**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 23**

**[Docket No. FAA-2017-0290; Special Conditions No. 23-281-SC]**

# Special Conditions: Pilatus Aircraft Limited Models PC-12, PC-12/45, PC-12/47; Autothrust System.

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special condition.

**SUMMARY:** This special condition is for the Pilatus Aircraft Limited PC-12, PC-12/45, and PC-12/47 airplanes. These airplanes, as modified by Innovative Solutions & Support, Inc., will have a novel or unusual design feature associated with the use of an autothrust system. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. This special condition contains the additional safety standards the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** This special condition is effective [INSERT DATE OF PUBLICATION IN FEDERAL REGISTER] and is applicable beginning May 24, 2017.

**FOR FURTHER INFORMATION CONTACT:** Jeff Pretz**,** Federal Aviation Administration**,** Small Airplane Directorate, Aircraft Certification Service, 901 Locust, Room 301, Kansas City, MO 64106; telephone (816) 329-3239; facsimile (816) 329-4090**.**

## SUPPLEMENTARY INFORMATION:

### Background

On April 4, 2016, Innovative Solutions & Support applied for a supplemental type certificate for installation of an autothrust system in the PC-12, PC-12/45, and PC-12/47 airplanes. The autothrust system is capable of setting forward thrust based on operation in either a pilot selectable torque or airspeed mode. Operation is limited to use only when above 400 feet above ground level (AGL) after takeoff, and requires disengagement at decision height (DH) or minimum decision altitude (MDA) on approach. The PC-12, PC-12/45, and PC-12/47 airplanes are nine-passenger, two-crewmember, single-engine turbo-propeller airplanes with a 30,000-foot service ceiling and a maximum takeoff weight of 9,039 to 10,450 pounds—depending on airplane model. These airplanes are powered by a single Pratt & Whitney PT6A-67 engine.

The Innovative Solutions & Support, Inc., modification installs an autothrust system in the PC-12, PC-12/45, and PC-12/47 airplanes to reduce pilot workload. The autothrust system is useable in all phases of flight from 400 feet AGL after takeoff down to the decision height on approach. The system includes a torque and airspeed mode along with monitors to prevent the system from exceeding critical engine or airspeed limits. A stepper motor provides throttle movement by acting through a linear actuator, which acts as a link between the stepper motor and throttle. The pilot can override the linear actuator by moving the throttle, which automatically disengages the autothrust system upon disagreement in the expected throttle position versus the actual position.

**Type Certification Basis**

Under the provisions of 14 CFR 21.101, Innovative Solutions & Support must show that the PC-12, PC-12/45, and PC-12/47 airplanes, as changed, continues to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A78EU. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis." The regulations incorporated by reference in A78EU are as follows: 14 CFR part 23, amendments 23-1 through 23-42.[1]

If the Administrator finds the applicable airworthiness regulations (i.e., 14 CFR part 23) do not contain adequate or appropriate safety standards for the PC-12, PC-12/45, and PC-12/47 airplanes because of a novel or unusual design feature(s), special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the PC-12, PC-12/45, and PC-12/47 airplanes must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38 and they become part of the type certification basis under § 21.101. Special conditions are initially applicable to the model for which they are issued**.** Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the FAA would apply these special conditions to the other model under § 21.101.

[1] *See* Type Certification Data Sheet A78EU, revision 25, "Certification Basis" section for the PC-12, PC-12/45, and PC-12/47 full certification basis. (http://rgl.faa.gov/)

**Novel or Unusual Design Features**

The PC-12, PC-12/45, and PC-12/47 airplanes will incorporate the following novel or unusual design feature:

Autothrust system

**Discussion**

As discussed in the summary section, this modification makes use of an autothrust system, which is a novel design for this type of airplane. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. Mandating additional requirements—developed in part—by adapting relevant portions of 14 CFR 25.1329, Flight guidance systems—applicable to autothrust systems—along with FAA experience with similar autothrust systems, mitigates the concerns associated with installation of the proposed autothrust system.

The FAA has previously issued this proposed special condition to part 23 turbojet airplanes, but not for turbo-propeller airplanes. The PC-12, PC-12/45, and PC-12/47 airplanes are unique with respect to other turbo-propeller designs in that the basic design does not include a separate propeller control lever. Future use of these special conditions on other turbo-propeller designs will require evaluation of the engine and propeller control system to determine their appropriateness.

