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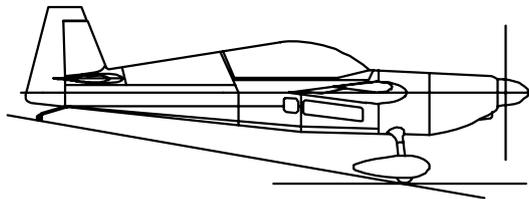
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# INFORMATION MANUAL

## *EXTRA 300*

### MANUFACTURER

EXTRA Flugzeugproduktions- und Vertriebs- GmbH  
Flugplatz Dinslaken  
46569 Hünxe, Federal Republic of Germany



### WARNING

**This is an Information Manual and may be used for general purposes only.**

**This Information Manual is not kept current.**

**It must not be used as a substitute for the official FAA Approved Pilot's Operating Handbook required for operation of the airplane.**

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THIS HANDBOOK SHALL ALWAYS BE CARRIED ON BOARD DURING FLIGHT.

PILOTS OPERATING HANDBOOK PREPARED  
BY:

EXTRA Flugzeugproduktions- und Vertriebs- GmbH

THIS MANUAL IS FURNISHED TO  
THE CIVIL AVIATION AUTHORITIES  
AS A PART OF THE CERTIFICATION-  
MATERIAL FOR THIS MODEL.

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**SECTION 0**

**PUBLICATION GUIDANCE**

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## 1 INTRODUCTION

This handbook contains 10 sections, and includes the material required to be furnished to the pilot by FAR Part 23 . It also contains supplementary data supplied by EXTRA Flugzeugproduktions- und Vertriebs- GmbH .

## 2 NOTES

- 2.1 This Flight Manual applies only to the aircraft whose nationality and registration marks are noted on the title page.
- 2.2 It is the responsibility of the pilot to be familiar with the contents of this Flight Manual including revisions and any relevant supplements.
- 2.3 Pages of this Airplane Flight Manual must not be exchanged and no alterations of or additions to the approved contents may be made without the EXTRA Flugzeugproduktions- und Vertriebs- GmbH/LBA approval.  
The editor has the copyright of this Flight Manual and is responsible for edition of revisions/ amendments and supplements.
- 2.4 Amendments, which affect the airworthiness of the aircraft will be announced in the publication Lufttüchtigkeitsanweisung (airworthiness directive) issued by LBA, Luftfahrt-Bundesamt, or by the manufacturer EXTRA Flugzeugproduktions- und Vertriebs- GmbH. The owner is responsible for incorporating prescribed amendments and should make notes about these on the records of amendments.
- 2.5 Should this Flight Manual get lost, inform EXTRA Flugzeugproduktions- und Vertriebs- GmbH, Dinslaken 46569 Hünxe, Federal Republic of Germany.
- 2.6 Should this Flight Manual be found, kindly forward it to the civil board of aviation in the country the aircraft is registered.

### 3 WARNINGS, CAUTIONS AND NOTES

The following definitions apply to Warnings, Cautions, and Notes:

**WARNING**

=> Operating procedures, techniques, etc which could result in personal injury or loss of life if not carefully followed

**CAUTION**

=> Operating procedures, techniques, etc , which could result in damage to equipment if not carefully followed.

**NOTE**

=> An operating procedures, technique, etc which is considered essential to emphasize.

"Shall", "Will", "Should" and "May"

The words "Shall" or, "will" shall be used to express a mandatory requirement. The word "should" shall be used to express nonmandatory provisions. The word "may" shall be used to express permissible.

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SECTION 1

GENERAL

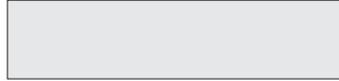
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## 1.0 DESCRIPTION

This description belongs to aircraft type EXTRA 300 with nationality and registration marks:



### Manufacturing

The airframe is built of tig-welded steel-tube construction. Wings, rudder and landing gear are manufactured of composite material.

The aircraft is a two-seater with the rear seat instrumented for pilot in comand.

## 1.1 SPECIFICATION OF CLASS

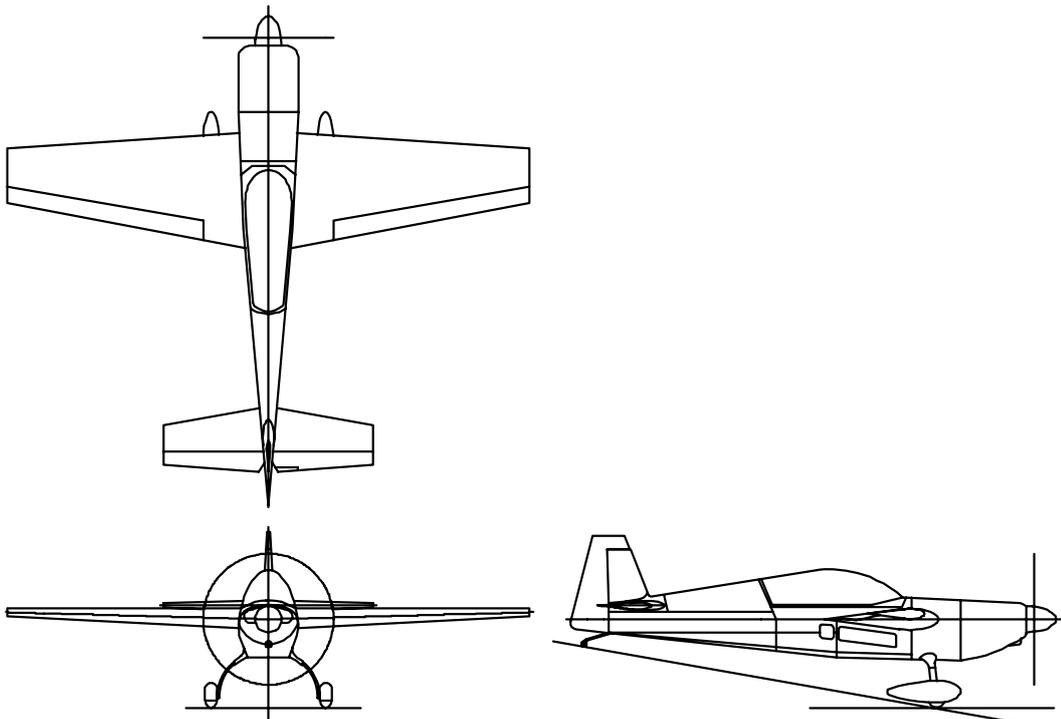
The aircraft is certified in normal and acrobatic category. LBA - Certificate No. 1086.

## 1.2 MANUFACTURER

Manufacturer EXTRA Flugzeugproduktions- und Vertriebs-GmbH, Flugplatz Dinslaken  
46569 Hünxe, Federal Republic of Germany.

## 1.3 TECHNICAL DATA

### 1.3.1 3-VIEW DRAWING



### 1.3.2 MAIN DATA

- Length	7,12 m (23,36 ft)
- Height	2,62 m ( 8,60 ft)
- Span	8,00 m (26,25 ft)
- Wheel-base	1,80 m ( 5,91 ft)
- Wheel-track	5,02 m (16,47 ft)

### 1.3.3 WING

- Wing span	8,0 m (26,25 ft)
- Wing-area	10,7 m <sup>2</sup> (115,17 ft <sup>2</sup> )
- Airfoil	Root: MA 15 S. Tip, MA 12 S
- Chord	Root: 1,85 m. Tip, 0,83 m
- MAC	1,404 m ( 4,61 ft)
- Aileron area	2 x 0,855 m <sup>2</sup> (2 x 9,20 ft <sup>2</sup> )
- Aileron deflection	± 30°, tolerance ± 2°

### 1.3.4 HORIZONTAL TAIL

- Span	3,20 m (10,50 ft)
- Area	2,56 m <sup>2</sup> (27.56 ft <sup>2</sup> )
- Airfoil	Wortmann FX 71-L-150/30

### 1.3.5 ELEVATOR

- Area	0,77 m <sup>2</sup> (8,29 ft <sup>2</sup> )
- Elevator-deflection	up 25°; down 25°; tolerance ± 2°
- Trim-tab-deflection	± 15°, tolerance ± 2°

### 1.3.6 VERTICAL TAIL

- Area	1,39 m <sup>2</sup> (14,96 ft <sup>2</sup> )
- Airfoil	Wortmann FX 71-L-150/30

### 1.3.7 RUDDER

- Area	0,51 m <sup>2</sup> ( 5,49 ft <sup>2</sup> )
- Rudder deflection	left 30°; right 30°; tolerance ± 2°

**1.4 ENGINE**

Manufacturer Textron-Lycoming Williamsport Plant PA 17701 USA.

- a) Type Lycoming AEIO-540-L1B5
- b) Type Lycoming AEIO-540-L1B5D

Rated power: 300 HP @ 2700 RPM; 270 HP @ 2400 RPM

**1.5 PROPELLER**

Manufacturer MT-Propeller Entwicklung GmbH, Federal Republic of Germany.

- a) Type MTV-9-B-C/C 200-15 3-blade constant speed.
- b) Type MTV-14-B-C/C 190-17 4-blade constant speed.

**1.5.1 EXHAUST SYSTEMS (OPTIONAL)**

Manufacturer Gomolzig Flugzeug- und Maschinenbau GmbH, Federal Republic of Germany

Exhaust Silencer for standard system: PN: EA 300 NSD GO3-606500.

Complete 6 in 1 System with integrated Silencer: PN: EA 300-606000

**1.6 FUEL**

Fuel type AVGAS 100/100 LL (for alternate fuel grades see later issues of Textron Lycoming S.I. No 1070)

Minimum 100/130 octane. Maximum 115/145 octane.

Total fuel capacity 160 liters (42.3 US Gallon)

- Wingtanks (2 x 60 l) 120 liters (31.7 US Gallon)

- Acro tank (1) 40 liters (10.6 US Gallon)

Usable fuel capacity in the system 158 liters (41 US Gallon)

Usable fuel capacity for acrobatic 38 liters (10.04 US Gallon)

**1.7 OIL**

Maximum sump capacity: 16 qts.

Minimum sump capacity: -Acrobatic: 12 qts.  
-Normal: 9 qts.

Average ambient air temperature	Mil-L6082 grades	Mil-22851 ashless dispersant grades
All temperatures	----	SAE 15W50 or 20W50
> 27°C (80°F)	SAE 60	SAE 60
> 16°C (60°F)	SAE 50	SAE 40 or 60
- 1°C til 32°C (30°F - 90°F)	SAE 40	SAE 40

**1.7 OIL (CONT.)**

Average ambient air temperature	Mil-L6082 grades	Mil-22851 ashless dispersant grades
-18°C til 21°C (0°F - 70°F)	SAE 30	SAE 30,40 or 20W40
-18°C til 32°C (0°F - 90°F)	SAE 20W50	SAE 30,40 or 20W40
< -12°C (10°F)	SAE 20	SAE 30 or 20W30

(single or multi - viscosity aviation grade oils see latest issue of Textron Lyc. S.I. No. 1014)

**1.8 LOADING**

Wing loading	88,8 kg/m <sup>2</sup> 76,6 / 81,3 kg/m <sup>2</sup>	Normal Acrobatic ( 1 seat / 2 seats )
Power loading	3,17 kg/hp 2.73 / 2.90 kg/hp	Normal Acrobatic ( 1 seat / 2 seats )

**1.9 TERMINOLOGY**

**Air Speeds**

CAS	Calibrated Air Speed. CAS is the same as TAS (True Air Speed) in standard atmospheric condition at sea level
KCAS	Calibrated speed in knots
GS	Ground speed
IAS	Indicated air speed
KIAS	Indicated speed in knots
TAS	True air speed. It's the same as CAS compensated for altitude, temperature and density
VA	Maneuvering speed
VNE	Never exceed speed
VNO	Maximum structural cruising speed
VS	Stalling speed or minimum steady flight speed
VX	Best angle-of-climb speed
VY	Best rate-of-climb speed

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**Meteorological terminology**

ISA	International standard atmospheric condition
OAT	Outside air temperature

**1.10 SECONDARY TERMINOLOGY**

FPM	Feet/minute
ft	Feet = 0.3048 m
m	Meter
inch	inch = 2.54 cm
L	Liters
Gal	US gallon = 3.79 liters
Qts	US quart = 0.946 liters
hp	Horse power (english)
h	Hour
kts	Knots (NM/h) = 1.852 kilometer per hour
Lbs	English pound = 0.4536 kg
hPA	hekto Pascal
IN HG	Inches of mercury
MP	Manifold pressure
PA	Pressure altitude (ft)
NM	Nautical miles = 1.852 km
RPM	Revolutions per minute
CG	Center of gravity
Arm	Arm is the horizontal distance from reference datum
Moment	is the product of weight of an item multiplied by its arm.

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**SECTION 2**

LIMITATIONS

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## SECTION 2

### LIMITATIONS

#### 2.1 GENERAL

This section includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the aircraft, its engine, standard systems, and standard equipment. The limitations included in this section have been approved by the Luftfahrt-Bundesamt (LBA). Observance of these operating limitations is required by national aviation regulations.

<b>NOTE</b>
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In case of an aircraft equipped with specific options additional information required for safe operation will be contained in Section 9 "Supplements".

