SECTION I. GENERAL

A. Registration Particulars

1. Airplane designation: PIPER CHEROKEE, Model PA-28-180.
2. Registration Marks: G-BCCF.
3. Constructor's Serial Number: 28-7405069.
4. Designed and Constructed by: Piper Aircraft Corporation
   Vero Beach, Florida, U.S.A.
   32960
5. F.A.A. Certificate of Airworthiness for Export:
   Number: _____
   Date of Issue: _____
6. Model PA-28-180 British Flight Manual, Piper Aircraft Corporation Report VB-462, Approved by the Secretary, Civil Aviation Authority on: 26 March 1973.
7. This airplane shall be operated in accordance with the limitations in Section II and any additional limitations in the Supplements contained in Section VI.

"This is the flight ma
Certificate of Airworthine

This is the Flight Manual which forms part of the Certificate of Airworthiness for aircraft G-BCCF

WARNING

THE RUDDER PEDALS ARE SUSPENDED FROM A TORQUE TUBE WHICH EXTENDS ACROSS THE FUSELAGE. THE PILOT SHOULD BECOME FAMILIAR WITH THE PROPER POSITIONING OF HIS FEET ON THE RUDDER PEDALS SO AS TO AVOID INTERFERNECE WITH THE TORQUE TUBE WHEN MOVING THE RUDDER PEDALS OR OPERATING THE TOE BRAKES.

APPROVED AEROPLANE FLIGHT MANUAL

FOR THE PIPER MODEL -

PA-28-180

PREPARED IN ACCORDANCE WITH BRITISH
CIVIL AIRWORTHINESS REQUIREMENTS

Rev. 2

SERIAL NUMBER: 28-7305001 to 28-7505259

PREPARED BY: J. M. Sheehan
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John Patrick
Manager, Flight Test

ISSUE DATE: 11 September 1972

DOA SO-1 APPROVED

FAA DOA
APPROVAL BY: H. W. Barnhouse
H. W. Barnhouse
FAA/DOA Coordinator

SECTION I. GENERAL (continued)

B. Table of Contents

SECTION I. GENERAL (continued)

SECTION I. GENERAL (continued)

LIST OF ILLUSTRATIONS

SECTION I. GENERAL (continued)

SECTION I. GENERAL, (continued)

C. Amendment System

The current amendment state of this manual is noted on the amendment record sheet (Page 7). Amendments to the text are indicated by a vertical line in the margin together with the revision number. The revision number and the revision date are given in the margin of the revised page. This revision number supersedes the original issue and all previous revisions and contains the latest approved information pertinent to the airplane.

Amendments to supplements published by another organization other than Piper Aircraft Corporation, and included in this manual without the consent of Piper Aircraft Corporation, are the responsibility of that organization. These amendments will not necessarily be reflected on the amendment record sheet of Page 79 of Section VI.

A record of approved supplements and their embodiment into the manual is provided for on Page 79 of Section VI.

PREPARED	PIPER AIRCRAFT CORP.	REPORT VB-462
CHECKED	DEVELOPMENT CENTER, VERO BEACH, FLA.	MODEL PA-28-180
APPROVED		PAGE 7

UNITED STATES F.A.A.

AMENDMENT RECORD SHEET

REVISION NO.	DATE OF REVISION- DAY	MO.	YR.	REVISED BY	APPROVAL DATE (CAA) DAY	MO.	YR.	REVISION TITLE	PAGES AFFECTED
1	5	3	73	JMS	26	3	73	Revised Zero Fuel Wgt Limit	14
								Revised Items 11 and 14	24,25
								Revised Item A.1.	51
								Revised Data and Graphs	57,58,60,62, 63,64,65,66, 68,69,73 and 75
								Improved Printing Quality	71
2	25	2	77	RKK	14	4	77	Added Closing Serial number to effectivity.	Title
								Clarified drawing.	53

H.W. Dankhouse
DOA SO-1 APPROVED

Ward Evans

PREPARED	PIPER AIRCRAFT CORP.	REPORT VB-462
CHECKED	DEVELOPMENT CENTER, VERO BEACH, FLORIDA	MODEL PA-28-180
APPROVED		PAGE 8

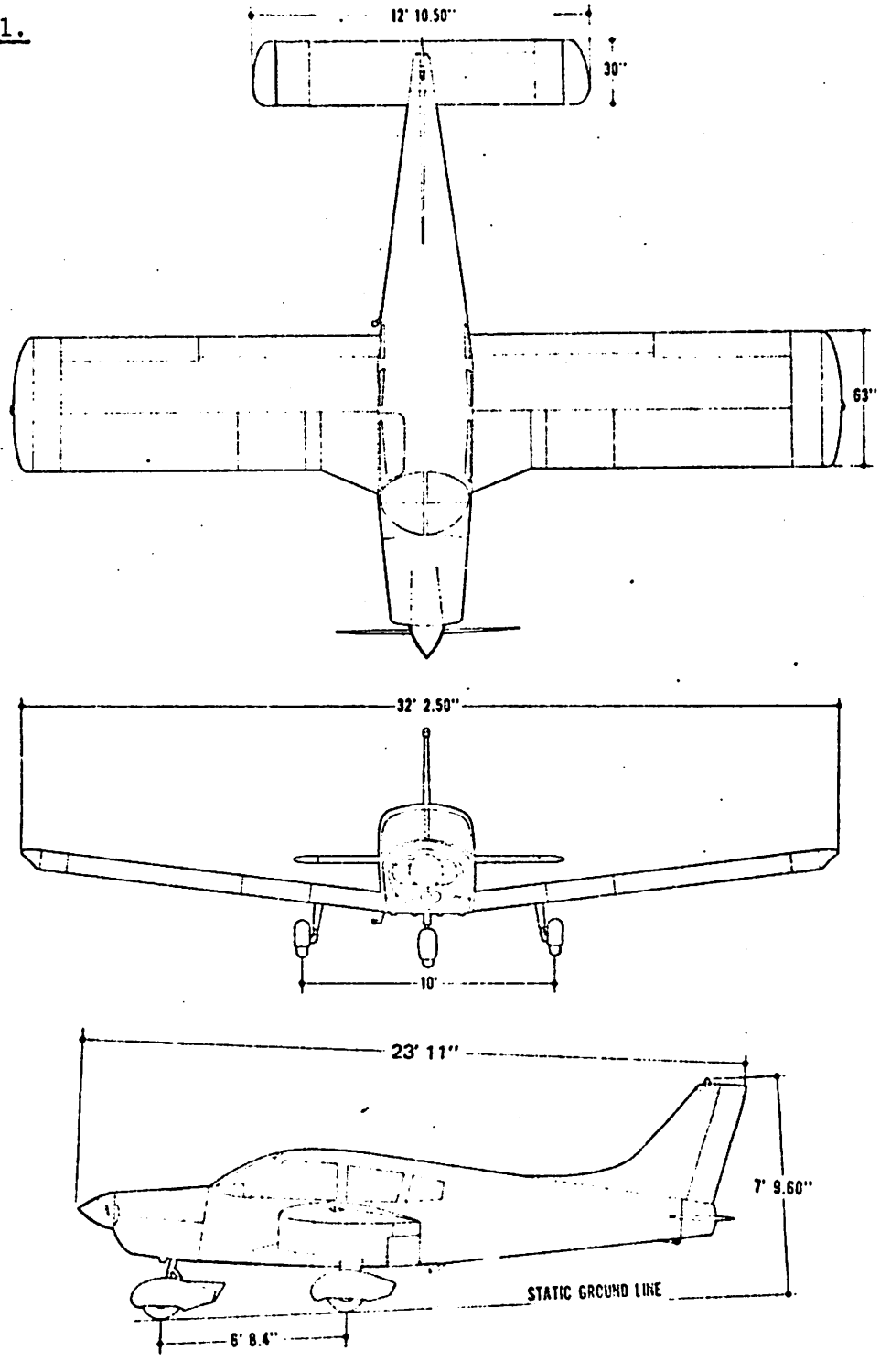
C.A.A. AMENDMENT RECORD SHEET

REVISION NO.	DATE OF REVISION			REVISED BY	APPROVAL DATE (CAA)			REVISION TITLE	PAGES AFFECTED
	DAY	MO.	YR.		DAY	MO.	YR.		
C/S 1	18	8	81	C.A.A.	18	8	81	ADDITION LIMITATION FOR U.K. CERTIFICATION	FACING PAGE 21.
	20	05	97	NEA				CAA AWN 88 SUPPLEMENT	REAR OF MANUAL
	23	05	90		01	09	91	CAA AD 01-02-90 CURTISS FUEL ~~STRAINER~~ STRAINER	FRONT OF LIMITATIONS SECTION
	17	06	97					WEIGHT & BALANCE REPORT	FACING PAGE 15

SECTION I. GENERAL, (continued)

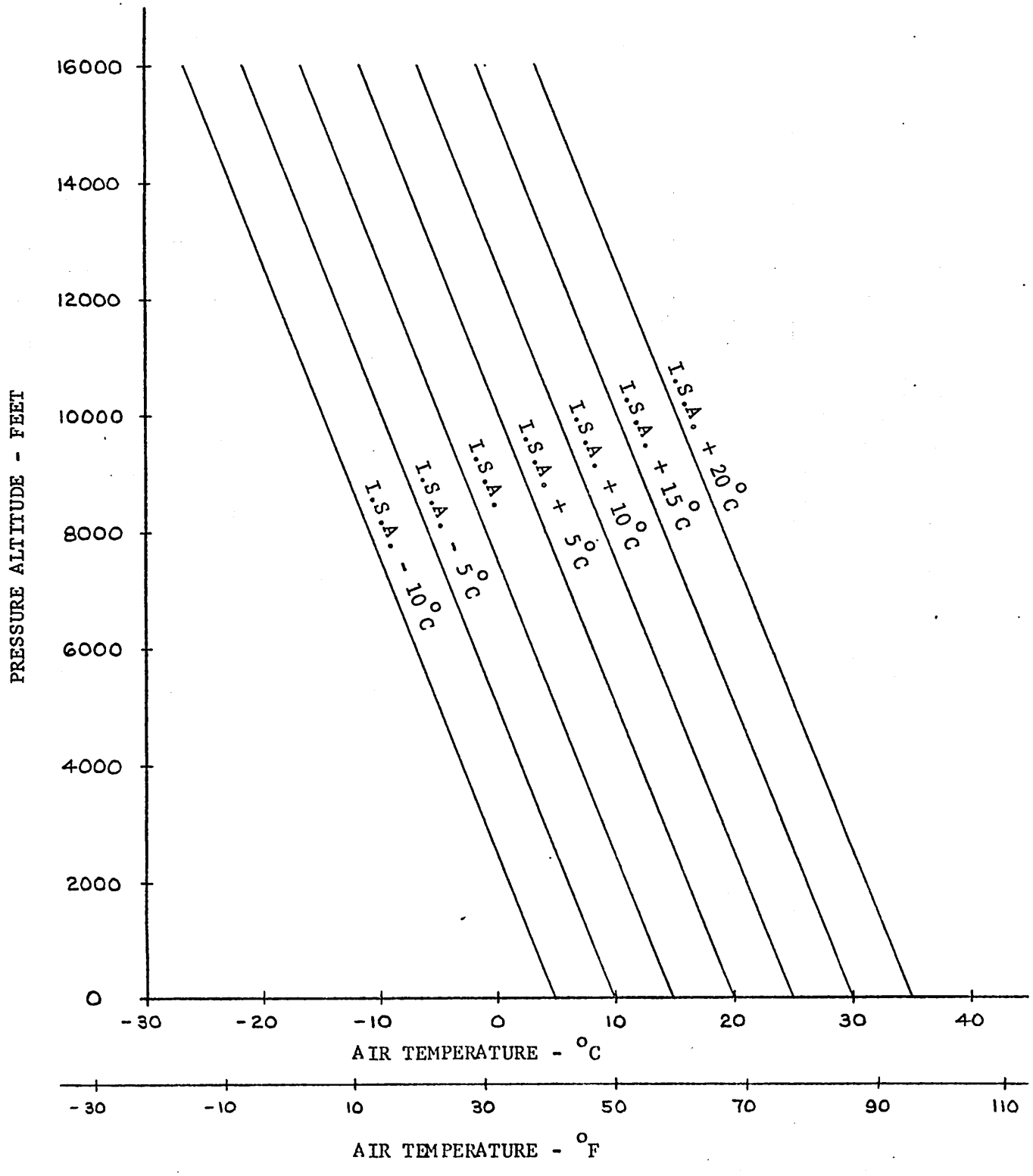
D. General Arrangement Drawing (not to scale)

FIGURE 1.



SECTION I. GENERAL (continued)

E. Figure 2. Determination of Temperature in Relation to I.S.A.



SECTION I. GENERAL, (continued)

F. Definitions

1. AIR TEMPERATURE

The temperature of the free air near to, but not influenced by the aeroplane. This temperature may be a reported, forecast or, when permitted by the Air Navigation Regulations, a declared temperature derived in accordance with an approved system.

2. ALTITUDE

The altitude shown on the charts is pressure altitude which is the expression of atmospheric pressure in terms of altitude above mean sea level according to the interrelation of these factors in the International Standard Atmosphere (I.S.A.). This may be obtained by setting the sub-scale of an accurate pressure type altimeter at 1,013 millibars (29.92 inches or 760 millimeters of mercury).

3. I.S.A.

International Standard Atmosphere. See Page 10 for temperature variation versus altitude.

4. GRADIENT OF CLIMB

The tangent of the angle of climb expressed as a percentage i.e., $\frac{\text{change in height}}{\text{horizontal distance traveled}} \times 100$

SECTION I. GENERAL, (continued)

5. GROSS PERFORMANCE

The average performance which a fleet of aeroplanes can be expected to achieve or exceed if satisfactorily maintained and flown in accordance with the associated techniques described in the manual.

6. NET PERFORMANCE

The gross performance modified in the manner prescribed in the relevant requirement to make appropriate allowance for those variations from the Gross Performance which are not dealt with in Operational Regulations.

7. HARD RUNWAY

A surface such as concrete or tarmac.

8. HEIGHT

The lowest distance between the lowest part of the aeroplane and the relevant datum.

9. WEIGHT

The total weight of the aeroplane, including fuel, oil, equipment, crew and payload.

10. A.S.I.R.

The uncorrected Air Speed Indicator Reading.

SECTION I. GENERAL, (continued)

11. I.A.S.

The Indicated Air Speed, which is the A.S.I.R. corrected for instrument error only.

12. E.A.S.

The Equivalent Air Speed, which is I.A.S. corrected for position and compressibility errors.

