s. 47F(1) [redacted]

From:	s. 47F(1) [redacted]
Sent:	Monday, 27 July 2015 12:04 PM
To:	ATSB - Comms
Cc:	s. 47F(1) [redacted]
Subject:	FW: AO-2015-086 Collision with terrain involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015 [DLM=For-Official-Use-Only]
Attachments:	Aviation Investigation Web Notification.pdf
Follow Up Flag:	Follow up
Flag Status:	Completed

Hi s. 47F(1) [redacted]

Below is the approved summary text for the website, for the new investigation 086.

s. 47F(1) [redacted]

The ATSB is investigation a collision with terrain at Lakeside Airpark, Queensland on 26 July, 2015 involving a PA32 aircraft, registered VH-BKD. [sic]

During landing, the aircraft struck the runway, then veered off, striking an embankment before coming to a stop in a nearby dam.

The pilot and five passengers were able to safely egress. One passenger sustained minor injuries and the aircraft was substantially damaged.

As part of the investigation, the ATSB will interview the pilot, and witnesses. A report is expected within several months.

This material contains information that may cause limited damage to national security, Australian Government agencies, commercial entities or members of the public. Recipients should ensure they handle and store this material appropriately.

s. 47F(1) [redacted]

From: s. 47F(1) [redacted]
Sent: Monday, 27 July 2015 12:16 PM
To: s. 47F(1) [redacted] ATSB - Comms
Cc:
Subject: RE: AO-2015-086 Collision with terrain involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015 [DLM=For-Official-Use-Only]

Follow Up Flag: Follow up
Flag Status: Completed

New investigation web page now available at:
http://www.atsb.gov.au/publications/investigation_reports/2015/aair/ao-2015-086.aspx

Please advise of any changes required.

s. 47F(1) [redacted]

Webservices and Publishing Manager
Australian Transport Safety Bureau

Level 2, 62 Northbourne Avenue
Canberra ACT 2601

P s. 47F(1) [redacted] | M s. 47F(1) [redacted] | E s. 47F(1) [redacted]

Australia's national transport safety investigator

AVIATION | MARINE | RAIL

Web www.atsb.gov.au
Twitter @ATSBinfo

From: s. 47F(1) [redacted]
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To: ATSB - Comms
Cc: s. 47F(1) [redacted]
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Document 3


Crystal Brook
Dittmer
Proserpine
Preston
Palm Grove
Long Island
Kelsey Creek
Conway
Gunyarra
Lethebrook
Andromache
Midge Point
Lakeside Airpark
Bloomsbury
Yalboroo
St Helens Beach
Google earth
Image © 2015 CNES / Astrium
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Image © 2015 DigitalGlobe
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Lakeside Airpark
© 2015 Europa Technologies
© 2015 Google
Image © 2015 CNES / Astrium
Google earth
Tour Guide
2005
Imagery Date: 9/20/2013   20°41'07.56" S 148°38'11.45" E elev 0 m eye alt 1.73 km

LAKESIDE AIRPARK

ELEV 175

FULL NOTAM SERVICE NOT AVBL

QLD		UTC +10	YLAK
S 20 41.1	E 148 37.5	VAR 8 DEG E	UNCR

AD OPR G.Poole, PO Box 606, Caboolture, QLD, 4510. EMAIL office@corporatepark.com.au; PH 0418 711 224, Web Site www.whitsundaysales.com.au.

ATS COMMUNICATIONS FACILITIES

FIA BRISBANE CENTRE 135.5 On Ground

CTAF 126.7

ADDITIONAL INFORMATION

1. Daylight OPS only.
2. PPR. Phone or Email for hazards/map file.
3. Feral animals some hours.
4. Wet weather shortens NE end.

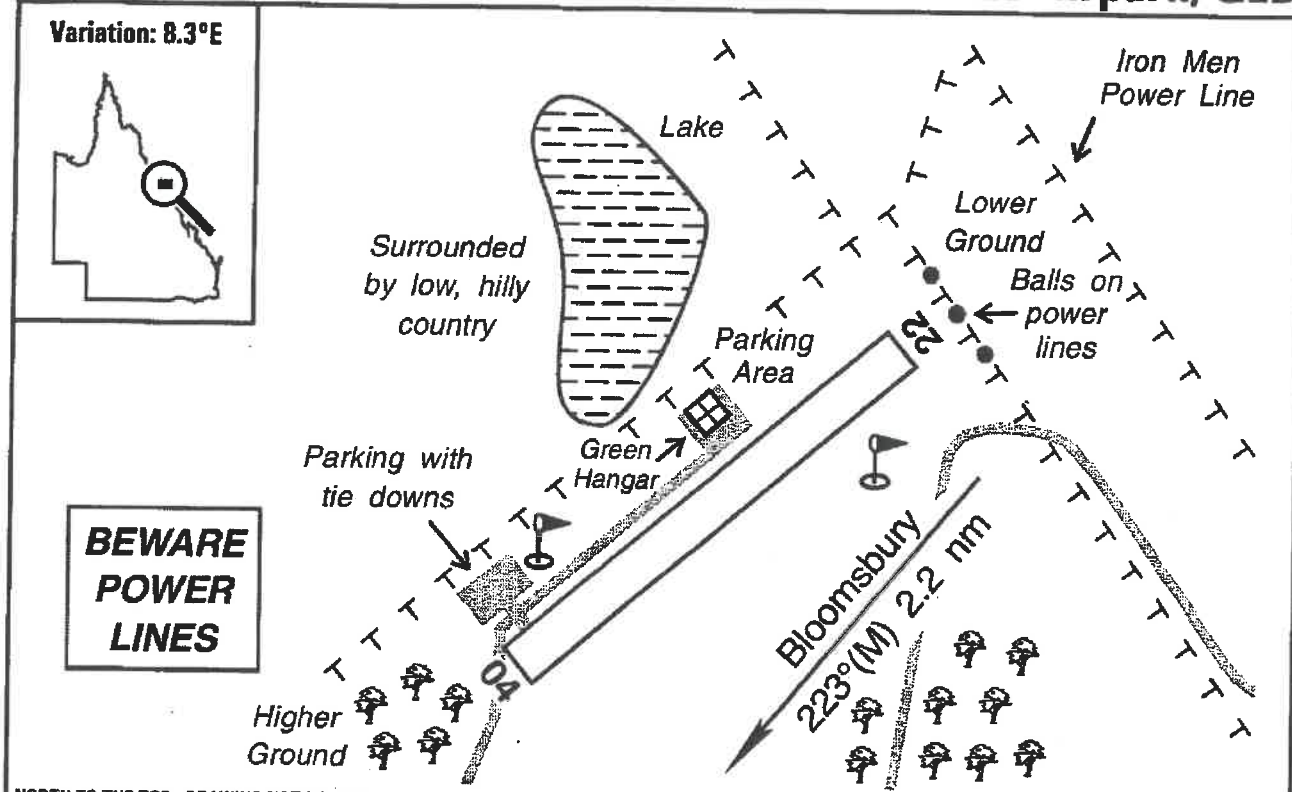
CHARTS RELATED TO THE AERODROME

WAC 3234, 3235

Information may be continued on next page:PTO

Warning: It is a requirement to check airstrip condition and details with owner

Lakeside Airpark, QLD



NORTH TO THE TOP - DRAWING NOT TO SCALE

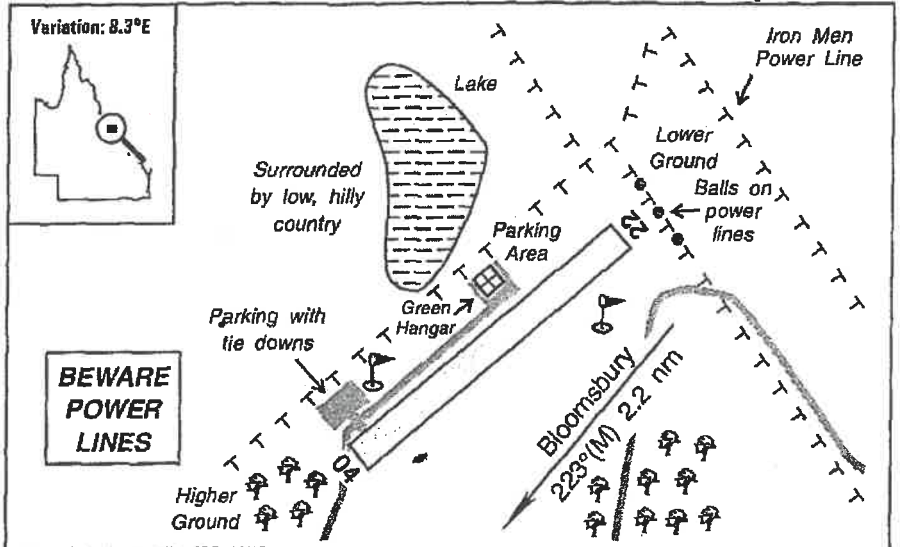
Elevation:	175 Feet AMSL	**Time Zone:**	UTC + 10
GPS Position:	20° 40.852' South 148° 37.831' East	**Area Forecast:**	44
WAC Charts:	Clermont (3234), Rockhampton (3235)	**ALA Code:**	YLAK

Owner/Operator:	Lakeside Airpark 0418 711224, office@caboolturecommercial.com
Strip Directions:	04-22
Strip Lengths:	1000 metres (wet weather may shorten the NE end)
Strip Surface:	Unsealed - slashed grass
Windsock:	Yes - two
Strip Markers:	White cones and tyres
Lighting:	Nil
Fuel:	Nil
Special Procedures And Remarks:	CTAF 126.7. Brisbane Centre 135.5 (on the ground). The north east end of the runway goes unserviceable in wet weather. Daylight operations only. The country side is a maze of power lines, only those closest to the airstrip are shown. This area is not safe for low flying - no buzzing. Two sets of power lines must be cleared when landing on runway 22. Beware trees, birds, feral animals, kangaroos and other animals. Slopes up to the south west - preferred landing direction is runway 22 if wind not a factor. Caution: strong, gusty crosswinds, windshear. Parking with tie downs. Latest information: Garry Poole 0418 711224. Permission required prior to use. Cross check details with ERSA.

Document 7

Warning: It is a requirement to check airstrip condition and details with owner prior to use

Lakeside Airpark, QLD



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Document 8

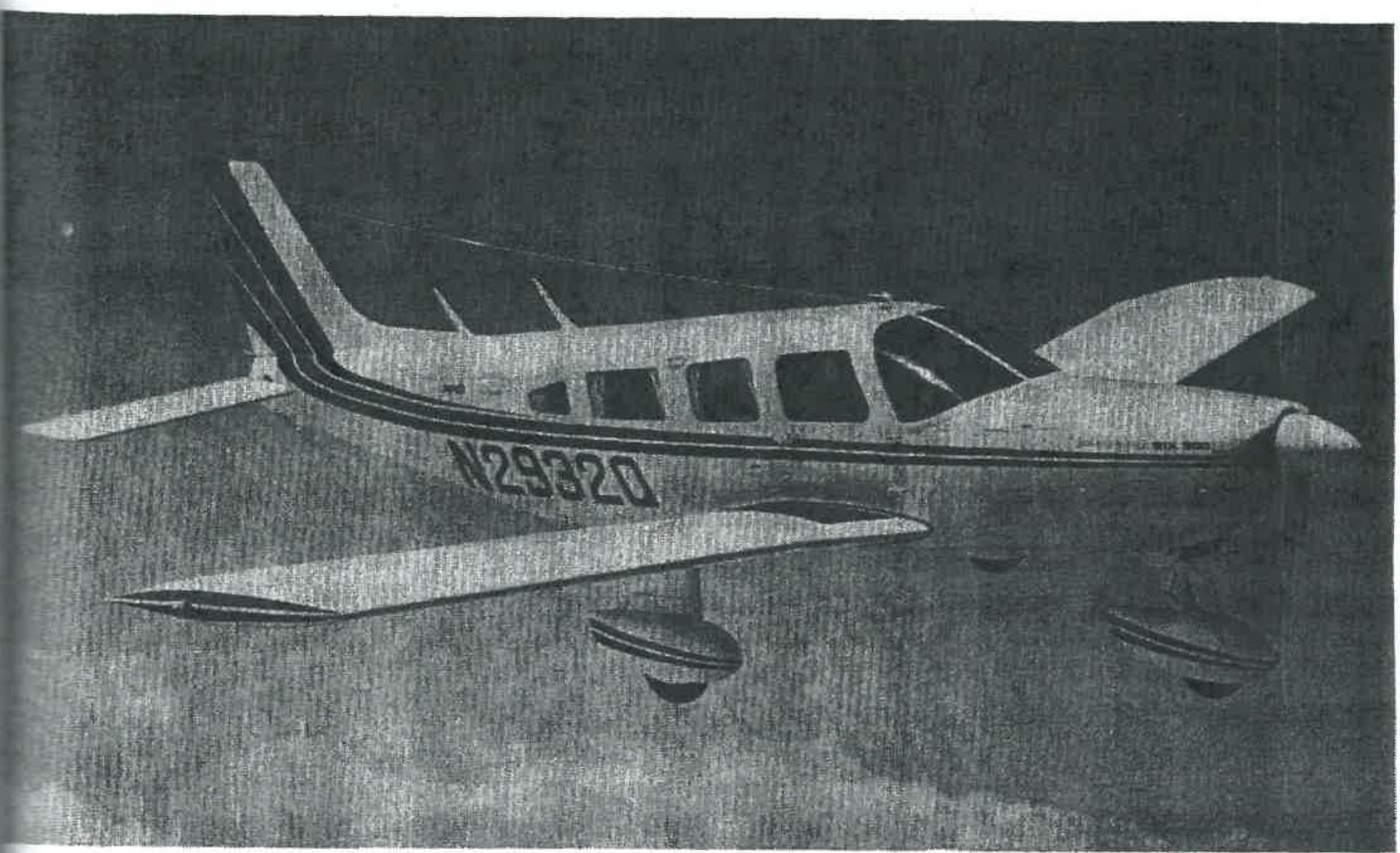
PIPER

CHEROKEE SIX 300

INFORMATION MANUAL

1400 lbs
useful
@ 2500 ship
80
2 months

CHEROKEE SIX 300 INFORMATION MANUAL



Cherokee Six 300

PA-32-300

HANDBOOK PART NO. 761-569

A complete or partial replacement of this manual, Part No. 761 559, may be obtained only from Piper Customer Services.

Published by
PUBLICATIONS DEPARTMENT
Piper Aircraft Corporation
761 559
Issued: July 1973

APPLICABILITY

The aircraft serial number eligibility bracket for application of this manual is 32-7440001 through 32-7640130. The specific application of this manual is limited to the Piper PA-32-300 model airplane designated by serial number and registration number on the back of the title page of this manual.

This manual cannot be used for operational purposes unless kept in a current status.

REVISIONS

The information compiled in the Pilot's Operating Manual will be kept current by revisions distributed to the airplane owners.

Revision material will consist of information necessary to update the text of the present manual and/or to add information to cover added airplane equipment.

I. Revisions

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the manual in accordance with the instructions given below:

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the left hand margin of the page, opposite revised, added or deleted material. A line opposite the page number or section title and printing date, will indicate that the text or illustration was unchanged but material was relocated to a different page or that an entire page was added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified by symbols.

III. Original Pages Issued

The original pages issued for this manual prior to revision are given below:

1-1 through 1-4, 2-1 through 2-19, 3-1 through 3-18, 4-1 through 4-7, 5-1 through 5-30, 7-1 through 7-12, 8-1 through 8-2, 9-1 through 9-12, 10-1 through 10-15.

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

PERFORMANCE

Published figures are for standard airplanes flown at gross weight under standard conditions at sea level unless otherwise stated. Performance for a specific airplane may vary from published figures depending upon the equipment installed, the conditions of engines, airplane and equipment, atmospheric conditions and piloting technique. Each performance figure below is subject to the same conditions as on the corresponding performance chart from which it is taken in the Performance Charts Section.

GROSS WEIGHTS	3400	2900
Takeoff Ground Run, 10° flaps, sea level (ft)	1050	750
Takeoff Distance Over 50-ft Obstacle, 10° flaps, sea level (ft)	1500	1200
Best Rate of Climb Speed (mph)	105	100
Rate of Climb (ft per min)	1050	1350
Best Angle of Climb Speed (mph)	95	–
Max Speed, sea level (mph)	174*	175*
Max Speed Optimum Altitude, 8,300 ft, 75% power (TAS) (mph)	168*	171*
Service Ceiling (ft)	16,250	20,000
Absolute Ceiling (ft)	18,000	21,500
Cruise Speed at Best Power Mixture (mph)		
65% power, 11,500 ft	163	167
55% power, 15,000 ft	155	163
Range at Best Power Mixture (mi)**		
75% power, 8,000 ft	780	779
65% power, 11,500 ft	845	850
55% power, 15,000 ft	905	935
Cruise Speed at Best Economy Mixture (mph)		
75% power, 8,000 ft	166	169
65% power, 11,400 ft	159	165
55% power, 15,000 ft	149	157
Range at Best Economy Mixture (mi)**		
75% power, 8,000 ft	850	865
65% power, 11,400 ft	945	980
55% power, 15,000 ft	1030	1080
Stalling Speed, flaps down, (CAS) (mph)	63	58
Stalling Speed, flaps up, (CAS) (mph)	71	66
Landing Roll, flaps down, sea level (ft)	630	540
Landing Distance Over 50-ft Obstacle, sea level (ft)	1000	850

*The speed stated is with optional wheel fairings installed. Subtract 3 mph if wheel fairings are not installed.
**No reserve.

GROSS WEIGHTS	3400	2900
WEIGHTS		
Standard Empty Weight (lbs)	1824	1824
Maximum Useful Load (lbs)	1576	1076

POWER PLANT

Engine - Lycoming	(Serial nos. 7440001 through 7640065 and 7640067 through 7640071) IO-540-K1A5 (Serial nos. 7640066, 7640072 and up) IO-540-K1G5
Rated Horsepower	300
Rated Speed (rpm)	2700
Bore (inches)	5.125
Stroke (inches)	4.375
Displacement (cubic inches)	541.5
Compression Ratio	8.7:1
Dry Weight (pounds)	457
Propeller (Standard)	HC-C2YK-1( )/8475-4 or HC-C2YK-1( )/8475D-4 or HC-C2YK-1( )F/F8475D-4
(Optional)*	HC-C2YK-1( )/8475R-0 or HC-C2YK-1( )F/F8475R-0
Propeller Diameter (inches) (Standard)	80
(Optional)	84

FUEL AND OIL

Fuel Capacity (inboard) (U.S. gal)	50
With Standard Auxiliary (U.S. gal)	84
Oil Capacity (U.S. qts)	12
Fuel, Aviation Grade (min octane)	100/130

BAGGAGE

	Forward	Aft
Maximum Baggage (lbs)	100	100
Baggage Space (cubic ft)	8	20
Baggage Door Size (in.)	16 x 22	

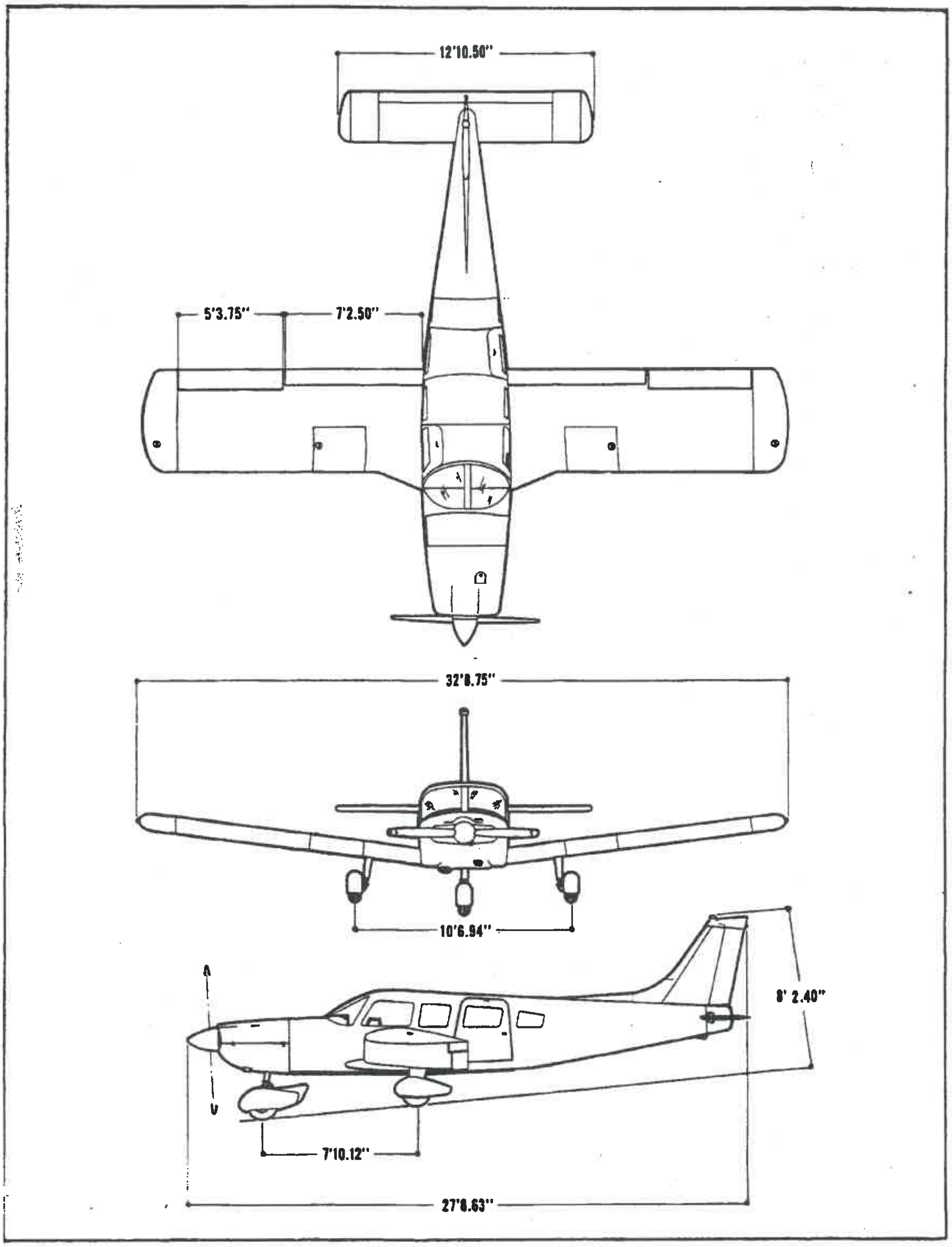
*Serial nos. 7440001 thru 7540188 only

DIMENSIONS

Wing Span (ft)	32.8
Wing Area (sq ft)	174.5
Wing Loading (lbs per sq ft)	19.5
Length (ft)	27.7
Height (ft)	8.2
Power Loading (lbs) per hp	11.3

LANDING GEAR

Wheel Base (ft)		7.8
Wheel Tread (ft)		10.6
Tire Pressure (lbs)	Nose	28-30
	Main	35-40


12'10.50"
5'3.75"
7'2.50"
32'8.75"
10'6.94"
8' 2.40"
7'10.12"
27'8.63"

DESCRIPTION

AIRPLANE AND SYSTEMS

DESCRIPTION

AIRPLANE AND SYSTEMS

THE AIRPLANE

The PA-32-300 is a six-place (seventh seat optional), single-engine, low-wing, all metal monoplane. Removable seats give the airplane a wide range of cargo and passenger loading options. Its large capacity, combined with an economical and powerful fuel injected 300 horsepower engine, makes this Cherokee a versatile airplane for personal or commercial use.

AIRFRAME

Except for the tubular steel engine mount, steel landing gear struts, other miscellaneous steel parts, and the dent resistant fiberglass extremities - cowling and tips of wings and tail surfaces - the **basic airframe** is of aluminum alloy.

The **fuselage** is a conventional semi-monocoque structure with a cabin door on the right front and a cargo and passenger door on the left rear.

The **wings** are attached to each side of the fuselage by the insertion of the butt ends of the mainspars into a spar box carry-through which is an integral part of the fuselage structure. This provides, in effect, a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the rear spar and at an auxiliary front spar.

The **wing airfoil section** is a laminar flow type, NACA65_2-415 with a maximum thickness at about 40% aft of the leading edge.

The **empennage** consists of the fin, the stabilator, and the stabilator trim tab.

ENGINE AND PROPELLER

The **Lycoming IO-540-K1A5** (Serial nos. 7440001 through 7640065 and 7640067 through 7640071 or **IO-540-K1G5** (Serial nos. 7640066, 7640072 and up) **engine** installed in the PA-32-300 is rated at 300 horsepower at 2700 rpm. This engine has a compression ratio of 8.7 to 1 and required 100/130 minimum octane fuel. The engine is equipped with a geared starter, a 60 ampere alternator, dual magnetos, vacuum pump drive, a vane-type fuel pump, and fuel injection.

The **exhaust system** consists of dual exhaust stacks routed to a single heavy gauge stainless steel muffler on serial numbers 7440001 through 7540188. On later models individual exhaust pipes are routed in pairs to three heavy gauge stainless steel mufflers. Exhaust gases are routed overboard at the underside of the engine cowling. The muffler (or mufflers) are surrounded by a shroud which provides heat for the cabin and for windshield defrosting.

Cowling on the Cherokee Six is designed to cool the engine in all normal flight conditions, including protracted climb, without the use of cowl flaps or cooling flanges.

The **constant speed propeller** is a Hartzell HC-C2YK-1 ( )F/F8475D-4 with a diameter of 80 inches. The propeller is controlled by a governor mounted at the left forward side of the crankcase. The governor is operated by a cable from the power control quadrant.

The **power control quadrant** located in the lower center of the instrument panel includes throttle, mixture, and propeller controls. A **friction lock** on the right side of the quadrant prevents creeping of the controls. 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.**

INDUCTION SYSTEM

On Serial Numbers 7440001 through 7540188, the Induction Air for the engine enters an opening in the nose cowl below the propeller and is picked up by a large air duct. The air is directed through a filter and on to the servo regulator. Should the filter become blocked, a spring-loaded door in the air box between the filter and the servo regulator opens automatically. The door may also be opened manually by a control located on the right side of the quadrant.

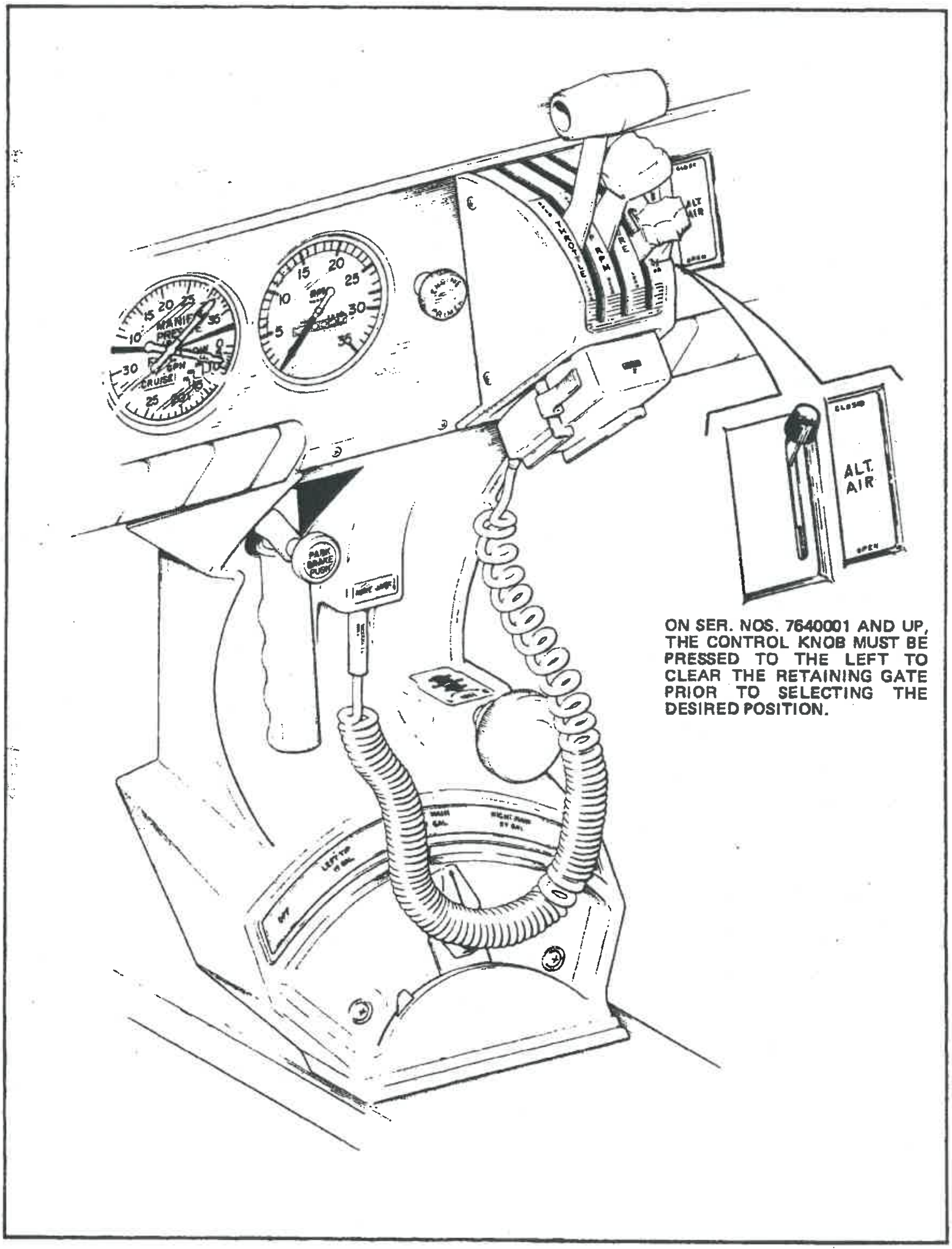
On Serial Numbers 7640001 and up, an induction scoop is located on the left side of the lower cowl. An intake air box is attached to the inside of the cowl adjacent to the air filter box. The filter box is located at the aft end of the induction scoop. Access to the filter is gained through a detachable plate located on the outside of the lower cowl. The intake air box incorporates a manually operated two-way valve designed to allow induction air either to pass through the filter or to bypass the filter and supply heated air directly to the engine.

Alternate air selection insures induction air flow should the filter become blocked. Since the air is heated, the alternate air system offers protection against induction system blockage caused by snow or freezing rain, or by the freezing of moisture accumulated in the induction air filter. Alternate air is unfiltered; therefore, it should not be used during ground operation when dust or other contaminants might enter the system. The primary (through the filter) induction source should always be used for takeoffs. On serial numbers 7640001 and up, the control is operated by pressing the knob to the left to clear the retaining gate and then moved in the desired direction.

The Bendix RSA-10ED1 type fuel injection system consists of a servo regulator which meters fuel flow in proportion to airflow to the engine, giving the proper fuel-air mixture at all engine speeds, and a fuel flow divider which receives the metered fuel and accurately divides the fuel flow among the individual cylinder fuel nozzles.

A combination fuel flow indicator and manifold pressure gauge is installed in the left side of the instrument panel. The fuel flow indicator is connected to the fuel flow divider and monitors fuel pressure. The instrument converts fuel pressure to an accurate indication of fuel flow in gallons per hour and percentage of cruise power.

*Serial nos. 7540001 and up



Throttle Quadrant and Console

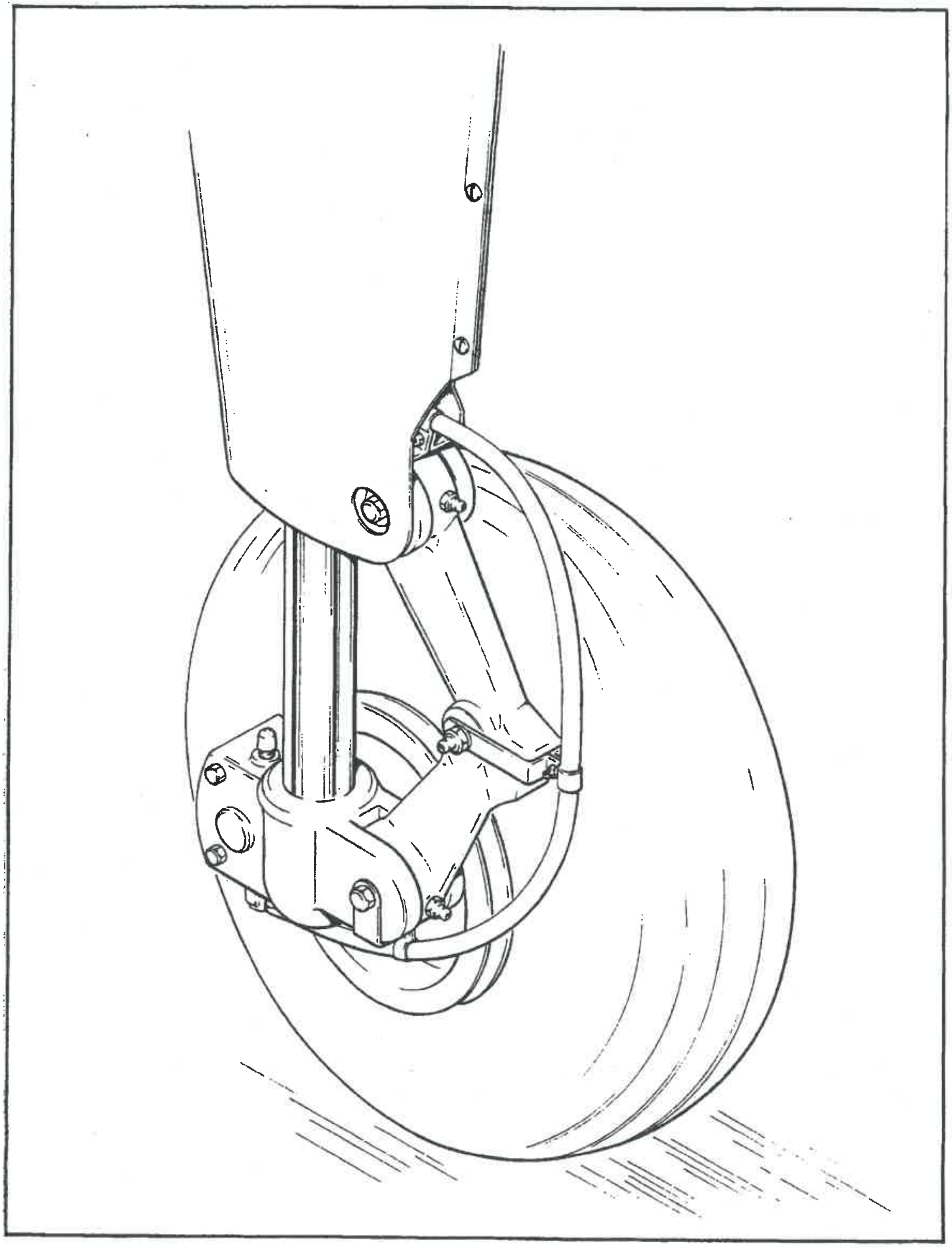
LANDING GEAR

All three landing gear use Cleveland 6.00 x 6 wheels. The main gear have brake drums and Cleveland double disc hydrualic brake assemblies. The nose wheel carries a 6.00 x 6 four or six ply tire and the main gear use 6.00 x 6 six ply tires. All three tires are tube type.

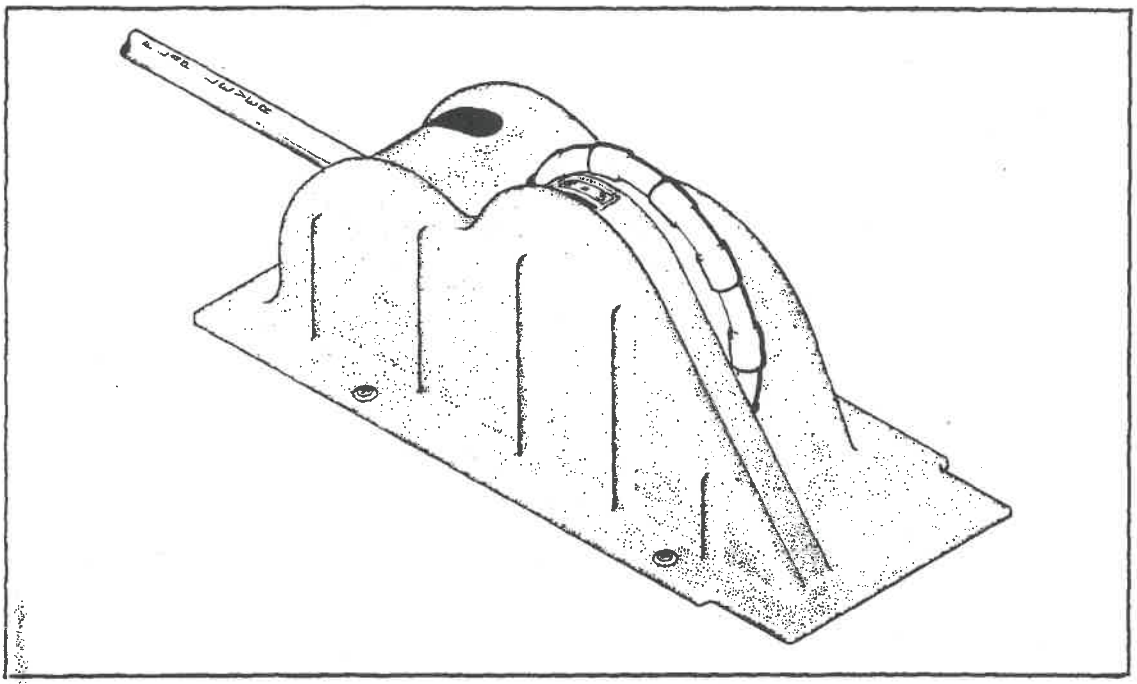
The nose gear is steerable using a combination of full rudder pedal travel and brakes. The *nose gear can be turned 24° each side of center. A spring device is incorporated in the rudder* pedal torque tube assembly to aid in rudder centering and to provide rudder trim. The nose gear also includes a shimmy dampener.

The **oleo struts** are of the air-oil type. The normal extensions are 3-1/4 inches for the nose gear and 4-1/2 inches for the main gear under normal static load (empty weight of airplane plus full fuel and oil).

The **brakes** are operated by toe pedals attached to the left rudder pedals or by a hand lever and master cylinder located below and behind the left center of the instrument sub-panel. Optional toe brakes are available for the right rudder pedals. Hydraulic cylinders are located above each pedal and adjacent to the hand lever. The brake fluid reservoir is on the top left front of the fire wall. The **parking brake** is incorporated in the lever brake and is engaged 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 to disengage the catch; then allow the handle to swing forward.



Main Wheel Assembly



Console

FLIGHT CONTROLS

Dual controls, with a cable system between the controls and the surfaces, are installed as standard equipment.

The horizontal tail is of the all-movable slab type (stabilator). The stabilator provides extra stability and controllability with less size, drag, and weight than conventional tail surfaces.

An anti-servo tab which also acts as a longitudinal trim tab, is located on the horizontal tail. This tail is actuated by a control mounted on the control tunnel between the front seats.

The ailerons are provided with a differential action which tends to eliminate adverse yaw in turning maneuvers and to reduce the amount of coordination required in normal turns.

The flaps are manually operated, balanced for light operating forces, and spring-loaded to return to the up position. A past-center lock incorporated in the actuating linkage holds the flap when it is in the up position so that it may be used as a step on the right side. Since the flap will not support a step load except in the full up position, it should be completely retracted when the airplane is on the ground. The flaps have three extended positions, 10, 25, and 40 degrees.

FUEL SYSTEM

The standard fuel capacity of the Cherokee Six is 84 gallons, all of which is usable except for approximately one pint in each of the four tanks. The **two main inboard tanks**, which hold 25 gallons each, are attached to the wing structure with screws and nut plates and can be removed easily for service or inspection. The **tip tanks** are constructed of resin-impregnated fiberglass, and each one holds 17 gallons.

When using less than the standard 84 gallon capacity of the tanks, fuel should be distributed equally between each side. The tip tanks should always be filled first, and fuel from the main tanks should be used first. All weight in excess of 3112 pounds must be in fuel weight only.

The **fuel selector control** is located below the center of the instrument panel on the sloping face of the control tunnel. It has five positions, one position corresponding to each of the four tanks plus an OFF position.

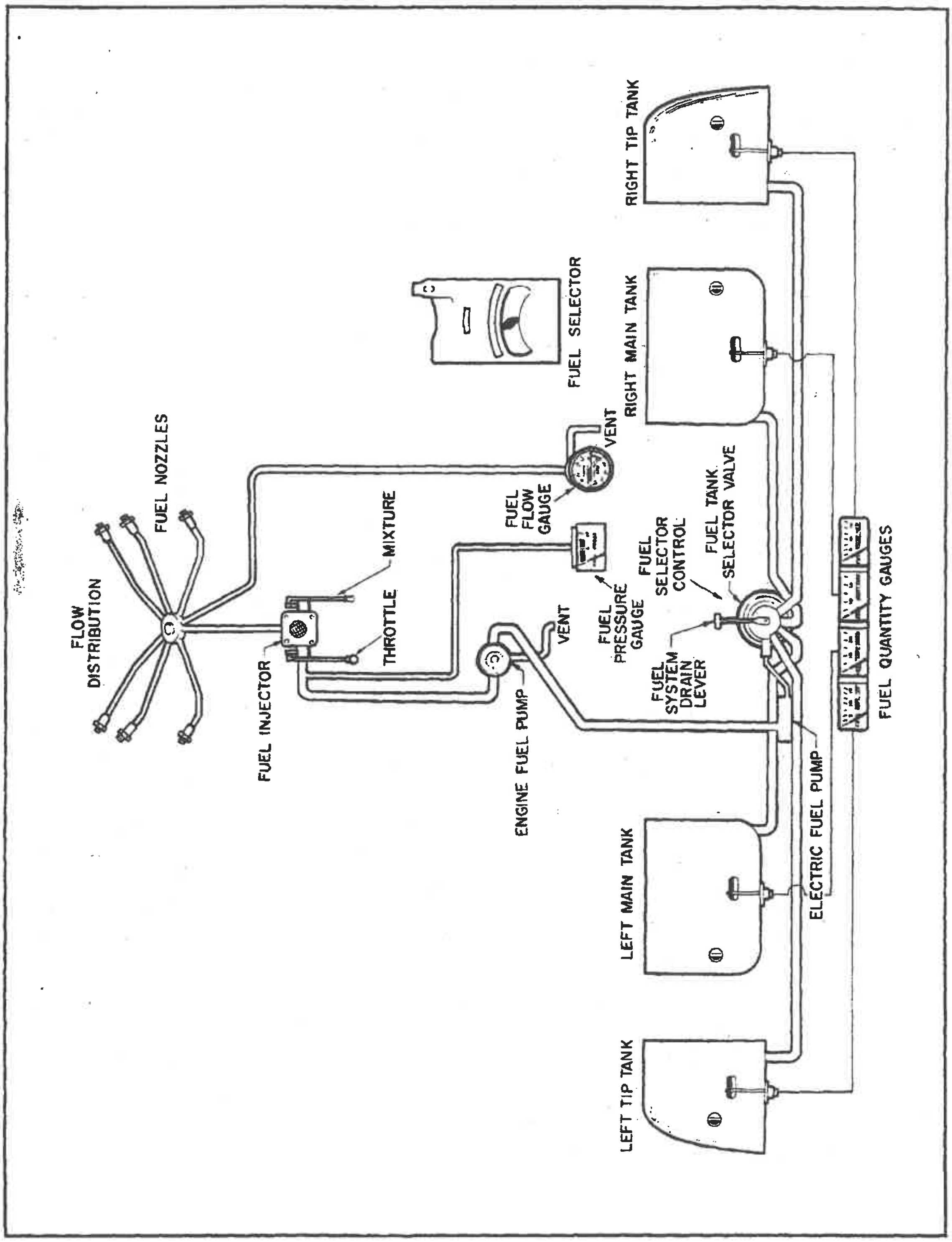
To avoid the accumulation of water and sediment, the fuel system should be drained daily prior to first flight and after refueling. Each tank is equipped with an **individual quick drain** located at the lower inboard rear corner of the tank. The **fuel strainer** and a **system quick drain valve** are located in the fuselage at the lowest point of the fuel system. It is important that the fuel system be drained in the following manner:

1. Drain each tank through its individual quick drain located at the lower inboard rear corner of the tank, making sure that enough fuel has flowed to ensure the removal of all water and sediment.
2. Place a container beneath the fuel sump drain outlet located under the fuselage. A special container is furnished for this operation.
3. Drain the fuel strainer by pressing down on the lever located on the right side of the cabin on the forward edge of the wing spar housing. Move the selector through the following sequence: OFF position, left tip, left main, right main, and right tip while draining the strainer. Make sure that enough fuel has flowed to drain the fuel line between each tank outlet and the fuel strainer, as well as the strainer itself. With full fuel tanks, it will take approximately 11 seconds to drain all the fuel in one of the fuel lines from the tip tank to the strainer, and approximately 6 seconds to drain all of the fuel from the line from either main tank to the fuel strainer. When the tanks are less than full, it will take a few seconds longer.
4. Examine the contents of the container placed under the fuel sump drain outlet. When the fuel flow is free of water and sediment, close the drain and dispose of the contents of the bottle.

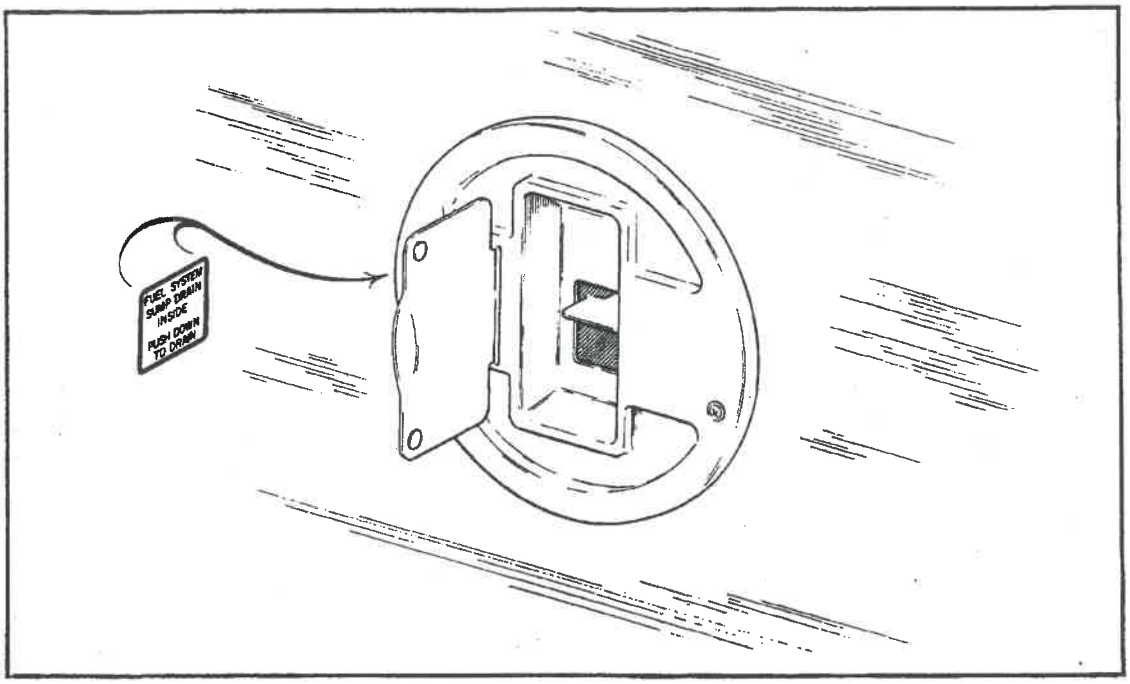
CAUTION

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

After using the underseat quick drain, check from the outside to make sure that it has closed completely and is not leaking.



Fuel System Schematic



Fuel Drain Lever

Fuel quantity gauges for each of the four tanks are located in the engine gauge cluster on the left side of the instrument panel. A **fuel pressure indictor** is also incorporated in the engine gauge cluster.

An **electric fuel pump** is provided for use in case of failure of the engine driven pump. The electric pump operates from a single switch and independent circuit protector. It should be ON for all takeoffs and landings.

ELECTRICAL SYSTEM

The 14-volt electrical system includes a 12-volt **battery** for starting and to back up alternator output. Electrical power is supplied by a 60 ampere **alternator**. The battery, a master switch relay, a voltage regulator and an overvoltage relay are located beneath the floor of the forward baggage compartment, and access is obtained by removing the floor.

Electrical switches are located on a panel to the pilot's left and all **circuit breakers** are on the lower right instrument panel behind a decorative door. Two thumb-wheel rheostat switches to the left of the circuit breakers control the navigation lights and the intensity of the instrument panel lights.

Standard **electrical accessories** include the starter, the electric fuel pump, the stall warning indicator, the cigar lighter, the ammeter, and the 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 the navigation lights, an anti-collision light, and instrument panel lighting.

Circuit provisions are made to handle a full complement of communications and navigational equipment.

The **alternator system** offers many advantages over a generator system. The main advantage is full electrical power output at much lower engine speed, which results in improved radio and electrical equipment operation. Since the alternator output is available all the time, the battery will be charging almost continuously. This will make cold weather starting easier.

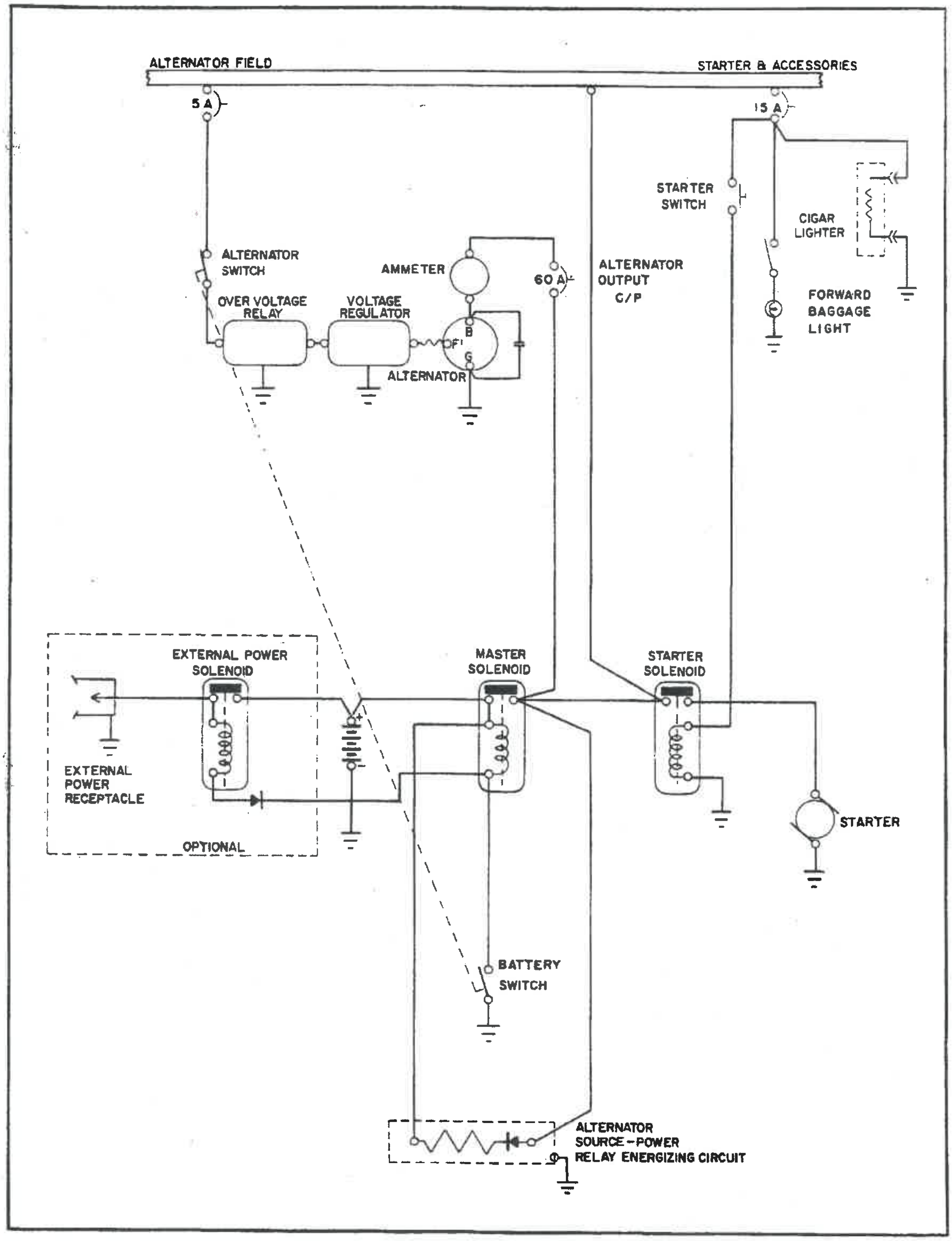
The **ammeter** in the alternator system displays in amperes the load placed on the alternator. It does not indicate battery discharge. With all electrical equipment off (except the master switch) the ammeter will be indicating the amount of charging current demanded by the battery. As each item of electrical equipment is turned on, the current will increase to a total appearing on the ammeter. This total includes the battery. The maximum continuous load for night flight, with radios on, is about 30 amperes. This 30 ampere value, plus approximately 2 amperes for a fully charged battery, will appear continuously under these flight conditions.

