DR400/140B

PARTS & SERVICES

PILOT'S OPERATING HANDBOOK
and
APPROVED FLIGHT MANUAL

FLIGHT MANUAL

CE PR

PARTS & SERVICES

DR400/140B

S/N 2090
2650
S/N ≥ 2669 except 2704 & 2705
S/N < 2669 transformed by DET150102

Document n° 1002873

FLIGHT MANUAL

For the

DR400/140B

S/N 2090
2650
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S/N < 2669 transformed by DET150102

Type Certificate n° EASA.A367

Series N°.....**2726**

Registration N°.....**HB-KOJ**

Approval

EASA
MINOR CHANGE APPROVAL
10067679
29 NOVEMBER 2018

This manual includes information that the certification requirements require to be provided to the pilot.
This aircraft must be operated within the operating limits specified in this flight manual.

THIS DOCUMENT MUST BE KEPT PERMANENTLY IN THE AIRCRAFT

Document n°: 1002873

LIST OF REVISIONS

Edition/ revision	Section	Description	Date	Approval EASA
Original/0	All	Original edition	28/11/2018	**EASA MINOR CHANGE APPROVAL 10067679**

The edited text is indicated by a vertical line in the margin.

◆ Note : The owner is responsible for ensuring that the aircraft manual is always up-to-date. It is therefore very important to correctly incorporate all revisions in this manual as they are received.

LIST OF SECTIONS IN FORCE

Section	Edition/revision	Date
0	0/0	11/2018
1	0/0	11/2018
2	0/0	11/2018
3	0/0	11/2018
4	0/0	11/2018
5	0/0	11/2018
6	0/0	11/2018
7	0/0	11/2018
8	0/0	11/2018
9	0/0	11/2018

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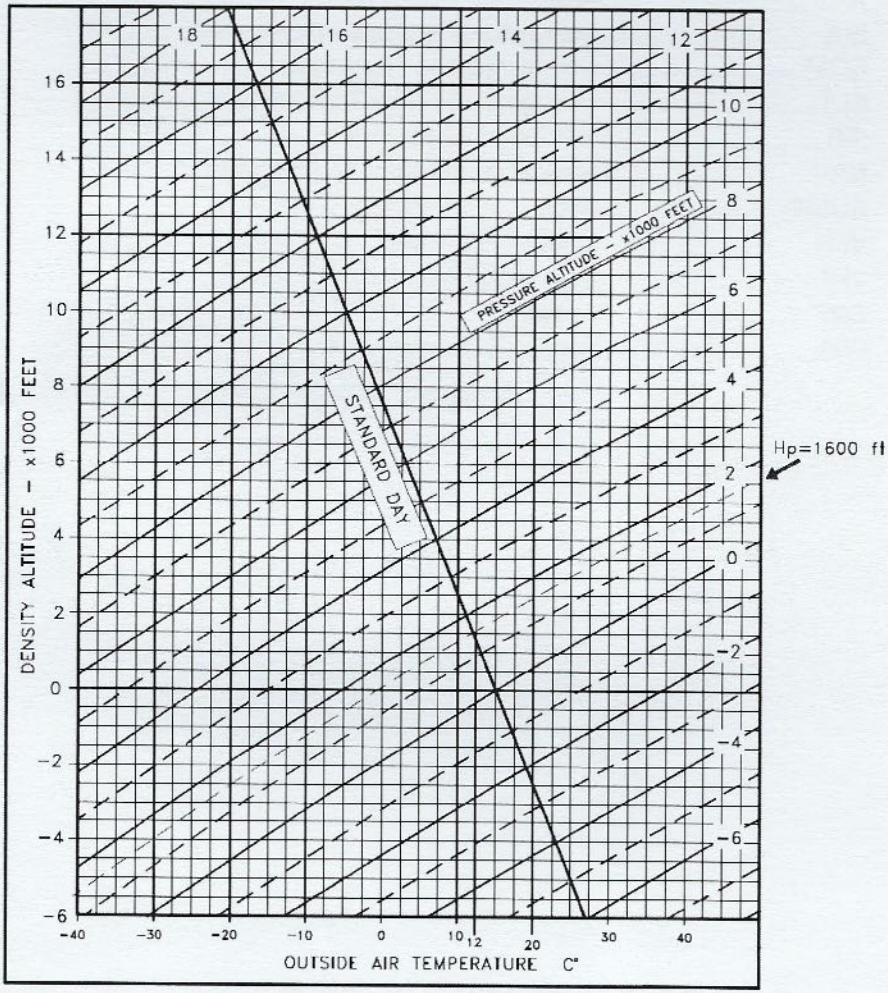
ABBREVIATIONS

sq. ft	Square foot
ft	Foot
In	Inch
Nm	Nautical mile
Km	Kilometre
M	Metre
cm	Centimetre
Kt	Knot
m/s	Metre per second
tr/mn or rpm	Revolutions per minute
Va	Manœuvering speed
VC	Design cruise speed
Vfe	Maximum flap extended speed
Vne	Never exceed speed
Vno	Maximum cruising speed
Vso	Stall speed in landing configuration
Vs1	Stall speed with flaps retracted
VI	Indicated airspeed
Vlof	Lift-off speed
KIAS	**K**not **I**ndicated **A**ir**S**peed
KTAS	**K**not **T**rue **A**ir**S**peed
TAS	**T**rue **A**ir**S**peed
Km/h	Kilometre per hour
HP	Horsepower
HPa	Hectopascal
In.Hg	Inch of mercury
Mbar	Millibar
Zp	Pressure altitude
l	Litre
Imp. gal	Imperial gallon
Us gal	US gallon
Psi	Pound per square inch
Lb	Pound
Kg	Kilogram

°C	Degree Celsius
°F	Degree Fahrenheit
V	Volt
A	Amp
ISA	**I**nternational **S**tandard **A**tmosphere
COM	Communication Transceiver
ELT	Emergency Locator Transmitter
IFR	Instrument Flight Rules
NAV	Navigation Indicator and Receiver
AUDIO	Audio Control Panel
VFR	Visual Flight Rules
VHF	Very High Frequency
CPF	Firewall
LS6	Service letter n°6

TABLE STANDARD ATMOSPHERE



Example :

Temperature = 20°C
Pressure altitude = 1600ft
Standard temperature = 12°C

CONVERSION FACTORS

nautical mile	.....	x1·852	=	kilometres
feet	.....	x0·305	=	metres
inches	.....	x0·0254	=	metres
inches	.....	x25·4	=	millimetres
feet/minute	.....	x0·00508	=	metre/second
gallons (US)	.....	x3·785	=	litres
gallons (imp.)	.....	x4·546	=	litres
quarts (US)	.....	x0·946	=	litres
knots	.....	x1·852	=	km/h
psi	.....	x0·0689	=	bar
in. Hg	.....	x33·86	=	mbar
lb	.....	x0·453	=	kg
(°F – 32)	.....	$x^5/_9$ -32	=	°C
kilometres	.....	x0·539	=	nautical mile
metres	.....	x3·281	=	feet
metres	.....	x39·37	=	inches
millimetres	.....	x0·03937	=	inches
metre/second	.....	x197	=	feet/minute
litres	.....	x0·264	=	gallons (US)
litres	.....	x0·220	=	gallons (imp)
litres	.....	x1·057	=	quarts (US)
km/h	.....	x0·539	=	knots
bar	.....	x14·51	=	psi
mbar	.....	x0·02953	=	in. Hg
kg	.....	x2·205	=	lb
°C	.....	$x^9/_5$ + 32	=	°F

SECTION 0 :

GENERAL

CONVENTIONS

This document uses the following conventions and warnings. They must be strictly followed in order to avoid injuries to persons, damage to equipment, decreased operational safety of the aircraft or breakdowns that may result from abnormal operation.

▲ **WARNING**: Failure to observe these safety rules can result in injury or even death.

■ REMARK : Failure to observe these particular notes and safety procedures may result in damage to the engine or to other equipment.

◆ Note : Information for a better understanding of an instruction.

THIS DOCUMENT IS FOR DR400 AIRCRAFT INCLUDING:
S/N 2090
2650
S/N ≥ 2669 EXCEPT 2704 & 2705
S/N < 2669 TRANSFORMED BY DET150102

UPDATE AND REVISION OF THE DOCUMENT

▲ **WARNING**: Only an up to date flight manual allows safe operation. The current editions and revisions of this manual are available in the LS6 C.E.A.P.R

◆ Note : The edition of this manual is indicated on the first page.

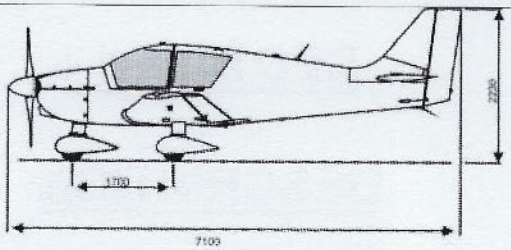
DESCRIPTION

SECTION 1 :

DESCRIPTION

GENERAL DIMENSIONS

Maximum span ..... (28 ft 7·3 in) 8·72 m
Total length..... (23 ft 3·53 in) 7·10 m
Total height..... (7 ft 3·79 in) 2·23 m
Propeller ground clearance..... (11 in) 0·28 m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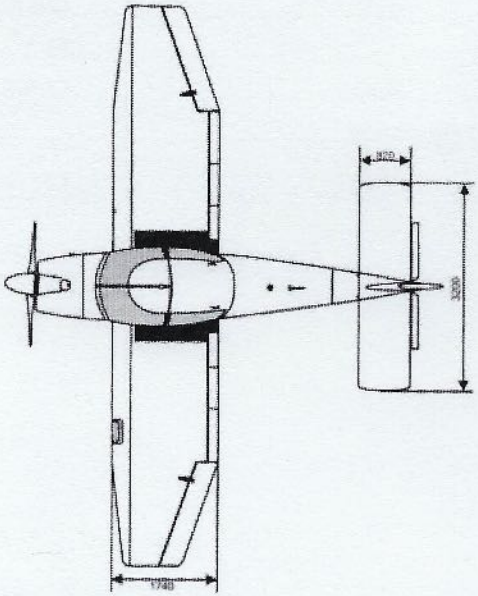
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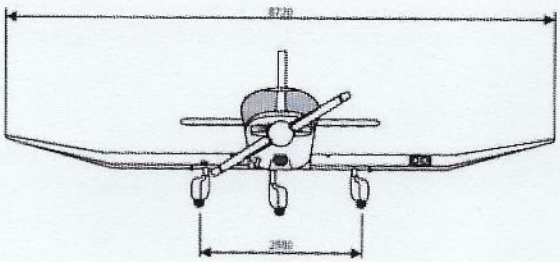
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CABIN INTERIOR DIMENSIONS

Length ..... (5 ft 3·8 in) 1·62 m

Width (at shoulders) ..... (3 ft 11·2 in) 1·20 m

Width (at armrests) ..... (3 ft 7·3 in) 1·10 m

Height ..... (4 ft 0·4 in) 1·23 m

4 places, accessible from both sides via the sliding canopy.

WING

Surface area ..... (146·40 sq ft) 13·6 m²

Profile ..... NACA 43013.5 modifié

Aspect ratio ..... 5·35

Dihedral at the wingtips ..... 14°

AILERONS

Surface area (per aileron) ..... (6·13 sq ft) 0·57 m²

Span (per aileron) ..... (5 ft 3·8 in) 1·62 m

The ailerons are statically balanced.

FLAPS

Surface area (per flap) ..... (3·55 sq ft) 0·33 m²

Span (per flap) ..... (6 ft 7·72 in) 2·025 m

HORIZONTAL TAILPLANE

Surface area (stabilator) ..... (31 sq ft) 2·88 m²

Total surface area including trim tab ..... (2·8 sq ft) 0·26 m²

Span ..... (10 ft 6 in) 3·20 m

VERTICAL TAILPLANE

Total surface area ..... (17·55 sq ft) 1·63 m²

Surface area of the fin ..... (10·76 sq ft) 1 m²

Surface area of the rudder ..... (6·78 sq ft) 0·63 m²

LANDING GEAR

Type Tricycle, Fixed

Track ..... (8 ft 5·6 in) 2·58 m

Wheelbase ..... (5 ft 5 in) 1·65 m

Tyre size ..... 380 x 150 or 500 - 5

Shock absorber oil: ..... MIL. H. 5606 - A

NORME AIR 3520

Nose landing gear

Tyre pressure ..... (26 psi) 1·8 bar

Shock absorber pressure ..... (73 psi) 5 bar

Main landing gear

Tyre pressure ..... (29 psi) 2 bar

Shock absorber pressure ..... (87 psi) 6 bar

BRAKES

The disc brakes are operated by independent hydraulic circuits on each main landing gear wheel.

Hydraulic circuit oil ..... MIL.H.5606 - A

Norme AIR 3520

POWERPLANT

Number of engines 1

Number of cylinders 4

Engine manufacturer: ..... LYCOMING

Engine model: O-320-D2A

Configuration of engine ..... Flat 4, boxer

Maximum power ..... 160 HP at 2700 rpm

PROPELLER

◆ **Note :** **All performances in this manual are given with the 74 DM6 S5-2-64 propeller. For other approved propellers, report to the documentation associated with the propeller.**

Manufacturer : ..... SENSENICH

Model	74 DM 6S5-2-64
Diameter	1,83 m (72in)
Number of blades	2
Pitch	64 in
Minimal rate Full throttle Sea level	2200tr/mn

FUEL

Total capacity ..... 110 litres / 29 US gal / 24·2 Imp gal

Total usable fuel volume..... 109 litres / 28·7 US gal / 24 Imp gal

Unusable fuel volume .....1 litre / 0·26 US gal / 0·22 Imp gal

Approved fuel types are described in SECTION 2 of this manual.

The total capacity of the tanks can be increased to 160 l (42,24 us gal / 35,2 imp) (159 l usable (42 us gal / 35 imp)) with the installation of an optional additional tank of 50 l (13.2 us / gal11 imp).

Main tank:

Total capacity ..... 110 litres / 29 US gal / 24·2 Imp gal

Optional (long-range) tank:

Total capacity ..... 50 litres / 13·2 US gal / 11 Imp gal

OIL

Total engine capacity:..... (8 US quarts) 7·5 litres
Usable capacity: ..... (6 US quarts) 5·7 litres
Approved types: ..... See Section 2 - Limitations

■ REMARK: Only use an approved oil of the exact denomination!

The approved grades of oil are described in SECTION 2 of this manual.

2
LIMITATIONS

SECTION 2:

LIMITATIONS

CERTIFICATION STANDARDS

The DR 400/140B aircraft has been certified on the 09/11/75 in the "NORMAL" and "UTILITY" categories conforming to the following technical conditions:

- General Conditions of regulation AIR 2052 updated 6 June 1966.
- Additional Conditions for conformity with FAR Part 23 Amendement 7.
- Special conditions for the canopy release.

TYPE OF USE

The aircraft is approved for the following:

- VFR by day in non-icing conditions.
- VFR by night in non-icing conditions with optional supplementary equipment.
- IFR by day and by night in non-icing conditions with optional supplementary equipment.

NOTE

All speeds are indicated speeds unless otherwise indicated.

AUTHORISED USE

LIMITING SPEEDS	km/h	KIAS
Vne, never exceed	308	166
Vno, maximum in normal use	260	140
Va, maximum manoeuvering	215	116
Vfe, maximum with flaps extended	170	92

Table 2-1 - Limiting speeds

AIRSPEED INDICATOR MARKINGS		km/h	KIAS
Red line (never exceed)	Vne	308	166
Yellow arc (Operate with caution and only in calm air)	Vno-Vne	260-308	140-166
Green arc (Normal operation range)	Vs_1-Vno	99-260	53-140
White arc (Range with flaps extended)	Vso-Vfe	87-170	47-92

Table 2-2 - Airspeed indicator markings

PRACTICAL CEILING

The practical ceiling of the DR400/140B is 17900 ft.

▲ **WARNING**: You must comply with current regulations regarding maximum flight altitudes and take into account that high altitude flight can cause problems due to lack of oxygen.

LOAD FACTOR LIMITS AT THE MAXIMUM AUTHORISED MASS

(2006 lb) 910 kg (category "U"):
Flaps retracted ..... *n* between – 2·2 and + 4·4
Flaps extended ..... n = + 2

(2205 lb) 1000 kg (category "N"):
Flaps retracted ..... *n* between – 1·9 and + 3·8
Flaps extended ..... n = + 2

▲ **WARNING** : Voluntary flight under negative g-loads is prohibited. Prolonged negative g-loads (a few seconds) may damage the propeller control and the engine by loss of oil pressure.

MAXIMUM AUTHORISED MASSES

	Cat. "U"	Cat. "N"
At take-off	(2006 lb) 910 kg	(2205 lb) 1000 kg
At landing	(2006 lb) 910 kg	(2205 lb) 1000 kg

Table 2-3 - Maximum authorised masses

MASS AND BALANCE

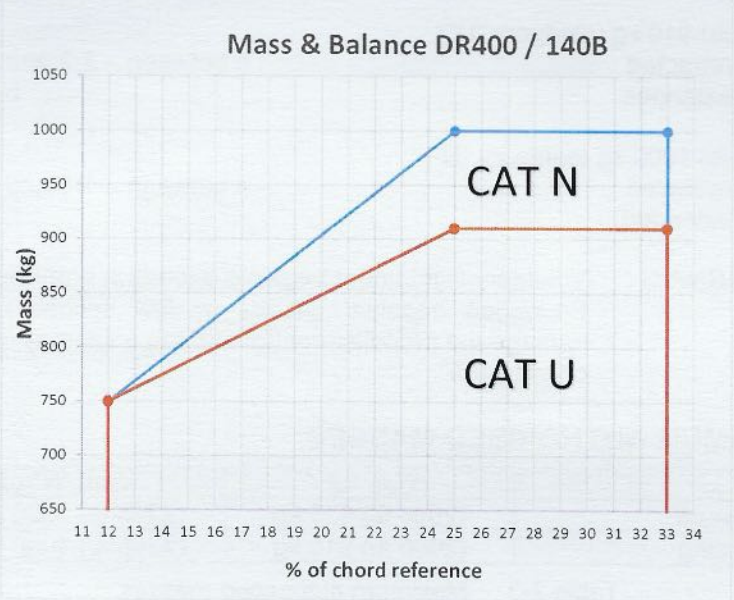


Figure 2-1 Mass and balance envelope

Normal Category

Front limit (12 % ref.): 0·205 m behind the reference plane at 750 kg

Intermediate limit (25 % ref.): 0·428 m behind the reference plane at 1000 kg

Rear limit (33 % ref.): 0·564 m behind the reference plane at 1000 kg

Utility Category

Front limit (12 % ref.): 0·205 m behind the reference plane at 750 kg

Intermediate limit (25 % ref.): 0·428 m behind the reference plane at 910 kg

Rear limit (33 % ref.): 0·564 m behind the reference plane at 910 kg

Reference plane: Leading edge of the rectangular part of the wing.

Reference chord: 1·71 m (5·61 ft)

LOAD PLANNING

(See also the nomogram, SECTION 6)

The mass of the engine oil and the unusable fuel must be included in the unladen mass of the aircraft.

	Mass kg (lb)	Lever arm m (in)
Front seats	2 x 77 (2 x 170)	0,36 - 0,46 (14 - 18)
Rear seats	2 x 77 (2 x 170)	1,19 (47)
Fuel, main tank	78,5 (173)	1,12 (44)
Fuel, supplementary tank (if installed)	36 (79)	1,61 (63,4)
Luggage (*)	40 (88)	1,9 (75)

Table 2-4 - Loading plan

* The position of the luggage has a very important influence on the balance because of the length of its lever arm. Be careful to assess the mass and balance accurately.

LOAD LIMITS

Number of occupants:

Front seats 2

Rear seats 2

Luggage compartment:

Maximum authorised mass ..... (88 lb) 40 kg

ENGINE LIMITS

Manufacturer ..... LYCOMING
Model O-320-D2A
Maximum take-off and continuous power ..... 119 kW (160 HP)
Maximum take-off and continuous rpm ..... 2700 rpm
Maximum using starter continuously 30s
Maximum cylinder head temperature ..... 260°C (500°F)

◆ Note: Unless otherwise specified, in this document all the values of rpm refer to the rotational speed of the propeller.

OIL

Maximum temperature (red line) ..... (245 °F) 118 °C
Normal temperature (green arc) ..... (140 to 245 °F) 60 to 118°C
Normal pressure (green arc) ..... (55 to 95 psi) 3·8 to 6·5 bar
Minimum idle pressure (red line) ..... (25 psi) 1·70 bar
Maximum pressure when cold and for take-off (red line). (115 psi) 7·9 bar
Total capacity of the engine ..... (8 us quarts) 7·5 l
Usable capacity ..... (6 us quarts) 5·7 l

Oil Specifications

Air Temperature	Ashless disperant (AD) grades	Pure mineral grades
All temperatures	SAE 15W50 or 20W50	----------
Above +25°C (80°F)	SAE 60	SAE 60
Above +15°C (60°F)	SAE 40 or SAE 50	SAE 50
0°C to +30°C (30°F to 90°F)	SAE 40	SAE 40
-15°C to +20°C (0°F to 70°F)	SAE 40, 30 or 20W40	SAE 30
Below -10°C (10°F)	SAE 30 or 20W30	SAE 20

During the first 50 hours of operation: pure mineral oil.
After the first 50 hours of operation: AD grades.

Refer to the latest edition of the the Lycoming Service Instruction n°1014

MARKING OF THE ENGINE INSTRUMENTS

The operating ranges of the various engine parameters are given in the following table:

Instrument	Red zone	Yellow zone	Green zone	Yellow zone	Red line
Tachometer (rpm)			2000 - 2700		2700
Oil pressure: bar (psi)	1·70 (25)	1·7-3·8 (24-55)	3·8 – 6·6 (55-95)	6·6 – 7·9 (95-114)	7·9 (115)
Oil temperature : °C (°F)			60 – 118 (140-245)		118 (245)
Fuel pressure hPa (psi)			80-350 (1.1-5)		Min : 80 (1.1) Max : 350 (5)

Table 2-6 - Marking of the engine instruments

EARTHING BEFORE AND DURING TANK FILLING

Ground the exhaust system to eliminate electrostatic charges.

AUTHORISED FUEL GRADES

▲ **WARNING**: The use of unapproved fuels and additives can cause dangerous malfunction of the engine.

Aviation fuel*..... AVGAS 100 LL
Octane rating*..... (octane) 100 minimum

* Refer to the latest edition of the Lycoming Service Instruction n°1070

OPERATIONAL LIMITS IN THE "U" CATEGORY

Within the limits of this category, the following maneouvres are permitted:

- Steep turns (60°)
- Lazy eights
- Chandelles (zoom)
- Stalls (maximum pitch 20°, wings horizontal, balanced flight)

These manœuvres must be carried out under the following conditions:

- Rear seats must be unoccupied
- Entry and exit speeds must be within the normal range
- Maximum recommended entry speed: (116 kt) 215 km/h.

▲ **WARNING**: Intentional spins are prohibited!

▲ **WARNING**: Intentional negative g manœuvres are prohibited!

RUNWAY SURFACE

This aircraft can take-off and land on any runway surface.

■ REMARK: unprepared or rough runways may have holes, bumps or stones that could damage the propeller, the fairings or other projecting parts.

MARKING

The diagrams below represent the markings that must be displayed. These markings can be placards or directly printed on the desk. The shape, size, typeface and colours may vary.

Figure 2-2 - Near the cap of the main tank : 110 litres AVGAS.

Figure 2-3 - Near the cap of the supplementary tank, if installed.

AVIATION OIL	DISPERSANT		MINERAL	
	SAE	GRADE	SAE	GRADE
ALL TEMPERATURE	15W50 20W50			
ABOVE +25°C (80°F)	60	120	60	120
ABOVE +15°C (60°F)	40 ou 50	80 ou 100	50	100
0°C to +30°C (30°F à 90°F)	40	80	40	80
-15°C to +20°C (0°F à 70°F)	30, 40 ou 20W40	80 ou 65	30	65
BELOW - 10°C (10°F)	30 ou 20W30	65	20	55
See Lycoming Service Instruction n° 1014 for more information				

Figure 2-4 - On the inside of the oil-filler access hatch.

Figure 2-5 - Near the distress beacon.

Figure 2-6 - On the access hatch of the ground power socket (if installed) on the starboard side of the aircraft.

◆ Note: The socket is non-reversible to prevent polarity inversion.

Figure 2.7 - On the stabilator trim tabs.

On the flaps.

Figure 2-8 - Adjacent to the annunciator panel.

Figure 2-9 - Near the respective switches.

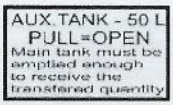


Figure 2-10 - Near the transfer plunger if the supplementary fuel tank is installed.

Figure 2-11 - On the central console, near the appropriate switches.

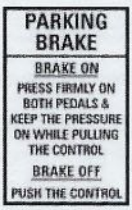


Figure 2-12 - Near the parking brake knob.

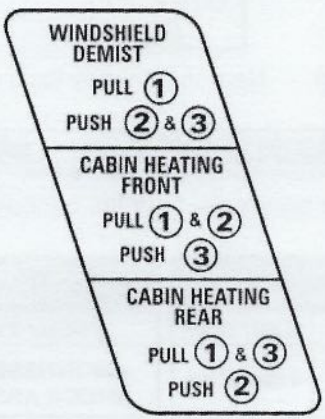


Figure 2-13 - On the right side of the cabin.

Figure 2-14 - On the heater controls.

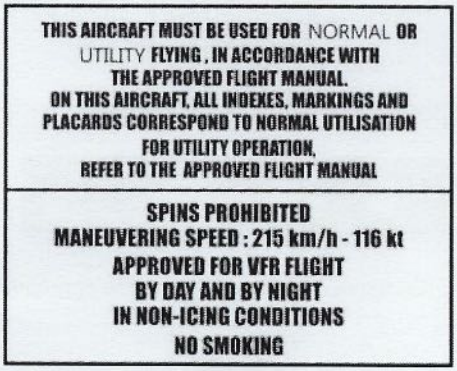


Figure 2-15 - On the ceiling of the sliding canopy.

Figure 2-16 - Near the canopy locking handle.

Figure 2-17 - On the arm-rests, near the canopy emergency release.

DR400/140B TRAIN PRINCIPAL / MAIN GEAR	
PNEU / TYRE	2 bar / 29 psi
AMORTISSEUR SHOCK ABSORB.	6 bar / 87 psi

DR400/140B TRAIN AVANT / NOSE GEAR	
PNEU / TYRE	1,8 bar / 26 psi
AMORTISSEUR SHOCK ABSORB.	5 bar / 73 psi

Figure 2-18 - On the fairings of the main wheels and of the nose wheel.

Figure 2-19 - In the luggage compartment or on the door of the compartment.

Figure 2-20 - On the inside of the luggage compartment door.

SECTION 3:

EMERGENCY PROCEDURES

CHECKLISTS

ENGINE FAILURE OR LOSS OF POWER

At take-off and before rotation

1. Throttle control ..... reduce
2. Brake and avoid obstacles
3. Mixture ..... lean (pull back)
4. Fuel selector valve ..... off
5. Magneto switches ..... off
6. Battery master ..... OFF
7. Emergency evacuation ..... if necessary

Immediately after take-off

1. Level out
   (Attitude approximately 5° nose-down)
   Flaps in take-off position ..... 73 KIAS (135 km/h)
2. Land straight ahead with only minor heading corrections to avoid obstacles.

When landing is inevitable:

3. Mixture ..... lean (pull back)
4. Fuel selector valve ..... off
5. Magneto switches ..... off
6. Flaps ..... take-off or landing position
7. Battery master ..... OFF
8. On short final ..... UNLOCK THE CANOPY
9. Land at the minimum speed
10. When the aircraft has stopped ..... evacuate immediately

▲ **WARNING** : Never turn back to the runway because the altitude after take-off is rarely sufficient.

ENGINE FAILURE IN FLIGHT

1. Establish glide speed :
   Flaps retracted ..... 78 KIAS (145 km/h).
   (In these conditions, without wind, the aircraft's glide range is approximately nine times its height above the ground). Locate a suitable landing area.

◆ Note : Under these conditions the descent rate will be 850 to 900 ft/min.

▲ **WARNING**: A windmilling propeller will increase the rate of descent and thus severely reduce the glide range.

If the height is sufficient to attempt a restart:

2. Fuel selector valve ..... OPEN
3. Electric pump ..... ON
4. Mixture ..... Fully RICH
5. Throttle ..... ¼ open
6. Magneto switch ..... on L+R BOTH

If the propeller is still turning then the engine should restart.

If the propeller is stopped, operate the starter

If the starter does not operate and the engine does not start :

7. Switch "battery" and "alternator" ..... check ON

If the starter operates but the engine does not restart:

8. Annunciator panel and fuel levels ..... troubleshooting

   If the main tank is empty but there is fuel in the supplementary tank (If installed)
   Transfert valve ..... OPEN

If the propeller does not turn:

9. Starter ..... OPERATE

   <u>If the engine or the propeller is seized, do not operate the starter.</u>

If the motor does not function normally, prepare for a *"landing without engine power"*.

LANDING WITHOUT ENGINE POWER

Choose an appropriate landing area:

1. Speed ..... 78 KIAS (145 km/h) flaps retracted
   ..... 73 KIAS (135 km/h) flaps in take-off position
2. Seat belts and harnesses ..... secure
3. Transmit a MAYDAY, giving your location and intent, on the frequency of the local ATC or AFIS or, failing that, transmit on 121·500 mHz.
4. Transponder ..... SQUAWK 7700
5. Emergency locator beacon ..... ACTIVATE

Before landing:

6. Electric fuel pump ..... Off
7. Mixture ..... Weak (pull backward)
8. Throttle ..... Closed
9. Magneto switches ..... Off
10. Fuel selector valve ..... Closed
11. Alternator switch ..... Off
12. Flaps, when it is certain that the landing area can easily be reached ..... Take-off or landing
13. Battery master ..... Off
14. Canopy ..... Unlocked
15. Touch-down at the lowest possible speed
16. Brake ..... As required
17. When the aircraft has stopped ..... Disembark immediately

▲ **WARNING**: If the canopy is jammed then use the emergency release:
Canopy handle in « open » position.
Release the two levers on the armrests, either side of the panel, and pull them upright.

