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NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

FOM Excerpt – Automated Flight

(4 pages)

02.07.02 AUTOMATED FLIGHT

02.07.02.01 PHILOSOPHY

The design philosophy of autoflight systems is to reduce the workload for the flight crew. The UPS operational autoflight philosophy is to achieve effective management of the autoflight systems installed on the aircraft in order to increase safety, situational awareness and operational efficiency.

Autoflight procedures are specific by aircraft type and may be found in each fleet AOM. This information should be used for guidance in the establishment and monitoring of autoflight procedures on each fleet.

NOTE: Some flight procedures are predicated on full automation.

02.07.02.02 AUTOFLIGHT SYSTEMS

Autoflight Systems include the following: Autopilot (A/P), Flight Director (F/D), Autothrottles (A/T) and Flight Management System (FMS).

02.07.02.03 THREAT MANAGEMENT

Industry research has revealed several issues in Threat and Error Management (TEM) relative to autoflight systems. While the stated design philosophy behind autoflight systems is reduced pilot workload with the associated benefits, autoflight systems can distract crews from the primary task of aviating.

In general, as autoflight systems become more sophisticated, the greater the threat of automation error. The more time spent on the programming and manipulation of autoflight systems, the less time is available to monitor aircraft flight path and performance.

UPS flight crews are generally trained to operate autoflight systems at the highest level of automation. A potential consequence to this is a conditioned response to address automation issues first in times of confusion. Maintaining proficiency in manual flight modes reduces the tendency to always rely on autoflight systems as the first choice.

INAPPROPRIATE USE OF AUTOMATED SYSTEMS

A general example is electing to perform strategic flight planning in a tactical environment. An example in FMS equipped aircraft might be reprogramming the selected approach from the ILS 35R to the ILS 35L. If the reprogramming occurs several miles out, or on the downwind leg, it may be manageable and appropriate. The closer to the turn to final the more inappropriate FMS reprogramming becomes. At some point on the approach, you should limit the set-up to selecting the correct ILS frequency and course and setting the altimeter bugs. During visual approaches, it may be most effective to utilize a lower level of automation or revert to manual flight. Rapidly changing ATC instructions in the visual environment requires immediate flight path adjustments that may create confusion and distraction if high levels of automation are employed.

AUTOMATION-INDUCED “ERRORS”

This involves the tendency to correct automation-induced errors by manipulating the automated system rather than the controls of the aircraft. An example of this might be the aircraft exceeding the programmed speed profile. Immediate manual control of throttles might be the appropriate response.

02.07.02.04 SELECTING APPROPRIATE LEVEL OF AUTOMATION

The crewmember’s goal should be to develop and maintain a thorough knowledge of the capabilities and use of the automated flight systems on the aircraft. This includes maintaining a high degree of proficiency and skill in manual flight modes. Crewmembers are encouraged to routinely practice manual flight including manual use of thrust levers. Achieving this goal will allow you to select the most appropriate level of automation for a given situation and effectively manage threats. The selection of the appropriate level of automation requires an assessment of the operational environment in a given situation.

TERMINAL AREA OPERATIONS

Covers all operations below 10,000′. MSL. This flight regime may also be defined as situations where autoflight system inputs are limited to tactical, short range manipulation of flight parameters or routing. For example, Mode Control Panel (MCP) inputs to follow ATC instructions to change heading or altitude; selecting and executing Direct-To or Intercept Leg-To commands or reprogramming the selected approach on FMS equipment. This category generally excludes strategic use of autoflight systems.

ENROUTE OPERATIONS

Includes climb and descent above 10,000′ MSL and the cruise phase-of-flight. This flight regime may also be defined as situations where autoflight system inputs involve strategic, long-range planning and/or manipulation of flight parameters. For example; programming of FMS equipment to comply with an ATC re-route, loading of STARs and the expected approach procedure or modification of FMS parameters to achieve optimum performance. This regime may also include situations that require tactical use of autoflight systems.

MANUAL CONTROL

When immediate manipulation of flight parameters is required to ensure the safety of the flight crew and aircraft, the flight crew must manually intervene. This is the most important concept in autoflight decision making. Two maneuvers demonstrate this concept clearly:

- The CFIT maneuver: maximum performance is dependent upon aggressive and immediate intervention by the pilot
- Windshear avoidance maneuver: maximum performance may require intervention by the pilot