The **master switch** is a split switch with the left half operating the master relay and the right half energizing the alternator. This switch is interlocked so that the alternator cannot be operated without the battery. For normal operation, be sure that both halves are turned on.

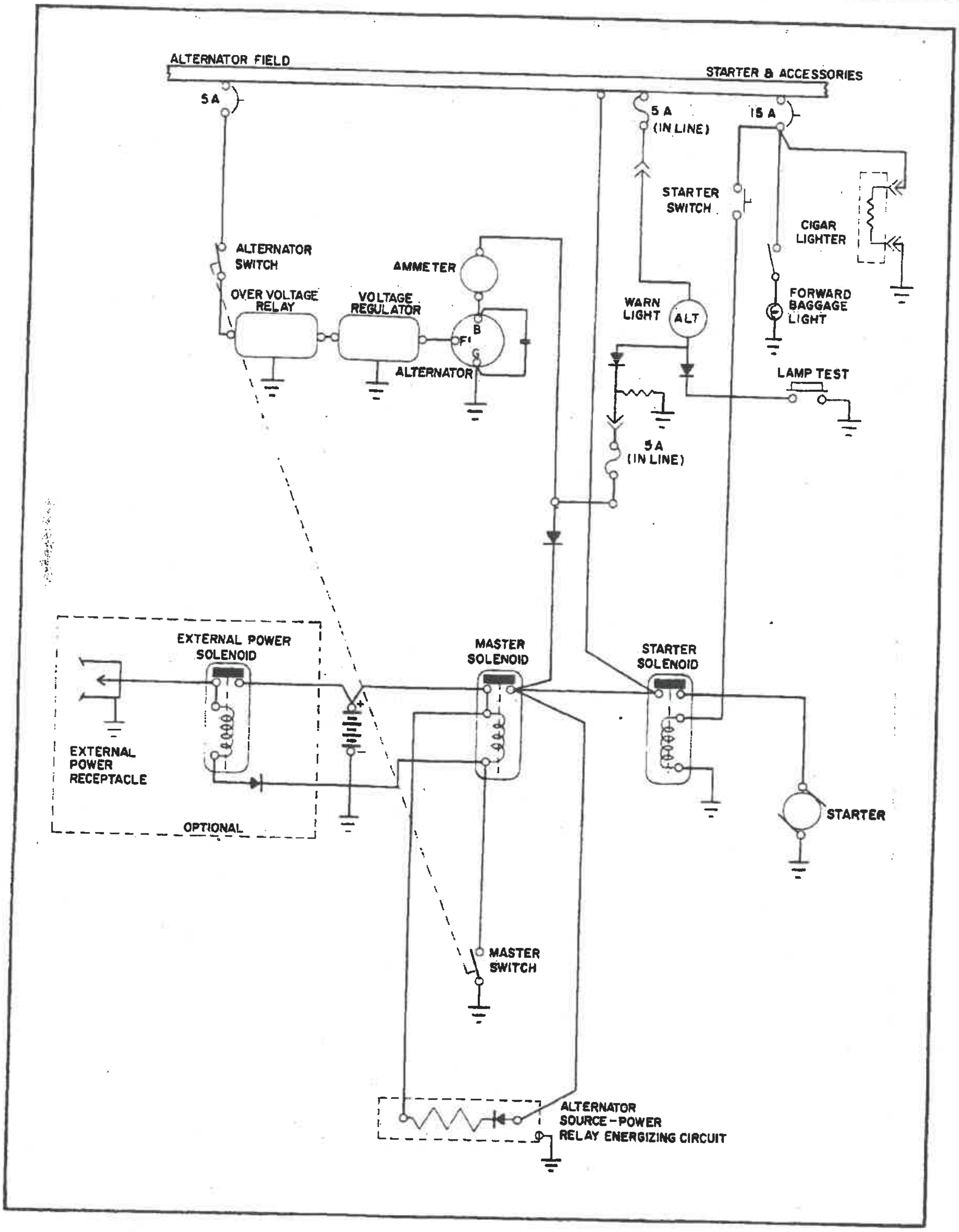
If no output is indicated by the ammeter during flight, reduce the electrical load by turning off all unnecessary electrical equipment. Check both the 5 ampere field breaker and the 60 ampere output breaker and reset if open. If neither circuit breaker is open, turn off the alternator switch for 1 second to reset the overvoltage relay. If the ammeter continues to indicate no output, turn off the alternator switch; maintain a minimum electrical load; and terminate the flight as soon as practical.

Maintenance on the alternator should prove to be a minor factor. Should service be required, contact a Piper Dealer.

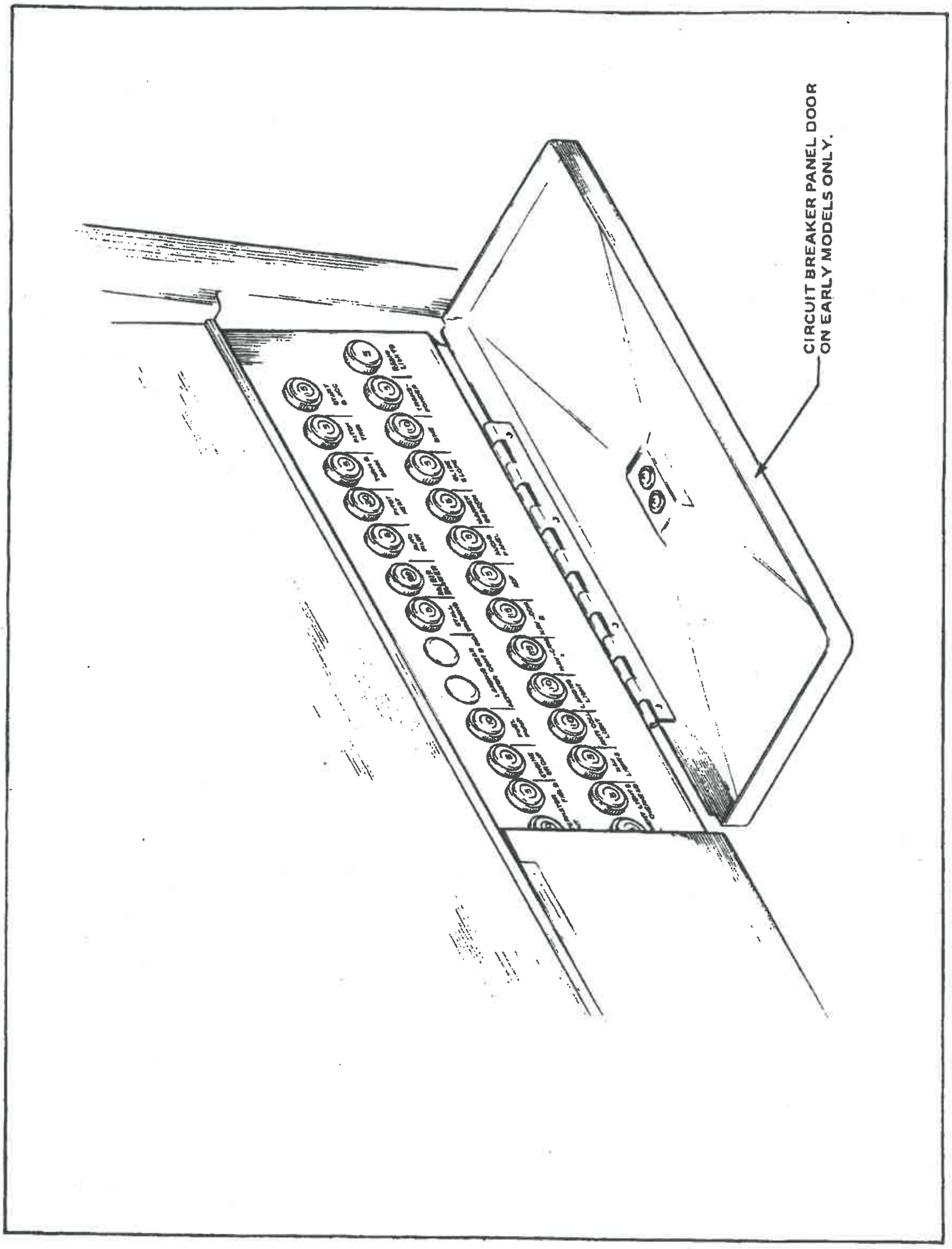
*Serial nos. 7540001 and up



Alternator and Starter Schematic (Ser. Nos. 7440001 through 7440182)



Alternator and Starter Schematic (Ser. Nos. 7540001 and up)



Circuit Breaker Panel

VACUUM SYSTEM

The vacuum system employed to operate the gyro instruments includes an engine-driven dry vacuum pump, a vacuum regulator valve, and the tubing necessary to complete the system.

The use of a dry type vacuum pump eliminates the need for an oil-air separator and the hardware necessary for its installation.

The vacuum gauge is mounted on the right side of the instrument panel. The gauge is calibrated in inches of mercury and indicates the amount of suction created by the engine-driven vacuum pump. As the system filter becomes clogged or the lines obstructed, the gauge will show a decrease in pressure (a low vacuum indicator light is provided in the annunciator panel*). Do not reset the regulator until the filter and lines have been checked.

A vacuum regulator valve is incorporated in the system to control vacuum pressure to the gyro instruments. The regulator valve is located under the instrument panel. Access to the valve for maintenance and adjustment is gained from below the instrument panel. The regulator should be set so that the vacuum gauge reads 5.0 ± .1 inches of mercury with the engine running at medium RPM after warm-up.

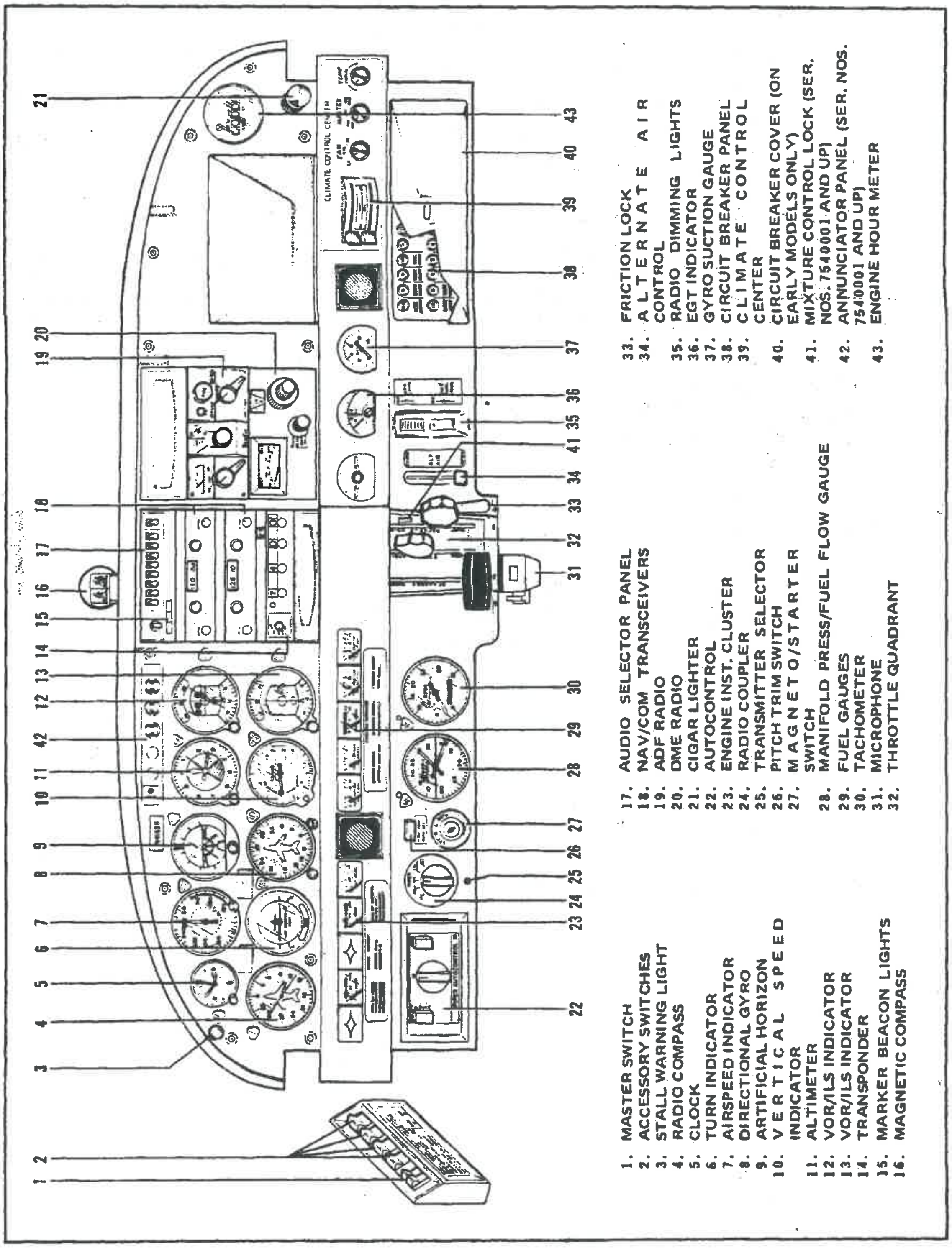
INSTRUMENT PANEL

The instrument panel of the Cherokee Six 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 located 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 electrically operated.

A natural separation of the flight group and the power group is achieved by the placement of the flight group in the upper instrument panel and the power group in the center and lower instrument panels. The radios are located in the center section of the panel, and the circuit breakers are in the lower right behind a decorative door.

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.

*Serial nos. 7540001 and up



Instrument Panel

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 are picked up by the pitot head on the bottom of 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 lower left instrument panel.

To prevent bugs and water from entering the pitot and static 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.

HEATING AND VENTILATING SYSTEM

Heat for the cabin interior and the defroster system is drawn from a heater muff attached to the exhaust system. Controls for these systems are located on the lower right side of the instrument panel.

NOTE

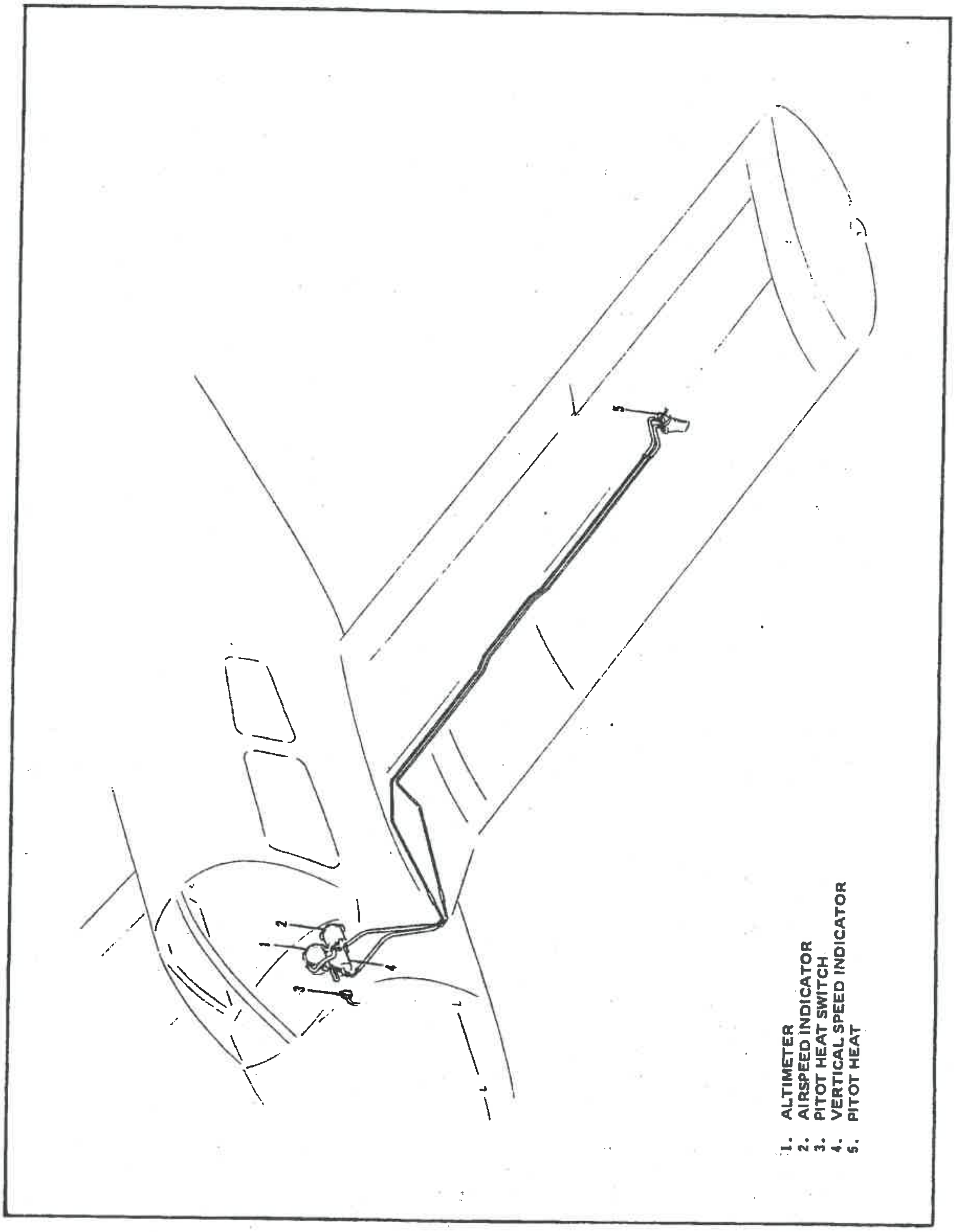
If unusual odors are detected, turn off the heat and inspect the system for leaks.

Fresh air inlets are located in the leading edge of each wing at the intersection of the tapered and straight sections, and in the leading edge of the fin. Two large adjustable outlets are located on each side of the cabin, one forward and one aft of the front seat near the floor. There are also adjustable outlets above each seat. In airplanes without air conditioning, an optional blower may be added to the overhead vent system to aid in the circulation of cabin air.

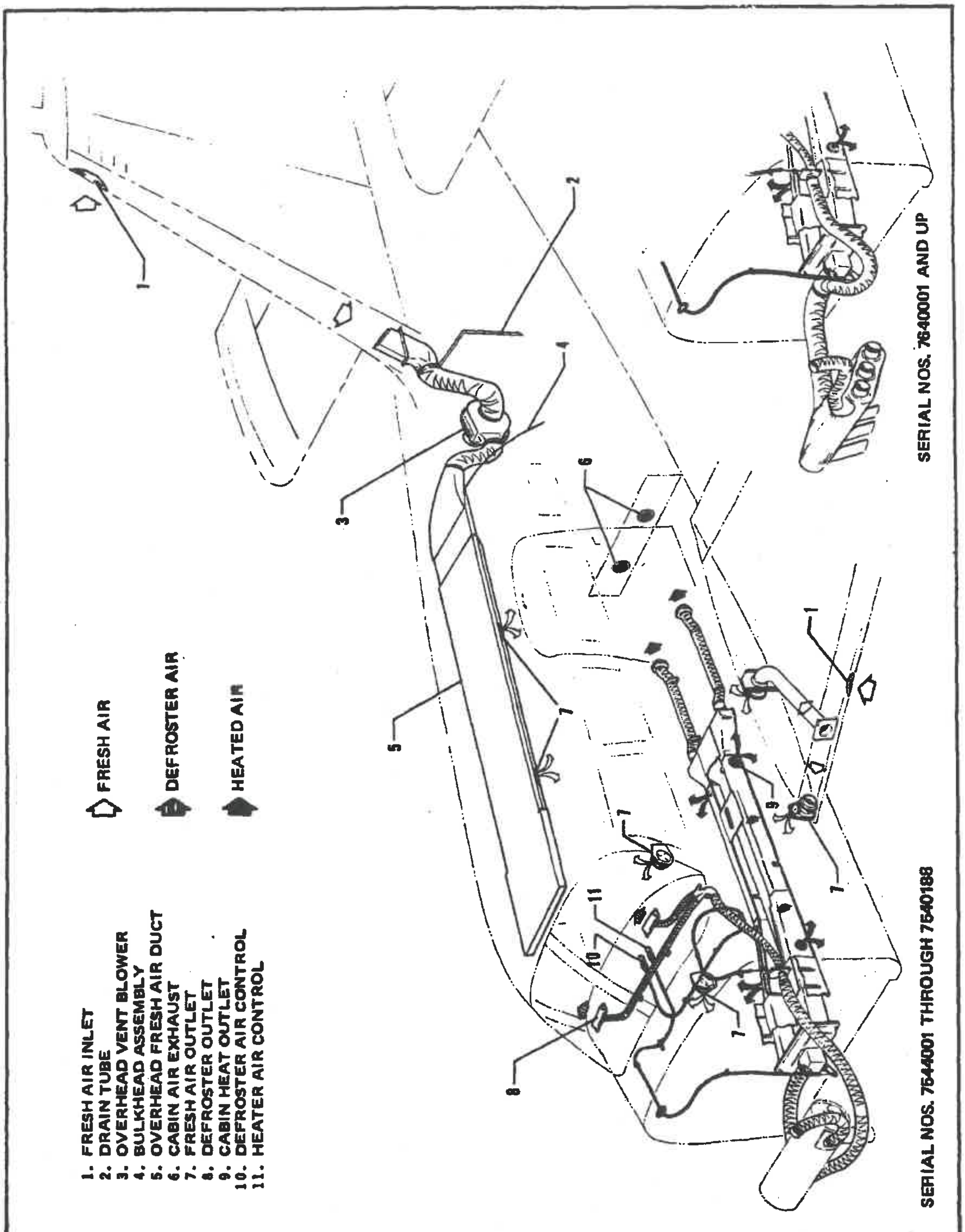
CABIN FEATURES

For ease of entry and exit and for pilot and passenger comfort, the front seats are adjustable fore and aft. All seats recline and have armrests and are available with optional headrests. The front seats can be equipped with optional vertical adjustment. The center and rear seats are easily removed for additional cargo space. Some rear seat installations incorporate leg retainers with latching mechanisms which must be released before the rear seats can be removed. Releasing the retainers is easily accomplished by turning the latching mechanisms 90° with a coin or screwdriver. An optional jump seat can be installed between the two middle seats to give the airplane a seven-place capacity.

Single strap shoulder harnesses controlled by inertia reels are standard equipment for the front seats and are offered as optional equipment for the third, fourth, fifth and sixth seats, but not for the seventh seat. The shoulder strap is routed over the shoulder adjacent to the windows and attached to the lap belt in the general area of the person's inboard hip.



Pitot-Static System



Heating and Ventilating System

The inertia reel should be checked by tugging sharply on the strap. The reel will lock in place under this test and prevent the strap from extending. Under normal movement, the strap will extend and retract as required.

BAGGAGE AREA

The airplane has two separate baggage areas, each with a 100 pound capacity. An 8 cubic foot forward luggage compartment, located just aft of the fire wall, is accessible through a 16 x 22 inch door on the right side of the fuselage. A 22 cubic foot aft compartment is located behind the fifth and sixth seats and is conveniently accessible even during flight from inside the cabin.

NOTE

It is the pilot's responsibility to be sure when the baggage is loaded that the airplane's C.G. falls within the allowable C.G. range. (See Weight and Balance Section.)

STALL WARNING

An approaching stall is indicated by a stall warning indicator which is activated between five and ten miles per hour above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on graphs in the Performance Charts Section. The stall warning indicator is a red warning light on the left side of the instrument panel on earlier models and a continuous sounding horn located behind the instrument panel on later models. The stall warning indicator is activated by a lift detector installed on the leading edge of the left wing. During preflight, the stall warning system should be checked by turning the master switch "ON," lifting the detector and checking to determine if the indicator is actuated.

FINISH

All exterior surfaces are primed with etching primer and finished with acrylic lacquer available in a variety of colors and combinations. To keep the finish attractive looking, economy size spray cans of touch-up paint are available from Piper Dealers.

AIR CONDITIONING*

The air conditioning system is a recirculating 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 a flush position when the system is OFF.

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

*Optional equipment

An **optional electric blower** is mounted on the aft side of the rear cabin panel. 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.

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 turned 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 turned OFF to aid in cabin air circulation. "LOW," "MED" 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 turned off individuallly.

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.

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 compressor and retracts the scoop. This allows maximum power and maximum rate of climb. The fan continues to operate 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.

PIPER EXTERNAL POWER*

An optional starting installation known as Piper External Power (PEP) is accessible through a receptacle located on the left side of the nose section aft of the cowling. 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.

*Optional equipment

F.A.A. APPROVED
EMERGENCY PROCEDURES

NONE APPLICABLE TO THIS AIRPLANE

AIRPLANE FLIGHT MANUAL

FOR

CHEROKEE SIX 300

APPLICABLE TO SERIAL NUMBERS 32-7440001 THROUGH 32-7640130

REPORT: VB-562
MODEL: PA-32-300

AIRPLANE FLIGHT MANUAL

TABLE OF CONTENTS

SECTION I

LIMITATIONS

The following limitations must be observed in the operation of this airplane:

A. ENGINE

Lycoming IO-540-K1A5 (Serial nos. 7440001 through 7640065 and 7640067 through 7640071)
Lycoming IO-540-K1G5 (Serial nos. 7640066, 7640072 and up)

ENGINE LIMITS
For all operations 2700 RPM, 300 HP

B. FUEL

100/130 minimum aviation grade fuel

C. PROPELLER

Hartzell HC-C2YK-1/8475D-4 or HC-C2YK-1( )/8475-4 or HC-C2YK-1( )F/F8475D-4
Low pitch stop 13.5° ± .2°, high pitch stop 34° ± 1°
Maximum diameter 80 inches, minimum diameter 78.5 inches

OPTIONAL PROPELLER (Ser. nos. 7440001 through 7540188 only)
Hartzell HC-C2YK-1( )/8475R-0 or HC-C2YK-1( )F/F8475R-0
Low pitch stop 12.4° ± .2°, high pitch stop 29° ± 1°
Maximum diameter 84 inches, minimum diameter 82.3 inches

D. POWER INSTRUMENTS

OIL TEMPERATURE	
Green Arc (Normal Operating Range)	75° F to 245° F
Red Line (Maximum)	245° F
OIL PRESSURE	
Green Arc (Normal Operating Range)	60 PSI to 90 PSI
Yellow Arc (Caution Range)	25 PSI to 60 PSI
Red Line (Minimum)	25 PSI
Red Line (Maximum)	90 PSI
FUEL PRESSURE	
Green Arc (Normal Operating Range)	18 PSI to 40 PSI
Red Line (Minimum)	18 PSI
Red Line (Maximum)	40 PSI
Yellow Arc (Idle Range)	12 PSI to 18 PSI
TACHOMETER	
Green Arc (Normal Operating Range)	500 to 2700 RPM
Red Line (Maximum Continuous Power)	2700 RPM

E. AIRSPEED LIMITATIONS AND AIRSPEED INSTRUMENT MARKINGS (Calibrated Airspeed)

NEVER EXCEED	212 MPH
MAXIMUM STRUCTURAL CRUISE	168 MPH
MANEUVERING	149 MPH
FLAPS EXTENDED	125 MPH
MAXIMUM POSITIVE LOAD FACTOR	3.8
MAXIMUM NEGATIVE LOAD FACTOR	No inverted maneuvers approved

AIRSPEED INSTRUMENT MARKINGS

Red Radial Line (Never Exceed)	212 MPH (184 KTS)
Yellow Arc (Caution Range) (Smooth Air Only)	168 MPH to 212 MPH (146 KTS to 184 KTS)
Green Arc (Normal Operating Range)	71 MPH to 168 MPH (62 KTS to 146 KTS)
White Arc (Flap Down)	63 MPH to 125 MPH (55 KTS to 109 KTS)

F. MAXIMUM WEIGHT 3400 LBS

G. C. G. RANGE

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

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
3400	91.4	95.5
3300	89.0	96.2
2900	80.0	96.2
2400	76.0	96.2

Straight line variation between points given.

NOTE

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

H. MANEUVERS

No acrobatic maneuvers including spins approved.

I. 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. NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED."

"THIS AIRCRAFT APPROVED FOR NIGHT IFR 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	Mixture set	Flaps 10° (1st notch)
Electric fuel pump on	Propeller set	Trim tab - set
Engine gauges checked	Fasten belts/harness	Controls free
Alternate air closed		Doors latched
Seat backs erect		Air Conditioner - Off

LANDING CHECK LIST

Seat backs erect	Fuel on proper tank	Mixture rich
Fasten belts/harness	Electric fuel pump on	Propeller set
Air Conditioner - Off		Flaps down (125 mph)

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:

"ROUGH AIR OR MANEUVERING SPEED 149 MPH."

On the instrument panel in full view of the pilot:

"DEMONSTRATED CROSSWIND COMPONENT 20 MPH."

In full view of the pilot: (For operation with the rear door removed)

"FOR FLIGHT WITH THE DOOR REMOVED, SEE THE LIMITATIONS AND PROCEDURES SECTIONS OF THE AIRPLANE FLIGHT MANUAL."

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."

On the fuel selector valve cover:

"ALL WEIGHT IN EXCESS OF 3112 POUNDS MUST BE FUEL WEIGHT ONLY. FILL TIP TANKS FIRST. USE MAIN TANKS FIRST."

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."

On the instrument panel in full view of the pilot when the supplementary white strobe lights are installed:

"WARNING - TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT 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."

J. REAR CABIN DOOR OR REAR CABIN DOOR AND CARGO DOOR REMOVED

The following limitations must be observed in the operation of this airplane with the rear cabin door or rear cabin door and cargo door removed:

1. The airplane may be flown with the rear cabin door or rear cabin door and cargo door removed. Flight with the front door removed is not approved.
2. Maximum speed - 165 mph.
3. No smoking.
4. All loose articles must be tied down and stowed.
5. Jumper's static lines must be kept free of pilot's controls and control surfaces.
6. Operation approved VFR flight conditions only.

K. LOADING LIMITATIONS

The following limitations must be observed in the operation of this airplane.

1. Fill tip tanks first; use main tanks first.
2. This airplane must not be operated at gross weights in excess of 3112 pounds unless the weight over 3112 pounds is fuel weight only.
3. Remove fuel from the main tanks first when required for proper weight and balance.

L. NOSE WHEEL FAIRING REMOVED

When the nose wheel fairing is removed, two nose wheel centering springs (part number 67168) must be installed.

M. NOISE LEVEL (Ser. nos. 7640001 and up)

No noise reduction procedures are required for this airplane. The noise level achieved during type certification was 79.27 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.

SECTION II

PROCEDURES

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

2. Electric fuel pump must be on for both landing and takeoff.

3. Except as noted above, all operating procedures for this airplane are normal.

4. When operating with the rear cabin door removed, it is recommended that all occupants wear parachutes.

5. Air conditioned Models only: Warning - the air conditioner must be off to insure normal takeoff performance.

6. Fuel System Preflight Procedure:

   The fuel system should be drained daily prior to first flight and after refueling to avoid the accumulation of water or sediment. Each fuel tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. The fuel strainer and a system quick drain valve are located in the fuselage at the lowest point of the fuel system. It is important that the fuel system be drained in the following manner:

   a. Drain each tank through its individual 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.

   b. Place a container under the fuel sump drain outlet, which is located under the fuselage.

   c. Drain the fuel strainer by pressing down on the lever located on the right hand side of the cabin below the forward edge of the rear seat. The fuel selector must be positioned in the following sequence: off position, left tip, left main, right main, and right tip while draining the strainer to insure that the fuel lines between each tank outlet and fuel strainer are drained as well as the strainer. When the fuel tanks are full, it will take approximately 11 seconds to drain all the fuel in one of the lines between a tip tank and the fuel strainer and approximately six seconds to drain all the fuel in one of the lines from a main tank to the fuel strainer. When the fuel tanks are less than full, it will take a few seconds longer.

d. Examine the contents of the container placed under the fuel sump drain outlet for water and sediment and dispose of the contents.

CAUTION

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

After using the under-seat quick drain, it should be checked from outside to make sure it has closed completely and is not leaking.

SECTION III

PERFORMANCE

All performance is given for a weight of 3400 pounds.

Loss of altitude during stalls can be as great as 350 feet, depending on configuration and power.

Stalling speed, in mph, (Calibrated Airspeed):

Flaps Up	-	71
Flaps Down	-	63

Flap deflection versus handle position is:

lst notch	-	10 degrees
2nd notch	-	25 degrees
3rd notch	-	40 degrees

Air Conditioned Models Only:

When the full throttle position is not used or in the event of a malfunction which causes the compressor to operate and the condenser door to remain extended, a decrease in rate of climb of as much as 100 fpm can be expected at all altitudes.

SECTION IV

OPTIONAL EQUIPMENT

NOTE

THE INFORMATION CONTAINED IN THIS SECTION APPLIES WHEN THE RELATED EQUIPMENT IS INSTALLED IN THE AIRCRAFT.

A. Electric Pitch Trim Installation

B. AutoFlite II Installation

C. Air Conditioner Installation

D. Piper AutoControl III and/or AutoControl IIIB Installation

E. Piper AltiMatic IIIC Installation

A. ELECTRIC PITCH TRIM INSTALLATION

The following emergency information applies in case of electric pitch trim malfunction.

1. In case of malfunction, disengage electric pitch trim by operating push button trim switch on instrument panel.

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

3. In cruise configuration, malfunction results in 10° pitch change and 50 ft altitude variation.

D. PIPER AUTOCONTROL III AND/OR AUTOCONTROL IIIB INSTALLATION

1. LIMITATIONS
   a. Autopilot OFF during takeoff and landing.
   b. Autopilot use prohibited above 180 MPH CAS.

2. PROCEDURES
   a. PREFLIGHT
      (1) Roll Section
         (a) Place Radio Coupler in "Heading" mode and place A/P ON/OFF switch in the "ON" position to engage roll section. Rotate roll command knob Left and Right and observe control wheel describes a corresponding Left and Right turn, then center knob.
         (b) Set proper D.G. Heading on D.G. and turn Heading Indice to aircraft heading. Engage "Heading" mode switch and rotate Heading Indice right and left. Aircraft control wheel should turn same direction as Indice. While D.G. indice is set for a left turn, grasp control wheel and override the servo to the right. Repeat in opposite direction for right turn.
         (c) If VOR signal available check Omni mode on Radio Coupler by swinging Omni needle left and right slowly. Observe that control wheel rotates in direction of needle movement.
         (d) Disengage by placing the A/P ON/OFF switch to the "OFF" position.

   b. IN-FLIGHT
      (1) Trim airplane (ball centered).
      (2) Check air pressure or vacuum to ascertain that the Directional Gyro and Attitude Gyro are receiving sufficient air.
      (3) Roll Section
         (a) To engage, center Roll Command Knob, place the A/P ON/OFF switch to the "ON" position. To turn rotate roll command knob in desired direction. (Maximum angle of bank should not exceed 30°.)
         (b) For heading mode, set Directional Gyro with Magnetic Compass. Push directional gyro HDG knob in, rotate to aircraft heading. Place the console HDG ON/OFF switch to the "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.

NOTE

In HDG mode the maximum bank angles are limited to approximately 20° and single command, heading changes should be limited to 150°. (HDG Indice not more than 150° from actual aircraft heading.)

(4) VOR

(a) To Intercept:

1. Using OMNI Bearing Selector, dial desired course, inbound or outbound.
2. Set identical heading on Course Selector D.G.
3. After aircraft has stabilized, position coupler mode selector knob to OMNI mode. As aircraft nears selected radial, interception and crosswind correction will be automatically accomplished without further switching.

NOTE

If aircraft position is less than 45° from selected radial, aircraft will intercept before station. If position is more than 45°, interception will occur after station passage. As the aircraft nears the OMNI station, (1/2 mile) the zone of confusion will direct an "S" turn in alternate directions as the OMNI indicator needle swings. This alternate banking limited to the standard D.G. bank angle, is an indication of station passage.

(b) To select new course:

1. To select a new course or radial, rotate the HDG indice to the desired HDG (match course).
2. Rotate OBS to the new course. Aircraft will automatically turn to the intercept heading for the new course.

(c) To change stations:

1. If same course is desired, merely tune receiver to new station frequency.
2. If different course is desired, position coupler mode selector to HDG mode. Dial course selector D.G. to new course. Dial OBS to new course and position coupler mode selector to OMNI mode.

(5) VOR Approach

Track inbound to station as described in VOR navigation section. After station passage:

(a) Dial outbound course on Course Selector D.G., then dial same course on OBS.
(b) After established on outbound radial, position coupler mode selector to HDG mode and select outbound procedure turn heading. After 40 seconds to 1 minute select a turn in the desired direction with the Course Selector D.G. to the inbound procedure turn heading.
(c) Set OBS to inbound course.
(d) When aircraft heading is 45° to the inbound course, dial Course Selector D.G. to inbound course and position coupler mode selector to OMNI mode.

NOTE

For precise tracking over OMNI station, without "S" turn, position coupler mode selector to HDG mode just prior to station passage. If holding pattern is desired, position coupler mode selector to HDG mode at station passage inbound and select outbound heading in direction of turn. After elapsed time, dial inbound course on Course Selector D.G. When aircraft heading is 45° to radial, position coupler mode selector to OMNI mode.

(6) LOC Approach Only
- (a) To intercept dial ILS outbound course on Course Selector D.G. When stabilized, position coupler mode selector to LOC REV mode.
- (b) After interception and when beyond outer marker, position coupler mode selector to HDG mode and dial outbound procedure turn heading. After one minute, dial inbound procedure turn heading in direction of turn.
- (c) When aircraft heading is 45° to ILS inbound course dial inbound course on Course Selector D.G. and position coupler mode selector to LOC NORM mode.
- (d) At the missed approach point (M.A.P.), or when missed approach is elected, position coupler mode selector to HDG mode and execute missed approach procedure.

(7) LOC Approach - Back Course (Reverse)
- (a) To intercept dial ILS Back Course outbound heading on Course Selector D.G. When stabilized, position coupler mode selector to LOC NORM mode.
- (b) After interception and when beyond fix, position coupler mode selector to HDG and dial outbound procedure turn heading. After one minute, dial inbound procedure turn heading in direction of turn.
- (c) When heading 45° to inbound course, dial inbound course on Course Selector D.G. and position coupler mode selector to LOC REV mode.
- (d) Approximately 1/2 mile from runway, position coupler mode selector to HDG mode to prevent "S" turn over ILS station near runway threshold.
- (e) Missed approach - same as Front Course. (See (6) d)

c. EMERGENCY OPERATION

(1) In an emergency the AutoControl can be disconnected by placing the A/P ON/OFF switch to the "OFF" position.

(2) The AutoControl can be overpowered at either control wheel.

(3) An Autopilot runaway, with a 3 second delay in the initiation of recovery, while operating in a climb, cruise or descending flight could result in a 38° bank and 40 foot altitude loss.

(4) An Autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in an 8° bank and 10 foot altitude loss.

3. PERFORMANCE

No change.

EMERGENCY PROCEDURES

EMERGENCY PROCEDURES

INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, takeoff, or in flight. 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 modern 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 are discussed 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 remain proficient in them.

ENGINE POWER LOSS DURING TAKEOFF

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

1. If sufficient runway remains for a normal landing, land straight ahead.
2. If insufficient runway remains, maintain a safe airspeed and make only a shallow turn if necessary 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. ALTERNATE AIR - ON

NOTE

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.

If power is not regained, proceed with the POWER OFF LANDING procedure.

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 100 MPH IAS, and if altitude permits, proceed as follows:

1. Fuel Selector - Switch to another tank containing fuel.
2. Electric Fuel Pump - On
3. Mixture - Rich
4. Alternate Air - On
5. Engine Gauges - Check for an indication of the cause of power loss.
6. If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:

8. Alternate Air - Off
9. Electric Fuel Pump - Off

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

If time permits:

1. Ignition Switch - "L" then "R" then back to "BOTH."
2. Throttle and Mixture - Different settings. (This may restore power if the problem is too rich or too lean a mixture, or if there is partial fuel system restriction.)
3. Try other fuel tanks. (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.)

NOTE

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.

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

POWER OFF LANDING

If loss of power occurs at altitude, trim the aircraft for best gliding angle (100 MPH IAS, 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 and the propeller control in full "DECREASE RPM," the airplane will travel approximately one and one half miles for each one thousand feet of altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let them help.

When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the field at the downwind position to make a normal approach. When the field can easily be reached, slow up to 90 MPH IAS for the shortest landing. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these.

Touchdown should normally be made at the lowest possible airspeed, with full flaps.

When committed to landing:

1. Ignition - Off
2. Master Switch - Off
3. Fuel Selector - Off
4. Mixture - Idle Cut-Off
5. Seat Belt (and harness if available) - Tight

PROPELLER OVERSPEED

Propeller overspeed is caused by a malfunction in the propeller governor, or low oil pressure, which allows the propeller blades to rotate to full low pitch. If this should occur, proceed as follows:

1. THROTTLE - RETARD
2. OIL PRESSURE - CHECK
3. PROPELLER CONTROL - FULL DECREASE RPM, THEN SET IF ANY CONTROL IS AVAILABLE.
4. REDUCE AIRSPEED
5. THROTTLE - AS REQUIRED TO REMAIN BELOW 2700 RPM.

SPINS

Intentional spins are prohibited in this aircraft. If a spin is inadvertently entered, immediately use the following recovery 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

OPEN DOOR

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

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

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. If lower latch is open - open top latch, push door further open, and then close rapidly. Latch top latch.

A slip in the direction of the open door will assist in latching procedure.

FIRE

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.

SOURCE OF FIRE - CHECK

1. Electrical Fire (Smoke in Cabin):
   a. Master Switch - Off
   b. Vents - Open
   c. Cabin Heat - Off
   d. Land as soon as possible.

2. Engine Fire (In Flight):
   a. Fuel Selector - Off
   b. Throttle - Closed
   c. Mixture - Idle Cut-Off
   d. Heater - Off (In all cases of fire)
   e. Defroster - Off (In all cases of fire)
   f. If terrain permits, land immediately.

NOTE

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

3. Engine Fire (During Start):
   Engine fires during start are usually the result of overpriming. The following procedure is designed to draw the excess fuel back into the induction system.
   a. If engine has not started:
      (1) Mixture - Idle Cut-Off
      (2) Throttle - Open
      (3) Turn engine with starter (This is an attempt to pull the fire into the engine.)
   b. If engine has already started and is running, continue operating to try pulling the fire into the engine.
   c. In either case stated in (a) and (b), if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.
   d. If external fire extinguishing is to be applied:
      (1) Fuel Selector Valves - Off
      (2) Mixture - Idle Cut-Off

LOSS OF OIL PRESSURE

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.

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 stoppage occurs, proceed to POWER OFF LANDING.

LOSS OF FUEL PRESSURE

1. Electric Boost Pump - On
2. Fuel Selector - Check on full tank

If problem is not an empty fuel tank, land as soon as practical and have engine-driven fuel pump checked.

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 seals, 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 problem. Watch the oil pressure gauge for an accompanying loss of pressure.

ALTERNATOR FAILURE

Loss of alternator output is detected through zero reading 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, alternator failure can be assumed.

1. Reduce Electrical Load.
2. Alternator Circuit Breakers - Check
3. "Alt" Switch - Off (for 1 second), then On

If the ammeter continues to indicate no output, or alternator will not stay reset, turn off "Alt" switch, maintain minimum electrical load and land as soon as practical. All electrical load is being supplied by the battery.

ENGINE ROUGHNESS

Engine roughness may be caused by dirt in the injector nozzles, induction system icing, or ignition problems. To eliminate roughness, proceed as follows:

1. Mixture - Adjust for maximum smoothness. Engine will run rough if too rich or too lean.
2. Alternate Air - On
3. Electric Fuel Pump - On
4. Fuel Selector - Change tanks to see if fuel contamination is the problem.
5. Engine Gauges - Check for abnormal readings. If any gauge readings are abnormal, proceed accordingly.
6. 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.

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

WEIGHT AND BALANCE

FOR

CHEROKEE SIX 300

APPLICABLE TO SERIAL NUMBERS 32-7440001 THROUGH 32-7640130

ISSUED: MAY 14, 1973
REVISED: MARCH 23, 1979

REPORT: VB-551
MODEL: PA-32-300

WEIGHT AND BALANCE

WEIGHT AND BALANCE

In order to achieve the performance, safety and good flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position wthin the approved envelope. The aircraft offers a tremendous flexibility of loading. However, you cannot fill the airplane, with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must ensure 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 performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, 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 try to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded aircraft, however, will perform as intended. This airplane is designed to provide excellent performance and safety within the flight envelope. Before the airplane is delivered, it is weighed, and a basic weight and C.G. location is computed. (Basic weight consists of the empty weight of the aircraft plus the unusable fuel and full oil capacity.) Using the basic 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 envelope.

The basic weight and C.G. location for a particular airplane are recorded in the aircraft log book or in the weight and balance section of the Airplane Flight Manual. 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 weight and basic C.G. position and to write these in the aircraft log book. The owner should make sure that it is done.

A weight and balance calculation can be helpful in determining how much fuel or baggage can be boarded so as to keep the C.G. within allowable limits. If it is necessary to remove some of the fuel to stay within maximum allowable gross weight, the pilot should not hesitate to do so.

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

WEIGHT AND BALANCE DATA

WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location. This data is on Page 5-7.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and empty weight center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

1. PREPARATION

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

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

   c. 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.

   d. Drain all oil from the engine, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.

   e. 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.

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

2. LEVELING

   a. With airplane on scales, block main gear oleo pistons in the fully extended position.

   b. Level airplane (see diagram) deflating nose wheel tire, to center bubble on level.

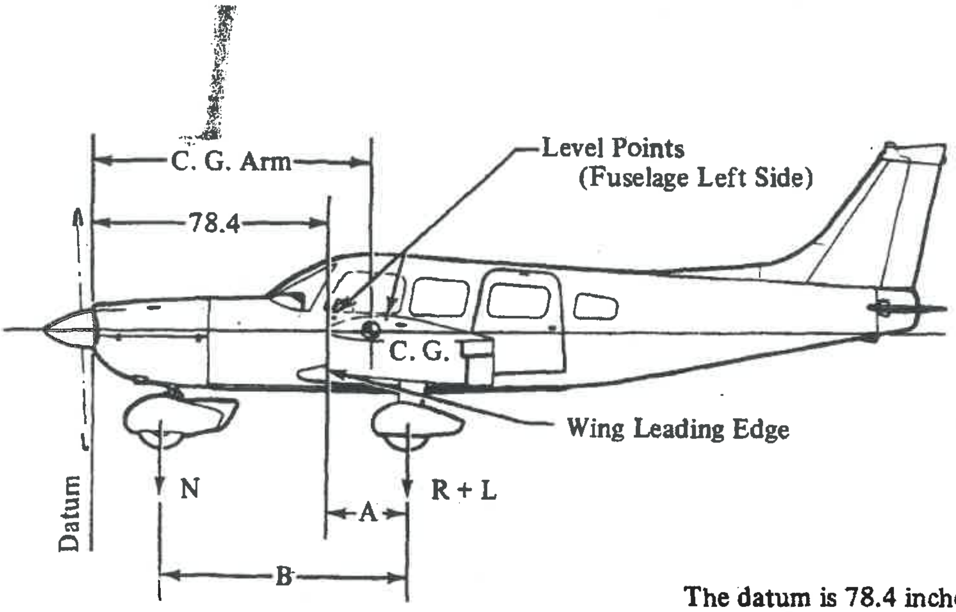
3. WEIGHING - AIRPLANE EMPTY WEIGHT

a. 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)			
Airplane Empty Weight, as Weighed (T)			

4. EMPTY WEIGHT CENTER OF GRAVITY

a. The following geometry applies to the PA-32-300 airplane when airplane is level (See Item 2).



A =

B =

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

b. Obtain measurement "A" by measuring from a plumb bob dropped from the wing leading edge, at the intersection of the straight and tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.

c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.

d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

$$\text{C. G. Arm} = 78.4 + (\quad\quad) - \frac{(\quad\quad)(\quad\quad)}{(\quad\quad)} = \quad\quad \text{inches}$$

5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (.4 gallon)	+2.3	103.0	+237
Licensed Empty Weight			

WEIGHT AND BALANCE DATA

MODEL PA-32-300 CHEROKEE

Airplane Serial Number ____________________

Registration Number ____________________

Date ____________________

AIRPLANE BASIC WEIGHT

Item	Weight (Lbs)	X	C. G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
*Empty Weight Actual / Computed					
Unusable Fuel (3.2 pints)	2.3		103.0		237
Standard Empty Weight					
Optional Equipment					
Licensed Empty Weight					
Oil (12 quarts)	22.5		16.6		374
Basic Weight					

*Empty weight is defined as dry empty weight (including paint and hydraulic fluid) plus 2.4 lbs undrainable engine oil.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

(Gross Weight) - (Licensed Empty Weight) = Useful Load

(3400 lbs) - (lbs) = lbs.

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

C. G. RANGE AND WEIGHT INSTRUCTIONS

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

SAMPLE LOADING PROBLEM (Normal Category)

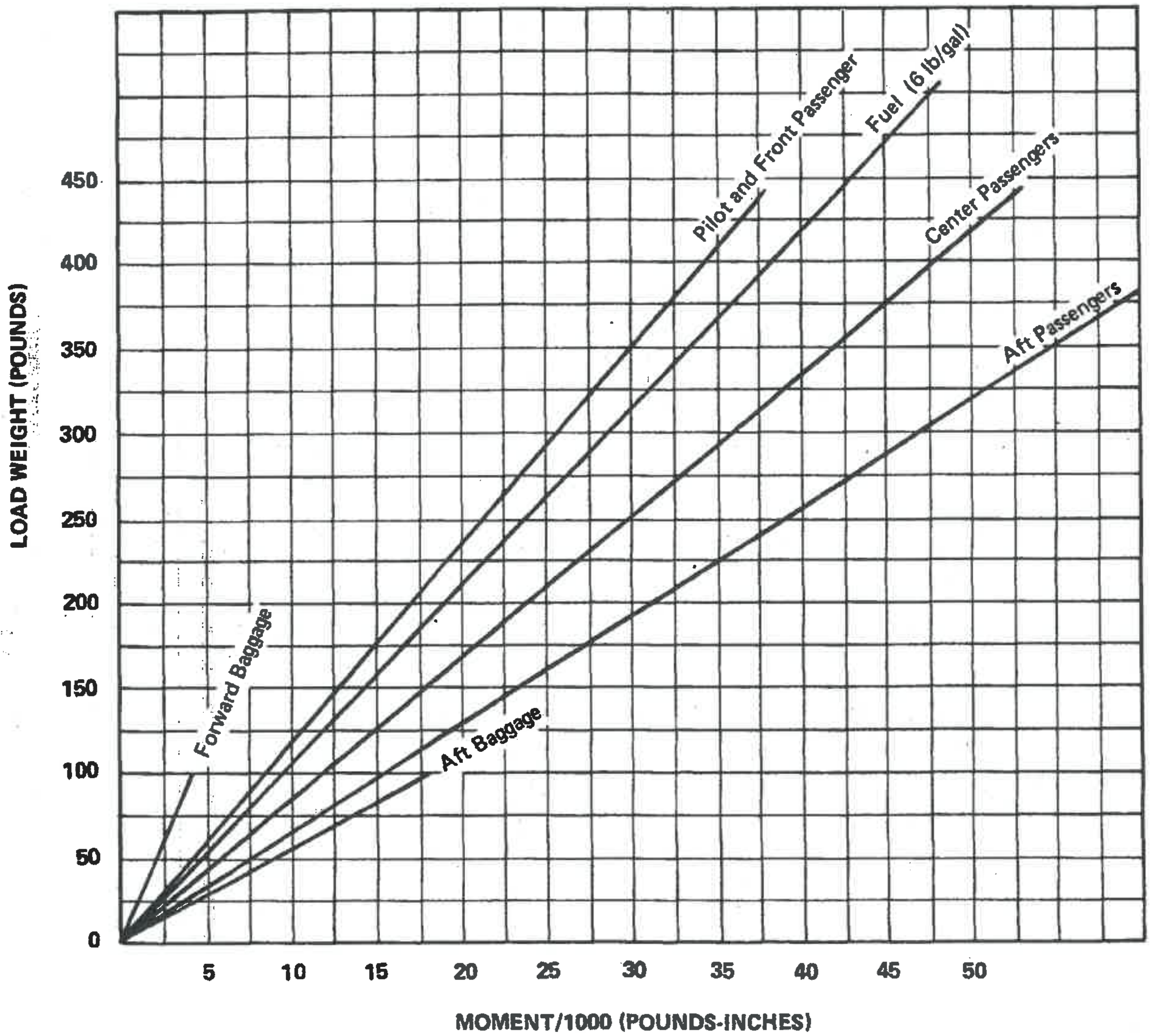
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Weight			
Pilot and Front Passenger	340.0	85.5	29070
Passengers (Center Seats)	340.0	118.1	40154
Passengers (Rear Seats)	340.0	155.7	52938
Passenger (Jump Seat)*		118.1	
Fuel (84-Gallon Maximum)		95.0	
Baggage (Forward)		42.0	
Baggage (Aft)		178.7	
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. range and weight graph. Since this point falls within the weight - C.G. envelope, this loading meets the weight and balance requirements.

