TELEDYNE CONTINENTAL MOTORS SANDCAST SERIES MAINTENANCE AND OPERATOR'S MANUAL

Quick Links

Table of Contents

MODEL IO-550-D, E, F & L

SANDCAST SERIES
CONTINENTAL© AIRCRAFT ENGINE

MAINTENANCE AND OPERATOR'S MANUAL

Teledyne Continental Motors, Inc.

FORM X30605

FAA APPROVED
APRIL 1990

IO-550D, E, F, L
MAINTENANCE AND OPERATOR'S MANUAL

- NOTICE -

Teledyne Continental Motors (TCM) engine operating instructions are generated prior to and independently of the aircraft operating instructions established by the airframe manufacturer. TCM's operating instructions are developed using factory controlled parameters that are not necessarily the same as those specifications required to satisfy a specific aircraft / engine installation. Because of this difference the aircraft operator should use the airframe manufacturer's operating instructions found in the Pilots Operating Handbook (POH) while operating the aircraft unless otherwise specified by the original airframe manufacturer.

FORM NO. X30605

MAINTENANCE AND OPERATOR'S MANUAL

FOR

IO-550D,E,F,L AIRCRAFT ENGINE

-NOTICE-

The operator must comply with all the instructions contained in this manual in order to assure safe and reliable engine performance. Failure to comply will be deemed misuse, thereby relieving the engine manufacturer of responsibility under its warranty.

This manual contains no warranties, either expressed or implied. The information and procedures contained herein provide the operator with technical information and instructions applicable to safe operation.

CHAPTER INDEX

CHAPTER 1

INTRODUCTION

Section Index

INTRODUCTION

1-1 SCOPE

Recommendations, cautions and warnings regarding operation of this engine are not intended to impose undue restrictions, but are inserted to enable the pilot to obtain maximum performance from the engine commensurate with safety and efficiency. Abuse, misuse, or neglect of any piece of equipment can cause eventual failure. In the case of an aircraft engine it should be obvious that a failure may have disastrous consequences. Failure to observe the instructions contained in this manual constitutes unauthorized operation in areas unexplored during development of the engine, or in areas which experience has proved to be undesirable or detrimental.

Notes, Cautions and Warnings are included throughout this manual. Application is as follows:

NOTE. . .Special interest information which may facilitate the operation of equipment.

CAUTION. . .Information issued to emphasize certain instructions or to prevent possible damage to engine or accessories.

WARNING. . .Information which, if disregarded, may result in severe damage to or destruction of the engine or endangerment to personnel.

1-2 RELATED PUBLICATIONS

1. Overhaul Manual for IO-550D,E,F,L Series Aircraft Engine. Form X30607A.

2. Illustrated Parts Catalog for IO-550 Series Aircraft Engine. Form X30606A.

3. Teledyne Continental Motors Aircraft Engine Service Bulletins.

4. Fuel Injection Manual. Form X30593A.

The above publications can be ordered through your Teledyne Continental Motors Distributor or ordered directly, if prepaid, from:

Teledyne Continental Motors
Aircraft Products Division
P. O. Box 90
Mobile, AL 36601
Attn: Accounts Receivable

II. Accessory Manuals:

A. Ignition System

Master Service Manual
TCM Ignition Systems and Components
Form X40000
Teledyne Continental Motors
Aircraft Products Division
P. O. Box 90
Mobile, Alabama 36601
Attn: Publications Dept.

B. Starter Motor

Service Manual
Teledyne Continental Motors
Aircraft Products Division
P. O. Box 90
Mobile, Alabama 36601
Attn: Publications Dept.

C. Alternator

Alternator Service Instructions
Form X30531-3
Teledyne Continental Motors
Aircraft Products Division
P. O. Box 90
Mobile, Alabama 36601
Attn: Publications Dept.

1-3 ABBREVIATIONS AND GLOSSARY OF TERMS

Abbreviation	Terms
A.B.C.	After Bottom Center
ADMP	Absolute Dry Manifold Pressure
Approx.	Approximately
A.T.C.	After Top Center
Bar	Barometric
B.B.C.	Before Bottom Center
B.H.P.	Brake Horsepower
BSFC	Brake Specific Fuel Consumption
BSOC	Brake Specific Oil Consumption
B.T.C.	Before Top Center
C.A.R.	Civil Air Regulations
C.G.	Center of Gravity
c.f.m.	Cubic Feet Per Minute
C.H.T.	Cylinder Head Temperature
CW	Clockwise Rotation
CCW	Counterclockwise Rotation
°C	Degrees Celsius
°F	Degrees Fahrenheit
°	Degrees of Angle
Dia.	Diameter
EGT	Exhaust Gas Temperature
FAA	Federal Aviation Administration
Fig.	Figure (Illustration)
Front	Propeller End of Engine
Ft.	Foot or Feet
F.T.	Full Throttle
FT-LBS	Foot Pounds Torque
G.P.M.	Gallons Per Minute
gms	Grams
Hex	Hexagon
H_2O	Water
Hg.	Mercury
hr.	Hour
I.D.	Inside Diameter
IN-LBS	Inch Pounds Torque
in. (")	Inches
Left Side	Side on which No's 2, 4 and 6 cylinders are located.
Lbs.	Pounds
Lockwire	Soft stainless steel wire used to safety connections, etc.
Man.	Manifold or Manometer

Abbreviation	Terms
MAP	Manifold Absolute Pressure
Max.	Maximum
Min.	Minimum
N.P.T.	National Pipe Thread (Tapered)
N.R.P.	Normal Rated Power
N.C.	National Course (Thread)
N.F.	National Fine (Thread)
O.A.T.	Outside Air Temperature
O.D.	Outside Diameter
oz.	Ounce
PPH	Pounds Per Hour
Press.	Pressure
p.s.i.	Pounds Per Square Inch
PSIA	Power Per Square Inch Absolute
PSIG	Power Per Square Inch Gauge
Rear	Accessory End of Engine
Right Side	Side on which No's 1, 3 and 5 cylinders are located.
R.P.M.	Revolutions Per Minute
Std.	Standard
TBO	Time Between Overhaul
T.C.D.P.	Turbocharger Deck Pressure
T.D.C.	Top Dead Center
Temp.	Temperature
T.I.T.	Turbine Inlet Temperature
Torque	Force x lever arm (125 ft.-lbs. torque = 125 lbs. Force applied one ft. from bolt center or 62-1/2 lbs 2 ft. from center)
100LL	100 Octane Low Lead Fuel
1-3-5	Cylinder numbering right side of engine (rear to front)
2-4-6	Cylinder numbering left side of engine (rear to front)
30'	Thirty minutes of angle (60' equal one degree)

Glossary

ADMP	Absolute dry manifold pressure, is used in establishing a baseline standard of engine performance. Manifold pressure is the absolute pressure in the intake manifold; measured in inches of mercury.
Ambient	A term used to denote a condition of surrounding atmosphere at a particular time. For example; Ambient Temperature or Ambient Pressure.
BHP	Brake Horsepower. The power actually delivered to the engine propeller shaft. It is so called because it was formerly measured by applying a brake to the power shaft of an engine. The required effort to brake the engine could be converted to horsepower - hence: "brake horsepower".

BSFC	Brake Specific Fuel Consumption. Fuel consumption stated in pounds per hour per brake horsepower. For example, an engine developing 300 horsepower while burning 150 pounds of fuel per hour, has a BSFC of .5. $$\frac{\text{Fuel Consumption in PPH} = .5}{\textbf{Brake Horsepower}}$$
Cavitation	Formation of partial vacuums in a flowing liquid as a result of the separation of its part.
Cold Soaking	Prolonged exposure of an object to cold temperatures so that its temperature throughout approaches that of ambient.
Corrosion	Deterioration of a metal surface usually caused by oxidation of the metal.
Critical Altitude	"Critical Altitude" means the maximum altitude at which, in standard atmosphere, it is possible to maintain, at a specified rotational speed, a specified power or a specified manifold pressure. Unless otherwise stated.
Density Altitude	Altitude as determined by pressure altitude and existing ambient temperature. In Standard Atmosphere (IAS) density and pressure altitudes are equal. For a given pressure altitude, the higher the temperature, the higher the density altitude.
Dynamic Condition	A term referring to properties of a body in motion.
E.G.T.	Exhaust Gas Temperature. Measurement of this gas temperature is sometimes used as an aid to fuel management.
Exhaust Back Pressure	Opposition to the flow of exhaust gas, primarily caused by the size and shape of the exhaust system. Atmospheric pressure also affects back pressure.
Four Cycle	Short for "Four Stroke Cycle." It refers to the four strokes of the piston in completing a cycle of engine operation (Intake, Compression, Power and Exhaust).
Fuel Injection	A process of metering fuel into an engine by means other than a carburetor.
Gallery	A passageway in the engine or subcomponent. Generally one through which oil is flowed.
Galling or Scuffing	Excessive friction between two metal surfaces resulting in particles of the softer metal being torn away and literally welded to the harder metal.
Hg"	Inches of Mercury. A standard for measuring pressure, especially atmospheric pressure or manifold pressure.
Heat Soaked	Prolonged exposure of an object to hot temperature so that its temperature throughout approaches that of ambient.
Humidity	Moisture in the atmosphere. Relative humidity, expressed in percent, is the amount of moisture (water vapor) in the air compared with the maximum amount of moisture the air could contain at a given temperature.
Impulse Coupling	A mechanical device used in some magnetos to retard the ignition timing and provide higher voltage at cranking speeds for starting.
Lean Limit Mixture	The leanest mixture approved for any given power condition. It is not necessarily the leanest mixture at which the engine will continue to operate.

Manifold Pressure	Pressure as measured in the intake manifold down-stream of the air throttle. Usually measured in inches of mercury.
Mixture	Mixture ratio. The proportion of fuel to air used for combustion.
Naturally Aspirated (Engine)	A term used to describe an engine which obtains induction air by drawing it directly from the atmosphere into the cylinder. A nonsupercharged engine.
NRP	Normal Rated Power.
O.A.T.	Outside Air Temperature.
Octane Number	A rating which describes relative anti-knock (detonation) characteristics of fuel. Fuels with greater detonation resistance than 100 octane are given performance ratings.
Oil Temperature Control Valve	A thermostatic unit to divert oil through or around the oil cooler, as necessary, to maintain oil temperature within desired limits.
Overboost Valves	A pressure relief valve, set slightly in excess of maximum deck pressure, is provided to prevent damaging overboost in the event of a system malfunction.
Overhead Valves	An engine configuration in which the valves are located in the cylinder head itself.
Overspeed	When an engine has exceeded its rated revolutions per minute.
Performance Rating	A rating system used to described the ability of fuel to withstand heat and pressure of combustion as compared with 100 octane fuel. For example, an engine with high compression and high temperature needs a higher Performance Rated fuel than a low compression engine. A rating of 100/130 denotes performance characteristics of lean (100) and rich (130) mixtures respectively.
Pressure Altitude	Altitude, usually expressed in feet, (using absolute static pressure as a reference) equivalent to altitude above the standard sea level reference plane (29.92" Hg).
Propeller Load Curve	A plot of horsepower, fuel flow, or manifold pressure versus RPM through the full power range of one engine using a fixed pitch propeller or a constant speed propeller running on the low pitch stops. This curve is established or determined during design and development of the engine.
Propeller Pitch	The angle between the mean chord of the propeller and the plane or rotation.
Ram	Increased air pressure due to forward speed.
Rated Power	The maximum horsepower at which an engine is approved for operation. Rated power may be expressed in horsepower or percent.
Retard Breaker	A device used in magnetos to delay ignition during cranking. It is used to facilitate starting.
Rich Limit	The richest fuel/air ratio permitted for any given power condition. It is not necessarily the richest condition at which the engine will run.
Rocker Arm	A mechanical device used to transfer motion from the pushrod to the valve.
Run Out	Eccentricity of wobble of a rotating part.
Scavenge Pump	A pump (especially an oil pump) to prevent accumulation of liquid in some particular area.

Sonic Venturi	A restriction, especially in cabin pressurization systems, to limit the flow of air through a duct.
Standard Day	By general acceptance, temperature -59°F/15°C, pressure -29.92 In. Hg.
Static Condition	A term referring to properties of a body at rest.
Sump	The lowest part of a system. The main oil sump on a wet sump engine contains the oil supply.
TBO	Time Between Overhauls. Usually expressed in operating hours.
TDC	Top Dead Center. The position in which the piston has reached the top of its travel. A line drawn between crankshaft rotation axis, through the connection rod and axis and the piston pin center would be straight line. Ignition and valve timing are stated in terms of degrees before or after TDC.
Thermal Efficiency	Regarding engines, the percent of total heat generated which is converted into useful power.
T.I.T.	Turbine Inlet Temperature. The measurement of E.G.T. at the turbocharger turbine inlet.
Torque	Twisting moment or leverage, stated in pounds-foot (or pounds-inch).
Turbocharger	A device used to supply increased amounts of air to engine induction system. In operation, a turbine is driven by engine exhaust gas. In turn, the turbine directly drives a compressor which pumps air into the engine intake.
Vapor Lock	A condition in which the proper flow of a liquid through a system is disturbed by the formation of vapor. Any liquid will turn to vapor if heated sufficiently. The amount of heat required for vaporization will depend on the pressure exerted on the liquid.
Variable Absolute Controller	A device used to control the speed, and thus the output pressure of the turbocharger. It does so by operating the wastegate which diverts, more or less, exhaust gas over the turbine.
Vernatherm Valve	A thermostatic valve used to divert oil through or around the oil cooler, as necessary, to maintain oil temperature within desired limits.
Viscosity	The characteristic of a liquid to resist flowing. Regarding oil, high viscosity refers to thicker or "heavier" oil while low viscosity oil is thinner. Relative viscosity is indicated by the specific "weight" of the oil such as 30 "weight" or 50 "weight". Some oils are specified as multiple-viscosity such as 10W30. In such cases, this oil is more stable and resists the tendency to thin when heated or thicken when it becomes cold.
Volatility	The tendency of a liquid to vaporize.
Volumetric Efficiency	The ability of an engine to fill its cylinders with air compared to their capacity for air under static conditions. A "normally aspirated" engine will always have a volumetric efficiency of slightly less than 100%, whereas superchargers permit volumetric efficiencies in excess of 100%.

Wastegate Valve (Hydraulic)	A unit, used on turbocharged engines, to divert exhaust gas through or around the turbine, as necessary to maintain turbine speed. As more air is demanded by the engine, due to throttle operation, the compressor must work harder. In order to maintain compressor and turbine speeds, more exhaust must be flowed through the turbine. The wastegate valve closes and causes gas, which would go directly overboard, to pass through the turbine. The wastegate is usually operated by an actuator which gets signals from the turbocharger controller.
Wastegate Valve (Manual)	A ground adjustable bypass located in the turbine exhaust (Fixed Orifice) bypass duct. The position of the fixed orifice wastegate valve remains constant throughout all modes of engine operation.
Critical Altitude	The maximum altitude at which a component can operate at 100% capacity. For example, an engine with a critical altitude of 16,000 feet cannot produce 100% of its rated manifold pressure above 16,000 feet.
Dynamic Condition	A term referring to properties of a body in motion.
E.G.T.	Exhaust Gas Temperature. Measurement of this gas temperature is sometimes used as an aid to fuel management.
Exhaust Back Pressure	Opposition to the flow of exhaust gas, primarily caused by the size and shape of the exhaust system. Atmospheric pressure also affects back pressure.

1-4 MANUAL REVISIONS

This manual and Teledyne Continental Motors related manuals are current and correct to the best of Teledyne Continental Motors' knowledge at the time of publication. Any errors, recommended changes, or questions should be submitted in writing to:

Technical Publications Department
Teledyne Continental Motors
P.O. Box 90
Mobile, Alabama 36601

Manuals will be revised and updated as necessary.

Consult Teledyne Continental Motors' Service Bulletin publications for latest technical information available.

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CHAPTER 2

TOOLS AND EQUIPMENT

Section Index

2-1 TOOLS

The mechanic should be equipped with a complete set of common tools to include the minimum of:

1. Wrenches - 1/4" thru 1"

2. Common and Phillips Head Screwdrivers

3. Pliers- - Common, Diagonal Cutter, Needle Nose, Duck Bill, Vise Grip, Snap Ring.

4. Ratchets 1/4", 3/8", 1/2" Drive

5. Sockets - 1/4" Drive 5/32" thru 1/2" - 3/8" Drive 3/8" thru 1" - 1/2" Drive 7/16" thru 1-1/4"

6. Sockets (Deepwell) - 1/2" Drive 7/16" thru 1"

7. Feeler Gages

8. Leather Mallet

9. Torque Wrenches (Calibrated) - 0-500 In. Lbs. - 0-100 Ft. Lbs.

10. Micrometers

2-2 SPECIAL TOOLS

Specific tools illustrated or similar tools marketed by other manufacturers are necessary for service and maintenance of the aircraft engine. Tool illustrations shown on the following pages are used with the permission of the respective manufacturers.

Illustrations in this section show only the general appearance of tools and do not correspond to the actual size of shape. Details of special tools, fixtures, equipment and consumable materials appropriate to overhaul procedures are listed in the various chapters and subsystems of the overhaul manual; the following information is primarily for procurement purposes.

NOTICE

All tools reference Sub-section 2-2 Special Tools, are for reference only, not for the purpose of promoting or suggesting tools to be purchased from the indicated sources.

IDENTIFICATION CODE FOR TOOLS

CODE		SUPPLIER
(ALR)	=	ALCOR, INC.
(BTC)	=	BORROUGHTS TOOL AND EQUIPMENT CORP.
(CSPC)	=	CHAMPION SPARK PLUG, CO.
(EEI)	=	EASTERN ELECTRONICS, INC.
(FTSC)	=	FEDERAL TOOL SUPPLY CO., INC.
(OTC)	=	OTC TOOLS & EQUIPMENT CO.
(MCSC)	=	McMASTER-CARR SUPPLY CO.
(SOT)	=	SNAP ON TOOLS

SPECIAL TOOLS

PROCUREMENT SOURCES

COMPANY	GENERAL PRODUCT SUMMARY
ALCOR, INC. (ALR) Box 32516 10130 Jones Maltsberger Rd. San Antonio, TX 78284 512/349-3771	Instruments for Light Powered Aircraft Special Tools
BORROUGHS TOOL & EQUIP. CORP. 2429 N. Burdick St. **(BTC)** Kalamazoo, MI 49007-1897 616/345-5163 or 345-2700	Precision Instruments Measuring Instruments Precision Tools Special Tools
CHAMPION SPARK PLUG, CO. (CSPC) Box 910, 900 Upton Ave. Toledo, OH 43661 419/535-2461	Spark Plugs, Ignitors Oil Filters Special Tools
EASTERN ELECTRONICS, INC. (EEI) 180 Roberts St. East Hartford, CT 06108 203/528-9821	Fuel Pressure Test Equipment Measuring Instruments Precision Tools Piston Position Indicators Printed and Standard Circuits
FEDERAL TOOL SUPPLY CO., INC. (FTSC) 10631 Capital Oak Park, Michigan 48237 800/521-1508 TOLL FREE or 313/543-9300	Precision Inspection Instruments Special Tools
OTC TOOLS & EQUIPMENT (OTC) Division of Owatonna Tool Company Owatonna, Minnesota 55060 507/451-5310	Precision Tools Special Tools Hydraulic Accessories
McMASTER-CARR SUPPLY CO. (MCSC) P.O. Box 4355 Chicago, Illinois 60680 312/833-0300	Precision Tools Special Tools
SNAP ON TOOLS (SOT) 2611 Commerce Blvd. Birmingham, Alabama 35210 205/956-1722	Precision Tools Special Tools

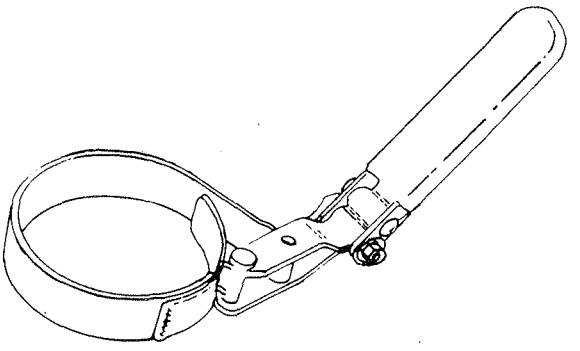
Special Tools

Item &	Part Number	Nomenclature	Application	Vendor
1.	GA333	Strap Wrench	Oil Filter Removal 3: to 3 3/8"	SOT
	GA340	Strap Wrench	Oil Filter Removal 3 1/2" to 3 7/8"	SOT
	YA341	Strap Wrench	Oil Filter Removal 4 1/8" to 4 7/16"	SOT
2.	CT-470	Oil Filter Can Cutter	Oil Filter Sludge Inspection	CSPC
3.	3882	Cylinder Base Nut Wrenches	Cylinder Removal	BTC
4.	8079	Cylinder Base Nut Wrenches	Cylinder Removal	BTC
5.	5203 & 5204	Cylinder Base Nut Wrenches	Cylinder Removal	BTC
6.	8121	Piston Pin Removers	Piston Removal	BTC
7.	CFL10	Cylinder Hone	Cylinder Reconditioning	SOT
8.	4965A	Crankshaft Blade and Damper Bushing Remover/ Replacer	Crankshaft Reconditioning	SOT
	3604	Crankshaft Blade and Damper Bushing Remover/ Replacer	Crankshaft Reconditioning	BTC
	3607	Crankshaft Blade and Damper Bushing Remover/ Replacer	Crankshaft Reconditioning	BTC
	3607-1	Crankshaft Blade and Damper Bushing Remover/ Replacer	Crankshaft Reconditioning	BTC
	8068	Crankshaft Blade and Damper Bushing Remover/ Replacer	Crankshaft Reconditioining	BTC
9.	52213A	Holding Fixture Adapters	Cylinder Hold Down	BTC
10.	5221B	Holding Fixture	Cylinder Hold Down	BTC
11.	122	Valve Guide Cleaner	Cylinder Reconditioning	BTC
12.	8066	Seal Seat Cutter	Cylinder Reconditioning	
13.	7521A	Spring Checker	Spring Inspection	BTC
14.	3611	Valve Guide Remover	Cylinder Reconditioning	BTC
	2874	Valve Guide Remover	Cylinder Reconditioning	BTC
15.	4912	Valve Guide Replacer	Cylinder Reconditioning	BTC
	3619	Valve Guide Replacer	Cylinder Reconditioning	BTC
	2842	Valve Guide Replacer	Cylinder Reconditioning	BTC
16.	8118	Rocker Arm Bushing Remover/Installer	Rocker Arm Reconditioning	BTC
17.	4901	Ring Compressor	Engine Assembly	BTC
	2839	Ring Compressor	Engine Assembly	BTC
	3618	Ring Compressor	Engine Assembly	BTC
18.	4901B	Ring Compressor	Engine Assembly	BTC
	4901A	Ring Compressor	Engine Assembly	BTC
	3601	Ring Compressor	Engine Assembly	BTC
	2839A	Ring Compressor	Engine Assembly	BTC
19.	3170	Floating Holder	Cylinder Reconditioning	BTC
20.	3602	Valve Spring Compressor	Cylinder Assembly/Disassembly	BTC
21.	68-3	Push Rod Spring Compressor	Push Rod Housing Installation/Removal	BTC
22.	4951A	Flaring Tool Push Rod Hsg.	Push Rod Housing Reconditioning	BTC
23.	4981	Valve Guide Remover	Cylinder Reconditioning	BTC
24.	8086	Valve Seat Insert R&R	Cylinder Reconditioning	BTC
25.	4910	Installer Valve Seat Insert	Cylinder Reconditioning	BTC
	4956	Installer Valve Seat Insert	Cylinder Reconditioning	BTC
26.	8116	Common Parts Kit	Cylinder Reconditioning	BTC

Item &	Part Number	Nomenclature	Application	Vendor
27.	8116-24 thru -29	Valve Stem Hole Reamers	Cylinder Reconditioning	BTC
28.	8116-1R thru 15R	Reamers	Cylinder Reconditioning	BTC
29.	8116-1B thru 15B	Boring Bars	Cylinder Reconditioning	BTC
30.	8116-1 thru 16	Expanding Guide Bodies	Cylinder Reconditioning	BTC
31.	4909	Valve Seat (Straight Side) Insert Cutters	Cylinder Reconditioning	BTC
	4954	Valve Seat (Straight Side) Insert Cutters	Cylinder Reconditioning	BTC
	5224	Valve Seat (Straight Side) Insert Cutters	Cylinder Reconditioning	BTC
	5225	Valve Seat (Straight Side) Insert Cutters	Cylinder Reconditioning	BTC
32.	8135	Valve Seat (Step Side) Insert Cutters	Cylinder Reconditioning	BTC
	8136	Valve Seat (Step Side) Insert Cutters	Cylinder Reconditioning	BTC
	8138	Valve Seat (Step Side) Insert Cutters	Cylinder Reconditioning	BTC
33.	2769A13	Rosan^{R} Stud Remover	Stud Remover	MCSC
34.	8111A	Connecting Rod Fixture	Connecting Rod Inspection	BTC
35.	8042C	Adapter Kit	Connecting Rod Inspection	BTC
36.	874-40,41	Reamers Conrod Bushing	Connecting Rod Reconditioning	BTC
	5008,8071	Reamers Conrod Bushing	Connecting Rod Reconditioning	BTC
37.	8098	Remover/installer Set Connecting Rod Bushing	Connecting Rod Reconditioning	TC
38.	8122A	Common Drive Handle	Cylinder Reconditioning	BTC
	8139,40,41	Pilots	Cylinder Reconditioning	BTC
39.	23-1	Needle Bearing Installer	Needle Bearing Replacement	BTC
	8053	Needle Bearing Installer	Needle Bearing Replacement	BTC
40.	8077A&B	Bushing R/R Set	Crankshaft Reconditioning	BTC
41.	8077C	Bushing R/R Counterweight	Crankshaft Reconditioning	BTC
42.	8104	Engine Stand	Engine Assembly/Disassembly	BTC
43.	7726	Tork Band Tension Adjuster	Generator/Alternator Belt Tensioning	BTC
44.	4973	Generator Drive Holders	Generator/Alternator Disassembly	BTC
45.	8156	Cylinder Heating Stand	Cylinder Reconditioning	BTC
46.	8093C	Bearing Puller	Bearing Removal Starter Clutch Shaft	BTC
47.	8093D	Bearing Puller	Bearing Removal Starter Clutch Shaft	BTC
48.	5210	Differential Pressure Gauge	Setting Differential Fuel Pressure	BTC
49.	7251	Differential Pressure Cylinder Checker	Checking Cylinder Compression	BTC
50.	BT-33-73F	Belt Tension Gauge	Alternator/Generator Belt Adjustment	BTC
51.	BT-60C	Hydraulic Valve Lifter Tester	Hydraulic Lifter Testing	BTC
52.	8091	GEN/ALT Tester	Checking GEN/ALT Output	BTC
53.	2608A	Timing Disc	Setting Engine Timing	BTC
54.	4974	Pulley Holder	Sheave Removal	BTC
55.	8082	Alignment Gage Bar	Checking Comp & Driver Sheave Alignment	
56.	8094A	Crankcase Drill Fixture	Crankcase Modification	BTC
57.	8334	Vacuum Pump	Vacuum Testing	BTC

Item &	Part Number	Nomenclature	Application	Vendor
58.	61-5	Pulley Puller	GEN/ALT Sheave Removal	BTC
59.	8094B	Drill Fixture	Journal Bearing Modification	BTC
60.	4918	Spark Plug Insert Replacer	Cylinder Reconditioning	BTC
61.	8064	Step Cutter Thru-Bolt	Crankcase Modification	BTC
	8065	Step Cutter Thru-Bolt	Crankcase Modification	BTC
62.	504-1	Spark Plug Insert Tap	Cylinder Reconditioning	BTC
63.	4919	Spark Plug Insert Remover	Cylinder Reconditioning	BTC
64.	8054	Slide Hammer	Multi Use	BTC
65.	445	Spark Plug Tap	Cylinder Reconditioning	BTC
66.	8074	Rosan[R] Lock Ring Installer	Stud Installation	BTC
67.	505	Stud Drivers	Stud Installation	BTC
68.	4978	Scavenge Pump Drill Fixture	Crankcase Modification	BTC
69.	8025	Drill Fixture	Crankcase Squirt Nozzle Replacement	BTC
70.	L423	Crankcase Spitter	Crankcase Separation	BTC
71.	5209	Propeller Shaft Oil Seal Installer	Installation of Seal over Propflange	BTC
72.	8048	Oil Pressure Relief Spot Facer	Removal of surface Material around holes	BTC
	8155	Oil Pressure Relief Spot Facer	Removal of surface Material around holes	BTC
73.	8117A	Runout Block Set	Crankshaft Inspection	BTC
74.	8087A&B	Polishing Tools for Crankshaft Bearings	Crankshaft Reconditioning	BTC
75.	8165	Injector Nozzle Remover and Installer	Injector Removal & Replacement	BTC
76.	8114	Crankcase thru Bolt Removers	Engine Disassembly	BTC
77.	7912A	Hex Drive	Loosening Tubing "B" Nuts	BTC
78.	7710	Rotabroach Cutters	Hole Cutting	BTC
79.	1153	Puller	Removal of Press Fit Parts	OTC
	679	Puller	Removal of Press Fit Parts	OTC
80.	1035	Puller	Removal of Press Fit Parts	OTC
	927	Puller	Removal of Press Fit Parts	OTC
81.	1037	Puller	Removal of Press Fit Parts	OTC
82.	1079	Puller	Removal of Press Fit Parts	OTC
	1063	Puller	Removal of Press Fit Parts	OTC
83.	115-153	Outside Micrometers	Dimensional Inspection	FTSC
84.	545-116	Dial Bore Gages	Dimensional Inspection	FTSC
85.	122-125	Blade Micrometers	Dimensional Inspection	FTSC
86.	126-137	Screw Thread Micrometers	Dimensional Inspection	FTSC
	226-137	Screw Thread Micrometers	Dimensional Inspection	FTSC
87.	159-211	Depth Micrometers	Dimensional Inspection	FTSC
88.	4903-1 thru -5	Reamers Rocker Shaft Support Boss	Cylinder Reconditioning	BTC
	4905	Reamers Rocker Arm & Shaft Bushing	Rocker Arm Reconditioning	BTC
	5129-1 thru -5	Reamers (Straight Vlve Cylinder)	Cylinder Reconditioning	BTC
	5130	Reamer Rocker Shaft Bushing	Cylinder Reconditioning	BTC
	7232	Reamer Rocker Arm Bushing	Rocker Arm Reconditioning	BTC
89.	4914-1HS thru 5HS	Reamers Valve Guide Boss	Cylinder Reconditioning	BTC
	4943-1HS thru 5HS	Reamers Valve Guide Boss	Cylinder Reconditioning	BTC

Item &	Part Number	Nomenclature	Application	Vendor
90.	2847-2Cp	Reamer (Carbide Tipped)	Cylinder Reconditioning	BTC
	4913-1Cp	Reamer (Carbide Tipped)	Cylinder Reconditioning	BTC
	3606-CP	Reamer (Carbide Tipped)	Cylinder Reconditioning	BTC
	2847-1Cp	Reamer (Carbide Tipped)	Cylinder Reconditioning	BTC
	2847-2HP	Reamer (High Speed Steel)	Cylinder Reconditioning	BTC
	4913-1HP	Reamer (High Speed Steel)	Cylinder Reconditioning	BTC
	3606-HP	Reamer (High Speed Steel)	Cylinder Reconditioning	BTC
	28471HP	Reamer (High Speed Steel)	Cylinder Reconditioning	BTC
91.	2684	Reamer (Square Shank)	Cylinder Reconditioning	BTC
	2686	Reamer (Square Shank)	Cylinder Reconditioning	BTC
	2689	Reamer (Square Shank)	Cylinder Reconditioning	BTC
	2693	Reamer (Square Shank)	Cylinder Reconditioning	BTC
	4104	Reamer (Square Shank)	Cylinder Reconditioning	BTC
92.	2848-1	Plug Gage	Valve Guide Inspection	BTC
	2848-2	Plug Gage	Valve Guide Inspection	BTC
	3615	Plug Gage	Valve Guide Inspection	BTC
93.	7308	Dial Thickness Gage	Dimensional Inspection	FTSC
94.	52.030-006	Precision Vernier Calipers	Dimensional Inspection	FTSC
95.	600R-30	Inside Measuring Instrument	Dimensional Inspection	FTSC
96.	647	Alternator Analyzer Voltage Regulator Tester	Charging System Test	EEI
97.	E100	Alternator/Regulator/ Battery Tester	Charging System Test	EEI
98.	Model 29	Voltage & Circuit Tester	Electrical System Test	EEI
99.	11-9110-1	Magneto Timing Light	Set Engine Timing	KTC
100.	Model E25	Timing Indicator	Set Engine Timing	EEI
101.	Model E10	Cold Cylinder Tester	Cylinder Firing Improperly	EEI
102.	Model E5	Hi-Voltage Tester	Test Ignition Cable Continuity	KTC
103.	646953	Master Orifice Tool	Cylinder Compression Test	BTC
104.	85328	Alcor Portable Digital EGT Unit	Engine Test	ALR
105.	85329	Alcor Portable Digital CHT Unit	Engine Test	ALR



①

Strap Wrench

For removal of oil filter, spring steel band surrounds and tightens as the handle is pulled. Vinyl gripped handle swivels to clear obstructions.