13. T.A.S.

The True Air Speed of the aeroplane relative to the undisturbed air, which is the E.A.S. corrected for altitude and temperature.

14. TAKE-OFF SAFETY SPEED

The minimum speed at which, following sudden and complete failure of the engine in the take-off configuration, adequate control exists to establish a glide at a safe margin above the stall.

15. MANOEUVRING SPEED

The maximum speed for full application of primary flight controls.

16. V_{NO}

The Normal Operating Limit Speed which is the maximum cruising speed.

PIPER 001-02-90

Applicable to Piper PA-28 series aircraft fitted with a Curtis fuel strainer drain valve, including those modified in accordance with CSE Service Bulletin No 6/75.
Compliance is required not later than 2 weeks from the effective date of this Directive which is 7 February 1990.
Modify by installing a placard adjacent to the fuel strainer drain valve stating:

WARNING
ENSURE FUEL DRAIN IS CLOSED AFTER USE

NOTE: Letters to be clear and at least 4 mm high on a contrasting background.

Insert a copy of this Directive into the Limitations Section of the Pilot Operating Handbook/Flight Manual.

PIPER 005-02-90

Applicable to PA-28-140 aircraft Serial Nos. 28-20000 through 28-7325459, PA-28-150/160 aircraft Serial Nos. 28-01 through 28-4377, PA-28-180 aircraft Serial Nos. 28-671 through 28-7305433, PA-28-235 aircraft Serial Nos. 28-10001 through 28-7310155, PA-32-260 aircraft Serial Nos. 32-1 through 32-7300041 and PA-32-300 aircraft Serial Nos. 32-4000 through 32-7340130.
Compliance is required at the next 150 hour or Annual Check, whichever is the sooner, from the effective date of this Directive which is 5 March 1990.
Modify by installing aft inboard wing access panel in accordance with Service Bulletin 789A.

PIPER 003-04-90

Applicable to PA-34-200, PA-34-200T and PA-34-220T aircraft.
Compliance is required at the next 150 hour or Annual Check whichever is the sooner from the effective date of this Directive which is 4 May 1990.
Inspect nose landing gear steering channel assembly Part No. 95394-00 for cracks or other signs of distress paying special attention to the welds. REPLACE any cracked nose landing gear steering channel assemblies. INSPECT nose landing gear operation to ensure correct engagement of the spherical roller into the steering channel guide. REPEAT INSPECTION of the nose landing gear steering channel assembly at every 150 hour or Annual Check whichever is the sooner.

SECTION II. LIMITATIONS

THE AEROPLANE MUST BE OPERATED SO THAT THE LIMITATIONS AND INSTRUCTIONS IN THIS SECTION ARE OBSERVED.

A. The following weights given are maximum limitations.

1. The Maximum Take-off Weight is 2450 pounds.
2. The Maximum Landing Weight is 2450 pounds.
3. The Maximum Weight for Aerobatic Manoeuvres is 1950 pounds. (Reference Page 22 for approved Aerobatic Manoeuvres)
4. The aeroplane is not structurally limited by a zero fuel weight limit.

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B. Baggage Loading *

The maximum baggage capacity is 200 pounds. For aerobatic operation, baggage and aft passengers are not allowed.

C. Fuel System

1. There are no fuel loading limitations. However, it is recommended that the fuel load be symmetrical to provide better roll control.
2. The word "gallon" as used throughout this report means U.S. gallon unless otherwise stated.
3. The unusable fuel in this aircraft has been determined as 1.0 gallon in each wing in critical flight attitudes. (1.0 gallon is the total per side).

Items marked * must either be placarded or the applicable instrument colour marked.

SECTION II. LIMITATIONS (continued)

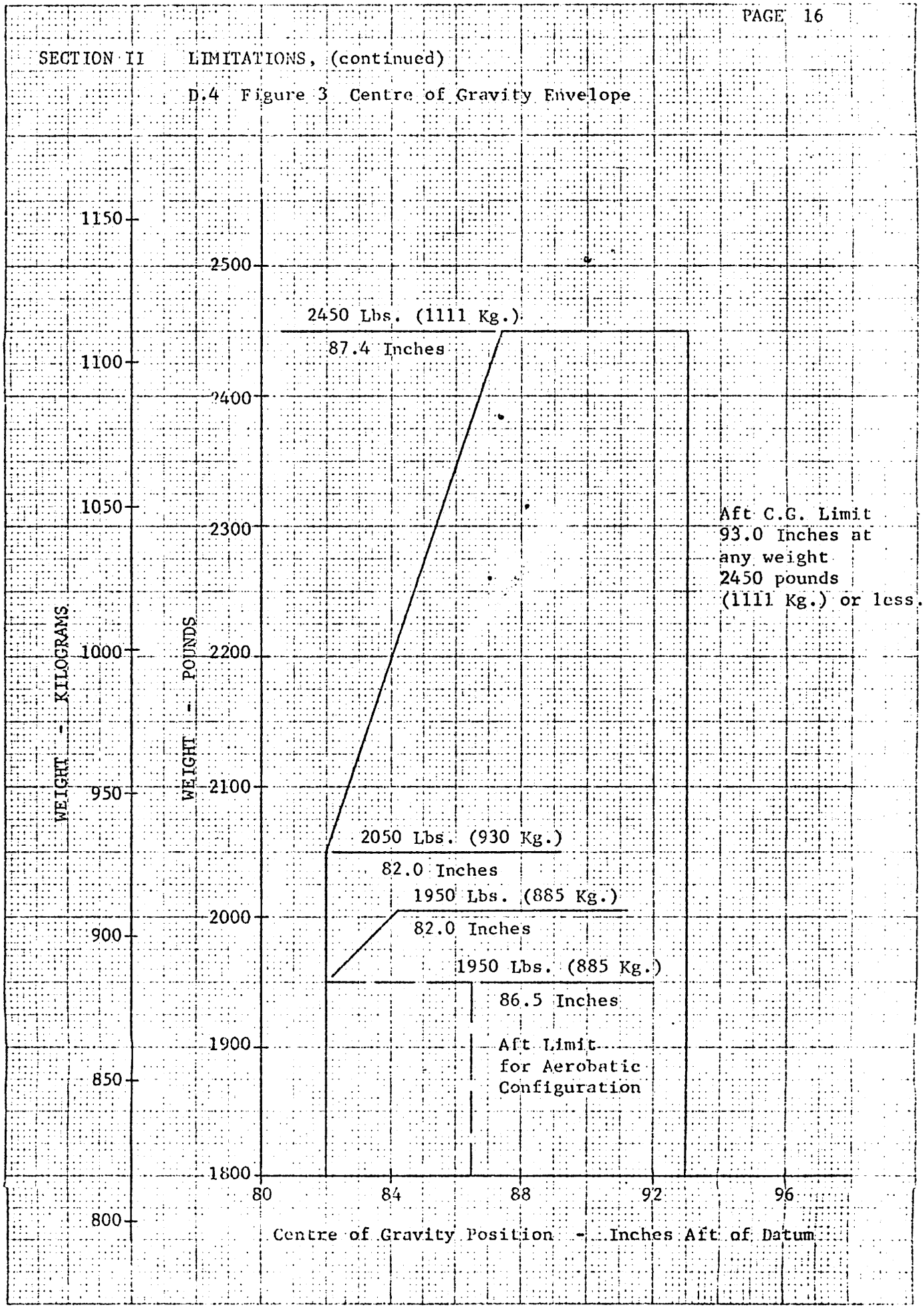
4. The usable fuel in this aircraft has been determined as 48.0 gallons in critical flight attitudes. (48.0 gallons is the total per aeroplane).
5. The fuel selector may be in either "Right Tank" or "Left Tank" position for any flight configuration. Use fullest tank for take-off and landing.
6. The electric fuel pump should be "ON" for take-off, landing and when the engine driven pump is inoperative. It is a good procedure to use the electric fuel pump when switching tanks.

D. Centre of Gravity

1. The aircraft loading is to be distributed so that the centre of gravity lies between the limits of 82.0 inches aft of the datum at 2050 pounds, 87.4 inches aft of the datum at 2450 pounds and an aft limit of 93.0 inches aft of the datum at 2450 pounds and below. The c.g. limitations have a straight line variation between the points given.
2. The load is to be distributed so that the centre-of-gravity for approved aerobatic manoeuvres lies between the limits of 82.0 inches aft of the datum at 1950 pounds and an aft limit of 86.5 inches aft of the datum at 1950 pounds and below.
3. The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

SECTION II LIMITATIONS, (continued)

D.4 Figure 3 Centre of Gravity Envelope



SECTION II. LIMITATIONS, (continued)

E. Power-Plant Limitations

ENGINE

Lycoming O-360-A4A with carburetor setting IO-3878

PROPELLER

Sensenich M76EMMS or 76EM8S5

Diameter: 76 Inches

Pitch: 60 Inches

Static RPM at maximum permissible throttle setting:

Not over 2425 RPM

Not under 2325 RPM

No additional tolerance permitted.

FUEL

The minimum grade of fuel approved for use in this engine is 100/130 octane aviation gasoline, specification No. D. Eng. R.D. 2485 with a maximum limit of 5.5 MLS. TEL/Imperial Gallon.

OIL

The oil approved for use in this engine is to specification No. D Eng. 2472 grade B/O and the latest applicable Lycoming Specification.

SECTION II. LIMITATIONS, (continued)

OIL TEMPERATURE

Normal Operating Range	75°F to 245°F	(Green Arc)	*
Maximum	245°F	(Red Line)	*

OIL PRESSURE

A minimum oil pressure of 25 PSI should be obtained or exceeded within 30 seconds when starting the engine.

Normal Operating Range	60 PSI to 90 PSI	(Green Arc)	*
Caution Range	25 PSI to 60 PSI	(Yellow Arc)	*
Minimum	25 PSI	(Red Line)	*
Maximum	90 PSI	(Red Line)	*

FUEL PRESSURE

Normal Operating Range	.5 PSI to 8 PSI	(Green Arc)	*
Maximum	8 PSI	(Red Line)	*
Minimum	.5 PSI	(Red Line)	*

ENGINE SPEED LIMITATIONS

The maximum permissible rotational speed for all conditions of flight is 2700 RPM (Red Line).* The normal operating range is 500 RPM to 2700 RPM (Green Arc).*

Items marked * must either be placarded or the applicable instrument colour marked.

SECTION II. LIMITATIONS, (continued)

FUEL/AIR MIXTURE CONTROL

The operation and limitations of the fuel/air mixture shall be in accordance with the latest applicable Lycoming Specification.

F. Airspeed Limitations

1. The operating speed limitations are given in terms of indicated airspeeds (I.A.S.)

2. NEVER EXCEED SPEED, V_{NE}*

Is 175 MPH I.A.S. (152 Knots).

3. NORMAL OPERATING LIMIT SPEED, V_{NO}*

Is 143 MPH - I.A.S. (124 Knots). During normal cruising flight, the aeroplane should not be flown at a speed greater then V_{NO}. The aeroplane shall only be flown at speeds between the normal operating limit speed and the never exceed speed at the discretion of the pilot, having due regard to the prevailing atmospheric conditions.

4. MANOEUVRING SPEED*

Is 129 MPH - I.A.S. (112 Knots). Manoeuvres involving an approach to the stall or full application of aileron, stabilator, or rudder control shall not be undertaken at a speed greater than the manoeuvring speed.

5. WING-FLAPS EXTENDED SPEED, V_{FE}*

Is 116 MPH - I.A.S. (101 Knots). The wing flaps shall not be extended when the aeroplane is flying at a speed greater than V_{FE}.

Items marked * must either be placarded or the applicable instrument colour marked.

SECTION II. LIMITATIONS, (continued)

6. ENTRY SPEED FOR AEROBATIC MANOEUVRES*

Is 129 MPH - I.A.S. (112 Knots) for steep turns, Lazy Eights and Chandelles.

7. AIRSPEED INDICATOR COLOR MARKINGS

Green Arc

(Normal Operating Range) 68 MPH to 140 MPH (E.A.S.)

Yellow Arc

(Caution Range-Smooth Air) 140 MPH to 171 MPH (E.A.S.)

White Arc

(Flaps Extended Range) 61 MPH to 115 MPH (E.A.S.)

Radial Red Line

(Never Exceed Speed-Smooth Air) 171 MPH (E.A.S.)

Items marked * must either be placarded or the applicable instrument colour marked.

CIVIL AVIATION AUTHORITY

CAA Change Sheet no.1 issue 1 to the FAA approved Aeroplane Flight Manual Piper report no. VB-462

Piper	Constructor's	Registration
PA28-180	Serial No. 28-7405069	Marks G-BCCF

CAA ADDITIONAL LIMITATIONS FOR UNITED KINGDOM CERTIFICATION

The aeroplane must be operated in accordance with the following limitations in addition to those contained in the approved flight manual and in any relevant supplement thereto.

CATEGORY

Notwithstanding the statement on page 21 of the flight manual, the Piper PA28-180 type of aircraft is eligible for certification in the United Kingdom in the Transport Category (Passenger).

This aeroplane may, however, be restricted to another category and to a particular use and this will be stated in the certificate of airworthiness.

To be inserted in report VB-462 to face page 21.

5th July 1979

SECTION II. LIMITATIONS (continued)

8. SUMMARY OF AIRSPEEDS

		I.A.S.		E.A.S.	
		MPH	KNOTS	MPH	KNOTS
1.	Never Exceed Speed, V_{NE}	175	152	171	148
2.	Normal Operating Limit Speed, V_{NO}	143	124	140	122
3.	Manoeuvring Speed	129	112	127	110
4.	Wing Flaps Extended Range (White Arc)	116	101	115	100
		52	45	61	53
5.	Normal Operating Range (Green Arc)	143	124	140	122
		60	52	68	59
6.	Caution Range (Smooth Air Only -	175	152	171	148
	Yellow Arc)	143	124	140	122
7.	Best R/C Speed at Gross Weight	82	71	85	74
8.	Entry Speed for Steep Turns, Lazy Eights and Chandelles	129	112	127	110

G. Miscellaneous Limitations

1. CATEGORY

Aircraft of this type are eligible for certification in the General Purpose Category. However, this aeroplane may be restricted to particular use or to some other category, and this will be stated in the Certificate of Airworthiness.

SECTION II. LIMITATIONS, (continued)

2. VFR and IFR FLIGHT

Flying VFR and IFR during day or night is permitted when the required equipment is installed and when allowed by the Air Navigation Regulations.

3. FLIGHT BY NIGHT

Night flying is permitted when the required equipment is installed, and when allowed by the Air Navigation Regulations.

