ARROW IV

PILOT'S OPERATING HANDBOOK

AND

FAA APPROVED AIRPLANE FLIGHT MANUAL

OE-DRN
S.No. 28R-7918050

REFERENCE

AIRPLANE SERIAL NO.

AIRPLANE REGIST. NO.

PA-28RT-201
REPORT: VB-930 FAA APPROVED BY: Ward Evans

WARD WANS
D.O.A. No. SO-1
PIPER AIRCRAFT CORPORATION
VERO BEACH, FLORIDA

DATE OF APPROVAL:
NOVEMBER 30,1978

FAA APPROVED IN NORMAL CATEGORY BASED ON CAR 3. THIS HANOBOOK INCLUDESTHEMATERIALREQUIRED TO BE FURNISHED TO THE PILOT BY CAR 3AND CONSTITUTES THE APPROVED AIRPLANE FLIGHT MANUAL AND MUST BE CARRIED IN THE AIRPLANE AT A U TIMES.

Dieses Luftfahrzeug darf nur für die im Lufttüchtigkeitszeugnis eingetragenen und bestätigten Verwendungs-, Einsatz- u. Navigationsart verwendet werden.

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS HANDBOOK TO APPLICABLE AIRCRAFT. THIS HANDBOOK REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED ON THE FACE OF THE TITLE PAGE WHEN OFFICIALLY APPROVED. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28RT-201, ARROW IV

PILOT'S OPERATING HANDBOOK,
REPORT: VB-930 REVISION _____

PIPER AIRCRAFT CORPORATION
APPROVED SIGNATURE AND STAMP _____

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.PILOT'S OPER TING HANDBOOK **LOG OF** REVISIONS

Current Revisions to the PA-28RT-201 Arrow IV Pilot's Operating Handbook, REPQRT: VB-930 issued November 30, 1978.

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. **1** 761 690 (PR790216)	3-11 3-15 3-16 4-14 6-2 6-17, 6-20, 6-23 6-33 7-17 9-i 9-9 through 9-12 9-13 through 9-18 9-19 through 9-28	Revised first para Revised first & third para. Correct report number. Revised second para. Revised first & second para. Revised page headings. Revised Autopilots info. Revised note to waming & changed anti-collision to strobe. Revised Table of Contents. Added AutoFlite II Autopilot Instl. Supplement. Added AutoControl IIIB Autopilot Instl. Supplement. Added AltiMatic IIIC Autopilot Instl. Supplement.	Ward Evans Ward Evans Feb. 16, 1979
Rev. 2 761 690 (PR790413)	6-42 6-43 7-29, 7-30 7-31	Revised item 349; added item 350; relocated item 351 to pg, 6-43. Added item 351 from pg. 6-42. Revised para. 7.39. Added pg.	Ward Evans Ward Evans April 13, 1979

PILOT'S OPERATING HANDBOOK LOG OF REVISIONS (cont)

Revision Number and Code	Revised Pages	Description of Revision	FAA Approval Signature and Date
Rev. 3 761 690 (PR800729)	iii	Revised ser. no. applicability.	
	1-3	Revised item 1.3 (c).	
	2-3	Revised item 2.7 (c) and (e).	
	2-4	Revised item 2.9 (c).	
	3-15	Revised para. numbers, rpm and KIAS.	
	4-i	Revised Table of Contents.	
	4-9	Revised para. 4.5.	
	4-18	Relocated para. 4.21 from page 4-19; added para. 4.23 info. from pg. 4-20.	
	4-19	Relocated info. to pg. 4-18; added para. 4.23 from pg. 4-20	
	4-20	Relocated para. 4.23 to pg. 4-19; added note to para. 4.25.	
	4-26	Revised warning.	
	5-5	Revised para. 5.5. (c) (3), (4), (5).	
	5-6	Revised para. 5.5 (d) (1), (2), (3); revised power setting in 5.5 (e); revised 5.5 (e) (2).	
	5-7	Revised para. 5.5 (e) (5), (f) (1), (g) (1).	
	5-9	Revised Table of Contents.	
	5-19	Revised fig. 5-17.	
	5-24	Relocated fig. 5-23 to pg. 5-24a.	
	5-24a	Added pg.; reiocated fig. 5-23 from pg. 5-24.	
	5-24b	Added pg.; added fig. 5-24.	
	5-25	Revised fig. 5-25.	
	5-26	Revised fig. 5-27.	
	5-26a	Added pg.; added fig. 5-28.	
	5-26b	Added pg.	
	5-27	Revised fig. 5-29	

Revision Number anc Code	Rcviscd Pages	Description of Revision	FAA Approval Signature and Date
Rev. 3 761 690 (PR800299) (cont)	5-28	Revised fig. 5-31.	
	5-29	Revised fig. 5-33.	
	6-i	Kevised Table of Contents.	
	6-1	Revised para. 6.I.	
	6-3	Relocated para. 6.3 fig. 6-1 on pg. 6-4; addcd caution notc to para. 6.3 (a) (3).	
	6-4	Relocated para. 6.3 (d) (2) on pg. 6-5; added para. 6.3 fig. 6-I.	
	6-5	Relocated para. 6.3 (d) (2) from pg. 6-4.	
	6-14	Revised item Ib.	
	6-15	Revised item 9.	
	6-16	Kevised item 21.	
	6-18	Revised item 43.	
	6-30	Relocated item 203 on pg. 6-31; added item 202.	
	6-3I	Relocated item 213 and 215 on pg. 6-32; added item 203.	
	6-32	Relocated items 213 and 215 from pg. 6-31.	
	6-34	Relocated items 243 thru 249 on pg. 6-34a.	
	6-34a	Added pg.; relocated items 24: thru 249 from pg. 6-34.	
	6-34b	Added pg.; Relocated items 25I thru 255 from pg. 6-35.	
	6-35	Relocated items 251 thru 255 on page 6-34b: added item 256; added item 271 from pg. 6-36.	
	6-36	Relocated item 271 on pg. 6-35; revised item 273.	
	7-3	Rcvised para. 7.7.	Ward Evans Feb. 28, 1980 Ward Evans
	8-i	Rcviscd Table of Contents.	

Revision Number anc Code	Reviscd Pages	Dcscription of Revision	FAA Approval Signaturc ancl Date
Rev. 4 761 690 (PR870131)	2-9 3-2, 3-3, 3-6 3 9, 3-10 3-11, 3-12 3-15 3-16 4-9 4-18 4-19 4-20 4-25. 4-26 7-4 7-6 7-7 7-8 7-9 7-10 7-11	Reviscd para. 2.25. Reviscd para. 3.3. Revised para. 3.9. Revised para. 3.13. Reviscd para. 3.27. Relocated info. to pagc 3- 16. Revised para. 3.27. Relocated info from page 3-15. Reviscd para. 4.5. Revised para. 4.2 1. Relocated info. *to* pagc **4-** 19. Revised Para. 4-21. Relocated info from pagc **4-** 18. Revised Para. 4.25. Revised Para. 4.39. Revised fig. 7-1. Revised para. 7.11; rcvised fig. 7-3. Relocatcd info. from page 7-7. Reviscd para. 7.11. Relocated info. to pagc 7-6. Revised para. 7.11 Revised fig. 7-5. Revised fig. 7-7. Revised fig. 7-9.	D.H. Trompler 5/7/87 Date
Rcv. **5** 761 690 (PR960906)	vi-b 3-6, 3-15, 8-1, 8-2, 8-3, 8-11. 9-13,	Addcd Rev. **5** to L of R pg. Reviscd para. 3.3. Revised para. 3.27. Revised para. 8.1. Revised Para. 8.3. Revised para. 8.3 Reviscd Para. 8.19 Removed Sec. 3(a)(2)	Peter E. Peck Sept. 06, 19 3 Date

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GENERAL

SECTION I

GENERAL

1.1 INTRODUCTION

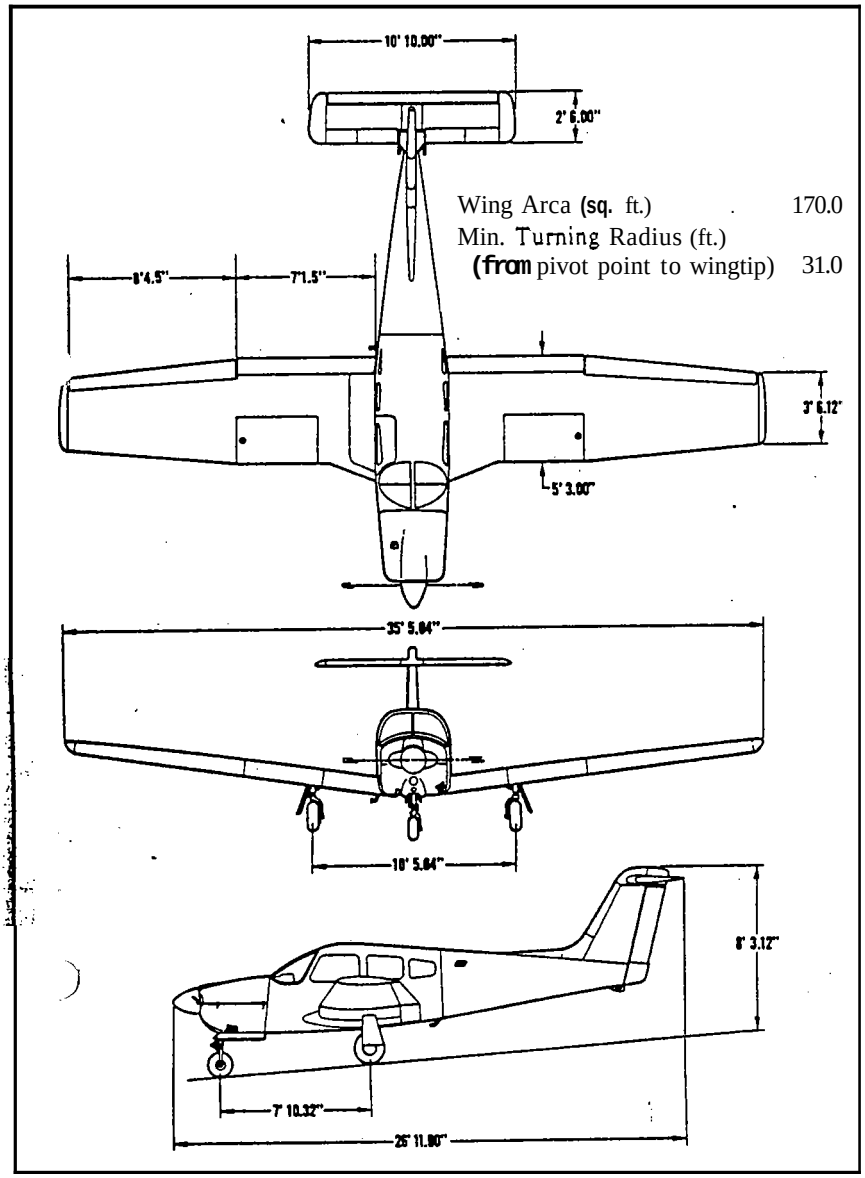
This Pilot's Operating Handbook is designed for maximum utilization as an Operating guide for the pilot. It includes the material requircd to be fumished to the pilot by CAR 3 and FAR Part 21 Subpart J. It also contains supplemental data supplied by the airplane manufacturer.

This handbook is not designed as a Substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status.

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the Operating limitations as outlined by instrument markings, placards, and this handbook.

Although the arrangement of this handbook is intended to increase its in-flight capabilities, it should not be used solely as an occasional Operating reference. The pilot should study the entire handbook to familiarize himself with the limitations, Performance. procedures and operational handling characteristics of the airplane before flight.

The handbook has been divided into numbered (arabic) sections, each provided with a "finger-tip" tab divider for quick reference. The limitations and emergency procedures have been placed ahead of the normal procedures, Performance and other sections to provide easier access to information that may be required in flight. The "Emergency Procedures" Section has been fumished with a red tab divider to present an instant reference to the section. Provisions for expansion of the handbook have been made by the deliberate omission of certain Paragraph numbers, figure numbers, item numbers and pages noted as being intentionally left blank.



Wing Arca (sq. ft.)	170.0
Min. Turning Radius (ft.) (from pivot point to wingtip)	31.0

THREE VIEW
Figure 1-1

13 ENGINES

(a) Number of Engines	1
(b) Engine Manufacturer	Lycoming
(c) Engine Model Number	IO-360-C1C6
(d) Rated Horsepower	200
(e) Rated Speed (rpm)	2700
(f) Bore (in.)	5.125
(g) Stroke (in.)	4.375
(h) Displacement (cu. in.)	361
(i) Compression Ratio	8.5:1
(j) Engine Type	Four Cylinder, Direct Drive, Horizontally Opposed. Air Cooled and Fuel Injected

15 PROPELLERS

McCAULEY

(a) Number of Propellers	1
(b) Propeller Manufacturer	McCauley
(c) Blade Model	90DHA-16
(d) Number of Blades	2
(e) Hub Model	B2D34C213
(f) Propeller Diameter (in.)	
(1) Maximum	74
(2) Minimum	73
(g) Propeller Type	Constant Speed, Hydraulically Actuated

HARTZELL	
(a) Number of Propellers	1
(b) Propeller Manufacturer	Hartzell
(c) Blade Model	F7666A-2R
(d) Number of Blades	2
(e) Hub Model	HC-C2YK-1( )F
(f) Propeller Diameter (in.)	
(1) Maximum	74
(2) Minimum	72
(g) Propeller Type	Constant Speed, Hydraulically Actuated

1.7 FUEL

(a) Fuel Capacity (U.S. gal.) (total)	77
(b) Usable Fuel (U.S. gal.) (total)	72
(c) Fuel Grade, Aviation	
(1) Minimum Octane	100/130 - Green
(2) Specified Octane	100 - Green, 100 LL - Blue or 100/130 - Green
(3) Alternate Fuels	Refer to latest revision of Lycoming Service Instruction 1070

1.9 OIL

(a) Oil Capacity (U.S. qts.)	8
(b) Oil Specification	Refer to latest issue of Lycoming Service Instruction 1014
(c) Oil Viscosity	Refer to Section 8 - Paragraph 8.19

1.11 MAXIMUM WEIGHTS

(a) Maximum Takeoff Weight (lbs.)	2750
(b) Maximum Landing Weight (lbs.)	2750
(c) Maximum Weights in Baggage Compartment	200

1.13 STANDARD AIRPLANE WEIGHTS*

(a) Standard Empty Weight (lbs.): Weight of a standard airplane including unusable fuel, full Operating fluids and full oil.	1627
(b) Maximum Useful Load (lbs.): The difference between the Maximum Takeoff Weight and the Standard Empty Weight.	1123

1.15 BAGGAGE SPACE

(a) Compartment Volume (cu. ft.)	24
(b) Entry Width (in.)	22
(c) Entry Height (in.)	20

1.17 SPECIFIC LOADINGS

(a) Wing Loading (lbs. per sq. ft.)	16.18
(b) Power Loading (lbs. per hp)	13.75

*These values are approximate and vary from one aircraft to anothcr. Refcr to Figure 6-5 for the Standard Empty Weight value and the Useful Load value to be used for C.G. calculations for the aircraft specified.

1.19 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

The following definitions are of symbols, abbreviations and terminology used throughout the handbook and those which may be of added operational significance to the pilot.

(a) General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated Speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equai to true airspeed in standard atmosphere at sea level.
KCAS	Caiibrated Airspeed expressed in "Knots."
GS	Ground Speed is the Speed of an airplane relative to the ground.
IAS	Indicated Airspeed is the Speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KIAS	Indicated Airspeed expressed in "Knots."
M	Mach Number is the ratio of true airspeed to the Speed of sound.
TAS	True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
VA	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
VFE	Maximum Flap Extended Speed is the highest Speed permissible with wing flaps in a prescribed extended Position.

VLE	Maximum Landing Gear Extended Speed is the maximum Speed at which an aircraft can be safely flown with the landing gear extended.
VLO	Maximum Landing Gear Operating Speed is the maximum Speed at which the landing gear can be safely extended or retracted.
VNE/MNE	Never Exceed Speed .or Mach Number is the Speed limit that may not be exceeded at any time.
VNO	Maximum Structural Cruising Speed is the Speed that should not be exceeded except in smooth air and then only with caution.
VS	Stalling Speed or the minimum steady flight Speed at which the airplane is controllable.
VSO	Stalling Speed or the minimum steady flight Speed at which the airplane is controllable in the landing configuration.
VX	Best Angle-of-Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
VY	Best Rate-of-Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

(b) Meteorological Terminology

ISA	International Standard Atmosphere in which: The air is a dry perfect gas; The temperature at sea level is 15° Celsius (59° Fahrenheit); The pressure at sea level is 29.92 inches Hg (1013 mb); The temperature gradient from sea level to the altitude at which the temperature is -56.5°C (-69.7°F) is -0.00198°C (-0.003566°F) per foot and zero above that altitude.
OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.
Indicated Pressure Altitude	The number actually read from an altimeter when the barometnc subscale has been set to 29.92 inches of mercury (1013 millibars).
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometnc altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

(c) Power Terminology

Takeoff Power	Maximum power permissible for takeoff.
Maximum Continuous Power	Maximum power permissible continuously during flight.
Maximum Climb Power	Maximum power permissible during climb.
Maximum Cruise Power	Maximum power permissible during. cruise.

(d) Engine Instruments

EGT Gauge	Exhaust Gas Temperature Gauge

(e) Airplane Performance and Flight Planning Terminology

Climb Gradient	The demonstrated ratio of the changc in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of thc airplane during takeoff and landing was actually demonstrated during certification tests.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
MEA	Minimum en route IFR altitude.
Route Segment	A pan of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be estabiished.

(f) Weight and Balance Terminology

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusabie Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full Operating fluids and full oil.

Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.
Useful Load	Difference between takeoff weight, or ramp weight if applicable, and basic empty weight.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. (It includes weight of start, taxi and run up fuel.)
Maximum Takcoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.

1.21 CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
acres	0.4047	ha
	43560	sq. ft.
	0.0015625	sq. mi.
atmospheres (atm)	76	cm Hg
	29.92	in. Hg
	1.0133	bar
	1.033	kg/cm ^{2}
	14.70	lb./sq. in.
	2116	lb./sq. ft.
bars (bar)	0.98692	atm
	14.503768	lb./sq. in.
British Thermal Unit (BTU)	0.2519958	kg-cal
centimeters (cm)	0.3937	in.
	0.032808	ft.
centimeters of mercury at 0°C (cm Hg)	0.01316	atm
	0.3937	in. Hg
	0.1934	lb./sq. in.
	27.85	lb./sq. ft.
	135.95	kg/m ^{2}
centimeters per second (cm/sec.)	0.032808	ft./sec.
	1.9685	ft./min.
	0.02237	mph
cubic centimeters (cm ^{3})	0.03381	fl. oz.
	0.06102	cu. in.
	3.531 x 10 $^{-5}$	cu. ft.
	0.001	l
	2.642 x 10 $^{-4}$	U.S. gal.

MULTIPLY	BY	TO OBTAIN
cubic feet (cu. ft.)	28317	cm 3
	0.0283 17	m 3
	1728	cu. in.
	0.037037	cu. yd.
	7.48 1	U.S. gal.
	28.32	1
cubic feet per minute (cu. ft./min.)	0.472	1/sec.
	0.0283 17	m 3/min.
cubic inches (cu. in.)	16.39	cm 3
	1.639 x 10 -5	m 3
	5.787 x 10 -4	cu. ft.
	0.5541	fl. oz
	0.01639	l
	4.329 x 10 -3	U.S. gal.
	0.01732	U.S. qt.
cubic meters (m 3)	6 1024	cu. in.
	1.308	cu. yd.
	35.3147	cu. ft.
	264.2	U.S. gal.
cubic meters per minute (m 3/min.)	35.3147	cu. ft./min.
cubic yards (cu. yd.)	27	cu. ft.
	0.7646	m 3
	202	U.S. gal.
degrees (arc)	0.01745	radians
degrees per second (deg./sec.)	0.0 1745	radians/sec.
drams, fluid (dr. fl.)	0.125	fl. oz.
drams, avdp. (dr. avdp.)	0.0625	oz. avdp.

MULTIPLY	BY	TO OBTAIN
feet (ft.)	30.48	cm
	0.3048	m
	12	in.
	0.33333	yd.
	0.0606061	rod
	1.894 x 10-4	mi.
	1.645 x 10-4	NM
feet per minute (ft./min.)	0.01136	mph
	0.01829	km/hr.
	0.508	cm/sec.
	0.00508	m/sec.
feet per second (ft./sec.)	0.6818	mph
	1.097	km/hr.
	30.48	cm/sec.
	0.5921	kts.
foot-pounds (ft.-lb.)	0.138255	m-kg
	3.24 x 10-4	kg-cal
foot-pounds per minute (ft.-lb./min.)	3.030 x 10-5	hp
foot-pounds per second (ft.-lb./sec.)	1.818 x 10-5	hp
gallons, Imperial (Imperial gal.)	277.4	cu. in.
	1.201	U.S. gal.
	4.546	l
gallons, U.S. dry (U.S. gal. dry)	268.8	cu. in.
	1.556 x 10-1	cu. ft.
	1.164	U.S. gal.
	4.405	l

MULTIPLY	BY	TO OBTAIN
gallons, U.S. liquid (U.S.gal.)	231	cu. in.
	0.1337	cu. ft.
	4.951×10^{-3}	cu. yd.
	3785.4	cm^3
	3.785×10^{-3}	m^3
	3.785	l
	0.83268	Imperial gal.
	128	fl. oz.
gallons per acre (gal./acre)	9.353	l/ha
grams (g)	0.001	kg
	0.3527	oz. avdp.
	2.205×10^{-3}	lb.
grams per centimeter (g/cm)	0.1	kg/m
	6.721×10^{-2}	lb./ft.
	5.601×10^{-3}	lb./in.
grams per cubic centimeter (g/cm^3)	1000	kg/m^3
	0.03613	lb./cu. in.
	62.43	lb./cu. ft.
hectares (ha)	2.471	acres
	107639	sq. ft.
	10000	m^2
horsepower (hp)	33000	ft.-lb./min.
	550	ft.-lb./sec.
	76.04	m-kg/sec.
	1.014	metric hp
horsepower, metric	75	m-kg/sec.
	0.9863	hp
inches (in.)	25.40	mm
	2.540	cm
	0.0254	m
	0.08333	ft.
	0.027777	yd.

MULTIPLY	BY	TO OBTAIN
inches of mercury at 0° C (in. Hg)	0.033421	atm
	0.4912	lb./sq. in.
	70.73	lb./sq. ft.
	345.3	kg/m ^{2}
	2.540	cm Hg
	25.40	mm Hg
inch-pounds (in.-lb.)	0.01 1521	m-kg
kilograms (kg)	2.204622	lb.
	35.27	oz. avdp.
	1000	g
kilogram-calories (kg-cal)	3.9683	BTU
	3087	ft.-lb.
	426.9	m-kg
kilograms per cubic meter (kg/m ^{3})	0.06243	lb./cu. ft.
	0.001	g/cm ^{3}
kilograms per hectare (kg/ha)	0.892	lb./acre
kilograms per square centimeter (kg/cm ^{2})	0.9678	atm
	28.96	in. Hg
	14.22	lb./sq. in.
	2048	lb./sq. ft.
kilograms per square meter (kg/m ^{2})	2.896 x 10 $^{-3}$	in. Hg
	1.422 x 10 $^{-3}$	lb./sq. in.
	0.2048	lb./sq. ft.
kilometers (km)	1 x 10 $^{-5}$	cm
	3280.8	ft.
	0.6214	mi.
	0.53996	NM

MULTIPLY	BY	TO OBTAIN
kilometers per hour (km/hr.)	0.9113	ft./sec.
	58.68	ft./min.
	0.53996	kt
	0.6214	mph
	0.27778	m/sec.
	16.67	m/min.
knots (kt)	1	nautical mph
	1.689	ft./sec.
	1.1516	statute mph
	1.852	km/hr.
	51.48	m/sec.
liters (l)	1000	cm^3
	61.02	cu. in.
	0.03531	cu. ft.
	33.814	fl. oz.
	0.264172	U.S. gal.
	0.2200	Imperial gal.
	1.05669	qt.
liters per hectare (l/ha)	13.69	fl. oz./acre
	0.107	gal./acre
liters per second (l/sec.)	2.12	cu. ft./min.
meters (m)	39.37	in.
	3.280840	ft.
	1.0936	yd.
	0.198838	rod
	6.214×10^{-4}	mi.
	5.3996×10^{-4}	NM
meter-kilogram (m-kg)	7.23301	ft.-lb.
	86.798	in.-lb.
meters per minute (m/min.)	0.06	km/hr.

MULTIPLY	BY	TO OBTAIN
meters per second (m/sec.)	3.280840	ft./sec.
	196.8504	ft./min.
	2.237	mph
	3.6	km/hr.
microns	3.937×10^{-5}	in.
miles, statute (mi.)	5280	ft.
	1.6093	km
	1609.3	m
	0.8684	NM
miles per hour (mph)	44.7041	cm/sec.
	4.470×10^{-1}	m/sec.
	1.467	ft./sec.
	88	ft./min.
	1.6093	km/hr.
	0.8684	kt
miles per hour square (m/hr. sq.)	2.151	ft./sec. sq.
millibars	2.953×10^{-2}	in. Hg
millimeters (mm)	0.03937	in.
millimeters of mercury at 0°C (mm Hg)	0.03937	in. Hg
nautical miles (NM)	6080	ft.
	1.1516	statute mi.
	1852	m
	1.852	km
ounces, avdp. (oz. avdp.)	28.35	g
	16	dr. avdp.

MULTIPLY	BY	TO OBTAIN
ounces, fluid (fl. oz.)	8	dr. fl.
	29.57	cm^3
	1.805	cu. in.
	0.0296	l
	0.0078	**U.S.** gal.
Ounces, fluid per acre (fl. oz./acre)	0.073	l/ha
Pounds (lb.)	0.453592	kg
	453.6	**g**
	3.108×10^{-2}	slug
Pounds pcr acre (lb./acre)	1.121	**kg/ha**
Pounds per cubic foot (lb./cu. ft.)	16.02	**kg/m^3**
pounds per cubic inch (lb./cu. in.)	1728	lb./cu. ft.
	27.68	**g/cm^3**
Pounds per square foot (lb./sq. ft.)	0.1414	in. Hg
	4.88243	**kg/m^2**
	4.725×10^{-4}	atm
Pounds per square inch (psi or lb./sq. in.)	5.1715	cm Hg
	2.036	in. **Hg**
	0.06804	atm
	0.0689476	bar
	703.1	**kg/m^2**
quart, **U.S.** (qt.)	0.94635	**l**
	57.749	cu. in.
radians	57.30	deg. (arc)
	0.1592	rev.
radians per second (radians/sec.)	57.30	deg./sec.
	0.1592	rev./sec.
	9.549	**rpm**

MULTIPLY	BY	TO OBTAIN
revolutions (rev.)	6.283	radians
revolutions per minute (rpm or rev./min.)	0.1047	radians/sec.
revolutions per second (rev./sec.)	6.283	radians/sec.
rod	16.5	ft.
	5.5	yd.
	5.029	m
slug	32.174	lb.
square centimeters (cm^2)	0.1550	sq. in.
	0.001076	sq. ft.
Square feet (sq. ft.)	929	cm^2
	0.092903	m^2
	144	sq. in.
	0.1111	sq. yd.
	2.296×10^{-5}	acres
Square inches (sq. in.)	6.45 16	cm^2
	6.944×10^{-3}	sq. ft.
Square kilometers (km^2)	0.3861	sq. mi.
Square meters (m^2)	10.76391	sq. ft.
	1.196	sq. yd.
	0.0001	ha
Square miles (sq. mi.)	2.590	km^2
	640	acres
Square rods (sq. rods)	30.25	sq. yd.
square yards (sq. yd.)	0.8361	m^2
	9	sq. ft.
	0.0330579	sq. rods

MULTIPLY	BY	TO OBTAIN
yards (yd.)	0.9144	m
	3	ft.
	36	in.
	0.181818	rod

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SECTION 2

LIMITATIONS

SECTION 2

LIMITATIONS

2.1 GENERAL

This section provides the "FAA Approved" Operating limitations, instrument markings, color coding and basic placards necessary for the safe Operation of the airplane and its Systems.

Limitations associated with those optional systems and equipment which require handbook Supplements can be found in Section 9 (Supplements).

2 3 AIRSPEED LIMITATIONS

SPEED	KIAS	KCAS
Never Exceed Speed (VNE) - Do not exceed this speed in any Operation.	190	186
Maximum Structural Cruising Speed (VNO) - Do not exceed this speed except in smooth air and then only with caution.	149	148
Design Maneuvenng Speed (VA) - Do not make full or abrupt control movements above this speed.		
At 2750 lbs. G.W.	121	121
At 1863 lbs. G.W.	96	97

CAUTION

Maneuvering speed decreases at lighter weight as the effects of aerodynamic forces become more pronounced. Linear interpolation may be used for intermcdiate gross weights. Maneuvering speed should not be exceeded while operating in rough air.

SPEED	KIAS	KCAS
Maximum Flaps Extended Speed (VFE)- Do not exceed this speed with the flaps extended.	108	104
Maximum Landing Gear Extension Speed - Do not exceed this speed when extending the landing gear.	130	130
Maximum Landing Gear Retraction Speed - Do not exceed this speed when retracting the landing gear.	109	109
Maximum Landing Gear Extended Speed (VLE)- Do not exceed this speed with the landing gear extended.	130	130

2.5 AIRSPEED INDICATOR MARKINGS

MARKING	IAS
Red Radial Line (Never Exceed)	190 KTS
Yellow Arc (Caution Range - Smooth Air Only)	149 KTS to 190 KTS
Green Arc (Normal Operating Range)	58 KTS to 149 KTS
White Arc (Flap Down)	53 KTS to 108 KTS

2.7 POWER PLANT LIMITATIONS

(a) Number of Engines	1
(b) Engine Manufacturer	Lycoming
(c) Engine Model No.	IO-360-C1C6
(d) Engine Operating Limits	
(1) Maximum Horsepower	200
(2) Maximum Rotation Speed (RPM)	2700
(3) Maximum Oil Temperature	245° F
(e) Oil Pressure	
Minimum (red line)	25 PSI
Maximum (red line)	100 PSI
(f) Fuel Pressure	
Minimum (red line)	14 PSI
Maximum (red line)	45 PSI
(g) Fuel Grade (minimum octane)	100/130 - Green
(h) Number of Propellers	1
(i) Propeller Manufacturer	McCauley or Hartzell
(j) Propeller Hub and Blade Model	
(1) McCauley	B2D34C213/90DHA-16
(2) Hartzell	HC-C2YK-1( )F/ F7666A-2R
(k) Propeller Diameter	
(1) McCauley	
Minimum	73
Maximum	74
(2) Hartzell	
Minimum	72
Maximum	74
(l) Blade Angle Limits	
(1) McCauley	
Low Pitch Stop	12.5 ± 0.2°
High Pitch Stop	27.5 ± 0.5°
(2) Hartzell	
Low Pitch Stop	14.0 ± 0.2°
High Pitch Stop	29.0 ± 2.0°

(m) RPM Restrictions (McCauley Propeller Only)	Avoid Continuous Operation Between 1500 and 1950 RPM Below 15 Inches Map.

2.9 POWER PLANT INSTRUMENT MARKINGS

(a) Tachometer	
Green Arc (Normal Operating Range)	500 to 2700 RPM
Red Line (Maximum Continuous Power)	2700 RPM
(b) Oil Temperature	
Green Arc (Normal Operating Range)	75° to 245° F
Red Line (Maximum)	245° F
(c) Oil Pressure	
Green Arc (Normal Operating Range)	60 PSI to 90 PSI
Yellow Arc (Caution Range) (Idle)	25 PSI to 60 PSI
Red Line (Minimum)	25 PSI
Red Line (Maximum)	100 PSI
(d) Fuel Pressure	
Green Arc (Normal Operating Range)	14 PSI to 45 PSI
Red Line (Minimum)	14 PSI
Red Line (Maximum)	45 PSI

2.11 WEIGHT LIMITS

(a) Maximum Weight **2750** LBS.
(b) Maximum Baggage **200** LBS.

NOTE

Refer to Section 5 (Performance) for maximum weight as limited by Performance.

2.13 CENTER OF GRAVITY LIMITS

Weight Pounds	Forward Limit Inches Aft of Datum	Reanvard Limit Inches Aft of Datum
2750	90.0	93.0
2400	**85.5**	93.0

NOTES

Straight line Variation between points given.

The datum used is **78.4** inches ahead of the wing leading edge at the intersection of the straight and tapered section.

It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See Section 6 (Weight and Balance) for proper loading instructions.

2.15 MANEUVER LIMITS

No acrobatic maneuvers including spins approved.

2.17 FLIGHT LOAD FACTORS

(a) Positive Load Factor (Maximum)	3.8 G
(b) Negative Load Factor (Maximum)	No inverted maneuvers approved

2.19 TYPES OF OPERATIONS

The airplane is approved for the following Operations when equipped in accordance with FAR 91 or FAR 135.

(a) Day V.F.R.
(b) Night V.F.R.
(c) Day I.F.R.
(d) Night I.F.R.
(e) Non Icing

2.21 FUEL LIMITATIONS

(a) Total Capacity	77 U.S. GAL.
(b) Unusable Fuel The unusable fuel for this airplane has been determined as 2.5 gallons in each wing tank in critical flight attitudes.	5 U.S. GAL.
(c) Usable Fuel The usable fuel in this airplane has been determined as 36.0 gallons in each wing tank.	72 U.S. GAL.
(d) Fuel remaining when the quantity indicators read zero cannot be used safely in flight.	

2.23 NOISE LEVEL

The noise level of this aircraft is **75.5** d B(A).

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for Operation at, into, or out of, any airport.

The above Statement not withstanding the noise level stated abovc **has** been verified by and approved by the Federal Aviation Administration in noise level test flights conducted in accordance with FAR **36,** Noisc Standards - Aircraft Type and Airworthiness Certification. This aircra' model is in compliance with all FAR 36 noise Standards applicable to th_ type.

2.25 PLACARDS

In full view of the pilot:

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

THIS AIRCRAFT APPROVED FOR NIGHT I.F.R. NON-ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.

In full view of the pilot, the following Takeoff and Landing Check Lists will be installed:

TAKEOFF CHECK LIST

Fuel on Proper Tank
Electric Fuel Pump - On
Engine Gauges - Checked
Alternate Air - Closed
Seat Backs Erect
Mixture - Set
Propeller - Set
Fasten Belts/Harness
Flaps - Set
Trim Tab - Set
Controls - Free
Doors - Latched
Air Conditioner - Off

LANDING CHECK LIST

Fuel on Proper Tank
Scat Backs Erect
Fasten Belts/Harness
Electric Fuel Pump - On
Mixture - Rich
Propeller - Set
Gear Down
Flaps - Set (White Arc)
Air Conditioner - Off

The "Air Conditioner Off" item in the above Takeoff and Landing Check Lists is mandatory for air conditioned aircraft only.

On the instrument panel in full view of the pilot:

MANEUVERING SPEED 121 KIAS
AT 2750 LBS. (SEE A.F.M.)

On the instrument panel in full view of the pilot:

DEMONSTRATED CROSSWIND COMPONENT 17 KTS

On the instrument panel in full view of the pilot:

NO ACROBATIC MANEUVERS.
INCLUDING SPINS. APPROVED

On the instrument panel in full view of the pilot:

GEAR DOWN	130 KIAS (MAX.)
GEAR UP	109 KIAS (MAX.)
EXTENDED	130 KIAS (MAX.)

Near emergency gear lever:

EMERGEKCY DOWN

Near emergency gear lever (aircraft equipped with backup gear extender)

OVERRIDE ENGAGED AUTO-EXT-OFF
LOCK PIN ON SIDE
TO ENGAGE OVERRIDE:
PULL LEVER FULL UP. PUSH LOCK PIN
TO RELEASE OVERRIDE:
PULL LEVER FULL UP & RELEASE

Near gear selector switch:

GEAR UP	109 KIAS MAX.
DOWN	130 KIAS MAX.

Adjacent to upper door latch:

ENGAGE LATCH BEFORE FLIGHT

On the instrument panel in full view of the pilot:

WARNING

TURN OFF STROBE LIGHTS WHEN IN CLOSE PROXIMITY TO GROUND OR DURING FLICHT THROUGH CLOUD, FOG OR HAZE.

In **full** view of the pilot, in the area of the air conditioner controls when the air conditioner is installed:

WARNING

AIR CONDITIONER MUST BE OFF TO INSURE NORMAL TAKEOFF CLIMB PERFORMANCE.

On inside of baggage compartment door:

BAGGAGE MAXIMUM 200 LBS. SEE WEIGHT AND BALANCE DATA FOR BAGGAGE LOADING BETWEEN 150 LBS. AND 200 LBS.

Adjacent to fuel tank filler caps:

FUEL - 100/ 130 AVIATION GRADE - MIN. USABLE CAPACITY 36 GAL.

USABLE CAPACITY TO BOTTOM OF FILLER NECK INDICATOR ***25*** GAL.

Above fuel quantity gauges:

FUEL REMAINING WHEN QUANTITY INDICATOR READS ZERO CANNOT BE USED SAFELY IN FLICHT.

On the instrument panel in full view of the pilot in aircraft McCauley propeller installations only:

AVOID CONTINUOUS OPERATION BETWEEN 1500 AND 1950 RPM BELOW 15" MANIFOLD PRESSURE.

