PILOT'S OPERATING HANDBOOK
and
APPROVED AIRPLANE FLIGHT MANUAL

DR400/180

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This publication includes the material required to be furnished to the pilot by FAR Part 23 and AIR 2052, and constitutes the EASA approved Airplane Flight Manual.

Ce manuel est la traduction en langue anglaise du manuel français approuvé.

This aircraft must be operated within the operating limits specified in this flight manual.

THIS DOCUMENT MUST BE PERMANENTLY KEPT
ON BOARD THE AIRCRAFT.

This edition is applicable from s/n 2216 included.

Document nr 1001587 GB

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Nr	DESCRIPTION	MODIFIED PAGES	DATE OF APPROVAL
1	• Instrument pannel layout • Corrections	- 0.02; 1.10; 1.11; 1.13 - 1.12; 2.05	05 February 1992
2	• Corrections • Noise measurement operation placards. • Auxilliary fuel tank. • Night VFR. • Towing procedure	- Cover page, i, ii, iii,, - 0.01 to 0.06; 1.05; 1.07 to 1.12; 1.13; 2.01, - 2.05 to 2.10; 4.05, - 4.10 to 4.12; 6.02; - 7.01 to 7.18	24 March 1995
3	• Supplement 4: low voltage • Supplement 5: GPS	- i, ii, iii, 7.01, 7.19 to 7.20 - 7.21 to 7.24	15 October 1997
4	• Corrections • Addition of Lycoming O-360 A1P Engine • Supplement 5: GPS • Supplement 6: S-TEC 55 Autopilot. • Supplement 7: Sensenich 76EM895-0-58 propeller • Supplement 8: IFR	- Cover page, ii, iii, 0.03, 1.07, 1.09,.1.12, 2.06, 2.07, 3.02 to 3.06, 4.05 to 4.07, 4.11, 4.13, 4.14, 5.03, 5.05, 5.06, 7.01, 7.07 to 7.10 - 1.05 - 7.21 to 7.24 - 7.25 to 7.44 - 7.45 to 7.48 - 7.49 to 7.56	22 March 2002
5	• Corrections • New pages • Supplement 5 GPS Corrections, GNS 430 • Supplement 9: S-TEC 20 & 30 autopilot • Supplement 10: electrical elevator trim	- Cover page, ii, iii, 2.06, 3.03, 3.06, 4.06, 4.13, 5.03, 5.06, 7.01 - iv, v - 7.21 to 7.23 7.57 to 7.66 - 7.67 to 7.70	28 MAR 2002

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Nr	*Description*	*Modified pages*	*Date of approval*
6	Modified pages	Cover page, ii, iii, v, 7.01	23 March 2005
	Supplement 9: withdrawn	7.57 to 7.66	
	Supplement 10: withdrawn	7.67 to 7.70	

SECTION 0 GENERAL

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LISTE DES ABREVIATIONS UTILISEES

sq ft.....Square foot
ft.....Foot
in.....Inches
Nm.....Nautic mile
km.....Kilometer
m.....Meter
cm.....Centimeter
kt.....Knot
m/s.....Meter per second
tr/mn ou rpm ...Rotation per minute
Va.....Maneuvering speed
VC.....Calibrated air speed
Vfe.....Maximum flaps extended speed
Vne.....Never exceed speed
Vno.....Maximum cruising speed
Vso.....Stalling speed landing configuration
Vs1.....Stalling speed flaps up position
VI.....Indicated air speed
km/h.....Kilometer per hour
HP.....Horse Power
hPa.....Hectopascal
in.Hg.....Inches of mercury
mbar.....Millibar
Zp.....Pressure altitude
l.....Liter
imp gal.....Imperial gallon
us gal.....US gallon
psi.....Pound per square inch
lb.....Pound
kg.....Kilogramme
°C.....Degrees Centigrade
°F.....DegreesFarenheit
V.....Volt
A.....Ampere

LIST OF RADIO ABBREVIATIONS

ADF ..... Automatic Direction Finder

ATC ..... Air Traffic Control

COM ..... Communication Transceiver

DME ..... Distance Measuring Equipment

ELT ..... Emergency Locator Transmitter

ILS ..... Instrument Landing System

MKR ..... Marker Beacon Receiver

NAV ..... Navigation Indicator and Receiver

AUDIO ..... Audio Control Panel

VFR ..... Visual Flight Rules

IFR ..... Instrument Flight Rules

VHF ..... Very High Frequency

VOR ..... VHF Omni-Range

CONVERSION FACTORS

nautical miles	X	1.852	=	kilometers
feet	X	0.305	=	meters
inches	X	0.0254	=	meters
inches	X	25.4	=	millimeters
feet/minut	X	0.00508	=	meter/second
gallons (US)	X	3.785	=	liters
gallons (Imp)	X	4.546	=	liters
quarts (US)	X	0.946	=	liters
knots	X	1.852	=	km/h
psi	X	0.0689	=	bar
in.Hg	X	33.86	=	mbar
lb	X	0.453	=	kg
(°F - 32)	X	5/9	=	°C

kilometers	X	0.539	=	nautical miles
meters	X	3.281	=	feet
meters	X	39.37	=	inches
millimeters	X	0.03937	=	inches
meter/second	X	197	=	feet/minut
liters	X	0.264	=	gallons (US)
liters	X	0.220	=	gallons (Imp)
liters	X	1.057	=	quarts (US)
km/h	X	0.539	=	knots
bar	X	14.51	=	psi
mbar	X	0.02953	=	in.Hg
kg	X	2.205	=	lb
°C	X	9/5 + 32 .	=	°F

BAROMETRIC PRESSURE CONVERSION TABLE

Below pressure in MILLIBAR or HECTOPASCAL the pressure in INCHES of MERCURY is indicated.

→mbar or hPa

→in. Hg

950	960	970	980	990	1000	1010	1020	1030	1040
28.05	28.35	28.64	28.94	29.23	29.53	29.63	30.12	30.42	30.71
951	961	971	981	991	1001	1011	1021	1031	1041
28.08	28.38	28.67	28.97	29.26	29.56	29.85	30.15	30.45	30.74
952	962	972	982	992	1002	1012	1022	1032	1042
28.11	28.41	28.70	29.00	29.29	29.59	29.88	30.18	30.47	30.77
953	963	973	983	993	1003	1013	1023	1033	1043
28.14	28.44	28.73	29.03	29.32	29.62	29.91	30.21	30.50	30.80
954	964	974	984	994	1004	1014	1024	1034	1044
28.17	28.47	28.76	29.06	29.35	29.65	29.94	30.24	30.53	30.83
955	965	975	985	995	1005	1015	1025	1035	1045
28.20	28.50	28.79	29.09	29.38	29.68	29.97	30.27	30.56	30.86
956	966	976	986	996	1006	1016	1026	1036	1046
28.23	28.53	28.82	29.12	29.41	29.71	30.00	30.30	30.59	30.89
957	967	977	987	997	1007	1017	1027	1037	1047
28.26	28.56	28.85	29.15	29.44	29.74	30.03	30.33	30.62	30.92
958	968	978	988	998	1008	1018	1028	1038	1048
28.29	28.58	28.88	29.18	29.47	29.77	30.06	30.36	30.65	30.95
959	969	979	989	999	1009	1019	1029	1039	1049
28.32	28.61	28.91	29.20	29.50	29.80	30.09	30.39	30.68	30.98

REMINDER:
The standard pressure of 1013.2 mbar or hPa equals 29.92 in.Hg

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SECTION 1 DESCRIPTION

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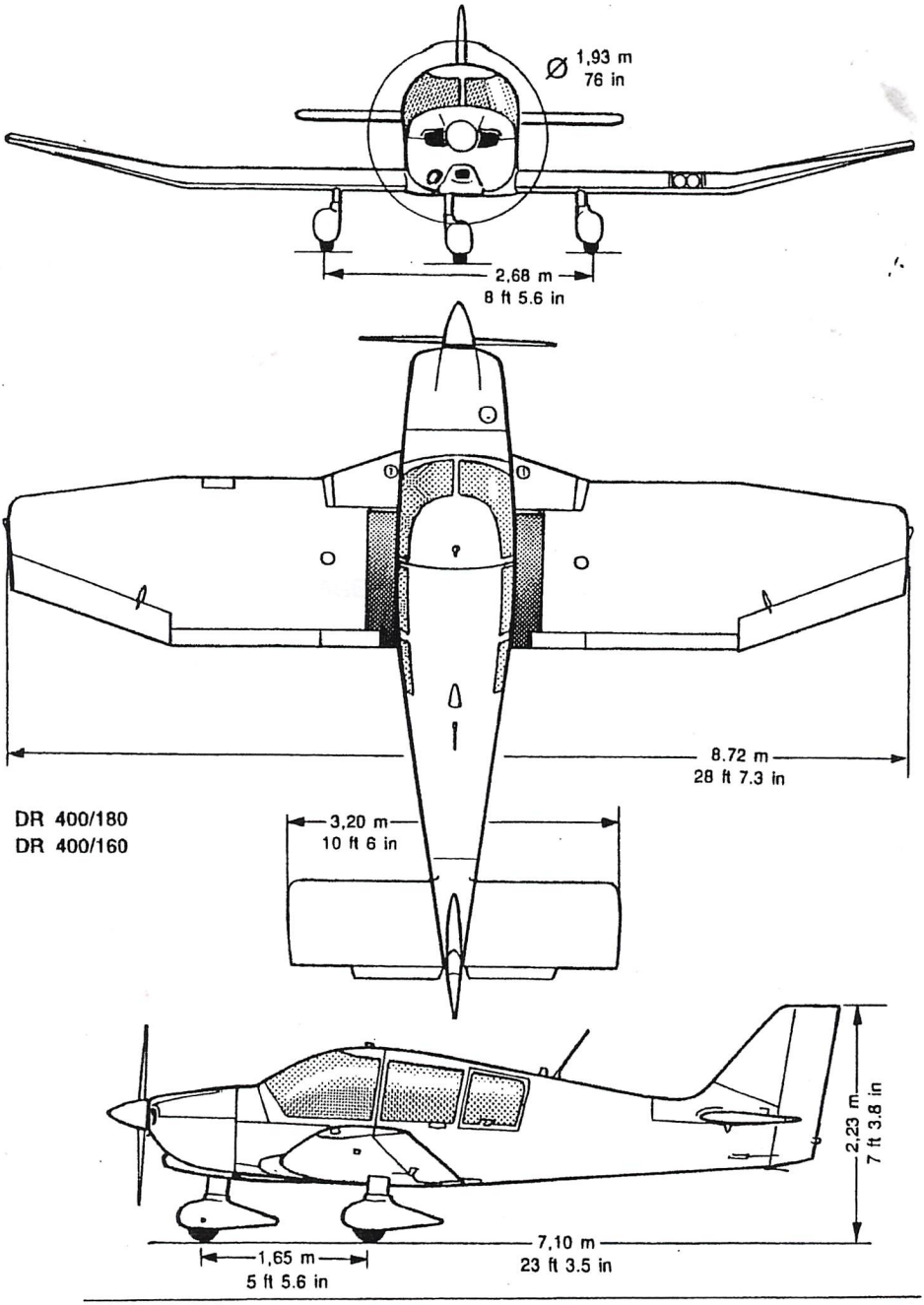

Ø 1,93 m
76 in
2,68 m
8 ft 5.6 in
8,72 m
28 ft 7.3 in
DR 400/180
DR 400/160
3,20 m
10 ft 6 in
2,23 m
7 ft 3.8 in
7,10 m
23 ft 3.5 in
1,65 m
5 ft 5.6 in

OVERALL DIMENSIONS

Wing span ..... (28 ft 7.3 in) 8.72 m
Overall length ..... (23 ft 3.5 in) 7.10 m
Overall height ..... (7 ft 3.8 in) 2.23 m
Propeller ground clearance ..... (9.84 in) 0.25 m

INTERNAL CABIN DIMENSIONS

Length ..... (5 ft 3.8 in) 1.62 m
Width ..... (3 ft 7.3 in) 1.10 m
Height ..... (4 ft 0.4 in) 1.23 m

4 seats, accessible from both sides by sliding canopy.

WINGS

Wing area ..... (152.86 sq ft) 14.2 m^2
Airfoil ..... NACA 23013.5 modified
Aspect ratio 5.35
Dihedral at wing tips ..... 14°

AILERONS (each)

Surface ..... (6.13 sq ft) 0.57 m^2
Span ..... (5 ft 3.8 in) 1.62 m

The ailerons are statically balanced.

WINGS FLAPS (each)

Surface ..... (3.55 sq ft) 0.33 m^2
Span ..... (6 ft 7.7 in) 2.02 m

HORIZONTAL STABILIZER

Total control surface ..... (31 sq ft) 2.88 m^2
of which antibalance tab ..... (2.8 sq ft) 0.26 m^2
Span ..... (10 ft 6 in) 3.20 m

VERTICAL STABILIZER

Surface overall ..... (17.55 sq ft) 1.63 m^2
Stabilizer ..... (10.76 sq ft) 1 m^2
Rudder ..... (6.78 sq ft) 0.63 m^2

LANDING GEAR

Fixed Tricycle Type

Track ..... (8 ft 5.6 in) 2.58 m
Wheel base ..... (5 ft 5 in) 1.65 m
Tyre size ..... 380 x 150

Oil, shock struts : MIL. H. 5606 - A
Norme AIR 3520

Nose Gear

Tyre pressure ..... (26.1 psi) 1.8 bar
Shock strut pressure ..... (72.55 psi) 5 bar

Main landing gear

Tyre pressure .....(29 psi) 2 bar
Shock strut pressure .....(87 psi) 6 bar

BRAKES

The disc brakes are operated by an independent hydraulic circuit on each main gear wheel.

Hydraulic oil.....MIL H 5606-A
AIR 3520 standard

POWERPLANT

Engine
Manufacturer .....LYCOMING
Type ..... O-360-A3A or O-360 A1P
Number of cylinders 4
Maximum continuous power..... 180 HP at 2700 tr/min

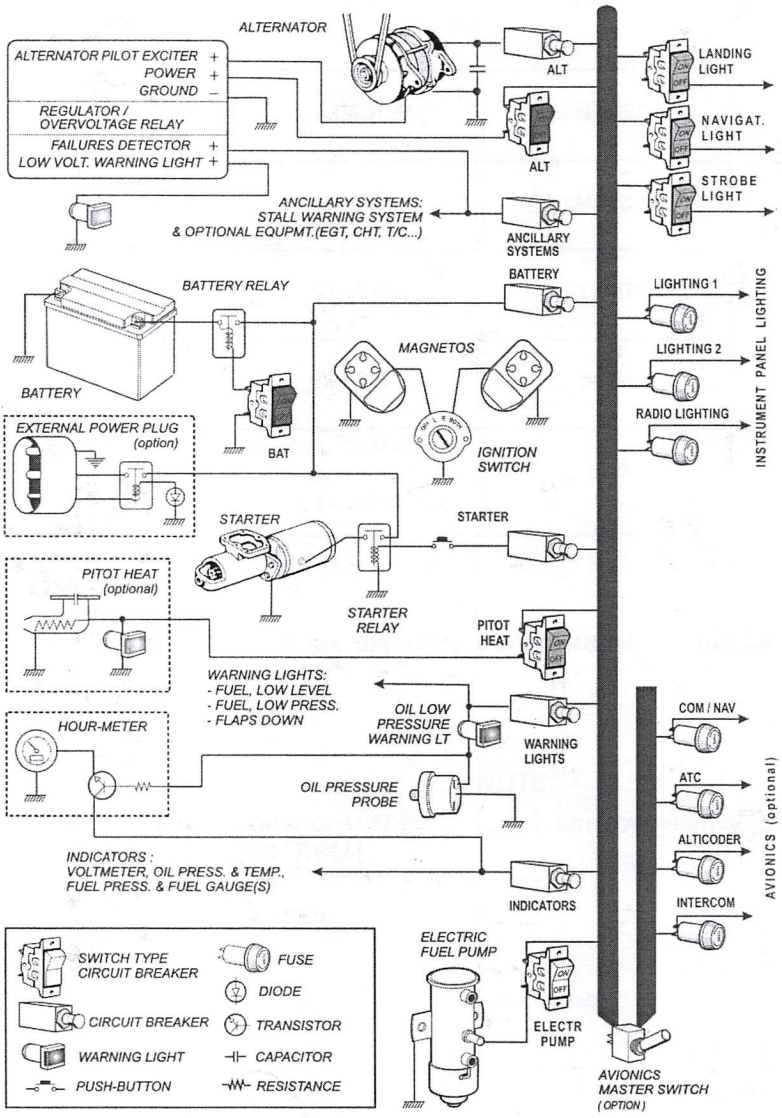
Propeller

MANUFACTURER	SENSENICH
TYPE	76 EM8 S5-0-64
DIAMETER	1,93 m (76 in)*
PITCH	64 in
MINIMAL STATIC RPM FULL THROTTLE SEA LEVEL	2200

