PREPARED	PIPER AIRCRAFT CORP. DEVELOPMENT CENTER, VERO BEACH, FLA	
CHECKED		
APPROVED	REPORT VB-163	PAGE

DUPLICATE

AIRPLANE FLIGHT MANUAL

MODEL PA-28-180

SERIAL NOS. 671 THRU 5600

FAA IDENTIFICATION NO. _____

SERIAL NO. 28-1300

THIS DOCUMENT MUST BE KEPT IN AIRPLANE AT ALL TIMES.

FAA APPROVED: Original signed by Walter R. Haldeman *
Walter R. Haldeman
Chief, Engineering & Manufacturing Branch
Southern Region - - - Atlanta, Georgia

DATE: August 3, 1962

FAA APPROVED: Gene Dearing For Retype Only.
Gene Dearing
Aerospace Engineer

DATE: August 12, 1964

Log of Revisions

REVISION NO.	PAGE	DESCRIPTION	APPROVED	DATE
1	1	Deleted Propeller Pitch Information. Added Static R.P.M. Information	for H. E. Waterman Supervisor SO-EMDO-42	5/25/64
2	2	Placards Section: Added Placard No. 5	H. E. Waterman Supervisor SO-EMDO-42	7/8/64
3	2	Added to Placard No. 3: "BAGGAGE, MAX. 200 LBS., SEE WEIGHT AND BALANCE DATA FOR BAGGAGE LOADINGS BETWEEN 150 LBS. AND 200 LBS."	for H. C. Faller Supervisor SO-EMDO-43	8/5/64
	1	Added Sensenich M76EMMS		
4	3	Item 5 added to Procedures Section.	H. C. Faller Supervisor SO-EMDO-43	10/20/64
5	1	Limitations Section: Revised Oil Temperature and Fuel Pressure Range	for H. C. Faller Supervisor, SO-EMDO-43	6/23/65
6	1	Limitation Section: Add note to Engine Limits	H. C. Faller Supervisor, SO-EMDO-43	1/5/66
7	2	C. G. Range: 1975 lbs. 85.9 In. 95.9 In. 1650 lbs. 84.0 In. 95.9 In. Was 18.50 lbs. 85.1 In. 95.9 In.		
	4	Added Procedures Section And Item 6		
	2	Added Placard No. 6	H. C. Faller Supervisor SO-EMDO-43	5/20/66

FAA APPROVED 8/3/62

Log of Revisions

Revision No.	Page	Description	Approved	Date
8	1	Revised Oil Temperature, Oil Pressure and Fuel Pressure Limitations		
	2,3	Revised Placards No. 3 and No. 5		
	5	Added Page 5		
		Procedures Section - Added Item 7		
	6	Added Page 6	Henry C. Faller Supervisor SO-EMDO-43	7/15/66
9	1	Limitations Section Add "or 0-360-A4A	Henry C. Faller Supervisor SO-EMDO-43	8/2/66
10	2, 3	C. G. Range - Placard No. 1 and Placard No. 3 revised to include utility category operations. Added utility category max. wt. and approved maneuvers		
	4	Procedures Section - Added to Item 3 "For Normal Category Operation". Added Placard No. 7.		
	3	Placards Section - Added utility category operation to Item 4.		
	1	Added Utility Category		
	2	Added maximum positive load factor for Utility Category. Added Baggage Capacity.	Henry C. Faller Supervisor SO-EMDO-43	12/6/66

FAA APPROVED 8/3/62

Log of Revisions

PAGE	DESCRIPTION	APPROVED	DATE
3	Placards Section: Revised Placard No. 1 to read, "In Full View of the Pilot"	H. C. Faller Supervisor SO-EMDO-43	5/12/67
2	Revised C. G. Range	H. C. Faller Supervisor SO-EMDO-43	9/25/67
3, 4	Revised Placard No. 4 and No. 7 to read: "In full view of the pilot"	H. C. Faller Supervisor SO-EMDO-43	4/2/68
1	Added Aircraft Serial Numbers 1571 and 1573 to Engine and Propeller Limitations	H. C. Faller Supervisor SO-EMDO-43	6/3/68
1	Added Propeller Designations	H. C. Faller Supervisor SO-EMDO-43	6/24/68
Title	Allocated Piper Report No. VB-163 to this Manual.	H. M. Toomey FAA DOA SO-1	11/14/68
Title	Added Applicable Serial Nos. 1 Thru 4377	H. M. Toomey FAA DOA SO-1	4/22/69
1	Added Supplement No. 1		

Log of Revisions

REVISION NO.	PAGE	DESCRIPTION	APPROVED	DATE
18	Title	Changed applicable Serial Nos. from 1 thru 4377 to 1 thru 5600.	H. M. Toomey FAA DOA SO-1	7/15/69
19	Title	Changed applicable Serial Nos. from 1 thru 5600 to 671 thru 5600.	H. M. Toomey FAA DOA SO-1	9/23/69
20	2	Added Forward Intermediate and Forward Gross Weight Points	H. M. Toomey FAA DOA SO-1	5/8/70
21	2	Deleted Forward Intermediate and Forward Gross Weight Points	G. C. Stephen FAA DOA SO-1	9/14/70
22	1	Changed oil pressure gauge markings	Ward Evans	7-25-75

Piper Model PA-28-180.
Normal and Utility Categories

AIRPLANE FLIGHT MANUAL

1. Limitations Section — The following limitations must be observed in the operation of this airplane.

Engine — Lycoming 0-360-A3A or 0-360-A4A

Engine Limits — Maximum permissible RPM for takeoff, 2475. For all other operations, 2700 rpm, 180 hp, (A/C S/N 28-671 to 1760A). For all operations, 2700 rpm, 180 hp, (A/C S/N 28-1571, 1573, 1761 and up).

Fuel — 91/96 minimum octane aviation fuel.

Propeller — Sensenich M76 EMM or 76EM8 (S/N 671 to 1760A)
Sensenich M76 EMMS or 76EM8S5 (S/N 1571, 1573, 1761 & up).
Maximum diameter 76 inches, minimum diameter 76 inches.
Static RPM at maximum permissible throttle setting. Not over 2450, not under 2275. No additional tolerance permitted.

Power Instruments — Oil temperature: GREEN arc (normal operating range) 120°F to 245°F; YELLOW arc (caution range) 60°F to 120°F; RED line (maximum) 245°F (S/N 671 to S/N 1760A)

Oil Temperature: GREEN arc (normal operating range) 75°F to 245°F; RED line (maximum) 245°F (S/N 1571, 1573, 1761 &up).

Oil Pressure: GREEN arc (normal operating range) 60 psi to 90 psi; YELLOW ARC (caution range) 25 psi to 60 psi; RED line (minimum) 25 psi when installed or 60 psi when installed; RED line (maximum) 90 psi.

Fuel Pressure: GREEN arc (normal operating range) .5 psi to 5 psi; RED line (minimum) .5 psi; RED line (maximum) 5 psi (S/N 671 to S/N 1760A)

Fuel Pressure: GREEN arc (normal operating range) .5 psi to 8 psi; RED line (minimum) .5 psi; RED line (maximum) 8 psi (S/N 1571, 1573, 1761 and up)

Tachometer: GREEN arc (normal operating range) 500 to 2700 rpm; RED line (maximum continuous power) 2700 rpm.

Airspeed Limits	Never exceed	171 mph
	Maximum structural cruise	140
	Maneuvering	129
	Flaps extended	115
	Maximum positive load factor	3.8 Normal Category
	Maximum positive load factor	4.4 Utility Category
	Maximum negative load factor	No inverted maneuvers approved.

Maximum Weight: 2400 lbs - Normal Category; 150 lbs - Utility Category.

Baggage Capacity: 200 lbs

C. G. Range: The datum used is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section.

1. Normal Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
2400	92.1	94.5
2200	89.2	95.9
1975	85.9	95.9
1650	84.0	95.9

2. Utility Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
1950	85.8	86.5
1650	84.0	86.5

Straight line variation between points given.

NOTE: It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See weight and section for proper loading instructions.

Maneuvers

1. Normal Category - All acrobatic maneuvers including spins prohibited.
2. Utility Category - Approved maneuvers for Utility Category only.

	Entry Speed
Spins (Flaps Up)	Stall
Steep Turns	129 mph
Lazy Eights	129
Chandelles	129

Placards

1. In full view of the pilot:

   "THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

   ALL MARKINGS AND PLACARDS ON THIS AIRPLANE APPLY TO ITS OPERATION AS A UTILITY CATEGORY AIRPLANE. FOR NORMAL AND UTILITY CATEGORY OPERATIONS, REFER TO THE AIRPLANE FLIGHT MANUAL.

   FOR SPIN RECOVERY, USE FULL RUDDER AGAINST SPIN, FOLLOWED IMMEDIATELY BY FORWARD WHEEL.

   NO ACROBATIC MANEUVERS (INCLUDING SPINS) ARE APPROVED FOR NORMAL CATEGORY OPERATIONS."

2. Adjacent to upper door latch:

   "ENGAGE LATCH BEFORE FLIGHT."

3. On the inside of the baggage compartment door:

   "MAXIMUM BAGGAGE 125 LBS." (S/N 671 to 1760A)
   (MAXIMUM BAGGAGE MAY BE INCREASED TO 200 LBS. IN ACCORDANCE WITH PIPER SERVICE SPARES LETTER NO. 242)

   UTILITY CATEGORY OPERATION - NO BAGGAGE OR AFT PASSENGERS ALLOWED. NORMAL CATEGORY OPERATION - SEE AIRPLANE FLIGHT MANUAL WEIGHT AND BALANCE SECTION FOR BAGGAGE AND AFT PASSENGER LIMITATIONS.

4. In full view of the pilot:

   "ROUGH AIR OR MANEUVERING SPEED 129 MPH."

   "UTILITY CATEGORY OPERATION - NO AFT PASSENGERS ALLOWED."

5. On the instrument panel in full view of the pilot when the oil cooler winterization kit is installed:

   "OIL COOLER WINTERIZATION PLATE TO BE REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS 50° F."