Instrument markings and placards are provided for the acrobatic category only; for normal category refer to corresponding limitations. This aircraft is certified under LBA-Flugzeug-kennblatt Nr. 1086, Type Certification Data Sheet (T.C.D.S.).

Any exceedance of given limitations have to be reported by the pilot and considered by corresponding maintenance or inspection procedure according to the *SERVICE MANUAL EA 300*.

#### 2.2 AIR SPEED (IAS)

Never Exceed Speed	VNE	220 knots
Max. Structural Cruising Speed	VNO	158 knots
Maneuver Speed (Normal Cat.)	VA	140 knots
Maneuver Speed (Acro I , Acro II)	VA	158 knots

#### 2.3 CROSS-WIND COMPONENT

Max. demonstrated cross-wind component for take-off and landing 15 knots.

#### 2.4 ENGINE

Engine-type Textron-Lycoming AEIO-540-L1B5 / AEIO-540-L1B5D with rated maximum 300 HP @ 2700 RPM.

**2.4.1 FUEL**

Minimum grade aviation gasoline : 100/100LL; for alternate fuelgrades see latest revision of Lyc. S.I. No. 1070  
 Total fuel capacity 160 litres (42,3 US Gallon).  
 Usable fuel capacity 158 litres (41,7 US Gallon).  
 For acrobatic flight wing tanks must be empty.  
 Total fuel capacity for acrobatic 40 litres (10,6 US Gallon) in acro tank.  
 Usable fuel capacity for acrobatic 38 litres (10,04 US Gallon) in acro tank.

**2.4.2 ENGINE LIMITATIONS**

**a) Tachometer gauge**

-Max. Take-Off (max. 5 min)	2700 RPM
-Max. Continuous	2400 RPM

**NOTE**

If not stated somewhere else (refer to Section: 4.12 Acrobatic Maneuvers) the aircraft may be operated in the acrobatic maneuvers up to 2700 RPM.

**b) Oil-temperature gauge**

-Max	245°F
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**c) Oil capacity**

-Maximum sump capacity:	16 qts.
-Minimum sump capacity:	-Acrobatic: 12 qts.
	-Normal: 9 qts.

**d) Oil pressure**

-Minimum Idling	25 Psi
-Normal	55 - 95 Psi
-Starting, Warm up, Taxi and Take-Off	115 Psi

**CAUTION**

It is normal for the oil pressure to "flicker" from 10 to 30 psi when going from upright to inverted flight. During knife edge flights and zero-g flights oil pressure may drop and the oil system may not scavenge resulting in engine failure or damage if flight is prolonged. Knife edge and zero-g flight should not exceed 10 seconds.

**WARNING**

If oil pressure drops to 0 psi the propeller pitch changes automatically to coarse (high) pitch with a corresponding decrease in RPM. Apply positive g to avoid engine stoppage.

**e) Fuel pressure**

-Max	40 Psi
-Min	18 Psi
-Min Idle	12 Psi

**f) Cylinder head temperature**

-Max 500°F

**2.5 PROPELLER**

MT-Propeller Entwicklung GmbH, Federal Republic of Germany

- a) Type MTV-14-B-C/C190-17
- b) Type MTV-9-B-C/C200-15

Maximum Take-Off (max 5 min)	2700 RPM
Maximum Continuous	2400 RPM *

**NOTE \***

If not stated otherwise (refer to Section: 4.12 Acrobatic Maneuvers) the aircraft may be operated in the acrobatic maneuvers up to 2700 RPM.

**2.6 WEIGHT LIMITS**

Max allowed empty weight:	
-Normal category	745 kg (1643lbs)
-Acrobatic category ( 1 seat)	701 kg (1546lbs)
( 2 seats)	665 kg (1466lbs)
Max allowed T/O weight:	
-Normal category	950 kg (2095 lbs)
-Acrobatic category ( 1 seat)	820 kg (1808 lbs)
( 2 seats)	870 kg (1918 lbs)
Max allowed landing weight:	950 kg (2095 lbs)

**2.7 WEIGHT AND C.G. ENVELOPE**

Vertical reference = fire-wall.  
Horizontal reference = upper longerons in cockpit.

**2.7.1 NORMAL FLIGHT**

Weight:	forward C.G.	rear C.G.
-MaxT/O 950 kg (2095 lbs)	78,0cm (30.7")	86,0cm (33.8")
-820 kg (1808 lbs) (and below)	75,0cm (29.5")	89,8cm (35.3")

(Straight line variation between the stated limits.)

**2.7.2 ACROBATIC FLIGHT (1 SEAT)**

Max T/O Weight:	forward C.G.	rear C.G.
820 kg (1808 lbs) (and below)	75.0cm (29.5")	89,8cm (35.3")

**2.7.3 ACROBATIC FLIGHT (2 SEAT)**

Weight:	forward C.G.	rear C.G.
-Max T/O 870 kg (1918 lbs)	76,5cm (30.1")	88,5cm (34.8")
-820 kg (1808 lbs) (and below)	75.0cm (29.5")	89,8cm (35.3")

(Straight line variation between the stated limits.)

**2.8 ACROBATIC MANEUVERS**

**2.8.1 NORMAL FLIGHT**

All acrobatic maneuvers are prohibited except stall, chandelle, lazy eight and turns up to 60 degrees bank angle.

**2.8.2 ACROBATIC FLIGHT**

The plane is designed for unlimited acrobatics (wing tank must be empty). Inverted flight maneuvers are limited to max 4 min. Recommended basic maneuver entry speeds are listed in the following list.

**NOTE**

If acrobatic maneuvers will be performed with co-pilot or passenger, the pilot has to check and attend the physiological capability before and during acrobatic maneuvers due to the high possible g-loads.  
Check weight and C/G !

Maneuvers	Recommended entry speeds		Symbol	Remarks
	min KIAS	max KIAS		
Segment: horizontal Line	$V_s$	$V_{ne}$		
45° climbing	80	$V_{ne}$		
90° up	158	$V_{ne}$		
45° diving	$V_s$	$V_{ne}$		reduce throttle
90° diving	$V_s$	$V_{ne}$		reduce throttle
1/4 Loop climb.	100	190		
Looping	100	190		
Stall turn	100	190		
Aileron roll	80	158		full deflection
Snap roll	80	140		
"tail slide"	100	190		
Spin	$V_s$			
Inverted spin	$V_s$			
Knife edge	>150			< 10 s
Inverted Flight	> $V_s$	190		< 4 min

**CAUTION**

Particular caution must be exercised when performing maneuvers at speeds above  $V_a$  (158 KIAS). Large or abrupt control inputs above this speed may impose unacceptably high loads which exceed the structural capability of the aircraft.

**NOTE**

For Acrobatic Maneuvers see Section 4. All maneuvers can be performed in upright and inverted flight attitude.

**2.9 LOAD FACTOR**

**2.9.1 NORMAL FLIGHT**

+ 6 g  
- 3 g

## 2.9.2 ACROBATIC FLIGHT

+ 10 g / - 10 g for 1 seat occupied (MTOW 820 kg / 1808 lbs)  
+ 8 g / - 8 g for 2 seat occupied (MTOW 870 kg / 1918 lbs)

## 2.10 FLIGHT CREW LIMITS

Minimum crew is one pilot in the rear seat. 2 persons in both categories (Normal and Acrobatic). Pilot in command seat is the rear seat, Co-pilot or passenger seat is the front seat. Noise optimized headsets are required.

## 2.11 KINDS OF OPERATIONAL LIMITS

Only VFR flights at day are allowed. The A/C may be operated at OAT from -20°C (-4°F) to +44°C (+111°F). Below temperatures of -10°C (+14°F) the oil vent line must be modified by the low temperature kit (breather line). Flight in known icing-conditions is prohibited. Smoking is prohibited.

### 2.11.1 STRUCTURAL TEMPERATURE/COLOUR LIMITATION

Structure is qualified up to 72°C (161.6°F). Structure temperatures (composite) above 72°C (161.6°F) are not permitted. Not to exceed this temperature limit, color specification for composite structure (manufacturer document EA-03205.19) has to be complied with.

To check the temperature inside the cockpit (potential "green house" effect) a reversible temperature indicator (*STRUCTURAL OVERHEAT INDICATOR*) is applied on the rear web of the wing main spar in the carry-through section. After reaching the temperature limit of 72°C (161,6°F) the word "RISK" appears and flying is prohibited.



## 2.12 MAXIMUM OPERATING ALTITUDE

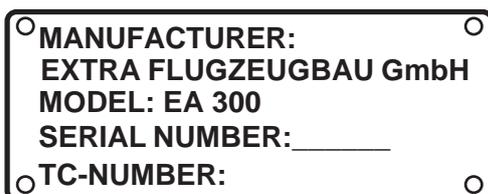
Max. certified operating altitude is 16000 ft MSL (4877 m)

## 2.13 TIRE PRESSURE

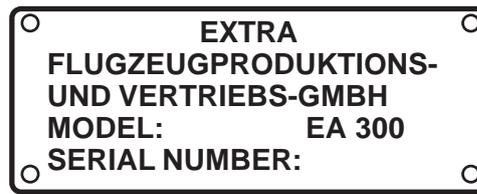
The tire pressure is 3,4 Bar (49,3 PSI).

## 2.14 MARKINGS AND PLACARDS

### 2.14.1 AIRCRAFT IDENTITY PLACARD



or



2.14.2 OPERATING PLACARDS

$V_A = 158$  Kts (Acro)  
 $V_A = 140$  Kts (Normal)

(near airspeed indicator)

THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE ACROBATIC CATEGORY. OTHER LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THIS CATEGORY OR IN THE NORMAL CATEGORY ARE CONTAINED IN THE AIRPLANE FLIGHT MANUAL. APPLICABLE RPM LIMITATION MUST BE OBSERVED.

(in the rear cockpit)

THIS AIRPLANE IS CERTIFICATED FOR VFR, DAY OPERATION. OPERATION IN KNOWN ICING CONDITIONS IS PROHIBITED.

(on the rear instrument panel)

F U E L  
AVGAS 100/100 LL

(near the filler cap on each wingtank)

OIL

(on the seperate hatch / upper cowling)

FUEL SHUTOFF VALVE      ON      OFF

(in both cockpits at the right side)

NOSE DOWN <= NEUTRAL => NOSE UP  
TRIM

(near the handle at the right side  
in the rear cockpit)

WING TANK  
MUST BE EMPTY FOR ACROBATICS  
USABLE FUEL 120 L (31.7 US GAL.)

(on the rear insrumnt panel under  
fuel capacity indicator)

ACRO TANK INDICATION (ON GROUND)  
SHOWS FULL AT 38 L (10 US GAL.)  
AND ZERO AT 10 L (2.6 US GAL)

**ACRO TANK  
USABLE 38 L (10 US GAL.)**

(on the rear instrument panel under  
fuel capacity indicator)

**ACROBATIC: ± 10 G, 1 PILOT                      ± 8 G, 2 PERSON ON BOARD  
MTOW: 820 KG (1808 LBS)    MTOW: 870 KG (1918 LBS)**

**NORMAL: + 6 G/ -3 G; MTOW: 950 KG (2095 LBS)  
ACROBATICS INCL. SPIN NOT APPROVED**

(in both cockpits)

**AUXILIARY FUEL PUMP  
ON                      OFF**

(near pump-switch on the instrument panel  
in the rear cockpit)

**NO SMOKING**

(in both cockpits)

**USE OF HEADSET IS REQUIRED  
USE OF PARACHUTE IS RECOMMENDED**

(on the right side of both  
instrument panels)

**MAGNETIC  
DIRECTION INDICATOR  
CALIBRATION**

(near Mag. Dir. Indicator)

**LOW RPM    <= PROP =>    HIGH RPM**

(on RPM control unit in the  
rear cockpit)

**LEAN            <= MIXTURE =>            RICH**

(on mixture control unit in the  
rear cockpit)

**CLOSE    <= THROTTLE =>    OPEN**

(near throttle control in both  
cockpits)

**LOCK            <= CANOPY =>            UNLOCK**

(near canopy locking handles  
of each cockpit)

**V E N T  
O P E N**

(near the eyeball-type adjustable vents)

**APPROVED ACROBATIC MANEUVERS  
AND RECOMMENDED ENTRY AIRSPEEDS**

MANEUVERS	SPEEDS	
	min KIAS	max KIAS
Segment: horizontal Line	Vs	Vne
45° climbing	80	Vne
90° up	158	Vne
45° diving	Vs	Vne
90° diving	Vs	Vne
1/4 Loop climb.	100	190
Looping	100	190
Stall turn	100	190
Aileron roll	80	158
Snap roll	80	140
"Tail-slide"	100	190
Spin	Vs	
Inverted spin	Vs	
Inverted flight Less than 4 min	> Vs	190
Knife edge Less than 10 s	>150	

(in both cockpits)

**CAUTION**

Particular caution must be exercised when performing maneuvers at speeds above Va (158 KIAS). Large or abrupt control inputs above this speed may impose unacceptably high loads which exceed the structural capability of the aircraft.