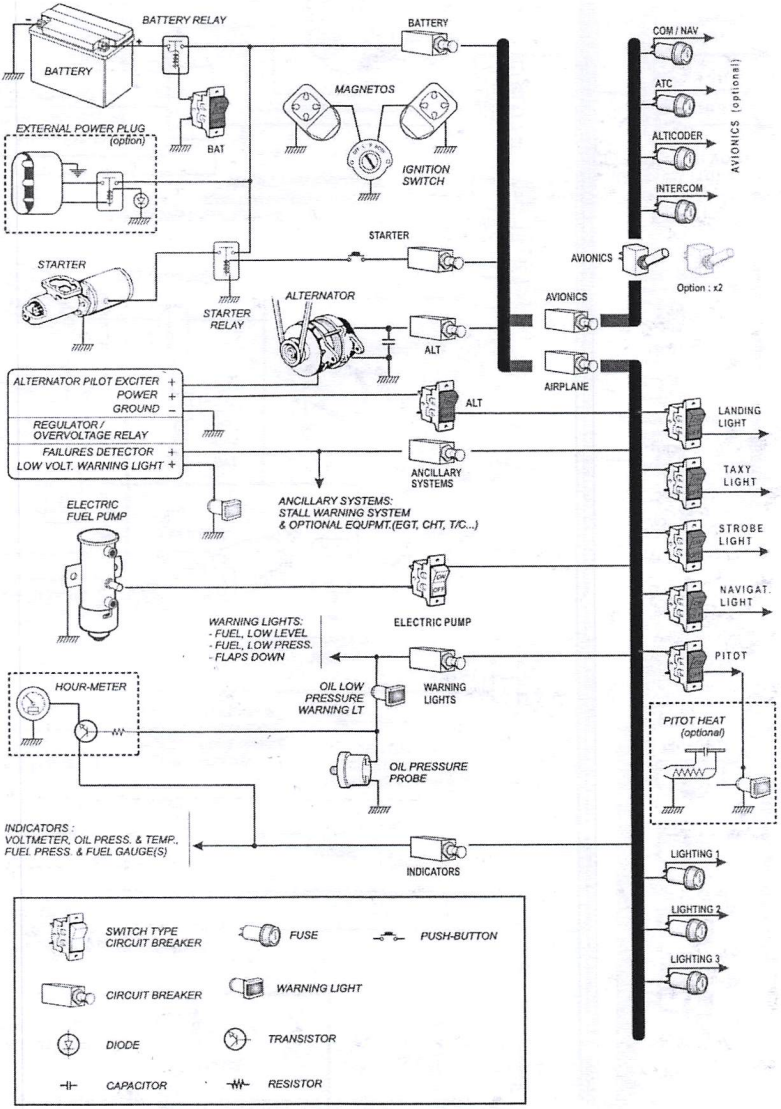
*** Any reduction in diameter during repair is forbidden.**

NOTE
Avoid continuous engine speed use between 2150 rpm and 2350 rpm

ELECTRICAL CIRCUIT - 40 A type



ELECTRICAL CIRCUIT - 60 A type



FUEL

Aviation petroleum * ..... AVGAS 100 LL
Fuel grade * ..... (octane) 100 minimum
Total fuel capacity ..... (41.8 imp/50.16 us gal) 190 l
Total usable fuel ..... (41.58 imp/49.10 us gal) 189 l
Unusable fuel ..... (0.22 imp/0.264 us gal) 1 l

Total fuel capacity can be increased to 240 l (52.8 imp/63.36 us gal) (239 l usable (52.58 imp/63.09 us gal)) by installation of optional fuel tank of 50 l (11 imp/13.2 us gal).

OIL **

Total engine capacity ..... (8 US quarts) 7.5 l
Usable capacity ..... (6 US quarts) 5.7 l

During the first 50 hours of operation:
Pure mineral oil

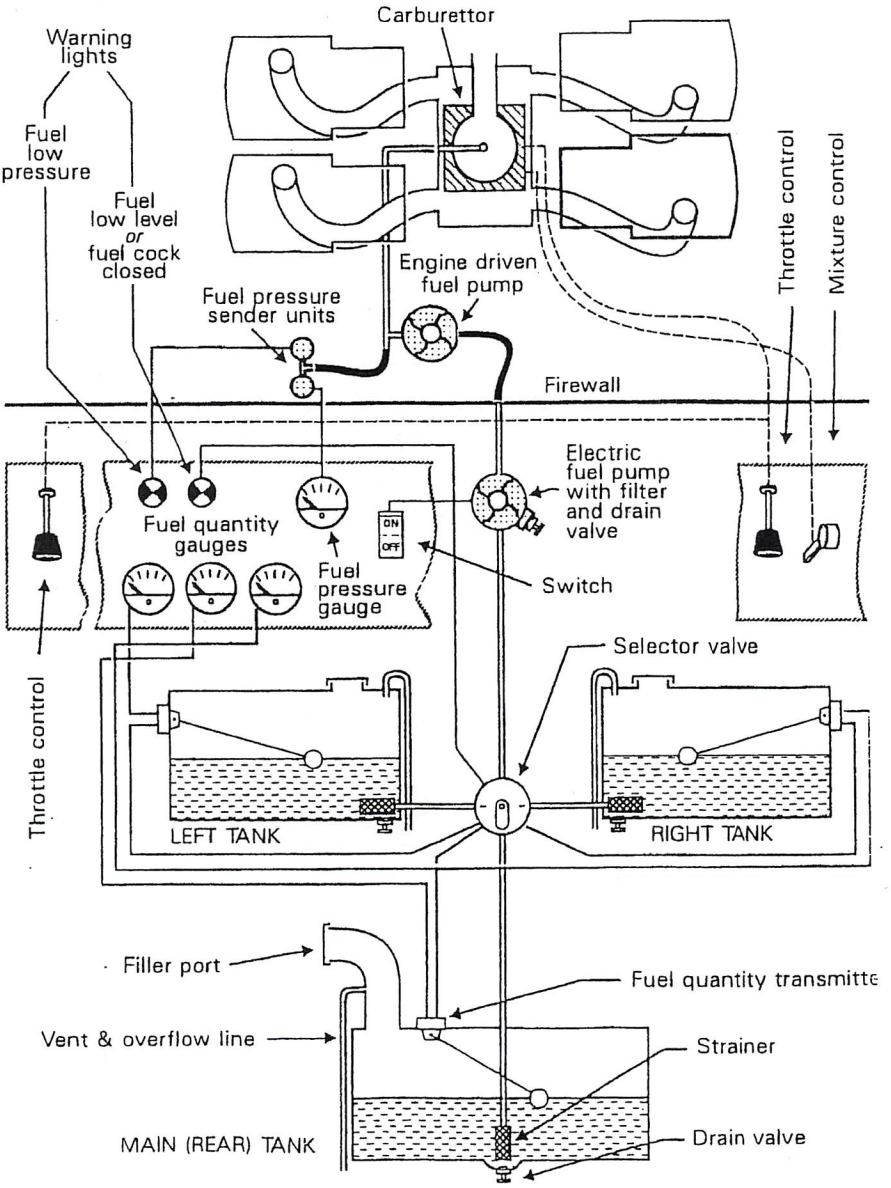
After the first 50 hours of operation:
Dispersant oil

Grades

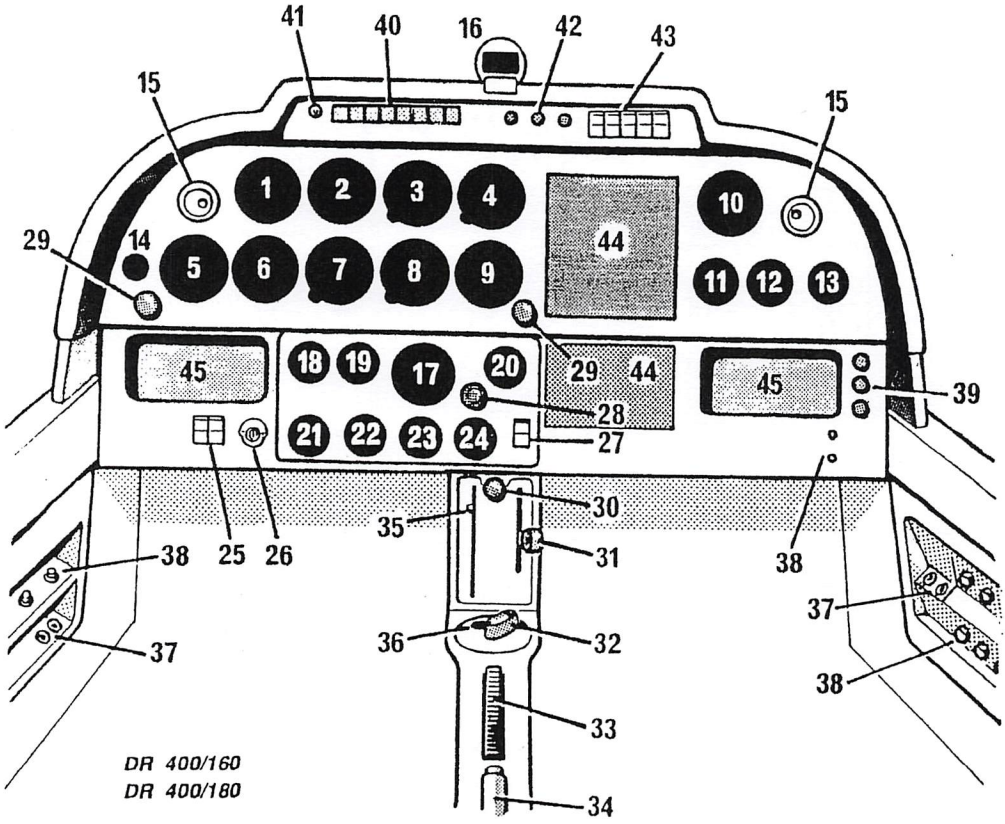
Oil	dispersant	pure mineral
all temperatures	SAE 15W50 or 20W50	------
above +25°C (80°F)	SAE 60	SAE 60
above +15°C (60°F)	SAE 40 or SAE 50	SAE 50
from 0°C to +30°C (30°F to 90°F)	SAE 40	SAE 40
from -15°C to +20°C (0°F to 70°F)	SAE 40, 30 or 20W40	SAE 30
below -10°C (10°F)	SAE 30 or 20W30	SAE 20

* Refer to Service Instruction Lycoming n° 1070 (last issue).
** Refer to Service Instruction Lycoming n° 1014 (last issue).

FUEL SYSTEM DIAGRAM



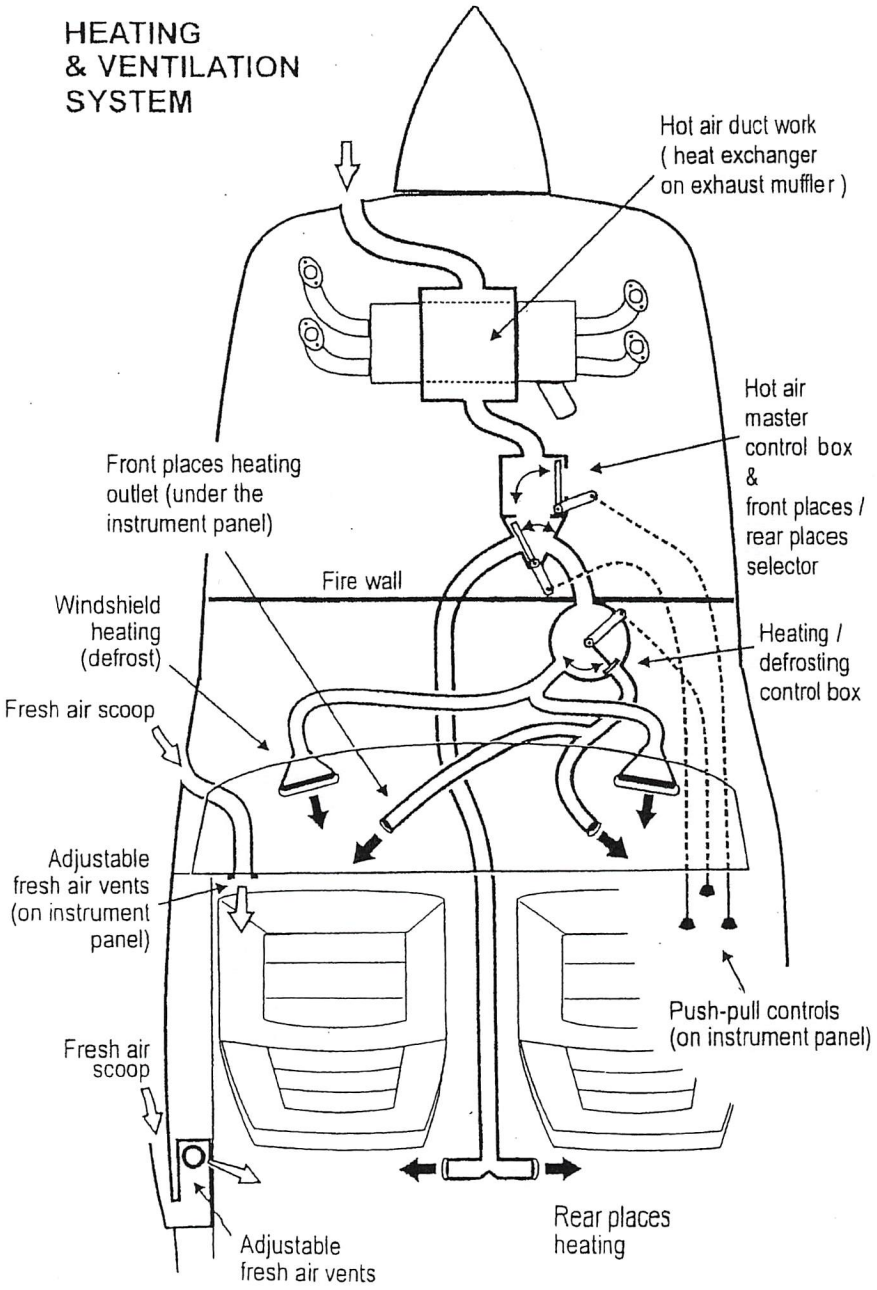
INSTRUMENT PANEL



1..... Airspeed indicator
2..... Gyro horizon (option)
3..... Altimeter
4..... Optional equipment
5..... Optional equipment
6..... Turn and bank indicator (option)
7..... Directional gyro (option)
8..... Rate of climb indicator (option)
9..... Optional equipment
10..... Optional equipment
11..... Optional equipment
12..... Optional equipment
13..... Optional equipment
14..... Vacuum gauge (option)
15..... Cabin vent
16..... Magnetic compass
17..... Tachometer
18..... Oil pressure gauge
19..... Oil temperature gauge
20..... Fuel pressure gauge
21..... Voltmeter
22..... Fuel gauge
23..... Optional equipment
24..... Cylinder head temperature (CHT)
25..... Switch type circuit breaker (Battery, Alternator)
26..... Magneto switch
27..... Safety switch (electric pump)
28..... Carburetor heat control
29..... Throttle
30..... Parking brake locking control
31..... Mixture lever friction control
32..... Fuel cock
33..... Elevator trim tab control wheel
34..... Flap control lever
35..... Trim tab position indicator
36..... Starter push button
37..... Mike, Headset-Jack sockets (option)
38..... Fuses
39..... Cabin heat control
40..... Annunciator panel (from L to R):
- oil pressure
- fuel pressure
- fuel low level
- alternator load
- flaps extended
- pitot heat (option)
- towing cable secured

41..... Day/night lighting selector
42..... Instrument panel lighting
43..... Switch type circuit breaker (from L to R):
- taxi lights (option)
- landing lights (option)
- strobe lights (option)
- navigation lights (option)
- pitot heat (option)

44..... Radio equipment (option)
45..... Storage box (or optional equipment)


HEATING
& VENTILATION
SYSTEM
Hot air duct work
(heat exchanger
on exhaust muffler)
Hot air
master
control box
&
front places /
rear places
selector
Front places heating
outlet (under the
instrument panel)
Fire wall
Windshield
heating
(defrost)
Heating /
defrosting
control box
Fresh air scoop
Adjustable
fresh air vents
(on instrument
panel)
Push-pull controls
(on instrument panel)
Fresh air
scoop
Rear places
heating
Adjustable
fresh air vents

SECTION 2 LIMITATIONS

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NOTE

All speeds in this manual are Indicated Air speeds unless orherwise specified

CERTIFICATION STANDARDS

The DR 400/180 aircraft has been certified on the 10.05.72 in the "NORMAL" and "UTILITY" category conforming to the following tchnical conditions :

- General conditions of regulation AIR 2050 updated 6 June 1966.
- Complementary conditions for conformity with FAR part 23 - Amendment 7.
- Special conditions relative to the cockpit canopy release.