4. FLIGHT AT HIGH ALTITUDE

When flying above 10,000 feet, it is the pilot's responsibility to consider the physical limitations of the pilot and passengers, oxygen equipment required, and compliance with all applicable Air Navigation Regulations.

5. FLIGHT IN ICING CONDITIONS

The aeroplane is not approved for flight in icing conditions.

6. AEROBATIC MANOEUVRES*

(a) The following aerobatic manoeuvres are permitted provided the aeroplane is loaded within the approved weight and center of gravity limits.

(1) Steep Turns

(2) Lazy Eights

(3) Chandelles

Items marked * must either be placarded or the applicable instrument colour marked.

SECTION II LIMITATIONS, (continued)

(b) Baggage and aft passengers are prohibited for all aerobatic manoeuvres.

(c) All aerobatic manoeuvres are prohibited above a gross weight of 1950 pounds.

(d) Inverted manoeuvres and spins are prohibited.

7. FLIGHT LOAD FACTORS

The PA-28-180 structure has been designed to withstand a positive manoeuvring load factor of 4.4 g flaps up, 2.0 g with the flaps fully deflected (40^{o}) and a negative manoeuvring load factor of 1.76 g flaps up without permanent deformation up to a gross weight of 1950 pounds.

The PA-28-180 structure has been designed to withstand a positive manoeuvring load factor of 3.8 g flaps up and 2.0 g with the flaps fully deflected (40^{o}) without permanent deformation up to a gross weight of 2450 pounds.

8. MINIMUM CREW

The minimum crew is one pilot.

Items marked * must either be placarded or the applicable instrument colour marked.

SECTION II. LIMITATIONS, (continued)

9. NUMBER OF OCCUPANTS

The total number of persons carried including crew shall not exceed four or the number of seats which are approved for use during take-off and landing. Children under the age of three years carried in the arms of passengers need not be included in the total.

10. SMOKING

Smoking is prohibited while the aeroplane is on the ground and during take-off and landing.

11. CLIMATIC CONDITIONS

Rev. 1

The operating suitability of the aeroplane has been established for temperatures up to the range defined by I.S.A. + 20 °C.

A minimum temperature has not been established.

12. AUTOMATIC-PILOT LIMITATIONS

The following limitations are for the Auto-Control III, Autoflite and Auto Flite II installations.

(a) Refer to Supplement number 2 for the limitations of the Auto-Control III installation.

(b) Refer to Supplement number 3 for the limitations of the Auto Flite installation.

(c) Refer to Supplement number 4 for the limitations of the Auto Flite II installation.

SECTION II. LIMITATIONS, (continued)

13. ELECTRIC PITCH TRIM LIMITATION

Minimum height above the terrain for the operation of the electric pitch trim is 400 feet.

14. MAXIMUM ALTITUDE

Rev. 1

The maximum permissible operating altitude is given as the absolute ceiling of the aeroplane which is 14,500 feet. (At gross weight and I.S.A. conditions).

15. ADDITIONAL PLACARDS

The following placards and markings are required to be displayed in the aeroplane:

(a) Adjacent to upper door latch - "Engage Latch Before Flight".

(b) On the Instrument Panel - "Warning - Turn off strobe lights when taxiing in vicinity of other aircraft, or during flight through cloud, fog or haze".

(c) In full view of the pilot:

"Take-off Checklist

Fuel on proper tank
Electric fuel pump on
Engine gauges checked
Flaps - set
Carb. Heat off
Mixture - set
Seat backs erect
Fasten belts/harness
Trim Tab - set
Controls - free
Door - latched
Air Conditioner - off "

SECTION II. LIMITATIONS, (continued)

(d) In full view of the pilot:

"Landing Checklist

Fuel on proper tank
Mixture rich
Electric fuel pump on
Seat backs erect
Flaps - set (115 MPH)
Fasten belts/harness
Air conditioner - Off"

NOTE: The "Air Conditioner - Off" item in the above take-off and landing checklists is mandatory for air conditioned aircraft only.

(e) Adjacent to fuel tank filler cap - "Fuel, 100-130 Aviation Grade Min., usable capacity 24 Gal., usable capacity to bottom of filler neck indicator 17 Gal."

(f) On the instrument panel, when the oil cooler winterization kit is installed - "Oil Cooler Winterization Plate to be removed when Ambient Temperature exceeds 50°F."

(g) In full view of the pilot, in the area of the air conditioner control panel when the air conditioner is installed:

"Warning - Air Conditioner must be off to insure normal take-off climb performance".

SECTION II. LIMITATIONS, (continued)

(h) On the instrument panel in full view of the pilot when the autoflite is installed:

" For heading changes: Press disengage switch on control wheel. Change heading, release disengage switch".

(i) On the instrument panel in full view of the pilot when the Autoflite II is installed:

"Turn Autoflite on. Adjust trim knob for minimum heading change. For heading change, press disengage switch on control wheel, change heading, release switch. Rotate turn knob for turn commands. Push turn knob in to engage tracker. Push trim knob in for Hi sensitivity. Limitations: Autoflite off for takeoff and landing."

16. VACUUM GAUGE

The operating limits for the vacuum system are 5.0 $\pm$ .1 inches of mercury.

17. ENGINE STARTER

Limit engine starting to 30 second periods.

18. STALL WARNING SYSTEM

The stall warning system is inoperative with the master switch off.

SECTION III. EMERGENCY PROCEDURES

A. INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, take-off, or in flight. These procedures are suggested as usually the best course of action for coping with the particular condition described, but are not a substitute for sound judgement and common sense. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

B. ENGINE FIRE DURING START

Engine fires during start are usually the result of over priming. The procedures below are designed to draw the excess fuel back into the induction system:

1. Starter - continue to crank engine
2. Throttle - open
3. Mixture - Idle cut-off
4. Electric Fuel Pump - Off
5. Fuel selector - Off (if time allows)
6. Abandon aircraft if fire continues

C. ENGINE POWER LOSS DURING TAKE-OFF

The proper action to be taken if loss of power occurs during take-off will depend on circumstances.

1. If sufficient runway remains for a normal landing, land straight ahead.

SECTION III. EMERGENCY PROCEDURES, (continued)

2. If insufficient runway remains, maintain a safe airspeed and make only a shallow turn to avoid obstructions. Use of flaps depends on circumstances. Normally, flaps should be fully extended for touchdown.
3. If you have gained sufficient altitude to attempt a restart, proceed as follows:
   (a) Maintain safe airspeed
   (b) Fuel Selector - switch to another tank containing fuel
   (c) Electric Fuel Pump - check on
   (d) Mixture - check rich
   (e) Carburetor Heat - on
4. If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.
5. If power is not regained, proceed with the POWER OFF LANDING procedure.

D. 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 low altitude, the first step is to prepare for an emergency landing. (See POWER OFF LANDING.) Maintain an airspeed of at least 80 MPH IAS, and if altitude permits, proceed as follows:

SECTION III. EMERGENCY PROCEDURES, (continued)

1. Fuel Selector - switch to another tank containing fuel.
2. Electric Fuel Pump - On.
3. Mixture - Rich
4. Carburetor Heat - On
5. Engine Gauges - check for an indication of the cause of power loss
6. Primer - Check Locked
7. If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.
8. When power is restored:
   (a) Carburetor Heat - Off
   (b) Electric Fuel Pump - Off (If fuel pressure decreases below green arc, turn electric fuel pump - On, refer to Item III. H.)

If the above steps do not restore power, prepare for an emergency landing. If time permits:

9. Ignition Switch - "L" then "R" then back to "BOTH".
10. Throttle and Mixture - different settings
    (This may restore power if problem is too rich or too lean a mixture, or partial fuel system restriction.)
11. Try another fuel 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.)

SECTION III. EMERGENCY PROCEDURES, (continued)

12. If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

13. If power is not restored, proceed with POWER OFF LANDING Procedures.

E. POWER OFF LANDING

1. If loss of power occurs at altitude:
   (a) Trim the aircraft for best gliding angle (80 MPH-IAS).
   (b) Air Conditioner Off
   (c) Look for a suitable field
2. If measures taken to restore power are not effective, and time permits, check charts for airports in the immediate vicinity for a possible landing.
3. Notify appropriate authorities of difficulty and pilot's intentions via radio.
4. When a suitable field has been located:
   (a) Establish spiral pattern around the field
   (b) Attempt to have 1000 feet altitude above the ground at the downwind position.
   (c) As much as possible, make a normal approach.
   (d) Excess altitude may be lost by widening your pattern, using flaps, slipping, or a combination of these.

SECTION III. EMERGENCY PROCEDURES, (continued)

(e) Touchdowns should normally be made at the lowest possible airspeed with full flaps.

5. When committed to a landing:

(a) Ignition - Off

(b) Master Switch - Off

(c) Fuel Selector - Off

(d) Mixture - Idle Cut-Off

(e) Seat Belt and Harness - Tight

F. FIRE

1. The aircraft is not equipped with a fire detection system. Thus, fire is detected by the following means:

(a) Visual observation of flames or smoke

(b) Smell

(c) Presence of unusual heat in the cabin

2. Check the source of the fire by the following:

(a) Visual observation

(b) Instrument readings

(c) Discerning the character of the smoke

3. Electrical Fire

(a) Master Switch - Off

(b) Vents - Open

(c) Cabin Heat - Off

(d) Land as soon as practical

SECTION III. EMERGENCY PROCEDURES, (continued)

4. Engine Fire

(a) Mixture Control - Idle cut-off

(b) Fuel Selector - Off

(c) Electric Fuel Pump - Check Off

(d) Master Switch - Off

(e) Magneto Switch - Off

(f) Throttle - Closed

(g) Dive to blow out fire (if altitude permits)

(h) Proceed with POWER OFF LANDING procedure.

G. LOSS OF OIL PRESSURE

1. Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually 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.

2. 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.

SECTION III. EMERGENCY PROCEDURES, (continued)

3. 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 increase in temperatures, or oil smoke, are apparent, and an airport is not close.

4. If engine stoppage occurs, proceed to POWER OFF LANDING.

H. LOSS OF FUEL PRESSURE

1. Electric Boost Pump - On

2. Fuel Selector - Check on full tank

3. If problem is not an empty fuel tank:

   (a) Land as soon as practical

   (b) Have engine driven fuel pump checked

I. HIGH OIL TEMPERATURE

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

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

SECTION III. EMERGENCY PROCEDURES, (continued)

J. ALTERNATOR FAILURE

1. Loss of alternator output is detected through a zero reading on the ammeter.
2. Insure that the reading is zero and not merely low by actuating an electrically powered device.
3. If no increase in the ammeter reading is noted, alternator failure can be assured and the following should be executed:
   (a) Reduce electrical load
   (b) Alternator circuit breakers - check
   (c) "Alt" switch - Off (for 30 seconds), then On.
4. If the ammeter continues to indicate no output, or alternator will not stay reset,:
   (a) Turn off "ALT" switch
   (b) Maintain minimum electrical load
   (c) Land as soon as practical
   (d) In this case, all electrical load is being supplied by the battery.

K. ENGINE ROUGHNESS

1. Engine roughness is usually due to carburetor icing, and may be accompanied by a slight loss of airspeed or altitude. If too much ice is allowed to accumulate, restoration of full power may not be possible. Therefore, *prompt action* is required.

SECTION III. EMERGENCY PROCEDURES, (continued)

2. Carburetor heat - on (See Item K.4). RPM will decrease slightly and roughness will increase. Wait for a decrease in engine roughness or an increase in RPM, indicating ice removal. If no change in approximately one minute, return carburetor heat to COLD. If the engine is still rough, try steps below.

   (a) Mixture - Adjust for maximum smoothness. Engine will run rough if too rich or too lean.

   (b) Electric Fuel Pump - On

   (c) Fuel Selector - Change to other tank to see if fuel contamination is the problem.

   (d) Engine Gauges - Check for abnormal readings. If any gauge readings are abnormal, proceed accordingly.

   (e) Magneto Switch - "L" then "R", then back to "BOTH". If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full rich, to a landing at the first available airport.

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

4. Partial carburetor heat may be worse than no heat at all, since it may partially melt ice, which will refreeze in the intake system. When using carburetor heat, therefore, always use full heat, and when ice is removed return the control to the full cold position

SECTION III. EMERGENCY PROCEDURES, (continued)

L. SPINS

Intentional spins are prohibited. In the event that an unintentional spin is encountered, recovery can be accomplished by immediately using the following procedures:

1. Throttle - Idle
2. Rudder - Full opposite to direction of rotation.
3. Control Wheel - Full forward
4. Rudder - Neutral (when rotation stops)
5. Control Wheel - as required to smoothly regain level flight attitude.

M. OPEN DOOR

To close the door in flight, proceed as follows:

1. Slow aircraft to 100 MPH - IAS
2. Cabin Vents - Close
3. Storm Window - Open
4. If upper latch is open - latch.
5. If lower latch is open:
   (a) Open top latch
   (b) Push door open further
   (c) Close rapidly
   (d) Top latch - latch
6. A slip to the right will assist in latching the door.

SECTION IV. NORMAL PROCEDURES

A. Preflight

1. Make sure the weather is suitable for the flight.
2. Plan the navigation (if going cross-country).
3. Check weight and balance for the flight. (See Figure 3 on page 16).
4. Investigate performance and range. (See performance section of this manual).

B. Walk-Around Inspection

1. In Cabin:

(a) Avionics - turn off, to save power and wear on the units.

(b) Master Switch - turn on.

(c) Fuel quantity - ensure adequate for flight plus reserve.

(d) Master Switch - turn off to save battery.

(e) Ignition Switch - should be off to prevent inadvertent start during inspection of propeller.

(f) Mixture Control - should be in idle cut-off position, again to prevent inadvertent engine start.

(g) Trim indicators - set to neutral so that tabs may be checked for alignment.

(h) Flaps - extend and retract to check operation. This should be done before engine start so that you can hear any noise which might indicate binding.

SECTION IV. NORMAL PROCEDURES, (continued)

(i) Control locks - if a seat belt is used as a control lock, unfasten and free control wheel.

(j) Paperwork - check that the proper aircraft papers are aboard and that the necessary inspections have been performed.

2. Outside Airplane

(a) Right wing, aileron and flap - no damage, no ice. Check hinges.

(b) Right main gear - no leaks, tires inflated and not excessively worn, approximately 4.5 inches piston exposed under static load. Check brake blocks and discs for wear and damage.

(c) Right wing tip and leading edge - no damage or ice.

(d) Fuel cap - open to check quantity and color of fuel. Check cap vent, and then secure.

(e) Right fuel sump - drain, check fuel vent.

