

CONVERSION OF LYCOMING ENGINE
FROM 65 HP. 0-145-B2 into 75 HP. 0-145-C2
Serial No. 5780-2

MOONEY M-18-L, N119C
Serial No. 51

REPORT NO. 52
January 23, 1998

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ENGINE:

The LYCOMING Model 0-145-B and -C engines are identical in design with only such changes in construction as to permit different horsepower ratings. The B series is rated at 65 horsepower at 2550 R.P.M. and the C series is rated at 75 horsepower at 3100 R.P.M.

The only difference in the engines is the replacement of the single valve springs and seats in the 65 hp B series engines with the dual valve springs and seats in the 75 hp C series engines.

To convert the B engine to a C engine would entail the removal of the following parts:

- 45440 Seat-Valve Spring-Lower (Except C Series)
- 45441 Seat-Valve Spring-Upper (Except C Series)
- 45453 Spring-Valve (B Engines Only)

The following parts would then be installed:

- 45471 Seat-Valve Spring-Upper (Dual Springs)
(C Engine Only)
- 45472 Seat-Valve Spring-Lower (Dual Springs)
(C Engine Only)
- 45473 Spring-Valve-Outer (Dual Springs)
(C Engine Only)
- 45474 Spring-Valve-Inner (Dual Springs)
(C Engine Only)

PROPELLERS:

There are several approved propellers for the Lycoming powered Mooney M18-L.

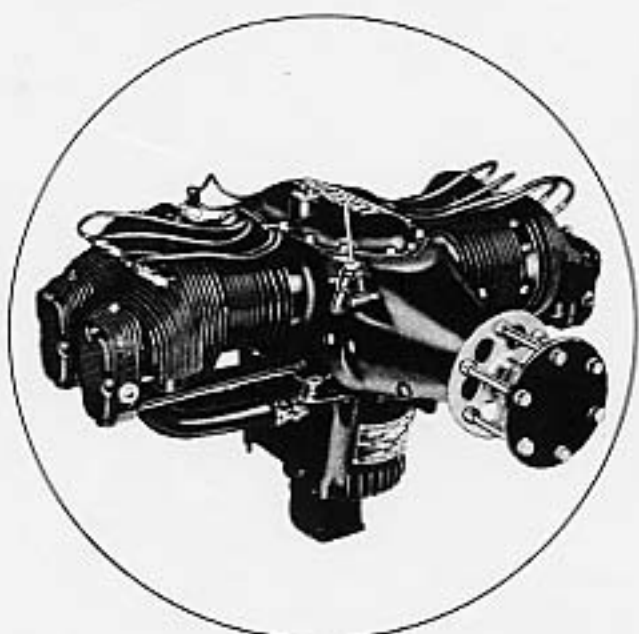
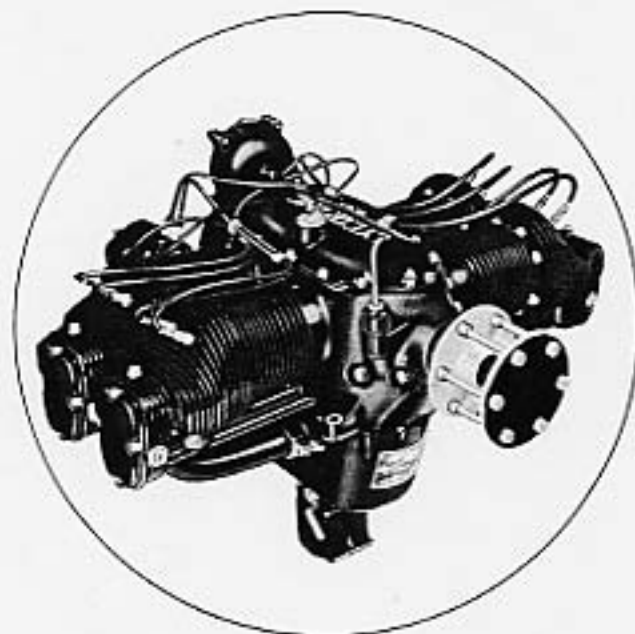
Mooney N119C is now equipped with the Flottorp 63L60 propeller, which is a good climb/cruise propeller. It is possible to exceed redline of 2550 R.P.M. in level flight to 8,500 ft. altitude. The primary purpose of this proposed modification is to raise the redline, thereby improving the performance of the aircraft, both in level flight and descending from altitude.