APPROVED OPERATION

VFR by day, in non-icing conditions

AIRSPEED LIMITATIONS	km/h	(kt)
Vne never exceed	308	(166)
Vno max. cruise	260	(140)
Va max. maneuver	215	(116)
Vfe max. flaps extended	170	(92)

AIRSPEED INDICATOR MARKINGS		km/h	kt
Red line-never exceed	Vne	308	166
Yellow arc operate with caution and only in "smooth air"	Vno - Vne	260 - 308	140 - 166
Green arc normal operation range	Vs1 - Vno	105 - 260	56 - 140
White arc	Vso - Vfe	95 - 170	51 - 92

LOAD FACTOR LIMITS AT GROSS WEIGHT

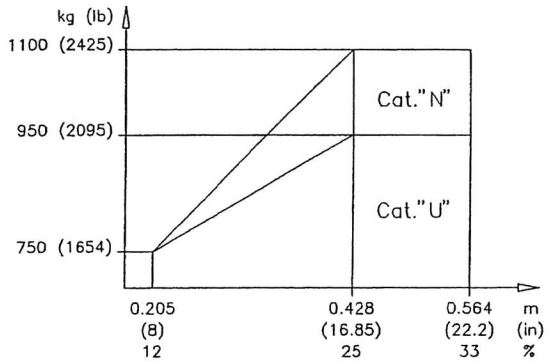
(2095 lb) 950 kg (category "U")
Flaps up ..... n between + 4.4 and -2.2
Flaps down ..... n = +2

(2425 lbs) 1100 kg (category "N")
Flaps up ..... n between + 3.8 and -1.9
Flaps down ..... n = +2

MAXIMUM AUTHORIZED WEIGHTS

	Cat."U"	Cat."N"
On take off	(2095 lb) 950 kg	(2425 lb) 1100 kg
On landing	(2095 lb) 950 kg	(2304 lb) 1045 kg

WEIGHT AND BALANCE



Levelling ..... Upper fuselage longeron
Datum ..... wing leading edge, rectangular section
Chord line ..... (67.3 in) 1.71 m

LOAD PLANNING

(Refer also to weight and balance chart, section 6).

The weight of engine oil, as well as the unusable fuel, must be included in the empty weight of the aircraft.

	Weight kg (lb)	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 fuselage tank	78.5 (173)	1.12 (44)
Fuel Wing tanks	57.6 (127)	0.1 (3.9)
Baggage (**)	60 (132)	1.9 (75)

** Within the authorized weight and balance limits.

* The carriage of more than two passengers (with a total weight below or equal to the maximum indicated) is authorized on the rear bench, provided that passenger seat belts are installed for each passenger, and that weight and balance are within the stated limits.

ENGINE LIMITATIONS

Continuous starter operation.....15 to 20 sec
Max. rpm (red line).....2700 rpm
Max. cylinder head temperature (red line) if equipped.....(500°F) 260°C

TACHOMETER MARKINGS

Red arc.....2150 to 2350 rpm
Green arc.....2350 to 2700 rpm
Red line.....2700 rpm

FUEL

Aviation petroleum*.....AVGAS 100 LL
Grade*.....(octane) 100 minimum
Maximum total capacity.....(41.8 imp/50.16 us gal) 190 l
Usable total capacity.....(41.58 imp/49.10 us gal) 189 l
Unusable capacity.....(0.22 imp/0.264 us gal) 1 l
Normal pressure.....(1.1 to 5 psi) 80 to 350 mbar

Total fuel capacity can be increased to 240 l (52.8 imp/ 63.36 us gal) (239 l usable (52.58 imp/63.09 us gal) by the installation of auxiliary fuel tank of 50 l (11 imp/13.2 us gal).

OIL

Maximum temperature (red line).....(245°F) 118°
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 (red line).....(115 psi) 7.9 bar
Total engine capacity.....(8 US quarts) 7.5 l
Usable capacity.....(6 US quarts) 5.7 l
Grades.....see page 1.08

* Refer to Service Instruction Lycoming n°1070 (last issue).

LOAD LIMITS

Number of occupants:
Front seats 2
Rear seats 2

Baggage compartment:
Maximum authorized weight ..... (132 lb) 60 kg

OPERATIONAL LIMITATIONS IN THE "U" CATEGORY

Within the limits of this category, the following maneuvres are authorized:

- Steep turns, lazy eights, chandelles in which the angle of bank is more than 60°.

- Stalls (except whip stalls).

These maneuvres must be carried out within the conditions below:

- The rear seats must be unoccupied
- Entry and exit speeds must be within the normal operating range
- Recommended entry speed: (116 kt) 215 km/h

PLACARDS

The following information is displayed in the form of composite or individual placards.

In clear view of the pilot:

"THIS AIRCRAFT MUST BE USED FOR NORMAL OR UTILITY FLYING, ONLY 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"

"AEROBATICS, INCLUDING SPINS ARE PROHIBITED WHEN USED IN NORMAL CATEGORY"

"VA MANEUVERING SPEED: 215 km/h – 116 kt"

"APPROVED FOR VFR FLIGHT BY DAY IN NON-ICING CONDITIONS ONLY"

"NO SMOKING"

In the baggage bay:

"BAGGAGE BAY MAX. LOAD 60 kg – SEE LOADING DIAGRAM"

Near the main tank filler port:

"AVGAS 100LL 110 liters"

Near the wing tanks filler ports:

"AVGAS 100LL 40 liters"

On each main gear wheel fairing:

"MAIN GEAR

TYRE 2 bar /29 psi SHOCK ABSORB. 6 bar / 87 psi"

On the front gear wheel fairing:

"NOSE GEAR

TYRE 1.8 bar / 26 psi SHOCK ABSORB. 5 bar / 73 psi"

On the hydraulic fluid reservoir:

"HYDRAULIC FLUID
AIR 3520
MIL. H.5606-A
SHELL FLUID 4
BP Hydraulic 1 (Aero)

Under the oil dip access door located on the engine cowling

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

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SECTION 3 EMERGENCY PROCEDURES

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ENGINE FAILURE DURING TAKE OFF ROLL

With sufficient runway remaining:

Throttle to idle, and stop in the runway axis using brakes as required.

Without sufficient runway remaining:

Throttle ..... idle
Brakes ..... apply heavily
Mixture ..... cut-off
Fuel valve ..... off
Magneto switch ..... off
Battery switch ..... off

ENGINE FAILURE IMMEDIATELY AFTER TAKE OFF

Glide speed (flaps in take off position) ..... (78 kt) 145 km/h
Mixture ..... cut-off
Fuel valve ..... off
Magneto switch ..... off
Battery switch ..... off

NOTE CAREFULLY

Land straight ahead, with only small direction changes to avoid obstructions.
Never try to turn back to the runway, as altitude after take off is seldom sufficient.

ENGINE FAILURE IN FLIGHT

If altitude is evaluated to be sufficient to try an engine restart:

- Establish maximum glide speed, flaps up 150 km/h (81 kt) (in these conditions, and without wind, the aircraft covers approximately 9.3 times its altitude).
- Fuel valve.....open
- Electric pump ..... on
- Mixture .....fully rich
- Throttle.....1/4 travel forward
- Magneto switch ..... L + R ("Both")

If the propeller still turns, the engine should restart.

If the propeller is stopped, operate the starter.

If the engine still does not start, prepare for a forced landing, following the procedure below.

POWER OFF FORCED LANDING OFF AIRFIELD

Look for a suitable landing area :
Belts and harness.....tight
Electric pump ..... off
Mixture.....cut-off
Throttle .....to idle
Magneto switch ..... off
Fuel valve ..... off
Alternator switch..... off

Final

Flaps.....full down
Battery switch.....off
Canopy.....unlock

PRECAUTIONARY POWER LANDING OFF AIRFIELD

Fly over the choosen field several times at low speed 150 km/h (81 kt) in order to locate the most suitable landing area, flaps in "take off" position, then make a precautionary approach at 125 km/h (67 kt), flaps in "landing" position.

On final, unlock the canopy.

Before touch-down

Magneto switch ..... off
Battery switch ..... off

> **NOTE: IN CASE OF CANOPY JAMMING**
>
> Canopy handle in "open" position.
> Free the two canopy release levers located on the arm rests, on both sides of the instrument panel, and place them in vertical position.

FIRE

Engine fire during starting

Keep the engine turning with:
Fuel valve ..... off
Electric pump ..... off
Throttle ..... full power
Mixture ..... cut-off

The aim of this procedure is to make the engine "swallow" the accumulated fuel in the inlet pipes (generally following an excess of fuel injection during a difficult engine start).

If the fire continues

Magneto switch ..... off
Battery switch ..... off
Alternator switch ..... off

Abandon the aircraft, and try to extinguish the fire with the aids available: fire extinguishers, covers, clothing or sand.

Engine fire in flight

Fuel valve ..... off
Throttle ..... full power until engine stops
Mixture ..... cut-off
Electric pump ..... off
Alternator switch ..... off
Cabin heat and ventilation ..... off
Establish maximum glide speed ..... (81 kt) 150 km/h

Prepare for a forced landing off airfield, following the procedure in the paragraph "Power off forced landing off airfield".

Do not attempt to restart the engine.

Cabin fire

Extinguish the fire by all means possible (optional extinguisher).

To eliminate smoke, apply maximum ventilation.

In case of an electrical fire (fumes indicating insulation burning):

Cabin ventilation ..... reduce
Alternator switch ..... off
Battery switch ..... off
Battery circuit breaker ..... pull out
Alternator circuit breaker ..... pull out

Land quickly if the fire continues.

VIBRATIONS AND ENGINE ROUGHNESS OPERATION

Vibrations and engine roughness operation are generally due to (verify in this order):

- Carburetor icing: see paragraph "Icing" on next page
- Mixture set too rich or too lean: adjust the mixture (see section 4)
- Contamination in the fuel system: verify fuel pressure. Switch on the electric pump.
- Ignition failure: magneto switch on "L", then on "R", then return to "Both". Select the position providing the best engine operation, and fly to the nearest airfield with mixture set to obtain the smoothest engine operation possible at reduced power.

LOW OIL PRESSURE

In case of low oil pressure indication, check oil temperature, and if it is too high (red arc):

- Reduce power
- Fly to the nearest airfield, and prepare for an off airfield landing

ICING

Proceed as follows when inadvertently encountering icing :

- Carburetor heat on.
- Increase power in order to reduce ice built-up to minimum.
- Switch on pitot heat (if installed).
- Select maximum cabin heat, and direct the total output to the windscreen (position "defrost") in order to remove the ice quickly.
- Turn back, or change altitude, to obtain an outside air temperature less conducive to icing.
- Plan to land at the nearest airfield.

With an extremely rapid ice build-up, carry out a forced landing.

Remember that a layer of 0.5 cm (0.2 in) on the wing leading edge fairly increases stall speed. If needed, use a higher than normal approach speed : 145 km/h (78 Kt).

REMARKS

If continuous carburator heat is deamed necessary, it is imperative to adjust the mixture control to obtain normal engine operation.

Always use carburetor heat fully on or fully off. In certain cases, an intermediate position could increase icing.

ELECTRICAL POWER SUPPLY MALFUNCTION

Alternator failure is indicated when the amber "alternator failure" light on the warning panel is lit, and a progressive drop in voltage (shown on the voltmeter).

If "alternator failure" is lit

- Switch off alternator, then back on.
  This operation resets the overvoltage relay which may have cut-out due to a transiant overvoltage.

If the failure continues

- Switch off the alternator
- Switch off all electrical equipment not essential for continuing the flight
- Land as soon as possible, and have the electrical system inspected.

NOTE
An alternator failure does not prevent the engine from operating normally.

INADVERTENT SPIN

Should a spin occur, use the following procedure :

- Throttle ..... idle
- Rudder ..... maximum opposite to direction of rotation
- Elevator ..... neutral
- Allerons ..... neutral
- Once rotation stops, rudder to neutral position and recover within flight limitations.

NOTE
If flaps are down when spin begins, retract them immediately.

LOSS OF ELEVATOR CONTROL

In the event of loss of elevator control (accidental disconnection)

- Stabilize the aircraft in level flight, flaps up, at 150 km/h (81 kt), using the elevator trim and throttle.
- Do not change the elevator trim setting, and control the angle of descent only with throttle.

  Reduce power only on short final, and near to the ground.

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SECTION 4 NORMAL PROCEDURES

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LOADING

Before each flight, insure that the total weight and the load balance are within the established limits. For this, use the weight and balance chart in section 6.

NORMAL OPERATING SPEEDS

The speeds reminded here under are indicated air speeds recommended for normal operations.

They are based on a standard aircraft, operated at gross weight, in standard atmosphere, at sea level. They can change from one aircraft to another, depending on installed equipment, aircraft and engine condition, atmospheric conditions and pilot proficiency.

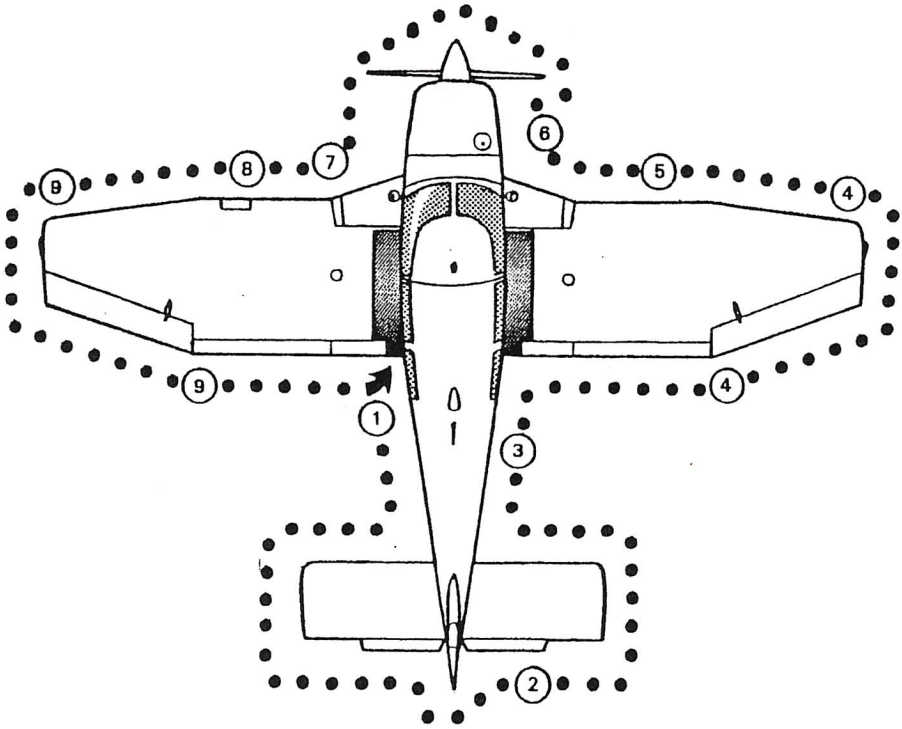
- Best rate of climb speed
  flaps in take off position (1st notch) ..... (81 kt) 150 km/h
  flaps up ..... (92 kt) 170 km/h

- Best angle of climb speed
  flaps in take off position (1st notch) ..... (70 kt) 130 km/h
  flaps up ..... (76 kt) 140 km/h

- Maximum operating speed in turbulence
  flaps up ..... (140 kt) 260 km/h

- Maximum speed
  flaps in landing position (2nd notch) ..... (92 kt) 170 km/h

- Landing speed final approach
  flaps in landing position (2nd notch) ..... (68 kt) 125 km/h



PREFLIGHT INSPECTION

To be performed before each flight.
This inspection may be reduced after intermediate on route landings.