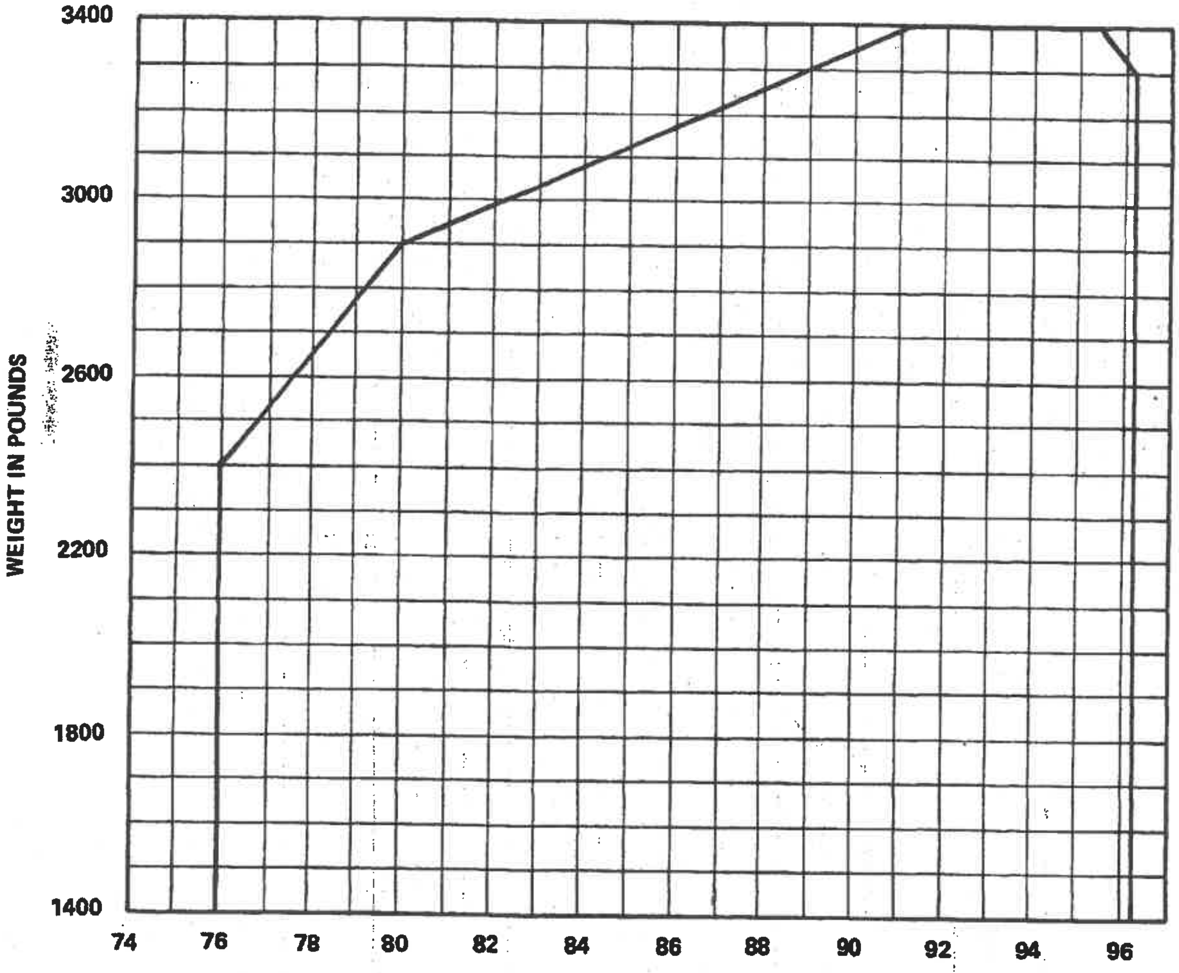
IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

*Optional Equipment.

LOADING GRAPH



C. G. RANGE AND WEIGHT



OPERATING INSTRUCTIONS

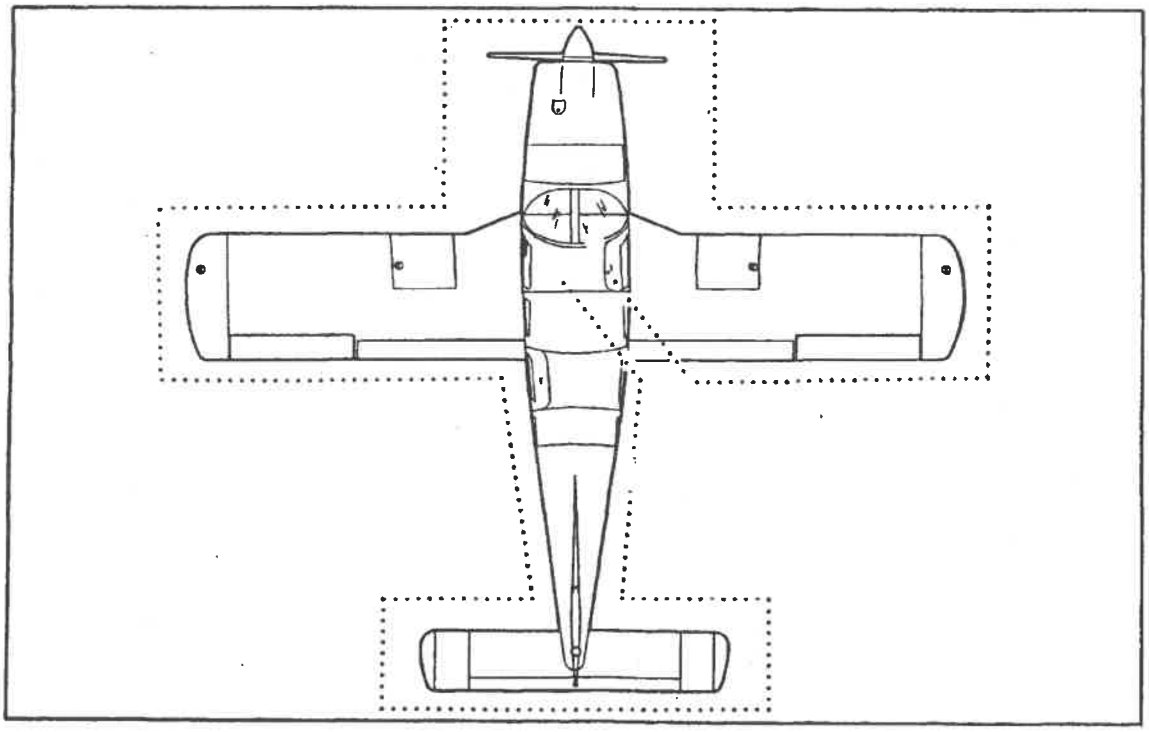
OPERATING INSTRUCTIONS

PREFLIGHT

The airplane should be given a thorough preflight and walk-around inspection. The preflight should include a check of the airplane's operational status, computation of weight and C.G. limits, takeoff distance, 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.

Walk-Around Inspection

1. a. Release seat belts securing the control wheel.
   b. Master switch ON.
   c. Check fuel quantity gauges (four tanks).
   d. Master switch and ignition OFF.
2. a. Check for external damage and operational interference of control surfaces or hinges.
   b. Insure that wings and control surfaces are free of snow, ice or frost.
3. a. Visually check wing tip tank fuel supply; secure caps.
   b. Drain wing tip tank sumps (See Description - Airplane and Systems Section for procedure).



c. Check navigation lights.

4. a. Visually check main fuel tank fuel supply; secure caps.
   b. Drain main fuel tank sumps (See Description - Airplane and Systems Section for procedure).
   c. Check that fuel system vents are open.
   d. Check main gear shock struts for proper inflation (4-1/2 inches).
   e. Check tires for cuts, wear, and proper inflation.
   f. Check brake blocks for wear and damage.
   g. On left wing check pitot head. Remove cover if used; check that holes are clear.
5. a. Check windshield for cleanliness.
   b. Check the propeller and spinner for defects or nicks.
   c. Check for obvious fuel or oil leaks.
   d. Check oil level. (Insure dipstick is properly seated.)
   e. Check cowling and inspection covers for security.
   f. Check nose wheel tire for inflation, wear.
   g. Check nose wheel shock strut for proper inflation (3-1/4 inches).
   h. Check air inlets for foreign matter.
   i. Check alternator belt tension.
6. a. Stow tow bar and control locks if used.
   b. Check baggage for proper storage and security.
   c. Close and secure
   d. Drain fuel strainer sump (See Description - Airplane and Systems Section for procedure).
7. a. Upon entering the aircraft, ascertain that all primary flight controls operate properly.
   b. Close and secure the fore and aft cabin doors.
   c. Check that required papers are in order and in the airplane.
   d. Fasten seat belts and shoulder harness. Check function of inertia reel.

STARTING ENGINE

After completing the preflight inspection:

1. Set brakes ON.
2. Set the propeller in full INCREASE RPM.
3. Select the desired tank with the fuel selector.

STARTING ENGINE WHEN COLD

1. Open the throttle approximately 1/2 inch.
2. Turn the master switch ON.
3. Turn the auxiliary electric fuel pump ON.
4. Move the mixture control to FULL RICH until an indication is noted on the fuel flow meter. (Engine is primed.)
5. Move the mixture control to IDLE CUT-OFF.
6. Engage the starter by rotating the magneto switch clockwise and pressing in.
7. When the engine fires, release the magneto switch; advance the mixture control to FULL RICH; move the throttle to the desired setting.
8. If the engine does not fire within five to ten seconds, disengage the starter and reprime.

STARTING ENGINE WHEN HOT

1. Open the throttle approximately 1/2 inch.
2. Turn the master switch ON.
3. Turn the auxiliary electric fuel pump ON.
4. Mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating the magneto switch clockwise and pressing in. When the engine fires, release the magneto switch; advance the mixture; move the throttle to the desired setting.

STARTING ENGINE WHEN FLOODED

1. Open the throttle full.
2. Turn the master switch ON.
3. Turn the auxiliary electric fuel pump OFF.
4. Mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating the magneto switch clockwise and pressing in. When the engine fires, release the magneto switch; advance the mixture; retard the throttle.

When the engine is firing evenly, advance the throttle 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 Remedies.**

Starter manufacturers recommend 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.

STARTING WITH EXTERNAL POWER SOURCE*

An optional feature called 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.

The procedure is as follows:

1. Turn the airplane master switch to OFF.
2. 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.
3. Insert the plug of the jumper cable to the socket located on the fuselage.
4. Turn the airplane master switch ON and proceed with the normal engine starting technique.
5. After the engine has starter, turn the master switch OFF and disconnect the jumper cable from the airplane.
6. Turn the master switch ON and check the alternator ammeter for indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

*Optional equipment

WARM-UP

Warm-up the engine at 1000 to 1200 RPM. Avoid prolonged idling at low RPM, as this practice may result in fouled spark plugs.

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

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.

GROUND CHECK

The magnetos should be checked 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 5.0" ± .1" Hg at 2000 RPM.

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, but as long as the pressure is within limits the engine is ready for takeoff.

Check the annunciator panel lights with the press-to-test button*.

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. The engine is warm enough for takeoff when the throttle can be opened without the engine faltering.

*Serial nos. 7540001 and up

TAKEOFF

Just before takeoff the following items should be checked:

1. Fuel on proper tank
2. Electric fuel pump on
3. Engine gauges checked
4. Alternate air closed
5. Mixture set
6. Propeller set
7. Seat backs erect
8. Fasten belts/harness
9. Empty seats - seat belts snugly fastened
10. Flaps 10° (1st notch)
11. Trim tab set
12. Controls free
13. Doors latched
14. Air conditioner off

The takeoff technique is conventional for the Cherokee Six. The tab should be set slightly aft of neutral, with the exact setting determined by the loading of the aircraft. Allow the airplane to accelerate to 65 to 70 MPH, then ease back on the wheel enough to let the airplane fly itself off the ground. Premature raising of the nose, or raising it to an excessive angle, will result in a delayed takeoff. After takeoff let the aircraft accelerate to the desired climb speed by lowering the nose slightly.

Takeoffs are normally made with flaps extended 10° (first notch).

Short Field, Obstacle Clearance:

Lower flaps to 25° (second notch), accelerate aircraft to 65-70 miles per hour and ease back on the wheel to rotate. After breaking ground, accelerate to best angle of climb speed, 95 miles per hour, and climb past obstacle. Continue climb and accelerate to best rate of climb speed, 105 miles per hour, and slowly retract the flaps.

Short Field, No Obstacle:

Lower flaps to 25° (second notch), accelerate aircraft to 65-70 miles per hour and ease back on the wheel to rotate. After breaking ground, accelerate to best rate of climb speed, 105 miles per hour, and slowly retract the flaps while climbing out.

Soft Field, Obstacle Clearance:

Lower flaps to 25° (second notch), accelerate aircraft, pull nose gear off as soon as possible and lift off at lowest possible airspeed. Accelerate just above the ground to best angle of climb speed, 95 miles per hour, to climb past obstacle clearance height. Continue climb while accelerating to best rate of climb speed, 105 miles per hour, and slowly retract the flaps.

Soft Field, No Obstacle:

Lower flaps to 25° (second notch), accelerate aircraft, pull nose gear off as soon as possible and lift off at lowest possible airspeed. Accelerate just above the ground to best rate of climb speed, 105 miles per hour, and climb out while slowly retracting the flaps.

CLIMB

The best rate of climb at gross weight will be obtained at 105 miles per hour. The best angle of climb may be obtained at 95 miles per hour. At lighter than gross weight these speeds are reduced somewhat.* For climbing en route, a speed of 115 miles per hour is recommended. This will produce better forward speed and increased visibility over the nose during the climb.

When reaching the desired altitude, the electric fuel pump may be turned off.

STALLS

The stall characteristics of the Cherokee Six are conventional. Visual stall warning is provided by a red light located on the left side of the instrument panel which illuminates automatically between 5 and 10 miles per hour above the stall speed. The gross weight stalling speed of the Cherokee Six with power off and full flaps is 63 miles per hour. With the flaps up this speed is increased 8 miles per hour. Loss of altitude during stalls can be as great as 350 feet, depending on configuration and power. The stall speed chart is at gross weight. Stall speeds at lower weights will be correspondingly less.

Stall speed in mph (Calibrated Airspeed):

Flaps Up	- 71
Flaps Down	- 63

CRUISING

The cruising speed of the Cherokee Six is determined by many factors, including power setting, altitude, temperature, loading, and equipment installed on the airplane.

The normal maximum cruising power is 75% of the rated horsepower of the engine. True airspeeds, which can be obtained at various altitudes and power settings, can be determined from the Performance Charts Section.

When selecting cruising RPM below 2300, 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. After the desired power settings have been set up, adjust the mixture control for corresponding best power setting as indicated by the fuel flow meter. The low side of the power setting, as shown on the fuel flow meter, indicates best economy for that percent of power while the high side indicated best power.

*To obtain the performance presented in the Performance Section of this manual, full power (full throttle and 2700 RPM) must be used.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising operation above 5000 feet altitude and at pilot's discretion at lower altitudes when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the FULL RICH position for all operations under 5000 feet.

To lean the mixture, disengage 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 the 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.

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

In order to keep the airplane in best lateral trim during cruise flight, the fuel should be used alternately from each main tank, and when these are nearly exhausted, from each tip tank. It is recommended that one main tank be used for one hour after takeoff, the other main tank used until nearly exhausted, then return to the first main tank. When nearly exhausted, turn to one tip tank and alternate at one-half hour intervals to maintain lateral trim.

The following listing contains, as a reminder, a few of the more highly recommended fuel operation procedures:

1. Fuel quantity should be visually checked in all fuel tanks before entering the aircraft.
2. After using the underseat quick drain, it should be checked from outside the aircraft to make sure it has closed completely, and is not leaking.
3. Takeoff should be made on the tank with the highest quantity of fuel to assure best fuel flow, and this tank selected before or immediately after starting in order to allow fuel flow to be adequately established before takeoff. The tank with the highest quantity of fuel should be selected for landing.
4. Fuel tank selection at low altitude is not recommended, since little recovery time is available in the event of an error in tank selection. When switching tanks, make sure that the selector drops into a detent, and is lined up with the desired tank.
5. The electric fuel pump should be turned on before switching tanks, and should be left on for a short period thereafter.
6. 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.
7. Operation of the engine driven fuel pump should be checked while taxiing or during pretakeoff engine run up by switching off the electric fuel pump and observing fuel pressure.
8. During cruise, the electric fuel pump should be in the off position so that any malfunction of the engine driven fuel pump is immediately apparent.
9. If signs of fuel starvation should occur at any time during flight, fuel exhaustion should be suspected, at which time the fuel selector should be immediately positioned to a full tank and the electric fuel pump switched to the on position.
10. When the seventh seat is used, all weight in excess of 3112 pounds must be in fuel weight only. Fill tip tanks first and use fuel from main tanks first.

*Serial nos. 7540001 and up

TURBULENT AIR OPERATION

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

MANEUVERS

Intentional spins are prohibited in this airplane. In the event that an inadvertent spin occurs, standard recovery technique should be used immediately.

APPROACH AND LANDING

Before landing check list:

1. Seat backs erect
2. Fasten belts/harness
3. Air Conditioning off
4. Fuel on proper tank
5. Electric fuel pump on
6. Mixture rich
7. Propeller set
8. Flaps down (125 mph)

The airplane should be trimmed to an approach speed of about 90 miles per hour with flaps extended. The flaps can be lowered at speeds up to 125 miles per hour, if desired. The propeller should be set at approximately 2500 RPM to facilitate ample power for an emergency go-around and to prevent overspeeding of the engine if the throttle is advanced sharply. The mixture control should be 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 varied 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 electric fuel pump on. Reduce the speed during the flareout and contact the ground close to the stalling speed (63 to 70 MPH). After ground contact hold the nose wheel off as long as possible. As the airplane slows down, drop the nose and apply the 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 aircraft 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.

STOPPING ENGINE

At the pilot's discretion, the flaps should be raised and the electric fuel pump turned off. After parking, the air conditioner and radios should be turned off, the propeller set in the full increase position, and the engine stopped by disengaging the mixture control lock* and pulling the mixture control out 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 and the parking brake set.

AIRSPEED DATA

All airspeeds quoted in this manual are calibrated unless otherwise noted. Calibrated airspeed is indicated airspeed corrected for instrument and position errors. The following table gives the correlation between indicated airspeed and calibrated airspeed if zero instrument error is assumed. This calibration is valid only when flown at maximum gross weight in level flight.

AIRSPEED CORRECTION TABLE

Flaps 0°												
IAS - MPH	60	70	80	90	100	110	120	130	140	150	160	170
CAS - MPH	70	78	85	94	102	111	120	130	139	148	157	166
Flaps 40°												
IAS - MPH	60	70	80	90	100	110	120					
CAS - MPH	68	76	84	93	101	110	119					

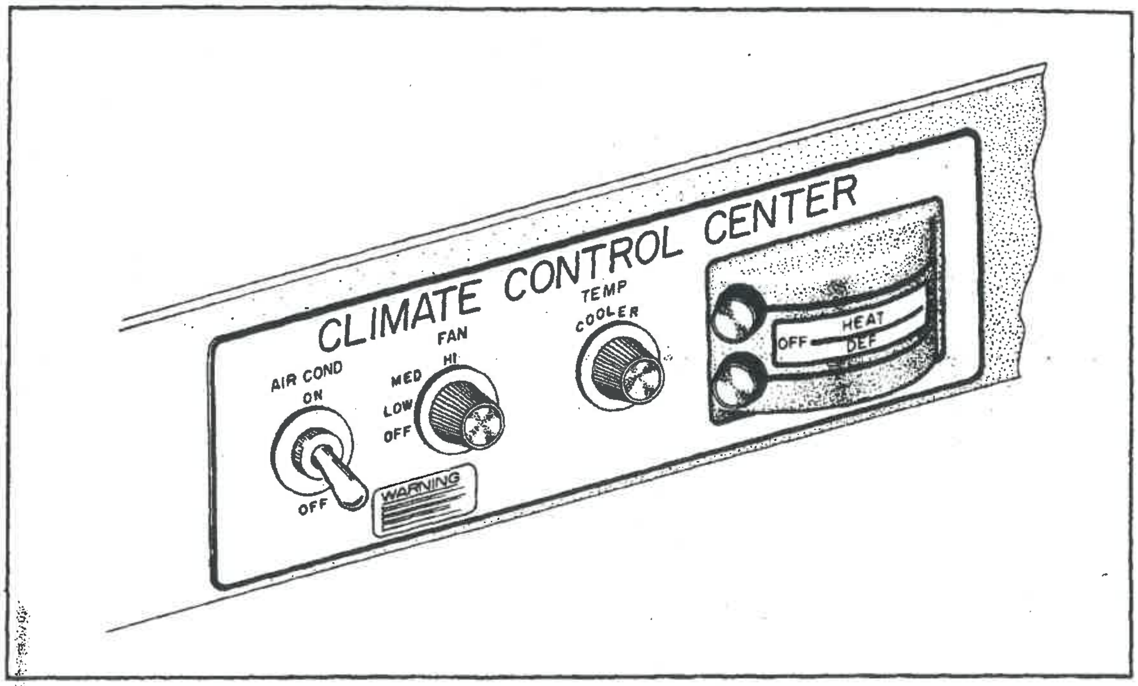
MOORING

The Cherokee Six should be moved on the ground with the aid of the nose wheel tow bar provided with each plane and secured behind the rear seats. Tie downs can be secured to rings provided under each wing and to the tail skid. The aileron and stabilator controls should be secured by looping the safety belt through the control wheel and pulling it snug. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured. The flaps are locked when in the full up position and should be left retracted.

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 see the Airplane Flight Manual and Weight and Balance Sections.

*Serial nos. 7540001 and up



Air Conditioner Controls

AIR CONDITIONING*

To operate the air conditioning system either on the ground or in flight:

1. Start the engine.
2. Turn the air conditioning Master Switch to "ON."
3. Turn "TEMP" control to desired temperature. Clockwise rotation increases cooling.
4. Select desired "FAN" position, "LOW," "MED" or "HIGH."

AIR CONDITIONER OPERATIONAL CHECK PROCEDURE

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

1. Check aircraft Master Switch ON.
2. Select desired "FAN" position, "LOW," "MED" or "HIGH."
3. Turn the air conditioner control switch to "ON" - the "Air Cond. Door Open" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.
4. Turn the air conditioner control switch to "OFF" - the "Air Cond. Door Open" warning light will go out, thereby indicating the air conditioner condenser door is in the up position.

*Optional equipment

5. 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.

AIR CONDITIONER EFFECTS ON AIRPLANE 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 increase in drag. When the air conditioner is turned off there is normally no measurable difference in climb, cruise or range performance 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.

1. The decrease in true airspeed is approximately 5 mph at all power settings.
2. The decrease in range may be as much as 35 statute miles for the 84 gallon 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. 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.

EMERGENCY LOCATOR TRANSMITTER*

The Emergency Locator Transmitter (ELT) when installed, is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. (On aircraft manufactured prior to mid-1975, this plate is retained by three steel Phillips head screws. On aircraft manufactured from mid-1975 and on, this plate is attached with three slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, a key, a knife blade, etc. If there are no tools available in an emergency the screw heads may be broken off by any means.) The ELT is an emergency locator transmitter which meets the requirements of FAR 91.52. The unit operates on a self-contained battery. The replacement date as required by FAA regulations is marked on the transmitter label.

*Optional equipment

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

A pilot's remote switch, located on the left side panel, is provided to allow the transmitter to be controlled from inside the cabin.

1. On some models the pilot's remote switch has three positions and 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 activate 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.

2. On other models the pilot's remote switch has two positions and is placarded "ON/RESET" and "ARM (NORMAL POSITION)." The switch is normally left in the down or "ARM" position. To turn the transmitter off, move the switch to the "ON/RESET" position for one second then return it to the "ARM" position. To activate the transmitter for tests or other reasons, move the switch upward to the "ON/RESET" position and leave it in that position as long as transmission is desired.

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.

The locator should be checked during the ground check to make certain the unit has not been accidentally activated. Check by tuning a radio receiver to 121.5 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.

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 other time, the tests should be coordinated with the nearest FAA tower or flight service station.

OPERATING TIPS

OPERATING TIPS

The following Operating Tips are of particular value in the operation of the Cherokee PA-32-300.

1. Learn to trim for takeoff so that only a very light back pressure on the wheel is required to lift the airplane off the ground.
2. The best speed for takeoff is about 70 MPH under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in event of engine failure.
3. Flaps may be lowered at airspeeds up to 125 MPH. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.
4. Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.
5. 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.
6. The overvoltage relay is provided to protect the electronics equipment from a momentary overvoltage condition (approximately 16.5 volts and up), or a catastrophic regulator failure. In the event of a momentary condition, the relay will open and the ammeter will indicate "0" output from the alternator. The relay may be reset by switching the ALT switch to OFF for approximately one second and then returning the ALT switch to ON. If after recycling the ALT switch the condition persists, the flight should be terminated as soon as practical. Reduce the battery load to a minimum. The ALT light on the annunciator panel* will illuminate if the alternator fails. Recycle the ALT switch and check the ALT FIELD circuit breaker. If the failure persists after this action, reduce electrical loads and land as soon as practical.
7. The vacuum gauge is provided to monitor the pressure available to assure the correct operating speed of the vacuum driven gyroscopic flight instruments. It also monitors the condition of the common air filter by measuring the flow of air through the filter.

   If the vacuum gauge does not register 5" ± .10" Hg at 2000 RPM, the following items should be checked before flight:

   a. Common air filter could be dirty or restricted.
   b. Vacuum lines could be collapsed or broken.
   c. Vacuum pump worn.
   d. Vacuum regulator, not adjusted correctly. The pressure, even though set correctly, can read lower under two conditions: (1) Very high altitude, above 12000 feet, (2) Low engine RPM, usually on approach or during training maneuvers. This is normal and should not be considered a malfunction.

*Serial nos. 7540001 and up

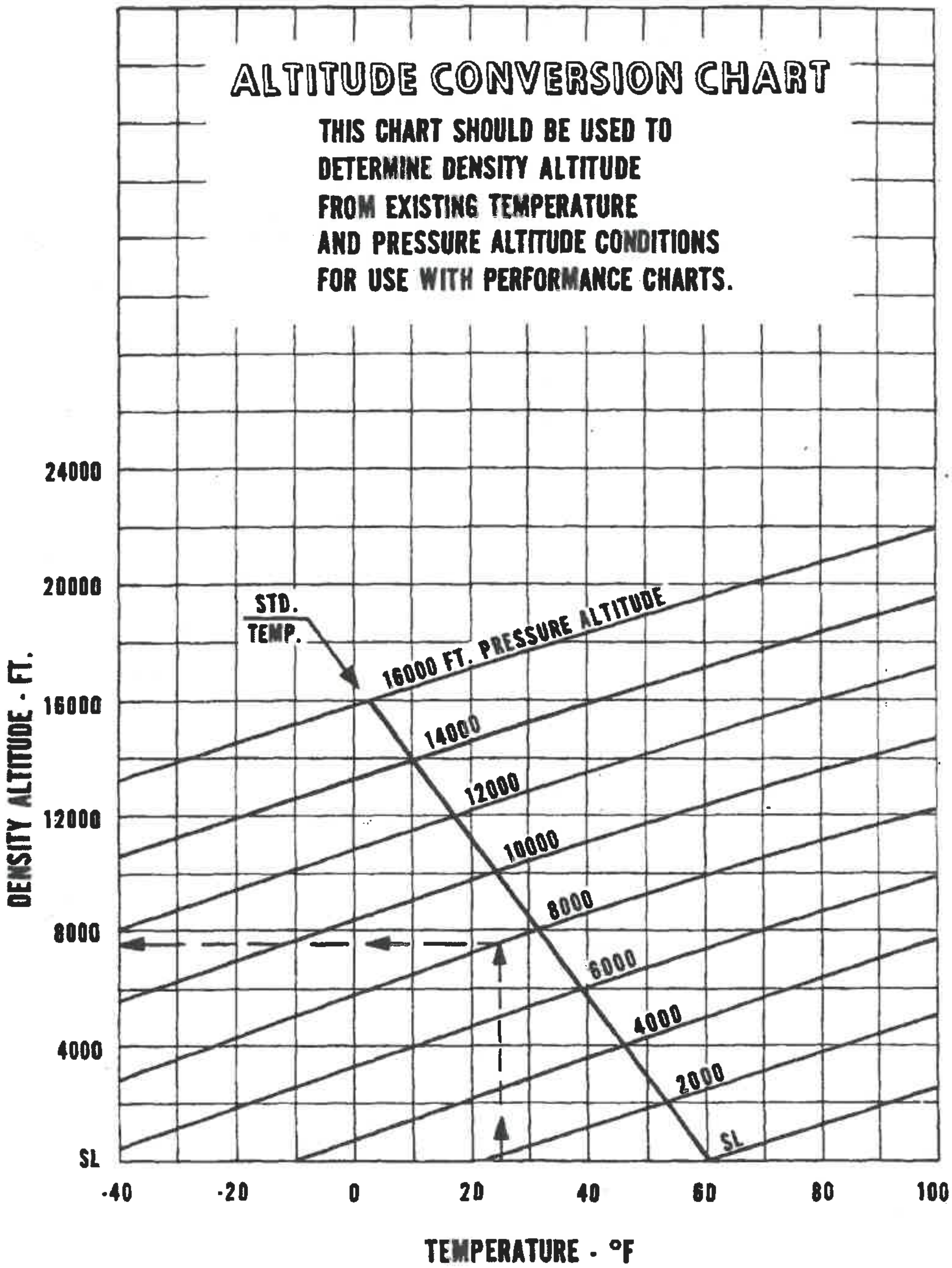
8. The shape of the wing fuel tanks is such that in certain maneuvers the fuel may move away from the tank outlet. If the outlet is uncovered, the fuel flow will be interrupted and a temporary loss of power may result. Pilots can prevent inadvertent uncovering of the outlet by avoiding maneuvers which could result in uncovering the outlet.

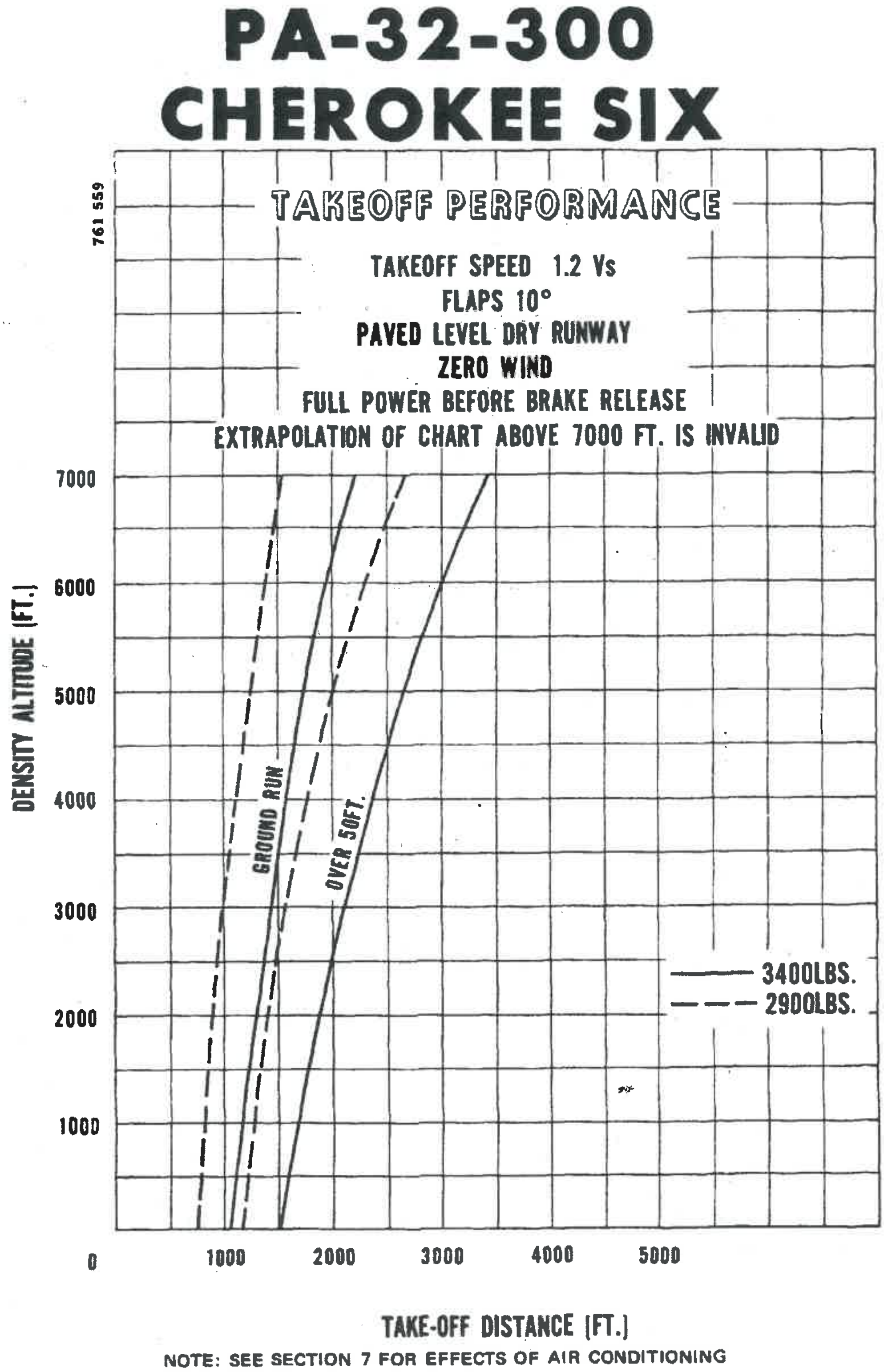
   Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

   Prolonged slips or skids which result in excess of 2000 feet 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.
9. Anti-Collision lights should not be operating when flying through overcast and clouds, since reflected light can produce spacial disorientation. Do not operate strobe lights when taxiing in the vicinity of other aircraft.
10. 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 interference with the torque tube when moving the rudder pedals or operating the toe brakes.
11. In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

PERFORMANCE CHARTS

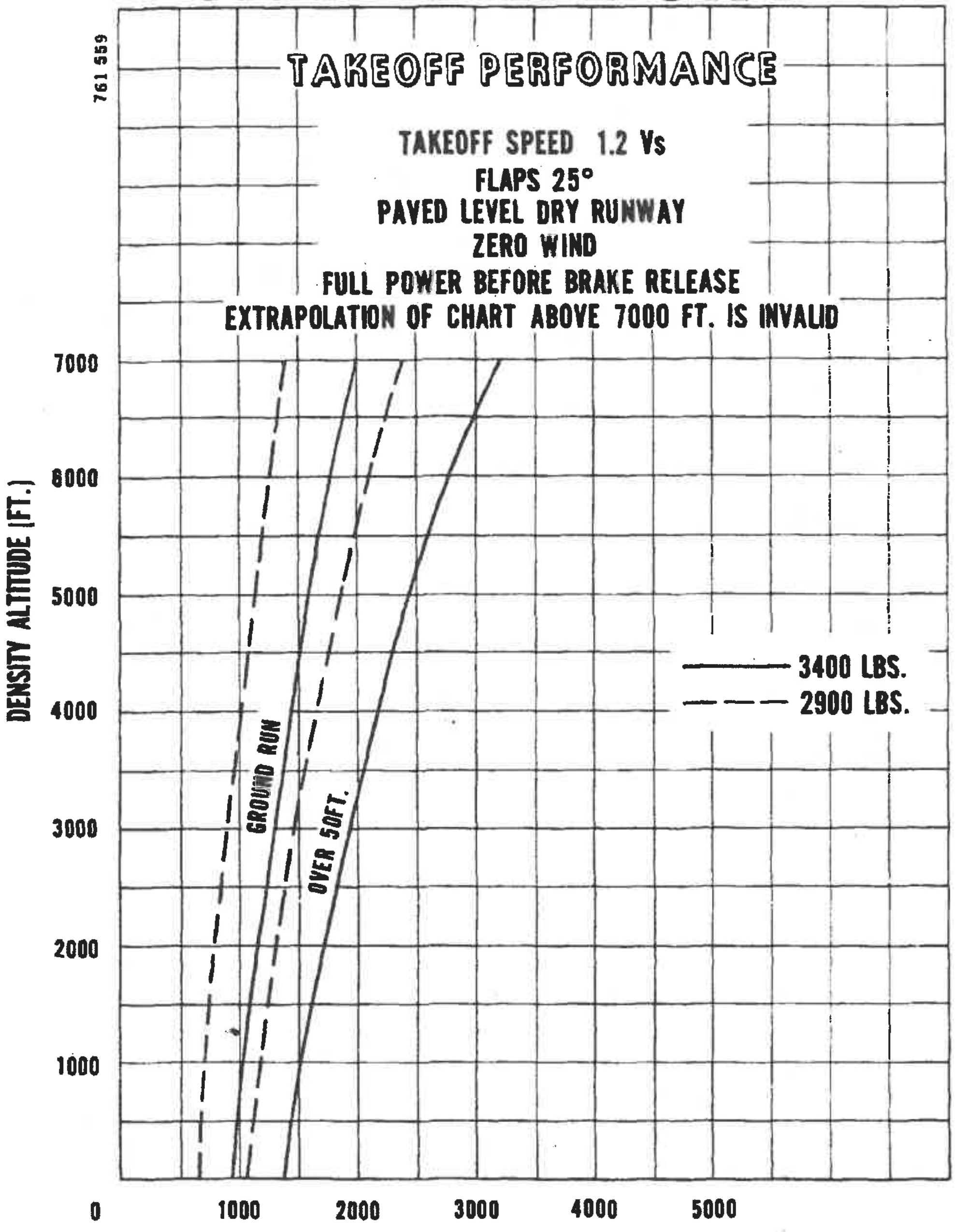
PA-32-300
CHEROKEE SIX





NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-32-300
CHEROKEE SIX



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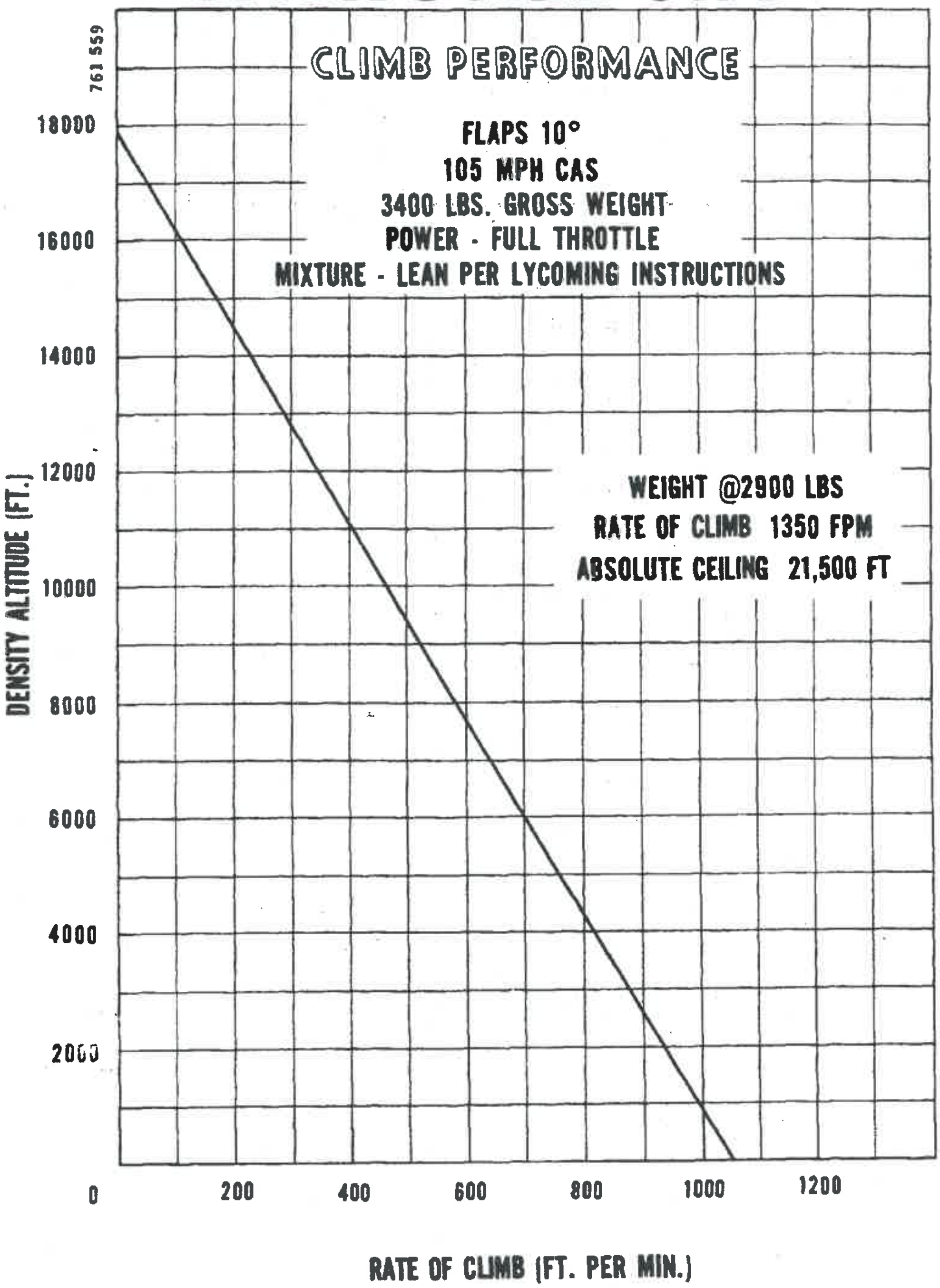
PA-32-300 CHEROKEE SIX



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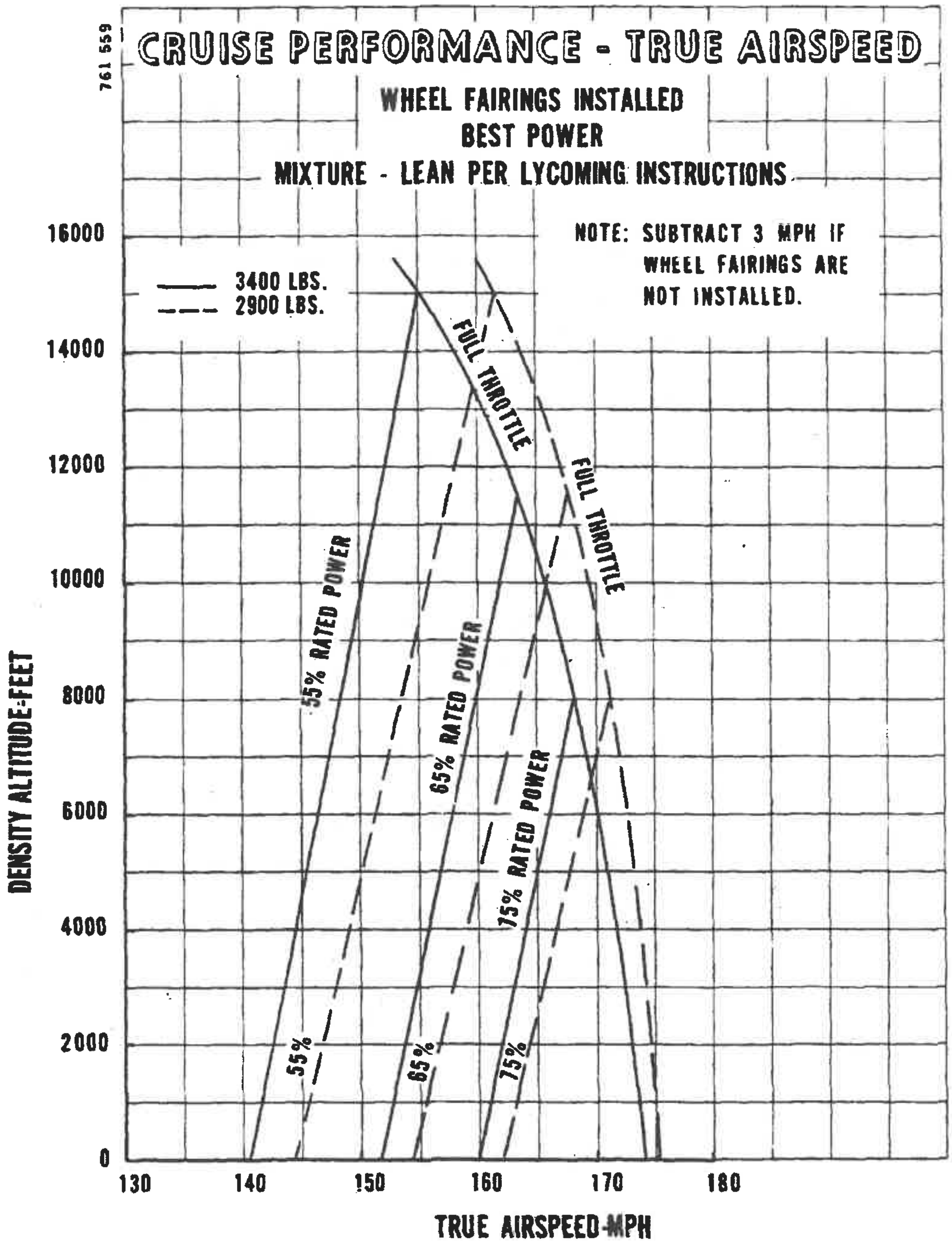
PA-32-300
CHEROKEE SIX



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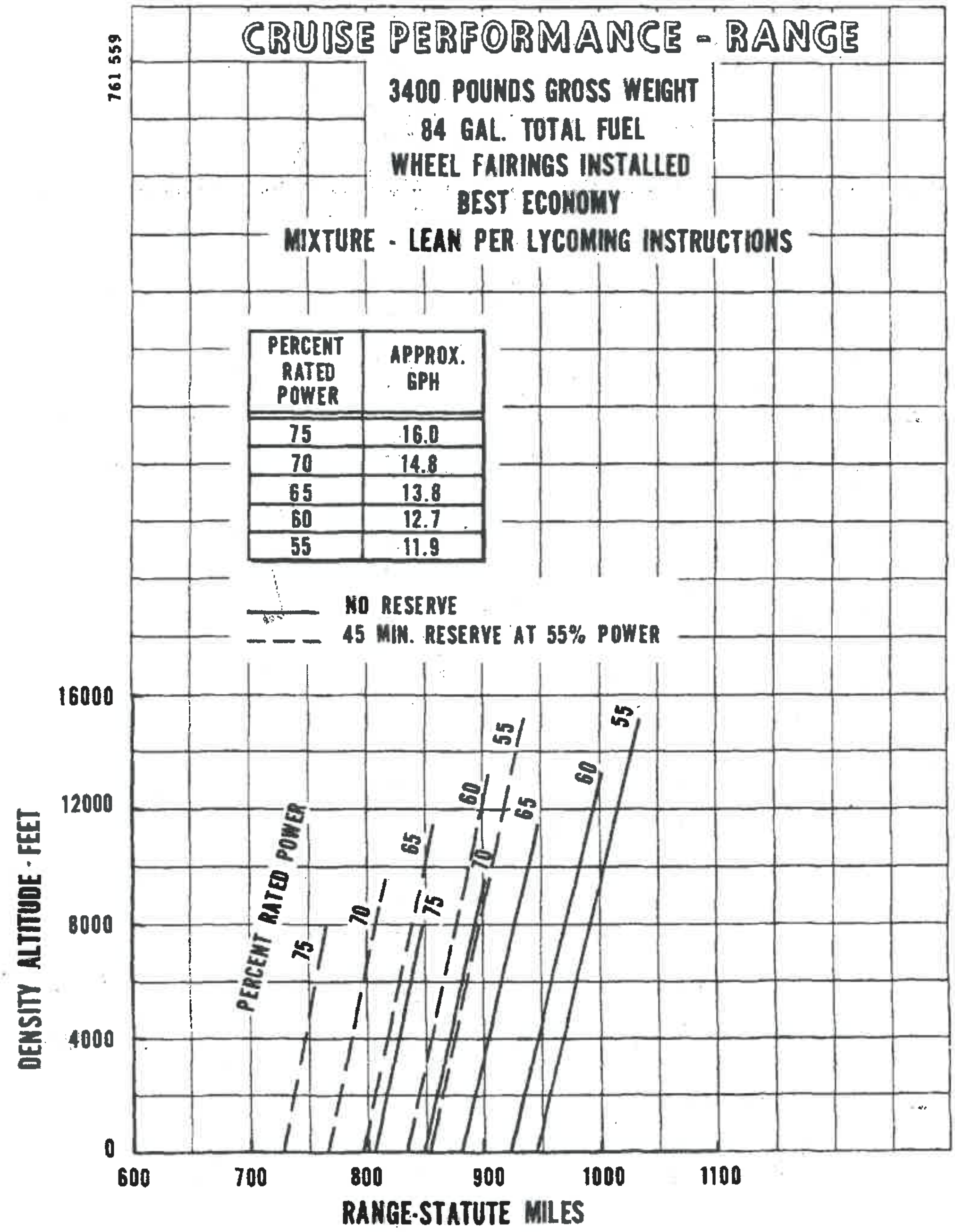
PA-32-300 CHEROKEE SIX



PERCENT RATED POWER	APPROX. GPH
75	16.0
70	14.8
65	13.8
60	12.7
55	11.9

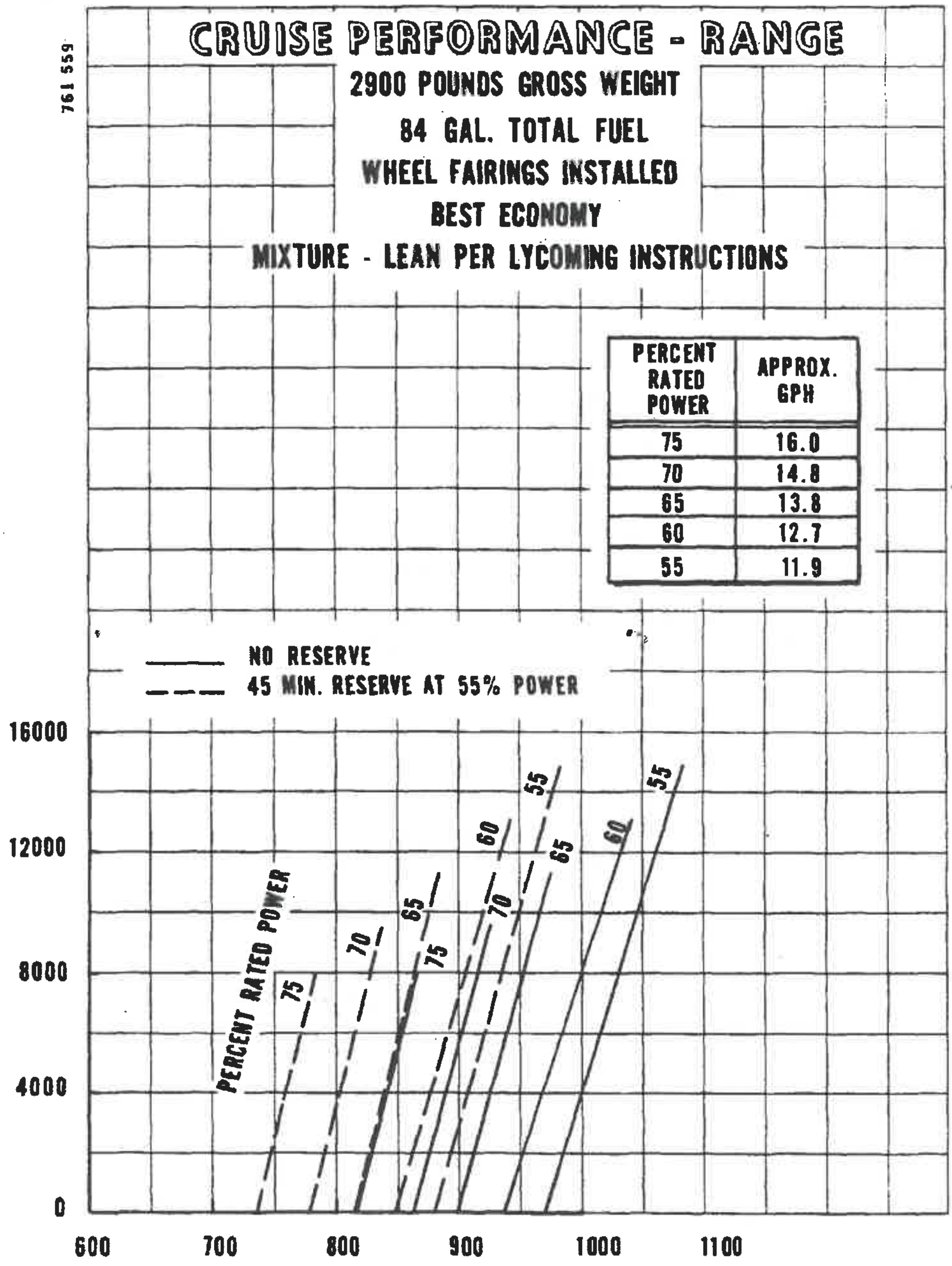
NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-32-300
CHEROKEE SIX

