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UPDATE ON U.S. FLIGHT PATH MANAGEMENT ADVISORY CIRCULAR

(Presented by the United States)

EXECUTIVE SUMMARY	
This paper presents an update on the United States (U.S.) Federal Aviation Administration's (FAA) issued draft Advisory Circular (AC) 120-FPM, which provides guidance and recommended practices for operational procedures and training to assure the intended guidance and control of aircraft trajectory and energy. Known as flightpath management (FPM), this includes manual flight operations, managing automated systems, pilot monitoring, and energy management in flight or on the ground. This AC provides guidance and recommended practices for Title 14 of the Code of Federal Regulations (14 CFR) parts 121 and 135 certificate holders (CH), as well as part 142 training centers in developing operational policies, procedures, and pilot training to support effective FPM. FPM provides a unifying framework for operations and pilot training to meet these regulatory requirements.	
Strategic Objectives:	This information paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
Financial implications:	This paper has no significant financial implications.
References:	Report of the Performance-based Operations Aviation Rulemaking Committee/Commercial Aviation Safety Team Flight Deck Automation Working Group: https://www.faa.gov/aircraft/air_cert/design_approvals/human_factors/media/OUFPMS_Report.pdf Safety Alert for Operators 13002 Manual Flight Operations Safety Alert for Operators 15011 Roles and Responsibilities for Pilot Flying (PF) and Pilot Monitoring (PM) Safety Alert for Operators 17007 Manual Flight Operations Proficiency

1. INTRODUCTION

1.1 In 1996, the FAA published Human Factors Team Report on the Interfaces between Flight crews and Modern Flight Deck Systems. At that time, the review of data identified issues that showed vulnerabilities in flight crew management of automation and situation awareness. Since 1996, major improvements have been made in the design, training, and operational use of on-board systems for FPM (autopilot, autothrottle/autothrust, flight director, flight management systems (FMS), etc., and their associated flight crew interfaces).

1.2 To address these original vulnerability concerns, the Performance-Based Aviation Rulemaking Committee (PARC) and the Commercial Aviation Safety Team (CAST) established a joint working group of authorities, industry, and researchers to update the 1996 FAA report and to address, for current and projected operational use, the safety and efficiency of modern flight deck systems for FPM (including energy-state management). The final report entitled, *Operational Use of Flight Path Management Systems, Performance-Based Operations Aviation Rulemaking Committee (PARC)/Commercial Aviation Safety Team (CAST) Flight Deck Automation Working Group (FltDAWG)* was issued on September 5, 2013. This report included a recommendation for revisions to relevant FAA ACs, or the creation of, or revision to, other applicable ACs and other guidance, to incorporate information on automation training and procedures for automation management.

1.3 On January 21, 2014, the FAA established the Air Carrier Training Aviation Rulemaking Committee (ACT ARC) to provide a forum for the U.S. aviation community to discuss, prioritize, and provide recommendations to the FAA concerning operations conducted under parts 121, 135, and 142, specifically addressing air carrier training. The ACT ARC Steering Committee established the Flight Path Management Workgroup (FPM WG), which made a number of recommendations related to FPM. The ACT ARC Steering Committee adopted the recommendations with unanimous consent and submitted to the FAA as ACT ARC Recommendations.

1.4 Beginning in 2015, the ACT ARC began issuing a series of recommendations addressing FPM, including operator policies, MFO, the use of automation, pilot monitoring (PM), and energy management (EM), and information management. The ACT ARC provides a forum for the United States aviation community to discuss, prioritize, and provide recommendations to the FAA concerning operations conducted under parts 121, 135, and 142 training centers. These ACT ARC recommendations, which are addressed in AC 120-FPM, can be found at: https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs200/afs280/act_arc/act_arc_reco/.

1.5 AC 120-FPM provides guidance and recommended practices for operators to implement operational procedures and training for the planning, execution, and assurance of the guidance and control of aircraft trajectory and energy, which is known as FPM. FPM topics addressed in the AC include manual flight operations (MFO), managing automated systems, PM, and EM. It provides guidance and recommended practices to 14 CFR parts 121 and 135 certificate holders, as well as part 142 training centers in developing operational policies, procedures, and training to support effective flight path management.

2. DISCUSSION

2.1 FPM is the planning, execution, and assurance of the guidance and control of aircraft trajectory and energy, in flight or on the ground. “Flight Path” means trajectory (lateral, longitudinal, and vertical) and energy state of the aircraft. “Flight Path” includes “Ground Path” if the aircraft is in motion on the ground.