Magneto switch ..... off
Controls ..... free
Battery switch ..... on
Flaps ..... check operation
Fuel quantity ..... check
Battery switch ..... off
Aircraft documents ..... check availability on board
Baggage ..... check stowing

Check flight controls displacements, then make an aircraft walk-around inspection (as shown above) beginning at the fuselage left side.

1	Fuel filler cap	in place, locked
	Static vent	clean, unobstructed
	Fuselage main tank drain valve	actuated
	Baggage compartment door	tight fitted, closed and locked
2	Horizontal stabilizer	surface condition, hinges without clearance
	Rudder	check hinges and clearance
3	Static vent	clean, unobstructed
4	Flap and aileron	check condition and hinges
	Wing tip and navigation light (optional)	check condition
5	Stall warning	clean, check displacement
	Right main landing gear	check attachment and fairing condition
		normal shock absorber compression
		tyre inflated
	Right tank drain valve	actuated
6	Fuel drain valve	actuated
	Oil level	check, oil cap secured, panel closed
	Engine cowl attachment	check
	Propeller	clean, in good condition
	Propeller spinner	no play
	Air inlets	clean, unobstructed
7	Nose gear	check attachment and fairing condition
		normal shock absorber compression
		tyre inflated
		tow-bar removed
	Exhaust pipes	rigid
	Canopy cleanliness	check
8	Left main landing gear	check attachment and fairing condition
		normal shock absorber compression
		tyre inflated
	Left tank drain valve	actuated
	Pitot	clean, unbostructed
	Lights (optional)	glass clean
9	Wing tip and navigation light (optional)	check condition
	Flap and aileron	check condition and hinges

CABINE INTERIOR CHECK PRIOR START-UP

- Canopy ..... closed and locked
- Parking brake ..... locked
- Front seats ..... adjusted and locked
- Belts and harness ..... adjusted and fastened
- Flight controls free ..... without play or excessive friction ..... (check rudder on taxi)
- Master switch ..... on
- Elevator trim ..... verify travel then bring to take-off position

STARTING ENGINE

Normal procedure

Carburator heat ..... off
Mixture ..... full rich
Strobe light ..... on
Gauges ..... check
Fuel valve ..... check operation, open
Magneto switch L
Electric pump ..... on
Throttle ..... carry out 2 or 3 injections, then ¼ travel forward
Propeller area ..... clear
Canopy ..... closed and locked
Flaps ..... retracted
Starter ..... on (max. operation time 15 to 20 sec)
When engine fires magneto switch ..... L+R ("both")

Hot engine procedure

Same as "normal procedure", but without injection.

Cold weather procedure

Same as "normal procedure", but keeping successive injections up to 900 to 1000 rpm.

Engine "flooded"

Electric pump ..... off
Mixture ..... cut-off
Throttle ..... full power
Starter ..... operate for several seconds

As soon as the engine starts, advance mixture control to "rich", and resume the normal procedure, without injection.

CAUTION

Avoid operating the starter for more than 20 seconds. Wait at least a minute before operating it again.
As soon as the engine is running, verify the engine oil pressure. If it is zero after 15 to 20 seconds, switch off, and investigate the cause.

AFTER THE ENGINE STARTS

RPM 1200
Electric pump ..... off
Alternator switch ..... on
Voltmeter ..... green arc
Vacuum gauge (if installed) ..... check
Lights ..... test

Radio ..... on
Altimeter ..... set
Flaps ..... up

TAXIING

Parking brake ..... unlocked
Brakes ..... test
Turn and bank indicator ..... check
Directional gyro ..... check setting
Avoid exceeding 1200 rpm as long as oil temprature remains in the yellow range.

ENGINE RUN-UP

Parking brake ..... locked
Oil pressure and temperature ..... green range
Fuel pressure ..... green range
Mixture ..... fully rich
Carburetor heat ..... off

Magneto check

Throttle ..... 2000 rpm

Magneto selection :
Max. drop between L or R and L+R ("Both") ..... 175 rpm
Max. difference between L and R ..... 50 rpm

Carburetor heat check

Carburetor heat ..... on
Check rpm drop, (approx. 100) then return to ..... off

Mixture check

Lean until rpm reduction, then
return to "full rich"

Engine idle check

Throttle ..... 600 to 650 rpm

BEFORE TAKE OFF

Controls ..... free
Magneto switch ..... L+R ("Both")
Cabin (Seats,belts,canopy) ..... check
Fuel ..... switch the most full tank
Electric pump ..... on
Elevator trim ..... neutral according to balance
Engine instruments ..... check
Flight instruments ..... set
Flaps ..... fully down, then return to "take off position"
Throttle ..... "holding" 1200 rpm

TAKE OFF

Normal take off

Take off minimal rpm 2200
Take off speed ..... (54 kt) 100 km/h
Initial climb speed ..... (70 kt) 130 km/h

After obstacle clearance,

reduce angle of climb to obtain ..... (81 kt) 150 km/h
Electric pump ..... off
Fuel pressure ..... check (green range)
Flaps ..... up

Short take off

Flaps ..... (1^{st} notch) take off position
Apply full power (brakes applied) ..... (mini.) 2200 rpm
then release the brakes
Take off speed ..... (54 kt) 100 km/h
Then, if necessary, (to clear an obstacle)
best angle of climb speed ..... (70 kt) 130 km/h

Cross wind take off

Flaps ..... (1st notch) take off position
Ailerons .....into the wind
Take off at a slightly higher airspeed than normal.
Correct drift in the normal way (max. bank angle, close to the ground: 15°)

Demonstrated cross-wind velocity (22 kt) 40 km/h

CLIMB

Normal climb (flaps up)

Set climb speed 170 km/h (92 kt); 160 km/h (86 kt) at ceiling.

Above 5000 ft, adjust mixture.

Best angle of climb

A better rate of climb is obtained at 130 km/h (70 kt), flaps in take off position (1st notch), and 140 km/h (76 kt) with flaps up.

NOTE

This type of climb should only be used exceptionally, due to poor engine cooling.

CRUISE

Refer to Section 5 for rpm settings and cruise performance.

Operation of mixture control

Maintain mixture control in the "full rich" position during take off and in the climb.

In certain conditions (high altitude take off, long climb above 5000 ft, carburator heat on), this setting could be too rich, and result in irregular engine operation or loss of power.

In these cases, adjust the mixture to recover regular engine operation, and not for fuel economy.

Mixture adjustment when in stable cruise:

Progressively lean the mixture until a slight reduction in rpm is noted: then lightly enrich to re-establish power and normal engine operation.

NOTE

Take care not to lean the mixture too much, which would cause engine overheating.

ALWAYS ENRICH THE MIXTURE BEFORE AN INCREASE IN POWER.

USE OF FUEL

Switch on the electric pump when changing tank.

Switch the most full tank before take off or landing.

DESCENT

Rapid descent

Power ..... as required to maintain the desired descent path
Carburetor heat as required ..... on or off
Each 1500 ft, apply power to avoid excessive engine cooling, and to clean the spark plugs.

Approach or down wind

Fuel ..... switch the most fuel tank
Mixture ..... fully rich
Electric pump ..... on
Carburetor heat as required ..... on or off
Cabin (Belts and seats) ..... check
Flaps ..... below 170 km/h (92 kt) in take off position
Speed ..... (81 kt) 150 km/h
Elevator trim ..... set
Roll stabilizer or Autopilot (if equipped) ..... off

Final

Carburetor heat ..... off
Flaps ..... below 150 km/h (81 kt) (2nd notch) landing position
Approach speed ..... (68 kt) 125 km/h
Elevator trim ..... set

LANDING

Short landing

Flaps ..... (2nd notch) landing position
Approach speed, with throttle setting ..... (65 kt) 120 km/h
After touchdown, brake heavily keeping nose up with elevator and retracting flaps.

Landing in crosswind or gusty conditions

Flaps ..... Take off position
Approach speed ..... 130 km/h (70 kt) + 1/2 gust speed
Correct drift in the normal way.
Demonstrated crosswind ..... (22 kt) 40 km/h

Overshoot procedure

Carburator heat off ..... check
Throttle ..... full
Speed ..... (67 kt) 125 km/h
Progressively raise flaps to the "take off position", then establish
Normal climb speed ..... (78 kt) 145 km/h

AFTER LANDING

Electric pump ..... off
Flaps ..... up
Navigation instruments ..... off

ENGINE SHUT-DOWN

Parking brake ..... tight
Flaps ..... down
Radio and electrical equipment ..... off
Magneto cut-off check at idle ..... off, then L + R ("Both")
Rpm 1000
Mixture ..... cut-off

After the engine stops

Magneto switch ..... off
Alternator switch ..... off
Battery switch ..... off
Release the parking brake when wheel chocks in place.

PARKING BRAKE USE

Brake on

Press on both pedals, keep pressure on, while pulling the parking brake control upwards.
Then release the pressure on the pedals (the parking brake control remains in the pulled position).

Brake off

Push the control down.

EXTERNAL POWER SOCKET

An external power socket without relay is installed to make easier the starting of the engine.

Limitations: not affected

Emergency procedures: not affected

Normal procedures

Battery switch ..... off
Alternator switch ..... off
External power socket ..... connected
Starter ..... engaged
After starting:
Battery switch ..... on
Alternator switch ..... on
External power socket ..... disconnected

NOTE :
The external power source provides a 12 V tension as long as the battery switch is switched on.

SECTION 5 PERFORMANCE

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NOISE LIMITATION

In compliance with the decree of 19.02.1987, the maximum acceptable noise level for the DR400/180 aircraft, at a certified gross weight of (2425 lb) 1100 kg is 84.6 dB(A) (ICAO annex 16 chapter 10).

The noise level determined under the conditions of the decree, is 76.4 dB(A) at max. continuous power.

The DR400/180 aircraft has received noise limitation certificate nr N45.

AIRSPEED INSTALLATION CALIBRATION

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

The above figures do not take into account the ASI own tolerance.

NOTE

All speeds in this manual are Indicated Air speeds unless otherwise specified.

STALL SPEEDS

Weight 1100 kg (2425 lb) engine idle	km/h (kt)		
Bank angle	0°	30°	60°
Flaps up	105 (57)	113 (61)	148 (78)
Flaps Take off position	99 (53)	106 (57)	140 (76)
Flaps Landing position	95 (51)	102 (55)	134 (72)

TAKE OFF PERFORMANCE

At gross weight 1100 kg (2425 lb)
Without wind, flaps in "take off position" (1st notch), engine full power.

Take off speed.....(54 kt) 100 km/h
Over 15 m (50 ft) barrier speed.....(70 kt) 130 km/h

Pressure Altitude (ft)	Temperature °C (°F)	Weight 1100 Kg (2425 lb)				Weight 900 kg (1984 lb)			
		Take off distance		Run to clear 15m(50ft) barrier		Take off distance		Run to clear 15m(50ft) barrier	
		m	(ft)	m	(ft)	m	(ft)	m	(ft)
0	- 5 (23) Std = 15 (59) 35 (95)	215 250 290	(700) (815) (945)	445 515 600	(1450) (1690) (1955)	120 140 165	(395) (460) (535)	250 290 340	(820) (955) (1105)
2500	- 10 (14) Std = 10 (50) 30 (86)	260 305 355	(860) (1005) (1165)	540 635 735	(1780) (2085) (2415)	150 175 200	(485) (565) (655)	310 360 415	(1005) (1175) (1360)
5000	- 15 (5) Std = 5 (41) 25 (77)	330 385 445	(1075) (1260) (1465)	680 795 925	(2225) (2610) (3035)	185 215 250	(605) (710) (825)	385 450 520	(1255) (1475) (1710)
8000	- 21 (-6) Std = -1 (30) 19 (66)	430 505 590	(1410) (1660) (1935)	890 1050 1225	(2925) (3445) (4010)	245 285 335	(795) (940) (1095)	505 590 695	(1660) (1945) (2265)

Head wind influence: For 10 kt multiply by 0.85
For 20 kt multiply by 0.65
For 30 kt multiply by 0.55

Down wind influence: Add 10% to distance per section of 2 kt

Dried grass runway: Add 15%

CLIMB PERFORMANCE

1) Flaps, take off position:

At maximum weight of 1100 kg (2425 lb) in standard atmosphere

Maximum rate of climb after take off ..... (827 ft/mn) 4.2 m/s
reduction of 0.24 m/s (47 ft/mn) per 1000 ft
Best rate of climb speed .....(81 kt) 150 km/h
Best angle of climb speed .....(70 kt) 130 km/h

2) Flaps up:

In standard atmosphere,
Full throttle, mixture best power,

- At maximum weight of 1100 kg (2425 lb):

Maximum rate of climb after take off ..... (885 ft/mn) 4.5 m/s
reduction of 0.24 m/s (47 ft/mn) per 1000 ft
Service ceiling .....14720 ft
Best rate of climb speed after take off .....(92 kt) 170 km/h)
up to ceiling (86 kt) 160 km/h
Best angle of climb speed .....(76 kt) 140 km/h

- At weight of 900 kg (1984 lb):

Maximum rate of climb after take off ..... (1200 ft/mn) 6.1 m/s
reduction of 0.26 m/s (51 ft/mn) per 1000 ft
Service ceiling .....19720 ft

Temperature influence:

Each 10°C above standard, lowers the ceiling by 1000 ft and reduces rate of climb by 0.24 m/s (47 ft/mn).

Time, Consumption, Climb distance

At gross weight 1100 kg (2425 lb)
Without wind, in standard atmosphere,
Flaps retracted, full power: maximum rate of climb after take off.
Start and roll consumption included.

PRESSURE ALTITUDE ZP (ft)	TIME (min)	FUEL CONSUMPTION l (imp/us gal)	RANGE (km)	(Nm)
3000	4	4.5 (1/1.2)	9.3	5
5500	7.5	8 (1.8/2.1)	17.6	9.5
8500	16.5	15 (3.3/4)	38.8	21

Glide performance

Engine off, the aircraft glides 9,3 time its height (without wind) at 150 km/h (81 kt).

Altitude and temperature do not have a perceptible influence.

CRUISE PERFORMANCE

At gross weight 1100 kg (2425 lb), in standard atmosphere.
Optimum mixture setting, usable fuel (41.58 imp/49.1 us gal) 189 l .
Without reserve fuel, without wind.

Consumption and climbing time compensated with descent.