CRUISE PERFORMANCE - RANGE

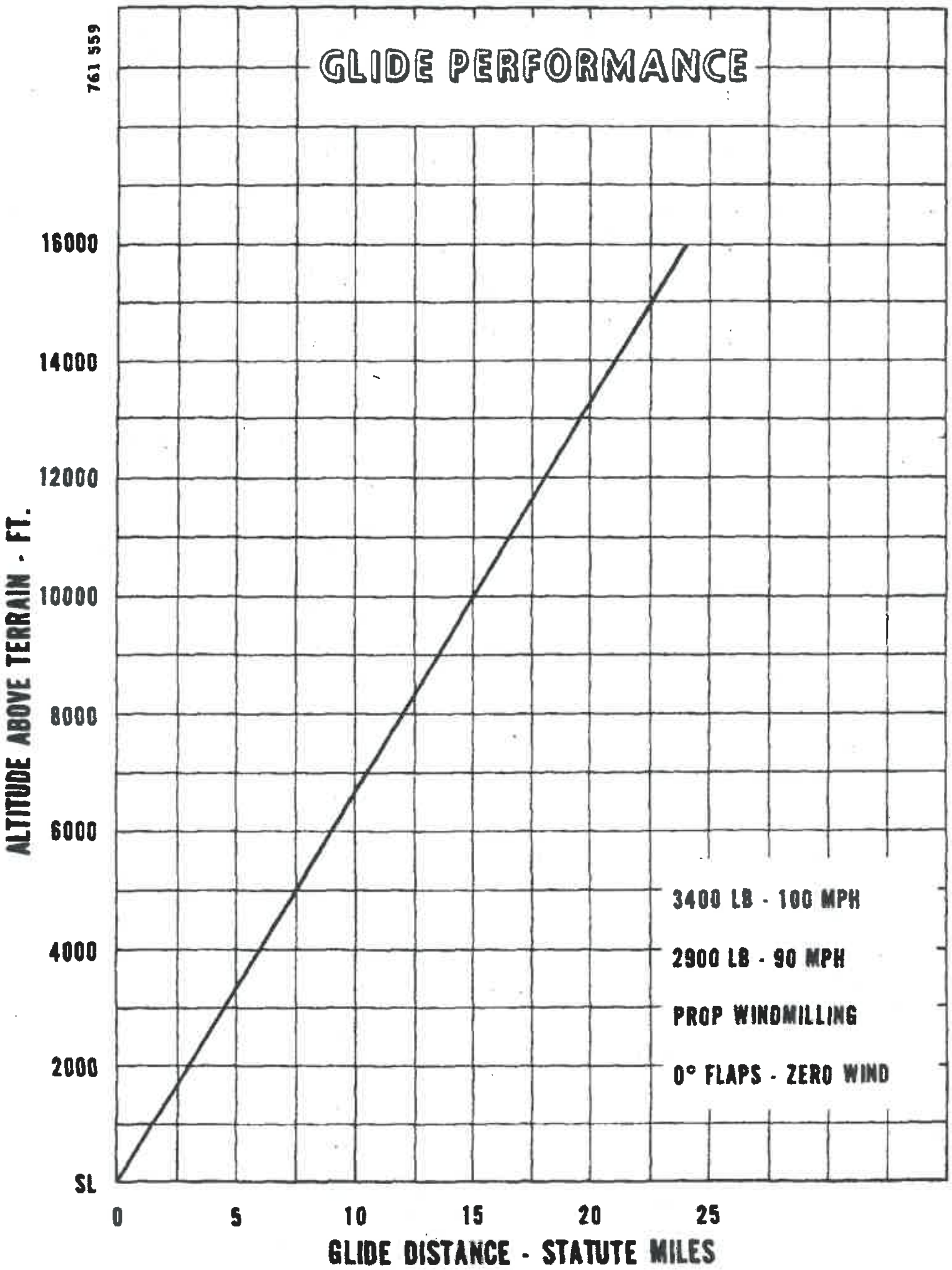
2900 POUNDS GROSS WEIGHT
84 GAL. TOTAL FUEL
WHEEL FAIRINGS INSTALLED
BEST ECONOMY
MIXTURE - LEAN PER LYCOMING INSTRUCTIONS

PERCENT RATED POWER	APPROX. GPH
75	16.0
70	14.8
65	13.8
60	12.7
55	11.9



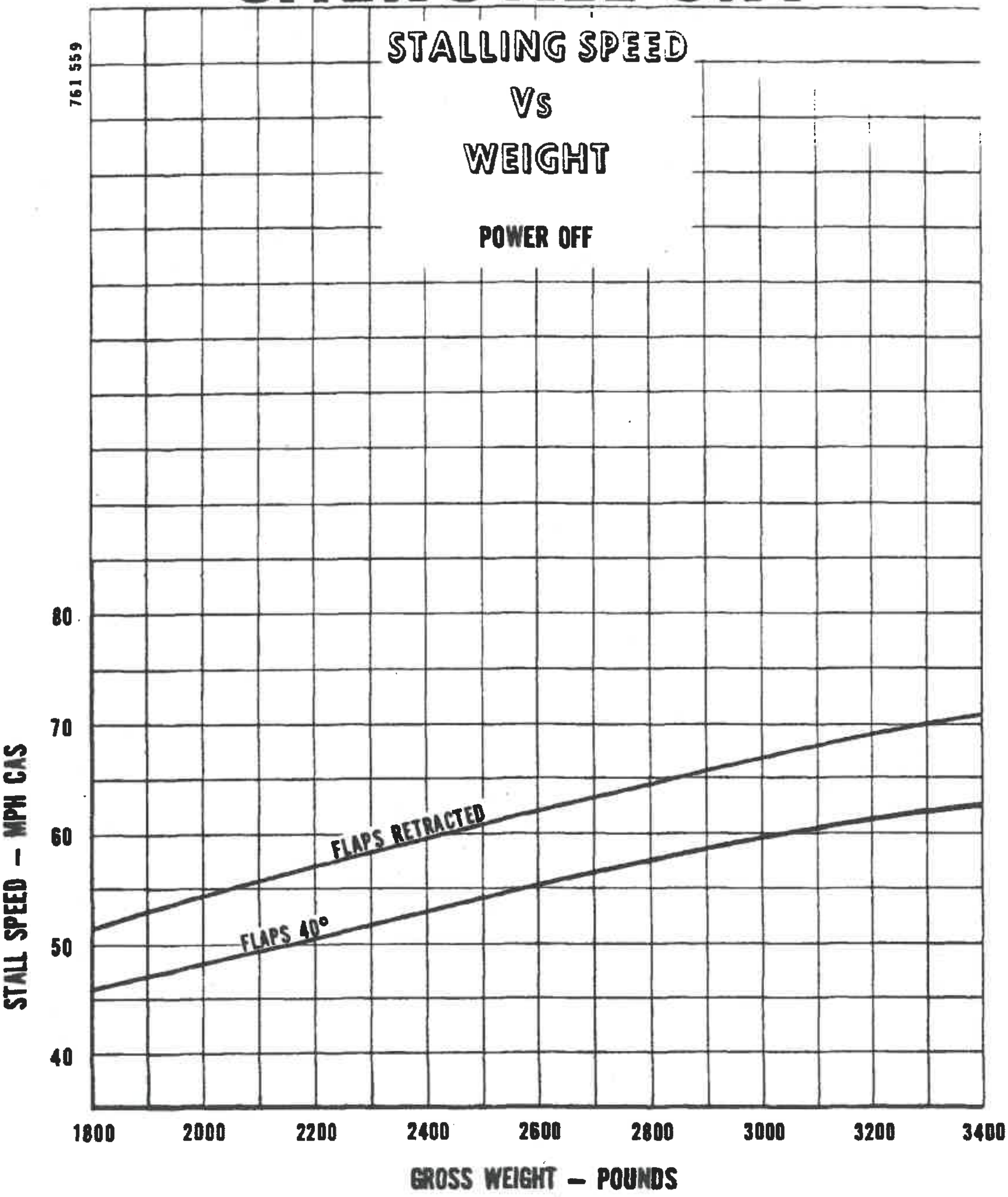
NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-32-300 CHEROKEE SIX



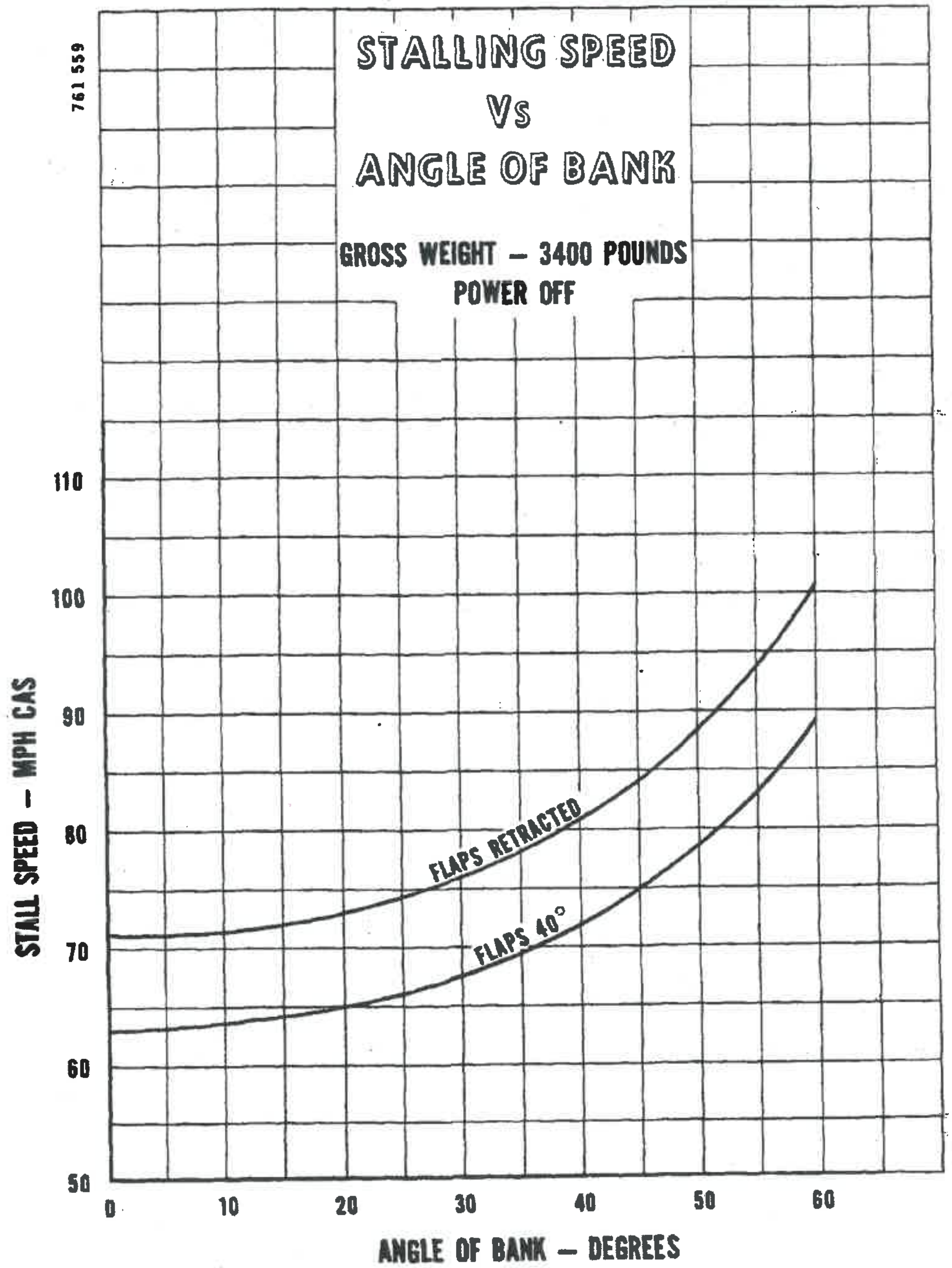
NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-32-300
CHEROKEE SIX



NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

PA-32-300
CHEROKEE SIX



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PA-32-300
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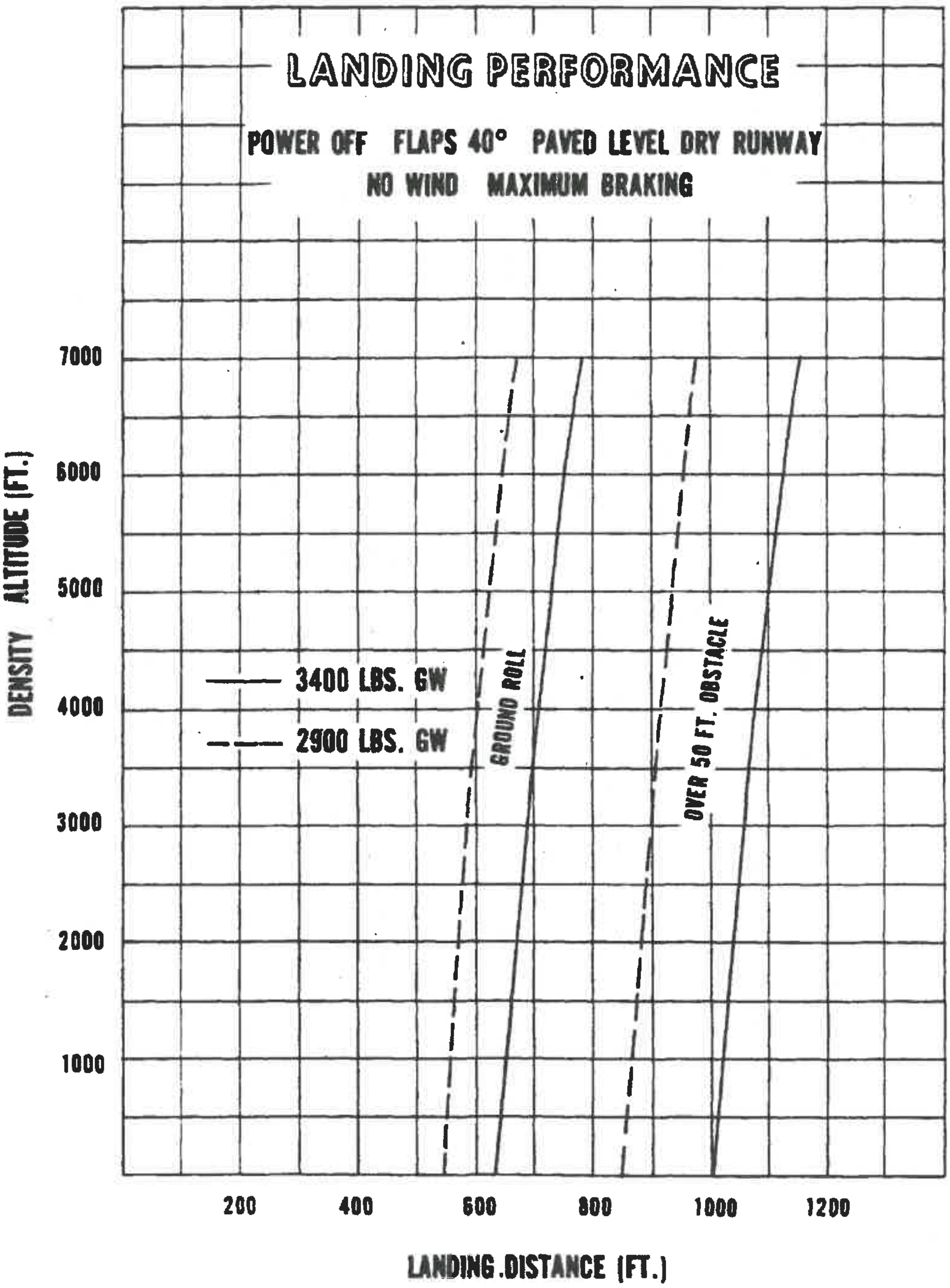

NOTE: SEE SECTION 7 FOR EFFECTS OF AIR CONDITIONING INSTALLATION ON PERFORMANCE.

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Power Setting Table - Lycoming Model IO-540-K,-L,-M Series, 300 HP Engine

Press. Alt Feet	Std Alt Temp °F	165 HP – 55% Rated RPM AND MAN. PRESS.				195 HP – 65% Rated RPM AND MAN. PRESS.				225 HP – 75% Rated RPM AND MAN. PRESS.			Press. Alt Feet
		2100	2200	2300	2400	2100	2200	2300	2400	2200	2300	2400	
SL	59	22.5	21.8	21.2	20.7	25.6	24.7	23.8	23.2	27.6	26.6	25.8	SL
1,000	55	22.3	21.6	21.0	20.5	25.3	24.4	23.5	22.9	27.3	26.3	25.5	1,000
2,000	52	22.1	21.4	20.7	20.2	25.1	24.2	23.3	22.7	27.1	26.1	25.2	2,000
3,000	48	21.9	21.2	20.5	20.0	24.8	23.9	23.0	22.5	26.8	25.8	24.9	3,000
4,000	45	21.7	21.0	20.3	19.8	24.6	23.7	22.8	22.2	26.5	25.6	24.6	4,000
5,000	41	21.5	20.8	20.1	19.6	24.3	23.5	22.5	22.0	–	25.3	24.4	5,000
6,000	38	21.3	20.6	19.8	19.3	24.0	23.2	22.3	21.7	–	25.0	24.1	6,000
7,000	34	21.0	20.4	19.6	19.1	23.7	22.9	22.0	21.5	–	–	23.8	7,000
8,000	31	20.8	20.2	19.4	18.9	–	22.5	21.8	21.2				8,000
9,000	27	20.6	20.0	19.2	18.6	–	–	21.5	21.0				9,000
10,000	23	20.4	19.8	19.0	18.4	–	–	21.2	20.7				10,000
11,000	19	20.2	19.6	18.7	18.2	–	–	–	20.4				11,000
12,000	16	20.0	19.4	18.5	18.0								12,000
13,000	12	–	19.2	18.3	17.7								13,000
14,000	9	–	–	18.0	17.3								14,000
15,000	5	–	–	–	16.9								15,000

To maintain constant power, correct manifold pressure approximately 0.18" Hg for each 10° F variation in induction air temperature from standard altitude temperature. Add manifold pressure for air temperature above standard; subtract for temperature below standard.

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HANDLING AND SERVICING

HANDLING AND SERVICING

This section contains information on preventive maintenance. Refer to the PA-32 Service Manual for further maintenance procedures. Any complex repair or modification should be accomplished by a Piper Certified Service Center.

GROUND HANDLING

TOWING

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed below the forward ledge of the rear baggage compartment or by power equipment that will not damage or excessively strain the nose gear steering assembly. Towing lugs are incorporated as part of the nose gear forks.

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 gear struts as high up on the tubes as possible. Lines should be long enough 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.

TAXIING

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

a. Taxi a few feet forward and apply the brakes to determine their effectiveness.
b. Taxi with the propeller set in low pitch, high RPM setting.
c. While taxiing, make slight turns to ascertain the effectiveness of the steering.
d. Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside the airplane.
e. When taxiing over uneven ground, avoid holes and ruts.
f. 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.

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 overnight, it is suggested that it be moored securely.

a. To park the airplane, head it into the wind if possible.
b. 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.

c. Aileron and stabilator controls may be secured with the front seat belt. Wheel chocks may be used if available.

MOORING

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

a. Head the airplane into the wind if possible.
b. Retract the flaps.
c. Immobilize the ailerons and stabilator by looping the seat belt through the control wheel and pulling it snug.
d. Block the wheels.
e. Secure tie-down ropes to the wing tie-down 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 tie-down ropes from the landing gear forks and securing the rudder.

f. Install a pitot head cover if available. Be sure to remove the pitot head cover before flight.
g. Cabin and baggage doors should be locked when the airplane is unattended.

CLEANING

CLEANING ENGINE COMPARTMENT

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

a. Place a large pan under the engine to catch waste.
b. With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser. 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.

c. 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.

d. Remove the protective tape from the magnetos.
e. Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

CLEANING LANDING GEAR

Before cleaning the landing gear, place a cover of plastic or a similar waterproof material over the wheel and brake assembly.

a. Place a pan under the gear to catch waste.
b. Spray or brush the gear area with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.
c. Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow it to dry.
d. Remove the cover from the wheel and remove the catch pan.
e. Lubricate the gear in accordance with the Lubrication Chart.

CLEANING EXTERIOR 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 surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. To wash the airplane, use the following procedure:

a. Flush away loose dirt with water.
b. Apply cleaning solution with a soft cloth, a sponge or a soft bristle brush.
c. To remove exhaust stains, allow the solution to remain on the surface longer.
d. To remove stubborn oil and grease, use a cloth dampened with naphtha.
e. Rinse all surfaces thoroughly.
f. 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.

CLEANING WINDSHIELD AND WINDOWS

a. Remove dirt, mud and other loose particles from exterior surfaces with clean water.
b. 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.
c. Remove oil and grease with a cloth moistened with kerosene.

CAUTION

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

d. After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
e. 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.

CLEANING HEADLINER, SIDE PANELS AND SEATS

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

CAUTION

Solvent cleaners require adequate ventilation.

c. Leather should be cleaned with saddle soap or a mild hand soap and water.

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 removed and cleaned like any household carpet.

ENGINE AIR FILTER

Removing Engine Air Filter (Serial Nos. 7440001 through 7540188)

a. Remove the top cowling.
b. The air filter is located on the lower left side of the engine. Remove the thumb screws securing the cover. Remove the cover, then the filter.

Removing Engine Air Filter (Serial Nos. 7640001 and up)

a. Remove the access door on left side of lower cowl.
b. Remove the wing nuts securing the filter. Remove the filter.

Cleaning Engine Air Filter

The injector 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:

a. Tap the filter gently to remove dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.
b. If the filter is excessively dirty or shows any damage, replace it immediately.
c. Wipe the filter housing with a clean cloth soaked in unleaded gasoline. When the housing is clean and dry, install the filter.

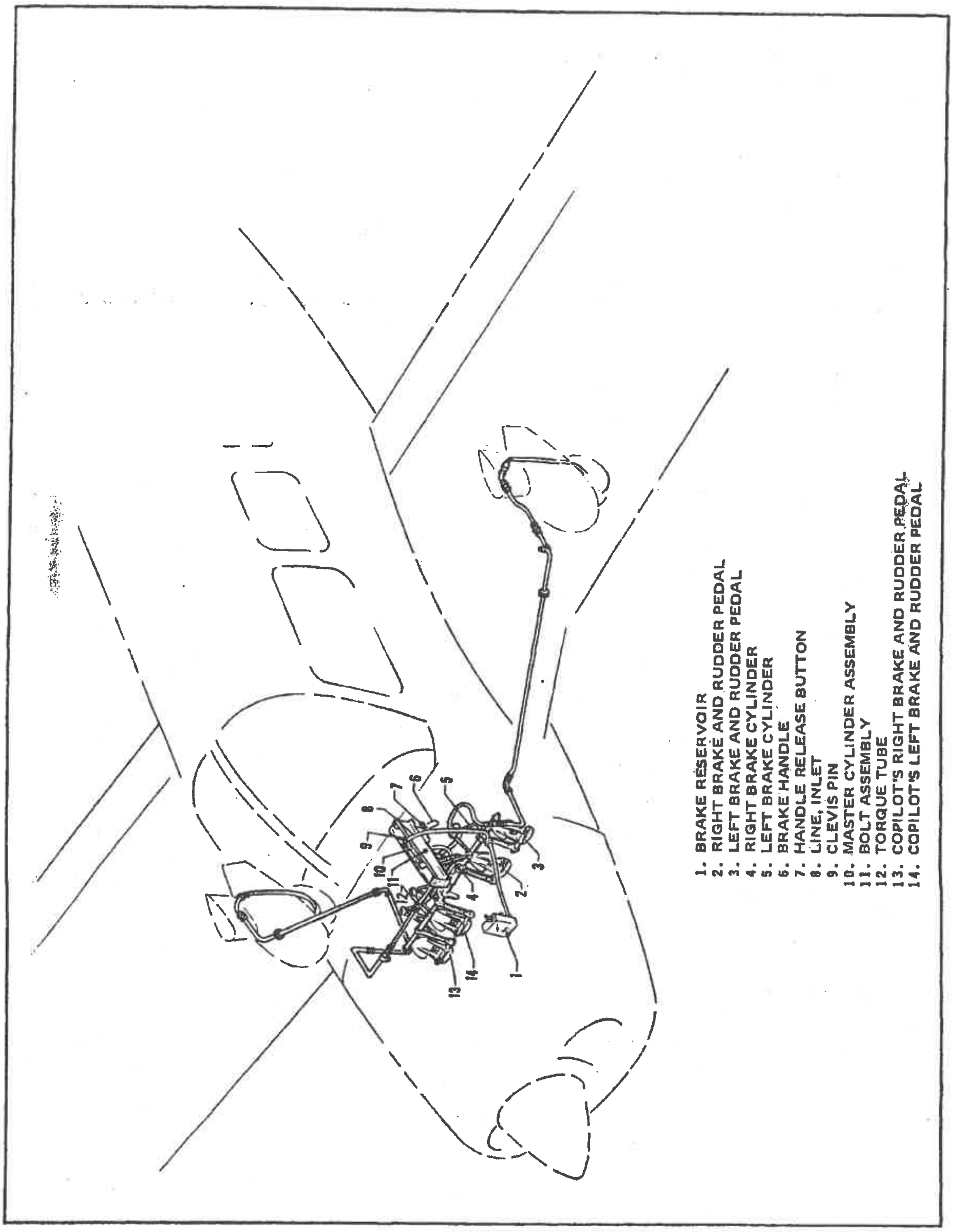
Installation Of Engine Air Filter

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

BRAKE SERVICE

The brake system is 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 pressure from the brake end of the system. This will eliminate air from the system.

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



Brake System

LANDING GEAR SERVICE

The landing gears use Cleveland Aircraft Products [illegible] wheels. [illegible] x 6 tube type. The main gear tires are 6 ply rating and the nose gear [illegible] rating. See TIRE INFLATION, this Section.

Main wheels are removed by taking off the hub cap, axle nut and the two [illegible] the brake segment in place, after which the wheel slips easily from the axle.

The nose wheel is removed by taking off the axle nut and washer from one side, sliding out the axle rod and plugs, lightly tapping out the axle tube, and then removing the wheel and spacer tubes from between the fork. Wheels are replaced by reversing the procedure.

Tires are removed from the wheels by deflating the tire, removing the through bolts, and separating the wheel halves.

Landing gear oleo struts should be checked for proper strut exposure and visible leaks. The required extensions for the struts under normal static load (empty weight of airplane plus full fuel and oil) are 3-1/4 inches for the nose gear and 4-1/2 inches for the main gear. If the strut exposure is below that required, it should be determined whether air or oil is needed by first raising the airplane on jacks. Depress the valve core to allow air to escape from the strut housing chamber. Remove the filler plug and slowly raise the strut to full compression. If the fluid is then visible up to the bottom of the filler plug hole, only proper inflation with air is required.

If fluid is below the bottom of the filler plug hole, oil should be added. Replace the plug with the valve core removed. Then attach a clear plastic hose to the valve stem of the filler plug and submerge the free end in a container of hydraulic fluid (MIL-H-5606). Fully compress and extend the strut several times, thus drawing fluid into the strut chamber and expelling air. To allow fluid to enter the bottom chamber of the nose gear strut housing, it is necessary to disconnect the torque link assembly and allow the strut to extend a full 10 inches. (The nose gear torque links need not be disconnected.) DO NOT allow the strut to extend beyond 12 inches. When air bubbles cease to flow through the hose, fully compress the strut, remove the filler plug, and again check the fluid level. When the fluid level is correct, disconnect the hose, reinstall the valve core, the filler plug, and the main gear torque links.

With the fluid in the strut housing at the proper level, attach a strut pump to the air valve. With the airplane on the ground under normal static load, inflate the oleo strut to the proper strut exposure.

In jacking the airplane for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 350 pounds of ballast should be placed on the base of the tail stand before jacking up the airplane. The hydraulic jacks are placed under the jack points on the underside of the wings, and the airplane is jacked up until the tail stand can be attached to the tail skid. After attaching the tail stand and adding ballast, the jacking can be continued until the airplane is at the desired height.

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.

OIL REQUIREMENTS

The oil capacity of the Lycoming IO-540 series engine is 12 quarts, and the minimum safe quantity is 2-3/4 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. The following grades are recommended for the specified temperatures:

TEMPERATURE	GRADE
Temperatures above 60°F	S.A.E. 50
Temperatures between 30°F and 90°F	S.A.E. 40
Temperatures between 0°F and 70°F	S.A.E. 30
Temperatures below 10°F	S.A.E. 20

FUEL SYSTEM

SERVICING FUEL SYSTEM

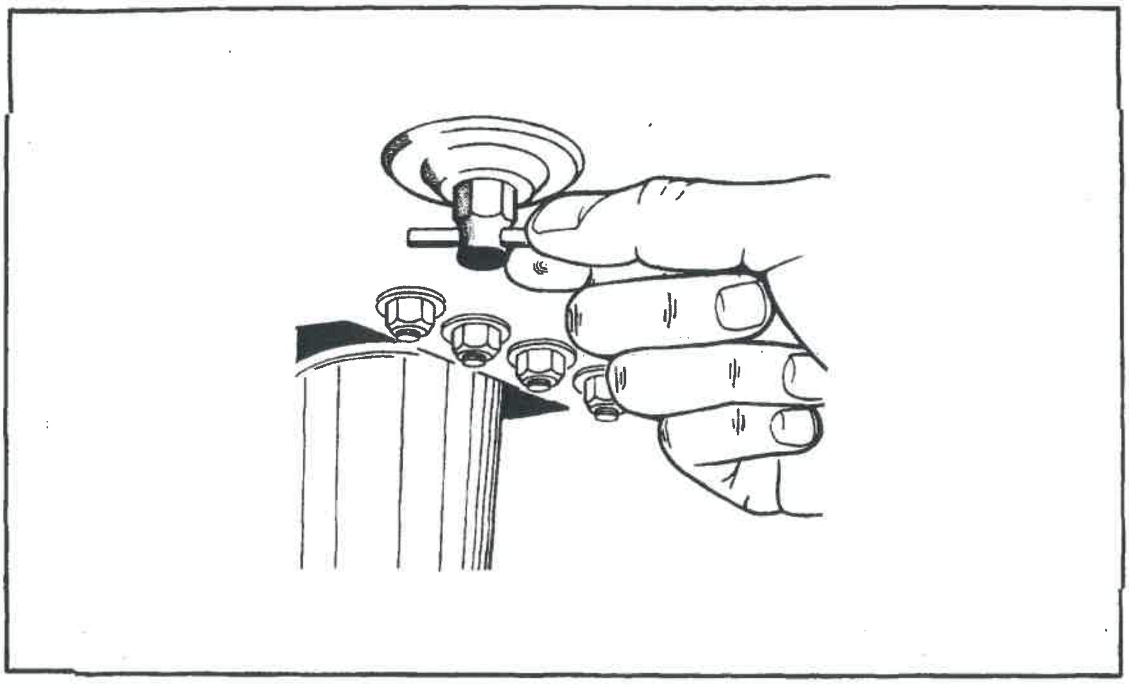
At every 50 hour inspection, the fuel screens in the strainer and in the injector must be cleaned. The screen in the injector is located in the housing where the fuel line connects to the injector. The fuel strainer is located under the floor panel and is accessible for cleaning through an access plate on the underside of the fuselage. After cleaning, a small amount of grease applied to the gasket will facilitate reassembly.

FUEL REQUIREMENTS

Aviation grade fuel with a minimum octane of 100/130 must be used in this airplane. Since the 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 octanes.

FILLING FUEL TANKS

Observe all safety precautions required when handling gasoline. Fill the fuel tanks through the filler located on the forward slope of the wings and on the wing tips. Each wing tank holds a maximum of 25 U.S. gallons, and each wing tip tank holds a maximum of 17 U.S. gallons. When using less than the standard 84 gallon capacity, fuel should be distributed equally between each side, with the wing tip tanks filled first.



Fuel Drain

DRAINING FUEL VALVES AND LINES

The fuel system should be drained before the first flight of the day and after refueling to avoid the accumulation of water and sediment. Each fuel tank has an individual quick drain at the lower inboard corner. A fuel strainer with a fuel system quick drain is located at the lowest point in the system. Each tank should be drained through its individual quick drain until sufficient fuel has flowed to ensure the removal of any contaminants. The fuel system quick drain, operated by a lever inside the cabin on the right forward edge of the wing spar housing, should be opened while the fuel selector valve is moved through the four different tank positions. Enough fuel should flow at each position to allow the fuel lines and the strainer to clear. A container is provided for the checking of fuel clarity. (See Description - Airplane and Systems Section for more detailed instructions.)

CAUTION

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

After using the fuel system quick drain, check from outside the airplane to be sure that it has closed completely and is not leaking.

DRAINING FUEL SYSTEM

The bulk of the fuel may be drained by opening the individual drain on each tank. The remaining fuel may be drained through the fuel strainer. Any individual tank may be drained by closing the fuel selector valve and then draining the desired tank.

TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures – 28-30 psi for the nose gear and 35-40 psi for the main gear. All wheels and tires are balanced before original installation, and the relationship of tire, tube, and wheel should be maintained upon reinstallation. Unbalanced wheels can cause extreme vibration in the landing gear; therefore, in the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. When checking tire pressure, examine the tires for wear, cuts, bruises, and slippage.

BATTERY SERVICE

Access to the 12-volt battery is through a removable panel in the floor of the forward baggage compartment. The battery box has a plastic tube which is normally closed off with a cap and which should be opened occasionally to drain off any accumulation of liquid. The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

If the battery is not up to charge, recharge starting at a 4 amp rate and finishing with a 2 amp rate. Quick charges are not recommended.

FACTS YOU SHOULD KNOW

The Federal Aviation Administration (FAA) occasionally publishes **Airworthiness Directives (ADs)** that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent to the latest registered owner of the affected aircraft and also to subscribers of the service. The owner should periodically check with his Piper dealer or A & P mechanic to see whether he has the latest issued AD against his aircraft.

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

Service Bulletins are of special importance and should be complied with promptly. These are sent to the latest registered owners, distributors and dealers. Depending on the nature of the bulletin, material and labor allowances are usually applicable.

Service Letters deal with product improvements and service hints pertaining to the aircraft. They are sent to dealers and distributors so they can properly service the aircraft and keep it up to date with the latest changes. Owners should give careful attention to the Service Letter information.

Service Spares Letters offer improved parts, kits and optional equipment which were not available originally and which may be of interest to the owner.

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

Piper Aircraft Corporation has a **Subscription Service** for the Service Bulletins, Service Letters and Service Spares Letters. This service is offered to interested persons such as owners, pilots and mechanics at a nominal fee, and may be obtained through Piper dealers and distributors. A Service Manual and revisions are available from a Piper dealer.

Pilot's Operating Manual supplements are distributed by the manufacturer as necessary. These revisions and additions should be studied and put into the operating manual to keep it up to date. This manual contains important information about the operation of the aircraft and should be kept with the aircraft at all times, even after resale. Every owner, to avail himself of the Piper Aircraft Service Back-Up, should stay in close contact with his Piper dealer or distributor so that he can receive the latest information.

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. **Major alterations** accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

The owner or pilot is required to ascertain that the following **Aircraft Papers** are in order and in the aircraft.

a. To be displayed in the aircraft at all times:
   1. Aircraft Airworthiness Certificate Form FAA-1362B.
   2. Aircraft Registration Certificate Form FAA-500A.
   3. Aircraft Radio Station License Form FCC-404A, if transmitters are installed.
b. To be carried in the aircraft at all times:
   1. Aircraft Flight Manual.
   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 log books are not required to be in the aircraft, they should be made available upon request. Log books should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

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:

1. Repair or change tires and tubes.
2. Service landing gear wheel bearings, such as cleaning, greasing or replacing.
3. Service landing gear shock struts by adding air, oil or both.
4. Replace defective safety wire and cotter keys.
5. Lubrication not requiring disassembly other than removal of non-structural items such as cover plates, cowling or fairings.
6. Replenish hydraulic fluid in the hydraulic reservoirs.
7. 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.
8. Replace side windows and safety belts.
9. Replace seats or seat parts with replacement parts approved for the aircraft.
10. Replace bulbs, reflectors and lenses of position and landing lights.
11. Replace cowling not requiring removal of the propeller.
12. Replace, clean or set spark plug clearance.
13. Replace any hose connection, except hydraulic connections, with replacement hoses.
14. Replace pre-fabricated fuel lines.
15. Replace the battery and check fluid level and specific gravity.

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

If the above work is accomplished, an entry must be made in the appropriate log book. The entry should contain:

1. The date the work was accomplished.
2. Description of the work.
3. Number of hours on the aircraft.
4. The certificate number of pilot performing the work.
5. Signature of the individual doing the work.

REQUIRED SERVICE AND INSPECTION PERIODS

Piper Aircraft Corporation provides for the initial and first 50-hour inspection, at no charge to the owner. The **Owner Service Agreement** which the owner receives upon delivery of the aircraft should be kept in the aircraft at all times. This identifies him to authorized Piper dealers and entitles the owner to receive service in accordance with the regular service agreement terms. This agreement also entitles the transient owner full warranty by any Piper dealer in the world.

One hundred hour inspections are required by law if the aircraft is used commercially. Otherwise this inspection is left to the discretion of the owner. This inspection is a complete check of the aircraft and its systems, and should be accomplished by a Piper Authorized Service Center or by a qualified aircraft and power plant mechanic who owns or works for a reputable repair shop. The inspection is listed, in detail, in the inspection report of the appropriate Service Manual.

An **annual inspection** is required once a year to keep the Airworthiness Certificate in effect. It is the same as a 100-hour inspection except that it must be signed by an Inspection Authorized (IA) mechanic or a General Aviation District Ofice (GADO) representative. This inspection is required whether the aircraft is operated commercially or for pleasure.

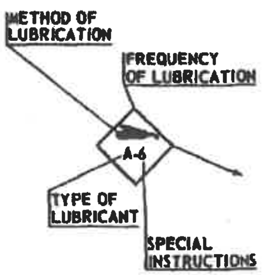
A **Progressive Maintenance** program is approved by the FAA and is available to the owner. It involves routine and detailed inspections at 50-hour intervals. The purpose of the program is to allow maximum utilization of the aircraft, to reduce maintenance inspection cost and to maintain a maximum standard of continuous airworthiness. Complete details are available from Piper dealers.

A **spectographic analysis** of the oil is available from several sources. This system, if used intelligently, provides a good check of the internal condition of the engine. For this system to be accurate, oil samples must be sent in at regular intervals, and induction air filters must be cleaned or changed regularly.

TYPE OF LUBRICANTS

IDENTIFICATION LETTER	LUBRICANT	SPECIFICATION	PREFERRED PRODUCT AND VENDOR
A	LUBRICATING OIL, GENERAL PURPOSE, LOW TEMP.	MIL-L-7870	
B	LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED SAE 50 ABOVE 60°F AIR TEMP. SAE 40 30° TO 90°F AIR TEMP. SAE 30 0° TO 70°F AIR TEMP. SAE 20 BELOW 10°F AIR TEMP.	MIL-L-6082	
C	HYDRAULIC FLUID, PETROLEUM BASE	MIL-H-5606	
D	GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW	MIL-G-23827	
E	GREASE, AIRCRAFT, HIGH TEMP.		TEXACO MARRAK ALL PURPOSE GREASE, MOBIL GREASE 77 (OR MOBILUX EP2), SHELL ALVANIA EP GREASE 2
F	GREASE, LUBRICATION, GENERAL PURPOSE, AIRCRAFT	MIL-G-7711	
G	PARKER O-RING LUBRICANT		
H	AERO LUBRIPLATE		FISKE BROS. REFINING CO.
I	FLUOROCARBON RELEASE AGENT DRY LUBRICANT	#MS-122	

EXAMPLE



SPECIAL INSTRUCTIONS

1. AIR FILTER - TO CLEAN FILTER, TAP GENTLY TO REMOVE DIRT PARTICLES. DO NOT BLOW OUT WITH COMPRESSED AIR OR USE OIL. REPLACE FILTER IF PUNCTURED OR DAMAGED.
2. BEARINGS AND BUSHINGS - CLEAN EXTERIOR WITH A DRY TYPE SOLVENT BEFORE LUBRICATING.
3. WHEEL BEARINGS - DISASSEMBLE AND CLEAN WITH A DRY TYPE SOLVENT. ASCERTAIN THAT GREASE IS PACKED BETWEEN THE BEARING ROLLER AND CONE. DO NOT PACK GREASE IN WHEEL HOUSING.
4. OLEO STRUTS, HYDRAULIC PUMP RESERVOIR AND BRAKE RESERVOIR - FILL PER INSTRUCTIONS ON UNIT OR CONTAINER, OR REFER TO SERVICE MANUAL, SECTION II.
5. PROPELLER - REMOVE ONE OF THE TWO GREASE FITTINGS FOR EACH BLADE. APPLY GREASE THROUGH FITTING UNTIL FRESH GREASE APPEARS AT HOLE OF REMOVED FITTING.
6. LUBRICATION POINTS - WIPE ALL LUBRICATION POINTS CLEAN OF OLD GREASE, OIL, DIRT, ETC. BEFORE LUBRICATING.
7. INTERVALS BETWEEN OIL CHANGES CAN BE INCREASED AS MUCH AS 100% ON ENGINES EQUIPPED WITH FULL FLOW (CARTRIDGE TYPE) OIL FILTERS - PROVIDED THE ELEMENT IS REPLACED EACH 50 HOURS OF OPERATION.
8. FUEL SELECTOR VALVE - LUBRICATE AREA WHERE DETENT BALL MOVES ACROSS COVER PLATE.
9. O-RING, CONTROL SHAFT BUSHING - DISASSEMBLE O-RING RETAINER PLATES FROM INSTRUMENT PANEL, LUBRICATE O-RING AND REASSEMBLE.
10. AILERON HINGES WITH TEFLON SLEEVES SHOULD NOT BE LUBRICATED. AILERON HINGES WITHOUT TEFLON SLEEVES SHOULD FIRST BE CLEANED WITH A DRY TYPE SOLVENT THEN LUBRICATED WITH MIL-L-7870 LUBRICATING OIL.
11. THIS TRANSMISSION TO BE 1/2 FULL OF GREASE. APPLY GREASE DURING ASSEMBLY AND LUBRICATE TRANSMISSION BALL NUT AND SCREW WITH MIL-G-23827 GREASE.
12. APPLY FLUOROCARBON DRY LUBRICANT TO DOOR SEALS AT LEAST ONCE A MONTH TO PREVENT THE SEAL FROM STICKING, AND IMPROVE SEALING CHARACTERISTICS.

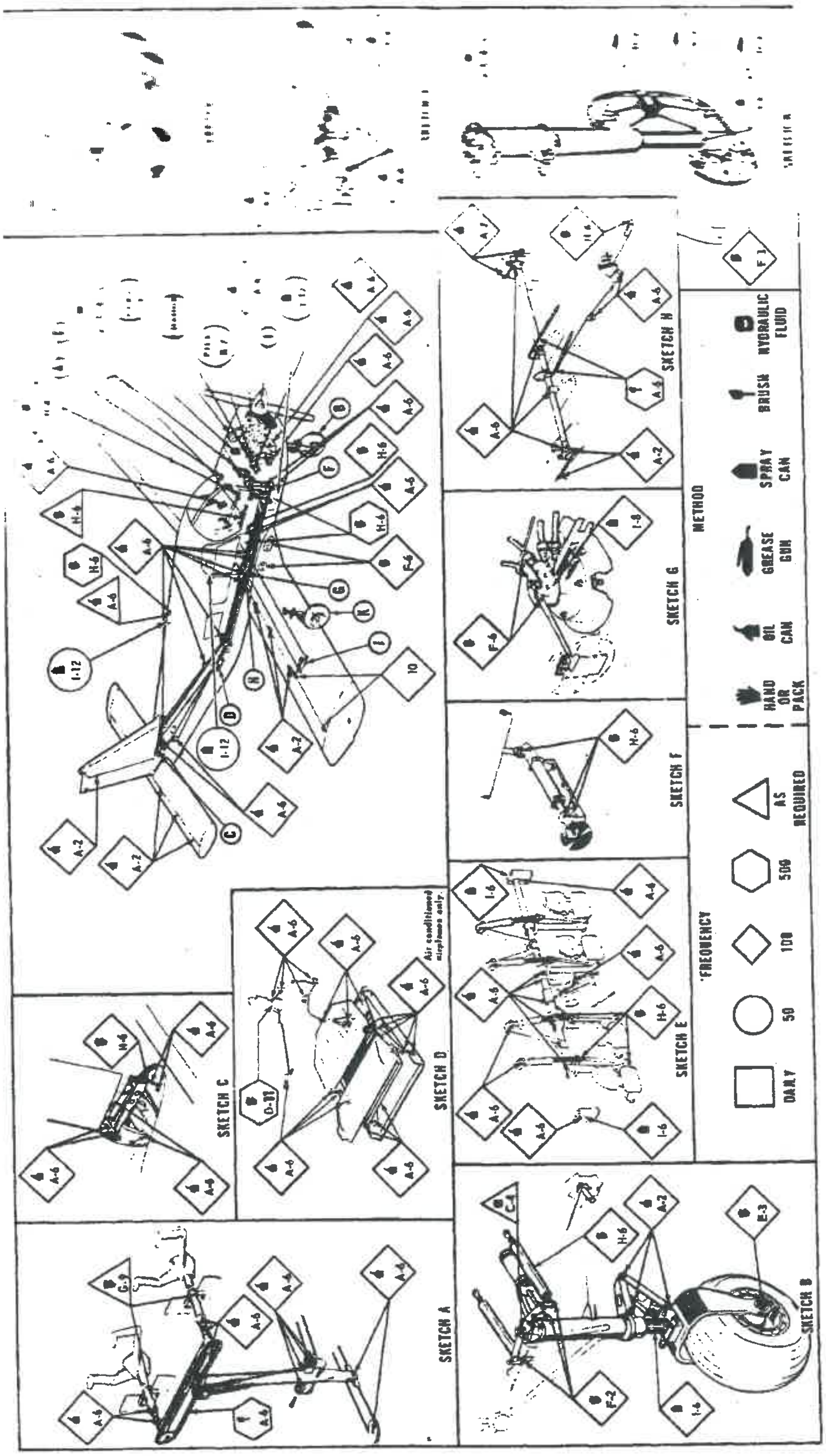
NOTES

1. PILOT AND PASSENGER SEATS - LUBRICATE TRACK ROLLERS AND STOP PINS AS REQUIRED. (TYPE OF LUBRICANT: "A")
2. WHEEL BEARINGS REQUIRE CLEANING AND REPACKING AFTER EXPOSURE TO AN ABNORMAL QUANTITY OF WATER.
3. FUEL SELECTOR VALVE - LUBRICATE FUEL SELECTOR VALVE AS REQUIRED, REFER TO PIPER SERVICE LETTER NO. 351.
4. SEE LYCOMING SERVICE INSTRUCTIONS NO. 1014 FOR USE OF DETERGENT OIL.

CAUTIONS

1. DO NOT USE HYDRAULIC FLUID WITH A CASTOR OIL OR ESTER BASE.
2. DO NOT OVER-LUBRICATE COCKPIT CONTROLS.
3. DO NOT APPLY LUBRICANT TO RUBBER PARTS.

Lubrication Nomenclature



Lubrication Chart

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Page 1
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BERLIN AVIONICS
3165 DONALD DOUGLAS LOOP S
SANTA MONICA, CA. 90405
FAA REPAIR STATION Ebur109k

WEIGHT AND BALANCE REPORT *** REVISED EQUIPMENT LISTÇ

Aircraft Type ----------	:	PIPER
Aircraft Model ---------	:	PA32-300
Aircraft S/N -----------	:	32-7440074
Aircraft Registration --	:	N7801A
Maximum Gross Weight ---	:	3400 LBSÇ

Revised weight and balance computations are based on previous data dated 02/19/04.

				WEIGHT (LBS)	ARM (IN)	MOMENT (IN/LBS)
PREVIOUS EMPTY WEIGHT			<<< CORRECTED >>>	2074.5	74.88	155334.50
PREVIOUS USEFUL LOAD			<<< CORRECTED >>>	1325.5Ç		
* EQUIPMENT REMOVED *						
Model	Serial #	Description				
KX 155	U37703	KING COM/NAV		5.0	69.5	347.50
KI-209	53079	KING VOR/LOC		1.0	71.0	71.00
TNL 1000	4323230	TRIMBLE GPS		1.9	69.5	132.05
* EQUIPMENT ADDED *						
Model	Serial #	Description				
GI 106A	B0510706	GARMIN VOR/LOC		1.5	72.0	108.00
GNS 430	97126116	GAR GPS/COM/NAV		6.5	69.5	451.75
GA 56	59404427	GARMIN ANTENNA		0.5	59.0	29.50
NEW EMPTY WEIGHT			<<< CURRENT >>>	2075.1	74.88	155373.20
NEW USEFUL LOAD			<<< CURRENT >>>	1324.9		
MAXIMUM GROSS WEIGHT				3400.0Ç		

s. 38(1), s. 47F(1)

[redacted]

Document 10

Transport Safety Investigation Act 2003- Section 62

Authorisation to access restricted information

Form: F62-1

Australian Government
Australian Transport Safety Bureau

ATSB Investigation No. AO-2015-086

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015

Authorisation under Transport Safety Investigation Act 2003 – Section 62

Section 62 of the Act allows the ATSB to authorise a non-staff member to have access to information that is classified as 'restricted information' while requiring the non-staff member to adhere to confidentiality requirements of the Act.

Description of restricted information which access is being given to:

s. 38(1), s. 47F(1) [redacted]

The person or persons listed below have been authorised to access the identified restricted information. Through being authorised access to the information under section 62, the identified person or persons within the Organisation are subject to the confidentiality requirements of subsection 60(3) of the *Transport Safety Investigation Act 2003* (information relating to section 60 of the TSI Act is provided overleaf). The signed persons acknowledge and accept these obligations.