**WARNING:**  
**SOLO FLYING FROM  
REAR SEAT ONLY!**

(on front instrument panel)

**2.14.3 INSTRUMENT MARKINGS**

AIRSPPEED INDICATOR

green arc	60 Kts	-	158 Kts
yellow arc	158 Kts	-	220 Kts
red line	220 Kts		

OIL PRESSURE INDICATOR

red line	25 Psi
yellow arc	25 Psi - 55 Psi
green arc	55 Psi - 90 Psi
yellow arc	90 Psi - 100 Psi
red line	100 Psi

OIL TEMPERATURE INDICATOR

yellow arc	< 140 °F
green arc	140 °F - 210 °F
yellow arc	210 °F - 245 °F
red line	245°F

CYLINDERHEAD TEMPERATURE INDICATOR

yellow arc	< 150 °F
green arc	150 °F - 435 °F
yellow arc	435 °F - 500 °F
red line	500°F

RPM INDICATOR

green arc	700 RPM - 2400 RPM
yellow arc	2400 RPM - 2700 RPM
red line	2700 RPM

G - METER

green arc	- 5 g	-	+ 8 g
yellow arc	+ 8 g	-	+ 10 g
red line	+ 10 g		

FUEL FLOW INDICATOR

green arc	0 gal / h - 35 gal / h
red radial	35 gal / h

MANIFOLD PRESSURE INDICATOR

green arc	10 " Hg - 25 " Hg
yellow arc	25 " Hg - 29.5 " Hg
red radial	29.5 " Hg

**2.15 KINDS OF OPERATION EQUIPMENT LIST**

The aircraft may be operated in day VFR when the appropriate equipment is installed and operable. Flying under icing conditions is prohibited.

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was predicated. The following systems and items of equipment must be installed and operable for the particular kind of operation indicated.

	NORMAL	ACROBATIC	
		1 seat	2 seats
<b>COMMUNICATION</b>			
1. Transceiver-VHF	1	1	1
<b>ELECTRICAL POWER</b>			
1. Battery	1	1	1
2. Alternator	1	1	1
3. Ammeter	1	1	1
<b>FLIGHT CONTROL SYSTEM</b>			
1. Elevator-trim control	1	1	1
2. Stall warning	1	1	1
<b>FUEL</b>			
1. Boost pump	1	1	1
2. Fuel quantity indicator	2	2	2
3. Manifold pressure	1	1	1
4. Fuel flow indicator	1	1	1
5. Fuel pressure	0	0	0
<b>LIGHT</b>			
1. Wing-tip position / strobe light	1	1	1
<b>NAVIGATION</b>			
1. Altimeter	1	1	1
2. Airspeed indicator	1	1	1
3. Mag. direction indicator	1	1	1
4. OAT indicator	0	0	0
5. Vertical speed indicator	0	0	0
6. Turn and bank indicator	0	0	0
7. Artificial horizon	0	0	0
8. Directional gyro	0	0	0
9. Transponder <sup>1</sup>	1	1	1

<sup>1</sup>) In some airspaces Mode S Elementary Surveillance functionality is required

	NORMAL	ACROBATIC	
		1 seat	2 seats
<b>ENGINE CONTROL</b>			
1. RPM indicator	1	1	1
2. Exhaust gas temperature ind.	0	0	0
3. Cylinder head temperature ind.	0	0	0
<b>OIL</b>			
1. Oil temperature indicator	1	1	1
2. Oil pressure indicator	1	1	1
<b>FLIGHT CREW EQUIPMENT</b>			
1. Parachute rear	0	*	*
2. Parachute front	0	0	*
3. Seat belt rear	1	1	1
4. Seat belt front	1	0	1
5. Headset rear	1	1	1
6. Headset front	1	0	1

**NOTE**

The zeros ( 0 ) used in the above list mean that the equipment and/or system was not required for type certification for that kind of operation.

Either equipment or systems in addition to those listed above may be required by the national operating regulations.

The asterisks ( \* ) used in the above list mean that latest national aviation regulations must be observed in determining whether the equipment and/or system are required. According FAR Part 91 „General Operating and Flight Rules" each occupant of an US registered airplane must wear an approved parachute when performing acrobatic maneuvers.

Extra Flugzeugproduktions- und Vertriebs- GmbH considers acrobatics without wearing an approved parachute to be unsafe.

**2.16 NOISE LEVEL**

The noise level with silencer Gomolzig 606000 (6 in 1) and propeller MTV-14-B-C/C190-17 has been established in accordance with ICAO Annex 16, as 77.3 dB(A)

The noise level with propeller MTV-9-B-C/C200-15 has been established in accordance with FAR 36 Appendix G, as 73.0 dB(A).

No determination has been made by the LBA for the FAA that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out any airport.

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SECTION 3

EMERGENCY PROCEDURES

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## SECTION 3

### EMERGENCY PROCEDURES

#### 3.0 INTRODUCTION

##### 3.0.1 GENERAL

This section contains the checklist and procedures coping with emergencies that may occur. This checklist must be followed in various emergencies to ensure maximum safety for the crew and/or aircraft.

Thorough knowledge of these procedures will enable the aircrew to better cope with an emergency. The steps should be performed in the listed sequence. However the procedures do not restrict the aircrew from taking any additional action necessary to deal with the emergency. The procedures contain items classified as critical or noncritical. The critical items are actions that shall be performed immediately to avoid aggravating the emergency.

##### 3.0.2 GENERAL BEHAVIOUR IN EMERGENCY SITUATIONS

As soon as one of the crew member becomes aware that an emergency situation exists, he must immediately alert the other crew member of the situation. In any emergency situation, contact should be established with a ground station as soon as possible after completing the initial corrective action. Include position, altitude, heading, speed, nature of the emergency and pilot's intentions in the first transmission. There after the ground station should be kept informed of the progress of the flight and of any changes or developments in the emergency. Three basic rules apply to most emergencies and should be observed by each aircrew member:

1. Maintain aircraft control
2. Analyze the situation and take proper action
3. Land as soon as possible/as soon as practical

The meaning of "*as soon as possible*" and "*as soon as practical*" as used in this section is as follows:

Land AS SOON AS POSSIBLE (ASAP) = Emergency conditions are urgent and require an immediate landing at the nearest suitable airfield, considering also other factors, such as weather conditions and aircraft mass.

Land AS SOON AS PRACTICAL = Emergency conditions are less urgent and in the aircrews judgement the flight may be safely continued to an airfield where more adequate facilities are available.

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### 3.1 AIRSPEEDS FOR EMERGENCY OPERATION

Stall speed	60 KIAS
Engine failure after take-off	80 KIAS
Best recommended gliding speed ( glide angle 1 : 6,2 )	
- Normal (950 kg)	90 KIAS
- Acro (820 kg)	80 KIAS
Precautionary landing with engine power	80 KIAS
Landing without engine power	80 KIAS
Maximum demonstrated cross wind component	15 Knots

### 3.2 OPERATIONAL CHECKLIST

#### 3.2.1 ENGINE FAILURE DURING TAKE-OFF ROLL

1. Throttle	IDLE
2. Brakes	APPLY
3. Mixture	IDLE CUT OFF
4. Ignition switch	OFF
5. Master switch	OFF

#### 3.2.2 ENGINE FAILURE IMMEDIATELY AFTER TAKE-OFF

Stall speed 60 KIAS

1. Airspeed	80 KIAS
2. Mixture	IDLE CUT OFF
3. Fuel shutoff valve	OFF
4. Ignition switch	OFF
5. Master switch	OFF
6. Forced landing	PERFORM as practical

#### 3.2.3 ENGINE FAILURE DURING FLIGHT (RESTART PROCESS)

1. Airspeed	80 KIAS
2. Fuel shutoff valve	ON
3. Mixture	RICH
4. Boost pump	ON
5. Ignition switch	BOTH (or START if propeller has stopped)

---

### 3.2.4 OIL SYSTEM MALFUNCTION

If oil pressure indicates low:	Apply positive "g"
If oil pressure is not regained than:	
1. Airspeed	80 KIAS
2. Throttle	REDUCE TO IDLE
3. Engine oil temperature	OBSERVE INDICATION
4. Land	ASAP

**WARNING**

If oil pressure drops to 0 psi the propeller pitch changes automatically to coarse (high) pitch with a corresponding decrease in RPM.

### 3.2.5 ALTERNATOR FAILURE

An alternator failure is indicated by the red light of the low voltage monitor.  
If red light illuminates:

1. Alternator	SWITCH OFF AND ON
2. Low voltage monitor	CHECK INDICATION
3. Red light off	CONTINUE FLIGHT
If red light illuminates again:	
4. Land	AS SOON AS PRACTICAL

## 3.3 FORCED LANDINGS

### 3.3.1 EMERGENCY LANDING WITHOUT ENGINE POWER

1. Seat belts, shoulder harnesses	SECURE
2. Airspeed	80 KIAS
3. Mixture	IDLE CUT OFF
4. Fuel shutoff valve	OFF
5. Ignition switch	OFF
6. Master switch	OFF
7. Touchdown	SLIGHTLY TAIL LOW
8. Brakes	OPTIMUM BRAKING

### 3.3.2 PRECAUTIONARY LANDING WITH ENGINE POWER

1. Seat belts, shoulder harnesses	SECURE
2. Airspeed	80 KIAS
3. Selected field	FLY OVER, noting terrain and obstructions, then reaching a safe altitude and airspeed
4. Master switch	OFF
5. Touchdown	SLIGHTLY TAIL LOW
6. Ignition switch	OFF
7. Mixture	IDLE CUT OFF
8. Fuel shutoff valve	OFF
9. Brakes	APPLY HEAVILY

### 3.4 FIRES

#### 3.4.1 DURING START ON GROUND

1. Cranking	CONTINUE to get a start which would suck the flames and accumulated fuel through the air inlet and into the engine.
2. Fuel shutoff valve	OFF
3. Power	1700 RPM for one minute.
4. Engine	SHUT DOWN
5. After engine stop	ABANDON aircraft and inspect for damage
6. Fire	EXTINGUISH using fire extinguisher if available

**WARNING**

Do not open engine compartment access doors while engine is on fire

#### 3.4.2 IF ENGINE FAILS TO START

1. Cranking	CONTINUE
2. Throttle	FULL OPEN
3. Mixture	IDLE CUT OFF
4. Fuel shutoff valve	OFF
If fire is extinguished	
5. Master switch	OFF
6. Ignition switch	OFF
7. Engine compartment	INSPECT

---

### 3.4.3 ENGINE FIRE IN FLIGHT

- |                             |   |
|-----------------------------|---|
| 1. Mixture                  | IDLE CUT OFF  |
| 2. Fuel shutoff valve       | OFF   |
| 3. Master switch            | OFF   |
| 4. Airspeed                 | 100 KIAS, find your<br>airspeed/attitude<br>will keep the<br>fire away from the cockpit |
| 5. Land as soon as possible |   |

### 3.5 ICING

#### 3.5.1 INADVERTENT ICING ENCOUNTER

1. Turn back or change altitude to obtain an outside temperature that is less conducive to icing.
2. Plan a landing at the nearest airfield. With extremely rapid ice build-up select a suitable "off airport" landing field.

### 3.6 UNINTENTIONAL SPIN

Refer to section 4 (Normal Procedures) acrobatic maneuver, spin recovery.

### 3.7 MANUAL BAIL-OUT

When in an emergency situation that requires abandoning the aircraft and while wearing a parachute, which is at least strongly recommended for acrobatics:

- Inform your passenger
- Reduce speed to 100 Kts if possible
- Pull mixture to lean
- Open canopy (the lowpressure over the canopy in normal flight will flip the canopy full open immediately)
- Take off headset
- Open seat belt
- Leave airplane to the left side
- Try to avoid wing and tail
- Open parachute

### 3.8 EMERGENCY EXIT AFTER TURN OVER

- |                        |              |
|------------------------|--------------|
| 1. Master switch       | OFF          |
| 2. Fuel shutoff valve  | OFF          |
| 3. Seat belts          | OPEN         |
| 4. Parachute harnesses | OPEN         |
| 5. Canopy handle       | PULL TO OPEN |

**NOTE**

If canopy fails to open break the canopy.

- |             |               |
|-------------|---------------|
| 6. Aircraft | EVACUATE ASAP |
|-------------|---------------|

### 3.9 ELEVATOR CONTROL FAILURE

In case of elevator control failure the aircraft can be flown with the elevator trim. In this case trim nose up to the desired speed and control horizontal flight or descend with engine power. For landing trim nose up and establish a shallow descend by adjusting throttle. To flair the plane gently increase power to bring the nose up to landing attitude.

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SECTION 4

NORMAL PROCEDURES

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**SECTION 4**

**NORMAL PROCEDURES**

**4.0 GENERAL**

**4.0.1 AIRSPEEDS FOR NORMAL OPERATION**

**SPEEDS IN KIAS**

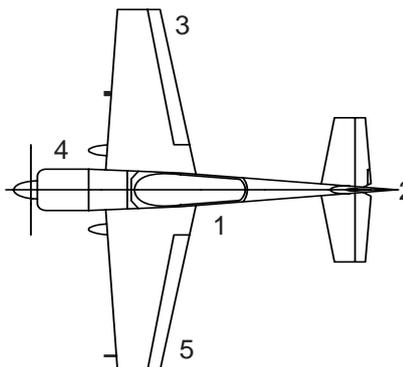
CATEGORY	ACRO		NORMAL
	1 seat	2 seats	
Start:			
-Rotating Speed	60	62	65
Climb:			
-Vx	87	89	93
-Vy	96	99	104
-Recommended Normal Climb Speed	100	105	110
-Max. Cruise	185	185	185
Landing:			
-Approach	80	85	90
-on Final	72	74	78
-Go-Around Speed	90	95	100
Recommended Airspeed For Flight In Rough Air (maximum)	VA=158	VA=158	VA=140
Max. Demonstrated Cross Wind Component	15 Kts	15 Kts	15 kts

**4.0.2 CHECKLIST AND PROCEDURES**

This handbook contains the checklist and procedures to operate the aircraft in normal and acrobatic operation. The pilot should be familiar with all procedures contained in this Pilot's Operating Handbook, which should be carried on board. The pilot has to comply with Checklist for daily check and inspections (see Section 8, Handling, Servicing and Maintenance).