PRECAUTIONARY LANDING

1. Survey the chosen landing area, making several low-speed passes if necessary 70 kt (130 km/h), flaps in take-off position (first stage);
2. Then make a precautionary approach at 65 kt (120 km/h), flaps in landing position (2nd stage);
3. On final, unlock the canopy.

After touch-down

4. Mixture ..... Fully weak (rearward)
5. Fuel selector valve ..... CLOSED
6. Battery master ..... off

▲ **WARNING**: If the canopy is jammed then use the emergency release:
Canopy handle in « open » position.
Release the two levers on the armrests, either side of the panel, and pull them upright.

FIRE

Engine fire on the ground, during starting

Let the engine run with:

1. Fuel selector valve ..... CLOSED
2. Electric pump ..... OFF
3. Throttle ..... FULL THROTTLE
4. Mixture ..... Fully weak (rearward)

◆ Note : This manœuvre is intended to burn the fuel that has accumulated in the engine manifold (usually due to excessive fuel injection during a difficult start-up).

5. Emergency evacuation ..... if necessary

Extinguish the flames with an extinguisher, fire blanket or sand.

▲ **WARNING**: Have an authorised person or workshop inspect the damage caused by the fire and repair or replace any damaged equipment before the next flight.

Engine fire in flight

1. Fuel selector valve ..... OFF
2. Throttle ..... Full throttle
   ..... **Until the engine stops**
3. Mixture ..... fully weak (rearward)
4. Electric fuel pump ..... OFF (if it is on)
5. Alternator switch ..... Off
6. Cabin heating and ventilation ..... CLOSED
7. Glide speed ..... 78 KIAS (145 km/h)
8. Extinguisher (if available and if the fire has spread to the cabin)
   ..... Use as required

Do not attempt to restart the engine.

◆ Note: Continue by following the procedures described in the chapter « landing without engine power ».

Cabin fire

Extinguish the fire using whatever means are available (extinguisher optional).
To eliminate the fumes, fully open the air vents.

Electrical fire

◆ Note: In the case of an electrical fire (combustion of insulation produces a characteristic odour):

1. Electrical equipment and radio (after a quick call)..... OFF
2. Magneto switches .....(BOTH) ON
3. Battery master..... OFF
4. Alternator switch ..... OFF
5. Cabin ventilation.....CLOSED
6. Cabin heat.....CLOSED
7. Extinguisher (if available)..... use as required

If the fire persists: Make an emergency landing.
See « *Landing without engine power* ».

▲ **WARNING** : If the battery master is off then the flaps cannot operate.

If the fire is extinguished: land at the nearest available aerodrome.

8. Cabin ventilation..... OPEN
9. Check the circuit breakers ..... **do not reset if open**
10. Pull circuit breakers of all equipment unnecessary for immediate continued flight.
11. Battery master..... ON

    .....Wait and check that there are no problems
12. Alternator switch ..... ON

    .....Wait and check that there are no problems
13. Avionics master..... ON
14. Only operate the equipment that is necessary to continue the flight.

    Reset the circuit breakers that have not been disconnected and whose function is necessary to continue the flight, one at a time, waiting a little between each to check for problems.

▲ **WARNING**: Breakers that were found to be switched off must not be reset. If the system has tripped the problem is overload or short-circuit. Reconnecting the circuit may result in resumption of the fire.

ENGINE MALFUNCTION

Vibration and rough running

Vibrations and rough running of the engine are usually due to the following:

1. Carburettor icing ..... See the "ICING" paragraph
2. The mixture set too rich or too lean ..... Adjust the mixture
3. Impurities in the fuel system ..... Check the fuel pressure
   ..... Switch on the electric fuel pump
4. An ignition failure ..... Switch magneto to L
   ..... Switch magneto to R

   Select the position that provides the best engine operation and fly to the nearest airfield at reduced speed.

   Mixture ..... Adjust to achieve smooth running

Oil pressure too low

1. Reduce power as quickly as possible if conditions permit.

◆ Note: After a loss of oil pressure, maximum power should only be used when flying close to the ground and only for the duration necessary to regain altitude in order to make a safe landing or to determine the cause of the pressure loss.

2. Check the oil temperature: if the oil temperature is high or is close to the operating limit :
   i. Land as soon as possible at the next aerodrome;
   ii. Be ready for a forced landing;
   iii. Expect an engine failure.

Oil temperature is too high

1. Reduce power and increase airspeed (nose down) as soon as possible.

◆ Note: If the oil temperature is too high, full power should only be used when flying close to the ground and only for the duration necessary to regain altitude in order to make a safe landing or to determine the cause of the excessive temperature.

2. Check the oil pressure. If the oil pressure is lower than normal:
   i. Land at the next available aerodrome;
   ii. Be ready for a forced landing;
   iii. Expect an engine failure.

3. If the oil pressure is within the normal range:
   i. Land at the next available aerodrome.

◆ Note: When operating in hot weather or in low-speed climbs, the engine temperature may rise. Avoid overheating of the engine as follows:

1. Increase airspeed by reducing the rate of climb;
2. Reduce the power if the engine temperature approaches the red zone.

ICING

▲ **WARNING** : Flight in icing conditions is prohibited.
Icing seriously degrades the aerodynamics of the aircraft and increases the stall speed.

If you experience icing then proceed as follows:

1. Carburettor heat.....Warm (backward)
2. Increase power and speed to reduce ice accumulation;
3. Pitot heat..... ON (if installed)
   Without Pitot heat then consider the airspeed indication to be unreliable;
4. Immediately leave the area where icing has occurred. If possible, change altitude so as to achieve exterior temperature and conditions less likely to cause icing.
5. Heating / cabin de-icing.....as required

Plan a landing at the nearest aerodrome. In the case of very rapid ice formation, execute a forced landing.

◆ Note: A layer of 0·5 cm (0·2 in) on the leading edge of the wing will significantly increase the stall speed. If necessary, adopt an approach speed greater than normal: 81 KIAS (150 km/h). Do not use flaps.

If it is nessessery to keep the carburettor heat on.

6. Adjust the mixture to have a regular engine operation.

◆ Remark: Only use the carburettor heat in "warm" or "cold" position. An intermediate position can cause more icing under certain conditions.

BREAKDOWN OF ELECTRICAL GENERATION

Alternator failure results in illumination of the «charge» warning light on the annunciator panel and a progressive reduction of the battery voltage (indicated by the voltmeter).

If the indicator illuminates

1. Alternator..... switch off and then on again

◆ Note: The purpose of this operation is to reset the over-voltage relay that can disconnect after a transient overvoltage.

If the fault persists

1. Alternator switch .....Off
2. Turn off all electrical equipment that is not essential for the continuation of the flight;
3. Land as soon as possible at the nearest available aerodrome.

ELECTRICAL SYSTEM FAULT

1. Check the relevant circuit breaker switch;
2. If the system is necessary for the continuation of the flight, reset it once. If the circuit breaker trips again then do not try again as the equipment has failed.

▲ **WARNING**: **Do not reset a circuit breaker more than once.** A circuit breaker is a safety system. If the breaker has tripped, the problem is overload or short circuit. Resetting the breaker could cause a fire.

INADVERTANT SPIN

In the event of an unexpected spin, apply the following procedures:

1. Throttle ..... close (pull back)
2. Rudder ..... fully **AGAINST** the direction of rotation
3. Elevator ..... neutral
4. Ailerons ..... neutral
5. When rotation has stopped, centralise the rudder and recover within flight limitations.

◆ Note: If the flaps are deployed at the start of the spin, retract them immediately.

LOSS OF ELEVATOR CONTROL

In the event of loss of elevator control:

- Stabilise the aircraft in level flight, flaps up, at 70 kt (130 km/h) using the rudder trim and the throttle.
- Do not change the elevator trim and control the angle of descent only with the throttle. Only reduce power on short final, near the ground.

LOSS OF TRIM CONTROL

In the event of failure of the electric elevator trim control:

1. Counter using the elevator as required
2. Pull the circuit breaker for the electric elevator
3. Do not try to reset the breaker in flight
4. Reduce speed to minimise the effort necessary to operate the elevator
5. Conserve the configuration to allow a safe landing with the minimum effort.

LOSS OF FLAP CONTROL

FLAPLESS APPROACH.

Approach speed ..... 70 KIAS (130 km/h)

Short final ..... 65 KIAS (120 km/h)

In the event of a flapless landing, the landing distance will be increased by 30%.

4

NORMAL
PROCEDURES

SECTION 4 :

NORMAL PROCEDURES

LOADING

Before every flight, ensure that the total mass and centre of gravity are within the prescribed limits. For these, refer to SECTION 6.

NORMAL OPERATING SPEEDS

The speeds listed below are the indicated airspeeds recommended for normal operation of the aircraft.
They apply to a standard aircraft, at maximum take-off mass, in standard atmosphere, at sea level.
They can vary from one aircraft to another, according to the equipment installed, the condition of the aircraft and the engine, the atmospheric conditions and the skill of the pilot.

Optimal climb speed

Flaps in take-off position (1st stage) ..... 78 KIAS (145 km/h)
Flaps retracted ..... 86 KIAS (160 km/h)

Maximal operating speed in turbulent air

Flaps retracted ..... 140 KIAS (260 km/h)

Maximum speed with flaps

Flaps in landing position (2nd stage)..... 92 KIAS (170 km/h)

Landing speed (final approach)

Flaps in landing position (2nd stage)..... 62 KIAS (115 km/h)

PRE-FLIGHT INSPECTION

To be done before each flight:

During all exterior inspections, inspect all the joints, the pivot pins and the bolts; check that the fabric is not damaged, that it is in good condition and that there are no dents or tears; check that all control surfaces are moving correctly and that there is no excessive play; check that there are no leaks near the fuel tanks or fuel lines. In general, identify and report anything abnormal.

In cold weather, remove all frost, ice and snow from the fuselage, the fixed surfaces and the control surfaces. Check that there is no ice or debris that could interfere with the movement of the control surfaces. Check that there is no accumulation of snow or ice in the wheel fairings.

If so equipped, check that the pitot probe heater is working by turning on the pitot heat for less than 30 seconds.

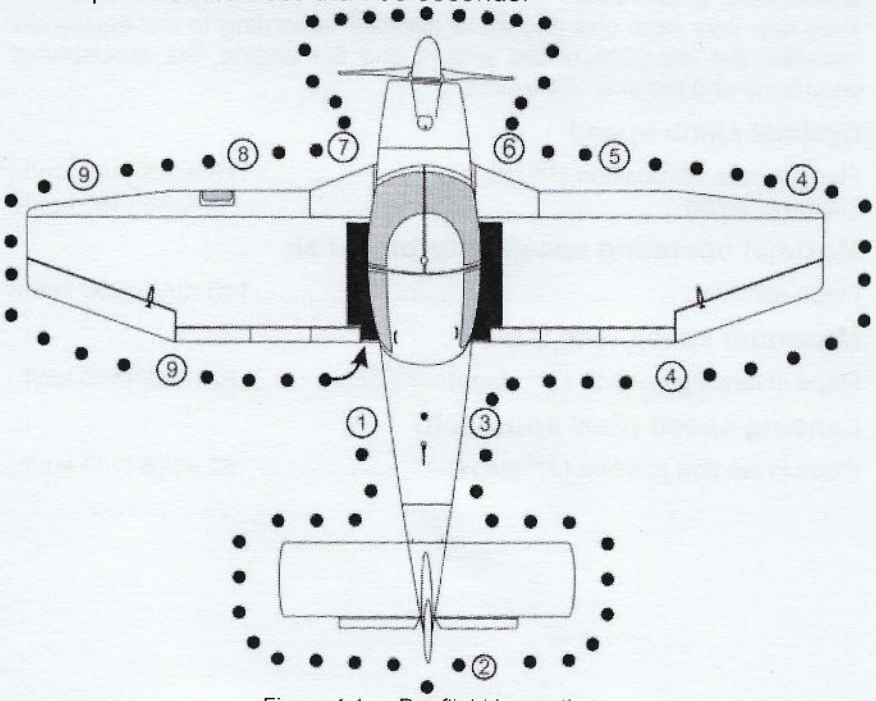


Figure 4-1 - Pre-flight inspection

Magneto switch ..... OFF
Throttle ..... CLOSED
Mixture ..... LEAN (pull back)
Avionics / radio (if so equipped) ..... OFF
Flight controls ..... free with movement in the correct direction
Battery master ..... ON

▲ **WARNING** : When the battery master is on, when using ground power, or when turning the propeller, treat the propeller as live.

Flaps ..... check operation
Trim ..... check operation
Fuel quantity ..... check
Fuel gauge conforms to dip-stick (if so equipped) ..... check
Oil pressure indicator ..... Illuminated
Battery master ..... OFF
Aircraft documents ..... on board
Luggage ..... properly stowed

Check the travel of the control surfaces, then circle the aircraft, starting with the left side of the fuselage (see figure 4-1).

1 _____

a) Fuel cap..... in place, locked
b) Fuel tank vents (underneath)..... unobstructed
c) Fuel drain (main tank)
Fuel drain (supplementary tank) (if so equipped).....
.....strain and inspect samples
d) Static port .....clean, unobstructed

▲ **WARNING**: Testing the fuel is essential to ensure that there are no impurities nor water in the tanks.
To perform a reliable test the aircraft must be on a horizontal surface and have been immobile for about 30 minutes.
(These conditions are usually fulfilled before the first flight of the day).
The sample must be taken in a clean container intended for the purpose and which allows the identification of impurities and water.

▲ **WARNING**: Make sure that the type of fuel is correct (AVGAS 100LL: the colour must be blue)

2 _____

a) Stabilator .....condition of the surface, correct movement
b) Rudder.....full and correct movement

3 _____

a) Static port .....clean, unobstructed

4 _____

a) Flaps, ailerons .....check condition and hinges
b) Wing-tip and navigation lights (if fitted) ..... check operation

5 _____

a) Stall warner .....inspect and test

◆ Note : With the battery master switched on, test the stall warner to make sure that the warning signal is activated when the tab is lifted.

b) Right main undercarriage .... check fairing attachment and condition

shock absorber compression normal
tyre condition: inflation and wear
check for accumulation of debris inside the fairings

6

a) Fuel pump drain ..... strain and inspect the sample
b) Engine oil ..... check level, cap secured, hatch closed
c) Exhaust pipes ..... rigid
d) Engine cowlings secured ..... check
e) Propeller ..... clean, in good condition
f) Propeller spinner ..... no play
g) Air intakes ..... clean, no obstructions

7

a) Front undercarriage ..... check fairing attachment and condition
shock absorber compression normal
tyre condition: inflation and wear
check for accumulation of debris inside the fairings
tow-bar removed
b) Canopy cleanliness ..... check

8

a) Left main undercarriage ..... check fairing attachment and condition
shock absorber compression normal
tyre condition: inflation and wear
check for accumulation of debris inside the fairings
b) Pitot ..... clean, unobstructed
c) Lights (if fitted) ..... clean lenses

9

a) Wing-tip and navigation lights (if fitted) ..... check condition
b) Flaps, ailerons ..... check and condition and hinges

CABIN INTERIOR CHECK PRIOR TO START-UP

1. Canopy ..... closed, unlocked
2. Parking brake ..... on
3. Front seats ..... adjusted and secured
4. Belts and harnesses ..... adjusted and fastened
5. Flight controls ..... free, without play or excessive friction, move in the correct direction, (check rudder during taxiing)
6. Battery master ..... ON
7. Alternator switch ..... OFF
8. Annunciator panel ..... Test, set DAY/NIGHT as needed
9. Circuit breakers ..... CLOSED
10. Elevator trim ..... movement and direction verified, then returned to take-off position
11. Fuel quantity ..... check that it is sufficient for the flight

◆ Note : Check that the fuel gauge reading concurs with the visible fuel level in the tanks and/or the documentation in the journey log.

12. All electrical and avionics switches ..... OFF

■ REMARK: The avionics master switches must be off during engine start-up to avoid possible damage to the on-board electronic equipment.

◆ Note : It is preferable to retract the flaps fully or to the take-off position before starting to avoid any projection.

ENGINE STARTING

Normal procedure

1. Canopy ..... closed
2. Strobe ..... ON
3. Carburettor heat ..... cold (forward)
4. Mixture ..... rich (forward)
5. Fuel selector valve ..... check operation, OPEN
6. Electric pump ..... ON
7. Throttle ..... 2 or 3 injections then ¼ open
8. Propeller area ..... clear
9. Starter ..... ENGAGE (15 to 20 seconds maximum)
10. When the engine starts ..... release the starter and return the magneto switch to ..... L+R (Both)
11. Oil pressure warning light ..... extinguished

■ REMARK: Avoid continuously operating the starter for more than 20 seconds. Wait one minute before retrying. After six attempts, let the starter cool down for 30 minutes.

■ REMARK : As soon as the engine is running, check the oil pressure. If the oil pressure warning light is not extinguished or the pressure is zero after 15 to 20 seconds, stop the engine immediately and find the cause.

■ REMARK: If the red « Starter » warning light on the annunciator panel is illuminated then the starter is still engaged. Stop the engine immediately and find the cause.

▲ **WARNING**: If the main battery is not capable of operating the starter, perform the maintenance necessary to have an operational battery.

Hot engine procedure

Same as « normal procedure » without injection.

Cold weather procedure

Same as « normal procedure » but advance the throttle in successive movements to achieve 900 to 1,000 rpm.

Flooded engine procedure.

1. Electric pump ..... OFF
2. Mixture ..... Fully weak (move backwards)
3. Throttle ..... Fully open
4. Starter ..... ACTIVATE

As soon as the engine is running, return the mixture to "RICH", then resume the normal procedure.

AFTER THE ENGINE STARTS

1. Rotational speed ..... 1200 rpm
2. Electric pump ..... OFF
3. Alternator ..... On
4. ALT light (charge) ..... check that it is EXTINGUISHED
5. Oil pressure ..... Check
6. Vacuum gauge (if installed) ..... Check
7. Canopy ..... CLOSED AND LOCKED
8. Harnesses and belts ..... BUCKLED
9. Avionics master switch (if installed) ..... ON
10. COM / NAV inst. radionavigation ..... ON, set
11. Altimeter ..... Set QNH/QFE
12. Horizon, directional giro (if fitted) ..... Set
13. Flaps ..... RETRACT

TAXIING

1. Parking brake..... disengaged
2. Brakes ..... test
3. During changes of direction:
   a. Turn indicator (if fitted) ..... check
   b. Directional gyro (if fitted) .....check operation
   c. Magnetic compass ..... check

■ REMARK: When taxiing, steer with the rudder pedals, it is not necessary to brake to change direction. Speed should be moderate and at the minimum power required to move forward without using the brakes. Continuous or excessive braking can cause overheating or damage to the brakes and surrounding systems.

It is recommended to avoid exceeding 1200 rpm as long as the oil temperature is outside the green range.

BEFORE TAKE-OFF

1. Parking brake ..... ENGAGED
2. Canopy ..... CLOSED AND LOCKED
3. Flight controls ..... free and moving in the correct direction
4. Flight and navigation instruments ..... check, set
5. Cabin heater ..... as required

6. Fuel selector valve ..... OPEN
7. Fuel volume ..... check that it is sufficient for the flight
8. Elevator trim circuit breaker ..... Engaged
9. Electric elevator trim control ..... down/up
   ..... check that the movement is in the correct direction
10. Elevator trim ..... take-off position

◆ Note: Do not use the electric trim during take-off and initial climb.

◆ Note: The power check must be carried out in a clean area (without debris) to minimise the risk of damage to the propeller or other parts of the aircraft.

11. Oil temperature and pressure ..... green zone
12. Fuel pressure (if equipped) ..... green zone
13. Mixture ..... Fully rich (push forward)
14. Carburettor heat ..... Cold (push forward)

Checking magnetos

15. Throttle ..... for 2000 rpm
16. Magneto selection
    Maximum drop between L or R and L+R ..... 175 rpm
    Maximum difference between L and R ..... 50 rpm

Carburettor heat check

17. Carburettor heat ..... Warm (backward)
    Verify an engine speed drop (100 rpm)
18. Carburettor heat ..... Cold (Forward)

Mixture check

19. Mixture ..... Lean until engine rpm falls, then return to fully rich

Engine idle check

20. Throttle ..... close
    ..... Engine speed 600 to 650 rpm
21. Throttle ..... Increase until engine speed is steady at 1200 rpm
22. Engine instruments ..... CHECK
23. Flaps ..... fully down, then return to take-off position
24. Electric pump ..... ON
25. Radios and avionics ..... ON, and set
26. Parking brake ..... RELEASE

TAKE-OFF

Cross-wind take-off

1. Flaps ..... (1st stage) take-off position
2. Ailerons ..... into wind

◆ Note : Take-off at a speed slightly greater than for a normal take-off. Correct for drift as usual (maximum bank near the ground 15°).

Demonstrate cross-wind limit ..... 22 KT (40 km/h).

Short take-off

1. Flaps ..... (1st stage) take-off position
2. Full throttle against the brakes, then release the brakes ..... minimum 2200 rpm
3. Rotation speed ..... 54 KIAS (100 km/h)
   Initial climb speed ..... 70 KIAS (130 km/h)
4. Speed after clearing obstacles ..... 86KIAS (160 km/h)
5. Flaps ..... RETRACT
6. Electric pump ..... OFF

CLIMB

Normal climb (flaps retracted)

Best rate of climb speed 86 KIAS (160 km/h), 75 KIAS (140km/h) on the ceiling.

When the best rate of climb is not required, a higher speed will improve forward visibility.

1. Throttle ..... Full power (push forward)
2. Mixture ..... Fully rich (push forward)

Best angle of climb

Minimum 8.3%, at sea level, standard atmosphere, maximum mass, rotating at 70 KIAS (130 km/h), flaps in take-off position (1st stage).

▲ **WARNING**: This type of climb should only be used if it is essential to clear obstacles (because of poor cooling of the engine).

1. Throttle ..... Full power (push forward)
2. Mixture ..... Fully rich (push forward)

CRUISE

◆ Note: For the settings and performance in cruise, refer to Section 5.

1. Power.....Maximum 100 % (maximum continuous power)
   Recommended : 75 %
2. Elevator trim..... SET
3. Oil temperature and pressure..... MONITOR REGULARLY
4. Fuel level (Fuel gauge and warning light)
   ..... MONITOR REGULARLY

◆ Note: If the aircraft is equipped with a supplementary tank, it is essential that there is sufficient capacity in the main tank to receive the contents of the supplementary tank before transferring the fuel in the supplementary tank into the main tank. Otherwise, the excess fuel will be lost.

Use of the mixture control

Keep the mixture control fully rich during take-off, best angle of climb and best rate of climb.

In some conditions (take-off at high altitude, or prolonged climb above 5,000 ft) this setting may be too rich and lead to irregular engine operation or loss of power.

In these situations, adjust the mixture for regular engine operation and not for best fuel economy.

Mixture adjustment in stable cruise:
Set the fuel flow according to section 5 or progressively lean the mixture until the engine runs irregularly, then slightly enrich the mixture to regain the previous rpm again.

■ REMARK: Be careful not to over-lean the mixture to avoid engine overheating.

■ REMARK: Always enrich the mixture before increasing power and/or changing altitude.

◆ Note: Depending on the on-board instrumentation, refer to the relevant equipment manual for instruction regarding mixing (for example: EGT).

DESCENT

1. Mixture ..... Rich
2. Power..... as required to achieve the desired slope/speed
3. Carburettor heat..... on demand, warm or cold

Approach or down wind

1. Mixture .....fully rich (push forward)
2. Electric pump ..... ON
3. Carburettor heat..... on demand, warm or cold
4. Cabin (seats, belts) ..... check
5. Flaps ..... below de 92 KIAS (170 km/h), Take-off position (1st stage)
6. Speed .....81 KIAS (150 km/h)
7. Elevator trim.....ADJUST

Final

1. Carburettor heat..... Cold (push forward)
2. Flaps .....recommended below 81 KIAS (150 km/h) Landing position (2nd stage)
3. Approach speed.....62 KIAS (115 km/h)

◆ Note: The approach speed can be increased by up to 73 KIAS (135 km/h) to improve manoeuverability. This can increase the landing distance.

4. Elevator trim.....ADJUST

◆ Note: Do not use the electric elevator trim on short final and during roundout.

LANDING

Landing on a short runway

◆ Note: The landing distances in section 5 are obtained with the following procedure

To make a landing on a short runway, in calm weather, make an approach at 62 KIAS (115 km/h) with the flaps in the landing position.
When passing 50 ft (15 m) start to reduce engine power. Touch down must be without engine power and on the main wheels first.
Immediately after the main wheels touch, apply the brakes as fully as possible without locking the wheels until the aircraft has stopped.
Keep the stick back during braking to put the load on the main wheels (so as to maximise braking efficiency).

Normal landing

In general, the normal landing procedure is used when optimum landing performance is not required.

▲ **WARNING**: Ensure that the landing distance available is at least 1·5 times the landing distance given in section 5.

Normal landings are made with full flap and from an approach speed between 62 KIAS (115km/h) and 70 KIAS (130 km/h).
Surface wind and turbulence are generally the main factors that determine a comfortable approach speed.

◆ Note: approach speeds greater than 62 KIAS (115 km/h) result in longer distances, so be sure that the distance available is at least 1·5 times the landing distance in section 5.

Touchdown is made with no engine power and on the main wheels to reduce both the landing speed and the required braking force.
Gently lower the nose wheel onto the runway after the aircraft slows down.
When the nose-wheel is straight, its shock absorber must be allowed to compress so as to unlock the nose gear and allow nose-wheel steering.
Smoothly return the stick to the neutral position.
Apply the brakes as required.

◆ Note: If landing with the flaps retracted, the landing distance required will be increased by 30%.

Landing in crosswind or in strong gusts

1. Flaps ..... (1st stage) take-off position recommended
2. Approach speed ..... 70 kt (130 km/h) + 1/2 gust speed
3. Drift ..... correct in the conventional manner

Touch down on the main wheels first.

Avoid rolling on the main wheels and let the nose-wheel down as quickly and smoothly as possible in order to compress the shock absorber and unlock the nose-gear (see SECTION 7) to allow nose-wheel steering.

Insufficient force on the nose-gear may cause it to remain locked in the longitudinal axis of the aircraft, thus preventing nose-wheel steering.

Push the stick in the direction of the wind.

Demonstrate cross wind limit 22 kt (40 km/h)

◆ Note: To compensate for the greater approach speed and the use of only one stage of flap, assume that the landing distance will be increased by 50%.

■ WARNING: For strong gusts, the speed and flap position must be adjusted so that the Vfe is not exceeded.

Landing distances calculation example:

- Headwind : 10KT
- Air temperature : 5°C
- Altitude : 2000 ft
- Paved and dry runway
- Weight: 950 kg (max.)

Landing distance with landing on short runway procedure.

Reminder: The landing distance is the distance from the 15m (50ft) to the complete stop.

Table 5-10 section 5
Landing distance without wind correction = **510m**

Correction of the Headwind influence section 5
Corrected distance = 510 *0.79 = **403 m**

Landing distance with normal landing procedure.
Same as above but with 1.5 coefficient
Distance to consider = 1.5 *403 = **605 m**

Landing distance in crosswind or strong gusts

- Crosswind : 20KT full crosswise

Flaps: take-off position (1st stage)
Approach speed = 70 KIAS (130 km/h)
Safety distance = 1.5*510 = **765 m**

- Gust wind : 20KT

Flaps: take-off position (1st stage)
Approach speed = 70KIAS (130 km/h) + 10KT (18.5 km/h) = 80KIAS (148.5 km/h)

Safety distance = 1.5*510 = **765m**

Going around

1. Pitch ..... take-off
2. Carburettor heat ..... Cold (push forward)
3. Throttle ..... Full (push forward)
4. Mixture ..... Fully rish, CHECK
5. Speed ..... 65 KIAS (120 km/h)
6. Return the flaps to the take-off position (1st stage), then adjust the speed for a normal climb: 75 KIAS (140 km/h)

AFTER LANDING

1. Electric pump ..... OFF
2. Flaps ..... UP
3. Navigation instruments ..... OFF

ENGINE SHUT-DOWN

1. Parking brake ..... ON
2. Throttle ..... IDLED
3. Flaps ..... DOWN
4. Avionics master switch ..... OFF
5. Idle cut-off tests at idle speed ..... cut, then L+R (Both)
6. Engine speed ..... 1,000 rpm
7. Mixture ..... Fully weak (pull back)

After engine shut-down

1. Magneto switch ..... OFF
2. Alternator switch ..... OFF
3. Battery master ..... OFF
4. After placing the wheels chocks ..... release the parking brake

STALLS

The stall characteristics of the DR400 are traditional. Power-off stalls are accompanied by a slight floating of the nose if the stick is held fully back. The power-off stall speeds at maximum mass are given in section 5, Performance.
During a stall at altitude, while the indicated speed decays slowly it is possible to feel a slight vibration of the cabin and to hear the stall warner sound at 5 to 10 kt before the stall. Normally, the stall is indicated by a slight yaw and it is possible to hold the wings level or in a bank by co-ordinated use of the ailerons and rudder. When the stall warner sounds, to recover, push the stick forward to allow the aircraft to accelerate, apply full throttle if necessary and bring the wings level with co-ordinated use of the controls.

▲ **WARNING**: Extreme caution must be exercised to avoid uncoordinated, abrupt or extreme manœuvres near the stall, especially near the ground.

USE OF THE PARKING BRAKE

To apply the brakes

Press both pedals. Maintain the pressure and pull the parking brake plunger control upward.
Release the pressure on the pedals; the parking brake control must remain in the pulled (extended) position.

Or

Pull the parking brake plunger control up.
Press both pedals firmly, then release the pedals. The parking brake control must remain in the pulled (extended) position.

To release the brakes

Push the parking brake plunger fully down.

▲ **WARNING**: Do not pull the parking brake control during flight. If landing with the parking brake engaged, the brakes will be fully applied as soon as the toe-brake pedals are pressed. This can lock the wheels and cause a tyre burst or a fire.

5

PERFORMANCES

SECTION 5 :

PERFORMANCE

◆ Note : **All performance figures in this manual are with the 74 DM6 S5-2-64 propeller.**

NOISE LIMITATION

In accordance with the decree of the 19/02/87, the admissible noise level for the DR400/140B aircraft corresponding to the total mass of (2205 lb) 1000 kg is 83.2 dB(A) (ICAO Annex 16 chapter 10).