Name of authorised person	Signature of authorised person	Date	Phone
s. 47F(1) [redacted]	s. 47F(1) [redacted]	31 July 2015	s. 47F(1) [redacted]

Please return a signed copy of this form to the person at the ATSB listed below

PO Box 967
Civic Square ACT 2608 Australia

Signature of ATSB/Delegate

Name of ATSB/Delegate: s. 47F(1) [redacted]

Date 31/07/2015

Delegate Phone: s. 47F(1) [redacted]

Delegate Fax: 02-6274 6207

Delegate Email: s. 47F(1) [redacted]

Document 11

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government
Australian Transport Safety Bureau

ATSB Investigation No. AO-2015-086

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015

To Name: s. 38(1), s. 47F(1) [redacted]

Organisation:

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003.* The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Location of interview | Interview Date | Interview Time:

s. 38(1), s. 47F(1) [redacted]

Description of material, date required and any special instructions

s. 38(1) [redacted]

Evidence Required by: s. 38(1) [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate

s. 47F(1) [redacted]

Name of ~~Chief Commissioner~~ /Delegate :

s. 47F(1) [redacted]

Date: 28/07/2015

Phone: s. 47F(1) [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.
Section 32—Require attendance to answer questions or produce evidence For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions. The ATSB must first give the person written notice, allowing a reasonable time to comply. Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation). Failure to comply is an offence. The penalty is a fine.
Section 47—Self-incrimination no excuse You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you. However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2015-086

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015

To Name: s. 38(1), s. 47F(1) [redacted]

Organisation:

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003.* The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Location of interview | Interview Date | Interview Time:

s. 38(1), s. 47F(1) [redacted]

Description of material, date required and any special instructions

s. 38(1) [redacted]

Evidence Required by: s. 38(1) [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate

s. 47F(1) [redacted]

Name of ~~Chief Commissioner~~/Delegate:

s. 47F(1) [redacted]

Date: 28/07/2015

Phone: s. 47F(1) [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.
Section 32—Require attendance to answer questions or produce evidence For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions. The ATSB must first give the person written notice, allowing a reasonable time to comply. Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation). Failure to comply is an offence. The penalty is a fine.
Section 47—Self-incrimination no excuse You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you. However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2015-086

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Organisation: s. 38(1) [redacted]

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s. 38(1) [redacted]

Evidence Required by: s. 38(1) [redacted]

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Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate

s. 47F(1) [redacted]

Name of ~~Chief Commissioner~~ /Delegate :

s. 47F(1) [redacted]

Date

29/07/2015

Phone:

s. 47F(1) [redacted]

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Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2015-086

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Organisation: s. 38(1) [redacted]

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s. 38(1) [redacted]

Evidence Required by: s. 38(1) [redacted]

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s. 47F(1) [redacted]

Name of ~~Chief Commissioner~~ /Delegate :

s. 47F(1) [redacted]

Date

29/07/2015

Phone:

s. 47F(1) [redacted]

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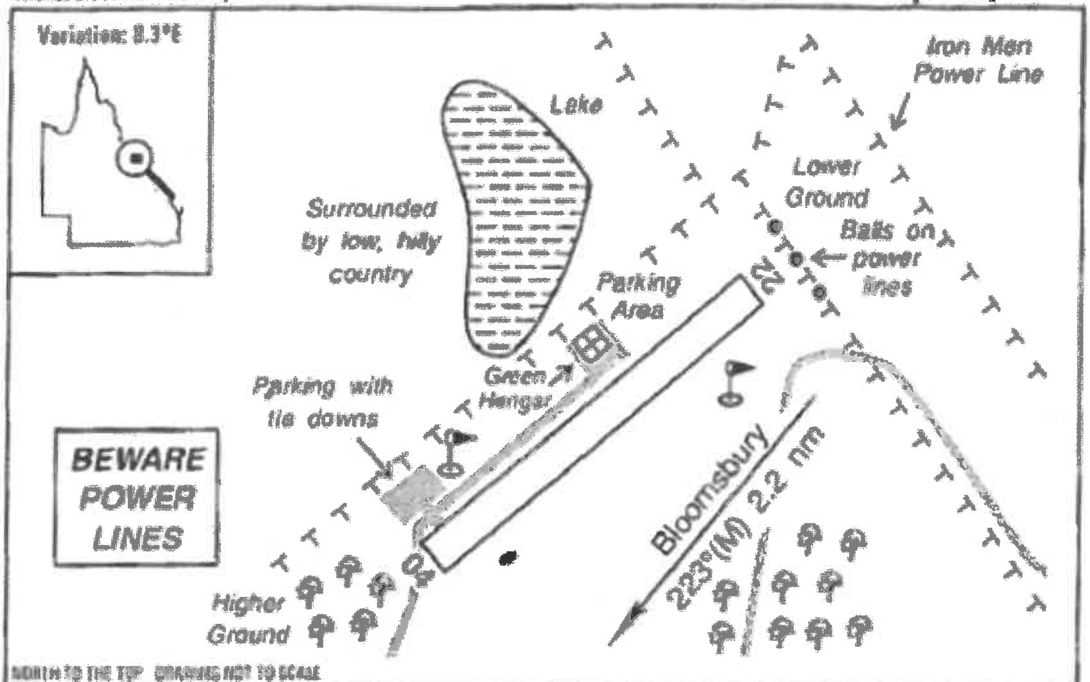
Document 15

Lakeside Airpark, QLD



Elevation:	175 Feet AMSL	**Time Zone:**	UTC + 10
GPS Position:	20° 40.852' South 148° 37.831' East	**Area Forecast:**	44
WAC Charts:	Clermont (3234), Rockhampton (3235)	**ALA Code:**	YLAK
Owner/Operator:	Lakeside Airpark 0418 711224, office@caboolturecommercial.com		
Strip Directions:	04-22		
Strip Lengths:	1000 metres (wet weather may shorten the NE end)		
Strip Surface:	Unsealed - slashed grass		
Windsock:	Yes - two		
Strip Markers:	White cones and tyres		
Lighting:	Nil		

From: s. 47F(1) [redacted]
To: [redacted]
Subject: FW: AO-2015-086 Collision with terrain during landing, involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015 [DLM=Sensitive]
Date: Wednesday, 21 October 2015 12:56:00 PM

---

s. 38(1), s. 47F(1) [redacted]

Short Investigation Team

62 Northbourne Avenue, Canberra ACT
PO Box 967, Civic Square ACT 2608

P s. 47F(1) [redacted] | E s. 47F(1) [redacted] F 02 6274 6207

http://www.atsb.gov.au/aviation/short-investigations.aspx

Australia's national transport safety investigator

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Web www.atsb.gov.au
Twitter @ATSBinfo

From: s. 47F(1) [redacted]
Sent: Wednesday, 21 October 2015 12:53 PM
To: s. 47F(1) [redacted]
Subject: RE: AO-2015-086 Collision with terrain during landing, involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015 [DLM=Sensitive]

s. 38(1), s. 47F(1) [redacted]

From: s. 47F(1) [redacted]
To: s. 47F(1) [redacted]
CC: [redacted]
Subject: AO-2015-086 Collision with terrain during landing, involving a PA32 aircraft, VH-BDG at Lakeside Airpark, Queensland on 26 July, 2015 [DLM=Sensitive]
Date: Mon, 19 Oct 2015 11:06:36 +0000

Special Request

s. 38(1), s. 47F(1) [redacted]

Investigator in charge
Short Investigation Team

62 Northbourne Avenue, Canberra ACT
PO Box 967, Civic Square ACT 2608

P s. 47F(1) [redacted] | E s. 47F(1) [redacted] | F 02 6274 6207

http://www.atsb.gov.au/aviation/short-investigations.aspx

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This material may contain information that cannot be disclosed further due to: Transport Safety Investigation Act 2003

Document 21

s. 38(1), s. 47F(1)

[redacted]

s. 38(1), s. 47F(1)

[redacted]

Australian Government
Australian Transport Safety Bureau

Document 22

Aviation Notification Form

Notification Officer: s. 47F(1) [redacted] **Phone:** 1800 011 034

All orange fields are Mandatory unless information is not available from Reporter

Reporters Name: RCC **Role:** **Employer**
Report date: 26/07/2015 **Report time:** 1631 **Phone:**

Registration: VH BDG **Flight No:** **Aircraft Type:** PA 32
eg. Boeing 737, Cessna 210
Occurrence type: Runway excursion **Operation Type:** Charter
eg. Loss of separation, wheels up landing — eg.charter pax, mustering, private
Occurrence Date: 26/07/2015 **Occurrence Time:** 1610 ◉ Local ○ UTC
Occurrence location: Lake side air park, Bloomsbury, North of Mackay **State:** Qld
Latitude/Longitude: S 20.67919 E 148.63348
Important for accidents away from aerodromes
Aircraft Operator: s. 47F(1) [redacted]

Injuries

	Fatal	Serious	Minor	Nil
Crew				
Passengers		1		
Ground				

Damage description: Plane submerged in lake north west of runway

Description of occurrence and Additional Information: (Press ALT + ENTER for a new paragraph)

Charter flight, ran of end of runway into lake.
6 POB escaped before plane submerged.
I injury. Qld ermegency services attending, extent unknown.
Pilot - s. 47F(1) [redacted]
Owner - s. 47F(1) [redacted]
Police Co-ordinator - s. 47F(1) [redacted]

Flt Recs Quarantined: ○ Yes ○ No **ELT Disabled** ○ Yes ○ No **Guard:** ○ Yes ○ No

Passed on:	Date	Time	Name		Date	Time	Name
COR:	########	1635	s. 47F(1) [redacted]	WebSMS:			
Other:				Other:			

Document 23

s. 38(1), s. 47F(1)

[redacted]

s. 38(1), s. 47F(1)

[redacted]

From: s. 47F(1) [redacted]
To: Repcon
Subject: Accident 201503322 VH-BDG Collision with terrain Lakeside Airpark (ALA) 26 July 2015 [SEC=UNCLASSIFIED]
Date: Monday, 27 July 2015 1:11:00 PM
Attachments: State Of Manufacture.pdf

Hi,

Please find attached the notification of an accident involving Piper PA-32. Please notify the appropriate organisations.

The ATSB is investigating this accident.

Regards

s. 47F(1) [redacted]
Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601

P s. 47F(1) [redacted] | E s. 47F(1) [redacted] | M s. 47F(1) [redacted] | REPCON 1800 020 505

Australia's national transport safety investigator

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http://www.atsb.gov.au/voluntary/repcon-aviation.aspx
REPCON Marine Confidential Reporting Scheme
http://www.atsb.gov.au/voluntary/repcon-marine.aspx
Aviation Self Reporting Scheme (ASRS)
http://www.atsb.gov.au/voluntary/asrs.aspx

Australian Government
Australian Transport Safety Bureau

ICAO Annex 13 Chapter 4
Accident & Serious Incident Notification

ATSB Reference:	201503322	**Category:**	Accident
Investigation:	Yes - AO-2015-086		
Date and Time:	Sunday, July 26, 2015 3:50 PM		EST
Location:	Lakeside Airpark (ALA)		
State:	QLD	**Country:**	Australia
Latitude:	-20.6850	**Longitude:**	148.6250
Highest Injury:	Minor		
Occurrence:	Operational - Terrain Collisions - Collision with terrain		
Site Access:	Accessible		
Dangerous Goods:	Nil		

Injury Details:

	Crew	Passenger	Ground
Fatal	0	0	0
Serious	0	0	0
Minor	0	1	0
Nil	1	4	-

Nationalitites: N/A

Aircraft Details:

VH-BDG

Aircraft Type:	Aeroplane	
Serial Number:	32-7740092	
Manufacturer:	PIPER AIRCRAFT CORP	
Model:	PA-32-300	
Engine Manufacturer:	TEXTRON LYCOMING	
Engine Model:	IO-540	
Operation:	Private	Pleasure / Travel
Damage Level:	Substantial	
Country of Registration:	Australia	
Country of Manufacture:	United States	
Departed:	Lakeside Qld	
Destination:	Lakeside Qld	

Summary: During landing, the aircraft struck the runway nose first before hitting an embankment and submerging into a dam. The investigation is continuing.

From: Investigations
To: s. 47F(1) [redacted]
Subject: RE: Accident 201503322 VH-BDG Collision with terrain Lakeside Airpark (ALA) 26 July 2015 [SEC=UNCLASSIFIED]
Date: Friday, 31 July 2015 7:41:35 PM

Hi s. 47F(1) [redacted]

Hope you are well. Thank you for the notification, we will not be taking any further AAIB action, however if you require any assistance, please let me know.

Best regards

s. 47F(1) [redacted]

Air Accidents Investigation Branch (AAIB)
Farnborough House
Berkshire Copse Road
Aldershot
Hampshire
GU11 2HH
TEL: +44 (0)1252 510300
FAX: +44 (0)1252 376999

s. 47F(1) [redacted]

www.aaib.gov.uk

From: s. 47F(1) [redacted]
Sent: 31 July 2015 06:37
To: Investigations
Subject: Accident 201503322 VH-BDG Collision with terrain Lakeside Airpark (ALA) 26 July 2015 [SEC=UNCLASSIFIED]

Hi s. 47F(1) [redacted]

Please find attached the notification of an accident involving Piper PA-32. s. 38(1), s. 47F(1) [redacted]
s. 38(1), s. 47F(1) [redacted]

The ATSB is investigating this accident.

Regards

s. 47F(1) [redacted]

Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601

P s. 47F(1) [redacted] | E s. 47F(1) [redacted] | M s. 47F(1) [redacted] | REPCON 1800 020 505

Australia's national transport safety investigator

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Aviation Self Reporting Scheme (ASRS)
http://www.atsb.gov.au/voluntary/asrs.aspx

From: s. 47F(1) [redacted]
To:
Subject: FW: Australia, Piper PA-32-300, 7/26/15
Date: Tuesday, 28 July 2015 1:46:35 AM
Attachments: State Of Manufacture.pdf

Please see attached ATSB notification. Show me as the Accredited Rep and let me know if you need additional information.

Thanks,

s. 47F(1) [redacted]

National Transportation Safety Board
505 South 336th Street, Suite 540
Federal Way, WA 98003
Direct: s. 47F(1) [redacted] Cell: s. 47F(1) [redacted]

From: NTSB ROC
Sent: Sunday, July 26, 2015 8:21 PM
To: s. 47F(1) [redacted]
NTSB ROC; s. 47F(1) [redacted]
Subject: IFN: Australia, Piper PA-32-300, 7/26/15

The following text was included in reply to the notifying authority:

Thank you for your notification to the National Transportation Safety Board. The notification has been forwarded to the appropriate duty officer for response.

From: s. 47F(1) [redacted]
Sent: Sunday, July 26, 2015 11:18:19 PM (UTC-05:00) Eastern Time (US & Canada)
To: NTSB ROC
Subject: Accident 201503322 VH-BDG Collision with terrain Lakeside Airpark (ALA) 26 July 2015 [SEC=UNCLASSIFIED]

Hi,

Please find attached the notification of an accident involving Piper PA-32. Please notify the appropriate organisations.

The ATSB is investigating this accident.

Regards

s. 47F(1) [redacted]

Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601

P s. 47F(1) [redacted] | E s. 47F(1) [redacted] | M s. 47F(1) [redacted] | REPCON 1800 020 505

Australia's national transport safety investigator

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Australian Government
Australian Transport Safety Bureau

ICAO Annex 13 Chapter 4
Accident & Serious Incident Notification

ATSB Reference: 201503322 **Category:** Accident
Investigation: Yes - AO-2015-086
Date and Time: Sunday, July 26, 2015 3:50 PM EST
Location: Lakeside Airpark (ALA)
State: QLD **Country:** Australia
Latitude: -20.6850 **Longitude:** 148.6250
Highest Injury: Minor
Occurrence: Operational - Terrain Collisions - Collision with terrain
Site Access: Accessible
Dangerous Goods: Nil

Injury Details:

	Crew	Passenger	Ground
Fatal	0	0	0
Serious	0	0	0
Minor	0	1	0
Nil	1	4	-

Nationalitites: N/A
Aircraft Details:
VH-BDG

Aircraft Type: Aeroplane
Serial Number: 32-7740092
Manufacturer: PIPER AIRCRAFT CORP
Model: PA-32-300
Engine Manufacturer: TEXTRON LYCOMING
Engine Model: IO-540
Operation: Private Pleasure / Travel
Damage Level: Substantial
Country of Registration: Australia
Country of Manufacture: United States
Departed: Lakeside Qld
Destination: Lakeside Qld

Summary: During landing, the aircraft struck the runway nose first before hitting an embankment and submerging into a dam. The investigation is continuing.

From: [redacted]
To: United Kingdom AAIB 24 hour contact
Subject: Accident 201503322 VH-BDG Collision with terrain Lakeside Airpark (ALA) 26 July 2015 [SEC=UNCLASSIFIED]
Date: Friday, 31 July 2015 3:36:00 PM
Attachments: State Of Manufacture.pdf

Hi [redacted]

Please find attached the notification of an accident involving Piper PA-32. [redacted]

The ATSB is investigating this accident.

Regards

[redacted]
Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601
P [redacted] E [redacted] M [redacted] | REPCON 1800 020 505

Australia's national transport safety investigator

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Australian Transport Safety Bureau

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Highest Injury:	Serious		
Occurrence:	Operational - Terrain Collisions - Collision with terrain		
Site Access:	Accessible		
Dangerous Goods:	Nil		

Injury Details:

	Crew	Passenger	Ground
Fatal	0	0	0
Serious	0	1	0
Minor	1	0	0
Nil	0	4	-

Nationalitites: British

Aircraft Details:

VH-BDG

Aircraft Type:	Aeroplane	
Serial Number:	32-7740092	
Manufacturer:	Piper Aircraft Corp	
Model:	PA-32-300	
Engine Manufacturer:	TEXTRON LYCOMING	
Engine Model:	IO-540	
Operation:	Private	Pleasure / Travel
Damage Level:	Substantial	
Country of Registration:	Australia	
Country of Manufacture:	United States	
Departed:	Lakeside Qld	
Destination:	Lakeside Qld	

Summary: During landing, the aircraft struck the runway nose first before hitting an embankment and submerging into a dam. The investigation is continuing.

From: s. 47F(1) [redacted]
To: NTSB USA National Transport Safety Authority
Subject: Final reports Investigation Bulletin 44 [SEC=UNCLASSIFIED]
Date: Monday, 9 November 2015 10:45:00 AM
Attachments: Final report.pdf

Hi,

Please find attached our Investigation Bulletin 44 containing Final report for

AO-2015-013 relates to 201500138
AO-2015-086 relates to 2015003322
AO-2015-090 relates to 201503512
AO-2015-092 relates to 201503557
AO-2015-026 relates to 201500662
AO-2015-064 relates to 2015002724
AO-2015-091 relates to 201503514

Cheers

s. 47F(1) [redacted]
Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601
P s. 47F(1) [redacted] E s. 47F(1) [redacted] M s. 47F(1) [redacted] REPCON 1800 020 505

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Document 29

Australian Government

Australian Transport Safety Bureau

Aviation Short Investigations Bulletin

Issue 44

Investigation

ATSB Transport Safety Report

Aviation Short Investigations

AB-2015-118

Final – 4 November 2015

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
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Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Contents

Piston aircraft

Landing gear malfunction involving a Cessna 210, VH-SMP

What happened

VH-SMP

Source: Keith Anderson, modified by the ATSB

On 1 February 2015, at about 0800 Western Standard Time (WST), a Cessna 210 aircraft, registered VH-SMP (SMP), departed from Kununurra Airport, Western Australia, for a scenic flight over King George falls with the pilot and five passengers on board.

The pilot returned to Kununurra after about 2 hours. During the approach, the pilot selected the landing gear selector to the down position. However, the green landing gear down indicator light did not illuminate. In addition, the landing gear pump continued to operate until the landing gear pump circuit breaker popped. The pilot observed that the right and left main landing gear appeared to be in the down and locked position. However, the pilot was unable to observe the nose landing gear.

As he was unable to verify the position of the nose landing gear, the pilot conducted a missed approach and held at about 1,500 ft above the ground level to investigate the reason for the malfunction. The pilot also broadcast on the common traffic advisory frequency (CTAF) his intentions and briefed the passengers.

The pilot selected the landing gear down and up another two times. However, in the down selection, there was no green landing gear down light and the landing gear pump continued to operate until the circuit breaker popped. The pilot inspected the landing gear down light globe and determined it was operational.

The pilot then used the 'landing gear fails to extend' and 'manual gear extension' checklists, and conducted a manual gear extension. The main landing gear was observed to be in the down position, but there was still no landing gear down green light.

The pilot contacted the operator first via a text message using a mobile phone, and then on the company radio frequency. After consulting with the operator, the pilot conducted a low-level pass over the runway to enable the operator to observe the landing gear position from the ground.

During the low-level pass, the operator observed the landing gear and reported to the pilot that the landing gear appeared to be in the down position. The operator told the pilot that it was likely to be an indication problem. The pilot returned SMP for a landing on runway 12 and briefed the passengers for the landing.

At about 1020, SMP landed, with the main landing gear wheels touching down first. The pilot held full back pressure on the elevator controls to hold the nose wheel off the runway for as long as possible. After about 100 m, the nose of the aircraft sank on to the runway. At this point, the nose wheel collapsed, the propeller struck the runway, and the aircraft came to a stop. Once the aircraft was stationary, the pilot completed the shutdown checks. The pilot and passengers then exited the aircraft through the two front doors.

The pilot and five passengers were uninjured. The aircraft sustained minor damage, including damage to the propeller, nose wheel, and engine cowling.

Pilot comment

The pilot reported that when the manual gear extension hand pump was used to pump the gear down, and was pumped until it could not be pumped further, it felt just like when the gear is in the down and locked position.

The pilot indicated that SMP last flew on 12 January 2015, about 3 weeks before the incident flight, and that there was no outstanding maintenance.

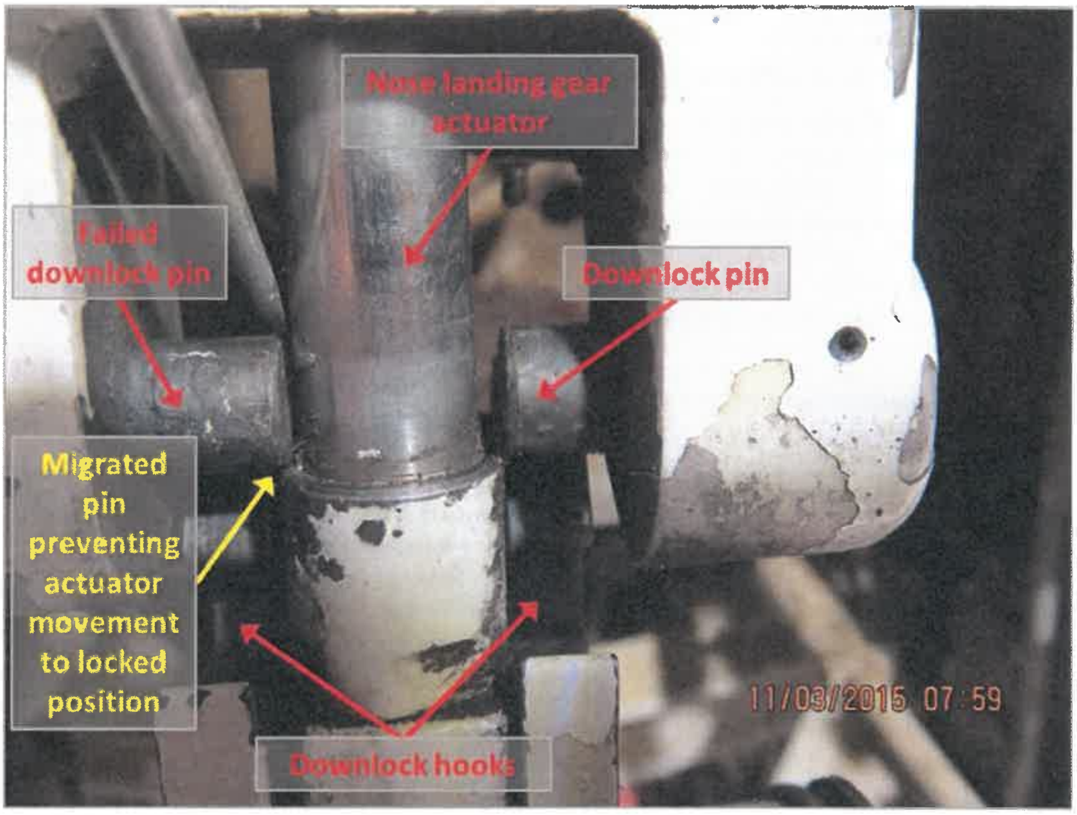
Owner investigation

The owner of the aircraft conducted an investigation into the incident. As part of their investigation, they determined that one of the nose landing gear down lock pins had failed. The pin had failed in the area of the machined groove for the pin retention roll pin (Figure 1). The failed down lock pin migrated out and interfered with the nose landing gear actuator. This movement prevented the nose landing gear down lock mechanism from engaging in the down and locked position (Figure 2). The other down lock pin was serviceable.

Figure 1: Failed nose landing gear downlock pin

Source: Aircraft owner

Figure 2: SMP nose landing gear downlock assembly, showing the failed downlock pin preventing actuator movement to the locked position



Source: Aircraft owner, modified by the ATSB

Cessna Service Bulletin

Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Inspection* dated 29 December 1995, recommended the inspection of the nose landing gear downlock actuator pins to determine the security of the pins.

Cessna had introduced the service bulletin as they had received reports that the nose landing gear actuator downlock pins had cracked and failed. It was found that the pins had failed at a circumferential groove that was used to secure the pin in the actuator bearing end. The service bulletin indicated that non-compliance could result in failure of the nose landing gear to lock in the down position and possibly collapse.

The recommended inspection was to be carried out initially within the next 200 hours operation or 12 months, whichever occurred first. Subsequent inspections at each landing gear retraction check were not to exceed 200 hours of operation thereafter. After the installation of the downlock actuator pin replacement, the repetitive inspection was not required.

Aircraft maintenance

SMP was manufactured in 1976 and, at the time of the incident, the aircraft had 9,965 hours total time in service. The aircraft was maintained under the Civil Aviation Safety Authority (CASA) maintenance schedule (*Civil Aviation Regulations 1988* (CAR) *Schedule 5*). As the nose landing gear was inspected in accordance with *Schedule 5*, the operator reported that they did not need to comply with Cessna *SEB95-20*.

The periodic (100 hourly or 12-month) maintenance inspections were carried out in August 2014 at 9,871 hours total time in service (94 hours prior to the accident). This maintenance was conducted in accordance with the CASA maintenance schedule (*Schedule 5*). *Schedule 5* did not include a specific inspection requirement to determine the security of the down lock pins.

NTSB investigation into similar failures

The US National Transport Safety Board (NTSB) investigated an accident involving a Cessna R182 aircraft, registered N6149S at Allegheny County Airport, West Mifflin, Pennsylvania on 18 May 2005 where the nose landing gear collapse during the landing.[1]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. The NTSB examined the downlock pin and found that it had failed due to a fatigue crack. The investigation also found that the Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Pin Inspection* had not been carried out. The investigation found over 30 other nose landing gear collapses that were attributed to the actuator down lock pins on similarly equipped Cessna aircraft.

The NTSB also investigated another similar accident involving a Cessna R182 aircraft, registered N5274S, at Ames Municipal Airport, Ames, Iowa, on 22 October 2006 where the nose landing gear collapse during the landing.[2]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator assembly bearing end had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. Both downlock pins were found to have fatigue cracks. Again, there was no evidence that Cessna Service Bulletin *SEB95-20* had been complied with.

ATSB comment

On 12 September 2011, a flight control system event occurred involving Cessna 210N, VH-JHF, 48 km West of Bourke Airport, NSW. The ATSB investigation (AO-2011-115) found that reported elevator control input difficulties resulted from the fracture of the aircraft's two horizontal stabiliser rear attachment brackets. The nature of the failures was typical of the damage sustained by aircraft as they age and move beyond the manufacturer's originally intended design life.

The investigation identified that maintaining class B aircraft in accordance with the Civil Aviation Safety Authority (CASA) maintenance schedule, without due regard to the manufacturer's or other approved data, does not adequately provide for the continuing airworthiness of those aircraft.

As a result of the investigation the ATSB issued CASA a Safety Recommendation *AO-2011-115-SR-050*:

> *The Australian Transport Safety Bureau recommends that CASA proceed with its program of regulatory reform to ensure that all aircraft involved in general aviation operations are maintained using the most appropriate maintenance schedule for the aircraft type.*

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

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1 The NTSB aviation accident report *IAD05IA066*, is available from the NTSB website.

2 The NTSB aviation accident report *CHI07LA011*, is available from the NTSB website.

Aircraft owner

As a result of this occurrence, the aircraft operator has advised the ATSB that the aircraft owner has taken the following safety actions:

Aircraft maintenance

Subsequent to the incident, the aircraft owner replaced the landing gear down lock pins with updated pins on two other aircraft that the owner is responsible for, and found no abnormalities with the removed pins or the nose landing gear actuator bearing ends.

Safety message

This accident highlights the importance of comprehensive, periodic maintenance inspections and the role manufactures continuing airworthiness instructions in maintaining ageing aircraft. As aircraft age, the original maintenance schedules may not be sufficient to ensure the aircraft's ongoing safety. As a result of investigation report AO-2011-115 the ATSB encourages registration holders of class B aircraft to review their aircraft's maintenance schedule to determine if it is the most appropriate for their aircraft and to ensure that it adequately provides for the continuing airworthiness of the aircraft.

In 2007, the ATSB released research report B20050205 - *How Old is Too Old? The impact of ageing aircraft on aviation safety* and is available from the ATSB website. The report found that some aircraft manufacturers have recognised that the original maintenance schedules may not be sufficient to ensure the aircraft's (ongoing) safety. Those manufacturers have developed additional continuing airworthiness information. The report concluded that adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

In 2012, in recognition of the Australian general aviation aging aircraft fleet, CASA released a discussion paper *Ageing Aircraft Management Plan (AAMP)*. The discussion paper makes the following relevant points:

- As an aircraft ages up to and beyond its original design assumptions, the nominated maintenance program needs to be modified to take into account ageing issues. In particular, inspections of key areas or components not usually accessed.
- CASA and Authorised Persons are obliged to take into account all relevant maintenance data or information pertinent to a particular aircraft type. This includes manufacturer's data, Airworthiness Directives, Service Bulletins and other continuing airworthiness information.
- CASA Maintenance *Schedule 5* was originally conceived as a minimum schedule of maintenance activities, to be undertaken on a very limited range of relatively simple, 'orphan' aircraft
- CASA Maintenance *Schedule 5* was not originally intended to address ageing aircraft related issues. The literal application of this schedule on its own was not intended to replace the manufacturer's instructions for continued airworthiness, where available.

The adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

General details

Occurrence details

Date and time:	1 February 2015 – 1020 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Landing gear malfunction	
Location:	Kununurra Airport, Western Australia	
	Latitude: 15° 46.68' S	Longitude: 128° 42.45' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210L	
Registration:	VH-SMP	
Serial number:	21061544	
Type of operation:	Charter - passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

Collision with terrain involving a Victa 115 Airtourer, VH-MUV

What happened

On 29 May 2015, at about 1145 Eastern Standard Time (EST), a Victa 115 Airtourer aircraft, registered VH-MUV (MUV), departed from Leongatha Airport, Victoria, for crosswind circuit training, with an instructor and student on board.

The student pilot was flying the first circuit. The instructor reported that the circuit was normal and the approach was stable up to about 100 ft above ground level (AGL) when the student put the final stage of flap out. As the aircraft flared to land on runway 22, a strong gust of wind blew the aircraft off the runway centreline to the left and the aircraft bounced hard. The student initiated a go-around, applying full power, with the aircraft still drifting further to the left. As the aircraft was not climbing, the instructor called “taking over” and the student handed over control of the aircraft. The instructor lowered the nose of the aircraft to gain airspeed.

The aircraft continued to drift further away from the runway centreline. The student noticed the flaps were in the down position and, thinking that it would assist and without checking with the instructor, retracted the flaps to the up position. The aircraft descended and about 100 m past the threshold of runway 22, the aircraft collided with the airport perimeter fence. After a further 20 m, the aircraft flipped over the fence and came to rest upside down. The instructor and student exited the aircraft quickly through the broken canopy, as fuel was gushing from the fuel tanks. The instructor and student pilot received minor injuries and the aircraft was substantially damaged (Figure 1).

Figure 1: VH-MUV inverted after flipping over the airport perimeter fence

Source: Aircraft operator

Instructor comment

The instructor reported that the purpose of the flight was to instruct the student in crosswind landing techniques and then to conduct further flight training in the training area. The instructor indicated that, as they were planning to conduct 2 hours of flight training, the aircraft had full fuel on board and was near the aircraft maximum take-off weight.

The instructor described the wind as gusting between 15 to 22 kt at 270 degrees, with a crosswind component of between 10 to 15 kt.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

Flight training organisation

As a result of this accident, the flight training organisation advised the ATSB that they are taking the following safety actions:

- The instructor has been briefed on the importance of making sure students understand not to touch any of the aircraft's controls when the instructor is in control of the aircraft.
- The instructor has been briefed on the handing over and taking over procedures with the emphasis on handing over and taking over controls procedures.

Safety message

It is important in flight training to have a positive exchange of flight controls. The US Federal Aviation Administration (FAA) has found that numerous accidents have occurred due to a lack of communication or misunderstanding regarding who had actual control of the aircraft, particularly between students and flight instructors. The FAA publication Aviation Instructor's Handbook, includes a section on the Positive Exchange of Flight Controls. The handbook provides guidance to use for the positive exchange of flight controls (Figure 2).

Figure 2: FAA Positive exchange of Flight Controls

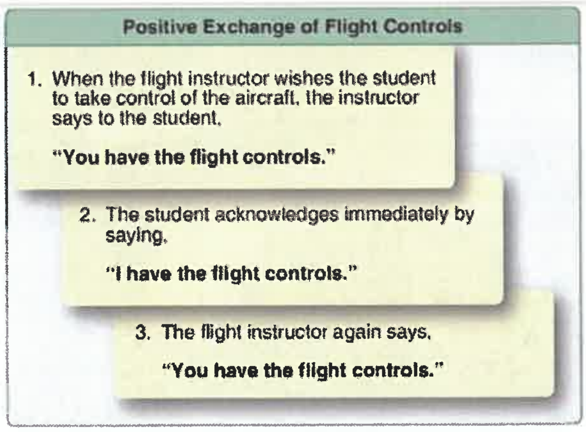

Figure 8-6. *During this procedure, a visual check is recommended to see that the other person actually has the flight controls. When returning the controls to the instructor, the student should follow the same procedure the instructor used when giving control to the student. The student should stay on the controls and keep flying the aircraft until the instructor says, "I have the flight controls." There should never be any doubt about who is flying the aircraft.*

Source: US Federal Aviation Administration

General details

Occurrence details

Date and time:	29 May 2015 – 1200 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Leongatha Airport, Victoria	
	Latitude: 38° 29.73' S	Longitude: 145° 51.58' E

Aircraft details

Manufacturer and model:	Victa 115 Airtourer	
Registration:	VH-MUV	
Serial number:	96	
Type of operation:	Flying Training	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 2	Passengers – 0
Damage:	Substantial	

Separation issue involving a Pacific Aerospace CT/4B, VH-YCU, and a Diamond DA 40, VH-UNV

What happened

Early in the afternoon on 4 June 2015, a Pacific Aerospace CT/4B, registered VH-YCU (YCU), was conducting an instrument training flight in the training area to the south-west of Tamworth, New South Wales, with an instructor and student on board. At the same time, a Diamond DA 40, registered VH-UNV (UNV), departed Tamworth on a visual navigation student assessment flight, bound for Bankstown, New South Wales, also with an instructor and student on board. Both aircraft were operating under the visual flight rules,[1] and the weather conditions were fine and clear.

As part of the training sequence, the instructor in YCU directed the student to intercept the 360 degree bearing from the Quirindi non-directional beacon (NDB)[2] The instructor further directed the student to track inbound to the Quirindi NDB at 4,500 ft[3] on that bearing (Figure 1), and carry out a Quirindi NDB-A approach.

When about 10 NM north of Quirindi, the student in YCU broadcast their position and intentions on the Quirindi Common Traffic Advisory Frequency (CTAF).[4] The pilot of a recreational aircraft responded to the effect that they were operating in the circuit area at Quirindi. There was no response from any other aircraft. When about 5 NM from Quirindi, the student in YCU made another broadcast on the CTAF, indicating their intention to enter a holding pattern from overhead the NDB, in preparation for the NDB-A approach. There was no response from any other aircraft to that broadcast.

At about the same time, UNV was tracking from Gate South (a reporting point south-west of Tamworth) towards Quirindi, also at 4,500 ft (Figure 1). The crew of UNV planned to overfly Quirindi then turn to the south-east and track towards Scone. The crew of UNV were monitoring the area VHF,[5] but not the Quirindi CTAF. As such, the crew of UNV did not hear the CTAF broadcasts made by the student in YCU. Even though the crew of both aircraft were monitoring the area VHF, neither had made any broadcasts on that frequency, so neither crew was aware of the other aircraft. At the time, both were tracking towards Quirindi at the same altitude.

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1 Visual flight rules are a set of regulations, which allow a pilot to only operate an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

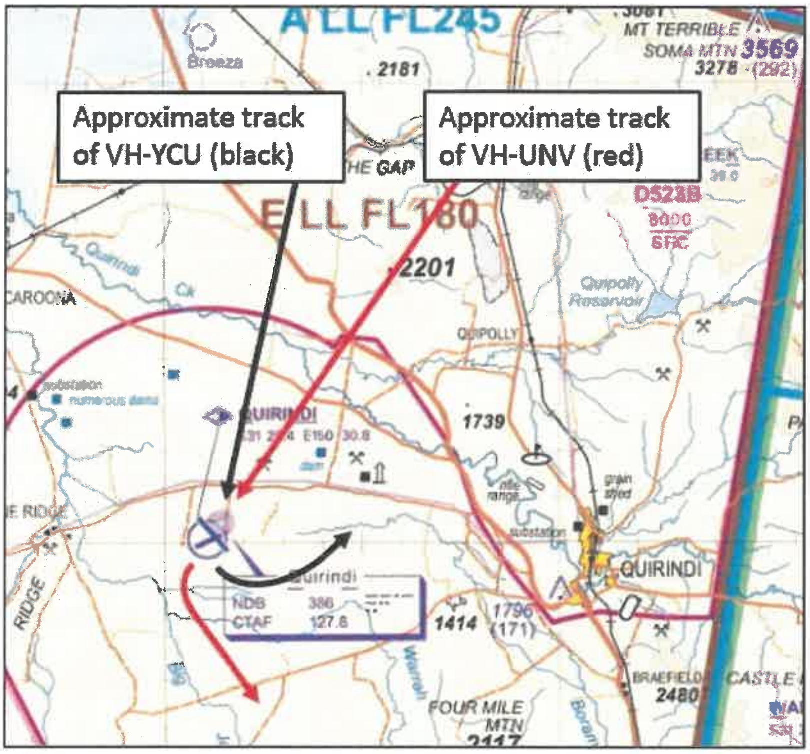
2 An NDB is a radio transmitter used as an aid to navigation. The signal does not include inherent directional information.

3 4,500 ft above mean sea level is about 3,450 ft above ground level overhead Quirindi aerodrome.

4 The CTAF is the frequency on which pilots operating at a non-controlled aerodrome should make positional radio broadcasts.

5 Area VHF (very high frequency) is the appropriate flight information area frequency for a location.

Figure 1: Extract from a visual chart showing the manner in which the tracks of the two aircraft converged as they neared Quirindi, and the general direction of flight of each aircraft after they passed Quirindi (YCU turning to the north-east and UNV turning to the south-east)



Source: Airservices Australia, additions by the ATSB

Just north of Quirindi, the traffic collision avoidance device fitted to YCU alerted the crew to an aircraft in their vicinity, at a distance of 0.4 NM, at the same altitude. The instructor commenced an intensified lookout and soon sighted UNV. At that moment, UNV was in about the 10 o'clock position[6] relative to YCU, at the same altitude, on a slightly converging flight path. The instructor in YCU estimated that at the time UNV was sighted, YCU was in approximately the 4 o'clock position relative to UNV.

Although there was no immediate risk of a collision, the instructor in YCU took control of the aircraft from the student and made a heading adjustment through about 20 degrees to the right. On the new heading, the instructor was satisfied that the flight path of the two aircraft would diverge. In recalling the incident, the instructor in YCU estimated that, at their closest point, the separation between the two aircraft was about 60 m laterally, at the same altitude.

After sighting UNV, the instructor in YCU attempted to establish contact with the crew of UNV on the Quirindi CTAF. The pilot of the recreational aircraft operating at Quirindi responded, but there was no response from the crew of UNV.

Still unaware of the proximity of YCU, the crew of UNV passed over Quirindi then turned to the south-east towards Scone, and commenced a climb to 5,500 ft. As they climbed, the instructor in UNV sighted YCU behind and beneath them, in about their 8 o'clock position. By that time, the crew in YCU had also passed Quirindi, and were now turning towards the north-east for the NDB-A holding pattern. Having sighted YCU, the instructor in UNV was satisfied that the two aircraft were on divergent headings and vertical separation was increasing as UNV climbed.

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6 The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of a position of an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

Following the separation issue, the instructor in YCU called air traffic control (Brisbane Centre) on the area VHF in an attempt to establish communications with the crew of UNV. The crew of UNV, who were still monitoring the area VHF, intercepted that call and responded. The crew of UNV then selected the Quirindi CTAF on one of their radios, and they had a brief discussion on that frequency. By the time communications were established on the CTAF, UNV was nearing 5,500 ft on a south-easterly heading towards Scone. The crew of YCU were resuming their planned exercise, entering the Quirindi NDB-A holding pattern.

Instructor comments - YCU

The instructor in YCU made a number of comments regarding the incident, including:

Use of radios. YCU was fitted with two VHF radios. During operations in the training area, the crew were monitoring the area VHF on one radio, and company operations on the other. The radio that was being used to monitor the company operations frequency, was switched to the Quirindi CTAF as they prepared for their NDB-A approach at Quirindi. As such, the crew were monitoring the area VHF and Quirindi CTAF at the time of the incident.

Instrument flight training hood. The student in YCU was wearing an instrument flight training hood. The hood projected forward from the student's helmet in a manner that denied the student external visual reference, but allowed the student to scan cockpit instruments (to simulate instrument meteorological conditions). Under these circumstances, the instructor maintained a lookout for other aircraft and hazards, but the position of the student's helmet and hood was such that the instructor's visibility to the left of the aircraft was partially obscured. With that in mind, when alerted to other traffic in the vicinity, the instructor targeted a lookout to the left of the aircraft, past the student's helmet and hood. During this targeted lookout, the instructor sighted UNV. When the instructor sighted UNV, the aircraft was remaining on a constant line of sight relative to YCU, in approximately the 10 o'clock position.

Density of training operations at Quirindi and Gunnedah. The instructor in YCU noted that even though Quirindi and Gunnedah are often used for flight training purposes, there is nothing in the En route Supplement Australia (ERSA) to alert pilots accordingly.

Instructor comments - UNV

The instructor in UNV made a number of comments regarding the incident, including:

Use of radios. UNV was fitted with two VHF radios. The instructor commented that depending on the circumstances, either radio could be used to monitor and broadcast on relevant CTAFs. At the time of this incident, the crew were monitoring the area VHF with one radio, and the company operations frequency on the other.

Monitoring the CTAF. The instructor in UNV was aware that the student in UNV was not monitoring the Quirindi CTAF as they approached from the north, even though it was normal practise to monitor a CTAF under these circumstances (overflying an aerodrome). On this occasion, the instructor elected not to prompt the student to monitor the CTAF in order to reinforce a teaching point to the student regarding frequency management. The instructor was satisfied that a visual lookout would suffice under the circumstances – the conditions were fine and clear, and there were no broadcasts or other transmissions on the area VHF to suggest that there was any potentially conflicting traffic in their area.

ATSB comment

The separation issue in this case may have been avoided if the pilots of the two aircraft involved had been monitoring and broadcasting on the same frequency. Both crews were monitoring the area VHF, but operating under the visual flight rules, there was no specific requirement for the crew of either aircraft to make a broadcast on that frequency. The crew of YCU broadcast their position and intentions on the Quirindi CTAF, but the crew of UNV were not monitoring that frequency.

The requirement to monitor a CTAF is subject to a level of interpretation, particularly with respect to the altitude above an airfield at which the requirement applies. The Aeronautical Information Package (AIP) requires a pilot to broadcast on the CTAF when he/she enters the vicinity of a non-controlled aerodrome. AIP goes on to describe the vicinity of a non-controlled aerodrome as being:

> *…within 10 nm of the aerodrome and at a height above the aerodrome that could result in conflict with operations at the aerodrome.*

Existing forums and processes (managed by CASA and Airservices Australia) allow airspace users to influence the manner in which airspace is managed and propose changes to relevant documents (such as the En Route Supplement Australia). Where changes have the potential to improve safety, operators are encouraged to present proposals for consideration, using those forums and processes. One relevant forum for proposing airspace-related safety improvements is the CASA Regional Airspace and Procedures Advisory Committee.

Safety message

Pilots are encouraged to 'err on the side of caution' when considering when to make broadcasts and whether specific frequencies should be monitored, particularly noting the fundamental importance of communication in the effective application of the principles of see-and-avoid. An ATSB report titled *Limitations of the See-and-Avoid Principle* outlines the major factors that limit the effectiveness of un-alerted see-and avoid.

The ATSB SafetyWatch programme highlights broad safety concerns that emerge from investigations and occurrence data reported to the ATSB by industry. One safety concern relates to operations around non-controlled aerodromes. The ATSB safety watch website page, *Safety around non-controlled aerodromes,* includes the following relevant comments:

SafetyWatch

> *Insufficient communication between pilots operating in the same area is the most common cause of safety incidents near non-controlled aerodromes.*

> *A search for other traffic is eight times more effective when a radio is used in combination with a visual lookout than when no radio is used.*

The CASA booklet titled *Operations at non-controlled aerodromes* provides guidance with respect to the limitations of the see-and-avoid principle and relevant radio procedures. Civil Aviation Advisory Publication 166-1 also provides relevant guidance with respect to CTAF procedures.

General details

Occurrence details

Date and time:	4 June 2015 – 1420 EST	
Occurrence category:	Incident	
Primary occurrence type:	Separation issue	
Location:	Near Quirindi, New South Wales	
	Latitude: 31° 29.92' S	Longitude: 150° 31.08' E

Aircraft details – VH-YCU

Manufacturer and model:	Pacific Aerospace Corporation CT/4B	
Registration:	VH-YCU	
Serial number:	079	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Aircraft details – VH-UNV

Manufacturer and model:	Diamond Aircraft Industries DA 40	
Registration:	VH-UNV	
Serial number:	40.1077	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Collision with terrain during landing, involving a PA32 aircraft, VH-BDG

What happened

On the afternoon of 26 July 2015, the pilot prepared a PA32-300 (Cherokee Six) aircraft, VH-BDG (BDG), for a private joy flight around the Whitsunday Islands off the Queensland coast, (Figure 1) departing from the Lakeside Airpark. The pilot had arranged for five acquaintances to come on the flight as passengers.

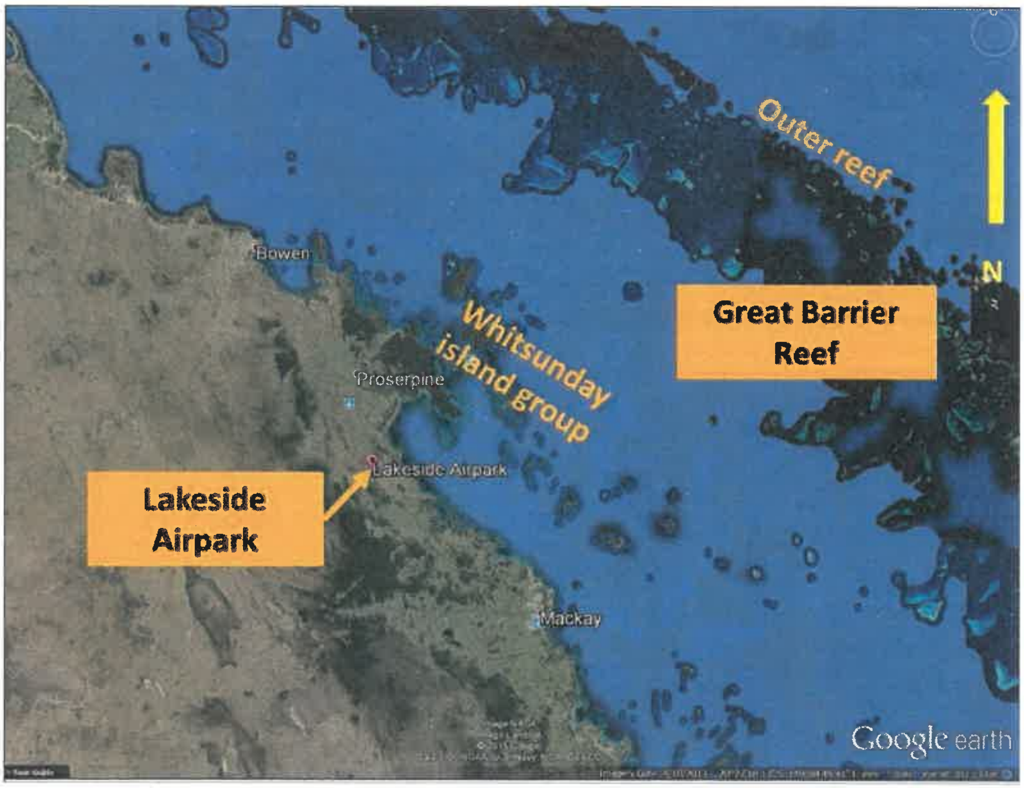
About a week earlier, the pilot, who had an injured right foot at the time, organised another pilot to fly BDG on a re-positioning flight to the Lakeside Airpark. Due to being unable to fly the re-positioning flight, the accident flight became the pilot's first time operating from the Airpark.

Pilot recollections

The pilot reported that they delivered a safety brief outlining the relevant safety features of the aircraft, just prior to loading the passengers. After loading the four rear passengers, the pilot secured the left rear cargo door, and then entered the cockpit through the front right door, followed by the front seat passenger.

The flight departed at about 1400 Eastern Standard Time (EST), and remained outside controlled airspace. The flight overflew some of the Whitsunday island group as well as the outer reef area of the Great Barrier Reef, prior to setting a return course to the Airpark about one and half hours later (Figure 1).

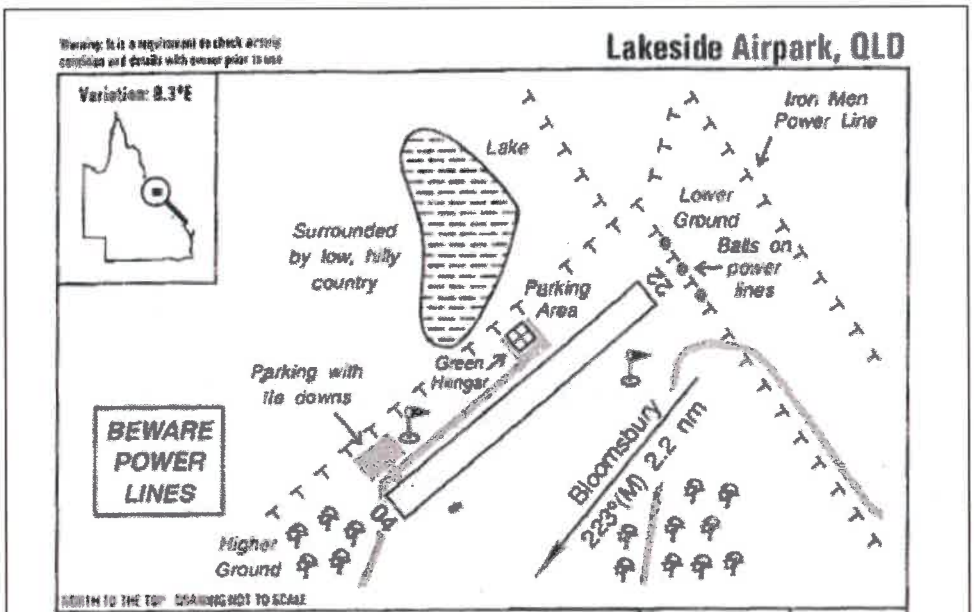
Figure 1: A google earth extract showing the general area where the joyflight was conducted



Source: Google earth, annotated by the ATSB

The pilot approached the extended centreline at an oblique angle and conducted a straight in approach to runway 22 (Figures 2 and 3). When about 6 NM from the airfield, at about 2,300 ft above mean sea level, the aircraft was configured for descent. After reducing the airspeed from about 135 to about 100 kt, and with 10° of flap selected, the aircraft descended to about 1,800 ft.

Figure 2: An extract from the Queensland Country Airstrip Guide. Diagrammatic representation of Lakeside Airpark and local hazards



Elevation:	175 Feet AMSL	Time Zone:	UTC + 10
GPS Position:	20° 40.852' South 148° 37.831' East	Area Forecast:	44
WAC Charts:	Clermont (3234), Rockhampton (3235)	ALA Code:	YLAK
Owner/Operator:	Lakeside Airpark 0418 711224, office@caboolturecommercial.com		
Strip Directions:	04-22		
Strip Lengths:	1000 metres (wet weather may shorten the NE end)		
Strip Surface:	Unsealed - slashed grass		
Windsock:	Yes - two		
Strip Markers:	White cones and tyres		
Lighting:	Nil		

Source: Queensland Country Airstrip Guide, 2012 edition

Figure 3: Approach to runway 22 at Lakeside Airpark. Note the unsealed and sealed portion of the runway. Also, note the difficulty in detecting the power lines on approach. Photo taken about a week prior to the accident

Source: Barry Dionysius

In order to maintain sufficient clearance over the two rows of power lines, and still land near the threshold, well before the sealed section of the runway, the pilot planned a steeper approach than normal. The flap was set to 40° (full flap) and the rate of descent increased to about 500-600 feet per minute.

