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## **1. TOWING**

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The DR 400/180 R “tug” is equipped with:

- A structural reinforcement installed on the aircraft at the production stage.
- A tube support bearing a 12 A type Tost or Aérazur tow-hook.
- A hook-release handle near the pilot's seat.
- An instruction placard near the hook-release handle.

### **Propellers approved for towing**

76-58, H0-27-HM-180/138

EVRA TR5 180-102/140-CR11

### **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:

Do not exceed  $V_i = 140$  km/h (75 kt) with flaps at 1<sup>st</sup> notch.

Full throttle whilst climbing.

**Descent:** Do not close throttle below 2500 RPM in order to avoid the engine cooling being too quick. Recommended speed  $V_i = 250$  km/h (135 kt)

### **Towing speed**

Gliders: Any speed is possible between the minimum aircraft towing speed  $V_r$  and the maximum authorized speed for 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 is  $V_r$  whereas it may exceed 130 km/h for gliders with a high wing loading and high glide ratio.

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

**Banner towing procedures**

In addition to the usual procedures

- Check the correct working of the hook in 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 to such a distance 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 100 km/h (53 kt).

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

For banner towing at slow speed under warm weather conditions, it is advised if need be to install the cooling flap (see drawing 58 - 319) on the inferior engine cowling for better engine cooling. This flap belongs to the option" equipment of the aircraft.

**Limits of use**

	See remarks	1)	2)	3)
Weight of the towing aircraft	kg	750	840	1000
Minimum glider towing speed $V_r$	km/h (kt)	110 (60)	115 (62)	125 (67)
Minimum banner towing speed $V_b$	km/h (kt)	95 (51)	100 (54)	120 (64)
Maximum authorized speed for the glider on tow	km/h (kt)	135 (73)	140 (75)	150 (81)
Maximum glider weight $V_z$ at $V_r = 0,7$ m/s	kg	970 kg	765 kg	420 kg
100 Cx.S maximum of the banner (S in m <sup>2</sup> )		230	155	65

Remarks:

- 1) Normal utilization = 1 pilot, full tank
- 2) Case of training pilots schooling
- 3) Exceptional case: passengers transport with a light glider on tow or leaflets dropping with a reduced banner

**Breaking resistance of the towing cable**

- Maximum 1 000 da N
- Minimum 0.8 time the weight of the glider

**Performance on tow**

Weight of the towing aircraft	kg	750	840	1000
Stalling speed (V <sub>c</sub> ) with flaps at first notch	km/h (kt)	83 (45)	88 (47)	96 (52)
Climbing speed at V <sub>r</sub> at ground level with a glider under extreme conditions (conditions FAR 23 65 b)	(m/s)	2.65	2.8	3.05
At V <sub>r</sub> without glider	(m/s)	7.25	6.25	4.9
At V <sub>b</sub> with extreme banner	(m/s)	2.65	2.8	3.05
At V <sub>b</sub> without banner	(m/s)	6.35	5.45	4.5

**Take-off performance on grass runway with a glider equipped with a wheel**

In each cell, total distance in meters from the start of the motion of the aircraft until it reaches a 50 ft (15 m) height at V .1.3 Vs1

(Between brackets: rolling distance necessary to reach 1.1 Vs1).

Tug weight: 750 kg

Weight of glider		300 kg	600 kg
Altitude	Temperature		
Z = 0	Std 15 °C	375 (205)	535 (300)
	35 °C	415 (230)	595 (335)
Z = 4000 ft	Std 7 °C	510 (285)	745 (430)
	27 °C	565 (325)	835 (495)

Tug weight: 840 kg

Weight of glider		300 kg	600 kg
Altitude	Temperature		
Z = 0	Std 15 °C	465 (260)	655 (375)
	35 °C	515 (290)	730 (425)
Z = 4000 ft	Std 7 °C	635 (365)	925 (555)
	27 °C	710 (415)	1040 (635)

Tug weight: 1000 kg

Z = 0	Std 15 °C	660 (380)
	35 °C	735 (435)
Z = 4000 ft	Std 7 °C	925 (555)
	27 °C	1040 (635)

## **2. SUPPLEMENTARY TANK (OPTIONAL)**

Capacity: 50 liters (11 UK.Gallon)

Lever arm: 1.61 m (63.4 inches)

Localization: under luggage compartment

To use the fuel of the supplementary tank, first consume enough fuel from the rear tank and then empty the supplementary tank fuel in the rear tank by means of the knob located on the central console.

The fuel quantity which is in the supplementary tank is indicated by a gauge located on the right upper side of the instrument panel.

### **3. USE OF ROLL STABILIZER (OPTIONAL EQUIPMENT)**

#### **1 - Type**

EDO-AIRE-MITCHELL CENTURY 1 - AK 306 roll stabilizer.

#### **2 - Operating limits**

Do not use the stabilizer during take-off or landing.

#### **3 - Emergency procedure**

In case of incorrect operation, the stabilizer can be momentarily put out of action, either by pressing the switch located on the control stick, or by means of the master switch (placed in the OFF position) on the instrument panel.

Furthermore, the stabilizer can be easily overridden by means of the manual flight controls.

#### **4 - Normal procedures**

##### **4.1 - Pre-flight check:**

- actuate the stabilizer master switch
- rotate the "TURN" control knob to the left or to the right, and make sure that the control wheel turns in the corresponding direction.
- while taxiing, with the "TURN" knob in neutral, check that the control wheel turns in the opposite direction, when a turn is done.
- check the movement of the ailerons.
- make sure that, when the push-button switch located on the control wheel is pressed, the stabilizer is temporarily disengaged.

##### **4.2 - Before take-off and landing :**

Place the stabilizer master switch in the OFF position.

##### **4.3 - Climbing, cruising, descent**

After having stabilized the aircraft attitude and set the elevator trim, place the stabilizer master switch in the ON position.

With the "TURN" knob in neutral, adjust the button marked "trim" to prevent any heading drift.

A turn may be controlled either manually, by pressing the push-button on the control stick and using the controls, or by turning the "TURN" knob (standard turning rate).

NOTE: for level flight without heading drift, the stabilizer must be properly trimmed and the ball of the turn and bank indicator must be kept in the center position.

**4. USE OF DR 400/180R IN NIGHT VFR AND NON ICING CONDITIONS**

In order to be used in Night VFR, it is mandatory that the DR400/180 be fitted with the following equipment, in addition to the day VFR.

In compliance to "Arrêté du 10 novembre 1967" modified by "Arrêté du 08 juillet 1976".

- 1. Gyro horizon
- 2. Turn and bank indicator
- 3. Directional gyro
- 4. Vertical speed indicator
- 5. Navigation lights
- 6. Strobe lights
- 7. Two landing lights
- 8. Instrument panel lighting
- 9. Handheld flashlight
- 10. A Category 2 E/R V.H.F.
- 11. A category 2 V.O.R. or a category 2 A.D.F.
- 12. A night VFR placard
- 13. Spare fuses

The following placard must be displayed on the instrument panel.

*VFR DAY AND NIGHT FLIGHT  
IN NON ICING CONDITIONS*

**Electric power supply failure due to battery failure**

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

- battery, alternator and radio (if installed) circuit breakers ..... off
- battery switch .....on
- alternator switch .....on
- Notice that circuits are again switched on.
- Reset only the switches necessary to ensure flight safety.

**Electric power supply failure**

Refer to section 3.

**Recommendation for night operation**

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

**Normal procedure for night flight**

These procedures complete those of section 4.

**Preparation**

Study of the meteorological report, in order to avoid flight in dangerous conditions (minima, climbing...)

Verify that fuel and oil quantities comply with regulations.