GA333 for 3" to 3-3/8" Dia. Filters
GA340 for 3-1/2" to 3-7/8" Dia. Filters
YA 341 for 4-1/8" to 4-7/16" Dia. Filters

Oil Filter Sludge Inspection

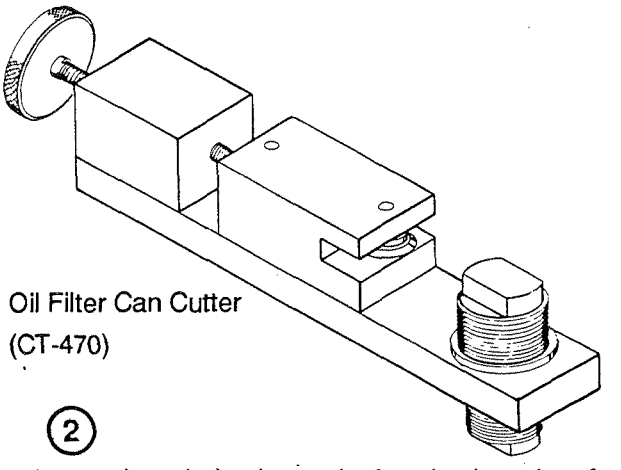
Inspection of engine sludge trapped in spin-on oil filters has been a recommended practice for many years. Licensed aircraft mechanics recognize the value of visual inspection to aid in determining if internal engine wear or malfunction has occurred, and to inspect for metal or other contaminates within the engine oil system.

Use of the Champion CT-470 Oil Filter Can Cutter eases the opening of spin-on filters without introducing foreign material into the filter.

Following is the recommended procedure for inspection of full flow oil filters:

1) Remove filter from the engine and place on a drain tray. Allow oil to drain through a clean cloth to determine if foreign material drains from the filter.

2) Using the Champion CT-470 Can Cutter, open the filter as follows; (See photos):



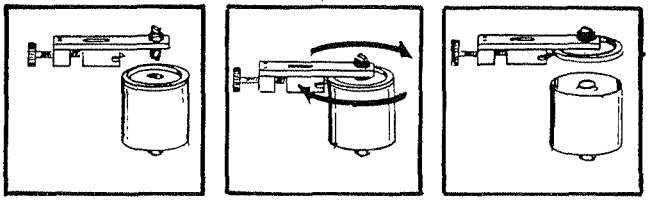
Oil Filter Can Cutter
(CT-470)

②

a. Insert threaded adapter in female threads of filter, or screw rotating bushing on male threads of filter.

b. Slightly tighten cutter blade against filter and rotate 360°. Repeat operation until mounting plate section separates.

c. Lift mounting plate to expose complete filter media for inspection.



3) Using a clean plastic bucket containing approximately 1 pt. clean varsol, swish filter element around in the varsol to loosen entrapped metal or other contaminant.

4) Using a clean magnet, work it around in the varsol solution. Ferrous metal particles in the solution should adhere to the magnet for inspection.

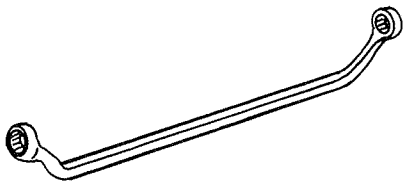
5) After all ferrous metal particles have been retrieved by the magnet, pour remaining varsol through another clean shop rag, and in a bright light, any non-ferrous metals should be detectable.

Cylinder Base Nut Wrenches
3882 Series

The 3882 Series Wrenches feature 1/2" square drive and 12-point hex sockets. The wall thickness between the hex and wrench O.D. is closely controlled for maximum strength. Approx. 16" long overall.

3882 9/16" hex
3882-1 7/16" hex
3882-2 1/2 " hex
3882-3 5/8" hex
3882-4 3/4" hex

3882A 9/16"hex
3882-3A 5/8" hex

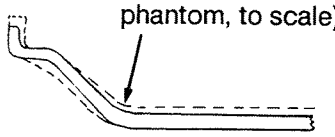


(3)

Cylinder Base Nut Wrench

Special modified 3882-type wrench, this special wrench is perfect for those occasional situations when the 3882 wrench won't fit. It's a slightly different configuration, as shown.

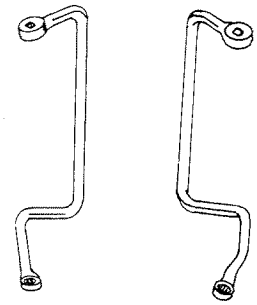
8079 9/16" hex



(4)

Cylinder Base Nut Wrench
For 470 and 520 Series

The special configuration of these wrenches permits access to the cylinder base nut areas as shown. Approx. 17" long.



5203
5/8" hex

5204
5/8" hex

(5)

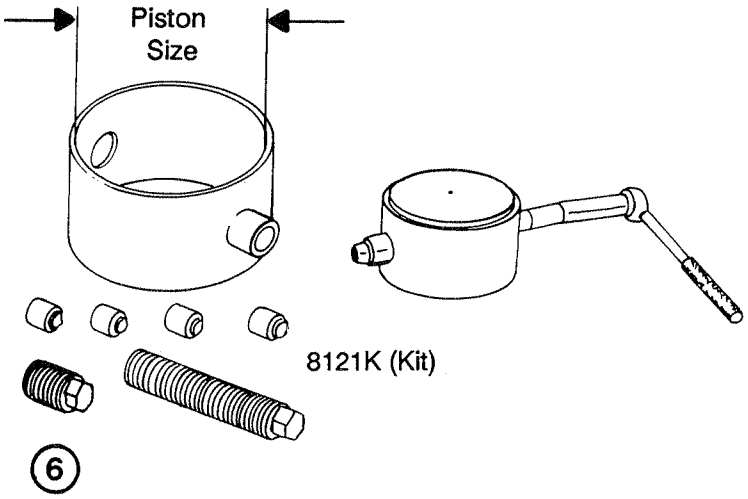
Piston Pin Removers

8121 Series

Design allows piston pin removal without removing adjoining cylinder. Sizes to fit Continental engines.

Body Assy. Piston Size

8121A	4-7/16"
8121B	5"
8121C	5-1/8"
8121D	5-1/4"

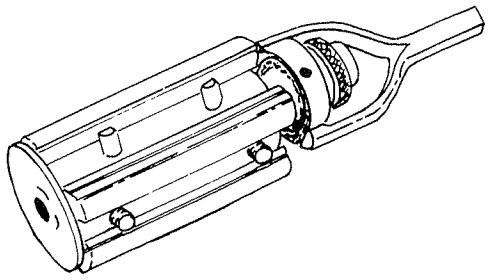


⑥

Cylinder Hone

Expandable racks adjust to cylinder size with universal joint action. Optional set for use on TCM cylinders.

CFL10	Standard/3" to 4-1/4"
CFL10-7	Optional/4" to 6-1/2"

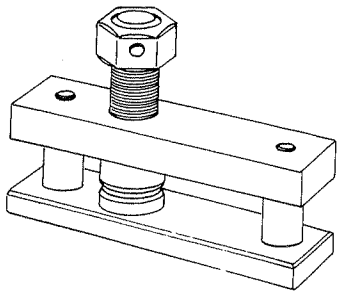


⑦

Crankshaft Blade and Dampener Bushing Removers/Replacers

Back-up plates and forcing screws are rugged, heat-treated alloy steel. Be sure to keep forcing screws greased.

4965A	-	for 5/8" I.D. Bushing
3604	-	for 3/4" I.D. Bushing
3607	-	for 15/32" I.D. Bushing
3607-1	-	for GTSIO-520
8068	-	for .604 I.D. Bushings



⑧

Holding Fixture Adapters

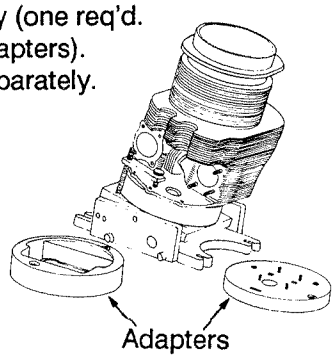
With these adapters, you may bolt the cylinder onto the 5221B Fixture in order to do:

Cylinder Honing
Valve Seat Insert Work (insert removal, seat cutting, insert installation).

5221-13A Adapter for Continetal O and IO-470 and 520 Series

Note: The original #5221 Fixtures require 4 additional tapped holes in rocker plate to accept the above adapters- a blueprint showing hole sizes and locations is included with adapters.

5221-17A Cylinder Holdown Clamp Assembly (one req'd. fits all adapters). Order separately.



(9)

Universal Cylinder Holding Fixture 5221B

This is a heavy-duty, precision fixture manufactured to extremely close tolerances. Suitable for use on vertical mills or drill presses, it allows quick indexing of required angles for valve work.

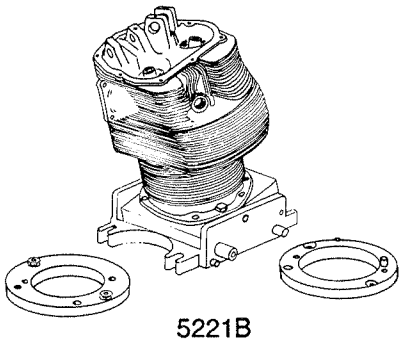
FEATURES:

* For all Continental Engines
* Fixture indexes in all present positions required to machine valve guides.
* Locks in at these angles:

0° 11° 45' 12° 40' 16°
11° 30' 12° 15°

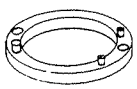
* Adapter rings are included to cover all Continental engines.

5221-10LA For wide deck
5221-11LA For narrow deck

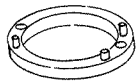


5221B

(10)



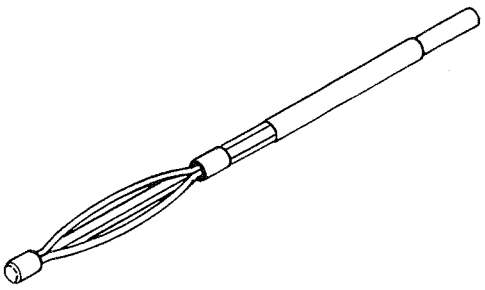
5221-10LA



5221-11LA

Valve Guide Cleaner 122

Expandable type fits all Continental engines.

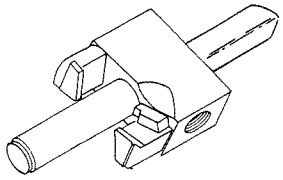


(11)

Seal Seat Cutter 8066

Per Continental Bulletin M76-24R.1

Modifies valve guide to comply with M76-24R.1 carbide-tipped cutter blades compensate for wear.



(12)

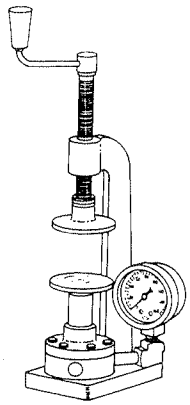
Spring Checker 7521A

Per Continental Bulletin M74-16

Check valve spring quickly and easily. Hydraulically actuated extremely accurate readout (0-160 pounds). Includes step gauges for all required dimensions. 7521 Checker is less step gauges.

Max. spring dimensions: Ht.-2-1/2", O.D.-2".

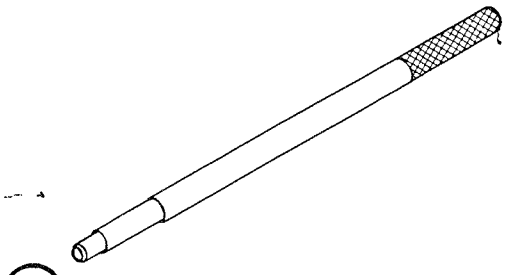
(Heat-Shrink Type)



(13)

Valve Guide Removers (Cold Force Removal Type)

Tough heat-treated steel.
3611 - .375" I.D. Guide
2874 - .436/.438" I.D. Guide

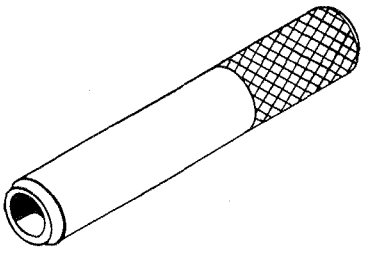


(14)

Valve Guide Replacers

Alloy steel, heat-treated for maximum toughness.

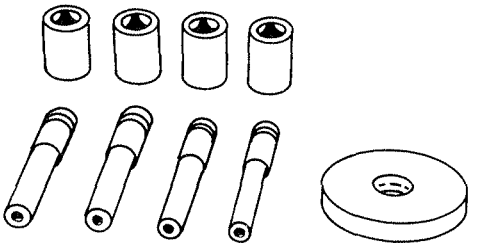
4912 - .344" I.D. Guide
3619 - .375" I.D. Guide
2842 - .436/.438 I.D. Guide



(15)

Rocker Arm Bushing Remover/Installer Set 8118

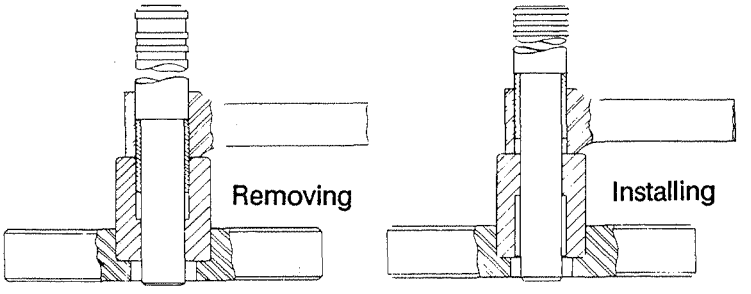
Driver and Adapter Assy.	Pilot Dia.	Ram Dia.	Replaces Tool
8118G	.731	.871	7233
8118H	.706	.808	5007/2881-1
8118J	.593	.699	4904
8118K	.573	.714	------



8118 Set includes one each 8118G, 8118H, 8118J, 8118K and 8098-10 Base.

Driver and Adapter Assemblies also available individually. The 8098-10 Base must be used with 8118G, 811H, 8118J and 8118K Driver and Adapter Assemblies.

Makes rocker arm bushing removal/installation fast and easy. All components of 8118 set are also available individually.

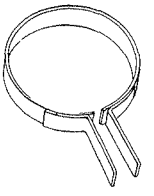


(16)

Piston Ring Compressors

Flexible Band Type

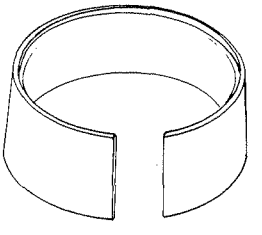
4901 - for 3-7/8" and 4-1/6" bore engines
2839 - for 5" and 5-1/4" bore engines
3618 - for 4-7/16" bore engines



(17)

Tapered Type

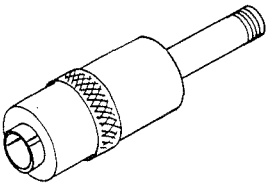
4901B - for 3-7/8" bore engines
4901A - for 4-1/6" bore engines
3601 - for 4-7/16" bore engines
2839A - for 5" bore engines
5201 - for 5-1/4" bore engines



(18)

3170 - Floating holder

No. 3 Morse male, compensates for misalignment between reamer and work. Provides unrestricted float.

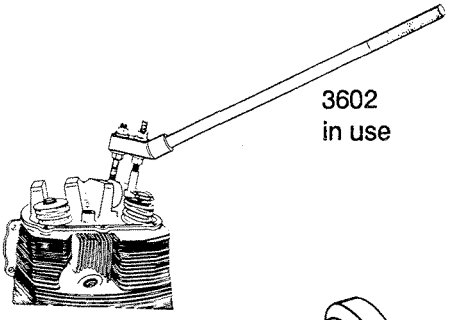


19

Valve Spring Compressor 3602

Adjustable type works on all Continental engines.

Hook installs on rocker shaft (or on special rocker nut furnished) and c-shaped collar compresses spring to allow keeper removal. All stressed parts are heated-treated steel. Handle is approx. 18" long for good leverage.

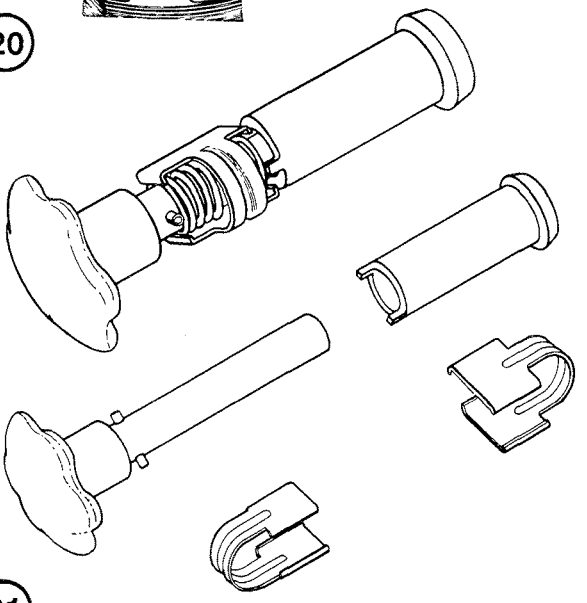


20

Push Rod Spring Compressor 68-3

For compressing and holding push rod springs on all engines with spring loaded tubes. The 68-3 compresses the spring, which can then be removed with furnished clips.

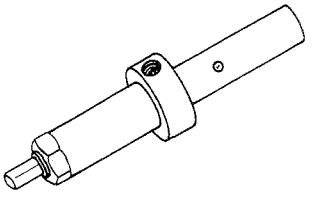
Eliminates wiring springs together- to install, simply insert spring then pull off clip! Includes instructions.



21

Flaring Tool for Push Rod Housing 4951A

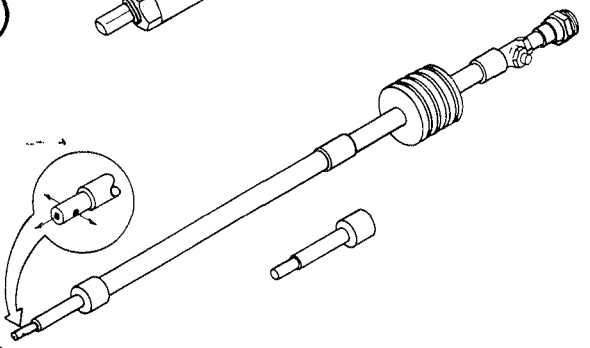
For A & C Series - expanding ball type tool. Balls rotate inside housing, expanding it into aluminum boss.



22

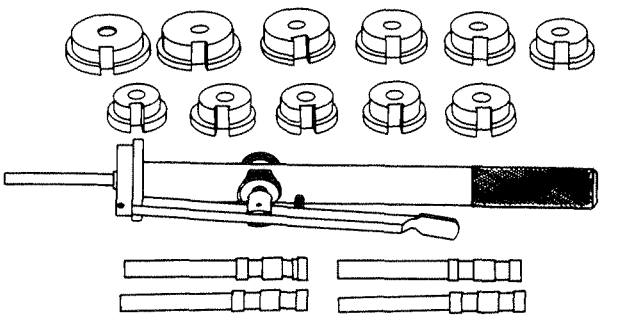
Valve Guide Remover 4981

Removes guides by heat-shrink method. Cylinder is heated to 475°F, then tool injects water to guide bore. A light tap with the slide hammer removes guide. A water reservoir (not included) supplies the low water pressure required to cool the guides for easy removal. Replacement guide is usually same size as the one removed.

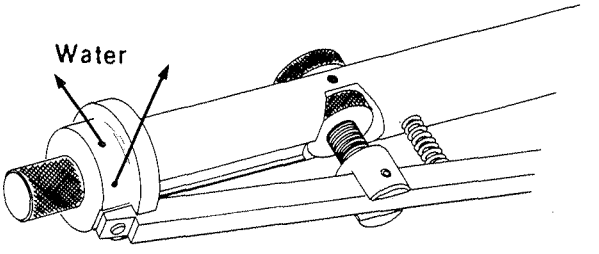


23

Valve Seat Insert Remover and Replacer 8086

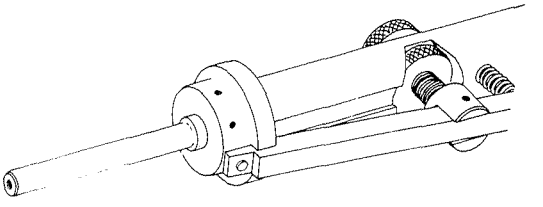


A complete tool set to remove and install valve seats by the heat-shrink method. Cylinders are heated to 500°-550°F. Same handle and head is used to remove and drive down seats during installation. Mallet may be used on the handle as the seating force. Low water pressure on the order of 1 to 2 p.s.i. is all that is needed for pulling seats. This one tool set will do all Continental engines from 65 to 520 and IO-550.



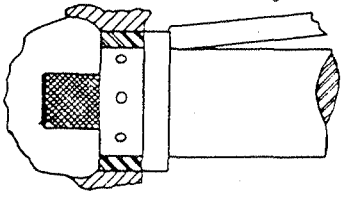
Set includes:

* (1) Handle/lever assembly
* (12) Puller heads (size to fit all Continental engines
* (10) Installer pilots
* (1) Remover plug
* 6 feet of super flexible hose to attach to water supply
* Instructions
* Storage case.



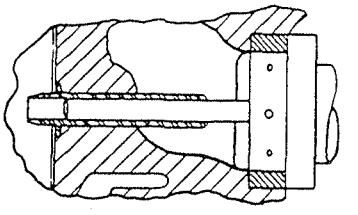
Tool is rigged for removal. Center is plugged to route water out thru small holes in rim of removing head.

Fig. 1.



Tool is rigged for replacement. Guide on end of tool slips into valve stem hole for perfect alignment. No more cocked seats.

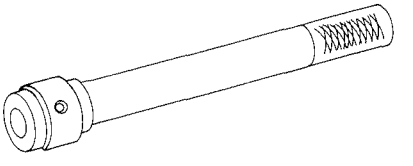
Fig. 2.



Installer Valve Seat Inserts

4910 -For 1-45/64" O.D. Exhaust and 1-53/64" O.D. Intake Inserts.
(Includes head and handle)

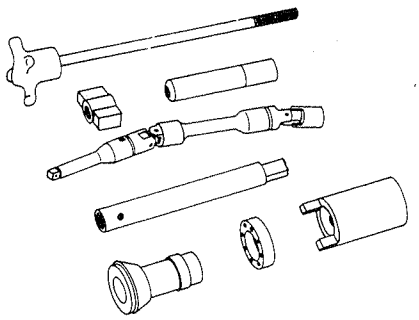
4956 -For 1-3/4" O.D. Exhaust and 1-57/64" O.D. Intake Inserts.
(Includes head and handle)



8116 Common Parts Kit

Does not include Expanding Guide Bodies or cutting tools. See below.

Select Size Parts are not part of 8116 kit. You buy only what you need (reamers, expanding guide bodies, boring bars, etc.).



Valve Guide To Valve Seat

Alignment System

MIS-ALIGNED VALVE SEATS AND GUIDES CAN BE RE-ALIGNED QUICKLY:

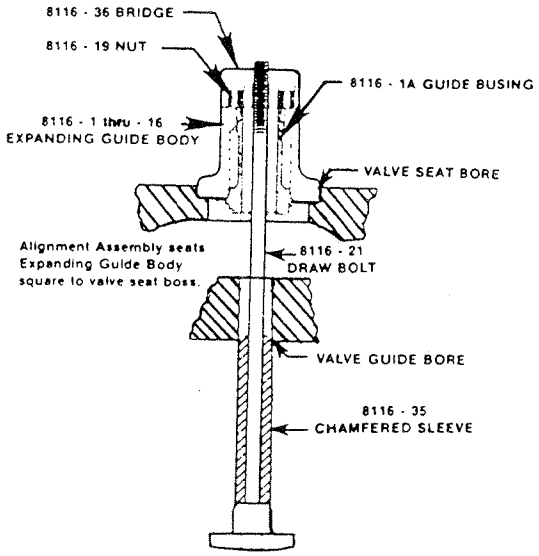
Here's how it's done:

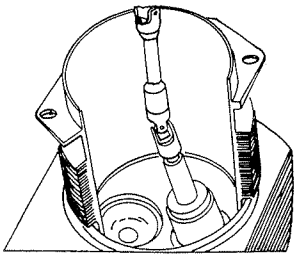
Step 1. Removed old guides and seats

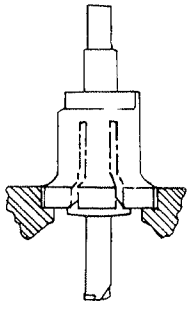
Step 2. Install Expanding Guide Body into valve seat boss.

Step 3. Place Boring Bar into Guide. Bore valve guide boss concentric and perpendicular to valve seat. Follow up with Reamer.

Step 4. Use your drill press for bore or ream operations as shown in this picture. The same guide set-up works for both.



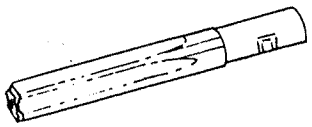




Valve Stem Hole Reamers

(Takes the place of 2847, 3606 & 4913 Series reamers).

Tool No.	Hole Dia.
8116.24	.344
8116.25	.375
8116.27	.436
8116.29	.438



(27)

Boring Bars

Made of high speed M2 tool steel, precision ground.

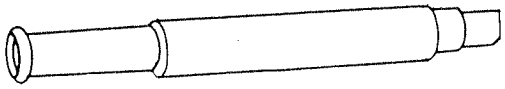
(28)

Reamers

Tool No.	Hole Dia.
8116-1R	.531
8116-2R	.536
8116-3R	.541
8116-4R	.546
8116-5R	.551
8116-6R	.561
8116-10R	.625
8116-11R	.630
8116-12R	.635
8116-13R	.640
8116-14R	.645
8116-15R	.655

Reamers

Valve Guide Boss. (Takes place of 4914 and 4943 Series reamers).



(29)

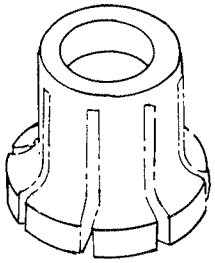
Boring Bars

Tool No.	Hole Dia.
8116-1B	.525
8116-2B	.530
8116-3B	.535
8116-4B	.540
8116-5B	.545
8115-6B	.555
8116-10B	.620
8116-11B	.625
8116-12B	.630
8116-13B	.635
8116-14B	.640
8116-15B	.650

(*Example: Use **8116-6B Boring Bar** to bore hole to .555, then finish with **8116-6R Reamer** to .561 dia.)

Expanding Guide Bodies

Expanding Body No.	Minimum Retracted Dia.	Maximum Expanded Dia.
8116-1	1.656	1.681
8116-2	1.685	1.710
8116-3	1.748	1.773
8116-4	1.785	1.810
8116-5	1.810	1.835
8116-6	1.839	1.864
8116-7	1.873	1.898
8116-8	2.068	2.093
8116-9	2.108	2.133
8116-10	2.113	2.138
8116-11	2.228	2.253
8116-12	2.388	2.413
8116-13	2.474	2.499
8116-14	2.515	2.540
8116-15	2.594	2.619
8116-16	2.629	2.654

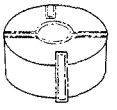


(30)

Valve Seat Insert Cutters

Straight Side - Non Step

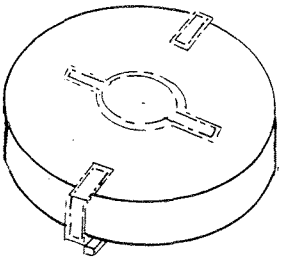
WARNING! Measure New Insert O.D. and then select proper cutter.



Straight Side Cutters

(31)

Part No.	Use	Finish Dim.	O.S.
4909-8	Int	1.822	.010"
4909-9	Int	1.814	.002"
4909-12	Exh	1.689	.002"
4909-13	Exh	1.697	.010"
4954-5	Int	1.880	.005"
4954-8	Int	1.885	.010"
4954-9	Int	1.885	.002"
4954-10	Int	1.895	.020"
4954-11	Int	1.905	.030"
4954-12	Exh	1.752	.002"
4954-13	Exh	1.760	.010"
4954-14	Exh	1.770	.020"
4954-15	Exh	1.780	.030"
4985-1	Int	2.115	.005"
4985-2	Int	2.120	.010"
4985-3	Int	2.125	.015"
4985-4	Int	2.130	.020"
4985-5	Int	2.140	.030"
4985-6	Exh	1.669	.005"
4985-7	Exh	1.664	.010"
4985-8	Exh	1.669	.015"
4985-9	Exh	1.674	.020"
4985-10	Exh	1.684	.030"
5224-5	Int	2.522	.005"
5224-10	Int	2.527	.010"
5224-15	Int	2.523	.015"
5224-20	Int	2.537	.020"
5224-30	Int	2.547	.030"
5225-5	Exh	1.793	.005"
5225-10	Exh	1.798	.010"
5225-15	Exh	1.808	.015"
5225-20	Exh	1.808	.020"
5225-30	Exh	1.818	.030"



Step Side Cutters

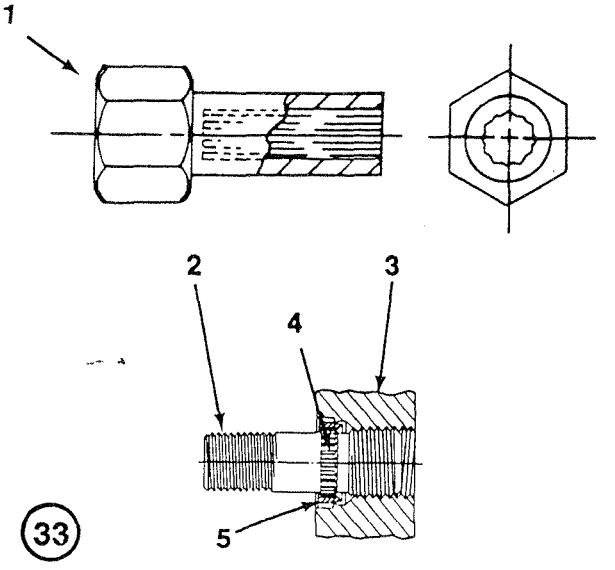
(32)

Part No.	Small Diameter	Large Diameter	O.S.	Part No.	Small Diameter	Large Diameter	O.S.
8135	1.654	1.884	STD	8138-3	1.803	2.070	.015"
8135-1	1.659	1.884	.005"	8136-4	1.808	2.070	.020"
8135-2	1.664	1.884	.010"	8138-5	1.818	2.070	.030"
8135-3	1.669	1.884	.015"	8138	2.271	2.632	STD
8135-4	1.674	1.884	.020"	8138-1	2.276	2.632	.005"
8135-5	1.684	1.884	.030"	8138-2	2.281	2.632	.010"
8136	1.788	2.070	STD	8138-3	2.286	2.632	.015"
8136-1	1.793	2.070	.005"	8038-4	2.291	2.632	.020"
8136-2	1.798	2.070	.010"	8138-5	2.301	2.632	.030"

Rosan® Stud Remover

This stud remover is for use in extracting studs from cylinder assemblies using **Rosan® type Studs.**

Using the hammer, drive the stud driver (1) over stud (2) as far as possible without making contact with the cylinder head (3). Using the ratchet or pull handle, apply a firm, constant pressure in the clockwise (tightening) direction, the serration (4) on the stud will strip. When the stud gives, reverse the ratchet and back the stud out until there are three threads still engaged in the lock ring (5). Move the stud with the driver still attached, up, down and sideways. The lock ring will pop out of the cylinder without damaging it. The stud driver is Part No. 2769A13.



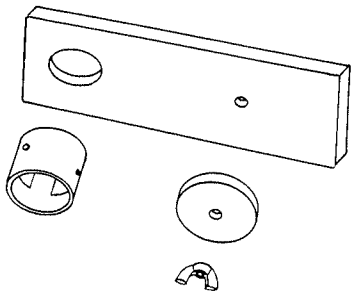
(33)

Connecting Rod Reaming and Alignment Checking Fixture

With these precision tools, it's easy to check connecting rods (without bushings) for alignment and warpage.

The 8111A Base/Retainer Kit is required as well as one (or more) of the Adapter Kits described below. The 8111A Kit includes the high-carbon steel base (hardened and ground for long life); retaining collar, cap (for connecting rod) and wing nut.

The 8111A Base/Retainer Kit fits the following Adapter Kits as described below.



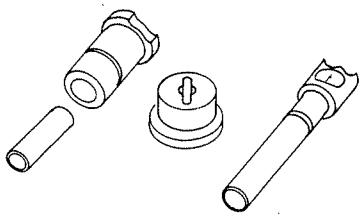
(34) Base/Retainer Kit 8111A

Adapter Kits

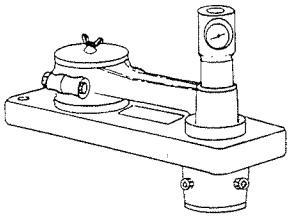
These kits contain the indicator gauge assembly, which as a dial indicator reading in ten-thousandths of an inch (.0001"). The gauge body is lapped into the mating bushing for accurate readings. Instructions are included.

Adapter Kits

8042C for 520-470-E Series 1.125"
8072C for O-200, O-300,360 1.00" & .922"



Complete tool combining 8111A Base with one of the 3 listed adapter kits shown checking rod for alignment.



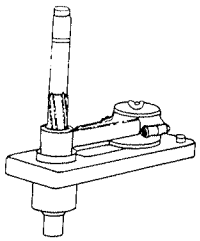
(35)

Reamers, Connecting Rod Bushing

High-speed steel reamers with 3/4" diameter pilot. Use with 8111A Base/Retainer Kit and proper Adapter Kit as shown above.