6. On the instrument panel in full view of the pilot when the autoflite is installed:

   "FOR HEADING CHANGES: PRESS DISENGAGE SWITCH ON CONTROL WHEEL. CHANGE HEADING, RELEASE DISENGAGE SWITCH.

Placards (Cont'd)

7. In full view of the pilot: "UTILITY CATEGORY ONLY." Acrobatic maneuvers are limited to the following:

	Entry Speed
Spins (Flaps Up).....	Stall
Steep Turns.....	129 mph
Lazy Eights.....	129
Chandelles.....	129

Airspeed Instrument Markings

RED radial line	Never exceed	171 mph (148 knots)
YELLOW arc	Caution Range (Smooth Air Only)	140 to 171 mph (121 to 148 knots)
GREEN arc	Normal Operating Range	67 to 140 mph (58 to 121 knots)
WHITE arc	Flap Down Range	57 to 115 mph (50 to 100 knots)

2. Procedures Section

1. The stall-warning system is inoperative with the master switch off.
2. Electric fuel pump must be on for both landing and takeoff.
3. The PA-28-180 airplane is approved under FAA Regulation CAR 3 which prohibits intentional spins for normal category operation. The following information is noteworthy:
   a. The stall characteristics of the PA-28-180 are normal with the nose pitching down moderately following the stall, occasionally with a moderate roll which can be corrected by normal use of ailerons and rudder against the roll.
   b. Prolonged use of full rudder during stall practice may result in a rapid roll followed by a spin and should be avoided. Recovery from an incipient spin may be effected in less than one additional turn by use of opposite rudder followed by full forward control wheel.
   c. In the event that a fully developed spin is inadvertently experienced, recovery is best made by using full opposite rudder followed by full forward wheel and full opposite aileron. The control positions against the spin should be maintained during the entire recovery, which may require several turns and a substantial loss of altitude if the airplane is loaded heavily with a rearward center of gravity.
4. Except as noted above, all operating procedures for this airplane are normal.

FAA APPROVED 8/3/62

REVISED 4/2/68 Rev. No. 13

Procedures Section
(Cont'd.)

5. (Electric Pitch Trim Installation Only)
The following emergency information applies in case of electric pitch trim malfunction:

a. In case of malfunction, disengage electric pitch trim by pulling out circuit breaker on instrument panel.

b. In emergency, electric pitch trim may be overpowered using manual pitch trim.

c. In cruise configuration, malfunction results in 10^{o} pitch change and 30 Ft. altitude variation.

6. (Autoflite Installation Only)
The following emergency information applies in case of autoflite malfunction:

a. In case of malfunction PRESS disconnect switch on pilot's control wheel.

b. Rocker switch on instrument panel - OFF.

c. Unit may be overpowered manually.

d. In cruise configuration malfunction, 3 seconds delay results in 60^{o} bank, and 100 Ft. altitude loss.

e. In approach configuration malfunction, 1 second delay results in 10^{o} bank and 0 Ft. altitude loss.

7. (AutoControl III Installation Only)

I. Limitations:
Pilot off during take off and landing.

II. Procedures:

a. Normal Operation
Refers to Manufacturer's Operation Manual.

b. Emergency

1. In case of malfunction, disengage manual controls.
2. In emergency, pilot may be overpowered manually.
3. In cruise configuration malfunction, 3 seconds delay results in 60^{o} bank and 100 Ft. altitude loss.
4. In approach configuration malfunction, 1 second delay results in 10^{o} bank and 0 Ft. altitude loss.

3. Performance Section

The following performance figures were obtained during FAA Type tests and may be realized under conditions indicated with the airplane and engine in good condition and with average piloting technique. All performance is given for 2400 pounds.

Loss of altitude during stalls varied from 125 to 200 feet, depending on configuration and power.

Stalling speeds, in mph, power off, versus angle of bank (Calibrated Airspeed):

Angle of bank	0°	20	40	50	60
Flaps Up	67	69	76	83	94
Flaps Down	57	--	--	--	--

FAA APPROVED 8/3/62
REVISED 7/15/66 Rev. No. 8

SERVICE SPARES Letter

PIPER FACTORY CERTIFIED PARTS & ACCESSORIES

SP-242 June 21, 1966

SUBJECT: Baggage Compartment Weight Increase

TO: All Distributors and Dealers

ATTENTION: Service Spares Managers

MODELS AFFECTED: PA-28-150, PA-28-160, PA-28-180, Serial Nos. 28-1 to 28-1760A incl.

A baggage compartment weight increase to 200 pounds is available for those aircraft listed above. A baggage weight placard, part number 65796-00, and a revised airplane flight manual reflecting the increased baggage allowance are required.

The following listing indicates the part number and the price of the placard:

Part Number	Nomenclature
65796-00	Placard - Baggage Weight

"DISTRIBUTORS"

NOTE: When submitting your order to Piper Aircraft Corporation, Vero Beach, Florida, for placard 65796-00, it will be required that the airplane model and serial number be included on the parts order form in order that the appropriate revised flight manual be included.

Very truly yours,

PIPER AIRCRAFT CORPORATION

Robert A. Martin
Service Spares Manager

RECEIVED
JUL 5 1966
PIPER AIRCRAFT CORP.
VRB SALE-SERVICE

RAM:eb:k

PIPER AIRCRAFT CORPORATION
LOCK HAVEN, PENNSYLVANIA, U.S.A.

SUPPLEMENT NO. 1 TO PIPER MODEL PA-28 FLIGHT MANUAL

MODELS AFFECTED: Piper PA-28 models equipped with Lycoming 0-360-A3A engine and Sensenich M76EMM-0, M76EMMS-0, 76EM8S5-0 or 76EM8-0 propeller.

PROPELLER LIMITS

Avoid continuous operation between 2150 and 2350 RPM.

The aircraft tachometer must be placarded to show a red arc between 2150 and 2350 RPM in accordance with Piper Service Letter No. 526.

NOTE: This document must be attached to the Airplane Flight Manual.

FAA DOA SO-1
APPROVED H. M. Toomey
H. M. Toomey

DATE 4/22/69

AIRPLANE FLIGHT MANUAL

SUPPLEMENT NO. 2

CENTER OF GRAVITY RANGE

FOR

MODEL PA-28-180

THIS AIRPLANE FLIGHT MANUAL SUPPLEMENT IS APPLICABLE TO AIRCRAFT WITH SERIAL NUMBERS 28-671 TO 28-3072, INCLUSIVE, WHEN PIPER PART NO. 65280-00 TUBE-LANDING GEAR STRUT PISTON IS INSTALLED.

SERIAL NUMBERS 28-3073 TO 28-5859 MAY USE THIS SUPPLEMENT WITH NO ADDITIONAL MODIFICATION TO THE AIRCRAFT.

THIS DOCUMENT MUST BE ATTACHED TO THE AIRPLANE FLIGHT MANUAL

FAA APPROVED: Glenn C Stephen

G. C. Stephen, FAA DOA SO-1
Piper Aircraft Corporation

DATE: September 14, 1970

PIPER MODEL PA-28-180

Log of Revisions

REVISION NO.	PAGE	DESCRIPTION	APPROVED	DATE

FAA APPROVED 9/14/70

PREPARED	PIPER AIRCRAFT CORP.	Airplane Flight Manual Supplement
CHECKED	DEVELOPMENT CENTER, VERO BEACH, FLA.	Model PA-28-180
APPROVED	REPORT VB-261	PAGE 1 of 2

PIPER MODEL PA-28-180
NORMAL AND UTILITY CATEGORIES

AIRPLANE FLIGHT MANUAL SUPPLEMENT

This supplement must be attached to the Airplane Flight Manual dated August 3, 1962 or August 12, 1964 or April 22, 1969, when the expanded C. G. Envelope is used. The information contained herein supplements the information of the basic Airplane Flight Manual; for limitations, procedures, and performance data not contained in this document, consult the manual proper.

1. Limitations Section — The following limitations must be observed in the operation of this airplane with this center of gravity range:

Maximum Weight — 2400 lbs.

C. G. Range — The datum used is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section.

1. Normal Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
2400	91.0	94.5
2200	87.8	95.9
2150	87.0	95.9
1650	84.0	95.9

