FIJI AERONAUTICAL INFORMATION CIRCULAR

Civil Aviation Authority of Fiji
Private Bag (NAP0354), Nadi Airport
Republic of Fiji
Tel: (679) 6721 555; Fax (679) 6721 500
Website: www.caaf.org.fj

AIC 07/18
Effective
4 JAN 2018
OPS/ATC

MODE AWARENESS AND ENERGY STATE MANAGEMENT ASPECTS OF FLIGHT DECK AUTOMATION

1. Background

1.1 Automation has contributed substantially to the improvement in air operator safety around the world. Automation increases the timeliness and precision of routine procedures, and greatly reduces the opportunity to introduce risks and threatening flight regimes.

1.2 Nevertheless, in complex and highly automated aircraft, automation has its limits. More critically, flight crews can lose situational awareness of the automation mode under which the aircraft is operating or may not understand the interaction between a mode of automation and a particular phase of flight or pilot input. These and other examples of mode confusion often lead to mismanaging the energy state of the aircraft or to the aircraft deviating from the intended flight path for other reasons. These issues have been identified as factors in several major accidents around the world.

2. Applicability

2.1 All air operators should review this guidance AIC and ensure that their policy, procedures and training reflect these industry best practices. Consideration by air operators that the findings and guidance contained in the AIC will be a positive contribution to flight safety.

3. Purpose

3.1 This AIC is issued to alert air operators to the importance that air crews are aware of the automation mode under which the aircraft is operating. It provides a sample automation policy to support the use of aircraft automation.

3.2 The objective of the sample policy is to help minimize the frequency with which pilots experience mode confusion and undesirable energy states. This, in turn, requires that crews understand the functions of the various modes of automation. The sample policy is based on a set of common industry practices that are known to be effective. Operators should compare this to their existing policies and identify any needed changes. In addition, the sample policy includes practical guidance that air operators may include in their policies in order to help pilots respond effectively to particular types of automation

anomalies. The suggested guidance is intended only as examples of effective responses to selected circumstances. The suggested guidance does not necessarily identify the only proper response.

Note: The terminology used in this AIC and in the examples reflects terminology for Airbus and Boeing aircraft. Air Operators may need to amend the terminology to apply this document to their own fleet mixes, the need for consistent language within a single air operator, or other unique characteristics.

4. Findings

4.1 In almost all cases the flight crew did not understand what the automation was doing, or did not know how to manipulate the automation to eliminate the error. In such cases, when the crew changed automation levels they often made the problem worse. This problem applied to all automation modes and it applied regardless of whether the crew induced the event or the event was precipitated by a problem with the automation system. *In all 50 cases from the last 5 years of data, pilots were unable to return the aircraft to the desired flight path in a timely manner.* This was due to two root causes:

- inadequate training and system knowledge; and
- the unexpected incompatibility of the automation system with the flight regime confronting pilots in their normal duties.

4.2 For example, the crew may have made a manual input to the flight controls that would have been appropriate with the autopilot disengaged. However, if the auto thrust system was still engaged and was in a mode that did not support the flight control input, the resulting flight path or energy state was often undesirable.

4.3 Yet, among the 16 air operator automation policies reviewed, the most common concept simply directs crews to *"use the level of automation that will best support the desired operation of the aircraft*." This concept is fine if the crew understands what the automation is doing at the time of the problem onset, and is then able to determine if the current or another automation level will better suit the operation. However, nearly all incident reports shared one common factor: regardless of whether an error was pilot induced or was a function of the automation system, pilots did not understand what the automation was doing, or did not know how to use the automation to eliminate an error. Consequently, the recommendations emphasize specific elements that should be incorporated into automation policies and then systematically reinforced.

4.4 A core philosophy of "*fly the airplane*" should permeate any air operator's policy on automation. While recognizing that automation has brought major improvements to safety, air operators should require and systematically reinforce a philosophy of *"fly the airplane."* If pilots recognize that they do not understand the nature of an anomaly and do not precisely understand the solution, pilots should not continue in an unstable or unpredictable flight path or energy state while attempting to correct an anomaly. Instead, crews should

revert to a more direct level of automation until the aircraft resumes the desired flight path and/or airspeed. This may ultimately require the crew to turn off all automation systems and flying the aircraft manually. When the aircraft once again is flying the desired flight path and/or airspeed, the crew can begin to reengage the automation, as appropriate. Below is a recommended statement to be included in the operators' automation policies and which should be systematically reinforced.

"***At any time, if the aircraft does not follow the desired vertical flight path, lateral flight path or airspeed, do not hesitate to revert to a more direct level of automation. For example, revert from FMS guidance to non-FMS guidance, or when operating in a non-FMS guidance but with A/THR or A/T engaged, disengage and set thrust manually.***"

4.5 In addition to this recommended philosophical foundation, a broad set of elements should be incorporated in operators' automation policies. The policy recommendations are organized according to seven broad topics that automation policies should address:

- Philosophy;
- Levels of Automation;
- Situational Awareness
- Communication;
- Verification;
- Monitoring; and,
- Command and Control.

4.6 Operators should assess their policies against these seven categories, fill any identified gaps, and ensure that each element is regularly reinforced in operating procedures and training programs.