(f) Cowling - open access door to inspect engine.

(1) Check oil quantity - six to eight quarts. Insure dipstick is properly seated.

(2) Check for obvious fuel and oil leaks.

(3) Secure access door and check cowling and inspection covers for security.

SECTION IV. NORMAL PROCEUDRES, (continued)

(g) Gascolator - drain

(h) Windshield - check for damage and cleanliness.

(i) Propeller - check for nicks, oil leaks, cracks on spinner and security of spinner.

(j) Alternator belt - check

(k) If air conditioner is installed - check compressor belt.

(l) Nose Section - overall structure and surface undamaged. Check landing light condition.

(m) Nose Gear - check for leaks, approximately 3.25 inches piston exposed under static load, tire inflated and not excessively worn. Tow bar removed and stowed properly.

(n) Air Inlets - check for foreign matter (right and left).

(o) Left Fuel Sump - drain, check fuel vent.

(p) Fuel Cap - open to check quantity and color of fuel. Check cap vent and then secure.

(q) Pitot Tube - holes unobstructed, heat checked by feel if need is anticipated.

(r) Left Main Gear - no leaks, tires inflated and not excessively worn, approximately 4.5 inches piston exposed under static load. Check brake blocks and discs for wear and damage.

SECTION IV. NORMAL PROCEDURES, (continued)

(s) Stall Warning Vane - no damage, free movement.

(t) Left Wing Tip and Leading Edge - no damage or ice.

(u) Empennage - no damage, free of ice, hinges secure.

(v) Stabilator - freedom of motion.

(w) Antennas - secure and undamaged.

(x) Baggage Compartment Door - close and secure after baggage is properly stored and secured.

(y) Navigation and Landing Lights - check (after master switch and light switches have been turned on in cabin). Check panel and interior lights.

(z) Cabin Door - close and secure.

C. Before Starting Engine

1. Seats adjusted
2. Seat belts, shoulder harness - fastened.
3. Parking brake - set
4. Circuit breakers - in
5. Radios - off
6. Set carburetor heat control in the full cold position.
7. Fuel selector - select desired tank
8. Alternator - on

D. Starting Engine When Cold

1. Master Switch - on
2. Electric Fuel Pump - on

SECTION IV. NORMAL PROCEDURES, (continued)

3. Mixture Control - advance to full rich
4. Throttle Control - pump throttle control full open and closed 2 to 3 times then set control 1/4 open.
5. Starter - engage by rotating magneto switch clockwise and pressing in.
6. Throttle control - desired setting when the engine fires.
7. If engine does not fire within 5 to 10 seconds,
   (a) Starter - disengage
   (b) Priming Pump - prime with one to three strokes
   (c) Repeat steps 1 through 6 without pumping the throttle control.

E. Starting Engine When Hot

1. Throttle - open approximately 1/2 inch.
2. Master Switch - on
3. Electric Fuel Pump - on
4. Mixture Control - idle cut-off
5. Starter - engage by rotating magneto switch clockwise and pressing in.
6. When the engine fires,
   (a) Mixture Control - advance
   (b) Throttle Control - advance to desired setting

F. Starting engine when flooded

1. Throttle Control - open full
2. Master Switch - on

SECTION IV. NORMAL PROCEDURES, (continued)

3. Electric Fuel Pump - off
4. Mixture Control - idle cut-off
5. Starter - engage by rotating magneto switch clockwise and pressing in.
6. When the engine fires,
   (a) Mixture Control - advance
   (b) Throttle Control - retard to desired setting.

G. General Information for Starting Engine

1. When engine is firing evenly - advance throttle to 800 RPM.
2. If oil pressure is not indicated within 30 seconds,
   (a) Stop engine
   (b) Determine trouble
   (c) Oil pressure indication may take longer in cold weather.
3. If engine has failed to start refer to the "Lycoming Operating Handbook, Engine Troubles and their Remedies".
4. Starter cranking is limited to 30 seconds with a two minute delay between cranking periods. Longer cranking periods decrease the life of the starter.

SECTION IV. NORMAL PROCEDURES, (continued)

H. Taxi

1. Before taxiing, the brakes should be checked by moving forward a few feet, throttling back and applying pressure on the toe pedals. The following equipment may be checked during taxiing.
   (a) Instruments - turn indicator, directional gyro, coordination ball.
   (b) Heater and Defroster - especially important on a cold day.
2. The autopilot, if installed, should be off during taxiing, and the electric fuel pump should be off in order to check the operation of the engine-driven fuel pump.

I. Before Take-Off

1. Warm up engine between 800 RPM and 1200 RPM
   (a) Limit to two minutes in warm weather
   (b) Limit to four minutes in cold weather
2. Avoid prolonged idling at low RPM
3. If necessary to hold for take-off, it is recommended to idle engine at 1200 RPM.
4. A thorough check should be made before take-off, using a check list. Before advancing the throttle to check the magnetos and the propeller action, be sure that the engine is warm enough to accept the power if it is a cold day. If there is no hesitation in engine action when the throttle

SECTION IV. NORMAL PROCEDURES, (continued)

is advanced, the engine is warm enough.

(a) Parking Brake - on

(b) Engine run-up

(1) Throttle Control - forward to 2000 RPM

(2) Mixture Control - full rich

(3) Electric fuel pump - on

(4) Magnetos - check (right and left)

Maximum drop - 175 RPM

Maximum differential drop - 50 RPM

(5) Carburetor Heat - on. A drop in RPM indicates proper operation. Turn carburetor heat off.

(6) Throttle Control - retard, 800 RPM to 1200 RPM.

(c) Fuel Selector - on proper tank

(d) Engine Gauges - in the green arc

(e) Vacuum Gauge - 5.0 inches of mercury

(f) Alternator - on

(g) Altimeter - set

(h) Attitude Indicator - set

(i) Clock - wound and set

(j) Quadrant Friction - adjusted

(k) Wing Flaps - set

(l) Trim Tabs (stabilator and rudder) - set

(m) Controls - free, full travel

SECTION IV. NORMAL PROCEDURES, (continued)

(n) Seat Backs - erect

(o) Seat Belts and Shoulder Harness - fasten

(p) Cabin Door - latched

J. Normal Take-Off (Flaps Up)

Take off should not be attempted with ice or frost on the wings. Take-off distances and 50-foot obstacle clearance distances are shown on charts in the Performance Section of this manual. The performance shown on charts will be reduced by soft, wet or grassy surface.

Avoid fast turns onto the runway, followed by immediate take-off, especially with a low fuel supply. As power is applied at the start of the take-off roll, look at the engine instruments to see that the engines are operating properly and putting out normal power, and at the airspeed indicator to see that it is functioning.

The take-off performance given on pages 62 and 65 is based on a take-off speed of 78 MPH IAS (68 Kts. IAS). Accelerate the aeroplane to this airspeed and rotate. This airspeed applies to any take-off weight.

SECTION IV. NORMAL PROCEDURES, (continued)

K. Crosswind Component

1. The maximum crosswind component in which the aeroplane has been demonstrated to be safe for take-off and landing is 16 knots at a tower height of 33 feet.

L. Normal Climb

The climb performance presented on pages 68 and 71 is based on a climbing speed of 71 Knots - IAS (82 MPH - IAS). The electric fuel pump may be turned off when a safe altitude has been attained.

M. Normal Cruise

When leveling off at cruise altitude, the pilot may reduce to a cruise power setting in accordance with the Power Setting Table in the Owner's Handbook. The normal cruising power is 75 percent of the rated horsepower of the engine. The mixture should be leaned in accordance with the recommendations for the O-360-A4A engine in the Lycoming Operator's Manual which is provided with the aircraft.

In order to keep the airplane in best lateral trim during cruising flight, the fuel should be used alternately from each tank. It is recommended that one tank be used for one hour after take-off, then the other tank be used for two hours, then return to the first tank, which will have approximately

SECTION IV. NORMAL PROCEDURES, (continued)

one and one half hours of fuel remaining if the tanks were full at take-off. The second tank will contain approximately one half hour of fuel. Do not run tanks completely dry in flight.

N. Approach and Landing

Prior to entering the traffic pattern the following landing checklist should be observed:

1. Seat Backs - erect
2. Seat Belts and Shoulder Harness - fastened
3. Fuel Selector - on proper tank
4. Electric Fuel Pump - on
5. Mixture Control - full rich
6. Flaps - set as required:
   (a) Maximum speed permissible to lower the flaps is 101 Kts - IAS (116 MPH-IAS).
   (b) Flaps up, approach speed is 75 Kts-IAS (86 MPH-IAS)
   (c) 10^{o} (first notch), approach speed is 72 Kts-IAS, (83 MPH-IAS).
   (d) 25^{o} (second notch), approach speed is 69 Kts-IAS, (80 MPH-IAS).
   (e) 40^{o} (third notch), approach speed is 67 Kts-IAS, (77 MPH-IAS).
7. Carburetor Heat - off. Use carburetor heat only when there is an indication of carburetor icing. Use of

SECTION IV. NORMAL PROCEDURES, (continued)

carburetor heat reduces the power which may be critical in the case of a go-around. Additionally, full throttle operation with carburetor heat on is likely to cause detonation.

The amount of flap used during landings and speed of the aircraft at contact with the runway should be varied according to the landing surface and conditions of wind and airplane loading. It is generally good practice to contact the ground at 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. Reduce the airspeed during flare out and contact the ground close to stalling speed. After ground contact hold the nose wheel off as long as possible. As the airplane slows down, lower the nose and apply brakes. There will be less chance of skidding the tires if the flaps are retracted before applying the brakes. Braking is most effective when back pressure is applied to the control wheel, putting most of the airplane weight on the main wheels. In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

SECTION IV. NORMAL PROCEDURES, (continued)

The landing performance presented on page 75 is for full flaps, 40^{o} deflection and gross weight condition.

O. Post Landing - After leaving the runway

1. Electric Fuel Pump - off

P. Engine Shut-Down

1. Radio and Electrical Equipment - off
2. Throttle Control - closed
3. Mixture Control - idle cut-off
4. Magneto Switch - off
5. Mixture Switch - off
6. Parking Brake - on

Q. Rough Air Flight

In conditions of extreme turbulence, reduce power to slow the aeroplane slightly below the design manoeuvring speed of 112 Kts-IAS (129 MPH-IAS).

When flying in extreme turbulence or strong vertical currents and using the autopilot, the altitude-hold mode should not be used.

SECTION V. PERFORMANCE

A. General

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1. The aeroplane is classified in Performance Group D.

2. The representative cruising true airspeed for flight over water is 120 knots (138 MPH).

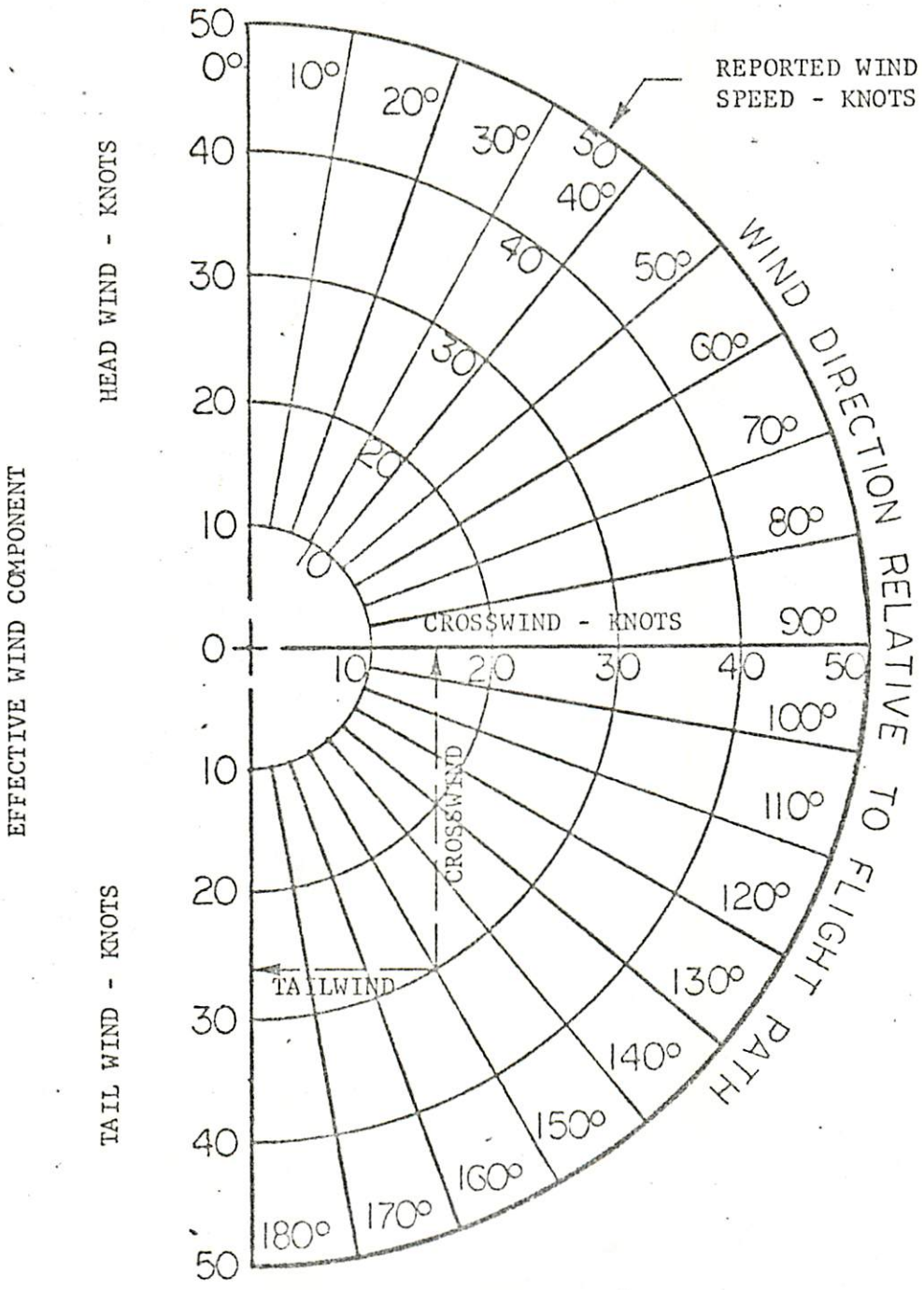
3. The performance presented in this section is based upon the aeroplane using the engine and propeller listed in the Limitations Section of this manual.

4. The performance may not be extrapolated beyond the limits stated in this manual and those presented on the graphs.

5. A graph for conversion of wind velocities to the wind component along the flight path is presented on page 52 of this manual.