2. Utility Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
1950	85.8	86.5
1650	84.0	86.5

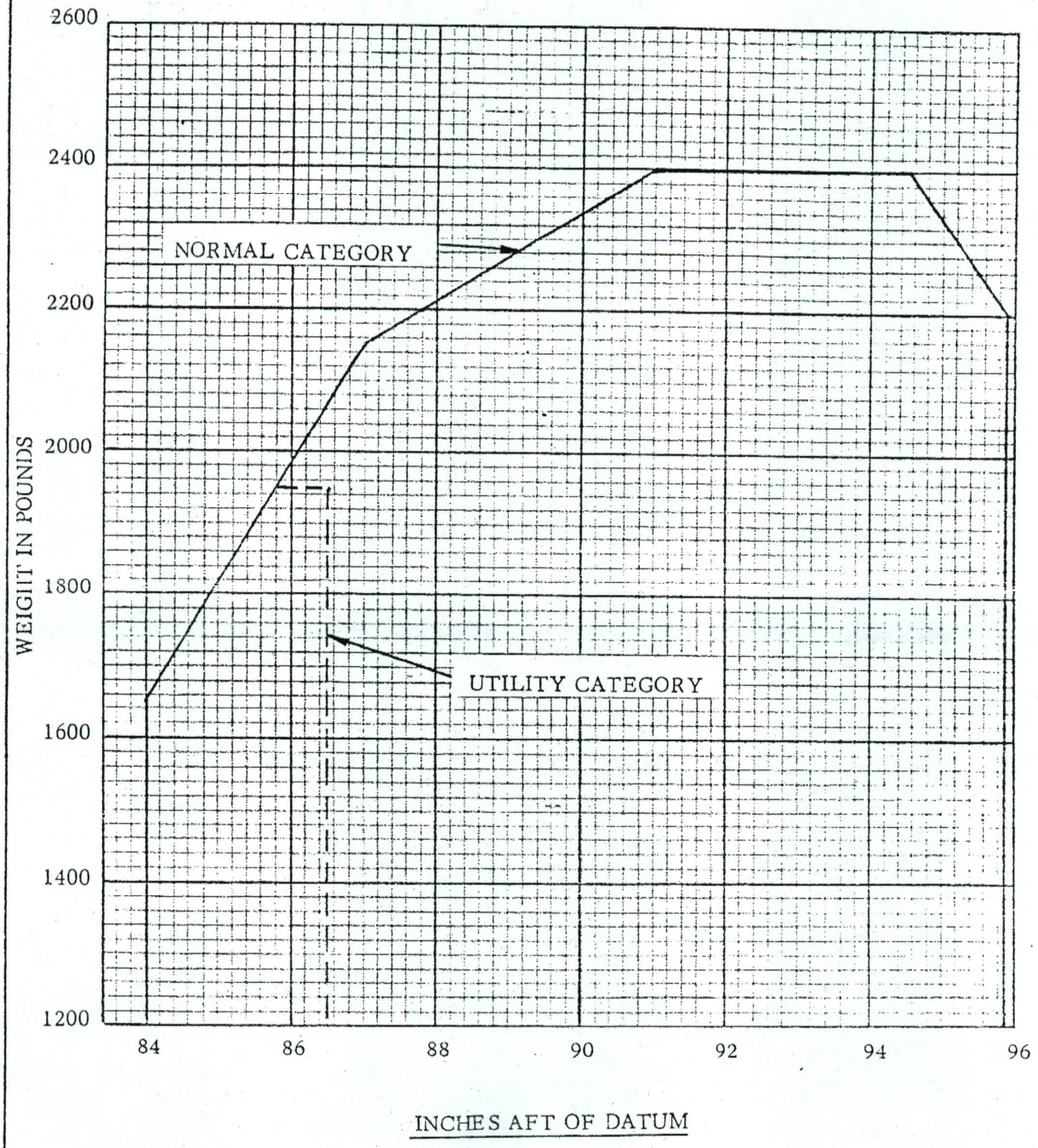
2. Procedures — "No Change"

3. Performance — "No Change"

FAA APPROVED 9/14/70

REVISED

C. G. RANGE AND WEIGHT



FAA Approved 9/14/70

Log of Revisions

REVISION NO.	PAGE	DESCRIPTION	APPROVED	DATE
1	Title	Changed applicable Serial Nos. from 1 thru 4377 to 1 thru 5600.	J. McCreary	7/15/69
2	Title	Changed applicable Serial Nos. from 1 thru 5600 to 671 thru 5600.	J. McCreary	9/23/69
3	Title	Changed applicable Serial Nos. from 671 thru 5600 to 671 thru 4377.	J. McCreary	5/8/69

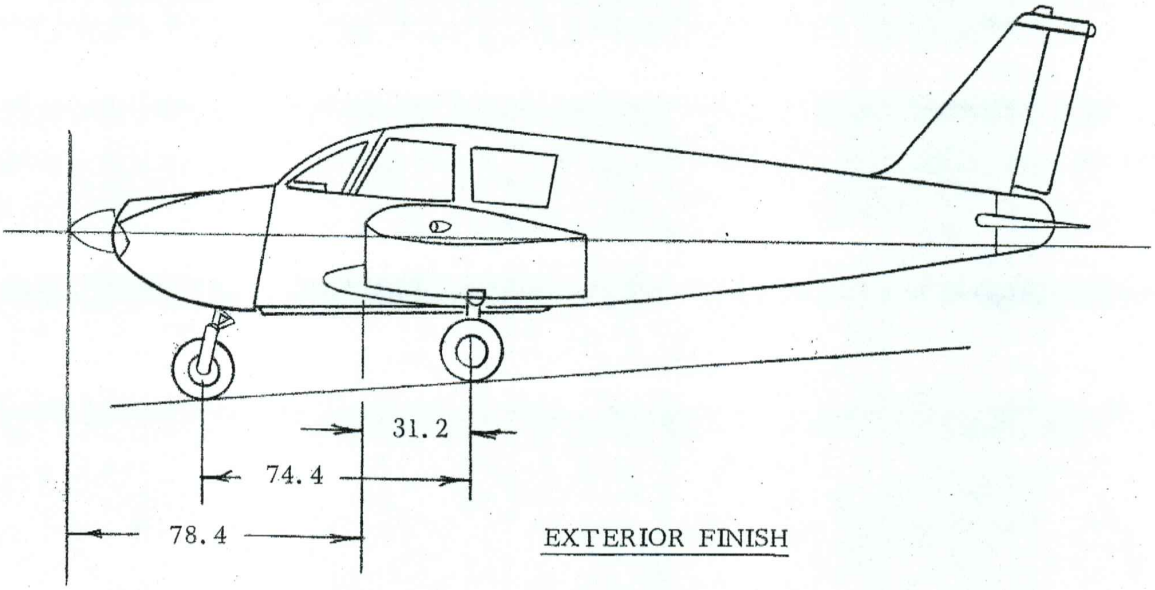
ACTUAL WEIGHT AND BALANCE

MODEL PA-28-180

SERIAL NUMBER 28 - _____

CERTIFICATE NUMBER _____

DATE _____



EXTERIOR FINISH

Base Color _____

1st Trim Color _____

2nd Trim Color _____

Registration No. Color _____

Type Finish _____

WEIGHT AND BALANCE
STANDARD EQUIPMENT LIST
MODEL PA-28-180

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Engine Accessories			
_____	Engine - Lycoming Model 0-360-A3A	274.4	26.1	6962
_____	Engine - Lycoming Model 0-360-A4A	282.4	26.1	7371
_____	Fuel Pump, Electric Auxiliary, Bendix Model 478360	1.8	41.8	75
_____	Fuel Pump, Engine Driven, Lycoming Drawing Nos. 73297, 74082, 75148 or 75246	1.6	41.3	66
_____	Oil Cooler, Piper Drawing, Harrison #C-8526250	2.6	18.1	47
_____	Filter, Fram Model CA-161 PL or AC No. A48C or Purolator AFP-2	.9	20.1	18
_____	Alternator, 35-amp, Chrysler No. 2098615	12.5	19.0	238
_____	Alternator, 60-amp, Chrysler No. 2642210 or 2642997	12.5	19.0	238
_____	Starter - Lycoming 74092 (Delco-Remy 1109511)	* 18.0	19.5	351
_____	Starter - Lycoming 76211 (Prestolite MZ 4206)	* 18.0	19.5	351
	Propeller and Propeller Accessories			
_____	Propeller, Sensenich M76EMM	34.5	10.1	348
_____	Propeller, Sensenich M76EMMS60	38.5	8.8	339
_____	Spinner and Attachment Plates	2.0	8.0	16

* Included in Engine Weight.

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Landing Gear and Brakes			
_____	Two Main Wheel Assemblies 6.00-6	32.0	109.6	3507
	(a) Cleveland Aircraft Products Wheel Assembly No. 40-28 Brake Assembly No. 30-18			
	(b) Two Main 4-Ply Rating Tires 6.00-6 with Regular Tubes			
_____	Two Main Wheel Assemblies	32.3	109.6	3540
	(a) Cleveland Aircraft Products Wheel Assembly No. 40-86 Brake Assembly No. 30-55			
	(b) Two Main 4-Ply Rating Tires 6.00-6 with Regular Tubes			
_____	One Nose Wheel 6.00-6	14.0	34.3	480
	(a) Cleveland Aircraft Products Wheel Assembly No. 38501 (Less Brake Drum)			
	(b) One Nose Wheel 4-Ply Rating Tire 6.00-6 with Regular Tubes			
	Electrical Equipment			
_____	Stall Warning Device, Safe Flight Instrument Corporation No. C52207-4	.2	80.2	16
_____	Voltage Regulator, Delco-Remy #118704	1.5	168.5	253
_____	Voltage Regulator, Chrysler #2098613	.5	57.8	29
_____	Voltage Regulator, Wico Electric #X-16300	.5	57.8	29
_____	Battery 12V, 25 A.H., Rebat Model S-25	21.5	160.9	3540

Check if Installed	ITEM	WEIGHT (LBS.)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Instrument			
_____	Compass - Airpath No. C2350-L41	.9	66.6	60
_____	Airspeed Indicator, PAC 63205-2	.6	67.7	41
_____	Tachometer, AC 1548302	.8	67.7	54
_____	Tachometer, Stewart Warner PAC 62177-2 or 62177-3	.7	67.7	47
_____	Altimeter, Aero Marine No. 522	1.4	66.8	94
_____	Engine Cluster, PAC 63922-2	.8	68.8	55
_____	Engine Cluster, PAC 63426	.8	68.8	55
_____	Engine Cluster, PAC 63426-2	.8	68.8	55
	Miscellaneous			
_____	Fwd. Seat Belts	1.0	86.9	87
_____	Aft Seat Belts	.8	123.0	98
_____	Flight Manual	----	----	----
_____	Tow Bar	1.3	122.3	139
	TOTAL			
	AIRCRAFT EMPTY WEIGHT AS (INCLUDES ITEMS CHECKED ON STANDARD EQUIPMENT LIST, UNUSABLE FUEL AND UNDRAINABLE OIL)	_____	_____	_____

OPTIONAL EQUIPMENT LIST
MODEL PA-28-180

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Engine Accessories			
_____	Vacuum Pump, Airborne Mechanisms Model No. 10-113A1, 113A5 or 200 cc and Drive	5.0	37.0	185
_____	Oil Filter - Lycoming #74911 (AC 81-A #6437032)	3.3	40.5	134
_____	Vacuum Regulator and Filter	2.2	57.0	125
	Electrical Equipment			
_____	Rotating Beacon, Grimes Model D7080	2.0	263.4	527
_____	Landing Light, G. E. Model 4509	.5	18.1	9
_____	Navigation Light (Rear) (1) Grimes Model 2064 (White)	.2	281.0	56
_____	Navigation Lights (2) Grimes Model A1285 (Red and Green)	.4	106.6	43
_____	Battery 12V, 35 A.H., Reading R-35	27.0	160.9	4344
_____	Cabin Light	.3	104.0	31
_____	Cabin Speaker	.8	104.0	83
_____	Rotating Beacon, Whelen Model WRM L-12	1.6	264.0	422