On short final, the aircraft suddenly began to sink rapidly, and the pilot recalled seeing a tree pass close by the left window. Judging that the aircraft was now too low; the pilot applied full power, held the aircraft nose in a raised position, turned the aircraft left toward lower ground, and initiated a go-around.

However, the aircraft continued to sink throughout this manoeuvre, and the tail struck the runway about 20 m in from the threshold. Throughout this attempt to go-around, the tail continued to drag along the gravelled section of the runway, leaving a mark about 30-35° to the left of the runway direction for about 18m.

Although not yet showing a positive rate of climb, the aircraft seemed to be flying. The pilot reported that the stall warning had not sounded, so assessed there was a choice between removing the power and attempting to land back on the runway, or continuing with the go-around. The pilot elected to continue with the go-around and continued toward the lower ground.

A witness mark made by the right wheel, commenced at about the same spot where the mark made by the tail stopped. The wheel mark continued for about 35m into the grassed area beside the runway.

Once into the grassed area, and with the aircraft most probably airborne, it struck a wire fence (Figure 4) then the raised embankment of the dam, which ran perpendicular to the runway. The pilot reported that the left wing tip struck the water and the aircraft spun around and entered the water. At some point throughout this sequence, the main wheels detached from the aircraft. The pilot reported continuing to battle for control of the aircraft, up until it arrived in the water.

Figure 4: Looking along runway 22 taken a few days after the accident

Source: Pilot

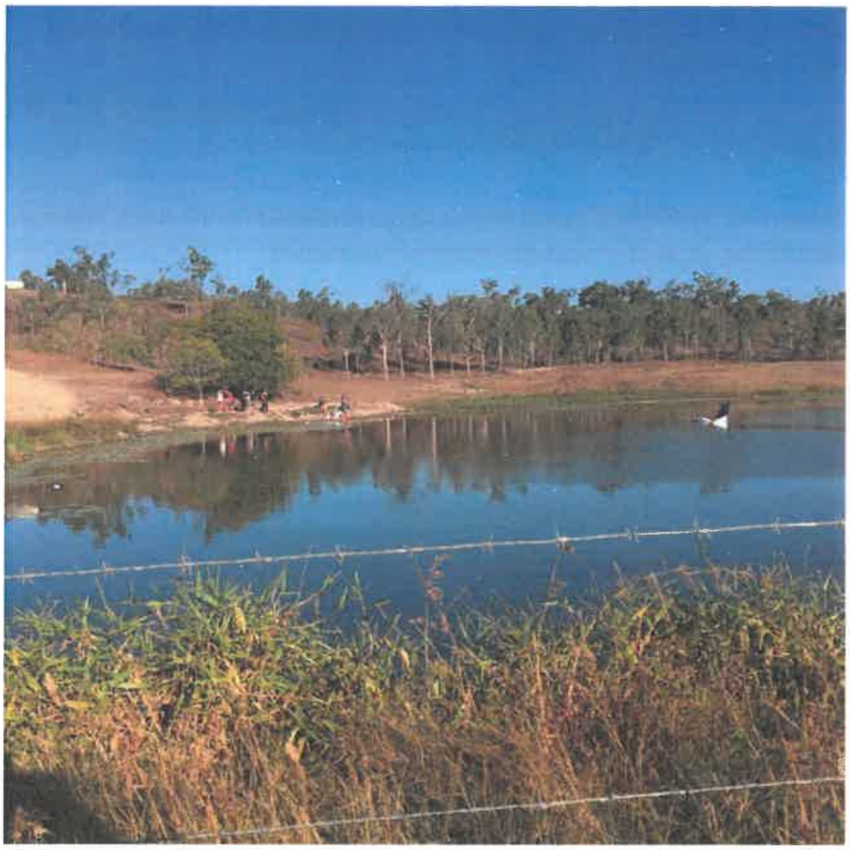
Post water impact

When the aircraft settled on the surface of the water, the pilot reported yelling to the passengers to 'get out'. The pilot then opened the front right door, pushed the passenger occupying the front right seat out, and then exited. The opening of the door resulted in the muddy water gushing inside and rapidly filling the aircraft. The passengers seated in the rear of the aircraft were unable to open the rear door. The water almost filled the entire cabin during this time.

The pilot was eventually able to get the rear door open from outside the aircraft and assisted some of the passengers out. The remaining passengers either made their own way out, or were assisted by other passengers.

One of the passengers sustained serious injuries, and the pilot and another passenger, minor injuries. The aircraft was almost completely submerged resulting in substantial damage (Figures 5 and 6).

Figure 5: Post accident showing VH-BDG partially submerged in the dam



Source: Airpark operator

Figure 6: VH-BDG after retrieval from the lake. Passenger 2 (below) reported that the left wing crumpled during the 'cartwheeling' toward the lake. Note: Significant damage occurred during the retrieval process

Source: Pilot

Pilot experience and comments

The pilot had approximately 581 total flying hours with about 112 of these on Cherokee Six type aircraft. The pilot made the following points:

- the hazard briefing conducted by the airpark operator some weeks earlier, included a request to land on the gravel area of the runway, as the seal was recently laid but had proved to be quite soft
- both weight and balance, and performance calculations were conducted for the flight, however these documents were damaged when the aircraft became submerged
- there may have been some wind shear or a down draft which contributed to the aircraft sinking on the approach
- the tail scraping along the gravel and over the fence during the attempted go-around added extra drag, which detracted from the aircraft's performance

Passenger comments

Three of the five passengers elected to provide their accounts of what happened.

Passenger one recalled:

- there was no pre-flight safety briefing; the pilot just indicated where each of them should sit
- during the landing approach, this passenger recalled thinking how low they were, when still some distance from touchdown
- the tail struck the ground, and recalls power being applied after that
- the aircraft flipping over and 'cartwheeling' toward the lake

Passenger two recalled:

- there was no pre-flight safety briefing
- during the approach to land they heard the pilot verbalising that the aircraft needed to slow down, and noted a significant decrease in speed
- the aircraft tail dragging along the ground, and the pilot calling out for assistance
- the left wing striking the ground and instantly crumpling (Figure 6)
- the aircraft then 'cartwheeled' ending up in the lake
- the water rose quickly in the aircraft when the front door was opened, leaving a very small pocket of air for the rear passengers
- they were rescued by the pilot through the rear door

Passenger three recalled:

- there was no pre-flight safety briefing
- the aircraft struck the ground prior to the runway
- the pilot shouted for assistance as the aircraft "went out of control during the approach"
- the aircraft 'cartwheeled' before arriving in the dam

Meteorological data

The ATSB obtained the Bureau of Meteorology weather report for area 44 covering the time of the accident. Area 44 was in two divisions that day and the southern division, which applied to the area south of Proserpine, including Lakeside Airpark, forecast variable winds of about 10 knots.

Lakeside Airpark landing area

Lakeside Airpark Landing area was identified in Enroute Supplement Australia (ERSA) (28 May 2015 version) as "UNCR" meaning it is both uncertified and unregistered.

As per the requirement for operations at this aerodrome, the pilot sought prior permission to operate there and a briefing on local hazards from the aerodrome operator. This onsite briefing by the aerodrome operator pointed out local hazards such as the power-lines in the vicinity and the preferred protocol of taking-off on runway 04, and landing uphill on runway 22, wind permitting. There was no hazard map available as mentioned in the ERSA.

Advisory material

The Civil Aviation Advisory Publication (CAAP) 89O-1 (2) "*Published aerodrome information and reporting changes (November 2000)* is available on the CASA website. This publication provides advisory material for publishing aerodrome information and reporting changes in respect of both licenced and unlicensed aerodromes that are included in the (ERSA).

Unlicensed aerodromes:

> *Unlicensed aerodromes are not required, under the regulations, to provide aerodrome information to [Aeronautical Information Service] (AIS) or the [Civil Aviation Safety Authority] (CASA) and to have their aerodromes included in ERSA.*
>
> *…unlicensed aerodromes may also be included in ERSA, on request of the aerodrome operators. However, the aerodrome information published will be of limited format, being of a non-operational nature…"*

CASA is conducting a post-implementation review of CASR Part 139 – Aerodromes. As part of this project, this CAAP and other Part 139 CAAPs and ACs will be reviewed. Additionally, CASR Part 175, which regulates the publication of aeronautical information, commenced on 5 March 2015 and the contents of CAAP 89O-1 (2) will be reviewed, to be consistent with this new regulation.

ATSB comment

The ATSB did not undertake an onsite investigation into this accident, but were provided with information through telephone interviews, reports, and detailed photographs.

The ATSB was unable to reconcile the differences evident between the recollections of the pilot and those of the three passengers who provided information.

Safety message

This accident highlights the importance of thorough pre-flight planning and preparation to minimise safety critical decisions in flight.

CASA have an online kit 'CASA Flight Planning Always Thinking Ahead" available from the downloaded from the CASA website.

This tool kit addresses the three levels of flight planning (the straightforward elements, unusual situations and whether to go) and their application over eight stages of flight.

The ATSB research report, *Improving the odds: Trends in fatal and non-fatal accident in private flying operations* (AR-2008-045) is available from the ATSB website.

This report encourages pilots to make decisions before the flight, continually assess the flight conditions, evaluate the effectiveness of their plans, set personal minimums, assess their fitness to fly, and to seek local knowledge (and if necessary a check flight) on the route and / or destination as part of the pre-flight planning process.

Also on the ATSB website, is a copy of the investigation (199804109) into a fatal accident involving another Cherokee Six aircraft (VH-POW). The pilot attempted to conduct a go-around from a degraded performance configuration with full flap extended and a nose-high attitude. The ATSB found that the aircraft's climb performance would have been substantially degraded with this configuration. The aircraft's nose-high attitude during the climb would have obstructed the pilot's forward vision and he may have been unaware that the aircraft had diverged from the extended centreline of the airstrip.

Occurrence details

Date and time:	26 July 2015 – 1550 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Lakeside Airpark, Queensland	
	Latitude: 20°41.10' S	Longitude: 148° 37.50' E

Aircraft details

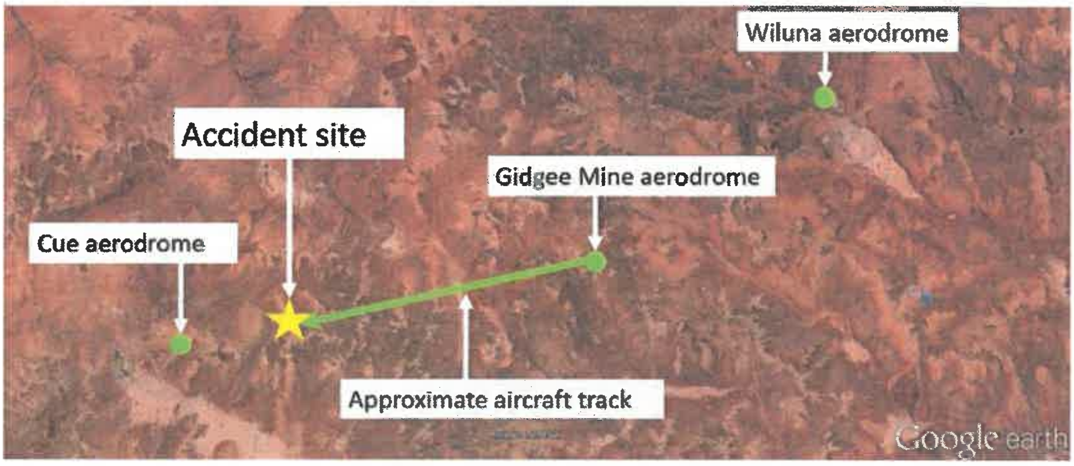
Manufacturer and model:	Piper Aircraft Corporation PA 32-300	
Registration:	VH-BDG	
Serial number:	32-7740092	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Minor	Passengers – 1 serious, 1 minor
Damage:	Substantial	

Engine failure and collision with terrain involving a Cessna 210, VH-ERU

What happened

On 1 August 2015, at about 1110 Western Standard Time (WST), a Cessna 210 aircraft, registered VH-ERU, departed Gidgee Gold mine for a private flight to Cue, Western Australia (Figure 1). The pilot was the sole occupant of the aircraft. The pilot reported that all engine indications were normal from the start and into the cruise at 3,500 ft above mean sea level. The elevation of the terrain in the area was about 1,700 ft above mean sea level.

Figure 1: Aircraft track and accident location



Source: Google earth – annotated by the ATSB

About 25 minutes into the flight, the pilot observed the engine oil temperature rising rapidly. The pilot opened the cowl flaps in an attempt to reduce the engine oil temperature, and noted that the cylinder head temperature and engine oil pressure were still in the normal range. As the pilot tried to determine the cause of the problem, the manifold pressure started to increase. The pilot reduced the throttle to try to decrease the manifold pressure, but it continued to rise.

The pilot then felt a slight vibration in the engine and through the aircraft controls, and broadcast a PAN[1] call on the Melbourne Centre radio frequency. The pilot did not receive any response to the broadcast, probably due to the aircraft's remoteness and low altitude. The aircraft was descending steadily, and the pilot looked for a suitable place to conduct a precautionary landing. However, the surrounding area was heavily treed. After turning towards the north and more open country, the vibration increased, and the pilot broadcast two Mayday[2] calls. Again, the pilot did not receive any response.

When about 500 ft above ground level, the vibration further increased and the engine failed with a bang. Smoke emanated from the engine compartment and over the windscreen, reducing the pilot's visibility through it. The pilot then sighted a fence line to the right and prepared for a forced landing, aiming to touchdown in a cleared area alongside the fence.

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1 An internationally recognised radio call announcing an urgency condition which concerns the safety of an aircraft or its occupants but where the flight crew does not require immediate assistance.

2 Mayday is an internationally recognised radio call for urgent assistance.

The pilot lowered the landing gear and extended the flap. When at about treetop height, the pilot selected the master switch and fuel off. The pilot also tightened the seatbelt and opened the aircraft door. As the pilot flared the aircraft to land, the right wing and strut collided with a tree. The aircraft yawed to the right, and the right main landing gear struck the ground and broke off. Although the pilot applied full left rudder to try to regain control of the aircraft, it collided with another tree and rolled onto its left side, before skidding and coming to rest against a third tree. The pilot suffered minor injuries and the aircraft sustained substantial damage (Figure 2).

The right fuel line ruptured during the impact sequence, causing fuel to run down into the cabin and onto the pilot. The pilot quickly exited the aircraft, concerned about the risk of fire, particularly as there was about 240 L of fuel in the tanks.

After waiting about half an hour for the fuel to stop running into the cockpit, the pilot returned to the aircraft and selected the master switch on. The pilot then made another radio broadcast requesting assistance, and again did not receive any response. The aircraft's emergency locator transmitter (ELT)[3] did not activate on impact, and its light had not illuminated. The pilot then tried, without success, to use the aircraft battery to power the ELT.

At about 1400, the pilot again made radio broadcasts without any response. As there was no mobile phone signal at the accident site, the pilot started walking towards higher terrain. At about 2200, after walking 25 km, the pilot gained mobile phone coverage and was able to call for assistance. After making the call, the pilot lit a fire to provide warmth and to deter a pack of wild dogs that had been circling. At about 0200 on 2 August, low cloud rolled in and it started to drizzle. About an hour later, the pilot provided rescue personnel with the coordinates of the location, obtained from the mobile phone. At about 0730, a rescue aircraft located the pilot and police arrived about 40 minutes later.

Figure 2: Accident site showing damage to VH-ERU

Source: Western Australia Police

[3] Crash-activated radio beacon that transmits an emergency signal that may include the position of a crashed aircraft. Also able to be manually activated.

Pilot comments

The pilot provided the following comments:

- The number three cylinder failed and blew a hole in the top of the engine casing.
- The pilot usually carried a satellite phone, but did not have it on this flight as it was being serviced.
- It was about a 40-minute flight to Cue, and the pilot would normally have advised someone of the planned route and expected arrival time, but omitted to do so on this day.
- The pilot had water, a first aid kit and a lighter in the aircraft, and planned to get a personal location beacon to carry in future.

Aircraft engine

The aircraft was fitted with a Continental IO-520 engine. The pilot had owned the aircraft for about 4 years, during which time the aircraft had accrued about 60 hours of flying time. Shortly after the pilot bought the aircraft, the number three cylinder had failed and been replaced. The pilot had recently replaced the propeller in accordance with an airworthiness directive.

The aircraft was damaged beyond repair. At the time of completing this report, no engineering inspection of the engine had been, or was expected to be, conducted following the accident.

Safety message

The ATSB reminds all pilots to let someone know where they are going, and what time they expect to arrive, before embarking on a flight. Although the incident flight was not in a designated remote area, it demonstrates that it is vitally important to carry emergency supplies, such as water, food, matches (or lighter), and first aid essentials. Where mobile and radio coverage is not available, a satellite phone can provide life-saving access to help.

Electronic locator transmitters installed in aircraft should be tested in accordance with the manufacturer's instructions. The ATSB research report AR-2012-128 found that ELTs function as intended in about 40-60% of accidents. NASA is currently conducting research to find ways to make ELTs more likely to function after a survivable crash.

General details

Occurrence details

Date and time:	1 August 2015 – 1140 WST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	035° M 77 km Mount Magnet Aerodrome, Western Australia	
	Latitude: 27° 32.93' S	Longitude: 118° 17.60' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210E	
Registration:	VH-ERU	
Serial number:	21058520	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 Minor	Passengers – Nil
Damage:	Substantial	

Collision with terrain involving a Grumman G164, VH-LKN

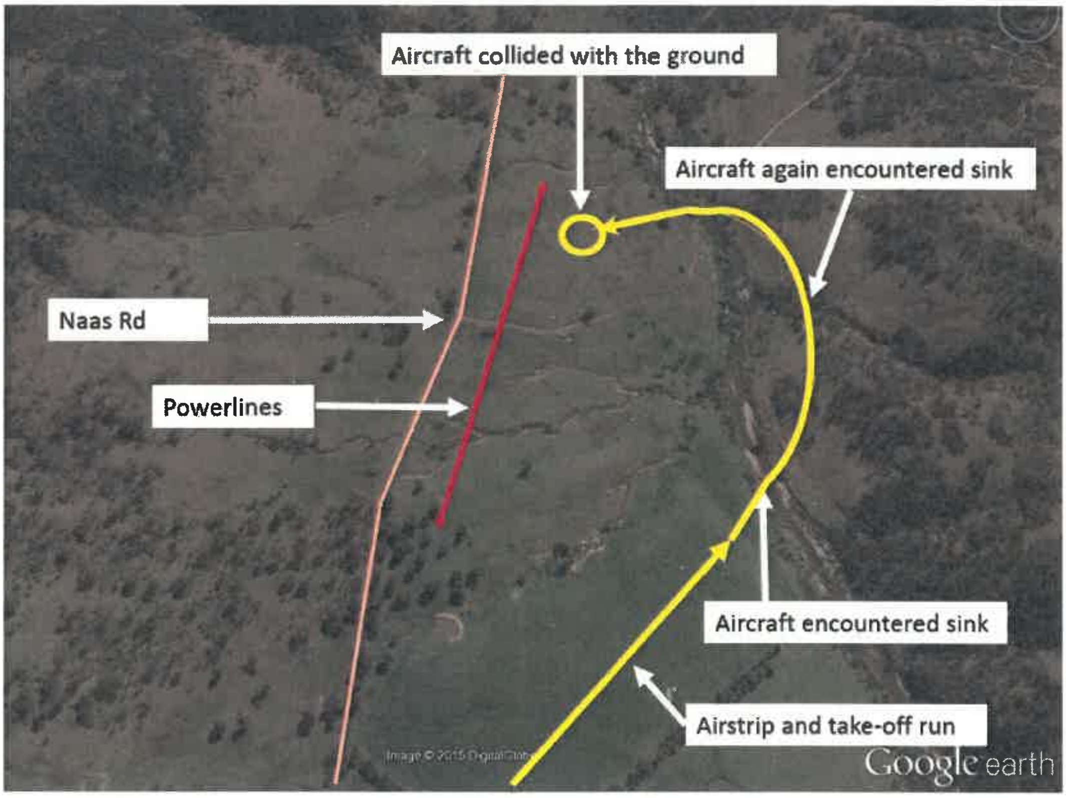
What happened

On 6 August 2015, the pilot of a Grumman G164 aircraft, registered VH-LKN, was conducting aerial spreading of superphosphate on a property about 33 km south-west of Tharwa, Australian Capital Territory. The target zone for the spreading was about 7 km to the south-east, and at an elevation about 1,000 ft higher than the airstrip and loading site.

The pilot commenced operations at about 1000 Eastern Standard Time (EST) and completed spreading of six loads of superphosphate. The pilot then had a lunch break and refuelled the aircraft to a total of about 180 L of fuel. The aircraft was also loaded with about 500 kg of superphosphate, which was about half its carrying capacity. The pilot observed a light, westerly wind of about 2 to 5 kt in the vicinity of the airstrip.

At about 1400, the pilot commenced the take-off run for the seventh load of the day. As the aircraft became airborne, the aircraft started to sink (Figure 1). To stop the aircraft sinking, the pilot applied the dump lever to start dumping the load of superphosphate. The aircraft then started to climb, so the pilot stopped dumping the load. The pilot also commenced a shallow left turn, away from rising terrain. As the aircraft turned, when at about 100 ft above ground level, it started to sink again. As it sank, the pilot felt a shake through the airframe, indicating that the aircraft was close to stalling. The pilot re-applied the dump lever to open the hopper door and try to reduce the aircraft load. Simultaneously, the pilot lowered the aircraft's nose and rolled the wings level, to try to recover from the incipient stall.

Figure 1: Departure airstrip, aircraft track and accident location



Source: Google earth and pilot recollection – annotated by the ATSB

The pilot sighted powerlines, a road and a row of trees ahead, beyond which the terrain rose steeply. The aircraft continued to descend and the pilot maintained the aircraft in a normal nose attitude for landing. As the aircraft neared the ground, the pilot reduced the throttle to idle and held the aircraft control stick in the full back position. The tailwheel struck the ground first, and then the right main landing gear dug into soft ground. The aircraft flipped over and came to rest inverted.

The pilot sustained minor injuries and the aircraft was substantially damaged (Figure 2).

Figure 2: Damage to VH-LKN

Source: Pilot

Pilot comments

The pilot provided the following comments:

- The airstrip was at an elevation of about 2,100 ft above mean sea level. The target pasture was about 1,000 ft higher than the airstrip.
- The airstrip was about 500 m in length and the fuel and chemical load was relatively light. The aircraft was well within its operational limitations.
- The weather forecast had indicated calm conditions, and the temperature was about 14°C.
- The sink that the aircraft encountered may have been a downdraft coming off the hill.
- If the airstrip had been higher up and closer to the target zone, the pilot would have had more time to dump the load, less distance to climb on each load, and a more accurate assessment of the wind conditions.
- Dumping liquid takes a few seconds, but granular substances like superphosphate take minutes for the hopper to empty when dumping the load.
- After the accident, the pilot verified that the hopper door was open, and superphosphate was present in the paddock, indicating that it had been dumping at the highest rate. Despite that, about 300 kg of superphosphate remained in the hopper.

Safety message

The pilot stated that the key to avoiding similar incidents was to understand the atmospheric conditions in steep mountainous country. Variations in wind strength and direction due to terrain can have serious consequences on flight safety, particularly when operating at low airspeeds and close to the ground.

ATSB investigated a similar accident involving a Grumman G-164A, in AO-2014-001.

General details

Occurrence details

Date and time:	6 August 2015 – 1400 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	33 km SW of Tharwa, Australian Capital Territory	
	Latitude: 35° 33.30' S	Longitude: 148° 59.68' E

Aircraft details

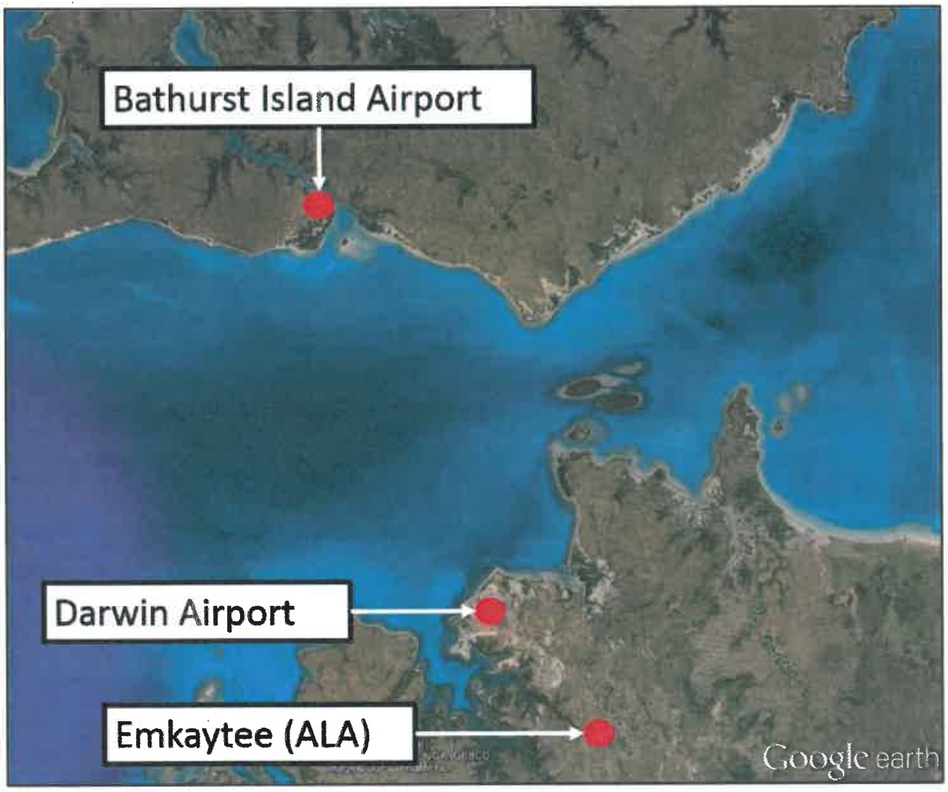
Manufacturer and model:	Grumman American Aviation Corporation G-164B	
Registration:	VH-LKN	
Serial number:	10B	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 (Minor)	Passengers – Nil
Damage:	Substantial	

Separation issue involving a Cessna 404, VH-ANM, and a Cessna 172, VH-MJK

What happened

On 15 August 2015, the student pilot of a Cessna 172 aircraft, registered VH-MJK (MJK) conducted a solo flight from Emkaytee aeroplane landing area (ALA) to Bathurst Island Airport, Northern Territory (Figure 1). There the student pilot completed touch-and-go circuits for about 30 minutes on runway 15.

Figure 1: Image showing Bathurst Island, Darwin and Emkaytee airports



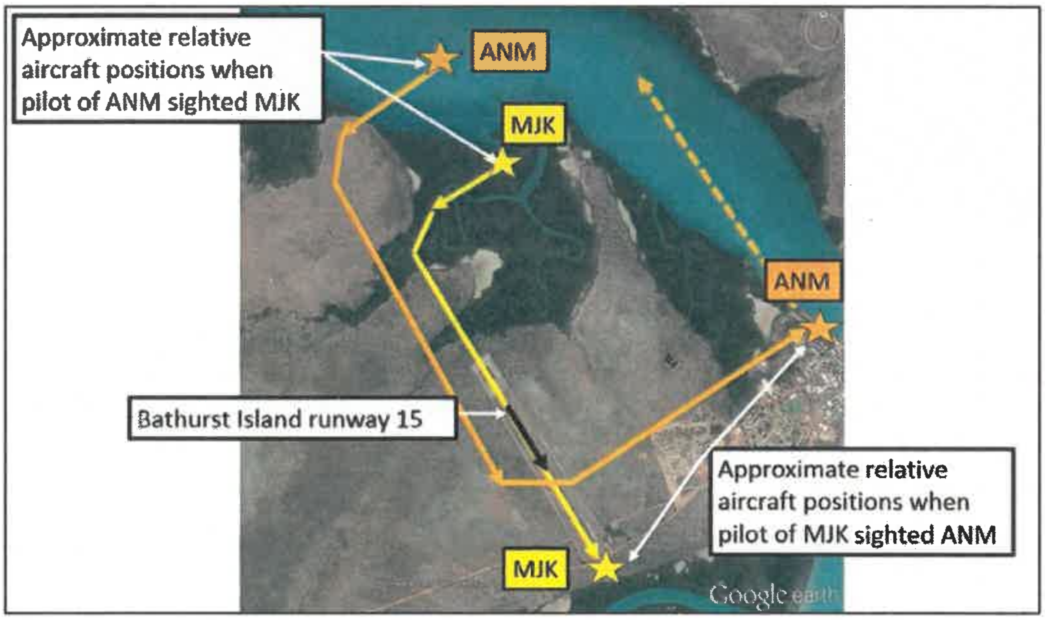
Source: Google earth – annotated by the ATSB

At about 1210 Central Standard Time (CST), a Cessna 404 aircraft, registered VH-ANM (ANM) and operated by Hardy Aviation, departed from Darwin Airport, Northern Territory, on a scheduled flight to Bathurst Island, with a pilot and five passengers on board. The pilot broadcast when inbound and about 15 NM from Bathurst Island Airport on the common traffic advisory frequency (CTAF) of 126.5 MHz, and did not receive any response. At about 1220, the aircraft joined on the downwind leg of the circuit for runway 15 at 1,000 ft above ground level and broadcast joining the circuit. As the aircraft turned onto base, the pilot sighted MJK also on base, at the same height, closer to the runway and estimated it was about 150 m away (Figure 2).

The pilot of ANM immediately manoeuvred the aircraft to the west to increase separation between the two aircraft. After unsuccessfully trying to contact the pilot of MJK on the CTAF, the pilot of ANM briefly selected frequency 126.7 MHz to try to communicate with the pilot of MJK, but again did not receive a response. The pilot of ANM observed MJK conduct a touch-and-go, and kept that aircraft in sight, while overflying and re-joining the circuit on the crosswind leg.

After the touch-and-go, when upwind of the runway at about 500 ft above ground level, the pilot of MJK sighted ANM. ANM was then to the left, above MJK at 1,000 ft, and turning onto the downwind leg. The pilot of MJK then saw that the radio was selected to frequency 126.6 MHz. The pilot checked their flight plan, noted that the correct frequency was 126.5, and immediately changed the radio to that frequency. The pilot of MJK then broadcast a departure call on the CTAF. The pilot of ANM then contacted the pilot of MJK, who advised that the radio had been on the wrong frequency.

Figure 2: Bathurst Island Airport showing approximate aircraft tracks and relative positions

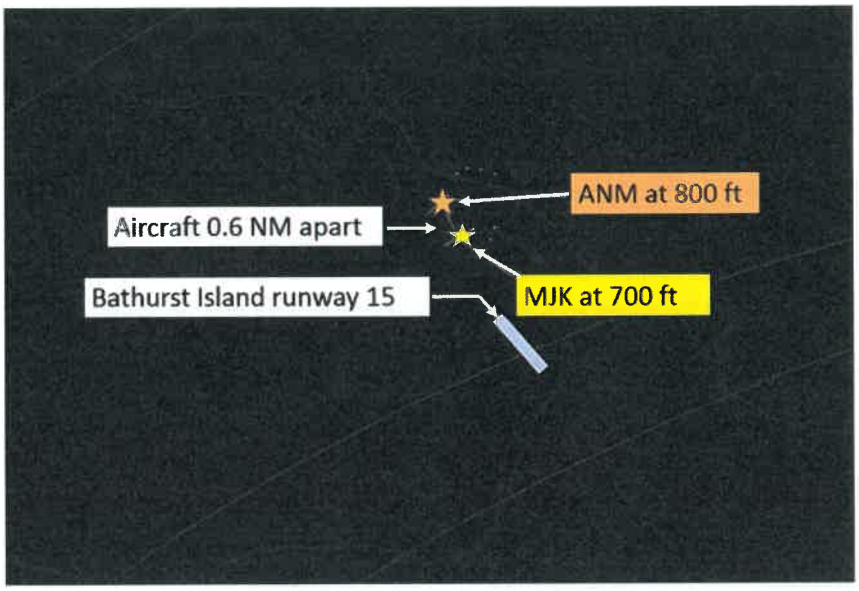


Source: Google earth – annotated by the ATSB

The pilot of ANM continued the approach, and landed at Bathurst Island, and MJK returned to Emkaytee without further incident.

The radar data provided to the ATSB by Darwin air traffic control, indicated the aircraft came within about 100 ft vertically and 0.6 NM at the closest proximity (Figure 3).

Figure 3: Radar display showing relative aircraft positions



Source: Department of Defence – annotated by the ATSB

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Operator of VH-ANM

As a result of this occurrence, the operator of VH-ANM advised the ATSB that they have taken following safety action:

Notice to company pilots

The Chief Pilot distributed a notice to all company pilots advising them of the incident. The notice stated that the Tiwi Islands continue to be a hot spot for traffic, and reminded pilots to be 'doubly aware' when operating in the area.

Safety message

The pilot of MJK commented that there were three important learnings from this incident:

- crosscheck the selected frequency against the flight planning notes
- ensure the selector reaches the detent when selecting a radio frequency
- listen for the 'beep-back' response from the CTAF to verify the correct frequency has been selected.

An aerodrome frequency response unit (AFRU) identifies correct radio frequency selection at non-towered aerodromes. The AFRU automatically responds to a transmission on the CTAF either with a pre-recorded voice message, if no transmission has been received in the previous five minutes, or with a beep-back.

Insufficient communication between pilots operating in the same area is the most common cause of safety incidents near non-towered aerodromes. The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is safety around non-towered aerodromes.

The booklet *A pilot's guide to staying safe in the vicinity of non-controlled aerodromes* outlines many of the common problems that occur at non-towered aerodromes, and offers useful strategies to keep yourself and other pilots safe.

General details

Occurrence details

Date and time:	15 August 2015 – 1220 CST	
Occurrence category:	Incident	
Primary occurrence type:	Separation issue	
Location:	Bathurst Island Airport, Northern Territory	
	Latitude: 11° 46.15' S	Longitude: 130° 37.18' E

Aircraft details: VH-ANM

Manufacturer and model:	Cessna Aircraft Company 404	
Registration:	VH-ANM	
Operator:	Hardy Aviation	
Serial number:	4040010	
Type of operation:	Air transport low capacity - Passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft details: VH-MJK

Manufacturer and model:	Cessna Aircraft Company 172N	
Registration:	VH-MJK	
Serial number:	17268245	
Type of operation:	Flying training – solo	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Helicopters

Engine failure involving an Enstrom 280, VH-YHD

What happened

On 28 February 2015, at about 1232 Eastern Standard Time (EST), an Enstrom 280 helicopter, registered VH-YHD (YHD), departed from Caloundra Airport, for a flight to Redcliffe Airport, Queensland, with the pilot, who was the only person on board.

After about half an hour, the pilot commenced a descent from 1,500 ft above ground level (AGL). The pilot then broadcast on the Redcliffe common traffic advisory frequency (CTAF) that YHD would join the Redcliffe circuit in about 6 minutes and navigated along the coastline toward Redcliffe.

At about 1,000 ft AGL, the pilot heard a bang and the engine stopped. This caused the helicopter to yaw to the left violently. The pilot then attempted to restart the engine but was unsuccessful. At about 800 ft AGL, the helicopter entered autorotation[1] and the pilot prepared to land on the beach. The pilot observed people swimming in the sea and manoeuvred the helicopter to an area where there were no people. The pilot arrested the descent and the skids contacted the sand. The helicopter continued to move forward along the sand, and then a few seconds later the helicopter blades impacted the sand, and the helicopter rolled over. The pilot received minor injuries and the helicopter was destroyed (Figure 1).

Figure 1: Accident site showing the damage to VH-YHD

Source: Queensland police

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[1] Autorotation is a condition of descending flight where, following engine failure or deliberate disengagement, the rotor blades are driven solely by aerodynamic forces resulting from rate of descent airflow through the rotor. The rate of descent is determined mainly by airspeed.

Witness

A witness to the accident reported that the helicopter was first sighted at about 100 m above the ground, descending and approaching from the north. The only noise was from the rotor blades, with no engine sound. The witness reported that the wind was quite strong coming from the east. A stronger easterly gust came when the helicopter was close to the ground. The helicopter landed and continued to move forward, but then flipped upside down and the rotor blades contacted the sand. The helicopter came to rest about 150 m from where the witness was located. A passer-by assisted the pilot to exit the helicopter.

Pilot comment

The pilot provided the following comments:

- This was the first flight after the completion of the periodic (100 hourly or 12-month) maintenance inspection.
- The helicopter operated normally during the engine run-up checks and the flight, up to the engine failure.
- The pilot commented not to delay in lowering the collective[2] and setting the airspeed as everything happened very quickly after the engine failed and the pilot instinctively conducted an autorotation.
- The landing was smooth with no bump.
- The weather was fine with a slight breeze from the north-east and the wind speed at Caloundra was about 10 kt.
- Rather than fly direct to Redcliff airport the pilot had selected to fly along the shoreline. If YHD had flown direct to Redcliff then the engine may have failed over Deception Bay and YHD may have landed in the water.
- The pilot stated that the number of flight hours experience on the helicopter type was about 60, with about eight flight hours on the type in the 90 days prior.

Helicopter maintenance

The helicopter engine was overhauled and installed in YHD in April 2006. At the time of the accident, the engine had completed about 146 hours since overhaul. The periodic (100 hourly or 12-month) maintenance inspection included overhaul of the engine magneto.

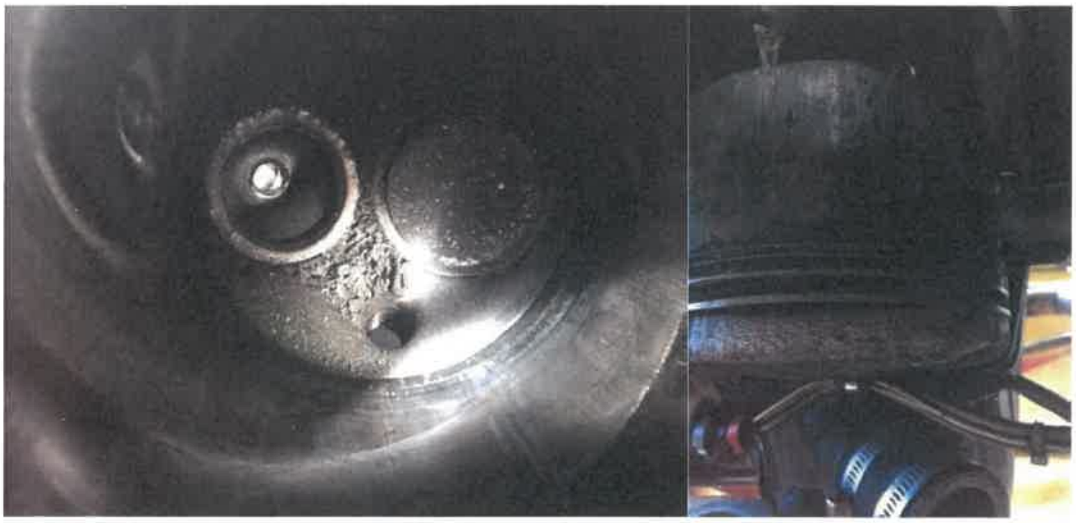
Maintenance organisation investigation

The maintenance organisation inspected the engine externally and removed the number three cylinder. They determined that the damage found to the number three cylinder and piston (Figure 2) was consistent with detonation. Extreme heat from uncontrolled burning of the combustion gases resulted in melting of the cylinder between the spark plug hole and the exhaust valve seat. This melting damaged the piston to an extent that the combustion gases would blow past the piston rings. The maintenance organisation did not remove the other cylinders.

The maintenance organisation also removed the engine magneto and fuel control unit. Both units were examined at a component overhaul facility. The examination of the magneto found no defects. The examination of the fuel control unit found that it was functioning normally and was set to a lean position, although this position could not be validated due to disruption during the accident.

2 Collective is the primary helicopter flight control that simultaneously affects the pitch of all blades of the lifting rotor. Collective input is the main control for vertical velocity.

Figure 2: Damage to number three cylinder and piston



Source: Aircraft maintenance organisation

ATSB comment

In 2007, the ATSB published an aviation safety research and analysis report, *Aircraft Reciprocating-Engine Failure An Analysis of Failure in a Complex Engineered System B2007/0191*. The safety study discussed detonation in more detail including the examination of the factors that contribute to detonation free - operation (normal combustion) and the factors that contribute to detonation.

Safety message

When planning a particular flight it is important for pilots to consider options and risk. In this accident, the pilot opted to follow the coastline, allowing for the option to land on the beach. The pilot in the pre-flight planning identified the hazard (flying over water) and although the likelihood of an engine failure was low, the consequences were high and made the decision to follow the coastline to mitigate the risk. If the pilot had selected the option to fly the most direct path then the engine would have failed over the water.

The US Federal Aviation Administration (FAA) has published information on risk management in a *Risk Management Handbook (FAA-H-8083-2)*. They have also published a guide *Tips for Teaching Practical Risk Management and Practical Risk Management for local VFR Flying*. The guide contains the Perceive-Process-Perform model that offers a structured way to manage risk for local visual flight rules flying (Figure 3).

Figure 3: Risk Management Decision Path: Perceive-Process-Perform

Source: US Federal Aviation Administration

General details

Occurrence details

Date and time:	28 February 2015 – 1305 EST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	5 km north-west of Redcliffe Airport, Queensland	
	Latitude: 27° 10.85' S	Longitude: 153° 01.78' E

Helicopter details

Manufacturer and model:	Enstrom 280	
Registration:	VH-YHD	
Serial number:	1187	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – Minor	Passengers – Nil
Damage:	Destroyed	

Windscreen fogging and collision with terrain involving a Robinson R22, VH-RBT

What happened

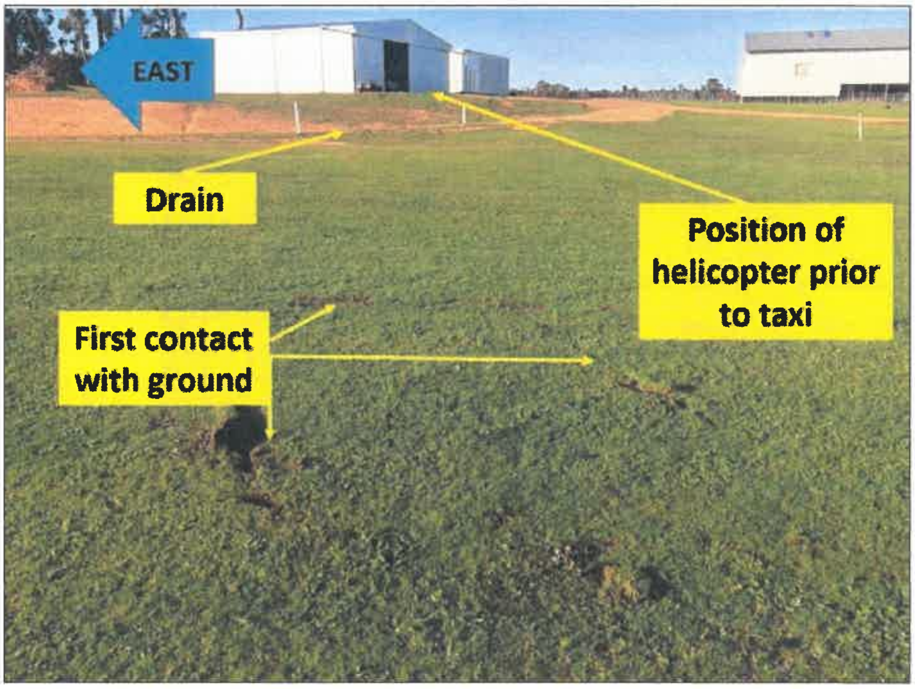
Early on the morning of 23 June 2015, the pilot pulled the Robinson R22 helicopter registered VH-RBT from the hangar on a property about 6 NM east of Boyup Brook aeroplane landing area (ALA), and prepared for a private flight with one passenger to Jandakot, Western Australia.

Prior to commencing the flight, the pilot re-checked the area meteorological forecast (ARFOR). The ARFOR indicated the probability of low cloud with fog, west of Boyup Brook ALA. The pilot reported that it was a cold and clear morning, with calm conditions. Although there was fog in a gully, about 200-300 m down the slope from the hangar, the general area and intended flight path were completely clear (Figure 1).

At about 0650 Western Standard Time (WST), the pilot started the helicopter engine and allowed the engine to warm up. The pilot then completed final preparations for departure while waiting for first light[1]

At about 0700, just after first light, the pilot reported that the horizon and the outline of the buildings and trees were clearly visible. After broadcasting intentions on the radio, the pilot established the helicopter into a hover about 2-3ft above the ground.

Figure 1: Marks where the helicopter tail and skid struck the ground. The drain the pilot planned to clear prior to transitioning to forward flight and hangar are in the background



Source: Pilot

[1] First light is when the centre of the sun is at an angle of 6° below the horizon before sunrise. At this time, the horizon is clearly defined but the brightest stars are still visible under clear atmospheric conditions.

After completing a power check, the pilot conducted a pedal turn to the east. The pilot intended to gain some height prior to transitioning the helicopter into forward flight, in order to clear the hangar and drain areas.

Due to the down-sloping terrain, the helicopter was about 15ft above the ground soon after lift-off. As the pilot began to raise the collective[2] and with their attention momentarily inside the cockpit, the passenger alerted them to the almost instantaneous external fogging of the windscreen. The pilot was briefly able to see the ground through the side window, before that also became shrouded in condensation. The pilot described this instant lack of external reference, as like being in a 'white room'. In an attempt to keep some necessary visual reference, the pilot reached down and flipped open the small vent located in the right door. Although a snapshot of ground was visible, it was insufficient to pinpoint the helicopter's actual position.

Now about 30-40 ft above the ground, the pilot elected to put the helicopter back on the ground. Manoeuvring slightly left to avoid the assumed position of the drain, the pilot unexpectedly felt the tail and rear skids of the helicopter strike the ground. The pilot stated this was a heavy collision, and resulted in the helicopter bouncing back into the air. The pilot applied some collective and the helicopter bounced again then yawed rapidly to the right. The pilot applied full left pedal in an attempt to prevent the helicopter from entering a spin, however the yaw continued, so the pilot rapidly reduced the throttle to idle. As the yaw decreased, the helicopter fell onto its left side (Figure 2).

Figure 2: VH-RBT at rest on the left side. Note the broken tail boom and rotor blades

Source: Pilot

Although hanging in the seatbelt, the pilot reached forward and shut off the mixture control and master switch. The pilot then egressed and assisted the passenger to undo their seatbelt and safely egress. Ground assistance arrived shortly after. The pilot reported that the fog was no longer on the windscreen.

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2 A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

The pilot was uninjured; however the passenger sustained minor injuries. The helicopter was substantially damaged.

Pilot experience and comments

The pilot had a total of about 915 helicopter and fixed wing hours, with about 756 of these on Robinson 22 helicopters.

The pilot commented that:

- the frost on the ground and the cold moist air above may have been mixed by the movement of the helicopter blades and caused the windscreen fogging
- when the windscreen fogged, the pilot thought that the helicopter had been moving forward, however when the helicopter tail struck the ground, the pilot realised that the lack of visual reference had led to a loss of situational awareness. The helicopter had in fact been moving backwards
- in hindsight, although the take-off was attempted immediately after first light, it may have been more prudent to delay the departure until the sun was properly up. This would have allowed a better natural horizon and a slight increase in temperature

Helicopter information

The helicopter had all the fittings and wiring to have a heater,[3] however the operator had removed the heater at the start of summer, and it had not been re-installed.

The pilot advised that there was a fresh air vent at the front of the windscreen, which ran up on the inside of the windscreen. It was their practice to keep this open, although the pilot could not be sure that is was open on the accident flight. The vents fitted to each door were initially closed.

Pilot operating handbook

The Robinson Helicopter Company Safety Notice SN-18 R Issued: January 85 and revised in February 1989 and June 1994 states:

> *LOSS OF VISIBILITY CAN BE FATAL*
>
> *Flying a helicopter in obscured visibility due to fog, snow, low ceiling, or even a dark night can be fatal. Helicopters have less inherent stability and much faster roll and pitch rates that airplanes. Loss of the pilot's outside visual references, even for a moment, can result in disorientation, wrong control inputs, and an uncontrolled crash. This type of situation is likely to occur when a pilot attempts to fly through a partially obscured area and realizes too late that he is losing visibility. He loses control of the helicopter when he attempts to turn to regain visibility but is unable to complete the turn without visual references.….*

ATSB comment

A cold windshield that is exposed to slightly warmer or moist air can 'fog up'. It is likely that the helicopter moved between different temperature layers as it moved forward and up, and this may have led to a combination of temperatures suitable to allow fog.

The use of heaters, demisters (if fitted) and air vents should always be operated as per the manufacturer's recommendations.

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[3] The heater warms the air in the cabin and thus the windscreen

General details

Occurrence details

Date and time:	23 June 2015 – 0700 WST	
Occurrence category:	Accident	
Primary occurrence type:	Weather - other	
Location:	11 km east of Boyup Brook ALA, (Longridge Farm), Western Australia	
	Latitude: 33° 54.03' S	Longitude: 116° 19.80'

Aircraft details

Manufacturer and model:	Robinson Helicopter Company R22 BETA	
Registration:	VH-RBT	
Serial number:	1980	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passenger –Minor
Damage:	Substantial	

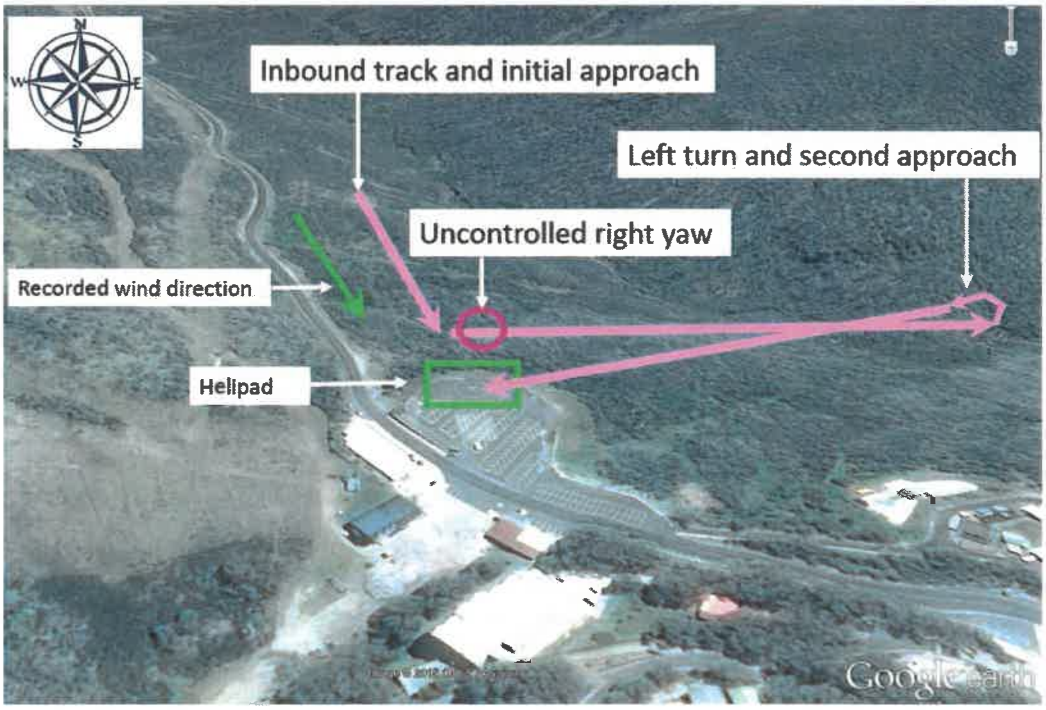
Loss of control involving a Bell 206L3, VH-BLV

What happened

On 20 July 2015, the pilot of a Bell 206L3 (Longranger) helicopter, registered VH-BLV (BLV), conducted a charter flight from Essendon Airport to Falls Creek, Victoria, with five passengers on board. The aircraft took off from Essendon close to its maximum take-off weight. Due to the weight, and therefore fuel limitations, the pilot landed and refuelled at a property near Lake Eildon. At about 1000 Eastern Standard Time (EST), the helicopter departed from the property for the 60 NM flight to Falls Creek, again close to its maximum take-off weight.

At about 1030, while 700 ft above ground level and tracking from the north-west, the pilot conducted a shallow approach towards the helipad at Falls Creek (Figure 1). As the helicopter descended to about 50 ft above ground level, the pilot found that significantly more power was required to conduct the approach than anticipated. The pilot assessed that there was insufficient power available to continue to land, and elected to abort the approach. The pilot pushed forwards on the cyclic[1] to increase the helicopter's airspeed and conducted a left turn towards the valley.