**Before flight**

Verify operation of:

- strobe lights
- navigation lights
- landing and taxi lights
- day/night selector switch
- emergency torch on board

**Taxiing**

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

**Before take-off**

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

**Take off**

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

**Use of night lighting**

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



## **5. EVRA (3 BLADES) TR5 180-102/140-CR 11 LOW PITCH PROPELLER, AND FVA-23-V2 MUFFLER**

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### **1- Description**

The 3 blade EVRA propeller is ground adjustable in order to meet the various uses of an airplane.

The pitch setting is 17° for the DR 400/180R.

### **2- Limitation**

The VNE is 295 km/h (159 KT)

Airspeed indicator marking

Red line: 295 km/h (159 KT)

### **3- Emergency procedures**

In case of abnormal engine vibrations:

Reduce rpm and speed, land on the nearest airfield and have the fixing of the blades checked as well as those of the muffler.

### **4- Normal procedures**

Take-off: minimum rpm 2400

Initial climb with flaps at 1<sup>st</sup> notch

V<sub>x</sub> = best angle of climb speed: 120 km/h

V<sub>y</sub> = best rate of climb speed: 140 km/h

Normal climb flaps up (retracted)

V<sub>x</sub> = 130 km/h (70 KT)

V<sub>y</sub> = 145 km/h (78 KT)

### **5- Performance**

#### **Noise limitation**

In compliance with the decree dated 03.04.1980, the maximum acceptable noise level for the DR400/180R aircraft at a certified gross weight of (2205 lb) 1000 kg is 73.3 dB (A).

The noise level determined under the conditions of the above mentioned decree, at max. continuous power is 68 dB (A).

In compliance with the decree dated 30.07.1975, the DR400/180R aircraft has received the noise limitation certificate nr N45 dated 21 April 1987.

**Take-off performance**Without wind, flaps 1<sup>st</sup> notch.

- In each cell: - total distance in meter (m) from stop to 15 m (50 ft) clearance at  $v=1.3 V_{s1}$ .  
 - (ground run to reach  $1.1 V_{s1}$ ).

Headwind influence : Multiply by 0.79 per 10 kt  
 Multiply by 0.64 per 20 kt  
 Multiply by 0.53 per 30 kt

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 1000 kg	
		Paved runway	Unpaved runway
0	-5	360 (180)	410 (230)
	Std = 15	400 (205)	455 (260)
	+35	440 (225)	505 (290)
4000	-13	475 (240)	550 (315)
	Std = 7	530 (275)	620 (365)
	+27	590 (305)	695 (410)
8000	-21	640 (325)	765 (450)
	Std = -1	715 (370)	870 (525)
	+19	800 (415)	985 (600)

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 850 kg	
		Paved runway	Unpaved runway
0	-5	235 (115)	255 (135)
	Std = 15	255 (125)	280 (150)
	+35	280 (140)	310 (170)
4000	-13	305 (150)	335 (180)
	Std = 7	335 (165)	375 (205)
	+27	370 (185)	415 (230)
8000	-21	395 (200)	450 (255)
	Std = -1	445 (225)	510 (290)
	+19	490 (250)	570 (330)

**Climb performance**

Standard atmosphere, MTOW 1000kg

Flaps 1<sup>st</sup> notch (take-off)Maximum vertical speed at sea level:  $V_z = 4.54$  m/sBest rate of climb speed:  $V_y = 140$  km/h (76 KT)Best angle of climb speed:  $V_x = 120$  km/h (65 KT)

Decrease by 0.25 m/s per 1000 ft

Flaps up (retracted)

Maximum vertical speed at sea level: 5 m/s

Best rate of climb speed:  $V_y = 145$  km/h (78 KT)Best angle of climb speed:  $V_x = 130$  km/h (70 KT)

Decrease by 0.25 m/s per 1000 ft

Operational ceiling: 15 400 ft at  $V_y = 135$  km/h

Weight influence: +0.6 m/s per 100 kg decrease

Temperature influence: -5% per each 10°C above standard

**Cruise performance**

Maximum weight 1000 kg.

Optimum mixture setting

Altitude (ft)	Power %	RPM	Fuel Consumption (l/h)	True airspeed (km/h)	Endurance (h.min)	Range (km)
0	65	2600	33.3	189	3.15	610
	55	2500	28.2	178	3.50	690
	45	2300	23	156	4.45	740
5 500	65	2690	33.3	201	3.15	650
	55	2600	28.2	188	3.50	720
	45	2400	23	167	4.45	790
10 500	60	2690	30.8	201	3.30	700
	55	2650	28.2	196	3.50	750
	45	2500	23	177	4.45	840

**Landing performance**Without wind, flaps 2<sup>nd</sup> notch.

In each cell: - total distance in meter (m) from 15 m (50 ft) clearance at  $V=1.3 V_{so}$  to stop.  
 - (ground run after touch down at  $V_{so}$ ).

Headwind influence : Multiply by 0.79 per 10 kt  
 Multiply by 0.64 per 20 kt  
 Multiply by 0.53 per 30 kt

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 1000 kg	
		Moderate braking Paved runway or unpaved runway	No braking Unpaved (grass) runway
0	-5	445 (205)	550 (310)
	Std = 15	470 (220)	580 (330)
	+35	500 (235)	615 (350)
4000	-13	490 (230)	605 (345)
	Std = 7	520 (250)	640 (370)
	+27	550 (270)	680 (400)
8000	-21	540 (260)	670 (390)
	Std = -1	575 (280)	715 (420)
	+19	610 (300)	760 (450)

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 800 kg	
		Moderate braking Paved runway or unpaved runway	No braking Unpaved ( grass) runway
0	-5	380 (165)	460 (245)
	Std = 15	400 (175)	490 (265)
	+35	420 (190)	515 (285)
4000	-13	410 (185)	500 (275)
	Std = 7	435 (200)	535 (300)
	+27	460 (215)	565 (320)
8000	-21	450 (205)	555 (310)
	Std = -1	480 (225)	590 (335)
	+19	505 (240)	625 (360)

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## **6. EVRA (3 BLADES) TR5 180-102/140-CR 11 HIGH PITCH PROPELLER, AND FVA-23-V2 MUFFLER**

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### **1- Description**

The 3 blade EVRA propeller is ground adjustable in order to meet the various uses of an airplane.

The pitch setting is 22.5° for the DR 400/180R.

### **2- Limitation**

The VNE is 295 km/h (159 KT)

Airspeed indicator marking

Red line: 295 km/h (159 KT)

### **3- Emergency procedures**

In case of abnormal engine vibrations:

Reduce rpm and speed, land on the nearest airfield and have the fixing of the blades checked as well as those of the muffler.

### **4- Normal procedures**

Take-off: minimum rpm 2105

Initial climb flaps 1<sup>st</sup> notch

V<sub>x</sub> = best angle of climb speed: 120 km/h

V<sub>y</sub> = best rate of climb speed: 140 km/h

Normal climb flaps up (retracted)

V<sub>x</sub> = 130 km/h (70 KT)

V<sub>y</sub> = 160 km/h (86 KT)

### **5- Performance**

#### **Noise limitation**

In compliance with the decree dated 03.04.1980, the maximum acceptable noise level for the DR400/180R aircraft at a certified gross weight of 1000 kg (2205 lb) is 73.3 dB (A).

The noise level determined under the conditions of the above mentioned decree, at max. continuous power is 71 dB (A).

In compliance with the decree dated 30.07.1975, the DR400/180R aircraft has received the noise limitation certificate nr N45 dated 21 April 1987.

**Take-off performance**Without wind, flaps 1<sup>st</sup> notch.

In each cell: - total distance in meter (m) from stop to 15 m (50 ft) clearance at  $v=1.3 V_{s1}$ .  
 - (ground run to reach 1.1  $V_{s1}$ ).