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Electrical Equipment (Cont'd)			
	Auxiliary Power Receptacle PAC 62225	2.7	168.0	454
	External Power Cable PAC 62355-2	4.6	142.8	657
	Piper Pitch Trim	4.0	158.0	632
	Heated Pitot Head	.4	100.0	40
	Instruments			
	Turn and Bank, Pioneer A-5	1.5	66.4	100
	Turn and Bank, Electric	2.7	65.8	178
	Suction Gauge, AN5771-11	.5	68.1	34
	Suction Gauge, Airborne Mechanisms 1G3-4	.5	68.1	34
	Suction Gauge, U.S. Gauge AW1821AFO3	.5	68.1	34
	Altimeter, AN5760-2 (C-12 or C-13)	Same as Standard Equipment Weight		
	Rate of Climb, Pioneer C-7	1.0	66.8	67
	Rate of Climb, AN5825	1.0	66.8	67
	Directional Gyro, Jack & Heintz	2.6	66.6	173
	Directional Gyro, Sperry	3.9	66.6	260
	Directional Gyro, Garwin (3")	2.4	65.6	157
	Directional Gyro, AIM (3")	3.1	64.9	201

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Instruments (Cont'd)			
_____	Artificial Horizon, Jack & Heintz	2.8	66.1	185
_____	Artificial Horizon, Garwin (3")	1.8	65.8	118
_____	Artificial Horizon, AIM (3")	2.2	65.3	144
_____	Air Temperature Gauge, Rochester Manufacturing Co., No. 1592-C2 or NHM-70 (Manning, Maxwell & Moore)	.2	82.6	17
_____	Clock, 8-Day, MIL-C-7939	.4	68.3	27
_____	Tru-Speed Indicator, PAC 62143-2	Same as Standard Equipment Weight		
_____	Piper Course Selector PAC 31058	3.0	66.6	200
_____	Electric Turn and Bank	2.7	65.8	178
_____	Pictorial Rate of Turn, Mitchell 52D69	1.3	66.2	86
_____	Rate of Climb, Karnish AC 135-3	1.0	66.8	67
_____	Brittain Turn Coordinator #TC-100(12)	2.6	65.6	171
	AutoPilots			
_____	AutoControl II			
_____	Roll Servo, Mitchell #1X221E-CH-1	2.8	60.6	170
_____	Console, Mitchell #1X224E-3	1.3	66.6	87
_____	Directional Gyro, Mitchell #52B15E	4.3	66.6	286
_____	or Directional Gyro, Course Selector PAC Drawing 31058-2	3.0	66.6	200

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	AutoPilots (Cont'd)			
	Artificial Horizon, Mitchell #52B9	4.5	66.1	298
	AutoControl III			
	Roll Servo, Mitchell #1D363-183R	2.5	122.2	306
	Console, Mitchell #1C338	1.2	66.6	80
	Cables	.7	95.5	67
	Attitude Gyro, Mitchell #52D66 (Garwin)	1.9	65.8	125
	Attitude Gyro, Mitchell #52D66 (AIM)	2.3	65.3	150
	Directional Gyro, Mitchell #52D54P (Garwin)	2.5	65.6	164
	Directional Gyro, Mitchell #52D54P (AIM)	3.2	64.9	208
	Omni Coupler	.9	65.8	59
	AutoFlite			
	Roll Servo, Mitchell #1D363-153	2.6	122.2	318
	Gyro Amplifier, Mitchell #1C359	1.8	111.8	201
	Cables	1.0	95.5	96
	Panel Unit	.3	68.8	21
	Omni Tracker (#1D482)	.5	64.5	32

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio			
_____	PM-1 Marker Beacon			
_____	Receiver	1.1	121.3	133
_____	Panel Unit	.3	69.0	21
_____	Cable	.3	85.0	26
_____	Piper Radio Compass PRC-3	4.5	64.4	290
_____	Piper VHF Transceiver PTR-1	5.0	64.8	324
_____	Piper Omni Convertor O-1	2.5	65.3	163
_____	King KX150B	9.1	62.8	572
_____	Omni Receiving Antenna, Narco VTP-37 (Includes Cables)	1.4	203.0	284
_____	VHF Antenna, Transmitting VHF-1	.3	157.8	47
_____	VHF Antenna, Transmitting VHF-2	.3	192.8	58
_____	Cable, VHF-1	.4	118.0	47
_____	Cable, VHF-2	.5	135.0	68
_____	Low Frequency Antenna	.5	167.0	84
_____	Loop Antenna (PRC-3)	.3	54.5	16
_____	Narco Mark 12A			
_____	Transceiver, Single	6.0	62.8	377
_____	Transceiver, Dual	12.0	62.8	754
_____	Modulator-Power Unit, Single	4.0	56.0	224
_____	Modulator-Power Unit, Dual	8.0	186.0	1488

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio (Cont'd)			
	Cable, Single	.3	58.0	17
	Cable, Dual	3.4	120.0	408
	Narco VOA-6 Omni Convertor	1.8	65.3	118
	Narco VOA-5 Omni Convertor	3.1	65.3	202
	Narco VOA-4 Omni Convertor	3.0	65.3	196
	Narco ADF-30	9.9	107.9	1068
	Narco Omnigator VTR-2A Installation (Less Antenna)	14.0	58.0	812
	Marker Antenna	1.2	64.8	78
	Piper Radio Compass PRC-4	4.9	64.4	316
	Loop Antenna (PRC-4)	.4	112.6	45
	Piper Omni Convertor OL-1	2.8	65.3	183
	Narco ADF-31			
	Receiver	5.1	64.4	328
	Loop Antenna	2.7	162.0	437
	Cable Antenna	1.7	108.0	184
	Bendix ADF-T-12C			
	Receiver	3.8	64.9	247
	Audio Amplifier	.8	64.9	52
	Radio Compass	1.7	67.3	114

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio (Cont'd)			
_____	Loop Antenna	1.2	160.8	193
_____	Cable, Antenna	1.5	108.0	162
_____	Narco - UDI-III DME	8.6	62.6	538
_____	Narco Mark III	7.5	63.6	477
_____	Narco UDI-4 DME			
_____	Receiver	8.5	62.6	532
_____	Antenna	.3	113.9	34
_____	Cable, Antenna	.4	100.0	40
_____	UGR-2 Glide Slope			
_____	Receiver	2.4	173.8	417
_____	Cable	2.1	128.0	269
_____	Antenna	.4	92.4	37
_____	Cable, Antenna	.5	145.0	73
_____	Transmitter Selector (Dual VHF Only)	.7	67.2	47
_____	Microphone	.5	75.0	38
_____	Headset	.5	66.0	33
_____	Junction Box	.6	67.2	40

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Miscellaneous			
_____	Nose Wheel Fairing	3.5	34.8	122
_____	Main Wheel Fairing	7.4	109.6	811
_____	Assist Step	1.8	156.0	281
_____	Toe Brakes (Dual)	10.5	54.6	573
_____	Toe Brakes (Single)	5.0	54.6	273
_____	Fire Extinguisher-Stop Fire #A-20	7.5	93.0	698
_____	Inertia Safety Belt PAC 65766	2.5	111.6	279
_____	Assist Strap and Coat Hooks	.2	109.5	22
_____	Lighter	.2	68.8	14
_____	Fire Extinguisher, Kidde Kompact VI (With Brackets)	5.3	85.0	451
	TOTAL			

EMPTY C.G. AFT DATUM IS _____

AIRCRAFT EMPTY WEIGHT _____ _____

OPTIONAL EQUIPMENT WEIGHT _____ _____

LICENSED EMPTY WEIGHT _____ _____

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY. THE EMPTY WEIGHT C.G. IS FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO FORM FAA-337 WHEN ALTERATIONS HAVE BEEN MADE.

C.G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total weight moment by the total weight to determine the C.G. location.
5. By using the figures of item 1 and item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets all weight and balance requirements.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
LICENSED EMPTY WEIGHT			
OIL (2 GALLON)	15	32.5	488
PILOT & PASSENGER	340	85.5	29070
FUEL		95.0	
PASSENGERS (REAR SEAT) *	340	118.1	40154
BAGGAGE *	_____	142.8	_____
TOTAL LOADED AIRPLANE			