874-40 .920" Roughing
874-41 .923" Finishing
5008 1.126" Finishing
8071 1.000" Finishing

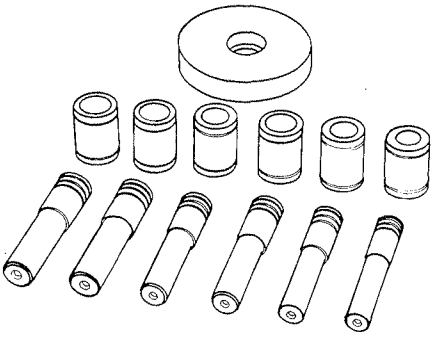
use together



(36) Complete tool using same adapters shown above with piston pin reamer. See at left for proper reamer to use

Universal Connecting Rod Bushing Remover and Installer Set 8098

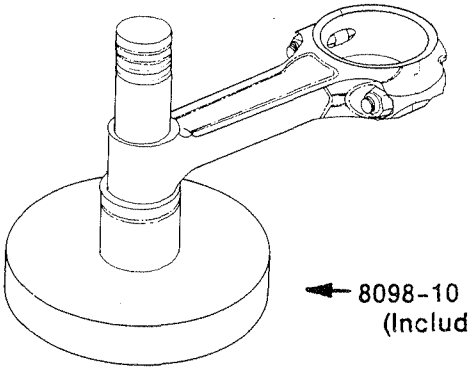
Complete set for removing and installing connecting rod bushings for Continental Support bushing reverses for either installing or removing.



8098 Complete Set Includes:
8098-10 Base

Driver and Adapter Assy.	Pilot Dia.	Ram Dia.	Replaces Tool
8098A	.844	.966	4902
8098B	.907	1.058	4949
8098C	.967	1.058	-
8098D	.984	1.082	3613
8098E	1.109	1.182	L-149
8098F	1.109	1.230	2879

(Above Driver and Adapter Assemblies also available individually).



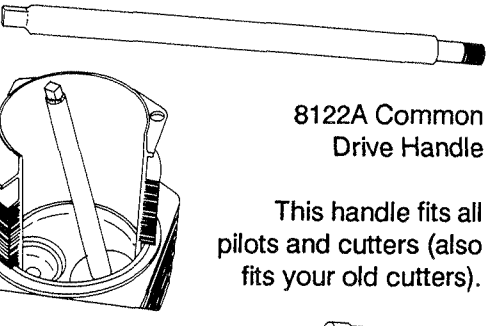
← 8098-10 Base (Included)

(37)

Common Drive Handle 8122A

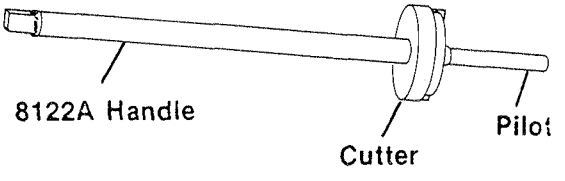
This Drive Handle fits all pilots and cutters, and it features positive pin drive as shown. (Combination of Morse taper and pin drive eliminates any slippage between handle and cutter.)

By using the 8122A with the proper pilot from below, you may choose to pilot into valve stem hole or valve guide boss.



8122A Common Drive Handle

This handle fits all pilots and cutters (also fits your old cutters).



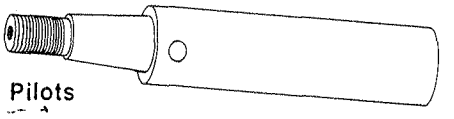
Pilots

All pilots are hardened and precision ground for accuracy. Two choices- pilot into valve stem hole or valve guide boss.

Pilot Choice No. 1- Pilot Into Valve Stem Hole
(On new installations only)

Part No.	Pilot Dia.
8139	.343
8410	.374
8141	.435

CAUTION: DO NOT USE ON WORN GUIDES!



Pilots

Pilot Choice No. 2 — Pilot Into Valve Guide Boss

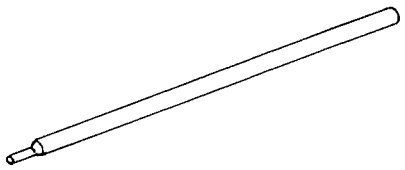
Part No.	Pilot Dia.	Application	Part No.	Pilot Dia.	Application
8123	.530	Standard	8129	.624	Standard
8124	.535	Oversize .005	8130	.629	Oversize .005
8125	.540	Oversize .010	8131	.634	Oversize .010
8126	.545	Oversize .015	8132	.639	Oversize .015
8127	.550	Oversize .020	8133	.644	Oversize .020
8128	.560	Oversize .030	8134	.654	Oversize .030

(38)

Needle Bearing Installers

Precisely machined to make bearing installation fast.

23-1 .562" pilot
8053 .750" pilot



(39)

Hydraulic Crankshaft Dampener Bushing Remover/Replacer Sets 8077A and 8077B

Remove and replace crankshaft bushings in a fraction of the time hydraulically! A few strokes of the pump handle removes or installs bushing with very little effort. Small actuating head fits in and around the crankshaft. Once the bushing is removed (or installed), a turn of the valve returns actuator for another cycle.

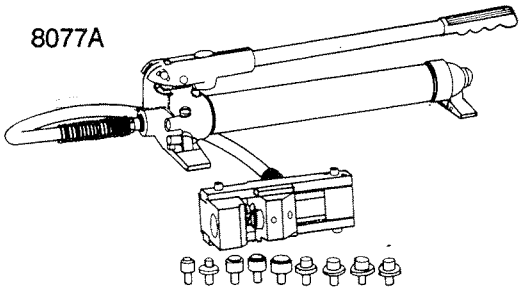
8077A includes:

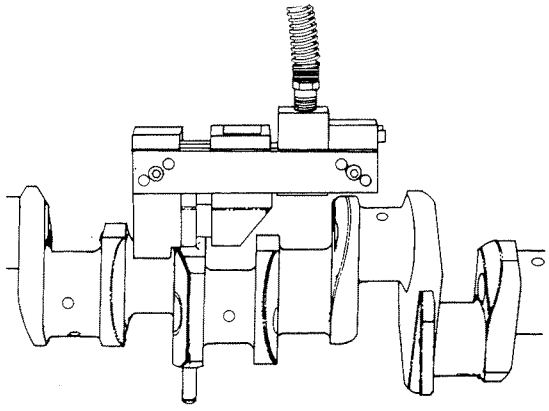
10,000 p.s.i. pump and cylinder; 5-ton output cylinder; 3-ft. long flex hydraulic hose; all adapters to fit 0-300 and 360, 470 and 520 Series.

8077B (less hydraulics) includes:

Items shown above in 8077A except no hydraulics are furnished. The actuator head has 1/4" NPT female port for connecting to your hydraulic hose.

8077A

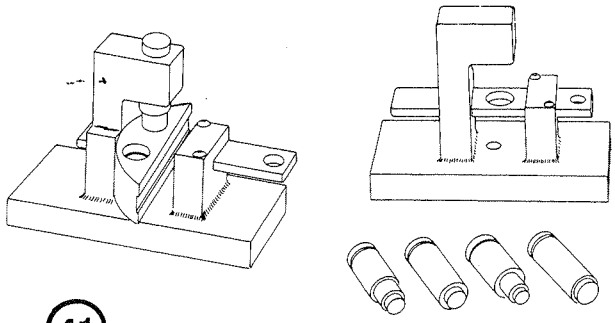




(40)

Counterweight Bushing Remover/Installer 8077C

Positive guide of all components assures perfect alignment. Includes adapters for O-300, 360, 470 and 520 Series engines.



(41)

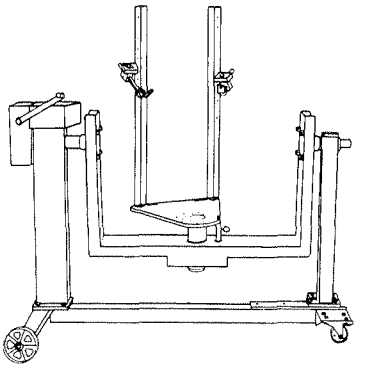
All Position Engine Stand

Assembly-Disassembly Transportation 8104

Designed to save time on the overhaul floor. Minimum attaching hardware allows complete engine accessibility.

Positive frame rotation (360°) locks in infinite number of positions simply by releasing handle. Engine mounting plate also rotates 360° and locks in place with heat-treated lock pin.

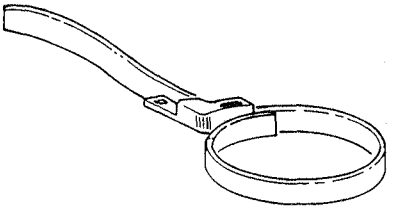
Flange holder is pre-drilled to accept all Continental engines. Threaded adapters included to mount non-flanged crankshafts. Shipping weight 400 lbs.



42

Tork Band Tension Adjuster 7726

Adjust belt tension without damage to components. Use on alternators, compressors, etc. Allows grabbing difficult round components.

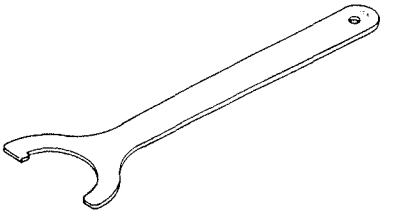


43

Generator Drive Holder

Hold drive gear for torquing or removing retaining nut.

4973 2.600" dia.
4973A 2.510" dia.



44

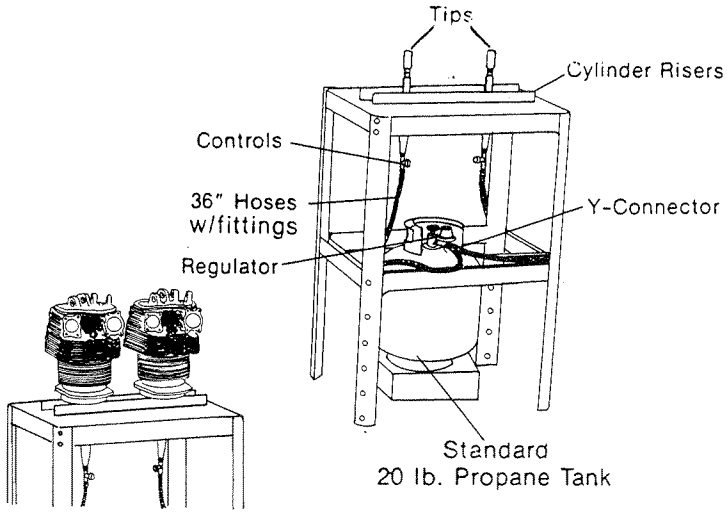
Cylinder Heating Stand 8156

In just 8-10 minutes, you can heat 2 cylinders simultaneously to 600°F. Or, you can heat one at a time (each tip is separately controlled).

Included with the 8156 Cylinder Heat Stand:

(2) Tips
(2) 36" Propane Hoses w/fittings
(1) Propane Regulator
(2) Controls
(1) Y-Connector
(1) Stand
(2) Cylinder Risers

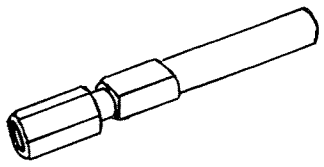
All screws, nuts and washers needed; and instructions.



45

Blind Needle Bearing 8093C Puller

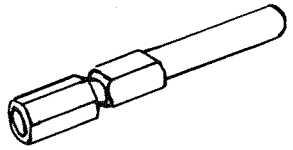
Use to remove 5/8" I.D. needle bearings in 470 and 520 Series engines. Use with 8054 Slide Hammer.



46

Starter Clutch Shaft Bearing Pullers

8093D for removing 3/4" I.D. bearings.

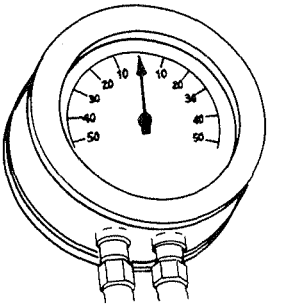


Use with 8054 Slide Hammer

47

Differential Pressure Gauge 5210

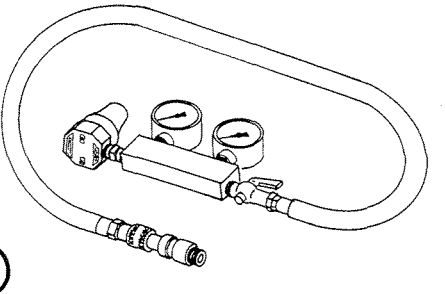
For turbo superchargers. A rugged, high precision gauge needed to set differential fuel measures. 50-0-50 psi, 4-1/2" dia. face, 1/4" pipe connection.



(48)

Differential Pressure 7251 Cylinder Checker

Use standard shop air pressure to check condition of rings, cylinder walls and valves.

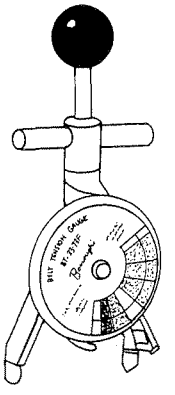


(49)

Belt Tension Gauge BT-33-73F (TSIO-520-BE uses BT-33-89P)

Set belt tension quickly and accurately to ensure maximum belt and bearing life. The proper belt-tension eliminates slippage and increases efficiency of belt-driven opponents. Compact- only 3 1/4" wide to fit in crowded areas. Easy to use- just apply gauge to belt, release ball handle and read tension on rotating dial.

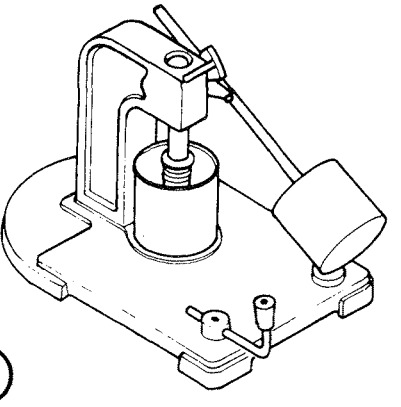
Calibrated for A-section V-belts (3/8" to 1/2" top width) and K-section (4,5, and 6 rib) poly-V belts. Range 30 to 180 lbs. and 130 to 800 newtons (dual scale).



(50)

Hydraulic Valve BT-60C Lifter Tester

For checking bleed down rate on hydraulic lifters. Hand input turns lifter as in actual use. Includes one gallon of BT-59 Test Oil (also available separately).



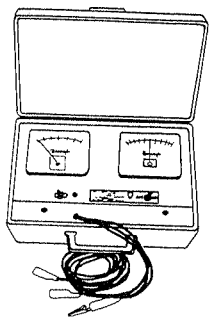
(51)

In-Aircraft Alternator/ Generator Tester 8091

Replace test bench. Uses aircraft's own engine to check systems and tests without component removal. Long leads permit tester to remain in cockput during testing.

* Voltage output
* Rotor
* Brushes
* Stator
* Field Input
* Diodes
* Windings

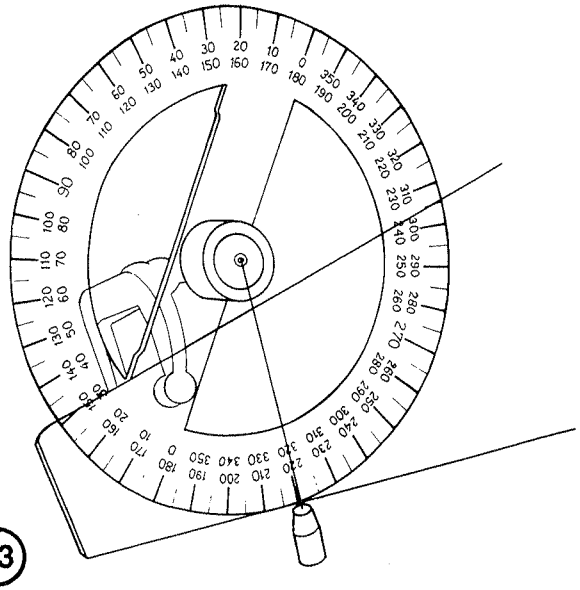
Features 0-30v DC voltmeter; 10-0-10 amp DC ammeter; circuit breaker protected. Two point hook-up- field term, and cigarette lighter.



(52)

Engine Timing Disc 3608A

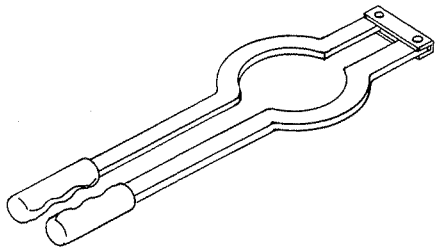
For all engines- universal application from J3 to DC3. Fastens to prop tip and accurate to ± 1/4 degree. Includes piston stop 3608A-15.



(53)

Pulley Holder 4974

For holding 2-1/2" to 3-1/2" dia. pulleys grip in pulley groove.

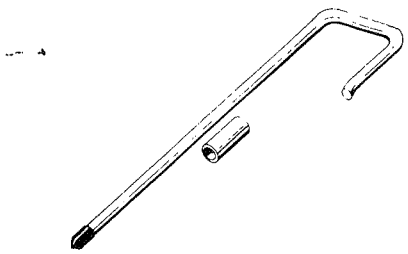


(54)

Pulley Alignment Gage Bar 8082

The 8082 gage bar allows a quick and easy alignment check between driver sheave and compressor sheave.

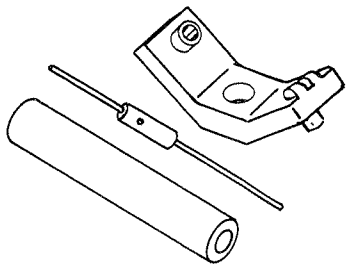
Used when installing air conditioning on models IO-520 and TSIO-520. Includes adapter sleeve for 1/2" v-belts.



(55)

Crankcase Drill Fixture 8094A
For Starter Clutch Adapter
Per Continental Bulletin 79-10

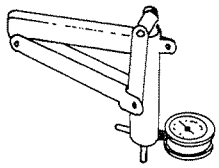
Modifies crankcase by drilling extra oil passage from rear main to starter bushing area.



(56)

Vacuum Pump 8334

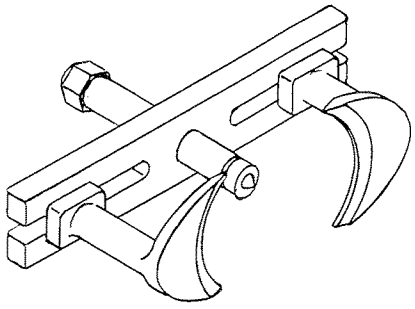
This new heavy-duty vacuum pump is designed for one-hand operation. Heavy steel wall; O-30 in Hg; nozzle fits several sizes of tubing.



(57)

Generator Pulley Puller 61-5

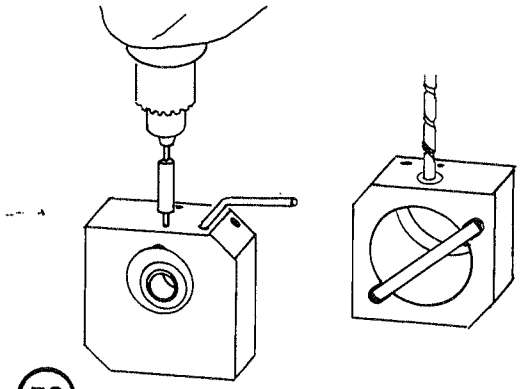
Quick removes pulleys from 2-1/2" to 5" diameter. Applies even pressure on outside of pulley in pulley groove. All components are tough, heat-treated alloy steel.



(58)

Bearing and Bushing 8094B
Drill Fixture
Per Continental Bulletin 79-10

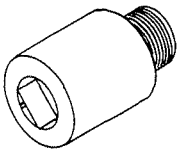
Use to reqork your present stock of main journal bearings and starter shaft bushings. Use Bearing Puller 8093B (see at right).



(59)

Spark Plug Insert Replacer 4918

Features 1/2" square drive. Use on all engines.

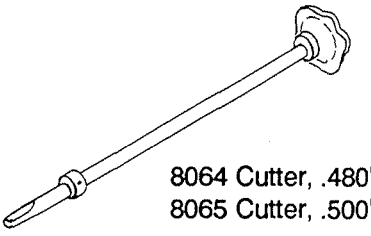


60

Thru-Bolt Bore Step Cutters

Per Continental Bulletin M77-9

Use to chamfer step in thru-bolt dowel boss prior to inserting improved thru-bolt with O-ring seal.

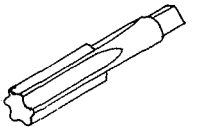


8064 Cutter, .480" dia.
8065 Cutter, .500" dia.

61

Spark Plug Insert Tap 504-1

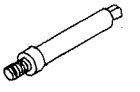
Use on all engines.



62

Spark Plug Insert Remover 4919

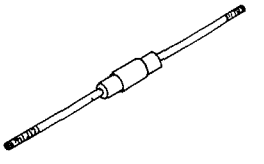
Use on all engines.



63

Slide Hammer 8054

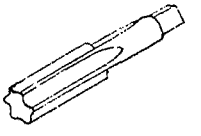
Heavy duty slide hammer features 2-1/2-lb. slide and 5/8"-18 thread. 24" long overall. Use with 8114 Series removers.



64

Spark Plug Tap 445

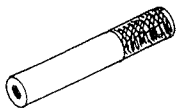
18 millimeter threads. High-speed steel.



65

Rosan® Lock Ring Installer
8074

Heat-treated, tough alloy steel. Knurled for sure grip. Approximately 4" long.

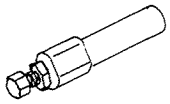


(66)

Stud Drivers

Six (6) different thread sizes:

505-1	1/4"-28	**505-5**	1/4"-20
505-2	5-16"-24	**505-6**	5/16"-18
505-3	3/8"-24	**505-4**	7/16"-20

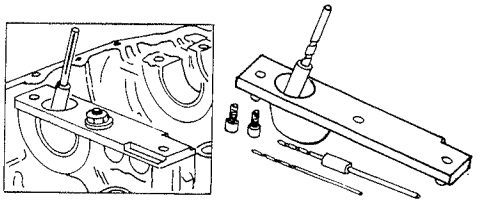


(67)

Drill Fixture
4978

For Scavenge Pump. Includes fixture and drills with pre-set stops

To modify 470 Scavenge Pump per Continental Bulletin M72-8.

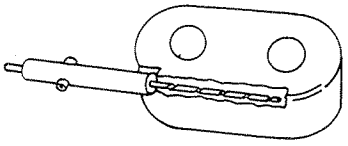


(68)

Drill Fixture
8025

For drilling and installing piston oil squirt nozzles in O-470V engines, converting to O-470VO per Continental Bulletin M75-13, IO-470 to IO-470OS.

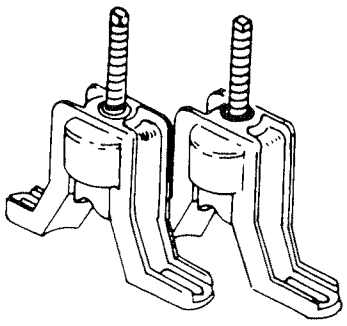
Includes all drills, drill bushings and stops required to a fast and efficient job.



(69)

Crankcase Splitter Set L423

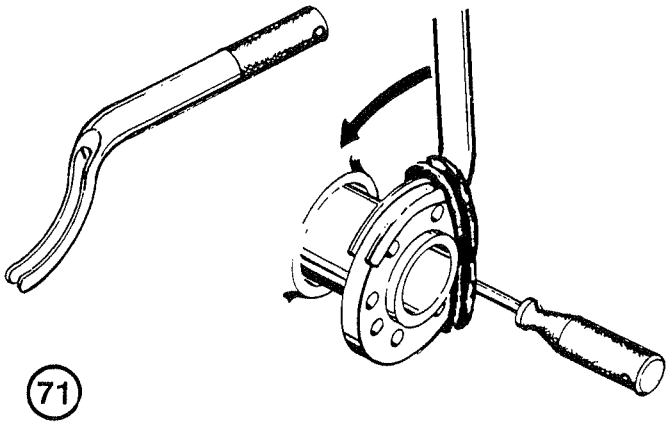
Makes splitting Continental crankcases easier and faster. Prevents crankcase damage. Puller assemblies bolt onto crankcase studs.



(70)

Propeller Shaft Oil Seal Installer 5209

For all flanged shafts. For installing one piece stretch seals without damaging sealing surfaces. Be sure to oil the seal before installing.

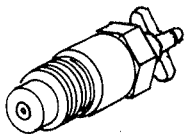


71

Oil Pressure Relief Spot Facers

Positive stop to prevent excess material removal. Cutter blades are heat-treated highspeed steel.

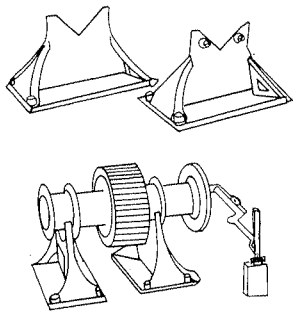
8048 Spot Facer for 470 and 520.



72

Runout Block Set 8177A

Use this set to check runout on crankshafts, etc. up to 4" diameter. Blocks are aluminum alloy with Teflon bearing surfaces. Approx. size: 4" w x 8" 1 x 5" h each.



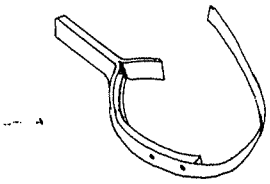
73

(Dial indicator not included)

Polishing Tools for Crankshafts Bearings

Special aluminum frame and felt polishing surfaces.

8087A 1-7/8" to 2-1/4" dia.
8087B 2-1/4" to 2-5/8" dia.



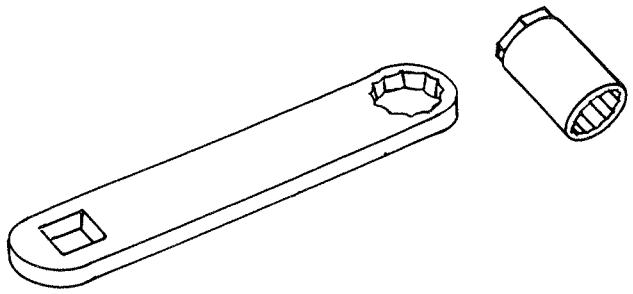
74

Injector Nozzle Remover and Installer 8165

This tool allows you to remove, install and tighten injector nozzles located close to intake parts on Piper Aircraft. Torque Wrench extension allows use of 3/8" square drive torque wrench to tighten nozzles to proper specifications.

Torque wrench extension is made of heat-treated steel for durability. Torque input and output is marked on extension.

Installer is special, thin-walled 6-pt. 1/2" hex socket.

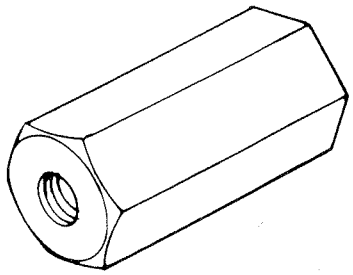


(75)

Crankcase Thru-Bolt Removers

Use with 8054 Slide Hammer to remove stubborn bolts.

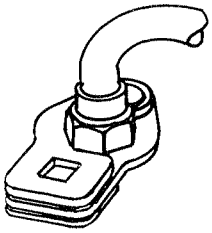
8114-8 Remover, 1/2"-20 threads
8114-7 Remover, 7/16"-20 threads
8114-6 Remover, 3/8"-24 threads

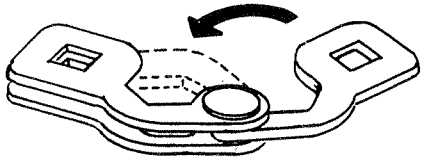


(76)

Hex Drive for Hex Tube Nut 7912A

Tubing nut wrench set for fuel systems, hydraulic systems and brakes.

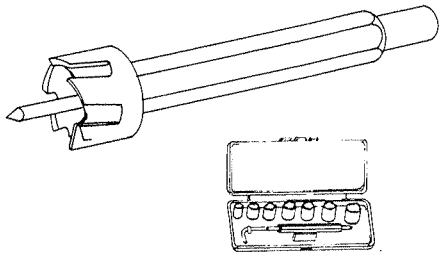




(77)

Rotabroach Cutters 7710

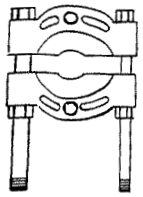
These cutters cut faster and cleaner than twist drills with only a fraction of the power and effort.



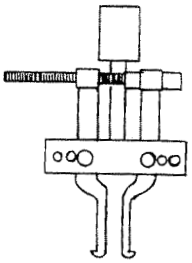
(78)

Pullers

These pullers provide a more controlled method to remove press-fit parts.

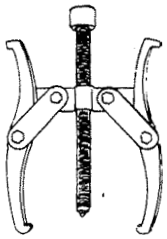


1153

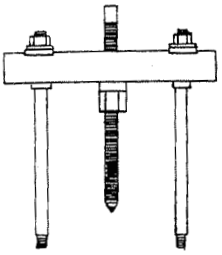


679

79

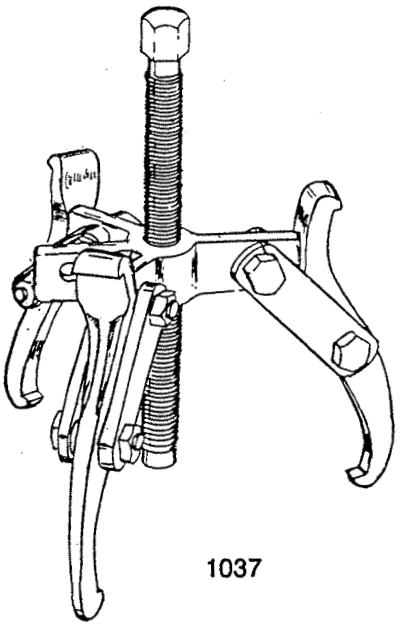


1035



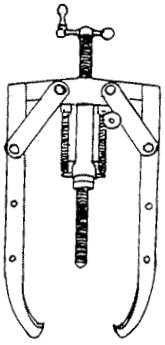
927

80

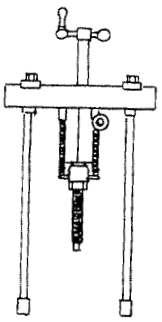


1037

81

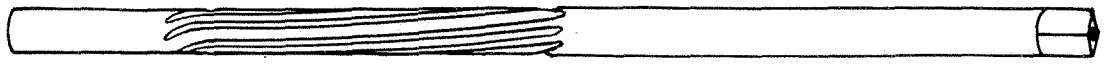


1079



1063

82



(88)

Reamers, Rocker Shaft Support Boss

4903-1- .645" Roughing (.609" Pilot)
4903-2- .680" Roughing (.643" Pilot)
4903-3- .703" Finishing (Use with 4903-1 & 4903-2) (.678" Pilot)
4903-4- .708" Finishing (Use with 4903-1 4903-2 & 4903-3) (.701" Pilot)
4903-5- .723" Finishing (Use with 4903-1, 4903-2, 4903-3 & 4903-4) (.706" Pilot)

NOTE: 5129 SERIES ARE FOR STRAIGHT VALVE ENGINES ONLY.

5129-1- .753" Roughing (.718" Pilot)
5129-2- .788" Roughing (.751" Pilot)
5129-3- .813" Finishing (Use with 5129-1 & 5129-2) (.786" Pilot)
5129-4- .818" Finishing (Use with 5129-1 & 5129-3) (.815" Pilot)
5129-5- .833" Finishing (Use with 5129-1, 5129-2, 5129-3 & 5129-4) (.815" Pilot)

Reamer, Rocker Arm & Shaft Bushing

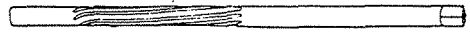
4905- .609" Std. (.594" Pilot)

Reamer, Rocker Shaft Bushing

5130- .751" Std (.707" Pilot)

Reamer, Rocker Arm Bushing

7232- .751" Std. (.732" Pilot)

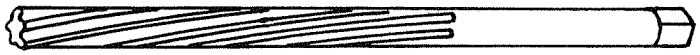


(89)

Reamers, Valve Guide Boss

Use at 275 RPM maximum

		USE MORSE ADAPTER
4914-1HS — .537"	.005" O.S. (.531" Pilot)	2689
4914-2HS — .542"	.010" O.S. (.534" Pilot)	2689
4914-3HS — .552"	.020" O.S. (.539" Pilot)	2689
4914-4HS — .547"	.015" O.S. (.539" Pilot)	2689
4914-5HS — .561"	.030" O.S. (.549" Pilot)	2689
4943-1HS — .631"	.005" O.S. (.624" Pilot)	2693
4943-2HS — .636"	.010" O.S. (.628" Pilot)	2693
4943-3HS — .646"	.020" O.S. (.633" Pilot)	2693
4943-4HS — .641"	.015" O.S. (.631" Pilot)	2693
4943-5HS — .656"	.030" O.S. (.645" Pilot)	2693



(90)

Engine Application Chart For Valve Guide Stem Hole Reamers

REAMERS				USE MORSE ADAPTER NO.
CARBIDE-TIPPED	HIGH-SPEED STEEL	CUTTING DIA.	PILOT DIA.	
2847-2CP	2847-2HP	.438	.422	2686
4913-1CP	4913-1HP	.344	.331	2684
4913-1CP	4913-1HP	.344	.331	2684
3606-CP	3606-HP	.375	.363	2684
2847-2CP	2847-2HP	.438	.422	2686
2847-1CP	2847-1HP	.436	.422	2686

Adapt square Shank Reamers to No. 2 or 3 Morse Taper

Part No.	Morse O.D.	Shank	Flats
2684	2	.323"	.242"
2686	3	.367"	.275"
2689	3	.480"	.360"
2693	3	.590"	.442"

4104 Reducer Sleeve, No. 2 Morse I.D. to No. 3 Morse O.D. sleeve only-will not fit reamer shank.

NOTE.....DO NOT use high-speed reamers on ni-resist guides.

(91)

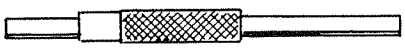
Suggestions For Reaming Valve Guide Stem Holes

1. Use high quality cutting oil.
2. Reamers are made to cut right hand only-**do not** turn backwards even a partial turn!
3. If using power, run high-speed reamers at 400 RPM maximum, and carbide-tipped at 700 RPM maximum. High-speed steel reamers for hand cutting.
4. The #5221B universal cylinder holding fixture is recommended for stem hole reaming, using a drill press or vertical mill.