Figure 1: Falls Creek helipad, approximate helicopter track and wind direction



Source: Google earth and pilot recollection – annotated by the ATSB

As the helicopter turned left, it started to yaw[2] rapidly towards the right. The pilot applied full left pedal to counteract the yaw, but the helicopter continued to yaw. The helicopter turned through one and a half revolutions, as the pilot lowered the collective.[3] Lowering the collective reduced the

---

1 A primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc varying the attitude of the helicopter and hence the lateral direction.

2 Term used to describe motion of an aircraft about its vertical or normal axis.

3 A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

power demand of the power rotor system, thereby increasing the ability of the anti-torque pedals to stop the right yaw. The combination of lowering collective and applying forward cyclic to gain forward airspeed, allowed the pilot to regain control of the helicopter. The pilot then conducted a left turn towards the helipad and made an approach to the helipad from an easterly direction. The helicopter landed following the second approach without further incident.

The pilot and passengers did not sustain any injuries and the helicopter was undamaged.

Weather

The pilot expected that the wind at Falls Creek would be variable at 2 kt, as it had been on departure from Essendon. The pilot did not see the windsock at the helipad prior to conducting the approach.

The Bureau of Meteorology provided the ATSB with a report of weather observations for Falls Creek. The automatic weather station is located south of the helipad at about 5,790 ft above mean sea level, above the village. Between 1020 and 1040, the recorded wind speed was from 17 to 20 kt, gusting to 24 kt, and wind direction was from 327° to 344° (degrees true), or 314° to 331° (degrees magnetic). The temperature was -1 °C.

Pilot comments

The pilot reported that the following combination of factors contributed to the incident:

- Unfamiliarity with the landing site and area.
- Inexperience operating at altitude, and unfamiliarity with the associated power requirements. The helipad at Falls Creek is at an elevation of about 5,000 ft above mean sea level.
- Lack of experience in the aircraft type – although the pilot had about 60 hours experience in the Bell Jetranger, this was only the pilot's second flight in the Longranger.
- High all up weight.
- Incorrect assessment of the wind direction – the pilot assumed that the wind would be light and variable at Falls Creek as it was had been on departure from Essendon. During the approach, the pilot assessed that the wind was from the right or a tailwind gusting to about 15 kt.

Operator comment

The operator of VH-BLV assessed that the unanticipated yaw was a result of too little pedal input, applied too late. This was most likely due to a combination of the pilot's inexperience on the 206L3, and being surprised by the downwind approach.

Hover ceiling

Hovering requires more power than any other flight regime. Additionally, hovering at higher altitudes requires more power than to hover at lower altitudes. The 'hover ceiling' is the height at which the power available equals the power required to hover. An increase in power increases the main rotor torque. This additional torque needs increased tail rotor thrust, to prevent the helicopter from yawing.

The Bell 206 L3 flight manual provides a *Hover ceiling – out of ground effect*[4] chart. At 5,000 ft, a temperature of 0 °C, and a gross weight of about 1,814 kg (4,000 lb), the helicopter was just within the chart's hover ceiling envelope. This indicates that adequate power should have been available to hover with those parameters. However, the wind direction and velocity also affect hovering performance.

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4 Helicopters require more power to hover out of ground effect due to the absence of a cushioning effect created by the main rotor downwash striking the ground. The distance is usually defined as more than one main rotor diameter above the surface.

A stronger head wind reduces the power required to hover, while a tailwind increases the power required to hover. On the initial approach to the helipad, a tailwind meant that an increase in power and tail rotor thrust was required. The increased tail rotor thrust absorbs power from the engine, which means less power is available for the main rotor to produce lift. This led to the pilot's assessment of insufficient power available, and decision to discontinue the approach.

Unanticipated right yaw

The US Federal Aviation Administration (FAA) Helicopter flying handbook describes loss of tail rotor effectiveness (LTE) or an unanticipated yaw, as 'an uncommanded, rapid yaw towards the advancing blade which does not subside of its own accord'. It is caused by an interaction between the main rotor and tail rotor.

At high altitudes, the lower air density reduces tail rotor thrust and efficiency. Therefore, when operating at high altitudes and high gross weights, particularly while hovering or at low airspeeds, the tail rotor thrust may not be sufficient to maintain directional control. This can result in unanticipated yaw or LTE. In these circumstances, the hover ceiling is effectively limited by the tail rotor thrust, rather than the power available.

In this incident, other factors may also have contributed to the unanticipated yaw: low and slow flight outside of ground effect, a low speed downwind turn and a large change of power at low airspeed as the pilot aborted the approach.

The US Federal Aviation Administration Advisory Circular, *Unanticipated right yaw in helicopters*, stated that unanticipated right yaw, or loss of tail rotor effectiveness (LTE) has been determined to be a contributing factor in a number of accidents. These mishaps have occurred at low altitude and in low-speed flight, often on final approach to landing. Unanticipated right yaw may occur during any manoeuvre in which the pilot is operating in a high-power, low-airspeed environment with a left crosswind (in aircraft with counter-clockwise blade rotation) or tailwind.

Three additional factors can significantly influence the severity of LTE:

- gross weight and density altitude
- low indicated airspeed
- a rapid application of power, causing power droop.

In order to reduce the onset of LTE, when manoeuvring between hover and 30 kt, the pilot should:

- Avoid tailwinds.
- Avoid out of ground effect hover and high power demand situations, such as low-speed downwind turns.
- Be aware of wind direction and velocity. A loss of translational lift results in an unexpected high power demand and an increased anti-torque requirement.
- Be aware that if a considerable amount of left pedal is being maintained, a sufficient amount of left pedal may not be available to counteract an unanticipated right yaw.
- Stay vigilant to power and wind conditions.

If a sudden unanticipated right yaw occurs, the pilot should:

- apply full left pedal
- simultaneously move cyclic forward to increase speed
- if altitude permits, reduce power.

Safety message

Pilots should understand and avoid conditions that are conducive to uncontrolled yaw or loss of tail rotor effectiveness. Pilots can reduce their exposure to LTE by maintaining awareness of the wind and its effect on the helicopter. If a pilot encounters unanticipated yaw, quick application of the correct response is essential to recover control of the helicopter. The ATSB reported on an incident involving LTE in AO-2013-121.

This incident also highlights the effect of gross weight and airfield elevation on aircraft performance. Understanding controllability issues at the limits of the normal operating envelope can assist pilots in recognising the symptoms of reduced aircraft performance. Further information is available in ATSB report AO-2013-203.

General details

Occurrence details

Date and time:	20 July 2015 – 1030 EST	
Occurrence category:	Serious Incident	
Primary occurrence type:	Loss of control	
Location:	Falls Creek, Victoria	
	Latitude: 36° 52.00' S	Longitude: 147° 17.00' E

Helicopter details

Manufacturer and model:	Bell Helicopter Company 206L3	
Registration:	VH-BLV	
Serial number:	51582	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this Bulletin

The ATSB receives around 15,000 notifications of Aviation occurrences each year, 8,000 of which are accidents, serious incidents and incidents. It also receives a lesser number of similar occurrences in the Rail and Marine transport sectors. It is from the information provided in these notifications that the ATSB makes a decision on whether or not to investigate. While some further information is sought in some cases to assist in making those decisions, resource constraints dictate that a significant amount of professional judgement is needed to be exercised.

There are times when more detailed information about the circumstances of the occurrence allows the ATSB to make a more informed decision both about whether to investigate at all and, if so, what necessary resources are required (investigation level). In addition, further publically available information on accidents and serious incidents increases safety awareness in the industry and enables improved research activities and analysis of safety trends, leading to more targeted safety education.

The Short Investigation Team gathers additional factual information on aviation accidents and serious incidents (with the exception of 'high risk operations), and similar Rail and Marine occurrences, where the initial decision has been not to commence a 'full' (level 1 to 4) investigation.

The primary objective of the team is to undertake limited-scope, fact gathering investigations, which result in a short summary report. The summary report is a compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence.

These reports are released publically. In the aviation transport context, the reports are released periodically in a Bulletin format.

Conducting these Short investigations has a number of benefits:

- Publication of the circumstances surrounding a larger number of occurrences enables greater industry awareness of potential safety issues and possible safety action.
- The additional information gathered results in a richer source of information for research and statistical analysis purposes that can be used both by ATSB research staff as well as other stakeholders, including the portfolio agencies and research institutions.
- Reviewing the additional information serves as a screening process to allow decisions to be made about whether a full investigation is warranted. This addresses the issue of 'not knowing what we don't know' and ensures that the ATSB does not miss opportunities to identify safety issues and facilitate safety action.
- In cases where the initial decision was to conduct a full investigation, but which, after the preliminary evidence collection and review phase, later suggested that further resources are not warranted, the investigation may be finalised with a short factual report.
- It assists Australia to more fully comply with its obligations under ICAO Annex 13 to investigate all aviation accidents and serious incidents.
- Publicises ***Safety Messages*** aimed at improving awareness of issues and good safety practices to both the transport industries and the travelling public.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Short Investigations

Aviation Short Investigations Bulletin Issue 44
AB-2015-118
Final – 4 November 2015

From:	s. 47F(1) [redacted]
To:	United Kingdom AAIB 24 hour contact
Subject:	Final report contained in Investigation Bulletin 44 [SEC=UNCLASSIFIED]
Date:	Monday, 9 November 2015 10:53:00 AM
Attachments:	Final report.pdf

Morning again,

Please find attached our Final report for investigation 201503322 – AO-2015-086 s. 38(1), s. 47F(1) [redacted]

Cheers

s. 47F(1) [redacted]
Team Leader Confidential Reporting
Australian Transport Safety Bureau

62 Northbourne Avenue
Canberra ACT 2601
P s. 47F(1) [redacted] E s. 47F(1) [redacted] M s. 47F(1) [redacted] REPCON 1800 020 505

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Australian Government

Australian Transport Safety Bureau

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Issue 44

Investigation

ATSB Transport Safety Report

Aviation Short Investigations

AB-2015-118

Final – 4 November 2015

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Landing gear malfunction involving a Cessna 210, VH-SMP

What happened

VH-SMP

Source: Keith Anderson, modified by the ATSB

On 1 February 2015, at about 0800 Western Standard Time (WST), a Cessna 210 aircraft, registered VH-SMP (SMP), departed from Kununurra Airport, Western Australia, for a scenic flight over King George falls with the pilot and five passengers on board.

The pilot returned to Kununurra after about 2 hours. During the approach, the pilot selected the landing gear selector to the down position. However, the green landing gear down indicator light did not illuminate. In addition, the landing gear pump continued to operate until the landing gear pump circuit breaker popped. The pilot observed that the right and left main landing gear appeared to be in the down and locked position. However, the pilot was unable to observe the nose landing gear.

As he was unable to verify the position of the nose landing gear, the pilot conducted a missed approach and held at about 1,500 ft above the ground level to investigate the reason for the malfunction. The pilot also broadcast on the common traffic advisory frequency (CTAF) his intentions and briefed the passengers.

The pilot selected the landing gear down and up another two times. However, in the down selection, there was no green landing gear down light and the landing gear pump continued to operate until the circuit breaker popped. The pilot inspected the landing gear down light globe and determined it was operational.

The pilot then used the 'landing gear fails to extend' and 'manual gear extension' checklists, and conducted a manual gear extension. The main landing gear was observed to be in the down position, but there was still no landing gear down green light.

The pilot contacted the operator first via a text message using a mobile phone, and then on the company radio frequency. After consulting with the operator, the pilot conducted a low-level pass over the runway to enable the operator to observe the landing gear position from the ground.

During the low-level pass, the operator observed the landing gear and reported to the pilot that the landing gear appeared to be in the down position. The operator told the pilot that it was likely to be an indication problem. The pilot returned SMP for a landing on runway 12 and briefed the passengers for the landing.

At about 1020, SMP landed, with the main landing gear wheels touching down first. The pilot held full back pressure on the elevator controls to hold the nose wheel off the runway for as long as possible. After about 100 m, the nose of the aircraft sank on to the runway. At this point, the nose wheel collapsed, the propeller struck the runway, and the aircraft came to a stop. Once the aircraft was stationary, the pilot completed the shutdown checks. The pilot and passengers then exited the aircraft through the two front doors.

The pilot and five passengers were uninjured. The aircraft sustained minor damage, including damage to the propeller, nose wheel, and engine cowling.

Pilot comment

The pilot reported that when the manual gear extension hand pump was used to pump the gear down, and was pumped until it could not be pumped further, it felt just like when the gear is in the down and locked position.

The pilot indicated that SMP last flew on 12 January 2015, about 3 weeks before the incident flight, and that there was no outstanding maintenance.

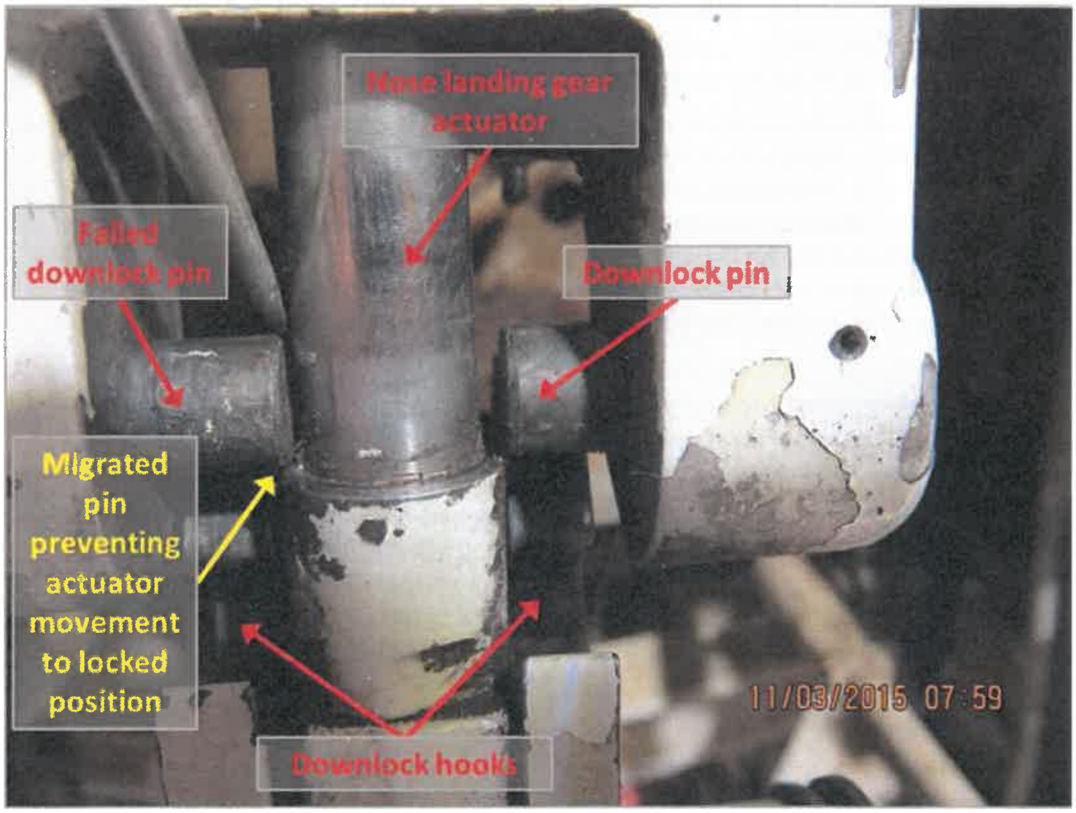
Owner investigation

The owner of the aircraft conducted an investigation into the incident. As part of their investigation, they determined that one of the nose landing gear down lock pins had failed. The pin had failed in the area of the machined groove for the pin retention roll pin (Figure 1). The failed down lock pin migrated out and interfered with the nose landing gear actuator. This movement prevented the nose landing gear down lock mechanism from engaging in the down and locked position (Figure 2). The other down lock pin was serviceable.

Figure 1: Failed nose landing gear downlock pin

Source: Aircraft owner

Figure 2: SMP nose landing gear downlock assembly, showing the failed downlock pin preventing actuator movement to the locked position



Source: Aircraft owner, modified by the ATSB

Cessna Service Bulletin

Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Inspection* dated 29 December 1995, recommended the inspection of the nose landing gear downlock actuator pins to determine the security of the pins.

Cessna had introduced the service bulletin as they had received reports that the nose landing gear actuator downlock pins had cracked and failed. It was found that the pins had failed at a circumferential groove that was used to secure the pin in the actuator bearing end. The service bulletin indicated that non-compliance could result in failure of the nose landing gear to lock in the down position and possibly collapse.

The recommended inspection was to be carried out initially within the next 200 hours operation or 12 months, whichever occurred first. Subsequent inspections at each landing gear retraction check were not to exceed 200 hours of operation thereafter. After the installation of the downlock actuator pin replacement, the repetitive inspection was not required.

Aircraft maintenance

SMP was manufactured in 1976 and, at the time of the incident, the aircraft had 9,965 hours total time in service. The aircraft was maintained under the Civil Aviation Safety Authority (CASA) maintenance schedule (*Civil Aviation Regulations 1988* (CAR) *Schedule 5*). As the nose landing gear was inspected in accordance with *Schedule 5*, the operator reported that they did not need to comply with Cessna *SEB95-20*.

The periodic (100 hourly or 12-month) maintenance inspections were carried out in August 2014 at 9,871 hours total time in service (94 hours prior to the accident). This maintenance was conducted in accordance with the CASA maintenance schedule (*Schedule 5*). *Schedule 5* did not include a specific inspection requirement to determine the security of the down lock pins.

NTSB investigation into similar failures

The US National Transport Safety Board (NTSB) investigated an accident involving a Cessna R182 aircraft, registered N6149S at Allegheny County Airport, West Mifflin, Pennsylvania on 18 May 2005 where the nose landing gear collapse during the landing.[1]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. The NTSB examined the downlock pin and found that it had failed due to a fatigue crack. The investigation also found that the Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Pin Inspection* had not been carried out. The investigation found over 30 other nose landing gear collapses that were attributed to the actuator down lock pins on similarly equipped Cessna aircraft.

The NTSB also investigated another similar accident involving a Cessna R182 aircraft, registered N5274S, at Ames Municipal Airport, Ames, Iowa, on 22 October 2006 where the nose landing gear collapse during the landing.[2]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator assembly bearing end had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. Both downlock pins were found to have fatigue cracks. Again, there was no evidence that Cessna Service Bulletin *SEB95-20* had been complied with.

ATSB comment

On 12 September 2011, a flight control system event occurred involving Cessna 210N, VH-JHF, 48 km West of Bourke Airport, NSW. The ATSB investigation (AO-2011-115) found that reported elevator control input difficulties resulted from the fracture of the aircraft's two horizontal stabiliser rear attachment brackets. The nature of the failures was typical of the damage sustained by aircraft as they age and move beyond the manufacturer's originally intended design life.

The investigation identified that maintaining class B aircraft in accordance with the Civil Aviation Safety Authority (CASA) maintenance schedule, without due regard to the manufacturer's or other approved data, does not adequately provide for the continuing airworthiness of those aircraft.

As a result of the investigation the ATSB issued CASA a Safety Recommendation *AO-2011-115-SR-050*:

> *The Australian Transport Safety Bureau recommends that CASA proceed with its program of regulatory reform to ensure that all aircraft involved in general aviation operations are maintained using the most appropriate maintenance schedule for the aircraft type.*

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

1 The NTSB aviation accident report *IAD05IA066*, is available from the NTSB website.

2 The NTSB aviation accident report *CHI07LA011*, is available from the NTSB website.

Aircraft owner

As a result of this occurrence, the aircraft operator has advised the ATSB that the aircraft owner has taken the following safety actions:

Aircraft maintenance

Subsequent to the incident, the aircraft owner replaced the landing gear down lock pins with updated pins on two other aircraft that the owner is responsible for, and found no abnormalities with the removed pins or the nose landing gear actuator bearing ends.

Safety message

This accident highlights the importance of comprehensive, periodic maintenance inspections and the role manufactures continuing airworthiness instructions in maintaining ageing aircraft. As aircraft age, the original maintenance schedules may not be sufficient to ensure the aircraft's ongoing safety. As a result of investigation report AO-2011-115 the ATSB encourages registration holders of class B aircraft to review their aircraft's maintenance schedule to determine if it is the most appropriate for their aircraft and to ensure that it adequately provides for the continuing airworthiness of the aircraft.

In 2007, the ATSB released research report B20050205 - *How Old is Too Old? The impact of ageing aircraft on aviation safety* and is available from the ATSB website. The report found that some aircraft manufacturers have recognised that the original maintenance schedules may not be sufficient to ensure the aircraft's (ongoing) safety. Those manufacturers have developed additional continuing airworthiness information. The report concluded that adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

In 2012, in recognition of the Australian general aviation aging aircraft fleet, CASA released a discussion paper *Ageing Aircraft Management Plan (AAMP)*. The discussion paper makes the following relevant points:

- As an aircraft ages up to and beyond its original design assumptions, the nominated maintenance program needs to be modified to take into account ageing issues. In particular, inspections of key areas or components not usually accessed.
- CASA and Authorised Persons are obliged to take into account all relevant maintenance data or information pertinent to a particular aircraft type. This includes manufacturer's data, Airworthiness Directives, Service Bulletins and other continuing airworthiness information.
- CASA Maintenance *Schedule 5* was originally conceived as a minimum schedule of maintenance activities, to be undertaken on a very limited range of relatively simple, 'orphan' aircraft
- CASA Maintenance *Schedule 5* was not originally intended to address ageing aircraft related issues. The literal application of this schedule on its own was not intended to replace the manufacturer's instructions for continued airworthiness, where available.

The adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

General details

Occurrence details

Date and time:	1 February 2015 – 1020 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Landing gear malfunction	
Location:	Kununurra Airport, Western Australia	
	Latitude: 15° 46.68' S	Longitude: 128° 42.45' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210L	
Registration:	VH-SMP	
Serial number:	21061544	
Type of operation:	Charter - passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

Collision with terrain involving a Victa 115 Airtourer, VH-MUV

What happened

On 29 May 2015, at about 1145 Eastern Standard Time (EST), a Victa 115 Airtourer aircraft, registered VH-MUV (MUV), departed from Leongatha Airport, Victoria, for crosswind circuit training, with an instructor and student on board.

The student pilot was flying the first circuit. The instructor reported that the circuit was normal and the approach was stable up to about 100 ft above ground level (AGL) when the student put the final stage of flap out. As the aircraft flared to land on runway 22, a strong gust of wind blew the aircraft off the runway centreline to the left and the aircraft bounced hard. The student initiated a go-around, applying full power, with the aircraft still drifting further to the left. As the aircraft was not climbing, the instructor called "taking over" and the student handed over control of the aircraft. The instructor lowered the nose of the aircraft to gain airspeed.

The aircraft continued to drift further away from the runway centreline. The student noticed the flaps were in the down position and, thinking that it would assist and without checking with the instructor, retracted the flaps to the up position. The aircraft descended and about 100 m past the threshold of runway 22, the aircraft collided with the airport perimeter fence. After a further 20 m, the aircraft flipped over the fence and came to rest upside down. The instructor and student exited the aircraft quickly through the broken canopy, as fuel was gushing from the fuel tanks. The instructor and student pilot received minor injuries and the aircraft was substantially damaged (Figure 1).

Figure 1: VH-MUV inverted after flipping over the airport perimeter fence

Source: Aircraft operator

Instructor comment

The instructor reported that the purpose of the flight was to instruct the student in crosswind landing techniques and then to conduct further flight training in the training area. The instructor indicated that, as they were planning to conduct 2 hours of flight training, the aircraft had full fuel on board and was near the aircraft maximum take-off weight.

The instructor described the wind as gusting between 15 to 22 kt at 270 degrees, with a crosswind component of between 10 to 15 kt.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

Flight training organisation

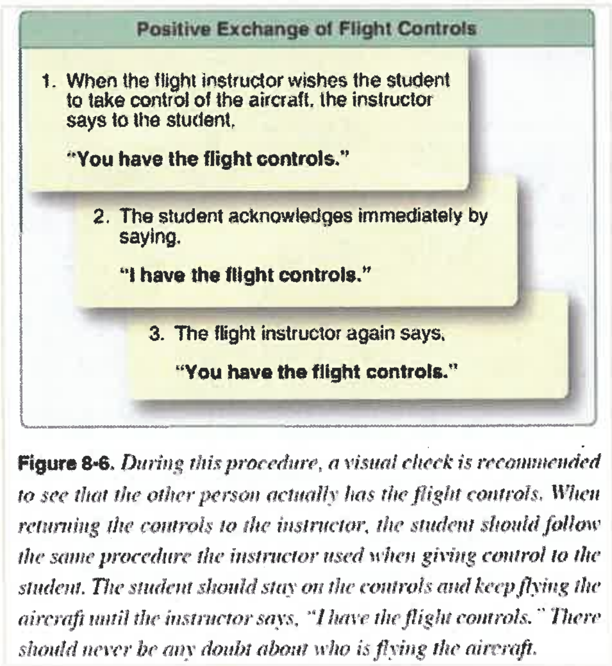
As a result of this accident, the flight training organisation advised the ATSB that they are taking the following safety actions:

- The instructor has been briefed on the importance of making sure students understand not to touch any of the aircraft's controls when the instructor is in control of the aircraft.
- The instructor has been briefed on the handing over and taking over procedures with the emphasis on handing over and taking over controls procedures.

Safety message

It is important in flight training to have a positive exchange of flight controls. The US Federal Aviation Administration (FAA) has found that numerous accidents have occurred due to a lack of communication or misunderstanding regarding who had actual control of the aircraft, particularly between students and flight instructors. The FAA publication Aviation Instructor's Handbook, includes a section on the Positive Exchange of Flight Controls. The handbook provides guidance to use for the positive exchange of flight controls (Figure 2).

Figure 2: FAA Positive exchange of Flight Controls



Positive Exchange of Flight Controls

1. When the flight instructor wishes the student to take control of the aircraft, the instructor says to the student,
   "You have the flight controls."
2. The student acknowledges immediately by saying,
   "I have the flight controls."
3. The flight instructor again says,
   "You have the flight controls."

Figure 8-6. *During this procedure, a visual check is recommended to see that the other person actually has the flight controls. When returning the controls to the instructor, the student should follow the same procedure the instructor used when giving control to the student. The student should stay on the controls and keep flying the aircraft until the instructor says, "I have the flight controls." There should never be any doubt about who is flying the aircraft.*

Source: US Federal Aviation Administration

General details

Occurrence details

Date and time:	29 May 2015 – 1200 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Leongatha Airport, Victoria	
	Latitude: 38° 29.73' S	Longitude: 145° 51.58' E

Aircraft details

Manufacturer and model:	Victa 115 Airtourer	
Registration:	VH-MUV	
Serial number:	96	
Type of operation:	Flying Training	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 2	Passengers – 0
Damage:	Substantial	

Separation issue involving a Pacific Aerospace CT/4B, VH-YCU, and a Diamond DA 40, VH-UNV

What happened

Early in the afternoon on 4 June 2015, a Pacific Aerospace CT/4B, registered VH-YCU (YCU), was conducting an instrument training flight in the training area to the south-west of Tamworth, New South Wales, with an instructor and student on board. At the same time, a Diamond DA 40, registered VH-UNV (UNV), departed Tamworth on a visual navigation student assessment flight, bound for Bankstown, New South Wales, also with an instructor and student on board. Both aircraft were operating under the visual flight rules,[1] and the weather conditions were fine and clear.

As part of the training sequence, the instructor in YCU directed the student to intercept the 360 degree bearing from the Quirindi non-directional beacon (NDB)[2] The instructor further directed the student to track inbound to the Quirindi NDB at 4,500 ft[3] on that bearing (Figure 1), and carry out a Quirindi NDB-A approach.

When about 10 NM north of Quirindi, the student in YCU broadcast their position and intentions on the Quirindi Common Traffic Advisory Frequency (CTAF).[4] The pilot of a recreational aircraft responded to the effect that they were operating in the circuit area at Quirindi. There was no response from any other aircraft. When about 5 NM from Quirindi, the student in YCU made another broadcast on the CTAF, indicating their intention to enter a holding pattern from overhead the NDB, in preparation for the NDB-A approach. There was no response from any other aircraft to that broadcast.

At about the same time, UNV was tracking from Gate South (a reporting point south-west of Tamworth) towards Quirindi, also at 4,500 ft (Figure 1). The crew of UNV planned to overfly Quirindi then turn to the south-east and track towards Scone. The crew of UNV were monitoring the area VHF,[5] but not the Quirindi CTAF. As such, the crew of UNV did not hear the CTAF broadcasts made by the student in YCU. Even though the crew of both aircraft were monitoring the area VHF, neither had made any broadcasts on that frequency, so neither crew was aware of the other aircraft. At the time, both were tracking towards Quirindi at the same altitude.

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1 Visual flight rules are a set of regulations, which allow a pilot to only operate an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

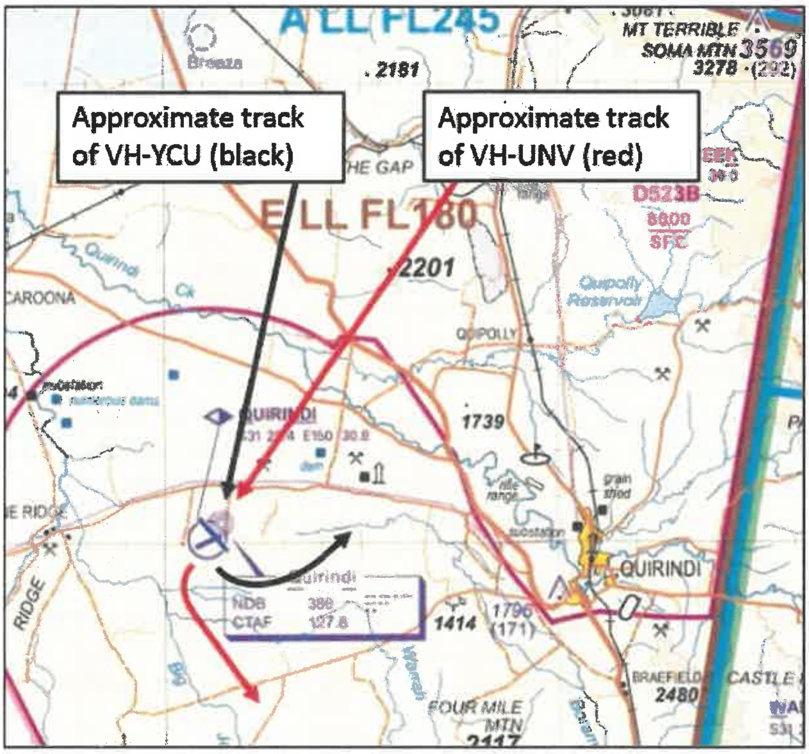
2 An NDB is a radio transmitter used as an aid to navigation. The signal does not include inherent directional information.

3 4,500 ft above mean sea level is about 3,450 ft above ground level overhead Quirindi aerodrome.

4 The CTAF is the frequency on which pilots operating at a non-controlled aerodrome should make positional radio broadcasts.

5 Area VHF (very high frequency) is the appropriate flight information area frequency for a location.

Figure 1: Extract from a visual chart showing the manner in which the tracks of the two aircraft converged as they neared Quirindi, and the general direction of flight of each aircraft after they passed Quirindi (YCU turning to the north-east and UNV turning to the south-east)



Source: Airservices Australia, additions by the ATSB

Just north of Quirindi, the traffic collision avoidance device fitted to YCU alerted the crew to an aircraft in their vicinity, at a distance of 0.4 NM, at the same altitude. The instructor commenced an intensified lookout and soon sighted UNV. At that moment, UNV was in about the 10 o'clock position[6] relative to YCU, at the same altitude, on a slightly converging flight path. The instructor in YCU estimated that at the time UNV was sighted, YCU was in approximately the 4 o'clock position relative to UNV.

Although there was no immediate risk of a collision, the instructor in YCU took control of the aircraft from the student and made a heading adjustment through about 20 degrees to the right. On the new heading, the instructor was satisfied that the flight path of the two aircraft would diverge. In recalling the incident, the instructor in YCU estimated that, at their closest point, the separation between the two aircraft was about 60 m laterally, at the same altitude.

After sighting UNV, the instructor in YCU attempted to establish contact with the crew of UNV on the Quirindi CTAF. The pilot of the recreational aircraft operating at Quirindi responded, but there was no response from the crew of UNV.

Still unaware of the proximity of YCU, the crew of UNV passed over Quirindi then turned to the south-east towards Scone, and commenced a climb to 5,500 ft. As they climbed, the instructor in UNV sighted YCU behind and beneath them, in about their 8 o'clock position. By that time, the crew in YCU had also passed Quirindi, and were now turning towards the north-east for the NDB-A holding pattern. Having sighted YCU, the instructor in UNV was satisfied that the two aircraft were on divergent headings and vertical separation was increasing as UNV climbed.

6 The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of a position of an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

Following the separation issue, the instructor in YCU called air traffic control (Brisbane Centre) on the area VHF in an attempt to establish communications with the crew of UNV. The crew of UNV, who were still monitoring the area VHF, intercepted that call and responded. The crew of UNV then selected the Quirindi CTAF on one of their radios, and they had a brief discussion on that frequency. By the time communications were established on the CTAF, UNV was nearing 5,500 ft on a south-easterly heading towards Scone. The crew of YCU were resuming their planned exercise, entering the Quirindi NDB-A holding pattern.

Instructor comments - YCU

The instructor in YCU made a number of comments regarding the incident, including:

Use of radios. YCU was fitted with two VHF radios. During operations in the training area, the crew were monitoring the area VHF on one radio, and company operations on the other. The radio that was being used to monitor the company operations frequency, was switched to the Quirindi CTAF as they prepared for their NDB-A approach at Quirindi. As such, the crew were monitoring the area VHF and Quirindi CTAF at the time of the incident.

Instrument flight training hood. The student in YCU was wearing an instrument flight training hood. The hood projected forward from the student's helmet in a manner that denied the student external visual reference, but allowed the student to scan cockpit instruments (to simulate instrument meteorological conditions). Under these circumstances, the instructor maintained a lookout for other aircraft and hazards, but the position of the student's helmet and hood was such that the instructor's visibility to the left of the aircraft was partially obscured. With that in mind, when alerted to other traffic in the vicinity, the instructor targeted a lookout to the left of the aircraft, past the student's helmet and hood. During this targeted lookout, the instructor sighted UNV. When the instructor sighted UNV, the aircraft was remaining on a constant line of sight relative to YCU, in approximately the 10 o'clock position.

Density of training operations at Quirindi and Gunnedah. The instructor in YCU noted that even though Quirindi and Gunnedah are often used for flight training purposes, there is nothing in the En route Supplement Australia (ERSA) to alert pilots accordingly.

Instructor comments - UNV

The instructor in UNV made a number of comments regarding the incident, including:

Use of radios. UNV was fitted with two VHF radios. The instructor commented that depending on the circumstances, either radio could be used to monitor and broadcast on relevant CTAFs. At the time of this incident, the crew were monitoring the area VHF with one radio, and the company operations frequency on the other.

Monitoring the CTAF. The instructor in UNV was aware that the student in UNV was not monitoring the Quirindi CTAF as they approached from the north, even though it was normal practise to monitor a CTAF under these circumstances (overflying an aerodrome). On this occasion, the instructor elected not to prompt the student to monitor the CTAF in order to reinforce a teaching point to the student regarding frequency management. The instructor was satisfied that a visual lookout would suffice under the circumstances – the conditions were fine and clear, and there were no broadcasts or other transmissions on the area VHF to suggest that there was any potentially conflicting traffic in their area.

ATSB comment

The separation issue in this case may have been avoided if the pilots of the two aircraft involved had been monitoring and broadcasting on the same frequency. Both crews were monitoring the area VHF, but operating under the visual flight rules, there was no specific requirement for the crew of either aircraft to make a broadcast on that frequency. The crew of YCU broadcast their position and intentions on the Quirindi CTAF, but the crew of UNV were not monitoring that frequency.

The requirement to monitor a CTAF is subject to a level of interpretation, particularly with respect to the altitude above an airfield at which the requirement applies. The Aeronautical Information Package (AIP) requires a pilot to broadcast on the CTAF when he/she enters the vicinity of a non-controlled aerodrome. AIP goes on to describe the vicinity of a non-controlled aerodrome as being:

> *...within 10 nm of the aerodrome and at a height above the aerodrome that could result in conflict with operations at the aerodrome.*

Existing forums and processes (managed by CASA and Airservices Australia) allow airspace users to influence the manner in which airspace is managed and propose changes to relevant documents (such as the En Route Supplement Australia). Where changes have the potential to improve safety, operators are encouraged to present proposals for consideration, using those forums and processes. One relevant forum for proposing airspace-related safety improvements is the CASA Regional Airspace and Procedures Advisory Committee.

Safety message

Pilots are encouraged to 'err on the side of caution' when considering when to make broadcasts and whether specific frequencies should be monitored, particularly noting the fundamental importance of communication in the effective application of the principles of see-and-avoid. An ATSB report titled *Limitations of the See-and-Avoid Principle* outlines the major factors that limit the effectiveness of un-alerted see-and avoid.

The ATSB SafetyWatch programme highlights broad safety concerns that emerge from investigations and occurrence data reported to the ATSB by industry. One safety concern relates to operations around non-controlled aerodromes. The ATSB safety watch website page, *Safety around non-controlled aerodromes,* includes the following relevant comments:

> *Insufficient communication between pilots operating in the same area is the most common cause of safety incidents near non-controlled aerodromes.*
>
> *A search for other traffic is eight times more effective when a radio is used in combination with a visual lookout than when no radio is used.*

The CASA booklet titled *Operations at non-controlled aerodromes* provides guidance with respect to the limitations of the see-and-avoid principle and relevant radio procedures. Civil Aviation Advisory Publication 166-1 also provides relevant guidance with respect to CTAF procedures.

General details

Occurrence details

Date and time:	4 June 2015 – 1420 EST	
Occurrence category:	Incident	
Primary occurrence type:	Separation issue	
Location:	Near Quirindi, New South Wales	
	Latitude: 31° 29.92' S	Longitude: 150° 31.08' E

Aircraft details – VH-YCU

Manufacturer and model:	Pacific Aerospace Corporation CT/4B	
Registration:	VH-YCU	
Serial number:	079	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Aircraft details – VH-UNV

Manufacturer and model:	Diamond Aircraft Industries DA 40	
Registration:	VH-UNV	
Serial number:	40.1077	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Collision with terrain during landing, involving a PA32 aircraft, VH-BDG

What happened

On the afternoon of 26 July 2015, the pilot prepared a PA32-300 (Cherokee Six) aircraft, VH-BDG (BDG), for a private joy flight around the Whitsunday Islands off the Queensland coast, (Figure 1) departing from the Lakeside Airpark. The pilot had arranged for five acquaintances to come on the flight as passengers.

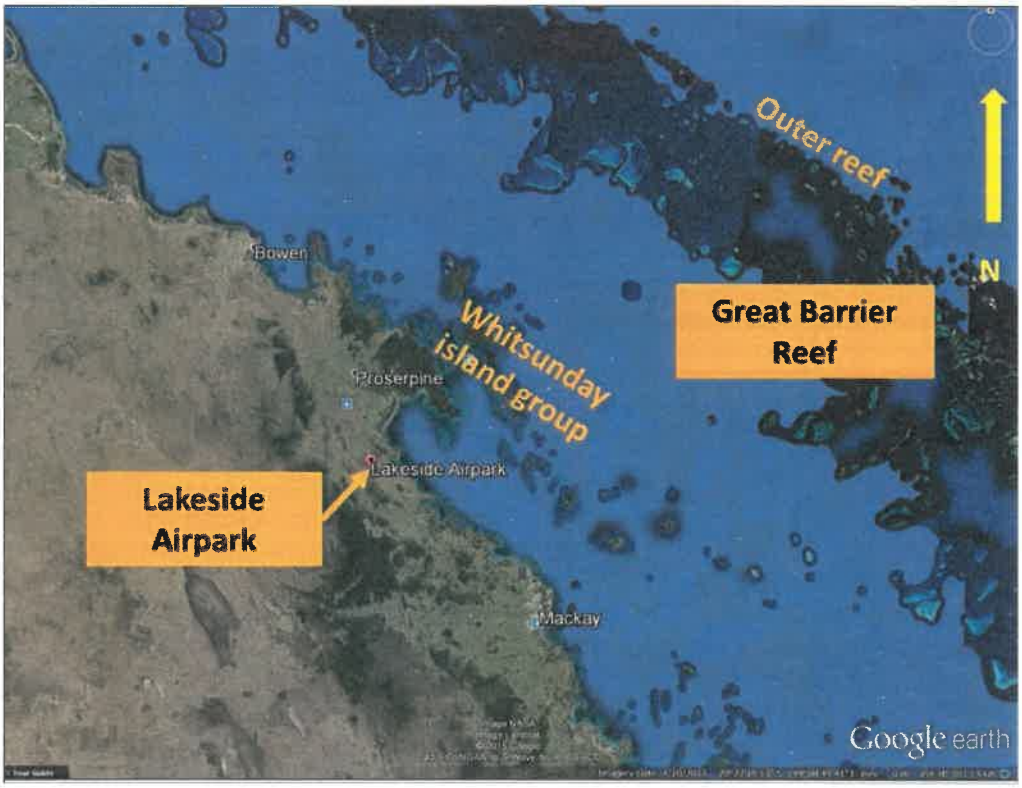
About a week earlier, the pilot, who had an injured right foot at the time, organised another pilot to fly BDG on a re-positioning flight to the Lakeside Airpark. Due to being unable to fly the re-positioning flight, the accident flight became the pilot's first time operating from the Airpark.

Pilot recollections

The pilot reported that they delivered a safety brief outlining the relevant safety features of the aircraft, just prior to loading the passengers. After loading the four rear passengers, the pilot secured the left rear cargo door, and then entered the cockpit through the front right door, followed by the front seat passenger.

The flight departed at about 1400 Eastern Standard Time (EST), and remained outside controlled airspace. The flight overflew some of the Whitsunday island group as well as the outer reef area of the Great Barrier Reef, prior to setting a return course to the Airpark about one and half hours later (Figure 1).

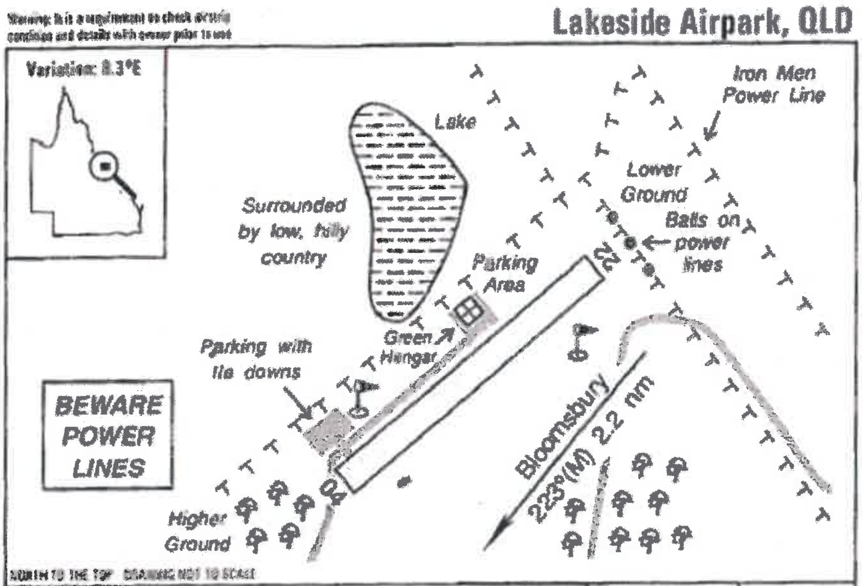
Figure 1: A google earth extract showing the general area where the joyflight was conducted



Source: Google earth, annotated by the ATSB

The pilot approached the extended centreline at an oblique angle and conducted a straight in approach to runway 22 (Figures 2 and 3). When about 6 NM from the airfield, at about 2,300 ft above mean sea level, the aircraft was configured for descent. After reducing the airspeed from about 135 to about 100 kt, and with 10° of flap selected, the aircraft descended to about 1,800 ft.

Figure 2: An extract from the Queensland Country Airstrip Guide. Diagrammatic representation of Lakeside Airpark and local hazards



Elevation:	175 Feet AMSL	**Time Zone:**	UTC + 10
GPS Position:	20° 40.852' South 148° 37.831' East	**Area Forecast:**	44
WAC Charts:	Clermont (3234), Rockhampton (3235)	**ALA Code:**	YLAK
Owner/Operator:	Lakeside Airpark 0418 711224, office@caboolturecommercial.com		
Strip Directions:	04-22		
Strip Lengths:	1000 metres (wet weather may shorten the NE end)		
Strip Surface:	Unsealed - slashed grass		
Windsock:	Yes - two		
Strip Markers:	White cones and tyres		
Lighting:	Nil		

Source: Queensland Country Airstrip Guide, 2012 edition

Figure 3: Approach to runway 22 at Lakeside Airpark. Note the unsealed and sealed portion of the runway. Also, note the difficulty in detecting the power lines on approach. Photo taken about a week prior to the accident

Source: Barry Dionysius

In order to maintain sufficient clearance over the two rows of power lines, and still land near the threshold, well before the sealed section of the runway, the pilot planned a steeper approach than normal. The flap was set to 40° (full flap) and the rate of descent increased to about 500-600 feet per minute.

On short final, the aircraft suddenly began to sink rapidly, and the pilot recalled seeing a tree pass close by the left window. Judging that the aircraft was now too low; the pilot applied full power, held the aircraft nose in a raised position, turned the aircraft left toward lower ground, and initiated a go-around.

However, the aircraft continued to sink throughout this manoeuvre, and the tail struck the runway about 20 m in from the threshold. Throughout this attempt to go-around, the tail continued to drag along the gravelled section of the runway, leaving a mark about 30-35° to the left of the runway direction for about 18m.

Although not yet showing a positive rate of climb, the aircraft seemed to be flying. The pilot reported that the stall warning had not sounded, so assessed there was a choice between removing the power and attempting to land back on the runway, or continuing with the go-around. The pilot elected to continue with the go-around and continued toward the lower ground.

A witness mark made by the right wheel, commenced at about the same spot where the mark made by the tail stopped. The wheel mark continued for about 35m into the grassed area beside the runway.

Once into the grassed area, and with the aircraft most probably airborne, it struck a wire fence (Figure 4) then the raised embankment of the dam, which ran perpendicular to the runway. The pilot reported that the left wing tip struck the water and the aircraft spun around and entered the water. At some point throughout this sequence, the main wheels detached from the aircraft. The pilot reported continuing to battle for control of the aircraft, up until it arrived in the water.

Figure 4: Looking along runway 22 taken a few days after the accident

Source: Pilot

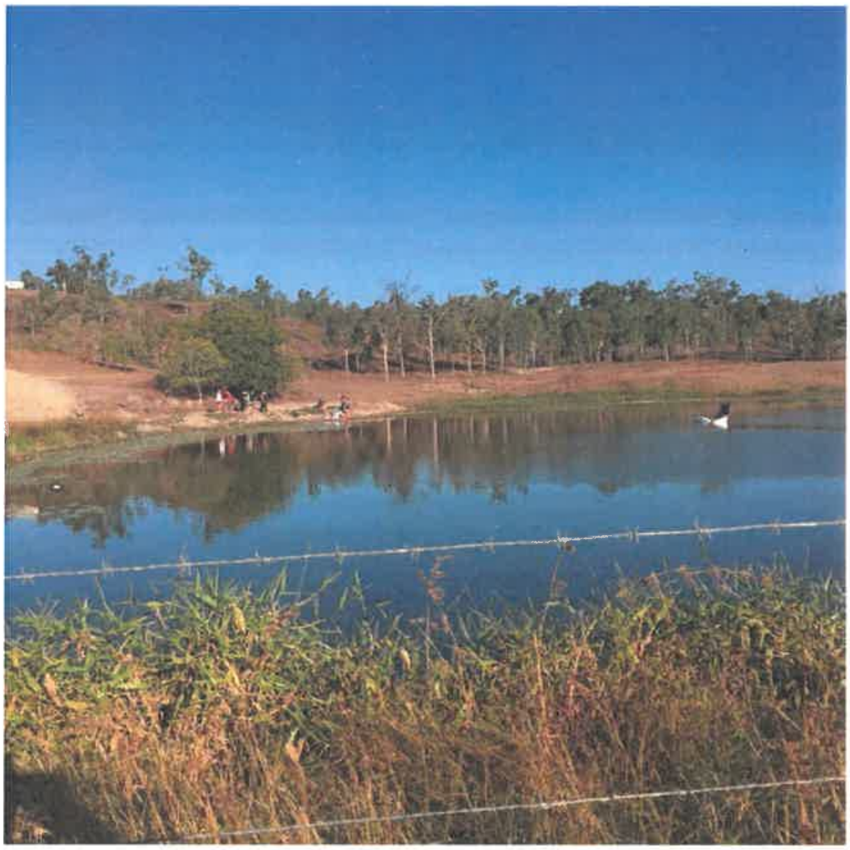
Post water impact

When the aircraft settled on the surface of the water, the pilot reported yelling to the passengers to 'get out'. The pilot then opened the front right door, pushed the passenger occupying the front right seat out, and then exited. The opening of the door resulted in the muddy water gushing inside and rapidly filling the aircraft. The passengers seated in the rear of the aircraft were unable to open the rear door. The water almost filled the entire cabin during this time.

The pilot was eventually able to get the rear door open from outside the aircraft and assisted some of the passengers out. The remaining passengers either made their own way out, or were assisted by other passengers.

One of the passengers sustained serious injuries, and the pilot and another passenger, minor injuries. The aircraft was almost completely submerged resulting in substantial damage (Figures 5 and 6).

Figure 5: Post accident showing VH-BDG partially submerged in the dam



Source: Airpark operator

Figure 6: VH-BDG after retrieval from the lake. Passenger 2 (below) reported that the left wing crumpled during the 'cartwheeling' toward the lake. Note: Significant damage occurred during the retrieval process

Source: Pilot

Pilot experience and comments

The pilot had approximately 581 total flying hours with about 112 of these on Cherokee Six type aircraft. The pilot made the following points:

- the hazard briefing conducted by the airpark operator some weeks earlier, included a request to land on the gravel area of the runway, as the seal was recently laid but had proved to be quite soft
- both weight and balance, and performance calculations were conducted for the flight, however these documents were damaged when the aircraft became submerged
- there may have been some wind shear or a down draft which contributed to the aircraft sinking on the approach
- the tail scraping along the gravel and over the fence during the attempted go-around added extra drag, which detracted from the aircraft's performance

Passenger comments

Three of the five passengers elected to provide their accounts of what happened.

Passenger one recalled:

- there was no pre-flight safety briefing; the pilot just indicated where each of them should sit
- during the landing approach, this passenger recalled thinking how low they were, when still some distance from touchdown
- the tail struck the ground, and recalls power being applied after that
- the aircraft flipping over and 'cartwheeling' toward the lake

Passenger two recalled:

- there was no pre-flight safety briefing
- during the approach to land they heard the pilot verbalising that the aircraft needed to slow down, and noted a significant decrease in speed
- the aircraft tail dragging along the ground, and the pilot calling out for assistance
- the left wing striking the ground and instantly crumpling (Figure 6)
- the aircraft then 'cartwheeled' ending up in the lake
- the water rose quickly in the aircraft when the front door was opened, leaving a very small pocket of air for the rear passengers
- they were rescued by the pilot through the rear door

Passenger three recalled:

- there was no pre-flight safety briefing
- the aircraft struck the ground prior to the runway
- the pilot shouted for assistance as the aircraft "went out of control during the approach"
- the aircraft 'cartwheeled' before arriving in the dam

Meteorological data

The ATSB obtained the Bureau of Meteorology weather report for area 44 covering the time of the accident. Area 44 was in two divisions that day and the southern division, which applied to the area south of Proserpine, including Lakeside Airpark, forecast variable winds of about 10 knots.

Lakeside Airpark landing area

Lakeside Airpark Landing area was identified in Enroute Supplement Australia (ERSA) (28 May 2015 version) as "UNCR" meaning it is both uncertified and unregistered.

As per the requirement for operations at this aerodrome, the pilot sought prior permission to operate there and a briefing on local hazards from the aerodrome operator. This onsite briefing by the aerodrome operator pointed out local hazards such as the power-lines in the vicinity and the preferred protocol of taking-off on runway 04, and landing uphill on runway 22, wind permitting. There was no hazard map available as mentioned in the ERSA.

Advisory material

The Civil Aviation Advisory Publication (CAAP) 89O-1 (2) "*Published aerodrome information and reporting changes (November 2000)* is available on the CASA website. This publication provides advisory material for publishing aerodrome information and reporting changes in respect of both licenced and unlicensed aerodromes that are included in the (ERSA).