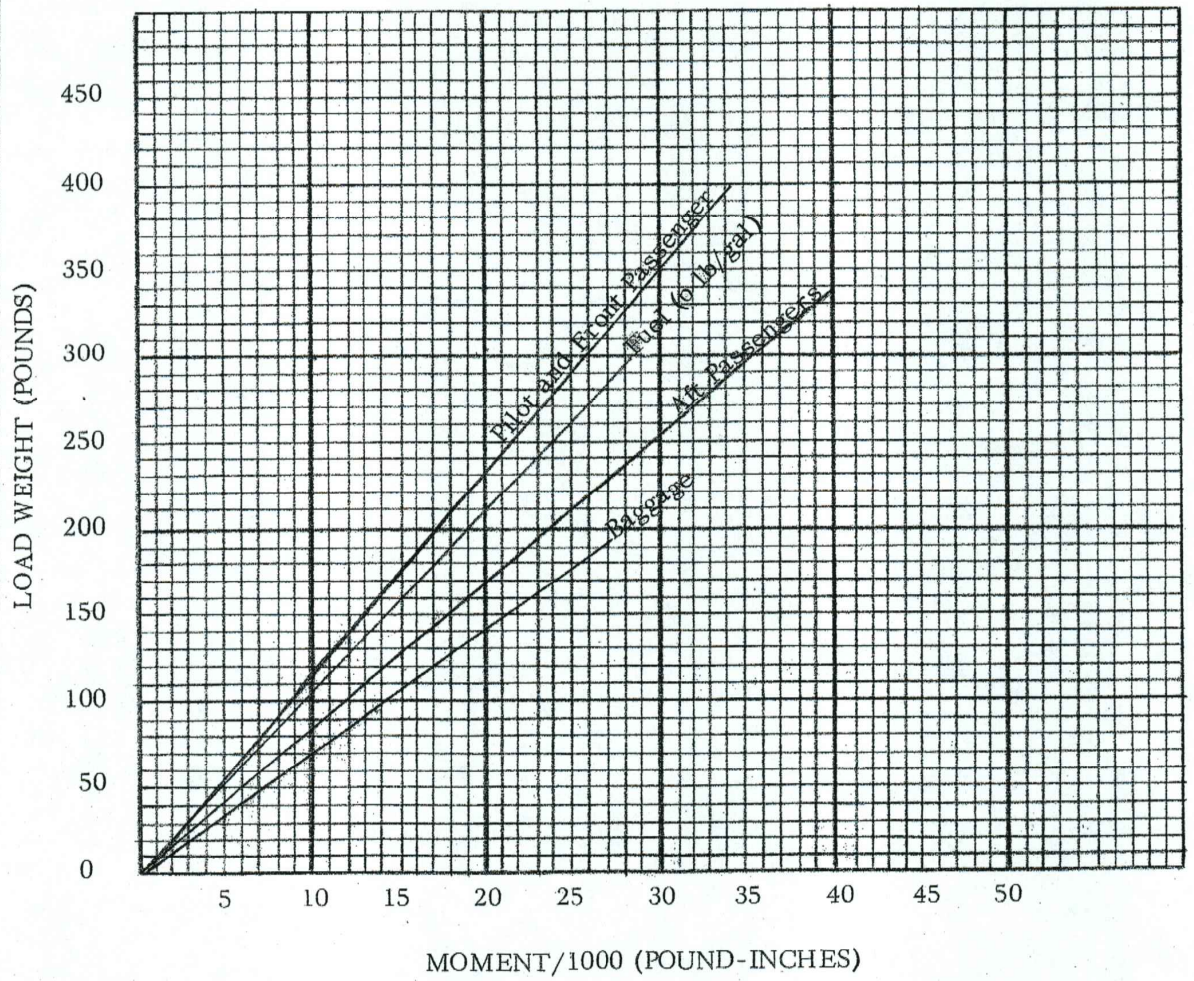
_____ = INCHES (ARM AFT DATUM)

LOCATE THIS POINT ( ) ON THE C.G. RANGE AND WEIGHT GRAPH. SINCE THIS POINT FALLS WITHIN THE C.G. ENVELOPE THE LOADING MEETS ALL WEIGHT AND BALANCE REQUIREMENTS.

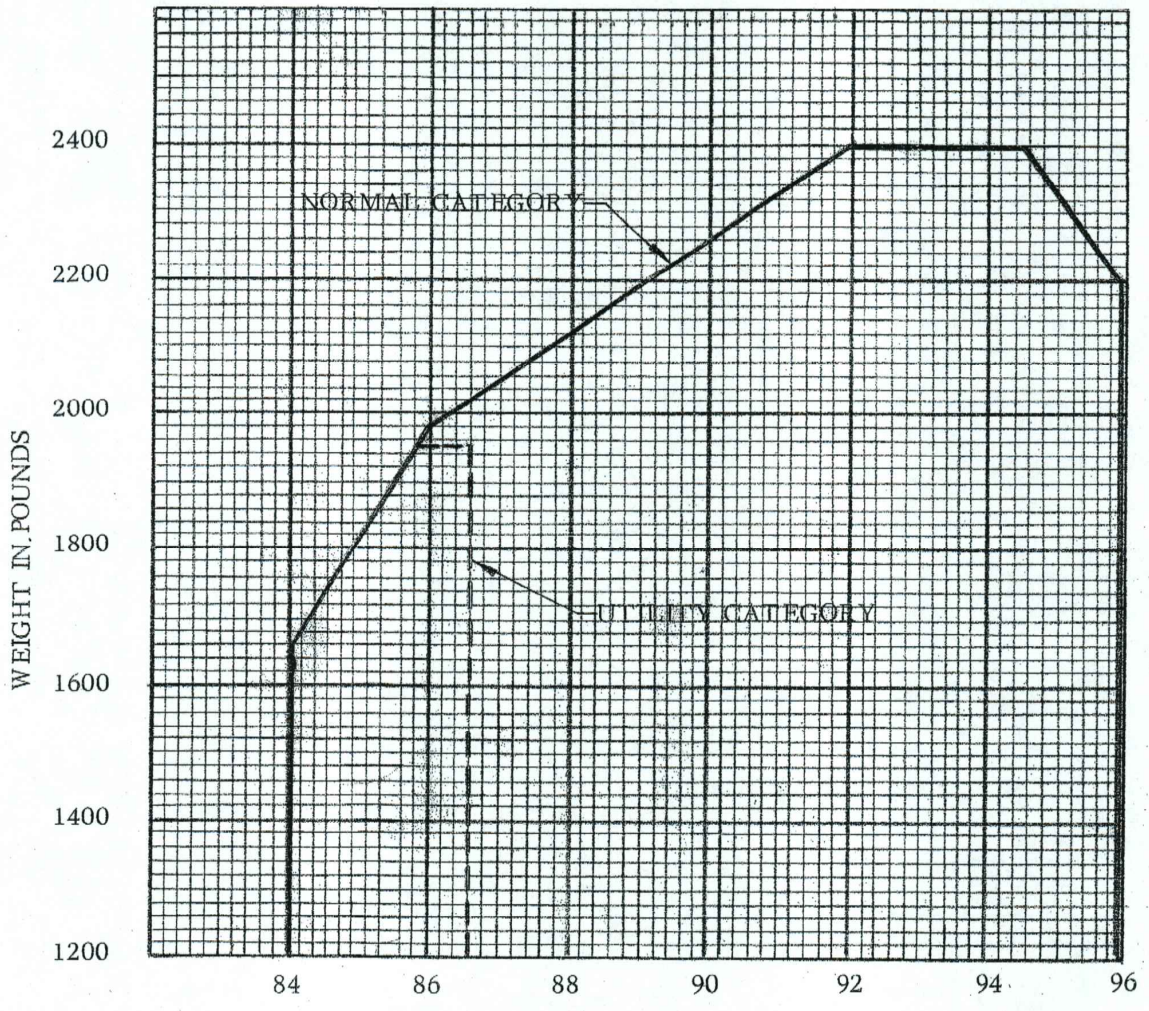
* Utility Category Operation - No baggage or aft passengers allowed.

Normal Category Operation - Maximum baggage 125 lbs. (S/N 671 to 1760A).
Maximum baggage 200 lbs. (S/N 1761 and up).
Check aft C.G. between 150 lbs. and 200 lbs.

LOADING GRAPH



C. G. RANGE AND WEIGHT



IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY. THE EMPTY WEIGHT C.G. IS FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO FORM FAA-337 WHEN ALTERATIONS HAVE BEEN MADE.

C.G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total weight moment by the total weight to determine the C.G. location.
5. By using the figures of item 1 and item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets all weight and balance requirements.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
LICENSED EMPTY WEIGHT	1278.9	86.2	110238.47
OIL (2 GALLON)	15	32.5	488
PILOT & PASSENGER	340	85.5	29070
FUEL	300	95.0	29000
PASSENGERS (REAR SEAT) *	340	118.1	40154
BAGGAGE *	125	142.8	17850
TOTAL LOADED AIRPLANE	2398.9		226800.47

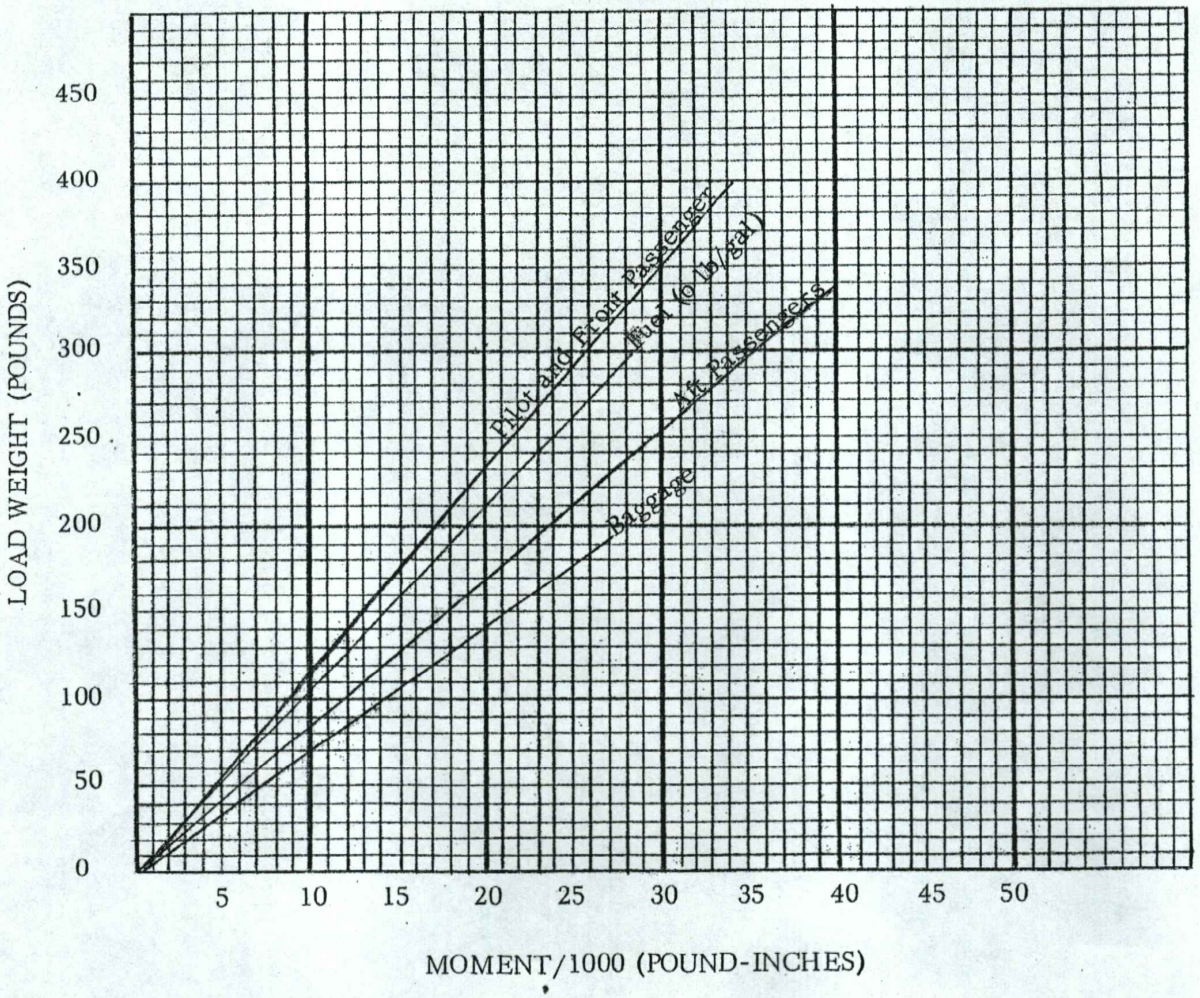
_____ = 94.5 INCHES (ARM AFT DATUM)

