
Type Acceptance Report

TAR 96/04 – Revision 3

Mooney M20 Series

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	1
2. ICAO TYPE CERTIFICATE DETAILS	1
3. TYPE ACCEPTANCE CERTIFICATE	3
4. TYPE DATA	4
5. ADDITIONAL NEW ZEALAND REQUIREMENTS	7
ATTACHMENTS	8
APPENDIX 1	8

Executive Summary

New Zealand Type Acceptance has been granted to the Mooney M20 Series based on validation of FAA Type Certificate no. 2A3. There are no special requirements for import.

Applicability is currently limited to the Models and/or serial numbers detailed in Appendix 1, which are now eligible for the issue of an Airworthiness Certificate in the Standard Category in accordance with NZCAR §21.177, subject to any outstanding New Zealand operational requirements being met. (See Section 5 of this report for a review of compliance of the basic type design with the operating Rules.) Additional variants or serial numbers approved under the foreign type certificate can become type accepted after supply of the applicable documentation, in accordance with the provisions of NZCAR §21.43(2).

1. Introduction

This report details the basis on which Type Acceptance Certificate No.96/04 was granted in the Standard Category in accordance with NZCAR Part 21 Subpart B.

Specifically the report aims to:

- (a) Specify the foreign type certificate and associated airworthiness design standard used for type acceptance of the model(s) in New Zealand; and
- (b) Identify any special conditions for import applicable to any model(s) covered by the Type Acceptance Certificate; and
- (c) Identify any additional requirements which must be complied with prior to the issue of a NZ Airworthiness Certificate or for any subsequent operations.

The report also notes the status of all models included under the foreign type certificate which have been granted type acceptance in New Zealand. Models covered by the type acceptance certificate issued under Part 21B are listed in Section 2 of this report. Models which were accepted prior to that under NZCAR Section B.9 are listed in Appendix 1.

2. ICAO Type Certificate Details

TC Holder: Mooney Aircraft Incorporated (until March 10, 1969)
 Mooney Aircraft Corporation (until June 17, 1970)
 Aerostar Aircraft Corporation (until October 25, 1973)
 Mooney Aircraft Corporation (until May 6, 2002)
 Mooney Airplane Company, Inc. (until July 23, 2010)
 Mooney Aviation Company, Inc.

Type Certificate: 2A3
Issued by: Federal Aviation Administration

MODEL: M20J

MCTOW 2740 lb. (1243 kg) [s/n 24-001 through 24-3217, except 24-3201]
2900 lb. (1315 kg) [s/n 24-3201, 24-3218 and on, and 24-1686 and
on when c/w with MAC Dwg. No.940071 plus AFM Supplement.]

Max. No. of Seats: 4

Noise Standard: FAR 36, effective September 20, 1976

Engine: Lycoming IO-360-A1B6D or -A3B6/D
FAA Type Certificate: 1E10

Propeller: McCauley B2D34C214/90DHB-16E/EP or B2D34C212/78CDA-4
FAA Type Certificate: P7EA
Hartzell HC-C2YK-1BF/F7666A-3Q
FAA Type Certificate: P-920

MODEL: M20R

MCTOW 3368 lb. (1527 kg)

Max. No. of Seats: 4

Noise Standard: FAR 36, effective September 20, 1976 as amended Dec 22, 1988

Engine: Teledyne Continental IO-550-G(5), -G(6), or -G(7)
FAA Type Certificate: E3SO

Propeller: McCauley 3A32C418-G(/)-82 NRC-9
FAA Type Certificate: P47GL
McCauley 2A34C241-G/82PGC-6
FAA Type Certificate: P3EA

MODEL: M20C

MCTOW 2575 lb. (1168 kg)

Max. No. of Seats: 4

Noise Standard: Not Applicable

Engine: Lycoming O-360-A1D or -A1A
FAA Type Certificate: E-286

Propeller: Hartzell HC-C2YK-1 or -C2YR-1/7666-2; HC-C2YK-1B/7666A-2
FAA Type Certificate: P-920
McCauley 2D34C53-A/74E-0
FAA Type Certificate: P47GL

