



**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 23**

**[Docket No. FAA-2018-0090; Special Conditions No. 23-286-SC]**

**Special Conditions: Textron Aviation, Inc., Model C90A King Air; Installation of Electronic Engine Control System**

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

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Textron Aviation, Inc., model C90A King Air airplane. This airplane as modified by Nextant Aerospace will have a novel or unusual design feature associated with installation of an engine that includes an electronic engine control system. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is **[INSERT DATE OF PUBLICATION IN FEDERAL REGISTER]**.

We must receive your comments by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**

**ADDRESSES:** Send comments identified by docket number FAA-2018-0090 using any of the following methods:

- Federal eRegulations Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.
- Hand Delivery of Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, S.E., Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://regulations.gov>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey

Avenue, SE., Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Jeff Pretz, Federal Aviation Administration, Aircraft Certification Service, Policy & Innovation Division, Small Airplane Standards Branch, AIR-691, 901 Locust, Room 301, Kansas City, MO, 64106; telephone (816) 329-3239; facsimile (816) 329-4090.

**SUPPLEMENTARY INFORMATION:**

The FAA has determined that notice and opportunity for prior public comment hereon are impracticable because these procedures would significantly delay issuance of the approval design and thus delivery of the affected aircraft. In addition, the FAA has determined, in accordance with 5 U.S.C. 553(b)(3)(B) and 553(d)(3), that notice and opportunity for prior public comment hereon are unnecessary because the substance of these special conditions has been subject to the public comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon issuance.

Special Conditions Number	Company/Airplane Model
23-01-05-SC <sup>1</sup>	Eclipse Aviation Corporation/Model 500
23-10-03-SC <sup>2</sup>	Diamond Aircraft Industries/Model DA-40NG
23-98-03-SC <sup>3</sup>	Raytheon Aircraft Company/Model 3000

<sup>1</sup>[http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgSC.nsf/0/3B5A8ECF0327533486256B80006AEF68?OpenDocument&Highlight=23-01-05-sc](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSC.nsf/0/3B5A8ECF0327533486256B80006AEF68?OpenDocument&Highlight=23-01-05-sc)

<sup>2</sup>[http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgSC.nsf/0/4D1C0F368222693386257904004BC13F?OpenDocument&Highlight=electronic%20engine%20control](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSC.nsf/0/4D1C0F368222693386257904004BC13F?OpenDocument&Highlight=electronic%20engine%20control)

<sup>3</sup>[http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgSC.nsf/0/FF5633DA88FBF46586256B96005F8AAF?OpenDocument&Highlight=electronic%20engine%20control](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSC.nsf/0/FF5633DA88FBF46586256B96005F8AAF?OpenDocument&Highlight=electronic%20engine%20control)

## **Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these special conditions based on the comments we receive.

## **Background**

On January 12, 2016, Nextant Aerospace applied for a supplemental type certificate (STC) for installation of two General Electric (GE) H75-100E engines that include electronic engine and propeller controls in the model C90A King Air. The model C90A, currently approved under Type Certificate No. 3A20, is a normal category twin turbo-propeller airplane with a maximum capacity of up to 13 passengers and a maximum takeoff weight of up to 9650 lbs. or 10,100 lbs., depending on the serial number modified. The airplane includes two Pratt & Whitney Corporation (PWC) PT6A-21 engines and either Hartzell or McCauley reversing propellers.

Nextant Aerospace originally received an STC for the model C90A for installation of two GE H75-100 engines. Nextant Aerospace has made application to amend the STC to install GE H75-100E engines, which include single channel analog supervisory electronic engine controls (EECs) in addition to the existing mechanical engine controls. The EEC does not include any software, but does provide single lever control for both the fuel metering and propeller control. The EEC also ensures the engine and

propeller remain within their operating limits throughout the approved operating range, including propeller reverse operation and starting. Loss of the EEC results in the pilot control of the hydro-mechanical metering/shut-off lever.

The Nextant Aerospace installation of GE H75-100E engines in the model C90A King Air use an electronic engine control system (a single channel supervisory control with a mechanical backup as opposed to a two-channel full authority control with no mechanical backup) instead of a traditional mechanical only control system. Although the engine control system is certificated as part of the engine, the installation of an engine with an electronic control system requires evaluation due to critical environmental effects and possible effects on or by other airplane systems. This includes indirect effects of lightning, radio interference with other airplane electronic systems, shared engine and airplane data, and power sources.

The regulatory requirements in 14 CFR part 23 for evaluating the installation of complex systems, including electronic systems and critical environmental effects, are contained in §§ 23.1306, 23.1308, and 23.1309. However, when § 23.1309 was developed, the use of electronic control systems for engines was not envisioned. The integral nature of these systems makes it necessary to ensure the airplane functions, which may be included in the EEC, are properly evaluated and that the installation does not degrade the EEC reliability, which is approved under part 33. Sections 23.1306(a) and 23.1308(a) are applied to the EEC to ensure it remains equivalent to a mechanical only system, which is not generally susceptible to the High Intensity Radiated Fields (HIRF) and lightning environments.