Plug Gauges, Valve Guide Stem Hole

Go and No-go Gauges are used to check for new limits (and service limits where applicable). Gauges are heat-treated alloy steel, precision ground.

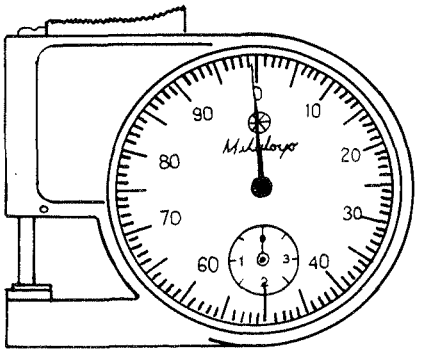
2848-1- .436" I.D. Guide
2848-2- .438" I.D. Guide
3615- .375" I.D. Guide



(92)

*Dial Thickness Gage

For use in measuring wall thickness in hard to reach areas.

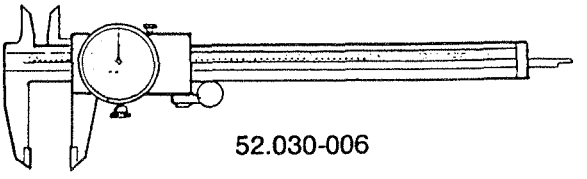


7308

(93)

*Precision Vernier Calipers

Precision Vernier instruments offer a wide range of precise tools for measuring accurately in thousandths of an inch. These include Vernier Calipers and Vernier Height gages in both the English and Metric Measure.



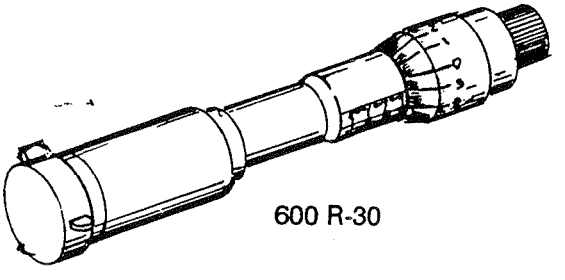
52.030-006

(94)

*Inside Measuring Instruments

Three measuring surfaces are lapped parallel to the longitudinal axis of the Micrometer, and stay aligned with the bore while measurements are taken.

Large ratchet stop provides constant measuring pressure to the wall surface, and insures repetitive reading to .0002" or .0001" (smaller ranges).



600 R-30

(95)

*NOTE: All precision measuring devices must have a current calibration that is traceable to the National Bureau of Standards.

*Alternator Analyzer

Voltage Regulator Tester

For field or bench use

* Designed to pinpoint developing problems before a total system breakdown occurs.

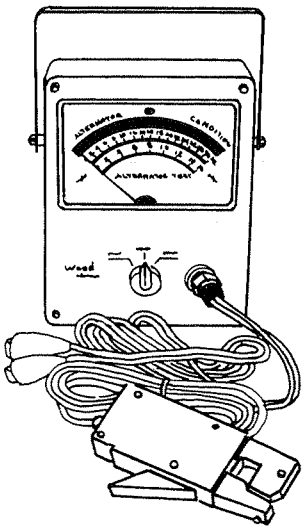
* Oscilloscope type performance with easy to use "ok" or "Defective" presentation.

* Detects failing diodes before normal indications occur.

EASY TO USE

* Inductive probe clamps over wire for alternator ripple test.

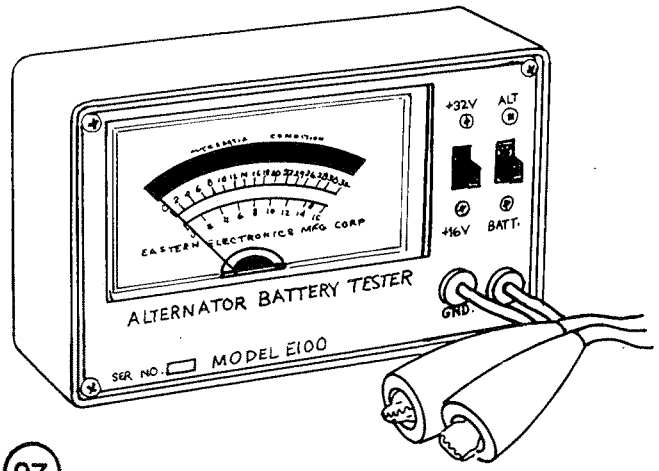
* Voltage regulator test leads clip on alternator output terminal and engine ground.



96

*Alternator/Regulator/ Battery Tester Model E100

Designed to test alternators, regulators, batteries on 12 and 24 volt systems with currents up to 32 volts DC. Has a pointer zero adjustment screw on the face of the instrument. Circuitry is entirely solid state and no battery or power source is required. Power for the unit is derived from the systems under test.

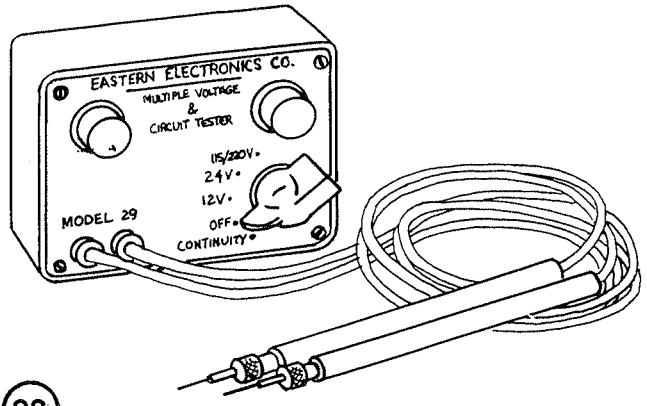


97

*Multiple Voltage & Circuit Tester For 12 & 24 Volts Model 29

Designed to test continuity of circuits, shorts, diodes, live circuits both low and high voltage in aircraft ignition and electronic equipment. Reads both AC and DC in all positions. Has easy-to-see bright red signal lights, with bulbs replaceable by unscrewing lenses of face of tester.

***WARNING . . . Keep equipment and personnel clear of prop area.**

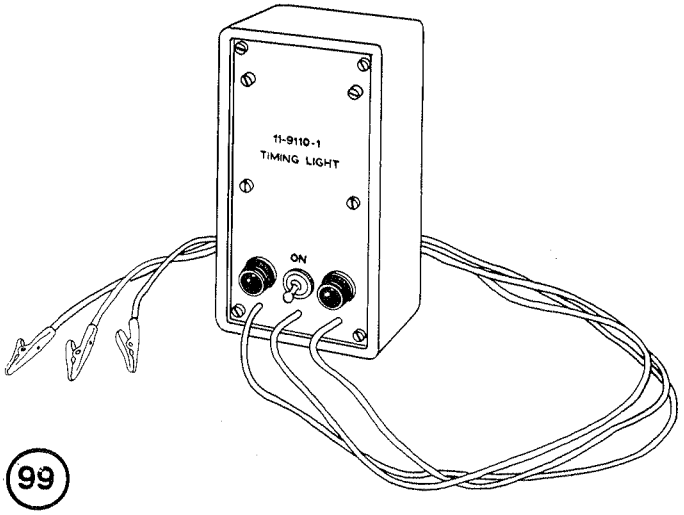


98

*Aircraft Magneto Timing Light

P/N 11-9110-1

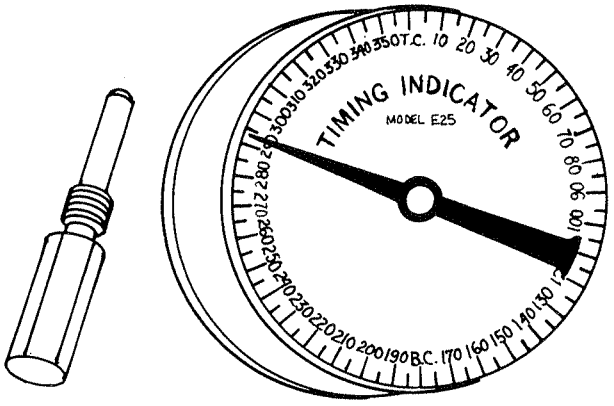
Designed for internal timing of "E Gap" and mag-to-engine timing. Precision solid state oscillator circuit sees coil primary winding as high impedance while checking continuity through contact points. When points open lights go out. Built rugged for years of reliable service. Uses four C-cell flashlight batteries.



99

*Aircraft Timing Indicator Model E25

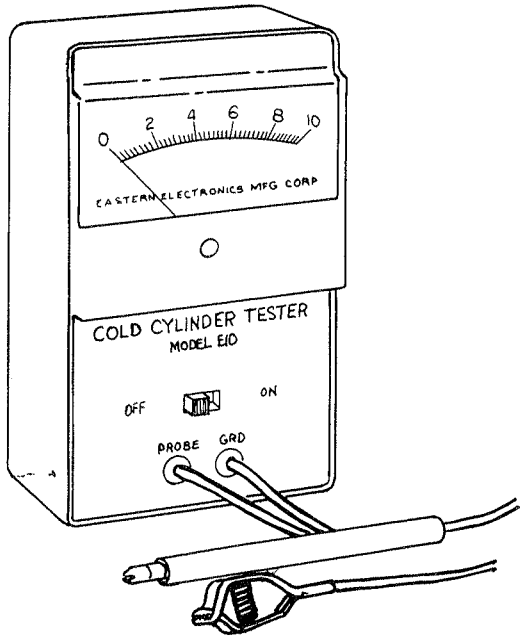
Improves the accuracy and speeds up the process of timing an aircraft magneto to the engine. Easily attached to the propeller spinner with mounting bands. Has top dead center locator.



100

*Cold Cylinder Test Model E10

Attach one wire with an alligator clamp and use another cable with a hand-held probe to test comparative temperatures from cylinder to cylinder in a matter of seconds. Spot source of rough running, mag drop or loss of power in a matter of minutes.



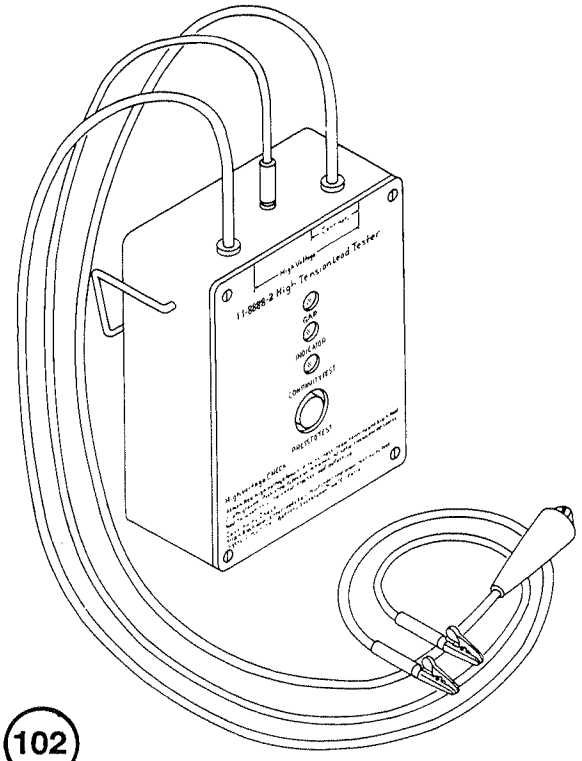
***WARNING . . . Keep equipment and personnel clear of prop area.**

101

High Tension Lead Tester Kit

P/N 11-8950-2

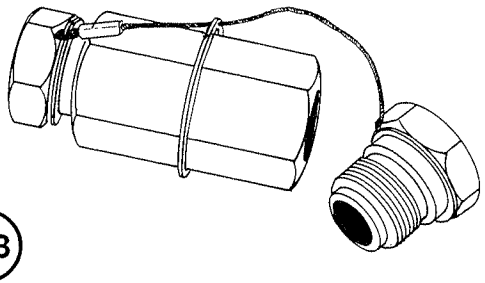
Designed for quick and simple troubleshooting of shielded ignition leads. Accurate on even the longest leads, high voltage pulses test insulation for leak. Built-in continuity lamp provides handy test of electrical connections. Uses two c-cell flashlight batteries. Includes top grain cowhide carrying case.



102

Master Orifice Tool
P/N 646953

Attach to differential cylinder pressure tester to check calibration and determine the low leakage limit. (Ref. TCM Service bulletin M84-15).



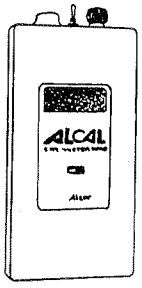
103

CYLINDER HEAD TEMPERATURE
EXHAUST GAS TEMPERATURE
TEST UNITS

*Alcor Portable Digital EGT Unit

For use with Type "K" Thermocouple. This device is lightweight 9 volt LCD unit, with a disposable battery.

Temperature Range 1000°-1800°F.



Part Number 85328

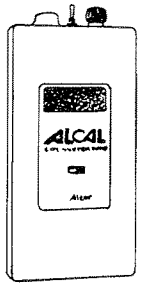
104

*Alcor Portable Digital CHT Unit

This device is used with Type "J" Thermocouple. It is a lightweight 9 volt LCD unit, with disposable battery.

Temperature Range 200°-600°F.

Indication from 32°-600°F.



Part Number 85329

105

***WARNING . . . Keep equipment and personnel clear of prop area.**

CHAPTER 3

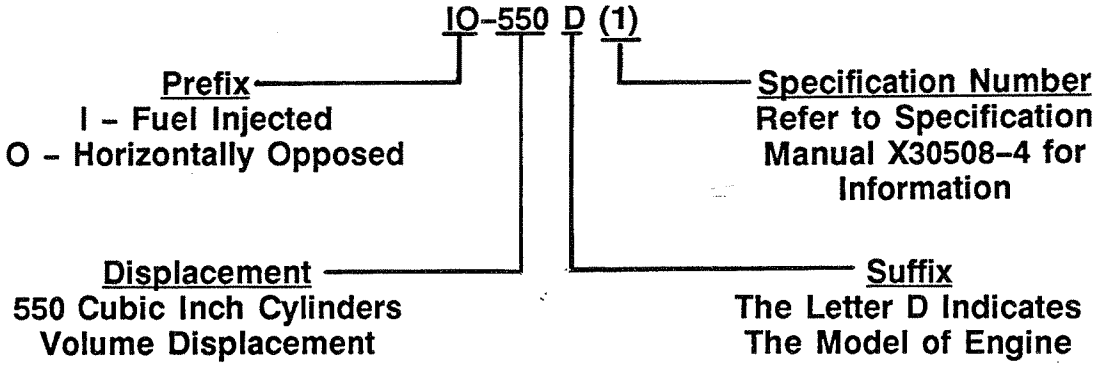
DETAILED ENGINE DESCRIPTIONS

Section Index

3-1 DESCRIPTION OF ENGINE MODEL CODE

Detailed Engine Description

Example:



3-2 BASIC DESIGN FEATURE

The IO-550D,E,F,L Series sandcast engines are air cooled, having six horizontally opposed, overhead, inclined valve cylinders. The cylinder displacement of 550 cubic inches is achieved with a 5.25 inch bore and 4.25 inch stroke. The IO-550D,E,F,L Series sandcast engines are naturally aspirated, Fuel Injected and have an 8.5 to 1 compression ratio. The crankshaft is equipped with pendulum type counterweight dampers that suppress torsional vibrations.

The IO-550D,E,F,L Series sandcast engines have a doweled six bolt hole configuration propeller flange. A mounting pad is provided on the lower forward 2-4-6 side crankcase to utilize a hydraulic controlled governor for the constant speed propeller.

The IO-550D,E,F,L Series sandcast engines are provided with a wet oil sump and high pressure oil system. The positive displacement oil pump is located on the lower aft portion of the crankcase. The desired oil pressure is maintained by a pressure relief valve located in the oil pump housing.

On the left side crankcase between cylinders #2 and #4 a .125-27 NPTF tapped oil pressure connection is provided to monitor oil pressure. On the oil cooler adapter a .625-18 NF tapped port is provided for the measurement of oil temperature and a .625-18 NF Plug is provided on the bottom of the sump for oil drainage.

Engine cranking is accomplished by a geared right angle drive starter adapter and a direct current starter motor. The engines have provisions for a belt driven alternator and are equipped with two gear driven magneto's. The exhaust systems are supplied by the airframe manufacturer.

3-3 LUBRICATION SYSTEM

Oil is drawn from the sump through the suction tube to the intake side of the engine gear driven oil pump. From the outlet side of the pump, oil is directed to the oil filter chamber and tachometer drive gear. A filter by-pass valve is incorporated in the pump housing in the event that the filter becomes clogged.

After leaving the pump, oil is directed through passages to the right crankcase oil gallery. Cylinder number 1,3, and 5 intake and exhaust tappets are lubricated by oil coming from passages leading off this gallery. An oil temperature control valve is located at the front end of the right oil gallery to regulate oil temperature within specific limits. When oil reaches a temperature high enough to require cooling, the control valve expands and directs oil to the cooler. From the oil control valve cavity, oil is directed to the foward camshaft bearing. A groove in the camshaft transfers the flow of oil to a passage in the left crankcase which is then directed to the left oil gallery.

Oil is directed to the governor drive bearing and propeller governor through passages off the left oil gallery. Control oil from the governor is channeled to the crankshaft oil transfer collar, which directs it to the crankshaft interior and on to the propeller.

Passageways from the left oil gallery direct oil to the main bearings and 2,4,6 side valve tappets. Four drilled passages, radiating from the rear main bearing conduct lubricating oil to the fuel pump drive, right and left magneto drives, accessory drives and to starter shaftgear. An intersecting passage directs oil to the idler gear support.

The pistons are cooled and cylinder walls lubricated by means of squirt nozzles which direct a stream of oil on the inner dome of each piston. These nozzles are fed by a groove cut in the main bearing saddles.

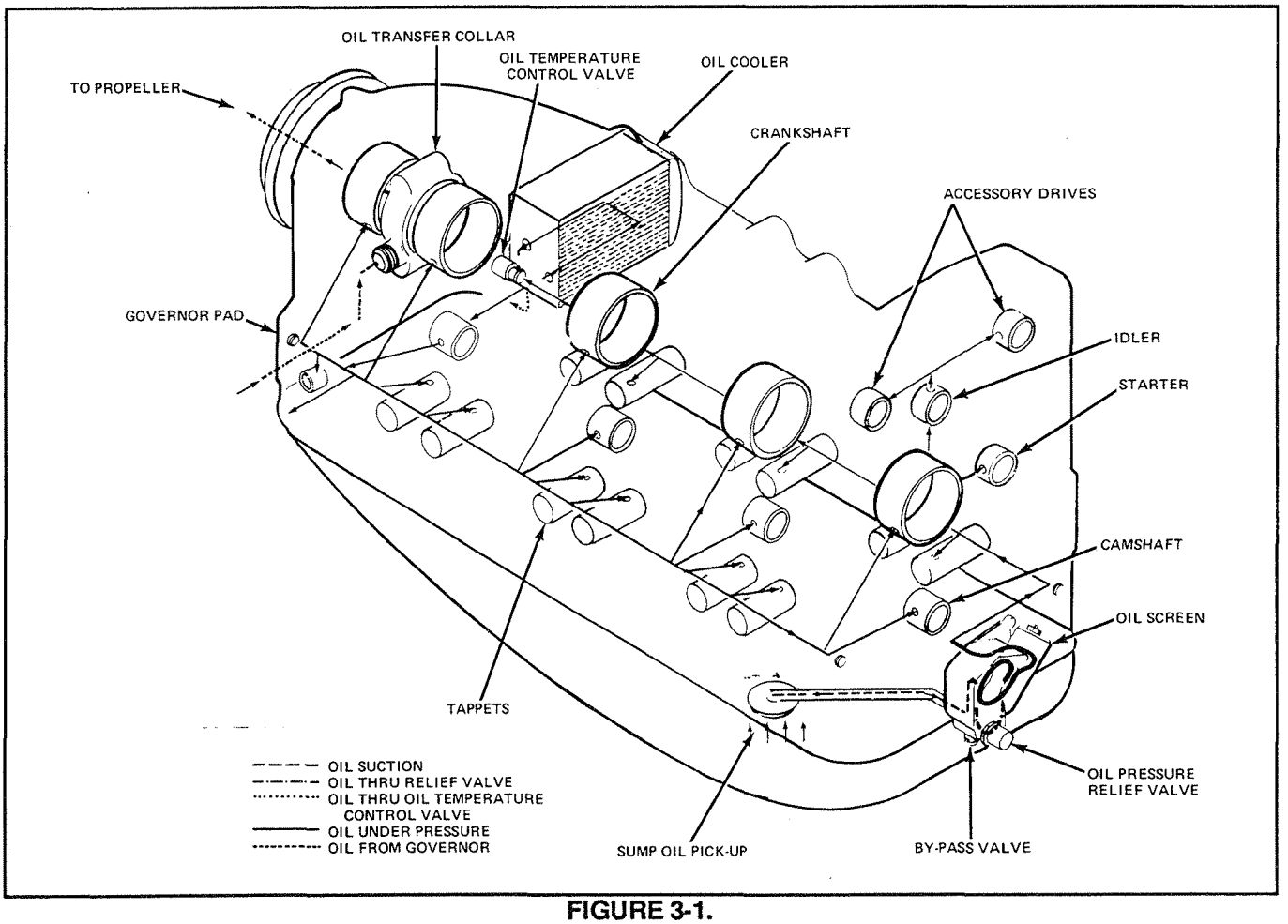


FIGURE 3-1.
LUBRICATION SYSTEM

3-4 INDUCTION SYSTEM

The air induction system used on the IO-550 Series Engines consists of intake tubes, a balance tube, connecting hoses, clamp assemblies and a combination air throttle and fuel metering control. The air throttle assembly may be located at the rear of the engine support by brackets, or below the oil sump supported by an inverted manifold assembly. The intake manifold and balance tube are mounted below the cylinders. The intake duct and filter are provided by the aircraft manufacturer.

3-5 IGNITION SYSTEM

Conventional twin ignition is provided by two magnetos. The left magneto fires 1-3-5 lower and 2-4-6 upper spark plugs, while the right magneto fires the 1-3-5 upper and 2-4-6 lower spark plugs.

Torque from the engine crankshaft is transmitted through the idler gear to the magneto drive gear. The magneto drive gear incorporates rubber bushings that engage the magneto impulse coupling. As the rubber bushings in the drive gear turns the coupling drive lugs, counterweighted latch pawls, inside the coupling cover, engage a pin on the magneto case and hold back the latch plate until it is forced inward by the coupling cover. When the latch plate is released, the coupling spring spins the magneto shaft through its neutral position and the breaker opens to produce a high voltage surge in the secondary coil. The spring action permits the latch plate, magneto and breaker to be delayed through a lag angle of 30 degrees of drive gear rotation during the engine cranking period. Two stop pins in the case and two lobes on the breaker cam produce two sparks per revolution of the drive shaft. After the engine is started, counterweights hold the latch pawls clear of the stop pins and the magnet shaft is driven at full advance.

In engine models which employ the retard breaker system, the left magneto incorporates dual breakers which retard ignition spark during engine cranking. During the engine cranking period the right magneto is grounded and is inoperative. The retard breaker, in the left magneto, is actuated by the same cam as the main breaker, and is located so that its contacts will open at a predetermined number of degrees after the main breaker contact opens. A battery-operated starting vibrator furnishes electrical current to the magneto for retarded ignition starting regardless of engine cranking speed. The retarded ignition is in the form of a "shower of sparks" instead of a single spark as obtained from the impulse coupling magneto. When the engine starts and the ignition start switch is released to return to its "BOTH" position, the vibrator circuit and the retard breaker circuit become inoperative and both magnetos fire at full advance position.

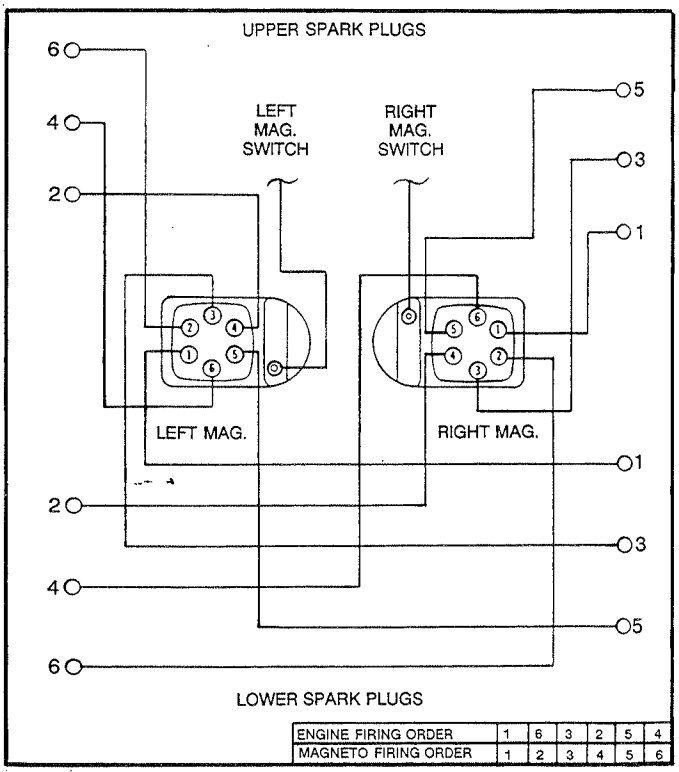


Figure 3-2.
IGNITION WIRING DIAGRAM

3-6. FUEL SYSTEM

WARNING. . . The use of a lower octane fuel than specified can result in destruction of an engine the first time high power is applied. This would most likely occur on takeoff. If the aircraft is inadvertently serviced with the wrong grade of fuel, then the fuel must be completely drained and the tank properly serviced.

Fuel (Min. Grade)) . . . . . .Aviation Grade 100 or 100LL

The TCM fuel injection system is of a multi-nozzle continuous flow type. Fuel flow to the cylinders is controlled by air throttle position, engine speed, mixture lever position and the altitude compensation feature in the fuel pump. A manual mixture control and a pressure gage indicating metered fuel flow are provided for precise leaning at any combination of altitude and power setting.

The continuous flow system permits the use of a typical rotary vane pump with integral relief valve in place of a much more complex and more expensive plunger type pump. The relief valve maintains maximum fuel flow under full power conditions. With this system there is no need for an intricate mechanism for timing injection to the engine.

The fuel injector pump is equipped with a vapor separator where the vapor is separated from the liquid fuel by swirling action and returned to the fuel tank. The fuel injector pump forces liquid fuel into the fuel metering assembly. Fuel flow is controlled by an Altitude Compensation Feature on the E, F and L models.

The air throttle assembly includes a butterfly valve which controls the amount of air entering the intake manifold. This valve is controlled by a lever which is connected to the aircraft throttle control.

The fuel control assembly contains a metering valve and a mixture control valve. The metering valve is linked to the air throttle valve lever. The mixture control valve is linked to the cockpit mixture control. The fuel control by-passes excess fuel back to the fuel injector pump inlet port.

The fuel manifold valve contains a diaphram chamber and outlet ports which connect to the fuel injector lines. The spring-loaded diaphragm works with a ported plunger which distributes the precise amount of fuel, through fuel injector lines, to the fuel injector nozzles in the cylinders. Ambient air is used to vent the nozzles.

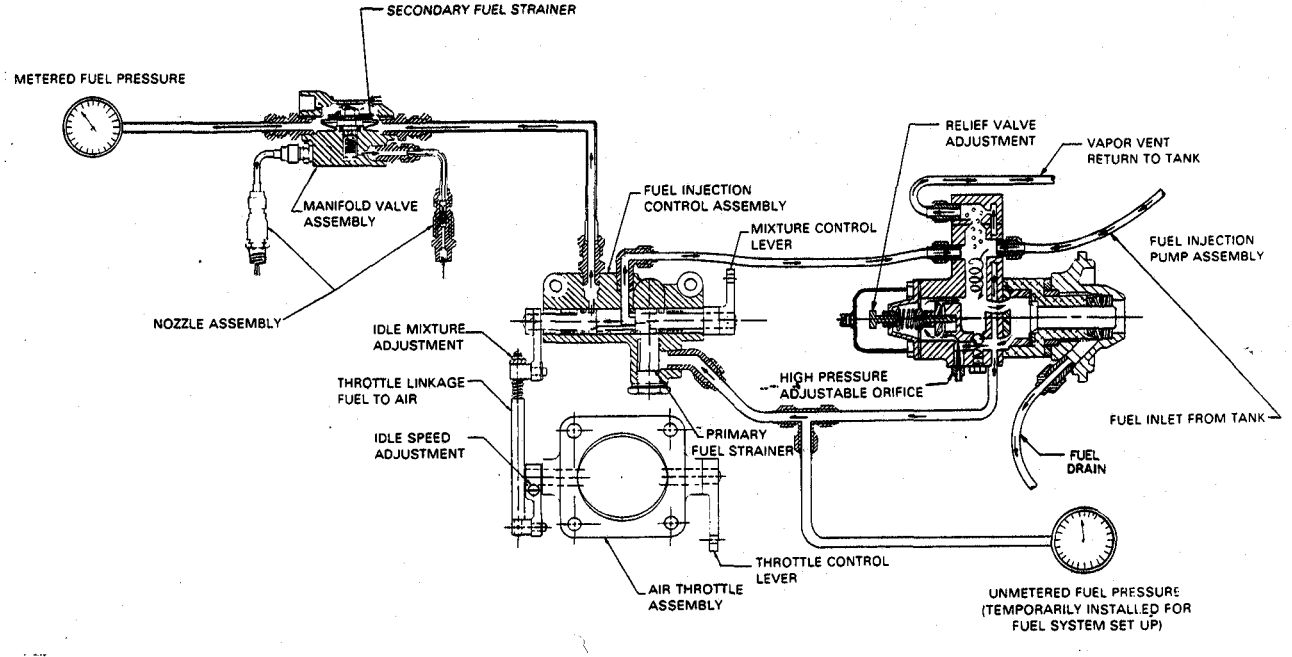


FIGURE 3-3.
FUEL SYSTEM SCHEMATIC

3-7. CYLINDERS

The six separate engine cylinder assemblies are air cooled, two valve, twin spark plug, hemispherical combustion chamber, aluminum head, steel cylinder barrel units of typical aircraft engine design. The cylinder head is screwed and shrunk onto the cylinder barrel which results in a gas tight fit without the use of gaskets or heavy cylinder head bolts. Valve seats and guides are also shrunk into the cylinder head at the time the barrel is fitted. Spark plug threads are protected by the use of replaceable helical coil inserts.

3-8. VALVE TRAIN

Exhaust valves are faced with a special heat and corrosion-resistant material and the valve stems are chromed for wear resistance. Oil fed to the hydraulic valve tappets, under pressure from the main galleries, lubricates the tappet guide surfaces and fills the reservoirs inside the tappets. Oil from the tappets flows through the pushrods to the rocker arms. Each rocker arm directs a portion of its oil through a drilled orifice toward the respective valve stem. Oil is returned to the crankcase through the pushrod housings, which are sealed to the cylinder head and crankcase by rubber seals. Drain holes in the crankcase tappet bores direct returning oil to the sump.

CHAPTER 4

ENGINE SPECIFICATIONS AND OPERATING LIMITS

Section Index

4-1 GENERAL

The operating limits and specifications listed in this section are applicable to the IO-550 aircraft engine. Consult Chapters 6 and 7 for additional operating procedures.

4-2 ENGINE SPECIFICATIONS

Manufacturer . . . . . Teledyne Continental Motors

Model IO-550D,E,F,L

Cylinders

- Arrangement . . . . . Individual air cooled cylinders in a horizontally opposed position.
- Bore (Inches) 5.25
- Stroke (Inches) 4.25
- Piston Displacement (cu. in.) 550
- Compression Ratio 8.5:1
- * Cylinder Head Temperature Maximum Allowable . . . . . 460°F
- Number of Cylinders 6

NOTE:
* Indicates temperature measured by Bayonet Thermocouple, (Aeronautical Standard AS234 Element or equivalent), installed in boss in bottom of cylinder head.

Cylinder Numbering (From accessory end toward propeller end):

- Right Side Cylinders 1-3-5
- Left Side Cylinders 2-4-6
- Firing Order 1-6-3-2-5-4

Dimensions	IO-550D	IO-550E	IO-550F	IO-550L
Length	36.74 In.	43.91 In.	40.91 In.	40.91 In.
Width	33.56 In.	33.56 In.	33.56 In.	33.56 In.
Height	36.74 In.	19.75 In.	19.75 In.	23.25 In.

Engine Weight - Dry (No oil in sump)

Complete Engines Includes:

Crankcase assembly, crankshaft assembly, camshaft assembly, valve drive train, cylinder assemblies, piston & connecting rod assemblies, oil sump assembly, intercylinder baffling, alternator, starter, starter adapter assembly, lubrication system (includes oil filter and oil cooler), accessory drives, ignition system (includes spark plugs), fuel injection system (includes starting primer), induction system, exhaust system, all engine to engine attaching hardware, hoses clamps and fittings.

DOES NOT include:

Outer cylinder baffling, prop governor, airframe to engine control cables, attaching hardware, hose clamps and fittings.

Total Engine Dry Weight with Accessoires

IO-550-D	463.20 Lbs.
IO-550-E	480.50 Lbs.
IO-550-F	454.00 Lbs.
IO-500 L	454.00 Lbs.

(Subject to product variation of + 2.5%.)