SECTION V. PERFORMANCE (Continued)

Conversion of Wind Velocities - Figure 4.



Example: Reported wind is 30 Knots and 150° relative to the aeroplane flight path or runway heading. The crosswind component is 15 Knots and the tailwind component is 26 Knots.

SECTION V. PERFORMANCE, (continued)

6. Pitot head location

(a) Figure 5.

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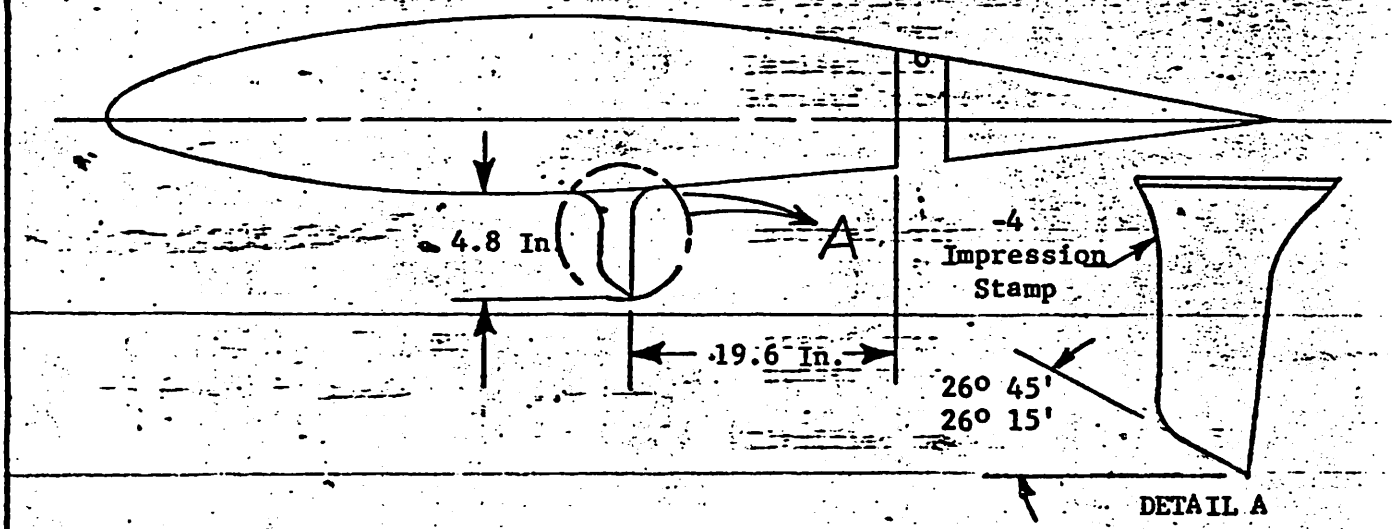


(b) Left wing location is Station 107.4 Inches.

(c) Pitot head is parallel to the centerline of the aeroplane.

(d) A static vent is located in the bottom of the pitot head.

7. The position error corrections to be applied to the I.A.S, to obtain E.A.S. are shown in Figures 6 and 7. Corrections are based on a weight of 2450 pounds. The variation of the correction at other weights is small.

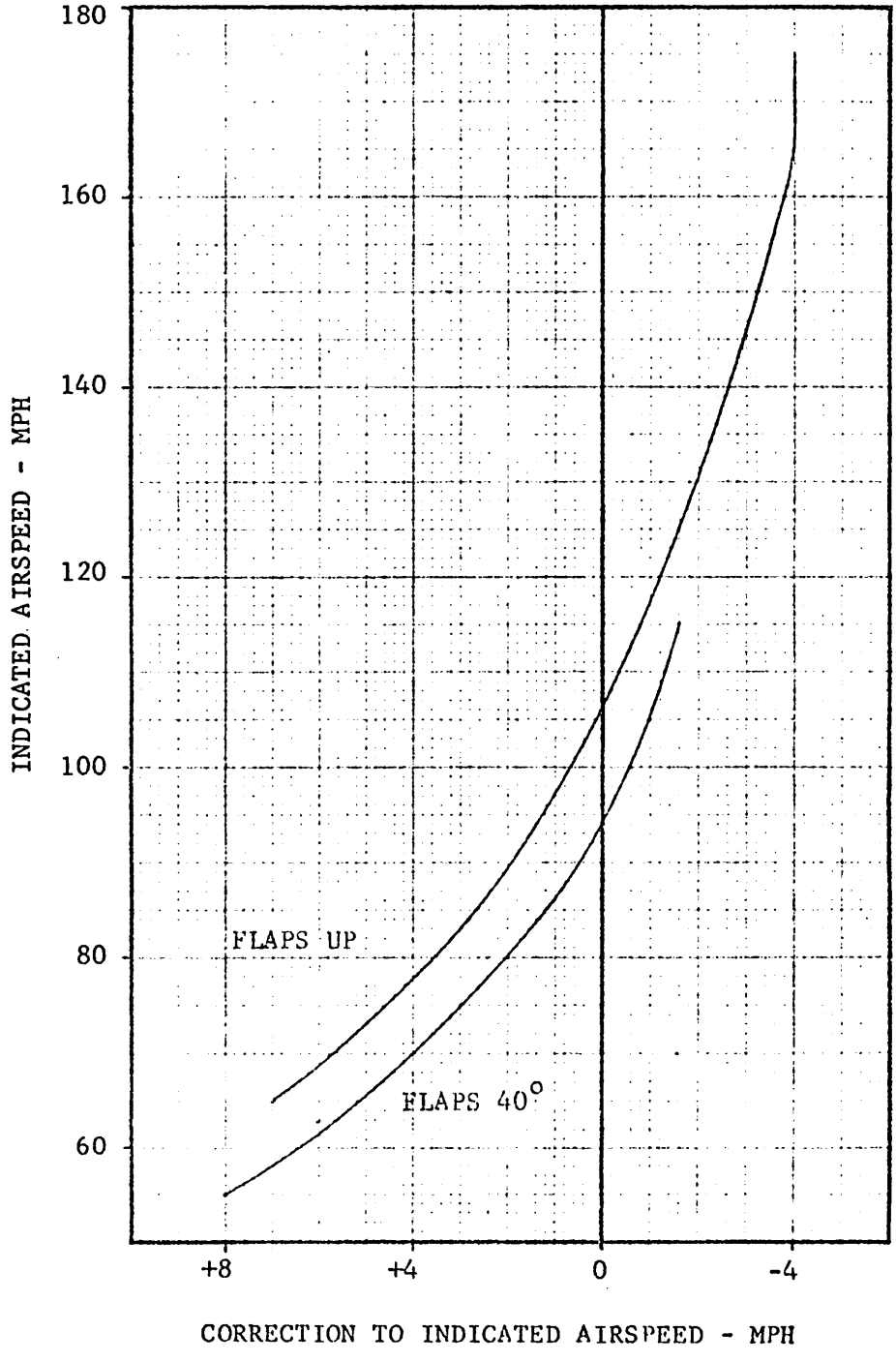
8. The maximum static error to the altimeter is less than 50 feet in all conditions.

NOTE: If other than -4 mast is installed contact Piper Aircraft Corp. for proper AFM.

SECTION V. PERFORMANCE (continued)

7. Position Error Correction to obtain E.A.S.

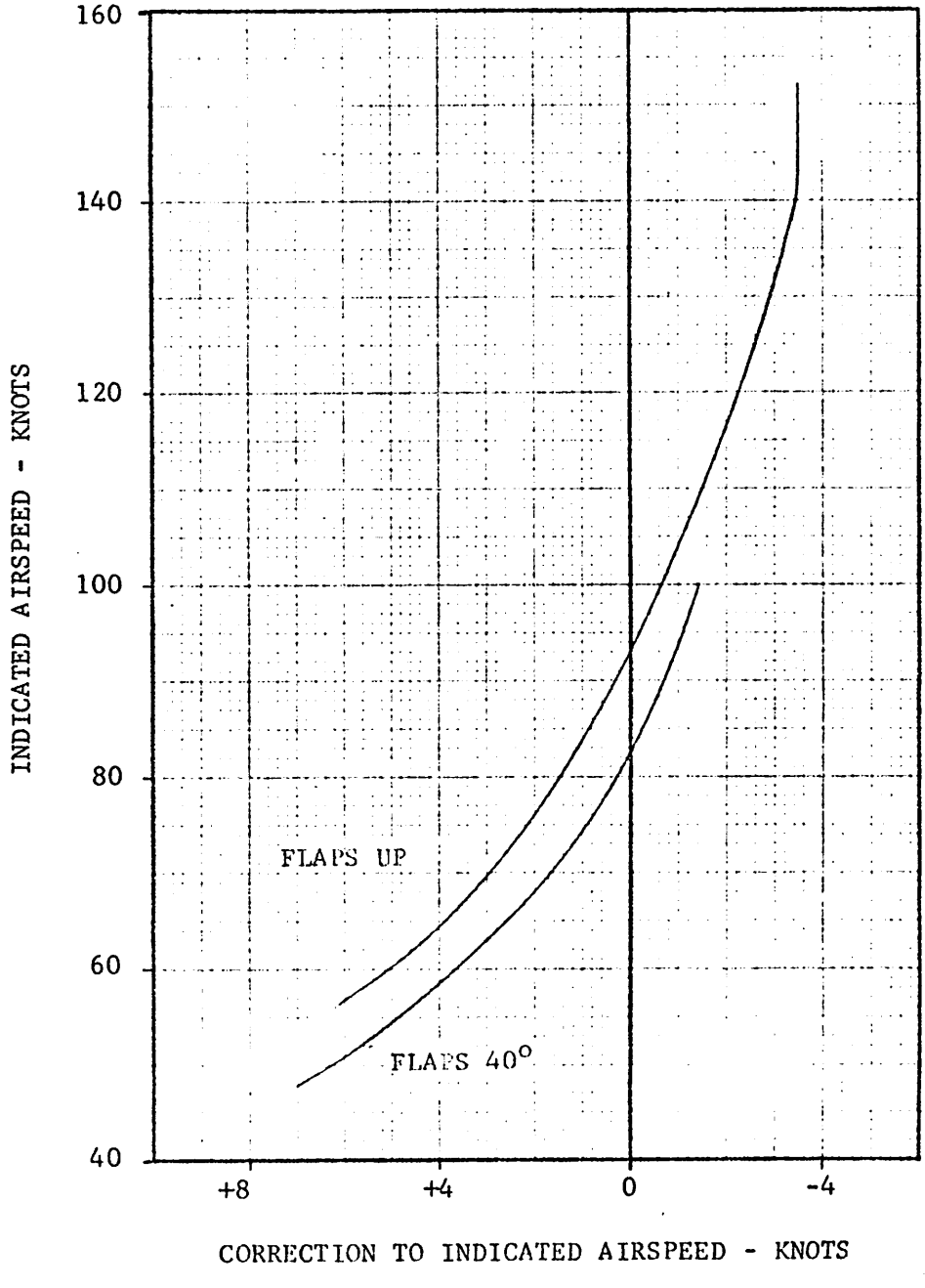
(a) Figure 6 .



SECTION V PERFORMANCE (continued)

7. Position Error Correction to obtain E.A.S.

(b) Figure 7.



SECTION V. PERFORMANCE (continued)

9. The power-off stalling speeds for several bank angles at forward C.G., and gross weight are given in the following tables.

Angle of Bank	0°				20°				40°			
	I.A.S.		E.A.S.		I.A.S.		E.A.S.		I.A.S.		E.A.S.	
	MPH	Kts	MPH	Kts	MPH	Kts	MPH	Kts	MPH	Kts	MPH	Kts
Flaps Up	60	52	68	59	62	54	70	61	73	63	78	67
Flaps 40°	52	45	61	53	55	48	63	55	64	56	70	61

Angle of Bank	50°				60°			
	I.A.S.		E.A.S.		I.A.S.		E.A.S.	
	MPH	Kts	MPH	Kts	MPH	Kts	MPH	Kts
Flaps Up	82	71	85	74	95	82	96	84
Flaps 40°	73	63	76	66	85	74	86	75

SECTION V. PERFORMANCE (continued)

B. MAXIMUM TAKE-OFF AND LANDING WEIGHT FOR ALTITUDE AND TEMPERATURE - FIGURE 8.

The maximum permissible take-off weight for varying altitudes and temperatures is shown in figure 8.

The example given by the arrowed dashed line shows that for an aerodrome altitude of 3800 ft. and an air temperature of 27°C (ISA +20°C, 81°F) the maximum permissible take-off and landing weight is 2300 Lbs. (1043 Kgs.)

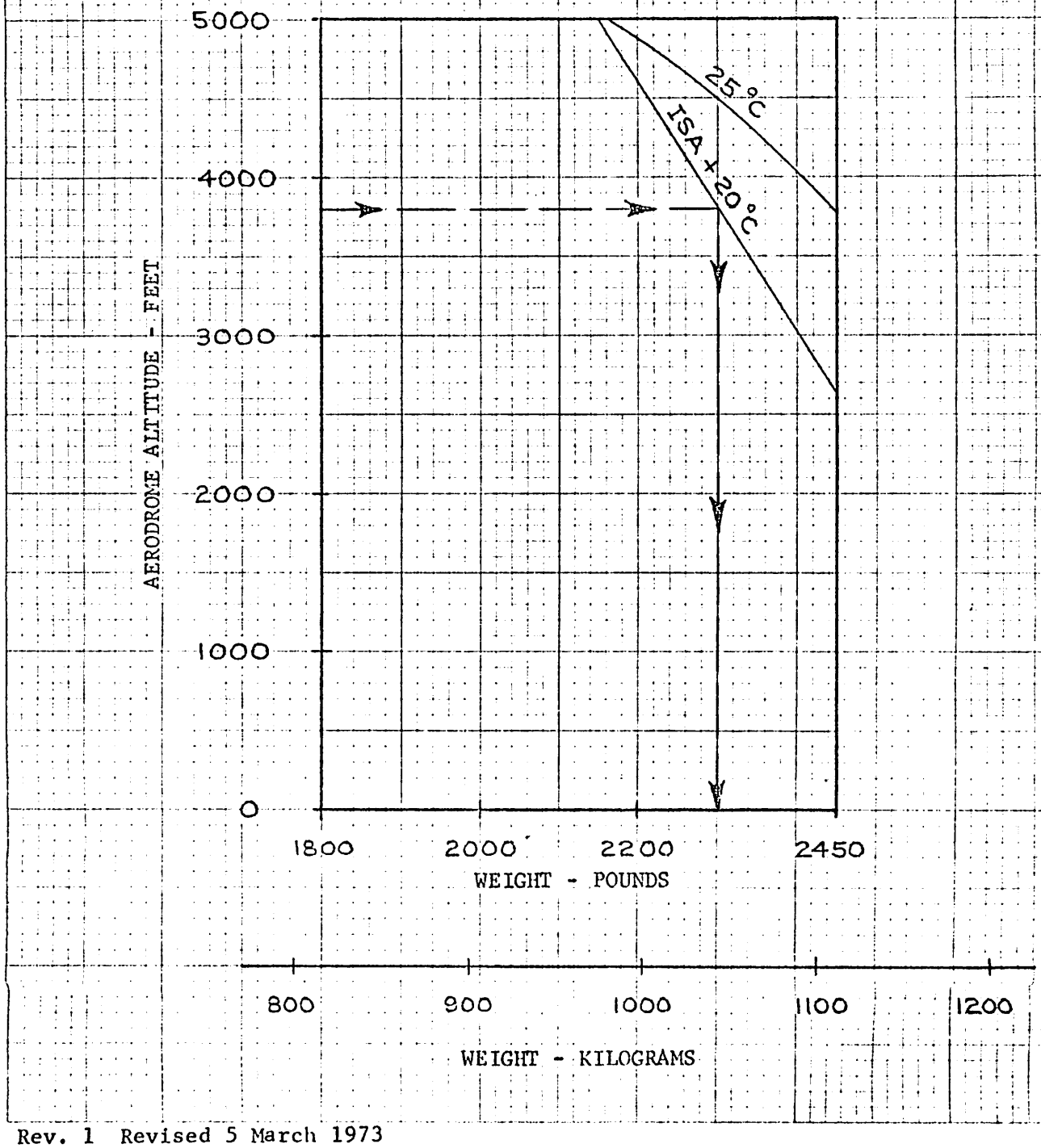
NOTE:

The weight may be limited by other performance considerations such as take-off distance or obstacle clearance becoming critical.