On the aft baggage closeout:

MAXIMUM BAGGAGE 200 LBS. NO HEAVY OBJECTS ON HAT SHELF.

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SECTION 3

EMERGENCY PROCEDURES

SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

The recommended procedures for coping with various types o emergencies and critical Situations are provided by this section. All of the required (FAA regulations) emergency procedures and those necessary for the safe Operation of the airplane as determined by the Operating and design features of the airplane are presented.

Emergency procedures associated with those optional Systems and equipment which require handbook Supplements are provided by Section 9 (Supplements).

The first portion of this section consists of an abbreviated emergency check list which supplies an action sequence for critical Situations with little emphasis on the Operation of Systems.

The remainder of the section is devoted to amplified emergency procedures containing additional information to provide the pilot with a more complete understanding of the procedures.

These procedures are suggested as the best course of action for coping with the particular condition described. but are not a Substitute for sound judgment and common sense. Since emergencies rarely happen in modet aircraft. their occurrence is usually unexpected and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures. such as power off landings. are a normal part of pilot training. Although these emergencies arediscussed here, this information is not intended to replace such training, but only to provide a source of reference and review. and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to rernain proficient in them.

3.3 EMERGENCY PROCEDURES CHECK LIST

ENGINE FIRE DURING START

Starter.. ..... crank engine
Mixture ..... idle cut-off
Throttle ..... open
Electric fuel pump ..... OFF
Fuelselector ..... OFF
Abandon if fire continues.

ENGINE POWER LOSS DURING TAKEOFF

If sufficient runway remains for a normal landing, leave gear down and land straight ahead.

If area ahead is rough, or if it is necessary to clear obstructions:
Gear selector switch ..... UP
Emergency gear lever (aircraft equipped with backup gear extender) ..... locked in OVERRIDE ENGAGED Position

If sufficient altitude has been gained to attempt a restart:
Maintain safe airspeed.
Fuel selector ..... switch to tank containing fuel
Electric fuel pump ..... check ON
Mixture ..... check RICH
Alternate air ..... OPEN
Emergency gear lever ..... as required
If power is not regained. proceed with power off landing.

ENGINE POWER LOSS IN FLICHT

Fuel selector ..... switch to tank containing fuel
Electric fuel pump ..... ON
Mixture ..... RICH
Alternate air ..... OPEN
Engine gauges ..... check for indication of cause of power loss
If no fuel pressure is indicated. check tank selector Position to be sure it is on a tank containing fuel.

When power is restored:
Alternate air ..... CLOSED
Electric fuel pump ..... OFF
If power is not restored prepare for power off landing.
Trim for 79 KIAS.

POWER OFF LANDING

On aircraft equipped with the backup gear extender, lock emergency gear lever in OVERRIDE ENGAGED Position before airspeed drops to 105 KIAS to prevent the landing gear from free falling.

Trim for 79 KIAS.
Locate suitable field.
Establish spiral pattern.
1000 ft. above field at downwind Position for normal landing approach.
When field can easily be easily reached slow to 72 KIAS for shortest landing.

GEAR DOWN EMERGENCY LANDING

Touchdowns should normally be made at lowest possible airspeed with full flaps.

When committed to landing:
Landing gear selector ..... DOWN
Throttle ..... close
Mixture ..... idle cut-off
Ignition ..... OFF
Master switch ..... OFF
Fuel selector ..... OFF
Seat belt and harness.. ..... tight

GEAR UP EMERGENCY LANDING

In the event a gear up landing is required, proceed as follows:
Flaps ..... as desired
Throttle ..... close
Mixture ..... idle cut-off
Ignition switches.. ..... OFF
Master switch ..... OFF
Fuel selector ..... OFF
Seat belt and harness.. ..... tight
Contact surface at minimum possible airspeed.

FIRE IN FLICHT

Source of fire ..... check

Electrical fire (smoke in cabin):
Master switch ..... OFF
Vents ..... open
Cabin heat ..... OFF
Land as soon as practicable.

Engine fire:
Fuel selector ..... OFF
Throttle ..... CLOSE
Mixture ..... idle cut-off
Electric fuel pump ..... .check OFF
Heater and defroster ..... OFF
Proceed with power off landing procedure.

LOSS OF OIL PRESSURE

Land as soon as possible and investigate cause.
Prepare for power off landing.

LOSS OF FUEL PRESSURE

Electric fuel pump ..... ON
Fuel selector ..... .check on full tank

HIGH OIL TEMPERATURE

Land at nearest airport and investigatc thc problcm.
Prepare for power off landing.

ALTERNATOR FAILURE

Verify failure.
Reduce elecirical load as niuch as possible.
Alternator circuit breakers ..... check
Alt switch ..... **OFF** (for I second), thcn on

It no'output:
Alt switch ..... **OFF**

Rcducc electrical load and land as soon as practical.

If battery is fully discharged, thc gear will have to be lowcred using the emergency gear extension procedure. Position lights will not illuminate.

ROPELLER OVEHSPEED

Throttle ..... rctard
Oil prcssure ..... check
Prop control ..... full DECKEASE **rpm,** then set if any control available
Airspeed ..... rcduce
Throttle ..... as requircd to remain bclow 2700 rpm

EMERGENCY LANDING CEAH EXTENSION

Prior io emergency exicnsion procedure:
Masicr swiich ..... chcck OP
Circuit breakcrs ..... check
Panel lights ..... OFF (in daytimc)
Gear indicator bulbs ..... check

If landing gcar docs not chcck down and lock:
Airspeed ..... reducc below 87 KIAS
Landing gear selector swiich ..... gear DOWN Position
If gear has failed to lock down on aircraft equipped with thc backup gea extender. raise emergency gear lever to "Override Engaged" posiiion.
If gear has still failed **to** lock down, move and ***hold*** the emergency lever down to the EMERGENCY DOWN Position.
If gear has still failed to lock down, yaw ihe airplanc abruptly from side to side with ihe ruddcr.

If the nose gear will not lock down using the above proccdure, slow the aircraft to the lowesi safe speed attainable using ihe lowest power setting required for safc Operation and accomplish the following:
Emergency gear lever (on aircraft equipped with the backup gear cxtender) ..... "OVERRIDE ENGAGED"
Landing gear selector switch ..... gear **DOWN** Position
If landing gear does not check down, rccycle gear through up position, and then select gear DOWN.

SPIN RECOVERY

Rudder ..... full opposite to direciion of roiation
Control whccl ..... full forward whilc neutralizing ailerons
Throiile. ..... idlc
Ruddcr ..... neutral (wheri roiation siops)
Control whecl ..... as required **to** smooihly regain level flight attitude

OPEN DOOR

If boih upper and sidc latches are opcn, ihe door will trail slightly opcn and and airspceds will be reduced slightly.

To close the door in flight:
Slow airplane to 87 **KIAS.**

Cabin vents	close
Storm window	open
If upper latch is open	latch
If side latch is open	pull on armrest while moving latch handle to latched position
If both latches are open	latch side latch then top latch

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3.5 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

The following paragraphs are presented to supply additional information for the purpose of providing the pilot wiih a more complete understanding of the recommended course of action and probable cause of an emergency Situation.

3.7 ENGINE FIRE DURINC START

Engine fires during start are usually the result of overpriming. The first ttempt to extinguish the fire is to try to start the engine and draw theexcess fuel back into the induction system.

If a fire is present before the engine has started. move the mixture control to idle cut-off. open the throttle and crank the engine. This is an attempt to draw the fire back into the engine.

If the engine hasstarted. continue Operating to try to pull the fire into the engine.

In either case (above).if fire continues more than a few seconds, the fire should be extinguished by the best available external means.

The fuel selector valves should be OFF and the mixture at idle cut-off if an external fire extinguishing method is to be used.

3.9 ENGINE POWER LOSS DURING TAKEOFF

The proper action to be taken if loss of power occurs during takeoff will depend on the circumstances of the particular Situation.

If sufficient runway rernains to complete a normal landing. leave the landing gear down and land straight ahead.

If the area ahead is rough. orif it is necessary to clear obstructions. move the gear selector switch to the UP Position. On aircraft equipped with the backup gear extender. lock the emergency gear lever in the OVERRIDE ENGAGED Position.

If sufficient altitude has been gained to attempt a restart, maintain a safe airspeed and switch the fuel selector to another tank containing fuel. Place the electric fuel pump to ON. Check that the mixture is RICH. Thealtemate air should be OPEN.

On aircraft equipped with the backup gear extender. the landing gear will extend automatically when engine power fails at speeds below approximately 95 K **IAS.** The glide distance with the landing gear extended is roughly halved. If the situation dictates. the landing gear can be retained in the retracted Position by locking the emergency gear lever in the OVERRIDE ENGAGED Position.

If engine failure was caused by fuel exhaustion. power will not be regained after switching fuel tanks until the empty fuel lines are filled. This may require up to ten seconds.

if power is not regained. proceed with the Power Off Landing procedure (refer to the emergency check list and Paragraph 3.13).

3.11 ENGINE POWER LOSS IN FLIGHT

Complete engine power loss is usually caused by fuel flow interruption and power will be restored shortly after fuel flow is restored. If power loss occurs at **a** low altitude. the first step is to prepare for an emergencylanding (refer to Paragraph **3.13).** An airspeed of at least **79** KIAS should be maintained.

If aititude permits. switch the fuel selector to another tank containing fuel and turn the electric fuel pump to ON. Move the mixture control to RICH and the alternate air to OPEN. Check the engine gauges for an indication of the cause of the power loss. If no fuel pressure is indicated, check the tank selector Position to be sure it is on a tank containing fuel.

When power is restored move the alternate air to the "CLOSED" Position and turn OFF the electric fuel pump.

If the preceding steps do not restore power. prepare for an emergency landing.

If time permits. turn the ignition switch to "L" then to "R" then back to "HOTH." Move the throttle and mixture control levers to different settings. This may restore power if the problem is too rich or too lean a mixture or if there is a partial fuel system restriction. Try the other fucl tank. Water in the fuel could take some time to be used up. and allowing the engine to windmill may restore power. If power loss is due to water. fuel pressure indications will be normal.

If engine failure was caused by fucl cxhaustion power will not be restored after switching fuel tanks until the empty fucl lines are filled. This may require up to ten seconds.

If power is not rcgained. procecd with the Power Off Landing procedure (refer to emergency check list and Paragraph 3.13),

3.13 POWER OFF LANDING

If loss of power occurs at altitude. lock emergency gear lever in "OVERRI'DE ENGAGED" position beforc airspeed drops to 105 KIAS to prevent the landing gcar from inadvertently free falling on aircraft equipped with thc backup gear extender. Trim thc aircraft for best gliding angle (79 KIAS. Air Cond. off) and look for a suitable field. If measures taken to restore power are not effective. and if time permits. check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. At best gliding angle. with the engine windmilling. iind the propeller control in full DECREASF. rpm. the aircraft will travel approximately 1.6 miles for each thousand feet of altitude. If possible. notify thc FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard. let him help.

When you have located a suitable field. establish a spiral pattem around this field. Try to be at 1000 feet above the field at the downwind position. to make a normal landing approach. When the field can easily be reached. slow to 77 KIAS with flaps down for thc shortest landing. Escess altitude rnay be lohi by widening your pattern. using flaps or slipping. or a combination of Ihese.

Whether to attempt a landing with gear up or down depends on man! factors. If the field chosen is obviously smooth and firm. and long enough to bring the plane to a stop. the gear should be down. If there are stumps or rocks or other large obstacles in the field. ihr. gear in thc down position will better protect the occupants of the aircraft. If. however. thc field is suspected to be excessively soft or short. or when landing in water of an! depth. a wheels-up landing will normally be safer and do less damage to the airplane.

On aircraft equipped with the backup gear extender, the landing gear will free fall at airspeeds below approximately 95 **KIAS.** and will take six to eight seconds *to* be down and locked. If a gear up landing is desired, it will be necessary to lock the override lever in the OVERRIDE ENGAGED position before the airspeed drops to 105 **KIAS** to prevent the landing gear from inadvertently free falling.

Touchdown should normally be made at the **lowest** possible airspeed.

(a) Gear Down Emergency Landing

When committed to a gear down emergency landing, close the throttle control and shut OFF the master and ignition switches. Flaps may be used as desired. Turn the fuel selector valve to OFF and move the mixture to idle cut-off. The seat belts and shoulder harness (if installed) should be tightened. Touchdown should be normally made at the lowest possible airspeed.

Always remember that the automatic gear mechanism will extend the gear below approximately 95 **KIAS** with power off. Be prepared to lock the emergency gear lever in the OVERRIDE ENGAGED position before the airspeed drops to 105 **KIAS** to prevent the landing **gear** from inadvertently free falling, unless gear extension is desired.

NOTE

If the master switch is OFF, the gear cannot be retracted.

(b) Gear Up Emergency Landing

On aircraft equipped with the backup gear extender, lock the emergency gear lever in OVERRIDE ENGAGED position before the airspeed drops to 105 **KIAS** to prevent the landing gear from inadvertently free falling. Wing **flaps** should be extended as desired.

When committed to a gear up landing, CLOSE the throttle and shut OFF the master and ignition switches. Turn OFF the fuel selector valve.

Touchdowns should normally be made at the **lowest** possible airspeed with full flaps.

3.15 FIRE IN FLIGHT

The presence of fire is noted through smoke, smell and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of the smoke, or other indications since the action to be taken differs somewhat in each case.

Check for the source of the fire first.

If an electrical fire is indicated (smoke in the cabin), the master switch should be turned **OFF.** The cabin vents should be opened and the cabin heat tumed **OFF.** A landing should be made as soon as possible.

If an engine fire is present, switch the fuel selector to **OFF** and close the throttie. Thc mixture should be at idle cut-off. Turn the electric fuel pump **OFF.** In all cases, the heater and defroster should be **OFF.** If radio communication is not required select master switch **OFF.** If the terrain permits, a landing should be made immediately.

NOTE

The possibility of an engine fire in flight is extremely remote. The procedure given is general and pilot judgment should be the determining factor for action in such an emergency.

3.17 LOSS OF OIL PRESSURE

Loss of oil pressure may be either partial or complete. **A** partial loss of oil pressure usuaily indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest airport, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine may stop suddenly. Maintain altitude until such time as a dead stick landing can be accomplished. Don't change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increases in temperatures, or oil smoke, are apparent, and an airport is not close.

If engine stappage occurs, proceed with Power Off Landing.

3.19 LOSS OF FUEL PRESSURE

The most probable cause of loss of fuel pressure is either fuel depletion in the fuel tank selected, or failure of the engine driven fuel pump. If loss of fuel pressure occurs, check that the fuei selector is on a tank containing fuel and turn ON the electric fuel pump.

If the problem is not an empty tank, land as soon as practicai and have the engine driven fuel pump and fuel system checked.

3.21 HIGH OIL TEMPERATURE

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle scals, a defective gauge, or other causes. Land as soon as practical at an appropriate airport and have the cause investigated.

A steady, rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and let a mechanic investigate the problern. Watch the oil pressure gauge for an accompanying loss of pressure.

3.23 ALTERNATOR FAILURE

Loss of alternator output is detected through zero rtading on the ammeter. Before executing the following procedure, insure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, altemator failure can be assumed.

The electrical load should be rcduced as much as possible. Check the alternator circuit breakcrs for a poppcd circuit breaker.

The ncxt step is to attempt to reset the overvoltage relay. This is accomplished by moving thc AL?' switch to **OFF** for one second and then to **ON.** If the trouble was causcd by a rnomentary overvoltage condition **(16.5** volts and up) this proccdurc should return the ammeter to a normal rcading.

If ihc ammetcr continucs to indicatc O Output. or if the alternator will not remain reset, turn off ihc ALT switch, rnaintain minimum electrical load and land as soon as practical. All electrical load is being supplied by ihe battery and can bc depleted rapidly.

3.25 PROPELLER OVERSPEED

Propcllcr ovcrspccd is caused by a malfunction in the propeller govcrnor or low oil pressurc which allows the propeller blades to rotate to full low pitch.

If propeller overspeed should occur, retard the throttle and check the oil pressure. The propeller control should be moved to full **"DECREASE *rpm*"** and thcn set if any control is available. Airspeed should be reduced and throttle used to maintain 2700 **RPM.**

3.27 EMERGENCY LANDINC GEAR EXTENSION

Prior to initiating thc emergency extension procedure check to insure that the master switch is ON and that the circuit breakers have not opencd. If it is daytime thc panel lights should bc turned **OFF.** Check the landing gear indicaiors for faulty bulbs.

NOTE

Refcr to paragraph 4.39 for differences when emcrgcncy cxtension procedure is performcd for training purposcs.

11'itic landing gear docs not check down and locked, rcduce the airspeed below 87 **KIAS.** Movc thc landing gear selector switch to thc **DOWN** position. If the gear has failed to lock down on aircraft equipped with the backup gear cxtcndcr, raise the emcrgency gear levcr to the OVERRIDE ENGAGED position.

If gear has still failed to lock down, move and hold thc emcrgcncy lever down to ihe EMERGENCY **DOWN** position.

If the gcar has still failed to lock down, yaw the airplane abruptly from side to side with the rudder.

If the nose gcar will not lock down using tlic abovc proccdurc. slow tlic airplane to the lowest safe specd attainable using thc lowest power settinj required for safe Operation and raise the emcrgcncy gear lever to the OVERRIDE ENGAGED position on aircraft cquippcd with tlie backup gear extnder. Move the landing gcar selector switch to ihc gear DOWN position. If the landing gear does not check down, recycle the gcar through the UP Position and then select the "DOWN" Position.

3.29 SPIN RECOVERY

Intentional spins are prohibited in this airplanc. If a spin is inadvertently entered, immediately apply full rudder opposite to the direction of rotation. Move the control wheel full forward while neutralizing the ailcrons. Move the throttle to IDLE. When the rotation stops. ncutralize the rudder and ease back on the control wheel as required to smoothly regain a level flight attitude.

3.31 OPEN DOOR

The cabin door is double latched, so the chances of its springing open in flight at both the top and bottom are remote. Howcver, should you forget the upper latch, or not fully engage the side latch, thc door may spring partially open. This will usually happen at takeoff or soon afterward. A partially opcn door will not affect normal flight characteristics, and a normal landing ciin be made with the door open.

If both upper and side latches are open, the door will trail slightly opcn, and airspeed will be reduced slightly.

To close the door in flight, slow the airplane to 87 KIAS, closc ihc cahin vents and open the storm window. If the top latch is opcn. latch ii. If the side latch is open, pull on the arm rest while moving tlic latch handle to the latched Position. If both latches are open, close ihe side latch then thc top latch.

3.33 ENGINE ROUGHNESS

Engine roughness may be caused by dirt in the injector nozzles, induction system icing, or ignition problems.

First adjust ihe mixture for maximum smoothncss. The engine will run rough if the mixture is too rich or too lean.

Move the alternate air to OPEN and then turn "ON" the electric fuel pump.

Switch the fuel seiector to another tank to see if fuei contamination is the problem.

Check the engine gauges for abnormal readings. If any gauge readings are abnormal proceed accordingly.

The magneto switch should then be moved to "L" then "R," then back to "BOTH." If operation is satisfactory on either magneto, proceed on that magncto at reduced power with full RICH mixture to a landing at the first available airport.

If roughness persists, prepare for a precautionary landing at pilot's discretion.

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SECTION 4

NORMAL PROCEDURES

SECTION 4

NORMAL PROCEDURES

4.1 GENERAL

This section clearly descnbes the recommended procedures for the conduct of normal Operations for the Arrow IV. All of the required (FAA regulations) procedures and those necessary for the safe Operation of the airplane as determined by the Operating and design features of the airplane are presented.

Normal procedures associated with those optional systems and equipment which require handbook Supplements are provided by Section 9 (Supplements).

These procedures are provided to present a source of reference and review and to supply information on procedures which are not the same for all aircraft. Pilots should familiarize themselves with the procedures given in this section in order to become proficient in the normal operations of the airplane.

The first portion of this section consists of a short form check list which supplies an action sequence for normal Operations with little emphasis on the Operation of the systems.

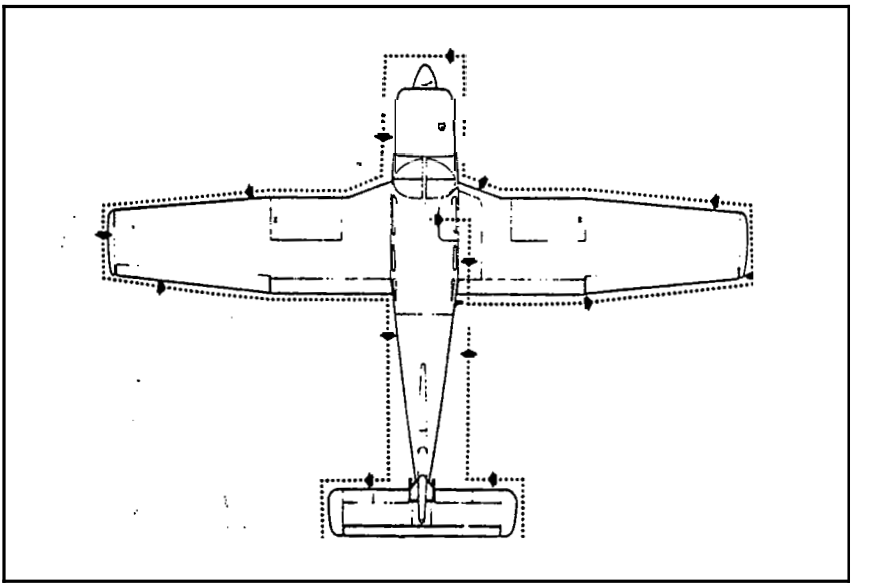
The remainder of the section is devoted to amplified normal procedures which provide detailed information and explanations of the procedures and how to perform them. This portion of the section is not intended for use as an in-flight reference due to the lengthly explanations. The short form check list should be used for this purpose.

4 3 AIRSPEEDS FOR SAFE OPERATIONS

The following airspeeds are those which are significant to the safc Operation of the airplane. These figures are for Standard airplanes flown at gross weight under Standard conditions at sea level.

Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of the engine, airplane and equipment, atmospheric conditions and piloting technique.

(a) Best Rate of Climb Speed	
gear up, flaps up	**87 KIAS**
gear down, flaps up	**76 KIAS**
(b) Best Angle of Climb Speed	
gear up, flaps up	**77 KIAS**
gear down, flaps up	**70 KIAS**
(c) Turbulent Air Operating Speed (See Subsection 2.3)	**121 KIAS**
(d) Maximum Flap Speed	**108 KIAS**
(e) Landing Final Approach Speed (Flaps **40°)**	**74 KIAS**
(f) Maximum Demonstrated Crosswind Velocity	**17 KTS**



4.5 NORMAL PROCEDURES CHECK LIST

PREFLIGHT CHECK

COCKPIT

Control wheel ..... release restraints
Parking brake ..... set
All switches ..... OFF
Mixture ..... idle cut-off
Master switch ..... ON
Fuel gauges ..... check quantity
Annunciator panel ..... check
Master switch ..... OFF
Primary flight controls. ..... proper Operation
Flaps ..... proper Operation
Trim ..... neutral
Pitot and static Systems.. ..... drain
Windows ..... .check clean

Required papers ..... check on board
Tow bar and baggage.. ..... stow properly - secure
Baggage door.. ..... close and secure

RIGHT WING

Surface condition ..... clear of ice, frost, snow
Flap and hinges.. ..... .check
Aileron and hinges ..... .check
Wing tip and lights.. ..... .check
Fuel tank ..... check supply visually - secure cap
Fuel tank vent ..... clear
Fuel tank surnp.. ..... drain
Tie down and chock .. .. remove
Main gear strut .. ..:...proper inflation (2.5 ± .25 in.)
Tire ..... .check
Brake block and disc ....check
Fresh air inlet ..... clear

NOSE SECTION

General condition ....check
Cowling ..... secure
Windshield ..... clean
Propeller and spinner.. ..... .check
AU inlets ..... clear
Alternator belt ..... check tension
Chock .. .. remove
Nose gear strut ..... .proper inflation (2.75 ± .25 in.)
Nose wheel tire ..... .check
Engine baffle seals ..... .check
Oil ..... check quantity
Dipstick ..... properly seated
Fuel strainer ..... drain

LEFT WING

Surface condition ..... clear of ice, frost, snow
Fresh air inlet ..... clear

Chock ..... remove
Main gear strut ..... proper inflation (2.5 ± .25 in.)
Tire ..... check
Brake block and disc ..... check
Fuel tank ..... check supply visually - secure cap
Fuel tank vent.. ..... clear
Fuel tank sump.. ..... drain
Tie down ..... remove
Pitot/static head ..... remove cover - holes clear
Wing tip and lights.. ..... check
Aileron and hinges ..... check
Flap and hinges.. ..... check

FUSELAGE

Antennas ..... check
Empennage ..... clear of ice, frost, snow
Fresh air inlet ..... clear
Stabilator and trim tab ..... check
Tie down ..... remove
Master switch ..... ON
Cockpit lighting ..... check
Nav and strobe lights.. ..... check
Stall warning ..... check
Pitot heat ..... check
All switches ..... OFF
Passengers ..... board
Cabin door.. ..... close and secure
Seat belts and hamess ..... fasten check inertia reel

BEFORE STARTING ENGINE

Brakes ..... set
Propeller.. ..... full INCREASE rpm
Fuel selector ..... desired tank
Alternate air ..... OFF

STARTMC ENGINE WHEN COLD

Throttie ..... 1/2" open
Master switch ..... ON
Electric fuel pump ..... ON
Mixture ..... prime then idle cut-off
Starter ..... engage
Mixture ..... full RICH
Throttle ..... adjust
Oil pressure ..... check

STARTING ENGINE WHEN HOT

Throttle ..... 1/2" open
Master switch ..... ON
Electnc fuel pump ..... ON
Mixture ..... idlc cut-off
Starter ..... engage
Mixture ..... advance
Throttle ..... adjust
Oil pressure ..... check

STARTINC ENGINE WHEN FLOODED

Throttle ..... open full
Master switch ..... ON
Electric fuel pump ..... OFF
Mixture ..... idle cut-off
Starter ..... engage
Mixture ..... advance
Throttle ..... retard
Oil pressure ..... check

STARTING WITH EXTERNAL POWER SOURCE

Master switch ..... **OFF**
All electrical equipment ..... **OFF**
Terminals ..... connect
Extcmal power plug ..... insert in fuselage

Proceed with normal start
Throttle ..... lowest possible RPM
Extemal power plug ..... disconnect from fuselage
Master switch ..... ON - check ammeter
Oil pressure ..... .check

WARM-UP

Throttie ..... 1400 to 1500 RPM

TAXIING

Chocks ..... removed
Taxi area .....clear
Throttle ..... apply slowly
Prop ..... high RPM
Brakes.. ..... .check
Steenng ..... check

GROUND CHECK

Propeller. ..... full **INCREASE**
Throttle ..... 2000 RPM
Magnetos .....max. drop 175 **RPM** -
max. diff. 50 RPM
Vacuum ..... 4.8" **Hg.** to **5.1" Hg.**
Oil temperature ..... .check
Oil pressure ..... .check

Air conditioner ..... check
Annunciator panel ..... press-to-test
Propeller. ..... exercise then full INCREASE
Alternate air ..... check
Engine is warm for takeoff when throttle can be opened without engine falterning.
Electric fuel pump ..... **OFF**
Fuel pressure ..... check
Throttle ..... retard

BEFORE TAKEOFF

Master switch ..... ON
Fiight instruments ..... check
Fuel selector ..... proper tank
Electric fuel pump ..... **ON**
Engine gauges ..... check
Altemate air ..... CLOSED
Seat backs ..... erect
Mixture ..... set
Prop ..... set
Belts/harness ..... fastened
Empty seats ..... seat belts snugly fastened
Flaps.. ..... set
Trim tab.. ..... set
Controls ..... free
Doors ..... latched
Air conditioner ..... **OFF**

TAKEOFF

NORMAL

Flaps ..... set
Tab ..... set
Accelerate to **65** to **75** KIAS.
Control wheel ..... back pressure to rotate to climb attitude

SHORT FIELD. OBSTACLE CLEARANCE

Flaps.. ..... 25" (second notch)
Accelerate to 50 to 60 KlAS depending on aircraft weight.
Control wheel ..... back pressure to rotate to climb attitude
After breaking ground. accelerate to 55 to 65 KlAS depending on aircraft weight.
Gear (OVERRIDE ENGAGED on aircraft equipped with backup gear extender) ..... UP
Accelerate to best flaps up angle of climb speed - 77 KIAS, slowlyretract the flaps and climb past the obstacle.
Accelerate to best flaps up rate of climb speed - 87 KIAS.

SOFT FIELD

Flaps.. ..... 25" (second notch)
Accelerate to 50 to 60 KlAS depending on aircraft weight.
Control wheel ..... back pressure to rotate to climb attitude
After breaking ground, accelerate to 55 to 65 KlAS depending on aircraft weight.
Gear (OVERRIDE ENGAGED on aircraft equipped with backup gear extender) ..... UP
Accelerate to best flaps up rate of climb speed 87 KIAS.
Flaps.. ..... retract slowly

CLIMB

Best rate (2750 Ib.) (gear up)
(flaps up) ..... .87 KlAS
Best rate (2750 Ib.) (gear down)
(flaps up) ..... .76 KlAS
Best angle (2750 Ib.) (gear up)
(flaps up) ..... .77 KlAS
Best angle (2750 lb.) (gear down) (flaps up). .....70 KlAS
En route ..... 104 KlAS
Electric fuel pump ..... OFF at desired altitude

CRUISING

Reference Performance charts, Avco-Lycoming Operator's Manual an-' power setting table.

Normal rnax power	75%
Power	set per power table
Mixture	adjust

APPROACH AND LANDINC

Fuel selector	proper tank
Seat backs	erect
Belts/harness	fasten
Electric fuel pump	ON
Mixture	set
Propeller..	set
Gear	.down - 130 KlAS max
Flaps	set - 108 KlAS max
Air conditioner	OFF

Trirn to **75** KlAS

STOPPING ENGINE

Flaps..	retract
Electric fuel pump	OFF
Air conditioner	OFF
Radios	OFF
Propeller..	full INCREASE
Throttle	full af
Mixture	idle cut-ofi
Magnetos.	OFF
Master switch	OFF

PARKINC

Parking brake	set
Control wheel	secured with belt
Flaps..	full up
Wheel chocks..	in place
Tie downs..	secure

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4.7 AMPLIFIED NORMAL PROCEDURES (GENERAL)

The following paragraphs are provided to supply detailed information and explanations of the normal procedures necessary for the safe Operation of the airplane.

4.9 PREFLIGHT CHECK

The airplane should be given a thorough prefiight and walk-around check. The preflight should include a check of the airplane's operational atus, computation of weight and C.G. limits, takeoff and landing distances, and in-flight Performance. A weather briefing should be obtained for the intended flight path, and any other factors relating to a safe flight should be checked before takeoff.

CAUTION

The flap Position should be noted befon boarding the airplane. The flaps must be placed in the UP Position' before they will lock and support weight on the step.

COCKPIT

Upon entering the cockpit, release the seat belts secunng the control wheel and set the parking brake. Insure that all electrical switches and the magneto switch are OFF and the mixture is in idle cutsff. Turn ON the master switch, check the fuel quantity gauges for adequate supply and check that the annunciator panel illuminates. Turn OFF the master switch. Check the primary flight controls and flaps for proper Operation and set the trim to neutral. Open the pitot and static drains to remove any moisture that has)umulated in the lines. Check the windows for cleanliness and that the required papers are on board. Properly stow the tow bar and baggage and secure. Close and secure the baggage door.

RIGHT WING

Begin the walk-around at the trailing edge of the right wing by checking that the wing surface and control surfaces are clear of ice, frost, snow or other extraneous substances. Check the flap, aileron and hinges for damage and operational interference. Static wicks should be firmly attached and in good condition. Check the wing tip and lights for damage.

Open the fuel cap and visually check the fuel color and the quantity should match the indication that was on the fuel quantity gauge, replace cap securely. The fuel tank vent should be clear of obstructions.

Drain the fuel tank through the quick drain located at the lower inboard rear corner of the tank, making sure that enough fuel has been drained to insure that all water and Sediment is removed. The fuel system should be drained daily pnor to the first flight and after each refueling.

CAUTION

When draining any amount of fuel, care should be taken to insure that no fire hazard exists before starting engine.

Remove the tie down and chock.

Next, a complete check of the landing gear. Check the gear strut for proper infiation, there should be 2.5 ± .25 inches of strut exposure under a normal static load. Check the tire for cuts, wear, and proper inflation. Make a visual check of the brake block and disc.

Check that the fresh air inlet is clear of foreign matter.

NOSE SECTION:

Check the generai condition of the nose section, look for oil or fluid leakage and that the cowling is secure. Check the windshield and clean if necessary. The propeller and spinner should be checked for detrimental nicks, Cracks, or other defects. The air inlets should be clear of obstructions and check the alternator belt for proper tension. The landing light should be clean and intact.

Remove the chock and check the nose gear strut for proper inflation; there should be 2.75 ± .25 inches of strut exposure under a normal static load. Check thc tire for cuts, wear, and proper inflation. Check the engine baffle seals. Check the oil level, make sure that the dipstick has been properly seated.

Open the fuel strainer located on the left sidc of the firewall longenough to remove any accumulation of water and Sediment.

LEFT WING

The wing surface should be clear of ice, frost, snow, or other extraneous substances. Check that the fresh air inlet is clear of foreign matter and rcmove the chock. Check the main gear strut for proper inflation, there should be 2.5 ± .25 inches of strut exposure under a normal static load. Check the tirc and the brake block and disc.

Open the fuel cap and visually check the fuel color. The quantity should match the indication that was on the fuel quantity gauge. Replace cap securely. The fuel tank vent should be clear of obstructions. Drain enough fuel to insure that all water and sediment has been removed.

Remove tie down and remove the cover from the pitot/static head on the underside of the wing. Make sure the holes are open and clear of obstructions. Check the wing tip and lights for damage. Check the aileron, flap, and hinges for damage and operational interference and that the static wicks are firmly attached and in good condition.

FUSELAGE

Check the condition and security of the antennas. The empennage should be clear of ice, frost, snow, or other extraneous substances and the fresh air inlet at the top of the fin should be clear of foreign matter. Check the stabilator and trim tab for damage and operational interference, the tnm tab should move in the same direction as stabilator. Remove the tie down.

Upon returning to the cockpit, an operational check of the intenor lights, exterior lights, stall warning system, and pitot heat should now be made. Turn the master switch and the appropriate switches ON. Check the panel lighting and the overhead flood light. Visually confirm that exterior lights are operational. Lift the stall detector on the leading edge of the left wing and detcrmine that the waming hom is activated. With the pitot heat switch ON the pitot head will be hot to the touch. After these checks are complete the master switch and all electrical switches should be tumed OFF.

Board the passengers and close and secure the cabin door. Fasten the seat belts and shoulder harness and check the function of the inertia reel by pulling sharply on the strap. Fasten seat belts on empty seats.

4.11 BEFORE STARTING ENGINE

Before starting the engine the brakes should be set ON and the propeller lever moved to the full INCREASE rpm Position. The fuel selector should then be moved to the desired tank.

4.13 STARTINC ENGINE

(a) Starting Engine When Cold

Open the throttle lever approximateiy 1/2 inch. Turn ON the master switch and the electric fuel pump. Move the mixture control to full RICH until an indication is noted on the fuel flow meter. The engine is now pnmed.

Move the mixture control to idle cutsff and engage the Starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture control to full RICH and move the throttle to the desired Setting.

If the engine does not fire within five to ten seconds, disengage the starter and repnme.

(b) Starting Engine When Hot

. Open the throttle approximately 1/2 inch. Turn ON the master switch and the electric fuel pump. Move the mixture control lever to idle cutsff and engage the Starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture and move the throttle to the desired Setting.

(c) Starting Engine When Flooded

The throttle lever should be full OPEN. Turn ON the master switch and turn OFF the emergency fuel pump. Move the mixture control lever to idle cut-off and engage the Starter by rotating the magneto switch clockwise. When the engine fires, release the magneto switch, advance the mixture and retard the throttle.

(d) Starting Engine With External Power Source

An optional feature called the Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the airplane's battery.

Turn the master switch OFF and turn all electncal equipment OFF. Connect the RED lead of the PEP kit jumper cable to the POSITIVE (+) terminal of an external 12-volt battery and the **BLACK** lead to the NEGATIVE (-) terminal. Insert the plug of the jumper cable into the socket located on the fuselage. Note that when the plug is inserted, the electrical system is ON. Proceed with the normal starting technique. .

After the engine has started, reduce power to the lowest possible RPM, to reduce sparking, and disconnect the jumper cable from the aircraft. Turn the master switch ON and check the alternator ammeter for an indication of output. DO NOT ATTEMPT FLIGHT **IF THERE** IS NO INDICATION OF ALTERNATOR OUTPUT.

NOTE

For all normal Operations using the PEP jumper cables, the master switch should be **OFF,** but it is possible **to** use the ship's battery in parallel by turning the master switch ON. This will give longer cranking capabilities, but will not incrcase the amperage.

CAUTION

Care should be exercised because if thc ship's battery has becn depleted, the extemal power supply can be reduced to the level of the ship's battery. This can be tested by turning the master switch ON momentanly while the Starter is engaged. If cranking speed increases, the ship's battery is at **a** higher level than the external power supply.