Brake Horsepower
- Rated Maximum Continuous Operation 300
- Recommended Maximum for Cruising 225

4-3 OPERATING LIMITS

Crankshaft Speed - RPM
- Rated Maximum Continuous Operation 2700
- Recommended Max. for Cruising (75% Power) 2500

Intake Manifold Pressure (In. Hg.)
- Maximum Take-Off . . . . . .Full Throttle
- Maximum Continuous . . . . . .Full Throttle
- Recommended Continuous Max. for Cruising . . . . . See Performance Chart

Fuel Control System . . . . . .Continental Continuous Flow Injection

Unmetered Fuel Pressure (P.S.I.G.)
- Idle (600 RPM) . . . . . .8.0 - 10.0
- Take-off . . . . . 33 - 36

Fuel-Avia. Gasoline-Min. Grade . . . . . .100LL (Blue) or 100 (Green)

Oil Specification . . . . . .(Refer to Chapter 9 for Spec. MHS-24B
- All Temperatures 20W-50 15W-50
- Below 50°F Ambient (Sea Level) . . . . . .SAE 30 or 10W-30
- Above 30°F Ambient (Sea Level) . . . . . .SAE 50

Oil Pressure
- Idle, Minimum, psi 10
- Normal Operation, psi . . . . . .30 to 60

IO-550D
Oil Sump Capacity (U.S. Quarts) 12
- Usable Oil - Quarts 20° Nose Up 7.0
- Usable Oil - Quarts 15° Nose Down 6.0

IO-550E
Oil Sump Capacity (U.S. Quarts) 12
- Usable Oil - Quarts 15° Nose Up 8.0
- Usable Oil - Quarts 5° Nose Down 8.0

IO-550F
Oil Sump Capacity (U.S. Quarts) 12
- Usable Oil - Quarts 20° Nose Up 7.0
- Usable Oil - Quarts 15° Nose Down 6.0

IO-550L
Oil Sump Capacity (U.S. Quarts) 10
- Usable Oil - Quarts 20° Nose Up 7.8
- Usable Oil - Quarts 15° Nose Down 6.7

Oil Consumption (Lb./BHP/Hr. Max. at rated power and RPM) . . . . . $\frac{.006 \times \%\ \text{Power}}{100}$

Oil Temperature Limits
- Minimum for Take-Off . . . . . 75°F
- Maximum Allowable . . . . . .240°F
- Recommended Cruising . . . . . .170°F

Ignition Timing (Compression stroke, breaker opens)
- Right Magneto, degrees BTC . . . . . 22°
- Left Magneto, degrees BTC . . . . . 22°

4-4 ACCESSORIES

Magnetos (IO-550-D&E) . . . . . .TCM (S1200 Series)

Magnetos (IO-550-F&L) . . . . . Slick Electro (6210)
. . . . . .TCM (S1200 Series) Optional

Ignition Harness
(IO-550-D&E) . . . . . TCM (5MM)
(IO-550-F&L) . . . . . Slick Electro (5MM Sheilded)
. . . . . TCM (5MM) Optional

Spark Plugs . . . . . 18MM X .750-20 Thd. Connection (FAA Approved)
Champion . . . . . RHB32E (TCM Part No. 634675)

Oil Cooler
IO-550-D,E&F . . . . . .TCM (Modine)
IO-550-L . . . . . Customer Supplied

Alternator . . . . . Customer Supplied
. . . . . .Prestolite 24V 70 AMP (Optional)

Starter . . . . . .TCM (24 Volt)

Fuel Injection System . . . . . .TCM

Quick Start Primer
IO-550-E . . . . . .TCM

ACCESSORIES DRIVE RATIOS TO CRANKSHAFT (Viewing Drive)

Accessory	Direction of Rotation *	Drive Ratio to Crankshaft
Tachometer	Optional	.5:1
Magneto	CCW	1.5:1
Starter	CCW	32:1
Alternator (Belt Dr.)	CCW	2:1
** Propeller Gov.	CW	1:1
Fuel Pump (Injection)	CW	1:1
Accessory Drives (2)	CW	1.5:1

* "CW" - Clockwise and "CCW" - Counterclockwise

** This drive is a modified AND20010 and is supplied with cover plate only.

CHAPTER 5

UNPACKING, INSTALLATION, TESTING AND REMOVAL

Section Index

5-1 UNPACKING

Packaging Category "A" (Cardboard Container)

1. Cut steel banding straps securing the container. (Use caution as straps may spring loose when cut.)

2. Remove the staples from the base of the cardboard cover.

3. Lift cardboard cover veritcally and remove.

4. Attach a hoist to the engine lifting eye, located at the top of the crankcase backbone. Take up slack on the hoist, then cut the steel banding straps holding the engine to the base. (Use caution as straps may spring loose when cut.) Lift the engine, vertically and install on a transportation stand or dolly.

Packaging Category "B" (Wooden Container)

1. Remove the four (4) lag screws attaching the wooden cover to the base.

2. Lift the wooden cover vertically and remove.

3. Open the moisture proof plastic bag.

4. Attach a hoist to the engine lifting eye located at the top of the crankcase backbone. Take up slack on the hoist, prior to loosening the engine mount bolts; then remove the bolts from the shipping shock mounts. Leave the engine vertically and install on a transportation stand or dolly.

5-2 PREPARATION FOR SERVICE

If the engine is **not** to be installed within five (5) days after unpacking, it should be represerved in accordance with procedures listed in Chapter 11.

If the engine is to be installed within five (5) days after unpacking, remove the shipping plugs installed in the lower spark plug holes and turn the crankshaft through at least two complete revolutions in order to remove the cylinder preservation oil from the cylinder. Remove the shipping plugs installed in the upper spark plug holes and inspect the cylinder bores with a flashlight or borescope for rust or contamination. Contact your Teledyne Continental Motors Distributor if any abnormal condition is noted.

Install the upper spark plugs finger tight and torque the lower spark plugs to 300-360 in. lbs. Do not lubricate spark plug threads prior to installation.

NOTE. . . Remove exhaust port protective plugs. Service the lubrication system with mineral (non-detergent) oil or Corrosion Preventive oil corresponding to MIL-C-6529 Type II. See Chapter 4 for sump capacity.

Remove the shipping plate from the propeller governor pad forward of number 6 cylinder. Lubricate the governor shaft splines with engine oil; install a new gasket and then install the propeller governor control. Attach with plain washers, new lock washer, and torque the nuts to 180-220 inch pounds.

CAUTION. . . Align spline of governor drive gear and assure that the governor is fully seated to the crankcase prior to installing the attaching hardware. This will eliminate the possibility of misalignment forcing the drive gear off location within the crankcase.

Optional Accessories: Optional accessories such as hydraulic pumps, vacuum pumps, etc., may be installed on the magneto and accessory drive pads located on the upper rear portion of the crankcase. Remove the accessory drive covers and install new gaskets. Install accessories in accordance with the airframe manufacturer's instructions.

Install all airframe manufacturer required cooling baffles, hoses, fittings, brackets and ground straps in accordance with airframe manufacturers installation instructions.

5-3 ENGINE INSTALLATION INSRUCTIONS (See Figure 5-1)

Install per airframe manufacturers instructions and the following generalized instructions. The engine should be hoisted just above the nacelle using the lifting eye bracket installed in the engine backbone.

1. Position upper mount on fitting assembly. Index upper mount with roll pin in back side of fitting assembly.

2. Using a shop punch or like instrument as an aligning tool, guide engine on upper mount and fitting assembly. Lower engine onto mounts.

3. Assemble lockwasher bonded spacer and lower mount with bolt. Position these items on the fitting assembly and index lower mount with roll pin. Align lockwasher with hole provided in lower mount.

4. Torque bolt as recommended by the airframe manufacturer.

5. Safety bolt by crimping the bars on lockwasher over the flat surfaces of the bolt head.

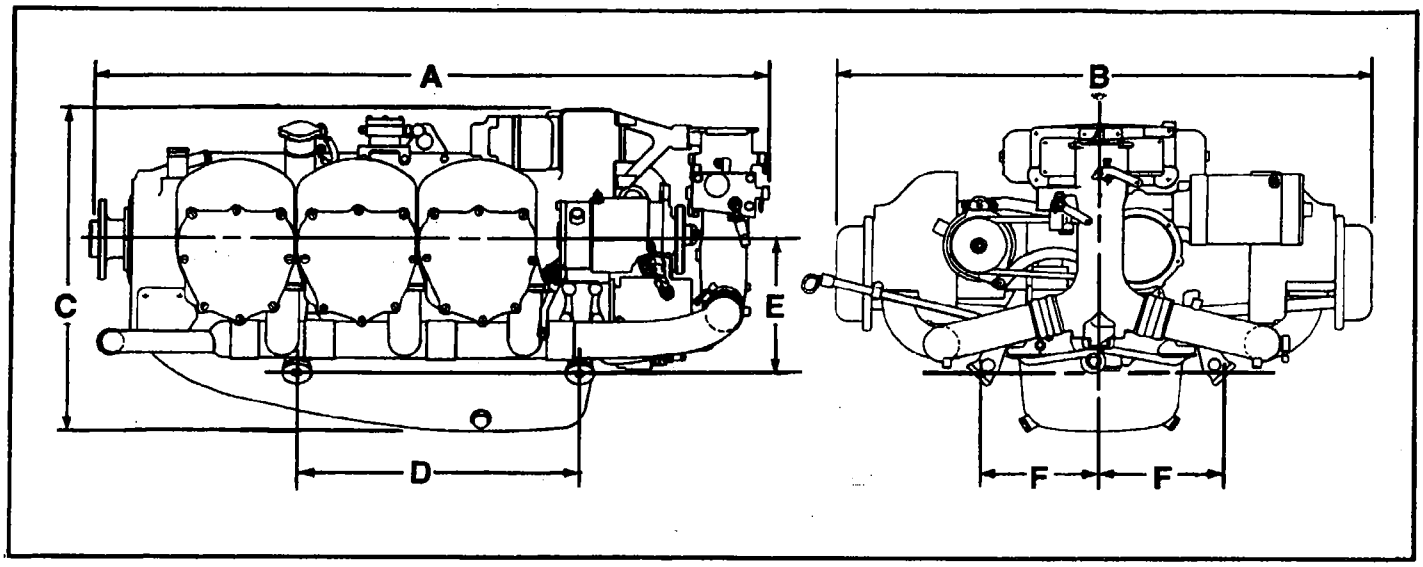
NOTE. . . Remove all protective covers, plugs, caps and identification tags as each item is connected or installed.

NOTE. . . See airframe manufacturer's instructions for engine to airframe connections.

CAUTION. . . The aircraft fuel tanks and lines must be purged to remove all contamination removed prior to installation in the main fuel inlet line to the fuel pump. Failure to comply can cause erratic fuel injection system operation and damage to its components.

WARNING. . . Do not install the ignition harness "B" nuts on the spark plugs until the propeller installation is completed. Failure to comply could result in bodily injury when the propeller is rotated during installation.

6. Install the approved propeller in accordance with the airframe manufacturer's instructions.



INSTALLATION DRAWING I0-550

Figure 5- 1

MODEL	DIMENSIONS					
	A	B	C	D	E	F
IO-550D	36.74	33.56	23.79	17.10	8.20	7.62
IO-550E	43.91	33.56	19.75	17.10	8.20	7.62
IO-550F	40.91	33.56	19.75	17.10	8.20	7.62
IO-550L	40.91	33.56	23.25	17.10	8.20	7.62

Figure 5-1

5-4 PREFLIGHT AND RUN-UP

The engine lubrication system must be pre-oiled prior to starting. This can be accomplished using a pressure oiling system installed into a main oil gallery or the oil pump. An acceptable alternate method is to use the engine starter to motor the engine with the top spark plugs removed until an oil pressure indication is noted.

NOTE... Recheck the oil level in the sump if the pre-oiling method was used. Do not operate the engine with more or less than the oil sump capacity. (See Operating Limits.)

If the magneto attaching nuts were loosened or the magnetos rotated during engine installation, magneto to engine timing must be accomplished prior to starting.

Install and torque the upper spark plugs to 300-360 in. lbs. Install the ignition harness "B" nuts to the spark plugs in the order shown in Fig. 3-2. "B" nuts are identified for position, i.e. "1T" for number one top spark plug etc.

Start the engine in accordance with the procedures listed in Chapter 6 or the airframe manufacturer's operator's manual.

Unmetered and metered fuel pressures should be adjusted prior to flight.

The engine has been tested at the factory and requires no further high power break-in on the ground. High power ground operation can be detrimental to cylinders, pistons, valves and rings.

5-5 FLIGHT TESTING

The engine has received a test cell run-in prior to leaving the factory, however a two hour flight test is recommended to assure that the piston rings have seated and that no induction system, exhaust system, oil or fuel system leaks exist prior to releasing the aircraft for normal service.

WARNING... Although the engine fuel system was adjusted at engine test the fuel system must be checked and adjusted in accordance with appropiate publications when the engine is first installed into the aircraft to ensure proper operation.

Ambient air and engine operating temperatures are of major concern during this test flight. Accomplish a normal pre-flight run-up in accordance with the aircraft flight manual. Conduct a normal take-off with full power and monitor the fuel flow, RPM, oil pressure, cylinder head temperatures and oil temperatures. Reduce to climb power in accordance with the flight manual and maintain a shallow climb altitude to gain optimum airspeed and cooling. Rich mixture should be used for all operations except leaning for field elevation (where applicable) and leaning to maintain smoothness during climb for the IO-550-D. Rich mixture should be used for all operations except leaning for cruise economy for the IO-550-E,F&L. Leaning operations should be performed in accordance with the airframe manufacturers insturctions.

Level flight cruise should be at 75% power with best power or richer mixture for the first hour of operation. The second hour power settings should alternate between 65% and 75% power with the appropriate best power mixture settings. Engine controls or aircraft altitude should be adjusted as required to maintain engine instrumentation within specifications.

The descent should be made at low cruise power settings, with careful monitoring of engine pressures and temperatures. Avoid long descents with cruise RPM and manifold pressure below 18" Hg.; if necessary decrease the RPM sufficiently to maintain manifold pressure.

Any abnormal conditions detected during test flight should be corrected and any final adjustments required should be accomplished prior to releasing the aircraft for normal service.

The engine can now be operated in normal service in accordance with the aircraft flight manual.

5-6 ENGINE REMOVAL INSTRUCTIONS

Identify each item as the item is disconnected from the engine to aid in reinstallation.

NOTE... If the engine is being removed to be placed in storage, accomplish steps listed in Chapter 11, in the section titled "Indefinite Storage" prior to removal.

1. Turn all cockpit switches and fuel selector valves OFF.

2. Disconnect the battery ground cable.

3. Disconnect the starter cable.

4. Tag and disconnect the engine wiring bundle from the following components.

   a. Magnetos

   b. Alternator

   c. Tach generator

   d. Oil temperature bulb

   e. Cylinder head temperature bulb

   f. Remove all clamps attaching engine wire bundle to engine components and route clear of the engine.

Accomplish the following items:

1. Drain the engine oil from the sump. Replace drain plug and tighten.

2. Remove the propeller in accordance with airframe manufacturer's instructions.

3. Remove engine to airframe connections in accordance with airframe manufacturer's instructions.

Attach a hoist to the engine lifting eye and relieve the weight from the engine mounts.

CAUTION. . . Place a suitable stand under the aircraft tail cone before removing the engine. The loss of weight may cause the tail to drop.

Remove the engine as follows:

1. Hoist engine vertically out of the nacelle and clear of the aircraft.

NOTE. . . Hoist engine slowly and make sure that all wires, lines and hoses have been disconnected.

2. Install engine on a transportation stand, dolly, or on the engine shipping container base.

5-7 GROUND HANDLING

After engine is removed from aircraft or container (attached to hoist) proceed with care. Do not let engine front, rear, sides or bottom come in contact with any obstructions as the extreme weight may cause damage to the engine or components. If contact has occured inspect for obvious or consequential damage.

5-8 CRATING AND SHIPPING

Category "A" (cardboard container). Lower engine onto container base and attach with metal banding straps. Install and attach container cover.

Category "B" (wooden container). Lower engine onto container base. Attach engine using shock mounts and bolts cover engine with plastic bag. Install and attach container cover to base.

CHAPTER 6

NORMAL OPERATING PROCEDURES

Section Index

6-1 GENERAL

CAUTION. . . This section pertains to operation under standard environmental conditions. The pilot should thoroughly familiarize himself with Chapter 8, Abnormal Environmental Conditions. Whenever such abnormal conditions are encountered or anticipated, the procedures and techniques for normal operation should be tailored accordingly. For example, if the aircraft is to be temporarily operated in extreme cold or hot weahter, consideration should be given to an early oil change and/or routine inspection servicing.

The life of your engine is determined by the care it receives. Follow the instructions contained in this manual carefully.

The engine received a run-in operation before leaving the factory. Therefore, no break-in schedule is required. Straight mineral oil (MIL-C-6529 Type II) should be used for the first oil change period (25 hours).

The minimum grade aviation fuel for this engine is 100LL (Blue or 100 (Green). If the minimum grade required is not available, use a higher rating. Never use a lower rated fuel.

WARNING. . . The use of a lower octane rated fuel can cause pre-ignition and/or detonation which can damage an engine the first time high power is applied, possibly causing engine failure. This would most likely occur on takeoff. If the aircraft is inadvertently serviced with the wrong grade of fuel, then the fuel must be completely drained and the tank properly serviced, prior to engine operation.

6-2 PRESTARTING

Before each flight the engine and propeller should be examined for damage, oil or fuel leaks, security and proper servicing.

1. Assure that fuel tanks contain proper type and quantity of fuel. (100LL-Blue, or 100 Green)

2. Drain a quantity of fuel from all sumps and strainers into a clean container. If water or foreign matter is noted, continue draining until only clean fuel appears.

3. Check oil level in sump.

6-3 STARTING

1. Throttle - open approximately 1".

2. Propeller Control - Full Increase RPM

3. Mixture Control - Full Rich

4. Fuel Boost Pump - Off

5. Battery - On.

6. Magnetos - On.

7. Boost pump or primer (according to installation) actuated approx. 3 seconds to prime the cylinders. (If the engine is warm, little or no priming will be necessary).

8. Starter - energize until engine begins to fire, then release.

NOTE. . . Initial starting ignition is provided by a special high voltage circuit operated by the starter switch, which fires the spark plugs and retards the ignition timing. Starting will be facilitated if the starter is released as soon as the engine starts so that normal ignition is provided by the magnetos.

9. Oil Pressure - 10 psi minimum within 30 seconds.

CAUTION. . . Do not engage the starter when the engine is running as this will damage the starter.

CAUTION. . . If difficulty in starting is experienced, do not crank for longer than thirty seconds at a time as the starter motor may overheat. If the engine does not start after thirty seconds of cranking, allow 3 to 5 minute cooling period before continued attempts.

6-4 COLD STARTS

Use the same procedure as for normal start, except that more prime will normally be necessary. After the engine begins running, it may be necessary to operate the primer intermittently for a few seconds in order to prevent the engine from stopping.

6-5 FLOODED ENGINE

1. Mixture Control - IDLE CUT-OFF.

2. Throttle - 1/2 OPEN.

3. Magneto/Start Switch - START.

4. When engine starts, return the Magneto/Start switch to BOTH. Retard the throttle and slowly advance the mixture control to FULL RICH position.

6-6 HOT STARTS

Use the same procedure as for normal start, except have mixture control full lean, throttle full open, and electric fuel pump on high for approximately 15 to 20 seconds. See Chapter 8-Starting a Hot ENgine.

6-7 GROUND WARM-UP

Teledyne Continental aircraft engines are aircooled and are dependent on the forward speed of the aircraft for cooling. To prevent overheating, it is important that the following rules be observed.

1. Head the aircraft into the wind.

2. Operate the engine on the ground with the propeller in "Full Increase" RPM position.

3. Avoid prolonged idling at low RPM. Fouled spark plugs can result from this practice.

4. Leave mixture in "Full Rich". Fuel pumps are altitude compensating.

5. Warm-up 900-1000 RPM.

6-8 PRE-TAKEOFF CHECK

1. Maintain engine speed at approximately 900 to 1000 RPM for at least one minute in warm weather, and as required during cold weather, to prevent cavitation in the oil pump and to assure adequate lubrication.

2. Advance throttle slowly until tachometer indicates an engine speed of approximately 1200 RPM. Allow additional warm-up time at this speed depending on ambient temperature. This time may be used for taxiing to takeoff position. The minimum allowable oil temperature for run-up is 75°F.

CAUTION. . . Do not operate the engine at run-up speed unless oil temperature is 75°F minimum and oil pressure is within specified limits of 30-60 PSI.

CAUTION. . . Operation of the engine at too high a speed before reaching minimum oil temperature may cause loss of oil pressure and engine damage.

3. Perform all ground operations with cowling flaps, (if installed), full open, with mixture control in "FULL RICH" position, and propeller control set for maximum RPM (except for brief testing of propeller governor).

4. Restrict ground operations to the time necessary for warm-up and testing.

5. Increase engine speed to 1700 RPM only long enough to perform the following checks:

a. Check magnetos: Move the ignition switch first to "R" position and note engine RPM,then move switch back to "BOTH" position to clear the other set of spark plugs. Then move the switch to "L" position and note RPM. The difference between the two magnetos operated individually should not differ more than 50 RPM with a maximum drop for either magneto of 150 RPM. Observe engine for excessive roughness during this check.

WARNING. . . Absence of RPM drop when checking magnetos may indicate a malfunction in the ignition circuit. Should the propeller be moved by hand (as during preflight) the engine may start and cause injury to personnel. This type of malfunction should be corrected prior to continued operation of the engine.

CAUTION. . . Do not underestimate the importance of pre-takeoff magneto check. When operating on single ignition, some RPM drop should be noted. Normal indications are 25-75 RPM drop and slight engine roughness as each magneto is switch off. An RPM drop in excess of 150 RPM may indicate a faulty magneto or fouled spark plugs.

Minor spark plug fouling can usually be cleared as follows:

(1) Magnetos - Both On.

(2) Throttle - 2200 RPM.

(3) Mixture - Move toward idle cutoff until RPM peaks and hold for ten seconds. Return mixture to full rich.

(4) Magnetos - Recheck.

If the engine is not operating within specified limits. it should be inspected and repaired prior to continued operational service.

Avoid prolonged single magneto operation to preclude fouling of the spark plugs.

b. Check throttle and propeller operation.

Move propeller governor control toward low RPM position and observe tachometer. Engine speed should decrease to minimum governing speed (200-300 RPM drop). Return governor control to high speed position. Repeat this procedure two or three times to circulate warm oil into the propeller hub.

Where applicable move propeller control to "feather" position. Observe for 300 RPM drop below minimum governing RPM, then return control to "full increase" RPM position.

CAUTION. . . Do not operate the engine at a speed in excess of 2000 RPM longer than necessary to test operation and observe engine instruments. Proper engine cooling depends upon forward speed of the aircraft. Discontinue testing if temperature or pressure limits are approached.

6. Instrument Indications.

a. Oil Pressure: The oil pressure relief valve will maintain pressure within the specified limits if the oil temperature is within the specified limits and if the engine is not excessively worn or dirty. Fluctuating or low pressure may be due to dirt in the oil pressure relief valve or congealed oil in the system. This should be corrected prior to continued operation of the engine.

b. Oil Temperatures: The oil cooler and oil temperature control valve will maintain oil temperature within the specified range unless the cooler oil passages or air channels are obstructed. Oil temperature above the prescribed limit may cause a drop in oil pressure, leading to rapid wear of moving parts in the engine.

c. Cylinder Head Temperature: Any temperature in excess of the specified limit may cause cylinder or piston damage. Proper cooling of cylinders depends on cylinder baffles being properly positioned on the cylinder heads and barrels, and other joints in the pressure compartment being tight so as to force air between the cylinder fins. Proper cooling also depends on operating practices. Fuel and air mixture ratio will affect cylinder temperature. Excessively lean mixture causes overheating even when the cooling system is in good condition. High power and low air speed, or any slow speed flight operation, may cause overheating by reducing the cooling air flow. The engine depends on the ram air flow developed by the forward motion of the aircraft for proper cooling.

6-9 POWER CONTROL

When increasing power, first increase the RPM with the propeller control and then increase manifold pressure with throttle. When decreasing power, throttle back to desired manifold pressure and then adjust to the desired RPM. Readjust manifold pressure after final RPM setting.

6-10 TAKEOFF

1. Position mixture to "FULL RICH". Where installed, cowl flaps should be positioned as specified by aircraft manufacturer.

2. Position fuel boost pump switch as instructed by aircraft manufacturer.

3. Use full throttle to obtain rated power for takeoff. During takeoff, observe manifold pressure RPM, fuel flow, engine temperature and oil pressure. All should be within normal limits.

NOTE. . . The engine is equipped with altitude compensating fuel pump which automatically leans to an appropriate full rich schedule with changes in manifold pressure caused by changes in altitude.

CAUTION. . . Cylinder head and oil temperatures must never be allowed to exceed the limitations specified. Near-maximum temperatures should occur only when operating under adverse conditions, such as high power settings, low airspeed, extreme ambient temperature, etc. If excessive temperatures are noted, and cannot reasonably be explained, or if abnormal cowl flap and/or mixture settings are required to maintain temperatures, then an inspection should be performed to determine the cause. Possible causes of high temperatures may include broken or missing baffles, inoperative cowl flaps, sticking oil temperature control unit, or restricted fuel nozzles (resulting in lean-running cylinders.) Faulty instruments or thermocouples may cause erroneously high (or low) temperature indications. Refer to Chapter 10 of this manual and/or the aircraft overhaul manual for trouble shooting procedures.

6-11 CLIMB

1. Recommended power for normal climb is 78%.

2. Climb at 78% power and above must be done at "FULL RICH" mixture setting, with cowl flaps, if provided, set to maintain proper cylinder head and oil temperature.

3. During climb (immediately after takeoff) observe manifold pressure RPM, fuel flow, engine temperature and oil pressure. All should be within limits.

NOTE. . . Generally, when the aircraft has been configured for climbout, engine power should be reduced. If power settings of greater than 78% NRP must be used, particular attention should be given to cylinder head, EGT, and oil temperatures, and mixture must be "FULL RICH".

WARNING. . . At power settings above 80% NRP, do not use the E.G.T. gage as an aid to mixture adjustment. If you attempt to determine the "peak" E.G.T. while the engine is operating at high power, burned valves, detonation, and possible engine failure can occur.

6-12 CRUISE

1. Set manifold pressure and RPM for cruise power selected.

2. After engine temperatures have stabilized at cruise condition (usually within 5 minutes), adjust mixture to lean cruise condition according to Chapter 13 of this manual.

NOTE. . . During high ambient temperature, a very low fluctuation in fuel flow may appear in the early flight stages, which is caused by excess vapor. If this occurs, operate the fuel boost pump as recommended by the aircraft manufacturer.

3. When a lean mixture setting is used, for cruise, and increased power is desired, the mixture control must be returned to the richer setting before changing the throttle or propeller setting. When reducing power, retard throttle, then adjust RPM and mixture.

4. If it is necessary to retard the throttles at altitudes above 10,000 Ft., leaning of the fuel mixture may also be necessary to maintain satisfactory engine operation on the IO-550-D engine. The mixture must be returned to the richer setting before the throttle is returned to the high power position. The IO-550-E,F&L engines utilizing altitude compensating fuel pumps should be leaned only for cruise enconomy per the airframe manufacturers instructions.

NOTE. . . Exhaust gas temperature may be used as an aid for mixture setting. Refer to Chapter 13 for leaning information.

6-13 DESCENT

Descent from high altitude is to be accomplished at cruise power settings and mixture control positioned accordingly.

CAUTION. . . Rapid descents at high RPM and idle manifold pressure setting are to be avoided.

During descent, monitor cylinder and oil temperature and maintain above the minimum specified limits.

NOTE. . . Avoid long descents at low manifold pressure as the engine can cool excessively and may not accelerate satisfactorily when power is reapplied. If power must be reduced for long periods, adjust propeller to minimum governing RPM and set manifold pressure no lower than necessary to obtain desired performance. If the outside air is extremely cold., it may be desirable to add drag to the aircraft in order to maintain engine power without gaining excess airspeed. Do not permit cylinder temperature to drop below 300°F for periods exceeding five (5) minutes.

6-14 LANDING

1. In anticipation of a go around and the need for high power settings, the mixture control should be set in "FULL RICH" before landing.

NOTE. . . Advance mixture slowly toward "FULL RICH". If engine roughness occurs, as may happen at very low throttle settings and high RPM, it may be desirable to leave the mixture control in a leaner than full rich position until the throttles are advanced above 15 inches of manifold pressure.

2. Operate the boost pump as instructed by aircraft manufacturer.

6-15 ENGINE SHUTDOWN

1. If boost pump has been on for landing, turn to "OFF".

2. Place mixture control in "IDLE CUTOFF".

3. Turn magnetos "OFF" after propeller stops rotating.

CHAPTER 7

EMERGENCY PROCEDURES

Section Index

7-1 ENGINE FIRE DURING START

If flames are observed in the induction or exhaust system during engine starting, proceed as follows:

1. Mixture Control - Move to the idle cut-off position.

2. Throttle Control - Move to the full open position.

3. Starter Switch - Hold in the cranking position until fire is extinguished.

7-2 GENERAL IN-FLIGHT INFORMATION

If a malfunction should occur in flight, certain remedial actions may eliminate or reduce the problem. Some malfunctions which might conceivably occur are listed in this section. Recommended corrective action is also included: however, it should be recognized that no single procedure will necessarily be applicable to every situation.

A thorough knowledge of the aircraft and engine systems will be an invaluable asset to the pilot in assessing a given situation and dealing with it appropriately.

7-3 ENGINE ROUGHNESS

Observe engine for visible damage or evidence of smoke or flame. Extreme roughness may be indicative of propeller blade problem. If any of these characteristics are noted, follow aircraft manufacturer's instructions.

1. Mixture - Adjust as appropriate to power setting being used. Do not arbitrarily go to Full Rich as the roughness may be caused by an overrich mixture.

2. Magnetos - Check On.

If engine roughness does not disappear after the above, the following steps should be taken to evaluate the ignition system.

1. Throttle - Reduce power until roughness becomes minimal.

2. Magnetos - Turn Off, then On, one at a time. If engine smooths out while running on single ignition, adjust power as necessary and continue. Do not operate the engine in this manner any longer than absolutely necessary. The airplane should be landed as soon as practical for engine repairs.

If no improvement in engine operation is noted while operating on either magneto alone, return all magneto switches to On.

CAUTION. . . The engine may quit completely when one magneto is switched off if the other magneto is faulty. If this happens, close throttle to idle and move mixture to idle cutoff before turning magnetos on. This will prevent a severe backfire. When magnetos have been turned back on, advance mixture and throttle to previous setting.

WARNING. . . If roughness is severe or if the cause cannot be determined, engine failure may be imminent. In this case, it is recommended that the aircraft manufacturer's emergency procedure be employed. In any event, further damage may be minimized by operating at a reduced power setting.

7-4 HIGH CYLINDER HEAD TEMPERATURE

1. Mixture - Adjust to proper fuel flow for power being used.

2. Cowl Flaps - Open.

3. Airspeed - Increase.

If temperature cannot be maintained within limits, reduce power, land as soon as practical and have the malfunction evaluated and repaired before further flight.

7-5 HIGH OIL TEMPERATURE

NOTE. . . Prolonged high oil temperature indications will usually be accompanied by a drop in oil pressure. If oil pressure remains normal, a high temperature indication may be caused by a faulty gage or thermocouple. If the oil pressure drops as temperature increases, proceed as follows:

1. Cowl Flaps - Open.

2. Airspeed - Increase.

3. Power - Reduce if steps 1 and 2 do not lower oil temperature.

CAUTION. . . If these steps do not restore oil temperature to normal, an engine failure or severe damage can result. In this case it is recommended that the aircraft manufacturer's emergency instructions be followed.

7-6 LOW OIL PRESSURE

If the oil pressure drops without apparent reason from normal indication of 30 to 60 psi, monitor temperature and pressure closely and have the engine inspected at termination of the flight. If oil pressure drops below 30 psi, an engine failure should be anticipated and the aircraft manufacturer's instructions should be followed.

7-7 IN-FLIGHT RESTARTING

CAUTION. . . Actual shutdown of an engine for practice or training purposes should be minimized. Whenever engine failure is to be simulated, it should be done by reducing power.

CAUTION. . . A few minutes exposure to temperatures and airspeed at flight altitudes can have the same effect on an inoperative engine as hours of cold-soak in sub-Arctic conditions. If the engine must be restarted, consideration should be given to descending to warmer air. Closely monitor for excessive oil pressure as the propeller is unfeathered. Allow the engine to warm up at minimum governing RPM and 15 inches of manifold pressure.

The following procedure is recommended for in-flight restarting.

1. Mixture - Advance to 3/4 FULL RICH.

2. Fuel Selector Valve - On.

3. Fuel Boost Pump - Off.

4. Magneto Switches - ON BOTH.

5. Throttle - NORMAL START POSITION (Open 1").

6. Propeller:

WITHOUT UNFEATHERING ACCUMULATOR:

a. Propeller Control - MOVE FROM FEATHER TO FULL DECREASE RPM.

b. Start Switch - START.

NOTE. . . The engine will run roughly until the propeller leaves the feathering range. Expect a fairly rapid surge of power as the engine accelerates to minimum governing RPM.

c. Oil Presure - Within limits, will probably be quite low if oil is cold. If no oil pressure is indicated, engine damage may occur if the restart is continued.

d. Throttle - Adjust to 15-20 inches manifold pressure until engine temperature reaches operating range. Adjust mixture as required.

WITH UNFEATHERING ACCUMULATOR:

a. Propeller Control - FORWARD OF FEATHERING DETENT UNTIL ENGINE ATTAINS 600 RPM; THEN BACK TO DETENT.

NOTE. . . If propeller does not unfeather or the engine does not turn, return the propeller control to the feather position and secure the engine.

b. Oil Pressure - STABILIZED.

c. Mixture - 3/4 FULL RICH.