3. Type Acceptance Certificate

The application for New Zealand type acceptance was from the importer, Neave/Campbell Syndicate, dated 9.3.96. The first-of-type example of the M20J was serial number 24-1009, registered ZK-MNY. (An application for approval of the M20J was originally made by the manufacturer in August 1978 and a full certification data package supplied. However the demonstrator (N4788H) does not appear to have ever been registered here. The manuals supplied were not kept current and in any event are only applicable to the 1978 model.) The M20 Series is a single-piston-engine low wing four-seat touring aircraft.

Type Acceptance Certificate No. 96/04 was granted to the Mooney Model M20J on 21 August 1996 based on validation of FAA Type Certificate 2A3. Specific applicability is limited to the coverage provided by the operating documentation supplied. There are no special requirements for import into New Zealand.

This report was raised to Revision 1 to include the later 1989-90 version of the M20J, because Mooney have different Flight Manuals for different production configurations (see below). The applicant was Aeromotive Limited, and type acceptance was granted on 15 September 2005. The first-of-type example was serial no. 24-3130 registered ZK-MRS. Revision 2 of this report added the M20R, after application by Hamilton Aero Maintenance Ltd. Type acceptance of this variant was granted on 23 December 2005. The first-of-type example was serial number 29-0091 registered ZK-VVB. Revision 3 initially added the 1968 Model M20C. The first-of-type example was serial no. 680095 registered ZK-MWP. After access to all manuals was provided by the manufacturer the revision was expanded to include all model years for any M20 variant which had already been type accepted.

All of the M20 Series have similar structural features, which include a semi-monocoque rear fuselage, tubular-steel main cabin structure, push-rod actuated controls, moveable empennage for trim, and trailing-link undercarriage legs with rubber suspension. The series has been gradually developed with increases in engine power, fuselage size and features. There have been a large number of marketing names and designations over the years.

The original 150 hp M20 "Mark Twenty" established the type's distinctive profile with a forward-sloping rudder trailing edge. The first development was the M20A with a 180 hp engine, while the M20B was the first variant with all-metal wings. The next (and definitive) model M20C "Mark Twenty One" included an increase in design airspeeds and gross weight, changes to the propeller, governor, exhaust system and heater muff, and continued in production from 1961 through 1978. The M20D was a short-lived economy version with fixed undercarriage. The model M20E was essentially the M20C with a 200 hp engine. The M20F introduced a lengthened fuselage with an enlarged cabin, and has an extra side window. The M20G was basically the M20F with the M20C 180 hp engine.

The M20J, introduced in 1977 as the "201" (for 201 mph), was essentially a clean-up of the Model M20F with a new engine and propeller, cowling, windshield and fairings, and increased speeds. The M20J was progressively improved over its 22-year production span, with increased flap and gear limiting speeds, better equipment and updated panel, electric cowl flaps and flush gear doors, among other changes. This results in a range of Flight Manuals for the model. Later versions had the commercial designation MSE.

The M20M, originally called Sabre and later TLS, was a development of the M20L. This was the Porsche-powered Model PFM, which also introduced the lengthened cabin. The M20M has the 270 hp Lycoming TIO-540 engine and the MCTOW is increased to 3200 lb.

The M20R “Ovation” is essentially similar to the M20M except that it uses the Continental IO-550 engine de-rated to 280 hp. It also has a restyled interior and new instrument panel layout. The Ovation 2, serial numbers 29-0183 and 29-0200 and on, introduced a new two-bladed propeller which offered lower weight and increased cruise speeds.

