

Proposed Special Condition SC-Auto-Throttle for CS-23 aircraft

– applicable to Pilatus PC-24

Introductory Note

The hereby presented Special Condition has been classified as an important Special Condition and as such shall be subject to public consultation, in accordance with EASA Management Board Decision 12/2007 dated 11 September 2007, Article 3 (2.), which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

Statement of Issue

The PC-24 is a Part 23 commuter Jet with capacity for 10 or more passengers, powered by two Williams International FJ44-4A engines, capable of IFR operations and having a highly integrated glass avionic suite including an Auto-Throttle system (ATS).

The current Part 23 airworthiness regulations do not contain appropriate safety standards for Auto-Throttle system (ATS) installations, so special conditions are required to establish an acceptable level of safety. Part 25 regulations do contain appropriate safety standards for these systems, so for this project, the special condition is based on the language in CS 25.1329 for the Auto-Throttle, substituting CS 23.1309 and CS 23.143 in place of the part 25 regulations referenced. As there is no equivalent CS 25.302 in the current CS 23 requirements, this is substituted by the Special Condition "Interaction of Systems and Structures" already issued on other similar projects. The here proposed Special Condition is aligned with a corresponding Special Condition on Auto-Throttle raised by the FAA.

Special Condition SC-Auto-Throttle for CS-23 Aircraft

The following special conditions, quoted from CS 25.1329 and modified with part 23 references, are proposed for the Pilatus PC-24 airplane.

- (a) Quick disengagement controls for the Auto-Thrust functions must be provided for each pilot. The Auto-Thrust quick disengagement controls must be located on the thrust control levers. Quick disengagement controls must be readily accessible to each pilot while operating the control wheel and the thrust control levers.
- (b) The effects of a failure of the system to disengage the Auto-Thrust functions when manually commanded by the pilot must be assessed in accordance with the requirements of CS 23.1309.
- (c) Engagement or switching of the Auto-Thrust system, a mode, or a sensor must not produce a transient response affecting the control or flight path of the airplane any greater than a minor transient, as defined in paragraph (l)(1) of this section.

- (d) Under normal conditions, the disengagement of any automatic control function of a flight guidance system may not produce a transient response of the airplane's flight path of the aeroplane any greater than a minor transient.
- (e) Under rare-normal or non-normal conditions, the disengagement of any automatic control functions of a flight guidance system must not produce a transient response affecting the control or flight path of the aeroplane any greater than a significant transient, as defined in paragraph (l)(2) of this section.
- (f) The function and direction of motion of each command reference control (e.g. heading select, speed select, N1 select or Auto-Thrust modes (i.e. De-rated TKF, FLEX, MAX TKF, MAX CONT, TOGA, ANTI-ICE IDLE, etc.)) must be readily apparent or plainly indicated on, or adjacent to, each control if necessary to prevent inappropriate use or confusion.
- (g) Under any condition of flight appropriate to its use, the flight guidance system must not:
 - 1) produce unacceptable loads on the aeroplane (in accordance with the dedicated project special conditions CRI that addresses CS 25.302 requirements), or
 - 2) create hazardous deviations in the flight path.This applies to both fault-free operation and in the event of a malfunction, and assumes that the pilot begins corrective action within a reasonable period of time.
- (h) When the flight guidance system is in use, a means must be provided to avoid excursions beyond an acceptable margin from the speed range of the normal flight envelope. If the aircraft experiences an excursion outside this range, the flight guidance system must not provide guidance or control to an unsafe speed.
- (i) The flight guidance system functions, controls, indications, and alerts must be designed to minimize flight crew errors and confusion concerning the behaviour and operation of the flight guidance system. Means must be provided to indicate the current mode of operation, including any armed, transitions, reversion modes, specific levers positions (motorized or not) and engine automatically targeted setting (Thrust Director). Selector switch position is not an acceptable means of indication. The controls and indications must be grouped and presented in a logical and consistent manner. The indications must be visible to each pilot under all expected lighting conditions.
- (j) Following disengagement of the Auto-Thrust, a caution (visual and aural) must be provided to each pilot.
- (k) During Auto-Thrust operation, it must be possible for the flight crew to move the thrust levers without requiring excessive forces. Depending on the design, the ATS system may disconnect or the levers return to ATS setting position once Human forces are removed. The Auto-Thrust may not create an unsafe condition when the flight crew applies an override force to the thrust levers.
- (l) For purposes of this section, a transient is a disturbance in the control or flight path of the airplane that is not consistent with response to flight crew inputs or environmental conditions.
 - 1) A minor transient would not significantly reduce safety margins and would involve flight crew actions that are well within their capabilities. A minor transient may involve a slight increase in flight crew workload or some physical discomfort to passengers or cabin crew.

- 2) A significant transient may lead to a significant reduction in safety margins, an increase in flight crew workload, discomfort to the flight crew, or physical distress to the passengers or cabin crew, possibly including non-fatal injuries. Significant transients do not require, in order to remain within or recover to the normal flight envelope, any of the following:
 - (i) Exceptional piloting skill, alertness, or strength.
 - (ii) Forces applied by the pilot which are greater than those specified in CS 23.143(c).
 - (iii) Accelerations or attitudes in the airplane that might result in further hazard to secured or non-secured occupants.

The applicant must also functionally demonstrate independence between the left and right Auto-Thrust system installation to prove they cannot have a single point failure that is not extremely improbable that inadvertently leads to a loss of thrust, or to substantial uncommanded thrust changes & transients, in both engines simultaneously.