Headwind influence: Multiply by 0.79 per 10 kt  
 Multiply by 0.64 per 20 kt  
 Multiply by 0.53 per 30 kt

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 1000 kg	
		Paved runway	Unpaved runway
0	-5	455 (230)	525 (300)
	Std = 15	505 (245)	600 (350)
	+35	560 (290)	655 (385)
4000	-13	605 (310)	740 (445)
	Std = 7	680 (345)	845 (510)
	+27	755 (390)	950 (585)
8000	-21	840 (425)	965 (550)
	Std = -1	930 (520)	1100 (645)
	+19	1030 (535)	1205 (710)

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 900 kg	
		Paved runway	Unpaved runway
0	-5	360 (180)	405 (225)
	Std = 15	400 (200)	455 (255)
	+35	440 (225)	500 (285)
4000	-13	475 (240)	550 (315)
	Std = 7	530 (270)	620 (360)
	+27	585 (300)	690 (405)
8000	-21	635 (320)	765 (450)
	Std = -1	715 (365)	870 (520)
	+19	795 (410)	980 (595)

**Climb performance**

Standard atmosphere, MTOW 1000kg

Flaps 1<sup>st</sup> notch (take-off)Maximum vertical speed at sea level:  $V_z = 3.65$  m/sBest rate of climb speed:  $V_y = 140$  km/h (76 KT)Best angle of climb speed:  $V_x = 120$  km/h (65 KT)

Decrease by 0.25 m/s per 1000 ft

Flaps up (retracted)

Maximum vertical speed at sea level: 4.25 m/s

Best rate of climb speed:  $V_y = 160$  km/h (86 KT)Best angle of climb speed:  $V_x = 130$  km/h (70 KT)

Decrease by 0.25 m/s per 1000 ft

Operational ceiling: 12 500 ft at  $V_y = 130$  km/h

Weight influence: +0.6 m/s per 100 kg decrease

Temperature influence: -5% per each 10°C above standard

**Cruise performance**

Maximum weight 1000 kg.

Optimum mixture setting

Altitude (ft)	Power %	RPM	Fuel Consumption (l/h)	True airspeed (km/h)	Endurance (h.min)	Range (km)
0	75	2400	39	218	2.45	600
	65	2200	33.3	198	3.15	650
5 500	75	2600	39	238	2.45	655
	65	2400	33.3	217	3.15	715
	55	2200	28.2	197	3.55	765
8500	75	2690*	39	246	2.45	675
	65	2500	33.3	227	3.15	750
	55	2300	28.2	207	3.55	805
10 500	65	2600*	33.3	237	3.15	780
	55	2400	28.2	215	3.55	835

\* : Full throttle

**Landing performance**Without wind, flaps 2<sup>nd</sup> notch.

In each cell: - total distance in meter (m) from 15 m (50 ft) clearance at  $V=1.3 V_{so}$  to stop.  
 - (ground run after touch down at  $V_{so}$ ).

Headwind influence : Multiply by 0.79 per 10 kt  
 Multiply by 0.64 per 20 kt  
 Multiply by 0.53 per 30 kt

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ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 1000 kg	
		Moderate braking Paved runway or unpaved runway	No braking Unpaved (grass) runway
0	-5	445 (205)	550 (310)
	Std = 15	470 (220)	580 (330)
	+35	500 (235)	615 (350)
4000	-13	490 (230)	605 (345)
	Std = 7	520 (250)	640 (370)
	+27	550 (270)	680 (400)
8000	-21	540 (260)	670 (390)
	Std = -1	575 (280)	715 (420)
	+19	610 (300)	760 (450)

ALTITUDE (feet)	TEMPERATURE (°C)	WEIGHT 800 kg	
		Moderate braking Paved runway or unpaved runway	No braking Unpaved ( grass) runway
0	-5	380 (165)	460 (245)
	Std = 15	400 (175)	490 (265)
	+35	420 (190)	515 (285)
4000	-13	410 (185)	500 (275)
	Std = 7	435 (200)	535 (300)
	+27	460 (215)	565 (320)
8000	-21	450 (205)	555 (310)
	Std = -1	480 (225)	590 (335)
	+19	505 (240)	625 (360)



## 7. CABLE WINCH (CABLE WINDER)

### SECTION 1 - DESCRIPTION

The electrical winch can automatically wind in the cable in flight by simply pressing an electrical switch.

The operation can be carried out at high speed with a short reel-in time.

If the electrical winch fails, the conventional hook can easily be brought into service.

### Description of system components

#### Control console

**ON/OFF** Three position toggle switch. One press for "ON" to start automatic winding. If problems arise, one position for "OFF" to stop the automatic winding operation.

**Indicator lamp** Orange control light to show the motor is energized.

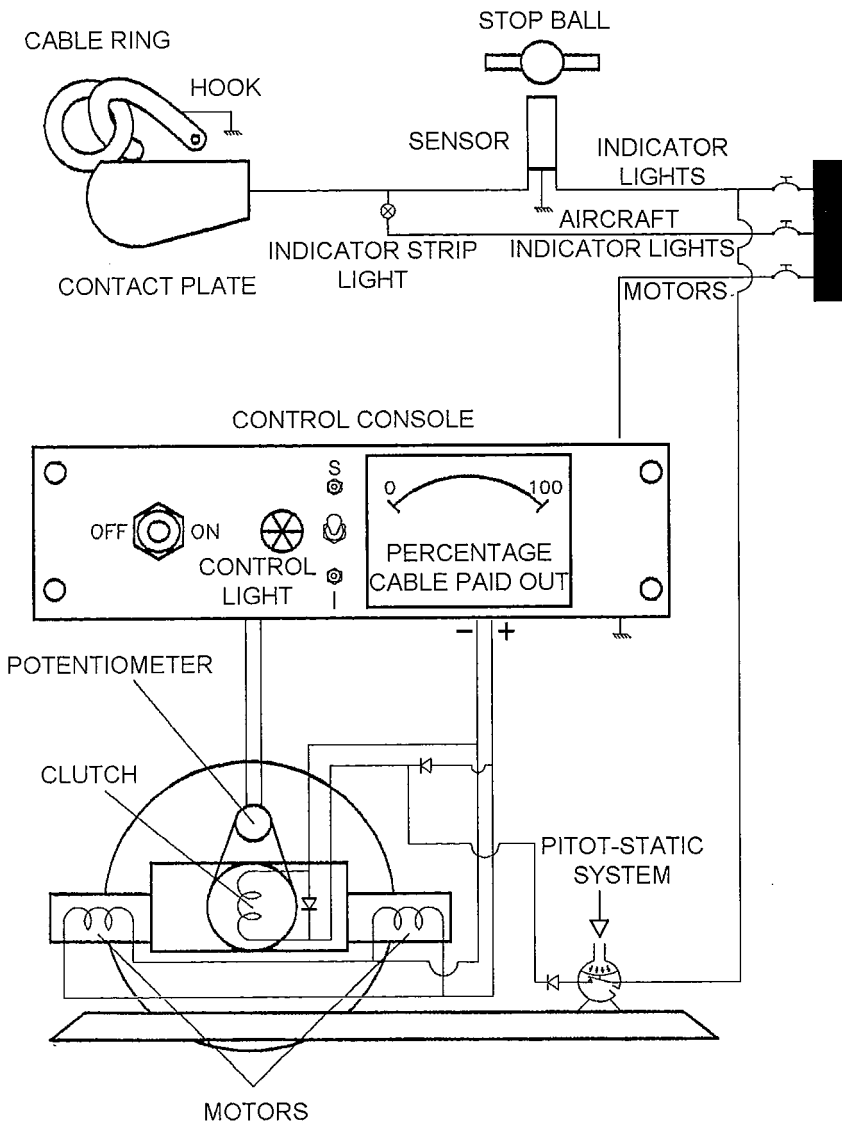
**Needle indicator** Indicates the length of cable paid out as a percentage, or the current consumed by the motors.