When the engine is firing evenly, advance the throttlc to 800 **RPM.** If oil pressure is not indicated within thirty seconds, stop the engine and determine

the trouble. In cold weather it will take a few seconds longer to get an oil pressure indication. If the engine has failed to start, refer to the Lycoming Operating Handbook, Engine Troubles and Their Rernedies.

Starter manufactures recomrnend that cranking periods be limited to thirty seconds with a two minute rest between cranking periods. Longer cranking periods will shorten the life of the starter.

4.15 WARM-UP

Warm-up the engine at 1400 to 1500 RPM. Avoid prolonged idling at low RPM. as this practice may result in fouled spark plugs.

Takeoff rnay be rnade as soon as the ground check is completed, provided that the throttle rnay be opened without backfiring or skipping, and without a reduction in engine oil pressure.

Do not operate theengineat high RPM when runninguportaxiingover ground containing loose stones. gravel or any loose material that rnay cause darnage to the propeller blades.

4.17 TAXIINC

Before attempting to taxi the airplane. ground personnel should be instructed and approved by a qualified person authorized by the owner. Ascertain that the propeller back blast and taxi areas are clear.

Power should be applied slowly to Start the taxi roll. Taxi a few feet forward and apply the brakes to determine their effectiveness. Taxi with the propeller set in low pitch. high RPM setting. While taxiing. make slight turns to ascertain the effectiveness of the steering.

Observe wing clearances when taxiing near buildings or other stationary objects. If possible. station an observer outside the airplane.

Avoid holes and ruts when taxiing over uneven ground.

Do not operate theengineat high RPM when running up ortaxiingover ground containing loose stones. gravel or any loose material that may cause damage to the propeller blades.

4.19 GROUND CHECK

The magnetos should bechecked at 2000 RPM with the propeller set at high RPM. Drop off on either magneto should not exceed 175 RPM and the difference between the magnetos should not exceed 50 RPM. Operation on one magneto should not exceed 10 seconds.

Check the vacuum gauge: the indicator should read between 4.8 and 5.1 inches Hg at 2000 RPM.

Check the annunciator panel lights with the press-to-test button. Also 'ieck the air conditioner and the alternate air.

The propeller control should be moved through its complete range to check for proper Operation, and then placed in full "INCREASE" rpm for takeoff. To obtain maximum rpm. push the pedestal mounted control fully forward on the instrument panel. Do not allow a drop of more than 500 RPM during this check. In cold weather the propeller control should be cycled from high to low RPM at least three times before takeoff to make sure that warm engine oil has circulated.

The electric fuel pump should be turned "OFF" after starting or during warm-up to make sure that the engine driven pump is Operating. Prior to takeoff the electric pump should be turned ON again to prevent loss of power during takeoff should the engine driven pump fail. Check both oil temperature and oil pressure. The temperature may be low for some time if the engine is being run for the first time of the day. The engine is warm enough for takeoff when the throttle can be opened without the engine faltering.

4.21 BEFORE TAKEOFF

All aspects of each particular takeoff should be considered prior to executing the takeoff procedure.

After takeoff on aircraft equipped with the backup gear extender. if the gear selector switch is placed in the gear up Position before reaching the airspeed at which the system no longer commands gear down*, the gear will not retract. For obstacle clearance on takeoff and for takeoffs from high altitude airports. the landing gear can be retracted after lift-off at the pilot's discretion by placing the gear selector switch in the "UP" position and then locking the emergency gear

*Approximately 75 KIAS at sea level to approximately 88 KIAS at 10.000 ft. with a straight line variation between.

lever in the "OVERRIDE ENGAGED" position. If dcsired. the "OVERRIDE ENGAGED" position can bc selected and lockcd before takeoff. and the gear will then retract as soon as the gear selector switch is placed in the "UP" position. Care should always be taken not to retract the gear prematurely. or the aircraft could settle back onto the runway. If the override lock is used for takeoff. it should be disengaged as soon as sufficient airspeed and terrain clearance are obtained, to return the gear system to normal Operation. For normal Operation. the pilot should extend and retract the gear with the gear selector switch located on the instrurnent panel. just as he would if the back-up gear extender system were not installed.

After all aspects of the takeoff are considered. a pretakeoff check procedure must be perforrned.

Turn "ON" the master switch and check and set all of the flight instruments as required. Check the fuel selector to make sure it is on the proper tank (fullest). Turn "ON" the electric fuel pump. Check the engine gauges. The alternate air should be in the "CLOSED" position.

All seat backs should bc erect.

The rnixture and propeller control levers should be set and the seat belts and shoulder harness fastcned. Fasten thc seat belts snuglyaround theempty seats.

Exercise and set the flaps and trim tab. lnsure proper flight control movement and response.

All doors should be properly secured and latched.

On air conditioned models. the air conditioner rnust be "OFF" to insure normal takeoff performance.

4.23 TAKEOFF

The normal takeoff techniquc is conventional for thc Arrow IV. The tab should be set slightly aft of neutral. with the exact setting deterrnined by the loading of the airplane. Allow the airplane to accelerate to 65 to 75 KIAS dcpcnding on the weight of the aircraft and ease back on the control wheel to rotate to climb attitude.

Thc procedurc used for a short field takeoff with an obstacle clearance or a soft field takeoff differs slightly from the normal tcchnique. The flaps

should be lowered to 25° (second notch). Allow the aircraft to accelerate to 50 to 60 KIAS depending on the aircraft weight'and rotate the aircraft to climb attitude. After breaking ground. accelerate to 55 to 65 KIAS, depending on aircraft weight and select gear up*. Continue to climb while accelerating to the flaps-up rate of climb speed. 87 KIAS if no obstacle is present or 77 KIAS if obstacle clearance is a consideration. Slowly retract the flaps while climbing out.

4.25 CLIMB

On climb-out after takeoff. it is recommended that the best angle of climb speed (77 KIAS) be rnaintained only if obstacle clearance is a consideration. The best rate of climb speed (87 KIAS) should be maintained with full power on the engines until adequate terrain clearance is obtained. At lighter than gross weight these speeds are reduced somewhat**. An en route clirnb speed of 104 KIAS or higher is also rccommended. This increased clirnb speed provides better engine cooling, less engine wear. reduced fuel consumption. lower cabin noise level, and better forward visibility.

When reaching the desired altitude. the electric fuel pump rnay be turned OFF.

NOTE

On aircraft equipped with the backup gear extender. during climbs at best angle of climb speed at any altitude and best rate of climb speed above approximately 9000 ft. density altitude. it may be necessary to select "OVERRIDE ENGAGED" to prevent thc landing gear from extending automatically during the climb. This altitude decrcascs with reduced climb power and increases with increased climb airspeed.

*If desired. on aircraft equipped with thc backup gear extender, the override engaged position can be selected and locked before takeoff, and thc gear will then retract assoon as the gear selector switch is placed in the up position. In this case care should be taken not to retract the gear prematurely, or thc aircraft could settle back onto thc runway. If thc override lock is iiscd lor takeoff. it should be disengagcd as soon as sufficient terrain clearance is obtained.' to return the gear system to normal operation.

**To obtain the Performance prcscntcd in the Performance Section of this handbook. full power (full throttle and 2700 RPM) must be used.

4.27 CRUISING

The cruising speed of the Arrow IV is determined by many factors, including power Setting, altitude, temperature, loading and equipment installed in the airplane.

The normal maximum cruising power is 75% of the rated horsepower of the engine. When selecting cruising RPM below 2400, limiting manifold pressure for continuous Operation, as specified by the appropriate "Avco-Lycoming Operator's Manual," should be observed.

To obtain the desired power, set the manifold pressure and RPM according to the power Setting table in this manual.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising Operation when 75% power or less is being used. If any doubt exists as to the amount of power beingused, the mixtureshould bc in the full "RICH" Position for ail Operations.

To iean the mixture, disengage the lock and pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich thc mixture by pushing the control towards the instrument panel until engine Operation becomes smooth. The fuel flow meter will give a close approximation of the fuel being consumed. The low side of thc power Setting, as shown on the fuel flow meter, indicates best economy for that percent of power while the high sidc indicates bcst power.

If the airplane is equipped with the optional exhaust gas temperaturc (EGT) gauge, a more accurate means of leaning is available to the pilot. For this procedure, refer to the "Avco-Lycoming Operator's Manual."

Following level-off for cruise, thc airplane should be trimmed.

The pilot should monitor weather conditions while flying and should be alert to conditions which might lead to icing. If induction system icing is expected, place the alternate air control in the "ON" Position.

Dunng flight, keep account of time and fuel used in connection with power settings to determine how the fuel flow and fuel quantity gauging systems are Operating. If the fuel flow indication is considerably higher than the fuel actually being consumed, a fuel nozzle may be clogged and require cleaning.

There are no mechanical uplocks in the landing gear system. In the event of a hydraulic system malfunction, the landing gear will free-fall to the gear down Position. The true airspeed with gear down is approximately 75% of the gear retracted airspeed for any given power setting. Allowances for the reduction in airspeed and range should be made when planning extended flight between remote airfields or flight over water.

In order to keep the airplane in best lateral trim dunng cruise flight, the fuel should be used alternately from each tank at one hour intervals.

Always remember that the electric fuel pump should be turned "ON" before switching tanks, and should be left on for a short period thereafter. To preclude making a hasty selection, and to provide continuity of flow, the selector should be changed to another tank before fuel is exhausted from the tank in use. The electric fuel pump should be normally 'OFF so that any malfunction of the engine driven fuel pump is immediately apparent. If signs of fuel starvation should occur at any time dunng flight, fuel exhaustion shouid be suspected, at which time the fuel selector should be immediately positioned to a fuli tank and the electric fuel pump switched to the "ON" Position.

4.29 APPROACH AND LANDING

Check to insure the fuel selector is on the proper (fullest) tank and that the seat backs are erect. The seat belts and shoulder harness should be fastened and the inertia reel checked.

Turn 'ON" the electnc fuel pump. The mixture should be set in the full "RICH" Position. Set the propeller at full "INCREASE" rpm to facilitate ample power for an emergency go-around.

ihe landing gear may be extended at speeds below 130 KIAS. The airplane should be trimmed to a final approach speed of about 75 KIAS with flaps extended. The flaps can be lowered at speeds up to 108 KIAS, if desired. Turn "OFF the air conditioner.

The mixture control should bc kept in full "RICH" Position to insure maximum acceleration if it should be necessary to open the throttle again.

The amount of flap used during landings and the Speed of the aircraft at contact with the runway should be vaned according to the landing surface and conditions of wind and airplane loading. It is generally good practice to contact the ground at the minimum possible safe Speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired.airspeed and approach flight path. Mixture should be full "RICH," fuel on the fullest tank, and the electric fuel pump "ON." Reduce the Speed during the flareout and contact the ground close to the stalling Speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, gently lower the nose and apply the brakes. Braking is most effective when flaps are raised and back pressure is applied to the control wheel, putting most of the aircraft weight on the main wheels. In high wind conditions, particuiarly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

431 STOPPING ENGINE

At the pilot's discretion, the flaps should be raised.

NOTE

- The flaps must be placed in the "UP" Position for the flap step to support weight. Passengers should be cautioned accordingly.

The electric fuel pump, air conditioner and radios should be turned "OFF," the propeiler set in the full "INCREASE" Position, and the engine stopped by disengaging the mixture control lock and pulling the mixture control back to idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. Then the magneto and master switches must be turned "OFF."

433 PARKING

If necessary, the airplane should be moved on the ground with the aid of the nose wheel tow bar provided with each airplane and secured behind the rear seats. The aileron and stabilator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The flaps are locked when in the "UP" Position and should be left retracted.

Tie downs can be secured to rings provided under each wing and to the tail skid. The rudder is held in Position by its Connections to the nose wheel steering and normally does not have to be secured.

4.35 STALLS

The stall characteristics of the Arrow IV are conventional. An approaching stall is indicated by a Stall warning horn which is activated between five and ten knots above Stall Speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The gross weight stalling Speed of the **Arrow IV** with power off and full flaps is **53** KIAS. With the flaps up this Speed is increased **6 KTS. Loss** of altitude during stalls can be **as** great **as** 400 feet, depending on configuration and power.

NOTE

The Stall warning system is inoperative with the master switch **"OFF."**

During preflight, tht stall waming system should be checked by turning the master switch "ON," lifting the detcctor and checking to determine if the hom is actuated. The master switch should be rcturned to the "OFF" Position after the check is complete.

437 TURBULENT AIR OPERATION

In keeping with good Operating practice used in all aircraft, it is recommended that when turbulent air is encountered or expected, thc airspeed be **reduced** to maneuvering Speed to reduce the structural loads caused by gusts and to allow for inadvertent specd build-ups which may occur as a result of the turbulence or of distractions caused by the conditions.

4.39 LANDING CEAR

Some aircraft are equipped with an airspeed - power sensing system (backup gear extender) which extends the landing gear under low airspeed - power conditions* even though the pilot rnay not have selected gear down. This system will also prevent retraction of the landing gear by normal means when the airspeed - power values are below a predetermined minimum. To override this system or to hold the ernergency gear lever in the "OVERRIDE ENGAGED" Position without maintaining manual pressure on the ernergency gear lever. pull the lever full up and push the lock pin in. To release the override, pull lever up and then release.

For normal Operation. the pilot should extend and retract the gear with the gear selector switch located on the instrument panel, just as he would if the back-up gear extender system were not installed.

The pilot should become familiar with the function and significance of the landing gear Position indicators and warning lights.

The red gear warning light on the instrument panel and the horn operate simultaneously in flight when the throttle is reduced to where the manifold pressure is approxirnately 14 inches of rnercury or below, and the gear selector switch is not in the "DOWN" position. Onaircraft equipped with the backup gear extender this warning will also occur during flight when the back-up extender systern has lowered the landing gear and the gear selector switch is not in the "DOWN" position and the manifold pressure is reduced below approximately 14 inches of rnercury. The red gear warning light on the instrument panel and the horn will also operate simultaneously on the ground when the master switch is "ON" and the gear selector switch is in the "UP" Position and the throttle is in the retarded Position.

The three green lights on the instrument panel operate individually as each associated gear is locked in the extended Position.

*Approximately 95 KIAS at any altitude. power off.

WARNING

Panel lights' dimrner switch must be off to obtain gear lights full intensity during daytirne flying. When aircraft is operated at night and panel lights' dimmer switch is turned on, gear lights will autornatically dim.

On aircraft equipped with the backup bear extender the yellow "Auto Ext. **OFF**" light immediately below the gear selector switch flashes whenever the emergency gear lever is in the "OVERRIDE ENGAGED" Position.

When the Emergency Landing Gear Extension Procedure (Paragraph **3.27)** is performed for training purposes. the following changes must be made to the procedure to prevent the hydraulic pump from activatingduring the procedure. On aircraft equipped with the backup gear extender the landing gear selector must be left in the UP Position until all gear Position indicators are green. On aircraft which do not have the backup gear extender a **pull** type LANDING GEAR PUMP circuit breaker is installed and must be pulled prior to executing the emergency extension procedure to allow normal gear system Operation.

4.41 WEIGHT AND BALANCE

It is the responsibility of the owner and pilot to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight.

For weight and balance data. refer to Section 6 (Weight and Balance).

TABLEOFCONTENTS

SECTION 5

PERFORMANCE

SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to the Arrow IV is provided by this section.

Performance information associated with those optional systems and equipment which require handbook Supplements is provided by Section 9 (Supplements).

5 3 INTRODUCTION - PERFORMANCE AND FLIGHT PLANNING

The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various Parameters of weight, altitude, temperature, etc.

Thc performance Charts are unfactored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft. This performance, however, can be duplicated by following the stated procedurcs in a properly maintained airplane.

Effects of conditions not considered on the Charts must be evaluated by j pilot, such as the effect of soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance. Endurance can be grossly affected by improper leaning procedures, and inflight fuel flow and quantity checks are recommended.

REMEMBER! To get chart performance, follow the chart procedures.

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the performance Charts in this scction. Each chart includes its own example to show how it is used.

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5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning our flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this handbook.

The basic empty weight for the airplane as delivered from the factory has been entered in Figure 6-5. If any alterations to the airplane have been made effecting weight and baiance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current basic empty weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11) and the C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity Position.

After proper utilization of the information provided we have found the following weights for consideration in our flight planning example.

The landing weight cannot be determined until the weight of the fuel to be used has been established [refer to item (g)(1)].

(1)	Basic Empty Weight	1890 lbs
(2)	Occupants (2 x 170 lbs.)	340 lbs.
(3)	Baggage and Cargo	70 lbs.
(4)	Fuel (6 lb./gal. x 50)	300 lbs.
(5)	Takeoff Weight	2600 lbs.
(6)	Landing Weight (a)(5) minus (g)(1), (2600 lbs. minus 62 lbs.)	2538 lbs.

Our takeoff weight is below the maximum of 2750 lbs., and our weight and balance calculations have determined our C.G. Position within the approved limits.

(b) Takeoff and Landing

Now that we have determined our aircraft loading, we must consider all aspects of our takeoff and landing.

All of the existing conditions at the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance and Takeoff Ground Roll graph (Figures 5-5, 5-7, 5-9 and 5-11) to determine the length of runway necessary for the takeoff and/or the bamer distance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.

The conditions and calculations for our example fiight are listed below. The takeoff and landing distances required for our example flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Aititude	1900 ft.	1900 ft.
(2) Temperature	20°C	20°C
(3) Wind Component (Headwind)	4 KTS	2 KTS
(4) Runway Length Available	3000 ft.	4600 ft.
(5) Runway Required	2250 ft.*	1490 ft.**

NOTE

The remainder of the performancc charts used in this flight planning example assume a no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and desccnt performancc.

*reference Figure 5-9
**reference Figure 5-35

(c) Climb

The next step in our flight plan is to determine the necessary climb Segment components.

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Fuel, Time and Distance to Climb graph (Figure **5-17).** After the fuel, timeand distance for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to the graph (Figure **5-17).** Now. subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

The remaining values are the true fuel. time and distance components for the climb Segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in our flight planning example.

(1)	Cruise Pressure Altitude	6000 ft.
(2)	Cruise **OAT**	**3°C**
(3)	Time to Climb (9.2 min. minus 2.8 min.)	6.4 min.*
(4)	Distance to Climb **(15** naut. miles minus **4** naut. miles)	11 naut. miles*
(5)	Fuel to Climb (2 gal. minus 0.5 gal.)	**1.5** gal.*

(d) Descent

The descent data will be determined prior to the cruise data to provide the descent distance for establishing the total cruise distance.

Utilizing the cruise pressure altitude and OAT we determine the basic fuel, time and distance for descent (Figure **5-31).** These figures must be adjusted for the field pressure altitude and temperature at the destination airport. **To** find the necessary adjustment values. use the existing pressure altitude and temperature conditions at the destination airport as variables **to** find the fuel, time and distance

*reference Figure **5-17**

values from the graph (Figure **5-31).** Now, subtract the values obtained from the **field** conditions from the values obtained from the cruise conditions to find the true fuel, time and distance values needed for the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of our example are shown below.

(1) Time to Descend
(6 min. minus 2 min.) . 4 **min.***

(2) Distance to Descend
(15.7 naut. miles minus
4.8 naut. miles) 10.9 naut. miles*

(3) Fuel to Descend
(1.5 gal. minus **0.5** gal.) 1.0 gal.*

(e) Cruise

Using the total distance to be traveled during the fiight. subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the Power Setting Table (Figure **5-19)** when selecting the cruise power Setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the appropriate Speed Power graph (Figure 5-21 or **5-23).**

Calculate the cruise fuel flow for the cruise power Setting(65% Power Best Economy for this example) from the information provided by the Best Economy Range chart (Figure **5-27).**

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel flow by the cruise time.

The cruise calculations established for the cruise Segment of our flight planning example are as follows:

(1) Total Distance 130 naut. miles

(2) Cruise Distance
(e)(1) minus (c)(4) minus (d)(2),
(130 naut. miles minus 11 naut. miles minus 10.9 naut. miles) 108.1 naut. miles

*reference Figure **5-3**1

(3) Cruise Power (Best Economy)	65% rated power
(4) Cruise Speed	126 KTS TAS*
(5) Cruise Fuel Consumption	9.2 GPH*
(6) Cruise Time	
(e)(2) divided by (e)(4), (108 naut. miles divided by 126 KTS)	.86 hrs. (52 min.)
(7) Cruise Fuel	
(e)(5) multiplied by (e)(6), (9.2 GPH mulitiplied by .86 hrs.)	7.9 gal.

(f) Total Flight Time

The total flight time is determined by adding the time to climb. the time to descend and the cruise time. Remember! The timevalues taken from the climb and descent graphs are in minutes and must be converted to hours before adding them to the cruise time.

The following flight time is required for our flight planning example.

(1) Total Flight Time

(c)(3) plus (d)(1) plus (e)(6).

(.i l hrs. plus .07 hrs. plus .86 hrs.)

(6.4 min. plus 4 min. plus 52 min.) 1.04 hrs. 62.4 min.

(g) Total Fuel Required

Determine the total fuel required by adding the fuel to climb. the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined. multiply this value by 6 lb./gal. to determine the total fuel weight used for the flight.

The total fuel calculations for our example flight plan are shown below.

(1) Total Fuel Required

(c)(5) plus (d)(3) plus (e)(7).

(1.5 gal. plus 1.0 gal. plus 7.9 gal.)	10.4 gal.
(10.4 gal. multiplied by 6 lb./gal.)	62 lbs.

*reference Figure 5-23

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5.7 PERFORMANCE CRAPHS

LIST OF FIGURES

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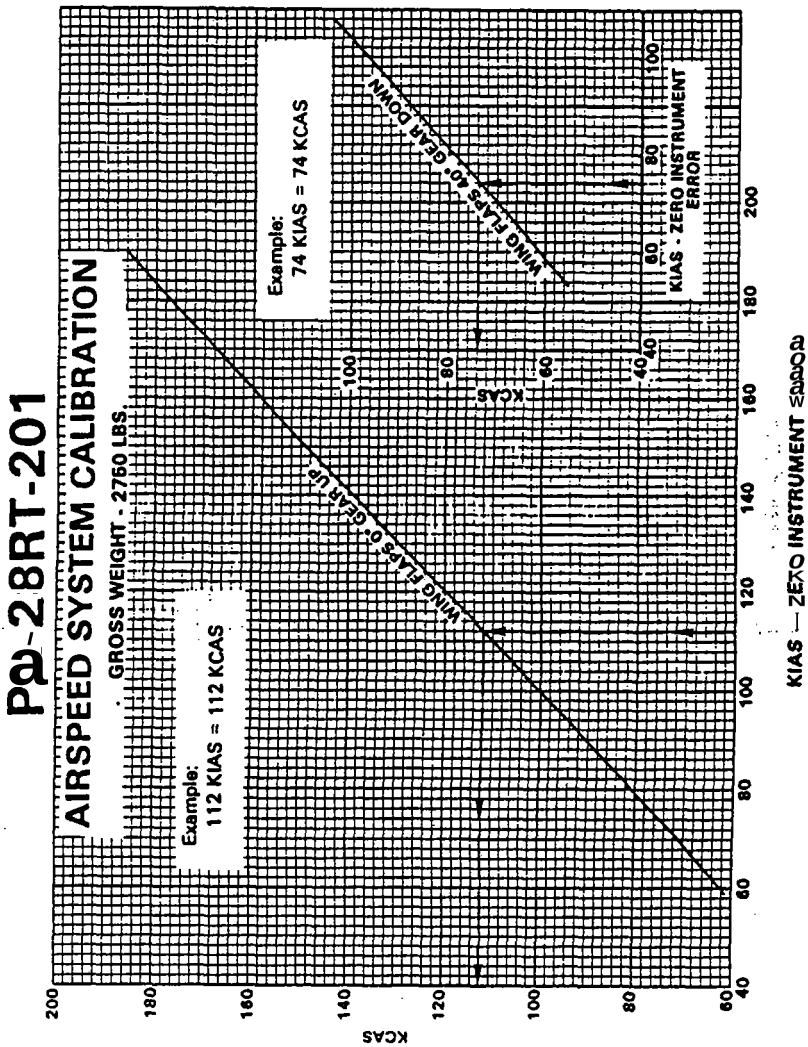
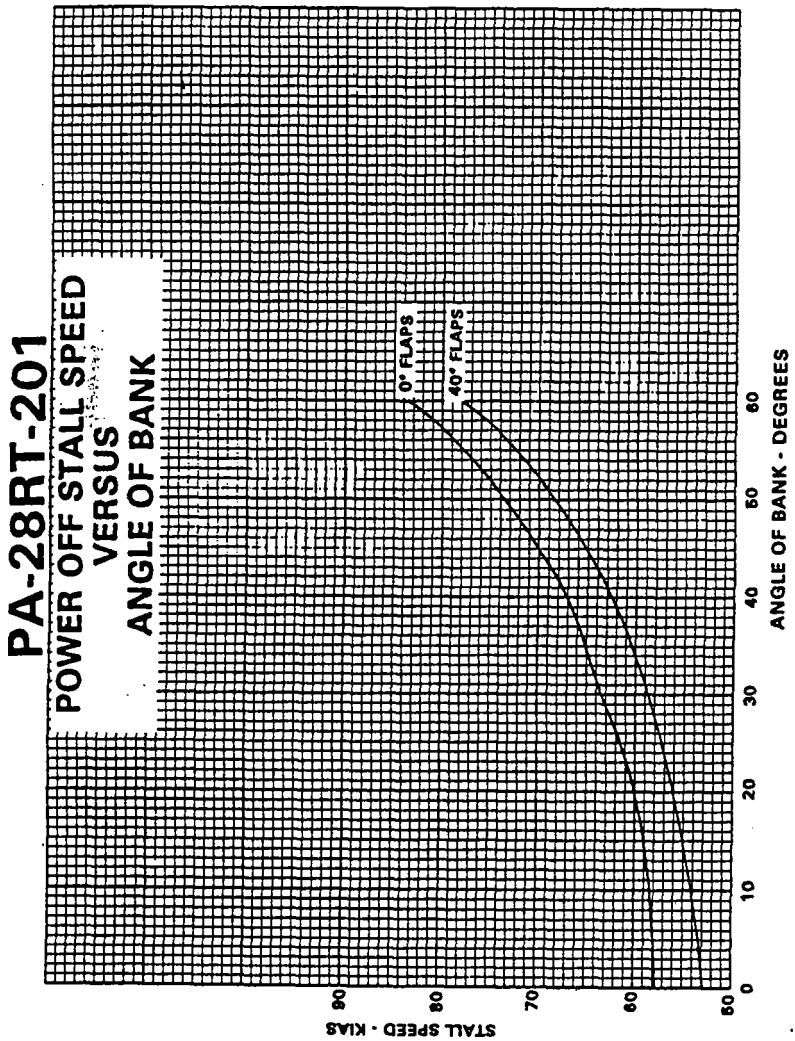
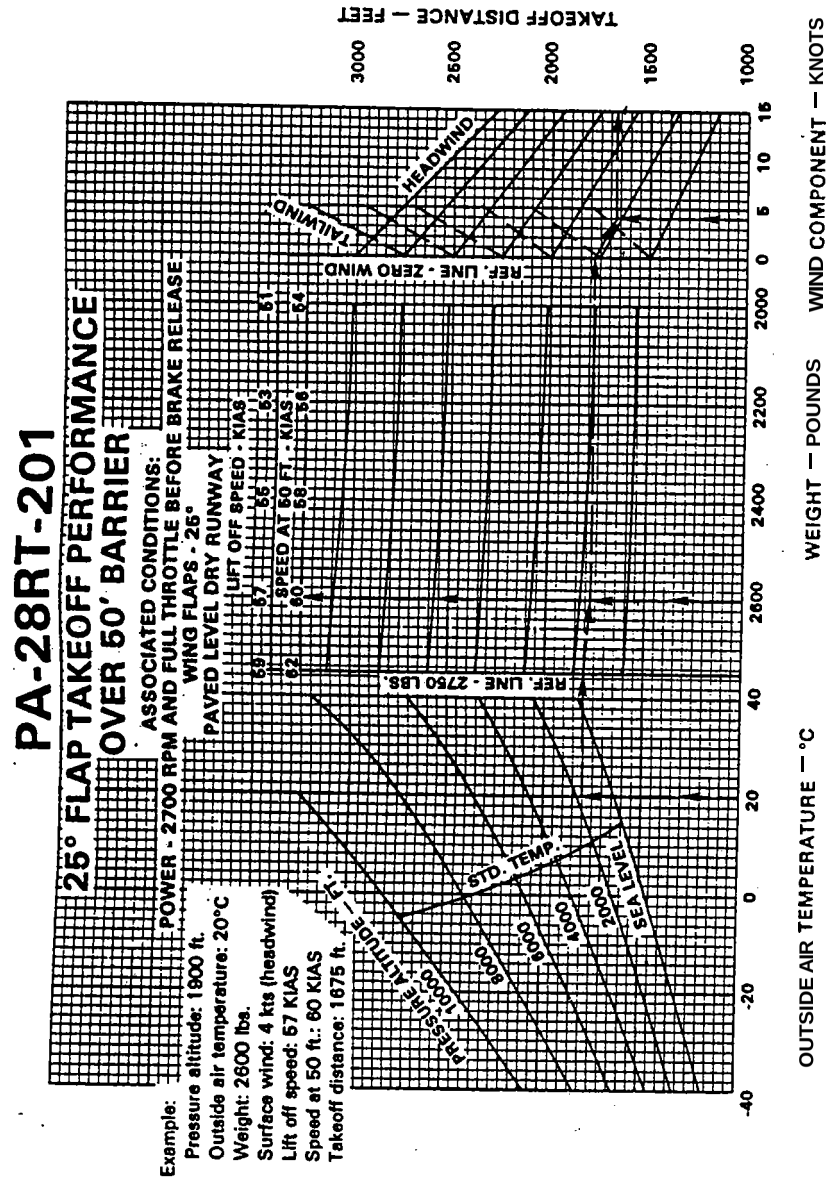


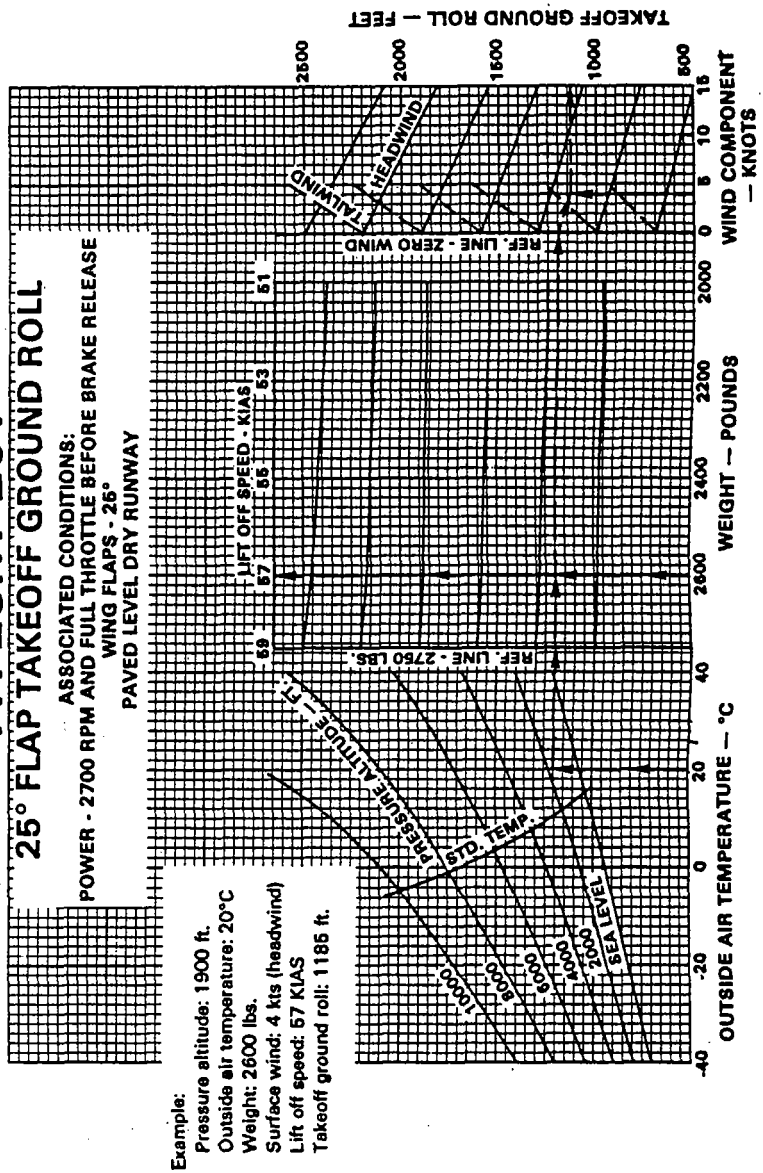
AIRSPEED SYSTEM CALIBRATION
Figure 5-1



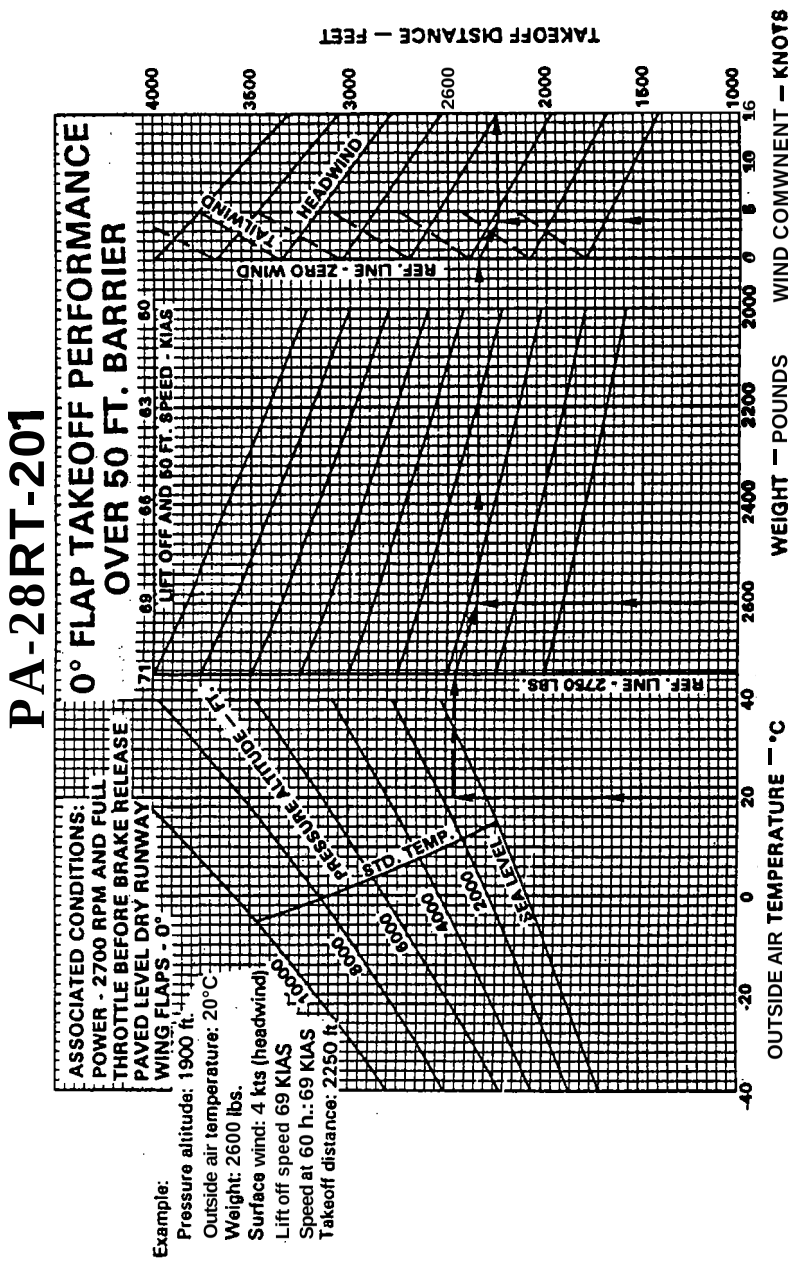
POWER OFF STALL SPEED VS. ANGLE OF BANK
Figure 5-3