The DR400/140B aircraft received the n°N45 Noise Limitation Type Certificate.

- Propeller 74 DM6 S5-2-64 - silencer CEAPR standard 01	74.9 dB
- Propeller 74 DM6 S5-2-64 - silencer CEAPR standard 01 + additional silencer APR	70.3 dB

CALIBRATION OF THE AIRSPEED INSTALLATION

Correction of the air speed indicator

VC = (VI + calibration) is practically equal to VI

The above formula does not take into account the air speed indicator's own tolerance.

Altitude correction

The altitude correction is practically equal to zero. The altimeter's own tolerance is not taken into account.

◆ Note : All speeds in this manual are indicated speeds unless otherwise specifed.

PARAMETERS AFFECTING THE PERFORMANCE

The calculated performance data in this section are based on datas derived from flight tests, with the aircraft and engine in good condition and utilising average piloting skills. Unless otherwise indicated, the ambient conditions are those of a standard atmosphere.

◆ Note: Whenever possible, choose the most conservative values of the following data so as to have a greater safety margin and to face up unforeseen events during the flight.

A conservative value for perfomance can be established by taking the next highest values for mass, altitude and temperature.

STALL SPEEDS

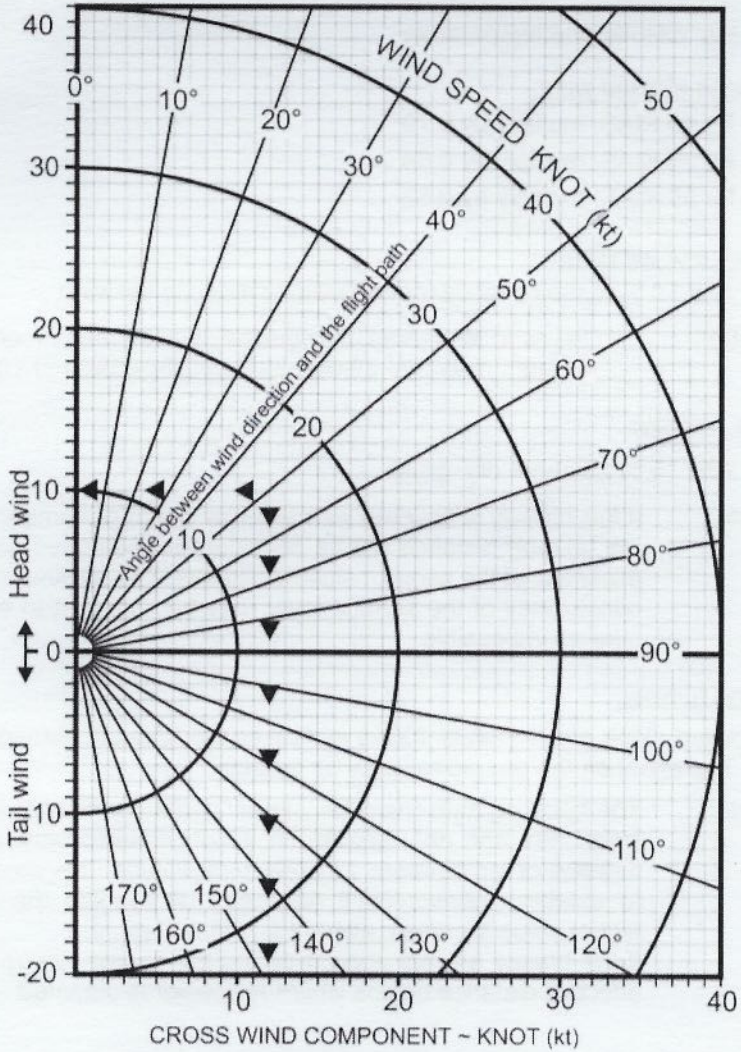
Engine idle Mass 1000 kg (2205 lb)	KIAS (km/h)		
Pitch	0°	30°	60°
Flaps retracted	54 (99)	58 (106)	76 (140)
Flaps 1st stage, take-off position	51 (93)	54 (99)	71(131)
Flaps 2nd stage, landing position	47 (87)	51 (93)	67 (123)

Tableau 5-1 - Stall speeds

WIND COMPONENT

Example:

Heading =	10°	Wind direction vs heading	50°
Wind direction =	60°	Crosswind 11Kt	
Wind speed =	15 Kt	Headwind = 10Kt	



TAKE-OFF PERFORMANCE

The take-off distances show the ground roll and the distance to clear 50 feet (15 metres) above the ground. These distances are based on a short take-off technique.
Conservative values can be determined by reading the next highest values for mass, altitude and temperature.

Influence of head wind:

- for 10 KIAS, multiply by 0.79
- for 20 KIAS, multiply by 0.64
- for 30 KIAS, multiply by 0.53

Influence of tail wind:

- Add 10 % to the distance for each 2kt increase in tail wind.

◆ Note: So as to limit take-off distances, it is not recommended to attempt to take off with a tailwind in excess of 10 kts.

Grass runway:

- Add 15 % for short, dry, grass.

◆ Note: If the runway is covered with snow or slush, remember that the take-off distance will be considerably increased as the thickness of the snow or slush increases. The thickness and consistency of the surface layer may be sufficient to make take-off impossible.

Sloping runway:

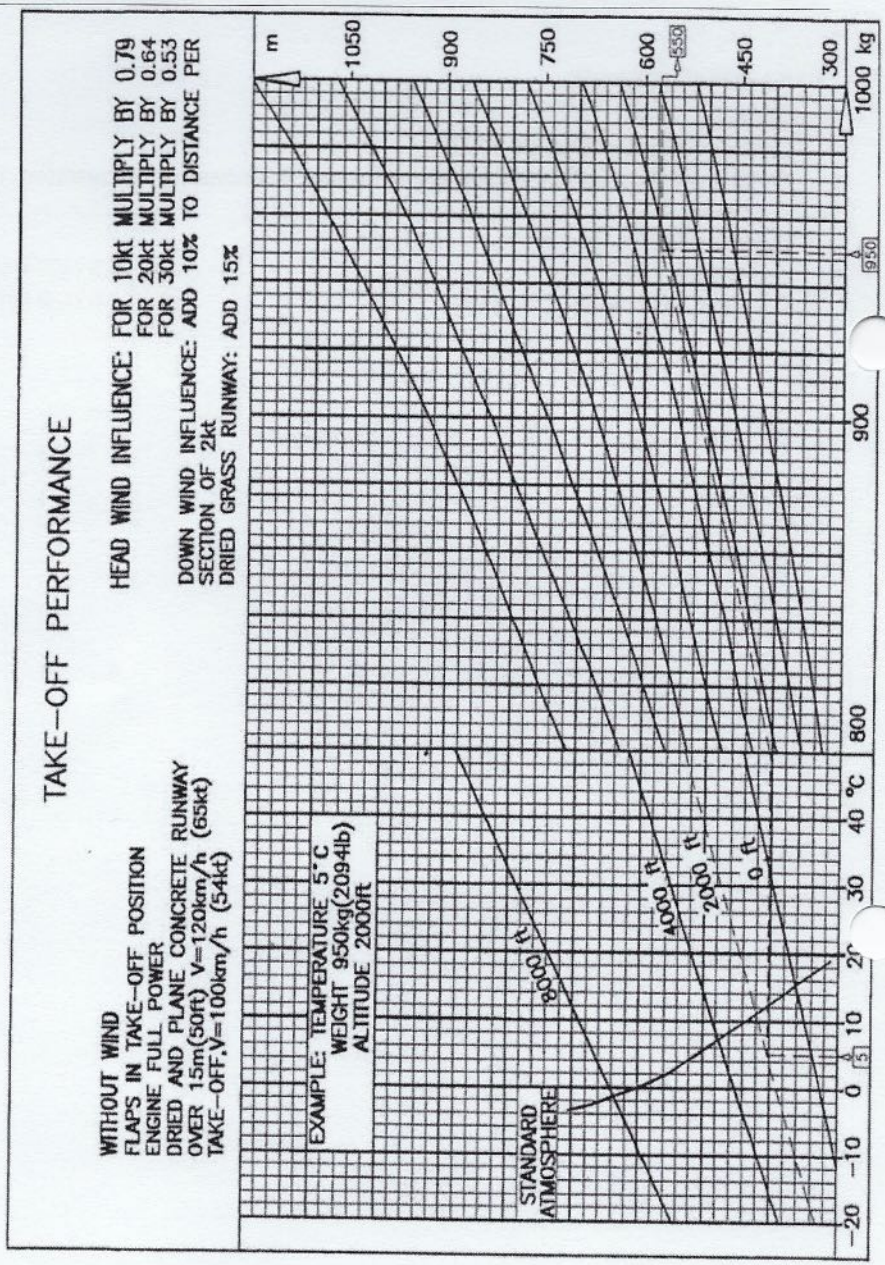
An upward slope of 2% (2m in 100m) increases the take-off distance by 10%. The effect on the ground roll may be greater.

◆ Note: The following data gives the take-off performance of a clean, insect-free and dry, aircraft, on a horizontal runway, as a function of temperature and pressure altitude. It is possible to establish conservative distances by reading the next higher value for mass, altitude and temperature.
If the brakes are not applied during the engine run-up, the effective distance begins where full power is obtained.

Take-off distances.

Conditions:

- Maximum take-off weight 1000 kg.
- No wind, flaps in take-off position (1st stage), full power before releasing the brakes.
- Runway hard, dry and flat.
- Take-off speed Vlof.....54 KIAS (100 km/h)
- Speed on passing 15 m (50 ft.).....65 KIAS (120 km/h)


TAKE–OFF PERFORMANCE
WITHOUT WIND
FLAPS IN TAKE–OFF POSITION
ENGINE FULL POWER
DRIED AND PLANE CONCRETE RUNWAY
OVER 15m(50ft) V=120km/h (65kt)
TAKE–OFF V=100km/h (54kt)
HEAD WIND INFLUENCE: FOR 10kt MULTIPLY BY 0.79
FOR 20kt MULTIPLY BY 0.64
FOR 30kt MULTIPLY BY 0.53
DOWN WIND INFLUENCE: ADD 10% TO DISTANCE PER SECTION OF 2kt
DRIED GRASS RUNWAY: ADD 15%
EXAMPLE: TEMPERATURE 5°C
WEIGHT 950kg(2094lb)
ALTITUDE 2000ft
STANDARD ATMOSPHERE
8000 ft
4000 ft
2000 ft
0 ft
m
1050
900
750
600
450
300
650
950
1000 kg
800
900
-20
-10
0
10
20
30
40 °C
5

CLIMB PERFORMANCE

At maximum weight of 1000kg (2205 lb) in standard atmosphere.
At sea level:

Best angle of climb speed (Vx)

Flaps in take-off position (1st stage) ..... 70 KIAS (130 km/h)

Best rate of climb speed (Vy)

Flaps in take-off position (1st stage) ..... 78 KIAS (145 km/h)

Flaps retracted ..... 86 KIAS (160 km/h)

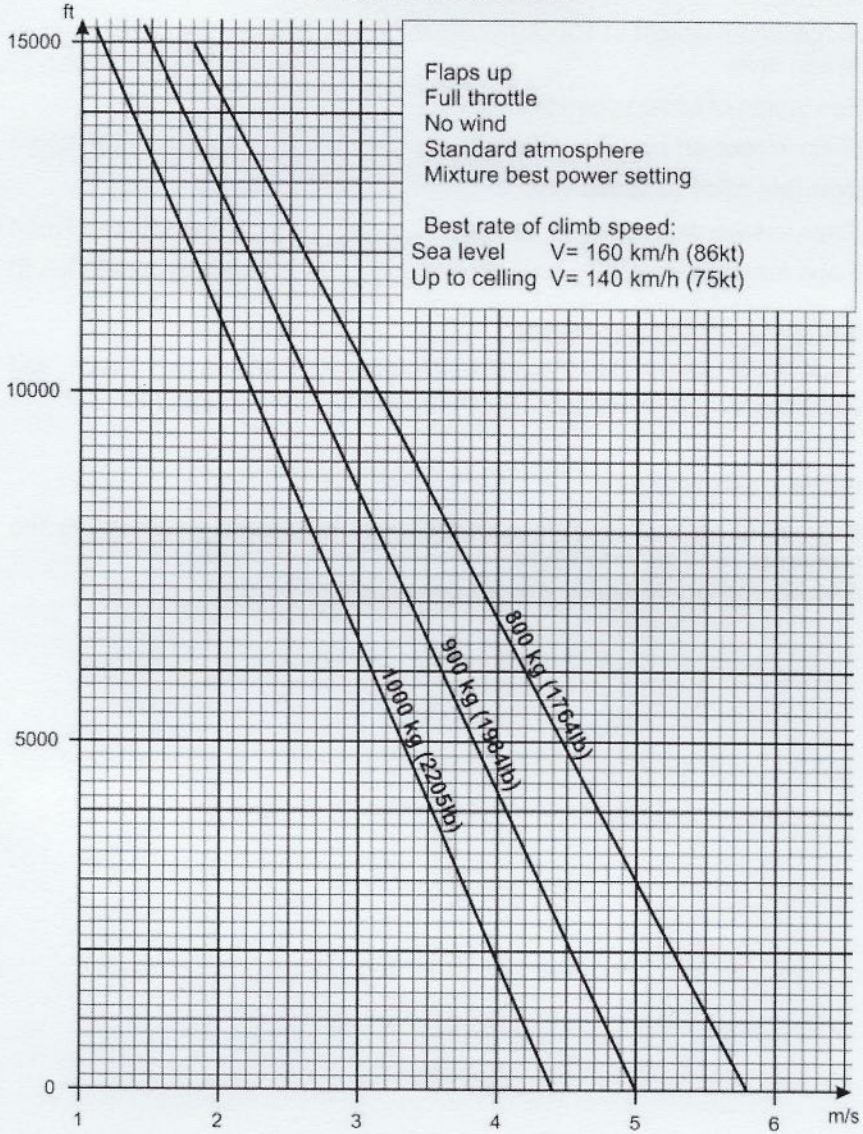
Influence of the temperature

Each 10°C above the standard, decrease the ceiling by 1000ft and decrease the climb rate by 47ft/min (0.24m/s).

Glide performance

Engine cut, without wind, the aircraft glides 9 times its height above the ground at 78 KIAS (145 km/h)
Altitude and temperature have no perceptible influence.

CLIMB PERFORMANCE



CRUISE PERFORMANCE

In standard atmosphere.
At maximum weight of 1000kg (2205 lb).
No wind.
Fully rich.

Standard capacity.
Standard tanks: ..... 109 litres usable.
Distributed as follows:

Main tank	110 litres

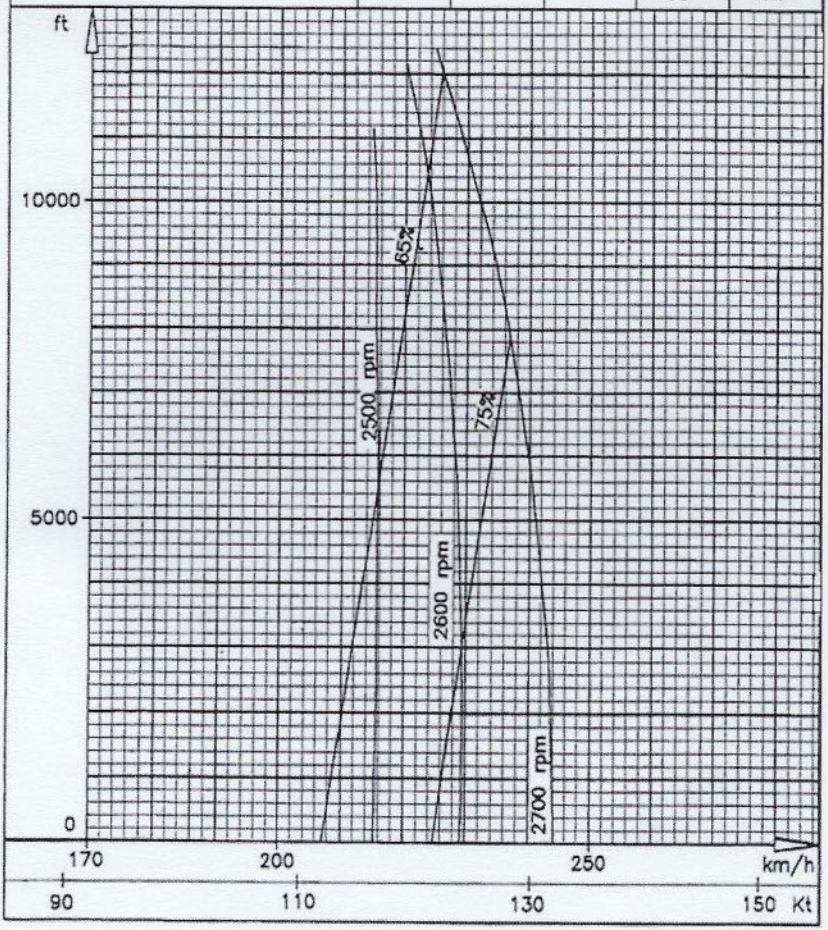
The capacity can be increased by means of an optional tank.
Standard tanks + optional tank : ..... 159 litres usable.

Optional tank	50 litres

CRUISE PERFORMANCE

At gross weight 1000kg (2205lb)
In standard atmosphere
Without wind
Optimum mixture setting

Power	Fuel consumption l/h (us gal/h) 75 % l/h	75 % us gal/h	65 % l/h	65 % us gal/h
2700	39.3	10.3	34.7	9.1
2600	38.3	10.1	33.8	8.9
2500			33	8.7



LANDING PERFORMANCE

The landing distance figures show the distance from a height of 50 feet (15 metres) above the ground to where the aircraft comes to a complete stop.
It is possible to establish conservative distances by taking the next higher values for mass, altitude and temperature.

Influence of head wind:

- for 10 KIAS, multiply by 0,79
- for 20 KIAS, multiply by 0,64
- for 30 KIAS, multiply by 0,53

Influence of tail wind:

- Add 10 % to the distance for each 2kt increase in tail wind.

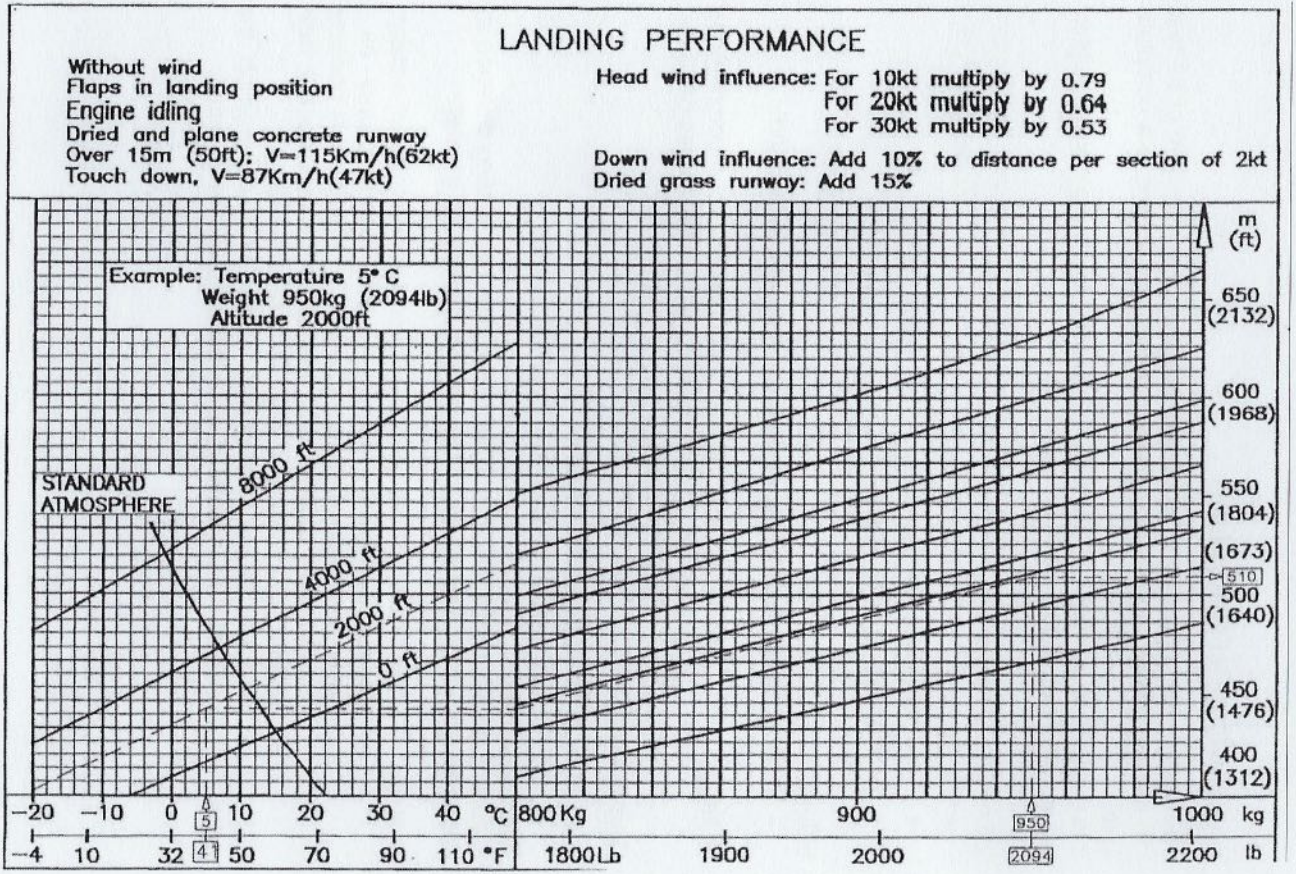
◆ Note: So as to limit landing distances, it is not recommended to attempt to take off with a tailwind in excess of 10 kts.

Grass runway:

- Add 15 % for short, dry, grass.

Sloping runway:
A downward slope of 2% (2m in 100m) increases the landing distance by approximately 10%. The effect on the ground roll may be greater.

◆ Note: The following data gives the landing performance of a clean, insect-free and dry, aircraft, on a horizontal runway, as a function of temperature and pressure altitude. It is possible to establish conservative distances by reading the next higher value for mass, altitude and temperature.
If the brakes are not applied during the engine run-up, the effective distance begins where full power is obtained.


LANDING PERFORMANCE
Without wind
Flaps in landing position
Engine idling
Dried and plane concrete runway
Over 15m (50ft): V=115Km/h(62kt)
Touch down, V=87Km/h(47kt)
Head wind influence: For 10kt multiply by 0.79
For 20kt multiply by 0.64
For 30kt multiply by 0.53
Down wind influence: Add 10% to distance per section of 2kt
Dried grass runway: Add 15%
Example: Temperature 5° C
Weight 950kg (2094lb)
Altitude 2000ft
STANDARD ATMOSPHERE
8000 ft
4000 ft
2000 ft
0 ft
m (ft)
650 (2132)
600 (1968)
550 (1804)
(1673)
510
500 (1640)
450 (1476)
400 (1312)
−20 −10 0 5 10 20 30 40 °C
−4 10 32 41 50 70 90 110 °F
800 Kg 900 950 1000 kg
1800 Lb 1900 2000 2094 2200 lb

6

MASS &
BALANCE

SECTION 6 :

MASS AND BALANCE

The nomogram that follows is used to determine the balance of the DR400.

The pilot must ensure that the aircraft is loaded correctly.

◆ Note : Due to the rearward position of the main tank (and the supplementary tank if fitted), the centre of gravity moves forward as fuel is used.

◆ Note : If the supplementary fuel tank is fitted, it is necessary to be sure that there is sufficient space in the main tank to take all the fuel contained in the supplementary tank before transferring the fuel from the supplementary tank into the main tank.

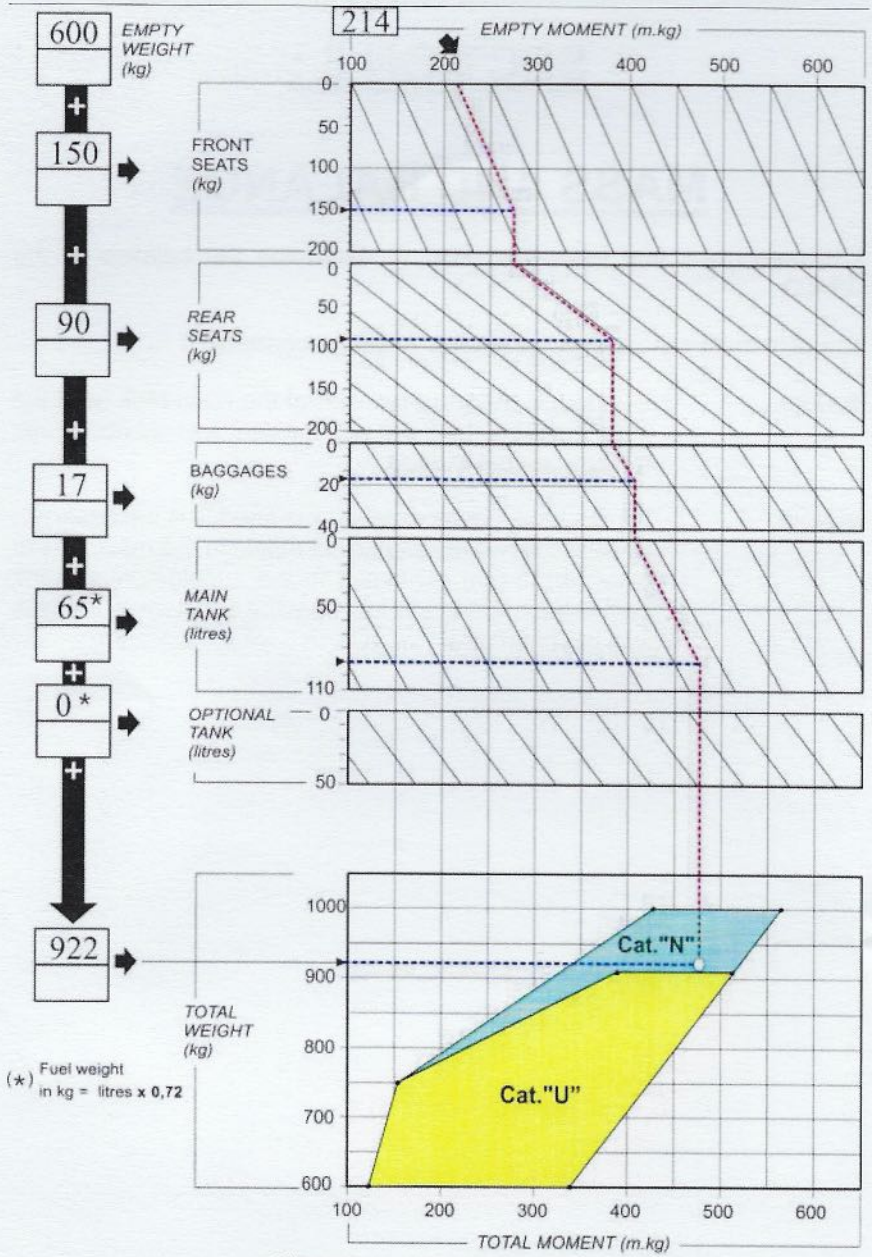


Figure 6-1 - Mass and balance

USE OF THE NOMOGRAM

1) Calculate the total weight of the aircraft:
   Empty weight (see the weighing sheet)
   + Weight of pilot and passengers
   + Weight of luggage
   + Fuel (1 litre 100LL = 0·72 kg)
   Ensure that the total weight does not exceed 1000 kg (2205 lb) for category N and 910 kg (2006 lb) for category U.
2) Enter the empty weight of the aircraft (see the weighing sheet) in the appropriate box of the nomogram, then proceed to enter your data according to the example, extending the dashed lines as appropriate.

The final point must be within the relevant mass-moment area for the loading to be acceptable.

▲ **WARNING** : In calculating the balance of your aircraft, **do not use** the values of empty weight and empty moment given in the preceeding example!
Instead, use the values from the latest weighing sheet of your aircraft.

EXAMPLE of loading calculation (dotted lines on the diagram)

Empty weight moment (for example) ..... (1548 ft.lb) 214 m.kg
Empty weight ..... (1323 lb) 600 kg
Pilot + front seat passenger ..... (331 lb) 150 kg
Rear passenger ..... (198 lb) 90kg
Luggage ..... (37·5 lb) 17 kg

This gives mass and balance without rear seat occupants and with empty tanks.

Fuel (full main tank) 90L (24imp/20us gal) ..... (143 lb) 65 kg
Fuel (empty optional tank) 0L (0imp/0us gal) ..... (0 lb) 0 kg

TOTAL WEIGHT ..... (2033 lb) 922 kg

Balance: within the prescribed area.

