

UNITED STATES OF AMERICA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION  
WASHINGTON, DC 20591

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In the matter of the petition of \* Regulatory Docket No. 030CE  
\*  
MOONEY AIRCRAFT CORPORATION \*  
\*  
for an exemption from \*  
§ 23.991(a)(1) \*  
of the Federal Aviation \*  
Regulations \*  
\*  
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GRANT OF AMENDMENT TO EXEMPTION

By letter dated May 13, 1987, Mr. W. E. Wheat, Post Office Box 72, Kerrville, Texas 78029, petitioned on behalf of Mooney Aircraft Corporation for an amendment to the limitations in the grant of exemption from the requirements of § 23.991(a)(1) of the Federal Aviation Regulations (FAR) to permit certification of a Model M20L airplane using the Porsche PFM3200No3 engine, which will not comply with § 23.991(a)(1). The Mooney Model M20L is a small, single reciprocating engine, four-place airplane.

Sections of the FAR affected:

Section 23.991(a)(1) requires, for reciprocating engine installations having fuel pumps to supply fuel to the engine, at least one pump for each engine must be directly driven by the engine and must meet § 23.995. This pump is a main pump.

The petitioner's supportive information is as follows:

Mooney Aircraft Corporation requests that the Exemption granted for Section 23.991(a)(1) to Mooney Aircraft Corporation dated February 13, 1987 to permit type certification of the Model M20L airplane with the Porsche PFM3200No3 engine installed provided compliance with seven (7) items (limitations) listed be shown, be amended to delete the term "fast-acting" as required in item No. 2 (limitation No. 2).

Mooney has not been successful in obtaining any of these items in the current rating required for usage in aircraft.

Additionally, by utilizing the battery in the engine bus circuit, as shown in Mooney Drawing 800350, Rev. AE, dated 5/8/87, along with the usage of a circuit breaker with a 10 amp lower rating between the engine bus and the aircraft bus that the intent of this device has been met. These circuit breakers must be of the same manufacture and type.

Mooney has tested and demonstrated to our (Mooney's) satisfaction that the operation of this (60 amp) circuit breaker does not affect the operation of the engine bus.

With the usage of two 70 amp alternators, Mooney does not contemplate usage of the right aircraft bus. By comparative analysis with the load requirements of the Model M20K, one alternator (70 amp) exceeds the maximum requirements anticipated. However, Mooney feels, in the interest of redundancy, that the second alternator should have the same capabilities, to provide sufficient electrical power to the airframe bus in the event that a fault requires use of the emergency crossover engagement.

The basic electrical distribution system proposed for the Mooney M20L uses the Porsche PFM3200No3 engine equipped with two 70 amp Bosch alternators with integral voltage regulators.

Two separate power (electrical) systems, which are identical to the point where the airframe electrical system connects to the engine electrical power systems, are installed, with the availability of a crossover circuit breaker to connect the two engine electrical buses in the event of an emergency.

Each engine bus is fed power from one 70 amp alternator and one 22 amp-hour battery. The purpose of the engine bus is to supply power for one electronic ignition system and one electrical fuel pump for the engine operation. An instrument indicating alternator current and voltage is connected to each bus.

Both the alternator and battery are connected to the engine bus through 70 amp circuit breakers.

The airframe bus power is supplied from the left engine bus through a 60 amp circuit breaker. A load current meter is provided in this system to monitor power usage.

In the event of one electronic ignition system failure, the engine will operate on a single unit (the electronic ignition system supplied by the other engine bus). The same is true concerning the electric fuel pump.

In the event of an alternator failure, indicated by the annunciator light, the alternator circuit breaker (70 amp "ALT") may be pulled and the crossover circuit breaker engaged by lifting the red guard and pushing the 50 amp circuit breaker button. The other alternator then supplies power to the entire system.

In the event of an inflight battery circuit fault, battery circuit breaker (70 amp "BAT") may be pulled and the corresponding battery switch turned off.

With the crossover circuit breaker engaged, any combination of alternator and battery combinations may be operated. This also applies to combinations of electronic ignition systems and electric fuel pumps.

The airframe bus operates from the left power system (engine bus) until the crossover circuit breaker is engaged. Then it will operate from any alternator/battery combination. The 60 amp circuit breaker between the engine bus and airframe bus insures a ten amp engine bus dedication in the event of airframe bus overload or fault.

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

To obtain the exemption, the petitioner must show, as required by § 11.25(b)(5) of the Federal Aviation Regulations, that: (1) granting the request is in the public interest, and (2) the grant of 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.

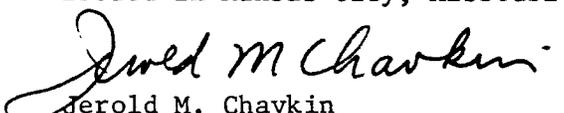
The FAA carefully reviewed all of the information contained in the petitioner's initial request for exemption and granted the exemption with seven specific limitations to assure the grant of exemption would not adversely affect safety. The petitioner subsequently encountered difficulties in locating the fast-acting circuit breakers of the proper size required by limitation Number 2.

The petitioner developed and tested an alternative design that would accomplish the intent of the fast-acting circuit breakers using a combination of standard circuit breakers and a dedicated battery to assure adequate power to quickly trip a standard circuit breaker like a fast-acting circuit breaker. FAA aircraft certification personnel witnessed these tests.

In consideration of the foregoing, I find that an amendment of limitation Number 2 in Exemption Number 4753 is in the public interest and will not adversely affect safety. Therefore, pursuant to the authority contained in Sections 313(a) and 601(c) of the Federal Aviation Act of 1958, as amended, delegated to me by the Administrator (14 CFR 11.53), Mooney Aircraft Corporation is hereby granted an amendment of Exemption Number 4753 so limitation Number 2 reads as follows:

2. The circuit breaker coupling the airframe bus to the engine bus, the circuit breaker coupling the engine bus' dedicated alternator, the circuit breaker coupling the engine bus' dedicated battery, and the circuit breaker coupling the two isolated engine buses together in an emergency must be of the same design (trip response time versus load percent of rating) and must be sized to assure compliance with limitation Number 1 of this exemption. The system design must assure that the engine electrical bus' dedicated battery is connected to the bus during all normal operations. Tests must be conducted to demonstrate that when the airframe bus supply breaker trips, the engine ignition and fuel pumps are not adversely affected, and the specified limits are not exceeded. All engine electrical functions must continue to operate satisfactorily after disconnect (load dump) from all airframe electrical systems.

Issued in Kansas City, Missouri on June 9, 1987.

  
Jerold M. Chavkin  
Acting Director, Central Region