7. Throttle - AS NECESSARY TO PREVENT OVERSPEED; Warm up at 15-20" Hg. manifold pressure. Adjust mixture as required for smoothness.

8. Oil Pressure, Oil and Cylinder Head Temperatures - NORMAL INDICATION.

9. Alternator Switch - ON.

10. Power - AS REQUIRED.

7-8 ENGINE FIRE IN-FLIGHT

1. Fuel Selector - Turn to the Off Position.

2. Mixture Control - Place in the Idle Cut-Off Position.

3. Throttle Control - Place in the Closed Position.

4. Propeller Control

a. Non-Feathering Type Propeller - Full Decrease RPM Position.

b. Feathering Type Propeller - Feather Position.

5. Magnetos - Place Both in the "OFF" position.

6. Follow air frame manufacturer's instructions for emergency/forced landing.

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CHAPTER 8

ABNORMAL ENVIRONMENTAL CONDITIONS

Section Index

8-1 GENERAL

Three areas of operation may require special attention. These are (a) extreme cold weather, (b) extreme hot weather and (c) high density altitude ground operation. The following may be helpful to the operator in obtaining satisfactory engine performance under adverse conditions.

8-2 COLD WEATHER OPERATION (Ambient Temperature Below Freezing)

NOTE... Prior to operation and/or storage in cold weather assure engine oil viscosity is SAE 30, 10W30, 15W50 or 20W50. In the event of temporary cold weather operation, not justifying an oil change to SAE 30, consideration should be given to hangaring the aircraft between flights.

Engine starting during extreme cold weather is generally more difficult than during normal temperature conditions. Cold soaking causes the oil to become thicker (more viscous), making it more difficult for the starter to crank the engine. This results in a slow cranking speed and an abnormal drain on the battery capacity. At low temperatures, gasoline does not vaporize readily, further complicating the starting problem.

False starting (failure to continue running after starting) often results in the formation of moisture on the spark plugs due to condensation. This moisture can freeze and must be eliminated either by applying heat to the engine or removing and cleaning the spark plugs.

8-3 PREHEATING

The use of preheat and auxiliary power unit (APU) will facilitate starting during cold weather and is recommended when the engine has been cold soaked at temperatures of 25°F and below in excess of 2 hours. Successful starts without these aids can be expected at temperatures below normal, provided the engine is in good condition and the ignition and fuel systems are properly maintained.

The following procedures are recommended for preheating, starting, warm-up, run-up and takeoff.

1. Select a high volume hot air heater. Small electric heaters which are inserted into the cowling opening do not appreciably warm the oil and may result in superficial preheating.

WARNING... Superficial application of preheat to a cold-soaked engine can cause damage to the engine. A minimum of preheat application may warm the engine enough to permit starting but will not de-congeal oil in the sump, lines, cooler, filter, etc.

Congealed oil in such lines may require considerable preheat. The engine may start and apparently run satisfactorily, but can be damaged from lack of lubrication due to congealed oil in various parts of the system. The amount of damage will vary and may not become evident for many hours. On the other hand, the engine may be severely damaged and could fail shortly following application of high power.

Proper procedures require thorough application of preheat to all parts of the engine. Hot air should be applied directly to the oil sump and external oil lines as well as the cylinders, air intake and oil cooler. Excessively hot air can damage non-metallic components such as seals, hoses and drive belts, so do not attempt to hasten the preheat process.

Before starting is attempted, turn the engine by hand or starter until it rotates freely. After starting, observe carefully for high or low oil pressure and continue the warm-up until the engine operates smoothly and all controls can be moved freely. Do not close the cowl flaps to facilitate warm-up as hot spots may develop and damage ignition wiring and other components.

2. Hot air should be applied primarily to the oil sump and filter area. The oil drain plug door or panel may provide access to these areas. Continue to apply heat for 15 to 30 minutes and turn the propeller, by hand, through 6 or 8 revolutions at 5 or 10 minute intervals.

3. Periodically feel the top of the engine and, when some warmth is noted, apply heat directly to the upper portion of the engine for approximately five minutes. This will provide sufficient heating of the cylinders and fuel lines to promote better vaporization for starting. If enough heater hoses are available, continue heating the sump area. Otherwise, it will suffice to transfer the source of heat from the sump to the upper part of the engine.

4. Start the engine immediately after completion of the preheating process. Since the engine will be warm, use normal starting procedure. (Refer to Figure 6-1 "Priming Time Requirement".)

NOTE. . . Since the oil pressure gage line may be congealed, as much as 60 seconds may elapse before oil pressure in indicated. If oil pressure is not indicated within one minute, shut the engine down and determine the cause.

5. Operate the engine at 1000 RPM until some oil temperature is indicated. Monitor oil pressure closely during this time and be alert for a sudden increase or decrease. Retard throttle, if necessary to maintain oil pressure below 100 psi. If oil pressure drops suddenly to less than 30 psi, shut down the engine and inspect the lubrication system. If no damage or leaks are noted, preheat the engine for an additional 10 to 15 minutes before restarting. (Refer to Section 6-8 "Pre-takeoff Check".)

6. Before takeoff, run up the engine to 1700 RPM. If necessary approach this RPM in increments to prevent oil pressure from exceeding 100 psi.

At 1700 RPM, adjust the propeller control to Full Decrease RPM until minimum governing RPM is observed, then return the control to Full Increase RPM. Repeat this procedure three or four times to circulate warm oil into the propeller dome. If the aircraft manufacturer recommends checking the propeller feathering system, move the control to the Feather position but do not allow the RPM to drop more than 300 RPM below minimum governing speed.

NOTE. . . Continually monitor oil pressure during run up.

7. Check magnetos in the normal manner.

8. When the oil temperature has reached 100°F and oil pressure does not exceed 80 psi at 1700 RPM, the engine has been warmed sufficiently to accept full rated power.

CAUTION. . . Do not close the cowl flaps in an attempt to hasten engine warm-up.

NOTE. . . Fuel flow will probably be on the high limit; however, this is normal and desirable since the engine will be developing more horsepower at substandard ambient temperatures.

If preheat is not used employ the same start procedures for a normal start (Chapter 6) except:

1. At temperatures below +20°F, continue priming while cranking until engine starts.

2. When engine starts and accelerates thru 500 RPM, release Starter.

3. Advance throttle slowly to obtain smooth engine operation.

4. Release primer.

5. Auxiliary Fuel Pump on low as necessary to obtain smooth engine operation.

6. Oil Pressure - Check. If none noted within 30 seconds, shut down engine and investigate.

Observe oil pressure for indication and warm-up engine at 1000 RPM. Ground operation and run up require no special techniques other than warming the engine sufficiently to maintain oil temperature and oil pressure within limits when full RPM is applied.

NOTE. . . Before applying power for takeoff, assure that oil pressure, oil temperature and cylinder head temperature are well within the normal operating range. When full power is applied for takeoff, assure that oil pressure is within limits and steady.

Any of the following engine conditions should be cause for concern, and are justification to discontinue the takeoff.

1. Low, high or surging RPM.

2. Fuel flow excessively high or low.

3. Any oil pressure indication other than steady within limits.

4. Engine roughness.

8-4 HOT WEATHER OPERATION (Ambient Temperature In Excess of 90°F.)

CAUTION. . . When operating in hot weather areas, be alert for higher than normal levels of dust, dirt or sand in the air. Inspect air filters frequently and be prepared to clean or replace them if necessary. Weather conditions can lift damaging levels of dust and sand high above the ground. If the aircraft is flown through such conditions, an oil change is recommended as soon as possible. Do not intentionally operate the engine in dust and/or sand storms. The use of dust covers on the cowling will afford additional protection for a parked aircraft.

Flight operation during hot weather usually presents no problem since ambient temperatures at flight altitudes are seldom high enough to overcome the cooling system used in modern aircraft design. There are, however, three areas of hot weather operation which will require special attention on the part of the operator. These are: (1) Starting a hot engine (2) Ground operation under high ambient temperature conditions and (3) Takeoff and Initial climbout.

1. Starting a Hot Engine. After an engine is shutdown, the temperature of its various components will begin to stabilize; that is, the hotter parts such as cylinders and oil will cool, while other parts will begin to heat up due to lack of air flow, heat conduction, and heat radiation from those parts of the engine which are cooling. At some time period following engine shutdown the entire unit will stabilize near the ambient temperature. This time period will be determined by temperature and wind conditions and may be as much as several hours. This heat soaking is generally at the extreme from 30 minutes to one hour following shutdown. During this time, the fuel system will heat up causing the fuel in the pump and lines to "boil" or vaporize. During subsequent starting attempts, the fuel pump will initially be pumping some combination of fuel and fuel vapor. At the same time, the injection nozzle lines will be filled with varying amounts of fuel and vapor. Until the entire fuel system becomes filled with liquid fuel, difficult starting and unstable engine operation can normally be expected.

Another variable affecting this fuel vapor condition is the state of the fuel itself. Fresh fuel contains a concentration of volatile ingredients. The higher this concentration is, the more readily the fuel will vaporize and the more severe will be the problems associated with vapor in the fuel system. Time, heat or exposure to altitude will "age" aviation gasoline; that is, these volatile ingredients tend to dissipate. This reduces the tendency of fuel to vaporize and, may induce starting problems associated with fuel vapor if the volatile condition reaches a low enough level, starting may become difficult due to poor vaporization at the fuel nozzles, since the fuel must vaporize in order to combine with oxygen in the combustion process.

The operator, by being congnizant of these conditions, can take certain steps to cope with problems associated with hot weather/hot engine starting. The primary objective should be that of permitting the system to cool. Lower power settings during the landing approach when practical will allow some cooling prior to the next start attempt. Reducing ground operation to a minimum is desired to keep engine temperatures down. Cowl flaps should be opened fully while taxiing. The aircraft should be parked so as to face into the wind to take advantage of the cooling effect. Restarting attempts will be the most difficult from 30 minutes to one hour after shutdown. Following that interval the fuel vapor will be less pronounced and normally will present less of a restart problem.

2. Ground Operation in High Ambient Temperature Conditions. Oil and cylinder temperatures should be monitored closely during taxiing and engine run up. Operate with cowl flaps full open. Do not operate the engine at high RPM except for necessary operational checks. If takeoff is not to be made immediately following engine run up, the aircraft should be faced into the wind with the engine idling at 900-1000 RPM. It may be desirable to operate the fuel boost pumps to assist in suppressing fuel vaporization and provide more stable fuel pressure during taxiing and engine run up.

3. Takeoff and Initial Climbout. Temperatures should be closely monitored and sufficient airspeed must be maintained to provide proper cooling of the engine.

CAUTION. . . Reduced engine power will result from higher density altitude associated with high temperature.

8-5 GROUND OPERATION AT HIGH ALTITUDE AIRPORTS

Altitude compensating fuel pump will automatically lean fuel flow.

If higher than desired temperatures are experienced during the climb phase the pilot may elect to establish a lower angle of attack, or higher climb speed, consistent with safety and thereby provide increased cooling for the engine.

CHAPTER 9

SERVICING AND UNSCHEDULED MAINTENANCE

Section Index

9-1 SERVICING

The owner or operator is primarily responsible for maintaining the engine in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of the Federal Aviation Regulations and "Airworthiness Limitation" of this manual per FAR A33.4. It is further the responsibility of the owner or operator to ensure that the engine is inspected in conformity with the requirements of Parts 43 and 91 of the Federal Aviation Regulations. Teledyne Continental Motors has prepared this inspection guide to assist the owner or operator in meeting the foregoing responsibilities. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgement of a certified airframe and power plant mechanic in the performance of his duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

Fuel (Min. Grade) . . . . . Aviation Grade 100 or 100LL

WARNING... The use of a lower octane rated fuel can result in destruction of an engine the first time high power is applied. This would most likely occur on takeoff. If the aircraft is inadvertently serviced with the wrong grade of fuel, then the fuel must be completely drained and the tank properly serviced.

Oil: (First 25 hours operation) . . . . . Mineral (non-Detergent) oil or Corrosion Preventive oil Corresponding to MIL-C-6529 Type II

Normal Service

All Temperatures 15W-50
20W-50

Below 50°F. Ambient Air (Sea Level) . . . . . SAE30 or 10W-30
Above 30°F Ambient Air (Sea Level) . . . . . SAE 50

Oil Sump Capacity: . . . . . IO550D,E,F 12 U.S. Quarts
IO550L 10 U.S. Quarts

Oil Change Interval:
With Integral Screen Filter . . . . . 25 Hrs.
With Small Full Flow Filter . . . . . 50 Hrs.
With Large Filter . . . . . 100 Hr.

Oil Filter Interval:
With Large or Small Filter . . . . . 50 Hrs.

CAUTION. . . Use only oils conforming to Teledyne Continental Motors Specification MHS24 or MHS25 after break-in period.

9-2 APPROVED PRODUCTS

The marketers of the aviation lubricating oils listed below have supplied data to Teledyne Continental Motors indicating their products conform to all requirements of TCM Specification MHS-24D or MHS-25, Lubricating Oil, Ashless Dispersant.

In listing the product names, TCM makes no claim or verfication of marketer's statements or claims. Listing is made in alphabetical order and is provided only for the convenience of the users.

Supplier	Brand
MHS-25	
Mobil Oil Company	Mobil AV 1
MHS-24	
BP Oil Corporation	BP Aero Oil
Castrol Limited (Australia)	Castrolaero AD Oil
Chevron U.S.A., Inc.	Chevron Aero Oil
Continental Oil	Conco Aero S
Delta Petroleum Company	Delta Avoil Oil
Exxon Company, U.S.A.	Exxon Aviation Oil EE
Gulf Oil Company	Gulfpride Aviation AD
Mobil Oil Company	Mobil Aero Oil
Mobil Oil Company	Mobil-Aero Super Oil SAE 20W-50
Pennzoil Company	Pennzoil Aircraft Engine Oil
Phillips Petroleum Company	Phillips 66 Aviation Oil, Type A
Phillips Petroleum Company	* X/C Aviation Multiviscosity Oil SAE 20W-50, SAE 20W-60
Quaker State Oil & Refining Co.	Quaker State AD Aviation Engine Oil
Turbo Resources Limited	Red Ram 20W-50 Aviation Motor Oil
Shell Canada Limited	Aeroshell Oil W, Aeroshell Oil W 15W-50
Shell Oil Company	Aeroshell Oil W, Aeroshell Oil W 15W-50 Anti Wear Formulation, Aeroshell Oil W 15W-50
Sinclair Oil Company	Sinclair Avoil
Texaco, Inc.	Texaco Aircraft Engine Oil - Premium AD
Union Oil Company of California	Union Aircraft Engine Oil HD

* Phillips Petroleum X/C II Aviation Oil Is Not An Approved Oil.

NOTE. . . The operator using an oil analysis service is reminded that an oil analysis does not reveal all abnormal engine conditions. It should not be used as a replacement or substitute for routine maintenance and inspection procedures recommended in the Operator's Manual, Service Bulletins, or other directives. For further information, see TCM Service Bulletin M87-12 Rev. 1 for current revision as applicable.

9-3 PREFLIGHT INSPECTION

Before each flight the engine and propeller should be examined for damage, oil leaks, proper servicing and security. Refer to the aircraft manual "Preflight Check List".

9-4 50 HOUR INSPECTION

Detailed information regarding adjustments, repair and replacement of components may be found in the appropriate Overhaul Manual. The following items should be checked during normal inspections:

1. Engine Conditions: **(Refer to Chapter 6)**	a.	Magneto RPM drop:	Check
	b.	Full Power RPM:	Check
	c.	Full Power Manifold Pressure:	Check
	d.	Full Power Fuel FLow:	Check
	e.	Idle RPM:	Check

Record any values not conforming to engine specifications so that necessary repair or adjustment can be accomplished.

2. Oil Filter:	Replace filter, inspect cartridge.
3. Oil:	Change oil, if integral screen or small filter is used.
4. Air Filter:	Inspect and clean or replace as necessary.
5. High Tension Leads:	Inspect for chafing and deterioration.
6. Magnetos:	Check and adjust only if non-conformities were noted in Step 1.
7. Visual:	Check hoses, lines, wiring, fittings, baffles, etc. for general condition.
8. Adjustments & Repairs	Perform service as required on any items that are not within specifications.
9. Engine Condition:	Run up and check as necessary for any items serviced in Step 8. Check engine for oil and fuel leaks before returning to service.

9-5 100 HOUR INSPECTION

Detailed information regarding adjustments, repair and replacement of components may be found in the appropriate Overhaul Manual. The following items should be checked during normal inspections:

1. Engine Conditions: **(Refer to Chapter 6)**	a.	Magneto RPM drop:	Check
	b.	Full Power RPM:	Check
	c.	Full Power Manifold Pressure:	Check
	d.	Full Power Fuel Flow:	Check
	e.	Idle RPM:	Check

Record any values not conforming to engine specifications so that necessary repair or adjustment can be accomplished.

2. Oil Filter:	Replace, inspect cartridge.
3. Oil:	Drain while engine is warm. Refil sump.
4. Valves/Cylinders:	Check compression (Refer to Service Bulletin M84-15 or subsequent revision as applicable).

5. Cylinders, Fins, Baffles:	Inspect.
6. Spark Plugs:	Inspect clean, regap (if necessary) reinstall. Rotate plugs from upper to lower positions and vice versa to lengthen plug life.
7. High Tension Leads:	Inspect for chafing and deterioration.
8. Magnetos:	Check. Adjust points and timing if necessary.

NOTE. . . Minor changes in magneto timing can be expected during normal engine service. The time and effort required to check and adjust the magnetos to specifications is slight and the operator will be rewarded with longer contact point and spark plug life, smoother engine operation and less corrective maintenance between routine inspections.

NOTE. . . At each 500 hours, the magnetos are required to be disassembled and inspected according to Magneto Service Manual.

9. Air Filter:	Inspect and clean or replace as necessary.
10. Alternate Air Door:	Check operation.
11. Fuel Metering Unit Inlet Screen:	Inspect and clean.
12. Throttle Shaft and Linkage:	Inspect for wear and lubricate.
13. Fuel Nozzles:	Inspect nozzles and vent manifold for leaks or damage.
14. Fuel & Oil Hoses & Lines:	Inspect for deterioration, leaks, chafing.
15. Fuel System	Check. Adjust as necessary if pre-inspection run-up indicates problems. (Refer to latest TCM Service Bulletin and airframe manufacturers manual for Procedure.)
16. Control Connections:	Inspect and lubricate.
17. Exhaust:	Check all joints for condition and leaks.
18. Adjustment & Repairs:	Perform service as required on any items that are not within specifications.
19. Engine Condition:	Perform complete run up. Check engine for fuel or oil leaks before returning to service.

NOTE. . . Refer to IO-550 Overhaul Manual or applicable Service Bulletins for proper procedures and limits.

9-6 UNSCHEDULED MAINTENANCE

Detailed information required for component part replacement, system adjustments, accessory replacement/repair, top overhaul etc., can be found in the "Related Publications" listed in Chapter 1.

No unscheduled maintenance of the categories listed above should be attempted without consulting the applicable related publications.

The Time Between Overhaul (TBO) for the IO-550D,E,F,L is 1700 hours. Those accessories supplied with this engine by TCM are considered to have the same TBO as the engine with the criteria for service and longevity as outlined in the most current TCM TBO service bulletin.

CHAPTER 10

TROUBLESHOOTING

Section Index

10-1 GENERAL INFORMATION

The troubleshooting chart which follows, discusses symptoms which can be diagnosed and interprets the results in terms of probable causes and the appropriate corrective action to be taken.

For additional information on more specific troubleshooting procedures, refer to Overhaul Manual and Service Bulletins.

All engine maintenance should be performed by a qualified mechanic. Any attempt by unqualified personnel to adjust, repair or replace any parts, may result in damage to the engine.

WARNING... Operation of a defective engine without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting of such damage, an injury can be avoided.

10-2 ENGINE TROUBLESHOOTING CHART

This troubleshooting chart is provided as a guide. Review all probable causes given, check other listings of troubles with similar symptoms. Items are presented in sequence of the approximate ease of checking, not necessarily in order of probability.

TROUBLE	PROBABLE CAUSE	CORRECTION
Engine Will Not Start	Fuel tank empty.	Fill with correct grade of fuel
	Improper starting procedure.	Refer to Pilot's Checklist for starting procedures and check for performance of each item.
	Cylinder overprimed. Engine flooded.	Place mixture levers in IDLE CUT-OFF position. Open throttle wide. Turn engine over several revolutions to clear cylinders.
	Induction system leak.	Tighten or replace loose or damaged hose connection.
	Excessive starter slippage.	Replace starter adapter.
	Fuel system malfunction.	Isolate cause and correct. (See Troubleshooting the Fuel Injection System.)
	Ignition system malfunction.	Isolate cause and correct. (See Troubleshooting the Ignition System.)
	Manifold valve vent obstruction.	Repair or replace manifold valve.
Engine Will Not Run At Idling Speed	Propeller levers set in high pitch (DECREASE RPM).	Use low pitch (INCREASE RPM) position for all ground operations.
	Fuel injection system improperly adjusted.	See Troubleshooting the Fuel Injection System.
	Air leak in intake manifold.	Tighten loose connection or replace damaged part.
Rough Idling	Fuel injection system improperly adjusted.	See Troubleshooting the Fuel Injection System.

10-2 ENGINE TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Rough Idling (Continued)	Mixture levers set for improper mixture.	Use FULL RICH position for all ground operation, except high altitude airports.
	Fouled spark plugs.	Remove and clean. Adjust gaps.
	Hydraulic lifters fouled.	Remove and clean lifters. Inspect and clean oil filter at more frequent intervals.
	Burned or warped exhaust valves, worn seat, scored valve guides.	Repair cylinder.
Engine Runs Too Lean At Cruising Power	Improper manual leaning procedure.	Refer to Chapter 13 for proper fuel flow settings.
	Fuel flow reading too low.	Check fuel strainer for clogging. Clean screen.
	Fuel injection malfunction.	See Troubleshooting the Fuel Injection System.
Engine Runs Too Rich At Cruising Power	Restrictions in air intake passages.	Check passages and remove restrictions.
Engine Runs Too Lean Or Too Rich At Throttle Setting Other Than Cruise	Fuel injection malfunction.	See Troubleshooting the Fuel Injection System.
Continuous Fouling Of Spark Plugs.	Piston rings excessively worn or broken.	Replace rings. Replace cylinder if damaged.
	Piston rings are not seated.	Hone cylinder walls, replace rings.
Engine Runs Rough At High Speed	Loose mounting bolts or damaged mount pads.	Tighten mounting bolts. Replace mount pads.
	Plugged fuel nozzle.	Clean.
	Propeller out of balance.	Remove and repair.
	Ignition system malfunction.	See Troubleshooting the Ignition System.
Continuous Missing At High Speed	Broken valve spring.	Replace.
	Plugged fuel nozzle.	Clean.
	Burned or warped valve.	Repair cylinder.
	Hydraulic tapped dirty or worn.	Remove and clean or replace.

10-2 ENGINE TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Sluggish Operation And Low Power	Throttle not opening wide.	Check and adjust linkage. (See Rigging of Mixture and Throttle Controls.)
	Restrictions in air intake passages.	Check.
	Ignition system malfunction.	See Troubleshooting the Ignition System.
	Fuel injection malfunction.	See Troubleshooting the Fuel Injection System.
	Valve seats worn and leaking. Piston rings worn or stuck in grooves.	Borescope cylinders and check compression.
High Cylinder Head Temperature	Low octane fuel.	Drain tanks and replace with correct grade of fuel.
	Lean fuel/air mixture due to improper manual leaning procedure.	See "CORRECTION" under "Engine run too lean at cruising power."
	Cylinder baffles loose or bent.	Check and correct.
	Dirt between cylinder fins.	Clean thoroughly.
	Excessive carbon deposits in cylinder head and on pistons.	Check ignition and fuel injection system.
	Magnetos out of time. No appreciable drop detected during pre-flight check.	Retime, internally and externally.
	Magneto distributor block contamination.	Disassemble and repair as required or replace magneto.
High Cylinder Head Temperature	Exhaust system gas leakage.	Locate and correct.
	Exhaust valve leaking.	Repair cylinder.
Oil Leaks	At front of engine; damaged crankshaft oil seal.	Replace.
	Around propeller mounting flange; damaged hub O-ring seal.	Replace.
	Around plugs, fittings and gaskets due to looseness or damage.	Tighten or replace.

10-2 ENGINE TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Low Compression	Piston rings excessively worn.	Repair cylinder.
	Valve faces and seats worn.	Repair cylinder.
	Excessively worn cylinder walls.	Replace cylinder & piston rings.
Slow Engine Acceleration On A Hot Day	Mixture too rich.	Momentarily pull mixture control back until engine acceleration picks up, then set proper mixture.
Rough Idle At Airfields With Ground Elevation Of 3500 Feet Or Higher	Mixture too rich.	Pull mixture control back to where the engine operates the smoothest at IDLE RPM.
Slow Engine Acceleration At Airfields With A Ground Elevation Of 3500 Feet Or Higher	Mixture too rich.	Adjust mixture per Chapter 13.
Engine Will Not Stop At Idle Cut-Off	Fuel manifold valve not seating tightly.	Repair or replace manifold valve.
High Engine Idle Pressure Impossible To Obtain.	Fuel manifold valve sticking closed.	Repair or replace manifold valve.
	Fuel manifold valve vent obstruction.	Repair or replace manifold valve.
Erratic Engine Operation	Fuel manifold valve sticking, or not free.	Repair or replace manifold valve.
Climbing to Altitudes Above 12,000 Feet, Engine Quits When Power Reduced.	Fuel vaporization.	Operate fuel boost pump according to aircraft manufacturer's instructions. See fuel flow per Chapter 13.
Low Fuel Pressure	Restricted flow to fuel metering valve.	Check mixture control for full travel. Check for restrictions in fuel filters and lines, adjust control and clean filter. Replace damaged parts.
	Fuel control lever interference.	Check operation of throttle control and for possible contact with cooling shroud. Adjust as required to obtain correct operation.
	Incorrect fuel injector pump adjustment and operation.	Check and adjust using appropriate equipment. Replace defective pumps.
	Defective fuel injector pump relief valve.	Replace pump.

10-2 ENGINE TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
High Fuel Pressure	Restricted flow beyond fuel control assembly.	Check for restricted fuel nozzles or fuel manifold valve. Clean or replace nozzles. Replace defective fuel manifold valve.
	Defective relief valve operation in fuel injector.	Replace fuel injector pump.
	Restricted re-circulation passage in fuel injector pump.	Replace pump.
Fluctuating Fuel Pressure	Vapor in fuel system, excessive fuel temperature.	Normally, operating the auxiliary pump will clear system. Operate auxiliary pump and purge system.
	Fuel gage line leak or air in gage line.	Drain gage line and tighten connections.
	Restrictions in vapor separator vent.	Check for restriction in ejector jet of vapor separator cover. Clean jet with solvent (only). Do Not Use Wire as Probe. Replace defective parts.
Low Oil Pressure On Engine Gage	Insufficient oil in oil sump oil dilution or using improper grade oil for prevailing ambient temperature.	Add oil, or change oil to proper viscosity.
	High oil temperature.	Defective vernatherm valve in oil cooler; oil cooler restriction. Replace valve or clean oil cooler.
	Leaking, damaged or loose oil line connections - Restricted screen or filter.	Check for restricted lines and loose connections, and for partially plugged oil filter or screens. Clean parts, tighten connections, and replace defective parts.
Engine Runs Rough At Speeds Above Idle	improper fuel-air mixture.	Check manifold connections for leaks. Tighten loose connections. Check fuel control and linkage for setting and adjustment. Check fuel filters and screens for dirt. Check for proper pump pressure, and replace pump if defective.
	Restricted fuel nozzle.	Remove and clean all nozzles.
	Ignition system and spark plugs defective.	Clean and regap spark plugs. Check ignition cables for defects. Replace defective components.

10-2 ENGINE TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Engine Lacks Power, Reduction In Maximum	Incorrectly adjusted throttle control, "sticky" linkage or dirty air cleaner.	Check movement of linkage by moving control from idle to full throttle. Make proper adjustments and replace worn components. Service air cleaner.
	Defective ignition system.	Inspect spark plugs for fouled electrodes, heavy carbon deposits, erosion of electrodes, improperly adjusted electrode gaps, and cracked porcelains. Test plugs for regular firing under pressure. Replace damaged or misfiring plugs. Spark plug gap to be 0.015 to 0.019 inch.
Engine lacks Power, Reduction In Maximum Manifold Pressure.	Loose or damaged intake manifolds.	Insepct entire manifold system for possible leakage at connections. Replace damaged components, tighten all connections and clamps.
	Fuel nozzles defective.	Check for restricted nozzles and lines and clean or replace as necessary.
Engine Has Poor Acceleration.	Idle mixture too lean.	Readjust idle mixture.
	Incorrect fuel-air mixture, worn control linkage, or restricted air cleaner.	Tighten loose connections, replace worn elements of linkage, service air cleaner.
	Defective ignition system.	Check accessible cables and connections. Replace defective spark plugs.

10-3 IGNITION TROUBLESHOOTING

This troubleshooting chart is provided as a guide. Review all probable causes given, check other listings of troubles with similar symptoms. Items are presented in sequence of the approximate ease of checking, not necessarily in order of probability.

TROUBLE	PROBABLE CAUSE	CORRECTION
Engine Fails To Start Due to Ignition Trouble	Ignition switch OFF or grounded switch wires.	Turn switch On. Check for grounded wires.
	Spark plugs fouled, improperly gapped, or loose.	Remove and clean. Adjust to proper gap. Tighten to specified torque.
	Magnetos improperly timed to engine.	Refer to Installation of Magnetos and Ignition Timing for timing procedures.
	Shorted condenser.	Replace condenser.
	Magneto internal timing incorrect or timed for opposite rotation.	Install correctly timing magneto.
Rough Idling	Spark plugs fouled or improperly gapped.	Clean spark plugs. Adjust spark plug gap.
	Weak condenser.	Replace condenser.
Rough At Speeds Above Idle	Loose or improperly gapped spark plugs.	Tighten to specified torque. Adjust to proper gap.
	High tension leak in ignition harness.	Check for faulty ignition harness.
	Weak or burned out condenser as evidenced by burned or pitted breaker points.	Replace points and condenser.
Sluggish Operation And/Or Excessive RPM Drop.	Fouled or dead spark plugs.	Clean spark plugs. Replace dead spark plugs.
	Improperly gapped spark plugs.	Adjust to proper gap.
	Magnetos out of time with plugs.	Refer to Installation of Magnetos and Ignition Timing for proper timing procedure.
	Damaged mangeto breaker points or condenser.	Replace points and condenser.

10-3 IGNITION TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
High Oil Temperature Indication	Low oil supply.	Replenish.
	Cooling air passages clogged.	Clean thoroughly.
	Cooler core plugged.	Remove cooler and flush thoroughly.

10-4 OIL SYSTEM TROUBLESHOOTING CHART

This troubleshooting chart is provided as a guide. Review all probable causes given, check other listings of troubles with similar symptoms. Items are presented in sequence of the approximate ease of checking, not necessarily in order of probability.

TROUBLE	PROBABLE CAUSE	CORRECTION
High Oil Temperature Indication	Thermostat damaged or held open by solid matter.	Remove, clean valve and seat. If still inoperative, replace.
	Oil viscosity too high.	Drain and refill with correct seasonal weight. (See Chapt. 2)
	Prolonged ground operation.	Limit ground operation to a minimum.
	Malfunctioning gage or bulb unit.	Check wiring. Check bulb unit. Check gage. Replace defective parts.
Low Oil Pressure Indication	Low oil supply. Oil viscosity too low.	Replenish. Drain and refill with correct seasonal weight. (See Chapt. 2)
	Foam in oil due to presence of alkaline solids in system.	Drain and refill with fresh oil. (It may be necessary to flush cooler core if presence of alkaline solids is due to a previous cleaning with alkaline materials.)
	Defective pressure pump.	Replace pump.
	Malfunctioning pressure gage.	Check gage. Clean plumbing. Replace if required.
	Weak or broken oil pressure relief valve spring.	Replace spring. Adjust pressure to 30-60 psi by adjusting screw.

10-5 FUEL INJECTION SYSTEM TROUBLE-SHOOTING CHART

This troubleshooting chart is provided as a guide. Review all probable causes given, check other listings of troubles with similar symptoms. Items are presented in sequence of the approximate ease of checking, not necessarily in order of probability.

TROUBLE	PROBABLE CAUSE	CORRECTION
Engine Will Not Start And No Fuel Flow Gage Indication	No fuel to engine.	Check tank fuel level.
	Mixture control improperly rigged.	Check mixture control for proper rigging.
	Engine not primed.	Auxiliary pump switch in PRIME position.
	Selector valve in wrong position.	Position selector valve to MAIN TANK position.
Engine Will Not Start With Fuel Flow Gage Indication	Engine flooded.	Reset throttle, clear engine of excess fuel, try another start.
	No fuel to engine.	Loosen one line at nozzle. If no fuel shows, with fuel flow on gage, replace fuel manifold valve.
Rough Idle	Nozzle restricted.	Remove nozzles and clean.
	Improper idle mixture.	Adjust fuel-air control unit in accordance with adjustment procedures.
Poor Acceleration	Idle mixture incorrect.	Adjust fuel-air control unit in accordance with adjustment procedures.
	Unmetered fuel pressure too high.	Lower unmetered fuel pressure.
	Worn linkage.	Replace worn elements of linkage.
Engine Runs Rough	Restricted nozzle.	Remove and clean all nozzles.
	Improper mixture.	Improper pump pressure, replace pump.
Low Fuel Flow Gage Indication	Restricted flow to metering valve.	Check mixture control for full travel. Check for clogged fuel filters.
	Inadequate flow from fuel pump.	Adjust engine-driven fuel pump.