Unlicensed aerodromes:

> *Unlicensed aerodromes are not required, under the regulations, to provide aerodrome information to [Aeronautical Information Service] (AIS) or the [Civil Aviation Safety Authority] (CASA) and to have their aerodromes included in ERSA.*
>
> *…unlicensed aerodromes may also be included in ERSA, on request of the aerodrome operators. However, the aerodrome information published will be of limited format, being of a non-operational nature…"*

CASA is conducting a post-implementation review of CASR Part 139 – Aerodromes. As part of this project, this CAAP and other Part 139 CAAPs and ACs will be reviewed. Additionally, CASR Part 175, which regulates the publication of aeronautical information, commenced on 5 March 2015 and the contents of CAAP 89O-1 (2) will be reviewed, to be consistent with this new regulation.

ATSB comment

The ATSB did not undertake an onsite investigation into this accident, but were provided with information through telephone interviews, reports, and detailed photographs.

The ATSB was unable to reconcile the differences evident between the recollections of the pilot and those of the three passengers who provided information.

Safety message

This accident highlights the importance of thorough pre-flight planning and preparation to minimise safety critical decisions in flight.

CASA have an online kit 'CASA Flight Planning Always Thinking Ahead" available from the downloaded from the CASA website.

This tool kit addresses the three levels of flight planning (the straightforward elements, unusual situations and whether to go) and their application over eight stages of flight.

The ATSB research report, *Improving the odds: Trends in fatal and non-fatal accident in private flying operations* (AR-2008-045) is available from the ATSB website.

This report encourages pilots to make decisions before the flight, continually assess the flight conditions, evaluate the effectiveness of their plans, set personal minimums, assess their fitness to fly, and to seek local knowledge (and if necessary a check flight) on the route and / or destination as part of the pre-flight planning process.

Also on the ATSB website, is a copy of the investigation (199804109) into a fatal accident involving another Cherokee Six aircraft (VH-POW). The pilot attempted to conduct a go-around from a degraded performance configuration with full flap extended and a nose-high attitude. The ATSB found that the aircraft's climb performance would have been substantially degraded with this configuration. The aircraft's nose-high attitude during the climb would have obstructed the pilot's forward vision and he may have been unaware that the aircraft had diverged from the extended centreline of the airstrip.

Occurrence details

Date and time:	26 July 2015 – 1550 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Lakeside Airpark, Queensland	
	Latitude: 20°41.10' S	Longitude: 148° 37.50' E

Aircraft details

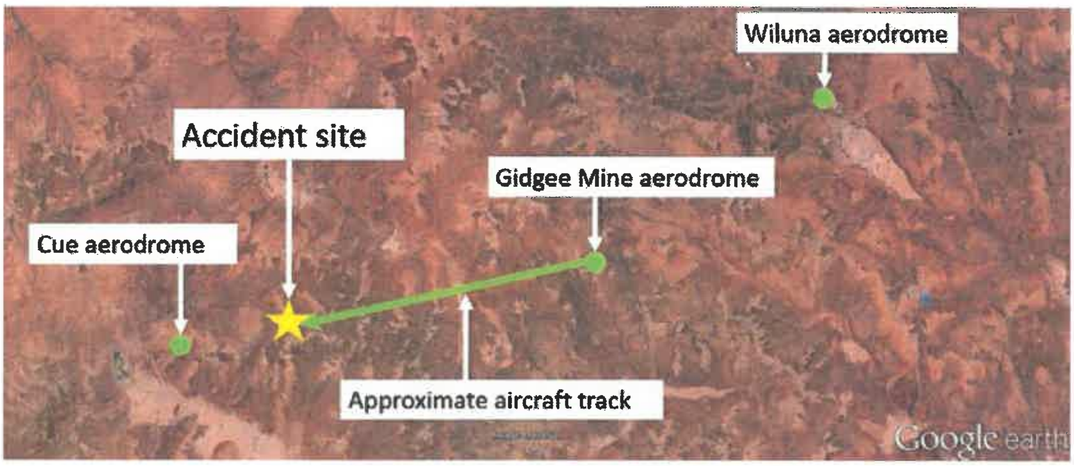
Manufacturer and model:	Piper Aircraft Corporation PA 32-300	
Registration:	VH-BDG	
Serial number:	32-7740092	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Minor	Passengers – 1 serious, 1 minor
Damage:	Substantial	

Engine failure and collision with terrain involving a Cessna 210, VH-ERU

What happened

On 1 August 2015, at about 1110 Western Standard Time (WST), a Cessna 210 aircraft, registered VH-ERU, departed Gidgee Gold mine for a private flight to Cue, Western Australia (Figure 1). The pilot was the sole occupant of the aircraft. The pilot reported that all engine indications were normal from the start and into the cruise at 3,500 ft above mean sea level. The elevation of the terrain in the area was about 1,700 ft above mean sea level.

Figure 1: Aircraft track and accident location



Source: Google earth – annotated by the ATSB

About 25 minutes into the flight, the pilot observed the engine oil temperature rising rapidly. The pilot opened the cowl flaps in an attempt to reduce the engine oil temperature, and noted that the cylinder head temperature and engine oil pressure were still in the normal range. As the pilot tried to determine the cause of the problem, the manifold pressure started to increase. The pilot reduced the throttle to try to decrease the manifold pressure, but it continued to rise.

The pilot then felt a slight vibration in the engine and through the aircraft controls, and broadcast a PAN[1] call on the Melbourne Centre radio frequency. The pilot did not receive any response to the broadcast, probably due to the aircraft's remoteness and low altitude. The aircraft was descending steadily, and the pilot looked for a suitable place to conduct a precautionary landing. However, the surrounding area was heavily treed. After turning towards the north and more open country, the vibration increased, and the pilot broadcast two Mayday[2] calls. Again, the pilot did not receive any response.

When about 500 ft above ground level, the vibration further increased and the engine failed with a bang. Smoke emanated from the engine compartment and over the windscreen, reducing the pilot's visibility through it. The pilot then sighted a fence line to the right and prepared for a forced landing, aiming to touchdown in a cleared area alongside the fence.

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1 An internationally recognised radio call announcing an urgency condition which concerns the safety of an aircraft or its occupants but where the flight crew does not require immediate assistance.

2 Mayday is an internationally recognised radio call for urgent assistance.

The pilot lowered the landing gear and extended the flap. When at about treetop height, the pilot selected the master switch and fuel off. The pilot also tightened the seatbelt and opened the aircraft door. As the pilot flared the aircraft to land, the right wing and strut collided with a tree. The aircraft yawed to the right, and the right main landing gear struck the ground and broke off. Although the pilot applied full left rudder to try to regain control of the aircraft, it collided with another tree and rolled onto its left side, before skidding and coming to rest against a third tree. The pilot suffered minor injuries and the aircraft sustained substantial damage (Figure 2).

The right fuel line ruptured during the impact sequence, causing fuel to run down into the cabin and onto the pilot. The pilot quickly exited the aircraft, concerned about the risk of fire, particularly as there was about 240 L of fuel in the tanks.

After waiting about half an hour for the fuel to stop running into the cockpit, the pilot returned to the aircraft and selected the master switch on. The pilot then made another radio broadcast requesting assistance, and again did not receive any response. The aircraft's emergency locator transmitter (ELT)[3] did not activate on impact, and its light had not illuminated. The pilot then tried, without success, to use the aircraft battery to power the ELT.

At about 1400, the pilot again made radio broadcasts without any response. As there was no mobile phone signal at the accident site, the pilot started walking towards higher terrain. At about 2200, after walking 25 km, the pilot gained mobile phone coverage and was able to call for assistance. After making the call, the pilot lit a fire to provide warmth and to deter a pack of wild dogs that had been circling. At about 0200 on 2 August, low cloud rolled in and it started to drizzle. About an hour later, the pilot provided rescue personnel with the coordinates of the location, obtained from the mobile phone. At about 0730, a rescue aircraft located the pilot and police arrived about 40 minutes later.

Figure 2: Accident site showing damage to VH-ERU

Source: Western Australia Police

3 Crash-activated radio beacon that transmits an emergency signal that may include the position of a crashed aircraft. Also able to be manually activated.

Pilot comments

The pilot provided the following comments:

- The number three cylinder failed and blew a hole in the top of the engine casing.
- The pilot usually carried a satellite phone, but did not have it on this flight as it was being serviced.
- It was about a 40-minute flight to Cue, and the pilot would normally have advised someone of the planned route and expected arrival time, but omitted to do so on this day.
- The pilot had water, a first aid kit and a lighter in the aircraft, and planned to get a personal location beacon to carry in future.

Aircraft engine

The aircraft was fitted with a Continental IO-520 engine. The pilot had owned the aircraft for about 4 years, during which time the aircraft had accrued about 60 hours of flying time. Shortly after the pilot bought the aircraft, the number three cylinder had failed and been replaced. The pilot had recently replaced the propeller in accordance with an airworthiness directive.

The aircraft was damaged beyond repair. At the time of completing this report, no engineering inspection of the engine had been, or was expected to be, conducted following the accident.

Safety message

The ATSB reminds all pilots to let someone know where they are going, and what time they expect to arrive, before embarking on a flight. Although the incident flight was not in a designated remote area, it demonstrates that it is vitally important to carry emergency supplies, such as water, food, matches (or lighter), and first aid essentials. Where mobile and radio coverage is not available, a satellite phone can provide life-saving access to help.

Electronic locator transmitters installed in aircraft should be tested in accordance with the manufacturer's instructions. The ATSB research report AR-2012-128 found that ELTs function as intended in about 40-60% of accidents. NASA is currently conducting research to find ways to make ELTs more likely to function after a survivable crash.

General details

Occurrence details

Date and time:	1 August 2015 – 1140 WST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	035° M 77 km Mount Magnet Aerodrome, Western Australia	
	Latitude: 27° 32.93' S	Longitude: 118° 17.60' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210E	
Registration:	VH-ERU	
Serial number:	21058520	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 Minor	Passengers – Nil
Damage:	Substantial	

Collision with terrain involving a Grumman G164, VH-LKN

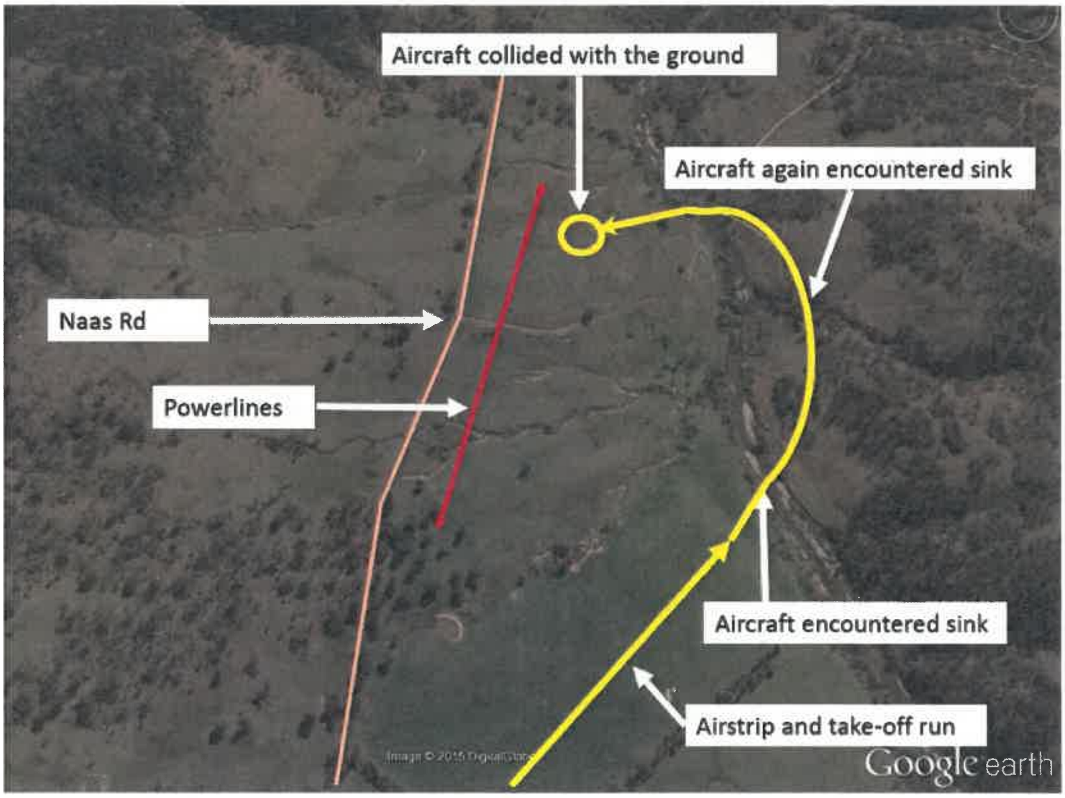
What happened

On 6 August 2015, the pilot of a Grumman G164 aircraft, registered VH-LKN, was conducting aerial spreading of superphosphate on a property about 33 km south-west of Tharwa, Australian Capital Territory. The target zone for the spreading was about 7 km to the south-east, and at an elevation about 1,000 ft higher than the airstrip and loading site.

The pilot commenced operations at about 1000 Eastern Standard Time (EST) and completed spreading of six loads of superphosphate. The pilot then had a lunch break and refuelled the aircraft to a total of about 180 L of fuel. The aircraft was also loaded with about 500 kg of superphosphate, which was about half its carrying capacity. The pilot observed a light, westerly wind of about 2 to 5 kt in the vicinity of the airstrip.

At about 1400, the pilot commenced the take-off run for the seventh load of the day. As the aircraft became airborne, the aircraft started to sink (Figure 1). To stop the aircraft sinking, the pilot applied the dump lever to start dumping the load of superphosphate. The aircraft then started to climb, so the pilot stopped dumping the load. The pilot also commenced a shallow left turn, away from rising terrain. As the aircraft turned, when at about 100 ft above ground level, it started to sink again. As it sank, the pilot felt a shake through the airframe, indicating that the aircraft was close to stalling. The pilot re-applied the dump lever to open the hopper door and try to reduce the aircraft load. Simultaneously, the pilot lowered the aircraft's nose and rolled the wings level, to try to recover from the incipient stall.

Figure 1: Departure airstrip, aircraft track and accident location



Source: Google earth and pilot recollection – annotated by the ATSB

The pilot sighted powerlines, a road and a row of trees ahead, beyond which the terrain rose steeply. The aircraft continued to descend and the pilot maintained the aircraft in a normal nose attitude for landing. As the aircraft neared the ground, the pilot reduced the throttle to idle and held the aircraft control stick in the full back position. The tailwheel struck the ground first, and then the right main landing gear dug into soft ground. The aircraft flipped over and came to rest inverted.

The pilot sustained minor injuries and the aircraft was substantially damaged (Figure 2).

Figure 2: Damage to VH-LKN

Source: Pilot

Pilot comments

The pilot provided the following comments:

- The airstrip was at an elevation of about 2,100 ft above mean sea level. The target pasture was about 1,000 ft higher than the airstrip.
- The airstrip was about 500 m in length and the fuel and chemical load was relatively light. The aircraft was well within its operational limitations.
- The weather forecast had indicated calm conditions, and the temperature was about 14°C.
- The sink that the aircraft encountered may have been a downdraft coming off the hill.
- If the airstrip had been higher up and closer to the target zone, the pilot would have had more time to dump the load, less distance to climb on each load, and a more accurate assessment of the wind conditions.
- Dumping liquid takes a few seconds, but granular substances like superphosphate take minutes for the hopper to empty when dumping the load.
- After the accident, the pilot verified that the hopper door was open, and superphosphate was present in the paddock, indicating that it had been dumping at the highest rate. Despite that, about 300 kg of superphosphate remained in the hopper.

Safety message

The pilot stated that the key to avoiding similar incidents was to understand the atmospheric conditions in steep mountainous country. Variations in wind strength and direction due to terrain can have serious consequences on flight safety, particularly when operating at low airspeeds and close to the ground.

ATSB investigated a similar accident involving a Grumman G-164A, in AO-2014-001.

General details

Occurrence details

Date and time:	6 August 2015 – 1400 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	33 km SW of Tharwa, Australian Capital Territory	
	Latitude: 35° 33.30' S	Longitude: 148° 59.68' E

Aircraft details

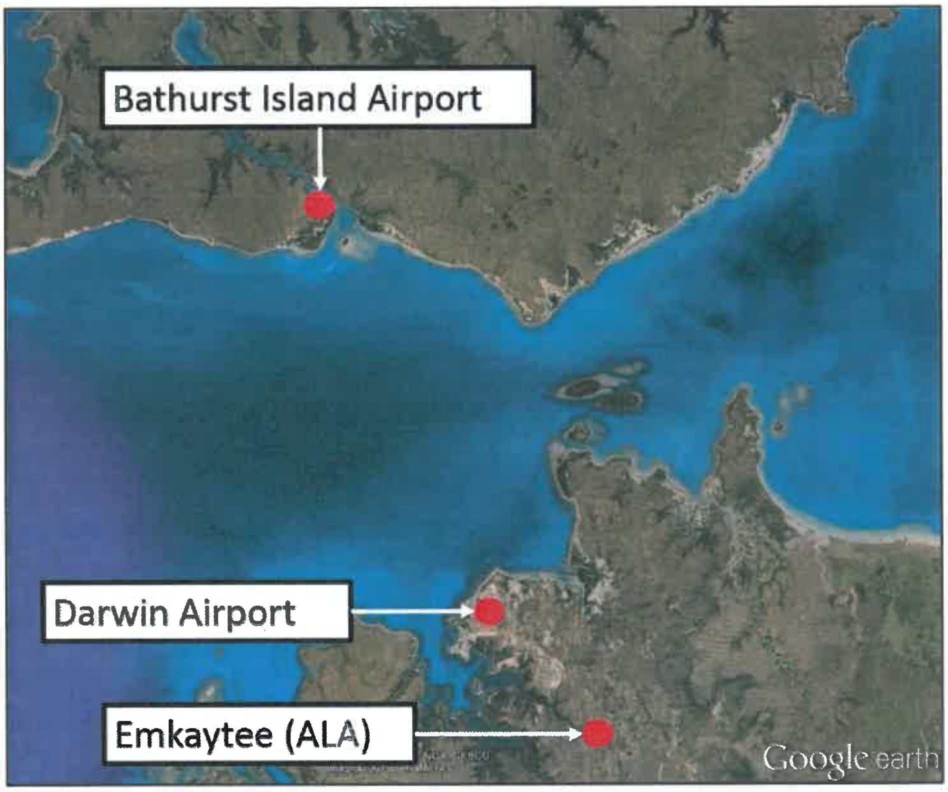
Manufacturer and model:	Grumman American Aviation Corporation G-164B	
Registration:	VH-LKN	
Serial number:	10B	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 (Minor)	Passengers – Nil
Damage:	Substantial	

Separation issue involving a Cessna 404, VH-ANM, and a Cessna 172, VH-MJK

What happened

On 15 August 2015, the student pilot of a Cessna 172 aircraft, registered VH-MJK (MJK) conducted a solo flight from Emkaytee aeroplane landing area (ALA) to Bathurst Island Airport, Northern Territory (Figure 1). There the student pilot completed touch-and-go circuits for about 30 minutes on runway 15.

Figure 1: Image showing Bathurst Island, Darwin and Emkaytee airports



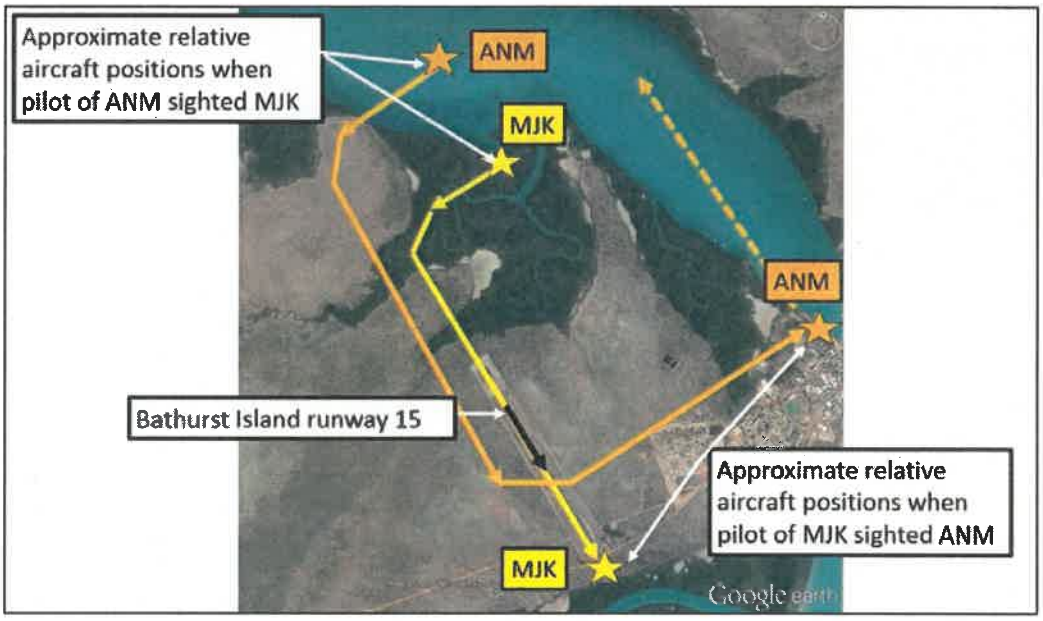
Source: Google earth – annotated by the ATSB

At about 1210 Central Standard Time (CST), a Cessna 404 aircraft, registered VH-ANM (ANM) and operated by Hardy Aviation, departed from Darwin Airport, Northern Territory, on a scheduled flight to Bathurst Island, with a pilot and five passengers on board. The pilot broadcast when inbound and about 15 NM from Bathurst Island Airport on the common traffic advisory frequency (CTAF) of 126.5 MHz, and did not receive any response. At about 1220, the aircraft joined on the downwind leg of the circuit for runway 15 at 1,000 ft above ground level and broadcast joining the circuit. As the aircraft turned onto base, the pilot sighted MJK also on base, at the same height, closer to the runway and estimated it was about 150 m away (Figure 2).

The pilot of ANM immediately manoeuvred the aircraft to the west to increase separation between the two aircraft. After unsuccessfully trying to contact the pilot of MJK on the CTAF, the pilot of ANM briefly selected frequency 126.7 MHz to try to communicate with the pilot of MJK, but again did not receive a response. The pilot of ANM observed MJK conduct a touch-and-go, and kept that aircraft in sight, while overflying and re-joining the circuit on the crosswind leg.

After the touch-and-go, when upwind of the runway at about 500 ft above ground level, the pilot of MJK sighted ANM. ANM was then to the left, above MJK at 1,000 ft, and turning onto the downwind leg. The pilot of MJK then saw that the radio was selected to frequency 126.6 MHz. The pilot checked their flight plan, noted that the correct frequency was 126.5, and immediately changed the radio to that frequency. The pilot of MJK then broadcast a departure call on the CTAF. The pilot of ANM then contacted the pilot of MJK, who advised that the radio had been on the wrong frequency.

Figure 2: Bathurst Island Airport showing approximate aircraft tracks and relative positions

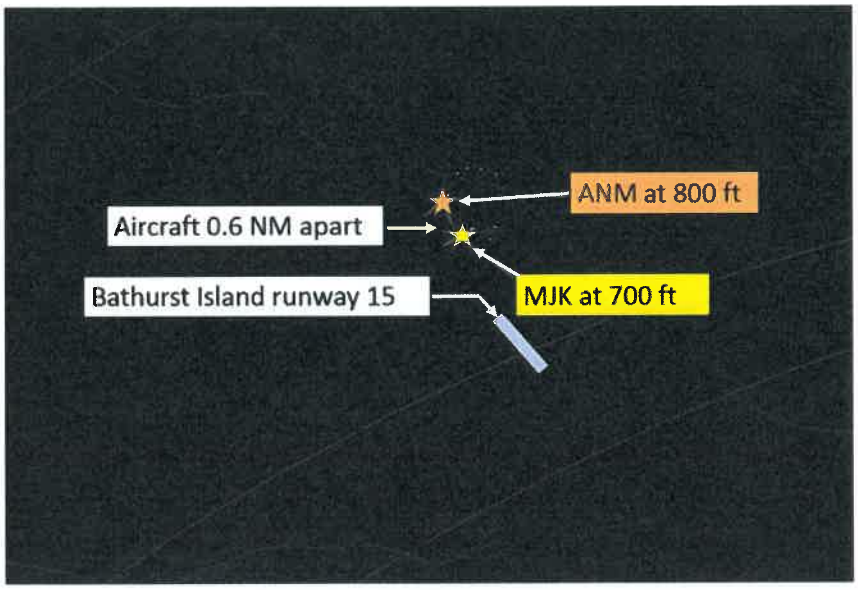


Source: Google earth – annotated by the ATSB

The pilot of ANM continued the approach, and landed at Bathurst Island, and MJK returned to Emkaytee without further incident.

The radar data provided to the ATSB by Darwin air traffic control, indicated the aircraft came within about 100 ft vertically and 0.6 NM at the closest proximity (Figure 3).

Figure 3: Radar display showing relative aircraft positions



Source: Department of Defence – annotated by the ATSB

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Operator of VH-ANM

As a result of this occurrence, the operator of VH-ANM advised the ATSB that they have taken following safety action:

Notice to company pilots

The Chief Pilot distributed a notice to all company pilots advising them of the incident. The notice stated that the Tiwi Islands continue to be a hot spot for traffic, and reminded pilots to be 'doubly aware' when operating in the area.

Safety message

The pilot of MJK commented that there were three important learnings from this incident:

- crosscheck the selected frequency against the flight planning notes
- ensure the selector reaches the detent when selecting a radio frequency
- listen for the 'beep-back' response from the CTAF to verify the correct frequency has been selected.

An aerodrome frequency response unit (AFRU) identifies correct radio frequency selection at non-towered aerodromes. The AFRU automatically responds to a transmission on the CTAF either with a pre-recorded voice message, if no transmission has been received in the previous five minutes, or with a beep-back.

Insufficient communication between pilots operating in the same area is the most common cause of safety incidents near non-towered aerodromes. The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is safety around non-towered aerodromes.

The booklet *A pilot's guide to staying safe in the vicinity of non-controlled aerodromes* outlines many of the common problems that occur at non-towered aerodromes, and offers useful strategies to keep yourself and other pilots safe.

General details

Occurrence details

Date and time:	15 August 2015 – 1220 CST	
Occurrence category:	Incident	
Primary occurrence type:	Separation issue	
Location:	Bathurst Island Airport, Northern Territory	
	Latitude: 11° 46.15' S	Longitude: 130° 37.18' E

Aircraft details: VH-ANM

Manufacturer and model:	Cessna Aircraft Company 404	
Registration:	VH-ANM	
Operator:	Hardy Aviation	
Serial number:	4040010	
Type of operation:	Air transport low capacity - Passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft details: VH-MJK

Manufacturer and model:	Cessna Aircraft Company 172N	
Registration:	VH-MJK	
Serial number:	17268245	
Type of operation:	Flying training – solo	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Helicopters

Engine failure involving an Enstrom 280, VH-YHD

What happened

On 28 February 2015, at about 1232 Eastern Standard Time (EST), an Enstrom 280 helicopter, registered VH-YHD (YHD), departed from Caloundra Airport, for a flight to Redcliffe Airport, Queensland, with the pilot, who was the only person on board.

After about half an hour, the pilot commenced a descent from 1,500 ft above ground level (AGL). The pilot then broadcast on the Redcliffe common traffic advisory frequency (CTAF) that YHD would join the Redcliffe circuit in about 6 minutes and navigated along the coastline toward Redcliffe.

At about 1,000 ft AGL, the pilot heard a bang and the engine stopped. This caused the helicopter to yaw to the left violently. The pilot then attempted to restart the engine but was unsuccessful. At about 800 ft AGL, the helicopter entered autorotation[1] and the pilot prepared to land on the beach. The pilot observed people swimming in the sea and manoeuvred the helicopter to an area where there were no people. The pilot arrested the descent and the skids contacted the sand. The helicopter continued to move forward along the sand, and then a few seconds later the helicopter blades impacted the sand, and the helicopter rolled over. The pilot received minor injuries and the helicopter was destroyed (Figure 1).

Figure 1: Accident site showing the damage to VH-YHD

Source: Queensland police

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1 Autorotation is a condition of descending flight where, following engine failure or deliberate disengagement, the rotor blades are driven solely by aerodynamic forces resulting from rate of descent airflow through the rotor. The rate of descent is determined mainly by airspeed.

Witness

A witness to the accident reported that the helicopter was first sighted at about 100 m above the ground, descending and approaching from the north. The only noise was from the rotor blades, with no engine sound. The witness reported that the wind was quite strong coming from the east. A stronger easterly gust came when the helicopter was close to the ground. The helicopter landed and continued to move forward, but then flipped upside down and the rotor blades contacted the sand. The helicopter came to rest about 150 m from where the witness was located. A passer-by assisted the pilot to exit the helicopter.

Pilot comment

The pilot provided the following comments:

- This was the first flight after the completion of the periodic (100 hourly or 12-month) maintenance inspection.
- The helicopter operated normally during the engine run-up checks and the flight, up to the engine failure.
- The pilot commented not to delay in lowering the collective[2] and setting the airspeed as everything happened very quickly after the engine failed and the pilot instinctively conducted an autorotation.
- The landing was smooth with no bump.
- The weather was fine with a slight breeze from the north-east and the wind speed at Caloundra was about 10 kt.
- Rather than fly direct to Redcliff airport the pilot had selected to fly along the shoreline. If YHD had flown direct to Redcliff then the engine may have failed over Deception Bay and YHD may have landed in the water.
- The pilot stated that the number of flight hours experience on the helicopter type was about 60, with about eight flight hours on the type in the 90 days prior.

Helicopter maintenance

The helicopter engine was overhauled and installed in YHD in April 2006. At the time of the accident, the engine had completed about 146 hours since overhaul. The periodic (100 hourly or 12-month) maintenance inspection included overhaul of the engine magneto.

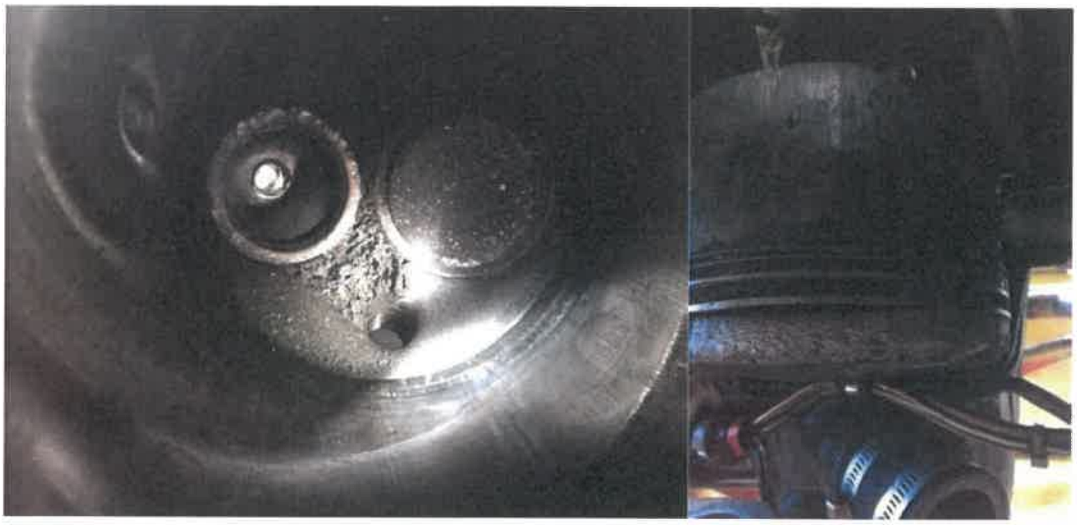
Maintenance organisation investigation

The maintenance organisation inspected the engine externally and removed the number three cylinder. They determined that the damage found to the number three cylinder and piston (Figure 2) was consistent with detonation. Extreme heat from uncontrolled burning of the combustion gases resulted in melting of the cylinder between the spark plug hole and the exhaust valve seat. This melting damaged the piston to an extent that the combustion gases would blow past the piston rings. The maintenance organisation did not remove the other cylinders.

The maintenance organisation also removed the engine magneto and fuel control unit. Both units were examined at a component overhaul facility. The examination of the magneto found no defects. The examination of the fuel control unit found that it was functioning normally and was set to a lean position, although this position could not be validated due to disruption during the accident.

2 Collective is the primary helicopter flight control that simultaneously affects the pitch of all blades of the lifting rotor. Collective input is the main control for vertical velocity.

Figure 2: Damage to number three cylinder and piston



Source: Aircraft maintenance organisation

ATSB comment

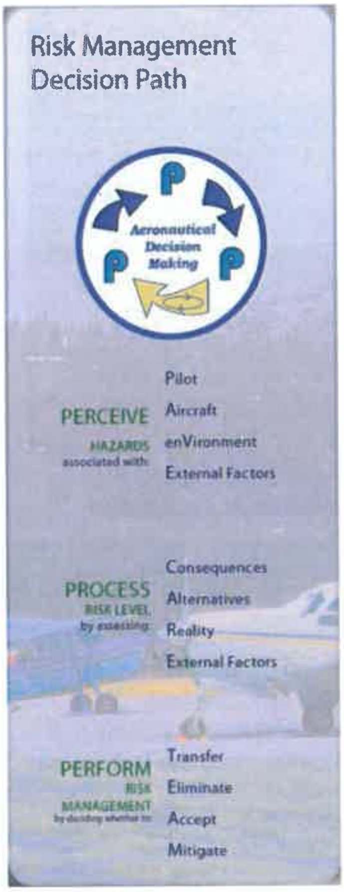
In 2007, the ATSB published an aviation safety research and analysis report, *Aircraft Reciprocating-Engine Failure An Analysis of Failure in a Complex Engineered System B2007/0191*. The safety study discussed detonation in more detail including the examination of the factors that contribute to detonation free - operation (normal combustion) and the factors that contribute to detonation.

Safety message

When planning a particular flight it is important for pilots to consider options and risk. In this accident, the pilot opted to follow the coastline, allowing for the option to land on the beach. The pilot in the pre-flight planning identified the hazard (flying over water) and although the likelihood of an engine failure was low, the consequences were high and made the decision to follow the coastline to mitigate the risk. If the pilot had selected the option to fly the most direct path then the engine would have failed over the water.

The US Federal Aviation Administration (FAA) has published information on risk management in a *Risk Management Handbook (FAA-H-8083-2)*. They have also published a guide *Tips for Teaching Practical Risk Management and Practical Risk Management for local VFR Flying*. The guide contains the Perceive-Process-Perform model that offers a structured way to manage risk for local visual flight rules flying (Figure 3).

Figure 3: Risk Management Decision Path: Perceive-Process-Perform



Source: US Federal Aviation Administration

General details

Occurrence details

Date and time:	28 February 2015 – 1305 EST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	5 km north-west of Redcliffe Airport, Queensland	
	Latitude: 27° 10.85' S	Longitude: 153° 01.78' E

Helicopter details

Manufacturer and model:	Enstrom 280	
Registration:	VH-YHD	
Serial number:	1187	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – Minor	Passengers – Nil
Damage:	Destroyed	

Windscreen fogging and collision with terrain involving a Robinson R22, VH-RBT

What happened

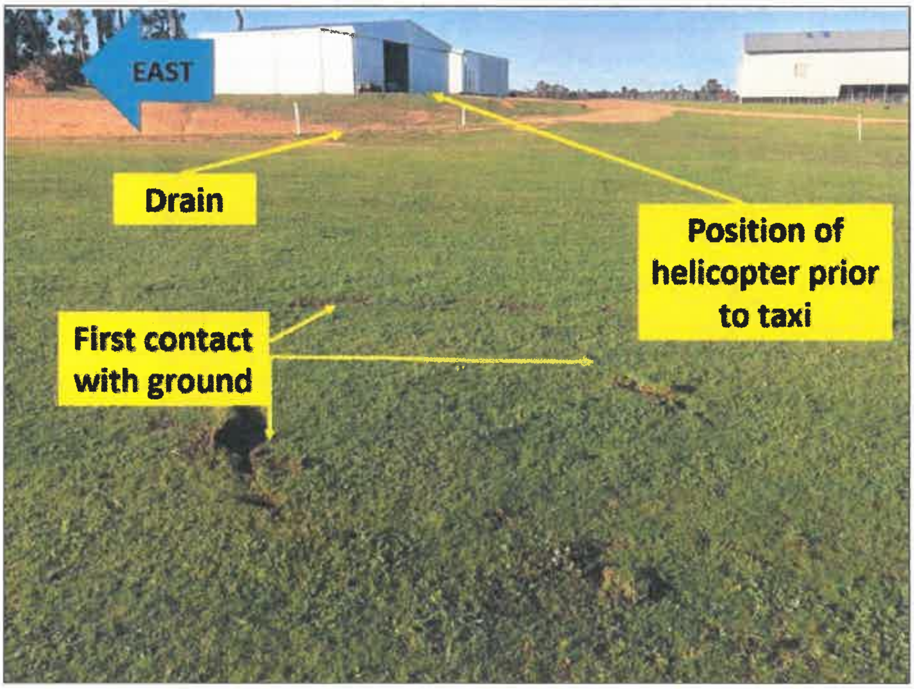
Early on the morning of 23 June 2015, the pilot pulled the Robinson R22 helicopter registered VH-RBT from the hangar on a property about 6 NM east of Boyup Brook aeroplane landing area (ALA), and prepared for a private flight with one passenger to Jandakot, Western Australia.

Prior to commencing the flight, the pilot re-checked the area meteorological forecast (ARFOR). The ARFOR indicated the probability of low cloud with fog, west of Boyup Brook ALA. The pilot reported that it was a cold and clear morning, with calm conditions. Although there was fog in a gully, about 200-300 m down the slope from the hangar, the general area and intended flight path were completely clear (Figure 1).

At about 0650 Western Standard Time (WST), the pilot started the helicopter engine and allowed the engine to warm up. The pilot then completed final preparations for departure while waiting for first light[1]

At about 0700, just after first light, the pilot reported that the horizon and the outline of the buildings and trees were clearly visible. After broadcasting intentions on the radio, the pilot established the helicopter into a hover about 2-3ft above the ground.

Figure 1: Marks where the helicopter tail and skid struck the ground. The drain the pilot planned to clear prior to transitioning to forward flight and hangar are in the background



Source: Pilot

[1] First light is when the centre of the sun is at an angle of 6° below the horizon before sunrise. At this time, the horizon is clearly defined but the brightest stars are still visible under clear atmospheric conditions.

After completing a power check, the pilot conducted a pedal turn to the east. The pilot intended to gain some height prior to transitioning the helicopter into forward flight, in order to clear the hangar and drain areas.

Due to the down-sloping terrain, the helicopter was about 15ft above the ground soon after lift-off. As the pilot began to raise the collective[2] and with their attention momentarily inside the cockpit, the passenger alerted them to the almost instantaneous external fogging of the windscreen. The pilot was briefly able to see the ground through the side window, before that also became shrouded in condensation. The pilot described this instant lack of external reference, as like being in a 'white room'. In an attempt to keep some necessary visual reference, the pilot reached down and flipped open the small vent located in the right door. Although a snapshot of ground was visible, it was insufficient to pinpoint the helicopter's actual position.

Now about 30-40 ft above the ground, the pilot elected to put the helicopter back on the ground. Manoeuvring slightly left to avoid the assumed position of the drain, the pilot unexpectedly felt the tail and rear skids of the helicopter strike the ground. The pilot stated this was a heavy collision, and resulted in the helicopter bouncing back into the air. The pilot applied some collective and the helicopter bounced again then yawed rapidly to the right. The pilot applied full left pedal in an attempt to prevent the helicopter from entering a spin, however the yaw continued, so the pilot rapidly reduced the throttle to idle. As the yaw decreased, the helicopter fell onto its left side (Figure 2).

Figure 2: VH-RBT at rest on the left side. Note the broken tail boom and rotor blades

Source: Pilot

Although hanging in the seatbelt, the pilot reached forward and shut off the mixture control and master switch. The pilot then egressed and assisted the passenger to undo their seatbelt and safely egress. Ground assistance arrived shortly after. The pilot reported that the fog was no longer on the windscreen.

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2 A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

The pilot was uninjured; however the passenger sustained minor injuries. The helicopter was substantially damaged.

Pilot experience and comments

The pilot had a total of about 915 helicopter and fixed wing hours, with about 756 of these on Robinson 22 helicopters.

The pilot commented that:

- the frost on the ground and the cold moist air above may have been mixed by the movement of the helicopter blades and caused the windscreen fogging
- when the windscreen fogged, the pilot thought that the helicopter had been moving forward, however when the helicopter tail struck the ground, the pilot realised that the lack of visual reference had led to a loss of situational awareness. The helicopter had in fact been moving backwards
- in hindsight, although the take-off was attempted immediately after first light, it may have been more prudent to delay the departure until the sun was properly up. This would have allowed a better natural horizon and a slight increase in temperature

Helicopter information

The helicopter had all the fittings and wiring to have a heater,[3] however the operator had removed the heater at the start of summer, and it had not been re-installed.

The pilot advised that there was a fresh air vent at the front of the windscreen, which ran up on the inside of the windscreen. It was their practice to keep this open, although the pilot could not be sure that is was open on the accident flight. The vents fitted to each door were initially closed.

Pilot operating handbook

The Robinson Helicopter Company Safety Notice SN-18 R Issued: January 85 and revised in February 1989 and June 1994 states:

> *LOSS OF VISIBILITY CAN BE FATAL*
>
> *Flying a helicopter in obscured visibility due to fog, snow, low ceiling, or even a dark night can be fatal. Helicopters have less inherent stability and much faster roll and pitch rates that airplanes. Loss of the pilot's outside visual references, even for a moment, can result in disorientation, wrong control inputs, and an uncontrolled crash. This type of situation is likely to occur when a pilot attempts to fly through a partially obscured area and realizes too late that he is losing visibility. He loses control of the helicopter when he attempts to turn to regain visibility but is unable to complete the turn without visual references…..*

ATSB comment

A cold windshield that is exposed to slightly warmer or moist air can 'fog up'. It is likely that the helicopter moved between different temperature layers as it moved forward and up, and this may have led to a combination of temperatures suitable to allow fog.

The use of heaters, demisters (if fitted) and air vents should always be operated as per the manufacturer's recommendations.

[3] The heater warms the air in the cabin and thus the windscreen

General details

Occurrence details

Date and time:	23 June 2015 – 0700 WST	
Occurrence category:	Accident	
Primary occurrence type:	Weather - other	
Location:	11 km east of Boyup Brook ALA, (Longridge Farm), Western Australia	
	Latitude: 33° 54.03' S	Longitude: 116° 19.80'

Aircraft details

Manufacturer and model:	Robinson Helicopter Company R22 BETA	
Registration:	VH-RBT	
Serial number:	1980	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passenger –Minor
Damage:	Substantial	

Loss of control involving a Bell 206L3, VH-BLV

What happened

On 20 July 2015, the pilot of a Bell 206L3 (Longranger) helicopter, registered VH-BLV (BLV), conducted a charter flight from Essendon Airport to Falls Creek, Victoria, with five passengers on board. The aircraft took off from Essendon close to its maximum take-off weight. Due to the weight, and therefore fuel limitations, the pilot landed and refuelled at a property near Lake Eildon. At about 1000 Eastern Standard Time (EST), the helicopter departed from the property for the 60 NM flight to Falls Creek, again close to its maximum take-off weight.

At about 1030, while 700 ft above ground level and tracking from the north-west, the pilot conducted a shallow approach towards the helipad at Falls Creek (Figure 1). As the helicopter descended to about 50 ft above ground level, the pilot found that significantly more power was required to conduct the approach than anticipated. The pilot assessed that there was insufficient power available to continue to land, and elected to abort the approach. The pilot pushed forwards on the cyclic[1] to increase the helicopter's airspeed and conducted a left turn towards the valley.

Figure 1: Falls Creek helipad, approximate helicopter track and wind direction

Source: Google earth and pilot recollection – annotated by the ATSB

As the helicopter turned left, it started to yaw[2] rapidly towards the right. The pilot applied full left pedal to counteract the yaw, but the helicopter continued to yaw. The helicopter turned through one and a half revolutions, as the pilot lowered the collective.[3] Lowering the collective reduced the

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[1] A primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc varying the attitude of the helicopter and hence the lateral direction.

[2] Term used to describe motion of an aircraft about its vertical or normal axis.

[3] A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

power demand of the power rotor system, thereby increasing the ability of the anti-torque pedals to stop the right yaw. The combination of lowering collective and applying forward cyclic to gain forward airspeed, allowed the pilot to regain control of the helicopter. The pilot then conducted a left turn towards the helipad and made an approach to the helipad from an easterly direction. The helicopter landed following the second approach without further incident.

The pilot and passengers did not sustain any injuries and the helicopter was undamaged.

Weather

The pilot expected that the wind at Falls Creek would be variable at 2 kt, as it had been on departure from Essendon. The pilot did not see the windsock at the helipad prior to conducting the approach.

The Bureau of Meteorology provided the ATSB with a report of weather observations for Falls Creek. The automatic weather station is located south of the helipad at about 5,790 ft above mean sea level, above the village. Between 1020 and 1040, the recorded wind speed was from 17 to 20 kt, gusting to 24 kt, and wind direction was from 327° to 344° (degrees true), or 314° to 331° (degrees magnetic). The temperature was -1 °C.

Pilot comments

The pilot reported that the following combination of factors contributed to the incident:

- Unfamiliarity with the landing site and area.
- Inexperience operating at altitude, and unfamiliarity with the associated power requirements. The helipad at Falls Creek is at an elevation of about 5,000 ft above mean sea level.
- Lack of experience in the aircraft type – although the pilot had about 60 hours experience in the Bell Jetranger, this was only the pilot's second flight in the Longranger.
- High all up weight.
- Incorrect assessment of the wind direction – the pilot assumed that the wind would be light and variable at Falls Creek as it was had been on departure from Essendon. During the approach, the pilot assessed that the wind was from the right or a tailwind gusting to about 15 kt.

Operator comment

The operator of VH-BLV assessed that the unanticipated yaw was a result of too little pedal input, applied too late. This was most likely due to a combination of the pilot's inexperience on the 206L3, and being surprised by the downwind approach.

Hover ceiling

Hovering requires more power than any other flight regime. Additionally, hovering at higher altitudes requires more power than to hover at lower altitudes. The 'hover ceiling' is the height at which the power available equals the power required to hover. An increase in power increases the main rotor torque. This additional torque needs increased tail rotor thrust, to prevent the helicopter from yawing.

The Bell 206 L3 flight manual provides a *Hover ceiling – out of ground effect*[4] chart. At 5,000 ft, a temperature of 0 °C, and a gross weight of about 1,814 kg (4,000 lb), the helicopter was just within the chart's hover ceiling envelope. This indicates that adequate power should have been available to hover with those parameters. However, the wind direction and velocity also affect hovering performance.

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4 Helicopters require more power to hover out of ground effect due to the absence of a cushioning effect created by the main rotor downwash striking the ground. The distance is usually defined as more than one main rotor diameter above the surface.

A stronger head wind reduces the power required to hover, while a tailwind increases the power required to hover. On the initial approach to the helipad, a tailwind meant that an increase in power and tail rotor thrust was required. The increased tail rotor thrust absorbs power from the engine, which means less power is available for the main rotor to produce lift. This led to the pilot's assessment of insufficient power available, and decision to discontinue the approach.

Unanticipated right yaw

The US Federal Aviation Administration (FAA) Helicopter flying handbook describes loss of tail rotor effectiveness (LTE) or an unanticipated yaw, as 'an uncommanded, rapid yaw towards the advancing blade which does not subside of its own accord'. It is caused by an interaction between the main rotor and tail rotor.

At high altitudes, the lower air density reduces tail rotor thrust and efficiency. Therefore, when operating at high altitudes and high gross weights, particularly while hovering or at low airspeeds, the tail rotor thrust may not be sufficient to maintain directional control. This can result in unanticipated yaw or LTE. In these circumstances, the hover ceiling is effectively limited by the tail rotor thrust, rather than the power available.

In this incident, other factors may also have contributed to the unanticipated yaw: low and slow flight outside of ground effect, a low speed downwind turn and a large change of power at low airspeed as the pilot aborted the approach.

The US Federal Aviation Administration Advisory Circular, *Unanticipated right yaw in helicopters*, stated that unanticipated right yaw, or loss of tail rotor effectiveness (LTE) has been determined to be a contributing factor in a number of accidents. These mishaps have occurred at low altitude and in low-speed flight, often on final approach to landing. Unanticipated right yaw may occur during any manoeuvre in which the pilot is operating in a high-power, low-airspeed environment with a left crosswind (in aircraft with counter-clockwise blade rotation) or tailwind.

Three additional factors can significantly influence the severity of LTE:

- gross weight and density altitude
- low indicated airspeed
- a rapid application of power, causing power droop.

In order to reduce the onset of LTE, when manoeuvring between hover and 30 kt, the pilot should:

- Avoid tailwinds.
- Avoid out of ground effect hover and high power demand situations, such as low-speed downwind turns.
- Be aware of wind direction and velocity. A loss of translational lift results in an unexpected high power demand and an increased anti-torque requirement.
- Be aware that if a considerable amount of left pedal is being maintained, a sufficient amount of left pedal may not be available to counteract an unanticipated right yaw.
- Stay vigilant to power and wind conditions.

If a sudden unanticipated right yaw occurs, the pilot should:

- apply full left pedal
- simultaneously move cyclic forward to increase speed
- if altitude permits, reduce power.

Safety message

Pilots should understand and avoid conditions that are conducive to uncontrolled yaw or loss of tail rotor effectiveness. Pilots can reduce their exposure to LTE by maintaining awareness of the wind and its effect on the helicopter. If a pilot encounters unanticipated yaw, quick application of the correct response is essential to recover control of the helicopter. The ATSB reported on an incident involving LTE in AO-2013-121.

This incident also highlights the effect of gross weight and airfield elevation on aircraft performance. Understanding controllability issues at the limits of the normal operating envelope can assist pilots in recognising the symptoms of reduced aircraft performance. Further information is available in ATSB report AO-2013-203.

General details

Occurrence details

Date and time:	20 July 2015 – 1030 EST	
Occurrence category:	Serious Incident	
Primary occurrence type:	Loss of control	
Location:	Falls Creek, Victoria	
	Latitude: 36° 52.00' S	Longitude: 147° 17.00' E

Helicopter details

Manufacturer and model:	Bell Helicopter Company 206L3	
Registration:	VH-BLV	
Serial number:	51582	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this Bulletin

The ATSB receives around 15,000 notifications of Aviation occurrences each year, 8,000 of which are accidents, serious incidents and incidents. It also receives a lesser number of similar occurrences in the Rail and Marine transport sectors. It is from the information provided in these notifications that the ATSB makes a decision on whether or not to investigate. While some further information is sought in some cases to assist in making those decisions, resource constraints dictate that a significant amount of professional judgement is needed to be exercised.

There are times when more detailed information about the circumstances of the occurrence allows the ATSB to make a more informed decision both about whether to investigate at all and, if so, what necessary resources are required (investigation level). In addition, further publically available information on accidents and serious incidents increases safety awareness in the industry and enables improved research activities and analysis of safety trends, leading to more targeted safety education.

The Short Investigation Team gathers additional factual information on aviation accidents and serious incidents (with the exception of 'high risk operations), and similar Rail and Marine occurrences, where the initial decision has been not to commence a 'full' (level 1 to 4) investigation.

The primary objective of the team is to undertake limited-scope, fact gathering investigations, which result in a short summary report. The summary report is a compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence.

These reports are released publically. In the aviation transport context, the reports are released periodically in a Bulletin format.

Conducting these Short investigations has a number of benefits:

- Publication of the circumstances surrounding a larger number of occurrences enables greater industry awareness of potential safety issues and possible safety action.
- The additional information gathered results in a richer source of information for research and statistical analysis purposes that can be used both by ATSB research staff as well as other stakeholders, including the portfolio agencies and research institutions.
- Reviewing the additional information serves as a screening process to allow decisions to be made about whether a full investigation is warranted. This addresses the issue of 'not knowing what we don't know' and ensures that the ATSB does not miss opportunities to identify safety issues and facilitate safety action.
- In cases where the initial decision was to conduct a full investigation, but which, after the preliminary evidence collection and review phase, later suggested that further resources are not warranted, the investigation may be finalised with a short factual report.
- It assists Australia to more fully comply with its obligations under ICAO Annex 13 to investigate all aviation accidents and serious incidents.
- Publicises ***Safety Messages*** aimed at improving awareness of issues and good safety practices to both the transport industries and the travelling public.

Australian Transport Safety Bureau

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Investigation

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Aviation Short Investigations
Aviation Short Investigations Bulletin Issue 44
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