LOCATE THIS POINT ( ) ON THE C.G. RANGE AND WEIGHT GRAPH. SINCE THIS POINT FALLS WITHIN THE C.G. ENVELOPE THE LOADING MEETS ALL WEIGHT AND BALANCE REQUIREMENTS.

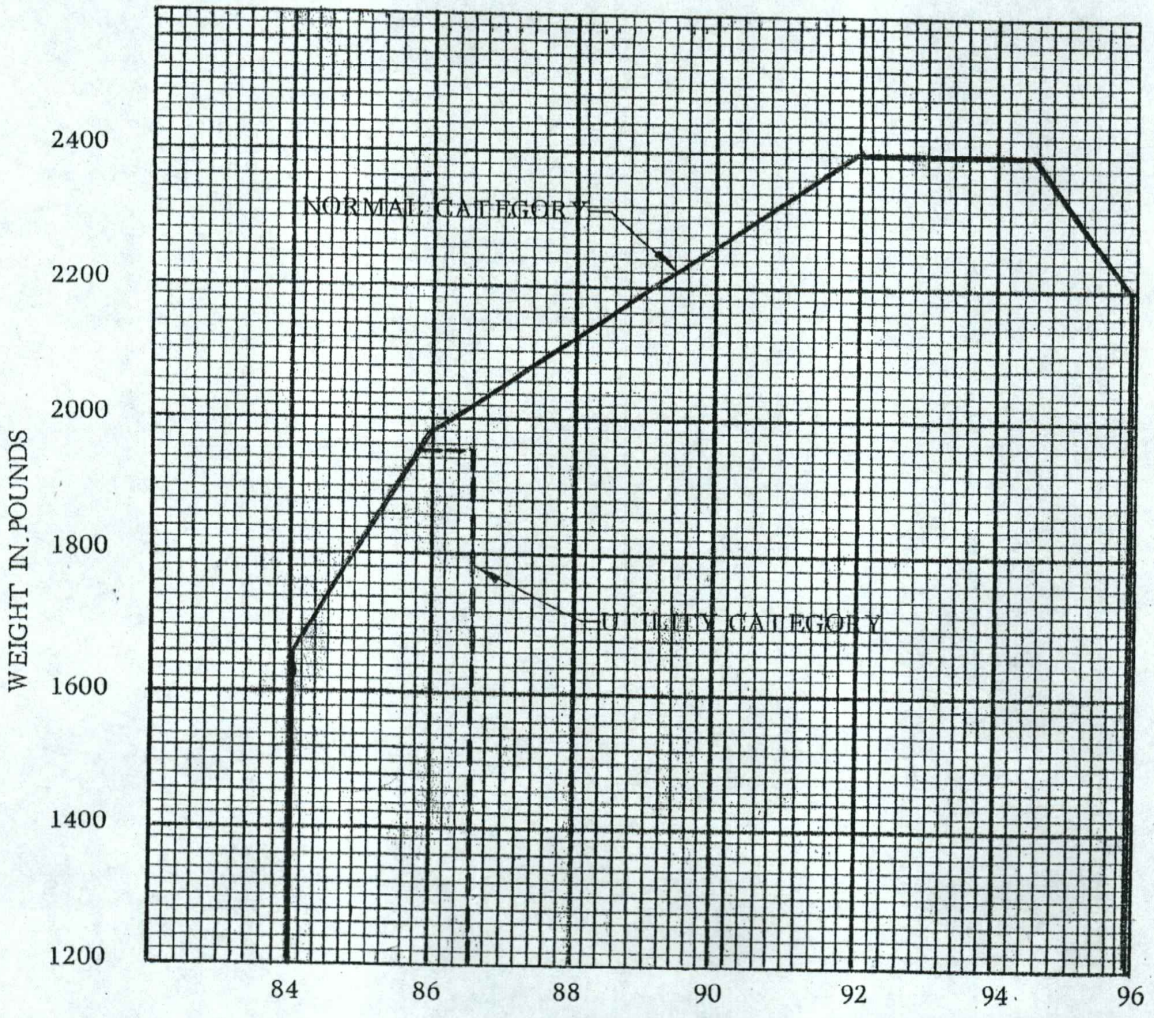
* Utility Category Operation - No baggage or aft passengers allowed.

Normal Category Operation - Maximum baggage 125 lbs. (S/N 671 to 1760A).
Maximum baggage 200 lbs. (S/N 1761 and up).
Check aft C.G. between 150 lbs. and 200 lbs.

LOADING GRAPH



C. G. RANGE AND WEIGHT



Kelly's Flying Service, LLC.

612 SE 150th Road
Warrensburg, MO 64093
(636) 688-0121
kralston05@charter.net

Registration Number	N7412W	**Manufacturer**	PIPER
Serial Number	28-1300	**Model**	PA28-180
Revision Date	01/07/2018	**Supersedes Date**	11/27/2006

REVISED WEIGHT AND BALANCE DATA

(Note: All weights are in pounds & Fuel Empty)

	WEIGHT	ARM	MOMENT
PREVIOUS AIRCRAFT INFORMATION	**1278.90**	**86.20**	**110238.47**

	ITEM - Installed / Removed			
Removed	Rudder pedal assembly	-7.00	54.60	-382.20
Removed	Oil Screen	-1.00	40.50	-40.50
Install	Rudder Pedal with Dual Toe Brakes	14.50	54.60	791.70
Install	Reiff Engine preheat system	1.20	26.10	31.32
Install	Oil Filter adaptor and Filter	2.80	40.50	113.40
		0.00	0.00	0.00
		0.00	0.00	0.00

REVISED AIRCRAFT INFORMATION

EMPTY AIRCRAFT	**1289.40**	**85.89**	**110752.19**
MAX GROSS WEIGHT	**2400.00**		
USEFUL LOAD	**1110.60**		

Prepared by: _____
Kelly G. Ralston AP2772745IA

REPORT VB-164

EQUIPMENT LIST

MODEL PA-28-180

SERIAL NOS. 671 THRU 4377

SUPPLEMENTAL WEIGHT AND BALANCE DATA AND EQUIPMENT LIST

Make	PIPER	**Serial Number**	28-1300
Model	PA28-180	**Registration No.**	N7412W
Prepared By	STEVE BENSON	**Date**	11/27/2006

Item Description	Weight	Arm	Moment
PREVIOUS DATA:	1285.80	86.1	110659.85
REMOVED THE FOLLOWING:			
KING KX-150	-9.10	62.8	-571.48
GENAVE BETA 5000	-3.40	62.0	-210.80
COM ANT	-0.60	89.0	-53.40
INSTALLED THE FOLLOWING:			
GARMIN GTX-320A	2.90	63.0	182.70
BENDIX/KING KY-97A S/N 36502	2.80	62.0	173.60
COMANT CI-122	0.50	116.0	58.00
		TOTAL MOMENT	110238.47

Superseded 01/07/2018

CATEGORY	EMPTY WEIGHT	EMPTY CENTER OF GRAVITY	USEFUL LOAD
NORMAL	1278.9	86.2	1121.1

Center of Gravity Range	(+84.0) to (+95.9) at 1650 lb. or less (+85.9) to (+95.9) at 1975 lb. (+88.4) to (+95.9) at 2150 lb. Straight line variation between points given.
Empty Wt. C. G. Range	None
Maximum Weight	2150 lb.
No. of Seats	4 (2 at +85.5, 2 at +118.1)
Maximum Baggage	125 lb. at (+142.8) on S/N 28-1 through 28-1760, and 28-1760A. See NOTE 8. 200 lb. at (+142.8) on S/N 28-1761 through 28-4377.
Fuel Capacity	50 gallons at (+95) (2 wing tanks) See NOTE 1 for data on system fuel.
Oil Capacity	8 quarts at (+32.5) (6 quarts usable) See NOTE 1 for data on system oil.

Control Surface Movements

Wing flaps	(± 2°)	Up	0°	Down	40°
Ailerons	(± 2°)	Up	30°	Down	15°
Rudder	(± 2°)	Left	27°	Right	27°
Stabilator	(± 1°)	Up	18°	Down	2°
Stabilator Tab	(± 1°)	Up	3°	Down	12°

Nose Wheel Travel

(± 2°) Left 30° Right 30°
(Effective on S/N 28-03; 28-1 through 28-3377; and 28-1760A)
(± 2°) Left 22° Right 22°
(Effective on S/N 28-3378 through 28-4377)

Manufacturer's Serial Nos. 28-03; 28-1 through 28-4377; and 28-1760A.