Sensenich has three approved propellers in their line, a cruise and two climb propellers. It is possible that one of the climb propellers, operating at a higher R.P.M., would further improve the performance, both climb and cruise.

HANDBOOK OF INSTRUCTIONS
WITH PARTS CATALOG

LYCOMING

MODEL O-145 AND GO-145 AVIATION ENGINES



AN



PRODUCT

LYCOMING,
DIVISION - THE AVIATION CORPORATION

WILLIAMSPORT 38 PENNSYLVANIA, U. S. A.

SECTION II

DESCRIPTION

GENERAL The **LYCOMING** Model O-145 and GO-145 engines are four cylinder, horizontally opposed, air-cooled aircraft engines. The A, B, and C series are identical in design with only such changes in construction as to permit the different horsepower ratings. The O-145 is direct drive while the GO-145 has a reduction gearing the ratio of 27 to 17.

On the O-145 the A series is rated at 50-55 horsepower at 2300 R.P.M., B series at 65 horsepower at 2550 R.P.M. and C series at 75 horsepower at 3100 R.P.M. The GO-145 engines are of the same general design as the O-145 engines except those design features necessary to incorporate the reduction gear unit. The engine is rated at 75 horsepower at 3200 R.P.M. and a propeller R.P.M. of 2015.

The numeral following the suffixing letter denotes the equipment on engine, that is "1"—single ignition, "2"—dual ignition, and "3"—dual ignition with generator and starter drive. All engines can be furnished or modified for the adoption of fuel pump if desired.

The O-145 crankshaft is forged chrome molybdenum steel and nitrided to produce a hard surface on journals and crankpins. Under no circumstance should any attempt be made to straighten this shaft.

The GO-145 crankshaft is forged chrome molybdenum steel, nitrided to produce a hard surface on the main and crankpin journals and is equipped with double, dynamic, dampeners to assure smooth operation of the engine at all speeds. Under no circumstance should any attempt be made to straighten this shaft.

This engine is licensed for manufacture, sale and for use under United States patents Nos. 2,103,643, and 2,112,984.

The crankshaft reduction gear and propeller shaft are forged nickel molybdenum steel with hardened, heavy spur type teeth to insure long life. The propeller flange is 6.00 inches in diameter, whereas, the propeller flange of the O-145 direct driven engines has a diameter of 5.50 inches.

The magneto timing on the various types is as follows:

O-145-A1, C1	28° B.T.C.
O-145-B1	22° B.T.C.
O-145-A2, A3, B2, B3	20° B.T.C.
O-145-C2, C3	25° B.T.C.
GO-145-C1	28°
GO-145-C2, C3	25°

The method of timing the engines is explained on page 23.

The text of the Instructions contained in Section III to XII inclusive are written around the O-145-A Series engines and when reference is made to A1, A2, or A3 series the same would apply to the respective B, C, or GO series engines, unless otherwise specified.

OIL RECOMMENDATIONS

	O-145-A Series	O-145-B and C Series	GO-145 Series
SUMMER (Temp. above 40°F.)	S.A.E. 30	S.A.E. 40	S.A.E. 40
WINTER (Temp. below 40°F.)	S.A.E. 20W	S.A.E. 30W	S.A.E. 30W