**4.1 PREFLIGHT INSPECTION**

**4.1.1 EXTERIOR INSPECTION ILLUSTRATION**



**4.1.2 GENERAL**

Visually check airplane for general condition during walk around inspection. Perform exterior check as outlined in the picture above in counterclockwise direction.

**4.2 CHECKLIST PROCEDURES**

**1) Cockpit**

- |                                |   |
|--------------------------------|---|
| 1. Pilot's Operating Handbook  | (AVAILABLE)   |
| 2. Airplane weight and balance | CHECKED   |
| 3. Structural temperature      | CHECK STRUCTURAL OVERHEAT INDECATOR ON WING MAIN SPAR WEB FROM THE FRONT COCKPIT. |
| 4. Ignition switch             | OFF   |
| 5. Master switch               | ON  |
| 6. Fuel quantity indicators    | CHECK   |
| 7. Master switch               | OFF   |
| 8. Fuel shutoff valve          | ON  |

**2) Empennage**

- |  |   |
|--|---|
| 1. All round inspection, canopy, surfaces, stabilizer, elevator, trim rudder and tailwheel | CHECK   |
| 2. Horizontal stabilizer attachment bolts  | CHECK FOR FREEPLAY BY MOVING THE TIP OF THE HORIZ. STABILIZER UP- AND DOWNWARDS |

**3) Right Wing**

- |  |       |
|--|-------|
| 1. Aileron, freedom of movement and security   | CHECK |
| 2. Trailing edge                               | CHECK |
| 3. Fuel tank vent opening (right landing gear) | CHECK |
| 4. Fuel quantity                               | CHECK |
| 5. Fuel tank filler cap                        | CHECK |
| 6. Right landing gear, wheel and brake         | CHECK |
| 7. Stall warning vane                          | CHECK |

**4) Nose**

- |                                    |  |
|------------------------------------|--|
| 1. Engine oil dipstick             | CHECK  |
| 2. Propeller and spinner           | CHECK  |
| 3. Air inlet                       | CHECK  |
| 4. Fuel filter drain               | DRAIN FOR AT LEAST 4<br>SECONDS TO CLEAR FILTER OF<br>POSSIBLE WATER<br>CHECK CLOSED |
| 5. Acro fuel tank drain            | DRAIN 4 SECONDS<br>CHECK CLOSED  |
| 6. Exhaust silencer (if installed) | CHECK FOR DAMAGE<br>AND SECURE ATTACHMENT  |

**5) Left wing**

- |  |        |
|--|--------|
| 1. Left landing gear, wheel and brakes       | CHECK  |
| 2. Fuel quantity                             | CHECK  |
| 3. Fuel tank filler cap                      | CHECK  |
| 4. Pitot cover                               | REMOVE |
| 5. Trailing edge                             | CHECK  |
| 6. Aileron, freedom of movement and security | CHECK  |

**6) Before starting engine**

- |   |                 |
|---|-----------------|
| 1. Preflight inspection                 | COMPLETE        |
| 2. Passenger briefing                   | COMPLETE        |
| 3. Parachute handling briefing          | COMPLETE        |
| 4. Seats, seatbelts, shoulder harnesses | ADJUST AND LOCK |
| 5. Canopy                               | CLOSE AND LOCK  |
| 6. Brake                                | CHECK           |
| 7. Avionics power switch                | OFF             |
| 8. Electrical equipment                 | OFF             |
| 9. Alternator                           | ON              |
| 10. Wingtip position / Strobe lights    | ON              |

### **4.3 STARTING PROCEDURES**

#### **4.3.1 COLD ENGINES**

The following starting procedures are recommended, however, the starting conditions may necessitate some variation from these procedures.

1. Perform pre-flight inspection.
2. Set propeller governor control to "High RPM" position.
3. Open throttle approximately 1/4 travel.
4. Turn boost pump "ON".
5. Move mixture control to "FULL RICH" until a slight but steady fuel flow is noted (approximately 3 to 5 seconds) and return mixture control to "IDLE CUT-OFF".  
Turn boost pump "OFF".
6. Engage starter.
7. When engine fires release the ignition switch back to "BOTH".
8. Move mixture control slowly and smoothly to "FULL RICH".
9. Check the oil pressure gauge. If minimum oil pressure is not indicated within 30 seconds, shut off the engine and determine trouble.

#### **4.3.2 HOT ENGINES**

Because of the fact that the fuel percolates and the system must be cleared of vapor, it is recommended to use the same procedure as outlined for cold engine start.

### **4.4 TAXIING THE AIRCRAFT**

- |                          |  |
|--------------------------|--|
| 1. Canopy                | CLOSE AND LOCK                               |
| 2. Brake                 | CHECK  |
| 3. Altimeter             | Set on QFE or QNH<br>Scale error max. +60 ft |
| 4. Avionic master switch | ON   |
| 5. Electrical equipment  | ON   |
| 6. Radio                 | Set and test                                 |
| 7. Mixture               | Leave in "FULL RICH" position                |

Operate only with the propeller in minimum blade angle (High RPM).  
Warm-up at approximately 1000-1200 RPM. The engine is ready for take-off when the throttle can be opened without the engine faltering.

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## **4.5 TAKE-OFF PROCEDURE**

### **4.5.1 BEFORE TAKE-OFF**

Before you line up at the runway for take-off:

- Check oil pressure and oil temperature.
- Check the magnetos at 1800 RPM. Allowed drop is 175 RPM (max. difference 50 RPM).
- Check Alternator Output.
- Move also the propeller control through its complete range to check operation and return to full "HIGH RPM" position.  
Turn boost pump "ON" (check indicator movement on the fuel flow gauge).

**NOTE**

The RPM Gauge is electronically operated. To check the magnetos the RPM source switch must be set to the same magento as the ignition switch. Otherwise the gauge will show zero.

### **4.5.2 TAKE-OFF**

Set throttle smoothly to max and let the airspeed go up to 60-65 knots. A light pressure on the stick lifts the tail to horizontal position. Rotate the aircraft at 65 knots. On reaching climb speed of 100 knots reduce the RPM and Manifold pressure to 2400/24" and proceed climbing.

## **4.6 CLIMB**

The maximum continuous RPM is restricted to 2400.

If not stated somewhere else (refer to Section: 4.12 Acrobatic Maneuvers) the aircraft may be operated in acrobatic maneuvers up to 2700 RPM. RPM above 2400 should, however, be used only for acrobatic maneuvers when necessary for maximum performance in order to avoid unnecessary noise.

Turn boost pump "OFF".

## **4.7 CRUISE**

- |                   |                                       |
|-------------------|---------------------------------------|
| 1. Altitude       | - As selected                         |
| 2. Throttle / RPM | - Adjust for cruising speed           |
| 3. Mixture        | - Adjust for minimum fuel consumption |
| 4. Trim           | - As required                         |
| 5. Fuel           | - Check periodically                  |

## 4.8 LANDING PROCEDURES

### 4.8.1 DESCENT

- |                |                   |
|----------------|-------------------|
| 1. Throttle    | - Reduce          |
| 2. Mixture     | - "FULL RICH"     |
| 3. RPM Control | - Set to 2400 RPM |
| 4. Trim        | - Adjust          |

### 4.8.2 APPROACH

- |               |                                 |
|---------------|---------------------------------|
| 1. Boost pump | - ON                            |
| 2. Mixture    | - set to "RICH"                 |
| 3. Airspeed   | - reduce to approach speed      |
| 4. Propeller  | - set to low pitch ("HIGH RPM") |

**NOTE**

It is recommended to set the RPM to 2400 during approach and landing in order to avoid unnecessary noise.

In case of "Go Around", RPM control must be set to max. RPM before applying power.

### 4.8.3 BEFORE LANDING

- |                      |                    |
|----------------------|--------------------|
| 1. Landing approach  | - proceed          |
| 2. Airspeed on final | - maintain 78 KIAS |
| 3. Elevator trim     | - adjust           |

**NOTE**

Stall speed will be

- |                 |         |
|-----------------|---------|
| MTOW = 820 kg : | 55 KIAS |
| MTOW = 870 kg : | 57 KIAS |
| MTOW = 950 kg : | 60 KIAS |

### 4.8.4 NORMAL LANDING

- |              |  |
|--------------|--|
| 1. Landing   | - perform as practicable with respect to surface and weather condition |
| 2. Touchdown | - 3 point landing  |

**NOTE**

The rudder is effective down to 30 KIAS

- |             |                    |
|-------------|--------------------|
| 3. Throttle | - CLOSE / IDLE     |
| 4. Braking  | - Minimum required |

**4.9 GO-AROUND**

Decide early in the approach if it is necessary to go around and then start go-around before too low altitude and airspeed are reached.

Proceed as follows:

- |                |   |
|----------------|---|
| 1. RPM control | - "HIGH RPM" / Full forward                       |
| 2. Throttle    | - "OPEN" / Take-off power                         |
| 3. Airspeed    | - Minimum 90 KIAS<br>rotate to go-around altitude |

**4.10 SHUTDOWN**

- |                          |                              |
|--------------------------|------------------------------|
| 1. Boost pump            | - "OFF"                      |
| 2. Engine                | - Run for 1 min. at 1000 RPM |
| 3. Dead cut check        | - Perform                    |
| 4. Avionic master switch | - "OFF" (if installed)       |
| 5. Mixture               | - "IDLE CUT OFF"             |
| 6. Ignition switch       | - "OFF"                      |
| 7. Master switch         | - "OFF"                      |

**4.11 LEAVING THE AIRCRAFT**

- |                |                  |
|----------------|------------------|
| 1. Canopy      | - Close and lock |
| 2. Aircraft    | - Secure         |
| 3. Pitot cover | - Attach         |
| 4. Log book    | - Complete       |

---

## 4.12 ACROBATIC MANEUVERS

### 4.12.1 GENERAL

**NOTE**

Prior to executing these maneuvers tighten harnesses and check all loose items are stowed. Start the maneuvers at safe altitude and max continuous power setting if not otherwise noted.

For maneuver limits refer to Section 2 LIMITATIONS.

After termination of acrobatic maneuvers the artificial horizon (if installed) must be reset if possible.

At high negative g-loads and zero g-periods it is normal that oil pressure and RPM indication might drop down momentarily returning to normal status at positive g-loads.

**WARNING**

The high permissible load factors of the airplane may exceed the individual physiological limits of pilot or passenger. This fact must be considered when pulling or pushing high g's.

### 4.12.2 MANEUVERS

**CAUTION**

Particular caution must be exercised when performing maneuvers at speeds above  $V_a$  (158 KIAS). Large or abrupt control inputs above this speed may impose unacceptably high loads which exceed the structural capability of the aircraft.

Acrobatics is traditionally understood as maneuvers like loop, humpty bump, hammerhead turn, aileron roll etc..

This manual does not undertake to teach acrobatics, however, it is meant to demonstrate the plane's capabilities.

For this reason maneuvers are divided into segments. The segments are described. Limitations are pointed out.

- Segment horizontal line:  
A horizontal line may be flown with any speed between  $V_s$  and  $V_{ne}$

- Segment line 45° climbing:  
The plane will follow the line at max. power. The speed will not decrease below 80 KIAS
  
- Segment line 90° up:  
Any entry speed may be used. Out of a horizontal pull-up at 200 KIAS the vertical penetration will be 2.500 ft. The speed will gradually decrease to 0.

**NOTE**

In extremely long lines an RPM decay may occur. This is related to a loss of oil pressure. Positive g's should be pulled immediately in order to protect the engine. Oil pressure will return immediately.

- Segment line 45° diving:  
Throttle must be reduced in order to avoid exceeding  $V_{ne}$ .
  
- Segment line 90° diving:  
Throttle must be reduced to idle in order to avoid exceeding  $V_{ne}$ .

Above segments may be filled up with aileron rolls on snap rolls. Watch  $V_A = 158$  KIAS for aileron rolls with max. deflection.  
Snap rolls should not be performed at speeds above 140 KIAS.

- Segment 1/4 loop, climbing:  
The minimum recommended speed is 100 KIAS. If the maneuver is to be followed by a vertical line, a higher entry speed is required depending on the expected length of the line. A complete loop can be performed at speeds above 100 KIAS.

**NOTE**

Since the maximum horizontal speed is 185 KIAS, higher speeds should be avoided in acrobatics since an unnecessary loss of altitude would occur.

- Torque maneuvers:  
All maneuvers with high angular velocity associated with high propeller RPM must be considered dangerous for the engine crankshaft.