III - Model PA-28-180 (Cherokee), 4 PCLM (Normal Category), Approved August 3, 1962; 2 PCLM (Utility Category), Approved December 6, 1966, for S/N 28-03; 28-671 through 28-5859; and 28-7105001 through 28-7205318.

Engine — Lycoming O-360-A3A or 0-360-A4A with carburetor setting 10-3878 or 10-4164-1

Fuel — 91/96 minimum grade aviation gasoline

Engine Limits

S/N 28-671 through 28-1760, and 28-1760A (except S/N 28-1571 and S/N 28-1573) (See NOTE 4):
Maximum permissible takeoff, 2475 r.p.m.
For all other operations, 2700 r.p.m. (180 hp)

S/N 28-1571; 28-1573; 28-1761 through 28-5859; and 28-7105001 through 28-7205318:
For all operations, 2700 r.p.m. (180 hp)

Propeller and Propeller Limits

Sensenich M76EMM or 76EM8 on S/N 28-671 through 28-1760, and 28-1760A (except S/N 28-1571 and S/N 28-1573).
Sensenich M76EMMS or 76EM8S5 on S/N 28-1571, 28-1573; 28-1761 through 28-5859; and 28-7105001 through 28-7205318.
Static r.p.m. at maximum permissible throttle setting not over 2450 r.p.m., not under 2275 r.p.m.
No additional tolerance permitted.
Diameter: Not over or under 76".
See NOTE 10.

Propeller Spinner Piper P/N 14422-00 on S/N 28-671 through 28-1760, and 28-1760A.
Piper P/N 63760-04 or 65805-00 on S/N 28-1761 through 28-5859; and 28-7105001 through 28-7205318.
See NOTE 11.

Airspeed Limits

Never exceed	171 mph	(148 knots)	CAS
Maximum structural cruising	140 mph	(121 knots)	CAS
Maneuvering	129 mph	(112 knots)	CAS
Flaps Extended	115 mph	(100 knots)	CAS

Center of Gravity Range

Utility Category (See NOTE 9)

(+84.0)	to	(+86.5)	at	1650 lb. or less
(+85.8)	to	(+86.5)	at	1950 lb.

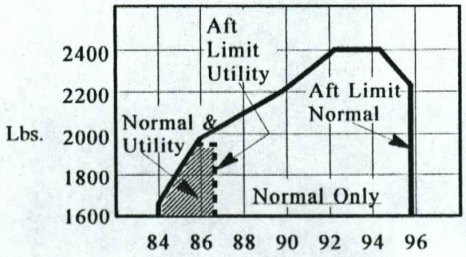
Normal Category (See NOTE 15)
(S/N 28-671 through 28-5859)

(+84.0)	to	(+95.9)	at	1650 lb. or less
(+85.9)	to	(+95.9)	at	1975 lb.
(+89.2)	to	(+95 9)	at	2200 lb.
(+92.1)	to	(+94.5)	at	2400 lb.

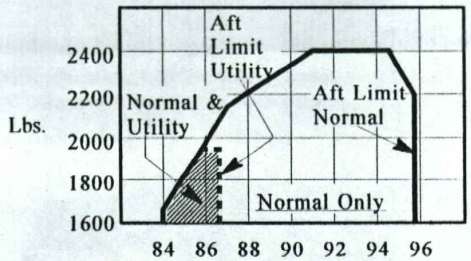
Normal Category
(S/N 28-7105001 through 28-7205318)

(+84.0)	to	(+95.9)	at	1650 lb. or less
(+87.0)	to	(+95.9)	at	2150 lb.
(+87.8)	to	(+95.9)	at	2200 lb.
(+91.0)	to	(+94.5)	at	2400 lb.

Straight Line Variation Between Points Given



Fuselage Station - Inches
(S/N 28-671 thru 28-5859)



Fuselage Station - Inches
(S/N 28-7105001 thru 28-7205318)

Empty Weight C. G. Range None

Maximum Weight
Normal Category: 2400 lb.
Utility Category: 1950 lb.

No. of Seats
Normal Category: 4 (2 at +85.5, 2 at +118.1)
Utility Category: 2 (2 at +85.5)

Maximum Baggage
Eligible Normal Category Only:
125 lb. at (+142.8) on S/N 28-671 through 28-1760, and 28-1760A. See NOTE 8.
200 lb. at (+142.8) on S/N 28-1761 through 28-5859, and 28-7105001 through 28-7205318.

Fuel Capacity
50 gallons at (+95) (2 wing tanks)
See NOTE 1 for data on system fuel.

Oil Capacity
8 quarts at (+32.5) (6 quarts usable)
See NOTE 1 for data on system oil.

Control Surface Movements

Wing flaps	(± 2°)	Up	0°	Down	40°
Ailerons	(± 2°)	Up	30°	Down	15°
Rudder	(± 2°)	Left	27°	Right	27°
Stabilator	(± 1°)	Up	18°	Down	2°
Stabilator Tab	(± 1°)	Up	3°	Down	12°

Nose Wheel Travel
(± 2°) Left 30° Right 30°
(Effective on S/N 28-671 through 28-3377)
(± 2°) Left 22° Right 22°
(Effective on S/N 28-3378 through 28-5859, and 28-7105001 through 28-7205318)

Manufacturer's Serial Nos.
28-03; 28-671 through 28-5859; and 28-7105001 through 28-7205318.
The manufacturer is authorized to issue airworthiness certificates for airplane serial numbers:

28-4704	28-4745	28-4754	28-4763	28-4776
28-4791	28-4795	28-4826	28-4834	28-4859
28-4875	28-4879	28-4891	28-4907	28-4919
28-4922	28-4935	28-4945	28-4946	28-4947
28-4955	28-4959	28-4961	27-4964	28-4967
28-4968	28-4971	28-4975	28-4977	28-4985
28-4995	28-4999	28-5004	28-5007	28-5015
28-5017	28-5018	28-5019	28-5020	28-5023
28-5026	28-5027	28-5028	28-5031	28-5039
28-5041	28-5046	28-5051	28-5053	28-5057
28-5060	28-5061	28-5062	28-5063	28-5064

28-5066 through 28-5859, and 28-7105001 through 28-7205318 under the delegation option provisions of FAR 21. See NOTE 17 and 20.

IV. Model PA-28S-160 (Cherokee), 4 PCSM (Normal Category), Approved February 25, 1963, for S/N 28-1 through 28-1700; and S/N 28-1760A.

Engine
Lycoming O-320-D2A with carburetor setting 10-3678-32 (See NOTE 18)

Fuel
100/130 minimum grade aviation gasoline

Engine Limits
For all operations, 2700 r.p.m. (160 hp)

Propeller and Propeller Limits
McCauley 1A175-GM
Static r.p.m. at maximum permissible throttle setting not over 2360 r.p.m., not under 2260 r.p.m.
No additional tolerance permitted.
Diameter: Not over 79", not under 78".

REIFF
PREHEAT SYSTEMS

Reiff Corp. PO Box 5 Ft. Atkinson, WI 53538 262-593-5292 Sales@ReiffPreheat.com
www.ReiffPreheat.com

HotBand Cylinder Heating System

INSTALLATION INSTRUCTIONS

Failure to follow these instructions may result in product failure.
If any of these instructions are unclear, please call for clarification before beginning.

1. Test the band heaters before installing by plugging in each one for 2-3 seconds until it begins to get warm, but do not allow them to get hot. Do not cut or damage the red heating elements.

2. Remove the cowling and anything else needed to gain access to the cylinder bases. The inter-cylinder baffles do not need to be removed.

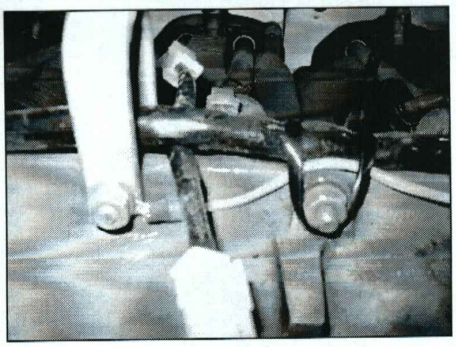
3. Using care not to pull on the wire leads, install a HotBand cylinder heater P/N CH38-XXX around the base of each cylinder, on the unfinned section. The leads must face the crankcase and be positioned on top of the cylinder. Bands with part numbers ending in "R" and "L" are interchangeable – the only difference is the screw orientation preferred for best access. Installation can usually be done easily by prebending the cylinder heater to about a 5 inch diameter, then feeding it from the top while holding the screw end. The prebend will allow the end to follow the curvature of the cylinder all the way around the bottom and back up to the top. It is usually easy to push the band between the cylinder and the baffles. While pushing the heater from the top place your free hand under the cylinder to help feed the end around the cylinder if necessary. Hand tighten the clamp with a screwdriver so it's **just snug - do not over tighten.** Over tightening will crush the silicone heating element.

4. **Safety wire the clamp screws,** or place a dab of RTV on the screw. If they vibrate loose the heating elements will burn out. See photo showing how to do this in our web page "Installation Instructions".

5. Install the wire harness P/N CH4 or CH6 longitudinally along the top center of the engine crankcase, using cable ties or clamps to secure it to the crankcase bolts as shown in photos. The AC plug should be located so it will be easily accessible with an extension cord, such as through the front air inlet (as shown at right) or oil check door. Avoid interference with any moving parts or controls, and heat sources such as exhaust pipes. If you must go through the rear baffle, insert the connector end of the harness rather than the AC plug end so that a smaller hole and grommet are needed.

6. Attach the green ground wire to the engine (photo at right), and test the connection by checking for continuity between the engine and the ground pin on the plug.

   Photo also shows one way to secure the harness to the crankcase bolts with wire ties.



7. Plug each cylinder heater into a harness connector. Extra connectors are provided for the heaters for the oil sump and oil cooler, if installed. 6" extensions are available ($5 each) if any of the heater leads will not reach the harness. **The heater leads must be well supported** by clamping them to the pushrod tubes (Lycomings) or bonding to the crankcase (Continentals) with a dab of silicone adhesive.