ALTI-TUDE	POWER		FUEL CONSUMPTION			TRUE AIR SPEED		ENDU-RANCE	RANGE	
Zp(ft)	%	rpm	l/h	gal/h imp	us	km/h	kt	h.min	km	Nm
0	75	2500	38	8.4	10.2	237	128	4.55	1178	636
	65	2350	33	7.3	8.8	220	119	5.40	1248	674
2500	75	2550	38	8.4	10.2	243	131	4.55	1208	652
	65	2400	33	7.3	8.8	225	121	5.40	1288	696
4500	75	2600	38	8.4	10.2	248	134	4.55	1233	666
	65	2450	33	7.3	8.8	230	124	5.40	1317	711
6500	75	2650	38	8.4	10.2	254	137	4.55	1263	682
	65	2500	33	7.3	8.8	235	127	5.40	1345	727
8500	75	2700	38	8.4	10.2	257	139	4.55	1278	690
	65	2550	33	7.3	8.8	240	130	5.40	1375	742
10500	65	2580	33	7.3	8.8	245	132	5.40	1402	757

LANDING PERFORMANCE

At gross weight 1045 kg (2304 lb),
Without wind, flaps in "landing" position, engine idling,
Dried and plane concrete runway,

Over 15 m (50 ft) barrier speed ..... (68 kt) 125 km/h
Touch down speed ..... (51 kt) 95 km/h

PRESSURE ALTITUDE Zp (ft)	TEMPERATURE °C (°F)	WEIGHT 1045 kg (2304 lb)				WEIGHT 845 kg (1863 lb)			
		Landing distance		Landing ground roll over 15m(50ft) barrier		Landing distance		Landing ground roll over 15m(50ft) barrier	
		m	(ft)	m	(ft)	m	(ft)	m	(ft)
0	- 5 (23) Std = 15 (59) 35 (95)	230 250 270	(755) (820) (886)	500 530 560	(1641) (1739) (1837)	190 200 215	(623) (656) (705)	425 450 475	(1394) (1476) (1558)
4000	- 13 (7) Std = 7 (45) 27 (81)	260 280 300	(853) (919) (984)	550 585 620	(1805) (1919) (2034)	210 230 240	(689) (755) (787)	465 495 520	(1526) (1624) (1706)
8000	- 21 (-6) Std = - 1 (30) 19 (66)	295 320 340	(968) (1050) (1116)	610 650 690	(2001) (2133) (2264)	240 260 275	(787) (853) (902)	510 545 575	(1673) (1788) (1887)

Head wind influence: For 10 kt multiply by 0,85
For 20 kt multiply by 0,65
For 30 kt multiply by 0,55

Down wind influence: Add 10% to distance per section of 2 kt

Dried grass runway: Add 15%

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SECTION 6 WEIGHT AND BALANCE

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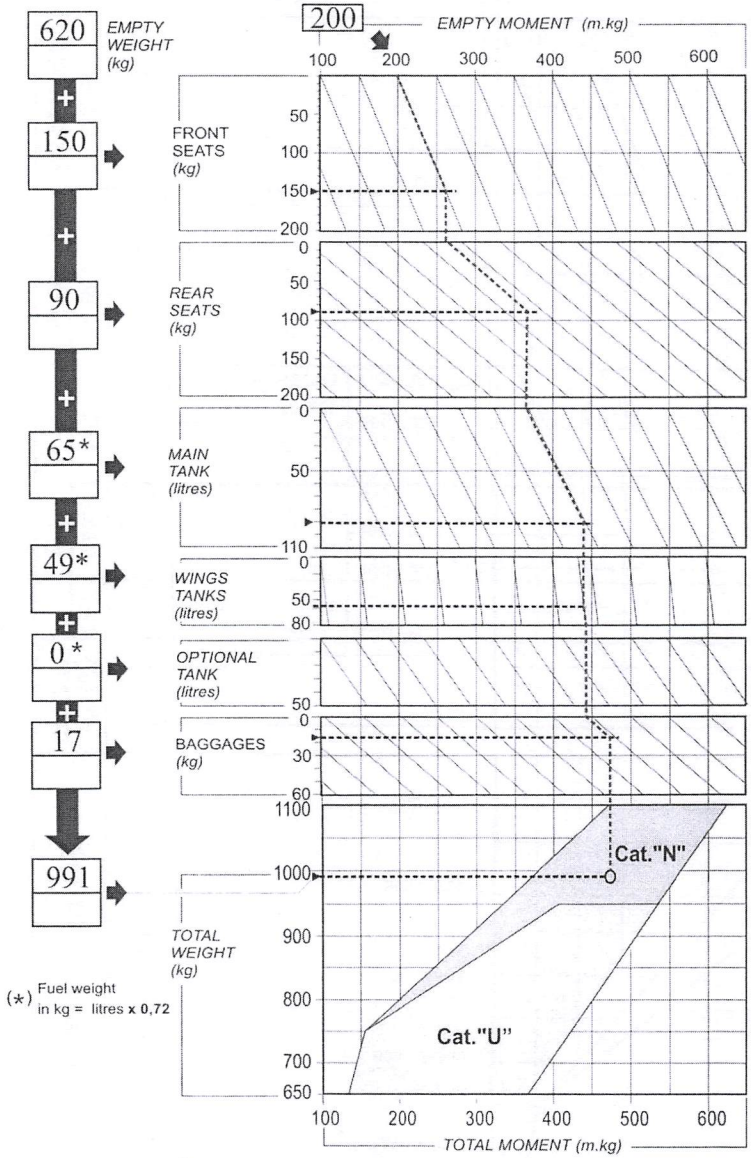
620
EMPTY WEIGHT (kg)
150
90
65*
49*
0 *
17
991
(*) Fuel weight in kg = litres x 0,72
200
EMPTY MOMENT (m.kg)
100 200 300 400 500 600
FRONT SEATS (kg)
50 100 150 200
REAR SEATS (kg)
0 50 100 150 200
MAIN TANK (litres)
0 50 110
WINGS TANKS (litres)
0 50 80
OPTIONAL TANK (litres)
50
BAGGAGES (kg)
0 30 60
TOTAL WEIGHT (kg)
1100 1000 900 800 700 650
Cat."N"
Cat."U"
100 200 300 400 500 600
TOTAL MOMENT (m.kg)

USE OF THE WEIGHT AND BALANCE DIAGRAM

1) Calculate the total loaded aircraft weight :
   empty weight (from the weight and balance sheet)
   + pilot and passengers
   + baggage
   + standard fuel
   Insure that total weight does not exceed 1100 kg (2425 lb) in "N" category and 950 kg (2095 lb) in "U" category.

2) Place the empty aircraft moment (from the weight and balance sheet) on the upper scale of the opposite diagram, and follow the example indicated by the dashed line.
   The resulting point must be within centre of gravity moment envelope (shaded area), for the load to be within limits.

EXAMPLE *

Empty aircraft - moment	(1447 ft.lb)	200	m.kg
Empty aircraft - weight	(1367 lb)	620	kg
Pilot + Front passenger	(331 lb)	150	kg
Rear passengers	(198 lb)	90	kg
Main fuel 90 l (24 imp/20 us gal)	(143 lb)	65	kg
Wing fuel 68 l (15 imp/18 us gal)	(108 lb)	49	kg
Baggage	(37.5 lb)	17	kg
TOTAL WEIGHT	(2185 lb)	991	kg

CENTRE OF GRAVITY : within the envelope

1 litre AVGAS = 0,72 kg (1.6 lb)
1 imp gal AVGAS = 3.27 kg (7.21 lb)
1 us gal AVGAS = 2.7 kg (6 lb)

*** ATTENTION**

For your aircraft center of gravity calculation, please do not use values of empty aircraft weight and empty aircraft moment indicated in the above example. Use values indicated on the last weight and balance sheet of your aircraft.

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Bundesamt für Zivilluftfahrt
Office fédéral de l'aviation civile

Wägungsbericht
Rapport de pesée

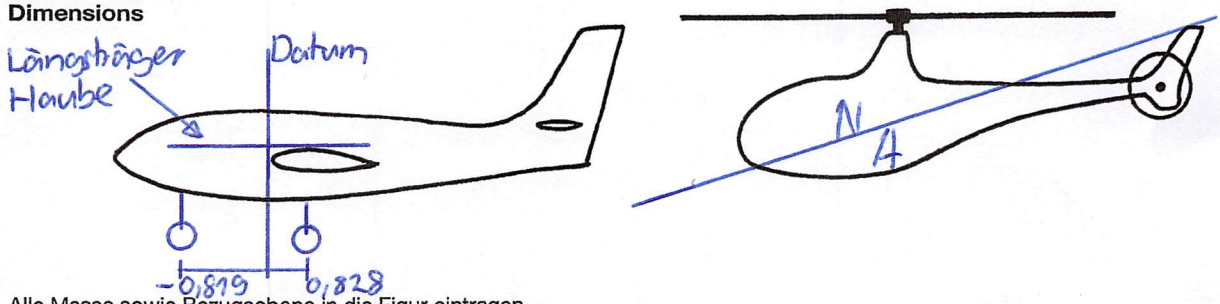
HB- KED	Muster / Type DR 400/180	Ort und Datum / Lieu et date Lupfig 10/10/2014

Bezugsebene gemäss Geräte-Kennblatt
Plan de référence selon la fiche de navigabilité: Flügeleintrittskante

Horizontallage gemäss Geräte-Kennblatt
Référence horizontale selon la fiche de navigabilité: Längsträger Haube

Grund der Wägung
Raison de la pesée: TM 73.920-12

Abmessungen
Dimensions



Alle Masse sowie Bezugsebene in die Figur eintragen
Reporter le plan de référence et les cotes des points de pesée sur le croquis approprié

Wägung
Pesée

mit Ausrüstung gemäss Ausrüstungsliste des Luftfahrzeug-Flughandbuchs (AFM)
avec l'équipement installé selon la liste du manuel de vol de l'aéronef (AFM)

Verwendete Wagen / Balances utilisées	Hersteller / Constructeur	Werknummer / No. de série	Eichdatum / Date de calibr.
Links / A gauche	Evergreen	2013/1778	21/05/13
Rechts / A droite	Evergreen	2013/1177	21/05/13
Vorne/Hinten / En avant/En arrière	Evergreen	2013/2217B	21/05/13

Wägung Nr. / Pesée no.	Wägepunkt / Point de pesée	Masse brutto / Masse brutte	Tara / Tare	Masse netto / Masse net kg
1	Links / A gauche			221
	Rechts / A droite			220
	Vorne/Hinten / En avant/En arrière			195,5
	Total			636,5
2	Links / A gauche			219
	Rechts / A droite			218,5
	Vorne/Hinten / En avant/En arrière			197,5
	Total			635,0
3	Links / A gauche			
	Rechts / A droite			
	Vorne/Hinten / En avant/En arrière			
	Total			

Hinweis / Note

Ist die Abweichung in den Ergebnissen 1 und 2 grösser als 1%, ist eine 3. Wägung durchzuführen.
Au cas où la différence entre les résultats 1 et 2 est supérieure à 1%, effectuer une 3ème pesée.

N
A

Schwerpunktbestimmung
Détermination du centrage

Durchschnittswerte aus den Wägungen / Valeurs moyennes des pesées	Masse kg	Arm/Bras	Moment
Wägepunkt links / Point de pesée gauche	220,0	0,828	182,16
Wägepunkt rechts / Point de pesée droit	219,3	0,828	181,58
Wägepunkt vorn/hinten / Point de pesée AV/AR	196,5	-0,819	-160,93
Für die Auswertung massgebend / Valeurs à utiliser pour le dépouillement	~~635,8~~	~~0,319~~	~~202,81~~

Übertragen auf Blatt 2 / A reporter sur la feuille 2

SUPERSEDED BY AMDT 1 TO CH.145.0181

Verteilung: BAZL/OFAC weiss/blanc
Distribution: Halter/Expl. gelb/jaune
Insp. rosa/rosé

Gewogen durch: G. Schaffner
Pesée effectuée par:

CH.MF.4001

BAZL 53.11 df 8.96 2000 34911/1

Auswertung der Wägung (Motorflugzeuge und Helikopter)
Dépouillement de la pesée (Avions à moteur et hélicoptères)

Tabelle I Gewogene, aber nicht zur Leermasse gehörende Teile
Equipements pesés, mais ne faisant pas partie de la masse à vide

Bezeichnung / Désignation	Masse	Arm/Bras	Moment
Total Abzüge / Total à retrancher			

N
A

Tabelle II Nicht gewogene, aber zur Leermasse gehörende Teile
Equipements non pesés, mais faisant partie de la masse à vide

Bezeichnung / Désignation	Masse	Arm/Bras	Moment
Total Zuschläge / Total à ajouter			

N
A

Leermasse (Gemäss Definition des Luftfahrzeug-Flughandbuchs)
Masse à vide (Selon définition du Manuel de Vol de l'aéronef)

				Masse kg	Arm/Bras	Moment m.kg
Übertrag Blatt 1:	/	Report feuille 1:				
Öl inbegriffen	/	Huile	SG:			
Nicht verwendbarer Treibstoff	/	Essence non-consommable	SG:			
Nicht verwendbarer Treibstoff	/	Essence non-consommable	SG:			
Abzüge gemäss Tabelle I	/	A retrancher selon tabelle I				
Zuschläge gemäss Tabelle II	/	A ajouter selon tabelle II				
Leermasse	/	Masse à vide		635,8	0,319	202,81

Resultat zu übertragen in AFM Deckblatt B
Résultat à reporter à la page de garde B AFM

Schwerpunktlage leer / Centrage à vide (falls vorgeschrieben / si prescrit)

Leermasse-Schwerpunktbereich gemäss Gerätekennblatt — bei _____ kg/lbs — von _____ m/in — bis _____ m/in
Domaine de centrage à vide selon fiche de navigabilité — à _____ — de _____ — à _____

Anmerkung: Der Schwerpunktbereich leer muss eingehalten werden, andernfalls ist das Luftfahrzeug durch Zugabe oder Entfernen von Ballast auszutrimmen.
Note: Le domaine de centrage à vide doit être respecté, sinon l'aéronef doit être équilibré en ajoutant ou retranchant du lest.

Verteilung: BAZL/OFAC weiss/blanc
Distribution: Halter/Expl. gelb/jaune
Insp. rosa/rosé

Auswertung: G. Schaffner
Dépouillement: CH.MF.4001

Eintragung AFM: G. Schaffner
Report dans l'AFM: CH.MF.4001

BAZL 53.11 df 8.96 2000 34911/2

Apex Robin DR400/180 AFM Equipment List

Avionitec AG, General Aviation Center, P.O.BOX 63, CH-8058 Zürich-Airport, Phone : +41 43 816 44 39, FAX + 41 44 814 33 42, E-Mail : avionik@avionitec.ch, CH 145.0181

Registration	HB-KED	Workorder	5827
Type	Robin DR 400/180	Serial Nr.	2294

LIST OF INSTALLED UNITS on 22. June 2016 :

Manufacturer	Unit Function	Unit Name	P/N	Weight (kg)	Arm (m)	Moment (m kg)
PowerFLARM	Traffic Transceiver	PowerFLARM Core	FLAPFC11E	0.27	-0.20	-0.05
Aboba	FLARM Traffic Display	V4+M		0.11	-0.10	-0.01
Comant	ADS-B Antenna	CI-105	CI105-16	0.14	1.65	0.23
RAMI	FLARM Bottom Antenna	AV-75		0.18	1.65	0.30
RAMI	FLARM Top Antenna	AV-75(F)		0.18	3.65	0.66
Total installed Units				**0.88**	**1.27**	**1.12**

LIST OF INSTALLED UNITS on 09. Aug 2017 :

Manufacturer	Unit Function	Unit Name	P/N	Weight (kg)	Arm (m)	Moment (m kg)
Garmin	NAV/COM	GNC 255A	011-02806-00	1.80	-0.25	-0.45
Total installed Units				**1.80**	**-0.25**	**-0.45**

WEIGHT AND BALANCE SUMMARY :

	Weight (kg)	Arm (m)	Moment (m kg)
N E W Running basic empty weight	**636.08**	**0.330**	**210.08**

Apex Robin DR400/180 A-M Equipment List

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SUPPLEMENT 1	AUXILIARY FUEL TANK

TABLE OF CONTENTS

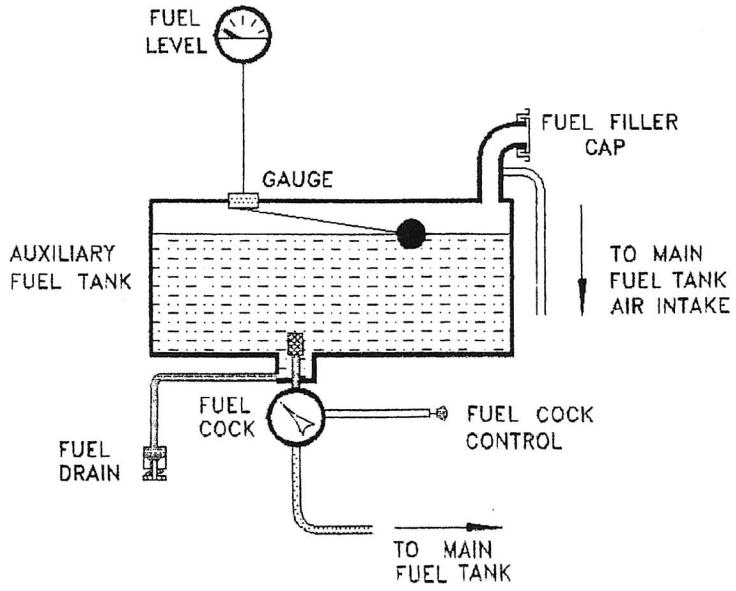
SECTION 1 - DESCRIPTION

The auxiliary fuel tank is located on the bottom of the baggage compartment and is connected to the main fuel tank by a transfer line.
Use first a sufficient quantity from the main fuel tank then refuel by pulling the auxiliary tank transfer valve control.
The quantity of auxiliary tank fuel is given by an independant gauge.

capacity ..... (11 imp/13,2 us gal) 50 l
level arm ..... (63 in) 1,61 m

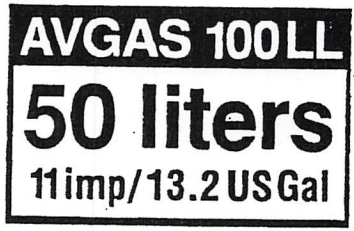
NOTA

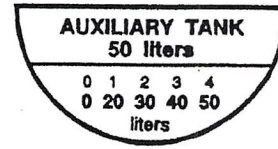
The main fuel tank must be empty enough to receive fuel quantity from the auxiliary fuel tank.