◆ Note:

1 litre AVGAS ..... 0·72 kg (1,6 lb)
1 imp gal AVGAS ..... 3·27 kg (7.2 lb)
1 US gal AVGAS ..... 2·7 kg (6 lb)

ROBIN NEW AIRCRAFT
Handcrafted in France since 1957

PROCES VERBAL DE PESEE ET DE CENTRAGE

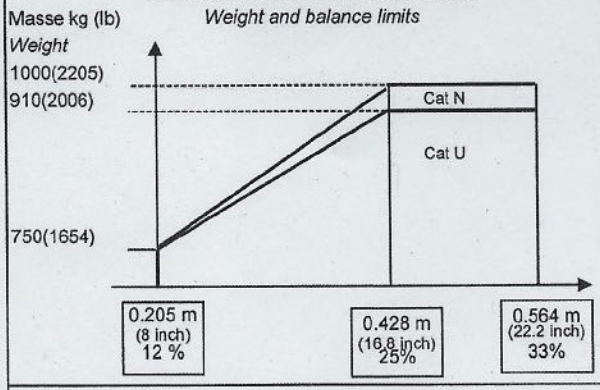
TYPE : **DR 400/140B**

N° DE SERIE / Serial number **2726**

IMMATRICULATION / Registration **HB-KOJ**

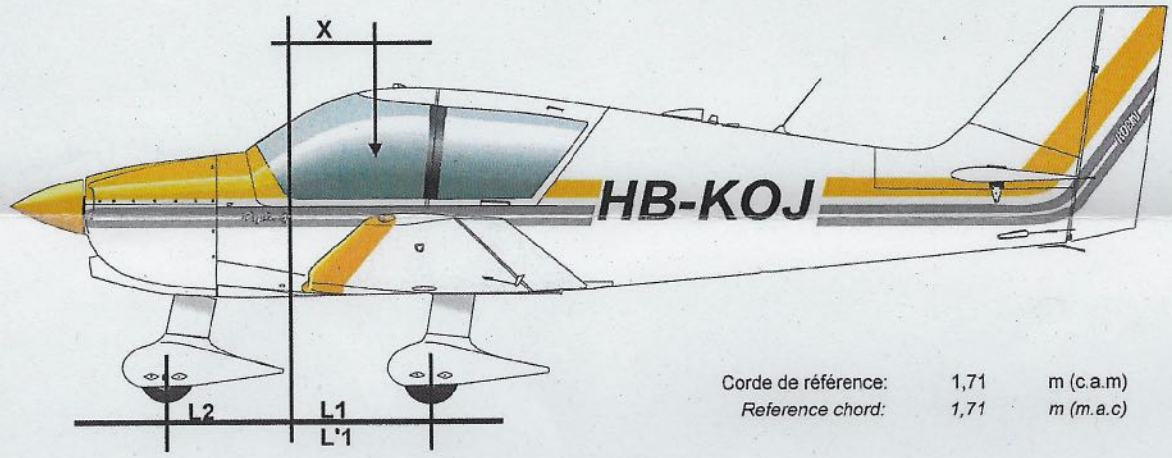
DOMAINE DE MASSE ET CENTRAGE

Weight and balance limits



Référence verticale:Bord d'attaque de la partie rectangulaire de la voilure
Mise a niveau:Longeron de fuselage horizontal
C G datum : leading edge of rectangular wing part
Levelling : horizontal reference top fuselage spar
Conditions de la pesée: Hors Documentation
- pleins d'huiles et liquide refroidissement-Barre de manoeuvre
- équipements figurants au Registre de Contrôle
- essence non utilisable comprise dans la masse à vide

Weighing conditions : - Wiithout documentation
- *full operating oil and cooling fluid -Towbar*
- *equipement listed in the inspection report*
- *unusable fuel inclued in empty weight*



Corde de référence: 1,71 m (c.a.m)
Reference chord: 1,71 m (m.a.c)

MASSE ET CENTRAGE A VIDE

Weight and balance-Empty aircraft

		Masse(kg)	Bras de Levier(m)	Moment(m*kg)
ROUE PPALE D *Main R wheel*	L1	241	0,828	199,548
ROUE PPALE G *Main L wheel*	L'1	240	0,828	198,720
ROUE AV *Front wheel*	L2	177,5	0,819	-145,373
Essence non utilisable *Unusable fuel*		0,72	1,120	0,806
Avion vide *Empty aircraft*		659,22	0,385	253,702
CENTRAGE *Balance*		22,51%	c.a.m m.a.c	

A Darois, le : 6 juin 2019 Visa ROBIN AIRCRAFT : R. RADOUAN

SYSTEM
DESCRIPTIONS

SECTION 7 :

SYSTEM DESCRIPTIONS

This section provides a description of the basic operating procedures for the standard aircraft and its systems. The optional equipment described in this section is identified as optional.

◆ Note: Some optional equipment, particularly avionics systems, may not be covered in this section. For descriptions and procedures not described in this section, refer to SECTION 9: « **Supplements** ».

Airframe

The DR400 is a four seat, single-engine, low-wing, monoplane aircraft with wing-tip dihedral, a one-piece horizontal tail and a fixed tricycle landing gear. The structure is mainly of reinforced or covered wood. Some parts are made of laminated composites, or aluminium alloys. The mechanical sub-assemblies are generally made of steel.

Flap control switch

The flaps are controlled by a multifunction unit which actuates the electric jack and controls the annunciator lights.

The control switch has three positions (retracted, take-off and landing)

The take-off position is indicated by the middle green light. The landing position is indicated by the middle and the bottom lights.

When the flaps are retracted, all the lights are extinguished.
The lights flash when the flaps are moving.
The system is protected by a specific circuit breaker.

At power-up, the system runs a self-test:

> If the red light remains illuminated then there is a fault. In this case, disconnect and then reconnect the circuit breaker to reset the system. If the fault persists, contact your maintenance organisation.

The system can also be reset in flight if the red light comes on.

Elevator system

The elevator control transmits movements to the stabilator by means of cables directly connecting the stick to an articulated joint (of monobloc type).

Aileron system

The ailerons are controlled directly by cables attached to the stick.

Rudder control

The rudder is turned by cables connected directly to the rudder pedals.

Control lock

The DR400 is not equipped with a control locking. If parking outside, it is advisable to prevent aileron and rudder movement by securing the **pilot's seat belt** around the stick.

Elevator trim

The elevator trim consists of an electric jack connected to the trim tab, a control switch and a position indicator on the centre console, and a circuit breaker.
A control switch is on both the pilot's and the co-pilot's stick.

Roll compensation

Roll adjustment can only be done in the workshop by fitting a trim tab under one aileron. The system is set for cruise at 75% power.

Yaw compensation

Yaw adjustment can only be done in the workshop by adjusting the rudder control cable tensioners. The system is set for cruise at 75% power.

Cabin layout

The following paragraphs give a general description of the cabin, the instruments and the controls. Details of the instruments, switches, circuit breakers and controls on the upper and lower and annunciator panels, and the central console are given in the supplement for the panel of the specific aircraft.

Panel and centre console

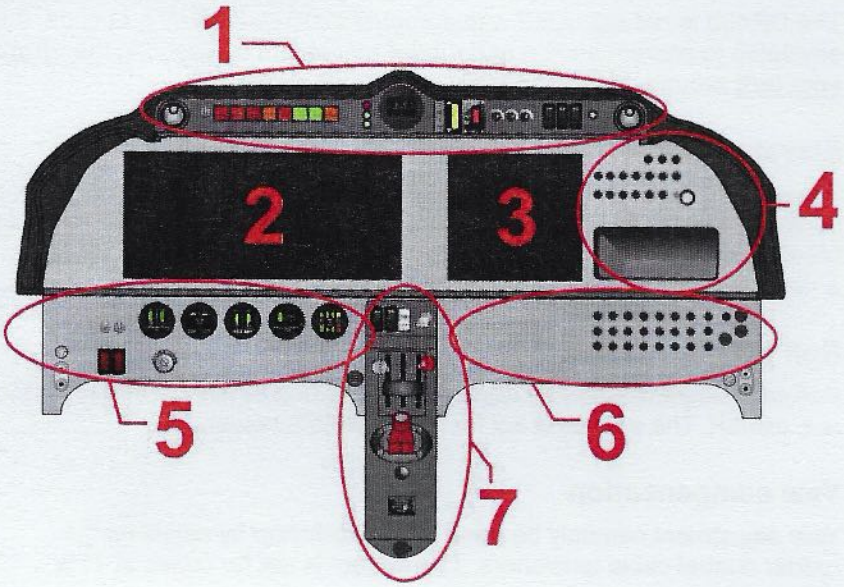


Figure 7-1

Part 1 = upper panel (ventilator / lights / compass / ELT)
Part 2 = flight instrument area (according to the equipment specified)
Part 3 = area for radio / navigation equipment
Part 4 = circuit breakers and storage box
Part 5 = engine instruments
Part 6 = area for radio / NAV, circuit breakers

Part 7 = - Controls for fuel pump, landing and taxiing lights, flaps
- Control for engine
- Control for carburettor heat
- Fuel selector valve
- Parking brake control
- Hour meter
- 12 V supply socket

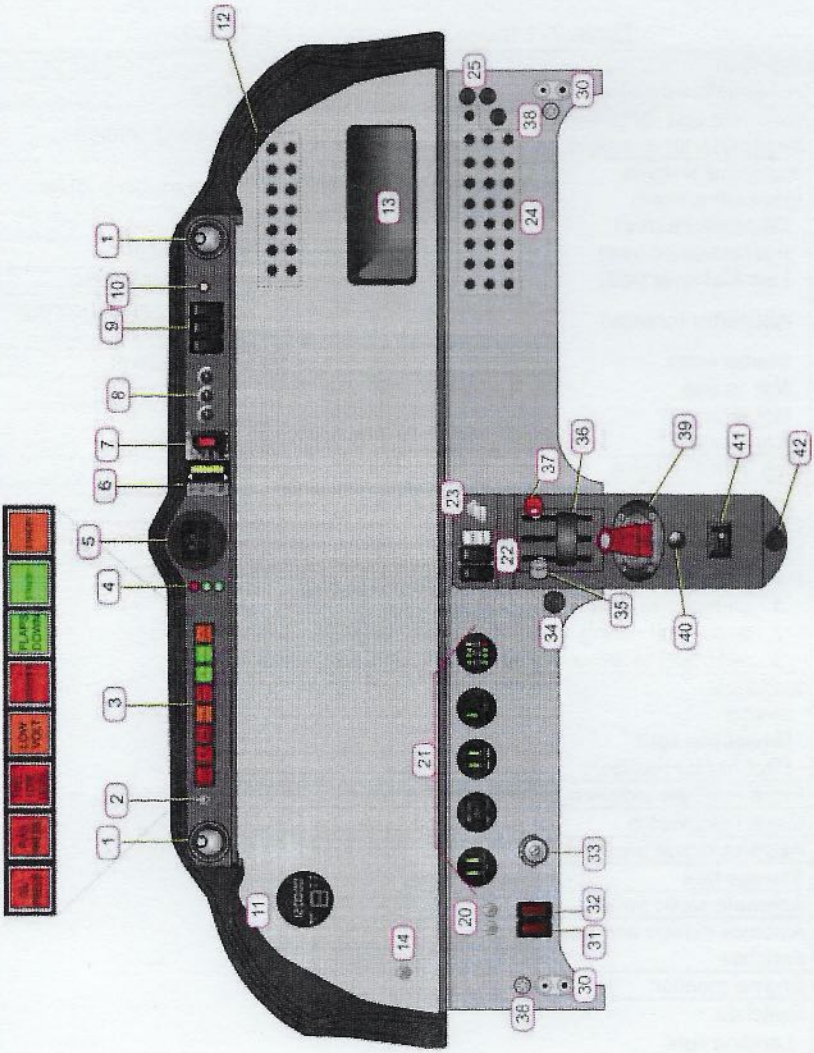


Figure 7-2 Panel

◆ Note: Refer to the panel supplement (SECTION 9) for the avionics and radio layout.

Table 7-1 Index for the panel figure 7-2

Pos	Function
1	Adjustable ventilators
2	Switch to test lights and change brightness for day/night
3	Annunciator lights: (from left to right) Oil pressure (red) Fuel pressure (red) Low fuel level (red) Alternator (orange) Starter (red) Not in use Not in use Not in use
4	Flap indicator lights
5	Magnetic compass
6	Elevator trim indicator
7	ELT switch
8	Panel lighting controls - 1 : under glare-shield - 2 : directional ceiling light - 3 : radio and instruments
9	Switches: Strobe Navigation light Pitot heater (option)
10	Flight recorder indicator light (option)
11	Clock / stopwatch
12	Avionics circuit breakers
13	Storage box
14	Alternate static switch
20	Avionics master and emergency switches
21	Engine monitor
22	Switches: Landing light Taxiing light Electric fuel pump
23	Electric flap control switch
24	Circuit breakers
25	Heating / demisting controls
30	Microphone / headphone jacks
31	Battery master
32	Alternator relay switch
33	Key operated starter switch
34	Auxillary fuel tank transfer control (option)
35	Carburettor heat control
36	Throttle
37	Mixture control
38	LEMO jack (optionnel)
39	Fuel selector valve
40	Parking brake control lever
41	Hour meter
42	12 V power socket

Canopy

The canopy opens by sliding forward allowing access to the seats.
To prevent the canopy striking the oil filler hatch, ensure the hatch is closed and locked before moving the canopy.
The operating handle is located at the top, in the centre of the canopy.
The exterior part of the handle is fitted with a key-operated lock.
The interior part of the handle is accessible by the pilot and the co-pilot.
In case of need, the canopy is equipped with a release system consisting of two levers located on the armrests, either side of the panel.
The levers release the canopy from its rails, allowing it to be lifted free.

Seats

The DR400 is equipped with seats that simultaneously adjust for height and reach by means of a lever (labelled '2' in figure 7-3) situated at the front left of the pilot's seat and the front right of the co-pilot's seat.
There are four different positions, from the lowest and furthest from the panel to the highest and nearest.
Whilst supporting your weight on the handle attached to the armrest and the panel using your outboard hand, move the seat control lever from right to left for the pilot seat or from left to right for the co-pilot seat with the other hand. Then pull forward or let back using the armrest handle to make the adjustment.
The seat control levers also allow the front seats to be tilted fully forward to give access to the rear seats.
A ring located at the rear of the front seats (labelled '2' in figure 7-3) allows the rear seat occupants to tilt the front seats fully forward.

Figure 7-3 (pilot's seat frame)

Seat belts

There is 2 different systems:

System n°1: On aircrafts before serial number n°2718
The belts for the front seats consist of three straps, two of which are adjustable and one of which is tensioned by a retractor (see figure 7-4) (optional for the rear seats).
Clip the shoulder strap (labelled 1) onto the stud (labelled 2) of the belt, and then lock the eye (labelled 3) into the buckle (labelled 4). Then tighten the two straps.
Lift the buckle (labelled 4) to release the belt.

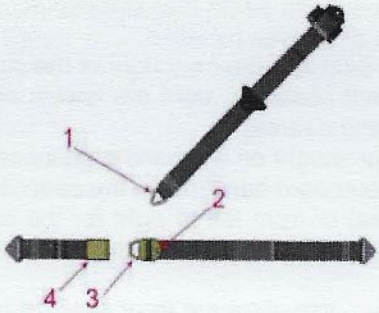


Figure 7-4 (Example: pilot's [left side] belt)

System n°2: On aircrafts since serial number n°2718.
This system consists of a single harness with retractor, to fulfill the functions of ventral belt and shoulder. 3-point belt with car buckle.

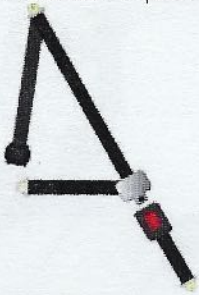


Figure 7-5 (Harness example)

Luggage compartment

The luggage compartment of the DR400 is behind the rear seats. It is accessible from the outside by a door secured by two, key-lockable, compression latches.

The hatch is unlocked by pressing the push-buttons (labelled 1 in fig 7-5) of each latch, after which the door is opened upwards.

The hatch is held open by means of a self-locking strut.

To close the hatch, pull forward on the hinge of the strut and let the door down. Then actuate the push-buttons to compress the seal and lock the latches.

It is recommended that both latches are locked by key before flight.

The baggage compartment floor is fitted with four elastic ropes for securing the luggage.

During flight, the luggage must be evenly distributed in the compartment so as to maintain the balance of the aircraft and must be secured using netting or straps attached to the fixing eyes on the compartment floor.

It is imperative to check the total weight and the centre of gravity of the aircraft when carrying luggage.

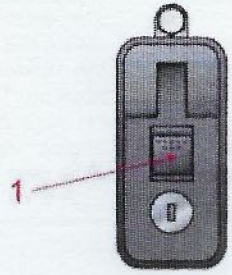
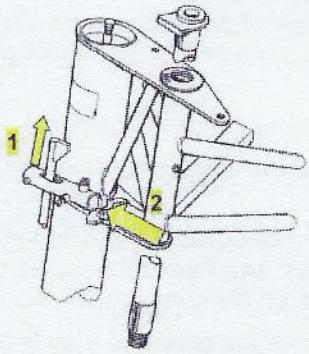


Figure 7-6 Compression latch

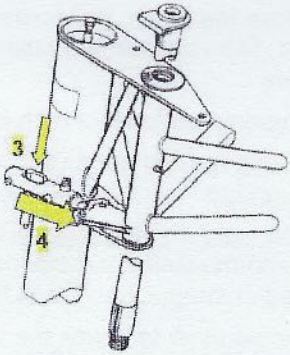
Landing gear

The DR400 is equipped with a fixed tricycle landing gear with oleo-pneumatic dampers, with the front wheel steerable using the rudder pedals. The nose gear is equipped with an anti-shimmy device.

The nose gear is equiped with a locking system that keeps the wheel in the axis of the aircraft during flight and allows steering on the ground.



On the ground: unlocking the nose gear.
The compression of the nose damper during the run (parking, landing) causes the rise of the cam (1). This action release the finger (2) which move back and leave the groove of the paddle of the engine frame and releases the nose gear.



In flight: locking the nose gear.
The expansion of the nose damper during the take-off or the flight causes the descent of the cam (3) into the housing. This action pushes the finger (4) into the groove of the paddle of the engine frame and immobilizes the nose gear.

Braking system

The brake master-cylinders are secured against the inside of the firewall by a bracket on which the parking brake valve is also fixed. The master-cylinders are actuated by hinged tubes located in the angle between floor and firewall and controlled by connecting rods attached to the pedals. Each brake (right or left) is operated independently from the pilot's or the co-pilot's position.

Braking is independent of steering.

Parking brake

The aircraft is equipped with a parking brake which allows pressure to be maintained in the master cylinders, thus locking the wheels.
When the aircraft is stationary, depress the brake pedals and maintain pressure. Pull the parking brake plunger and then release the pedals. The parking brake is now actuated.
To release the brake, simply push the plunger downwards.

▲ **WARNING**: Do not pull the parking brake plunger during flight. In the event of landing with the parking brake valve engaged, any braking force applied using the pedals will be maintained even if the pedals are released. This can lock the wheels and cause a tyre burst or a fire.

Use of the brakes

The braking system of an aeroplane is not intended to be permanently activated. To prevent the system overheating, it is important to:

- During the pre-flight inspection, make sure that the braking system is not locked
- Taxi using minimum power. Once in motion, on hard ground, idle power should be sufficient to keep the aircraft moving. The need to continuously taxi with power can indicate a problem (brake binding, residual pressure in the brake system, low tyre pressure...).
- Do not taxi with power and control the speed with the brakes.
- Be careful not to apply permanent pressure on the top of the pedals (thus applying the brakes). Lower your feet so as not to activate the brakes continuously.
- Brake intermittently rather than continuously to allow the brakes to cool between applications.
- Taxi at a moderate speed; it is safer both for you and for other users of the airfield.

Engine

The DR400/140B is equipped with a four cylinder 0-320-D2A Lycoming engine, with a power of 160 hp at 2700 rpm. Ignition is by double magentos.

Engine cooling

The engine is cooled by air passing both through the oil cooler and around the engine. The cooling air enters the engine compartment through two ports in the cowling. The heated air exits the engine compartment under the cowling.

Carburettor

The carburettor delivers the air / fuel mixture necessary for the engine to operate.

It also adjusts the fuel flow according to the position of the throttle lever operated by the pilot. The manual mixture control allows precise adjustment of the proportion of fuel in the mixture, and for the fuel supply to be cut completely.

Movement of the throttle lever causes the butterfly valve to rotate, thus changing the quantity of air / fuel mixture entering the cylinders.

In case of carburettor icing, the carburettor heat control opens a flap that ducts hot air into the carburettor to suppress ice formation. The supply of hot, less dense, air causes a decrease in engine power.

It is recommended to use the carburettor heat control fully on or fully off to avoid ice formation.

Engine air intake system

Air enters the engine compartment through the front left port of the cowling and passes through the inlet filter.

If the filter becomes clogged, the pilot can apply carburettor heat to allow the engine to continue to operate.

Be vigilant, however, because the air is now only coarsely filtered, so do not apply hot air continuously or on the ground.

Engine ignition

Ignition of the fuel / air mixture is achieved by two magnetos driven by the engine energising two spark plugs per cylinder.

Engine exhaust

After leaving the cylinders, the exhaust gases pass through the exhaust manifold and silencer and exit through the lower right side of the cowling. A sleeve-type heat exchanger, placed around the silencer, provides cabin heating.

Propeller

The aircraft is fitted with a fixed pitch propeller.
The propeller is driven directly by the engine output shaft.

■ REMARK: Do not move the aeroplane by pushing on the spinner.

Electrical system

The electrical system is equipped with the following displays and controls:

1. "Battery" master switch
   Connects the battery in normal operation
2. "Alternator" switch
   Turns the alternator off. The alternator must be left "on" during normal operation
3. "Starter" key
   This control is to select the magnetos and to operate the starter (the spring-loaded position at the clockwise limit = starter).
4. "Charge" indicator light
   This illuminates when the voltage is too high or too low (below 12·1 V or above 16V). The light is normally on when the engine is stopped with the battery master "on". With the engine running, the light should be extinquished after turning on the alternator switch.

Electrical circuit

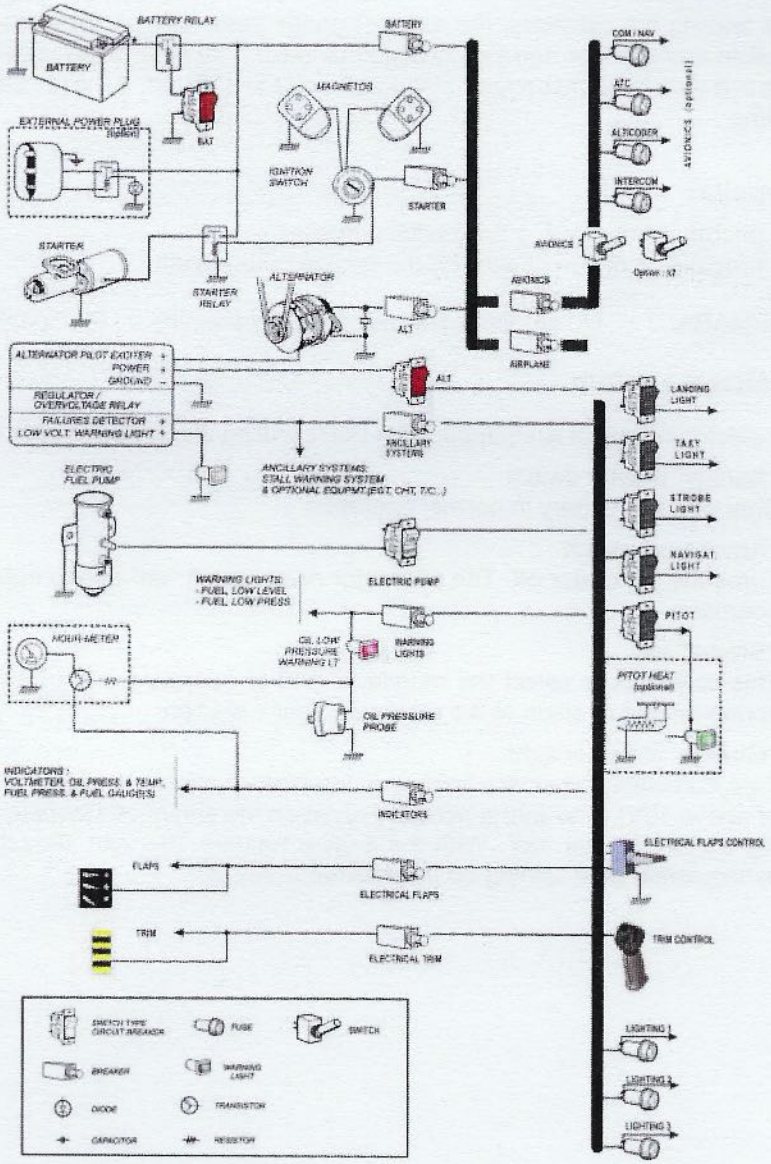


Figure 7-7 Simplified circuit diagram

Fuel / Fluids

The approved fuels and fluids are given in « SECTION 2 – Limitations » of this Flight Manual.

▲ **WARNING** : Under no circumstances should the engine be started if the level is too low ;

▲ **WARNING**: Fuel straining must be done to ensure that there is no water or impurities in the tanks.
For an effective test under good conditions, ensure that the aircraft has been stationary for at least 30 minutes on a horizontal surface
(These conditions are usually met before the first flight of the day).
Fuel straining must be done with a clean container intended for the purpose and which allows water to be identified.

▲ **WARNING**: Ensure the correct type of fuel (AVGAS 100LL: the colour must be blue)

■ REMARK: Use of non-approved fuels can cause damage to the engine and the fuel system, eventually causing engine failure.

Engine oil system

The engine is equipped with a wet sump oil system, for lubricating and cooling the engine. The engine oil is drawn from the crankcase, passed through a strainer, and is sent to the oil cooler mounted on the fire-wall. A control valve puts the oil in bypass if the temperature of the oil is low or the pressure drop is greater than a threshold value. The bypassed or cooled oil is then passed through an oil filter and then into the engine lubrication system.
The oil is also sent to the propeller regulator to regulate the pitch of the propeller.
The oil filler cap and the dipstick are located at the rear of the right side of the engine. The oil filler caps and dispstick are accessed via a hatch on the upper right side of the engine cowling.

Fuel system

The fuel system consists of a single main tank. This tank is equipped with a fuel level sensor with visual display, and an independent low fuel level visual alarm that is linked to the position of the fuel selector valve.

The 110 litre main tank is situated under the rear seats.

The fuel flows from the tank to the fuel selector valve under the floor and then to the electric pump. The fuel then passes from the electric pump to the mechanical pump.

The fuel selector valve has two positions: open and closed.

The mechanical pump supplies fuel under pressure to the carburettor, then the carburettor feeds the air / fuel mixture to the engine.

The electric fuel pump enables:

Increased fuel supply for priming and to prevent vapour formation;
Ensures the supply of fuel in case of failure of the mechanical pump;

The electric pump is operated by a switch located on the centre console.

Tank	Usable fuel	Unusable fuel
Main	109 litres 28·7 US gal 24 imp gal	1 litre 0·26 US gal 0·22 imp gal

Table 7-2 Fuel volumes

The total fuel capacity can be increased to a total of 160 litres (35·2 Imp. gal / 42·3 US gal), giving a usable volume of 159 litres (34·9 Imp. gal / 42 US gal), by installing the optional 50 litre (11 Imp. gal / 13·2 US gal) tank.

Optional tank

The 50 litre optional tank feeds into the main tank. A valve directly attached to the outlet of the tank is operated by a plunger on the panel.
The optional tank is installed in the fuselage behind the rear seat. The fuel contained in the optional tank can be transferred to the main tank by pulling the handle of the plunger situated on the panel.

▲ **WARNING** : The optional tank has a fuel level gauge but does not have a low-level warning.

◆ **Note :** The main tank must have sufficient space to accept the amount being transferred from the optional tank before starting the transfer.

Fuel gauges

Levels of fuel in the main tank and the supplementary tank (if installed) are indicated by gauges on the instrument panel (depending on the configuration of the panel).

◆ **Note** Indication of fuel levels in the tanks is a complex problem because the fuel is moving in the tanks. The fuel moves with turbulence and the manœuvres of the aircraft.
Always check that the gauges and your monitoring of fuel usage correspond. Use of the fuel gauges is not a substitute for proper preparation for flight, pre-departure fuel level checks, and in-flight fuel management techniques.

◆ **Note** The fuel level indication in the tanks is reliable and usable only when the aircraft is in level pitch, wings level, and in symmetrical flight.

Fuel tank selector

The fuel tank selector (and fire-wall valve) is situated in the centre console. Moving the selector to or from the « OFF » position requires a locking/unlocking action (pull up on the arrow-shaped control handle before turning it).