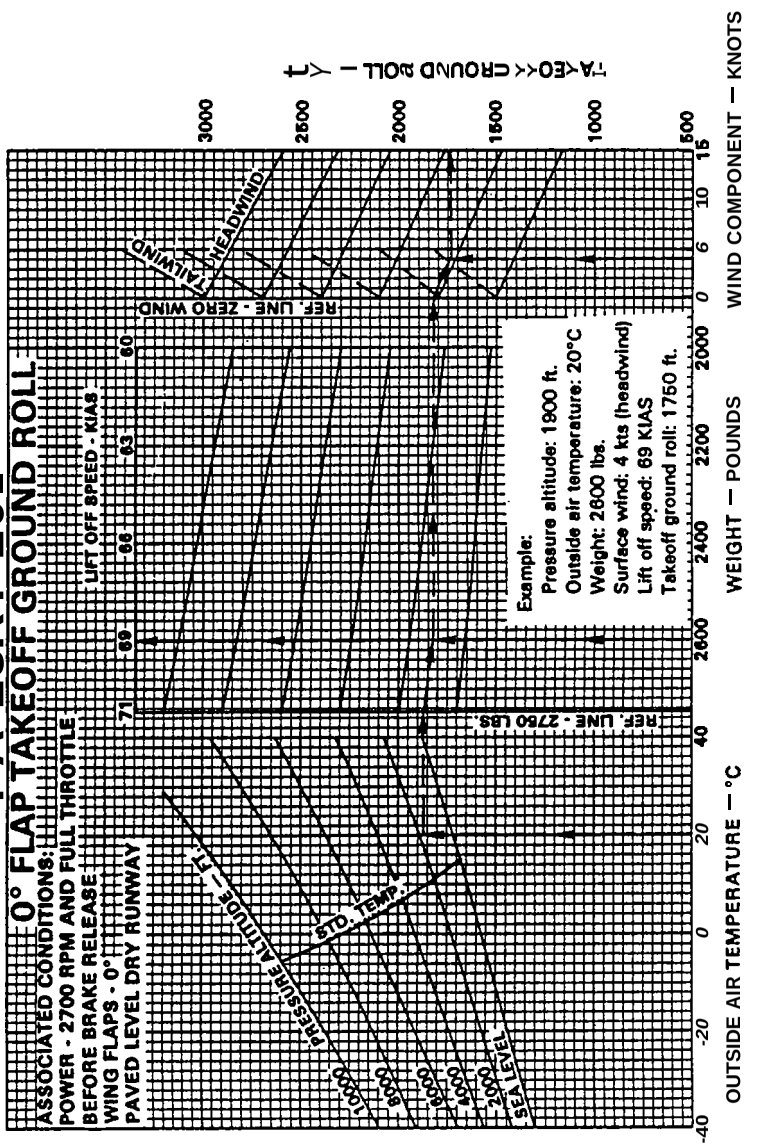
25° FLAP TAKEOFF PERFORMANCE
Figure 5-5



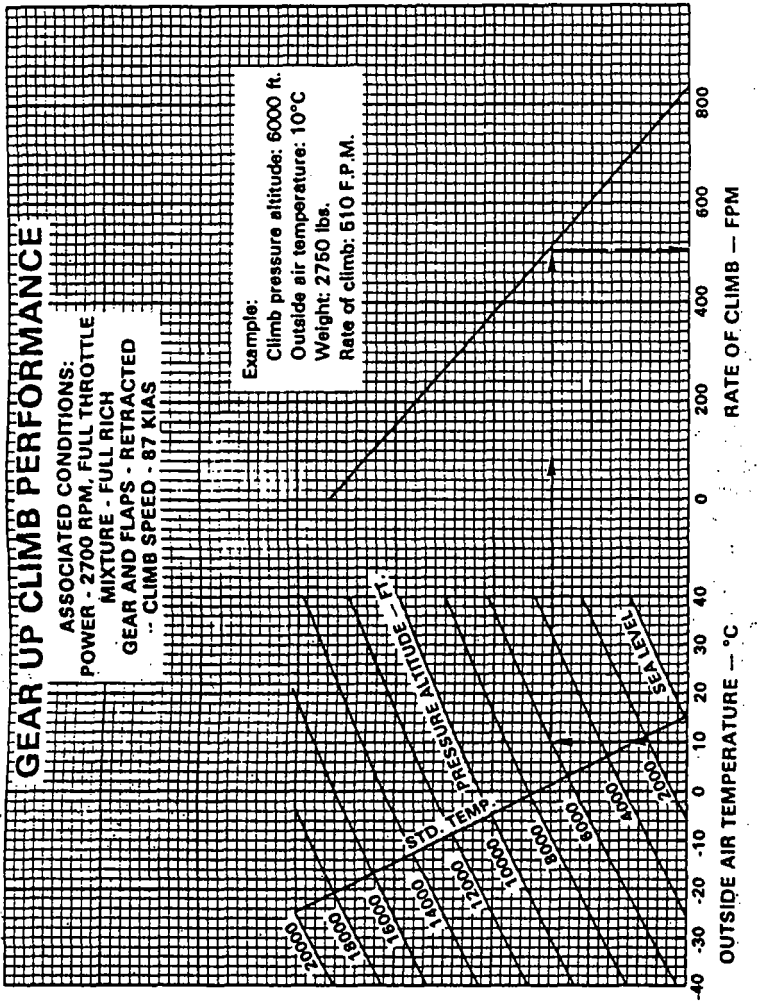
25° FLAP TAKEOFF GROUND ROLL
Figure 5-7



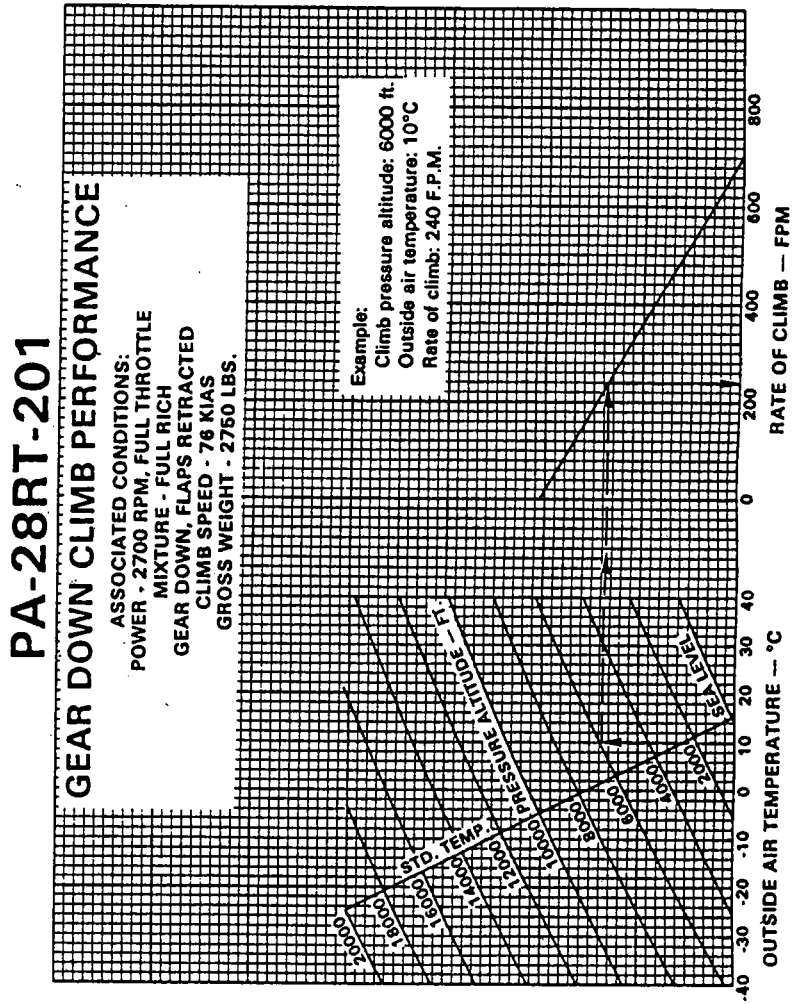
0° FLAP TAKEOFF PERFORMANCE
Figure 5-9



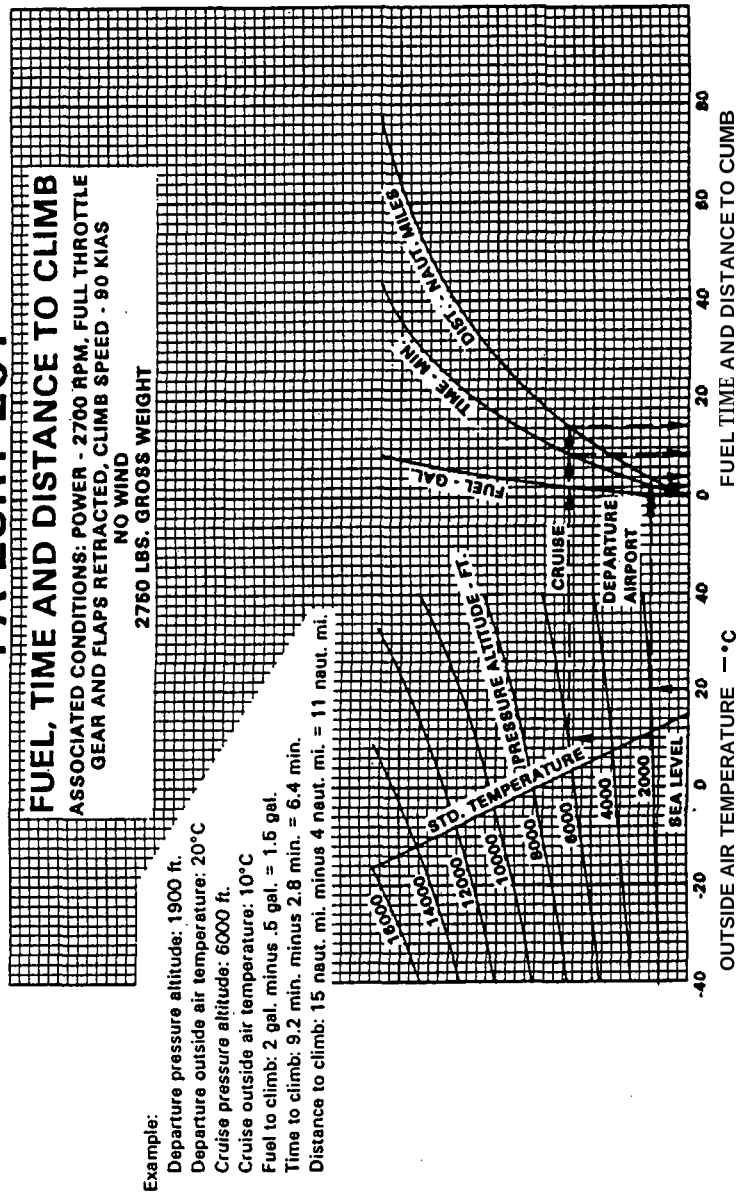
0° FLAP TAKEOFF GROUND ROLL
Figure 5-11



GEAR UP CLIMB PERFORMANCE
Figure 5-13



GEAR DOWN CLIMB PERFORMANCE
Figure 5-15



FUEL, TIME AND DISTANCE TO CLIMB
Figure 5-17

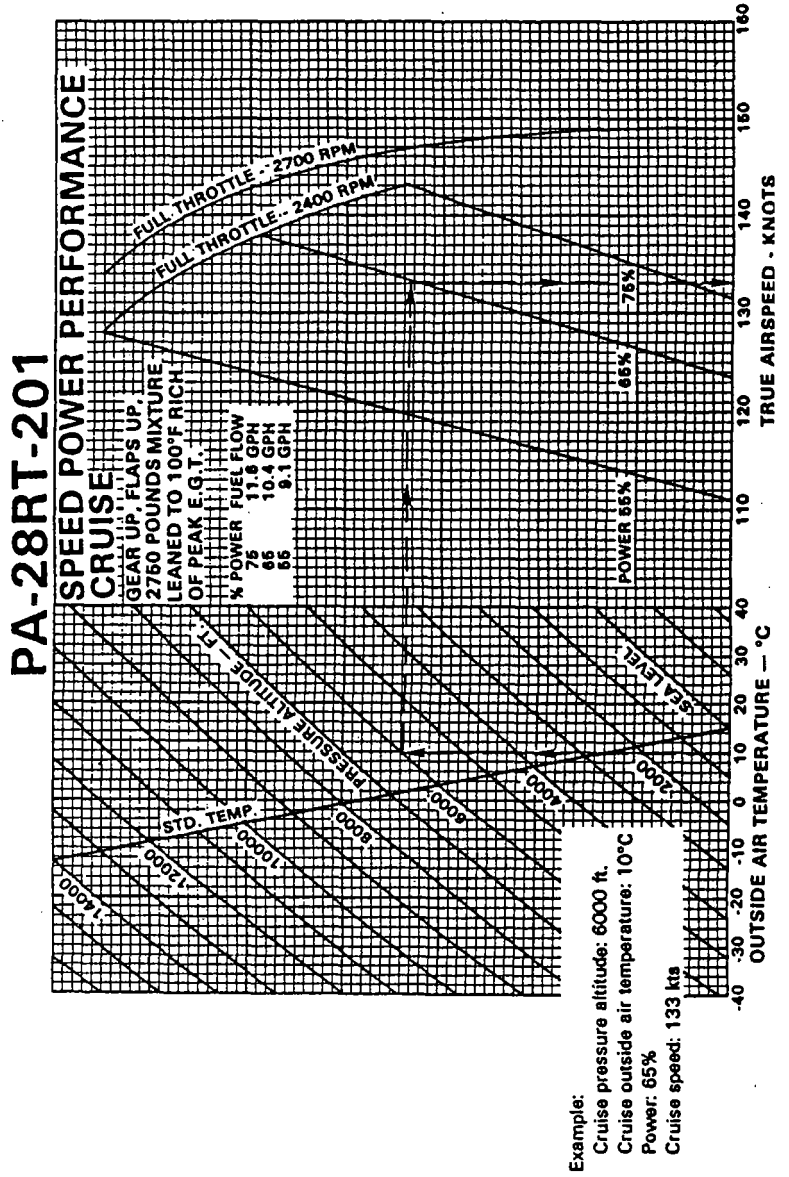
Power Setting Table - Lycoming Model IO-360-C Series, HP Engine

Press. Alt. Feet	Std. Alt. Tcmp. °F	110 HP - 55% Rated RPM AND MAN. PRESS. 2100	2400	130 HP - 65% Rated RPM AND MAN. PRESS. 2100	2400	150 HP - 75% Rated RPM AND MAN. PRESS. 2400	Press. Alt. Feet
S.L.	59	22.9	20.4	25.9	229	25.5	S.L.
1000	55	22.7	20.2	25.6	22.7	25.2	1000
2000	52	22.4	20.0	25.4	22.5	25.0	2000
3000	48	22.2	19.8	25.1	22.2	24.7	3000
4000	45	21.9	19.5	24.8	220	24.4	4000
5000	41	21.7	19.3	FT	21.7	FT	5000
6000	38	21.4	19.1	- -	21.5	- -	6000
7000	34	21.2	18.9	- -	21.3	- -	7000
8000	31	21.0	18.7	- -	21.0		8000
9000	27	FT	18.5	- -	FT		9000
10000	23	- -	18.3				10000
11000	19	- -	18.1				11000
12000	16	- -	17.8				12000
13000	12	- -	17.6				13000
14000	9	- -	FT				14000

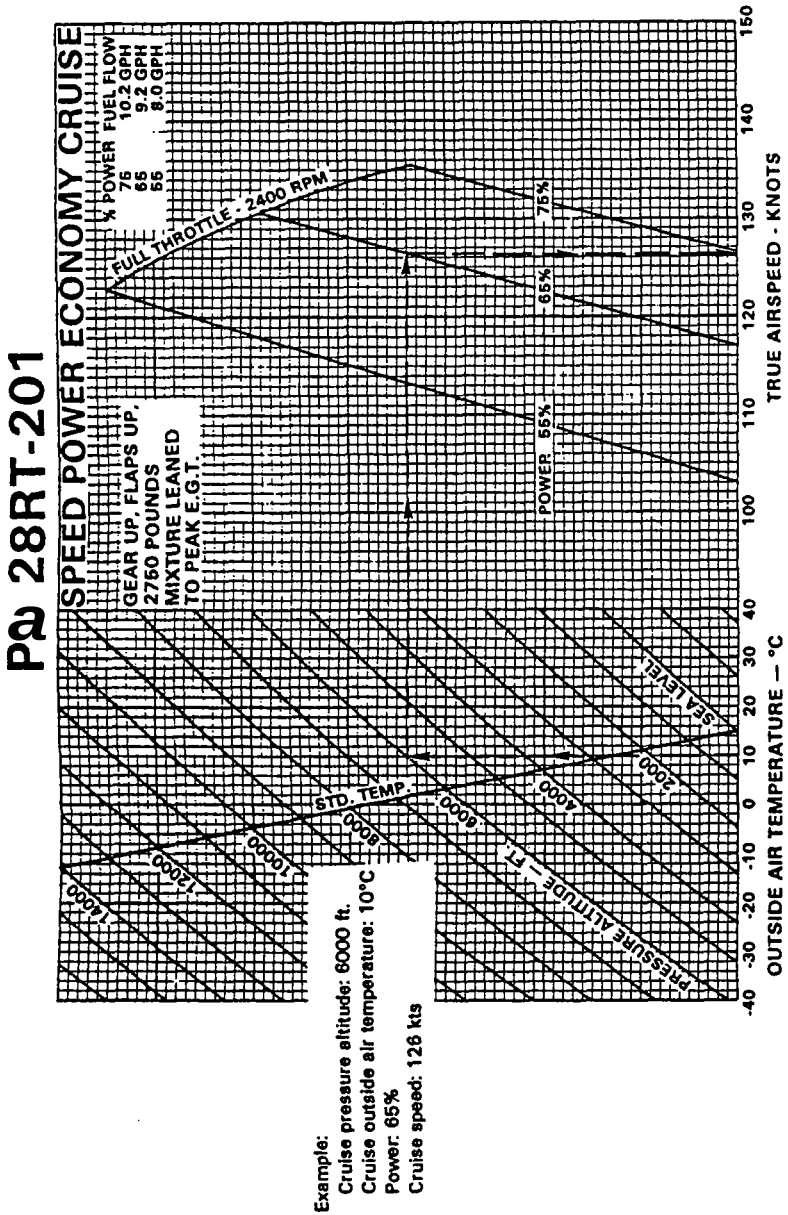
POWER SETTING TABLE
Figure 5-19

To maintain constant power, correct manifold pressure approximately 0.16" Hg for each 10°F Variation in inlet air temperature from atandard altitude temperature. Add manifold pressure for air tcmperstures abovc Standard; subtract for tempcraturcs below standard.

Full throttle manifold prcssurc values may not be obtainablc when atmospheric conditions are non-Standard.

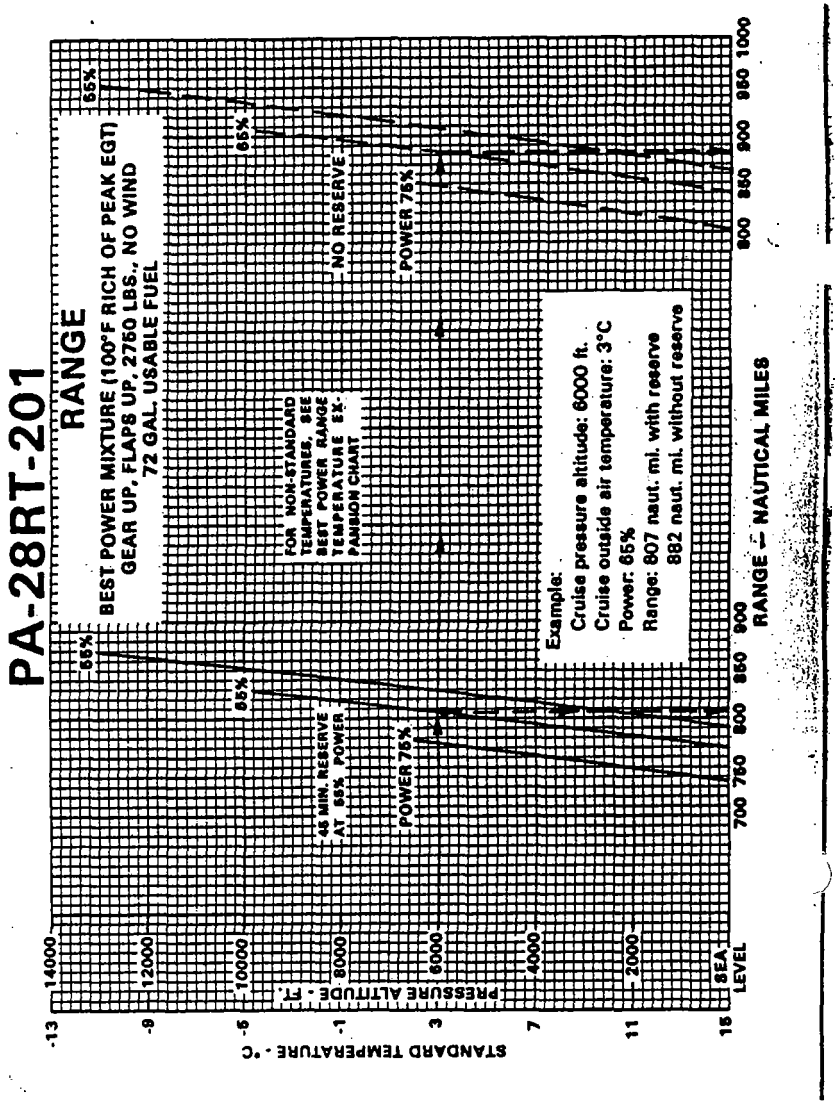


SPEED POWER - PERFORMANCE CRUISE
Figure 5-21

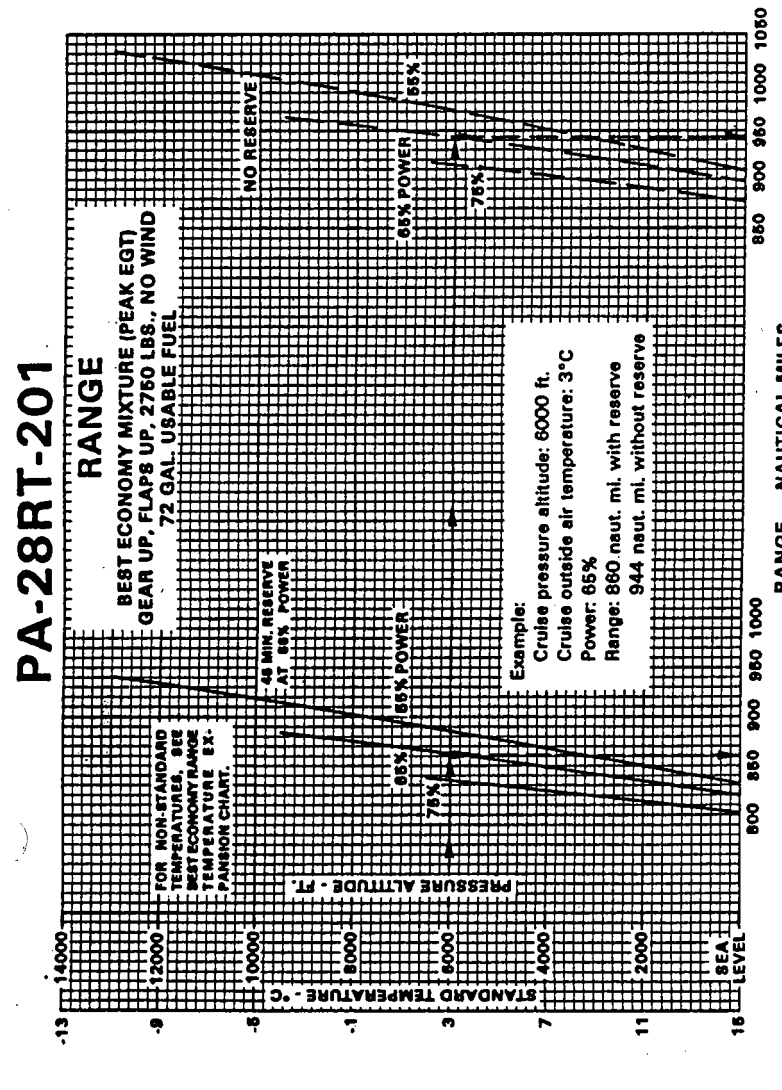


SPEED POWER - ECONOMY CRUISE
Figure 5-23

Pressure Altitude Feet	Outside Air Temp. °C	45 Min. Reserve % Power			No Reserve % Power		
		75	65	55	75	65	55
0	-15	699	737	754	764	805	824
2000	-19	712	748	766	778	818	838
4000	-23	725	759	778	793	83i	852
6000	-27	737	771	790	807	844	865
8000	-31	—	782	802	—	857	879
10000	-35	—	793	814	—	869	892
12000	-39	—	—	825	—	—	905
14000	43	—	—	836	—	—	918
0	0	717	754	772	783	824	844
2000	-4	730	765	785	798	837	858
4000	-8	743	777	797	813	850	872
6000	-12	756	789	809	827	863	886
8000	-16	—	800	821	—	876	900
10000	-20	—	811	833	—	889	913
12000	-24	—	—	844	—	—	926
14000	-28	—	—	855	—	—	939
0	30	749	785	805	819	858	880
2000	26	763	797	818	834	871	894
4000	22	776	809	831	849	885	909
6000	18	790	821	843	864	898	923
8000	14	—	832	855	—	912	937
10000	10	—	844	867	—	925	950
12000	6	—	—	878	—	—	963
14000	2	—	—	887	—	—	974
0	45	764	799	820	835	873	896
2000	41	778	811	833	850	887	911
4000	37	791	823	846	866	901	925
6000	33	805	835	858	881	914	940
8000	29	—	847	871	—	928	954
10000	25	—	858	882	—	940	967
12000	21	—	—	892	—	—	978
14000	17	—	—	898	—	—	987



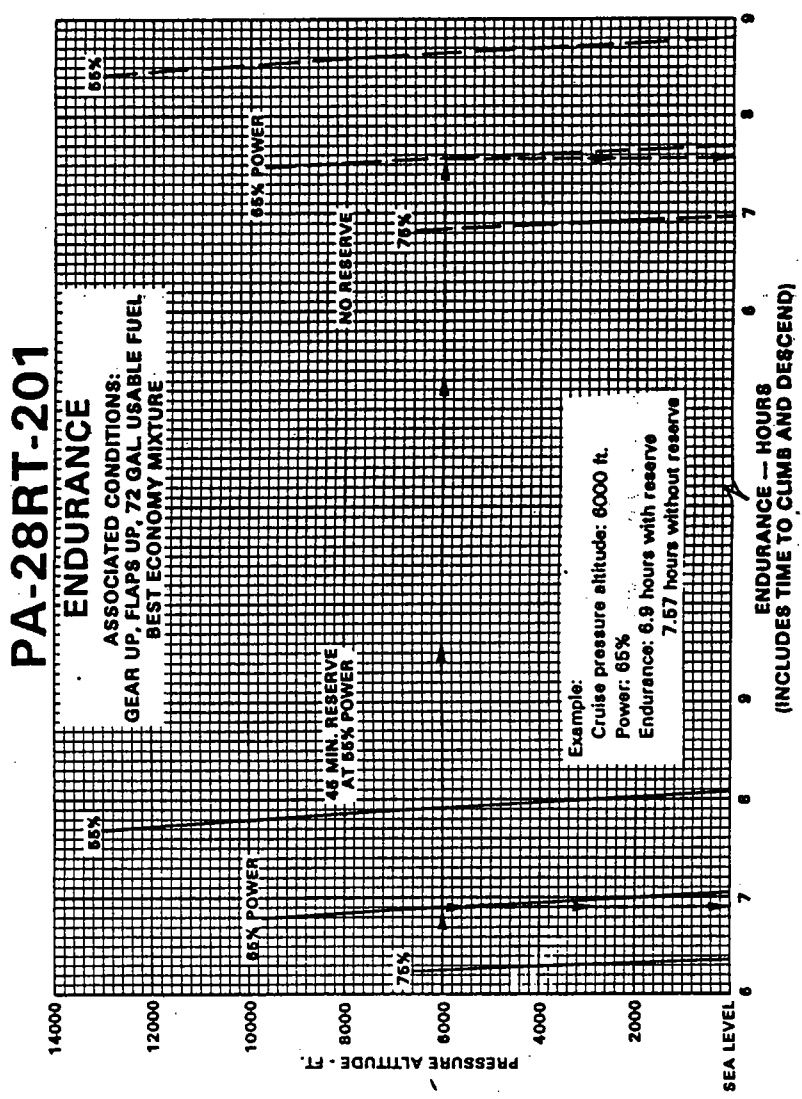
RANGE - BEST POWER MIXTURE
Figure 5-25



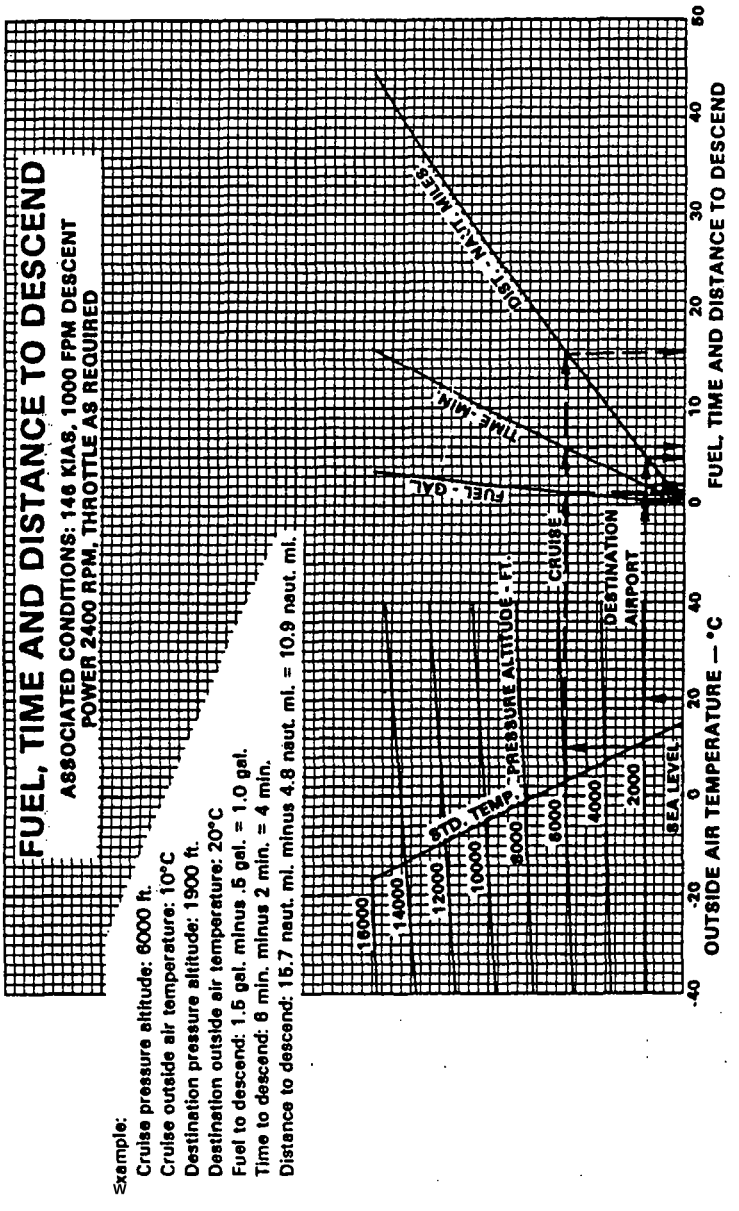
RANGE - BEST ECONOMY MIXTURE
Figure 5-27

Pressure Altitude Feet	Outside Air Temp. °C	45 Min. Reserve % Power			No Reserve % Power		
		75	65	55	75	65	55
0	-15	770	784	784	841	857	857
2000	-19	780	797	802	853	871	877
4000	-23	791	809	819	865	886	897
6000	-27	801	822	837	877	900	916
8000	-31	—	834	854	—	914	935
10000	-35	—	846	870	—	928	954
12000	-39	—	—	886	—	—	972
14000	-43	—	—	901	—	—	990
0	0	787	803	808	860	878	883
2000	-4	797	816	827	872	893	904
4000	-8	808	829	844	884	907	924
6000	-12	818	842	862	896	922	943
8000	-16	—	854	878	—	936	963
10000	-20	—	866	895	—	950	981
12000	-24	—	—	911	—	—	999
14000	-28	—	—	925	—	—	1017
0	30	817	838	853	893	916	932
2000	26	828	852	871	905	931	953
4000	22	839	865	889	918	946	973
6000	18	850	877	906	930	961	992
8000	14	—	890	923	—	975	1011
10000	10	—	902	939	—	988	1029
12000	6	—	—	953	—	—	1046
14000	2	—	—	965	—	—	1060
0	45	831	854	873	908	933	954
2000	41	842	868	891	920	949	975
4000	37	853	881	909	933	963	995
6000	33	864	893	926	946	978	1014
8000	29	—	906	943	—	992	1033
10000	25	—	917	958	—	1005	1050
12000	21	—	—	970	—	—	1065
14000	17	—	—	977	—	—	1074

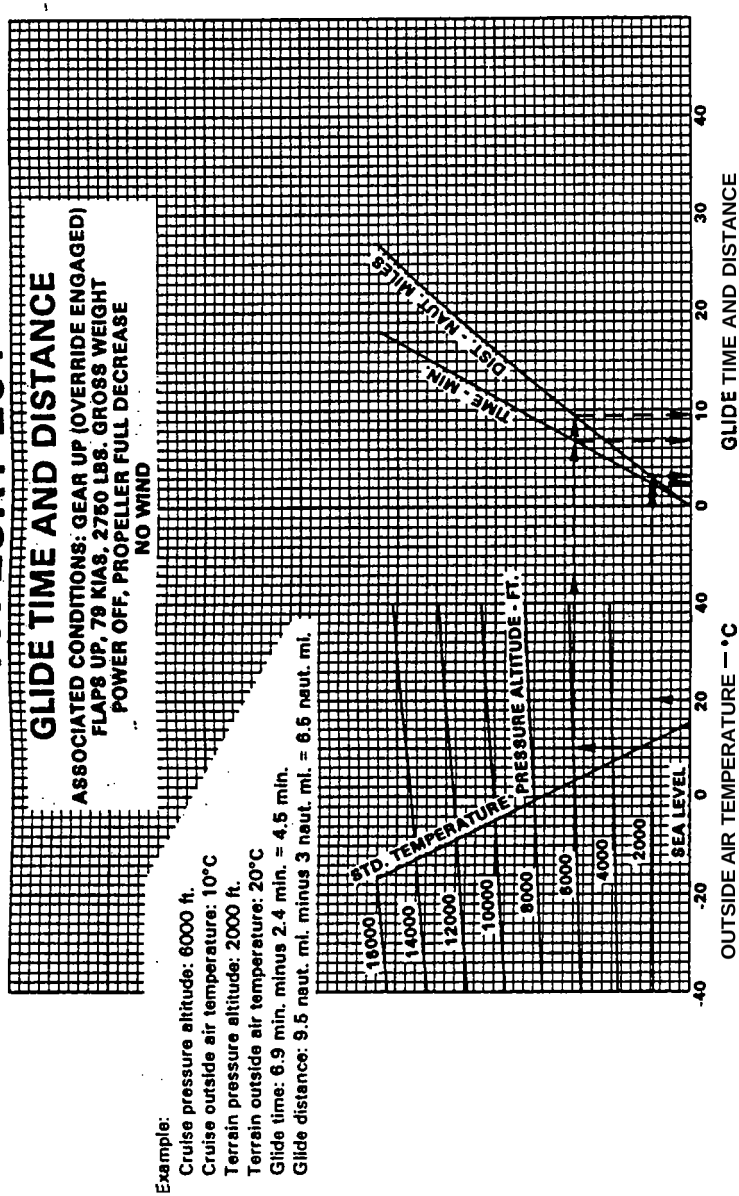
BEST ECONOMY RANGE
TEMPERATURE EXPANSION CHART
Figure **5-28**



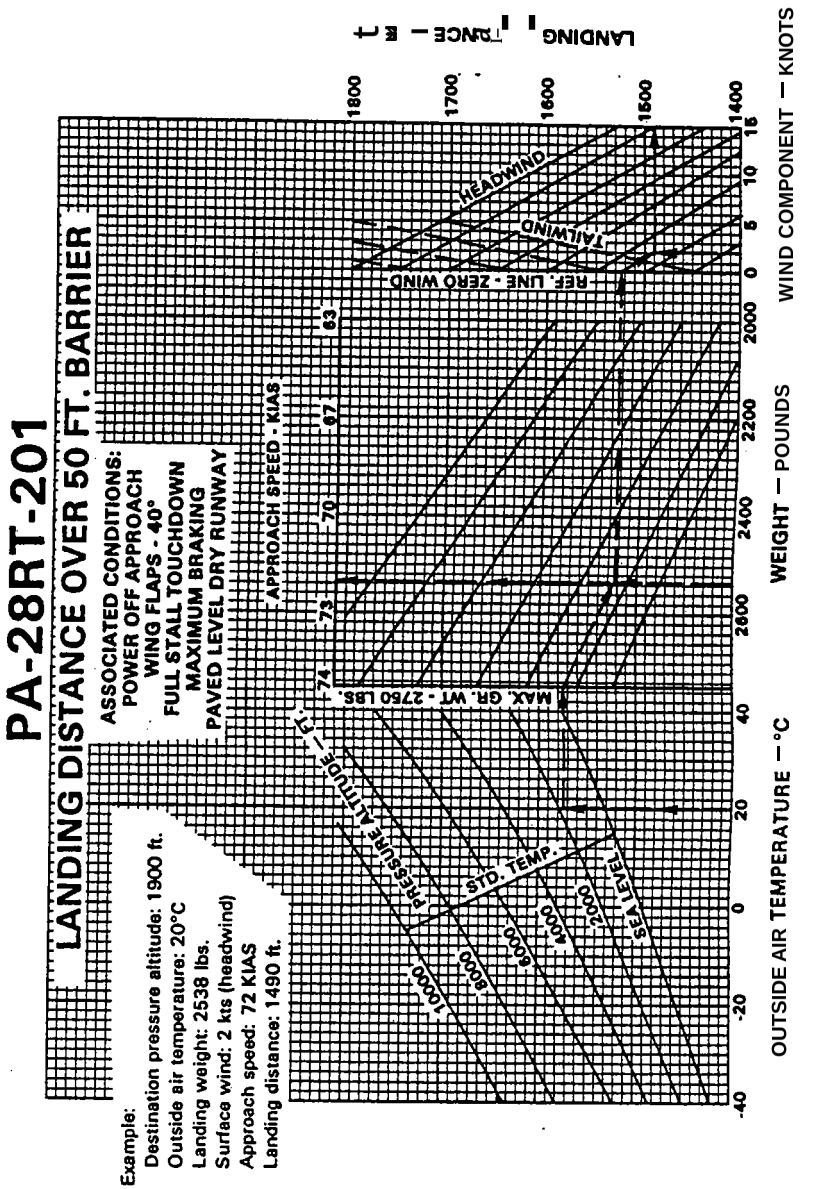
ENDURANCE
Figure 5-29



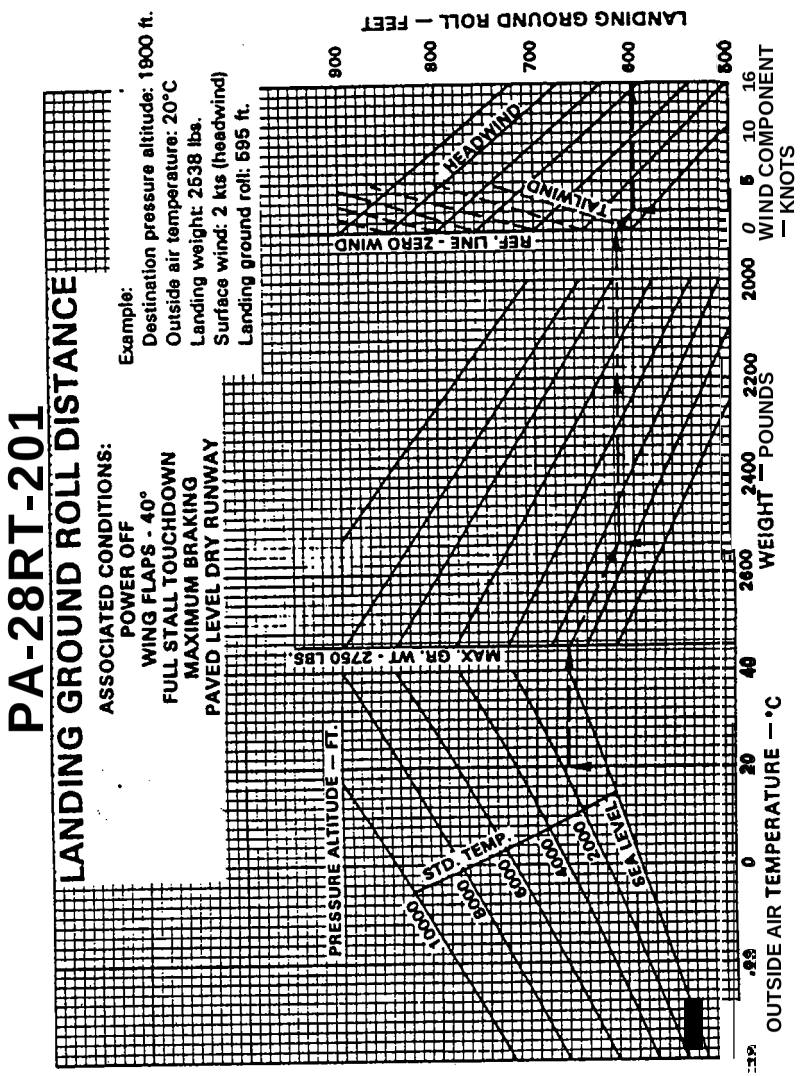
FUEL, TIME AND DISTANCE TO DESCEND
Figure 5-31



GLIDE TIME AND DISTANCE
Figure 5-33



LANDING DISTANCE OVER 50 FT.
Figure 5-35



LANDING GROUND ROLL DISTANCE
Figure 5-37

TABLE OF CONTENTS

SECTION 6

WEICHT AND BALANCE

SECTION 6

WEICHT AND BALANCE

6.1 GENERAL

In order to achieve the Performance and good flying characteristics, which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) Position within the approvcd Operating range (envelope). Although the airplane offers a trcmendous flexibility of loading, it cannot be fiown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb pcrformance it will have.