**Discussion of Comments**

Notice of proposed special conditions No. 23-17-01-SC for the Pilatus Aircraft Limited PC-12, PC-12/45, and PC-12/47 airplanes was published in the Federal Register on April 14,

2017 (82 FR 17943)[2]. No comments were received, and the special condition is adopted as proposed.

**Applicability**

As discussed above, this special condition is applicable to the PC-12, PC-12/45, and PC-12/47 airplanes. Should Innovative Solutions & Support, Ltd. apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. A78EU to incorporate the same novel or unusual design feature, the FAA would apply these special conditions to that model as well.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the Federal Register; however, as the certification date for the STC for the Pilatus Aircraft, Ltd., PC-12, PC-12/45, and PC-12/47 airplanes is imminent, pursuant to 5 U.S.C. 553(d), the FAA finds that good cause exists to make this special condition effective upon issuance.

**Conclusion**

This action affects only certain novel or unusual design features on PC-12, PC-12/45, and PC-12/47 airplanes. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features on the airplane.

**List of Subjects in 14 CFR Part 23**

Aircraft, Aviation safety, Signs and symbols.

**Citation**

The authority citation for these special conditions is as follows**:**

[2] Refer to the U.S. Government Printing Office at https://www.gpo.gov/.

**Authority:** 49 U.S.C. 106(f), 106(g); 40113 and 44701; 14 CFR 21.16 and 21.101; and 14 CFR 11.38 and 11.19.

**The Special Condition**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special condition is issued as part of the type certification basis for Pilatus Aircraft Ltd., PC-12, PC-12/45, and PC-12/47 airplanes modified by Innovative Solutions & Support, Inc.

1. Autothrust System**.**

In addition to the requirements of §§ 23.143, 23.1309, and 23.1329, the following apply:

(a) Quick disengagement controls for the autothrust function must be provided for each pilot. The autothrust quick disengagement controls must be located on the thrust control levers. Quick disengagement controls must be readily accessible to each pilot while operating the thrust control levers.

(b) The effects of a failure of the system to disengage the autothrust function when manually commanded by the pilot must be assessed in accordance with the requirements of § 23.1309.

(c) Engagement or switching of the flight guidance system, a mode, or a sensor may not cause the autothrust system to affect a transient response that alters the airplane's flight path any greater than a minor transient, as defined in paragraph (l)(1) of this special condition.

(d) Under normal conditions, the disengagement of any automatic control function of a flight guidance system may not cause a transient response of the airplane's flight path any greater than a minor transient.

(e) Under rare normal and non-normal conditions, disengagement of any automatic control function of a flight guidance system may not result in a transient any greater than a significant transient, as defined in paragraph (l)(2) of this special condition.

(f) The function and direction of motion of each command reference control, such as heading select or vertical speed, must be 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 may not produce hazardous loads on the airplane, nor 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 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 airplane experiences an excursion outside this range, a means must be provided to prevent the flight guidance system from providing guidance or control to an unsafe speed.

(i) The flight guidance system functions, controls, indications, and alerts must be designed to minimize flightcrew errors and confusion concerning the behavior and operation of the flight guidance system. A means must be provided to indicate the current mode of operation, including any armed modes, transitions, and reversions. 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 autothrust function, a caution (visual and auditory) must be provided to each pilot.

(k) During autothrust operation, it must be possible for the flightcrew to move the thrust levers without requiring excessive force. The autothrust may not create a potential hazard when the flightcrew 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 flightcrew inputs or environmental conditions.

(1) A minor transient would not significantly reduce safety margins and would involve flightcrew actions that are well within their capabilities. A minor transient may involve a slight increase in flightcrew 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 flightcrew workload, discomfort to the flightcrew, 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 § 23.143(c).

(iii) Accelerations or attitudes in the airplane that might result in further hazard to secured or non-secured occupants.

Issued in Kansas City, Missouri, on May 24, 2017.

Wes Ryan, Acting Manager,
Small Airplane Directorate,
Aircraft Certification Service.
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