBN) operations in the U.S. National Airspace System (NAS).

In June 2018, SC-227 was placed in Active Monitor Status by the PMC. Revision 9 of the ToR directed the committee to monitor the activity of EUROCAE WG-107 which is developing a new DME facility standard to offer more robust PBN reversion capability when GNSS is lost for any reason.

The SC-227 ToR calls primarily for updating RNP MASPS and MOPS to ensure more robust support for implementation of PBN operations relying on the RNP system by offering new minimum performance standards to provide resilient RNP capability through DME-based navigation.

The committee will also address PBN lessons learned as applicable to the material in the RNP MASPS and MOPS and offer ancillary improvements and editorial updates to the standards, mainly for clarity.

There is a specific lesson learned from using RNP equipment on conventional (non-RNP) procedures where the RNP system/equipment operation can differ from the intended (non-RNP) procedure due to ambiguities in the appropriate source for magnetic variation. For ToR-18, the RNP system/equipment requirements for applying magnetic variation should be expanded to avoid

display of hazardously misleading information when operating on procedure courses defined by ground-based navigation aids (NAVAIDs), such as VOR.

ToR-18 of SC-227 includes updates to the RNP MASPS and the RNP MOPS, as necessary, to mature the Time of Arrival Control (TOAC) functional, performance, and test requirements. The updates to the TOAC standards can enable FAA AIR to include TOAC in their minimum requirements for production approvals of RNP aircraft and their production approvals of RNP equipment through TSO-C115( ). This can allow new RNP implementation guidance to call-out the requirements for TOAC in support of Required Time of Arrival (RTA) operations described in the FAA's Integrated RTA and IM Concept of Operations (ConOps), available at https://www.faa.gov/sites/faa.gov/files/Integrated-RTA-IM-ConOps-v1.0.pdf. To the extent possible, the committee will ensure the updated TOAC requirements harmonize with the Flight-Deck Interval Management (FIM) requirements in RTCA DO-361A Change 1/EUROCAE ED-236A Change 1.

The ToR directs the committee to explore the possibility of defining new, first-of-their-kind, minimum standards for flight deck use of Data Driven Charts (DDC) with SC-217/WG-44 defined in DO-201B. The ToR directs the committee to also address EMD lessons learned as applicable to the material in the EMD MOPS and offer ancillary improvements to the EMD standards in the initial publication of DO-"ZZT", where "ZZT" is a placeholder for the number of the new DO- standard that will address both DDC and EMD.

ToR-18 also directs the committee to update the first publication of DO-"ZZT" (Minimum Operational Performance Standards for Depiction of Navigational Information on EMDs and EACDs) for the EMD to provide the pilot the requisite information for situational awareness during TOAC and FIM operations. The intent is not to update DO-"ZZT" for TOAC and FIM until after the initial publication of DO-"ZZT", so any updates to EMD needed for TOAC and FIM would be addressed in DO-"ZZT" Revision A.

With Rev 18, the ToR directs the committee to update the RNP MASPS and RNP MOPS to:

- Mature the Time of Arrival Control (TOAC) functional, performance and test requirements. The TOAC requirements should support the RTA operations as described in the FAA's Integrated RTA and Interval Management (IM) ConOps. This is intended to be accomplished by developing new simulations based on previous simulations and demonstrations for ADS-B operations.
- Mature the Estimated Time of Arrival (ETA) functional, performance and test requirements according to its intended functions and expected use cases.
- Add RNP system/equipment requirements for operating on instrument procedure courses defined by ground-based NAVAIDS.
- Strengthen the multi-sensor requirements for RNP to reduce dependency on GNSS sensors for all RNP operations and enable new means of compliance for RNAV and RNP operations through multi-sensor navigation with and without GNSS. For example, consider to
    - Add requirements for RNP system to select among multiple sensors and to prevent a single erroneous sensor from corrupting the RNP functions.

  - Develop new means to ensure availability of RNP Navigation when not based on GNSS, e.g. when based on DME(-Inertial) Navigation
  - Make further editorials to clarify requirements, as needed.
- Develop requirements for DME-based RNP. This should specifically include DME ground facility selection standards and interoperability aspects.
  - Add and/or clarify requirements for the RNP system/equipment using DME Navigation and DME-Inertial Navigation.