**Toggle switch and I and S trimmer**

When the toggle switch is at S (usual position), the indicator needle shows the percentage of cable length paid out. The trimmer S is used to set the 100 per cent reading whatever the length of cable used when the cable is fully paid out. Before setting the 100 per cent reading, the 0 per cent reading must be set with the cable fully wound in by mechanically adjusting the pay-out potentiometer next to the motors.

When the toggle switch is moved to I, the needle indicates the current drawn by the motors. The motor cut-out limit in the event of overload can be set by the trimmer I.

### Cable winch schematic



## **Cable Winder**

The winder includes a drum around which the cable is wound, two winding motors, an electromagnetic clutch, an adjustable friction brake, a pitot-static air capsule and a potentiometer.

The motors are energized in flight or on the ground at the same time as the clutch so that the cable can be wound in by moving the toggle switch on the control console to the "ON" position.

The clutch is energized automatically in flight by the pitot-static capsule connected to the aircraft system when it detects a speed above a set limit. This prevents cable being paid out inadvertently during flight.

The potentiometer mechanically connected to the drum provides an indication to the control console of the percentage of cable paid out.

The friction brake prevents the drum from spinning as the cable is paid out on the ground.

## **Tubular Mount**

The tubular mount includes a cable-cutter, a standard hook, a cable-extended proximity detector for the winder and a cable attached detector for the standard hook.

The cable-cutter is activated by the control handle on the aircraft instrument panel. It is used for cutting through the cable in an emergency.

The standard hook can be brought into service easily if the winder fails. Jettison is controlled by the same handle as the cable-cutter. The cable fully paid out detector for the winder and the cable attached detector for the standard hook activate the same indicator light on the instrument panel.

## **Control Handle**

The control handle on the instrument panel is used for cutting the winder cable and, when the standard hook is used, for jettisoning the cable. The changeover from the cable-cutter function to the jettison function is made by removing the control cable from the cable-cutter lever and attaching it to the standard hook lever. Both levers are on the tubular mount, and accessible from outside. A removable placard must be placed next to the control handle in accordance with its specific use.

Bringing the standard hook into service

- Remove the cone.
- Remove the cable from the cable-cutter lever handle (on the tubular mount) and attach it to the standard hook lever.
- Place the placard "Towing Hook / Pull to release Cable" near the handle on the instrument panel instead of the "Rope Shears" placard.
- Test that it is working.

## SECTION 2 - LIMITATIONS

The limitations of Section 2 are not affected by installation of the electrical winder.

## SECTION 3 - EMERGENCY PROCEDURES

The towing operation emergency procedures are not affected when using the Aératur standard hook. The following procedures are valid for operation with the cable winder only.

### TOWING INCIDENTS

#### Emergency Jettison

When the towing operation must be interrupted by the towing aircraft because of an unusual flight position relative to the glider, failure of the glider hook or other causes, proceed as follows:

Cable-cutter ..... pull the handle fully  
 Winder..... do not activate  
 Needle indication..... 100 per cent  
 Wing-mounted mirror..... check that the cable has been cut  
 Landing .....as normal

#### ATTENTION

If the glider is in a high position, the towing aircraft may find itself very rapidly in an uncontrollable situation.

**Cable Failure**

The remaining length of cable must be wound in:

Push button ..... to on  
 Wing-mounted mirror ..... check the remaining length  
 Push button ..... off when 5 m remains  
 Landing ..... with corresponding extra clearance

**INCIDENTS DURING CABLE WINDING****Loop Formation**

If loops form and prevent the cable from winding in normally, the motor should stop because of the increased effort encountered.

Push button ..... to off  
 Orange motor control lamp ..... off  
 Needle reading ..... note percentage still paid out  
 Wing-mounted mirror ..... check situation  
 Landing ..... with corresponding extra clearance

**ATTENTION**

When the cable cannot be fully wound in, care must be taken not to catch any obstacles during final approach. This could damage the towing aircraft or even bring it down.

**Motor Stoppage**

The motor may stop because of excessive speed of the towing aircraft requiring an unusually large winding force.

Speed ..... reduced  
 Motor circuit breakers ..... checked  
 Push button ..... to on

**Motor fails to Stop**

Push button ..... to off  
 Orange motor control light ..... off  
 If the orange motor control light is still on:  
 Motor circuit breaker ..... pull

**Incident with pitot-static sensor**

If the pitot-static sensor causes a leak in the aircraft system, the aircraft's airspeed indicator may give incorrect readings.

Choose a landing ground with a long enough runway.

Disregard the speed indications.

Estimate speed.

**REMARK**

Stall warning operation is not affected.

**SECTION 4 - NORMAL PROCEDURES****Pre-Flight Inspection**

The following inspections specifically of the cable winder must be made in addition to the NORMAL inspections in Section 4.

- 1 - Visually check the cable-cutter. Check the blade moves freely, but taking care not to nick the cable.
- 2 - Visually check the cable by pulling it: check there is no stiffness at the same time.
- 3 - Check the condition of the ring attachment knots.
- 4 - When the battery switch is on, the needle should read 100 per cent and the tow-hook indicator on the instrument panel strip should be on.
- 5 - Wind in the cable. The orange control light on the control console should come on; the orange indicator light on the instrument panel strip should go off. Check the winding operation is smooth.
- 6 - Check that the motor stops (orange control light on the control console goes off). The needle should indicate 0 per cent.

### **Towing Operations**

Place the towing aircraft in front of the glider.

Pull the cable and hook up the glider.

When the glider is ready, taxi slowly to pay out the cable.

When the tow-hook indicator light on the instrument panel strip comes on, check that the needle indicates 100 per cent.

Take off in the same way as with a standard hook.

#### **ATTENTION**

Do not accelerate before the tow-hook indicator light on the instrument panel strip comes on. This indicator light shows that the cable is fully paid out.

If the aircraft accelerates before the cable is fully paid out, the cable will continue to unwind without pulling the glider.

At the instant it is fully paid out, the cable will tighten suddenly and the glider may be catapulted by the elasticity of the cable.

This may cause the cable to break and could damage the glider and towing aircraft.

#### **ATTENTION**

If the cable is taut when the glider releases, loops may form.

Take care that the cable is not taut at the moment the glider is released.

### **After Release**

Move the toggle switch to on. Check that the orange control lamp on the control panel is on and that the orange indicator light on the instrument panel strip is off. Monitor the cable winding operation during the descent.

### **Before Landing**

Check that the needle reads 0 per cent.

Check with the wing-mounted mirror that the cable is wound in.

## **SECTION 5 - PERFORMANCE**

Performance in Section 5 is not affected by installation of the cable winder.

## **SECTION 6 - WEIGHT AND BALANCE**

With a 50 m cable, the total weight of the system is about 15.7 kg, and the moment arm is 2.57 m.

The weight and moment are included in the aircraft empty weight and moment if the cable winder is factory fitted.

## **8. GPS**

---

### **SECTION 1 - GENERAL POINTS**

The description of the GPS system and the operational procedures are detailed in the pilot's guide provided with the instrument.

### **SECTION 2 - LIMITATIONS**

The placard below is to be added to those on section 2:

**ATTENTION**

GPS must not be used as primary mean of navigation

### **SECTION 3 - EMERGENCY PROCEDURES**

Unchanged

### **SECTION 4 - NORMAL PROCEDURES**

Unchanged

### **SECTION 5 - PERFORMANCE**

Unchanged

### **SECTION 6 - WEIGHT AND BALANCE**

Unchanged





## AIRCRAFT FLIGHT MANUAL SUPPLEMENT

### NIGHT VFR

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

**This supplement supersedes any existing supplement concerning Night VFR.**

#### Applicability

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

#### List of current pages

Pages	Date
1	November 26 <sup>th</sup> , 2010
2	November 26 <sup>th</sup> , 2010
3	November 26 <sup>th</sup> , 2010
4	November 26 <sup>th</sup> , 2010
5	November 26 <sup>th</sup> , 2010

#### Approval

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



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

**SECTION 0. DESCRIPTION**

Not affected.