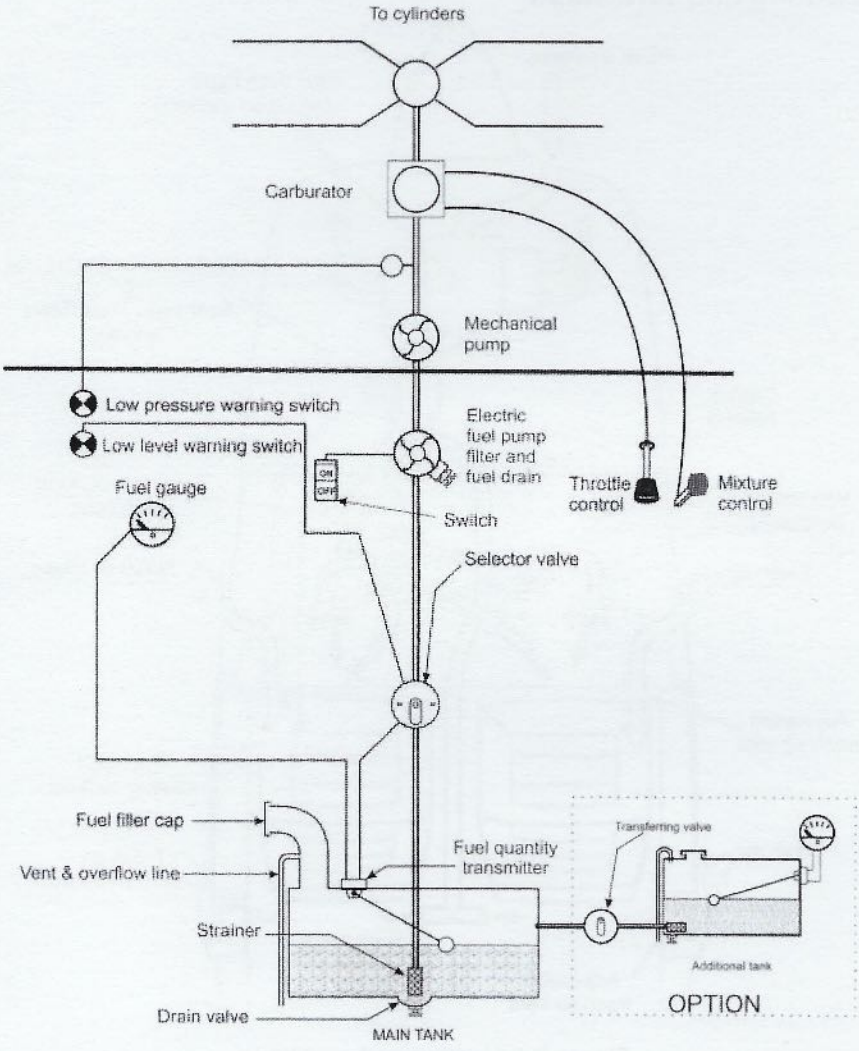


Figure 7-8 Simplified diagram of the fuel system

Heating and ventilation

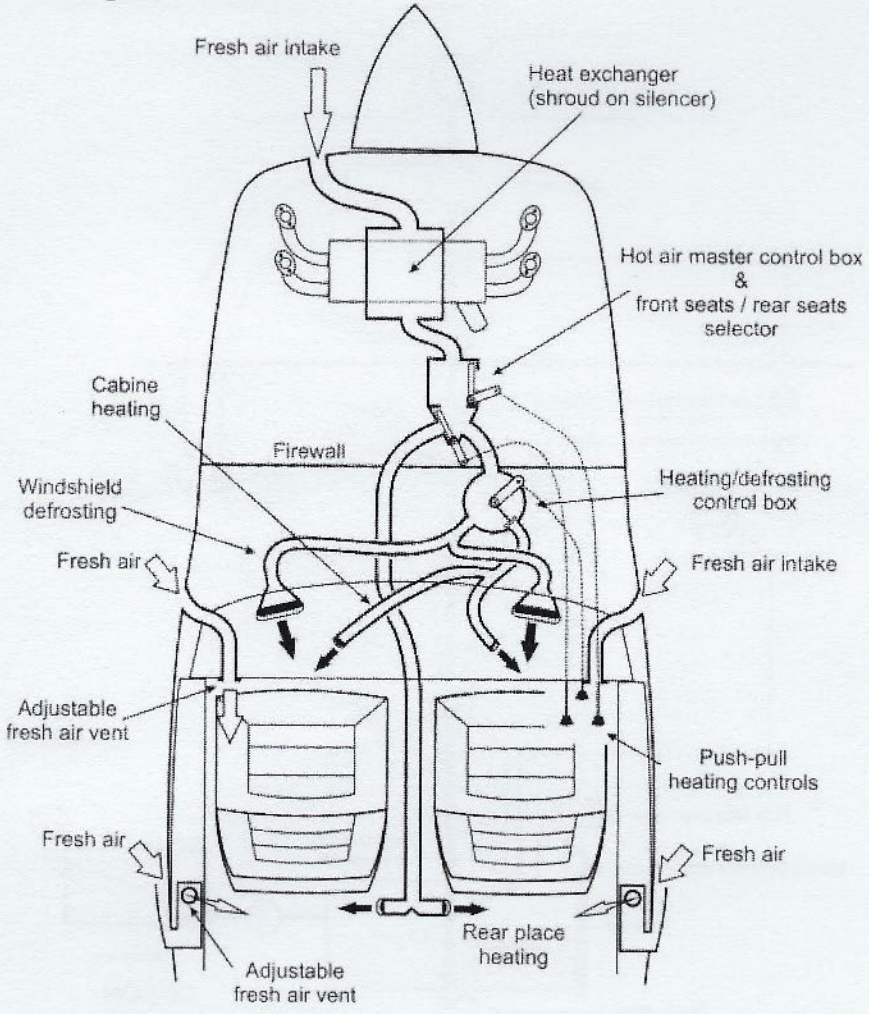


Figure 7-9 Heating and ventilation

Management of heating/demisting plungers			
	Function	Pull	Push
Control 1	Heating	YES	NO
Control 2	Heating / demisting selection	HEATING FRONT	WINDSHIELD DEMISTING
Control 3	Front / rear selection	BACK	FRONT

Table 7-3 - Heating control positions

◆ Note : distribution of heat (front / demisting or front / rear) can be adjusted by moving the controls 2 and 3 more or less.

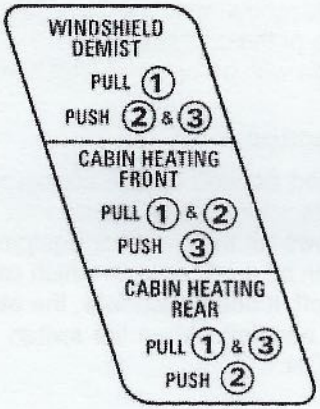


Figure 7-10 Heating control lable, right wall of the cabin.

Lighting (optional)

Optionally, the aircraft can be equipped with:
- Wingtip lights that combine navigation lights and anti-collision strobe lights;
- Taxiing and landing lights in the left leading edge of the wing;
- Adjustable interior lighting (panel, instruments and cabin).

Stall warning system

The aircraft is fitted with a stall warner that operates by detecting angle of attack. Whatever the configuration of the aircraft, the stall warner will trigger between 5 and 10 kts before the stall.

Pitot and static systems

The airspeed indicator, the vertical speed indicator and the altimeter all rely on the pressure system (for static pressure: 2 ports situated on either side of the fuselage; and for dynamic pressure: "PITOT", positioned under the wing on the left side of the aircraft).
The aircraft may be fitted with an optional pitot heater.

Avionics and navigation

The instruments installed depend on the configuration chosen. Refer to section 9 « Supplements » for specific items.
An avionics switch allows all the avionics equipment to be switched off together. This switch can be duplicated, in which case activating either will turn the avionics on or off. If one switch fails, the other will always operate (they are connected in parallel). When the switch is duplicated, only one switch must be turned ON.

Headset and microphone installation

The aircraft is equipped with microphone and headset jacks for each person. Optional, panel powered « Bose » (Lemo) jacks can be installed. A loudspeaker is located in the ceiling of the cabin to allow listening without headphones.

Flight recorder (optional equipment)

Safety Plane System, installed under STC

The aircraft is equipped with a flight recorder which registers the flight parameters. Its operation is automatic and it does not need user intervention.

The system has a LED to indicate its operation, located on the upper panel, and a dedicated circuit breaker on the middle or lower panel.

These components are labelled: « SafetyR ».

◆ Note : If the LED light remains on after the engine has started then this implies a malfunction of the Safety Plane **and the safety of the flight is not guaranteed.**

In the event of a malfuntion, see document 1002560 *Flight recorder user manual associated with the Robin airframe warranty* for a description of actions to be taken.
For other information, refer to the manufacturer's documentation.

Emergency locator transmitter

The aircraft is equiped with an autonomous emergency locator transmitter (ELT). The radio beacon and the antenna are located immediately behind the rear bulkhead of the cabin, to the left of the aircraft axis.
The main switch of the beacon, marked 'on', 'off', 'armed' is in the 'armed' position for normal operation. A remote control and an indicator panel are mounted on the upper panel. The radio beacon is mounted longitudinally in the aircraft and will detect a deceleration of greater than 3·5 ft/s. If a rapid deceleration is detected, the radio beacon transmits on the VHF band, alternately at 121·5 mHz and 406·0 mHz, approximately every 0·5 seconds.

Hour meter

The hour meter, mounted as standard, is located on the rear part of the centre console. It counts whenever the engine is running and totals the hours of operation of the engine.
Although fitted as standard, the hour meter is not mandatory equipment and, on request, it may be omitted during the building of the aircraft.

External power socket

The aircraft may be fitted with an optional external power socket located on the right side of the fuselage behind the wing.

The connection of a ground power unit to the power socket allows the following operations:
- Engine start;
- Demonstration of the electrical systems (eg the avionics) without draining the main battery;
- Recharging the battery.

The external power socket allows the aircraft electrical circuits to be directly powered whilst bypassing the aircraft's battery (the power source is downstrearm of the battery relay and supplies power directly to the electrical systems).

▲ **WARNING**: When the external power source is connected, the electrical buses are powered even if the battery master is switched OFF.
Before connecting the external power source, ensure that the starter circuit breaker is pulled to avoid the risk of the propeller spinning.

▲ **WARNING**: If the main battery is not able to start the engine, carry out the necessary maintenance operations to make the battery operational.

Start-up / Cockpit demonstration

Start-up and cockpit demonstrations are performed as if using the aircraft's battery.

Recharging the aircraft battery

Charging the aircraft's battery can be done as folows:
- pull the circuit breaker for the main and subsiduary buses (no systems should be supplied);
- connect a suitable charger (limited to 5A) to the external power socket;
- turn the battery master on;
- the battery is charging.

■ REMARK: Recharging takes a maximum of 12 hours; do not leave unattended for longer.

■ REMARK: The aircraft electrical circuit requires 14V. Ensure that the external power unit supplies DC regulated at 14V.

SECTION 8 :

MAINTENANCE OPERATIONS

Introduction

This section provides general guidelines for servicing the DR400. To ensure the safe and efficient operation of the aircraft, it is necessary to maintain contact with the authorised service centre of the aircraft to obtain the most recent relevant information.

Publications for the user

The approved flight manual is supplied with the aircraft, and is available for download with subscription.

Maintenance publications

Maintenance publications are available on subscription.

Towing

On the ground, the aircraft can be moved using a tow bar that is stored in the luggage compartment. To engage the tow, insert it into the tube on the left side of the front wheel.
In case of resistance, if the nose gear steering is locked, apply moderate pressure on the root of a propeller blade (do not push on the spinner), or lift the fuselage under the tail. If the nose wheel does not unlock then desist and consult the engineer in charge of mainteneance.

Parking

The aircraft must be parked so as to protect it from the weather and to prevent it becoming a risk to other aircraft. The parking brake can release spontaneously or cause stresses due to overheating during braking or during large temperature changes. It is, therefore, necessary to secure the aircraft if it is left unattended or outdoors overnight.

- Park the aircraft nose to wind if possible;
- Retract the flaps;
- Lock the stick using the pilot's seat belt;
- Chock the main wheels;

Cleaning

Cleaning the exterior surfaces

◆ Note : Before cleaning, position the aircraft in a shaded area to keep the surfaces cool.

The aircraft should be washed with mild soap and water. Strong, abrasive or alkaline soaps or detergents can scratch painted or plastic surfaces and can corrode metal. Cover areas where the cleaning solution could cause damage.

■ REMARK: Do not use a pressure washer; use a bucket of cleaning solution and a sponge.

- Rinse off loose dirt with water;
- Apply the cleaning solution with a soft cloth, a sponge or a brush with soft bristles;
- To remove exhaust residue, allow the cleaning solution to soak in for a while;
- Thoroughly rinse all the surfaces.

A good quality automobile wax, not containing silicones, can be applied to the painted surfaces for protection. Use soft cloths or a chamois leather to avoid scratching the surfaces during cleaning and polishing.

Windscreens and windows

Before cleaning the acrylic windows, rinse all loose dirt off before applying a cloth or chamois leather. Acrylic should never be rubbed dry. It is possible to remove scratches with a special polishing paste intended for acrylic.

■ REMARK: Only use a product intended for acrylic, non abrasive, anti-static, solvent free, for cleaning the windows.
Only use a non-abrasive cotton cloth or real chamois leather to clean the acrylic windows.
Paper towels and newspaper are very abrasive and will leave scratches.

Cleaning the interior surfaces

Vacuum clean the seats, carpets, trim panels and headlining at regular intervals to remove dirt and surface dust. During vacuuming, use a fine nylon brush to help dislodge the dust.

■ REMARK: Remove any sharp objects from pockets and clothing to avoid damaging the internal panels and the trim.

Panels and electronic display screens

Simply wipe the panels, control knobs and plastic surfaces with a soft, damp, cloth. Multifunction display screens, primary flight display, and other electronic displays must be cleaned according to the manufacturer's instructions.

Carpet

To clean the carpets, remove dirt with a brush or vacuum cleaner. For stains, use a non-flammable dry cleaning product.

SECTION 9 :

REGISTER OF SUPPLEMENTS

REGISTER OF SUPPLEMENTS

Installed supplements list

Document N°	TITEL	Installed	
		yes	no
-	Panel	☒	☐
1001114	Garmin GNS 430	☐	☒
1001168	S-TEC System 20&30 autopilot	☐	☒
1001287	**GPS GARMIN 100AVD** for VFR use in sight of the surface	☐	☒
1001305	**GPS GARMIN 150XL** for VFR use in sight of the surface	☐	☒
1001306	**BENDIX/KING KMD 150** for VFR use in sight of the surface	☐	☒
1001840	Night VFR	☒	☐
1002504	GPS GARMIN 695	☐	☒
1002530	GPS/SBAS GTN625, 635, 650, 725, 750	☒	☐
1002531	G500	☒	☐
1002545	GARMIN GTN 750	☐	☒
1002554	S.A.M	☒	☐
1002559	IFR	☐	☒
1002571	S-TEC System 55X autopilot	☒	☐
1002606	Fire extinguisher	☐	☒
1002618	ASPEN 1000	☐	☒
1001246	CO Detector	☒	☐
1001777	SENSENICH 72 CK S6-0-54 propeller	☐	☒
1002867	GARMIN GTX335_345 Transponder	☒	☐

SUPPLEMENT **INSTRUMENT PANEL**

HB-KOJ

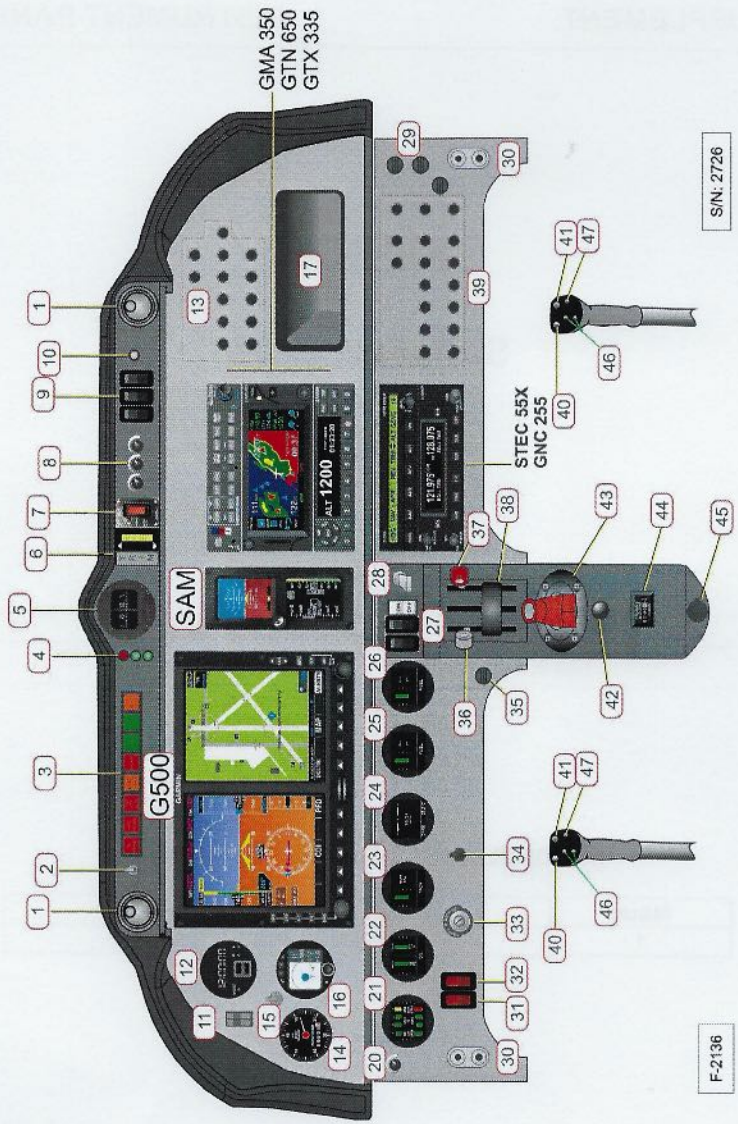
Serial nr: 2726

LIST OF CURRENT PAGES

Pages	Date
1 to 4	May 2019

CHRONOLOGICAL ACCOUNT OF ISSUES

Issue	Subject
1	Original instrument panel.


GMA 350
GTN 650
GTX 335
G500
SAM
STEC 55X
GNC 255
S/N: 2726
F-2136

1. Fresh air vent
2. Light test & day/night dimmer switch
3. Warning lights
   - Oil pressure low
   - Fuel pressure low
   - Fuel level low
   - Low Volt
   - Starter motor engaged
   - Free space
   - Free space
   - Free space
4. Flaps position indicator lights
5. Magnetic compass
6. Elevator trim position indicator
7. ELT remote control
8. Instrument panel lighting (from LH to RH)
   - Light 1: panel lights
   - Light 2: Overhead flood lights
   - Light 3: Radio & instruments
9. Safety interbreakers (from LH to RH)
   - Navigation light
   - Strobe light
   - Pitot heating
10. SafetyR control light
11. Autopilot master switch
12. Stopwatch
13. Avionics breaker
14. Horameter (Winter)
15. TCAS switch
16. TCAS
17. Storage rank

20. Digital indicator lighting knob
21. EGT/CHT
22. Oil temperature and pressure indicator
23. Tachymeter
24. Carburetor heating indicator
25. Fuel gauge
26. Auxiliary fuel gauge
27. Safety interbreakers (from LH to RH)
    - Landing light
    - Taxiing light
    - Electric fuel pump control
28. Electric flaps control lever
29. Cabin heat/windshield defrost control
30. Standard headset jacks
31. Battery master switch
32. Alternator relay switch
33. Starter key
34. Avionics master switch
35. Auxiliary tank valve control knob
36. Carburetor heat control
37. Mixture control
38. Throttle control
39. Breakers
40. CWS
41. Autopilot disconnect
42. Parking brake control knob
43. Fuel tank selector
44. Hourmeter
45. Auxiliary 12V socket
46. Elevator trim control
47. Push to talk

This document is a courtesy translation of its original French version.
In case of any difficulty, reference should be made to the French original issue.

AIRCRAFT FLIGHT MANUAL SUPPLEMENT

CARBONE (CO) MONOXIDE DETECTOR

This supplement includes the information to be provided to the pilot, as required by the certification basis. The information provided supersedes or completes the one of the approved aircraft flight manual.

This supplement supersedes any existing supplement concerning the CO detector.

Revision	Date	Description	Approval
//////////	13 May 2008	Original issue	EASA.A.C.04710
1	26 November 2010	Logo of manufacturer CAP aircraft applicability suppressed	EASA AFM Approval 10033448 20.01.2011

APPLICABILITY

Type of airplane	Models	Manufacturer change
DR300	all models	no.041204
DR400	all models	no.041204
ATL	all models	no.041204
R3000	all models	no.041204
DR220	all models	no.041204
DR221	all models	no.041204
DR200		no.041204
DR250	all models	no.041204
DR253	all models	no.041204
HR100	all models	no.041204
R1180T - R1180TD		no.041204

The sections of the aircraft flight manual are affected as follows:

1. GENERAL

Carbon monoxide is a colourless, odourless and tasteless toxic gas.
The symptoms of CO poisoning are, in order of appearance and of intensity: sensation of lethargy, heat, cranial tension;

- headache, pressure or beating in temples, whistling in ears;
- severe headache, chronic fatigue, dizzinesses and progressive decline of the visual acuteness;
- loss of any muscular force, vomits, convulsion and coma.

CO is particularly found in exhaust gases of the plane. The cabin being warmed by the air which circulated around the exhauxt pipes, a creek in these pipes can result in penetration of CO into the cabin.
As a safety precaution, a CO detector is recommanded inside the cabin, in the field of vision of the pilot.

1. LIMITATIONS

No change

2. EMERGENCY PROCEDURES

If the indicator of CO's detector changes colour; or if it smells exhaust gas in the cabin; or moreover if one or some of the symptoms of CO poisoning (see above) appears, apply at once the following:

- Close the cabin heating system
- Open all the sources of fresh air
- Land as soon as possible

Before resuming the flight, the plane must be examined by an authorized mechanic.

3. NORMAL PROCEDURES

PRE FLIGHT INSPECTION
If installed, check expiry date of CO's detector.

4. PERFORMANCE

No change.

5. WEIGHT AND BALANCE

No change.

AIRCRAFT FLIGHT MANUAL SUPPLEMENT

NIGHT VFR

This supplement includes the information to be provided to the pilot, as required by the certification basis. The information provided supersedes or completes the one of the approved French "Manuel de vol".

This supplement supersedes any existing supplement concerning Night VFR.

Applicability

Aircraft type and model	Manufacturer change
DR400/120 **DR400/140B** **DR400/160** **DR400/180** **DR400/180R** **DR400/200R**	**Dossier d'Evolution Technique DET n°060602R1**
DR400/500	**Dossier d'Evolution Technique DET n°061204**

List of current pages

Pages	Date
1	November 26th, 2010
2	November 26th, 2010
3	November 26th, 2010
4	November 26th, 2010
5	November 26th, 2010

Approval

Amendment	Date	Description	Approval
O	December 04th, 2006	Original issue	EASA.A.C.05014
1	April 16th, 2007	Insertion of DR400/500	EASA.A.C.05887
2	November 26th, 2010	Logo of manufacturer	EASA AFM Approval 10033448 20.01.2011

The sections of the aircraft flight manual are affected as follows.

SECTION 0. DESCRIPTION
Not affected.

SECTION 1. DESCRIPTION
The DR400/120, DR400/140B, DR400/160, DR400/180, DR400/180R, DR400/200R and DR400/500, equipped with a proper instrument panel lighting, can be used for V.F.R. flight in non-icing condition.

For a night VFR flight, the DR400/120, DR400/140B, DR400/160, DR400/180, DR400/180R, DR400/200R and DR400/500 must be equipped with following required equipment:

Flight and navigation
- one air-speed indicator
- one sensitive ajustable altimeter, with a 1 000 feet (304,80 mètres) per turn scale and with a barometric reference pressure indicator in hectopascal
- one compensable magnetic compass
- one vertical speed indicator (variometre)
- one artificial horizon (attitude gyros)
- a second artificial horizon or a gyroscopic rate-of-turn indicator with and integrated slip indicator (turn and bank indicator) separately supplied from the first artificial horizon
- one slip indicator when the airplane is equipped with two artificial horizons
- one directional gyro
- one VOR or one ADF depending on the planned route or one GPS class A, B or C approved
- one torch
- one set of spare fuses
- a navigation light system
- Strobe lights
- a landing light
- a lighting device for instrument panel and for safety equipment
- a watch displaying hours and minutes
- a night V.F.R. placard

Communication
- VHF radio equipment corresponding to the stipulations in equipments required by the the Air Traffic Authorities.

Surveillance
- Surveillance equipement corresponding to the stipulations in equipments required by the the Air Traffic Authorities.

SECTION 2. LIMITATIONS

Limitations of section 2 are not affected by Night VFR flight, except the placard concerning flight conditions which must be replaced by a placard with following text:

THIS AIRCRAFT MUST BE USED FOR *NORMAL* OR *UTILITY* FLYING, IN ACCORDANCE WITH THE APPROVED FLIGHT MANUAL. **ON THIS AIRCRAFT, ALL INDEXES, MARKINGS AND PLACARDS CORRESPOND TO NORMAL UTILISATION** **FOR UTILITY OPERATION, REFER TO THE APPROVED FLIGHT MANUAL**
SPINS PROHIBITED **MANEUVERING SPEED : 215 km/h - 116 kt** **APPROVED FOR VFR FLIGHT** **BY DAY AND BY NIGHT** **IN NON-ICING CONDITIONS** **NO SMOKING**

SECTION 3. EMERGENCY PROCEDURES

The following emergency procedures complete those of the section 3.

Lighting 1 and/or 3/radio failure

- Lighting 2 ..... on
- Lighting 1 fuse ..... verify
- Lighting 3/radio fuse ..... verify

If the failure persists, the lighting 2 and the torch can be used as emergency lighting.

Light failure

- Taxi light switch-type circuit breaker ..... verify

Battery failure (not applicable to DR400/135CDI)

If, following a complete battery failure, the alternator deactivates involving loss of power supply, proceed as follows:

- battery, alternator and radio (if installed) circuit breakers ..... off
- battery switch ..... on
- alternator switch ..... on

Notice that circuits are supplied again. Reset only the switches necessary to ensure flight safety.

SECTION 4. NORMAL PROCEDURES

These procedures complete those of section 4.

Preparation

Study of the meteorological report, in order to avoid flight in dangerous conditions (minima, climbing...).
Verify that fuel and oil quantities comply with regulations.

Before flight

Verify operation of:

- Strobe lights ..... verify
- Navigation lights ..... verify
- Landing light ..... verify
- Taxi light ..... verify
- Lighting 2 ..... verify
- Lighting 1 ..... verify
- Day/night selector switch ..... verify
- Emergency torch on board ..... verify

Lighting

- Switch on lighting 2
- Adjust with lighting 1 if necessary

Taxiing

- Strobe lights ..... on
- Navigation lights ..... on
- Landing light ..... on
- Gyro instruments ..... verify operation
- Artificial horizon ..... pitch index setting
- Directional gyro ..... correct rotation
- Turn and bank indicator ..... correct movement

Before take-off

- Vacuum indication ..... check
- VHF ..... test
- VOR or ADF ..... test
- Heating ..... defrost as necessary
- Landing light ..... on

Aligning

- Directional gyro setting

Take-off

- Maintain positive climb on rate of climb indicator.
- Switch off taxi and landing lights at the end of the runway.

Climb and cruise
Above 8000 feet, there is a risk of disturbance in the pilot's night vision.

Landing
- Landing light ..... on
- Taxi light ..... on

After engine shut down
- Light ..... off

SECTION 5. PERFORMANCE
Not affected

SECTION 6. WEIGHT AND BALANCE
Not affected

SECTION 7. OPTIONAL EQUIPMENT
Any "VFR flight" supplement is cancelled and replaced by this supplement.

GTN 750/650 GPS/SBAS

NAVIGATION SYSTEM

This supplement includes the information to be provided to the pilot, as required by the certification basis. The limitations and information contained herein either supplement or, in the case of conflict, override those in the flight manual.

Applicability

Aircraft type and model		Manufacturer change
TC EASA.A.367 (DR 300 DR 400)	DR 340, DR 315, DR 360, DR 380 DR 300/108, DR 300/180R, DR 300/140 DR 300/125 DR 400/125, DR 400/140, DR 400/160, DR 400/180, DR 400/180R, DR 400/2+2 DR 300/120 DR 400/120, DR 400/125i, DR 400/140B DR 400/120A, DR 400/160D, DR 400/120D, DR 400/180S, DR 400/100, DR 400RP, DR 400 NGL, DR 400/200R, DR 400/500, DR 400/140B avec STC EASA 10014219	DET n° 131203

Approval

Amdt	Description	Date	Approval
//////	Original issue	20 March 2013	EASA 10044135
1	Updated operating system software. Introduced optional GTN750 and added additional LPV approach capability per EASAC20-28 and PRNav per JAA TGL-10 Complete re-write to match EASA-approved template from Validated FAA AML STC (190-01007-A2) Updates to sections 2.5, 8.5 and 8.7 and re-number remaining sections following DGAC feedback	13/11/2015	EASA 10055773 Dtd December 2th, 2015

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Pages	Date
1 to 25	November 13th, 2015

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Section 1. GENERAL

1.1 Garmin GTN Navigators

The Garmin GTN navigation system is a GPS system with a Satellite Based Augmentation System (SBAS), comprised of one or more Garmin ETSO-C146 GTN650, or 750 navigator(s) and one or more Garmin approved GPS/SBAS antenna(s). The GTN navigation system is installed in accordance with AC 20-138A.

GTN system functions are shown in Table 1.

	GTN 650	GTN 750
GPS SBAS Navigation: • Oceanic, enroute, terminal, and non-precision approach guidance • Precision approach guidance (LP, LPV)	X	X
VHF Com Radio, 118.00 to 136.990, MHz, 8.33 or 25 kHz increments	X	X
VHF Nav Radio, 108.00 to 117.95 MHz, 50 kHz increments	X	X
LOC and Glideslope non-precision and precision approach guidance for Cat 1 minimums, 328.6 to 335.4 MHz tuning range	X	X
Moving map including topographic, terrain, aviation, and geopolitical data	X	X
Display of terminal procedures data (optional)		X
Display of traffic data, (optional)	X	X
Display of StormScope® data (optional)	X	X
Display of marker beacon annunciators (optional)		X
Remote audio panel control (optional)		X
Remote transponder control (optional)	X	X
TSO-C151c Class B TAWS (optional)	X	X
Supplemental calculators and timers	X	X
Control of GSR 56 Iridium Satellite Phone and SMS Text	X	X

Table 1 – GTN Functions

The GPS navigation functions and optional VHF communication and navigation radio functions are operated by dedicated hard keys, a dual concentric rotary knob, or the touchscreen.

Figure 1 - GTN 750 Control and Display Layout

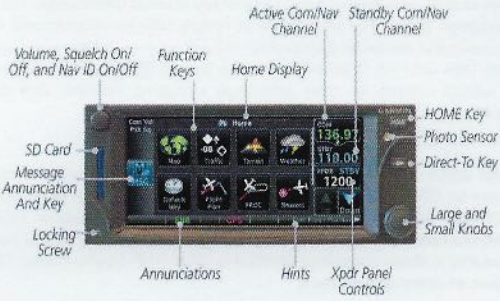


Figure 2 - GTN 650 Control and Display Layout

1.2 System Capabilities

The GTN system and associated navigation interface in this aircraft have the following capabilities, in addition to the core multifunction display capability:

- ☐ VHF Communication Radio
- ☐ Primary VHF Navigation
- ☐ Primary GPS Navigation (Enroute) and Approach Capability (LP/LNAV) – See below
- ☐ Primary GPS Approach Capability with Vertical Guidance (LNAV/VNAV, LPV) – See below
- ☐ TSO-C151c Class B Terrain Awareness and Warning System – See section 2.14

1.3 GPS/SBAS ETSO-C146 Class 3 Operation

The GTN complies with FAA AC 20-138A and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR enroute, terminal area, and non-precision approach operations (including those approaches titled "GPS", "or GPS", and "RNAV (GPS)" approaches). The Garmin GNSS navigation system is composed of the GTN navigator and antenna, and is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV," within the U.S. National Airspace System.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures without RF (radius to fix) legs. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

> ***Applicable to dual installations consisting of two Garmin GNSS units***: The Garmin GNSS navigation system has been found to comply with the requirements for GPS Class II oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138A and FAA Order 8400.12A. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. This does not constitute an operational approval.
>
> The Garmin GNSS navigation system has been found to comply with the navigation requirements for GPS Class II oceanic and remote navigation (RNP-4) in accordance with AC 20-138A and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for P-RNAV operations in accordance with JAA Administrative & Guidance Material Section One: General Part 3: Temporary Guidance Leaflets, Leaflet No 10 (JAA TGL-10 Rev 1). The GNSS navigation system has one or more ETSO-C146 Class 3 approved Garmin GTN Navigation Systems. The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for B-RNAV operations in accordance with EASA AMC 20-4. The Garmin GNSS navigation system complies with the equipment requirements for P-RNAV and B-RNAV/RNAV-5 operations in accordance with AC 90-96A CHG 1. This does not constitute an operational approval.