Center of gravity is a determining factor in flight characteristics. If thc C.G. is too far forward in any airpianc, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or tend to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and cvcn spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded airplane, however, will perform as intended. Befoi the airplane is delivered, it is weighed, and a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty weight and C.G. location, the pilot can easily determine the weight and C.G. Position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envclopc.

The basic empty weight and C.G. location are recorded in the Weight and Balance Data Form (Figure 6-5) and the Weight and Balance Record (Figure 6-7). The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic empty weight and C.G. position and to write these in the Aircraft Log Book and the Weight and Balance Record. The owner should make sure that it is done.

A weight and balance calculation is necessary in determininghow much fuel or baggage can be boarded so as to keep within ailowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing basic empty weight, C.G. Position, and useful load. Note that the useful load includes usable fuel, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

6 3 AIRPLANE WEICHINC PROCEDURE

At the time of deiivery, Piper Aircraft Corporation provides each airplane with the basic empty weight and Center of gravity location. This data is supplied by Figure 6-5.

The removal or addition of equipment or airplane modifications can affect the basic empty weight and Center of gravity. The following is a weighing procedure to determine this basic empty weight and Center of gravity location:

(a) Preparation

(1) Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

(2) Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.

(3) Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops. Then add the unusable fuel (5.0 gallons total, 2.5 gallons each wing).

CAUTION

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engines for a minimum of 3 minutes at 1000 RPM on each tank to insure no air exists in the fuel supply lines.

(4) Fill with oil to full capacity.

(5) Place pilot and copilot seats in fourth (4th) notch, aft of forward Position. Put flaps in the fully retracted Position and all control surfaces in the neutral Position. Tow bar should be in the proper location and all entrance and baggage doors closed.

(6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

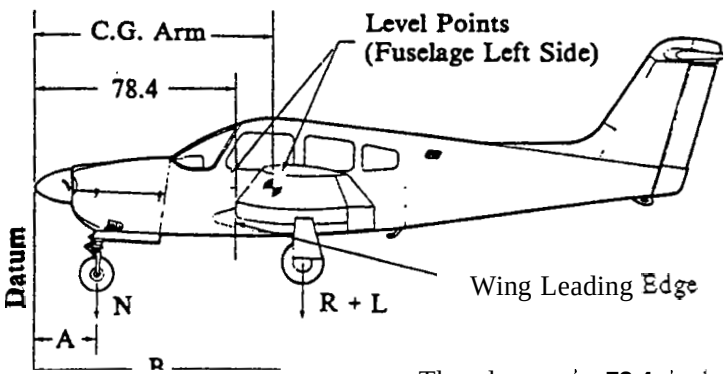
(1) With airplane on scales, block main gear oleo pistons in the fully extended Position.

(2) Level airplane (refer to Figure 6-3) deflating nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

(1) With the airplane level and brakes released. record the weight shown on each'scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Basic Empty Weight, as Weighed (T)			



A = 15.6
B = 109.7

The datum is 78.4 inches ahead of thc wing leading edge at thc intersection of the straight and tapered section.

LEVELING DIAGRAM
Figure 6-3

(2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N\ (A) + (R + L)\ (B)}{T} \quad \text{inches}$$

Where: $T = N + R + L$

6.5 WEIGHT AND BALANCE DATA AND RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-5 are for the airplane as delivered from the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as delivered from the factory has been entered in the Weight and Balance Record (Figure 6-7). This form is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.

MODEL PA-28RT-201 ARROW IV

Airplane Serial Number _____

Registration Number _____

Date _____

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	**C.G.** Arm (Inches Aft of Datum)	Moment (In-Lbs)
Standard Empty Weight* Actual / Computed			
Optional Equipment			
Basic Empty Weight			

*The standard empty weight includes full oil capacity and 5.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

(Gross Weight) - (Basic Ernpty Weight) = Usefui Load

(2750 lbs.) - (ibs.) = ibs.

THIS BASIC EMPTY WEICHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEICHT AND BALANCE DATA FORM
Figure 6-5

Page Nr. 1 = Berechnung des Wiegs u. Beladplanes

PA-28RT-201 | Serial Number | Registration Number OE-DRN | Page Number 2

Date	Item No.	Description of Article or Modification	Added (+) / Removed (-)	Weight Change Wt. (Lb.)	Weight Change Arm (In.)	Weight Change Moment /100	Running Basic Empty Weight Wt. (Lb.)	Running Basic Empty Weight Moment /100
08/80		Übertrag aus Wg.	+	1814	88	1598,32	1814	1598

WEIGHT AND BALANCE RECORD
Figure 6-7

PA-28RT-201 Serial Number | Registration Number | Page Number

Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change Wt. (Lb.)	Weight Change Arm (In.)	Weight Change Moment /100	Running Basic Empty Weight Wt. (Lb.)

WEIGHT AND BALANCE RECORD (con)
Figure 6-7 (cont)

6.7 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Wtight			
Pilot and Front Passenger	340.0	80.5	27370
Passengers (Rear Seats)	340.0	118.1	40154
Fuel (72 Gallons Maximum)		*95.0*	
Baggage (200 Lbs. Maximum)		142.8	
Moment due to Retraction of Landing Gear			819
Total Loaded Airplane			

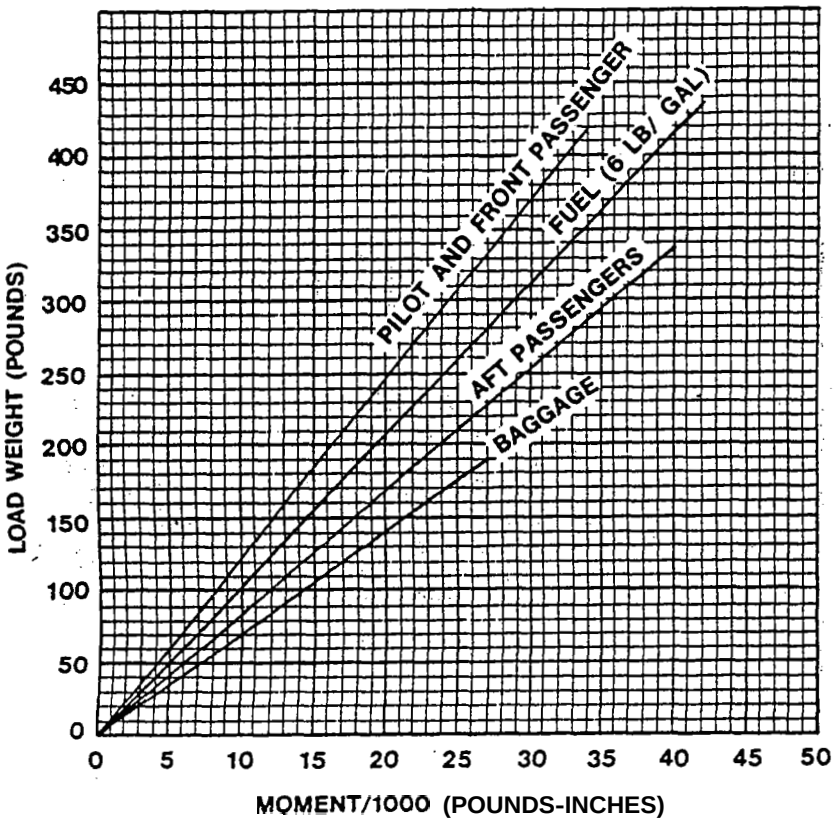
The center of gravity (C.G.) of this sample loading problem is at inches aft **of** the datum line. Locate this point ( ) **on** the C.G. rangt and weight graph. Since this point falls within the weight - C.G. envelope, this loading meets the weight and balance requirements.

IT **IS** THE RESPONSIBILITY OF THE **PILOT** AND **AIRCRAFT** OWNER ***TO*** INSURE THAT **THE** AIRPLANE **IS** LOADED PROPERLY.

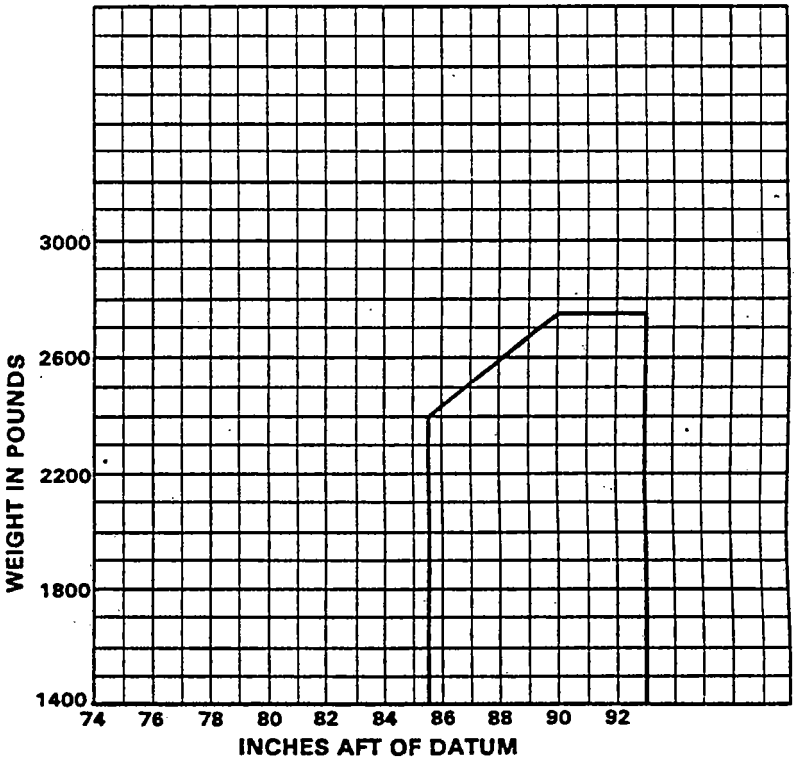
SAMPLE LOADING PROBLEM (NORMAL CATEGORY)
Figure **6-9**

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight	1814	88	1598
Pilot and Front Passenger		80.5	
Passengers (Rear Seats)		118.1	
Fuel (72 Gallons Maximum)		95.0	
Baggage (200 Lbs. Maximum)		142.8	
Moment due to Retraction of Landing Gear			819
Total Loaded Airplane			
max	2750	93	2557,5

WEICHT AND BALANCE LOADING FORM
Figure 6-11



LOADING GRAPH
Figure 6-13



Moment due to retracting landing gear = +819 in.-lbs.

C.C. RANGE AND WEICHT
Figure **6-15**

6.9 EQUIPMENT LIST

The following is a list of equiprnent which may be installed in the PA-28RT-201. It consists of those items used for defining the configuration of an airplane when the basic empty weight is established at the time of delivery. Only those Standard items which are alternate Standard items and those required to be listed by the certificating authority (FAA) are presented. Items marked with an "X" are those items which were installed on the airplane described below as delivered by the manufacturer.

Where the letter "A," "B," or "C" precedes an item, "A" denotes an item which is required equipment that must be installed in the aircraft; "B" denotes and item which is required equipment that must be installed in the aircraft unless replaced by an optional equivalent item; "C" denotes an optional item which replaces a required item of Standard equipment. Where no letter precedes an item, that item is not required equipment.

Unless otherwise indicated, the installation certification basis for the equipment included in this list is the aircraft's approved type design.

(a) Propeller and Propeller Accessories

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (in.) Aft Datum	Moment (Lb-In.)
1	A	Propeller				
		a. McCauley B2D34C213/90DHA-16 Cert. Basis - TC P7EA	Y	49.0	-1.9	-93
		b. Hartzell HC-C2YK-1( )F/F7666A-2R Cert. Basis - TC P920		55.0	-1.9	-105
3		Spinner Installation Piper Dwg. 35828-2 (McCauley Prop) or Piper Dwg. 99374 (Hartzell Prop)				
		a. Spinner Dome and Forward Bulkhead (McCauley Prop)	Y	2.8	-6.0	-17
		b. Spinner Dome and Forward Bulkhead (Hartzell Prop)		3.1	-5.6	-17
	A	c. Aft Bulkhead		1.9	3.4	6
5	A	Propeller Governor Hartzell Model F-2-7( ) Piper Dwg. 66634-4 Cert. Basis - TC P7EA	X			

(b) Engine and Engine Accessories

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (in.) Aft Datum	Moment (Lb-In.)
9	A	Engine - Lycoming Model 10-360-C1C6 Cert. Basis - TC 1E10	X	329.0	15.2	5001
11	A	Engine Driven Fuel Pump Lycoming P/N 75247 or LW-15473 Cert. Basis - TC 1E10		•		
13	A	Electric Fuel Pump (Weldon P/N 8120-G)	Y	2.2	42.3	93
15	A	Fuel Valve Piper Dwg. 66945-0 (System Components Corp. P/N SP 2378-B3)	X	0.6	61.9	37
17	A	Oil Coolers Piper Dwg. 67848-0 (Harrison P/N 8537820)	X	4.1	42.0	173

*Included in basic engine dry weight.

(b) Engine and Engine Accessories (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
19	A	Air Filter (Fram P/N CA-144PL)	X	0.9	20.0	19
21	B	Alternator Piper Dwg. 99945-0				
		a. Chrysler P/N 3656624	X	12.7	9.3	118
		b. Chrysler P/N 4111810		13.5	9.3	126
23	A	Starter (Prestolite P/N MZ4218) Cert. Basis - TC 1E10	X	*		
25	A	Oil Filter Lycoming P/N LW-13215 (Champion P/N CH-48110) or Lycoming P/N 15624) Cert. Basis - TC 1E10	X	*		

*Included in basic engine dry weight.

(c) Landing Gear and Brakes

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
35	A	Two Main Wheel Assemblies				
		a. Cleveland Aircraft Products				
		Wheel Assy. No. 40-86		5.4	109.7	592
		Brake Assy. No. 30-55		3.6	109.7	395
		Cert. Basis - TSO C26a	X			
		b. 6.00-6 Type III 6 Ply				
		Rating Tires with Reg. Tubes		17.2	109.7	1887
		Cert. Basis - TSO C62				
37	A	Nose Wheel Assembly				
		a. Cleveland Aircraft Products				
		Wheel Assy. No. 40-77				
		Cert. Basis - TSO C26a	X	2.6	15.6	41
		b. McCauley Industrial Corp.				
		Wheel Assy. No. D-30500				
		Cert. Basis - TSO C26b	____	3.6	15.6	56
		c. 5.00-5 Type III 4 Ply				
		Rating Tire with Reg. Tube		5.8	15.6	90
		Cert. Basis - TSO C62				
39	A	Handbrake Master Cylinder				
		Cleveland Aircraft Products				
		No. 10-22	X	0.6	60.9	37

(c) Landing Gear and Brakes (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (in.) Aft Datum	Moment (Lb-In.)
41	A	Toe Brake Cylinders a. Cleveland Aircraft Products No. 10-27 b. Gar-Kenyon Instruments 17000	Y —	0.7 0.4	53.0 53.0	37 21
43	A	Landing Gear Hydraulic Pump Piper Dwg. 67509-0 (Prestolite 105255B)	X	9.0	159.0	1431
45	A	Main Gear Hydraulic Cylinders (2) Piper Dwg. 96860-0 (Synco Devices SFA 232-3)	Y	2.2	108.0	238
47	A	Nose Gear Hydraulic Cylinder Piper Dwg. 35797-2 (Gar-Kenyon 9495 I)	X	2.0	41.8	84

(d) Electrical Equipment

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
55	A	Voltage Regulator Piper Dwg. 68804-3	X	0.5	53.4	27
57	B	Battery (Rebat S-25)	X	21.9	43.2	946
59	A	Starter Relay Piper Dwg. 99130-2 (RBM Control P/N 111-111)	X	1.0	45.7	46
61	A	Overvoltage Relay Piper PS50034-1 (Prestolite "Wico Div." P/N FOC-4002B)	X	0.5	51.2	26

(e) Instruments

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
71	B	Altimeter Piper PS50008-2 (United Instruments UI5934-P or UI5934P-1) Cert. Basis - TSO C10b	Y	1.1	60.9	67
73	B	Airspeed Indicator Piper PS50049-50S (United Instruments 8025-B.363) Cert. Basis - TSO C2b	X	0.6	61.8	37
75	A	Manifold Pressure and Fuel Flow Indicator Piper PS50031-6 (United Instruments 6092-H.55 or 6331-H.55) Cert. Basis - TSO C45 & C47	X	1.2	60.8	73
77	A	Compass Piper Dwg. 67462-6 (Airpath P/N C-2200-L4-B) Cert. Basis - TSO C7c	X	0.9	59.9	54
79	A	Tachometer Piper Dwg. 62177-3 Stewart Warner 551-WE(N)	Y	0.7	61.2	43

(e) Instruments (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
81	A	Left Engine Cluster Piper Dwg. 95241-11	X	0.8	62.4	50
83	A	Right Engine Cluster Piper Dwg. 95241-23, Plus 38224-3 (2)	X	0.8	62.4	50

(f) Miscellaneous

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
89	B	Left Front Seat Piper Dwg. 79337-21	X	15.5	84.0	1302
91		Right Front Seat Piper Dwg. 79337-22	X	15.5	84.0	1302
93		Left Rear Seat Piper Dwg. 96827-22	Y	14.5	123.0	1784
95		Right Rear Seat Piper Dwg. 96827-23	X	14.5	123.0	1784

(f) Miscellaneous (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
97	A	Front Seat Belts (2) Piper PS50039-4-2A (American Safety Eqpt. Corp. 449965 Black) Cert. Basis - TSO C22f	X	1.8	84.0	151
99	A	Aft Seat Belts (2) Piper PS50039-4-3A (American Safety Eqpt. Corp. 449968 Black) Cert: Basis - TSO C22f	X	1.6	123.0	197
101	A	Shoulder Harness (2) (Front Seats Only) Piper PS50039-4-21 (Pacific Scientific 1107447-05 Black)	X	1.4	119.5	167
103	A	Baggage Straps Piper Dwg. 66804-0 and 66805-0	X	1.3	142.8	186
105		Tow Bar Piper Dwg. 67336-0	X	2.2	156.0	343

(g) Propeller and Propeller Accessories
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)

(h) Engine and Engine Accessories (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
137	Vacuum Pump				
	a. Piper Dwg. 79399-0 (Airborne P/N 211CC)	X	1.8	40.0	72
	b. Piper Dwg. 36535-2 (Edo-Aire P/N IU128A)		2.2	40.0	88
139	Exhaust Gas Temperature Gauge Installation Piper Dwg. 69190-0, Alcor Indicator P/N 202A-7A or P/N 202B-7A Probe Model "A" Lead Assembly 90.00	X	0.7	55.4	39

(i) Landing Gear and Brakes
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)

(j) Electrical Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
151	Instrument Panel Lights Instl.	X	0.3	62.8	19
153	Instrument Light (Grimes 15-0083-7)	X	0.1	99.0	10
155	Cabin Light Piper Dwg. 79247	X	0.3	99.0	30

(j) Electrical Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
157	Landing Light Piper PS10008-4509 (G.E. Model 4509)	X	0.5	10.0	5
159	Navigation Lights (Wing) (2) Whelen P/N A429PR-D-14 (Red) and P/N A429PG-D-14 (Green)	X	0.4	106.6	43
161	Navigation Light (Rear) (2) Grimes Model A2064 (White)	X	0.4	292.0	117
163	Anti-Collision Lights (Wing Tip) (Whelen) Piper Dwg. 79850-14 & -15 Cert. Basis - STC SA615EA	X	5.7	157.9	900

(j) Electrical Equipment
(Optional Equipment) (cont)

Item No,	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
165	Heated Pitot Installation Piper Dwg. 35896-4 & -5	X	0.4	100.0	40
167	Piper Pitch Trim Piper Dwg. 67496-5	X	4.3	155.3	668
169 C	Battexy 12v 35 A.H. (Rebat R35)	X	*6.5	43.2	281
171	Auxiliary Power Receptacle Piper Dwg. 35842	X	2.7	62.7	169
173	External Power Cable Piper Dwg. 62355-2		4.6	142.8	657
175	Lighter (Casco P/N 200462)	X	0.2	62.9	13

*Weight and moment difference between standard and optional equipment.

(k) Instruments
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
191	Attitude Gyro				
	a. Piper Dwg. 99002-3 (Edo-Aire P/N 5000B-9)	____	1.9	59.4	113
	b. Piper Dwg. 99002-8 (Aeritalia S.P.A. P/N 36101P)	____	2.2	59.4	131
	Cert. Basis - TSO C4c				
193	Directional Gyro				
	a. Piper Dwg. 99003-3 (Edo-Aire P/N 4000B-9)	X	2.4	59.7	143
	b. Piper Dwg. 99003-7 (Aeritalia S.P.A. P/N 31101P)	____	1.9	59.7	113
	Cert. Basis - TSO C5c				
195	Horizontal Situation Indicator (HSI) (Mitchell P/N NSD-360A)				
	Cert. Basis - TSO C6c, C9c, C52c	____	4.6	59.9	276
197 C	Tru-Speed Indicator Piper PS50049-50T (United Instruments P/N 8125-B.364)				
	Cert. Basis - TSO C2b	____	(Same as standard tquipment)		

(k) Instruments
(Optional Equipment) (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (in.) Aft Datum	Moment (Lb-In.)
199	C	Altimeter Piper PS50008-3 (United Instruments P/N UI5934-PM or P/N UI5934-PM-1) Cert. Basis - TSO ClOb	____	(Same as Standard equipment)		
201	C	Encoding Altimeter Piper PS50008-6 (United Instruments P/N UI5035P-P23) or Piper PS50008-7 (United Instruments P/N UI5035PM-P24) Cert. Basis - TSO ClOb & C88	X	*0.9	60.3	54
202		Altitude Digitizer (United Instruments P/N 5125-P3) Cert. Basis - TSO C88	____	I.0	51.5	52

*Weight and moment difference between Standard and optional equipment.

(k) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
203	Rate of Climb Piper Dwg. 99010-5 (United Instruments P/N UI-7000) Cert. Basis - TSO C8b	X	1.0	60.9	61
205	Alternate Static Source Installation Piper Dwg. 35896-3 & -5	X	0.4	61.0	24
207	Turn and Slip Indicator Piper PS50030-2 (R. C. Allen P/N A2475-2) Cert. Basis - TSO C3b	X	2.6	59.7	155
209	Turn Coordinator Piper PS50030-3 (Electric Gyro Corp. P/N 1394T100) Cert. Basis - TSO C3b		2.6	59.7	155
211	MK 10 Radar Altimeter Piper Dwg. 37693-7		5.4	156.3	844

(k) Instruments
(Optional Equipment) (cont)

item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
213	Engine Hour Meter Piper Dwg. 79548-3	X	0.3	61.2	18
215	Clock Piper Dwg. 79621-4	X	0.4	62.4	25
217	Outside Air Temperature Gauge Piper Dwg. 79316-0 (Dresser Industries P/N NHM-70)	X	0.2	72.6	15
219	Gyro Suction Gauge Piper Dwg. 99480-0 (Airborne P/N 1G10-1) or (AN Std. P/N AN5777-1)	X	0.5	62.2	31
221	Vacuum Regulator (Airborne P/N 2H3-19)	X	0.6	49.6	30
223	Vacuum Filter Piper Dwg. 66673-0 (Airborne P/N 1J7-1)	X	0.3	49.6	15

(1) Autopilots
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
233	AutoFlite II Cert. Basis STC SA3162SW-D	____	5.6	91.8	514
235	AutoControl IIIB	____	9.6	77.6	745
	a. Directional Gyro 52D54	____	2.9	60.0	174
	b. Omni Coupler IC-388	____	1.0	60.3	60
	Cert. Basis STC SA3161SW-D				
237	AltiMatic IIIC	X	24.3	147.7	3589
	a. Directional Gyro 52D54	X	2.9	60.0	174
	b. Omni Coupler IC-388	____	1.0	60.3	60
	c. G/S Coupler IC-493	____	1.4	53.1	74
	Cert. Basis STC SA3323SW-D				

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(m) Radio Equipment
(Optimal Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
243	Collins VHF-250 or VHF-251 Comm Transceiver				
	a. Single	_____	4.0	56.9	228
	b. Dual	_____	8.1	56.9	461
	Cert. Basis - TSO C37b, C38b				
245	Collins VIR-350 or VIR-351 Nav Receiver				
	a. Single	_____	3.9	57.4	224
	b. Dual	_____	7.9	57.4	453
	Cert. Basis - TSO C40a, C36c				
247	Collins IND-350 ( ) VOR/LOC Indicator				
	a. Single	_____	1.0	60.2	60
	b. Dual	_____	2.0	60.2	120
	Cert. Basis - TSO C40a, C36c				
249	Collins IND-351 ( ) VOR/LOC/GS GS Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	60.2	78

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (in.) Aft Datum	Moment (Lb-In.)
251	Collins GLS-350 Glide Slope Receiver Cert. Basis - TSO C34c	_____	2.0	181.8	364
253	Collins DCE 400 Distance Computing Equipment Cert. Basis - TSO C40a	_____	2.1	58.9	124
255	Collins RCR-650 ADF Receiver and Antenna and IND-650 Indicator Cert. Basis - TSO C41c	_____	7.7	104.8	807

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
256	Collins RCR-650A ADF Receiver and Antenna and IND-650A Indicator Cert. Basis - TSO C41C	_____	8.4	100.9	848
257	Collins AMR-350 Audio/ Marker Panel Cert. Basis - TSO C35d, C50b	_____	*3.3	110.0	363
259	Collins TDR-950 Transponder Cert. Basis - TSO C74c	_____	*2.8	63.2	177
271	King KX 170 ( ) VHF Comm/Nav				
	a. Transceiver, Single	_____	7.3	56.6	413
	b. Transceiver, Dual	_____	14.6	56.6	826

*Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
273	King KX 175 ( ) VHF				
	a. Transceiver	X	11.4	56.6	645
	b. King KN 75 Glide Slope Rrceiver		I.6	184.3	295
	c. King KN 75 Glide Slope Receiver (2nd)		I.6	184.3	295
	d. King KN 72 VOR LOC Converter		1.3	183.6	239
	e. King KI 204 VOR ILS Indicator		1.7	60.5	I03
	Cert. Basis - TSO C3bc, C37b, C38b, C40a				
275	King KX 175 ( ) VHF				
	a. Transceiver (2nd)	X	10.0	56.6	566
	b. King KN 72 VOR LOC Converter		I.3	183.6	239
	c. King KI 203 VOR LOC Indicator		I.6	60.5	97
	Cert. Basis - TSO C36c, C37b, C38b.				

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
277	King KI 208 VOR/LOC Indicator				
	a. Single	X	1.0	59.6	60
	b. Dual		2.0	59.9	120
	Cert. Basis - TSO C34c, C36c, C40a				
279	King KI 209 VOR/LOC/GS Indicator				
	Cert. Basis - TSO C34c, C36c, C40a		1.2	59.9	72
281	King KN 74 R-Nav		4.7	56.6	266
283	King KI 206 R-Nav Indicator				
	Cert. Basis - TSO C34c, C36c, C40a		1.3	56.6	74
285	King KN 65A DME				
	Cert. Basis - TSO C66a	X	13.0	174.9	2274
287	King KR 85 Digital ADF	X	8.6	85.2	733
	a. Audio Amplifier		0.8	51.0	41
	Cert. Basis - TSO C41b				

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
289	King KR 86 ADF				
	a. First	_____	6.7	91.6	614
	b. Second	_____	9.7	107.0	1038
	c. Audio Amplifier	_____	0.8	51.0	41
291	King KMA 20 ( ) Audio Panel Cert. Basis - TSO C35c, C50b	X	37	70.8	262
293	King KT 76 ( )/78 ( ) Transponder Cert. Basis - TSO C74b	X	3.1	58.1	180
305	Narco Comm 120 VHF Transceiver				
	a. Single	_____	4.8	56.9	273
	b. Dual	_____	8.6	57.4	494
	Cert. Basis - TSO C37b, C38b				
307	Narco Nav 121 VHF Receiver				
	a. Single	_____	3.1	58.4	181
	b. Dual	_____	6.2	58.4	362
	Cert. Basis - TSO C36C, C40c, C66a				

*Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
309	Narco Nav 122 VHF Receiver				
	a. Single	———	*5.1	99.4	507
	b. Dual	———	*8.6	82.9	713
	Cert. Basis - TSO C35d, C36c, C40c, C66a				
311	Narco Nav 122A VHF Receiver				
	a. Single	———	*5.2	98.5	512
	b. Dual	———	*8.8	82.2	723
	Cert. Basis - TSO C34c, C35d, C36c, C40c, C66a				
313	Narco Nav 124A VHF Receiver				
	a. Single	———	*6.2	92.3	572
	b. Dual	———	*10.9	77.2	841
	Cert. Basis - TSO C35d, C36c, C40a, C66a				
315	Narco Nav 124R VHF Receiver				
	Cert. Basis - TSO C36c, C40a, C66a	———	4.4	57.5	253

*Weight includes marker antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
317	Narco ID 124 VOR/LOC/GS Indicator				
	a. Single	———	1.2	60.5	73
	b. Dual	———	2.4	60.5	145
	Cert. Basis - TSO C34c, C35d, C36c, C40c				
319	Narco UGR-2A Glide Slope				
	a. Single	———	4.2	154.0	647
	b. Dual	———	8.4	220.0	1848
	Cert. Basis - TSO C34b				
321	Narco CP135 Audio Selector Panel				
	Cert. Basis - TSO C50b	———	2.2	55.0	121
323	Narco CP135M Audio Selector Panel				
	Cert. Basis - TSO C50b, C35d	———	3.7	114.3	423
325	Narco CLC-60A R-Nav	———	9.6	140.1	1345
	a. Narco SA-11 Adapter	———	0.7	174.0	122

*Weight includes marker antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
327	Narco DME-190 TSO Cert. Basis - TSO C66a	_____	*5.9	60.9	359
329	Narco DME-195 Receiver and Indicator Cert. Basis - TSO C66a	_____	*13.2	154.5	2039
331	Narco ADF-141				
	a. Single	_____	*8.9	91.2	812
	b. Dual	_____	**17.9	107.6	1926
	Cert. Basis - TSO C41c				
333	Narco AT150 Transponder Cert. Basis - TSO C74c	_____	*3.0	57.3	172
	a. Narco AR-500 Altitude Encoder Cert. Basis - TSO C88	_____	1.0	51.5	52

*Weight includes antenna and cable.
**Weight includes dual antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
345	Antenna and Cable				
	a. Nav Receiving	Y	1.4	195.7	274
	b. #1 VHF Comm	Y	0.7	125.7	88
	c. #2 VHF Comm	X	0.8	147.5	118
	d. Glide Slope (Single)	X	0.9	122.2	110
	e. Glide Slope (Dual)		2.8	154.0	431
	f. Single ADF Sense	X	0.4	147.5	59
347	Anti-Static Antenna and Cable				
	a. #1 VHF Comm	Y	1.4	144.3	202
	b. #2 VHF Comm		1.5	170.7	256
	c. Single ADF Sense		0.5	147.5	74
349	Ernergency Locator Transmitter				
	(C.C.C. Model CIR-1 1-2)		1.7	254.0	432
	a. Antenna and Coax		0.2	240.0	48
	b. Shelf and Access Hole		0.5	253.5	127
	Cert. Basis - TSO C91				
350	Emergency Locator Transmitter				
	(Narco Model ELT-10)	X	3.5	254.0	889
	a. Antenna and Coax		0.3	240.0	72
	b. Shelf and Access Hole		0.5	253.5	127
	Cert. Basis - TSO C91				

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
351	Headphone Wm. J. Murdock P/N P-23 300 Ohms with MC162A Cushions or Telex Comm. P/N 61650-03	———	0.5	60.0	30
353	Microphone				
	a. Telex Acoustics P/N 60837-17 (Model 66C)	XX	0.3	64.9	19
	b. Narco P/N M700B	———	0.6	64.9	42
	c. Telex Acoustics P/N 62800-04 (Model 100T/NH)	———	0.3	64.9	19
355	Boom Microphone - Headset Piper Dwg. 37921-2 Telex 5 x 5 Mark II (P/N 62629-00)	———	0.3	80.5	24
357	Cabin Speaker, Installation Piper Dwg. 99746-0	X	0.8	99.0	79

(n) Miscellaneous
(Optional Equipment)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
387		Zinc Chromate Finish Piper Dwg. 79700-2	———	5.0	158.0	790
389		Stainless Steel Control Cables Piper Dwg. 79700-9	———	(Same as Standard equipment)		
391		Air Conditioner Piper Dwg. 35878-3	———	69.8	105.7	7378
393		Overhead Vent System Piper Dwg. 76304-23	X	6.4	159.6	I022
395		Overhead Vent System with Ground Ventilating Blower Piper Dwg. 76304-24	X	14.9	172.2	2566
397		Assist Step Piper Dwg. 65384	X	I.8	156.0	28I
399		Super Cabin Sound Proofing Piper Dwg. 79601-4	———	18.1	86.8	1571
401	C	Adjustable Front Seat (Left) Piper Dwg. 79591-2	X	*6.6	80.3	530

*Weight and moment difference between Standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
403	Adjustable Front Seat (Right) Piper Dwg. 79591-3	X	*6.6	79.6	525
405	Headrests (2) Front Piper Dwg. 79337-18	____	2.2	94.5	208
407	Headrests (2) Rear Piper Dwg. 79337-18	____	2.2	132.1	291
409	'Oversize Headrest (2) Front Piper Dwg. 79764-2	____	3.2	94.5	302
411	Oversize Headrests (2) Rear Piper Dwg. 79764-2	____	3.2	132.1	423
413	Inertia Safety Belts (Rear) (2) 0.8 lbs. each Piper PS50039-4-14 (Pacific Scientific P/N 1107319-01 Black) or (American Safety Eqpt. Corp, P/N 500853-401)	____	1.6	140.3	224

*Weight and mornent difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
415	Assist Strap Piper Dwg. 79455-0	_____	0.2	109.5	22
417	Curtain and Rod Installation Piper Dwg. 67955-2	_____	4.2	124.0	521
419	Luxurious Interior Piper Dwg. 67952-3	_____	*17.0	101.9	I732
42	Fire Extinguisher Piper Dwg. 37872-2 (Graviner HA1014-01) Total	X	5.6	57.9	324

*Weight and moment difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
423	Clip Installation - Map Piper Dwg. 37907-2	_____	0.1	70.0	7
	TOTAL OPTIONAL EQUIPMENT		_____	_____	_____

EXTERIOR FINISH

Base Color _____ Registration No. Color _____

Trim Color _____ Type Finish _____

Accent Color _____

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DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

SECTION 7

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYTEMS

7.1 THE AIRPLANE

The Arrow IV is a single engine, retractable landing gear, ali metal airplane featuring the tail surfaces in a "T" configuration. It has seating for up to four occupants, a 200 pound luggage compartment, and a 200 HP engine.