**SECTION 1. DESCRIPTION**

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

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

Flight and navigation

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

Communication

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

Surveillance

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



## AIRCRAFT FLIGHT MANUAL SUPPLEMENT

### SECTION 2. LIMITATIONS

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

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

### SECTION 3. EMERGENCY PROCEDURES

The following emergency procedures complete those of the section 3.

#### Lighting 1 and/or 3/radio failure

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

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

#### Light failure

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

#### Battery failure (not applicable to DR400/135CDI)

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

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

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



**SECTION 4. NORMAL PROCEDURES**

These procedures complete those of section 4.

**Preparation**

Study of the meteorological report, in order to avoid flight in dangerous conditions (minima, climbing...).

Verify that fuel and oil quantities comply with regulations.

**Before flight**

Verify operation of:

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

**Lighting**

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

**Taxiing**

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

**Before take-off**

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

**Aligning**

- Directional gyro setting

**Take-off**

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



## AIRCRAFT FLIGHT MANUAL SUPPLEMENT

---

### **Climb and cruise**

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

### **Landing**

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

### **After engine shut down**

- Light ..... off

### **SECTION 5. PERFORMANCE**

Not affected

### **SECTION 6. WEIGHT AND BALANCE**

Not affected

### **SECTION 7. OPTIONAL EQUIPMENT**

Any "VFR flight" supplement is cancelled and replaced by this supplement.



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

## **AIRCRAFT FLIGHT MANUAL SUPPLEMENT**

### **CARBONE (CO) MONOXIDE DETECTOR**

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

**This supplement supersedes any existing supplement concerning the CO detector.**

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

### **APPLICABILITY**

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



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

## **1. GENERAL**

Carbon monoxide is a colourless, odourless and tasteless toxic gas.

The symptoms of CO poisoning are, in order of appearance and of intensity: sensation of lethargy, heat, cranial tension;

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

CO is particularly found in exhaust gases of the plane. The cabin being warmed by the air which circulated around the exhaust pipes, a creek in these pipes can result in penetration of CO into the cabin.

As a safety precaution, a CO detector is recommended inside the cabin, in the field of vision of the pilot.

## **1. LIMITATIONS**

No change

## **2. EMERGENCY PROCEDURES**

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

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

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

## **3. NORMAL PROCEDURES**

PRE FLIGHT INSPECTION

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

## **4. PERFORMANCE**

No change.

## **5. WEIGHT AND BALANCE**

No change.





## VHF TRANSCEIVER VOR/ILS RECEIVER GARMIN GTN 650 GPS RECEIVER

This supplement includes the information to be provided to the pilot, as required by the certification basis.

This supplement must be inserted in the flight manual approved by EASA when the GTN 650 for VFR use is installed.

The information either supplements or overrides those in the approved flight manual.

The flight manual remains valid for what concerns limitations and operating procedures as well as performance not included in this supplement.

### Applicability

Aircraft type and model		Manufacturer change
DR400	All models	Minor change : Dossier d'Evolution Technique DET n°130201

### Approval

Amendment	Description	Date	Approval
//////	Original issue	19 March 2013	EASA. 10044100

### List of effective pages

Pages	Date
1 to 4	March 18 <sup>th</sup> , 2013



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

## **GENERAL**

The GTN 650 is a radio communication and radio navigation integrated unit which features GPS receiver/computer, VOR ILS receiver/converter and VHF transceiver.

**This supplement does not constitute an authorization to operational use.**

The installation of the GARMIN GTN 650 complies with GARMIN STC EASA 10037574 for a VFR use.

### **1. DESCRIPTION**

No change.

### **2. LIMITATIONS**

#### **General**

The GTN 650 must be used in accordance with the owner's manual.

The cockpit reference guide 190-01004-03 Rev. C NOV 2012 or latest revision must be available on board the aircraft.

The GTN 650 must use the latest approved versions of following softwares:

- Main: 3.00
- GPS: 5.00
- COM: 2.10
- NAV: 1.10

5 seconds after power-up, the main software version is displayed on the start-up self-test screen of the GTN 650.

The software reference indicated in the reference guide must conform to the one shown on the unit.

Navigation equipment required by the regulations for each flight phase must be available and in working condition.

The accuracy of the database cannot be guaranteed. Therefore, (if possible before the flight) the pilot must check, in the database, that the information to be used during the flight is current. This check shall be done against the official documentation.



### **Placards**

A limitation placard showing the following text:  
“USE OF GPS LIMITED TO VFR”  
is displayed next to the GPS.

### **3. EMERGENCY PROCEDURES**

System failures or abnormal conditions are shown by the display of a MSG annunciator issued by the unit. The “MSG” (MeSsaGe) annunciation informs the pilot of such situation.

#### **Loss of RAIM function**

When RAIM (Receiver Autonomous Integrity Monitor) is lost, use the other available means of navigation appropriate to the route and phase of flight. However, for route phase, GPS may still be used; in this case, position must be checked every 15 minutes with the use of alternate navigation means.

#### **Loss of GPS navigation**

When GPS navigation is lost or declared invalid, use the other available means of navigation.  
ATC must be contacted and informed, to return to a classic navigation.



#### **4. NORMAL PROCEDURES**

Normal procedures are described in the GARMIN GTN 650 cockpit reference guide with reference: 190-01004-03 Rév.C NOV 2012 or latest revision.

The GPS, VOR and ILS information is displayed on the GI 106A indicator when installed.

Information is selected by pressing the CDI key on the GTN 650.

This selection is shown by the light which is lit:

- VLOC (white light)      when VOR ILS is selected.
- GPS (green light)      when GPS is selected.

Other available information is announced by the lights installed close to the indicator and is the following:

- MSG amber color      blinks when GPS issues a message.  
                                     Stays on as long as a message is valid.
- WPT amber color      blinks when the aircraft is within 15 seconds of  
                                     a turning point announcing a change of course.  
                                     Stays steady when the aircraft is within 2  
                                     seconds of a turning point announcing a  
                                     change of course. The indicator goes off only  
                                     after the change of course is performed.

#### **5. PERFORMANCE**

No change.

#### **6. WEIGHT AND BALANCE**

No change.