EXPLANATION OF FIGURE

By observing the weight-altitude-temperature data in figure 8 the PA-28-180 will have a gross climb gradient of 5% (flaps up) at the takeoff surface.

FIGURE 8. MAXIMUM TAKE-OFF AND LANDING WEIGHT FOR ALTITUDE AND TEMPERATURE.



SECTION V. PERFORMANCE (continued)

C. Take-Off Procedures and Speeds

1. TAKE-OFF TECHNIQUE

With the flaps up and the engine at full throttle, accelerate the aeroplane to the take-off safety speed of 68 Knots - I.A.S. (78 MPH - I.A.S.) and initiate the lift-off. This speed applies to all weights and altitudes.

2. MAXIMUM CROSSWIND COMPONENT

The maximum crosswind component in which the aeroplane has been demonstrated to be safe for take-off and landing is 16 Knots (18 MPH) at a tower height of 33 feet.

SECTION V. PERFORMANCE (continued)

D. Take-Off Field Lengths

1. TAKE-OFF RUN REQUIRED - FIGURE 9.

The take-off run required from rest to the point of lift off is shown in Figure 9 for varying air temperatures, aerodrome altitudes, weights, reported wind components and uniform runway slopes.

ASSOCIATED CONDITIONS:

Engine	Full Throttle
Wing Flaps	Retracted
Technique	Accelerate to the take-off safety speed of 78 MPH-I.A.S., 68 Knots (82 MPH-E.A.S., 71 Knots). This take-off safety speed is for all weights and altitudes and lift off should be initiated at this speed.
Runway	Dry Tarmac Runway (See Note 2)

ILLUSTRATED EXAMPLE:

The example given by the arrowed dashed line shows that with an air temperature of 16° C (I.S.A. + 3° C, 61° F) at an aerodrome altitude of 1000 feet and a weight of 2000 pounds (907 Kg.), with a reported headwind component of 10 knots and a uniform uphill runway slope of 2%, the take-off run required is 1250 feet (381 metres).

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NOTES:

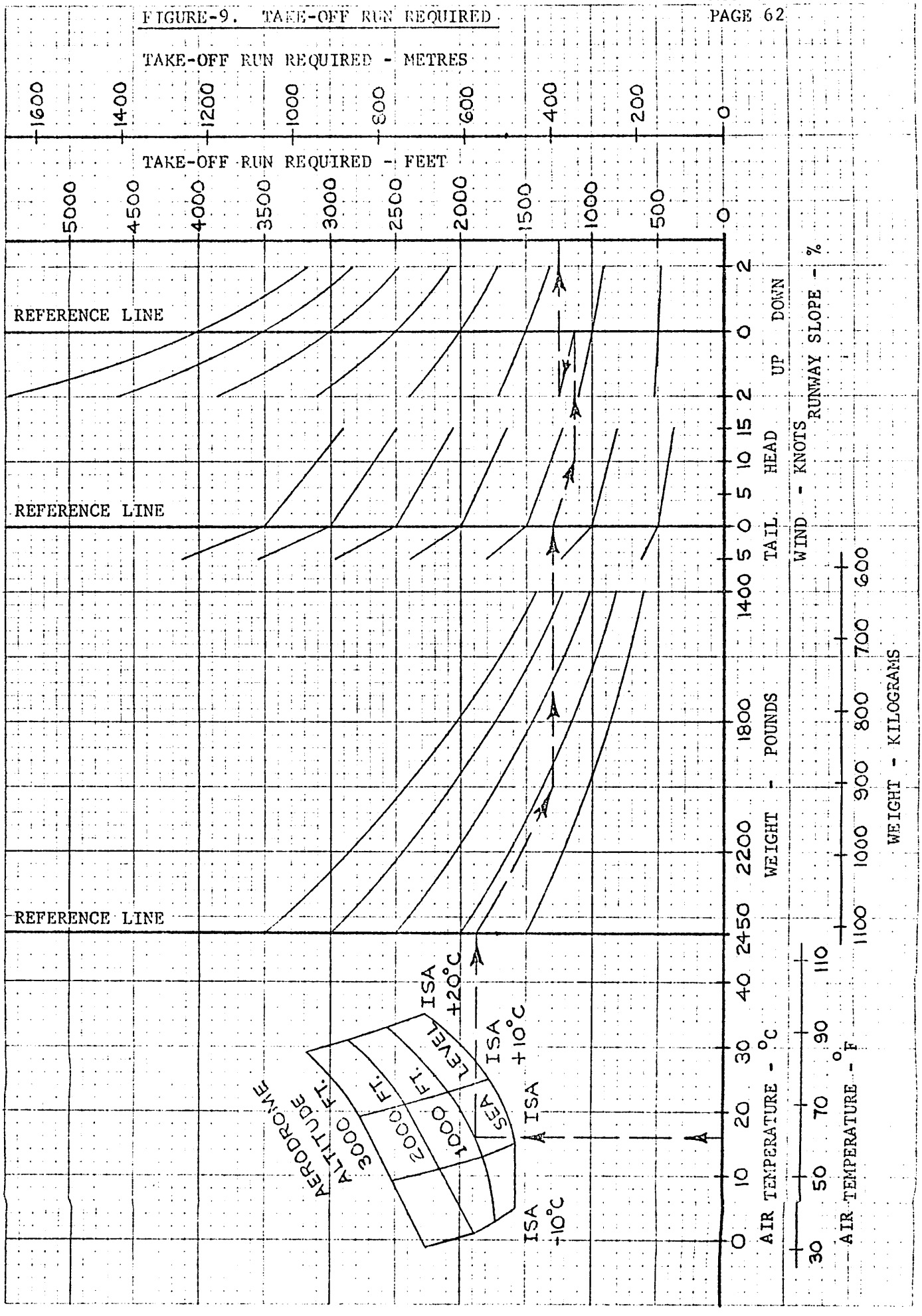
(1) The measured take-off run required has been factored by 1.15 to obtain the scheduled take-off run required.

SECTION V. PERFORMANCE (continued)

(2) For operation from short dry grass, the distances given for a dry tarmac runway should be increased by 6.5%.

(3) The wind correction grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may, therefore, be used directly in the grids.

FIGURE-9. TAKE-OFF RUN REQUIRED



SECTION V. PERFORMANCE (continued)

2. TAKE-OFF DISTANCE REQUIRED - FIGURE 10.

The take-off distance required from rest to the 50 ft. height point is shown in Figure 10 for varying air temperatures, aerodrome altitudes, weights, reported wind components and uniform runway slopes.

ASSOCIATED CONDITIONS:

Engine	Full Throttle
Wing Flaps	Retracted
Technique	Accelerate to the take-off safety speed of 78 MPH-I.A.S., 68 Knots (82 MPH-E.A.S., 71 Knots) and rotate. This take-off safety speed is for all weights and altitudes.
Runway	Dry Tarmac Runway

ILLUSTRATED EXAMPLE:

Rev. The example given by the arrowed dashed line shows that with an air temperature of 24 °C (I.S.A. +11 °C, 75 °F), at an aerodrome altitude of 1000 feet and a weight of 2000 pounds (907 Kg.), with a reported headwind component of 10 knots and a uniform uphill runway slope of 2%, the take-off distance required is 2320 feet (707 metres).

NOTES:

(1) The measured take-off over 50 feet distance has been factored by 1.25 to obtain the scheduled take-off distance required.

SECTION V. PERFORMANCE (continued)

(2) The wind correction grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may, therefore, be used directly in the grids.

(3) For operation from short dry grass, refer to page 61, Note (2), to correct for the additional take-off run required.

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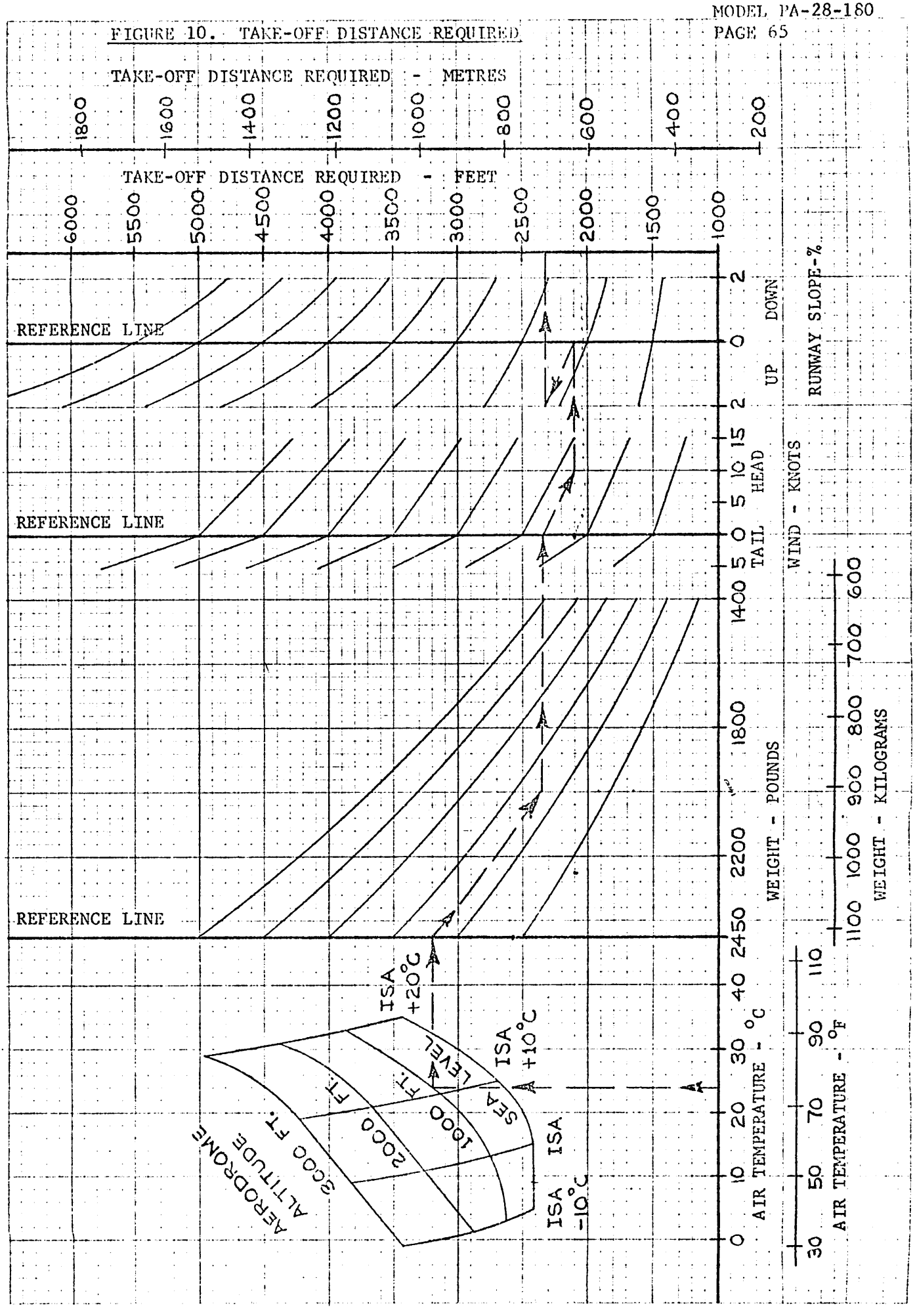
FIGURE 10. TAKE-OFF DISTANCE REQUIRED



SECTION V. PERFORMANCE (continued)

E. NET TAKE-OFF FLIGHT PATH

The net gradient of climb between 50 feet height and 1000 feet height is shown in Figure 11 for varying air temperatures, aerodrome altitudes , weights and reported wind components.

ASSOCIATED CONDITIONS:

Engine	Full Throttle
Wing Flaps	Retracted
Airspeed	78 MPH - I.A.S., 68 Knots (82 MPH-E.A.S., 71 Knots)
	This speed is valid for all weights and altitudes.

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ILLUSTRATED EXAMPLE

The example given by the arrowed dashed lines shows that with an air temperature of 22°C (I.S.A. +11°C, 72°F) at an aerodrome altitude of 2000 feet, a weight of 2000 pounds (907 Kg.) and a reported headwind component of 10 Knots, the net gradient of climb is 9.4%.

1

The horizontal distance traveled to climb from 50 feet to 1000 feet above the terrain is calculated as follows:

Height increment (for every case) is 1000-50 = 950 feet.