7 3 AIRFRAME

spar box carry-through, which is an integral part of the fuselage structure. The bolting of the spar ends into the spar box carry-through structure, which is located under the aft seats, provides in effect a continuous main spar. The wings are also attached fore and aft of the main spar by an auxiliary front

A vertical stabilizer, an all-movable horizontal stabilator, and a rudder make up the empennage. The stabilator, which is mounted on top of the fin, incorporates an anti-Servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the same direction as the stabilator, but with increased travel.

7.5 ENGINE AND PROPELLER

The Arrow IV incorporates a Lycoming IO-360-C1C6 four-cylinder, ject drive, horizontally opposed fuel injected engine rated at 200 horsepower at 2700 RPM. It is furnished with a starter, 60 ampere 14-volt altemator, shielded ignition, vacuum pump dnve, fuel pump, propeller govemor and a dry automotive type induction air filter. A recommended overhaul period of 1600 hours is based on Lycoming service experience. Operation beyond the recommended time is the decision of the Operator. Since Lycoming from time to time revises the recommended overhaul period, the owner should check the latest Lycoming Service Instruction at his Piper dealer for the latest recommended overhaul period and for any additional information.

The aircraft is cquipped with a constant speed, controllable pitch propeller. The propeller control is located on the power quadrant between the throttle and mixture controls. A mixture control lock is provided to prevent activation of the mixture control instead of the pitch control.

The exhaust system is a crossover type, which reduces back pressure and improves Performance. It is constructed entirely of stainless steel and is equipped with dual mufflers. Cahin heat and windshield defrosting are provided by a heater shroud around the muffler.

An oil cooler is located on the forward lower nght side of the fire wall, with the air inlet for the cooler located on the right side of the bottom cowling. A winterization plate is provided to restrict air dunng winter Operation. (See Winterization in Handling and Servicing.)

7.7 INDUCTION SYSTEM

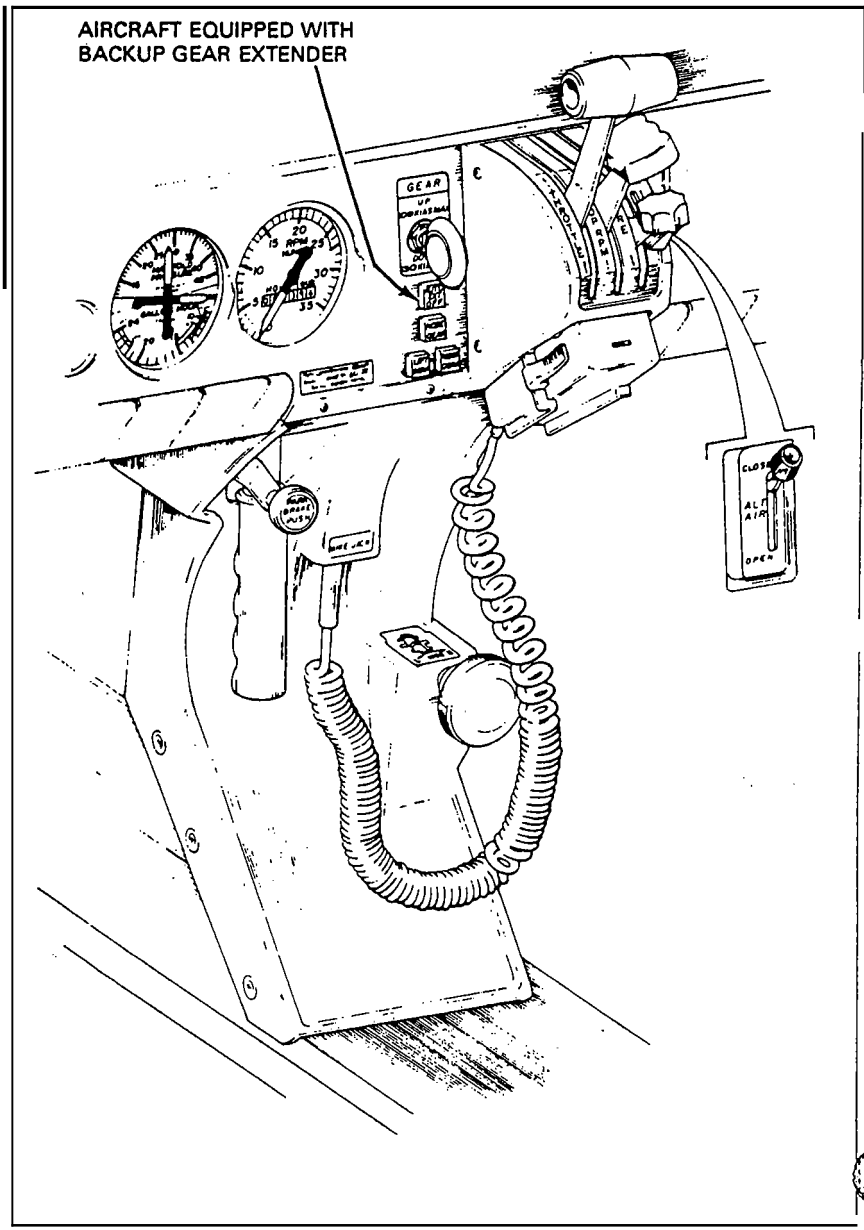
The induction System incorporates a Bendix RSA-5AD1 type fuel injector. The injector is based on the principle of differential pressure, which balances air pressure against fuel pressure. The regulated fuel pressure established by the Servo valve when applied across a fuel control (jetting System) makes the fuel flow proportional to airflow. Fuel pressure regulation by the Servo valve causes a minimal drop in fuel pressure throughout the metering System. Metering pressure is maintained above most vapor forming conditions while fuel inlet pressure is low enough to allow use of a diaphragm pump. The Servo System feature also checks vapor lock and associated starting problems.

The Servo regulation meters fuel flow proportionally with airflow and maintains the mixture as manually set for all engine speeds. The fuel flow divider receives metered fuel and distributes fuel to each cylinder fuel nozzle.

The fuel flow portion of the manifold pressure/fuel flow gauge is connected to the flow divider and monitors fuel pressure. This instrument converts fuel pressure to an indication of fuel flow in gallons per hour and percentage of rated horsepower.

The alternate air source of the induction System contains a door that functions automatically or manually. If the primary source is obstructed, the door will open automatically. It may be opened manually by moving the selector on the right side of the quadrant. The primary source should always be used for takeoff.

The pilot should read and follow the procedures recommended in the Lycoming Operator's Manual for this engine, in order to obtain maximum engine efficiency and time between engine overhauls.



CONTROL QUADRANT AND CONSOLE
Figure 7-1

7.9 ENGINE CONTROLS

Engine controls consist of a throttle control, a propeller control and a mixture control lever. These controls are located on the control quadrant on the lower center of the instrument panel (Figure 7-1) where they are accessible to both the pilot and the copilot. The controls utilize teflon-lined control cables to reduce friction and binding.

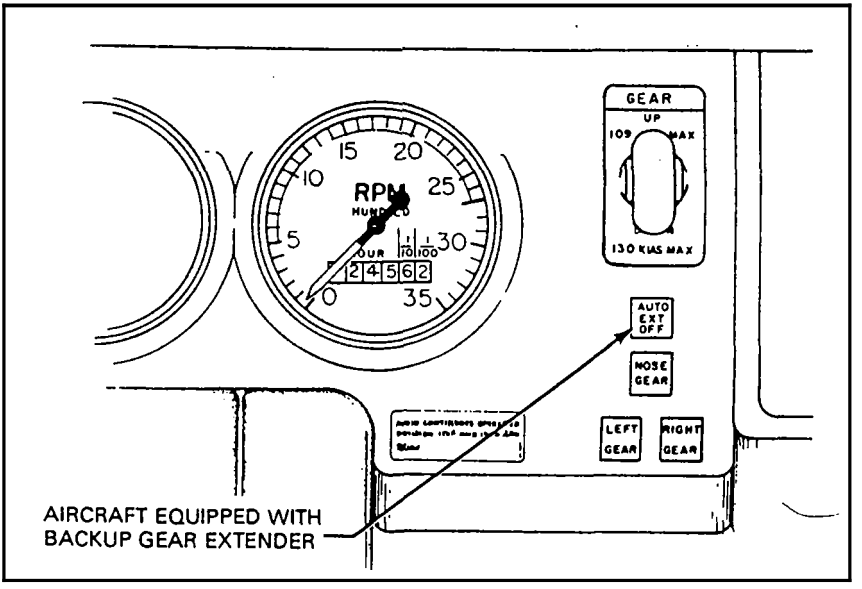
The throttle lever is used to adjust the manifold pressure. It incorporates a gear up warning horn switch which is activated during the last portion of travel of the throttle lever to the low power Position. If the landing gear is not locked down, the horn will sound until the gear is down and locked or until the power setting is increased. This is a safety feature to warn of an inadvertent gear up landing.

The propeller control lever is used to adjust the propeller speed from high RPM to low RPM.

The mixture control lever is used to adjust the air to fuel ratio. The engine is shut down by the placing of the mixture control lever in the full lean Position. In addition, the mixture control has a lock to prevent activation of the mixture control instead of the pitch control. For information on the leaning procedure, see the Avco-Lycoming Operator's Manual.

The friction adjustment lever on the right side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle, propeller, and mixture controls in a selected Position.

The alternate air control is located to the right of the control quadrant. When the alternate air lever is in the up, or closed, Position the engine is Operating on filtered air; when the lever is in the down, or open, Position the engine is Operating on unfiltered, heated air.



LANDING CEAR SELECTOR
Figure 7-3

7.11 LANDINC CEAR

The Arrow IV is equipped with a retractable tricycle landing gear. which is hydraulically actuated by an electrically powered reversible pump. The pump is controlled by a selector switch on the instrument panel to the left of the control quadrant (Figure 7-3). The landing gear is retracted or extended in about seven seconds.

Some aircraft also incorporate a pressure sensing device in the system which lowers the gear regardless of gear selector Position. depending upon airspeed and engine power (propeller slipstream). Gear extension is designed to occur. even if the selector is in the up Position. at airspeeds below approximately 95 KIAS with power off. The extension speeds will van from approximately 75 KTS to approximately 95 KIAS depending on power settings and altitude. The device also prevents the gear from retracting at airspeeds below approximately 75 KTS with full power. though the selector switch may be in the up Position. This speed increases with reduced power and/or increased altitude. Manual override of the device

is provided by an emergency gear lever located between the front seats to the left of the flap handle (refer to Figure 7-9). The sensing device operation is controlled by differential air pressure across a flexible diaphragm which is mechanically linked to a hydraulic valve and an electrical switch which actuates the pump motor. A high pressure and static air source for actuating the diaphragm is provided in a mast mounted on the left side of the fuselage above the wing. Any obstruction of the holes in this mast will cause the gear to extend. An optional heated mast is available to alleviate obstruction in icing conditions. The optional heated mast is turned on whenever the "PITOT HEAT" is turned on.

WARNING

Avoid ejecting objects out of the pilot storm window which could possibly enter or obstruct the holes in the mast.

The emergency gear lever. when placed in the raised Position. can be used to override the system. and gear Position is then controlled by the selector switch regardless of airspeed/power combinations. The emergency gear lever is provided with a locking device which may be used to lock the override lever in the up Position. The lock is located on the left side panel of the console below the level of the manual override lever. To lock the override lever in the up Position. raise the override lever to the full up Position and push the pin in. A yellow warning light located below the gear selector switch (Figure 7-3) flashes to warn the pilot that the automatic gear lowering system is disabled. The lock is spring-loaded to the off Position to aid disengagement. To disengage the lock raise the override lever and release. The lever will return to its normal Position and the yellow flashing light will extinguish. The lever must also be locked in the raised (up) Position when gear-up stalls are practiced.

The emergency gear lever. when used for emergency gear extension of the gear. manually releases hydraulic pressure to permit the gear to free-fall with spring assistance on the nose gear. The lever must be held in the downward Position for emergency extension.

Gear down and locked positions are indicated by three green lights located below the selector. and a red "Warning Gear Unsafe" light is located at the top of the panel. An all lights out condition indicates the gear is up. The landing gear should not be retracted above a speed of 109 KIAS and should not be extended above a speed of 130 KIAS.

The main landing gear uses 6.00 x 6 wheels. The main gear incorporate brake drums and Cleveland single disc hydraulic brake assemblies. The nose wheel carries a 5.00 x 5 four ply tire and the main gear use 6.00 x 6 six ply tires. All three tires are tube type.

A micro-switch in the throttle quadrant activates a warning horn and red "Warning Gear Unsafe" light under the following conditions:

(a) Gear up and power reduced below approximately 14 inches of manifold pressure.

(b) On aircraft equipped with the backup gear extender, if the system has extended the landing gear and the gear selector is up. with the power reduced below approximately 14 inches of manifold pressure.

(c) Gear selector switch "UP" while on the ground and throttle in retarded Position.

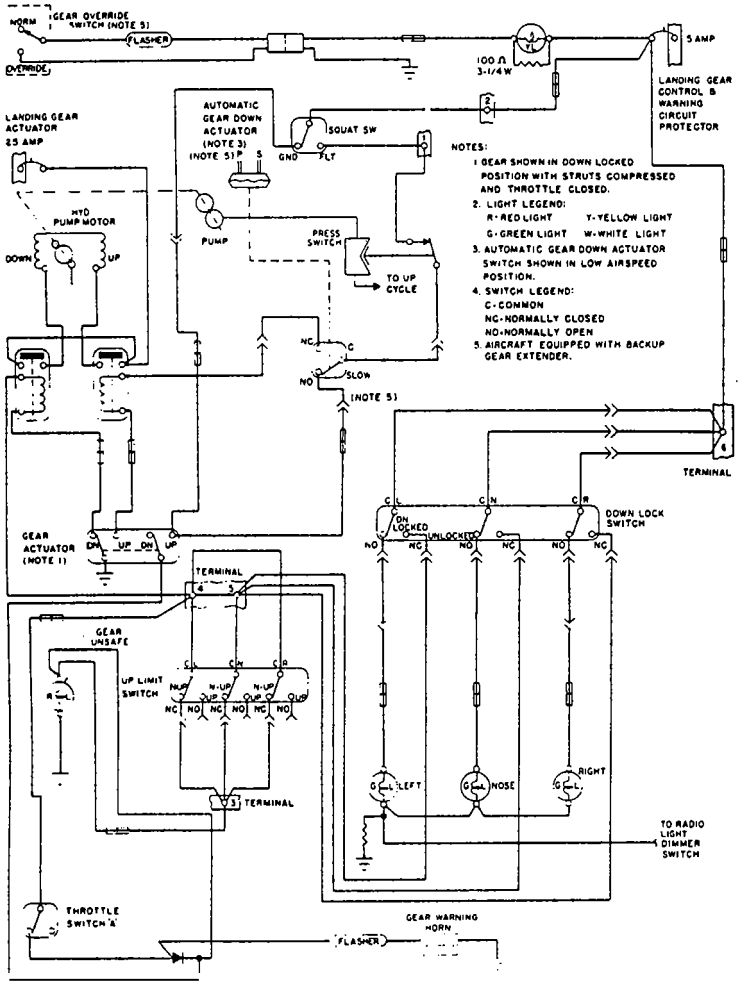
On aircraft which are NOT equipped with the backup gear extender an additional switch is installed which activates the warning horn and light whenever the flaps are extended beyond theapproach Position (10°) and the landing gear are not down and locked.

The gear warning horn emits a 90 cycle per minute beeping sound in contrast to the siall warning horn which emits a continuous sound.

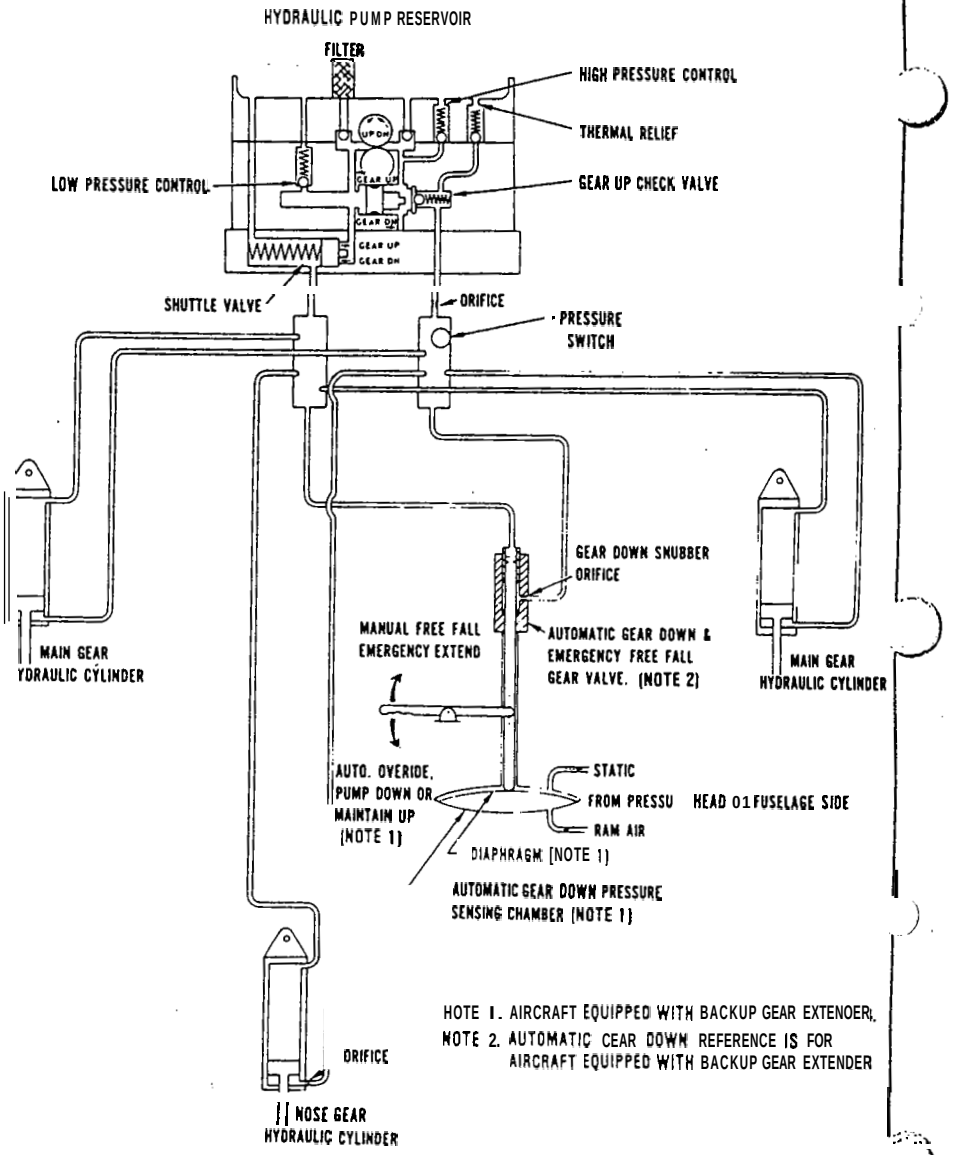
The nose gear is steerable through a 30 degree arc each side of center through the use of the rudder pedals. As the nose wheel retracts, the steering linkage disengages to reduce rudder pedal loads in flight. The nose wheel is equipped with a hydraulic shimmy damper to reduce nose wheel Shimmy. A bungee assembly is also included to reduce ground steering effort and to dampen shocks and bumps during taxiing.

The oleo struts are of theair-oil type, with normal extension being 2.75 + .25 inches for the nose gear and 2.5 + .25 inches for the main gear under normal static load (empty weight of airplane plus full fuel and oil).

The standard brake system includes toe brakes on the left and right set of rudder pedals and a hand brake located below and near the center of the instrument panel. The toe brakes and the hand brake have individual brake cylinders, but all cylinders use a common reservoir. The parking brake is incorporated in the lever brake and is operated by pulling back on the lever and depressing the knob attached to the top of the handle. To release the parking brake, pull back on the brake lever; then allow the handle to swing forward.

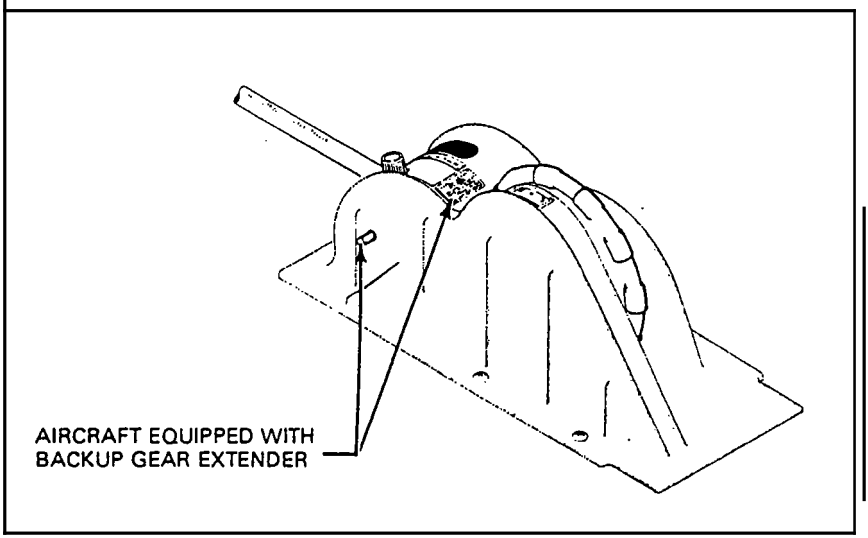


LANDING GEAR ELECTRICAL SCHEMATIC
Figure 7-5



LANDING CEAR HYDRAULIC SCHEMATIC

Figurc 7-7



FLICHT CONTROL CONSOLE
Figure **7-9**

7.13 FLICHT CONTROLS

Dual flight controls are provided as standard equipment. **A** cable system provides actuation of the control surfaces when the flight controls are moved in their respective directions.

The horizontal surface (stabilator) is mounted atop the fin in a "T" configuration and features a trim tab/servo mounted on the trailing edge. This tab serves the dual function of providing trim control and pitchcontrol forces. The trim function is controlled by a trim control wheel located on the control console between the two front seats (Figure 7-9). Rotating the wheel forward gives nose down trim and rotation aft gives nose up trim.

The rudder is conventional in design and incorporates a rudder trim. The trim mechanism is a spring-loaded recentering device. The trim control is located on the right side of the pedestal below the throttle quadrant. Turning the trim control clockwise gives nose right trim and counterclockwise rotation gives nose left trim.

Manually controlled flaps are provided. They are extended by a control cable and are spring-loaded to the retracted **(up)** Position. The control is located between the two front seats on the control console. To extend the flaps pull the handle up to the desired flap setting of 10, 25 or **40** degrees. To retract, depress the button on the end of the handle and lower the control.

When extending or retracting flaps, there is a pitch change in the aircraft. This pitch change can be corrected either by stabilator trim or increased control wheel force. When the flaps are in the retracted Position the right flap, provided with a over-center lock mechanism, acts as a step.

NOTE

The right flap will support a load only in the fully retracted (up) Position. When loading and unloading passengers make sure the flaps are in the retracted (up) Position.

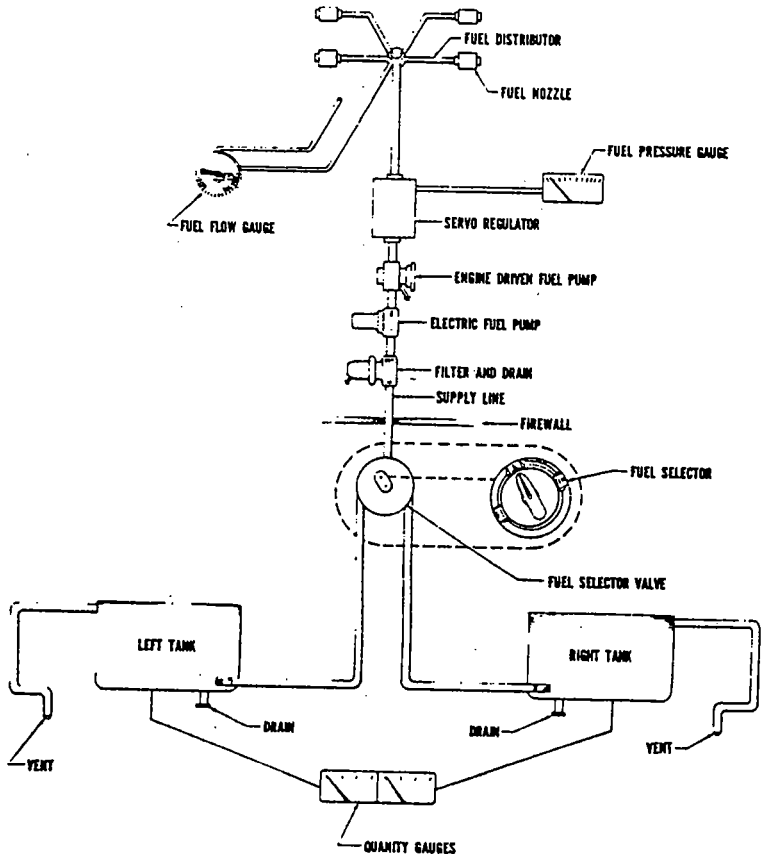
7.15 FUEL SYSTEM

The fuel system was designed with simplicity in mind. It incorporates two fuel tanks, one in each wing containing 38.5 **U.S.** Gallons, giving a total capacity of 77 gallons, of which 72 gallons are usable. The minimum fuel grade is 100/130 octane (green) or 100LL (blue). The tanks are attached to the leading edge of the wing with screws and are an integral **part of** the wing structure. This allows removal for service. The tanks are vented individually by a vent tube which protrudes below the bottom of the wing at the rear inboard corner of each tank. The vents should be checked periodically to ascertain that the vent is not obstructed and will allow free passage of air.

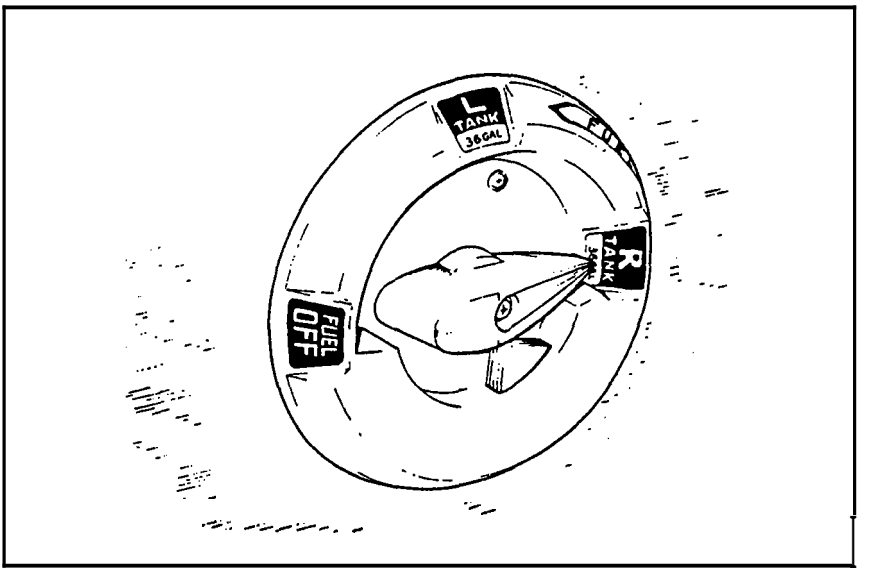
Each fuel tank has an individual quick drain located at the bottom inboard rear Corner. The fuel strainer also incorporates aquick drain, which is located on the left lower portion of the firewall. The quick drain protrudes thru the cowling to allow easy draining of the fuel strainer. To avoid the accumulation of water and Sediment, the fuel tank sumps and strainer should be drained daily prior to first flight and after refueling.

CAUTION

When draining fuel, care should be taken to ensure that no fire hazard exists before starting the engine.



FUEL SYSTEM SCHEMATIC
Figure 7-11



FUEL SELECTOR
Figure 7-13

A fuel tank selector allows the pilot to control the flow of fuel to the engine, and is located on the left side wall below the instrument panel. It has three Positions: OFF, **LEFT** TANK and **RIGHT** TANK. The arrow on the handle of the selector points to the tank which is supplying fuel to the engine. The valve also incorporates a safety latch which prevents inadvertently selecting the "OFF" Position.

Normally fuel is supplied to the engine through an engine-driven fuel pump. An electric fuel pump serves as a back-up feature. The electnc fuel pump is controlled by a rocker switch on the switch panel above the throttle quadrant. The electric fuel pump should be ON when switching fuel tanks and during takeoffs and landings.

Fuel quantity and pressure are indicated on gauges on the instrument panel. There is a separate fuel quantity gauge for each tank.

7.17 ELECTRICAL SYSTEM

All switches are grouped in a switch panel above the power quadrant. On the lower right side of the instrument panel is the circuit breaker panel, with each breaker clearly marked to show what circuit it protects. Also, circuit provisions are made *to* handle the addition of communications and navigational equipment.

Standard electrical accessories include alternator, starter, electric fuel pump, stall warning indicator, ammeter, and annunciator panel.

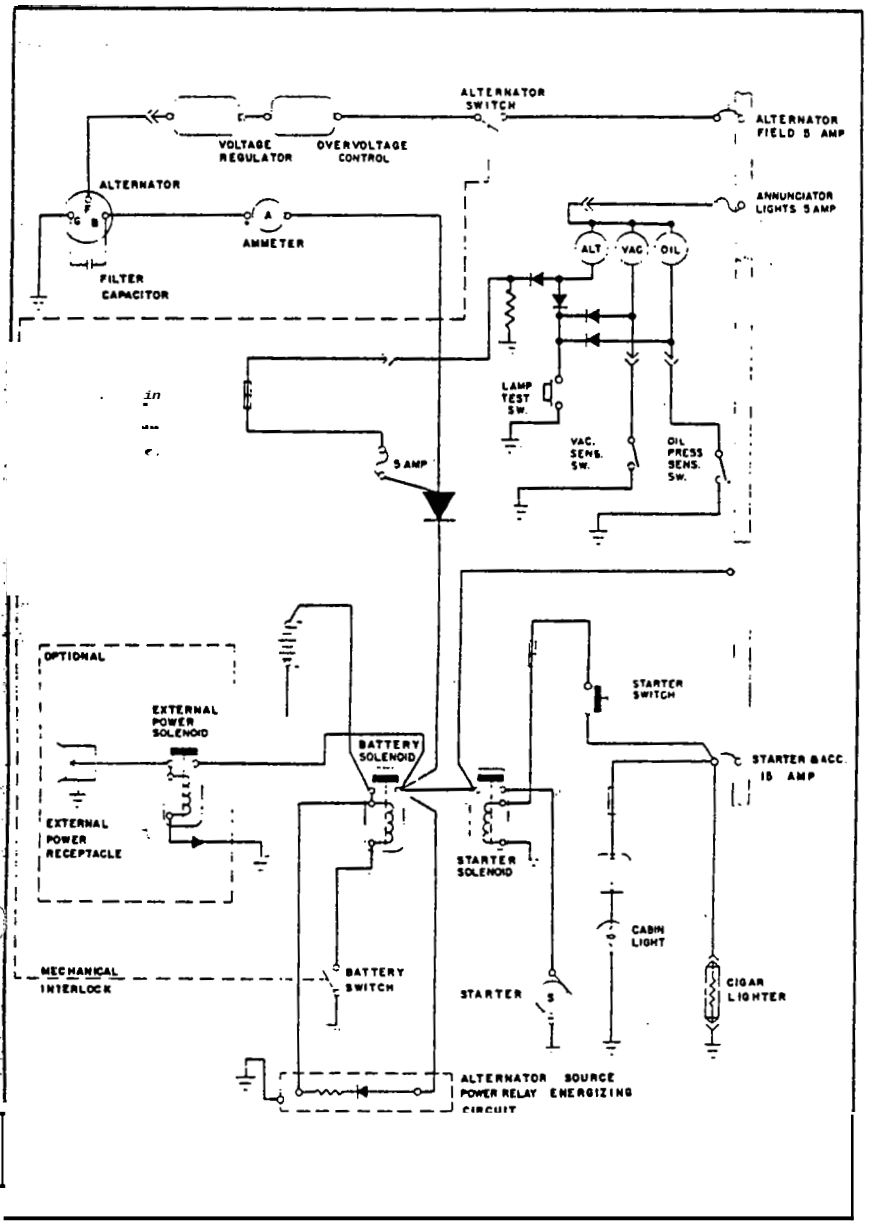
The annunciator panel includes alternator and low oil pressure indicator lights. When the optional gyro system is installed, the annunciator panel also includes a low vacuum indicator light. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly, and that he should check and monitor the applicable system gauge to determine when or if any necessary action is required.

Optional electrical accessories include navigation anti-collision, landing, instrument and cabin dome lights. Navigation and radio lights are controlled by a rheostat switch on the left side of the switch panel. The instrument panel lights are controilcd by a rheostat switch on the right side of the panel.

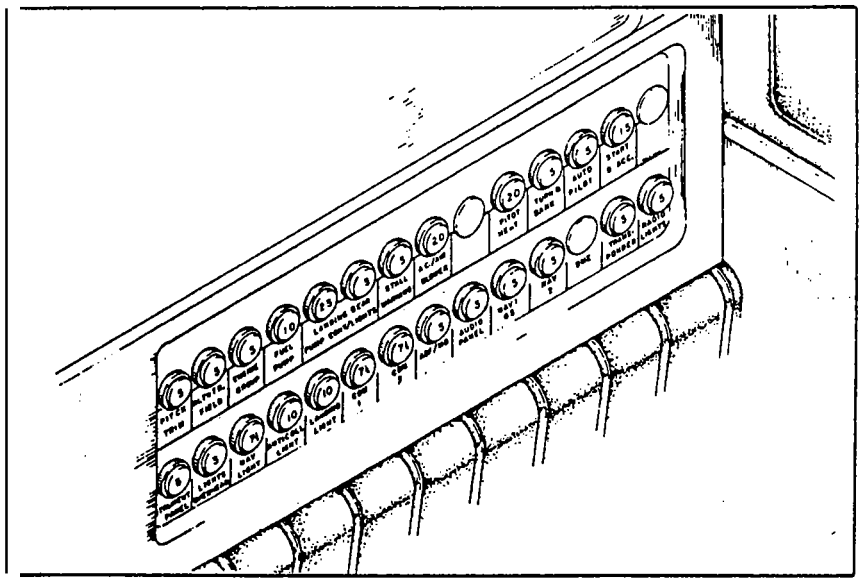
WARNING

When optionai panel lights are installed, rheostat switch must be off to obtain gear lights full intensity during daytime flying. When aircraft is operated at night and panel light rheostat switch is turned on, gear lights will automatically dim.

The anti-collision and landing lights are controlled by rocker switches on the switch panel.



ALTERNATOR AND STARTER SCHEMATIC
Figure 7-15



CIRCUIT BREAKER PANEL
Figure 7-17

WARNING

Strobe lights should not be Operating when flying through overcast and clouds since reflected light **can** produce spacial disorientation. Do not opcrate strobe lights in close proximity to ground, during takeoff and landing.

The master switch also located in the switch panel, is a split rocker switch. **One** side of the switchis the battery side **("BAT")** and the other is the alternator side ('ALT). Henceforth, "master switch" used in this manual, shall **mean** both 'BA?" and "ALT" switches. **The** "ALT" switch is provided for an emergency and its function is covered under "Alternator Failure" in the Emergency section of the handbook.

The primary electrical power source is a 14-volt, 60-amp altemator, which is protected by a voltage regulator and an overvoltage relay. The altemator provides full electrical power output even at low engine RPM. This provides improved radio and electncal equipment Operation and increases battery life by reducing battery load.

Secondary power is provided by a 12-volt, 25-ampere hour battery.

The ammeter as installed does not show battery discharge; rather it shows the electrical load placed on the System. With all thc electrical equipment off, and the master switch on, the ammcter will indicatc thc charging rate of the battery. As each electrical unit is switchcd on, the ammcter will indicate the total ampere draw of all the units including thc battery. For example, thc average continuous load for night flying with radios on is about 30 amperes. The 30 ampere value plus 2 amperes for charging the battery will then show on the ammeter, indicating the altemator is functioning propcrly.