**SUPPLEMENT**

**INSTRUMENT PANEL**

**HB-KHZ**

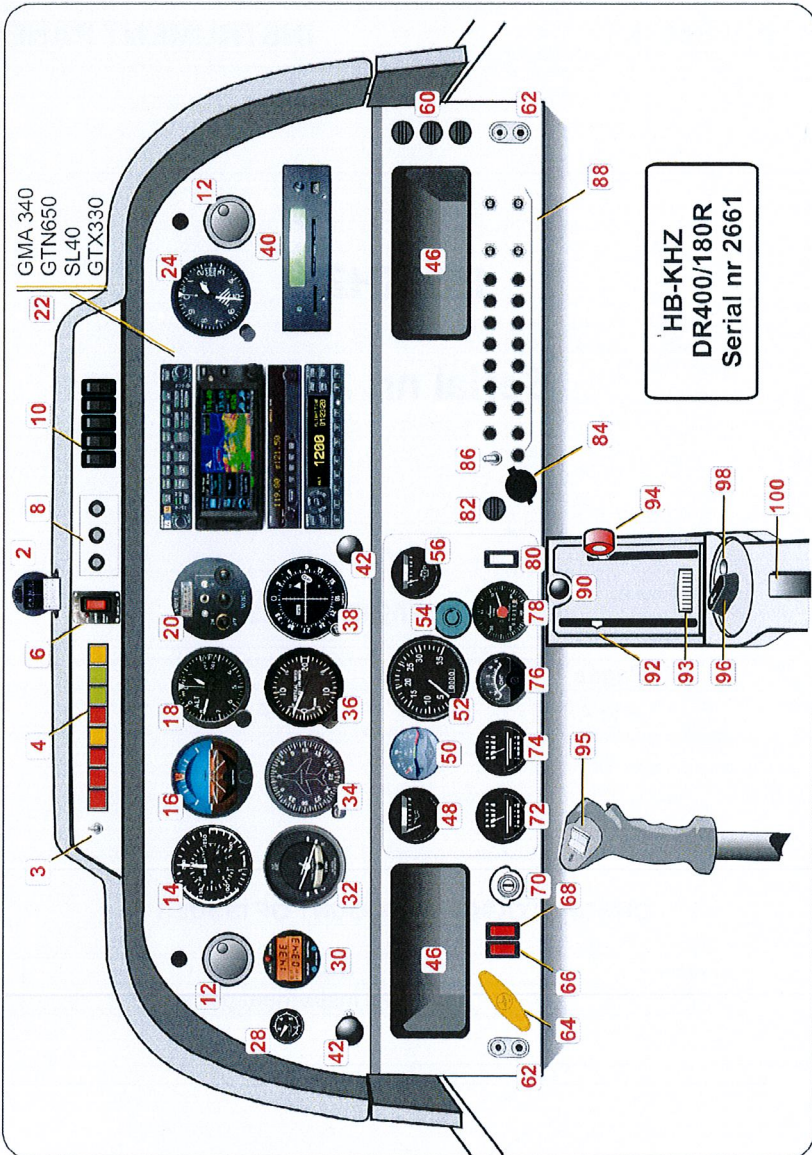
**Serial nr: 2661**

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1 to 4	April 2013

**CHRONOLOGICAL ACCOUNT OF ISSUES**

<b>Issue</b>	<b>Subject</b>
1	Original instrument panel.





2	Magnetic compass	54	Carburettor heat control
3	Lights test & day/night dimmer switch	56	Fuel pressure indicator
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16	Artificial horizon	82	Auxiliary tank control
18	Altimeter feet - mbar	84	12V socket
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## Zusätzliches Baumusterzeugnis

## Certificat de type supplémentaire No Z 25-00-01

## Supplemental Type Certificate

Dieses zusätzliche Baumusterzeugnis, ausgestellt für

Le présent certificat de type supplémentaire, établi au nom de

This supplemental type certificate, issued on behalf of

R. Maag  
Sunnmattweg 2  
Ch-5213 Villnachern

bescheinigt auf Grund der anwendbaren Verfügungen, dass die am ursprünglichen Baumuster des nachstehend bezeichneten Luftfahrzeuges oder Luftfahrzeugteiles vorgenommene Änderung, mit den zugehörigen Grenzen und Bedingungen, den Grundlufttüchtigkeitsanforderungen entspricht.

atteste, en vertu de l'examen partiel de type exécuté selon les ordonnances applicables, que la modification apportée au type original de l'aéronef ou de la partie d'aéronef désignée ci-après, avec les limites et conditions s'y rapportant, correspond aux exigences de navigabilité de base.

certifies, on the basis of the partial type certification executed, in accordance with the applicable orders, that the alteration carried out on the original type design of the aircraft or part thereof specified hereafter, with the pertinent limitations and conditions, is in conformity with the basis airworthiness requirements.

Grundmuster

Type de base

Basis type

Robin DR 400/180R, Robin DR 400/200 R  
Robin DR 300/180R  
Robin DR 400RP

Baumusterzeugnis Nr.

Certificat de type no

Type certificate No.

FDN No. 121

Lufttüchtigkeitsanforderungen

Exigences de navigabilité

Airworthiness requirements

FAR 23, Amdt. 23-1 bis 23-34

Beschreibung der Änderung

Description de la modification

Description of the alteration

Seileinzugsvorrichtung  
Typ RPM 01/88 ,RPM 04/95, RPM 05/95, RPM 11/01, RPM12/01  
Langenthaler Winde für Segelflugzeugschlepp

Die zusätzliche Baumusterzulassung stützt sich auf die im zugehörigen Geräte-Kennblatt enthaltenen Grenzen und Bedingungen.

La certification de type supplémentaire est fondée sur les limites et conditions contenues dans la fiche de navigabilité s'y rapportant.

The supplemental type certification is based on the limitations and conditions contained in the pertinent type certificate data sheet.

Die Gültigkeit dieses zusätzlichen Zeugnisses erlischt, wenn die Baumusterunterlagen oder der Nachweis der Lufttüchtigkeit nicht mehr vorhanden sind.

La validité du présent certificat supplémentaire expire lorsque les documents de type ou la preuve de navigabilité n'existent plus.

The validity of this supplemental certificate expires when the type design or the proof of airworthiness do not exist any more.

Ausgestellt am (Tag/Monat/Jahr)  
Délivré le (jour/mois/année)  
Issued on (day/month/year)

17.03.1989 / Erstausgabe  
27.04.1996 / Ausgabe 2  
08.03.2001 / Ausgabe 3

BUNDESAMT FÜR ZIVILLUFTFAHRT  
OFFICE FEDERAL DE L'AVIATION CIVILE  
FEDERAL OFFICE FOR CIVIL AVIATION

Rolf Meier

**Halter des zusätzlichen  
Baumusterzeugnisses:**

R. Maag  
 Sunnmattweg 2  
 CH – 5213 Villachern

**Musterbezeichnung:**

Seileinzugsvorrichtung Typ RPM 01/88; RPM 04/05;  
 RPM 05/95; RPM 11/01; RPM 12/01

**Hersteller:**

AIRLA-Flugzeugservice  
 W. Bernhard  
 CH – 3368 Bleienbach

**Ausstellungsdatum des  
zusätzlichen  
Baumusterzeugnisses:**

17. März 1989

**Technische Daten**

**Beschreibung:**

Seileinzugsvorrichtung speziell für das Schleppflugzeug Robin  
 DR 400/180R, DR 400/200R, DR 400/RP, DR 300/180R

Die Anlage besteht aus folgenden Komponenten:

- Seileinzug / Trommelantrieb mit Seil
- Klinikensupport mit Kappvorrichtung
- Elektrische Steuerung und Seillängenanzeige

**Gewicht & Schwerpunkt:**

- Masse der gesamten Anlage mit 50 m Seil (Zunahme nach Einbau mit Ersatz des Originalklinken-Support):

Typ RPM 01/88	ca. 15.6 kg
Typ RPM 04/95	ca. 13.5 kg
Typ RPM 05/95	ca. 14.6 kg
Typ RPM 11/01 & 12/01	ca. 16.0 kg

- Hebelarm auf Flügelvorderkante:

Typ RPM 01/88	2.57 m
Typ RPM 04/95	2.29 m
Typ RPM 05/95	2.52 m
Typ RPM 11/01 & 12/01	2.67 m

**Betriebsgrenzen und Wartung:**

Siehe Anhang zum Flughandbuch. BAZL genehmigt:

Typ RPM 01/88	08.03.1989
Typ RPM 04/95	27.04.1996
Typ RPM 05/95	27.04.1996
Typ RPM 11/01 & 12/01	01.01.2001

**Elektrische Leistung:** Für DR 300- , 400/180R : 258 VA  
DR 400/200R  
Für DR 400 : 306 VA

**Schilder:** Die Einzugsvorrichtung muss wie folgt bezeichnet werden:

- Adresse STC-Halter
- STC No. Z 25-00-01
- P/N RPM 01/88 , 04/94, 05/95, 11/01; 12/01
- Serie Nummer S/N ...