10-5 FUEL INJECTION SYSTEM TROUBLE-SHOOTING CHART (Continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
High Fuel Flow Gage Indication	Restricted flow beyond metering valve.	Check for restricted nozzles or fuel manifold valve. Clean or replace as required.
	Restricted recirculation passage in fuel pump.	Replace engine-driven fuel pump.
Fluctuating or Erroneous Fuel Flow Indications	Vapor in system, excess fuel temperature.	If not cleared with auxiliary pump, check for clogged ejector jet in vapor separator cover. Clean only with solvent, no wires.
	Air in fuel flow gage line. Leak at gage connection.	Repair leak and purge line.
Poor Idle Cut-Off	Engine getting fuel.	Check mixture control is in full idle cut-off. Check auxiliary pump is OFF. If neither, replace manifold valve.
Unmetered Fuel Pressure	Internal orifices plugged.	Clean internal orifices in injector pump.
Unmetered Fuel Pressure Drop	Relief valve stuck open.	Repair or replace injector pump.
Very High Idle And Full Throttle Fuel Pressure Present	Relief valve stuck closed.	Repair or replace injector pump.
No Fuel Pressure	Check valve stuck open.	Repair to replace injector pump.

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CHAPTER 11

ENGINE PRESERVATION AND STORAGE

Section Index

11-1 ENGINE PRESERVATION AFTER OVERHAUL

Freshly honed cylinders are very susceptible to CORROSION. The following procedures should be accomplished at the time of major overhaul or top overhaul.

Aircraft engine storage recommendations are broken down into the following categories:

A. Flyable Storage (7 to 30 days)

B. Temporary Storage (up to 90 days)

C. Indefinite Storage

11-2 FLYABLE STORAGE (7 to 30 days)

1. Service aircraft per normal airframe manufacturer's instructions.

2. During flyable storage, the propeller should be rotated by hand every 7 days. Rotate the engine six revolutions, stop the propeller at 45° to 90° from the original position.

CAUTION. . . For maximum safety, accomplish engine rotation as follows:

a. Verify magneto switches are "OFF".

b. Throttle position "CLOSED".

c. Mixture control "IDLE-CUT-OFF".

d. Set brakes and block aircraft wheels.

e. Assure that aircraft tie-downs are installed and verify that the cabin door latch is open.

3. If at the end of thirty (30) days the aircraft is not removed from storage, it should be flown for a minimum of thirty (30) minutes. If the aircraft cannot be flown, it should be represerved in accordance with Temporary Storage or Indefinite Storage.

11-3 TEMPORARY STORAGE (up to 90 days)

1. Preparation for storage.

a. Remove the top spark plug and spray atomized preservative oil, (Lubrication Oil-Contact and Volatile Corrosion-Inhibited, MIL-L-46002, Grade 1) at room temperature, through upper spark plug hole of each cylinder with the piston in approximately the bottom dead center position. Rotate crankshaft as opposite cylinders are sprayed. Stop crankshaft with none of the pistons at dead center.

NOTE. . . Shown below are preservative oils recommended for use in Teledyne Continental engines for temporary and indefinite storage:

MIL-L-46002, Grade 1 Oils:

NOX RUST VCI-105	Daubert Chemical Company 4700 S. Central Avenue Chicago, IL
TECTYL 859A	Ashland Oil, Inc. 1401 Winchester Avenue Ashland, Kentucky

b. Re-spray each cylinder. To thoroughly cover all surfaces of the cylinder interior; move the nozzle or spray gun from the top to the bottom of the cylinder.

c. Install spark plugs.

d. Spray preservative oil (approximately two ounces) through the oil filler tube.

e. Seal all engine openings exposed to the atmosphere using suitable plugs, or moisture resistant tape.

f. Engines installed in aircraft that are preserved for storage in accordance with this section should have a tag affixed to the propeller in a conspicuous place with the following notation on the tag: "DO NOT TURN PROPELLER - ENGINE PRESERVED".

2. Preparation for Service

a. Remove seals, tape, paper and streamers from all openings.

b. With bottom spark plugs removed, rotate the propeller several revolutions to remove preservative oil; re-install spark plugs.

c. Conduct a normal engine start.

d. Give the aircraft a thorough visual inspection prior to flight testing.

11-4 INDEFINITE STORAGE

1. Preparation for storage.

a. Drain the oil and refill with MIL-C-6529 Type II. Start engine and run until normal oil and cylinder head temperatures are reached. Fly the aircraft for thirty (30) minutes. Allow engine to cool to ambient temperature. Accomplish steps "1.a." and "1.b." of tempeorary storage.

b. Apply preservative to engine interior by spraying (approximately two ounces) through the oil filler tube.

2. Install dehydrator plugs MS27215-2, in each of the top spark plug holes, making sure that the contents of each plug is blue in color when installed. Protect and support the spark plug leads with AN-4060 protectors.

3. The TCM fuel injection system does not require any special preservation.

4. Place a bag of desiccant in the exhaust pipes and seal the openings with moisture resistance tape.

5. Seal the induction system with moisture resistant tape.

6. Seal the engine breather.

7. Attach a red streamer at each location where bags of desiccant are placed. Attach red streamers outside of the sealed areas.

8. Installed preserved engines should be conspicuously tagged: "DO NOT TURN PROPELLER ENGINE PRESERVED."

11-5 RETURNING ENGINE TO SERVICE

1. Remove the cylinder dehydrator plugs, tape, desiccant bags and streamers.

2. Drain the preservative oil and re-service with recommended lubricating oil.

3. Remove bottom plugs; rotate propeller to clear preservative oil from the cylinders.

4. Re-install the spark plugs and rotate the propeller by hand several revolutions to check for possible liquid lock. Start the engine.

5. Give the aircraft a thorough visual inspection and test flight per airframe manufacturer's instructions.

11-6 INDEFINITE STORAGE INSPECTION PROCEDURES

Aircraft prepared for indefinite storage should have the cylinder dehydrator plugs visually inspected every 30 days. The plugs should be changed as soon as their color changes. If the dehydrator plugs have changed color in one-half or more of the cylinders, all desiccant material on the engine should be replaced.

The cylinder bores of all engines prepared for indefinite storage should be re-sprayed with corrosion preventive oil every six (6) months, or less. Replace all desiccant and dehydrator plugs. Before spraying, the engine should be inspected for corrosion as follows: Inspect all cylinders through the spark plug hole. If cylinder exhibits rust stains, spray cylinder corrosion preventive oil and turn prop over six times, then re-spray all cylinders.

INTENTIONALLY

LEFT

BLANK

CHAPTER 12

AIRWORTHINESS LIMITATION

AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations Section is F.A.A. Approved and specifies maintenance required under Sections §43.16 and §91.163 of the Federal Aviation Regulations unless an alternative program has been F.A.A. Approved. This section is part of the type design of the IO550 engine pursuant to Section §21.31 of the Federal Aviation Regulations.

1. Mandatory Replacement Times.
Subject to additional information contained in F.A.A. Approved Mandatory Service Bulletins issued after the date of certification, the IO-550 engine does not contain any components having mandatory replacement times required for type certification.

2. Mandatory Inspection Intervals.
Subject to additional information contained in F.A.A. Approved Mandatory Service Bulletins issued after the date of certification, 50 hours and 100 hour inspections as described in the IO-550 Continued Airworthiness Maintenance and Operator's Manual and inspections mandated by the F.A.A. under 43 and 91 of the Federal Aviation Regulations are required for type certification.

3. Other Related Procedures.
Subject to additional information contained in F.A.A. Approved Mandatory Service Bulletins issued after the date of certification, the IO-550 engine does not have any inspection-related or replacement time-related procedures required for type certification.

4. Distribution of Changes to Airworthiness Limitations.
Changes to Airworthiness Limitations section constitute changes to the type design of the IO-550 engine and require F.A.A. approval pursuant to Federal Aviation Regulations Sections §21.95, §21.97 or §21.99. Such changes will be published in F.A.A. Approved Mandatory Service Bulletins, which are furnished to subscribers to TCM Service Bulletins and can be obtained by writing TCM, P.O. Box 90, Mobile, Alabama 36601.

CHAPTER 13

ENGINE PERFORMANCE AND CRUISE CONTROL

Section Index

The curves in this chapter represent uninstalled performance and are provided as a reference in establishing power conditions for takeoff, climb and cruise operation. Refer to aircraft manufacturer's flight manual for tabular climb and cruise data.

13-1 CRUISE CONTROL BY PERFORMANCE CURVE

1. Set manifold pressure and RPM at cruise power selected.

2. To determine actual horsepower, employ the following procedure:

a. Correct horsepower for inlet air temperature as follows:
(TS = Standard Altitude Temperature)
(1) Add 1% for each 10°F below TS.
(2) Subtract 1% for each 10° above TS

3. These engines are equipped with altitude compensating fuel pumps which automatically provide the proper full rich mixture at any given altitude. Adjust mixture to lean out fuel flow for cruise settings according to applicable fuel flow vs. brake horsepower curve.

CAUTION. . . When increasing power, enrich mixture, advance RPM and adjust throttle in that order. When reducing power, retard throttle, then adjust RPM and mixture.

NOTE. . . It may be necessary to make minor readjustments to fuel flow (mixture) after changing RPM.

13-2 CRUISE CONTROL BY E.G.T.

If exhaust gas temperature indicator is used as an aid to leaning proceed as follows:

1. Adjust RPM for desired cruise setting.

2. Slowly move mixture control toward "lean" while observing E.G.T. gage. Note position on the instrument where the needle "peaks" or starts to drop as mixture is leaned further.

3. The maximum recommended cruise setting is 235 BHP at 2500 RPM and 25.0 In. Hg. MAP with the mixture set at 25°F rich or lean or peak E.G.T. At cruise settings below 65% engine may be operated at peak E.G.T.

CAUTION. . . Do not attempt to adjust mixture by use of E.G.T. at setting above 78% of maximum power. Also, remember that engine power will change with ambient conditions. Changes in altitude or outside air temperature will require adjustments in manifold pressure and fuel flow. (Refer to Charts Fuel Flow Vs. BHP).

Gage fuel flow should fall between the maximum and minimum values on the curve. If not, the fuel injection system or instrumentation (including tachometer, manifold pressure, fuel flow gage or E.G.T. system) should be checked for maladjustments or calibration error.

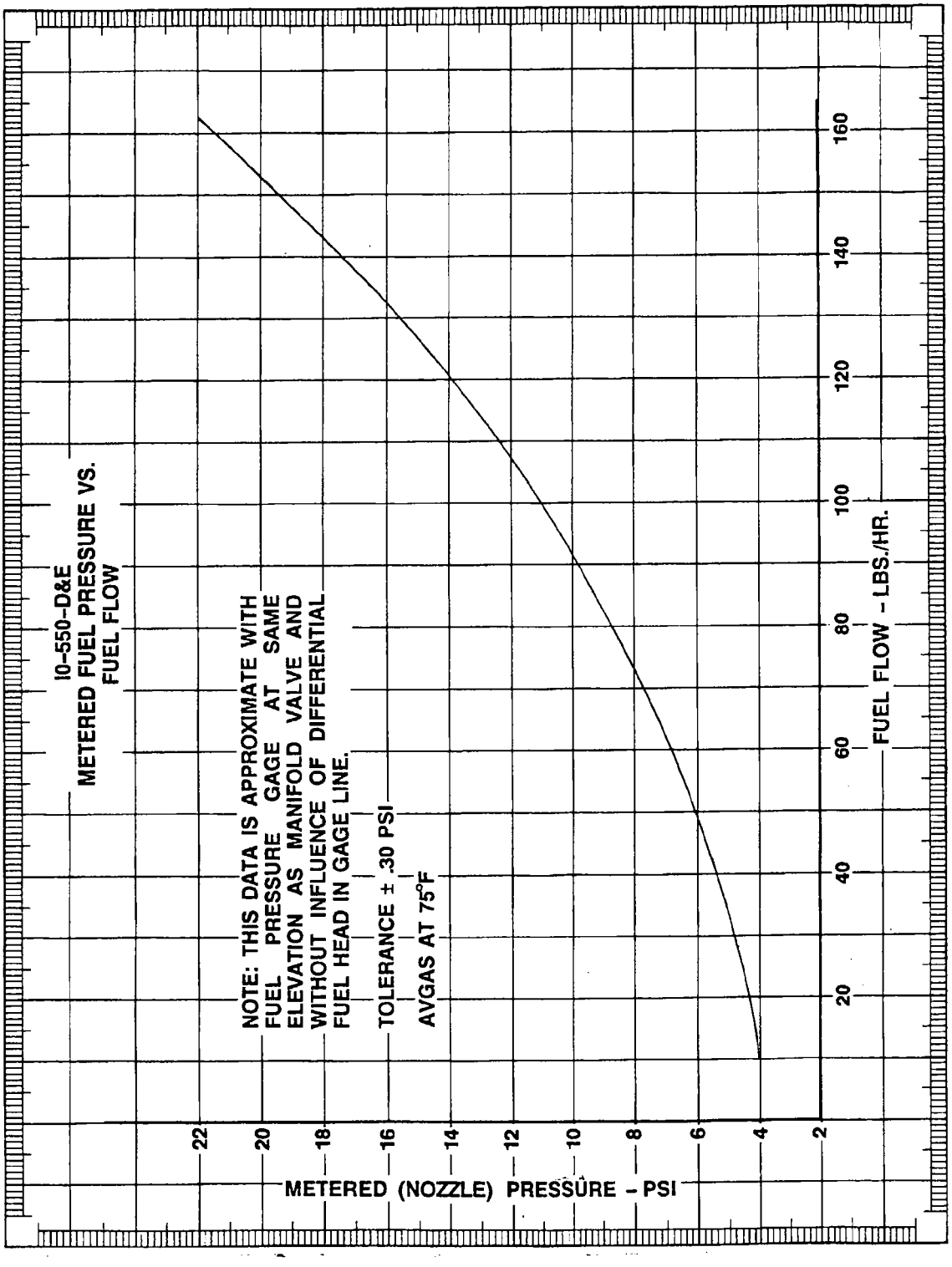

Figure 13-1. Metered Pressure Vs. Fuel Flow

IO-550-D&E

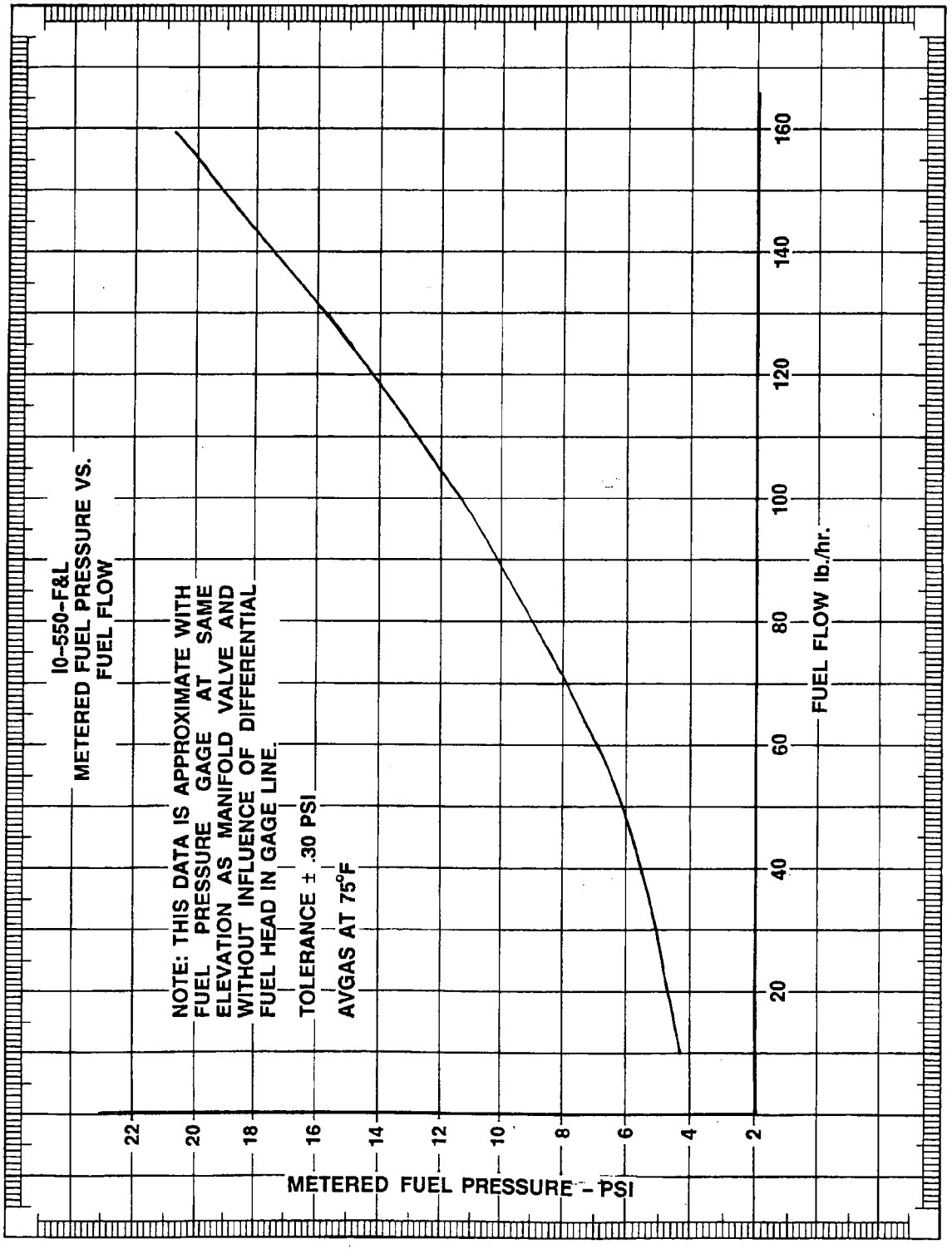

Figure 13-2. Metered Fuel Pressure Vs. Fuel Flow

IO-550-F&L

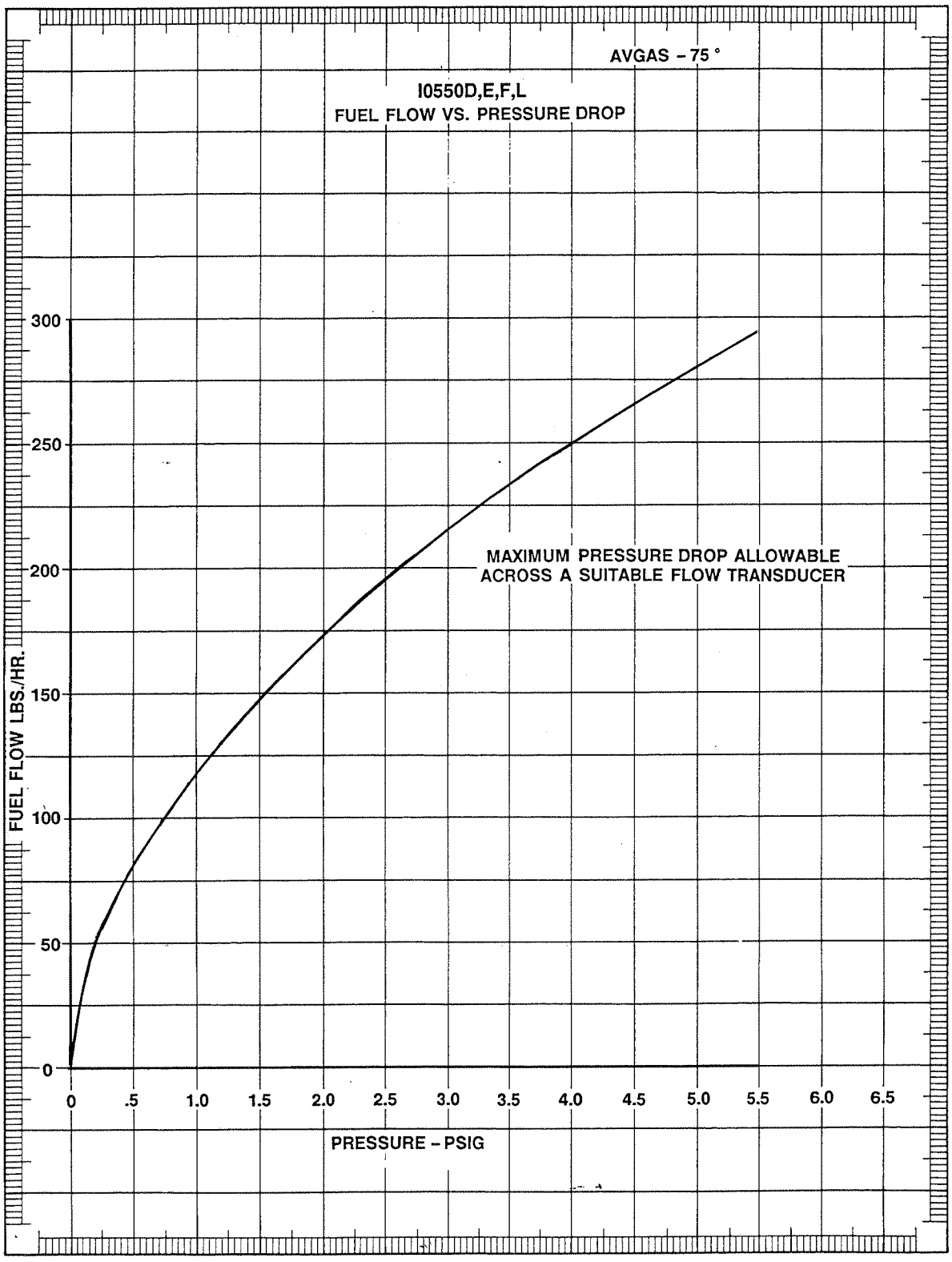

Figure 13-3. Fuel Flow Vs. Pressure Drop
IO-550-D,E,F&L

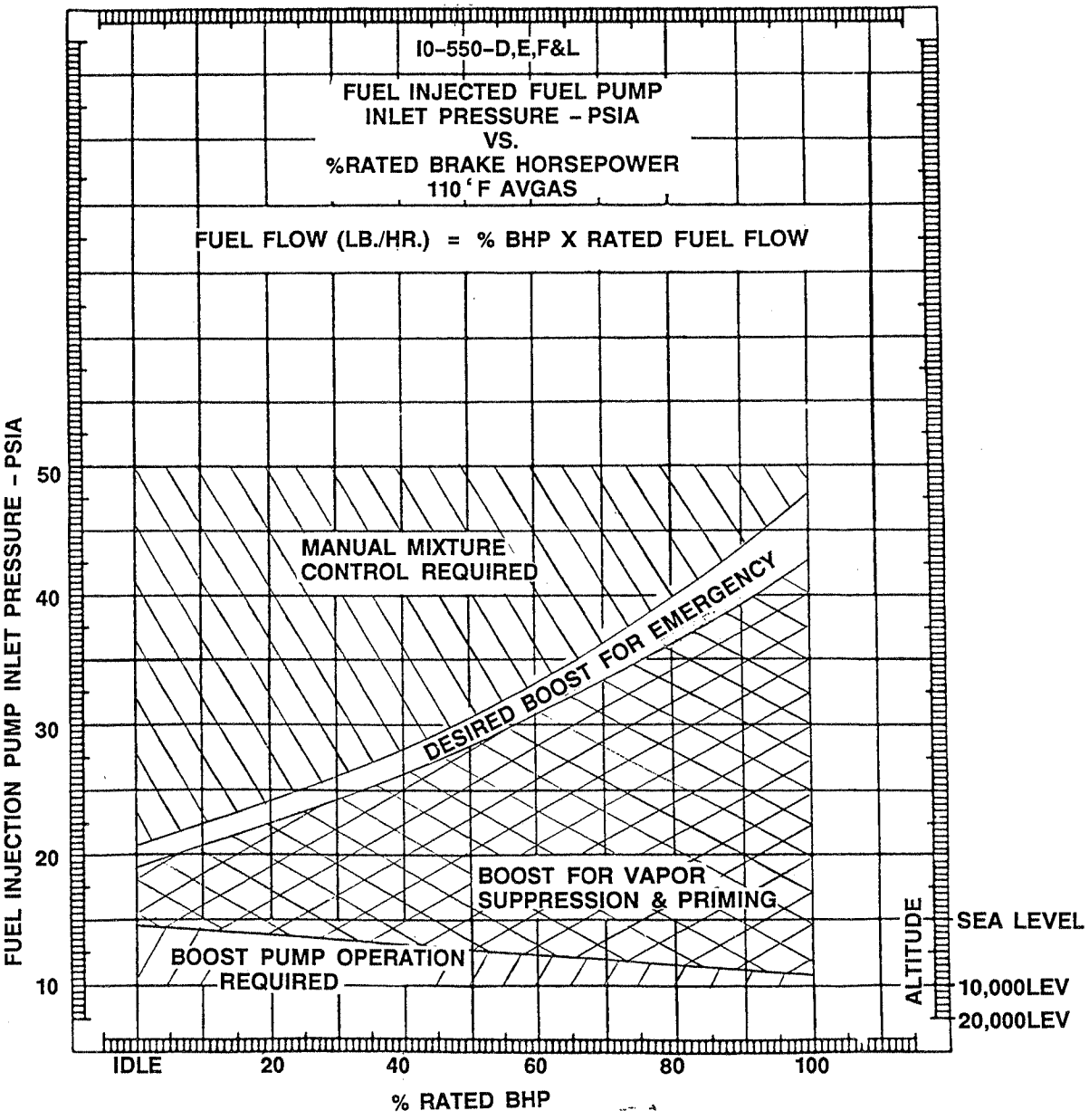

Figure 13-4. Fuel Injected Fuel Pump Inlet Pressure - PSIA Vs. % Rated Brake Horesepower IO-550D,E,F&L