SECTION I

SPECIFICATIONS

LYCOMING MODEL O-145 ENGINES

Type—Four Cylinder, Direct Drive, Horizontally Opposed, Air-Cooled

SERIES	O-145-A1	O-145-A2	O-145-A3	O-145-B1	O-145-B2	O-145-B3	O-145-C1	O-145-C2	O-145-C3
Engine Type Certificate	199	199	199	210	210	210	210	210	210
Rated Horse Power	50	55	55	65	65	65	75	75	75
Rated R.P.M.	2300	2300	2300	2550	2550	2550	3100	3100	3100
Cruising R.P.M. } Economy	2100	2100	2100	2300	2300	2300	2700	2700	2700
} Performance	2150	2150	2150	2450	2450	2450	2850	2850	2850
Bore	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4
Stroke	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4
Compression Ratio	6.65:1	6.65:1	6.65:1	6.5:1	6.5:1	6.5:1	6.5:1	6.5:1	6.5:1
Piston Displacement—Cubic Inch	144.5	144.5	144.5	144.5	144.5	144.5	144.5	144.5	144.5
Head Temperature—Maximum °F.	525*	525*	525*	525*	525*	525*	525*	525*	525*
Barrel Temperature—Maximum °F.	325*	325*	325*	325*	325*	325*	325*	325*	325*
Oil Temperature—Maximum °F.	220*	220*	220*	220*	220*	220*	220*	220*	220*
Fuel Octane	73	73	73	73	73	73	73	73	73
Fuel Consumption—Cruising BHP/Hr. Maximum—Lbs.	.55	.55	.55	.60	.60	.60	.60	.60	.60
Oil Sump Capacity—Quarts	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5
Oil Sump—Safe Quantity—Quarts	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Oil Pressure { Minimum Idling—Lbs.	15	15	15	15	15	15	15	15	15
{ Normal Operating—Lbs.	55-80	55-80	55-80	55-80	55-80	55-80	55-80	55-80	55-80
Crankshaft Rotation—Anti-Propeller End.	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise
Valve Clearance—Intake and Exhaust—Cold	.015"	.015"	.015"	.015"	.015"	.015"	.015"	.015"	.015"
Spark Occurs—Degrees B.T.C.	28°	20°	20°	22°	20°	20°	28°	25°	25°
Firing Order	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4	1-3-2-4
Spark Plugs—Champion .025" gap	AY-4	AY-4	AY-4	AY-4	AY-4	AY-4	AY-4	AY-4	AY-4
Engine Dry Weight including Carburetor, Magnetos or Magnetos and Spark Plugs	152	162	164	155	155.5	167.5	155	155.5	167.5
Lbs.	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33	5.33
Propeller Hub and Baffles—Lbs.	157.33	167.33	169.33	160.33	170.33	172.33	160.33	170.33	172.33
Engine Total Weight—Lbs.	.54	1.18	1.18	.54	1.18	1.18	.54	1.18	1.18
Radio Shielding—Added Weight—Lbs.	MA-2	MA-2	MA-2	MA-2	MA-2	MA-2	MA-2	MA-2	MA-2
Carburetor—Marvel *	Available	Available	Available	Available	Available	Available	Available	Available	Available
Altitude Control Available	One	Two	Two	One	Two	Two	One	Two	Two
Magneto—Scintilla SF-4L	Available	Available	Available	Available	Available	Available	Available	Available	Available
Fuel Pump	None	None	None	None	None	None	None	None	None
Generator and Starter	None	None	None	None	None	None	None	None	None

* Model of carburetor same for all engines but jet size different.