The Garmin GNSS navigation system is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV" and LPV Baro VNAV in accordance with EASA AMC20-27 and 20-28 within European airspace.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153 for database integrity, quality, and database management practices for the navigation database. Flight crew and operators can view the LOA status at FlyGarmin.com then select "Type 2 LOA Status."

Navigation information is referenced to the WGS-84 reference system.

Note that for some types of aircraft operation and for operation in non-U.S. airspace, separate operational approval(s) may be required in addition to equipment installation and airworthiness approval.

1.4 Additional References:

Temporary Guidance Leaflet 10, Rev 1: Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace

Acceptable Means of Compliance 20-4, Airworthiness Approval and Operational Criteria for the Use of Navigation Systems in European Airspace Designated for the Basic RNAV Operations

Acceptable Means of Compliance 20-27, Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations

Acceptable Means of Compliance 20-28, Airworthiness Approval and Operational Criteria for RNAV GNSS Approach Operation to LPV Minima using SBAS

Definitions

The following terminology is used within this document:

ADF:	Automatic Direction Finder
ADS-B:	Automatic Dependent Surveillance Broadcast
AEG:	Aircraft Evaluation Group (FAA)
APR:	Approach
CDI:	Course Deviation Indicator
DME:	Distance Measuring Equipment
EFB:	Electronic Flight Bag
EHSI:	Electronic Horizontal Situation Indicator
FIS-B:	Flight Information Services Broadcast
GNSS:	Global Navigation Satellite System
GPS:	Global Positioning System
GPSS:	GPS Roll Steering
GTN:	Garmin Touchscreen Navigator
HSI:	Horizontal Situation Indicator
IAP:	Instrument Approach Procedure
IFR:	Instrument Flight Rules
ILS:	Instrument Landing System
IMC:	Instrument Meteorological Conditions
LDA:	Localizer Directional Aid
LNAV:	Lateral Navigation
LNAV+V:	Lateral Navigation with advisory Vertical Guidance
L/VNAV:	Lateral/Vertical Navigation
LOC:	Localizer
LOC-BC:	Localizer Backcourse
LP:	Localizer Performance
LPV:	Localizer Performance with Vertical Guidance
MLS:	Microwave Landing System
NOTAM:	Notice to Airmen
OBS:	Omnibearing Select
RAIM:	Receiver Autonomous Integrity Monitoring
RMT:	Remote
RNAV:	Area Navigation
RNP:	Required Navigational Performance
SBAS:	Satellite Based Augmentation System
SD:	Secure Digital
SDF:	Simplified Directional Facility

Section 2. LIMITATIONS

2.1 Cockpit Reference Guide

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide, part number and revision listed below (or later revisions), *must* be immediately available to the flight crew whenever navigation is predicated on the use of the GTN.

- GTN 6XX Cockpit Reference Guide P/N 190-01004-04 Rev C
- GTN 7XX Cockpit Reference Guide P/N 190-01007-04 Rev C

2.2 Kinds of Operation

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations.

2.3 Minimum Equipment

The GTN must have the following system interfaces fully functional in order to be used for primary navigation during IFR operations:

Interfaced Equipment	Number installed	Number Required for IFR
External HSI/CDI/EHSI	1 or more	1
External GPS Annunciator	1 (Garmin G500)	1

Table 2 – Required Equipment

Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator plus a second source of GPS navigation or a separate source of VHF navigation. The separate source of VHF navigation must not be the primary GTN, but it may be a secondary GTN.

Operation in remote or oceanic operation requires two sources of GPS navigation.

2.4 Display of Distance to Waypoint

During installation, the GTN was configured to display distance to current waypoint on the Map Page (GTN 7XX) or Default Navigation Page (GTN 6XX). The display location of distance to current waypoint must not be altered or removed from these pages.

2.5 Flight Planning

For flight planning purposes, in areas where SBAS coverage is not available, the flight crew must check RAIM availability.

- Within the United States, RAIM availability can be determined using the Garmin WFDE Prediction program, Garmin part number 006-A0154-04 (included in GTN trainer) software version 3.00 or later approved version with Garmin approved antennas or the FAA's en route and terminal RAIM prediction website: www.raimprediction.net, or by contacting a Flight Service Station.
- Within Europe, RAIM availability can be determined using the Garmin WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at http://augur.ecacnav.com/augur/app/home.

- For other areas, use the Garmin WFDE Prediction program

This RAIM availability requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight. The route planning and WFDE prediction program may be downloaded from the Garmin website on the internet. For information on using the WFDE Prediction Program, refer to Garmin WAAS FDE Prediction Program, part number 190-00643-01, 'WFDE Prediction Program Instructions'.

For flight planning purposes, for operations within the U.S. National Airspace System on RNP and RNAV procedures when SBAS signals are not available, the availability of GPS RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight shall be delayed, cancelled, or rerouted on a track where RAIM requirements can be met. The flight may also be re-planned using non-GPS based navigational capabilities.

For flight planning purposes for operations within European B-RNAV/RNAV-5 and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight shall be delayed, cancelled, or rerouted on a track where RAIM requirements can be met.

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs), Standard Terminal Arrival (STAR), and enroute RNAV "Q" and RNAV "T" routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

It is not acceptable to flight plan a required alternate airport based on RNAV(GPS) LP/LPV or LNAV/VNAV approach minimums. The required alternate airport must be flight planned using an LNAV approach minimums or available ground-based approach aid.

Navigation information is referenced to the WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

2.6 System Use

In installations with two GTNs and an external GPS annunciator, the GTN source connected to the external GPS annunciator must be used as the navigation source for all IFR operations.

The only approved sources of course guidance are on the external EHSI display. The moving map and CDI depiction on the GTN display are for situational awareness only and are not approved for course guidance.

2.7 Applicable System Software

This AFMS/AFM is applicable to the software versions shown in Table 3.

The Main and GPS software versions are displayed on the start-up page immediately after power-on. All software versions displayed in Table 3 can be viewed on the System – System Status page.

Software Item	Software Version
Main SW Version	5.13
GPS SW Version	5.0
Com SW Version	2.13
Nav SW Version	6.02

Table 3 - Software Versions

2.8 SD Card

It is required that the SD/database card be present in the unit at all times. The card must not be removed or inserted during flight and/or while the GTN is powered on.

NOTE

Removal of the SD card will result in certain features/databases not being available and/or slow system performance

2.9 Navigation Database

GPS/SBAS based IFR enroute, oceanic, and terminal navigation is prohibited unless the flight crew verifies and uses a valid, compatible, and current navigation database or verifies each waypoint for accuracy by reference to current approved data.

"GPS", "or GPS", and "RNAV (GPS)" instrument approaches using the Garmin navigation system are prohibited unless the flight crew verifies and uses the current navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the navigation database.

Discrepancies that invalidate a procedure should be reported to Garmin International. The affected procedure is prohibited from being flown using data from the navigation database until a new navigation database is installed in the aircraft and verified that the discrepancy has been corrected. Navigation database discrepancies can be reported at FlyGarmin.com by selecting "Aviation Data Error Report." Flight crew and operators can view navigation database alerts at FlyGarmin.com then select "NavData Alerts."

If the navigation database cycle will change during flight, the flight crew must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

2.10 Ground Operations

Do not use SafeTaxi or Chartview functions as the basis for ground manoeuvring. SafeTaxi and Chartview functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview are to be used by the flight crew to

orient themselves on the airport surface to improve flight crew situational awareness during ground operations.

2.11 Approaches

a. Instrument approaches using GPS guidance may only be conducted when the GTN is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, LPV, or LP)

b. When conducting instrument approaches referenced to true North, the NAV Angle on the System - Units page must be set to **True**.

c. The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart. Navigating the final approach segment (that segment from the final approach fix to the missed approach point) of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR, TACAN approach, or any other type of approach not approved for GPS, is not authorized with GPS navigation guidance. GPS guidance can only be used for approach procedures with GPS or RNAV in the procedure title. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.

d. Advisory vertical guidance deviation is provided when the GTN annunciates LNAV + V. Vertical guidance information displayed on the VDI in this mode is only an aid to help flight crews comply with altitude restrictions. When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions.

e. Not all published Instrument Approach Procedures (IAP) are in the navigation database. Flight crews planning to fly an RNAV instrument approach must ensure that the navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the navigation database into the GTN system flight plan by its name. Users are prohibited from flying any approach path that contains manually entered waypoints.

f. IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the GTN and/or the CDI.

2.12 Autopilot Coupling

The flight crew may fly all phases of flight based on the navigation information presented to the flight crew; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes.

This installation is limited to:

- ☐ Lateral coupling only for GPS approaches. Coupling to the vertical path for GPS approaches is not authorized. (When an S-TEC 20/30 autopilot is installed)
- ☐ Lateral and vertical coupling for GPS approaches (only when an S-TEC 55X autopilot is installed).

2.13 Terrain Proximity Function (All Units)

Terrain and obstacle information appears on the map and terrain display pages as red and yellow tiles or towers, and is depicted for advisory use only. Aircraft manoeuvers and navigation must not be predicated upon the use of the terrain display. Terrain and obstacle information is advisory only and is not equivalent to warnings provided by TAWS.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan manoeuvers to avoid terrain or obstacles.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.14 TAWS Function

Flight crews are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

If an external TAWS annunciator panel is installed in the aircraft, this annunciator panel must be fully functional in order to use the TAWS system.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.15 Traffic Display

Traffic may be displayed on the GTN when connected to an approved optional TAS traffic device. These systems are capable of providing traffic monitoring and alerting to the flight crew. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft manoeuvring.

2.16 StormScope® Display

StormScope® lightning information displayed by the GTN is limited to supplemental use only. The use of the StormScope® lightning data on the display for hazardous weather (thunderstorm) penetration is prohibited. StormScope® lightning data on the display is intended only as an aid to enhance situational awareness of hazardous weather, not penetration. It is the flight crew's responsibility to avoid hazardous weather using official weather data sources.

When the GTN StormScope® page is operating without a heading source, as indicated by the "HDG N/A" label at the upper right corner of the StormScope® page, strikes must be cleared after each heading change.

2.17 Flight Planner/Calculator Functions

The Fuel Planning page uses Fuel on Board or Fuel Flow as received from an on board fuel totalizer, as entered by the pilot at system start-up, or as entered by the pilot when on the Fuel Planning page. This *is not* a direct indication of actual aircraft fuel flow or fuel on board and those values are only used for the Fuel Planning page. The fuel required to destination is only a calculated and predicted value based on the data entered into the planner. It is not a direct indication of how much fuel the aircraft will have upon reaching the destination.

2.18 Glove Use / Covered Fingers

No device may be used to cover fingers used to operate the GTN unless the Glove Qualification Procedure located in the Pilot's Guide/Cockpit Reference Guide has been successfully completed. The Glove Qualification Procedure is specific to a pilot / glove / GTN 725, 750 or GTN 625, 635, 650 combination.

2.19 Demo Mode

Demo mode may not be used in flight under any circumstances.

2.20 Telephone Audio

Telephone audio may not be distributed to the pilot or co-pilot unless a phone call is active.

2.21 Phone/SMS Suppress Visuals Setting

During installation, the GTN was configured to suppress visual alerts during approach, missed approach, and terminal operations for the GSR 56 Iridium Phone and SMS features. The Suppress Visuals setting on the Service-Phone page must not be changed from "On during APR/MAPR/TERM".

Section 3. EMERGENCY PROCEDURES

3.1 TAWS or GPWS WARNING

Red annunciator and aural "PULL UP":

Autopilot ..... **DISCONNECT**

Aircraft Control..... **INITIATE MAXIMUM POWER CLIMB**

Airspeed ..... **BEST ANGLE OF CLIMB SPEED**

After Warning Ceases:

Power ..... **MAXIMUM CONTINUOUS**

Altitude ..... **CLIMB AND MAINTAIN SAFE ALTITUDE**

Advise ATC of Altitude Deviation, if appropriate.

NOTE

Only vertical manoeuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the flight crew determines, based on all available information, that turning in addition to the vertical escape manoeuver is the safest course of action, or both.

Section 4. ABNORMAL PROCEDURES

4.1 LOSS OF GPS/SBAS NAVIGATION DATA

When the GPS/SBAS receiver is inoperative or GPS navigation information is not available or invalid, the GTN will enter one of two modes: Dead Reckoning mode (DR) or Loss of Integrity mode (LOI). The mode is indicated on the GTN by an amber "DR" or "LOI".

If the Loss of Integrity annunciation is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight.

If the Dead Reckoning annunciation is displayed, the map will continue to be displayed with an amber 'DR' overwriting the own-ship icon. Course guidance will be removed on the CDI. Aircraft position will be based upon the last valid GPS position, then estimated by Dead Reckoning methods. Changes in true airspeed, altitude, heading, or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute and Oceanic modes. Terminal and Approach modes do not support Dead Reckoning.

If Alternate Navigation Sources (ILS, LOC, VOR, DME, ADF) Are Available:

Navigation ..... **USE ALTERNATE SOURCES**

If No Alternate Navigation Sources Are Available:

4.2 DEAD RECKONING (DR) MODE:

Navigation ..... **USE GTN**

NOTE

All information normally derived from GPS will become less accurate over time.

4.3 LOSS OF INTEGRITY (LOI) MODE:

Navigation ..... **FLY TOWARDS KNOWN VISUAL CONDITIONS**

NOTE

All information derived from GPS will be removed.

NOTE

The airplane symbol is removed from all maps. The map will remain centered at the last known position. "NO GPS POSITION" will be annunciated in the center of the map.

4.4 GPS APPROACH DOWNGRADE

During a GPS LPV, LNAV/VNAV, or LNAV+V approach, if GPS accuracy requirements cannot be met by the GPS receiver, the GTN will downgrade the approach. The downgrade will remove vertical deviation indication from the VDI and change the approach annunciation accordingly from LPV, L/VNAV, or LNAV+V to LNAV. The approach may be continued using the LNAV only minimums.

During a GPS approach in which GPS accuracy requirements cannot be met by the GPS receiver for any GPS approach type, the GTN will flag all CDI guidance and display a system message "ABORT APPROACH-GPS approach no longer available". Immediately upon viewing the message, the unit will revert to Terminal navigation mode alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation must be utilized.

4.5 LOSS OF COM RADIO TUNING FUNCTIONS

If alternate COM is available:

Communications ..... **USE ALTERNATE COM**

If no alternate COM is available:

COM RMT XFR key (if installed).. **PRESS AND HOLD FOR 2 SECONDS**

NOTE

This procedure will tune the active COM radio the emergency frequency 121.5, regardless of what frequency is displayed on the GTN. Certain failures of the tuning system will automatically tune 121.5 without flight crew action.

4.6 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only)

Audio Panel Circuit Breaker..... **PULL**

NOTE

This procedure will force the audio panel into fail safe mode which provides only the pilot with communications and only on a single COM radio. If any non GTN 750 COM is installed, communication will be only on that radio. If only a GTN 750 is installed in the aircraft, then the pilot will have only the GTN 750 COM available. No other audio panel functions including the crew and passenger intercom will function.

4.7 TAWS CAUTION

When a TAWS CAUTION occurs, take corrective action until the alert ceases. Stop descending or initiate either a climb or a turn, or both as necessary, based on analysis of all available instruments and information.

4.8 TAWS INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to prevent alerting, if desired. Refer to GTN Cockpit Reference Guide for additional information.

To Inhibit TAWS:

Home Hardkey ..... .PRESS

Terrain Button ..... .PRESS

Menu Button..... ..PRESS

TAWS Inhibit Button..... PRESS TO ACTIVATE

4.9 TER N/A and TER FAIL

If the amber **TER N/A** or **TER FAIL** status annunciator is displayed, the system will no longer provide TAWS alerting or display relative terrain and obstacle elevations. The crew must maintain compliance with procedures that ensure minimum terrain and obstacle separation.

DATA SOURCE - HEADING SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a heading source to the GTN, the following features will not operate:

GPSS will not be provided to the autopilot for heading legs. The autopilot must be placed in HDG mode for heading legs.

Map cannot be oriented to Heading Up.

All overlaying traffic data from a TAS/TCAS I or GDL 88 interfaced to an on board traffic system on the main map display. The flight crew must use the dedicated traffic page on the GTN system to display TAS/TCAS I or GDL 88 traffic data.

All overlaying StormScope® data on the main map display. The flight crew must use the dedicated StormScope® page on the GTN system to display StormScope® data.

StormScope® must be operated in accordance with Section 0 when no heading is available.

DATA SOURCE – PRESSURE ALTITUDE SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a barometric altitude source to the GTN, the following features will not operate:

Automatic leg sequencing of legs requiring an altitude source. The flight crew must manually sequence altitude legs, as prompted by the system.

4.10 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS

Remove power from all equipment which is not necessary for flight, including GTN #2 if installed.

Section 5. NORMAL PROCEDURES

Refer to the Cockpit Reference Guide defined in Section 0 of this document or the Pilot's Guide defined in Section 0 for normal operating procedures and a complete list of system messages and associated flight crew actions. This includes all GPS operations, VHF communication and navigation, traffic, data linked weather, StormScope®, TAWS, and Multi-Function Display information.

The GTN requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Garmin provides training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization

5.1 Unit Power On

Database..... **REVIEW EFFECTIVE DATES**

Self Test..... **VERIFY OUTPUTS TO NAV INDICATORS**

Self Test - GPS Remote Annunciator:

VLOC..... **ILLUMINATED**

GPS..... **ILLUMINATED**

LOI or INTG..... **ILLUMINATED**

TERM..... **ILLUMINATED**

WPT..... **ILLUMINATED**

APR..... **ILLUMINATED**

MSG..... **ILLUMINATED**

SUSP or OBS..... **ILLUMINATED**

5.2 Before Takeoff

System Messages and Annunciators..... **CONSIDERED**

The G500 EHSI is used to display navigation data from the GTN the course pointer and the GTN will autoslew to the correct course when using GPS navigation. When using VLOC navigation the course pointer will not autoslew and must be rotated to the correct course by the pilot. For detailed information about the functionality of the EHSI system, refer to the EASA approved Flight Manual Supplement for that system.

CAUTION

The pilot must verify the active course and waypoint for each flight plan leg. The pilot must verify proper course selection each time the CDI source is changed from GPS to VLOC.

5.3 Autopilot Operation

The GTN may be coupled to an optional autopilot, if installed in the aircraft, when operating as prescribed in the LIMITATIONS section of this manual.

Autopilots coupled to the GTN system in an analogue (NAV) mode will follow GPS or VHF navigation guidance as they would with existing VOR receivers.

Autopilots that support GPSS or GPS Roll Steering in addition to the analogue course guidance will lead course changes, fly arcing procedures, procedure turns, and holding patterns if coupled in GPSS mode.

CAUTION

The GTN cannot provide course deviation to the autopilot for heading legs. Some autopilots do not allow the use of GPSS when course deviation is not provided.

For autopilot operating instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

5.4 Coupling the Autopilot during approaches

CAUTION

When the CDI source is changed on the GTN, autopilot mode may change. Confirm autopilot mode selection after CDI source change on the GTN. Refer to the EASA/FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

☐ This installation prompts the flight crew and requires the pilot to enable the approach outputs just prior to engaging the autopilot in APR mode.

To couple an approach:

Once established on the final approach course with the final approach fix as the active waypoint, the GTN will issue a flashing message indication.

Flashing Message Button.....**PRESS**
"Enable APR Output" Button.....**PRESS**

Section 6. PERFORMANCE

No change.

Section 7. WEIGHT AND BALANCE

See current weight and balance data.

Section 8. SYSTEM DESCRIPTIONS

8.1 Pilot's Guide

The Garmin GTN 6XX or GTN 7XX Pilot's Guide, part number and revision listed below, contain additional information regarding GTN system description, control and function. The Pilot's Guides *do not* need to be immediately available to the flight crew.

- GTN 6XX Pilot's Guide P/N 190-01004-03 Rev C or later
- GTN 7XX Pilot's Guide P/N 190-01007-03 Rev C or later

8.2 Leg Sequencing

The GTN supports all ARINC 424 leg types. Certain leg types require altitude input in order to sequence (course to altitude, for example). If a barometric corrected altitude source is not interfaced to the GTN, a popup will appear prompting the flight crew to manually sequence the leg once the altitude prescribed in the procedure is reached.

☐ This installation *has* a barometric corrected altitude source. The GTN will automatically sequence altitude legs.

8.3 Auto ILS CDI Capture

Auto ILS CDI Capture will not automatically switch from GPS to VLOC for LOC-BC or VOR approaches.

8.4 Activate GPS Missed Approach

☐ This installation *will* auto-switch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.

8.5 Terrain Proximity and TAWS

The Obstacle Database has an area of coverage that includes the United States and Europe, and is updated as frequently as every 56 days.

To avoid unwanted alerts, TAWS may be inhibited when landing at an airport that is not included in the airport database.

NOTE

The area of coverage may be modified as additional terrain data sources become available.

☐ This installation supports *Terrain Proximity. No aural or visual alerts* for terrain or obstacles are proviced. Terrain Proximity *does not* satisfy the TAWS requirement of 91.223.

☐ This installation supports *TAWS B.* Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.

8.6 GMA 35 Audio Panel

The GTN750 can interface to a GMA 35 remotely mounted audio panel and marker beacon receiver. Controls for listening to various radios, activating the cabin speaker, clearance playback control, and marker beacon are accessed by pressing the "Audio Panel" button on the GTN display screen. Volume controls for the audio panel are accessed by pressing the "Intercom" button on the GTN display screen.

8.7 Traffic System

This system is configured for the following type of traffic system. The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding the functionality of the traffic device.

☐ No traffic system is interfaced to the GTN.

☐ A TAS/TCAS I traffic system is interfaced to the GTN.

8.8 StormScope®

When optionally interfaced to a StormScope® weather detection system, the GTN may be used to display the StormScope® information. Weather information supplied by the StormScope® will be displayed on the StormScope® page of the GTN system. For detailed information about the capabilities and limitations of the StormScope® system, refer to the documentation provided with that system.

If the GTN system is receiving valid heading information, the StormScope® page will operate in the heading up mode as indicated by the label "HDG UP" presented at the upper right corner of the display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft and *is* automatically rotated to the correct relative position as the aircraft turns.

If the GTN system is not receiving valid heading information, because the interfaced heading system has malfunctioned, the StormScope® page will continue to operate without a heading source and indicate "HDG N/A" in the upper right corner of the GTN display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft but *is not* automatically rotated to the correct relative position as the aircraft turns. When operating in this mode, StormScope® strikes must be cleared after each turn the aircraft performs.

8.9 Power

Power to the GTN is provided through a circuit breaker labeled NAV/GPS (1/2).

Power to the optional GTN COM is provided through a circuit breaker labeled COMM (1/2)

Power to the optional GMA 35 is powered through a circuit breaker labeled AUDIO.

8.10 Databases

Database versions and effective dates are displayed on the start-up page immediately after power-on. Database information can also be viewed on the System – System Status page.

The Obstacle Database coverage area includes the United States and Europe.

8.11 Airspace Depiction and Alerts

The GTN aides the flight crew in avoiding certain airspaces with Smart Airspace and airspace alerts. Smart Airspace de-emphasizes depicted airspace that is not near the aircraft's current altitude. Airspace Alerts provide a message indication to the flight crew when the aircraft's current ground track will intercept an airspace type that has been selected for alerting.

NOTE

Smart Airspace and Airspace Alerts are separate features. Turning on/off Smart Airspace does not affect Airspace Alerts, and vice versa.

8.12 Transponder Control

The GTN can be interfaced to a Garmin transponder for control and display of squawk code, mode, and additional transponder functions. The activation of the "Enable ES" button on the transponder page does not indicate the aircraft is in full compliance with an ADS-B Out solution in accordance with TSO-C166b (1090ES). Consult your transponder documentation for additional information.

ELECTRONIC PRIMARY FLIGHT DISPLAY
NAVIGATION DISPLAY
G500

This supplement includes the information to be provided to the pilot, as required by the certification basis. The limitations and information contained herein either supplement or, in the case of conflict, override those in the flight manual.

Applicability

Aircraft type and model		Manufacturer change
TC EASA.A.367 (DR 300 DR 400)	DR 340, DR 315, DR 360, DR 380 DR 300/108, DR 300/180R, DR 300/140 DR 300/125 DR 400/125, DR 400/140, DR 400/160, DR 400/180, DR 400/180R, DR 400/2+2 DR 300/120 DR 400/120, DR 400/125i, DR 400/140B DR 400/120A, DR 400/160D, DR 400/120D, DR 400/180S, DR 400/100, DR 400RP, DR 400 NGL, DR 400/200R, DR 400/500, DR 400/140B with STC EASA 10014219	DET n° 131203

Approval

Amdt	Description	Date	Approval
//////	Original issue	20 March 2013	EASA 10044135
1	Update system operating software and interfaced equipment options Complete re-write to match EASA-approved template from Validated FAA AML STC	13/11/2015	EASA 10055773 Dtd December 2th, 2015

List of current pages

Pages	Date
1 to 25	November 13th, 2015

Contents

Section 1. GENERAL

1.1 Garmin G500 Primary Flight / Multi-Function Display System

The G500 PFD/MFD System consists of a Primary Flight Display (PFD) and Multi-Function Display (MFD) housed in a single Garmin Display Unit (GDU), plus an Air Data Computer (ADC) and Attitude and Heading Reference System (AHRS). The G500 interfaces with other installed systems in the aircraft, including Garmin GPS/SBAS navigators, VHF navigation radios, and various audio panels, video sources, radar altimeters, traffic systems and ADF navigators.

The primary function of the PFD is to provide attitude, heading, air data and navigation information to the pilot. The primary function of the MFD is to provide mapping, terrain, and flight plan information.

The standby instruments (altimeter, airspeed, attitude, and magnetic compass) are completely independent from the PFD and will continue to operate in the event the PFD is not usable. These standby instruments should be included in the pilot's normal instrument scan and may be referenced if the PFD data is in question.

1.2 System Power Sources

The G500 system depends on electrical power to maintain proper operation. The Garmin Display Unit (GDU), Attitude and Heading Reference System (AHRS), and Air Data Computer (ADC) are directly tied to the aircraft's main or essential bus and energized when the aircraft master switch is turned on. Other systems, like the navigation equipment, weather datalink, autopilot and Adapter (GAD) are typically located on the avionics bus and may not be operable during engine start.

The major components of the G500 are circuit breaker protected with resettable type breakers available to the pilot. These breakers are located at the main or essential bus circuit breaker panel and labelled as follows:

1. PFD - Garmin Display Unit (PFD/MFD), GDU 620
2. AHRS - Attitude and Heading Reference System, GRS 77
3. ADC - Air Data Computer, GDC 74A
4. GAD - Garmin Adapter, GAD 43/43e (optional)
5. STBY ATT- Electric Standby Attitude Gyro

Equipment that receives power from two different circuit breakers will be suffixed with the letters A and B. For example: PFD 1A and PFD 1B, or PFD 2A and PFD 2B.

1.3 Navigation Sources

The G500 requires at least one Garmin GPS/SBAS navigation unit to ensure the integrity of the Attitude and Heading Reference System. The AHRS will still operate in a reversionary mode if the GPS fails, and the PFD attitude display will still be presented, see Paragraph 2.8. The G500 HSI can be selected to display course deviation information from up to four independent sources: two GPS, and two VHF NAV. In addition, the HSI can display two simultaneous bearing pointers sourced from GPS, VHF NAV, or ADF.

1.4 Synthetic Vision Technology

SVT uses an internal terrain database and GPS location to present the pilot with a synthetic view of the terrain in front of the aircraft. The purpose of the SVT system is to assist the pilot in maintaining situational awareness with regard to the terrain and traffic surrounding the aircraft. A typical SVT display is shown below:

SVT provides additional features on the G500 primary flight display (PFD) which display the following information:

- **Synthetic Terrain**; an artificial, database derived, three dimensional view of the terrain ahead of the aircraft within a field of view of approximately 25 degrees left and 25 degrees right of the aircraft heading.
- **Obstacles**; obstacles such as towers, including buildings over 200 AGL that are within the depicted synthetic terrain field of view.
- **Flight Path Marker (FPM)**; an indication of the current lateral and vertical path of the aircraft. The FPM is always displayed when synthetic terrain is selected for display.
- **Traffic**; a display on the PFD indicating the position of other aircraft detected by a traffic system interfaced to the G500 system.
- **Horizon Line**; a white line indicating the true horizon is always displayed on the SVT display.

- **Horizon Heading**; a pilot selectable display of heading marks displayed just above the horizon line on the PFD.

- **Airport Signs**; pilot selectable "signposts" displayed on the synthetic terrain display indicating the position of nearby airports that are in the G500 database.

- **Runway Highlight**; a highlighted presentation of the location and orientation of the runway(s) at the destination airport.

The synthetic terrain depiction displays an area approximating the view from the pilot's eye position when looking directly ahead out the windshield in front of the pilot. Terrain features outside this field of view are not shown on the display.

The synthetic terrain display is intended to aid the pilot awareness of the terrain and obstacles in front of the airplane. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan manoeuvres to avoid terrain or obstacles. The synthetic vision elements are not intended to be used for primary aircraft control in place of the primary flight instruments.

1.5 Autopilot Interface

The G500 may be interfaced to an optional autopilot. The G500 typically provides course and heading datum to the autopilot based on the data selected for display on the HSI. For multiple GPS/NAV systems, the G500 acts as a selection hub for the autopilot's NAV mode, and the G500 may also provide GPS Steering data. Some autopilots may provide Flight Director capabilities which can be displayed on the G500

1.6 Audio Panel

The G500 PFD/MFD system should be interfaced into the aircraft audio panel to provide aural altering generated by the G500 (required for SVT installations).

1.7 Traffic and Weather Systems

The G500 PFD/MFD system supports TAS/TCAS traffic from various active traffic awareness systems. The information from these systems is available and controllable on the MFD.

Datalink weather is also available via the optional Garmin GSR 56 Iridium Transceiver. The control and display of Iridium satellite weather on the MFD is similar to XM weather (refer to the G500 pilot's guide).

