



U.S. Department
of Transportation
**Federal Aviation
Administration**

ACE-100
#214496
1999 JUN 14 AM 10:53

Memorandum

Subject: **ACTION:** Equivalent Level of Safety (ELOS), Single
Point Seat Belt Release for Raytheon Aircraft Company
Model 3000; ACE-99-08

Date: June 8, 1999

From: Program Manager-Raytheon Projects
ACE-117W

Reply to
Attn. of: Steven E. Potter
316-946-4124

To: Manager, ACE-100
Attn: Karl M. Schletzbaum

This memorandum is to document the concurrence to the subject equivalent level of safety to the Seats, berths, litters, safety belts and shoulder harnesses of 14 CFR, Part 23, Section 23.785(d).

Background:

See attached Raytheon Staff Study given in Raytheon Aircraft Company letters 940-99-02-136 and 940-99-03-129, dated February 12, 1999 and March 17, 1999, respectively.

Applicable Regulations:

Title 14 CFR, Part 23, Section 23.785(d), amendment 23.36.

Applicant's Position:

Raytheon Aircraft Company's Position is as stated in Equivalent Level of Safety documentation. Raytheon Aircraft Company letters dated February 12, 1999 and March 17, 1999 states their position.

FAA Position:

The Federal Aviation Administration's position, for this aerobatic trainer type airplane, is that the ejection seat system allows an equivalent level of safety even without a single point release of the occupant. The attached documents provide support and background data to solidify our position. Also, FAA Action Notice 8130.24 supplies additional information for Type Certification of Military Aircraft. The FAA recommends an equivalent level of safety be granted for Federal Aviation Regulation 23.785(d) per §21.21.

Compensating Features:

The Raytheon Aircraft Company Model 3000 Joint Primary Airplane Trainer System (JPATS) is an aerobatic airplane with compensating features to allow this equivalent level of safety to §23.785(d). The compensating features are the high speed ejection up to Vc using a canopy fracturing system and the Martin-Baker MkUS16LA ejection seat. The egress system also has the ability to be operated at zero speed and zero altitude.

Conclusion:

We concur with Raytheon Aircraft Company for an Equivalent Level of Safety for 23.785(d). Therefore, we recommend granting this ELOS per §21.21. The ELOS should be granted with the Airworthiness Limitations of the Airworthiness Sections of the Airplane Flight Manual and the Airplane Maintenance Manual.

Approved by:

Tina J. Miller
Program Manager-Raytheon Projects

6/11/99
Date

Concurred with:

for Ronald K. Rathgeber
Manager,
Wichita Aircraft Certification Office
ACE-115W

6-11-99
Date

Wanda K. Dike
Manager, Standards Office, ACE-110

7/2/99
Date

Michael Gallagher
Manager
Small Airplane Directorate,
Aircraft Certification Service, ACE-100

7/5/99
Date

Attachments 2

ATTACHMENT #2
FAA LETTER, dated 6-8-99

Raytheon Aircraft Company
9709 East Central
P.O. Box 85
Wichita, KS 67201-0085

Raytheon Aircraft

Beech
Hawker

Model: 3000

March 17, 1999

In Reply, Please Refer To: 940-99-03-129

Federal Aviation Administration
Mr. James A. Schueler, Program Manager
Wichita Aircraft Certification Office
1801 Airport Road, Room 100
Mid-Continent Airport
Wichita, KS 67209

Subject: Model 3000 Equivalent Level of Safety for Single Point Release of Restraint System – FAR 23.785(d)

- References:
- (1) Project # TC0005WI-A
 - (2) RAC Letter 940-99-03-053 dated March 3, 1999
 - (3) RAC Letter 940-99-02-136 dated February 12, 1999

Dear Mr. Schueler:

A decision was made in the March 3 coordination meeting (Ref: 2) to separate the Equivalent Level of Safety (EQS) request for the restraint system single point release requirements of 23.785(d) from the ejection seat EQS 23.562 and 23.807.

RAC decided that a new letter which gathers all pertinent facts (i.e. restraint system release demo, AFM limitations, etc.) would be sent to FAA so that this EQS would stand alone.

Staff Study for EQS on 23.785(d), attached, documents the airworthiness provisions of 23.785(d) not complied with are compensated by factors that provide an equivalent level of safety to the rule. No feature or characteristic of the proposed system makes the airplane unsafe for the certification category sought.