SECTION 2 - LIMITATIONS

The maximum take off weight and the weight and balance limits are not modified by the installation of the auxiliary fuel tank. Therefore, limitations of Section 2 are not modified, except following placards which complete those of the pages 2.08, 2.09 and 2.10.





SECTION 3 - EMERGENCY PROCEDURES

Emergency procedures are not affected by the installation of auxiliary fuel tank.

SECTION 4 - NORMAL PROCEDURES

In addition to normal procedures actuate the auxiliary fuel tank drain valve during the pre-flight check (point 1 page 4.05).

SECTION 5 - PERFORMANCE

Performance are not affected by the installation of auxiliary fuel tank because the maximum take off weight and the weight and balance limits are not modified.

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SUPPLEMENT 3 TOWING PROCEDURES

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

Your DR400/180 is equipped with:
- a structural reinforcement installed on the aircraft at the production stage
- a tube support bearing a AERAZUR or TOST tow-hook
- a hook-release handle near the pilot's seat
- an instruction placard near the hook-release handle.

SECTION 2 - PROPELLERS APPROVED FOR TOWING

Gliders: 76-58, 76-54
(76-64 would enter the critical RPM - zone under normal utilisation)

Banners: 76-54
(76-58 would enter the critical RPM - zone under normal utilisation).

Propeller HO-27-HM-180/138 (gliders and banners)

SECTION 3 - GLIDER TOWING PROCEDURES

In addition to the usual procedures, check the correct working of the hooks on the aircraft and on the glider.

Towing configuration

First stage of flaps up to Vi ..... 140 km/h (76 kt)
Then flaps ..... up position
Full throttle whilst climbing

Descent

Do not close throttle below 2500 rpm in order to avoid the engine cooling being too quick.

Recommended speed Vi ..... 250 km/h (135 kt)

TOWING SPEED

Gliders

Any speed is possible between the minimum aircraft towing speed Vr and the maximum authorised speed of the glider on tow.

The optimum climbing speed depends on characteristics of the glider: for gliders with a low wing loading and a medium glide ratio, the optimum speed in Vr where as it may exceed 130 km/h (70 kt) for gliders with a high wing loading and glide ratio.

A climbing speed higher than the optimum may be necessary in case of critical engine cooling.

SECTION 4 - BANNER TOWING PROCEDURES

In addition to the usual procedures:

- Check the correct working of the hook on the aircraft.
- Then attach the cable to the aircraft and to the banner.
- Lay the folded banner on the ground in front of the aircraft at such a distance that it has reached a sufficient speed when lifting the banner. For a pick up hooking in flight, the approach speed of the aircraft should be 105 km/h (56 kt).

A speed very close to Vb should be maintained for the whole flight.

For banner towing at a slow speed and under hot weather conditions, it is advised if need be to install the cooling flap on the inferior engine cowling to obtain a better engine cooling. This flap belongs to the optional equipment of the aircraft.

Following instruction placard is mandatory on this aircraft when equipped with a tow-hook:

SEE APPROVED FLIGHT MANUAL FOR TOWING INSTRUCTIONS

SECTION 5 - LIMITATIONS

See notes	1)	2)	3)
Weight of the towing aircraft kg	760	850	1000
Minimum glider towing speed Vr km/h	115	120	130
Minimum banner towing speed Vb km/h	100	105	120
Minimum authorized speed for the glide glider on tow km/h	140	145	160
Maximum glider weight for Vz = 0.7 m/s	915	710	370
Maximum glider weight for Vz = 1.7 m/s	710	555	295
100Cx.S maximum of the banner	190	125	45

Notes: 1) Normal utilisation: 1 pilot, 110 l fuel
2) Case of towing pilot's schooling
3) Exceptional case: Passengers transport with a light on tow or leaflets dropping with a reduced banner.

Following placards complete those of the pages 2.08, 2.09 and 2.10:

TOWING HOOK
(PULL TO RELEASE)

FOR TOWING INSTRUCTIONS
SEE APPROVED FLIGHT MANUAL

BAGGAGE BAY MAX. LOAD
60 kg
SEE LOADING DIAGRAM

BREAKING RESISTANCE OF THE TOWING CABLE

Maximum .....1000 daN
Minimum .....0,8 times the weight of the glider

SECTION 6 - TOWING PERFORMANCE

Weight of the towing aircraft (kg)	760	850	1000
Stalling speed (Vo) with first stage of flaps (km/h)	87	92	100
Climbing speed at Vr at ground level with a glider under extreme conditions (conditions FAR 23.65b) m/s	2,75	2,9	3,15
At Vr without glider (m/s)	7,2	6,2	4,9
At Vb with extreme banner	2,75	2,9	3,15
At Vb without banner	6,3	5,4	4,4

TAKE OFF PERFORMANCE ON GRASS RUNWAY WITH A GLIDER EQUIPPED WITH A WHEEL

Weight of towing aircraft: 760 kg

Weight of glider		300 kg		600 kg	
Altitude	Tempe-rature	Take off distance	Run to clear	Take off distance	Run to clear
Z: 0	St: 15°	410 m	225 m	580 m	330 m
	St: +20°	455 m	255 m	650 m	375 m
Z: 4000 ft	St: 7°	555 m	320 m	810 m	480 m
	St: +20°	620 m	360 m	910 m	550 m

Weight of towing aircraft: 850 kg

Weight of glider		300 kg		600 kg	
Altitude	Tempe-rature	Take off distance	Run to clear	Take off distance	Run to clear
Z: 0	St: 15°	505 m	285 m	710 m	415 m
	St: +20°	560 m	325 m	795 m	470 m
Z: 4000 ft	St: 7°	695 m	410 m	1005 m	615 m
	St: +20°	775 m	465 m	1135 m	705 m

Weight of towing aircraft: 1000 kg

Altitude	Temperature	Take off distance	Run to clear
Z: 0	St: 15°	700 m	415 m
	St: +20°	780 m	470 m
Z: 4000 ft	St: 7°	985 m	600 m
	St: +20°	1110 m	690 m

SUPPLEMENT 4 LOW VOLTAGE

A steady warning light is installed which will illuminate if the alternator output reduces to a level where the battery supplies power to the bus-bar (See Airworthiness Notice n°88).

Before engine start

Check low volts warning..... ON

After engine start

Check low volts warning..... OFF

If warning illuminates during flight

Reduce electrical load

Battery duration approx..... 30 minutes

Land on the nearest suitable airfield.

NOTE

Warning may illuminate with low engine rpm. Check it goes without when rpm increases.

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TABLE OF CONTENTS

SECTION 1 - GENERAL

The GPS mentioned hereunder are approved on DR400 series for day VFR in view of the ground or the sea.
The integrity of the position indicated by the GPS is not guaranteed.
It is therefore the responsibility of the pilot to verify the accuracy of this position by all means of navigation available.
The GPS operating manual at latest edition must be on board.
The coupling of the GPS mentioned hereunder to a flight director or to an autopilot is not authorised (except for the GPS underlined hereunder).

GARMIN	100 AVD, 150, 150 XL, GNC 250 XL, GNS 430
KING	KLN89 , KLN89B , KLN 90, KLN 90A KLN 90B , KLX135, KLX135A
MAGELLAN	SKY NAV 5000
TRIMBLE	TNL 2000

SECTION 2 - LIMITATIONS

The following placard complements those described on page 2.08

GPS LIMITED TO DAY VFR IN VIEW OF
THE GROUND OR THE SEA ONLY

SECTION 3 - EMERGENCY PROCEDURES

Not affected

SECTION 4 - NORMAL PROCEDURES

Not affected

SECTION 5 - PERFORMANCES

Not affected

SECTION 6 - WEIGHT AND BALANCE

Not affected

SUPPLEMENT 6 S-TEC 55 SYSTEM AUTOPILOT

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

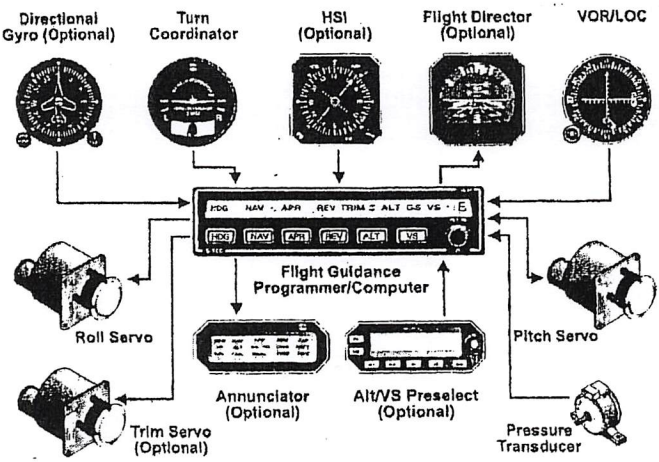
The 2 axes S-T4C 55 System autopilot (A/P) has a heading select (mode HDG) and a route intercept tracking (mode NAV) by means of VOR or RNAV equipment. A vertical speed command (mode VS) and altitude hold (mode ALT) are also provided.

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.

SYSTEM SCHEMATICS



SECTION 2 - LIMITATIONS

The limitations of section 2 remain unchanged except:

IFR, glider and banner towing are not allowed with the autopilot in operation.

Minimal height in descent.....500ft
Minimal height in cruise.....1000 ft
Minimum speed.....(75 kt) 139 km/h
Maximum speed.....(140 kt) 260 km/h

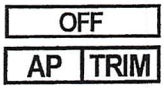
NOTE

Do not use the autopilot if following failures have been detected:

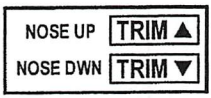
1) directional gyro, vacuum pump or vacuum circuit
2) electrical turn coordinator

The following placards complete those of the page 2.08:

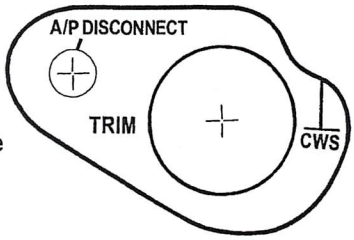
On panel
(master switch)



Near flight guidance programmer

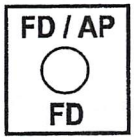


On the stick grip

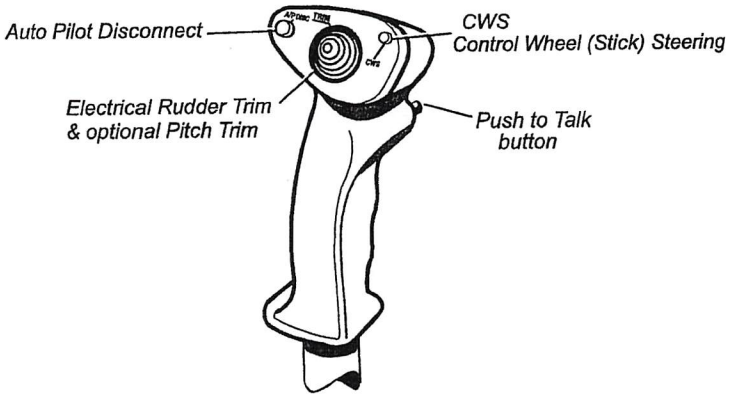


Near breakers

On selector switch, when equipped with optional flight director



Trim and CWS interrupt buttons are located on the left hand stick.



SECTION 3 - EMERGENCY PROCEDURES

In case of A/P failure:

1- Override the controls (roll, pitch) as necessary and disconnect A/P by pushing the red A/P button on the stick

/

NOTE
The A/P can be overriden without damage to the system.

2- Disconnect A/P by means of the switch on the panel

3- Pull the breaker and don't try to switch on the A/P

In case of electrical or pneumatical failure:

Switch off the A/P with A/P master switch.

NOTE

The A/P may be switched off by following means:

- *Depress red A/P button on the stick (A/P is not working anymore but still under power)*
- *A/P master switched off (A/P not powered)*
- *Pull A/P circuit breaker (A/P not powered)*
- *If the aircraft is equipped with optional autotrim **and** ALT or VS modes are engaged, depress trim switch on stick.*

In case of electrical trim failure (if equipped):

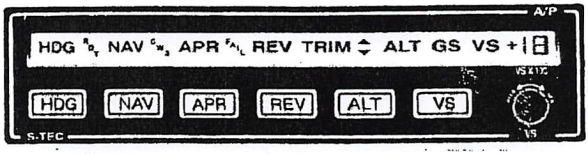
1- Pull electrical trim breaker and do not try to switch on the electrical trim again

2- Trim manually in respect with the indication on the programmer/ computer

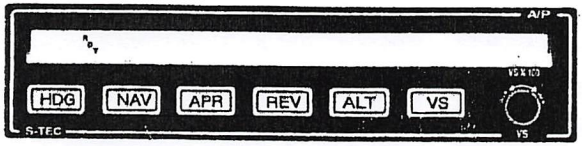
SECTION 4 - NORMAL PROCEDURES

4.1 – Preflight procedure

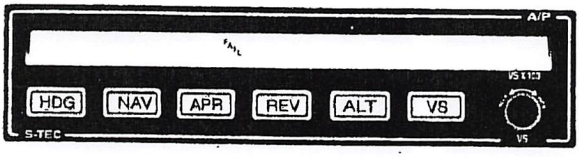
After engine start, directional gyro and turn coordinator must be powered.
Switch on A/P by means of A/P master switch. A self test will be performed. All segments of programmer/computer display will illuminate.



After seconds a satisfactory completion is indicated by RDY:



Should a fault be detected, the FAIL annunciator will remain and A/P cannot be engaged.



In that case, the A/P should be switched off.

NOTE

If the A/P detects the turn coordinator rotor speed as low or not turning, the display will remain blank and the A/P cannot be engaged.

At holding point, check the A/P working properly:

1- Vacuum: green arc
2- Master switch: ON
3- Display: RDY after autotest
4- Press and release CWS: CWS and VS annunciated
5- Overpower the A/P by moving stick in both pitch and roll axes:
   Control motions should be smooth, without looseness or free play
6- Press the red A/P disconnect on stick:
   RDY will flash
   An audible tone should be heard indicating the A/P disconnect
7- Move aircraft controls to ensure freedom and A/P disconnect

If optional autotrim is installed:

1- Autotrim switch: ON
2- Display: RDY
3- Press and release CWS: CWS ans VS annunciated
4- Push stick forward:
   After 3 seconds, trim should run "nose up"
   And display indicates Trim Δ (nose up)
5- Pull stick backward:
   After 3 seconds, trim should run "nose down"
   And display indicates Trim ∇ (nose down)
6- Move manual electrical trim switch up and down.
   Trim should operate int he commanded selection:
   RDY will flash.
   An audible tone should be heard indicating the A/P disconnect.

NOTE

Retrim aircraft for take off. Be sure A/P is disengaged.

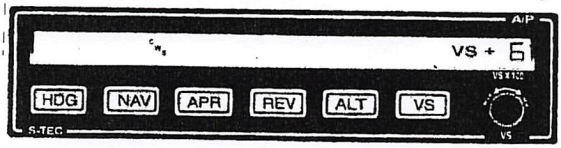
4.2 - Operating procedure

Find below an abstract of the main functions and operating procedure of the S-TEC 55 system. For more details, refer to the S-TEC Pilot's Operating Handbook (p/n 8747) latest edition.

Control Wheel Steering (CWS)

This mode engage both pitch and roll axes of the system and synchronize the A/P with the present aircraft attitude.