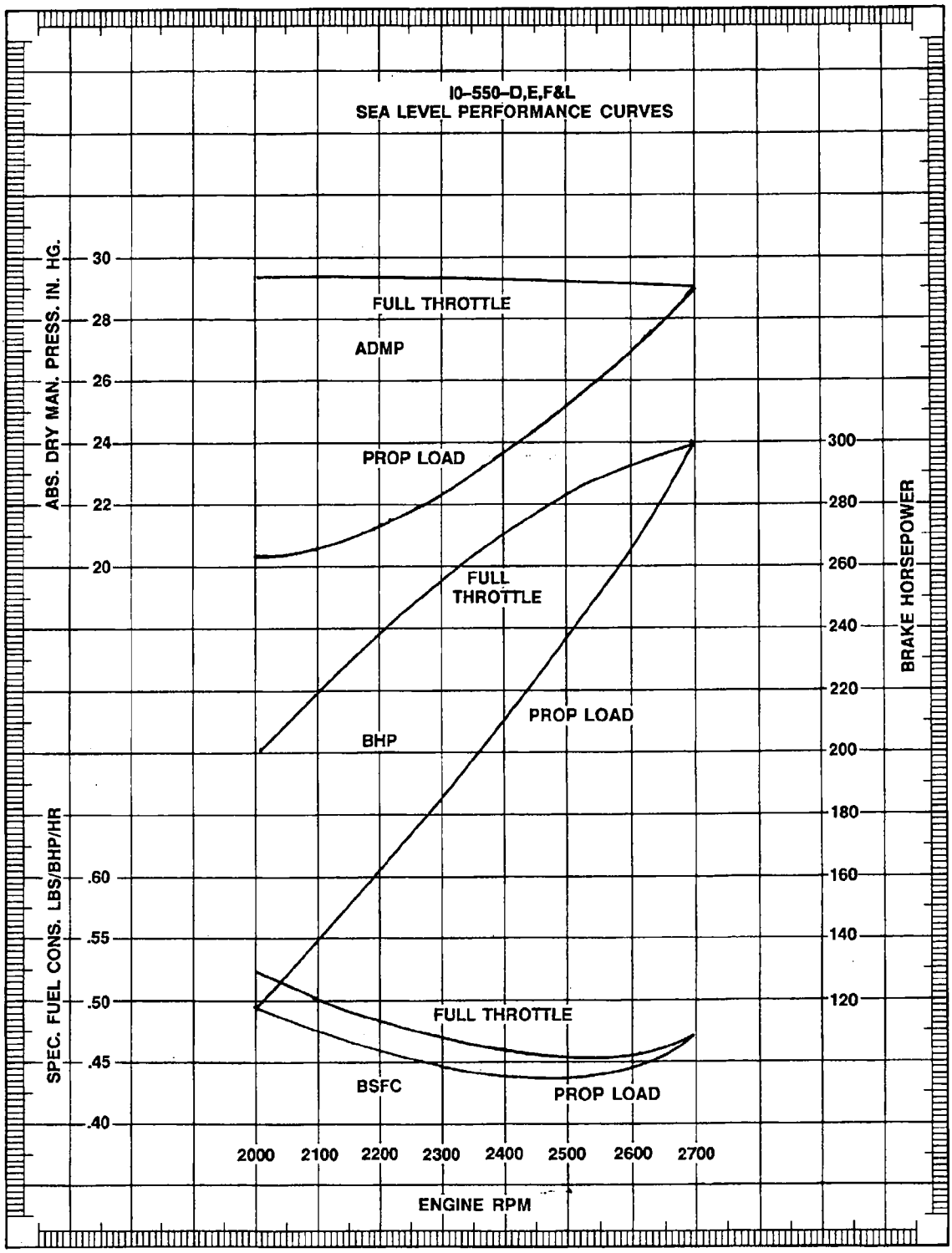

Figure 13-5. Sea Level Performance Curve
IO-550-D,E,F,&L

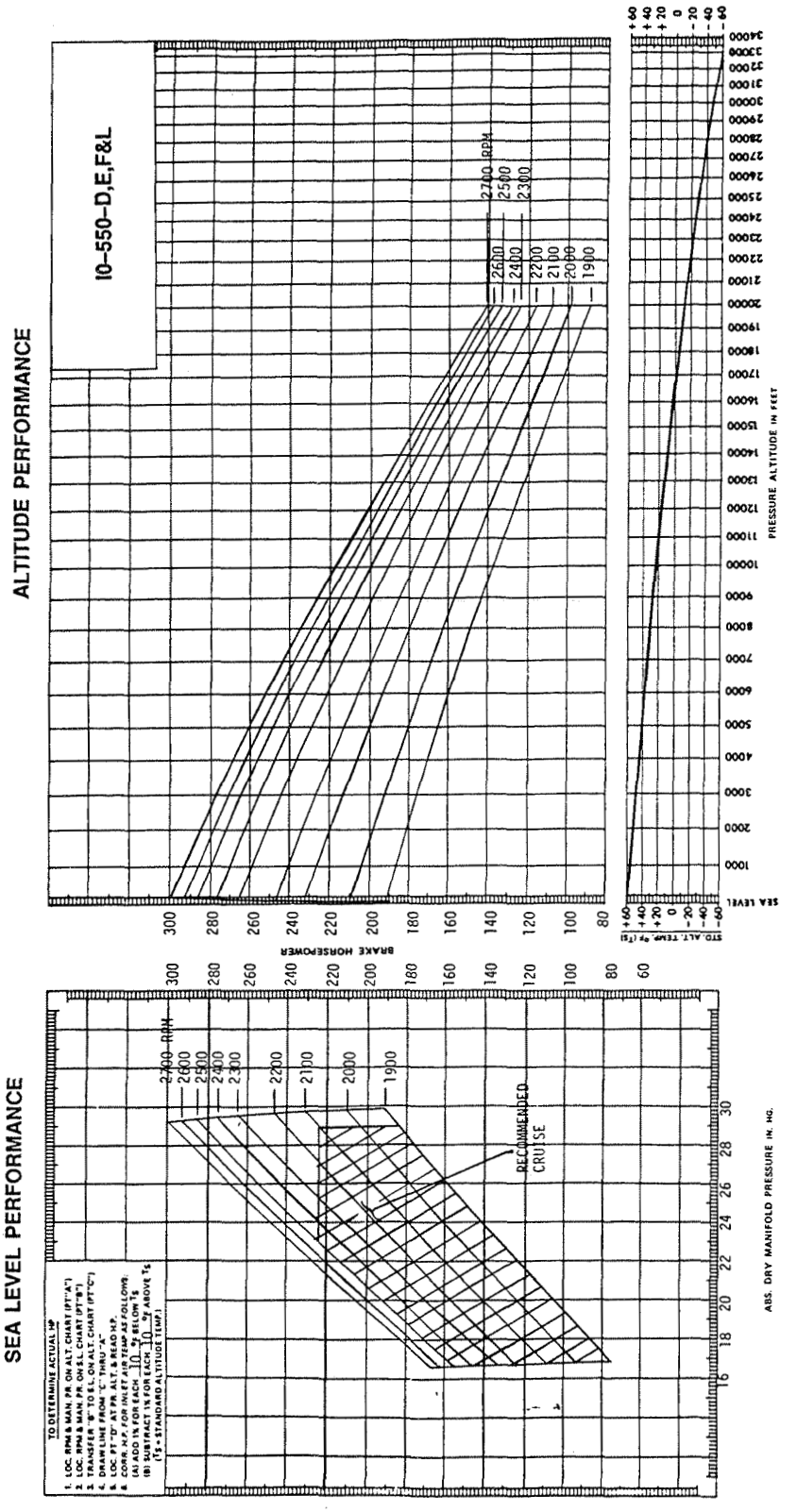

Figure 13-6. Sea Level Performance & Altitude Performance

IO-550-D,E,F&L

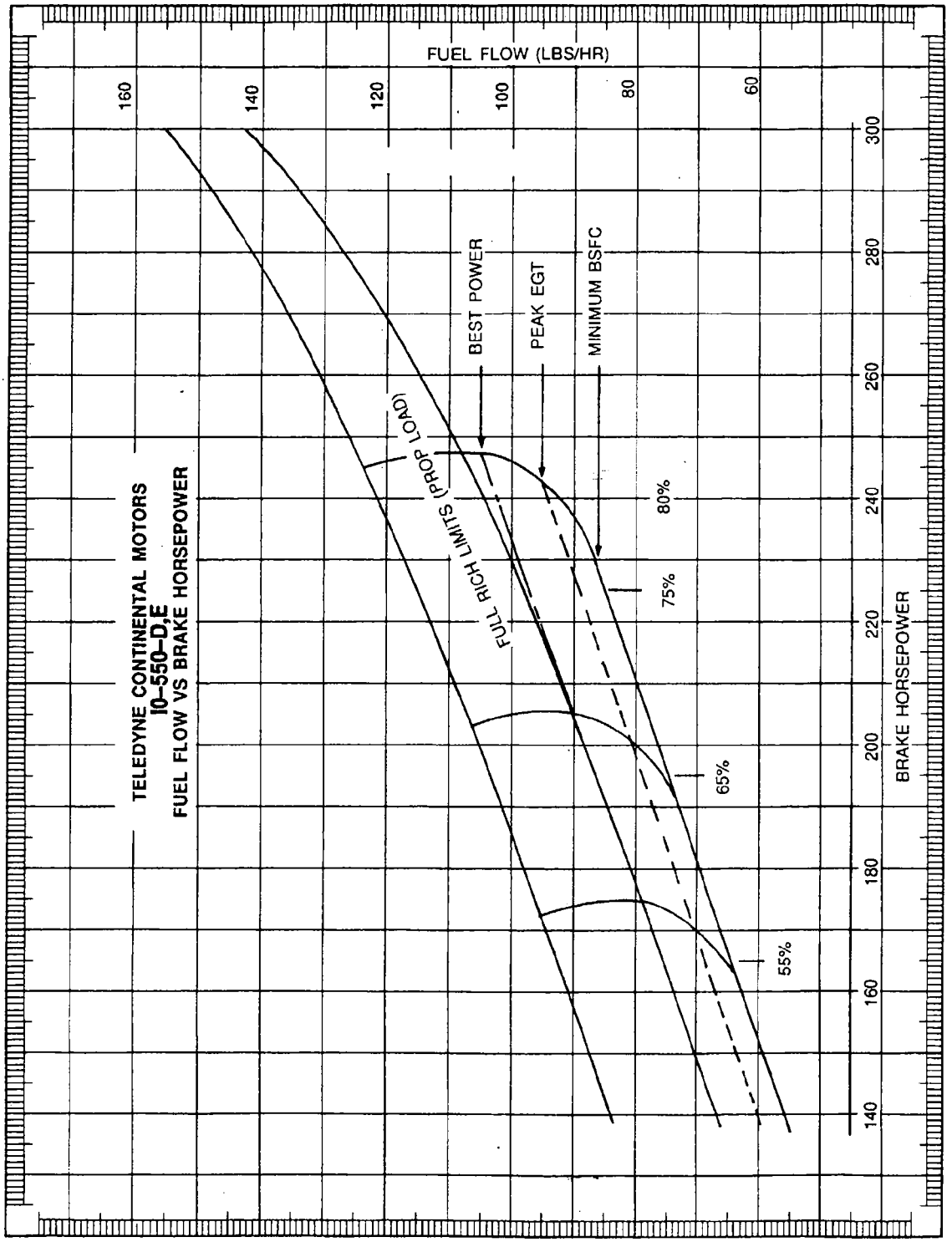

Figure 13-7. Fuel Flow Vs. Brake Horsepower
IO-550-D&E

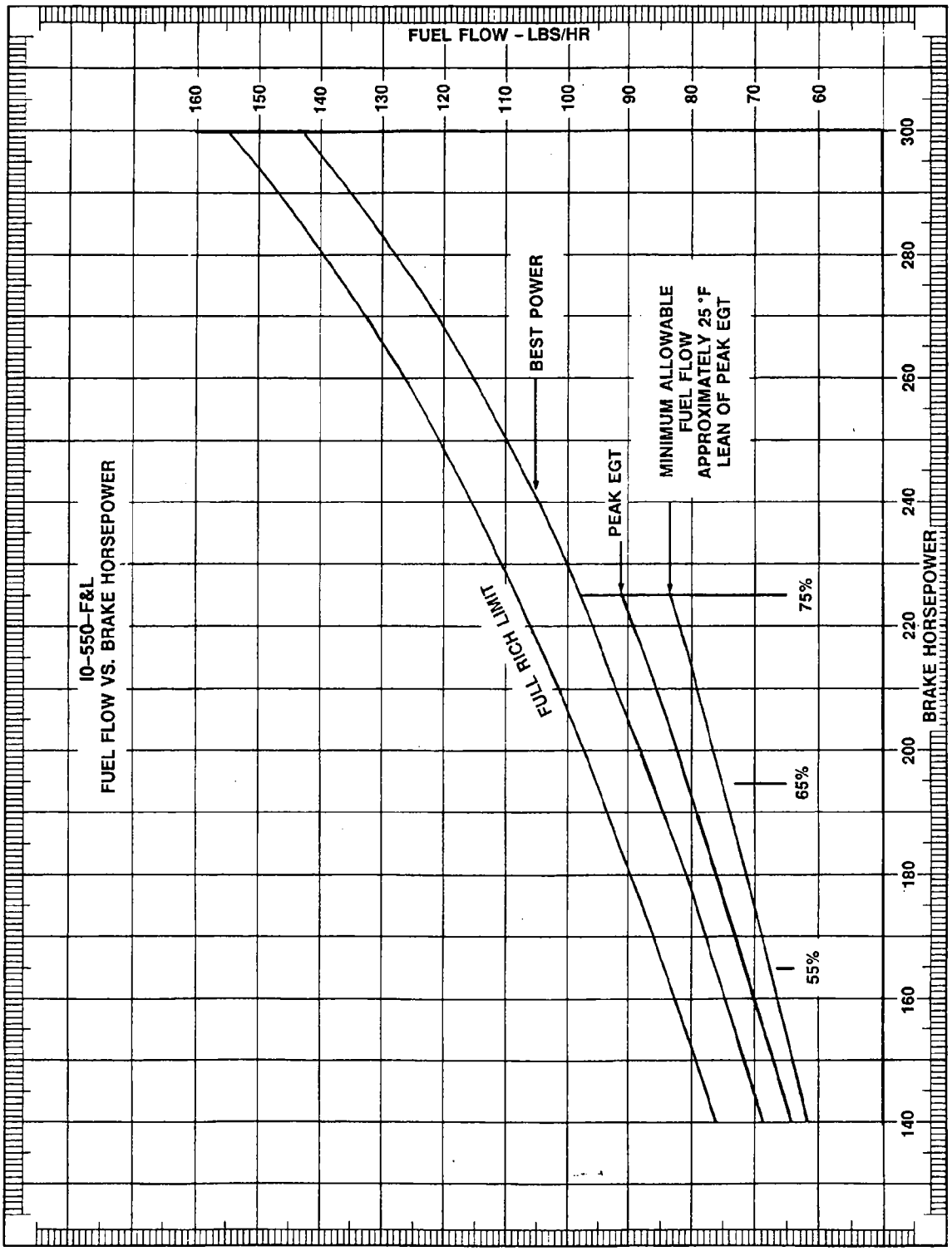

Figure 13-8. Fuel Flow Vs. Brake Horsepower
IO-550-F&L

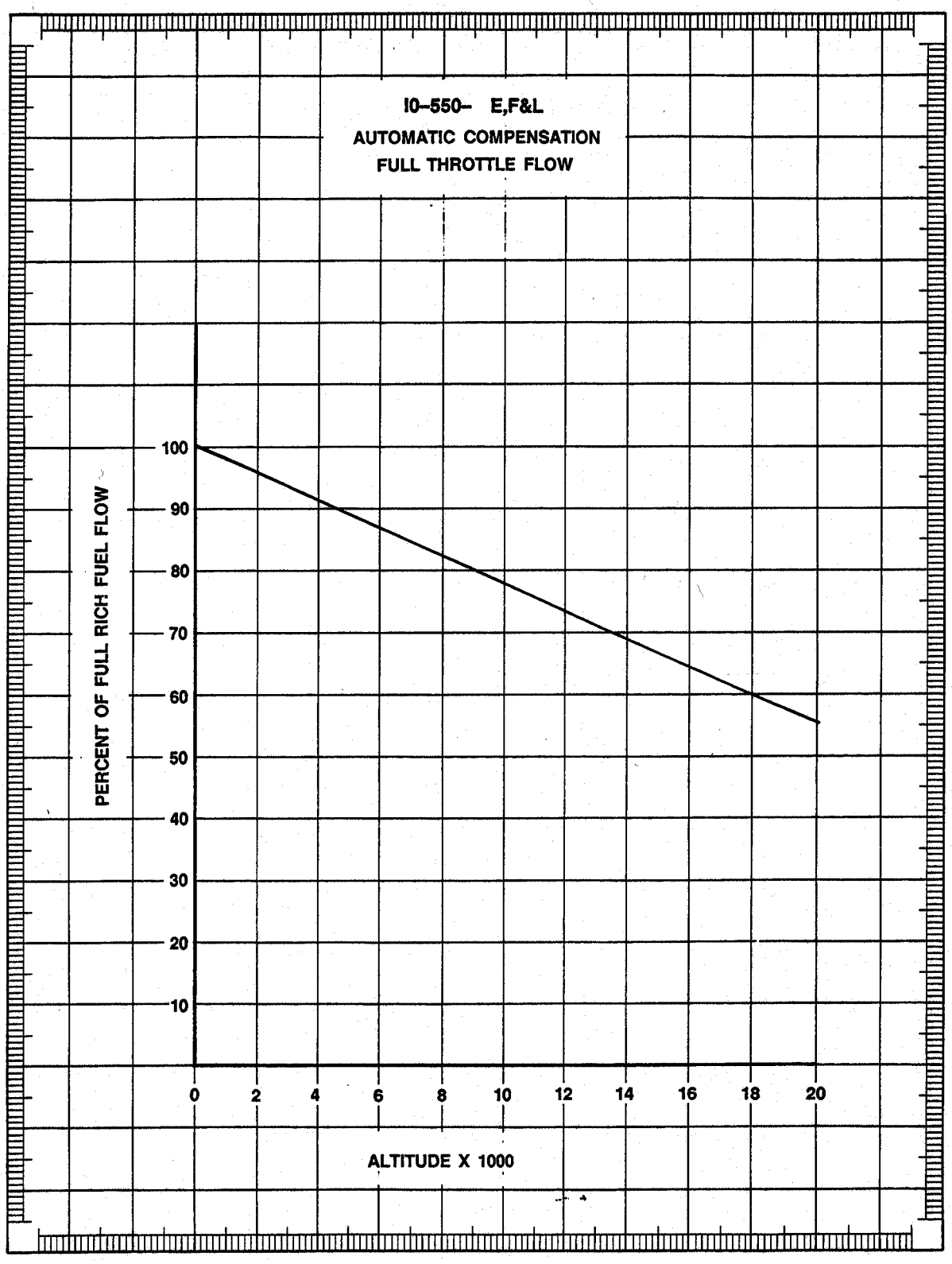

Figure 13-9. Automatic Compensation Full Throttle Flow IO-550-E,F&L

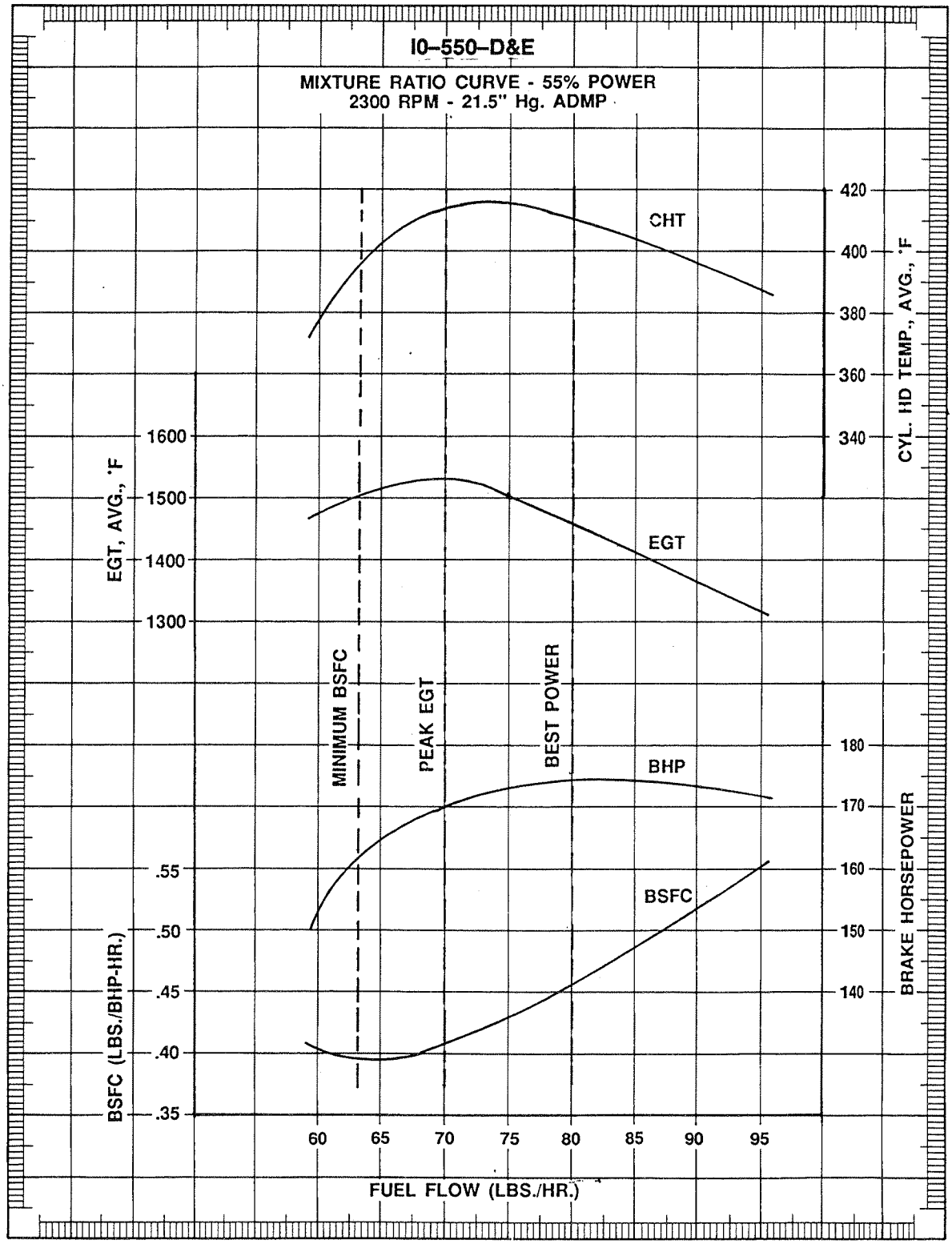

Figure 13-10. Mixture Ratio Curve 55% Power
IO-550-D&E

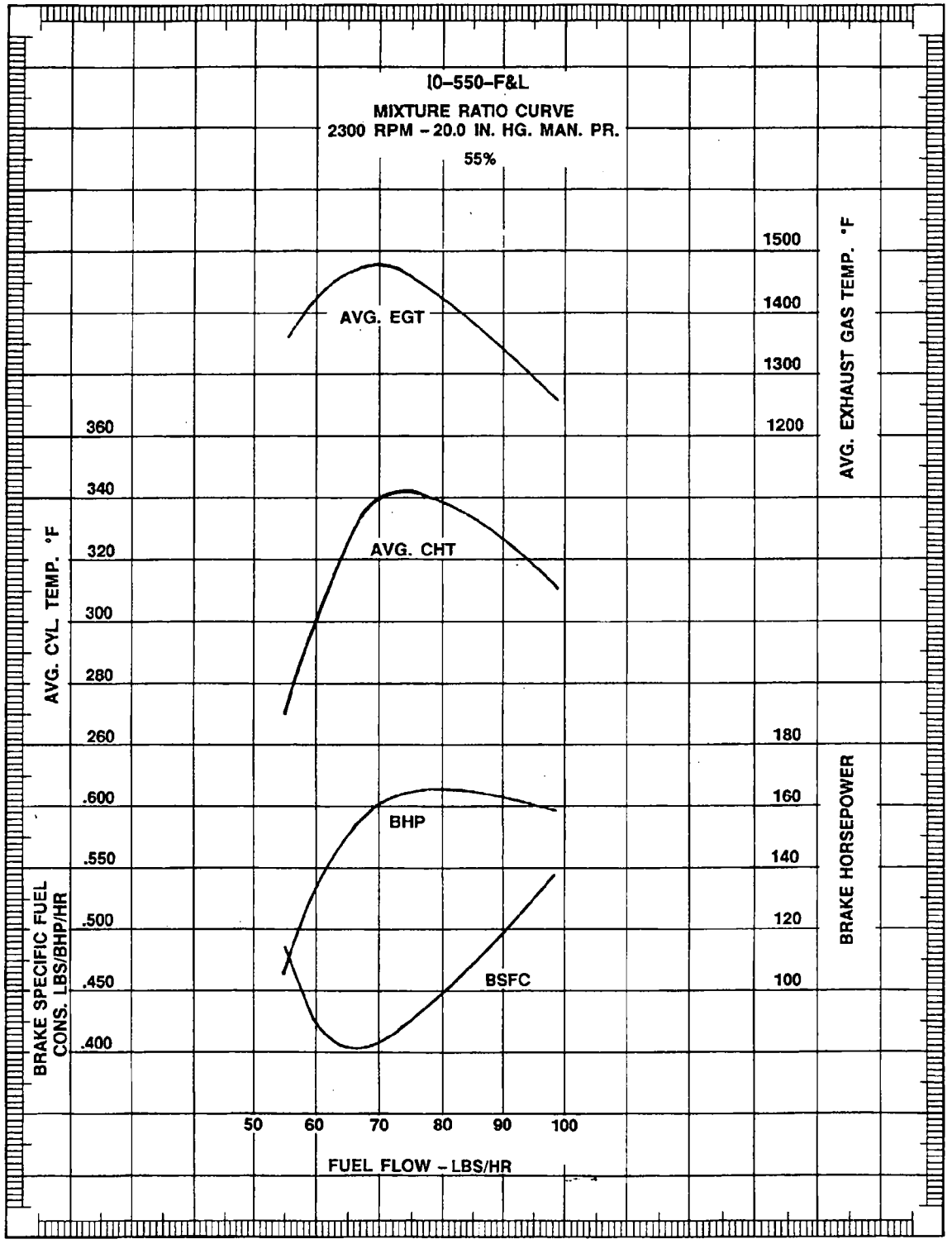

Figure 13-11. Mixture Ratio Curve 55% Power
IO-550-F&L

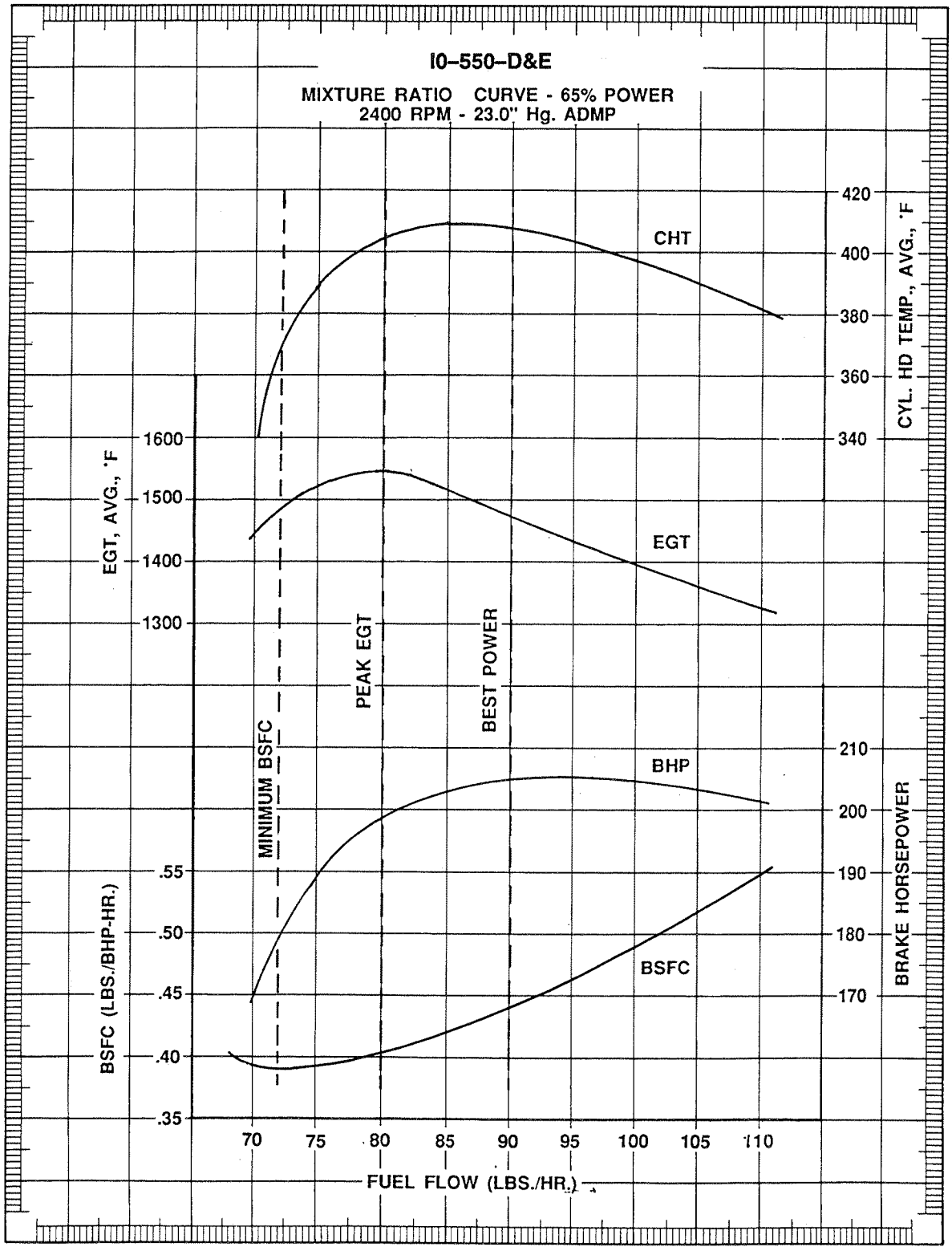

Figure 13-12. Mixture Ratio Curve 65% Power
IO-550-D&E

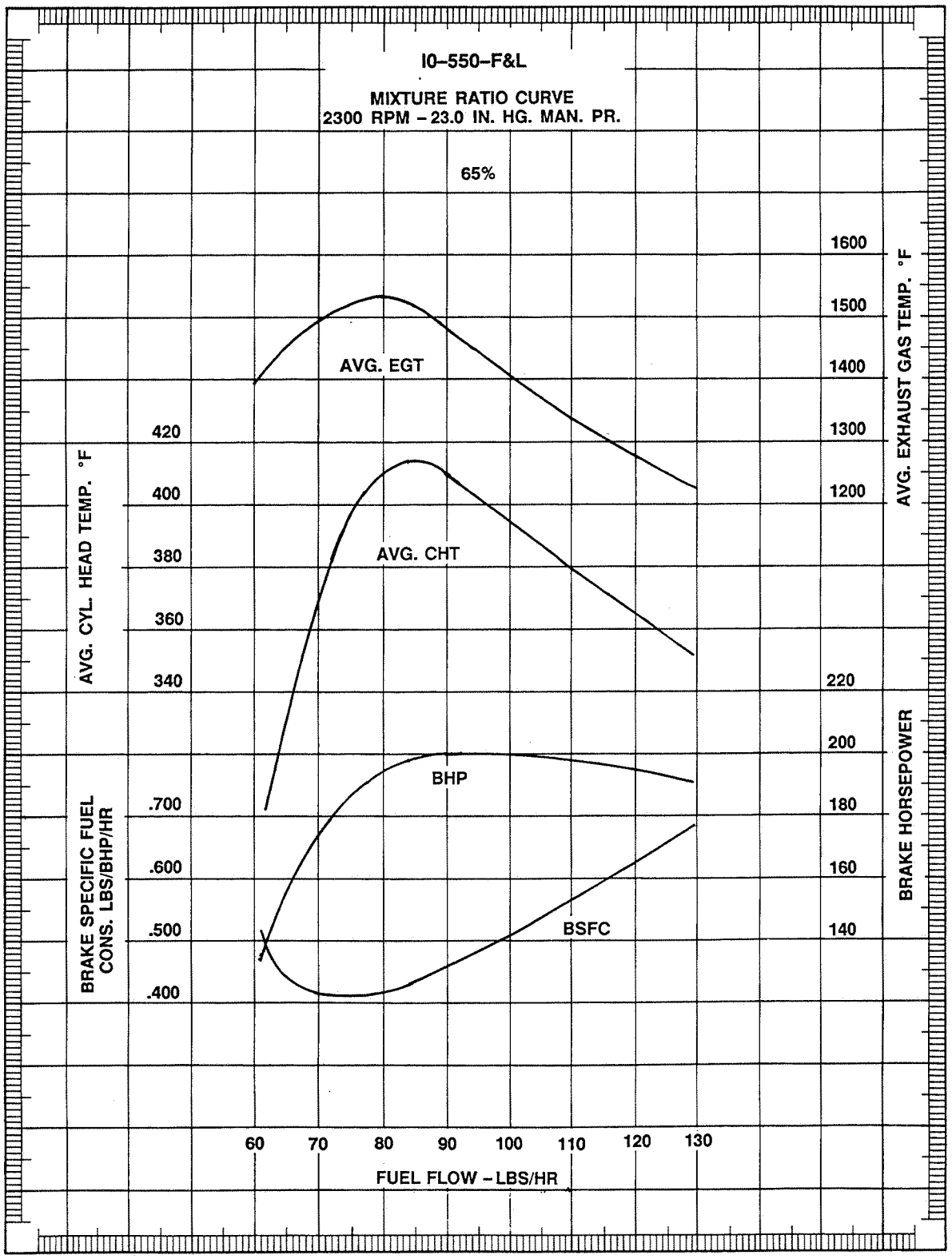

Figure 13-13. Mixture Ratio Curve 65% Power
IO-550-F&L

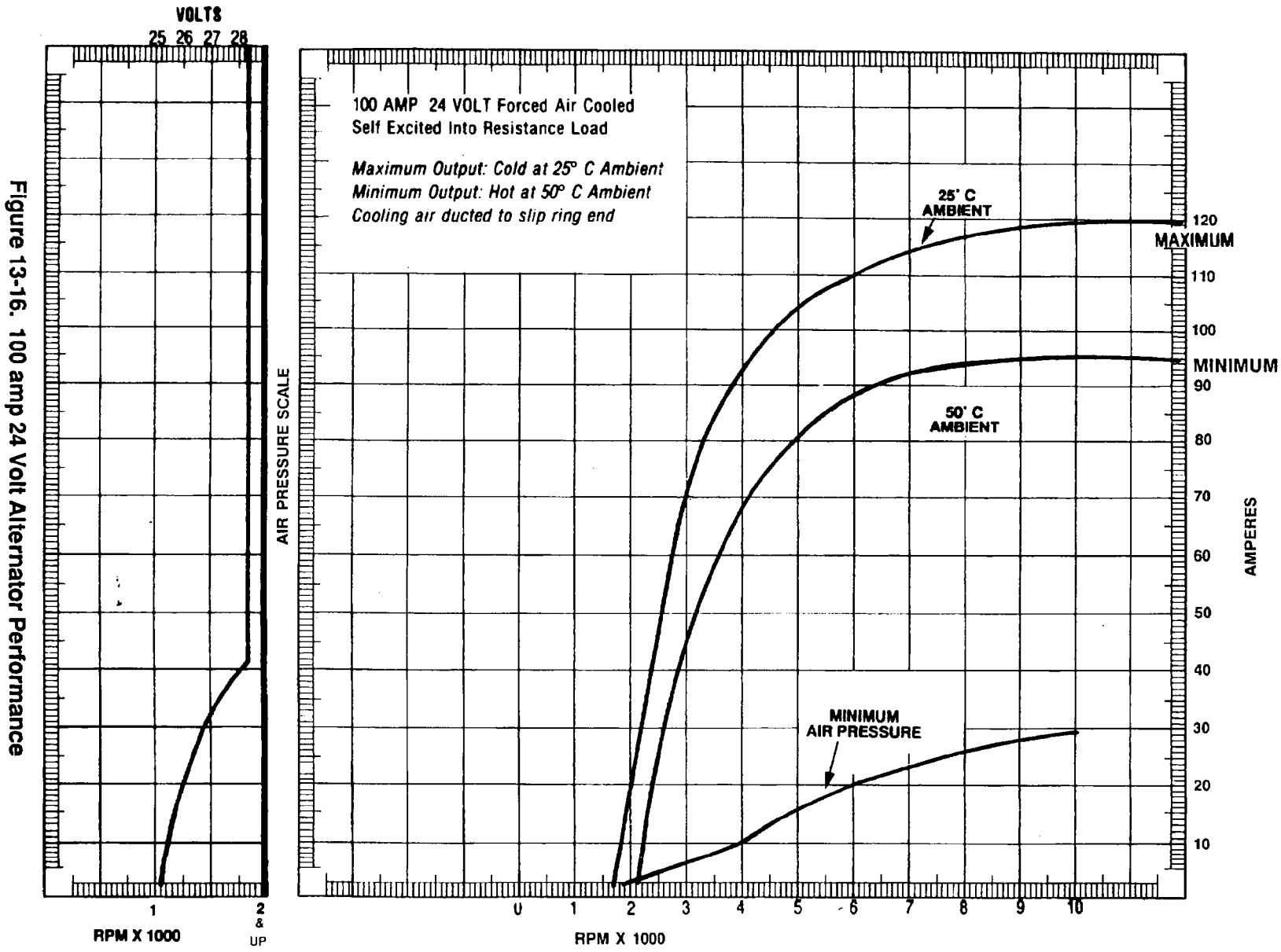

Figure 13-16. 100 amp 24 Volt Alternator Performance

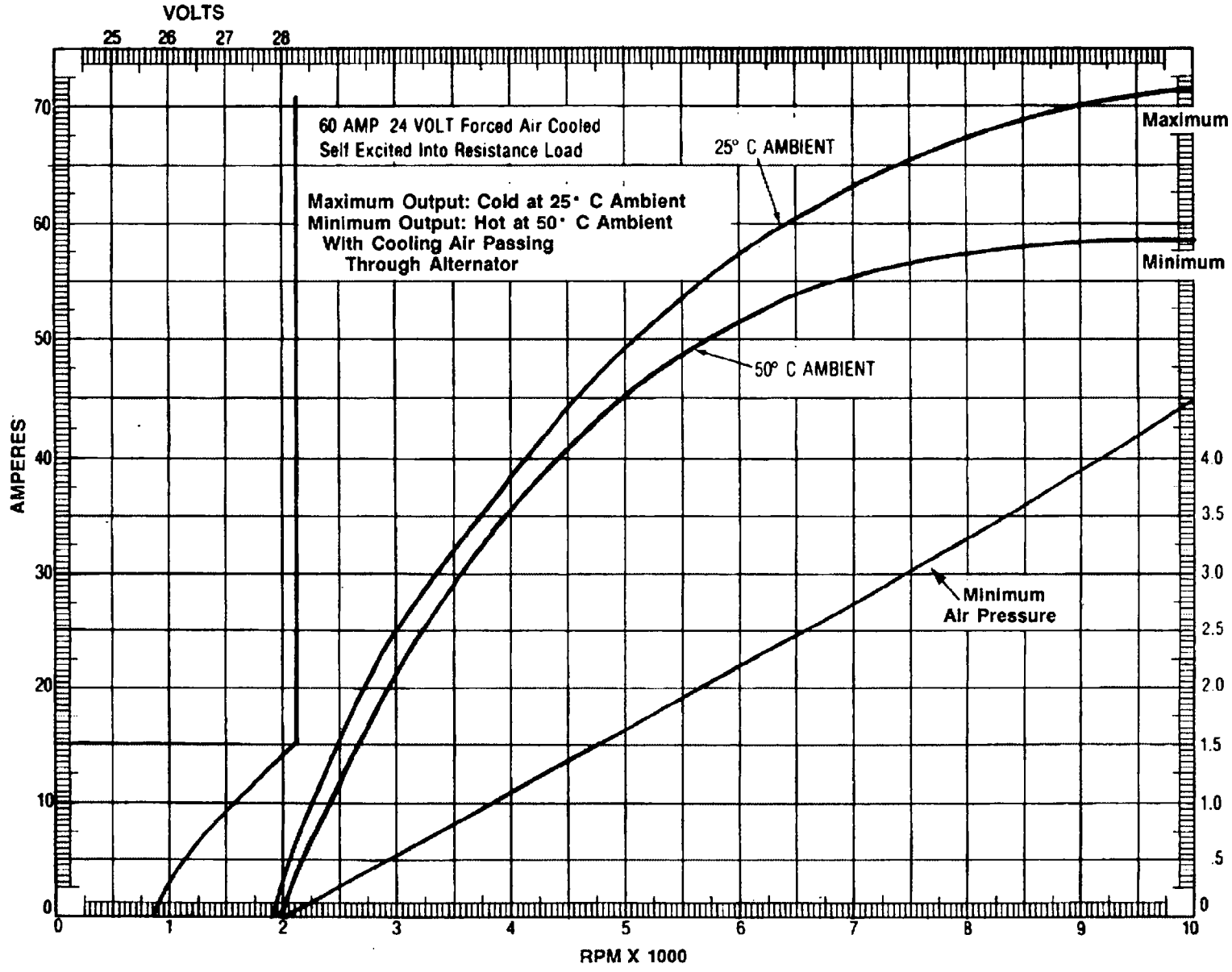

Figure 13-17. 60 amp 24 Volt Alternator Performance

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