LYCOMING MODEL O-145 AND GO-145 AVIATION ENGINES

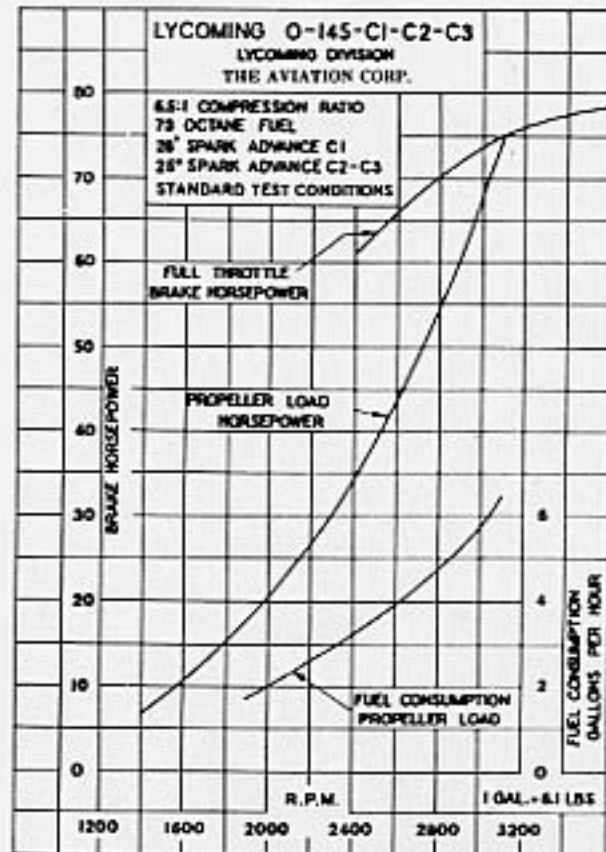
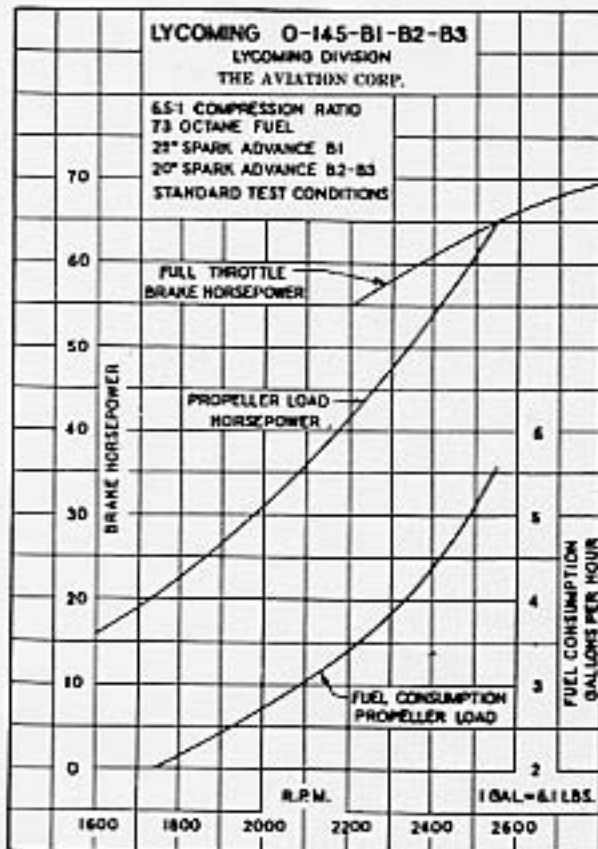
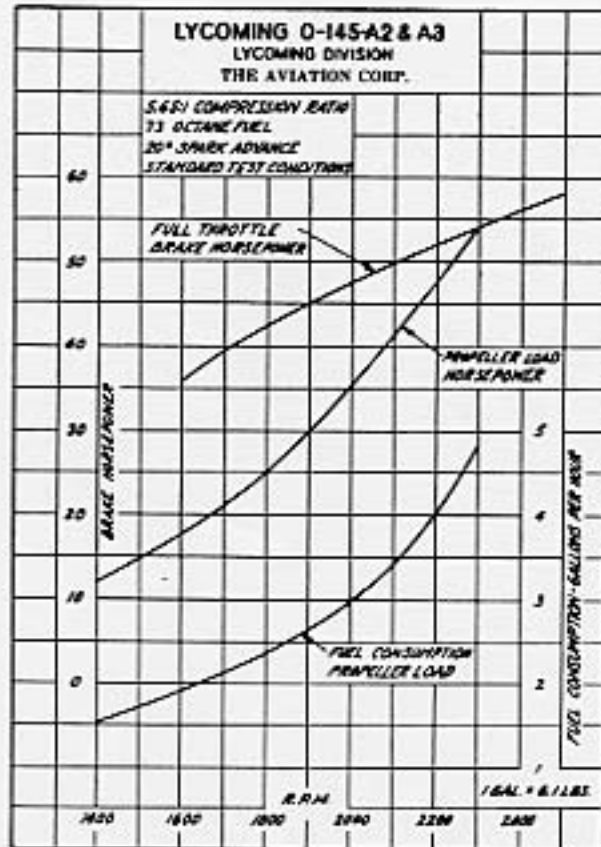
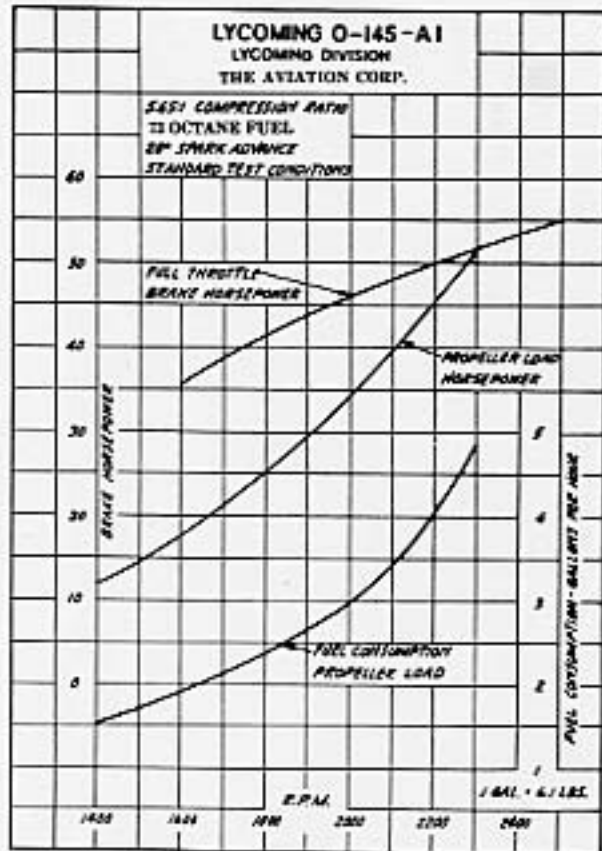