Horizontal distance = $\frac{950 \times 100}{9.4}$ = 10106 feet

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10106 feet x (.3048 metres/foot) = 3080 metres

SECTION V. PERFORMANCE (continued)

NOTES:

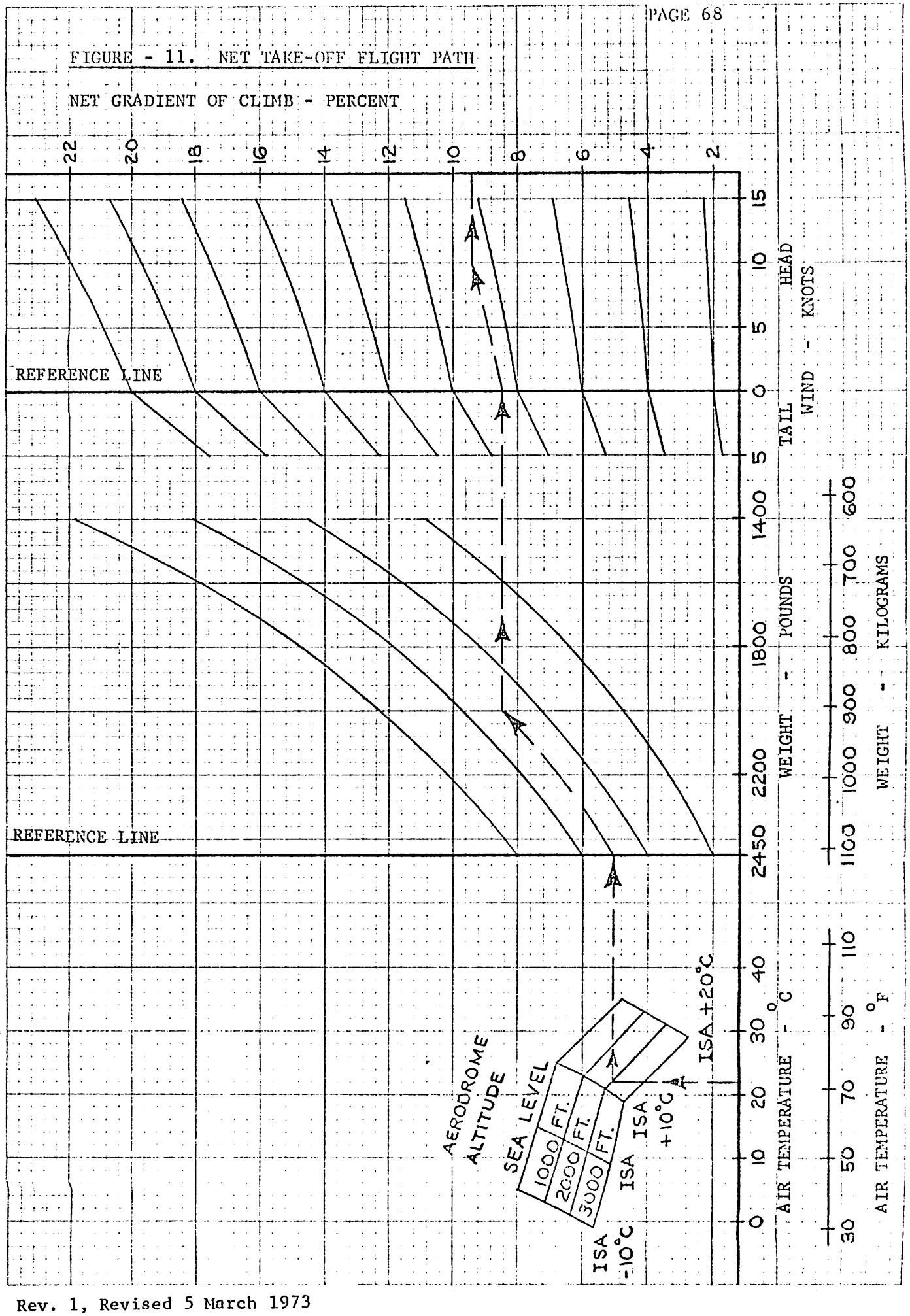
(1) The data given in Figure 11 has been derived from gross performance reduced by a margin of 2.0% gradient.

(2) The wind correction grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may, therefore, be used directly in the grids.

RADIUS OF A STEADY TURN

If, in the flight path construction a significant change of heading is to be assumed, the radius of turn can be assumed to be 2580 feet (a steady rate one, 180^{o} per minute turn).

FIGURE - 11. NET TAKE-OFF FLIGHT PATH



SECTION V. PERFORMANCE (continued)

F. En Route Performance

1. EN ROUTE PERFORMANCE CEILING AND GROSS RATE OF CLIMB - FIGURE 12.

The en route performance ceiling may be obtained from Figure 12 for varying weights, altitudes and air temperautres. The chart may also be used to determine the gross pressure rates of climb.

ASSOCIATED CONDITIONS:

Engine	Full Throttle		
Wing Flaps	Retracted		
Airspeed		I.A.S.	E.A.S.
	2450 Lbs.	82 MPH (71 Kts.)	85 MPH (74 Kts.)
	1400 Lbs	55 MPH (48 Kts.)	64 MPH (56 Kts.)

(Straight line variation between the points given.)

ILLUSTRATED EXAMPLE:

The example A given by the arrowed dashed line shows that for a weight of 2260 pounds (1025 Kgs.) in an atmosphere of I.S.A. + 10°C, the performance ceiling is 12,100 feet.

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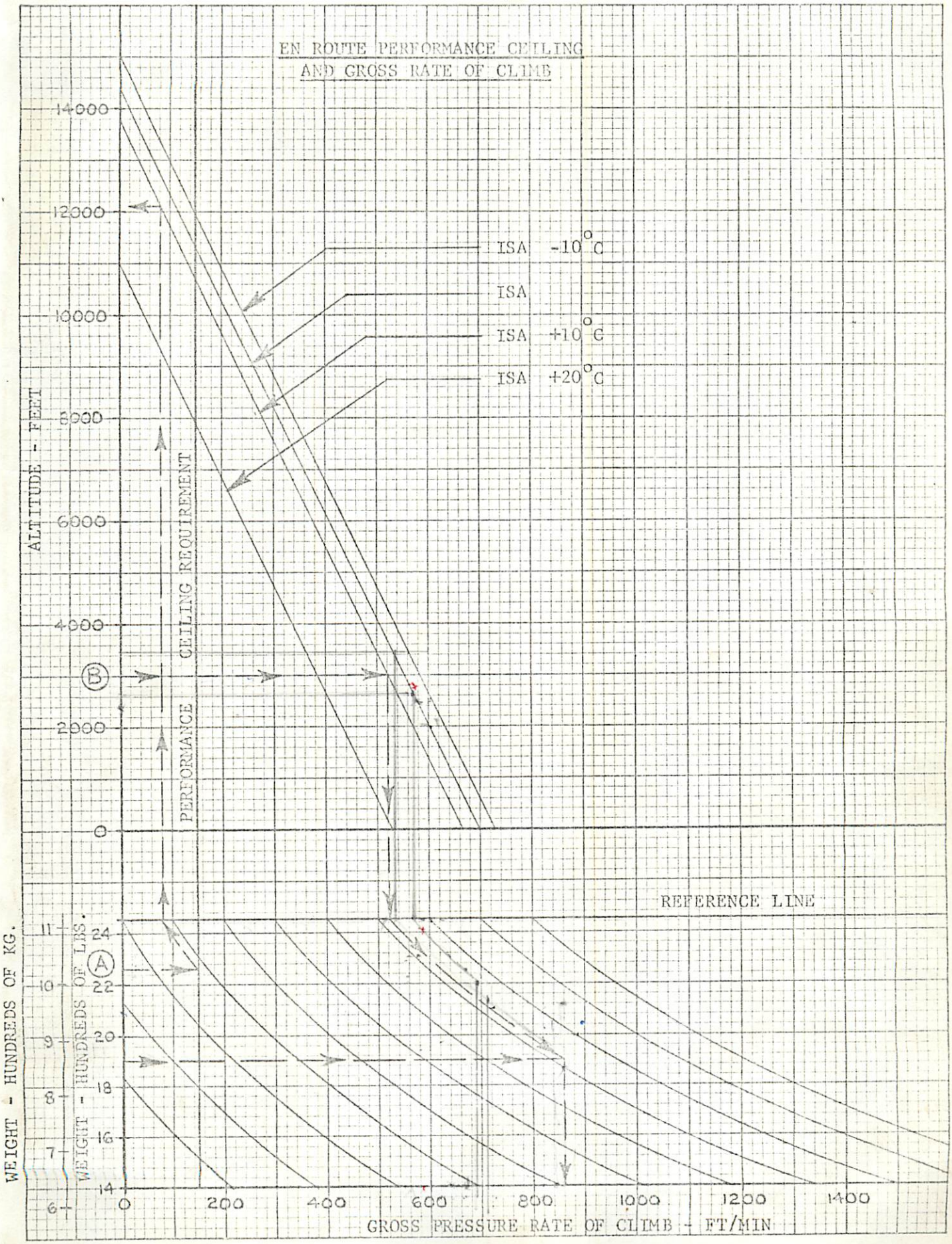
The example B shows that at a pressure altitude of 3,000 feet in an atmosphere of I.S.A. + 10°C at a weight of 1900 pounds (862 Kgs.), the gross pressure rate of climb is 860 feet per minute.

SECTION V. PERFORMANCE (continued)

NOTES:

(1) The performance ceiling is the maximum altitude which may be assumed when establishing compliance with the operating regulations pertaining to en route flight. It does not prohibit flying at a higher altitude (although at some altitudes, the operating regulations may require oxygen to be carried), but it is unlikely that the performance ceiling will be achieved unless full throttle and the air speed quoted are used towards the end of the climb.

FIGURE 12.



SECTION V. PERFORMANCE (continued)

G. Landing Procedures and Speeds

1. LANDING TECHNIQUE

For the approach and landing refer to pages 48, 49 and 50.

2. MAXIMUM CROSSWIND COMPONENT

The maximum crosswind component in which the aeroplane has been demonstrated to be safe for take-off and landing is 16 Knots (18 MPH) at a tower height of 33 feet.

SECTION V. PERFORMANCE (continued)

H. Landing Field Lengths

1. LANDING DISTANCE REQUIRED - FIGURE 13.

The total landing distance over a 50 ft. obstacle is shown in Figure 13 for varying air temperatures, aerodrome altitudes, weights, reported wind components and uniform runway slopes.

ASSOCIATED CONDITIONS:

Engine	Idling
Wing Flaps	40° (Fully Deflected)
Technique	Approach at an airspeed of 77 MPH-I.A.S., 67 Knots, (79 MPH-E.A.S., 69 Knots). The flaps are retracted after touchdown and maximum wheel braking is applied.
Runway	Dry Tarmac Runway (See Note 2).

ILLUSTRATED EXAMPLE:

The example given by the arrowed dashed line shows that at the sea level aerodrome altitude with an air temperature of 27 °C (I.S.A. +12°C, 81 °F) at a weight of 2100 pounds (953 Kgs.), with a reported headwind component of 10 Knots and a uniform downhill runway slope of 2.0%, the total landing distance over a 50 foot obstacle is 1415 feet (431 metres).

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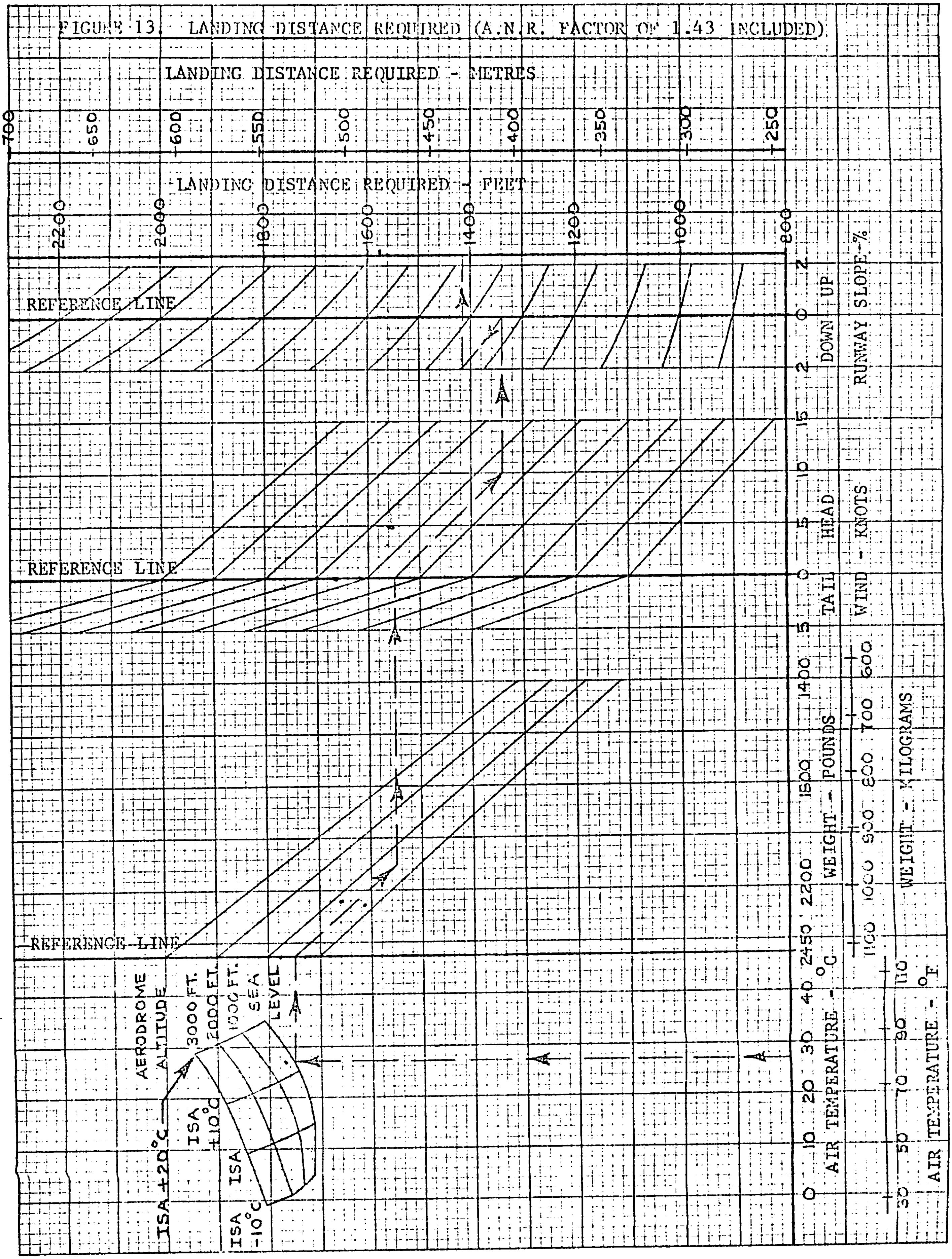
NOTES:

(1) The landing distance over 50 feet includes the Air Navigation Regulation field length factor 1.43. This means that distances obtained from Figure 13 may be equated directly to the landing distance available.