Although wooden composite propeller blades are used, the gyroscopic forces at the prop flange are extremely high.

**CAUTION**

If performing a gyroscopic maneuver such as flat spin, power on, or knife edge spin, reduce RPM to 2400 in order to minimize the gyroscopic forces.

**4.12.3 SPIN**

To enter a spin proceed as follows:

- Reduce speed, power idle
- When the plane stalls:
  - Kick rudder to desired spin direction
  - Hold ailerons neutral
  - Stick back (positive spinning), Stick forward (negative spinning)

The plane will immediately enter a stable spin.

- Ailerons against spin direction will make the spin flatter.
- Ailerons into spin direction will lead to a spiral dive.

Above apply for positive and negative spinning.

To stop the spin:

- Apply opposite rudder
- Make sure, power idle
- Hold ailerons neutral
- Stick to neutral position

The plane will recover within 1/2 turn.

Recovery can still be improved by feeding in in-spin ailerons.

**NOTE**

If ever disorientation should occur during spins (normal or inverted) one method always works to stop the spin:

- Power idle
- Kick rudder to the heavier side  
(this will always be against spin direction)
- Take hands off the stick

The spin will end after 1/2 turn. The plane will be in a steep dive in a side-slip.

Recovery to normal flight can be performed easily.

**NOTE**

After six turns of spinning the altitude loss including recovery is 2000 ft.

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**SECTION 5**

**PERFORMANCE**

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**SECTION 5**

**PERFORMANCE**

**5.1 GENERAL**

Performance data charts on the following pages are presented to facilitate the planning of flights in detail and with reasonable accuracy under various conditions. The data in the charts have been computed from actual flight tests with the aircraft and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented in the range and endurance charts allow for 45 minutes reserve fuel at specified speeds. Some indeterminate variables such as engine and propeller, air turbulence and others may account for variations as high as 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

**5.1.1 PERFORMANCE CHARTS**

Performance data are presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information are provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

All speeds in this chapter are Indicated Air Speeds (IAS). The performance figures below are given under following conditions.

1. Maximum allowed weight 950 kg (2095 lbs) except otherwise stated
2. Take-off and landing on concrete surface.
3. No wind.
4. Standard atmospheric condition.

**5.1.2 DEFINITION OF TERMS**

For definition of terms, abbreviations and symbols refer to section 1, General.

**5.1.3 SAMPLE PROBLEM**

**TAKE-OFF CONDITIONS**

Field Pressure Alt	2000 ft
Temperature	15°C
Wind Component (Headwind)	8 KT
Field Length	3000 ft

**CRUISE CONDITIONS**

Total Distance	400 NM
Pressure Altitude	8000 ft
Temperature (ISA)	-1°C

**TAKE-OFF**

Take-Off Distance is shown by Fig. 5.5

Example:

- T/O Weight: 870 kg (1918 lbs)
- Ground Roll: 112 m (367 ft)
- Total Distance to clear a 50 ft obstacle: 248 m (813 ft)

These distances are well within the available field length incl. the 8 Kt headwind.

**RATE OF CLIMB**

Fig. 5.6 shows the Rate Of Climb using Take-off Power

The Rate of Climb at 2000 ft : 2320 ft/min

The Time to Climb from 2000 ft to 8000 ft is acc. to Fig. 5.7:

=> (4,0 - 0,9) min = 3,1 min

The Fuel to Climb from 2000 ft to 8000 ft is:

=> (5,8 - 1,4) Liters = 4,4 Liters (1.2 US Gal.)

**CRUISE**

Cruise Altitude and Power Setting should be determined for most economical fuel consumption and several other considerations. In an altitude of 8000 ft and a Power Setting of 65 % a Fuel Consumption of 52 L/H (13.7 US Gal/H) and 3,25 NM/L (12.3 NM/US Gal) can be obtained by Fig. 5.9.

**RANGE AND ENDURANCE**

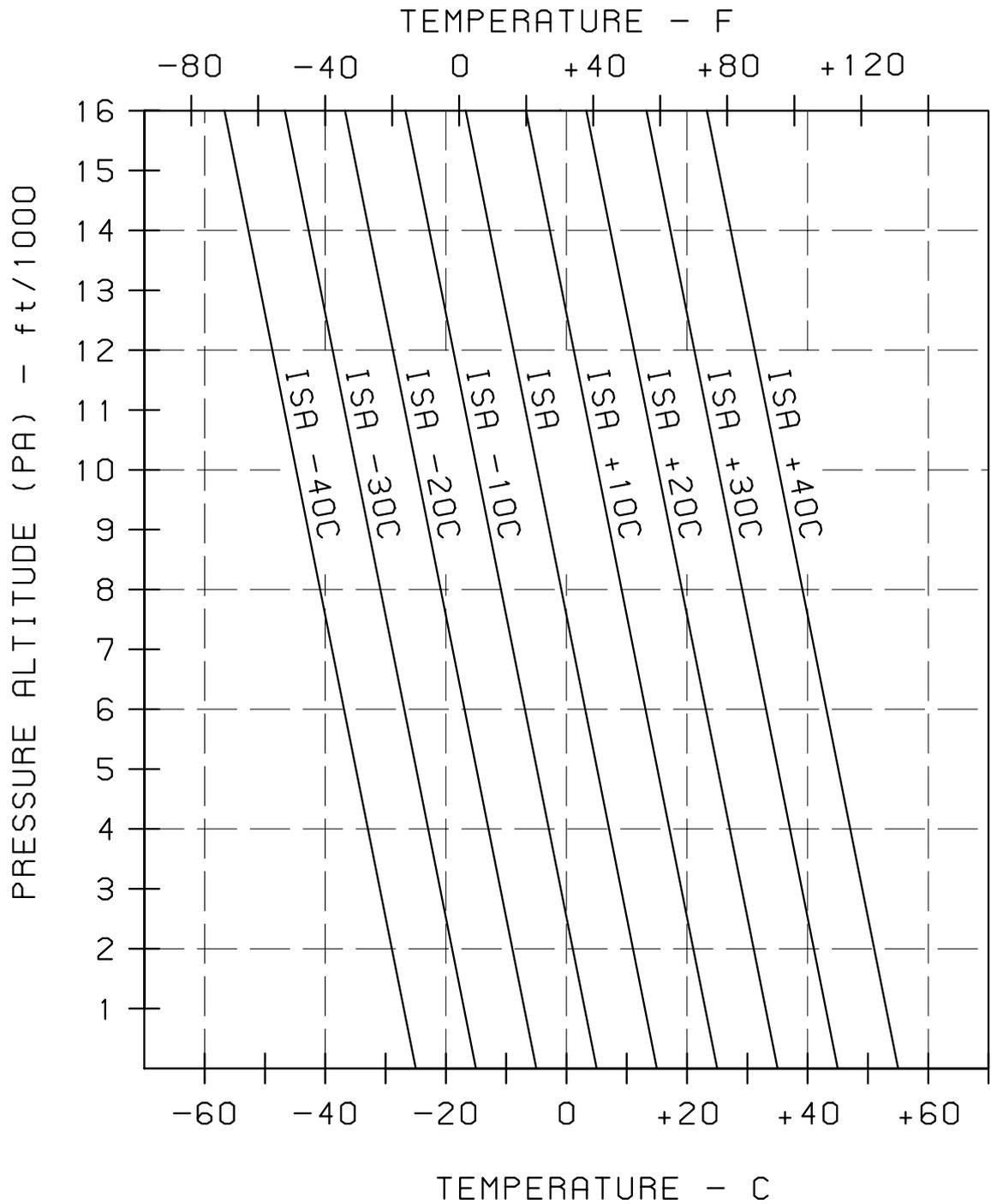
Fig. 5.8 presents Range and Endurance values for a T/O Weight of 950 kg (2095 lbs) including fuel for warm up and Take-Off from SL, max continuous Power climb to cruising altitude, and a reserve of 21 liter (5.5 US Gal.) for 45 minutes with 45% Power. 2 liters (0.53 US Gal.) unusable fuel is taken into account.

For the sample problem (appr.)

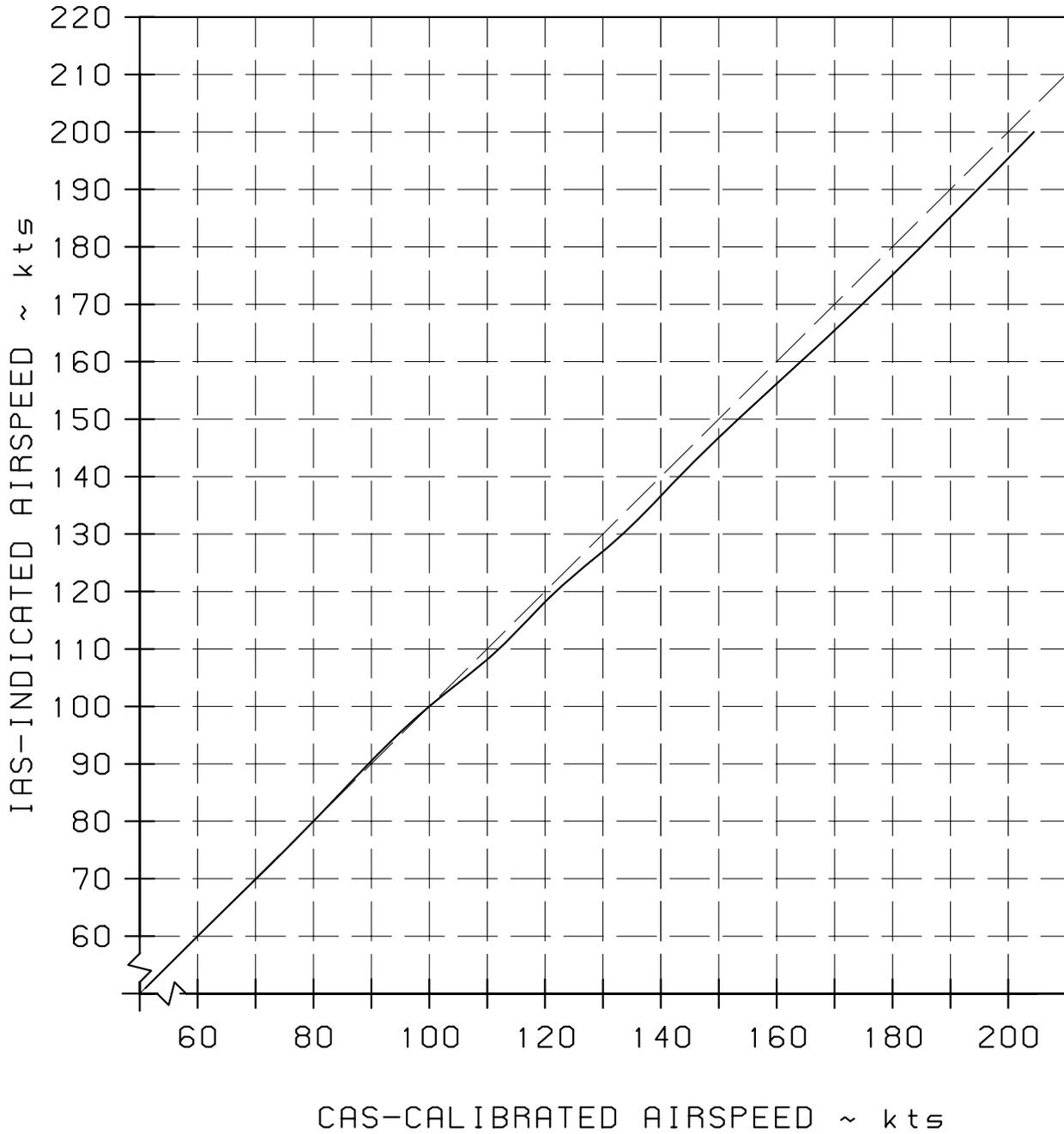
Total Fuel	160 L	(42.27 US Gal.)
Warm Up & T/O	- 5 L	(1.32 US Gal.)
Reserve	- 21 L	(5.55 US Gal.)
Unusable Fuel	- 2 L	(0.53 US Gal.)
	=====	=====
Usable Fuel	132 L	(34.9 US Gal.)
Range	415 NM	(768 km)
Endurance	2.49 HRS	

5.2 ISA CONVERSION

ISA Conversion of pressure altitude and outside air temperatur



## 5.3 AIRSPEED CALIBRATION



**NOTE**

Indicated airspeed assumes zero instrument error

**5.4 STALL SPEED**

CONDITION:

POWER IDLE  
FORWARD C/G

STALL SPEEDS

ANGLE OF BANK

WEIGHT	CATEGORY	0°	30°	45°
		1g	1,15 g	1,41 g
950 kg (2095 lbs)	Normal	KIAS 60	KIAS 65	KIAS 72
870 kg (1918 lbs)	ACRO (2 seat)	KIAS 57	KIAS 61	KIAS 68
820 kg (1808 lbs)	ACRO (1 seat)	KIAS 55	KIAS 59	KIAS 65