PRODUCT DELIVERABLES:

Product	Description	FRAC Completion Due Date*	FRAC* Or RAC	Projected Publication Date**	Change
MOPS DO-283D: Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation	The committee will update the MOPS to mature the functional, performance and test requirements for TOAC and ETA and to strengthen the RNP requirements for multi-sensor navigation and operating on routes and procedures based on ground-based NAVAIDs.	**November 2026**	**FRAC**	**March 2027**	
MASPS DO-236F: Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation	The committee will update the MASP to mature the functional, performance and test requirements for TOAC and ETA and to strengthen the RNP requirements for multi-sensor requirements and operating on routes and procedures based on ground-based NAVAIDs.	**November 2026**	**FRAC**	**March 2027**	

Product	Description	FRAC Completion Due Date*	FRAC* Or RAC	Projected Publication Date**	Change
MOPS DO-"ZZT": Minimum Operational Performance Standards for Depiction of Navigational Information on Electronic Map Displays and for Electronic Aeronautical Chart Displays	Update DO-257B to create a new DO-"ZZT" to add minimum standards for Data Driven Charting in support of RNP operations along with any updates based on DO-257B lessons learned. The new DO- will be titled, "Minimum Operational Performance Standards for Depiction of Navigational Information on Electronic Map Displays and for Electronic Aeronautical Chart Displays"	**January 2026**	**FRAC**	**March 2026**	
MOPS DO-"ZZT" Revision A: Minimum Operational Performance Standards for Depiction of Navigational Information on Electronic Map Displays and for Electronic Aeronautical Chart Displays	Update DO-"ZZT" (after initial publication) for the EMD to provide the pilot the requisite information for situational awareness during TOAC and FIM operations.	**November 2026**	**FRAC**	**March 2027**	

*Note: Final Review and Comment (FRAC) Completion Due Date refers to the date that the

committee plenary approves the document after completing the FRAC Process. SCs should submit the final document at least 45 days before the PMC meeting where it will be considered for approval.

**Note: Projected Publication Date refers to the date that the item will be approved by the PMC and officially published by RTCA.

SCOPE and COORDINATION:

While reviewing the work on DO-283C, the RNP MOPS, several areas of definition and clarification were identified to improve the ongoing usability of the MASPS and MOPS that will allow these documents to be clearer for their users.

The scope of work will update the MASPS to reflect the changes which are in process for DO-283C, the RNP MOPS.

The committee also intends to upgrade the existing minimum standards for the performance of DME-based RNP to offer a more robust capability permitting continuation of RNP operations in areas where the GNSS signal-in-space is denied for any reason (jamming, interference or spoofing). To the extent practical, the new standards will require taking advantage of all DME facilities in view and require appropriate checks to ensure continuing RNP monitoring and alerting. The new standards will also recognize the ability to perform DME RNP through operational use of DME facilities consistent with the existing DME facility standard in ICAO Annex 10, while also making no changes to the DME receiver or antenna requirements. The MASPS updates will be coordinated with EUROCAE. Coordination with EUROCAE WG-107 will also be beneficial to this effort to ensure the WG's work toward defining a new DME facility MASPS does not conflict with any aircraft-level requirements for DME use (i.e., no new hardware or software).

The committee will also consider expanding guidance for multi-sensor integration, inertial system integration, datalink use and applications of aircraft performance data consistent with new regulator guidance materials, operational implementations and new RTCA standards.