This staff study is forwarded for FAA's written concurrence and/or comments. When concurrence has been received, the finding will be DOA approved by proper completion of Form 90-31429 and filed in the Record of Compliance file. In addition, the program Check-Off List will identify this Equivalent Level of Safety Finding as granted, and the Type Certificate Data Sheet will identify such in the Certification Basis Section.

Very truly yours,

RAYTHEON AIRCRAFT COMPANY


A. C. Jackson, Group Manager
Product Design Assurance & FAA Liaison

ACJ:dsp

Attachment

SEP 3-22-99
1174 - Schueler
1999 MAR 18 AM 10:14
6661-6000
WICHITA ACC
RECEIVED
1186 S. Potter -

SCOPE

The Model 3000 (JPATS) is a single engine, tandem seating turboprop aircraft with an automatic powered escape system with the capability of safely ejecting both occupants from the aircraft throughout the entire range of speed and altitude for which it is approved to operate, including zero altitude and zero airspeed. The US Military qualified escape system featuring ejection seats and canopy severance system contains certain features that were not envisioned in the applicable FAR Part 23 certification rules dealing with seats, parachutes and escape systems; however, Certification Procedures of FAR Part 21.21 and Certification Rules 23.1301, 23.1309 and 23.1529, coupled with the ejection seat qualification to the Military Systems Requirements Document (SRD), contain adequate provisions to permit the airworthiness certification of this system to proceed.

The certification of the ejection seat system is being handled as a separate action from this EQS on 23.785(d) which pertains solely to the restraint system single point release requirements of 23.785(d).

BACKGROUND

It is FAA's stated position that the single point release issue should be dealt with independently from the EQS on the ejection seat system, since previous internal FAA agreements allow an EQS on the ejection seat to be issued based upon the ejection seat qualification to the Military Systems Requirements Document, but does not include an EQS to be granted to the single point release requirements of 23.785(d).

DISCUSSION

FAR 23.785(d) reads as follows:

(d) Each restraint system must have a single-point release for occupant evacuation.

Discussion and compensating Factors to FAR 23.785(d):

In the military aircraft with ejection seats, the restraint system is integral to the parachute harness and is part of the pilots flight gear or torso harness. These systems were developed through years of development and numerous tests have been conducted proving the design is quite durable and safe.

The restraint system for the Model 3000 is the US Air Force PCU/15P and PCU/16P Torso Harnesses integrated with the ejection seat. The PCU/15 & 16P Torso harness integrates the parachute harness and ejection seat survival kit into a unified assembly. The torso harness and ejection seat lap belt provide greater restraint than that provided by a lap belt and single shoulder strap. PCU/15&16P Torso harness has been designed and qualified by the US Air Force for use on all Air Force aircraft with ejection seats. The Torso Harness provides safe restraint in all regimes of flight, crash and ejection and is sized for pilot weights from 103 lbs to 245 lbs, (nude).

The pilot attaches to the ejection seat through the torso harness in four locations. Two upper points provide shoulder restraint, and the two lower points attach to the survival kit. There is a lap belt to provide lower torso support. Additionally, there are two lower leg garters worn just above the boot which provide leg support during ejection. This system because of its operation cannot have a single point release.

RAC has demonstrated the capability for both pilots to exit the aircraft in emergency ground egress situations in less than 15 seconds. This time element includes the steps required by each pilot to disconnect their oxygen, communication and emergency oxygen personal leads. While there are no emergency egress times specified for this class of airplane, it should be noted that the demonstrated time is considerably less than the ninety (90) seconds required for emergency egress per 23.803 for Commuter Category airplanes. The 23.803 regulation is cited here strictly as a benchmark on which to compare the results of this demonstration. The crew that participated in the demonstration consisted of a male test pilot and a female who is not a pilot. The video tape documenting the event has been provided to the FAA-ACO under separate cover.

As a condition for operation of the Model 3000, there is a limitation imposed in the FAA approved flight manual P/N 133-590003-5, requiring both RAC ejection seat training and RAC flight apparel. This training includes emergency ground egress and the steps required to free one from the seat restraint system.

The appropriate ejection seat system entries will also be noted on the TCDS.