1.8 Video sources

The G500 Avionics Display System can display images from up to 2 video inputs. Video images are displayed on the MFD. The G500 does not provide a means to control the video source; however the digital images from the video source can be adjusted using the G500.

1.9 Radar Altimeter

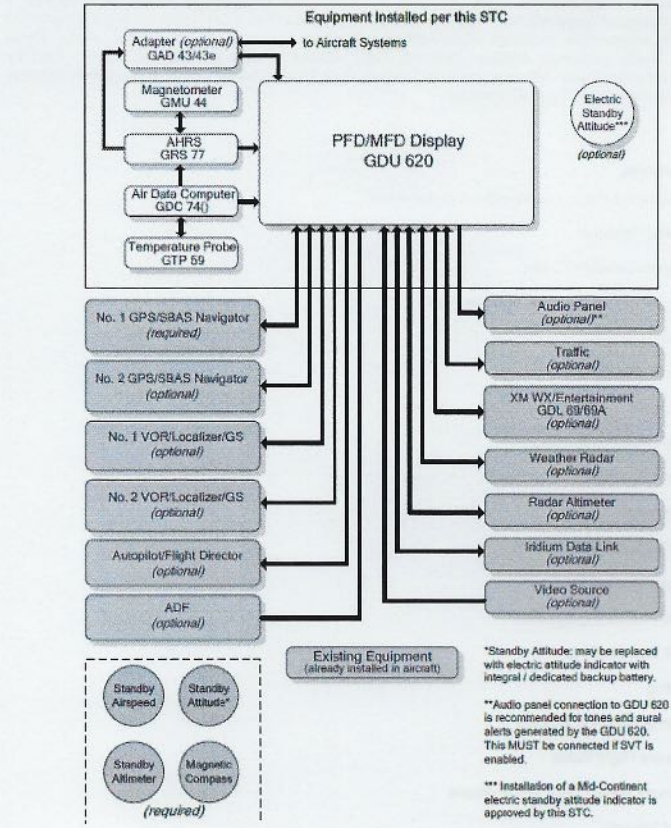
The G500 supports the display of radar altitude on the PFD from supported radar altimeters.

1.10 High Speed Data Bus Interface

Some Garmin equipment connected to the G500 system utilizes the High Speed Data Bus (HSDB) interface. HSDB is similar to an Ethernet bus and provides a high-speed interface between Garmin avionics. Like Ethernet, data between two units may be passed through intermediate "hub" units. Interfaced equipment that uses HSDB includes the GTN 6XX/7XX navigators and GTS 8XX traffic systems.

The HSDB interfaces are installed to so that maximum data path redundancy is achieved. However, depending on the number of HSDB units installed, failure of one HSDB unit may result in loss of data on the G500 from "downstream" HSDB units. Any loss of data will be annunciated on the G500.

1.11 G500 Operational Block Diagram



Standby Attitude* Standby Airspeed Standby Altimeter Magnetic Compass Equipment Installed per this STC (required) PFD/MFD Display GDU 620 *Standby Attitude: may be replaced with electric attitude indicator with integral / dedicated backup battery. **Audio panel connection to GDU 620 is recommended for tones and aural alerts generated by the GDU 620. This MUST be connected if SVT is enabled. ***

Installation of a Mid-Continent electric standby attitude indicator is approved by this STC. Air Data Computer AHRS Magnetometer GMU 44 GRS 77 GDC 74() Temperature Probe GTP 59 No. 1 GPS/SBAS Navigator (required) No. 1 VOR/Localizer/GS (optional) No. 2 GPS/SBAS Navigator (optional) No. 2 VOR/Localizer/GS (optional) Autopilot/Flight Director (optional) ADF (optional) Audio Panel (optional)** Traffic (optional) Adapter (optional) GAD 43/43e to Aircraft Systems Electric Standby Attitude*** (optional) Radar Altimeter (optional) Iridium Data Link (optional) Existing Equipment (already installed in aircraft) Video Source (optional)

1.13 Definitions

The following terminology is used within this document:

ADC: Air Data Computer

ADF: Automatic Direction Finder

AHRS: Attitude & Heading Reference System

AUX: Auxiliary

BARO: Barometric Pressure

BRG: Bearing

CDI: Course Deviation Indicator

CRS: Course

FD: Flight Director

FPM: Flight Path Marker

GDU: Garmin Display Unit

GPS: Global Positioning System

GPSS: GPS Roll Steering

HDG: Heading

HSI: Horizontal Situation Indicator

IFR: Instrument Flight Rules

IMC: Instrument Meteorological Conditions

LOI: Loss of Integrity

MFD: Multi Function Display

PFD: Primary Flight Display

SBAS: Space-based Augmentation System

SD: Secure Digital

SVT: Synthetic Vision Technology

TAS: Traffic Awareness System

TAWS: Terrain Awareness and Warning System (a TSO-C151b function)

TCAS: Traffic Collision and Avoidance System

TIS: Traffic Information Service

VFR: Visual Flight Rules

VMC: Visual Meteorological Conditions

V/S: Vertical Speed

Section 2. LIMITATIONS

2.1 Cockpit Reference & Pilot's Guide

The Garmin G500 Cockpit Reference Guide P/N 190-01102-03, Revision A or later appropriate revision must be immediately available to the flight crew.

Garmin also provides a detailed G500 Pilot's Guide P/N 190-01102-02. This reference material is not required to be on board the aircraft but does contain a more in depth description of all the functions and capabilities of the G500.

2.2 System Software Requirements

The G500 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Identification	Software Version
GDU 620	PFD/MFD	6.21
GRS 77	AHRS	3.04

2.3 Moving Map

The moving map on the MFD is advisory in nature and is not approved for course guidance. The moving map on the MFD must be cross checked for correctness against the PFD HSI, published charts, or other approved sources of navigation information.

2.4 Database Cards

Databases identified as intended for helicopter use must not be used. These databases may be identified by the word "HELI" or "HELICOPTER" in their title.
The G500 utilizes several databases. Database titles display in yellow if expired or in question (Note: the G500 receives the calendar date from the GPS, but only after acquiring a position fix.). Database cycle information is displayed at power up on the MFD screen, but more detailed information is available on the AUX pages. Internal database validation prevents incorrect data from being displayed.
The upper Secure Digital (SD) data card slot is typically vacant as it is used for software maintenance and navigational database updates. The lower data card slot should contain a data card with the system's terrain / obstacle information and optional data including Safe Taxi, FliteCharts and ChartView electronic charts.

CAUTION

Only one SD card may be present in the GDU620 and it must be in the lower slot.

The terrain databases are updated periodically and have no expiration date. Coverage of the terrain database is between North 75° latitude and South 60° latitude in all longitudes. Coverage of the airport terrain database is worldwide.
The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. Coverage of the obstacle database includes the United States and Europe. This database is updated on a 56-day cycle.
The Garmin SafeTaxi database contains airport diagrams for selected airports. This database is updated on a 56-day cycle.
The Garmin FliteCharts database contains procedure charts for the coverage area purchased. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.
The Jeppesen ChartView electronic charts database contains procedure charts for the coverage area purchased. An own-ship position icon will be displayed on these charts. This database is updated on a 14-day cycle. If not updated within 70 days of the expiration date, ChartView will no longer function.
The airport directory database contains information on landing facilities, such as operating hours, services available, and transportation/lodging resources. Airport directory information may be available from multiple sources and coverage areas. This database is updated on a 56-day cycle.

2.5 AHRS Operational Area

The AHRS used in the G500 is limited in its operational area: IFR Operations are prohibited north of 72L N and south of 70L S latitudes. In addition, IFR operations are prohibited in the following four regions:
1) North of 65° North latitude between longitude 75° W and 120° W
2) North of 70° North latitude between longitude 70° W and 128° W
3) North of 70° North latitude between longitude 85° E and 114° E
4) South of 55° South latitude between longitude 120° E and 165° E
Loss of the G500 heading and attitude may occur near the poles, but this will not affect the GPS track or standby attitude indicator.

2.6 Magnetic Variation Operational Area

IFR operations are prohibited in areas where the magnetic variation is greater than 99.9 degrees East or West.

2.7 Navigation Angle

The GDU 620 Navigation Angle can be set to either True or Magnetic on the AUX page. The Navigation Angle defines whether the GDU 620 headings are referenced to True or Magnetic North. The Navigation Angle set in the GDU 620 must match that which is set on all GPS/SBAS navigators interfaced to the unit.

2.8 AHRS Normal Operating Mode

The Attitude and Heading Reference System integrity monitoring features require the availability of GPS and Air Data. Although the attitude will remain valid if one of these systems becomes inoperative, IFR flight is not authorized unless both integrity systems are fully operational. The G500 monitors these

integrity systems automatically and will alert the pilot when the AHRS is not receiving GPS or Air Data. Note: In dual GPS installations, only one GPS needs to be available for IFR use.

2.9 Airspeed Limitations and Indicator Markings

The original type design approved airspeed limitations remain in effect. The airspeed limitations imposed by the AFM/POH, standby airspeed indicator and/or airspeed limitation placards must be observed.
The G500 airspeed tape displays red/white striping to indicate the maximum allowable airspeed (VNE/VMO/MMO). This maximum allowable airspeed display is configured to indicate the appropriate maximum allowable airspeed for the airplane, including variations for altitude or Mach number.
The G500 airspeed tape displays a red low-speed awareness band at the lower range of the airspeed tape. This low-speed awareness band is configured to a fixed value. It does not indicate an actual or calculated stall speed and does not adjust with variations in aircraft weight or other factors.
All other G500 airspeed tape indications are configured to indicate the original type design limitations. The G500 airspeed tape does not adjust these additional markings (including VNO, landing gear, or flap speed limitations) for variations with aircraft weight, altitude, or other factors.

2.10 Aerobatic Manoeuvres

Conducting aerobatic manoeuvres may cause the attitude information displayed on the G500 to be incorrect or temporarily removed from the display.

2.11 Electric Standby Attitude Gyro

If an electric standby attitude gyro is installed, the gyro operates from the aircraft electrical system with a dedicated emergency battery specific to the electric gyro. The electric attitude gyro battery capacity may vary considerably depending on temperature, charge status, and battery life condition. Low temperatures below 32°F will temporarily degrade battery capacity. Internal chemistry will slowly degrade battery capacity over several years of operation even when correctly maintained. A poorly maintained battery will suffer accelerated degradation. Extended storage in a discharged state and over-charging will permanently damage the battery. Complete charging is required to bring the battery up to full capacity if it has been unused for more than four months or partially discharged.

2.12 Course Pointer Auto Slewing

The G500 HSI will auto slew, i.e. automatically rotate the GPS course pointer to the desired course defined by each GPS leg. The system will also auto slew the VHF NAV course pointer when the CDI transitions to a LOC setting if an ILS, LOC, LOC BC, LDA, or SDF approach is loaded in the GPS/SBAS navigator.
The VHF NAV (green) course pointer will only auto slew if the approach is loaded in the navigator, a LOC frequency is loaded in the active NAV frequency, and *then* the HSI source is changed to the corresponding VHF NAV for the approach. Back Course approaches will auto slew to the reciprocal course.
The system is not capable of automatically setting the inbound VHF NAV course pointer if an approach is not loaded in the GPS/SBAS Navigation System.
The pilot should always double check the inbound course pointer prior to initiating any transition on any VHF NAV approach. Auto slewing the VHF NAV course pointer to the correct selected course is a database dependent function.

2.13 Synthetic Vision Technology

The use of the synthetic vision display elements alone for aircraft control without reference to the G500 primary flight instruments or the aircraft standby instruments is prohibited.
The use of the synthetic vision display alone for navigation, or obstacle, terrain, or traffic avoidance is prohibited.

2.14 Autopilot Interface

The G500 acts as a navigation source switching hub to an interfaced autopilot when multiple navigation sources are available. The autopilot will only couple to the heading, navigation, altitude, and vertical speed selections on PFD 1. Some autopilots may have navigation source selection integral to their system; this feature is overridden by the G500 navigation source selection described herein. Changing the navigation sources displayed on the HSI (by pressing the CDI button or the 1-2 button) may result in some autopilots disconnecting or entering a wings level mode.
The autopilot will not couple to the pre-selected altitude or vertical speed if not properly configured or supported by the installation. Refer to the autopilot operators' manual or Airplane Flight Manual Supplement for the proper operation of that system.

Not all autopilot systems are approved for GPS vertical coupling; therefore consult the AFMS for the GPS/SBAS system and/or the autopilot system.

2.15 Terrain Proximity Function

The G500 terrain configuration is indicated on the dedicated terrain page of the MAP group. "TERRAIN PROXIMITY" will be displayed as the page title if this function is configured. The G500 terrain and obstacle information appears on the MFD display as red and yellow tiles or towers, and is depicted for advisory only. Aircraft manoeuvres and navigation must not be predicated upon the use of the terrain display. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS.

2.16 TAWS Annunciations on the PFD [from a Garmin GTN750 navigator]

The G500 can display TAWS (Terrain Awareness and Warning System) annunciations on the PFD if the G500 is interfaced to a Garmin GTN750 navigator with integrated TAWS. The required TAWS annunciations appear in the upper right of the PFD. These annunciations include PULL UP (red), TERRAIN (yellow), TERR N/A (white), TERR INHB (white). These annunciations are not relative to the terrain displayed on the MFD or the yellow/red terrain shading of the Synthetic Vision displayed on the PFD of the G500 system. Refer to the Garmin GTN750 navigator Airplane Flight Manual Supplement for proper pilot action and information on these alerts.
TAWS alerts on the PFD of the G500 System are only displayed from the GPS/TAWS navigator interfaced as GPS 1 and are displayed regardless of the system 1-2 setting, which drives all other PFD and MFD data used by the G500.

2.17 Traffic Display

Traffic may be displayed on the G500 System when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft manoeuvring.

2.18 Kinds of Operations

Unless placarded as limited to VFR only operations, G500 equipment installed in an appropriately certified aircraft is approved for Day and Night / VFR and IFR operations.

The table below lists the minimum fully functional G500 System Elements** required for IFR flight operations:

Equipment	Number required	
	VFR	IFR
GDU620 Primary flight display/Navigation display		1
GTN750/650	-	1
GRS77 Attitude/Heading unit (AHRS)	-	1
GDC74A Air data computer (ADC)		1
GMU44 Magnetometer (GMU)	-	1
Standby attitude indicator	-	1
Standby airspeed indicator	1a	1
Standby altimeter	1a	1
Standby Nav CDI	-	1
Magnetic compass	1	1

* For VFR operations, the aircraft must have one source of altitude and airspeed information. This may be from either the PFD or the standby instruments. (i.e. all "1a" items or all "1b" items from the table above)
** For IFR flight a fully functional G500 system should not generate system alerts, which indicate faults within the system or any interfaced equipment.

2.19 Surface Operations

Do not use SafeTaxi or Chartview functions as the basis for ground manoeuvring. SafeTaxi and Chartview functions are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview are to be used by the flight crew to orient themselves on the airport surface to improve flight crew situational awareness during ground operations.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency procedures.

3.1.1 PFD 1 Failure

PFD 1 failure is indicated by the loss of displayed information on the PFD, including blank, frozen, or unresponsive display.
1. Use standby flight instruments for attitude, airspeed, altitude, and heading reference.
2. Refer directly to navigation source for navigation information (such as GPS).
If autopilot is engaged:
3. Verify autopilot mode and cross check against standby flight and navigation data.

3.1.2 AHRS Failure

Attitude and Heading Reference System (AHRS) failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the PFD. Rate-of-turn information (heading trend vector) will not be available. A heading failure will also occur as described in Section 3.2.1.

1. Use Standby Attitude Indicator.
2. Seek VFR conditions or land as soon as practical.

3.1.3 Air Data Computer (ADC) Failure

Air Data Computer failure is indicated by a red X and yellow text over the airspeed, altimeter, vertical speed, TAS and OAT displays. Some derived functions, such as true airspeed and wind calculations will also be lost. If valid GPS data is available, the PFD will automatically revert to display GPS calculated altitude relative to mean sea level. This GPS altitude is displayed above the altitude tape.
1. Use Standby Airspeed Indicator and Altimeter
2. Seek VFR conditions or land as soon as practical
If ADC 1 has failed and PFD 1 AIR DATA switch is installed:
3. PFD 1 AIR DATA switch – Select ADC 2

NOTE
ALT NO COMP and IAS NO COMP alerts will be present.

3.1.4 Loss of Electrical Power

In the event of a total loss of electrical power, the G500 system will cease to operate and the pilot must utilize the standby instruments to fly the aircraft.

3.1.5 Loss of Electrical Power to 3-inch Electric Standby Attitude Indicator
(flashing amber STBY PWR light)

When a 3-inch electric standby attitude indicator is installed, loss of primary electrical power to the attitude indicator is annunciated by a flashing amber light on the indicator. The attitude indicator is operating on backup battery power, and pilot action is required for the gyro to continue operating.
1. Press STBY PWR button on the indicator one time.
2. Verify that the flashing amber light extinguishes.
3. Verify that the red gyro warning flag is not displayed.
4. Seek visual meteorological conditions (VMC) or land as soon as practical (operation of standby attitude indicator is limited by battery life).

WARNING

Do not press the STBY PWR button a second time after the flashing amber light extinguishes. This will turn off the backup battery and the red gyro warning flag will be displayed. If the STBY PWR button is inadvertently pressed and the red gyro warning flag is displayed, press the STBY PWR button again to return to battery power operation (red gyro warning flag should not be displayed).

3.1.6 Loss of Electrical Power to 2-inch Electric Standby Attitude Indicator

(flashing or steady amber STBY text)

When a 2-inch electric standby attitude indicator is installed, loss of primary electrical power to the attitude indicator is annunciated by amber STBY text on the Annunciation Control Unit. The attitude indicator is operating on backup battery power, and pilot action may be required for the gyro to continue operating.

If the amber STBY text is flashing (manual operation):

1. Press the STBY PWR button one time.
2. Verify that the amber STBY text is steadily illuminated.
3. Verify that the red gyro warning flag is not displayed.
4. Seek visual meteorological conditions (VMC) or land as soon as practical (operation of standby attitude indicator is limited by battery life).

If the amber STBY text is steadily illuminated (automatic operation):

1. Verify that the red gyro warning flag is not displayed.
2. Seek visual meteorological conditions (VMC) or land as soon as practical (operation of standby attitude indicator is limited by battery life).

WARNING

Do not press the STBY PWR when the amber STBY text is steadily illuminated. This will turn off the backup battery and the red gyro warning flag will be displayed. If the STBY PWR button is inadvertently pressed and the red gyro warning flag is displayed, press the STBY PWR button again to return to battery power operation (red gyro warning flag should not be displayed).

3.2 Abnormal Procedures

3.2.1 Heading Failure

Heading failure is indicated by replacement of the digital heading display with amber "HDG" text and a red X.

If valid GPS ground track is available, it will automatically be displayed in place of heading. The HSI heading bug and course pointer will continue to function normally, using GPS ground track as a reference instead of magnetic heading.

If GPS track is not available:

1. Use standby compass for heading reference.
2. Verify selected course using "CRS" button and PFD knob.

CAUTION

No directional references will be displayed on HSI. The heading bug will be removed, and the course pointer will remain fixed at the top of the HSI regardless of aircraft heading. Course deviation indications will behave similar to a traditional CDI. VOR deviations will be relative the selected course with a TO/FROM indication. Localizer deviations will not be affected by the selected course, and reverse sensing will occur when tracking inbound on a localizer back course.

3.2.2 GPS Data Failure

GPS data failure may be indicated by any or all of following:
- Loss of GPS course deviation information on HSI
- Amber "LOI" text on the HSI
- Amber "NO GPS POSITION" text on the MFD moving map
- Loss of waypoint bearing or distance information

1. Select alternate GPS source, if available, by pressing "1-2" softkey on PFD.

If alternate GPS source is not available:
2. Select alternate navigation source using "CDI," "1-2," or "BRG" softkeys on PFD, or refer directly to external navigation data.

3.2.3 Navigation Data Failure (VOR/LOC/GS/ADF)

Navigation data failure may be indicated by any or all of following:
- Loss of course deviation information on HSI
- Loss of glideslope/glidepath information on PFD
- Loss of bearing pointer on HSI

1. Select alternate navigation source using "CDI," "1-2," or "BRG" softkeys on PFD, or refer directly to external navigation data.

3.2.4 Synthetic Vision (SVT) Failure

Several data sources are required to display SVT on the PFD (GPS, terrain database, attitude information, etc.). If any of these required data sources become unreliable or unavailable, SVT will automatically be removed, and the PFD will revert to the standard display of blue sky over brown ground. If there is a discrepancy between the SVT display and the actual terrain around the aircraft, SVT should be turned off manually.
To turn off SVT:
1. Press the "PFD" softkey on the PFD.
2. Press the "SYN VIS" softkey to turn off SVT.

3.2.5 Electrical Load Shedding

The following equipment is considered non-essential. If it becomes necessary to reduce electrical load (for example, during loss of generators or alternators), power to these units may be removed in the order listed.
1. PFD 2 circuit breaker(s) [if installed] – PULL
2. AHRS 2 circuit breaker(s) [if installed] – PULL
3. ADC 2 circuit breaker(s) [if installed] – PULL
4. GAD circuit breaker(s) [if installed] – PULL

3.3 Warnings, Cautions, and Advisories

The following tables show the colour and significance of the warning, caution, and advisory messages which may appear on the G500 displays.

NOTE

The G500 Cockpit Reference Guide and the G500 Pilot's Guide contain detailed descriptions of the annunciator system and all warnings, cautions and advisories

3.3.1 Warning annunciations – Red		
Annunciation	*Pilot Action*	*Cause*
ATTITUDE FAIL	Use Standby Attitude.	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	Use Standby Airspeed.	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display.
ALTITUDE FAIL	Use Standby Altitude.	Display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display.
VERT SPD FAIL	Cross check instruments.	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display.
HDG	Use Standby Magnetic Compass or GPS track information.	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display.
Red X	Reference the data source or alternate equipment.	A red X through any display field, indicates that display field is not receiving data or is corrupted.

3.3.2 Caution annunciations – Yellow		
Annunciation	*Pilot Action*	*Cause*
CHECK ATTITUDE Autopilot will automatically disconnect. Note: Only appears with the installation of an optional GAD 43 adapter	Fly the aircraft manually and crosscheck GDU 620 attitude indication with standby attitude indicator and other sources of attitude information (airspeed, heading, altitude, etc.)	The GDU 620 attitude monitors have detected an AHRS malfunction, or the inability to actively monitor the AHRS output.
MISCOMP (flag displayed on PFD attitude, airspeed, or altitude indicators)	Cross-check the flagged information against other sources to identify erroneous information.	Difference detected between displayed attitude, airspeed, or altitude (dual installations only).
AHRS ALIGN – Keep Wings Level	Limit aircraft attitude to ±10° bank and ±5° pitch as AHRS Aligns - OK to taxi.	Attitude and Heading Reference System is aligning. AHRS may not align with excessive pitch/bank angles.
NO GPS POSITION	If the system is configured with dual GPS, press the 1-2 button.	GPS data on the selected system is no longer valid. The Moving Map and associated data are not updating.
TRAFFIC	Visually acquire the traffic to see and avoid.	The configured traffic system has determined that nearby traffic may be a threat to the aircraft.
No Traffic Data	Use vigilance, as the traffic sensor is not able to detect traffic.	The configured traffic system is not able to detect traffic and / or provide the pilot with any traffic awareness.
NO AP DATA	Verify autopilot mode of operation using alternate means.	Autopilot mode of operation is not available.

3.3.3 Advisories – White	
Annunciation	*Pilot Action*
Various Alert Messages may appear under the MFD - ALERTS soft key.	View and understand all advisory messages. Typically, they indicate communication issues within the G500 System. Refer to the G500 Cockpit Reference for appropriate pilot or service action.

Section 4. NORMAL PROCEDURES

Refer to the Garmin G500 PFD/MFD System Cockpit Reference Guide P/N 190-01102-03 or G500 Pilot's Guide P/N 190-01102-02, presented in Paragraph 2.1 of this document, for normal operating procedures. This includes all Primary Flight Display and Multi-Function Display information.
Although intuitive and user friendly, the G500 PFD/MFD System requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid procedures in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training material with the Cockpit Reference Guide and the detailed Pilot's Guide. Pilots should take full advantage of these training tools to enhance system familiarization.

4.1 PFD Knob & PFD Soft Keys

The basic PFD controls are on the side and bottom of the PFD, next to and beneath the PFD display. The rotary knob performs the function annunciated on the display just to the upper left of the HSI: HDG, CRS, ALT, V/S, or BARO. If no function is annunciated then the knob is providing a HDG function. Assigning the function of the knob is done by pressing/releasing one of the dedicated function buttons to the left of the display. The knob defaults back to HDG if it is not rotated for a period of 10 seconds. The Garmin G500 PFD/MFD System Cockpit Reference describes each function and its operation.
The soft keys at the bottom of the PFD display are used to configure the course data displayed in the HSI (CDI button, 1-2 button) and select the optional bearing pointers (BRG1 and BRG2 button) which are may be overlaid in the HSI presentation on the PFD. The soft keys operate by press and release. Note: In Dual G500 installations, the CDI key located on the GNS units is not operational Consult the Garmin G500 PFD/MFD System Cockpit Reference for a complete description. The units and markings on the PFD are not user configurable. They match the units as specified in the aircraft's FAA approved Airplane Flight Manual and standby instruments. Display and control of the airspeed references (VR, VX, VY, and GLIDE) are made via the AUX page of the MFD; consult the Garmin G500 Cockpit Reference Guide for description and operation of these references.

4.2 MFD Knobs & MFD Soft Keys

The MFD controls are on the side and bottom of the MFD, next to and beneath the MFD display. The rotary knobs scroll through various page groups and pages of the MFD and manipulate data and settings by pressing the knob to activate a cursor.

Soft keys at the bottom of the display allow for some quick functions to be performed on each page. The soft keys operate by press and release. More detailed configuration is typically available by pressing the MENU button, which is on the right side of the display.
Pressing and holding down the CLR key is a shortcut to get back to the main map page on the MFD. This can be used as a quick way back, or when the pilot has selected a submenu within the system. The functions available under the MFD are explained in the Garmin G500 Cockpit Reference Guide.

4.3 Altitude Synchronization

The pilot must synchronize the PFD BARO setting and the Standby Altimeter Kollsman (baro-scale) window with the local altimeter setting as appropriate.

4.4 Electric Standby Attitude Gyro

When an electric standby attitude gyro is installed, test the backup battery before take-off.
1. Apply power to electric standby attitude gyro and allow the gyro to reach operating speed (approximately 5 minutes).
2. Verify that the red gyro flag is not in view.
3. Press and hold the STBY PWR button until the amber annunciator begins to flash.
4. Verify that the green annunciator is displayed continuously and the red annunciator is not displayed for the duration of the test (approximately 1 minute).

CAUTION

The standby attitude gyro must be considered inoperative if the red annunciator is displayed during the test.

4.5 Synthetic Vision Technology

The SVT system may be turned on or off, as desired. To access the synthetic vision system softkey menu, press the PFD softkey on the GDU 620, followed by the SYN VIS softkey. Synthetic vision terrain, horizon headings, and airport signs can be toggled on and off from this menu. Press the BACK softkey to return to the root PFD menu.

4.6 Autopilot Operations with the G500 System

The G500 PFD/MFD System offers various integration capabilities dependent mainly upon the type of autopilot installed in a particular aircraft.
The G500 installation in this aircraft provides the following autopilot integration capabilities:
☐ This installation *does not* interface with the autopilot (basic wing levelling autopilot or no autopilot is installed in the aircraft).

☐ Course / NAV Selection coupling to the autopilot.

☐ Heading Bug coupling capability to the autopilot.

☐ Roll Steering emulated via heading mode.

☐ Roll Steering capable autopilot.

☐ Altitude Pre-Selector integrated with the autopilot.

☐ Vertical speed bug integrated with the autopilot.

☐ Flight Director display driven from external autopilot or FD computer.

4.6.1 Attitude and Rate Based Autopilots

Rate-based autopilots in this aircraft (S-TEC 20, 30 and 55X) are driven by a turn coordinator gyro which may be mounted in the instrument panel or remotely mounted. The autopilot rate input is independent of the G500 system.
The pilot must understand the autopilot system inputs to detect faults and capabilities with inoperative equipment. Refer to the autopilot flight manual for operational information.

4.6.2 Course / NAV Selection coupling to the autopilot

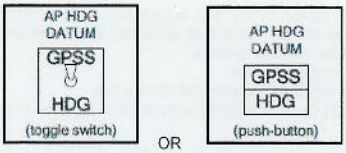
When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS1, GPS2, NAV1, NAV2) is switched via the G500 PFD display. Whatever is displayed on the HSI is the NAV source the autopilot is following. Most autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

4.6.3 Heading Bug coupling capability to the autopilot

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more then 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

4.6.4 Roll Steering emulated via HDG mode

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS on the PFD. Depending on the installation, GPSS mode may be toggled via an external switch located near the autopilot control panel, or by pressing and holding the HDG button on the PFD. If an external switch is installed, it will be either a toggle or push-button switch as depicted below.



If the installation uses the HDG button on the PFD, the PFD Knob Mode Indicator is expanded to label the button function.

GPSS OFF GPSS ON

When GPSS is selected on the PFD, the heading bug on the HSI changes to a hollow outline and a crossed-out heading bug appears in the PFD Knob Mode Indicator, indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used by the pilot for reference.

When GPSS is selected on the PFD, GPSS is annunciated in the lower left portion of the PFD. The GPSS mode annunciation depends on the location of the NAV STATUS information, as shown below.

NAV STATUS STYLE 1

NAV STATUS STYLE 2

When GPSS is selected on the PFD, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS navigator selected on PFD 1.
If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected HSI source on PFD 1 is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

4.6.5 Roll Steering capable autopilots

If the autopilot is already designed to receive Roll Steering information (S-TEC 55X), the data is transmitted via a digital communications bus from the G500 to the autopilot. The G500 receives this data from the GPS. In dual GPS installations, the G500 sends Roll Steering information for the GPS which is currently selected for use via the PFD 1-2 button.

