

TERMS OF REFERENCE
Special Committee (SC) 220
Automatic Flight Guidance and Control Systems
 (Revision 1)

REQUESTORS:

Organization	Person
Federal Aviation Administration	Mr. Nicholas A. Sabatini

SC LEADERSHIP:

Position	Name	Affiliation	Telephone	email	Change
Co-Chairs	Bill Nolte	Honeywell International	(602) 436-3770	bill.nolte@honeywell.com	<i>(link to changes in names)</i>
	Sherif Ali	Rockwell Collins, Inc.	(319) 295-6135	sfali@rockwellcollins.com	
DFO	Lee Nguyen	FAA, AIR-130	(202) 385-4676	lee.nguyen@faa.gov	
Secretary	Richard Hess	Universal Avionics Systems Corporation	(425) 602-1519	dhess@uascwa.com	

BACKGROUND:

The Federal Aviation Administration (FAA) requests that RTCA, Inc. form a committee to develop Minimum Operational Performance Standards (MOPS) and installation guidance for Automatic Flight Guidance and Control (AFGC) systems.

Dramatic changes in technology and design techniques associated with automatic flight guidance and control systems have resulted in much higher levels of complexity, automation, and integration. Automatic flight guidance and control systems encompass autopilot, autothrottle, and their related functions. These systems provide the functional and operational capability and performance needed to operate in the National Airspace System (NAS).

Service history and safety studies show that previous assumptions about pilot's role in and awareness of the aircraft automatic flight guidance and control operation need to be re-considered and addressed. The accidents, incidents, and safety indicators also demonstrate that the known vulnerabilities in existing automatic flight guidance and control systems are not confined to any one aircraft type, manufacturer, operator, or geographic region, suggesting a need for revised performance standards.

DELIVERABLES:

Product	Description	Due Date	Change
MOPS	<i>Minimum Operational Performance Standard (MOPS) for Automatic Flight Guidance and Control System and Equipment</i>	Dec 2010	<i>(link to all changes to dates, updates to docs)</i>
Installation Guidance Document (White Paper to FAA)*	<i>Installation Guidance Document for Automatic Flight Guidance and Control Systems – Part 23</i>	Oct 2011	
Installation Guidance Document (White Paper to FAA)*	<i>Installation Guidance Document for Automatic Flight Guidance and Control Systems – Parts 27/29</i>	Oct 2011	

*White paper was solicited by FAA and the industry to be consistent with AC25.1329

SCOPE:

Review and consider Automatic Pilots and Flight Directors pertinent documents (included in the initial documents section), and the corresponding final rule and the recommendation of the Aviation Rulemaking Advisory Committee (ARAC) “Safety Standards for Flight Guidance Systems” for transport airplanes and associated advisory materials.

The AFGCS MOPS and installation guidance will be used for the AFGC system functions and interfaces, including lateral and vertical guidance and control, automatic thrust/power control, collective control and limiting (rotorcraft), yaw dampers, turn coordination, and envelope protection/aircraft flight limit protection. Also, primary flight control functions such as thrust asymmetry (fixed wing) or power limiting (rotorcraft) are outside the scope of the committee.

The AFGCS is defined as per AC25.1329-1B, Section 19 A, B, & C:

- a. Elements of AFGCS.
 - (1) Flight guidance and control (for example, autopilot, flight directors (FDs) displayed head down or head up).
 - (2) Autothrottle/autothrust systems. The term “autothrust” is generic in nature and includes power control systems for propeller driven airplanes.
 - (3) Interactions with stability augmentation and trim systems.
 - (4) Alerting, status, mode annunciation, and situation information associated with flight guidance and control functions.

- b. Approach and Landing System. The AFGCS includes those functions necessary to provide guidance and control in conjunction with an approach and landing system, such as the following:
 - (1) Instrument landing system (ILS)
 - (2) Microwave landing system (MLS)
 - (3) Global navigation satellite system (GNSS)
 - (4) GNSS landing system (GLS)

- c. Flight Management System (FMS). The AFGCS also includes those functions necessary to provide guidance and control in conjunction with a FMS. The AFGCS does not include the flight planning and the generation of flight path and speed profiles tied to waypoints and other flight planning aspects of the FMS. However, it does include the interface between the FMS and AFGCS necessary for the execution of flight path and speed commands.