Figure 1

JANUARY 1947

LYCOMING MODEL O-145 AND GO-145 AVIATION ENGINES

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Part No.	PART NAME	Number Required								
		A1	A2	A3	B1 C1	B2 C2	B3 C3	GO C1	GO C2	GO C3
45431	Gasket—Cylinder Head	8	8	8	8	8	8	8	8	8
45433	Seat—Valve Intake	4	4	4	4	4	4	4	4	4
45434	Stud—.3125-18 N Form x 1.56 long									
	Magneto		4	4		4	4		4	4
	Generator or Cover			4			4			4
	Starter or Cover			6			6			6
	Fuel Pump or Cover	2	2	2	2	2	2	2	2	2
45435	Stud—Rocker Box Cover	16	16	16	16	16	16	16	16	16
45436	Connection—Exhaust Pipe (For alternate—See 45492 Connection)	4	4	4	4	4	4	4	4	4
45437	Connection—Intake Pipe									
	Cylinder Head	4	4	4	4	4	4	4	4	4
	Oil Sump	4	4	4	4	4	4	4	4	4
45440	Seat—Valve Spring—Lower (Except C Series)	8	8	8	8	8	8			
45441	Seat—Valve Spring—Upper (Except C Series)	8	8	8	8	8	8			
45442	Spring—Valve	8	8	8						
45443	Key—Valve (Double Groove) (As Req'd)									
45444	Circlip—.285 I.D. x .035 Dia. Valve Stems (For double Groove Valve only) (As Required)									
	Fuel Pump Plunger	1	1	1	1	1	1	1	1	1
45447	Bushing—Valve Rocker	8	8	8	8	8	8	8	8	8
45448	Shaft—Valve Rocker	4	4	4	4	4	4	4	4	4
45449	Plug— $\frac{1}{8}$ "—18—Special Hex. Hd. Valve Rocker Shaft	8	8	8	8	8	8	8	8	8
	Oil Sump (Refer to STD-453)	1	1	1	1	1	1	1	1	1
45450	Screw—Valve Adjusting	8	8	8	8	8	8	8	8	8
45451	Gasket— $2\frac{1}{32}$ I.D. x $1\frac{15}{16}$ O.D. x .040-.030 thick Valve—Rocker Shaft Plug Thermometer Hole Plug	8	8	8	8	8	8	8	8	8
	1	1	1	1	1	1	1	1	1	1
45452	Stud—Cylinder Head	32	32	32	32	32	32	32	32	32
45453	Spring—Valve (B Engines Only)				8	8	8			
45455	Gasket—Cylinder Head—Inner	4	4	4	4	4	4	4	4	4
45456-XD	Guide—Valve	8	8	8	8	8	8	8	8	8
45465	Seat—Exhaust Valve	4	4	4	4	4	4	4	4	4
45471	Seat—Valve Spring—Upper (Dual Springs) (C Engine Only)				8	8	8	8	8	8
45472	Seat—Valve Spring—Lower (Dual Springs) (C Engine Only)				8	8	8	8	8	8
45473	Spring—Valve—Outer (Dual Springs) (C Eng. Only)				8	8	8	8	8	8
45474	Spring—Valve—Inner (Dual Springs) (C Eng. Only)				8	8	8	8	8	8
45475	Valve—Exhaust (Single Groove)	4	4	4	4	4	4	4	4	4
45476	Tube—Rocker Box Vent—Right (External Ventilation System Only—Discontinued— Ending with Engine No. 488)	1	1	1	1	1	1			
45477	Tube—Rocker Box Vent—Left (External Ventilation System Only—Discontinued— Ending with Engine No. 488)	1	1	1	1	1	1			
45478	Tee— $\frac{1}{4}$ " Special (External Ventilation System Only—Discontinued— Ending with Engine No. 488)	2	2	2	2	2	2			
45479	Screw—Rocker Box Ventilation (External Ventilation System Only—Discontinued— Ending with Engine No. 488)	4	4	4	4	4	4			
45483	Gasket—Rocker Box Cover (Prior to Engine No. 489—Remove Center Section)	4	4	4	4	4	4	4	4	4
45484	Plug—Generator Idler Shaft Hole (Not Required when using Generator Drive)			1			1			1
45485	Cover—Rocker Box	4	4	4	4	4	4	4	4	4
45486	Gear—Crankshaft					1			1	
45487	Gear—Crankshaft		1							
45492	Connection—Exhaust Pipe (Screw-in Connection) (Refer to Service Bulletin No. 102)	4	4	4	4	4	4	4	4	4
45493	Key—Valve (Single Groove)	16	16	16	16	16	16	16	16	16
45501	Shaft Assembly—Oil Pump and Tachometer Drive (Discontinued—Ending with Engine No. 1373— Superseded by part No. 45505)	1			1					
45502	Shaft Assembly—Oil Pump and Tachometer Drive (Required with Fuel Pump Drive Only)	1	1	1	1	1	1	1	1	1
45505	Shaft Assembly—Oil Pump and Tachometer Drive (On single ignition engines prior to No. 1374 use part No. 45501)	1	1	1	1	1	1	1	1	1
45511	Seal—Tachometer Shaft	1	1	1	1	1	1	1	1	1
45512	Gland—Tachometer Shaft	1	1	1	1	1	1	1	1	1