1- Depress and hold the CWS switch located on the stick.
CWS and VS modes will annunciate and RDY will extinguish



2- Position of the aircraft in the desired roll and pitch attitude.
Aircraft vertical speed x 100 ft/min will be displayed in the display window above the VS selector knob

3- Stabilize the desired attitude for 2 or 3 seconds, release the CWS switch.
The A/P will maintain the required attitude.

NOTE

If the bank angle is grater than a standard rate of turn when the CWS switch is released, the bank angle will be reduced to produce 90% of a standard rate turn as a maximum.

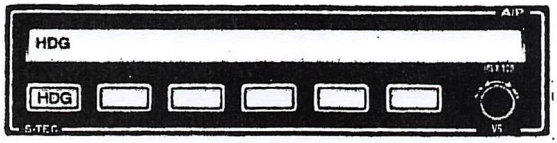
Frim the CWS mode, the pilot may select other modes such as HDG, NAV, ALT or may modify the present vertical speed using the VS knob.

The CWS mode can be reentered at any time by simply depressing the CWS switch. An audible tone will be heard indicating servo disengagement.

Heading mode (HDG)

Heading mode (HDG) may be selected initially from CWS or RDY mode.

1- Set the heading bug on the directional gyro (or optional HSI)
2- Select the HDG switch on the programmer/computer.
HDG annunciator will illuminate.



NOTE

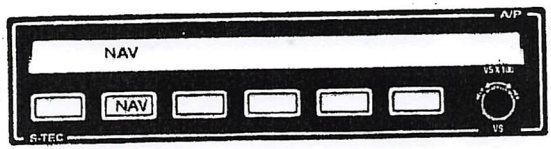
New headings can be selected simply by repositioning the heading bug.

In heading mode, the A/P is not coupled to any navigation aid. It may be necessary to compensate for wind drift.

NAV intercept and tracking

To intercept and track a VOR, RNAV:

1- Tune the proper frequency and select the desired course
2- Move the heading bug in the direction of desired travel to match the selected course
3- Engage NAV mode.....NAV will illuminate



NOTE

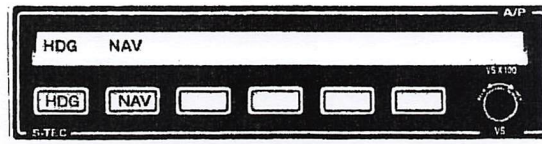
- *If the course needle is at full scale deviation (left or right), the A/P will establish a 45° intercept angle. As the aircraft approaches the selected course, the intercept angle will be gradually reduced.*
- *During the intercept sequence the system operates at 90% standard rate turn.*
- *The system measures the difference between actual and desired course. If the aircraft is established at 50% or more than desired course the NAV message will flash. It also may flash at station passage or when the NAV indicator flags. In this case, FAIL will illuminate.*

When a course change of 10° or more is required at enroute VOR:

1- Select the new course
2- Reset the NAV mode to reinstate the capture sequence
3- Set the HDG bug to the new course

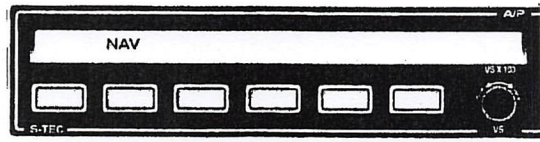
The pilot may select an angle of intercept less than the standard 45°:

1- Place heading bug on the desired heading to be used for the course intercept
2- Puch both HDG and NAV switches simultaneously. Both HDG and NAV will be annunciated.



NOTE

The selected heading will now be flown until the A/P computes that a turn must be made to intercept the selected course.
- At the beginning of the turn: HDG will extinguish.



- Set the heading bug on the selected course.

NOTE

Intercept angles greater than 45° usually in some course overshoot. Therefore, this type of intercept is not recommended.

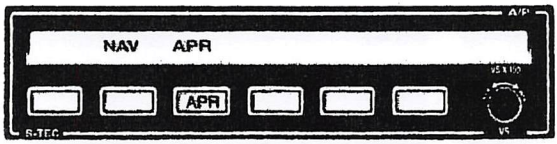
NOTE

If your aircraft is HSI equipped, it is not necessary to set the heading bug on the selected course to intercept.

Approach mode (APR)

The APR mode provides increased sensitivity for VOR or GPS navigation.

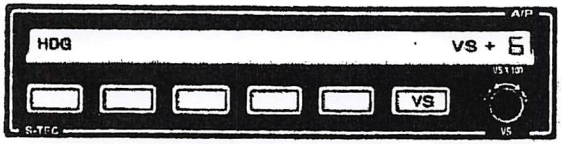
The pilot may select this mode if increased sensitivity is desired for enroute NAV tradking. NAV and APR will be annunciated.



Vertical Speed mode (VS)

In order to engage vertical speed, the roll axis must be engaged (CWS, HDG, or NAV mode).

In VS mode, the pilot may select the desired vertical speed in 100 ft increments by rotating the VS knob clockwise or counterclockwise.



The A/P annunciates and maintains the vertical speed at the time the mode is selected. The pilot may modify the vertical speed by rotating the VS knob.

NOTE

The pilot must be careful not to select a vertical speed which is in excess of the climb performance of the aircraft.
At full throttle, flaps up, following vertical speed can be maintained:

	Zp = Sea level		Zp = FL 75	
Weight Kg (lb)	Vi (kt) km/h	VS (ft/min)	Vi (kt) km/h	VS (ft/min)
1150 (2535)	(92) 170	984	(84) 155	510

A positive (climb) Vertical Speed should not be selected if the indicated airspeed results in a speed lower than the A/P minimum speed of 139 km/h (75 kt).

This also applies to negative (descent) Vertical Speed which should not exceed the maximum A/P airspeed of 260 km/h (140 kt).

NOTE

The + (positive) symbol annunciates a climb vertical speed selection.

The – (negative) symbol annunciates a descent vertical speed.

The VS mode annunciator flashes as an indication of excessive error between actual and selected vertical speed (usually in a climb) and the pilot should adjust power or reduce the selected vertical speed.

Altitude mode (ALT)

The altitude hold mode (ALT) may be engaged with any roll mode (HDG, NAV), or CWS, VS mode by pressing ALT mode switch.

ALT mode selection
The aircraft will maintain the pressure altitude present at the time of mode selection. ALT will annunciate.

NOTE

- *The pilot may adjust the selected pressure altitude by rotation of the VS knob. Each "click" will increase or decrease the altitude by 10 ft.*

  The maximum correction is ± 200 ft (± 20 clicks).

- *Correction in excess of ± 200 ft will require selecting the VS mod and reegaging ALT mode.*

REMARK

Radioelectric interferences (VHF emission) may result in pitch oscillation when ALT mode is engaged. A temporary altitude loss of 100 ft maximum can occur.

Pitch trim indicator

The programmer/computer indicates if the pilot has to trim the aircraft by annunciating following symbols:

Trim Δ .....Trim nose up
Trim ∇ .....Trim nose down

A placard is located near the programmer/computer to remind the symbols.

This annunciation will be steady for about 4 seconds in addition an audible tone will sound, then will flash until proper trim conditions have been met.

NOTE

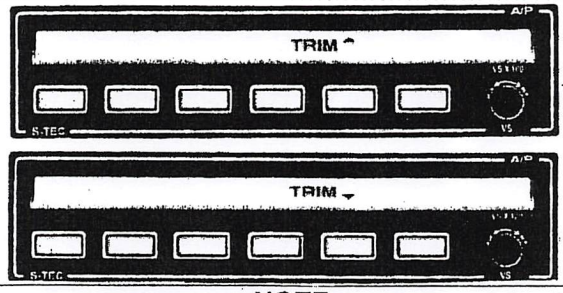
If TRIM is annunciated and the pilot disengages the A/P, there will be a residual out of trim force at the control stick.

Optional autotrim

If the autopilot is equipped with optional autotrim, the aircraft elevator trim will be maintained automatically when the trim master switch is on and a pitch mode engaged (VS, CWS, ALT).

When the elevator trim is in motion

Trim Δ .....Trim nose up
Trim ∇ .....Trim nose down



NOTE

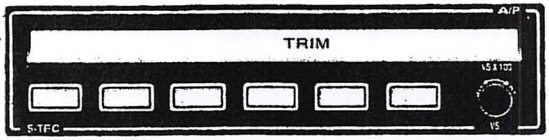
- *The message TRIM will flash should the trim continue to run in excess of 7 seconds.*
- *If the trim breaker is pulled or a failure has occured in the auto trim, the system will revert to "Pitch trim indicator" operation (refer to preceeding §)*

NOTE

Using the trim switch on the control stick while the pitch axis of the A/P is engaged will disconnect the A/P.

The autotrim option also provides the pilot with manual electric trim when the A/P is disengaged (RDY) or if only a roll axis mode has been selected (HDG or NAV).

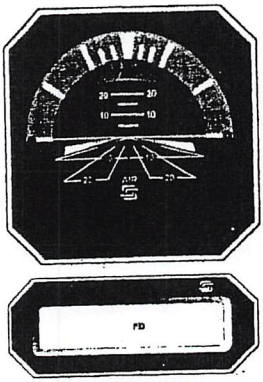
To use electric trim, push the trim toggle switch located on control stick. The TRIM message will flash while the trim is in motion.



Final descent

During final descent, the A/P has to be disconnected at the latest height of 500 ft by depressing the red A/P disconnect on the control stick.

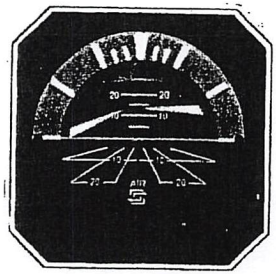
Optional flight director

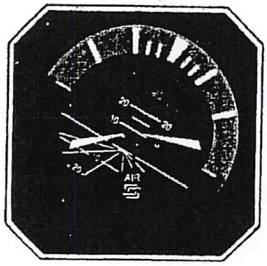


This system, which integrates both the roll axis and pitch axis, offers synchronized display of the flight profile? It is autopatically activated when the autopilot is engaged. A flight director provides a visual indication of how accurately the pilot or autopilot is tracking the commands of the active mode of operation.

Activation is indicated by the FD annunciator on the remote annunciator.

A remote **Parallax Adjustment** is provided to change the height of the horizontal display to compensate for different seat heights and a remote switch allows flight director operation when the autopilot is not in use.

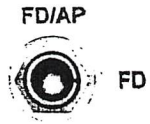




For proper flight technique, the system presentation requires the pilot to roll and pitch the aircraft toward the steering command bars until the delta-shaped reference is tucked into the steering command bars, indicating that commands have been satisfied. For example, if the display is up and left, the pilot would be required to establish a left turn, pitch-up attitude.

As bank angle and vertical speed approach the required amounts, bank angle and pitch-up attitude are shallowed. When the delta reference and the steering bars are matched the commands have been met. Thereafter, it is necessary to maneuver the aircraft to keep the display elements matched in order to accurately fly the programmed modes.

Accurate flight director operation requires alertness by the pilot and monitoring of the movement of the display. Keeping it matched is quite simple. However, control inputs must be timely for accurate flight director following of the desired command.



For manually controlled flight by flight director, place the **FD/AP** master switch in the **"FD"** position. This disables the autopilot servos, allowing the pilot to control the aircraft to the flight director commands.

To engage the autopilot without interruption, simply place the **FD/AP** master switch in the **"FD/AP"** position.

NOTE

A pitch mode "ALT" or "VS" and a roll mode "HDG", "NAV" or "REV" must be activated before the steering command bars will come into view.

SECTION 5 – PERFORMANCE

Not affected.

SECTION 6 – WEIGHT AND BALANCE

No change.

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SUPPLEMENT 7 Sensenich 76EM8S5-0-58 Propeller

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

The Sensenich 76EM8S5-0-58 Propeller can be fitted as an option.

SECTION 2 - LIMITATIONS

The procedures of the Section 2 are not modified.

SECTION 3 - EMERGENCY PROCEDURES

The procedures of the Section 3 are not modified.

SECTION 4 – NORMAL PROCEDURES

The procedures of the Section 4 are not modified, except those hereunder:

Take off
Minimal full throttle rpm 2350tr/min

SECTION 5 – PERFORMANCES

Noise limitation

In compliance with the decree of 19.02.1987, the maximum acceptable noise level for the DR400/180 aircraft, at a certified gross weight of (2425 lb) 1100 kg, is 84.6 dB(A) (OACI chapter 10, annex 16).

The noise level determined under the conditions of the decree, is 75.2 dB (A).

The DR400/180 aircraft has received noise limitation certificate nr N45.

Take off distance .....14 % decrease

Climb performance at sea level .....10 % increase

Best climb speed.....86 kt (160 km/h)

Cruise speed.....14 % decrease

SECTION 6 – WEIGHT AND BALANCE

The procedures of the Section 6 are not modified.

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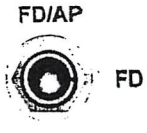
Accurate flight director operation requires alertness by the pilot and monitoring of the movement of the display. Keeping it matched is quite simple. However, control inputs must be timely for accurate flight director following of the desired command.



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To engage the autopilot without interruption, simply place the **FD/AP** master switch in the **"FD/AP"** position.

NOTE

A pitch mode "ALT" or "VS" and a roll mode "HDG", "NAV" or "REV" must be activated before the steering command bars will come into view.

SECTION 5 – PERFORMANCE

Not affected.

SECTION 6 – WEIGHT AND BALANCE

No change.

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SUPPLEMENT 7 Sensenich 76EM8S5-0-58 Propeller

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

The Sensenich 76EM8S5-0-58 Propeller can be fitted as an option.

SECTION 2 - LIMITATIONS

The procedures of the Section 2 are not modified.

SECTION 3 - EMERGENCY PROCEDURES

The procedures of the Section 3 are not modified.

SECTION 4 – NORMAL PROCEDURES

The procedures of the Section 4 are not modified, except those hereunder:

Take off
Minimal full throttle rpm 2350tr/min

SECTION 5 – PERFORMANCES

Noise limitation

In compliance with the decree of 19.02.1987, the maximum acceptable noise level for the DR400/180 aircraft, at a certified gross weight of (2425 lb) 1100 kg, is 84.6 dB(A) (OACI chapter 10, annex 16).

The noise level determined under the conditions of the decree, is 75.2 dB (A).

The DR400/180 aircraft has received noise limitation certificate nr N45.

Take off distance .....14 % decrease

Climb performance at sea level .....10 % increase

Best climb speed.....86 kt (160 km/h)

Cruise speed.....14 % decrease

SECTION 6 – WEIGHT AND BALANCE

The procedures of the Section 6 are not modified.

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SUPPLEMENT 8 IFR

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

The DR400/180 may be used for IFR operation in non-icing conditions subject to application of major modification no. 40 (latest revision). Major modification no. 40 relates to the installation of different instrument panel lighting and a different electrical system.

For IFR operation, it is mandatory for the DR400/180 IFR to have all of the equipment below installed in addition to the daytime VFR equipment, or alternatively, the equipment required by the country of registration.

Flight and navigation

- the air speed indicator must be fitted with a device for preventing icing (pitot heater). The pitot heater must be fitted with an warning light;
- two sensitive and adjustable altimeters graduated at 1000 feet (304,80 m) per revolution and with a pressure datum subscale in hectopascals;
- a vertical speed indicator graduated in feet per minute and fitted with stops;
- a compensable magnetic compass;
- an artificial horizon;
- a second artificial horizon or a gyroscopic turn co-ordinator with a separate power supply from the first artificial horizon.
  At least one of the artificial horizons must have a power failure indicator on or near the instrument;
- a ball type bank indicator if the aircraft is fitted with two artificial horizons;
- an alternative static pressure source or equivalent device.
  The two static pressure systems must be independent, or the two static pressure sources must be independent with a means of selecting one or the other;
- a thermometer that can be read from the pilot's seat indicating the outside temperature;
- a directional gyro;
- a stop watch indicating hours, minutes and seconds;
- two VOR receivers;
- an ADT receiver;

- on-board equipment so the aircraft can comply with published flight paths and at least one published approach procedure for the destination airfield and alternative airfield(s);
- a system of anti-collision lights;
- a system of navigation lights;
- a landing light;
- at least one taxiing light;
- a self-contained electric flashlight for each crew member as a minimum operating requirement;
- a device for lighting the flight instruments and essential safety devices. The lighting system for reading and using the different flight instruments and essential flight safety devices must be of adjustable intensity and must be backed up by a fixed stand-by lighting system;
- audio control panel light;
- the pitot heater must be fitted with an warning light.