The AFGC system architecture may be comprised of subsystems, line replaceable units or integrated modular avionics. This definition will be used as a baseline for Parts 23, 27 & 29 guidance, incorporating any necessary clarifications for these 14 CFR Parts.

ENVISIONED USE OF DELIVERABLE(S)

These standards and guidance materials should be useful to designers, equipment manufacturers, aircraft manufacturers, airlines and aircraft operators, installers, and aviation authorities concerning the design and approval of these automatic flight guidance and control systems.

The anticipated implementation of this committee's MOPS will be through revision and expansion of Technical Standards Order (TSO)-C9c - Automatic Pilots, dated October 15, 1960, C52b - Flight Directors, and perhaps other documents which require updating to address new AFGCS performance standards.

SPECIFIC GUIDANCE:

Develop and publish MOPS and installation guidance document(s) for AFGC systems and installations.

The MOPS will address but should not be limited to: safety, software and complex hardware design assurance, performance, protective mechanisms, environmental requirements (DO-160), interoperability, system functional components, fly-by-wire interfaces/compatibility and mechanical flight control interfaces/compatibility, pilot interface (e.g. function engagement/disengagement; mode activation/deactivation as appropriate for intended use), and other non-AFGC system component interfaces/compatibility.

The MOPS should not be prescriptive regarding architecture. The MOPS should describe the goals of safety mechanisms without being prescriptive regarding the implementation. (For example, one method of detecting pilot override of the autopilot is through the use of force sensors; however this is not the only means of detection. The goal is to ensure safe operation in the event of pilot override.)

General operational requirements will also be developed for mode annunciation, alerting for failures and malfunctions, and operating envelope. The committee will review AC25.1329-1B for MOPS requirements for annunciations and alerts.

The MOPS will contain generic requirements for all aircraft types as well as specific requirements tailored for fixed-wing and rotorcraft.

The AFGCS installation guidance will address but should not be limited to: design standards, installed system performance and requirements, system integration, envelope protection functions, failures and malfunctions, warnings and annunciations, pilot and flight deck interfaces, and system compatibility issues.

The installation guidance will address unique requirements for transport and small airplanes, and rotorcraft.

The committee will not make any recommendations for installation guidance for Part 25 aircraft since AC25.1329-1B was recently updated.

While the MOPS may be contained in a single document, the committee may consider creating separate documents for rotorcraft, small airplanes (Part 23), and transport airplanes (Part 25).

The MOPS and installation guidance will address AFGC functionality and technology that is provided in current aircraft and that is anticipated for future aircraft installations suitable for future operations (e.g., curved path RNP procedures). The committee should consider AFGC performance characteristics that would be compatible with these functions.

ILS/MLS/GLS signal integrity issues and tracking performance (e.g. CAT I, CAT II, Ref. AC120-29A; CAT III, Ref. AC120-28D) are already adequately addressed and will not be addressed by the committee.

ICC Coordination – None Identified.

EUROCAE Coordination - RTCA SC-220 is an independent advisory committee, not a joint RTCA/EUROCAE committee. Coordination between SC-220 and EUROCAE will be undertaken as appropriate.

- *Initial Documentation*

Documents	Intended Use
TSO-C9c	Reference document for MOPS
TSO-C52b	Reference document for MOPS
SAE AS402B	Reference document for MOPS
SAE AS8008	Reference document for MOPS
SAE ARP 5366	Reference document for MOPS
AC 25.1329	Reference document for installation guidance
AC 23.1329	Reference document for installation guidance
AC 27.1329	Reference document for installation guidance
AC 29.1329	Reference document for installation guidance
AC 90.101	Reference document for MOPS and Ins. guidance

TERMINATION:

Activities of Special Committee 220 will terminate with approval by the PMC of the committee’s final documents listed in the Terms of Reference. Any change/extension of a committee’s work program requires prior PMC approval.