**Lufttüchtigkeitsanforderungen:** FAR 23, Amdt. 23-1 bis 23-34  
BAZL TM-M 10.010-12  
BAZL TM-W 10.010-20

**Verbindliche Zeichen:**

Windenantrieb	Zeichnungen No. 1-138 & 1-146 No.200-0 (für Typ RPM 11/01 & RPM 12/01)
Klinkensupport	Zeichnungen No. 1-119 No.206-R (für Typ RPM 11/01 & RPM 12/01)
Einbau	Zeichnungen No. 3-135 & 3-139

**SUPPLEMENT TO AIRCRAFT**  
**FLIGHT MANUAL**  
**for**  
**Electrical powered Tow-Rope Winch**  
**TYPE RPM 11/01**  
**(Langenthaler-Winch)**

Aircraft-Manufacturer: Avions Robin SA

**Type of Aircraft: Robin DR 300-180R DR400-180R**  
**DR 400-200R DR 400RP**

This document must be permanently carried in the aircraft.  
It describes the operating procedures for the above mentioned equipment  
approved by FOCA STC No. 25-00-01.

The information included in this document completes or replaces that of the  
Original Flight Manual only in the indicated sections. All operating limitations,  
procedures and performances which are not included in this supplement are  
to be found in the Original Flight Manual.

Certified by the Federal Office for Civil Aviation

Signature:



Date:

22.08.01

**First edition: January 1<sup>st</sup>, 2001**

**Page 1 of 10**

## **SUPPLEMENT TO THE AIRCRAFT FLIGHT MANUAL RPM 11/01**

### **I. GENERAL**

No changes from with the Original Flight Manual

### **II. OPERATING LIMITATIONS**

No changes from with the Original Flight Manual

### **III. EMERGENCY PROCEDURES**

#### **REMARKS**

The emergency procedures during operation of the Aerazurhook remain unchanged the Original Aircraft Flight Manual.

The following remarks refer to the motor-driven rope winch only.

#### **3.1. DURING TOWING FLIGHT**

##### **3.1.1. EMERGENCY CUT-OFF**

***In case of unintended attitude during towing flight caused by the sailplane, by malfunction of the hook on the sailplane or, in case of intension due to other reasons, the following measures must be taken:***

#### **CAUTION**

If the sailplane is too far above its normal function the towplane can be forced into an uncontrolled attitude!

1. Emergency knife (yellow)
2. Rope winch

**PULL TO ITS LIMIT  
DO NOT OPERATE**

The rope indicator will continue to show 100%, but the rope will have been cut. The subsequent landing can be carried out normally.

**3.1.2. ROPE BREAK**

- |  |                     |
|--|---------------------|
| 1. Remaining rope length behind aircraft             | DETERMINE           |
| 2. Retract switch                                    | ON                  |
| 3. Retract switch ( with approx. 5m cable still out) | OFF                 |
| 4. Landing   | SUFFICIENT ALTITUDE |

6.

**3.2. DURING RETRACTION****3.2.1. UNINTENDED KNOT FORMATION**

In case of unintended knot formation in the rope, retraction will be interrupted and the motor will stop automatically.

- |                   |                        |
|-------------------|------------------------|
| 1. Retract switch | OFF                    |
| 2. Rope indicator | CHECK                  |
| 3. Landing        | SUFFICIENT<br>ALTITUDE |

**CAUTION**

Approaching aircraft must avoid under all circumstances the towing rope being caught by an obstacle (fence, tree etc.). This could cause severe damage to the aircraft or a crash.

**3.2.2. MOTOR STOPS**

- |                   |        |
|-------------------|--------|
| 1. Speed          | REDUCE |
| 2. Retract switch | ON     |
| 3. Retraction     | CHECK  |

**3.2.3. MOTOR DOES NOT STOP**

- |                                |       |
|--------------------------------|-------|
| 1. Retract switch              | OFF   |
| 2. Signal                      | CHECK |
| If signal continues to be red: |       |
| 3. Motor Circuit Breaker       | PULL  |

**IV. NORMAL OPERATING PROCEDURES**

Preflight-Check:

1. Visual check of cutting device, manual check of cutting knife for free movement  
**CAUTION: Do not damage the rope!**
2. Pull out the rope and check for condition, resistance during pulling.

3. Check condition of the knot at connecting rings, when a new rope is installed, make the knot according to annex A) than the motor stops, and than the indicator is at 0%.
4. Main switch ON, check rope signal for 100% indication.
5. Retract rope, check for smooth operation. Check signal for red colour.
6. With the rope retracted, check than the motor stops, and than the indicator is at 0%

### **Towing operation:**

#### Prior to take-off

- |  |                        |
|--|------------------------|
| 1. Towing aircraft on runway           | INTO POSITION          |
| 2. Rope                                | PULL OUT / ADJUST      |
| 3. When sailplane ready                | ROLL FORWARD           |
| 4. When "Towing Hook" lamp illuminates | CHECK ROPE SIGNAL 100% |
| 5. Take-off                            |                        |

### **ATTENTION**

Take-off only "ROPE OUT" signal is green;  
otherwise the rope will either break  
or the sailplane will be catapulted  
by the elasticity of the rope

#### After sailplane release

- |                   |                  |
|-------------------|------------------|
| 1. Flaps          | UP               |
| 2. Retract switch | ON               |
| 3. Signal         | CHECK FOR RED    |
| 4. During descent | CHECK RETRACTION |

#### Before landing

- |                |              |
|----------------|--------------|
| 1. Rope signal | CHECK FOR 0% |
|----------------|--------------|

#### Approach (Final)

- |                   |                          |
|-------------------|--------------------------|
| 1. Retract switch | ON                       |
| 2. Rope signal    | 0%                       |
| 3. Visual check   | MIRROR ON LEFT WING      |
| 4. Landing        | WITH SUFFICIENT ALTITUDE |

## V. FLIGHT PERFORMANCE

No change from Original Flight Manual

## VI. WEIGHT AND BALANCE

Weight of complete equipment (incl. 50 m rope) as additional weight after installation on the aircraft: 16,05 kg

Lever arm: 2,67 m

( Values included in tare weight)

## VII. DESCRIPTION OF EQUIPMENT

The motor-driven rope winch type RPM 11/01 was special developed for the towing aircraft type Robin-Remorquer. The conceptional layout of the equipment meets with the following requirements:

- Retraction of rope at high speeds > 200 km/h
- Short retraction intervals 40 m rope length < 60 s.
- Emergency knife
- Electric indicator of rope extrusion
- Automatic motor stop after rope retraction
- ***Indication of rope in case of malfunction***
- Rope extrusion force 40 to 50 N .
- Designed for easy servicing
- Reasonable weight

### 7.1. DESIGN OF ROPE RETRACTION EQUIPMENT

The equipment consists of the following major components:

- Hook support
- Drum drive
- Electrical control
- Protective cover with guiding pipe
- Rope

#### 7.1.1. HOOK SUPPORT

The support transfers the force from the rope or from the force blocker to the wooden fuselage. The front end of the pipe carries the guillotine device. The knife is operated by the pilot in case of emergency by means of the normal release lever. The Aerazur-hook can be operated by the same lever after moving the cable. The cut-off knife must be **removed** when operating the Aerazur-hook. The operational device will be indicated to the pilot by an exchangeable sign.



The force blocker is equipped with an electronic proximity switch, indicating "Locked" by illuminating a lamp if the force blocker is **normal load**.

### **7.1.2. DRIVE THE DRUM**

4

The drum drive is mounted on a profiled aluminium support, which is fixed by four screws to the fuselage of the aircraft on the left side near the installation opening. The drum is driven by an electric motor and via special gearing.

On the ground the towing rope is pulled out manually against a friction brake. In normal condition the brake is adjusted for 40-50N pulling force. This value can be adjusted by means of a spring.

A potentiometer drive detect the revolutions of the drum by means of a timing belt.