*—Parts not serviced as details

Control surface movements	Wing flaps	Up	0°	Down	16.5°
	Ailerons	Up	15.5°	Down	7°
	Elevators	Up	25°	Down	13° (stabilizer neutral at 0°)
	Rudder	Right	23°	Left	18°
	Stabilizer (Leading Edge)	Up	1.5°	Down	3.5°
Serial Nos. eligible	323 and up				
Required equipment	In addition to the pertinent required basic equipment specified in CAR 3, the following items of equipment must be installed: 2, 101, 201(c), 202(b), 205(b), 206(b), 401(k). (For night flying, instrument lights or equivalent to provide illumination of all placards and instruments and flasher type landing gear warning light or aural (Horn) warning are required in addition to equipment required by CAR 43).				

SPECIFICATIONS PERTINENT TO ALL MODELS

Datum	25.19 in. forward of wing leading edge outboard of fillet.
Leveling means	Right hand engine bearer tube (M-18L and M-18LA); front face of front spar under seat is 90° to level (M-18L, M-18LA, M-18C and M-18C 55)
Certification basis	Type Certificate No. 803 (CAR 3)
Production basis	None. Prior to original certification of each aircraft a FAA Inspector must perform a detailed inspection for workmanship, materials, and conformity with the approved technical data and a check of the flight characteristics.

Equipment: A plus (+) or minus (-) sign preceding the weight of an item indicates net change when that item is installed. "—" indicates "Does not apply."
Approval for the installation of all items of equipment listed herein has been obtained by the aircraft manufacturer except those items preceded by an asterisk (*). The asterisk denotes that approval has been obtained by someone other than the aircraft manufacturer. An item marked with an asterisk may not have been manufactured under a FAA monitored or approved quality control system.

Propellers and Propeller Accessories

		M-18-L	M-18L	M-18LA	M18C 55	
1.	Deleted - April 28, 1950					
2.	Propeller-Sensenich 66CB-52 or any other fixed pitch wood propeller which is eligible for the engine power and speed and which meets the following limits: Static r.p.m. at maximum permissible throttle setting: Not over 2085, not under 1890. No additional tolerance permitted. Diameter: Not over 66 in., not under 64.5 in.	10 lb.	(-21.5)	—	(-21.5)	—
3.	Propeller-Sensenich 60LY44 or 60MY49 or any other fixed pitch wood propeller which is eligible for the engine power and speed and which meets the following limits: Static r.p.m. at maximum permissible throttle setting: Not over 2350, not under 2100. No additional tolerance permitted. Diameter: Not over 60 in., not under 59 in. (Item 401(c) required)	11 lb.	(-21.5)	—	(-21.5)	—
4.	Propeller-Flotoep 63L60 or 63L56 or any other fixed pitch wood propeller which is eligible for the engine power and speed and which meets the following limits: Static r.p.m. at maximum permissible throttle setting: Not over 2220, not under 1995. No additional tolerance permitted. Diameter: Not over 63 in., not under 62 in. (Item 401(d) required).	8 lb.	(-21.5)	—	(-21.5)	—
5.	Propeller-Flotoep 65A60 to 66, Sensenich 65CK58 to 62, or any other fixed pitch wood propeller which is eligible for the engine power and speed and which meets the following limits: Static r.p.m. at maximum permissible throttle setting: Not over 2030, not under 1800. No additional tolerance permitted. Diameter: Not over 65 in., not under 63.5 in.	9 lb.	—	(-23)	—	(-23)