Solenoids, provided in the battery and starter circuits, are used to control high current drain functions remotely from the cabin.

7.19 VACUUM SYSTEM

The vacuum System is designed to operate the air driven gyro instrumenta. This includes the directional and attitude gyros when installed. The System consists of an engine vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The vacuum pump is a dry type pump which eliminates the need for an air/oil Separator and its plumbing. A shear drive protects the engine from damage. If the drive shears the gyros will become inoperative.

The vacuum gauge, mounted on the right instrument panel to the right of the radios, (refer to Figure 7-21) provides valuable information to the pilot about the Operation of the vacuum System. A decrease in pressure in a System that has remained constant over an extended period, may indicate a dirty filter, dirty screens, possibly a sticking vacuum regulator or lcak in system (a low vacuum indicator light is provided in the annunciator panel). Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge Variation from the norm, the pilot should have a mechanic check the System to prevent possible damage to the System components or eventual failure of thc System.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads 4.8 to 5.1 inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located behind the instrument panel.

7.21 PITOT-STATIC SYSTEM

The system supplies both pitot and static pressure for the airspeed indicator, altimeter and vertical speed indicator (when installed).

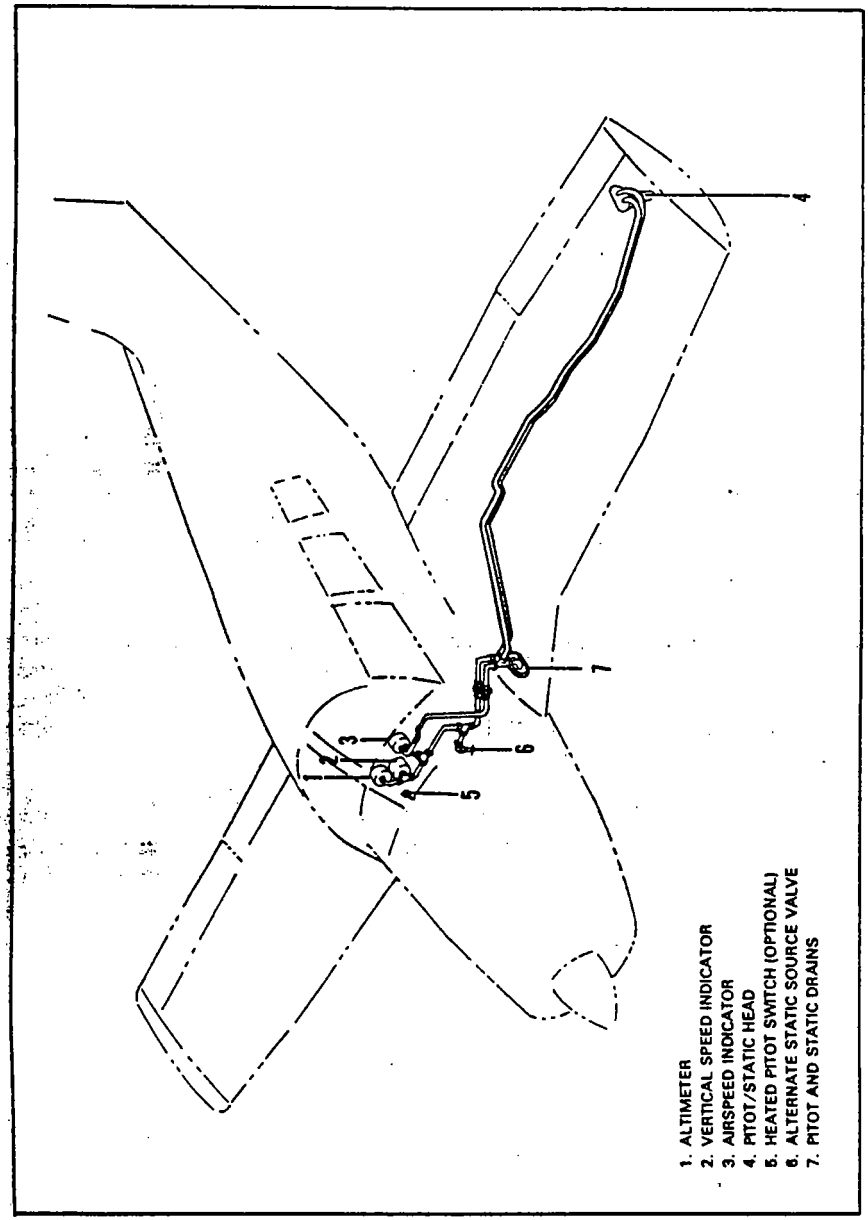
Pitot and static pressure is pickcd up by the pitot head on the bottomof the left wing. An optional heated pitot head, which alleviates problems with icing or heavy rain, is available. The switch for pitot heat is located on the switch panel. Push-button type pitot and static drains are located on the lower left sidewall of the cockpit.

An altcrnate static source is avaiiable as optional equipment. The control valve is located below the left side of the instrument panel. When the valve is set in the altemate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. The storm window and cabin vents must bc'closed and the cabin heater and defroster must be on dunng altemate static source Operation. The altimcter error is less than 50 feet unless otherwise placarded.

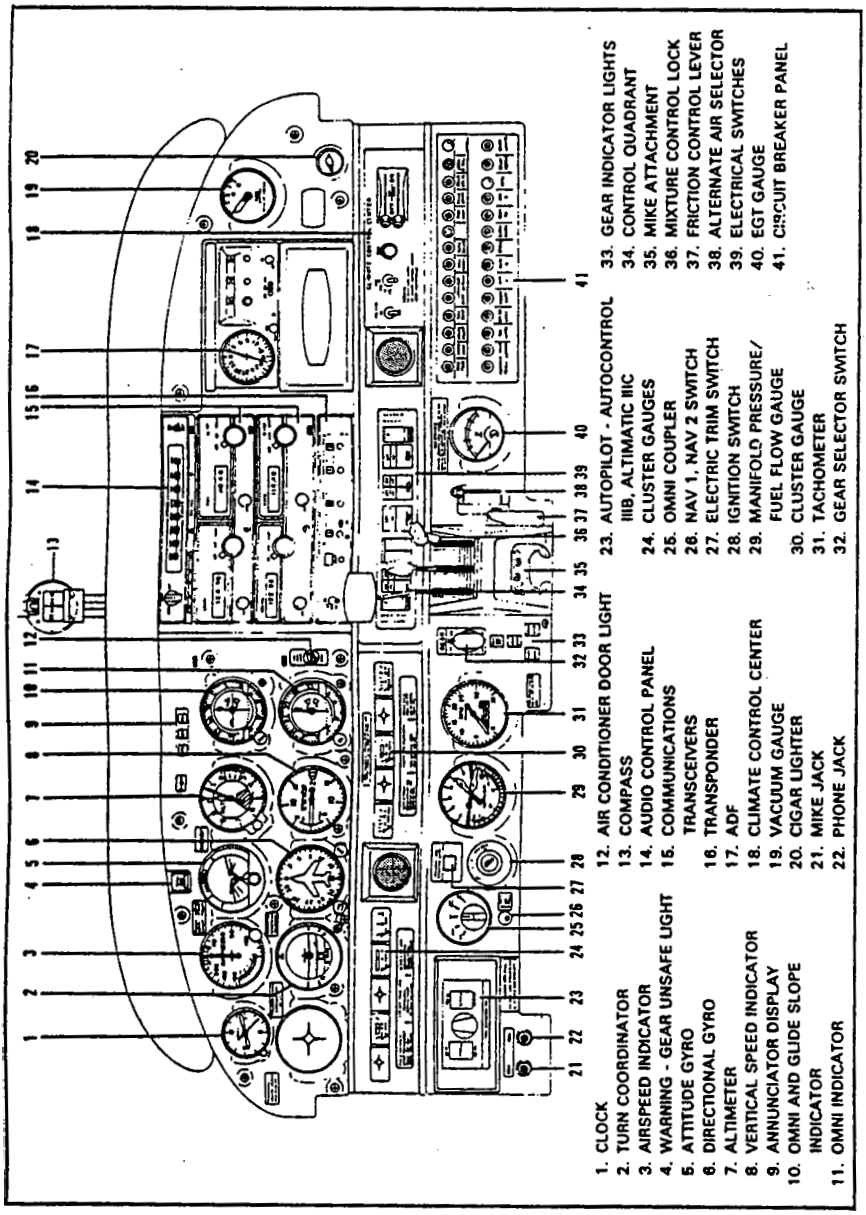
To prevent bugs and water from entering the pitot pressure holes when the airplane is parked, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

NOTE

During preflight, check to make sure the pitot cover is removed.



PITOT-STATIC SYSTEM
Figure 7-19



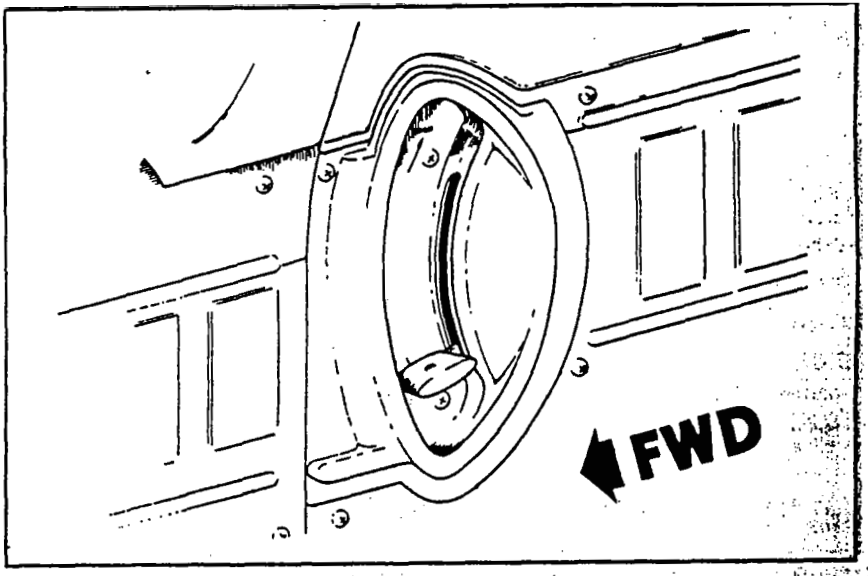
INSTRUMENT PANEL
Figure 7-21

7.23 INSTRUMENT PANEL

The instrument panel is designed to accommodate the customary advanced flight instruments and the normally required power plant instruments. The artificial horizon and directional gyro are vacuum operated and are locatcd in the center of the left hand instrument panel. The vacuum gauge is located on the right hand instrument panel. The turn indicator, on the left side, is electncally operattd.

The radios are located in the center section of the panel, and the circuit breakers are in thc lower nght corner of the panel.

An annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure or vacuum systems.



CABIN DOOR LATCH
Figure 7-23

7.25 CABIN FEATURES

All seat backs have three Position: normal, intermediate and recline. The adjiistment lever is located at the base of the seat back on the outboard side of the seat.. The front seats adjust fore and aft for ease of entry and occupant comfort. An armrest is located on the side panels adjacent otth front seat. The rear seats are easily removed to provide room for bulky items. Rear seat installations incorporate leg retainers with latching mechanisms which must be released before the rear seats can be removed. Releasing the retainers is accompiished by depressing the plunger behind each rear leg. Optional headrests are available.

A single strap shoulder harness controlled by an inertial reel, located above the side window, protects each front seat occupant. Optional shoulder straps for the rear occupants are available. The shoulderstrap is routed over the shoulder adjacent to the window and attached to the lap belt in the general area of the occupant's inboard hip. A check of the inertia reel mechanism can be made by pulling sharply on the strap and checking that the reel will lock in place under sudden stress; this locking feature prevents the strap

from cxtending and holds the occupant in place. Under normal movement the strap will extend and retract as required. Shoulder harnesses should be routinely worn during takeoff, landing and whenever an inflight emergency situation occurs.

Additional features include pilot storm window, two sun visors, ash trays for cach occupant, map pockets located on the side panels below the instrumcnt panel, miscellaneous pockets on the rear of the front seat backs, armrests for the front occupants, cabin or baggage door locks and ignition lock.

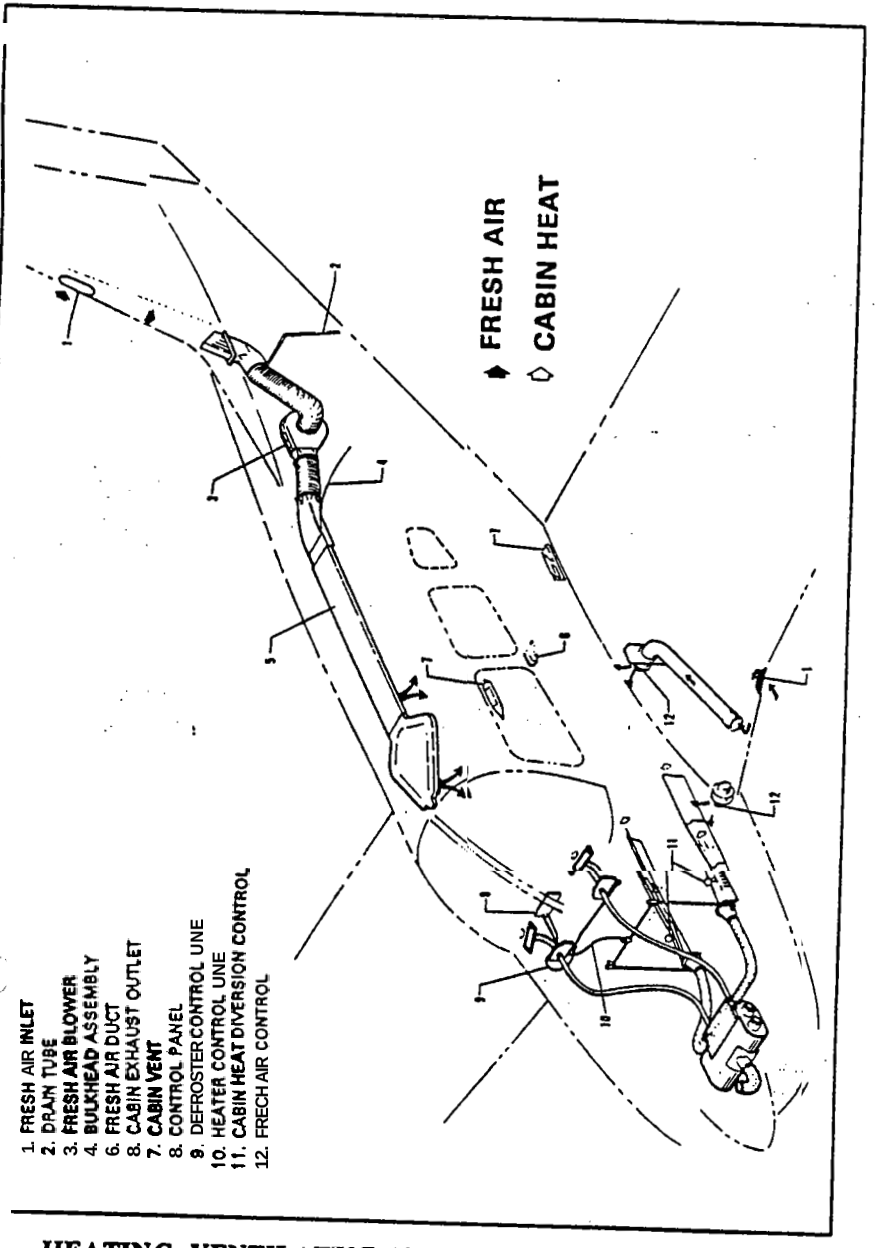
Thc cabin door is double latched. To close thecabin door, hold the door closed with the arm set while moving the side door latch to the "LATCHED" Position. Then engage the top latch. Both latches must be secured before flight.

7.27 BACCACE AREA

A largc baggage area. located behind the rear seats, is accessible either from the cabin or through a large outside baggage door on the right side of the aircraft. Maximum capacity is 200 lbs. Tie-down straps are provided and should bc used at all times.

NOTE

It is the pilot's responsibility to be sure whcn thc baggage is loaded that the aircraft C.G. falls within thc allowable C.G. Range. (See Weight and Balance Section.)



HEATING, VENTILATING AND DEFROSTING SYSTEM
Figure 7-25

7.29 HEATING, VENTILATINC AND DEFROSTING SYSTEM

The heating system is designed to provide maximum comfort for the occupants during winter and cool weather flights. The system includes a heat shroud, heat ducts, defroster outlets, heat and defroster controls.

CAUTION

When cabin heat is operated, heat duct surface becomes hot. This could result in burns if arms or legs are placed too close to heat duct outlets or surface.

An opening in the front of the lower cowl admits ram air to the heater shroud and then the air is ducted to the heater shut-offs on the nght and left side of the fire wall. When the shut-offs are opened the heated airthen enters the heat ducts located along each side of the center console. Outlets in the heat duct are located at each seat location. Airflow to the rear seats can be regulated by controls in the heat ducts located between the front seats. The temperature of the cabin is regulated by the heater control located on the nght side of the instrument panel.

Defrosting is accomplished by heat outlets located on the nght and left side of the cowl cover. Heated air is ducted directly to defroster shut-off valves at the fire wall, then to the defroster outlets. The airflow is regulated by a defroster control located below the heat control.

To aid air distribution, the cabin air is exhausted overboard by an outlet located on the bottom of the fuselage. Cabin exhaust outlets are located below and outboard of the rear seats. The above features are removed when air conditioning is installed.

Optional individual overhead fresh air outlets supply fresh air from an air inlet located on the tip of the vertical fin. The air is directed to a plenum chamber at the base of the fin, then ducted to the individual outlets. For individual comfort, the amount and direction of air can be regulated to control the amount of air and direction of desired airflow. An optional blower is available which forces outside air through the overhead vents for ground use. The blower is operated by a "FAN" switch with 3 positions - "OFF," "LOW," or "HIGH."

7.31 STALL WARNING

An approaching Stall is indicated by a Stall warning hom which is activated. between five and ten knots above Stall speed. Mild airframe buffeting and gentle pitching may also precede the Stall. Stall speeds are shown on graphs in the Performance Section. The Stall waming horn emits a continuous sound. The landing gear waming hom is different in that it emits a 90 cycle per minute beeping sound. The stali warning hom is activated by a lift detector installed on the leading edge of the left wing. During preflight, the Stall waming System should be checked by tuming the master switch "ON," lifting the detector and checking to determine if the hom is actuated.

733 FINISH

Ali extenor surfaces are primed with etching primer and finished with acrylic lacquer. To keep the finish attractive looking, economy size spray cans of touch-up paint are available from Piper Dealers.

735 AIR CONDITIONING*

The air conditioning System is a recircuiating air System. The major components include an evaporator, a condenser, a compressor, a blower, switches and temperature controls.

The evaporator is located behind the rear baggage compartment. This cools the air used for the air conditioning System.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is ON and retracts to aflush position when the System is OFF.

The compressor is mounted on the front right side of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive System of the compressor.

Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

*Optional equipment

The switches and temperature control are located on the lower right side of the instrument panel in the climate control center panel. The temperature control regulates the temperature of the cabin. Turning the control clockwise increases cooling; counterclockwise decreases cooling.

The fan speed switch and the air conditioning **ON-OFF** switch are inboard of the temperature control. The fan can be operated independently of the air conditioning; however, the fan must be on for air conditioner Operation. Turning either switch off will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is tumed on.

NOTE

If the system is not Operating in 5 minutes, turn the system **OFF** until the fault is corrected.

The fan switch allows Operation of the fan with the air'conditioner tumed **OFF** to aid in cabin air circulation. "LOW" or **"HIGH"** can be selected to direct a flow of air through the air conditioner outlets in the overhead duct. These outlets can be adjusted or tumed off individually.

The condenser door light is located to the nght of the engine instrument cluster in front of the pilot. The door light illuminates when the door is open and is **off** when the door is closed.

A circuit breaker on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full forward position, it actuates a micro switch which disengages the comprcssor and retracts the scoop. This allows **maximum** power and maximum rate of climb. The fan continues to opcrate and the air will remain cool for about one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage, the scoop will extend, and the system will again supply cool, dry air.

737 PIPER EXTERNAL POWER*

An optional starting installation known as Piper Extemal Power (PEP) is accessible through a receptacle located on the right side of the fuselagejust aft of thc fire wall. An external battery can be connected to the socket, thus allowing the operator to crank the engine without having to gain access to the airplane's battery.

7.39 EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) meets the requirements of FAR 91.52. It operates on self-contained batteries and is located in the aft fuselage section. It is accessible through a rectangular cover on the right hand side. A number 2 Philiips screwdriver is required to remove the cover.

A battery replacement date is marked on the transmitter. To comply with FAA regulations, the battery must be replaced on or before this date. The battcry must also be replaced if the transmitter has been used in an emergency Situation or if the accumulated test time exceeds one hour, or if the unit has been inadvertently activated for an undetermined time period.

NOTE

If for any reason a test transmission is necessary, the test transmission should be conducted only in the first five minutes of any hour and limited to three audio sweeps. If tests must be made at any othertime, the tests should be coordinated with the nearest FAA tower or flight service station.

NARCO ELT 10 OPERATION

On the ELT unit itself is a three position switch placarded "ON," "OFF" and "ARM." The ARM Position sets the ELT so that it will transmit after impact and will continue to transmit until its battery is drained. The ARM Position is selected when the ELT is installed in the airplane and it should remain in that Position.

*Optional equipment.

To use the ELT as a Portable unit in an emergency, remove thecover and unlatch the unit from its rnounting base. The antenna cable is disconnectcd by a left quarter-turn of the knurled nut and a pull. A sharp tug on the two small wires will break them loose. Deploy the self-contained antenna by pulling the plastic tab rnarked "PULL FULLY TO EXTEND ANTENNA." Move the switch to ON to activate the transmitter.

In the event the transmitter is activated by an impact, it can only be turned off by moving the switch on the ELT unit to **OFF.** Normal Operation can then be restored by pressing the small clear plastic reset button located on the top of the front face of the ELT and then moving theswitchto ARM.

A pilot's remote switch located **on** the left side panel is provided to allow the transrnitter to be turned on frorn inside the cabin. The Pilot's remote switch is placarded "ON" and "ARMED." The switch is normally in the ARMED Position. Moving the switch to ON will activate the transmitter. Moving the switch back to the ARMED Position will turn off the transmitter only if the impact switch has not been activated.

The ELT should be checked to make certain the unit has not been activated during the ground check. Check by selecting **121.50** MHz on an Operating receiver. If there is an oscillating chirping sound, the ELT may have been activated and should be tumed off immediately. This requires removal of the access cover and moving the switch to **OFF,** then press the reset button and return the switch to ARM. Recheck with the receiver to ascertain the transmitter is silent.

CCC CIR 11-2 OPERATION

On the unit itself is a three Position selector switch placarded **"OFF,"** "ARM" and "ON." The ARM Position is provided toset the unit to the automatic Position **so** that it will transmit only after impact and will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the OFF Position. The ARM Position is selected when the transmitter is installed at the factory and the switch should remain in that Position whenever the unit is installed in the airplane. The ON Position is provided **so** the unit can be used as a Portable transmitter or in the event the automatic feature was not triggered by impact or to periodically test the function of the transmitter.

Select the **OFF** Position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

NOTE

If the switch has been placed in the ON Position for any reason, the **OFF** Position has to be selected before selecting ARM. If ARM is selected directly from the ON Position, the unit will continue to transmit in the ARM Position.

A pilot's remote switch, located on the left side panel, is provided to allow the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded "ON," "AUTO/ARM and "OFF/RESET." The switch is normally left in the AUTO/ARM Position. To turn the transmitter off, move the switch momentarily to the **OFF**/RESET Position. The aircraft master switch must be ON to turn the transmitter **OFF. To** actuate the transmitter for tests or other reasons, move the switch upward to the ON Position and leave it in that Position as long as transmission is desired.

The unit is equipped with a Portable antenna to allow the locator to be removed from the aircraft in case of an emergency and used as a Portable signal transmitter.

The locator should be checked during the ground check to make certain the unit has not been accidentally activated. Check by tuning a radio receivcr to **121.50** MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately. Reset to the ARM Position and check again to insure against outside interference.

TABLE OF CONTENTS

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

SECTION 8

AIRPLANE HANDLING, SERVICINC AND MAINTENANCE

8.1 GENERAL

This section providcs general guidelines relating to the handling, servicing and maintcnancc **of** thc Arrow IV.

Evcry owner should stay in close contact with his Piper dcalcr or distributor and Authorized Piper Service Center to obtain the latcst information pertaining to his aircraft and to avail himsclf **of** the Piper Aircraft Scrvice Back-up.

Piper Aircraft Corporation takes a continuing interest in having the owner get the most efficient use from his aircraft and kecping it in thc best mechanical condition. Consequently, Piper Aircraft from time to time issues Service Bulletins, Service Letters and Service Spares Leiters relating to the aircraft.

Service Bulletins arc of special importance and Piper considcrs compliance mandatory. These arc sent directly to the latest FAA-registered owners in the United Statcs **(U.S.)** and Piper Service Ccnters worldwide. Dcpending on thc nature of the release. material and labor allowanccs may apply. This information is provided to all authorized Service Centers.

Service Letters dcal with product improvements and Service hints pertaining to the aircraft. Thcy are sent to dealers, distributors and occasionally (thc factory's discrction) to latest registercd owners, so they can propcrly service thc aircraft and kccp it up to date with the latest changcs. Owncrs should give careful attention to the Service Letter information.

Scrvice Spares Lettcrs offer improvcd parts, kits and optional equipment which wcrc not available originally and which inay bc **of** intcrcst to thc owncr.

If an owner is not having his aircraft serviced by an Authorized Pipcr Service Center, he should periodically check with a Pipcr dealer or distributor to find out the latcst information to keep his aircraft up to daic.

Piper Aircraft Corporation has a Subscripiion Service for the Servic Bulletins. Service Leiters and Service Spares Lcticrs. This scrvicc is offcred to interestcd persons such as owners, pilots and mechanics at a nominal fee, and may be obtaincd through Piper dcalcrs and disiribuiors.

A Service manual, parts catalog, and rcvisions to both, are availahlc from your Pipcr dcaler or distributor. Any corrcspondcncc rcgarding the airplane should include the airplane model and serial number to insur proper response.

8.3 AIRPLANE INSPECTION PERIODS

Piper Aircraft Corporation has developed inspection items and required inspeciion intervals (i.e.; ***50,*** 100, ***500,*** and 1000 hours) for the specific model aircraft. Appropriate forms are contained in the applicable Piper Service/Maintenance Manual, and should be cornplied with by a **properly** trained, knowledgeable, and qualified mechanic at a Piper **Authorize** Service Center or a reputable repair shop. Piper Aircraft **Corporatio** cannot accept responsibility for the continued airworthiness of any aircraft not maintained to these Standards, and/or not brought into cornpliance with applicable Service Bulletins issued by Piper Aircraft Corporation, instructions issued by the engine, propeller, or accessory rnanufacturers, or Airworthiness Directives issued by the FAA.

. **A** programmed inspection. approved by the Fedcral Aviation Administration (FAA), is also availablc to the owner. This involves routine and dctailed inspcctions to allow maximum utilization of thc airplanc. Maintenance inspcction costs are reduced, and the maximurn standard of coniinued airworthiness is maintained. Cornpleic details are available from Piper Aircraft Corporation.

In addition, bui in conjunction with the above, the FAA requircs periodic inspections on all aircraft to keep ihc Airworthiness Certificate in effcct. The owner is responsible for assuring compliance with thcse inspection requirernents and for rnaintaining proper documentation in logbooks and/or rnaintenance records.

A spectographic analysis of the engine oil is available from several sources. This inspection, if performed properly, provides a good check of the internal condition of the engine. To be accurate, induction air filters must be cleaned or changed regularly, and oil samples must be taken and sent in at regular intervals.

8.5 PREVENTIVE MAINTENANCE

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used in air carrier service. The following is a list of the maintenance which the pilot may perform:

(a) Repair or change tires and tubes.
(b) Service landing gear wheel bearings, such as cleaning, greasing or replacing.
(c) Service landing gear shock struts by adding air, oil or both.
(d) Replace defective safety wire and cotter keys.
(e) Lubrication not requiring disassembly other than **removal** of non-structural items such as cover plates, cowling or fairings.
(f) Replenish hydraulic fluid in the hydraulic reservoirs.
(g) Refinish the exterior or interior of the aircraft (excluding balanced control surfaces) when removal or disassembly of any primary structure or operating system is not required.
(h) Replace side windows and safety belts.

(i) Replace seats or seat parts with replaceincnt parts approvcd for thc aircraft.
(j) Replace bulbs, reflectors and lenses of position and landing lights.
(k) Replace cowling not requiring removal of ihe propeller.
(l) Replace, clean or set spark plug clearance.
(m) Replace any Iiose connection, except hydraulic connections, with replacement hoses.
(n) Replacc prefahricated fucl lincs.
(o) Replace thc battery and check fluid level and specific grnvity.

Although thc above work is allowed by law, each individual should ake a self analysis as to whether hc has the ability to perform the work.

If the above work is accomplished, an eniry must bc madc in the appropriatc logbook. The eniry should contain:
(a) The date the work was accomplished.
(b) Description of the work.
(c) Numbcr of hours on ihe aircraft.
(d) The certificate numbcr of pilot pcrforrning the work.
(c) Signature of the individual doing the work.

8.7 AIRPLANE ALTERATIONS

If thc owner desires to have his aircraft modified, hc must obtain FAA approval for the alteraiion. Major alterations accomplished in accordancc with Advisory Circular 43.13-2, when performed by an A & P mcchnnic, may be approved by thc local FAA officc. Major alterations to the basic airframe or systems not covcred by AC 43.13-2 require a Supplemental Type Certificate.

Thc owner or pilot is required to ascertain that ihc following Aircraft pers are in order and in the aircraft.
(a) To be displayed in the aircraft at all times:
(1) Aircrafi Airworthiness Certificate Form FAA-8100-2.
(2) Aircraft Rcgistration Certificate Form FAA-8050-3.
(3) Aircraft Radio Station License if transmitters are installed.

(b) To be carried in the aircraft at all times:
(1) Pilot's Operating Handbook.
(2) Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
(3) Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Logbooks should be complett and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

8.9 GROUND HANDLING

(a) Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the rear baggage compartment or by power equipment that will not damage or excessively strain the nose gear steennng assembly. The steennng bar is engaged by inserting it into the nose wheel axle.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its steering radius in either direction, as this will result in damage to the nose gear and steering mechanism.

CAUTION

Do not tow the airplane when the controls are secured.

In the event towing lines are necessary, ropes should be attached to both main gearstruts as high up on the tubes as possible. Lines should be long cnough to clear the nose and/or tail by not less than fifteen feet, and a qualified person should ride in the pilot's seat to maintain control by use of the brakes.

(b) Taxiing

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a quaiified person authorized by the owner. Engine starting and shutdown procedures as well as taxi techniques should be covered. When it is ascertained that the propeiier back blast and taxi areas are clear, power should be applitd to start the taxi roll, and the following checks should be performed:

(1) Taxi a few feet forward and apply the brakes to determine their effectiveness.
(2) Taxi with the propeller set in low pitch, high RPM Setting.
(3) While taxiing, make slight tums to ascertain the effectiveness of the steering.
(4) Observe wing clearance when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
(5) When taxiing over uneven ground, avoid holes and ruts.
(6) Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that may cause damage to the propeller blades.

(c) Parking

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or ovemight, it is suggested that it be moored securely.

(1) To park the airplane, head it into the wind if possible.
(2) Set the parking brake by pulling back on the brake lever and depressing the knob on the handle. To release the parking brake, pull back on the handle until the catch disengages; then allow the handle to swing forward.

CAUTION

Care should be taken when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

(3) Aileron and stabilator controls should be secured with the front seat belt and chocks used to properly block the wheels.

(d) Mooring

The airplane should be moored for immovabiiity, security and protection. The following procedures should be used for the proper mooring of the airplane:

(1) Head the airplane into the wind if possible.
(2) Retract the flaps.
(3) Immobilize the ailerons and stabilator by looping the seat belt through the control whecl and pulling it snug.
(4) Block the wheels.
(5) Secure tiedown ropes to the wing tiedown rings and to the tail skid at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tiedown ropes from the landing gear forks and securing the rudder.

(6) Install a pitot head cover if available. Besure to remove the pitot head cover before flight.
(7) Cabin and baggage doors should be locked when the airplane is unattended.

8.11 ENGINE AIR FILTER

(a) Removing Engine Air Filter

(1) Remove the upper cowl.
(2) Remove the wing nuts securing the filter box cover. Remove the filter.

(b) Cleaning Engine Air Filter

The induction air filter must be cleaned at least once every 50 hours, and more often, even daily, when Operating in dusty conditions. Extra filters are inexpensive, and a spare should be kept on hand for use as a rapid replacement.

To clean the filter:

(1) Tap the filter gently to remove dirt particles, heing careful not to damage the filter. DO **NOT** wash the filter in any liquid. DO **NOT** attempt to blow out dirt with compressed air.
(2) If the filter is excessively dirty or shows any damage, repiaa it immediately.
(3) Wipe the filter housing with a clean cloth soaked in unleaded gasoline. When the housingis clean and dry, install the filter.

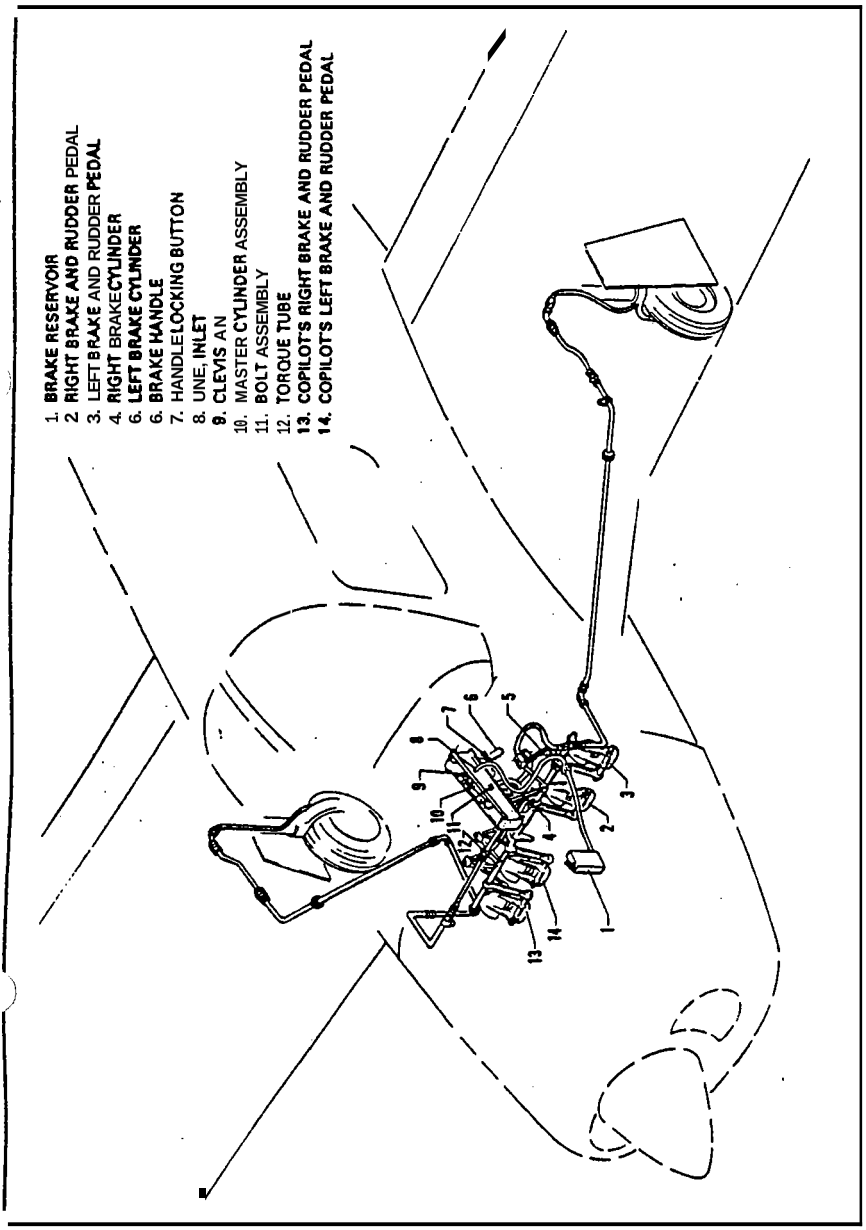
(c) Installation of Engine Air Filter

After cleaning or when repiacing the filter, install the filter in the reverse order of removal.

8.13 BRAKE SERVICE

The brake Systemis filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. The fluid level should be checked periodically or at every 100-hour inspection and replenished when necessary. The brake reservoir is located on the left side of the fire wall in the engine compartment. If the entire system must be refilled, fill with fluid under prtssure from the brake end of the System. This will eliminate air from the System.

No adjustment of the brake clearances is ntcessary. If after extended service brake blocks become excessively wom, they should be replaced with new segments.



BRAKE SYSTEM
Figure 8-1

8.15 LANDING GEAR SERVICE

The main landing gear uses 6.00 x 6 wheels with 6.00 x 6, six-ply rating tires and tubes. The nose wheel uses a 5.00 x 5 wheel with a 5.00 x 5 four-ply rating, type III tire and tube. (Refer to Paragraph 8.23.)