Max altitude loss during stall recovery is approximately 100 ft

**5.5 TAKE-OFF PERFORMANCE**

Power : T/O Power  
Runway: Concrete

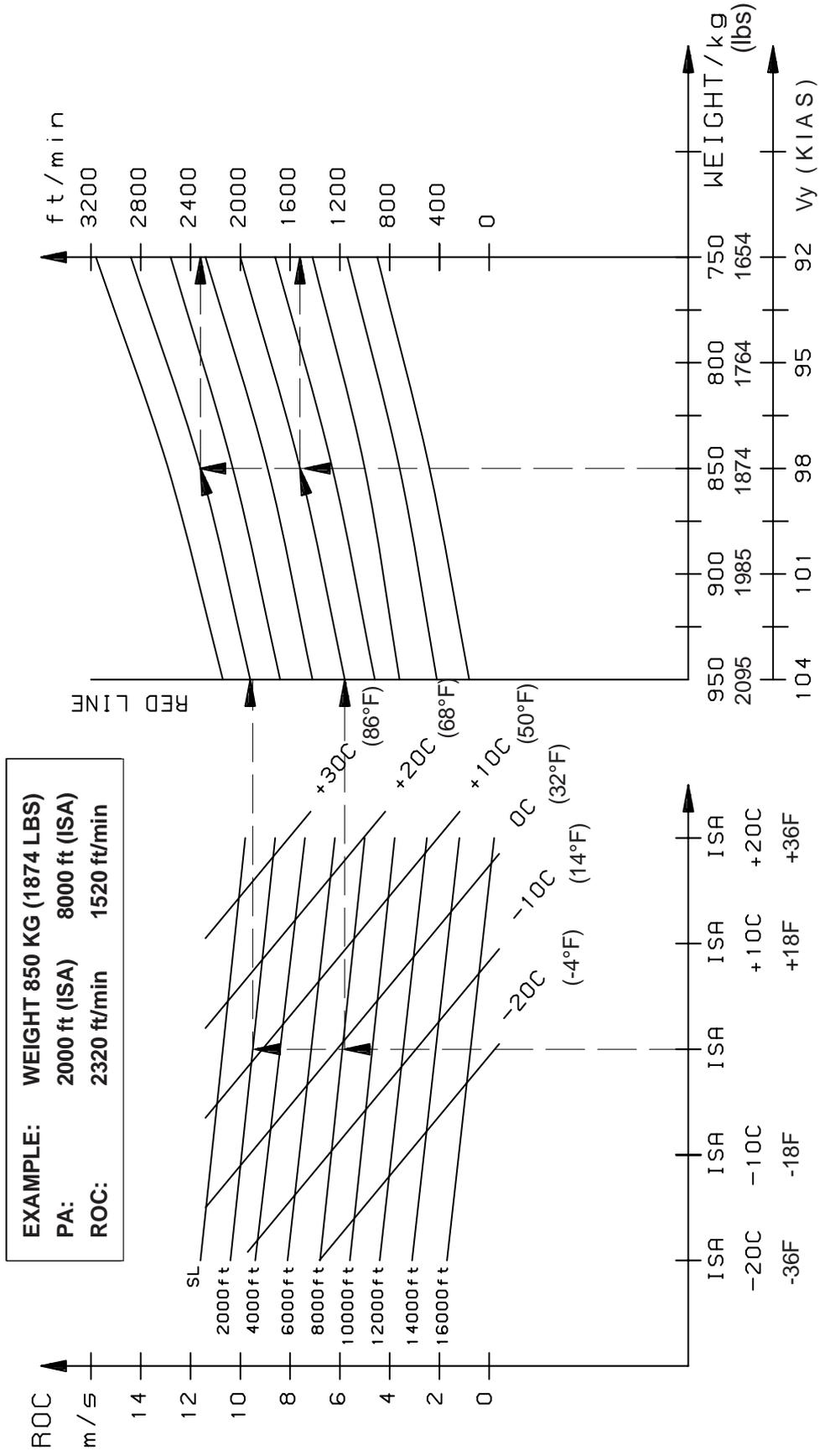
**NOTE**

For every 5 kts headwind, the T/O distance can be decreased by 4%. For every 3 kts Tailwind (up to 10) kts, the T/O distance is increased by 10%. On a solid, dry and plain Grass Runway, the T/O is increased by 15%.

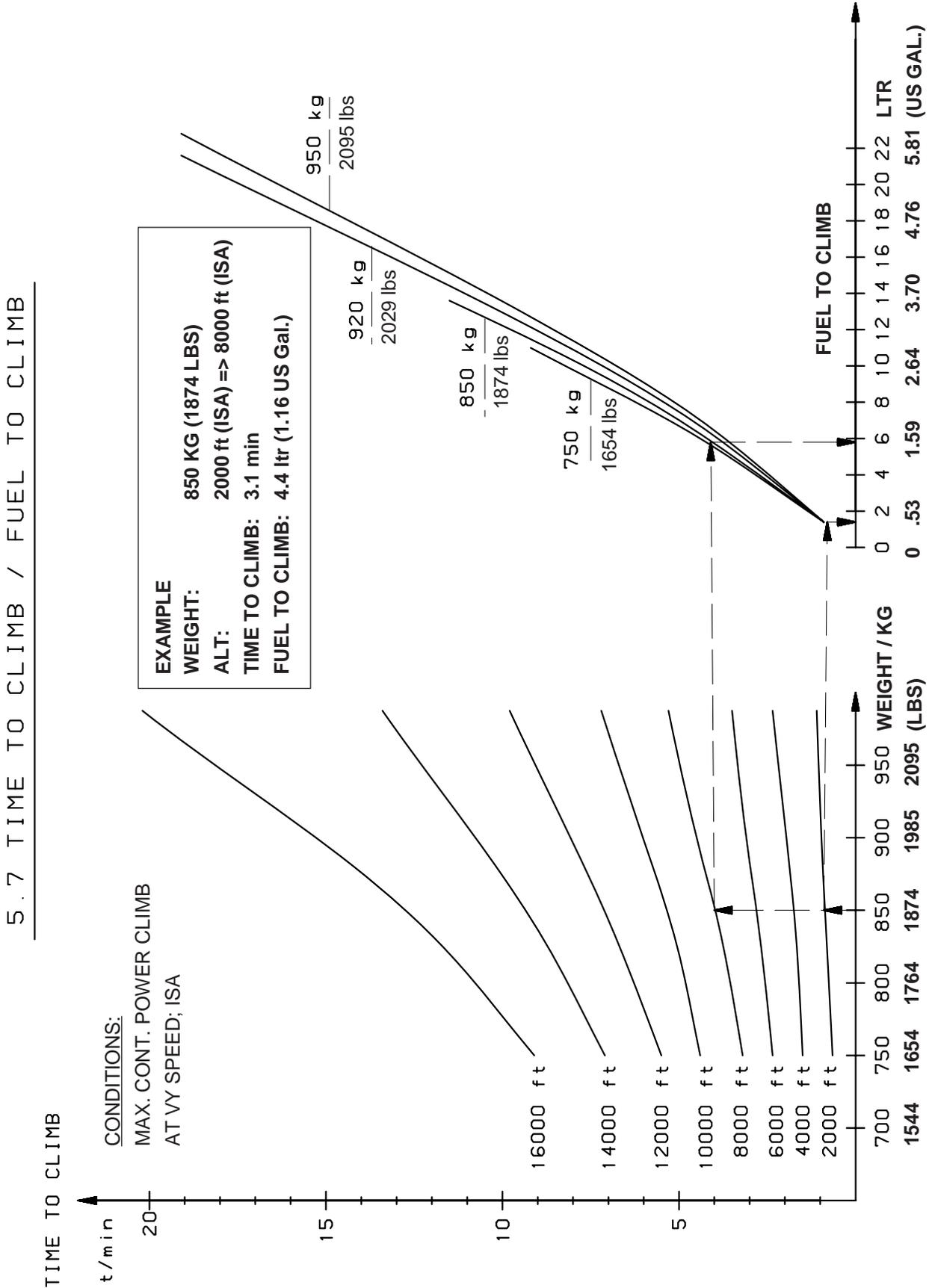
OAT			0°C (32°F)		15°C (59°F)		30°C (86°F)	
T/O weight	Rotating Speed	PA	T/O Roll	T/O over 50 ft	T/O Roll	T/O over 50 ft	T/O Roll	T/O over 50 ft
kg (lbs)	KIAS	ft	m (ft)	m (ft)	m (ft)	m (ft)	m (ft)	m (ft)
950 (2095)	65	SL	96 (315)	207 (679)	115 (377)	248 (813)	133 (436)	285 (935)
		2000	115 (377)	248 (814)	138 (453)	298 (978)	160 (525)	342 (1122)
		4000	138 (453)	298 (978)	166 (545)	357 (1171)	192 (630)	410 (1345)
		6000	166 (545)	358 (1175)	199 (653)	429 (1407)	230 (755)	492 (1614)
870 (1918)	62	SL	78 (256)	167 (548)	93 (305)	200 (656)	107 (351)	230 (755)
		2000	94 (308)	200 (656)	112 (367)	240 (787)	128 (420)	276 (906)
		4000	112 (367)	241 (791)	134 (440)	288 (945)	154 (505)	331 (1086)
		6000	135 (443)	289 (948)	161 (528)	346 (1135)	185 (607)	397 (1302)
820 (1808)	60	SL	67 (220)	114 (374)	79 (259)	170 (558)	93 (305)	200 (656)
		2000	80 (262)	173 (568)	95 (312)	204 (669)	112 (367)	240 (787)
		4000	97 (318)	207 (679)	114 (374)	248 (814)	134 (440)	288 (945)
		6000	116 (381)	249 (817)	137 (449)	294 (965)	161 (528)	347 (1138)