Communication

- two microphone-earphone headsets, or two microphones and one earphone headset and a cabin loud speaker;
- two 25 kHz VHF transceivers;
- in H-type zones, an HF transceiver.

Supervision

- an emergency locator transmitter operating automatically on impact (ELT);
- a Mode A and Mode C secondary radar on-board transponder with Mode S level 2 encoding altimeter or transponder.

SECTION 2 – LIMITATIONS

The aircraft is authorised for IFR operation when it is fitted with the equipment required by the regulation in the country of registration.

This equipment must be fully operational.

The limitations in Section 2 are not affected by IFR operation except for the following placards, which must be displayed in full view of the pilot:

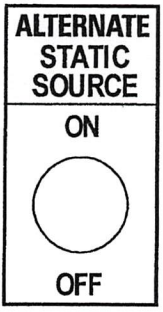
THIS AIRCRAFT MUST BE USED IN THE NORMAL CATEGORY IN ACCORDANCE WITH THE APPROVED FLIGHT MANUAL.

MANEUVERING SPEED: 215 km/h- 116 kt

APPROVED FOR IFR FLIGHT IN NON-ICING CONDITIONS.

SPINS PROHIBITED - NO SMOKING

Replaces the VFR flight conditions placard (page 2.08)



On the alternate static switch

USE OF THE ALTERNATE STATIC SYSTEM PRODUCES THE FOLLOWING INSTRUMENT ERRORS

INDICATED SPEED + 3 kt

INDICATED ALTITUDE + 40 ft

Near the alternate static switch

SECTION 3 - EMERGENCY PROCEDURES

The emergency procedures below supplement those of Section 3.

Air speed indicator failure

If the air speed indicator shows incorrect indications, check the pitot tube heater system:

- pitot heat on.....warning light (amber) off

Warning light on indicates a pitot heating system failure

Lighting failure 1

- Lighting 2.....on
- Lighting 1 fuse.....checked

If the fault cannot be corrected, lighting 2 and the flashlight are used as back-up lighting.

Landing light failure

Landing light circuit breaker switch.....checked

Battery failure

In the event of total battery failure causing alternator excitation failure, and so a total electrical failure, proceed as follows:

- battery master switch.....off
- alternator master switch.....off
- radio switch.....off
- alternator excitation.....off
- alternator excitation.....on
- alternator master switch.....on
- radio switch.....on

Check whether power is restored to the systems. Switch on only those systems required for flight safety.

Total electrical failure

Check the battery and alternator circuit breaker. If the battery circuit breaker only has tripped:

- switch off the electrical equipment that is not essential to the flight
- re-arm the battery and alternator circuit breaker
- switch off all the electrical items if necessary
- use the safety flashlight
- land maintaining the attitude given by ILS slope pre-displays

SECTION 4 - NORMAL PROCEDURES

The following normal procedures supplement those of Section 4.

Preparation

Examine the weather forecast to avoid dangerous flying conditions (minima, icing, etc.).

Check there is sufficient fuel for the planned flight and to comply with regulations.

Pre-flight inspection

Check the following equipment is operational:

Anti-collision lights.....checked
Navigation lights.....checked
Cabin lights.....checked
Flight instrument lights.....checked
Dimmer.....checked
Battery-operated flashlight on board.....checked

Taxiing

Anti-collision lights.....on
Navigation lights.....on
Pitot heater.....off
Gyroscopic instruments.....checked by successive left and right turns
Artificial horizon.....set
Directional gyro.....correct rotation
Turn and bank indicator.....correct deviation

Before take-off

Pitot heater.....on
Instrument vacuum.....checked
VHF.....test
VOR.....test
Radio compass.....test
Marker beacon lights.....tested
Transponder.....stand-by
Heating demisting.....as required

Line-up

- Directional gyro adjustment.

Take-off

- Maintain vertical speed indicator positive at all times
- Switch of taxiing and landing lights at end of runway

Climb and cruise

Above 8000 feet, the pilot may experience night vision problems

.

Landing

Landing light.....on
Taxiing light.....on

After engine shut-down
Lights.....off

SECTION 5 – PERFORMANCES

The performances in Section 5 are not affected.

AIRCRAFT FLIGHT MANUAL SUPPLEMENT

No. 5827-011

for PowerFlarm Collision Warning Device

A/C Make :	**Robin**
A/C Model:	**DR 400 / 180**
A/C S/N :	**2294**
Registration:	**HB-KED**

This Supplement must be attached to the basic Airplane Flight Manual. It describes the operating procedures for a fix installed Power FLARM Collision Warning System and its interfaces in accordance with the FLARM/FLOICE Installation FOCA Policy 1.6 (42-00.02) or later versions.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

This Flight Manual Supplement Revision is EASA approved under:
EASA CS STAN CS-SC051a.

Log of Revisions

Rev.-Nr.	Pages	Date	Remarks/Change	
Original Issue	1 - 9	22.06.2016	Complete Supplement	

Table of Contents

SECTION 1
GENERAL

The general aviation has been confronted since years to dramatic mid air collision accidents. With the extreme fine shape and relatively high cruise speed of modern gliders, the human vision has reached its limit of detection. Another aspect is the airspace restrictions to VFR that creates an augmentation of traffic density in certain areas and the associated airspace complexity that request more pilot attention on the navigation material. These have a direct impact on the probability of collision also affecting powered aircraft or rotorcraft operations.
These equipments in the general aviation are not required by technical specifications or by operation regulations, but are recognized by the regulators as an important step toward improved aviation safety. Therefore they are not considered as essential for flight and may be used for "situational awareness only" on basis of non interference to certified equipment required for safe flight/landing and no hazard to the persons on board.

Correct antenna installation has a great effect on the transmission/receiving range. The pilot shall care that no masking of the antenna occurs especially when the antennas (GPS, ADS-B and FLARM A/B) are located in the cockpit.
PowerFLARM will only give warnings of other aircraft that are likewise equipped with a compatible unit and from aircraft equipped with ADS-B-OUT (1090ES), Mode-C and Mode-S transponders (if interrogated by ground radar or TCAS). PowerFLARM is not detected by ACAS/ TCAS/TPAS or Air Traffic Control. Likewise PowerFLARM does not communicate with FIS-B or TIS-B systems.
The software version must be regularly updated as per the instructions given in the installation manual. If a version mismatch exists, error information is displayed during the equipment Power-ON and the system will not become operational.

An on/off switch on the PowerFLARM provides ready disconnection of the PowerFLARM system from the electrical bus in case of fume, fire, interferences or when flying over territories where the SRD frequency is not available for air-air communication.

SECTION 2
OPERATING LIMITATIONS

2.1 This POWERFLARM installation is compliant for "situation awareness only".

The following placard must be installed on the instrumental panel, at the proximity of the display'

For Situation Awareness only

2.2 Maneuvering must not be based solely on the use of the information presented on the PowerFLARM displays or aural annunciations.

PowerFLARM does not give any guidance on avoiding action. The azimuth and height accuracy of the computed traffic cannot always provide reliable warnings and only the most threatening traffic is announced. Therefore it is the pilot responsibility to evaluate by any means the real traffic position and altitude, the obstacle shape, the terrain and the meteorological situation prior executing any evasion maneuver.

Under no circumstances should a pilot or crewmember adopt different tactics or deviate from the normal principles of safe airmanship.

2.3 It is the pilot's responsibility to verify prior entering any states territory that the SRD frequency is permitted for use in air-air communication.

When such an acceptance does not explicitly or implicitly exist, the equipment shall be turned OFF. This verification is part of the flight planning.

2.4 The pilot shall not intentionally generate uncoordinated warnings that might frighten other aircraft's pilot.

Any intentional maneuver of this kind has to be carefully coordinated and agreed in advance. Unexpected reactions might be especially hazardous when lateral, vertical or time separations are small.

SECTION 3
EMERGENCY PROCEDURES

In case of Fire, Smoke, electrical burning smells or electromagnetic Interferences follow the Emergency procedure of the basic AFM.

The dedicated PowerFLARM switch will help to rapidly determine if the PowerFLARM installation is faulty or not, allowing to resume essential equipments as per the Emergency procedure of the basic Aircraft Flight Manual. The PowerFLARM is powered by the aircraft electrical bus. In case of malfunction turn the PowerFLARM System off by selecting the FLARM Switch to the Off Position.

SECTION 4
NORMAL PROCEDURES

4.1 General

It is recommended to carry the PowerFLARM Operating Manual, current revision on board the aircraft. To make good use of the information contains in this manual the pilot should know the hardware version, the software version, the serial number and the obstacle database name currently installed in the PowerFLARM.

4.2 Self-test

To switch on FLARM, the aircraft electrical power shall be available on the corresponding bus and the dedicated FLARM switch must be turned ON.
After switching on, the system performs a self-test routine, lights up all LEDs and displays either error codes or version information. The Aboba display manual describes how errors and version numbers are shown. If an error is shown, the system is not ready for operation.
When FLARM shifts to normal operation, it waits until it has acquired an adequate GPS position fix. When switching on the device after a long period or in a new location, this procedure can take several minutes. Without a proper GPS position fix, the system is not ready for operation.
Before departure, the pilot must ensure that FLARM has acquired a GPS fix and that no errors are shown (refer to the display manual).

4.3 Traffic Information Presentation

FLARM can show and warn about other aircraft, obstacles, and alert zones. When there is no threat, FLARM can show information about surrounding aircraft. The types of aircraft that are shown (FLARM/ADS-B/Mode-C/S, range limits, etc.) are defined in the settings during installation. How the information is shown is described in the Aboba display manual.
When FLARM calculates a risk for an imminent collision, it will give visual and aural warnings. There are three levels of warnings, depending on time to impact. The different warnings start at approximately 185, 12s, and 8s respectively. The display will show the relative bearing and vertical angle to the intruder (Mode-C/S traffic will only be shown as approximate range and vertical angle). When receiving a warning, immediately identify the intruder visually and take corrective action, if required. Never take corrective action based solely on collision warnings or displayed traffic.
If there are several threats, FLARM will only warn about the calculated most danger threat.
Depending on the phase of the flight, FLARM uses different movement models, forecasting methods and warning calculations to provide the pilot with the best possible support without causing a distraction. For example, when a glider is circling, the system sensitivity is reduced. These models and processes have been optimized, but are nevertheless a compromise and may be wrong.
Obstacle collision warnings are always given without bearing, when there is an obstacle in the calculated future flight path. Warnings are only given about obstacles that are in the current database. The database should be update with the AIRAC cycle, or at least once per year.

4.4 Line of sight

Compatible FLARM/FLOICE/PowerFLARM units and Transponders must be within range in order to provide a warning. The range is very much determined by the type, installation and position of the radio antennas, plus the relative positions of the two aircraft. Under optimal conditions, the system can give a range of well over 10 km. Normally, range should be minimum 3-10 km. The radio signals can only be received by line of sight. There is e.g. no FLARM communication between two aircraft on opposite sides of the same mountain. If there is only one FLARM antenna on top of the aircraft, the range directly below the aircraft will be zero or very limited.

4.5 GPS signal quality

PowerFLARM has to know its current position in order to operate. For this reason, PowerFLARM will only operate in the presence of good quality three-dimensional GPS reception. GPS reception is greatly influenced by the installation and position of the antenna, and aircraft attitude. This is particularly true during turns, when flying close to mountain slopes and in areas known for poor reception. If the installation is poor the GPS signal quality may be reduced. In particular, there can be rapid degradation of height calculations. PowerFLARM resumes operation as soon as the GPS reception quality is adequate.

4.6 Predicted flight path and accuracy

When close up, when two aircraft are at the same or similar height, or GPS reception is poor, the vertical bearing indication is imprecise and fluctuates. PowerFLARM calculates the predicted flight path of the aircraft to which it is fitted for less than the next 20 seconds. This prediction is based on immediate past data, current position- and movement data, plus a movement prediction model that is optimized for the respective user. This forecast is associated with a number of uncertainties that increase with an extension of the forecast time. There is no guarantee that an aircraft will actually follow the predicted flight path. For this reason, the warning issued will not be accurate in all cases.

4.7 Effect of wind

Movements calculated by the GPS relate to a fixed system of terrestrial coordinates. In strong wind there may be a substantial difference between aircraft heading and track, leading to a distortion of the threat bearing. If the wind speed is one third of True Airspeed (TAS) and the yaw free aircraft heading is 90° out of wind, then the threat indication displayed has an error of about 18°. If the wind is very strong, the track can deviate up to 180° from heading. Under such circumstances and when circling, the warnings given are unusable.

4.8 Data protection

The transmitter has no effect on what the receiver in the other aircraft does with the data. It is possible that this data may be captured and stored by other aircraft, or by ground stations, or used for other purposes. This opens up a range of possibilities, some of which may be in the pilot's own interest, (e.g. automated generation of an sailplane launch logging system, aircraft tracking, last position recovery), while others may not be (e.g. detecting tailing of other aircraft, airspace infringements, failure to take avoiding action prior to a collision). When PowerFLARM makes a transmission, the signal also bears identification.

SECTION 5
PERFORMANCE

No Change to basic flight manual

SECTION 6
WEIGHT AND BALANCE

No Change to basic flight manual

SECTION 7
SYSTEM DESCRIPTION

7.1 System description

PowerFLARM receives position and movement information from an internal GPS receiver with an external GPS antenna usually mounted on the glare shield. A pressure sensor further enhances the accuracy of position measurements. The predicted flight path is calculated by PowerFLARM and the information transmitted by radio. Provided they are within receiving range, the signals are received by further aircraft also equipped with FLARM/FLOICE/PowerFLARM or compatible devices. The incoming signal is compared with the flight path predicted by calculation for the second aircraft. At the same time, PowerFLARM compares the predicted flight path with known data on obstacles stored in an optional internal database.

PowerFLARM also receives ADS-B and Mode C/S Transponder signals.

The PowerFLARM traffic situation will be displayed on the PowerFLARM Display/Controller located in the Cockpit Panel. The PowerFLARM will generate also audio messages. The PowerFLARM is connected to the aircraft audiopanel auxiliary audio input. Audio volume may be adjusted by the volume control menu in the PowerFLARM device. The Display of the PowerFLARM front panel may be dimmed by settings available in the setup menu.
The PowerFLARM software and database can be updated via a USB Stick.

This aircraft is equipped with several antennas for the PowerFLARM System. One GPS antenna, one ADS-B antenna and one or two FLARM (A / B) antennas.
The PowerFLARM system is electrically protected by a 2.0 Amp fuse located in the cockpit panel, labelled as FLARM.
Obstacle information stored has been simplified. For example, PowerFLARM assumes that a power wire is slung absolutely straight between two fixed points with no sag. Likewise, data for power lines does not include all intermediate masts.

7.2 Radio transmission

The PowerFLARM system uses a data communication frequency in the SRD860 band. This band is ruled tor European applications in the documents ERC/REC 70-03 annex 1 (f) and ERC/DEC/(01)04. The band is free for any ground-ground applications and gets no official protection against external interferences. POWERFLARM is not considered as aeronautical mobile radio.
There are national differences in frequency allocation and operating conditions between countries. To be used for air-air application some countries require an authorization to be granted by each national communication authority. In Switzerland, BAKOM has granted this authorization for the FLARM/FLOICE/PowerFLARM application on the 23 March 2004. On the 29 May 2005 FOCA confirmed to BAKOM, that no Radio License will be required for FLARM/FLOICE/PowerFLARM.
The aircraft commander is solely responsible for ensuring that their use of PowerFLARM conforms to local regulations.
The radio transmission protocol employed places no limit on the number of units that may be operated within a given range. However, an increasing number of units within range is associated with a reduction in the probability that a single coded signal will be received ('graceful degradation'). The probability is small that subsequent signals will not be received from the same transmitter.

7.3 Electrical installation

This FLARM installation is electrically protected with a inline fuse, which is provided with this installation to readily disconnect the PowerFLARM installation when required by Emergency or operational needs. The pilot must be confident with his electrical bus topology and the FLARM installation.

7.4 Personalized PowerFLARM System overview

Below a System overview installed in this aircraft. Detailed wiring interconnection No 5827-FLARM can be found in the aircraft maintenance records.