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and the two bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the three through-bolts from the wheel and separating the wheel halves.

Landing gear oleos on the Arrow IV should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until 2.5 ± .25 inches of oleo piston tube is exposed, and the nose gear should show 2.75 ± .25 inches. To add air to the oleo struts, attach a strut pump to the valve assembly near the top of the oleo strut housing and pump the oleo to the desired position. To add oil, jack the aircraft, release the air pressure in the strut, remove the valve core and add oil through this opening with the strut extended. After the strut is full, compress it slowly and fully to aliow excess air and oil to escape. With the strut still compressed reinsert the valve stem and pump up the strut as above.

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 250 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at thc height desired.

The steennq arms from the rudder Pedals to the nose wheel are adjusted at the rudder Pedals or at the nose wheel by turning the threaded rod end bearings in or out. Adjustment is normally accomplished at the forward end of the rods and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. The tuming arc of the nose wheel is 30° in either direction and is factory adjusted at stops on the bottom of the forging.

8.17 PROPELLER SERVICE

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for nicks, scratches, and corrosion. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare. To prevent corrosion, the surface should be cleaned and waxed periodically.

8.19 OIL REQUIREMENTS

The oil capacity of the Lycoming **10-360** series engine is 8 **quarts.** and the minimuin safe quantity is **2** quarts. It is recommended that the oil be changed every 50 hours (not to exceed each **4** months*) and sooner under unfavorable operating condiiions. The following grades are recommended for ihe specciicd temperatures:

Average Ambient Air Temperature For Starting	Single Viscosity Grade	Multi-Viscosity Grades
Above 60°F	SAE ***50***	SAE **40** or **SAE** 50
30" to 90°F	SAE **40**	**SAE** 40
0" to 70°F	SAE **30**	SAE **40 or 20W-30**
Below 10°F	SAE 20	SAE **20W-30**

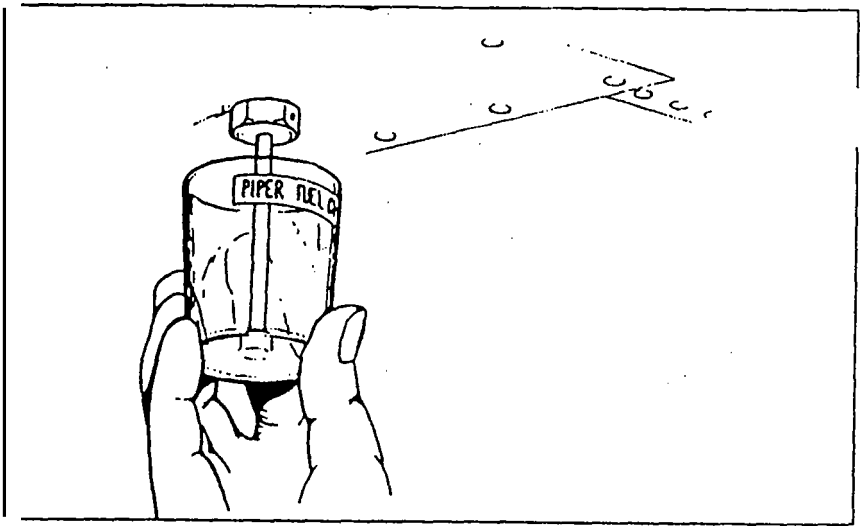
Use of ashless dispersant oil (MIL-L-22851) is recommended after the initial break-in period of ***25*** to 50 hours.*

* Refer io the latest revisiion of Lycoming Service Bulletin **480** for details.

8.21 FUELSYSTEM

(a) Servicing Fuel System

At every 50-hour inspection, the fuel screen in ihe strainer must be cleaned. The fuel strainer is located on the forward left lower side of **ihe** iire wall. It is accessible by removing the lower cowling. **After** cleaning, a small amount **of** grease applied ***to*** the gasket will facilitate reassembly.



FUEL DRAIN
Figure 8-3

(b) Fuel Requirements

Aviation grade fuel with a minimum octanc of 100/130 is specified for this airplane. Since ihe use of lower grades can cause serious engine damage in a **short** period of time, the engine warranty is invalidated by the use of lower octancs. Rcfcr to latest issue of Lycoming Service Instruction I070 **for** approvcd alternate grade fucls.

(c) Filling Fuci **Tanks**

Observe all safety precautions rcquired whcn handling gasoline. Fill ihe fuel tanks through the filler locaicd on the forward slopc of the wing. Each wing **holds** a maximum of 38.5 **U.S.** gallons. Whcn using less than the standard 77 gallon capaciiy, fuel should be distributed equally between each side.

(d) Draining Fuel Strainer, Sumps and Lines

The fuel strainer, located on the lower lcft side of the fire wall, is provided with a quick drain which should be drained before the first flight of the day or after refueling, to check for fuel contamination. If contamination is found, fuel should be drained until the contamination stops. If contamination persists after draining fuel for a minute, coniact a mechanic to check the fuel system.

Each fuel tank is provided with a fuel quick drain to check for contamination. Each tank should be checked for contamination in accordance with the above procedure.

(e) Draining Fuel System

The bulk of the fuel may be drained from the fuel cells by the use of a siphon hose placed in the cell or tank through the filler neck. The rcmaindcr of the fuel may be drained by opening all the drain valves.

CAUTION

When draining fuel, be sure that no fire hazard exists before starting the engine.

8.23 TIRE INFLATION

For maximum service from the tires, kcep them infiated to the proper pressure of 27 psi for nose tire and 30 psi for main tires. All wheels and tires are balanced before original installation, and the relationship of tire, tube and wheel should be maintained upon reinstailation. In the installation of new componcnts, it may be necessary to rebaiance the wheeis with the tires mounted. Unbalanced wheeis can cause extreme Vibration in the landing gear. When checking tire pressure, examine the tires for wear, cuts, bruises and slippage.

8.25 BATTERY SERVICE

Access to the 12-volt battery is gained by removing the upper cowl. It is mounted to the fonvard right side on the face of the fire wall. The battery Container has a plastic drain tube which is normally closed off with a cap. The cap should be opened periodically to remove battery acid which may have collected in the tube.

The battery fluid level must not be brought above the baffle plates. It should be checked every 30 days to determine that the fluid level is proper and the Connections are tight and free of corrosion. Do not fill the battery with acid - use water only.

If the battery is not properly charged, recharge it starting with a rate of four amperes and finishing with a rate of two amperes. The battery should be removed from the airplane for charging, and quick charges are not recommended.

The external power receptacle, if installed, is Iocated on the right side of the fuselage just aft of the fire wall.

Refer to the Arrow IV Service Manual for battery semcing procedure.

8.27 CLEANING

(a) Cleaning Engine Compartment

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent any solvent from entenng these units.

(1) Place a large pan under the engine to catch waste.
(2) With the engine cowling removed, Spray or brush the engine with solvent or a mixture of solvent and dcgreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternator, vacuum pump, starter, or air intakes.

(3) Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

(4) Remove the protective tape from the magnetos.
(5) Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

(b) Cleaning Landing Gear

Before cleaning the landing gear, place a plastic Cover or similar material over the wheel and brakc assembly.

(1) Place a pan under the gear to catch waste.
(2) Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have coiiected, it may be necessary to brush areas that were sprayed, in order to clean them.
(3) Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
(4) Remove the cover from the wheel and remove the catch pan.
(5) Lubricate the gear in accordance with the Lubncation Chart.
(6) Caution: Do not brush the micro switches.

(c) Cleaning Extenor Surfaces

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic sufaces or could cause corrosion of metal. Cover areas where cleaning Solution could cause damage. To wash the airplane, use the following procedure:

(1) Flush away loose dirt with water.
(2) Apply cleaning Solution with a soft cloth, a sponge or a soft bnstle brush.
(3) To remove exhaust stains, allow the Solution to remain on the surface longer.

(4) To remove stubbom oil and grease, use a Cloth dampened with naphtha.
(5) Rinse all surfaces thoroughly.
(6) Any good automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

(d) Cleaning Windshield and Windows

(1) Remove dirt, mud and other loose particles from exterior surfaces with clean water.
(2) Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft Cloth or sponge in a straight back and forth motion. Do not rub harshly.
(3) Remove oil and grease with a Cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachlonde, thinner, acetone, or window cleaning sprays.

(4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft Cloth. Do not use a circularmotion.
(5) A severe scratch or mar in plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

(t) Cleaning Headliner, Side Panels and Seats

(1) Clean headliner, side panels, and seats with a stiff bristle brush, and vacuum where necessary.
(2) Soiled upholstery, except leather, may be cleaned with a good upholstery cleaner suitablt for the material. Carefully foliow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate Ventilation.

(3) Leather should be cleaned with saddle soap or a mild hand soap and water.

(f) Cleaning Carpets

To clean carpets, first remove loose dirt with a whisk broom or vacuum. For soiled spots and stubborn stains use a noninflammable dry cleaning fluid. Floor carpets may be cleaned like aiiy household carpet.

8.29 WINTERIZATION

For winter Operation a winterization kit is installed on the inlet opening of the oil cooler outboard chamber of the plenum chamber. This kit should be installed whenever the ambient temperaturt is 50" F or less. When the kit is not being used it can be stowed on the bracket provided for this purpose on the top side of the oil cooler plenum chamber.

SECTION 9

SUPPLEMENTS

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient Operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

AU of the Supplements provided by this section are 'FAA Approved'' and consecutively numbered as a permanent part of this Handbook. The information contained in each Supplement applies only when the related equipment is installed in the airplane.

SUPPLEMENT 1

AIR CONDITIONINC INSTALLATION

SECTION 1 - GENERAL

This supplcment supplies information necessary for the efficient Operation of the airplane when the optional air conditioning system is installed. The information contained within this supplemcnt is to be used in conjunction with thc complete handbook.

This supplcment has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times whcn the optional air conditioning system is installed.

SECTION 2 - LIMITATIONS

(a) To insure maximum climb performance the air conditioncr must be turned 'OFF" manually pnor to takeoff to disengage thc compressor and retract the condenser door. Also the air conditioner must be tumed "OFF manually before thè landing approach in preparation for a possible go-around.

(b) Placards
In fuil view of the pilot, in the area of the air conditioner controls when the air conditioner is instailed:

"WARNING - AIR CONDITIONER MUST BE OFF TO INSURE NORMAL TAKEOFF CLIMB PERFORMANCE."

In full view of the pilot, to the right of the engine gauges (condenser door light):

"AIR COND DOOR OPEN"

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this Supplement.

SECTION 4 - NORMAL PROCEDURES

Prior to takeoff, the air conditioner should be checked for proper Operation as follows:

(a) Check aircraft master switch "ON."
(b) Turn the air conditioner control switch to 'ON" and the fan switch to one of the Operating positions - the "AIR COND DOOR OPEN" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.
(c) Turn the air conditioner control switch to "OFF - the 'AIR COND DOOR OPEN" waming light will go out, thereby indicating the air conditioner condenser door is in the up Position.
(d) If the "AIR COND DOOR OPEN" light does not respond as specified above. an air conditioner system or indicator bulb malfunction is indicated and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an in flight failure is suspected.

The condenser door light is located to the right of the engine instrument cluster in front of the pilot. The door light illuminates when the door is open and is off when the door is closed.

SECTION 5 - PERFORMANCE

Operation of the air conditioner will cause slight decreases in cruise speed and range. Power from the engine is required to run the compressor, and the condenser door, when extended. causes a slight incrcase in drag. When the air conditioner is turned off there is normally no measureable difference in climb, cruise or range pcrformanu of the airplane.

NOTE

To insure maximum climb performance the air conditioner must be turned off manually before takeoff to disengage the compressor and retract the condenser door. **Also** the air conditioner must be turned off manually before the landing approach in preparation for a possible go-around.

Although the cruise speed and range are only slightly affected by the air conditioner Operation, these changes should be considered in preflight planning. To be conservative, the following figures assume that the compressor is Operating continuously while the airplane is airborne. This will be the case only in extremely hot weather.

(a) The decrease in true airspeed is approximately 6 **KTS** at all power Settings.

(b) The decrease in range may be as much as 40 nautical miles for the **72** gallon usable fuel capacity.

The **climb** performance is not compromised measurably with the air conditioner Operating since the compressor is declutched and the condenser door is retracted, both automatically, when **a** full throttle Position is selected. When the full throttle position is not used or in the event of a malfunction which would cause the compressor to operate and the condenser door to be extended. a decrease in rate of climb of as much as 100 fpm can be expected at all altitudes. Should a malfunction occur which prevents condenser door retraction when the compressor is tumed off, **a** decrease **in** rate of climb of as much as **50** fpm can be expected.

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SUPPLEMENT 2

PIPER ELECTRIC PITCH TRIM

SECTION 1 - GENERAL

This Supplement supplies information necessary for the operation of the airplane when the optionai Piper Electric Pitch Tnm is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This Supplement had been 'FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper Electnc Pitch Tnm is installed.

SECTION 2 - LIMITATIONS

No changes of the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this Supplement.

SECTION 3 - EMERGENCY PROCEDURES

The following information applies in case of electric trim malfunction:

(a) In case of malfunction, disengage electnc pitch tnm by pushing pitch trim switch on instrument panel to off position.
(b) In an emergency, electric pitch tnm may be overpowered using manual pitch trim, and or control wheel pressure.
(c) in cruise configuration, a maifunction can result in a 20" pitch change and 600 ft. altitude Variation.
(d) In approach configuration, a malfunction can result in a 11° pitch change and 200 ft. altitude loss.

SECTION 4 - NORMAL PROCEDURES

The electnc tnm System may be turned ON or **OFF** by a switch located above the ignition switch. The pitch trim may be changed when the electnc trim System is turned on either by moving the manual pitch trim control wheel or by Operating the trim control switch on the pilot's control yoke. **To** prevent excessive speed increase in the event of an electric trim run-away malfunctin, the System incorporates an automatic disconnect feature which renders the System inoperative above approximately 169 **KIAS.** The disconnected condition does not affect the manual trim System.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this Supplement.

SUPPLEMENT 3

AUTOFLITE II AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This Supplement supplies information necessary for the Operation of the airplane when the optional AutoFlite II Autopilot is installed in accordance with STC SA3162SW-D. The information contained within this supplement is to be used in conjunction with the complete handbook.

This Supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional AutoFlite II Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot Operation prohibited above 175 KIAS.
(b) Autopilot must be OFF for takeoff and landing.

SECTION 3 - EMERCENCY PROCEDURES

(a) In case of malfunction, depress interrupt switch on pilot's control wheel, or overpower autopilot at either control wheel.
(b) AutoFlite II master switch - OFF.
(c) In climb, cruise or descent configuration a malfunction with a 3 second delay in recovery initiation may result in a 45° bank and a 300 foot altitude loss. Maximum altitude loss measured at 175 KIAS in a descent.
(d) In approach configuration, coupled or uncoupled; a malfunction with a 1 second delay in recovery initiation may result in a 16° bank and a 80 foot altitude loss.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT **INSPECTION**

(a) AutoFlite II master switch - **ON.**
(b) Rotate **turn** command knob to left and right. Aircraft control wheels should rotate in corresponding directioas.
(c) With AutoFlite II **on,** rotate aircraft control wheel to left and right. Only light forces should be required to ovemde roll servo clutch.
(d) AutoFlite II master switch - **OFF** - rotate control wheel left and **nght** to assure disengagement.

IN-FLIGHT PROCEDURE

(a) Engagement
(1) Check turn command knob in center detent Position.
(2) AutoFlite II master switch - **ON.**

(b) Disengagement
(1) AutoFlite II mastcr switch - **OFF.**

(c) Heading Changes
(1) Move trim **knob** on instrument for drift correction from a constant heading.
(2) Move turn command **knob** for left or nght banked tums. Rotation of knob to stop **will** yield an appropnate bank angle to obtain **an** approximate standard rate tum. Intermediate settings may be used for lesser turn rates.

(d) **OMNI** Tracker
(1) **Turn** command knob - move to center detent position and push **IN to** engage tracker. Aircraft will track desired radial established on **NAV 1** (or **as** selected, if equipped with **a NAV** selector switch).

NOTE

Tracker must be engaged within 10° of being **"on** course," i.e. VOR course needle centered and aircraft heading within a **10"** of VOR course.

(2) Trim knob - push IN for high sensitivity. Use high sensitivity position for localizer tracking and as desired for OMNE tracking.

(e) Maintain directional trim during all autopilot Operations.

SECTION 5 • PERFORMANCE

No changes to the basic Performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this Supplement.

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SUPPLEMENT 4

AUTOCONTROL IIIB AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplcmcnt supplies information necessary for thc opcration of thc airplanc whcn ihc optional Pipcr AutoControl IIIB is installcd in accordance with STC SA3161SW-D. The informaiion contained within this supplement is to bc uscd in conjunction with thc complcie handbook.

This supplcmcnt has been "FAA Approved" as a permanent part of this haiidbook and must remain in this handbook at all times when thc optional Piper AutoControl IIIB Autopilot is installcd.

SECTION 2 - LIMITATIONS

(a) Autopilot operation prohibitcd above 175 KIAS.
(b) Autopilot OFF for takcoff and landing.

SECTION 3 - EMERGENCY PHOCEDUKES

(a) In an emcrgcncy thc autopilot can be disconnected by:
(1) Pushing the roll ON-OFF rockcr switch - OFF.

(h) The autopilot can be overpowered at cither control whecl.

(c) An autopilot runaway, with a 3 second delay in the initiation of rccovery, while operating in a climb, cruise or dcsccnding flight, could rcsult in a 45" bank and a 300 foot altitude loss. Maximum altitude loss mcasurcd at 175 KIAS in a descent.

(d) An autopilot runaway, with a 1 second delay in the initiation of rccovcry, during an approach opcration, coupled or uncouplcd, could rcsult in a 16" bank and a 80 foot altitude loss.

(e) Emergency operation with optional NSD 360A (HSI) - Slaved and/or Non-Slavcd:

NSD **360A**

(1) Appearance of HDC flag:
   a. Check air suppiy gauge (vac or pressure) for adequate air suppiy (4 in. Hg. min.)
   b. Check compass circuit breaker.
   c. Observe display for proper operation
(2) To disable heading card - pull circuii brcakcr and use magnetic compass for dircctionüi daia. (Faciory insiriiiations may utilize NSD and electric trim circuit breakcr.)

NOTE

If hcading card is not opcrationai. autopilot shouid not bc used.

(3) Wiih card disabicd, VOR/Localizer and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
(4) Slaving Faiiure - (i.e. failure to self-correct for gyro drift):
   a. Check thai gyro slaving swiich is set to No. 1 Position (if equipped with Siave No. 1 - No. 2 swiich) or "Slaved" Position when equipped with Slnved and Frec Gyro Mode Swiich.
   b. Check for HDG flag.
   c. Check compass circuii brcaker.
   d. Reset hcading card while observing slaving mctcr.

NOTE

Dead siaving meter necdle or a nccdic displaced fully one direction indicates a siaving system failure.

   e. Select slaving amplifier No. 2, if equipped. If not equipped, proceed wiih itcm g bclow.
   f. Reset heading card while checking slaving meter. If proper slaving indication is not obiained.
   g. Switch to frec gyro modc and periodically sct card as unslaved gyro.

NOTE

In the localizer mode, the TO-FROM arrows may remain out of view, depending upon the design of the NAV converter used in the installation.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION

(a) AUTOPILOT

(1) Place Radio Coupler (if installed) in HDG mode and piace the AP ON-OFF switch to the ON position to engage roll section. Rotate roii command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.

(2) Set proper D.G. heading on D.G. and turn HDG bug to aircraft heading. Engage HDG mode rocker switch and rotate HDG bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.

(b) RADIO COUPLER - (OPTIONAL)

(1) Tune and identify VOR or VOT station. Position Radio Coupler to OMNI mode. Engage autopilot ON and HDG switches. Set HDG bug to aircraft headingand rotate O.B.S. to cause OMNI indicator needle to swing left and right slowly. Observe that control wheel rotates in direction of needle movement.

(2) Disengage AP ON-OFF switch. Reset Radio Coupler control to HDG.

IN-FLIGHT

(a) Trim airplane (ball centered):

(b) Check air pressure/vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.

(c) Roll Section

(1) To engage, center ROLL knob. push **AP** ON-OFF switch to On Position. To turn, rotate console ROLL knob in desired direction (Maximum angle of bank should not exceed 30°.)

(2) For heading mode, set directional gyro with magnetic compass. Push directional gyro **HDG** knob in, rotate bug to aircraft heading. Push console heading rocker **(HDG)** switch to ON Position. To select a new aircraft heading, push D.G. heading knob IN and rotate, in desired direction of turn, to the desired heading.

(d) Radio Coupling VOR-ILS with **HSI** Type Instrument Display - (Optional)

(1) VOR Navigation

a. Tune and identify VOR station. Select desired Course with **O.B.S.** (HSI Course Knob).

b. Select OMNI mode on radio coupler.

c. Select **HDG** mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR Course. Intercept angle magnitude depends on radio needle off Course magnitude, 100% needle deflection will result in 45° intercept with the intercept angle diminishing as the needle **off** set diminishes.

d. NAV **mode** - NAV modc provides reduced **VOR** sensitivity for tracking weak, or noisy **VOR** signals. NAV **mode** should be selected after the aircraft is established on Course.

(2) 'ILS-LOC Front Course

a. Set inbound, front, localizer course on ***O.B.S.*** **(HSI** Course Knob).

b. Select LOC-Normal on radio coupler to intercept and track inbound **on** the localizer. Select LOC-REV to intercept and track outbound to the procedure turn area.

c. Select **HDG** mode on autopilot console to engage coupler.

(3) ILS - Back Course
   a. Set inbound, front localizer Course on O.B.S. (HSI Course Knob).
   b. Select LOC-REV **on** radio coupler to intercept and track inbound on the back localizer Course. Select LOC-NORM to intercept outbound on the back Course to the procedure turn area.
   c. Select HDG mode **on** autopilot console to engage coupler.

(e) Radio Coupling - VOR/ILS with Standard directional gyro-(Optionai)

Radio Coupler Operation in conjunction with a Standard directional gyro and VOR/LOC display differs from Operation with an integrated display (HSI) only in one respect. The HDG bug is used as the radio Course datum and therefore must be **set** to match the desired VOR Course as selected on the **O.B.S.**

(1) For VOR Intercepts and Tracking:
Select the desired VOR **course** and set the HDG bug to the same heading. Select OMNI mode on the coupler and HDG mode on the autopilot console.

(2) For **ILS** Front Course Intercepts and Tracking:
Tune the localizer frequency and place the HDG bug **on** the inbound, front course heading. Select LOC-NORM mode **on** the coupler and HDG mode **on** the autopilot console.

(3) For LOC Back Course Intercepts and Tracking:
Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode with coupler and HDG mode on the autopilot console.

SECTION 5 - PERFORMANCE

No changes to the basic Performance provided by Section **5** of this Pilot's Operating Handbook are necessary for this Supplement.

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SUPPLEMENT 5

ALTIMATIC IIIC AUTOPILOT INSTALLATION

SECTION 1 • GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AltiMatic IIIC Autopilot is installed. The information contained within this supplement is to be used in conjunction with the complete handb**ook.**

This supplement has been "FAA Approved" as a permanent part of this handbook based on EDO-AIRE Mitchell STC SA3323SW-D and must remain in this handbook at all times when the optional AltiMatic **IIIC Autopilot is installed.**

SECTION 2 - LIMITATIONS

(a) Maximum speed for autopilot operation is 175 KIAS. (Autopilot Vmo)
(b) **A** Placard stating "Conduct trim check pnor to flight - (See **POH)"** to be installed **in** clcar view of the pilot.
(c) Autopilot **OFF** dunng takeoff and landing.
(d) During autopilot Operation, the pilot must be **in** his scat with the safety belt fastened.

SECTION 3 - EMERGENCY PROCEDURES

This aircraft is equipped with a Master Disconnect/Interrupt Switchon the pilot's control wheel. When thc switch button is depressed it **will** disconnect the autopilot. When depressed and held it **will** interrupt all Electric Elevator **Tnm** Operations. Trim Operations **will** be restored when the switch is released. If an autopilot or tnm emergency is encountered, do not attempt to determine which system is at fault. Immediately depress and hold the Master Disconnect/Interrupt button. Turn **off** autopilot and tnm master switch and retrim aircraft, then release the interrupt switch.

NOTE

Dunng examination of this Supplement, the pilot is advised to locate and identify the autopilot controls, the tnrn master switch and circuit breaker for both systems.

(a) In the event of an autopilot malfunction the autopilot can be:
(1) Overpowered at either control wheel.

CAUTION

Do not overpower autopilot pitch axis for periods longer than 3 seconds because the autotnm system will operate in a dircction to oppose the pilot and will, thereby, cause an increase in the pitch overpower forces.

(2) Disconnected by depressing the Master Disconnect/Interrupt Switch
(3) Disconnected by depressing the Trim Switch "AP OFF" bar.
(4) Disconnected by pushing the roll rocker switch "OFF."

(b) In the event of a trim malfunction:
(1) Depress and hold the Master Trim Interrupt Switch.
(2) Trim Master Switch - "OFF." Retrim aircraft as necessary using manual tnm system.
(3) Release Master Interrupt Switch - be alert for possible trim action.
(4) Trim Circuit Brcaker - Pull. Do not operate trim until problem is corrected.
(5) If the tnm system operates only in one direction, pull the circuit breaker and do not operate the tnm system until corrective action is taken. Monitor autopilot Operation closely when Operating without trim follow-up.

(c) If a trim runaway occurs with the autopilot Operating, the above procedure will disconnect the autopilot which will immediately result in higher control wheel forces. Be prepared to manuaiiy retrim, as necessary to eliminate undesirable foras.

(d) Altitude Loss During Malfunction:

(1) An autopilot malfunction during climb, cruise or descent with a 3 second delay in recovery initiation could result in as much as 55° of bank and 500 foot of altitudc loss. Maximum altitudc loss was recorded at 175 KIAS during descent.

(2) An autopilot malfunction during an approach with a 1 second delay in recovery initiation could result in as much as 16° of bank and 100 foot altitude loss. Maximum altitudc loss measured in approach configuration and Operating cithcr coupled or uncoupled.

(c) Emergency Operation With Optional NSD 360A (HSI)- Slaved and/or Non-Slaved

NSD 360A

(1) Appearance of HDG Flag:

a Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg. min.).

b. Check compass circuit breaker.

c. Observe display for proper operation.

(2) To disable heading card - pull circuit breakcr and use magnetic compass for directional data.

NOTE

If heading card is not operational, autopilot should not be used.

(3) With card disabled, VOR/Localizer and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.

(4) Slaving Failure - (i.e. failure to self-correct for gyro drift):

a. Check gyro slaving switch is sct to No. 1 position (if equipped with Slave No. 1 - No. 2 switch) or 'Slaved" position when equipped with Slaved and Free Gyro Mode Switch.

b. Check for HDG Flag.

c. Check compass circuit breaker.

d. Reset heading card while observing slaving meter.

NOTE

Dead slaving meter needle or a needle displaced fully one direction indicates a slaving system faiiure.

e. Select slaving amplifier No. 2, if equipped. If not equipped, proceed with g below.
f. Reset heading card while checking slaving meter. If proper slaving indication is not obtained,
g. Switch to free gyro and periodically set card as unslaved gyro.

NOTE

In the localizer mode the "TO-FROM" arrows may remain out of view, depending upon the dcsign of the NAV converter used in the installation.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION - AUTOPILOT

(a) Roll Section
  (1) Place Radio Coupler in "Heading" mode and place roll rocker switch "ON" to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
  (2) Set proper D.G. Heading on D.G. and turn Heading Bug to aircraft heading. Engage "Heading" mode rocker switch and rotate heading bug right and left. Aircraft control wheelshould turn same direction as bug. Grasp control wheel and manually ovemde servo, both directions.
  (3) Disengage autopilot by depressing trim switch. Check aiieron Operation is free and autopilot is disconnected from controls.

(b) Pitch Section
  (1) Engage "Roll" rocker switch.
  (2) Center pitch command disc and engage "Pitch" rocker switch.
  (3) Rotate pitch command disc full UP and full DOWN and check that control wheel moves same direction. Check to see that servo can be ovemden by hand at control wheel.

NOTE

- Autopilot might not be able to raise elevators on ground, without assistance from pilot.

(4) Hold control wheel and disengage autopilot by pressing Master Autopilot Disconnect/Trim Interrupt Switch button. Check Roll and Pitch controls to assure autopilot has disconnected.

TRIM SYSTEM

General

This aircraft is equipped with a Command Trim System designed to withstand any type of single malfunction, either mechanical or electrical, without uncontroiied opcration resulting. The preflight check procedure is designed to uncover hidden failures that might otherwise go undetected. Proper operation of the electric trim system is predicated on conducting the following preflight check before each flight. If the trim System fails any portion of the procedure, pull the trim circuit breaker out until trim system is repaired. Substitution of any trim system component for another model is not authorized. For emergency interrupt information, refer to Section 3 of this Supplement.

Command Electric Trim Switch

The Command Electric Trim Switch on the left hand portion of the pilot's control wheel has two functions:

(1) When the top bar (AP OFF) is pressed, it disconnects the Autopilot.

(2) When the top bar is pressed AND the rocker is moved fonvard. nose down tnm will occur, when moved aft, nose up trim will occur.

(a) Preflight: Command Trim - Before Each Flight

(1) Check tnm circuit breaker - IN.

(2) Trim Master Switch - ON.

(3) AP OFF - Check normal trim Operation - UP. Grasp trim wheel and check ovemdc capability. Check nose down Operation. Recheck ovemde.

(4) With trim Operating - depress interrupt switch - trim should stop - release interrupt switch - trim should operate.

(5) Activate center bar only. Push rocker fore and aft only. Trim should not operate with either separate action.

b) Autotrim - Before Each Flight
(1) AP **ON** - (Roll and Pitch Sections) Check automatic Operation **by** activating autbpilot pitch command UP then **DN**. Observe trim Operation follows pitch command direction.

NOTE

In autopilot mode, there will be approximately a 3 second delay between Operation of pitch command and Operation of tnm.

(2) Press ccntcr bar (AP **OFF**) - release - check autopilot disengagement.
(3) **Rotate** trim wheel to check manual trim Operation. Reset to takeoff position pnor to takeoff.

TOPILOT IN-FLIGHT PROCEDURE

(a) Tnm **airplane** (ball ctntered).

(b) Check air pressure or vacuum to ascertain that the directional gyro and attitude ***gyro*** are receiving sufficient air.

(c) Roll Section
(I) To **engage** - Center ROLL knob, push ROLL rockcr to "ON" position. To turn, **rotate console** ROLL' knob **in** desircd direction.
(2) For heading **mode, set** directional ***gyro*** with magnetic compass. Push directional ***gyro*** **HDG** knob in, rotate **to** select desired hcading. **Push** console heading rocker (HDG) to **"ON"** position. (Maximum angle ***to*** bank **will** be 20° with heading lock **engaged.)**

(d) Pitch Section (Roll section must **be** engaged prior to pitch section engagement).
(1) Center pitch trim indicator with the pitch command disc.
(2) Engage pitch rocker switch. To change attitudc, rotate pitch command disc **in** the desired direction.

(e) Altitude Hold

Upon reaching desired or cruising altitude, engage altitude hold mode rocker switch. As long as Altitude Hold mode rocker is engaged, aircraft will maintain selected altitude. For maximum passenger comfort, rate of ciimb or descent should be reduced to approximately **500 FPM** pnor to altitude hold engagement. For accurate Altitude Holding below **80** KIAS lower flaps one or two notches.

NOTE

Prior to disengaging Altitude Hold mode, rotate Pitch Command Disc to center.

(f) Radio Coupling VOR-ILS with H.S.I. type instrument display. (Optional)

(1) VOR Navigation

a. Tune and identify VOR Station. Select desired course by rotating CRS knob of **H.S.I.**

b. Select OMNI mode **on** Radio Coupler.

c. Select HDG mode on autopilot **console** to engage coupler.. Aircraft will turn to a 45° intercept angle to intercept the selected **VOR** course. Intercept **angle** magnitude depends **on** radio needle **off - course** magnitude, 100 % needle deflection **will** result in 45° intercept angle, diminishing as the needle off-set diminishes.

d. NAV mode - NAV mode provides reduced **VOR** sensitivity for tracking ***weak,*** or noisy, **VOR** signals. NAV mode should be selected after the aircraft is established on course.

(2) ILS-LOC Front Course

a. Set inbound, front, localizer course with H.S.I. **course** knob.

b. Select LOC-Normal **on** Radio Coupler to intercept and track inbound **on** the localizer. Select LOGREV to intercept and track the localizer course outbound to procedure turn area.

c. **Select** HDG mode **on** autopiiot console to engage coupler.

(3) ILS - Back Course
   a. Set inbound, front, localizer Course with H.S.I. Course knob.
   b. Select LOC-REV, on radio coupler to intcrcept and track inbound on the back localizer Course. Select LOC-NORM to intercept and track outbound on the back Course to the proccdurc turn area.
   c. Engage HDG mode on autopilot console to engage coupler.

(g) Radio Coupling - VOR/ILS with Standard directional gyro. (Optionai)

Radio Coupler Operation in conjunction with a Standard directional gyro and VOR/LOC display differs from Operation with an integrated display (H.S.I.) only in one respect. The HDG bug is used as the radio course datum and therefore must be set to match the desired VOR/ILS Course as selected on the O.B.S.

(1) For VOR Intercepts and Tracking:
Select the desired VOR Course and set the HDG bug to the same heading. Select OMNI mode on the coupler and engage HDG mode on the autopilot console.

(2) For ILS Front Course Intercepts and Tracking:
Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and engage HDG mode on the autopilot console.

(3) For LOC Back Course Intercepts and Tracking:
Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode on the coupler and engage HDG modc on the autopilot console.

(h) Coupled Approach Operations

(1) VOR or LOC
   a. After amval at the VOR Station, track outbound to the proccdure turn area as described in Section 4 (f) or (g) as appropriate. Slow to 90-100 KIAS and lower flaps as desired.
   b. Use HDG mode and Pitch or Altitude Hold modes as appropnate during proccdurc turn.

c. At the F.A.F. inbound, return to pitch mode forcontrol of descent and lower landing gear.

d. At the M.D.A. select altitude hold mode and add power for level flight. Monitor altimeter to assure accurate altitude control is being providtd by the autopilot.

e. Go-Around - For missed approach select desired pitch attitude with pitch command disc and disengage altitude hold mode. This will initiate the pitch up attitude Change. Immediately add takeoff power and monitor Altimeter and rate of climb for positive climb indication. After climb is established, retract flaps and gear. Adjust attitude as necessary for desired airspeed and select **HDG** mode for turn from the **VOR** final approach Course.

(2) ILS - Front Course Approach With Glide Slope Capture. (Optionai)

a. Track inbound to **LOM** as described in Section 4 (f) or (g) above and in Altitude Hold mode.

b. Inbound to **LOM** slow to 90 to 100 KIAS and lower flaps as desired.

c. Automatic Glide Slope capture will occur at Glide Slope intercept if the following conditions are met:

1. Coupler in LOC-Normal mode.
2. Altitude Hold mode engaged (Altitude Rocker on Console).
3. Under Glide Slope for more than 20 seconds.
4. Localizer radio frequency selected on NAV Receiver.

d. At Glide Slope Intercept immediately lower landing gear and reduce power to maintain approximately 80-90 KIAS on final approach. Glide Slope capture is indicated by lighting of the green Glide Slope engage Annunciator Lamp and by a slight pitch down of the aircraft.

e. Monitor localizer and Glide Slope raw data throughout approach. Adjust power as necessary to maintain correct final approach airspeed. All power changes should be of small magnitude and smoothly applied for best tracking Performance. Do not change aircraft configuration during approach while autopilot is engaged.

f. Conduct missed approach maneuver as described in (h) (1) e. above.

NOTE

Glide Slope Coupler will not automatically decouple from Glide Slope. Decoupling may be accomplished by any of the following means:
1. Disengage Altitude Mode.
2. Switch Radio Coupler to HDG Mode,
3. Disengage Autopilot.

4

SECTION 5 • PERFORMANCE

No changes to the basic performance provided by Section 5 of thc Pilot's Operating Handbook are necessary for this Supplement.

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SECTION 10

SAFETY TIPS

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SECTION 10

SAFETY TIPS

10.1 GENERAL

This section provides safety tips of particular value in the operation of the Arrow IV.

10.3 SAFETY TIPS

(a) Learn to trim for takeoff so that only a very light back pressure on the control wheel is required to lift the airplane off the ground.

(b) The best speed for takeoff is about 70 KIAS under normal conditions. Trying to pull the airplane off thc ground at too low an airspeed decreases the controllability of the airplane in thc event of engine failure.

(c) Flaps may be lowered at airspeeds up to 108 KIAS. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the fiaps. The flap step will not support weight if the flaps are in any extended position. The flaps must be placed in the "UP" position before they will lock and support weight on thc step.

(d) Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.

(e) Before starting the engine, check that all radio switches, light switches and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.

(f) Strobe lights should not be Operating when flying through overcast and clouds, since reflected light can produce spacial disorientation. Do not operate strobe lights when in close proximity to ground.

(g) The rudder pedais are suspended from a torque tube which extends across the fuseiage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedais or Operating the toe brakes.

(h) In an effort to avoid accidents, pilots should obtain and study the safety reiated information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

(i) Prolonged slips or skids which result in excess of 2000 ft. of altitude loss, or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when tank being used is not full.