4.6.6 Selected Altitude Bug Coupling

When installed appropriately, certain S-TEC 55X autopilots may be coupled to the PFD selected altitude bug for altitude preselect and capture. Except as described in this section, refer to the autopilot AFMS and/or Pilot's Guide for autopilot system operation.
To preselect and capture a selected altitude:
1. Select the desired altitude with the PFD selected altitude bug.
2. Press/hold VS then press ALT on the autopilot programmer computer to arm altitude hold mode.

CAUTION
Changing the selected altitude bug while ALT SEL mode is selected may result in autopilot mode changes. Verify the autopilot mode after changing the selected altitude.

4.6.7 Vertical Speed Bug Coupling

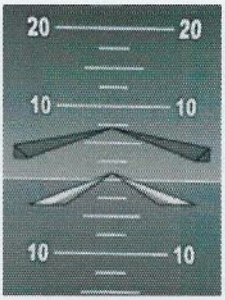
Certain S-TEC 55X autopilots may be coupled to the PFD vertical speed bug for maintaining a selected vertical speed. Except as described in this section, refer to the autopilot AFMS and/or Pilot's Guide for autopilot system operation.
To select and maintain a vertical speed:
1. Select the desired vertical speed with the PFD vertical speed bug.
2. Press VS on the autopilot programmer computer to engage vertical speed mode.

NOTE

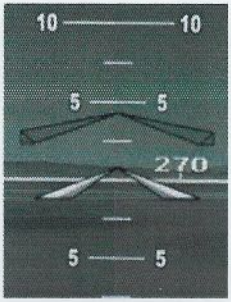
The selected vertical speed will automatically be reduced towards zero when approaching the selected altitude bug. AUTO will appear in the vertical speed PFD knob mode indicator when vertical speed is being reduced automatically. Manually changing the selected vertical speed while AUTO is displayed will cancel automatic vertical speed reduction.

4.6.8 Flight Director Display

If autopilot flight director commands are interfaced to the G500, they will be presented as a single cue flight director on the PFD. Control of the flight director is accomplished via the autopilot/flight director controller; there are no pilot controls or adjustments for the flight director on the G500.
The G500 system limits the distance the flight director pitch commands may deviate from the aircraft attitude icon. In the event that the pitch command provided by the autopilot flight director is greater than the distance allowed by the G500, the command bars will be displayed at the maximum distance allowed by the G500. As the aircraft pitch changes to satisfy the command bars, the bars will continue to be displayed at the maximum distance from the aircraft attitude icon until the aircraft pitch deviation is within the command display limit. In both examples below, the flight director is commanding approximately 7 degrees pitch up. With SVT turned off, the 7 degree pitch up command is displayed with the command bar at 7 degrees pitch up. With SVT turned on, the G500 limits the command bar shown as 4.5 degrees pitch up, which is the maximum deviation that can be displayed. The G500 system will hold the command bars at the same distance from the aircraft icon until the aircraft pitch attitude is within 4.5 degrees of the command.



SVT OFF



SVT ON

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin G500 PFD/MFD System Cockpit Reference Guide P/N 190-01102-03 for basic operational aspects of the system. For a complete detailed explanation of all the G500's capabilities see the G500 Pilot's Guide P/N 190-01102-02.

SAM
« STANDBY ATTITUDE MODULE »

This Aircraft Flight Manual Supplement (AFMS) includes the material required to be furnished to the pilot and additional information provided by the manufacturer.

Ce supplément au manuel de vol contient les informations que les conditions de certifications exigent de fournir au pilote. Ces informations remplacent ou complètent celles du manuel de vol approuvé.

Applicability ***Applicabilité***

Aircraft type and model *Type et modèle d'avion*		Manufacturer change *Modification constructeur*
Avions ROBIN	All models unless the ATL *Tous les modèles exceptés les ATL*	*Dossier d'Evolution Technique* DET n°130701

Approval ***Approbation***

Amendment *Amendement*	Date	Description	Approval *Approbation*
//////	11 Oct 2013	Original issue *Edition originale*	E.A.S.A approval 10046775

List of effective pages ***Liste des pages en vigueur***

Pages	Date
1 to *(à)* 2	October 11th, 2013

MODIFICATION

The sections of the aircraft flight manual are affected as follows.

Les sections du manuel de vol sont affectées de la façon suivante.

0. GENERAL

No change.

GENERALITES

Section non affectée.

1. DESCRIPTION

The "SAM" MD302 (Standby Attitude Module) is an instrument which combines in the same module the indications of attitude, altitude, airspeed and slip information. This receiver allows to replace the 3 conventional backup instruments (Horizon / Altimeter / Anemometer).

DESCRIPTION

Le « SAM » MD302 (Standby Attitude Module) est un instrument qui combine dans un même module les indications d'attitude, d'altitude, de vitesse air et de dérapage. Ce combiné permet de remplacer les 3 instruments conventionnels de secours (Horizon / Altimètre / Anémomètre).

2. LIMITATIONS

The operating manual MID CONTINENT MD302 SAM (P/N 9017846), must be on board.
Use is limited to VFR only.

LIMITATIONS

Le manuel d'utilisation MID CONTINENT MD302 SAM (référence 9017846), doit être à bord.
L'utilisation est limitée au VFR.

3. EMERGENCY PROCEDURES

No change

PROCEDURES D'URGENCES

Section non affectée.

4. NORMAL PROCEDURES

The operating manual MID CONTINENT MD302 SAM (P/N 9017846), must be on board.

PROCEDURES NORMALES

Le manuel d'utilisation MID CONTINENT MD302 SAM (référence 9017846), doit être à bord.

5. PERFORMANCE

No change.

PERFORMANCES

Section non affectée.

6. WEIGHT AND BALANCE

No change.

MASSE ET CENTRAGE

Section non affectée

AIRCRAFT FLIGHT MANUAL SUPPLEMENT

S-TEC SYSTEM 55 X AUTOPILOT

This flight manual supplement includes the information to be provided to the pilot, as required by the certification basis. The information provided supersedes or completes the one of the French "Manuel de vol" approved.

This supplement supersedes any existing supplement concerning the automatic pilot S-TEC SYSTEM 55 X.

Amendment	Date	Description	Approval
////////	22 May 2013	Original issue	AESA.10044946

APPLICABILITY

Aircraft	Manufacturer change
DR400	*Modifications : 121, 128, 132 020304*

PRESENTATION OF S-TEC 55 X AUTOPILOT

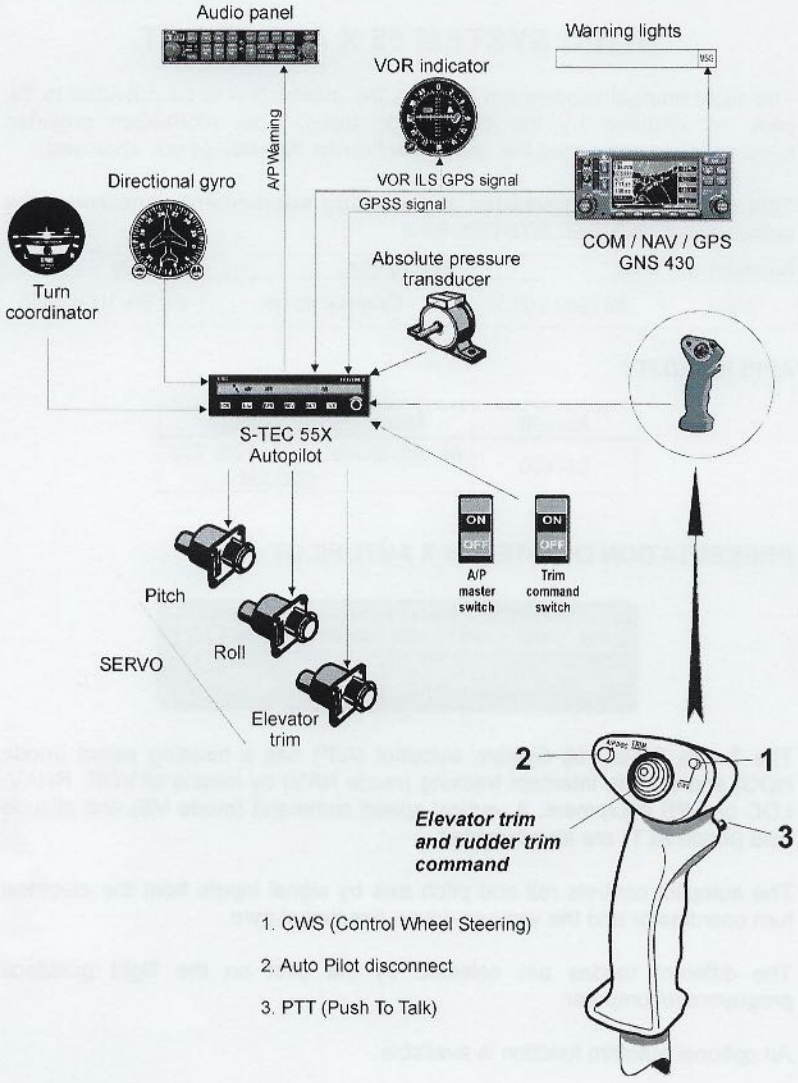
The 2 axis S-TEC 55 System autopilot (A/P) has a heading select (mode HDG) and a route intercept tracking (mode NAV) by means of VOR, RNAV, LOC or GPS equipment. A vertical speed command (mode VS) and altitude hold (mode ALT) are also provided.

The autopilot controls roll and pitch axis by signal inputs from the electrical turn coordinator and the vacuum driven directional gyro.

The different modes are selected by the pilot on the flight guidance programmer/computer.

An optional autotrim function is available.

Example of coupling of S-TEC System 55 X Autopilot with GPS/COM/NAV GNS430



FLIGHT MANUAL

When installing S-TEC 55 X autopilot, the sections of the aircraft flight manual are affected as follows:

Section 0 - General
Not affected.

Section 1 - Description
Not affected.

Section 2 - Limitations

The following limitations, pertinent to the S-TEC 55 X automatic pilot, must be added:

The S-TEC Autopilot System 55 X, Pilot's operating handbook, reference: P/N 87109, must be on board.

This automatic pilot is allowed in VFR
This automatic pilot is not allowed in IFR, nor in tow of gliders and streamers.

Minimum height for approach use ..... 500 ft
Minimum height for cruise use ..... 1 000 ft
Minimum speed for use ..... (75 kt) 139 km/h
Maximum speed for use ..... (140 kt) 260 km/h

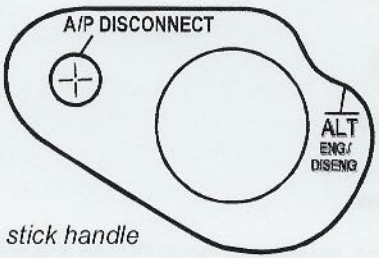
IMPORTANT

Do not use the automatic pilot in case of failure of:

1) of the directional gyroscope, of the vacuum pump or the air feeding circuit,
2) of the electric turn coordinator

Following placards must be added to previous ones.

AP master switch on instruments panel

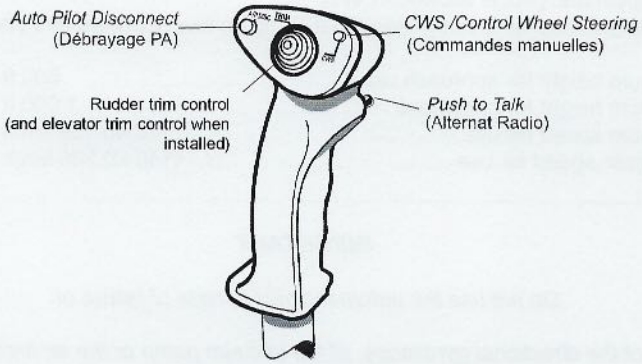


Cct Breaker

AUTOPILOT

On stick handle

The electrical trim switch and the CWS push button are located on the pilot stick handle.



Section 3 - Emergency procedures

If the A/P malfunctions or if the response is not consistent with the expected control order:
1- Take over the controls manually rather than looking for the cause of the problem. Then disconnect the A/P with the A/P disconnect button.

> ***NOTE***
> *The autopilot can be taken over with no damage to the system.*

2- Switch off the A/P (master switch on OFF position).

3- Pull the autopilot circuit breaker. Do not attempt to restart it.

In case of failure of pneumatic or electric systems:
Switch off the A/P (master switch on OFF position).

Note
The AP may be disconnected in several ways:
By pressing on the red "AP disc" switch on the stick (A/P is disconnected but still power supplied)
By switching the A/P master switch on the instrument panel to the OFF position (A/P is not supplied)
By pulling the autopilot circuit breaker (A/P label) (A/P is not supplied)
*If the A/p is fitted with autotrim **and** if ALT or VS mode is engaged, the electrical trim control will disconnect the A/P by means of the push buttons located on the stick handle.*

In case of failure of the electrical trim (if installed):

1 - Pull the electrical trim circuit breaker and do not attempt to restart it.
2 - Manually trim following the indications of the programmer / computer

Section 4 - Normal procedures

Refer to "S-TEC Autopilot System 55 X, Pilot's operating handbook", reference: P/N 87109 latest issue.

At holding point, check good operation of the autopilot:
1. Suction: green arc
2. Master switch: ON
3. Message on annunciator: RDY after autotest
4. Press and release the CSW switch: CWS and VS are displayed
5. Take over the Autopilot by moving the stick forward and backward then from the right to the left: there should not be any play in the controls.
6. Press on the "AP disc " red button: RDY flashes on display
   An audible beep indicates that A/P is disconnected
7. Move the control stick to make sure A/P is disconnected: free controls

When autotrim is installed, complete the previous procedure by checking good operation of autotrim.

1. Autotrim switch: ON
2. Message on annunciator: RDY
8. Press and release the CSW switch: CWS and VS are displayed
3. Move elevator control to nose down position: after 3 secondes, the autotrim starts trimming. Trim △ (nose up) is indicated
4. Move elevator control to nose up position: after 3 seconds, the autotrim starts trimming. Trim ▽ (nose down) is indicated
5. Verify the trim direction by setting the trim control switch on the stick handle to nose up then nose down position: RDY flashes on annunciator.
   An audible beep indicates that A/P is disconnected

NOTE: *Trim the aircraft for take-off and do make sure that A/P is disconnected (free flight controls)*

Operation

Refer to S-TEC Autopilot System 55 X, Pilot's operating handbook, reference: P/N 87109 latest issue.

IMPORTANT

During climb, make sure not to set the autopilot to hold a vertical speed out of the aircraft performance.

See the climb performance at the Flight Manual Section 5.

The setting of a positive VS (climb) must not lead to an indicated airspeed lower than the minimum operation speed of the A/P, ie 139 km/h (75 kt).

In the same way, the setting of a negative VS (descent) must not lead to overtake the maximum operation speed of the A/P, ie 260 km/h (140 kt).

Section 5 - Performance

Not affected.

Section 6 - Weight and balance

Not affected.

Section 7 - Optional equipments

Not affected.

TRANSPONDEURS GARMIN GTX335/345 avec ADS-B
GARMIN TRANSPONDERS GTX335/345 with ADS-B

Ce supplément au manuel de vol contient les informations que les conditions de certifications exigent de fournir au pilote.

Ces informations remplacent ou complètent celles du manuel de vol approuvé.
Le manuel de vol reste valide pour toutes les limitations et procédures opérationnelles ainsi que les performances non incluses dans ce supplément.

This supplement includes the information to be provided to the pilot, as required by the certification basis.

The information either supplements or overrides those in the approved flight manual.
The flight manual remains valid for what concerns limitations and operating procedures as well as performance not included in this supplement.

Applicabilité / *Applicability*

Type et modèle d'avion *Aircraft type and model*		Modification constructeur *Manufacturer change*
DR400 & DR3XX	Tous modèles *All models*	DET 161202

Approbation / *Approval*

AVERTISSEMENT

Ce supplément au manuel de vol est une traduction française de courtoisie, des informations jugées nécessaires de fournir au pilote.

Il est rédigé sur la base des suppléments approuvés FAA (190-00734-15 Rev.2) et EASA (190-00734-16 Rev.1) en vigueur à la date de publication de ce document.

WARNING

This flight manual supplement is a courtesy French translation of information deemed necessary to provide of the pilot.

This AFMS is based on approved FAA (190-00734-15 Rev.2) and approved EASA (190-00734-16 Rev.1) flight manual supplements in the publication date of this document.

Les suppléments approuvés par la FAA (190-00734-15) et l'EASA (190-00734-16) dans leur dernière version doivent être insérés dans le manuel de vol approuvé lorsqu'un transpondeur GARMIN GTX3x5 est installé dans l'aéronef pour une utilisation de la fonction ADS-B.

La mise à jour de la documentation est de ce fait, à la charge du propriétaire ou de l'exploitant de l'aéronef.

Ce supplément CEAPR peut être utilisé en lieu et place des suppléments FAA et EASA approuvés, sous la seule responsabilité du propriétaire ou de l'exploitant de l'aéronef.

FAA Approved Supplement (190-00734-15) and EASA Approved Supplement (190-00734-16) in their latest version must be included in the approved flight manual when a GARMIN GTX3x5 transponder is installed in the aircraft for use of the ADS-B function.

The up to date of the documentation is therefore at the expense of the owner or operator of the aircraft.

This CEAPR supplement may be used instead of approved FAA and EASA supplements, under the responsibility of the owner or operator of the aircraft.

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1 à *(to)* 10	Dec. 2017

INTRODUCTION

Ce supplément au manuel de vol permet de renseigner les différentes données liées à l'utilisation en ADS-B d'un transpondeur de type GTX3x5.

This Supplement allows to describe data due to the use of GTX3x5 transponders in ADS-B mode.

MODIFICATION

Les sections du manuel de vol sont affectées de la façon suivante :

The sections of the aircraft flight manual are affected as follow:

0. GENERALITES

Section non affectée.

0.GENERAL

No change.

1. DESCRIPTION

Section non affectée.

1.DESCRIPTION

No change.

2. LIMITATIONS

2.1 Général

Le GTX335 ou GTX345 doit être utilisé conformément au manuel d'utilisation Garmin.

Le manuel d'utilisation de référence 190-01499-00 Rév.C dans sa dernière version doit être disponible à bord de l'aéronef.

2.2 Equipement minimum

Les GTX33X et GTX3X5 doivent avoir les systèmes suivant totalement fonctionnel afin de répondre aux exigences 14 CFR 91.227 pour une utilisation en ADS-B Out (Automatic Dependent Surveillance – Broadcast) :

2. LIMITATIONS

2.1 General

The GTX335 or GTX345 must be used in accordance the Garmin owner's manual.

The pilot's reference guide 190-01499-00 Rev.C in is latest revision must be available on board of the aircraft.

2.2 Minimum Equipment

The GTX33X and GTX3X5 must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227

ADS-B Out (Automatic Dependent Surveillance-Broadcast) operations:

Equipements requis *Interfaced Equipment*	Nombre installé *Number Installed*	Nombre requis *Number required*
Source de pression altitude *Uncorrected Pressure Altitude Source*	1	1
Source de position GPS *GPS SBAS Position Source*	1 ou plus *1 or more*	1
Système de contrôle d'affichage à distance (pour les transpondeurs équipés) *Remote Control Display (for remotely mounted transponders)*	1 ou plus *1 or more*	1

2.3 ADS-B Out

Les GTX33X et GTX3X5 répondent aux exigences du paragraphe 14 CFR 91.227 pour une utilisation de l'ABS-B OUT seulement lorsque toutes les fonctions requises sont opérationnelles. Lorsque le système n'est pas opérationnel, un message d'erreur ADS-B Out sera affiché sur l'interface de commande à distance ou sur l'interface du transpondeur GTX.

2.3 ADS-B Out

The GTX33X and GTX3X5 only comply with 14 CFR 91.227 for ADS-B Out when all required functions are operational. When the system is not operational, ADS-B Out transmit failure messages will be present on the remote control display interface, or the GTX330 or GTX3X5 panel display.

2.4 Affichage du trafic TIS avec l'angle de navigation de l'utilisateur

L'affichage du trafic TIS à partir d'un GTX33/330 ou GTX335 n'est pas autorisé avec une interface d'affichage à distance configurée pour ce type d'utilisation.

2.4 TIS Traffic Display with User Navigation Angle

Display of TIS traffic from a GTX33/330 or GTX335 is not permitted with an interfacing display configured for a navigation angle of "user".

2.5 Logiciel système applicable

Les GTX335 ou GTX345 doivent utiliser les dernières versions approuvées des logiciels suivant :

- GTX335 : Logiciel principal version 8.02 (ou version ultérieure)
- GTX345 : Logiciel principal version 2.02 (ou version ultérieure)

La version du logiciel principal du GTX est affichée sur l'écran de démarrage durant la mise en fonction du GTX ou sur la page système de l'affichage de commande à distance pour les transpondeurs GTX équipés.

2.6 Arrêt de la diffusion des informations de pression altitude

Lors d'un vol dans un espace aérien nécessitant un émetteur ADS-B Out conforme au paragraphe 14 CFR 91.227, l'arrêt de la diffusion des informations de pression altitude ne doit être réalisé que sur demande du contrôle de la circulation aérienne. Il est possible d'arrêter de transmettre ces information en sélectionnant le mode ON du transpondeur.

2.7 Affichage des données météo.

N'utilisez pas les informations météo données par l'instrument lors d'un vol dans, près ou autour de zones météorologiques dangereuses. Les informations fournis par l'instrument peuvent ne pas décrire avec précision les conditions météorologiques actuelles.

N'utilisez pas les informations de temps ou de durée indiqués par l'instrument pour déterminé l'état d'un évènement météorologique, en raison du retard inhérent à la collecte et au traitement des données météo. L'information météorologique donnée par l'instrument peut être significativement plus âgé que l'évènement météo actuel.

2.5 Applicable system software

The GTX335 or GTX345 must use the latest approved versions of following softwares.

- *GTX335 Main SW Version : 8.02 (or later)*
- *GTX345 Main SW Version : 2.02 (or later)*

The Main GTX software version is displayed on the splash screen during start up for the GTX panel mounted units, or System page on the interfaced remote control display for remotely mounted GTX transponders.

2.6 Pressure Altitude Broadcast Inhibit (PABI)

Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control while operating within airspace requiring an ADS-B Out compliant transmitter per 14 CFR 91.227. PABI is enabled by selecting the GTX to ON mode.

2.7 Datalinked Weather Display (GTX345 Only)

Do not use datalink weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by datalink weather products may not accurately depict current weather conditions.

Do not use the indicated datalink weather product age to determine the age of the weather information shown by the datalink weather product. Due to time delays inherent in gathering and processing weather data for datalink transmission, the weather information shown by the datalink weather product may be significantly older than the indicated weather product age.

2.8 Appareils électroniques portatifs.

La fonctionnalité Bluetooth dans les avions de classe IV n'est pas approuvée en vertu du STC EASA et doit être désactivée. Une approbation supplémentaire est requise pour activer la fonctionnalité Bluetooth pour cette classe d'aéronef.

L'interface déportée et les données fournies par le GTX à l'appareil portatif ne sont pas approuvées pour remplacer l'équipement aéronautique requis. Les données présentées sur l'appareil portatif peuvent ne pas être suffisamment précisent pour être la seule source d'information permettant de prendre des décisions tactiques ou stratégiques.

L'utilisation d'un appareil d'affichage électronique portatif pendant les phases critiques du vol par le pilote est interdite.

2.8 Portable Electronic Devices

Bluetooth functionality in Class IV aircraft is not approved under this STC and must be disabled. Additional approval is required to enable Bluetooth functionality for this class of aircraft.

The Connext interface and data provided by the GTX to a PED is not approved to replace required aircraft equipment. The data presented on the PED may not have the required integrity to be used as the sole source of information to base tactical or strategic decision making.

Use of the Connext interface during critical phases of flight by the pilot flying is prohibited.

3. PROCEDURES D'URGENCES

Les pannes du système ou les conditions anormales sont indiquées par l'apparition d'un message délivré par l'équipement. L'ensemble des messages de pannes ou conditions anormales sont répertoriés et expliqués dans le manuel d'utilisation GARMIN 190-01499-00 RevC, § 7 « TROUBLESHOOTING »

3.1 Perte des données de position GPS/SBAS.

Si le récepteur GPS/SBAS n'est plus opérant ou si l'information de position GPS n'est pas disponible ou est invalide, le transpondeur GTX va arrêter de transmettre les données ADS-B Out assez rapidement.

Cas d'un GTX 3X5 :

Affichage du message « NO 1090 TX »

- Source de position GPS.....Vérifiée valide

Cas d'un GTX33 ou GTX3X5R :

Se référer à la documentation pour connaitre le message d'erreur affiché.

- Source de position GPS.....Vérifiée valide

3.2 Cas d'une installation à double transpondeur GTX3XR avec G950/1000.

Si le transpondeur #1 tombe en panne et que le transpondeur #2 est activé par le pilote, un message d'alerte s'affichera sur l'affichage du G1000 jusqu'à ce que l'alimentation du transpondeur #1 soit coupé.

Transpondeur #1 en panne, transpondeur #2 actif

- Breaker transpondeur #1.....Tiré

3: EMERGENCY PROCEDURES

The GTX 3X5 display system sends messages to the flight crew when trouble or otherwise abnormal conditions are detected. All trouble messages or abnormal conditions messages are listed on the GARMIN "Pilot's guide" 190-01499-00 RevC §7 "TROUBLESHOOTING"

3.1 LOSS OF GPS/SBAS POSITION DATA

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GTX will no longer be transmitting ADS-B Out data.

For GTX 3X5 installations:

NO 1090ES TX annunciator illuminated:

- *Interfaced GPS position sources ..... VERIFY VALID POSITION*

For GTX 33 and GTX 3X5R installations:

Reference Display Device documentation for applicable annunciation:

- *Interfaced GPS position sources ..... VERIFY VALID POSITION*

3.2 Dual GTX 3X5R Transponders in a G950/1000 installation

If Transponder #1 fails and Transponder #2 is activated by the pilot, the G1000 display will provide nuisance alerts unless power is removed from Transponder #1.

Transponder #1 Failed, Transponder #2 Active

- *Transponder #1 Circuit Breaker ..... PULL*

4. PROCEDURES NORMALES

Les procédures normales sont décrites dans le manuel d'utilisation des transpondeurs GTX335/345 référencé 190-01499-00 RevC.

A la mise en route du système.

1. Mode GTX..... « ALT » vérifié
2. Message « NO 1090ES TX » .....vérifié

Vérifier que le mode du transpondeur est sur « ALT » et prendre en considération le message « NO 1090ES TX » le cas échéant. (Ces messages peuvent apparaitre lors de la mise en route du système et lorsque celui-ci commence à recevoir les informations des systèmes externes.)

Avant le décollage.

1. 1090ES TX CTL..... « ON » Vérifié
2. « NO 1090ES TX »..... Eteint

Le 1090ES TX CTL doit être en fonctionnement «ON » et le message « NO 1090ES TX » (ou tout autre message associé) ne doit pas apparaitre.

5. PERFORMANCE

Section non affectée.

6. MASSE ET CENTRAGE

Section non affectée.

4 : NORMAL PROCEDURES

Normal procedures are described on the « Pilot's guide » 190-01499-00 RevC.

Unit Power ON

1. *GTX Mode..... VERIFY ALT*
2. *NO 1090ES TX..... CONSIDERED*

Check the GTX mode on "ALT" position and consider the "NO 1090ES TX" or" NO ADS-B" annunciation.(The NO ADS-B or NO 1090ES TX annunciation (or associated display annunciations) may illuminate as the unit powers on and begins to receive input from external systems, to include the SBAS position source.)

Before Takeoff

1. *1090ES TX CTL..... VERIFY ON*
2. *NO 1090ES TX ...EXTINGUISHED*

1090ES TX CTL must be turned on and NO 1090ES TX Annunciation (or associated display annunciations) must be EXTINGUISHED

5. PERFORMANCES

No change

6. WEIGHT AND BALANCE

No change.

7. DESCRIPTION SYSTEMES

Transpondeur GTX335

Caractéristiques :

- ADS-B Out (*Automatic Dependant Surveillance Broadcast*) Diffusion automatique des données (immatriculation, altitude, vitesse, angle...) aux autres aéronefs et aux stations au sol.
- Affichage du trafic (TIS) et alerte oral.
- Alerte d'écart d'altitude.
- Timer : Chrono, compte à rebours, vol, voyage.
- Affichage de la température extérieure.(option)
- Altitude / pression
- GPS interne (option)

Transpondeur GTX345

Lorsqu'il est connecté aux équipements adaptés, le GTX345 permet d'avoir accès aux fonctionnalités ADS-B In (Réception des données des autres aéronefs et contrôle au sol).

- ADS-B Out
- ADS-B In (Réception des données d'autres aéronefs et des stations au sol) et alerte oral.
- Prise en compte du système de conseil de trafic TCAD/TAS/TCAS I
- Affichage des données météo et informations de vol (FIS-B/Flight Information Services-Broadcast) (METAR, TAF, NOTAM ...).
- Alerte d'écart d'altitude
- Timer : Chrono, compte à rebours, vol, voyage.
- Affichage de la température extérieure.(option)
- Altitude / pression
- GPS interne (option)

7. SYSTEMS DESCRIPTION

GTX335 Transponder

GTX335 Features:

- *ADS-B Out (Automatic Dependant Surveillance Broadcast), transmission of Flight ID, Altitude, Speed, angle...*
- *TIS traffic display output and aural alerting*
- *Altitude deviation alerting*
- *Timers: count up, count down, flight, trip*
- *Static (Outside) air temperature display (Optional)*
- *Density and pressure altitude display*
- *Internal GPS (Optional)*

GTX345 Transponder

The GTX 345 includes ADS-B In functionality, when connected to a suitable display.

GTX345 Features:

- *ADS-B Out*
- *Dual-band ADS-B In traffic display output and aural alerting*
- *Integration with TCAD/TAS/TCAS I traffic systems*
- *FIS-B weather and flight information display output (METARs, TAFs, NOTAMs,...)*
- *Bluetooth interface provides traffic, weather, and attitude data to a Portable Electronic Device (PED)*
- *Altitude deviation alerting*
- *Timers: count up, count down, flight, trip*
- *Static (Outside) air temperature display (optional)*
- *Density and pressure altitude display*
- *Internal GPS (Optional)*

8. MANŒUVRE ENTRETIEN
MAINTENANCE

Section non affectée

8. MAINTENANCE PROCEDURE

No change