8. Test the system by plugging it in and feeling by hand to ensure each cylinder heater gets warm.

9. Before recowling the engine, have someone get in the cockpit and move all controls while you watch to see if there is any interference with any part of the heater system.

10. Installation of these FAA-PMA parts is a minor alteration and does not require an STC or Form 337. For type certificated aircraft an A&P is required to install them (or supervise owner installation) and document the engine logbook and W&B. The weight of the system is .8 lb for 4 cylinder engines, 1 lb for 6 cylinder engines. Add the weight of the oil and oil cooler heating system, if installed (see their instructions for weights). The arm is the same as the engine's arm.

Operating Instructions

Place a blanket over the engine cowling and plug all cowl openings to retain heat in the engine compartment. Plug in the heater at least 3-5 hours before engine start, 10-12 hours for maximum heating. We suggest using a WI-FI or cellular remote control to make it convenient for you to turn the preheater on prior to a flight. Continuous use during long periods of aircraft inactivity is not recommended, nor do we advocate continuous preheater use as a means to prevent corrosion in inactive engines. Corrosion can occur in engines that are not flown frequently, whether they are warm or not. Always use a grounded outlet for safety. For the best protection against shock, use a ground fault type outlet or extension cord. During each annual inspection the heaters and harnesses should be checked to make sure they are secure and undamaged.

HEATING TIME

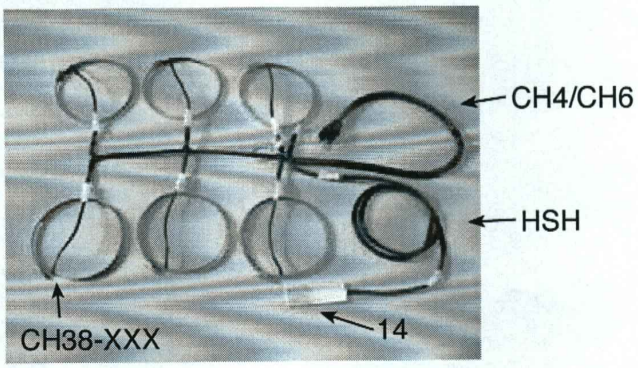
In hangar with cowl plugs and blanket

	Turbo XP System 100w per cyl 200w on oil		Standard System 50w per cyl 100w on oil		HotStrip System 200w on oil	
ELAPSED HOURS	CYLINDERS °F	OIL °F	CYLINDERS °F	OIL °F	CYLINDERS °F	OIL °F
0	22	22	22	22	22	22
1	41	66	35	52	26	66
2	60	84	46	63	33	80
3	77	100	57	73	37	87
5	105	123	74	87	46	96
12	147	156	103	110	60	104

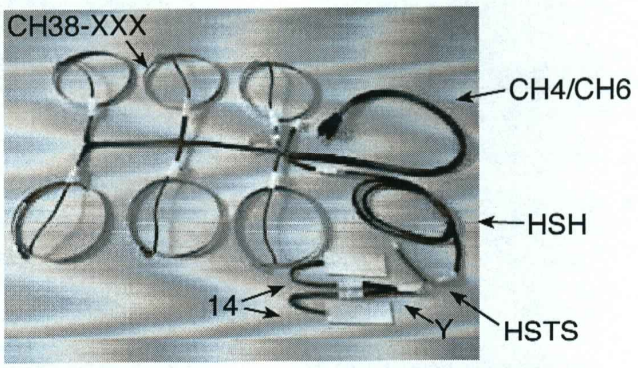
No Fault Warranty Install it, try it, and if you are unsatisfied for any reason, send it back within 30 days of purchase. Up to 5 years after your purchase we will replace or repair any part that fails for any reason.

ASSEMBLY PHOTOS

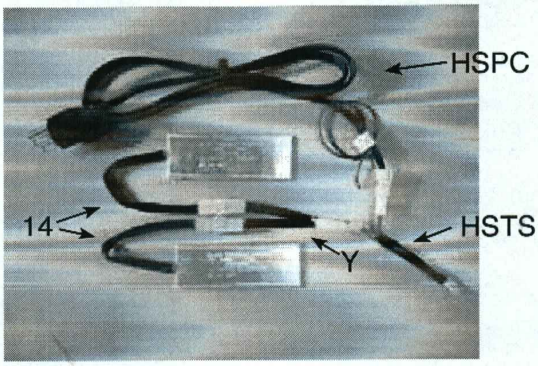
Standard System



Turbo & Turbo XP System



HotStrip Oil Sump Heater System



OPERATING INSTRUCTIONS

Place a blanket over the engine cowling and plug all cowl openings to retain heat in the engine compartment. Plug in the heater at least 4-5 hours before engine start, 10-12 hours for maximum heating. A cellular remote control can be used for convenience. Continuous use during long periods of aircraft inactivity is not recommended, nor do we advocate continuous preheater use as a means to prevent corrosion in inactive engines. Corrosion can occur in engines that are not flown frequently, whether they are warm or not. Always use a grounded outlet for safety. For the best protection against shock, use a ground fault type outlet or extension cord. During each annual inspection the heaters and harnesses should be checked to make sure they are secure and undamaged.

For improved performance our **HotBand Cylinder Heater System** may be added to your engine at any time. When this system is used along with the HotStrip oil heater, engine heating will be faster, warmer, and more uniform.

No Fault Warranty

Install it, try it, and if you are unsatisfied for any reason, send it back within 30 days of purchase. Up to 5 years after your purchase date we will replace or repair any part that fails for any reason.

REIFF
PREHEAT SYSTEMS

Reiff Corp. PO Box 5 Ft. Atkinson, WI 53538 262-593-5292 Sales@ReiffPreheat.com
www.ReiffPreheat.com

HotStrip Oil Sump Heater
INSTALLATION & OPERATING INSTRUCTIONS

Failure to follow these instructions WILL result in product failure.
If any of these instructions are unclear, please call for clarification before beginning.

1) Test each heating element before installation by plugging it in just long enough to verify that it gets warm (a few seconds).

2) See photos on page 2 showing how the parts plug together, and do a trial fit. Pick a spot to install the heater(s) that is a flat, smooth area on the bottom or side of the oil sump below the oil level. Do not install on a surface that is not flat, or over raised letters, gaps, dents, etc. Continental 360, 470, 520, 550: heater must go on the side, the bottom is not flat. Lycoming IO-360: for locations see photos in our web site "Installation Instructions". Locate parts away from controls like the throttle and mixture arms, to avoid interference with them. Do not bond to composite (non-metallic) sumps.

3) **Surface preparation is critical.** Paint and anodizing MUST be removed and both of the surfaces (sump and heater) must be scuffed (use Scotchbrite pad), cleaned with alcohol, lacquer thinner, or acetone, and dry.

4) **Thorough mixing of epoxy is critical.** Place the Aremco epoxy bag in your pocket for a while to soften it and make it easier to mix, then follow the instructions on the package. Remove the divider clip and lay the bag on a table and roll the two parts back and forth in the bag **for several minutes** with a large socket. Simply kneading the bag a few times with your fingers is NOT sufficient. Apply a coating of epoxy onto the **unprinted side** of the heater (the side with flaps), P/N 14. Position the heater onto the sump and apply firm pressure to squeeze out excess epoxy. Ideal epoxy thickness is 0.010" (like 3 sheets of paper). Use duct tape to hold the heater tightly to the sump while the epoxy cures. Place unused epoxy in the freezer and save it for final touch up in step 5. J-B Weld epoxy #8265 (available in most hardware stores) is a suitable substitute epoxy but **do not substitute any other adhesive including other J-B WELD products.**

5) **Proper curing is critical.** Aremco epoxy cures in 48 hrs at 75° F. Temps cooler than that will inhibit curing. For cold weather installations, it is not necessary to have the hangar at 75°. Tent the engine with a blanket and use the cylinder heaters, a heat lamp, or space heater to warm the sump to 75°. After the epoxy is fully cured (when it's hard), power up the heating elements (with sump full of oil) and watch them closely as they heat up. Probe the epoxy as it heats up and if it gets gooey, unplug it and allow it to cure longer. If using JB Weld follow the curing instructions on their package, except that 75°F is required to be fully cured in the 24 hrs stated in their instructions. Curing of either epoxy is complete when the epoxy is solid. Use epoxy to form a generous bead around and over the heater edges to "lock" the heater in place, and to seal the openings in the corners and the lead wire exit hole to keep out oil, water, or other foreign matter which can short out the heater. Allow this edge bead to cure before running the engine. IMPORTANT: Place a gob of epoxy or RTV over the lead wires for strain relief.

6) If your system includes a thermostat (P/N HSTS) bond it to the oil sump using the same procedure and epoxy as for the heater. The sensor is the small white box, bond it to the sump below the oil level a few inches from the heating elements.

7) Install the oil sump heater harness (P/N HSH or HSPC). P/N HSH plugs into a connector on the cylinder heater harness (P/N CH4, CH6, CH7, or CH9). On 4 & 6 cylinder engines route HSH through the rear baffle and down to the sump heater. Cut a 3/8" hole in the baffle, debur it, and insert the provided snap bushing to protect the harness. For P/N HSPC locate the AC plug so it will be accessible with an extension cord, typically through the cooling air exit or oil access door. Secure the harnesses using cable ties, clamps, or by bonding to the sump with epoxy or RTV. Avoid interference with any moving parts such as throttle linkage and heat sources such as exhaust pipes. Attach the green ground wire to the engine.

8) Installation of these FAA-PMA parts is a minor alteration and does not require an STC or Form 337. For certificated aircraft an A&P is required to install them or to supervise owner installation and document the engine logbook and W&B. The weight of the oil sump heater portion of each of our systems is as follows: HotStrip Oil Sump Heater System 0.44 lb, Standard System 0.18 lb, and the Turbo & Turbo XP Systems 0.3 lb. Note if you are installing the Standard, Turbo, or Turbo XP System you will also need to add to the above the weight of the cylinder heat system which is indicated in the cylinder heating system installation instructions.