4. Type Data

The type data requirements of NZCAR Part 21B Para §21.43 have been satisfied by supply of the following documents, or were already held by the CAA:

(1) ICAO Type certificate:

FAA Type Certificate No. 2A3

FAA Aircraft Specification No. 2A3 at Revision 47 dated Jul 31, 2002

- Model M20C approved 20 October 1961
- Model M20E approved 4 September 1963
- Model M20F approved 25 July 1966
- Model M20G approved 13 November 1967
- Model M20J approved 27 September 1976
- Model M20M approved 28 June 1989
- Model M20R approved 30 June 1994

(2) Airworthiness design requirements:

(i) *Airworthiness Design Standards:*

The certification basis of the Mooney M20 Series is CAR 3, effective Nov. 1, 1949, as amended to May 18, 1954, with some updated CAR 3 paragraphs for the Model M20F and the inclusion of some FAR 23 provisions for the Models M20J and later, as listed under the individual model details on the TCDS.

This is an acceptable certification basis in accordance with NZCAR Part 21B Para §21.4, because CAR 3 is the predecessor to FAR 23 which is the basic standard for small airplanes called up under Appendix C. There are no non-compliances and no special conditions have been prescribed by the Director under §21.23.

(ii) *Special Conditions:*

Nil

(iii) *Equivalent Level of Safety Findings:*

Nil

(iv) *Airworthiness Limitations:*

Nil

(3) Aircraft Noise and Engine Emission Standards:

(i) *Environmental Standard:*

The Models M20J onwards have been certificated under FAR Part 36, effective September 20, 1976, at the latest Amendment at time of certification.

(ii) *Compliance Listing:*

FM Section II – M20J FAR 36 certificated noise level at 2740 lb is 74.0 dB(A)

FM Section II – M20M FAR 36 certificated noise level at 3368 lb is 74.03 dB(A)

Report No. N-20R-1 – Noise Certification M20R – dated August 9, 1994

FM §II – M20R Ovation FAR 36 certificated noise level at 3368 lb is 72.6 dB(A)

FM §II – M20R Ovation 2 FAR 36 certificated noise level at 3368 lb is 77.3 dB(A)

(4) Certification Compliance Listing:

The CAA already held the following M20 Series technical reports:

Report No.73 – Structural Loading Data – Mooney Mark Twenty

Report No.78 – Type Inspection Report – Mooney Mark Twenty

Model M20 Type Inspection Report – dated 20 July 1955

Model M20A Type Inspection Report – dated 10 February 1958

Model M20B Type Inspection Report – dated 14 November 1960

Report No.115 – Loads and Analysis – Model M20C

Model M20C Type Inspection Report – dated Oct 2, 1961

Report No.147 – Structural Substantiation – M20E

Model M20E Type Inspection Report – dated August 2, 1963

Report No. 20F-3 – Structural Loading Data – Model M-20F

Report No. 20G-1 – Structural Substantiation – Model M-20G

Mooney supplied the following type data on the M20J at the time of the original application for NZ approval of the model:

Mooney Report 20J-11 - Structural Substantiation Summary

Mooney M20J - Type Inspection Report and FAA Drawing List

Report No. M-20R-2 – Compliance Checklist M20R – Rev.E dated 26-8-96

(5) Flight manual:

Pilot's Operating Handbook and FAA Approved Airplane Flight Manual No. 1223

Mooney M20J – CAA Accepted as AIR 2566 [Applicable s/n 24-0764 thru -1037]

Pilot's Operating Handbook and FAA Approved Airplane Flight Manual No. 3200

Mooney M20J – CAA Accepted as AIR 2929 [Applicable s/n 24-3079 thru -3153]

Pilot's Operating Handbook and FAA Approved Airplane Flight Manual No. 3600

Mooney M20R – CAA Accepted as AIR 2937 [Applicable serial numbers 29-0001 thru 29-0199, except 29-0183]

Pilot's Operating Handbook and FAA Approved Airplane Flight Manual No. 3800

Mooney M20R – CAA Accepted as AIR 2938 [Applicable serial numbers 29-0183, 29-0200 and on]