2.2 Ensuring that the aircraft is on a safe and correct flight path is the highest priority of all pilots on the flight crew. Ensuring the airplane is on the correct flight path includes the actions necessary to check/verify that the flight path is correct and to intervene as necessary if it is not correct.

2.3 AC 120-FPM includes guidance and recommended practices for the FPM in the topic areas of Operational Policy and Procedures; MFO; Managing Automated Systems; Pilot Monitoring; and Energy Management.

2.4 Flight Path Management Operational Policy and Procedures

2.4.1 Each operator should have a clearly stated, comprehensive FPM policy supported by the FPM guiding principles and by standard operating procedures. The guiding principles provide an overarching structure from which FPM policies and procedures. The guiding principles state the general concepts and expectations of FPM. Subsequently, the policies state how the principles are to be achieved.

2.4.2 The operator policy should identify appropriate opportunities for MFO in line operations to maintain proficiency.

2.4.3 Policy and procedures should include guidance for the appropriate use of automated systems recognizing they provide a set of tools (but are not the only available tools) to effectively manage the flight path. Operators should provide guidance on the use of all these tools (automated systems, manual flight, etc.).

2.4.4 Operator policy should include guidance for proper monitoring of the flight path and allocation of tasks between PF and PM to include:

a) monitoring the flight path during all combinations of manual and/or automated flight; and

b) task allocation, workload and system management strategies, and methods to address malfunctions for which there is no specific procedure.

2.5 Manual Flight Operations

2.5.1 MFO are those operations where the pilot is performing FPM while physically controlling pitch, roll, yaw, or thrust. Manual flight is the foundation upon which other technical flying skills are built. MFO applies to a broad range of situations, including situations where some automated systems are engaged or operating. Manual flight knowledge and skills are required in many situations, not only when all automated systems are off.

2.5.2 Pilots should be trained to identify and carry out appropriate opportunities for MFO in line operations to maintain proficiency.

2.6 Managing Automated Systems

2.6.1 There are many automated systems in modern airplanes, including autoflight systems (e.g., autopilot, autothrottle, autothrust, and flight director), FMS, and envelope protection systems. Automated systems are implemented for different functions, including aircraft control, flight guidance, alerting systems, systems management, and many others. Pilots should be adequately trained and proficient with respect to those systems.

2.7 Pilot Monitoring

2.7.1 Studies of crew performance, incidents, and accidents have identified inadequate monitoring and cross-checking as vulnerabilities for aviation safety. Effective monitoring and cross-checking can be the last barrier or line of defense against accidents because detecting an error or unsafe situation may break the chain of events leading to an accident. Conversely, when this layer of defense is absent, errors and unsafe situations may go undetected, potentially leading to adverse safety consequences. Therefore, it is required that operators establish operational policy and procedures on PM duties, and implement effective training for flight crews and instructors on the task of monitoring.

2.7.2 Flight path monitoring involves comparing the actual flight path to what is expected/desired. This requires pilots to observe and interpret flight path data, aircraft-configuration status, automated system modes and on-board systems appropriate to the phase of flight, anytime the aircraft is in motion, including during taxi.

2.7.3 Operators should have documented policies and procedures to describe the duties of the both PF and PM and to support effective flight path monitoring. These policies and procedures should state the primary task of the flight crew is FPM and emphasize the importance of vigilance to the flight path.

2.8 Energy Management

2.8.1 Industry reports and operational data indicate that pilots sometimes have vulnerabilities in awareness and management of the aircraft's energy state, across multiple phases of flight, which is potentially a significant contributing factor in flight path deviations, incidents, and accidents. This data reveals challenges at times in complying with arrival and departure procedures, approach and landing operations, and during go-arounds.

2.8.2 This AC provides guidance on recommended operational policy, procedures, and training considerations for Energy Management to support effective FPM. Operators should refer to their own data from safety management systems and from industry reports to determine additional areas of emphasis.

3. CONCLUSION

3.1 The FAA considers FPM to be a unifying framework for operations and pilot training. The FAA published the draft AC 120-FPM for public comment in February 2022 and is dispositioning the comments. The FAA expects to publish AC 120-FPM in late 2022.

3.2 The Assembly is invited to review this paper and FAA AC 120-FPM for consideration and awareness.

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