Finally, the committee would like to coordinate with SC-217/WG-44 to develop new minimum standards for DDC. SC-227 would define the minimum requirements for the RNP system to utilize DDC, while SC-217/WG-44 would define the minimum database requirements to support the charts. Data Driven Charting (DDC) industry standards will enable electronic display of procedure and route charts on the installed flight deck displays to include those in the primary field of view while meeting agreed upon operational and airworthiness requirements (to-be-determined) consistent with DO-"ZZT". The resulting flight deck display of DDCs shall provide the pilot flexible, filterable chart attributes while retaining select, minimum chart attributes. Ultimately, compliance with the resulting DDC standards should provide compliance with all regulatory requirements equivalent to carriage of paper charts in an aircraft. This should also simplify the display of complex routes and instrument procedures consistent with specific air traffic control (ATC) clearances while reducing pilot workload and averting potential flight deck confusion. By collaborating, the two committees can develop the new minimum requirements for a DDC application presented on the flight deck of an aircraft eligible for the RNP operations supported by DO-236D, DO-283C and DO-"ZZT".

Additionally, the committee may update the EMD standard for an EMD application presented on the flight deck of an aircraft eligible for the RNP operations supported by DO-"ZZT" to address lessons learned and to make improvements.

ENVISIONED USE OF DELIVERABLE(S)

FAA intends to use the updated minimum requirements in DO-236E and eventually DO-236F for aircraft-level RNP approvals and the requirements in DO-283C and eventually DO-283D for update of TSO-C115(), the TSO for RNP Equipment Supporting Multi-Sensor Inputs (e.g., flight management systems). Likewise, FAA will update guidance materials in AC20-138() and/or AC90-105(), as appropriate. The FAA intends to update TSO-C165() to reflect the update to DO-"ZZT", as appropriate. The ETSOs and CS-ACNS that reference these documents are also expected to be updated as necessary.

The intent is to provide the basis for FAA and user community procedural planning, investment analysis, and NAS architectural decision making providing the operational capabilities needed to achieve more efficient airspace management through enhanced capabilities of the aircraft incorporating these new and updated standards.

SPECIFIC GUIDANCE:

This paragraph is used to further define the committee's work program. Appropriate entries might include specific issues to be addressed, specific tasks to be accomplished, other agencies or organizations with which the committee should coordinate its activity, existing reference documents to consider, etc.

- *ICC Coordination* – This ToR should inform the Integration and Coordination Committee (ICC) of the committee's needs for coordination with SC-217 on DDC and with SC-186 regarding RTA/TOAC and FIM operational compatibility.
- *Support for the Activity* – The committee has support from OEMs: Collins Aerospace, Garmin, Ltd., Esterline CMC Electronics, GE Aviation, Honeywell International, Universal Avionics, Boeing, Airbus, Bombardier, Dassault, Embraer, Thales and Lufthansa Systems. Support from operators includes American Airlines, United Airlines and Delta Airlines. All branches of the FAA needed are in support as well.
- *EUROCAE Coordination* – EUROCAE WG-85 will work jointly on the updates in DO-236E to create a technically equivalent ED-75G. EUROCAE WG-85 will work jointly on the updates in DO-283C to release a new ED-323A as a technically equivalent standard.

- *Initial Documentation* - if applicable, list any input documents that will be made available to this committee to include the source of documents and purpose.

Documents	**Intended Use**
Executive Order 13905 of February 12, 2020	Awareness of current policy directives on Position, Navigation and Timing to insure resiliency with the US NAS.
MASPS DO-236E	Initial documentation
MOPS DO-283C	Initial Documentation
MOPS DO-257B	Initial Documentation for DO-“ZZT”
MOPS DO-“ZZT” initial publication	Initial Documentation for DO-“ZZT” Revision A
DO-317C MOPS for Aircraft Surveillance Applications (ASA)	Reference for EMD displays for ASA
DO-361A Change 1 MOPS for Flight-deck Interval Management (FIM)	Reference for EMD displays for FIM
FAA TSO-C195c Avionics supporting Automatic Dependent Surveillance - Broadcast (ADS-B) ASA	Reference for EMD displays for ASA and FIM
DO-201B Appendix A.9	Reference for initial DDC concepts as captured by SC-217/WG-44. Currently does not include requirements

TERMINATION: When the scope of this Terms of Reference is complete, the committee will recommend either that the committee Sunset, going into Active Monitoring Mode, or spend a period of time in Hiatus. If additional documents are identified by the committee as beneficial and useful, the group is expected to propose adding them to the PMC before initiating development.