Exemption No. 7190

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
KANSAS CITY, MISSOURI 64106

In the matter of the petition of	*	
	*	
RAYTHEON AIRCRAFT COMPANY	*	Regulatory Docket No. CE155
	*	
for exemption from § 23.181(b) of Title 14	*	
of the Code of Federal Regulations (CFR)	*	

PARTIAL GRANT OF EXEMPTION

By letter dated August 27, 1999, Mr. A.C. Jackson, Raytheon Aircraft Company, 9709 E. Central, Wichita, KS 67201-0085, petitioned for an exemption from compliance with § 23.181(b) of Title 14, Code of Federal Regulations (14 CFR) to permit the Raytheon Model 390 to be certified to a requirement equivalent to Part 25, § 25.181(b), Dynamic Stability, Amendment 25-42.

The petitioner requires relief from the following regulation(s):

Raytheon petitioned the FAA to exempt the Model 390 to utilize the directional stability-damping criterion of § 25.181 in lieu of the damping criterion of § 23.181(b).

> Section 23.181(b) of the FAR requires that any combined lateral-directional oscillations ("Dutch roll") occurring between the stalling speed and the maximum allowable speed appropriate to the configuration of the airplane must be damped to 1/10 amplitude in 7 cycles with the primary controls – (1) free; and, (2) in a fixed position.

The petitioner proposed these dynamic stability requirements as equivalent:

Any combined lateral/directional oscillations ("Dutch roll") occurring between $1.2V_S$ and maximum allowable speed appropriate to the configuration of the airplane must be positively damped with controls free, and must be controllable with normal use of the primary controls without requiring exceptional pilot skill.

The petitioner supports the request with the following information:

Equivalency Discussion

The Model 390 is similar in size and configuration to the Model 400A (Beechjet). The Beechjet has demonstrated safe flight operations over the past nine years. Dutch roll damping comparisons show the damping of the Model 390 is improved over that of the Beechjet (TC basis

Part 25). Available data indicates the Model 390 damping ratio is improved by an average of 0.030 for the flaps down case and 0.020 for cruise configuration. In addition, pilots for both airplanes are required to hold a type rating and, therefore, will have comparable training requirements.

Equivalent level of safety

The proposed Dynamic Stability requirement, which is the same as the Part 25 requirement, the requirement for type rated pilots, and the fact that the Model 390 has a better damping ratio than other aircraft certified to Part 25, will provide an equivalent level of safety to the Part 23 regulation.

Public Interest

If an exemption is not granted, there would be an estimated 67.8 million pounds of additional fuel used and accompanying emissions into the atmosphere due to the increased drag of an enlarged vertical tail area required to meet the Part 23 Dutch roll damping requirement. This estimate is based on an average mission length of 1.0 hr, an 850 aircraft fleet size, 360 flight hours per year per aircraft, and an 18-year aircraft life for the Model 390.

Comments on published petition summary:

A summary of this petition was published in the FEDERAL REGISTER for public comment on December 6, 1999 (64 FR 68192). The comment period closed on December 27, 1999, and the FAA did not receive any comments.

The Federal Aviation Administration's (FAA) analysis is as follows:

To obtain an exemption, the petitioner must show, as required by 14 CFR, Part 11, § 11.25(b)(5), that: (1) granting the request is in the public interest, and (2) the exemption would not adversely affect safety, or that a level of safety will be provided which is equal to that provided by the rule from which the exemption is sought.

The Part 23 requirement for Dutch roll oscillations to be damped to 1/10 amplitude in 7 cycles is, in part, a result of few small airplanes having yaw damper systems. In contrast, nearly all current transport category airplanes are type certificated with yaw dampers since the ride quality must be tailored to maximize passenger comfort and safety. In addition to the yaw damper requirement differences between Part 23 and Part 25, the standards for Part 25 do not address single pilot operations. Part 25 airplanes are typically flown by a crew of pilots type rated for that specific airplane. This is the reason that the Part 23 requirements are and should be more stringent for airplane handling characteristics.

The FAA has reviewed the information contained in the petitioner's request for exemption. We have determined that the current standards are appropriate minimum standards for typical Part 23, single pilot airplanes. The Part 25 requirements specify only that the characteristics be positively damped, which is not enough for turbojet Part 23 airplanes. "Positively damped" does

not adequately define the characteristics that a Part 23 airplane needs to exhibit. Single pilot operations, especially in IMC, necessitate a higher Dutch roll damping ratio for pilot workload considerations.

Yaw dampers are a common solution to meeting the Dutch roll requirements. The FAA expects to see an increasing number of high altitude/high performance airplanes that will probably need to incorporate a yaw damper to meet the requirements. Some existing aircraft meet the Dutch roll damping requirements at lower altitudes but not at their design cruising altitudes. For these airplanes, the FAA has allowed continued operation after a yaw damper failure provided the airplane is operated at or below the altitude where it can meet the damping requirements. This has been allowed provided that it is adequately addressed in the AFM.

Also, some Part 25 and Part 23 airplanes have been exempted from the use of the yaw damper for takeoff and landing because the yaw damper can interfere with controllability in crosswinds. This is a reasonable exception to the Dutch roll requirements and it is supported by service experience with similar airplanes. Therefore, the FAA will grant relief from the requirement to use the yaw damper for takeoff and landing. Considering the scope of Raytheon's original request for relief from § 23.181, the FAA can only support this partial grant of the exemption for takeoff and landing. The FAA will not grant relief from the entire flight envelope as originally requested. Also, as part of the partial grant of the exemption, the FAA will require a multiple pilot evaluation since the Model 390 is intended to be flown single pilot.

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest and will not adversely affect safety. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, as amended, delegated to me by the Administrator (14 CFR Part 11, § 11.53), the petition of Raytheon Aircraft Company, for exemption from 14 CFR Part 23, § 23.181(b) is hereby partially granted for the Model 390. This exemption is subject to the following limitation and condition:

> The Model 390 yaw damper may be disabled for takeoff and landing.
>
> A pilot evaluation must be made to verify that no unsafe condition exists with the airplane's handling characteristics with the yaw damper disabled during landing and takeoff. The evaluation should be conducted by at least two Aircraft Certification test pilots and at least one Aircraft Evaluation Group (AEG) pilot.

Issued in Kansas City, Missouri on April 24, 2000.

s/

Michael K. Dahl
Acting Manager
Small Airplane Directorate
Aircraft Certification Service