### **7.1.3. ELECTRICAL CONTROL**

#### **Rope signal**

A precision potentiometer is driven by the drum and a timing belt with reducer and gearing. Indication of the rope extension is carried out on a %-scale by means of an ohmmeter-circuit. Adjustment of the pulled-out length of the rope is done as follows:

Mechanical adjustment of the potentiometer for a fully retracted so as to indicate zero (Rope Off = 0 %). Now the rope is fully retracted.

Thereafter the indication on trimmer "S" can be adjusted for 100% with a small screwdriver.

(An adjustment of 100% is possible for a range of apprx. 50 or 80 revolutions of the drum).

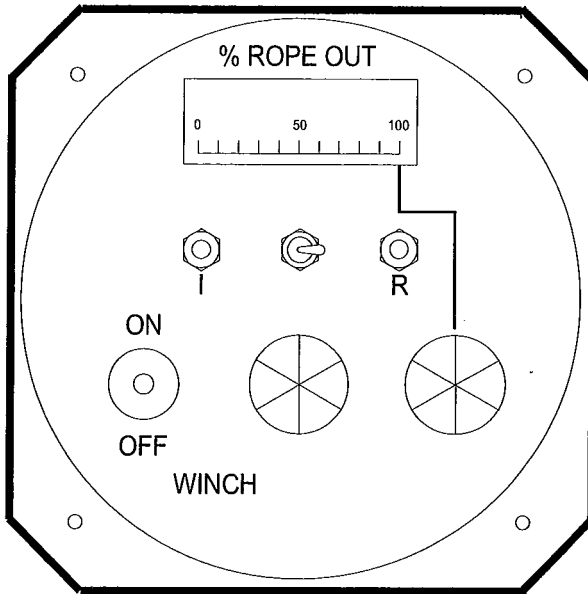
#### **Motor Control**

The motor control is switched "ON" by a short push of the button. As long as thr motor is on, the signal is red. Normally, the motor is switched off if the motor current which is proportional to the torque, exceeds the value given by the trimmer "I". With correct setting, this is the case when the end of the rope, or a knot comes to the cable entry and stops there. The motor can be stopped at any time by pushing the switch to "OFF" (e.g. in case of a rope break).

Pushing the small switch to "I" direction switches the instrument to an ammeter indication for the motor current with a range of 30A at 100%.

After retraction or in case of interference (unintended knots on the rope) the motor stops automatically due to a higher current consumption.

The cut-off value of the current must be adjusted so as to avoid early switching off through additional tension of rope by drag during quick descent.



#### 7.1.4. ROPE

Normal operation of the equipment requires the use of ropes from synthetic fibre with diameters from 7 to 8 mm and with a minimum tensile strength of 1000 daN. Other towing ropes are not permitted. The length of the rope can be chosen between 40 and 60 m. For narrow coiling on the drum rigidly braided ropes from synthetic fibre are not permitted.

The influence of UV radiation on the rope can be ignored for this type of motor-driven winch because of the equipment's protected installation within the fuselage of the aircraft.

The rope is guided in the centerline of the hook support and covered by an aluminium pipe in its length within the aircraft. In order to avoid damages of the rudder and of the fuselage the connector to the sailplane at the end of the rope is covered by a rubber joint.

See instructions TM-M F 10.010-12 dated 30.II.1987.

#### **ATTENTION**

If a new type of rope is installed, a check must be made that the guillotine can cut it.

### **7.1.5. ROPE GUIDING DEVICE**

For controlled guiding between the hook support and the drum the rope is being guided within a pipe, so that the rope does not get entangled within the fuselage of the aircraft.

### **7.2. TECHNICAL DATA**

- Time of rope retraction at  $v = 200 \text{ km/h} < 60 \text{ Sec.}$  for 40 m rope length.
- Extension force approx. 40 - 50N
- Rope retraction at  $V = 285 \text{ km/h}$  is possible
- Usable length of towing rope 30 through 60 m
- Current consumption max. 30 A

## **VIII. MAINTENANCE**

### **8.1. 50/100-h-CHECK**

- Pull out the rope completely and check condition
- Clean and check cut-off device, re-grind if necessary.
- Disassemble friction brake, check brake lining for damage.
- Adjust friction brake for 40 - 50N tension.
- Check all screws on the drum unit for tightness.
- Clean drum drive.
- Disassemble and clean pipe elbow in the area of the installation opening.
- Check inside of guiding pipe for wear (visual check!),  
exchange pipe if wall thickness is below 0,8mm.
- Check force blocker for tightness.
- Disassemble and clean inner parts of the hook support.
- Check hook support inside and out for corrosion.

### **8.2. REPLACEMENT OF ROPE**

In case of serious wear and in any case after 12 months towing rope must be replaced by a new one. ( Form knot according to Annex A )

### 8.3. PRESSURE GAUGE

Experience has proven that a 3mbar setting (80km/h) complies with the requirements.

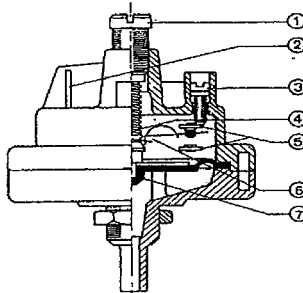
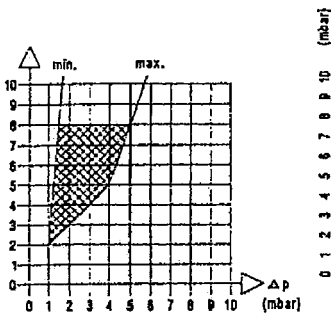
#### Range of adjustment

Adjustment range: 2 ... 8 mbar

Upper

Switch point (mbar)

Contact opening

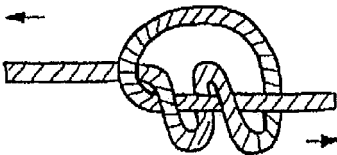


- Legend to the sectional drawing
1. Adjustment of switch point
  2. AMP connectors
  3. Adjustment of switch difference
  4. Pressure spring
  5. Change-over contact
  6. Snap contact
  7. Diaphragm

## ANNEX A

### Knots for force blocker

The knots show below can be used for the force blocker.



RORINGSTEK

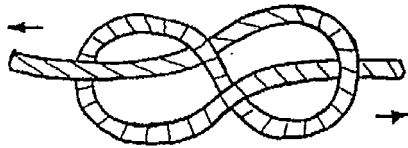


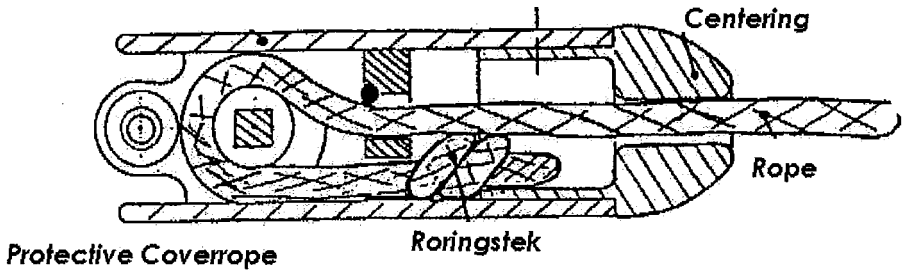
FIGURE OF EIGHT KNOT

- 10 -

**Knot for rope end**

8.

The sketch shows the connection of the end of the rope with the rope coupling.

**ANNEX B****Modification with Aerazur- or Tost-Hook**

Using the Aerazur- or the Tost Hook requires the following modifications

- 1.- Disassemble the protective cone with fastening device from the end of the hook support.
- 2.- Secure the guiding pipe in the hook support with a screw .
- 3.- Secure rope by a knot ( for rope on the drum only )
- 4.- Disassemble the guillotine.
- 5.- Fix the operating cable to the Aerazur- Tost-Hook .
- 6.- Mount plate on "Towing hook".
- 7.- Conduct functional test.