**5.6 RATE OF CLIMB PERFORMANCE**

**5.6 BEST RATE OF CLIMB WITH MAX CONTINUOUS POWER**



**5.7 TIME TO CLIMB, FUEL TO CLIMB**

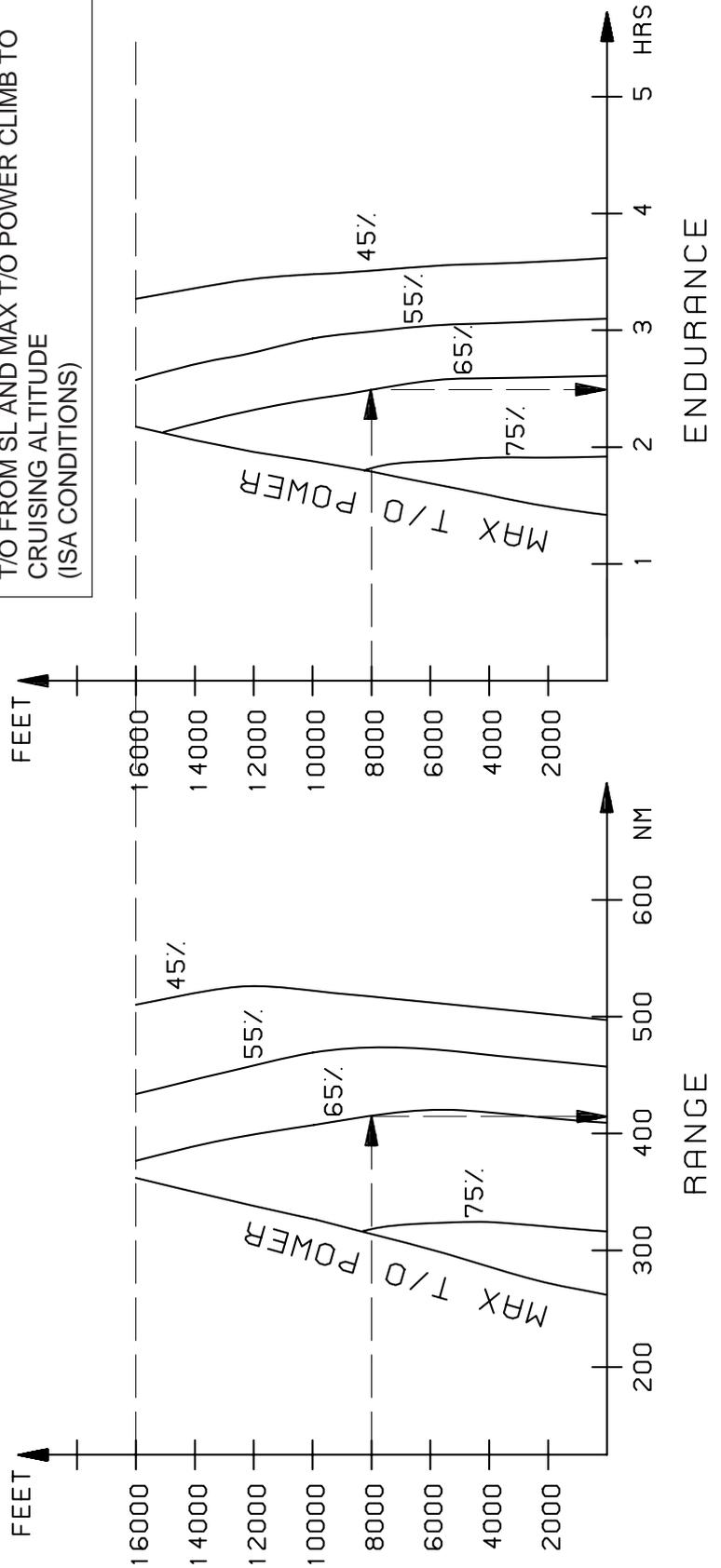


5.8 RANGE AND ENDURANCE

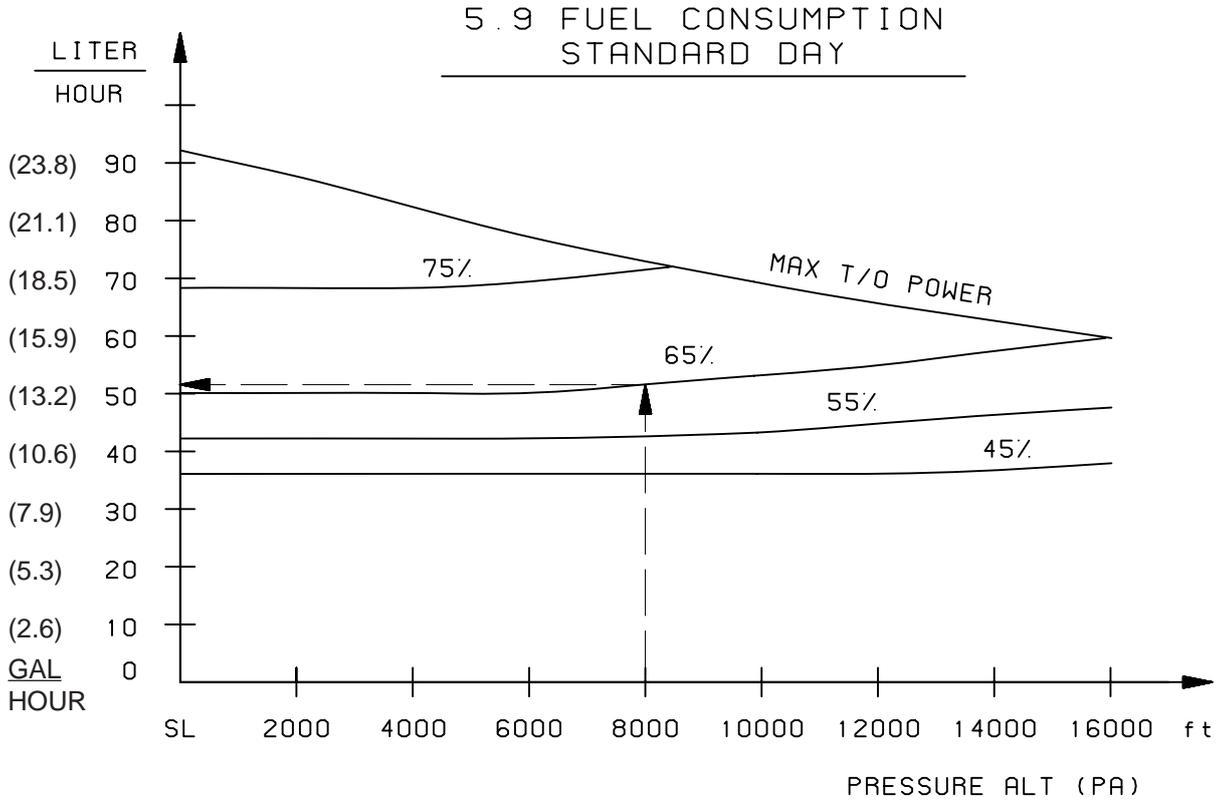
5.8 RANGE & ENDURANCE

EXAMPLE:  
 POWER SETTING: 65% RPM=2350 MP=21,5 "HG  
 CRUISE ALT : 8000 ft  
 RANGE : 415 NM  
 ENDURANCE : 2,49 HRS

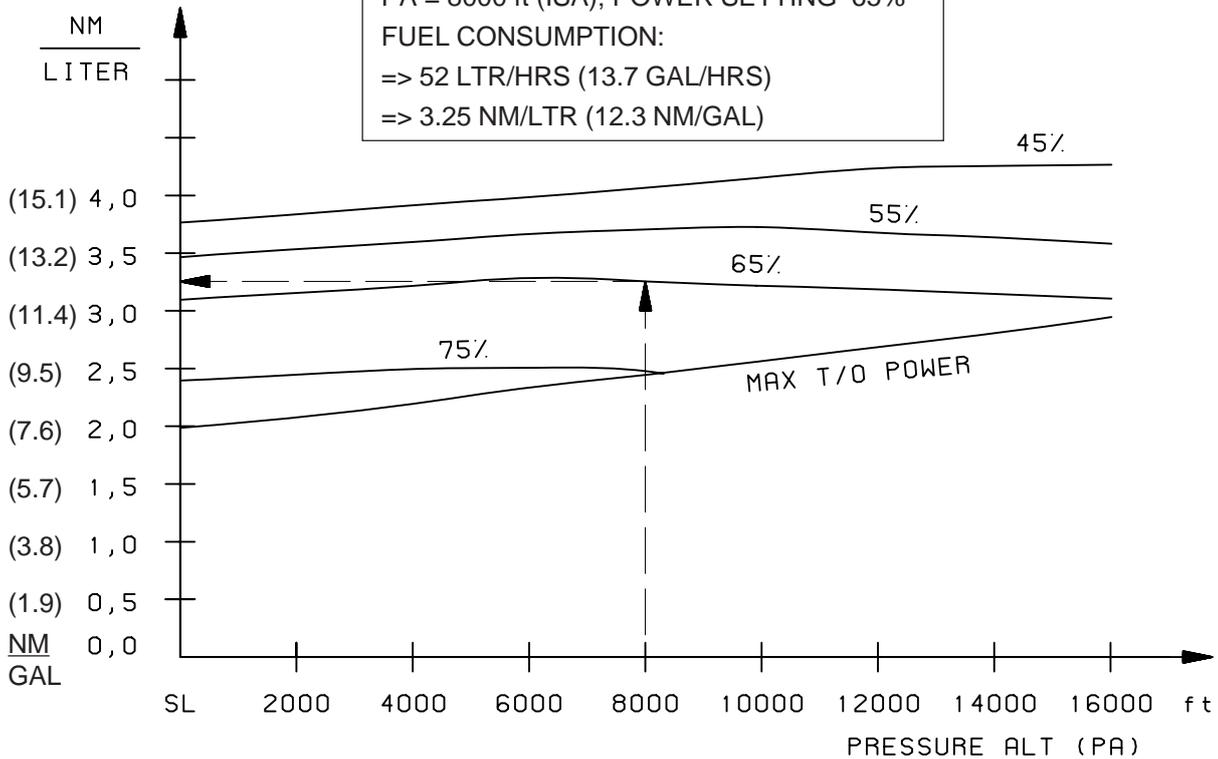
CONDITION:  
 T/O WEIGHT: 950 KG (2095 LBS)  
 TOTAL FUEL CAP.: 160 LTR (42.3 US GAL.)  
 INCL. WARM UP & T/O: 5 LTR (1.3 US GAL.)  
 RESERVE: 21 LTR (5.5 US GAL.)  
 UNUSABLE FUEL: 2 LTR (0.5 US GAL.)  
 T/O FROM SL AND MAX T/O POWER CLIMB TO  
 CRUISING ALTITUDE  
 (ISA CONDITIONS)



**5.9 FUEL CONSUMPTION**



**EXAMPLE:**  
 PA = 8000 ft (ISA); POWER SETTING 65%  
 FUEL CONSUMPTION:  
 => 52 LTR/HRS (13.7 GAL/HRS)  
 => 3.25 NM/LTR (12.3 NM/GAL)



**5.10 CRUISE PERFORMANCE**

Range and Endurance values for a T/O Weight of 950 kg (2095 lbs) including fuel for warm-up and Take-Off from SL, max. cont. Power climb to cruising altitude, and a reserve of 21 liters (5.55 Gal) for 45 minutes with 45% Power. 2 liters (0.53 Gal) unusable fuel is taken into account. (At ISA - Conditions.)

PA [ft]	Eng. [RPM]	Manif. Press. [IN HG]	Power Setting		Fuel Consumption		TAS [Kts]	IAS [Kts]	Endur. ① [h]	Range ① [NM]	Mixture ② Best ...
			[%]	[Hp]	[l/h]	[gal/h]					
2000	2400	25,1	75	225	68,7	(18,2)	167,6	160	1.91	320	Power
	2200	24,2	65	195	50,5	(13,3)	159,3	152	2.60	413	Economy
	2000	23,5	55	165	42,6	(11,3)	150,2	144	3.08	462	Economy
	2000	20,2	45	135	36,5	(9,6)	139,9	134	3.59	502	Economy
4000	2400	24,6	75	225	68,7	(18,2)	170,9	158	1.91	324	Power
	2200	23,7	65	195	50,5	(13,3)	162,4	150	2.59	418	Economy
	2000	23,0	55	165	42,6	(11,3)	153,1	142	3.06	467	Economy
	2000	19,7	45	135	36,5	(9,6)	142,6	133	3.59	507	Economy
6000	2200	23,2	65	195	50,5	(13,3)	165,6	149	2.57	422	Economy
	2000	22,5	55	165	42,6	(11,3)	156,1	141	3.04	472	Economy
	2000	19,3	45	135	36,5	(9,6)	145,4	131	3.53	512	Economy
8000	2350	21,5	65	195	52,0	(13,7)	169,0	147	2.49	415	Economy
	2050	21,4	55	165	43,0	(11,4)	159,3	139	2.99	472	Economy
	2000	18,8	45	135	36,5	(9,6)	148,4	130	3.51	517	Economy
10000	2150	19,9	55	165	43,7	(11,5)	162,5	138	2.93	469	Economy
	2000	18,4	45	135	36,5	(9,6)	151,4	129	3.48	522	Economy
12000	2300	18,3	55	165	45,2	(11,9)	165,9	136	2.81	458	Economy
	2000	17,9	45	135	36,5	(9,6)	154,5	127	3.44	526	Economy
14000	2075	17,7	45	135	37,1	(9,8)	157,8	122	3.36	520	Economy

**NOTE**

- ① For temperatures above/ below Standard (ISA), increase/decrease Range 1,7% and Endurance 1,1% for each 10°C above/below Standard Day Temperature for particular altitude.
- ② "Best Power" or "Best Economy" see latest issue of Textron Lycoming Operator's Manual (4-10) Series AEIO 540.

5.11 LANDING PERFORMANCE

Power : Idle  
Runway: Concrete  
Brakes: maximum

**NOTE**

For every knot headwind, the landing distance can be decreased by 3%.  
On a solid, dry and plain Grass Runway, the landing is increased by 15%.

OAT			0°C (32°F)		15°C (59°F)		30°C (86°F)	
Landing weight	Airspeed	PA	Land. Roll	Land. over 50 ft	Land. Roll	Land. over 50 ft	Land. Roll	Land. over 50 ft
[kg] / (lbs)	[KIAS]	[ft]	[m] / (ft)	[m] / (ft)	[m] / (ft)	[m] / (ft)	[m] / (ft)	[m] / (ft)
950 (2095)	90	SL	171 (561)	527 (1729)	177 (581)	548 (1798)	185 (607)	586 (1923)
		2000	181 (594)	558 (1831)	188 (617)	580 (1903)	197 (646)	602 (1975)
		4000	192 (630)	592 (1942)	199 (653)	615 (2018)	208 (682)	639 (2096)
		6000	203 (666)	627 (2057)	211 (692)	652 (2139)	220 (722)	678 (2224)
870 (1918)	85	SL	158 (518)	488 (1601)	164 (538)	507 (1663)	171 (561)	527 (1729)
		2000	165 (541)	518 (1699)	175 (574)	537 (1762)	181 (594)	558 (1831)
		4000	177 (581)	548 (1798)	185 (607)	570 (1870)	192 (630)	592 (1942)
		6000	188 (617)	582 (1909)	195 (640)	605 (1985)	203 (666)	627 (2057)
820 (1809)	80	SL	150 (492)	465 (1526)	156 (512)	483 (1585)	163 (535)	502 (1647)
		2000	159 (522)	492 (1614)	166 (545)	511 (1677)	173 (568)	532 (1745)
		4000	168 (551)	522 (1713)	176 (577)	543 (1781)	184 (604)	565 (1854)
		6000	179 (587)	553 (1814)	186 (610)	575 (1886)	194 (636)	598 (1962)

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SECTION 6

WEIGHT AND BALANCE AND EQUIPMENT LIST

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## 6.1 GENERAL

This section describes the procedure for establishing the basic weight and moment of the aircraft. Sample forms are provided for reference. Procedures for calculating the weight and movement for various operations are also provided. A comprehensive list of all equipment available for this aircraft is included. It is the responsibility of the pilot to ensure that the aircraft is loaded properly.

## 6.2 AIRCRAFT WEIGHING PROCEDURE

The aircraft weight is determined by weighing all three wheel loads simultaneously by three scales with the aircraft levelled.  
(Upper fuselage reference line horizontal)

Datum line for weight arms  $x$  is the fire wall.