SECTION V. PERFORMANCE (continued)

(2) For operations from dry grass runways with freshly cut grass and firm subsoil, the distances for a dry tarmac runway should be increased by 8%.

(3) The wind grids are factored so that 50% of headwinds and 150% of tailwinds are obtained. Reported winds may, therefore, be used directly in the grids.



SECTION V. PERFORMANCE (continued)

I. Net Glide Range

The horizontal glide range from any altitude is shown in Figure 14, for the aeroplane at a gross weight of 2450 pounds and a no wind condition.

ASSOCIATED CONDITIONS

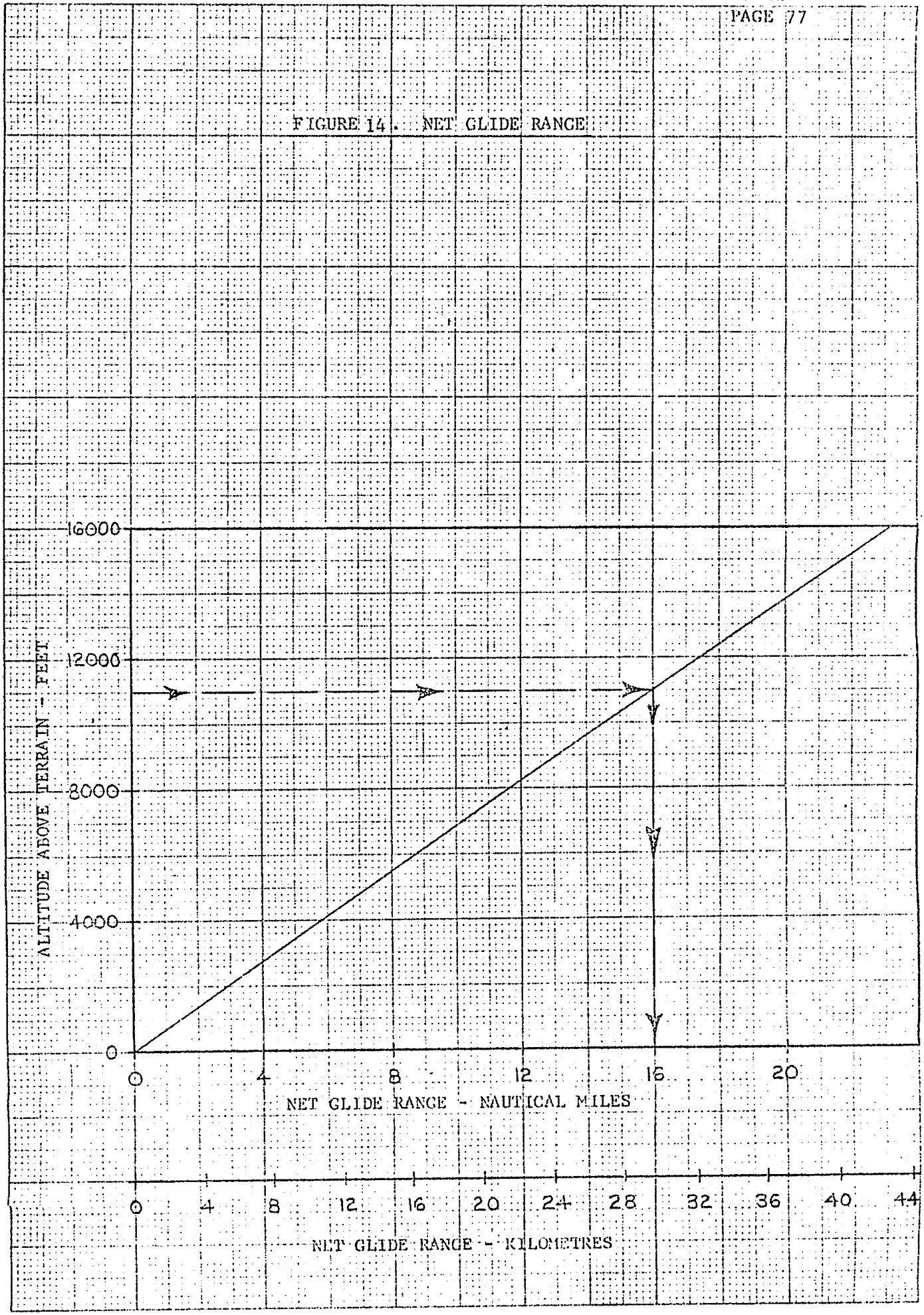
Engine	Power off, propeller windmilling
Wing Flaps	Retracted
Airspeed	82 MPH-I.A.S. (71 Knots - I.A.S.)

The example given by the arrowed dashed lines shows that at an altitude above the terrain of 11,000 feet, the net glide range for a no-wind condition is 16 nautical miles.

NOTES:

(1) The net glide range has a 1% steeper gradient than the gross glide range.

FIGURE 14. NET GLIDE RANGE



SECTION VI. SUPPLEMENTS

A. This section of the manual contains, in the form of supplements, information applicable to any particular feature, such as optional equipment, and uses of the aeroplane which are not covered by the information and data already included in the flight manual.

B. Only the supplements pertinent to the individual aeroplane, listed on page 79 need to be included in this manual and the date of embodiment recorded on the Record of Supplements sheet.

C. A supplement is identified by a number which is assigned to each complete supplement and recorded at the beginning of the individual presentation and on the Record of Supplements sheet.

D. The Record of Supplements sheet is presented on page 79 of this report.

E. It is recommended that amendments to Supplements be usually effected by a re-issue of the complete Supplement.

F. The amendments will be indicated on the Record of Supplements sheet in the Supplement Title column by listing the title and amendment, or revision, number.

G. Every copy of Report VB-462 should contain the latest revised copies of the Record of Supplements sheet and the Supplement System explanatory page.

RECORD OF SUPPLEMENTS

The following list of supplements have been approved by the Secretary of the Civil Aviation Authority and embodied in this manual.

SUPPLEMENT NUMBER	NAME OF CONSTRUCTOR	SUPPLEMENT TITLE	DATE OF APPROVAL			DATE OF EMBODIMENT			AUTHORIZED SIGNATURE OF EMBODIMENT
			Day	Mo.	Yr.	Day	Mo.	Yr.	
1	Piper Air-Craft Corp.	Electric Pitch Trim Installation							
2	Piper Air-Craft Corp.	AutoControl III Installation							X
3	Piper Air-Craft Corp.	Autoflite Installation							
4	Piper Air-Craft Corp.	Autoflite II Installation							
5	Piper Air-Craft Corp.	Air Conditioner Installation							
GAV|201	N|A 9|218|MOD|2051	CAA AWN 88. LOW VOLT BUS WARNING	19	7	89	20	5	97	

ELECTRIC PITCH TRIM INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

A. Limitations

The minimum height above the terrain for operation of the electric ptich trim is 400 feet.

B. Procedures

1. Preflight

(a) Circuit Breaker - Set

(b) Trim fore and aft

(c) Manually override electric pitch trim

(d) Check manual trim operation

(e) If trim system fails preflight, disengage electric pitch trim by pushing the pitch trim switch on the instrument panel to the "OFF" position. If the electric pitch trim does not disengage, have system repaired before flight.

2. Inflight

(a) Press the electric pitch trim switch fore and aft as required for trim.

C. Emergency Operation

1. In case of malfunction (runaway trim action) -

Disengage the electric trim system by pressing the push button switch on the instrument panel.

2. In emergency -

The electric pitch trim may be overpowered using the manual pitch trim.

ELECTRIC PITCH TRIM INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

3. In the cruise configuration, malfuction results in 10° pitch change and 200 feet altitude variation.

4. In the approach configuration, a malfunction can result in a 5° pitch change and 50 feet altitude loss.

C. Performance

The aeroplane performance remains unchanged.

AUTOCONTROL III INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

A. Limitations

1. Autopilot use is prohibited above 164 MPH-I.A.S. (142 knots).
2. Auto-Control III must be "OFF" for takeoff and landing.
3. The minimum height above the terrain for operation of the Auto-Control III is 200 feet.

B. Procedures

1. Normal Operation -

Refer to the current Auto-Control III Owner's Handbook.

C. Emergency Operation

1. In case of malfunction, turn "OFF" autopilot.
2. In emergency, autopilot may be overpowered manually.
3. In climb, cruise or descending flight, an autopilot runaway with a 3 second delay could result in 60° bank and 100 feet altitude loss.
4. In the approach configuration, an autopilot runaway with a 1 second delay could result in 10° bank and 10 feet altitude loss.

D. Performance

The aeroplane performance remains unchanged.

AUTOFLITE INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

A. Limitations

1. Autoflite must be "OFF" for take-off and landing.

2. The minimum height above terrain for operation of the "Autoflite" is 380 feet.

B. Procedures

1. Normal Operation

(a) Switch (located on the instrument panel) - ON.

(b) Disconnect Switch (located on left side of pilot's control wheel) - RELEASED.

2. Disengagement

(a) Press disconnect switch (located on pilot's control wheel).

(b) Switch (located on instrument panel) - OFF.

3. Heading changes

(a) Press disconnect switch (on pilot's control wheel) make heading change, then release disconnect switch.

(b) Move "Trim Knob" (on control panel) for drift correction.

C. Emergency Operation

1. In case of malfunction, press disconnect switch on pilot's control wheel.

2. Place switch (located on the instrument panel) in the "OFF" position.

AUTOFLITE INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

3. Autoflite may be overpowered manually.

4. In climb, cruise or descending flight an autopilot runaway with a 3 second delay could result in a 50^{o} bank, and 190 feet altitude loss.

5. In the approach configuration an autopilot runaway, with a 1 second delay could result in a 15^{o} bank and 40 feet altitude loss.

D. Performance

The aeroplane performance remains unchanged.

AUTOFLITE II INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

A. Limitations

1. Autopilot use is prohibited above 164 MPH-I.A.S. (142 knots).
2. Autoflite II must be "OFF" for take-off and landing.
3. The minimum height above terrain for operation of the "Autoflite II" is 380 feet.

B. Procedures

1. Normal Operation -

Refer to current Autoflite II Owner's Handbook.

C. Emergency Operation

1. In case of malfunction, press disconnect switch (located on the pilot's control wheel.)
2. Move the switch (located on the control panel) to the "OFF" position.
3. Autoflite II may be overpowered manually.
4. In climb, cruise or descending flight, an autopilot runaway, with a 3 second delay could result in 60° bank and 190 feet altitude loss.
5. In the approach configuration, an autopilot runaway with a 1 second delay results in 15° bank and 40 feet altitude loss.

D. Performance

The aeroplane performance remains unchanged.

AIR CONDITIONER INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

A. Limitations

1. The air conditioner must be "OFF" for take-off and landing.

B. Procedures

1. Preflight

(a) Aeroplane master switch - ON.

(b) Air conditioner switch - ON.

(c) Fan switch - select a fan speed.

(d) Check that the "AIR COND DOOR OPEN" warning light is on and the air conditioner door is open.

(e) Move throttle fully open - check that door closes and AIR COND DOOR OPEN light extinguishes.

2. In flight

(a) Turn Air Conditioner "ON" and select the fan speed desired. Adjust TEMP control for comfort.

C. Emergency Operation

1. If air conditioner system fails to operate, turn air conditioner switch to the "OFF" position.

2. Do not use the air conditioner or fan when the ammeter indicates loss of alternator output.

AIR CONDITIONER INSTALLATION

SECTION VI. SUPPLEMENTS (continued)

D. Performance

When the full throttle position is not used or in the event of a malfunction which caused 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. Should a malfunction occur which prevents condenser door retraction when the compressor is turned off, a decrease in rate of climb of as much as 50 fpm can be expected.

Northern Executive Aviation (Maintenance) Ltd.
Hangar 522, Manchester International Airport,
Wilmslow, Cheshire SK9 4LP.

Flight Manual Supplement.
Low Volt Bus Warning
CAA AWN 88.

Aircraft Registration.
G-BCCF
Supplement No. GAV/201.

A steady/flashing warning light is installed which will illuminate if the Generator/ Alternator output reduces to a level where the battery supplies power to the bus-bar.

Before Engine Start.

Check Low Volts Warning -- ON.

After Engine Start.

Check Low Volts Warning -- OFF.

If Warning Illuminates During Flight.

1. Reduce Electrical Load.
a. Switch **OFF** Alternator.
b. Switch **OFF** Strobe lights
c. Switch **OFF** Pitot heat.

2. Battery Duration Approx ....**63.47**...Mins.

3. Land As Soon As Possible.

NOTE; Warning may illuminate with low engine RPM. Check it goes out when RPM increases.

Northern Executive Aviation (Maintenance) Ltd. DATE:- 20/05/97

Hangar 522, Manchester International Airport,
Wilmslow, Cheshire SK9 4LP.

CAA AWN 88.

Registration **G-BCCF** Aircraft Type **Piper PA28-180** Aircraft ser no. **28-7405069.**

Battery Type **Gill G35** Capacity **23AH** Voltage **12V**

DATA

Battery rated capacity	Available capacity (A/Hours)	Available capacity (A/Mins)	Pre load Cruise consumption (A/Mins)	Cruise load (Amps)	Limited duration load (A/Mins)	Cruise duration (Mins)	Total duration (Mins)
23	17.25	1,035	190.55	14.61	63.25	53.47	**63.47**

Pre load shed criuse consumption

Equipment	Number Fitted	Pre load in AMPS	Pre Load in AMP/Mins	Post load shed AMPS (Cruise load)
Battery relay	1	1	5	1
Alternator field	1	3	15	
Narco 810 Comm.	1	0.7	3.5	0.7
Engine/fuel gauges	sys	1	5	1
Panel lights	sys	2.4	12	2.4
Turn co-ordinator	1	0.5	2.5	0.5
Low volt warning light	1	0.08	0.4	0.08
Navigation lights	sys	4	20	4
Transponder	1	2	10	2
NS9000 & IDME 891.	1	2.93	14.65	2.93
Strobe lights	sys	7.3	36.5	
Pitot heat	1	13.2	66	
Total		**38.11**	**190.55**	**14.61**

LANDING APPROACH LOADS

Equipment	No fitted	load	Time	Total	Notes
Fuel pump	1	0.65	5	3.25	
Landing light	1	8	5	40	
Narco 810 Comm	1	4	5	20	5 mins of transmission
				0	
				0	
Total		**12.65**		**63.25**	