OTHER RELEVANT AND PERTINENT INFORMATION

In January 1990, FAA published Action Notice 8130.24 entitled “ Procedures for Type Certification of Military Aircraft and Identification of Type Design Deviations”. Although this Notice expired in January 1991 without FAA issuing a new Notice and/or superseding information, the information contained in 8130.24 continues to be appropriate guidance to all ACO and MIDO offices.

Paragraph 3. entitled “ Equivalent Safety Findings” is of particular value in that the Notice allows the equivalency to be made “based upon how the aircraft is to be operated by the Military” and advises FAA “to seek expert assistance from the Military to fully understand the Military operation” and to “use that information to determine if an equivalent level of safety exists...”.

The Notice goes on to identify that “if in making the equivalent safety finding there were some Military or other unique equipment, design features, or operational characteristics that caused FAA to find that it was equivalent, then those factors must be made a restriction on the TCDS and reflected in the appropriate section of the airplane flight manual”.

CONCLUSION

The restraint release features of the Model 3000 ejection seat system is eligible for an Equivalent Level of Safety to 23.785(d) under the provisions of FAR 21.21. Pertinent information shows rules not complied with are compensated for by factors that provide an equivalent level of safety and that no feature or characteristic within the operating envelope makes the aircraft unsafe for the aerobatic category in which certification is requested.

END

ATTACHMENT TO LETTER 940-99-03-129 – STAFF STUDY FOR EQUIVALENT LEVEL OF SAFETY FAR 23.785(d)

Bc's: P. Jonas; C. Lee; D. St Peter; J Madia; B Pedroja

ATTACHMENT #1
FAA LETTER, date 6-8-99

Raytheon Aircraft Company
9709 East Central
P.O. Box 85
Wichita, KS 67201-0085

Raytheon Aircraft

Beech
Hawker

Model:3000

February 12, 1999

In Reply Please Refer To: 940-99-02-136

DOT Federal Aviation Administration
Mr. James A. Schueler, Program Manager
Wichita Aircraft Certification Office
Room 100, 1801 Airport Road
Mid-Continent Airport
Wichita, Ks. 67209

Subject: Equivalent Level of Safety to FAR 23.785(d)

- References:
- (1) Project # TC0005WI-A
 - (2) RAC Letter 940-98-05-036 dated 6-9-98
 - (3) FAA/RAC Interaction Item Number 1130.

23.785(b)
23.785(d)
included
in Equivalent
Level of Safety
1180
s. Potter

6-8-99

1999 FEB 12 PM 4:57
1170 Schueler

Dear Mr. Schueler:

In RAC letter reference (2) the staff study addresses an Equivalent Level of Safety Finding to FAR 23.785(d) along with other regulations which are not of interest in this letter. FAR 23.875(d) states "Each restraint system must have a single point release for occupant evacuation."

The restraint system in the model 3000 does include a single point lap belt, but the ejection seat requires additional connections to the parachute, leg restraints and survival kit, making literal compliance impossible.

The referenced staff study suggested that the automatic disconnects and specialized hardware mitigate any risk or hazard associated with the additional connections.

This letter provides supplemental information to support our staff study.

To support the equivalent level of safety, RAC conducted a demonstration to determine the time for a crew of two to exit the airplane in a simulated emergency ground evacuation. The time from start to both feet on the wing was less than 15 seconds. This is considerably less than the 90 seconds required for emergency evacuation required by FAR 23.803, though that rule is not applicable to the Model 3000. The requirement of FAR 23.803 is used strictly as a benchmark on which to compare the results of this demonstration.

940-99-02-136

page 2

The crew that participated in the demonstration consisted of a male test pilot and a female who is not a pilot. The attached video documents the event, and the capability of the crew to exit the airplane quickly and safely in the event of a ground incident requiring egress other than use of the ejection system.

Due to the nature of the ejection seat, in that it requires special connections, and the RAC evacuation demonstration of egress, RAC considers that this supplemental information demonstrates an equivalent level of safety to FAR 23.785(d).

Your prompt consideration of this information would be appreciated.

Very truly yours,

RAYTHEON AIRCRAFT COMPANY

A handwritten signature in black ink, appearing to read "A. C. Jackson", with a stylized flourish at the end.

A. C. Jackson, Group Manager
Product Design Assurance
& FAA Liaison

ACJ:bp

Attachment