1968 Mooney Ranger Owner's Manual M20C [serial numbers 680001 and on]
Manual Number 68-20C-OM-B (P/N 1187) – CAA Accepted as AIR 3190

(6) Operating Data for Aircraft, Engine and Propeller:

(i) *Maintenance Manual:*

M20C, D, E, F 1962-1967 Service and Maintenance Manual Number 104

M20C, E, F, G 1968-1978 Service and Maintenance Manual Number 106

Mooney M20J Service and Maintenance Manual No.123 – Issued December 1998
(Supersedes 1977 Manual No.106 and 1993 Manual No. 122)

Mooney M20R Service and Maintenance Manual No.160 – Issued June 1994

(ii) *Current service Information:*

Service Bulletins and Service Instructions are available on the manufacturer's
website www.mooney.com

(iii) *Illustrated Parts Catalogue:*

Mooney M20B, C, D, E 1961-1964 – Parts Catalog – Manual Number 202

Mooney M20C, D, E, F 1965-1967 – Parts Catalog – Manual Number 203

Mooney M20C, E, F, G 1968-1976 – Parts Catalog – Manual Number 205

Mooney M20J Illustrated Parts Catalog Manual No.226 – Issued 17 October 2003
(Supersedes 1977 Parts Catalog Manual No.206 and 1994 Manual No.225)

Mooney M20R & M20S IPC – Manual No.261 dated June 2000

(7) Agreement from manufacturer to supply updates of data in (4), (5) and (6):

Mooney has provided the CAA will access to their Technical Publications through
their <http://manuals.mooney.com/> portal. On this basis all M20 variants for
which the basic certification data has been provided and for which the model year
applicability is limited only by manual coverage can now be considered fully
included under this Type Acceptance certificate.

(8) Other information:

Mooney Engineering Drawing #800330 - "Electrical System - M20 Series"

Mooney Engineering Drawing #810081 - "Radio System Installation - M20"

Mooney Engineering Drawing #110052 - "Three View Drawing M20J"

5. Additional New Zealand Requirements

Compliance with the retrospective airworthiness requirements of NZCAR Part 26 is a prerequisite for the grant of a type acceptance certificate.

Civil Aviation Rules Part 26

Subpart B - Additional Airworthiness Requirements

Appendix B - All Aircraft

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
B.1	Marking of Doors and Emergency Exits	<i>To be determined on an individual aircraft basis</i>
B.2	Crew Protection Requirements – CAM 8 Appdx. B # .35	Not Applicable – Agricultural Aircraft only

Compliance with the following additional NZ operating requirements has been reviewed and were found to be covered by either the original certification requirements or the basic build standard of the aircraft, except as noted:

Civil Aviation Rules Part 91

Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
91.505	Seating and Restraints – Safety belt/Shoulder Harness	<i>Operating Rule – Compliance to be determined by operator</i>
91.507	Pax Information Signs - Smoking, safety belts fastened	Not Applicable – Less than 10 passenger seats
91.509 Min. VFR	(1) ASI (2) Machmeter (3) Altimeter (4) Magnetic Compass (5) Fuel Contents (6) Engine RPM (7) Oil Pressure	CAR §3.655(a)(1) N/A CAR §3.655(a)(2) CAR §3.655(a)(3) CAR §3.655(b)(1)(i) CAR §3.655(b)(1)(v) CAR §3.655(b)(1)(ii)
		(8) Coolant Temp (9) Oil Temperature (10) Manifold Pressure (11) Cylinder Head Temp. (12) Flap Position (13) U/c Position (14) Ammeter/Voltmeter
		N/A – Air cooled engine CAR §3.655(b)(1)(iii) CAR §3.655(b)(2)(iii) CAR §3.655(b)(2)(i) Fitted as Standard CAR §3.359 CAR §3.687
91.511	Night VFR Instruments and Equipment	<i>Operating Rule – Compliance to be determined by operator</i>
91.513	VFR Communication Equipment	<i>Operating Rule – Compliance to be determined by operator</i>
91.517	IFR Instruments and Equipment	<i>Operating Rule – Compliance to be determined by operator</i>
91.519	IFR Communication and Navigation Equipment	<i>Operating Rule – Compliance to be determined by operator</i>
91.523	Emergency Equipment: (a) More Than 10 pax - First Aid Kits per Table 7 - Fire Extinguishers per Table 8 (b) More than 20 pax - Axe readily acceptable to crew (c) More than 61 pax - Portable Megaphones per Table 9	<i>To be determined on an individual aircraft basis if used on Air Transport operations</i> Not Applicable – Less than 20 passenger seats Not Applicable – Less than 61 passenger seats
91.529	ELT - TSO C91a or C126 after 1/4/97 (or replacement)	<i>Operating Rule – Compliance to be determined by operator</i>
91.531	Oxygen Indicators - Volume/Pressure/Delivery	<i>Operating Rule – Compliance to be determined by operator</i>
91.533	Oxygen for non-pressurized aircraft	<i>Operating Rule – Compliance to be determined by operator</i>
91.541	SSR Transponder and Altitude Reporting Equipment	<i>Operating Rule – Compliance to be determined by operator</i>
91.543	Altitude Alerting Device - Turbojet or Turbofan	Not Applicable – Not turbo jet or turbofan powered
91.545	Assigned Altitude Indicator	<i>Operating Rule – Compliance to be determined by operator</i>
A.15	ELT Installation Requirements	<i>To be determined on an individual aircraft basis</i>

Civil Aviation Rules Part 135

Subpart F - Instrument and Equipment Requirements

PARA:	REQUIREMENT:	MEANS OF COMPLIANCE:
135.355	Seating and Restraints – Shoulder harness flight-crew seats	<i>Operating Rule – Compliance to be determined by operator</i>
135.357	Additional Instruments (Powerplant and Propeller)	Has all instruments required under FAR §23.1305
135.359	Night Flight	Landing light, Pax compartment
135.361	IFR Operations	Speed, Alt, spare bulbs/fuses
135.363	Emergency Equipment (Part 91.523 (a) and (b))	<i>Operating Rule – Compliance to be determined by operator</i>
135.367	Cockpit Voice Recorder	N/A – Only for 2-crew helicopters with more than 10 pax
135.369	Flight Data Recorder	Not Applicable – Less than 10 passenger seats
135.371	Additional Attitude Indicator	Not Applicable – Not turbo jet or turbofan powered

Attachments

The following documents form attachments to this report:

- Photographs FoT example 1977 M20J ZK-MNY serial no. 24-1009
- Photographs FoT example 1989 M20J ZK-MRS serial no. 24-3130
- Photographs FoT example M20R ZK-VVB serial no. 29-0091
- Three-view drawing Mooney Model M20J
- Three-view drawing Mooney Model M20R
- Copy of FAA Aircraft Specification Number 2A3

Sign off

.....
David Gill
Team Leader Airworthiness

.....
Checked – Peter Gill
Airworthiness Engineer

Appendix 1

List of Type Accepted Variants:

<i>Model:</i>	<i>Applicant:</i>	<i>CAA Work Request:</i>	<i>Date Granted:</i>
M20C (1962-1965)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20C (1966 model)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20C (1977-1978)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20E (1964-1965)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20F (1974 model)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20G (1968 model)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20M (1991-2003)	AC 21-1.2/NZCAR Part 21 Appendix A(c)		
M20J (1979-1980)	Neave/Campbell Syndicate	96/21B/19	21 August 1996
M20J (1989-1990)	Aeromotive Limited	6/21B/7	15 September 2005
M20R	Hamilton Aero Maintenance Ltd	6/21B/16	23 December 2005
M20 (All C,E,F,G,J,M Models)	H R Holtz	11/21B/31	13 September 2011