In some cases, the airplane in which the engine is installed determines a higher classification than the engine controls are certificated for, requiring the EEC systems be analyzed at a higher classification. As of November 2005, EEC special conditions mandated the § 23.1309 classification for loss of EEC control as catastrophic for any airplane. This is not to imply an engine failure is classified as catastrophic, but that the EEC must provide an equivalent reliability to mechanical engine controls. In addition, §§ 23.1141(e) and 25.901(b)(2) are applied to provide the fault tolerant design requirements of turbine engine mechanical controls to the EEC and ensure adequate inspection and maintenance interval for the EEC. As this is a supervisory EEC with a mechanical control backup, the intent of this special condition is to ensure the installation of both the EEC and mechanical backup provide an equivalent reliability to that expected of a mechanical only control.

Part 23 did not envision the use of electronic engine controls with either full authority controls or supervisory only controls, and lacks the specific regulatory requirements necessary to provide an adequate level of safety. Therefore, special conditions are necessary.

### **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (CFR) 21.101, Nextant Aerospace must show that the model C90A, as changed, continues to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. 3A20 or the applicable regulations in effect on the date of application for the change. 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 3A20 are as follows: CAR 3, effective May 15, 1956, amendments 3-1, 3-2, and 3-8; CAR 3, amendment 3-6; and CAR 3 § 3.705, amendment 3-7. In addition, the

certification basis includes special conditions and some requirements from 14 CFR parts 23, 25, 36 and SFAR 27, as noted on the Type Certificate Data Sheet. If the Administrator finds that the applicable airworthiness regulations in part 23 do not contain adequate or appropriate safety standards for the model C90A because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the model C90A 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 § 11.19, under § 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.

### **Novel or Unusual Design Features**

The model C90A King Air will incorporate the following novel or unusual design features:

The installation of an Electronic Engine Control (EEC) system.

### **Discussion**

As defined in the summary section, this airplane makes use of an electronic engine control system in addition to a traditional mechanical control 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 a structured assessment to determine potential installation issues mitigate the concerns that the addition of an electronic engine control does not produce a failure condition not previously considered.

### **Applicability**

These special conditions are applicable to the model C90A King Air when modified by Nextant Aerospace. Should Nextant Aerospace apply later for a supplemental type certificate to modify any other model included on Type Certificate No. 3A20 to incorporate the same novel or unusual design feature, the FAA would apply these special conditions to that model as well.

### **Conclusion**

This action affects only certain novel or unusual design features on the model C90A airplane. 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.

The substance of these special conditions has been subjected to the notice and comment period in several prior instances, identified above, and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, notice and opportunity for prior public comment hereon are unnecessary and the FAA finds good cause, in accordance with 5 U.S. Code §§ 553(b)(3)(B) and 553(d)(3), making these special conditions effective upon issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

## **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:

**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 Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Textron Aviation (formerly Beechcraft); model C90A King Air airplanes modified by Nextant Aerospace.

#### **1. Installation of Electronic Engine Control System**

a. For electronic engine control (EEC) system installations, it must be established that no single failure or malfunction or probable combinations of failures of EEC system components will have an effect on the system, as installed in the airplane, that causes the Loss of Thrust Control (LOTC) probability of the system to exceed those allowed in part 33 certification.

b. Supervisory electronic engine control system installations must be evaluated for environmental and atmospheric conditions, including lightning. The EEC system lightning and High Intensity Radiated Fields (HIRF) effects that would result in LOTC or an unacceptable change in power or thrust must be evaluated in accordance with §§ 23.1306 and 23.1308.

c. The components of the installation must be constructed, arranged, and installed to ensure their continued safe operation between normal inspections or overhauls.

d. Functions incorporated into any electronic engine control that make it part of any equipment, systems or installation whose functions are beyond that of basic engine control and which may also introduce system failures and malfunctions, are not exempt from § 23.1309 and must be shown to meet part 23 levels of safety as derived from § 23.1309. Part 33 certification data, if applicable, may be used to show compliance with any part 23 requirements. If part 33 data is used to substantiate compliance with part 23 requirements, then the part 23 applicant must be able to provide this data for their showing of compliance.

**Note:** The term "probable" in the context of "probable combination of failures" does not have the same meaning as used for a safety assessment process. The term "probable" in "probable combination of failures" means "foreseeable," or those, failure conditions anticipated to occur one or more times during the operational life of each airplane.

Issued in Kansas City, Missouri on February 16, 2018.

Pat Mullen  
Manager, Small Airplane Standards Branch  
Aircraft Certification Service  
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