$X_1$  = distance: fire wall - main wheel

$X_2$  = distance: fire wall - tail wheel

$X_N$  = distance: fire wall - item N

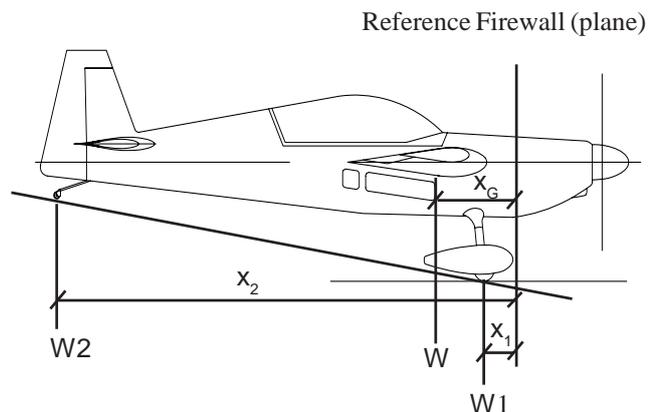
$X_G$  = distance: fire wall - Center of Gravity

$W_1$  = Sum of weights indicated by the two scales below the main wheels

$W_2$  = Weight indicated by the scale below the tail wheel

$W$  = Total weight =  $W_1 + W_2$

$X_G = \frac{(W_1 \times X_1) + (W_2 \times X_2)}{W}$  = C/G position

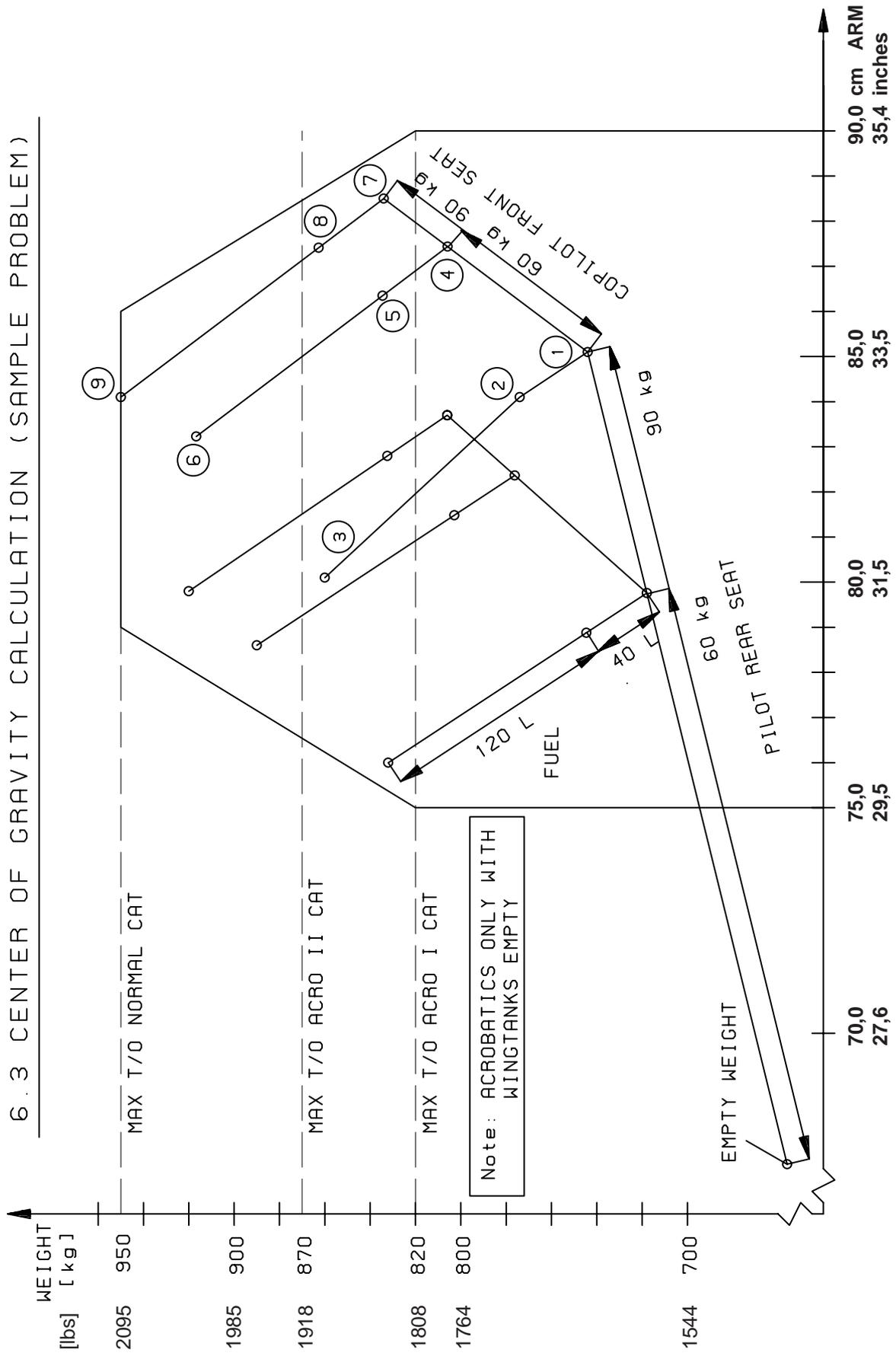


$$W = W_1 + W_2, \quad X_G = \frac{(W_1 \times X_1) + (W_2 \times X_2)}{W}$$



**6.3 CENTER OF GRAVITY CALCULATION (SAMPLE PROBLEM)**

POS	PILOT REAR SEAT		ACRO FUEL 40 L (10,6 US Gal)		COPILOT FRONT SEAT		FUEL IN WING (120 L) (31,7 US Gal)	
	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)
1	90	198	-	-	-	-	-	-
2	90	198	28,8	63,5	-	-	-	-
3	90	198	28,8	63,5	-	-	86,4	190,5
4	90	198	-	-	60	132	-	-
5	90	198	28,8	63,5	60	-	-	-
6	90	198	28,8	63,5	60	132	86,4	190,5
7	90	198	-	-	90	198	-	-
8	90	198	28,8	63,5	90	198	-	-
9	90	198	28,8	63,5	90	198	86,4	190,5



**6.3.1 SAMPLE**

Take-off Condition:		
Pilot On Rear Seat	90,0 kg	(198,5 lbs)
Copilot On Front Seat	90,0 kg	(198,5 lbs)
Acro Fuel 40 L	28,8 kg	(63,5 lbs)
120 l Fuel In Wing Tanks	86,4 kg	(190,5 lbs)
Aircraft Empty Weight	654,0 kg	(1442 lbs)
	=====	=====
	949,2 kg	(2093 lbs)

To find C/G, follow line "Pilot Rear Seat" from Empty Weight to "90 kg" [198,5 lbs] (Point 1). Continue on line "Copilot Front Seat" to 90 kg (Point 7). Now follow line "Fuel" via Point 8 (40 L [10,6 Gal] Acro Fuel) to Point 9 ( 120 L [10,6 Gal] Fuel in Wing Tank).

FIND:     Weight ~ 949 kg (2093 lbs)  
          C/G     ~ 84,2 cm (33,1 inch)

**6.3.2 WEIGHT AND BALANCE RECORD SHEET**

	WEIGHT	ARM	MOMENT
EMPTY WEIGHT			
PILOT			
COPILOT			
ACRO FUEL			
WING FUEL			
	$\Sigma W =$		$\Sigma (W \times X) =$

$$XG = \frac{\Sigma (W \times X)}{\Sigma W} =$$

**6.4 LOADING WEIGHTS AND MOMENTS**

OCCUPANTS : max. 2

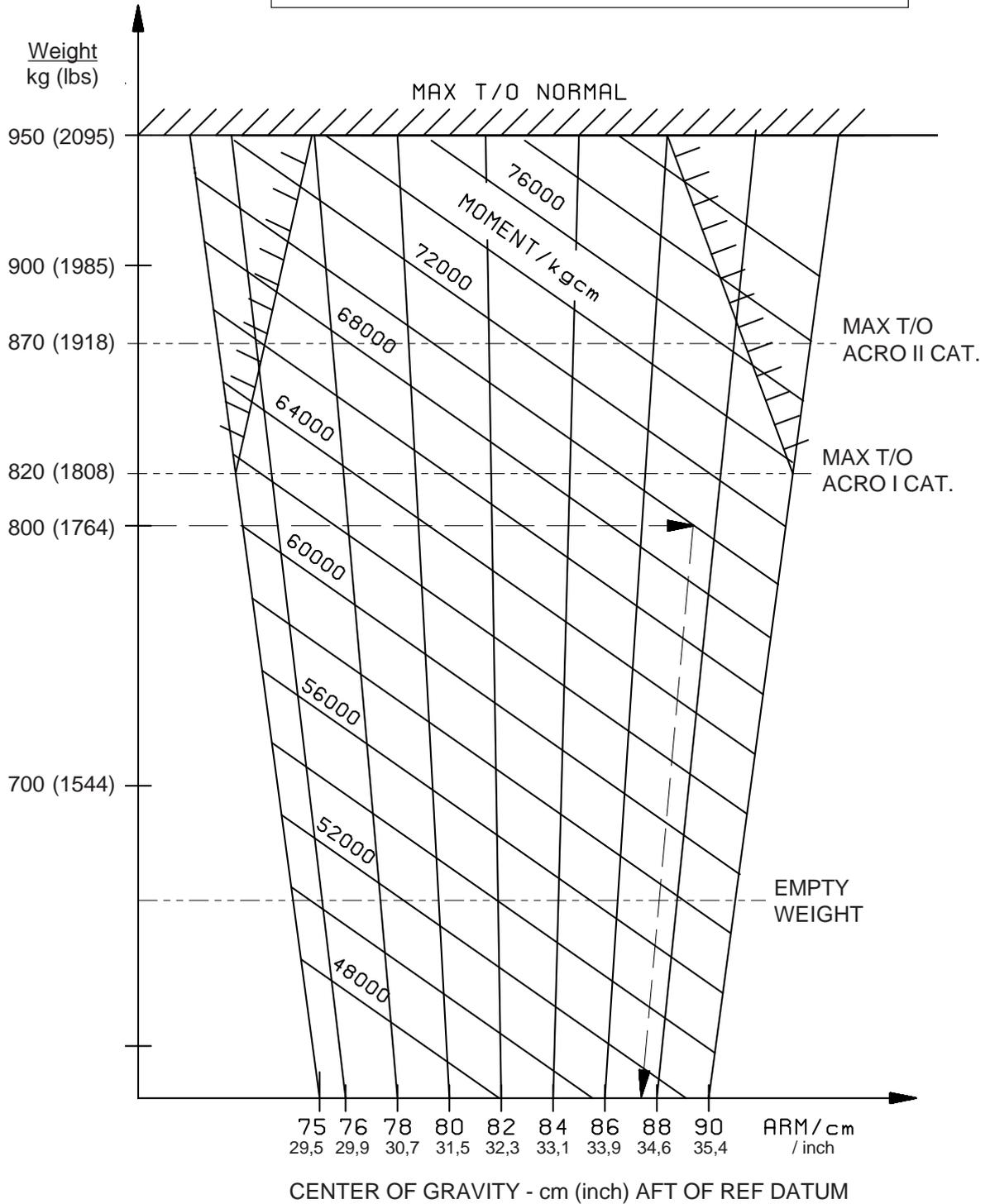
WEIGHT		PILOT REAR SEAT ARM = 217cm (85,4")		COPILOT FRONT SEAT ARM= 116cm (45,7")	
KG	LBS	MOMENT KG x CM (IN x LBS)			
60	132	13020	(11273)	6960	(6032)
65	143	14105	(12212)	7540	(6535)
70	154	15190	(13152)	8120	(7038)
75	165	16275	(14091)	8700	(7541)
80	176	17360	(15030)	9280	(8043)
85	187	18445	(15970)	9860	(8546)
90	198	19530	(16909)	10440	(9049)

FUEL MAX 160 LITER (42,3 US GAL.)

CAPACITY		WEIGHT		MOMENT	
LITER	US GAL.	KG	LBS	KG CM	IN LBS
20	5,3	14,4	31,7	792	688
40	10,6	28,8	63,5	1584	1375
60	15,9	43,2	95,3	2333	2025
80	21,2	57,6	127,0	3082	2675
100	26,4	72,0	158,8	3830	3325
120	31,7	86,4	190,5	4579	3975
140	37,0	100,8	222,3	5328	4625
160	42,3	115,2	254,0	6077	5275

**6.5 WEIGHT AND MOMENT LIMITS**

**EXAMPLE:**  
**AT 800 KG (1764 LBS) AND 70000 KG CM (60768 IN LBS),**  
**THE C/G LOCATION IS 87,5CM (34,4") AFT OF REF DATUM**



**6.6 EQUIPMENT LIST**

**EA 300 S/N:**

QTY	ITEM	MANUFACT.	P/N	WEIGHT (KG)	ARM (m)	MARK IF INSTALLED	REQUIRED (R) OPTIONAL (O) ALTERNAT. (A)
1	Engine	Textron Lycoming	AEIO-540-L1B5	194.90	-0.72		R
1	Magneto L/H	Slick	6251 or 6351	2.30	-0.15		R
1	Magneto R/H	Slick	6250 or 6350	2.00	-0.15		R
1	Engine	Textron Lycoming	AEIO-540-L1B5D	194.90	-0.72		A
1	Magnetos	Bendix	D6LN-3000	5.20	-0.15		A
4	Shock Mounts	Lord	J 7764-20	1.70	-0.29		R
4	Shock Mounts	Barry Controls	94016-02	1.70	-0.29		A
1	Exhaust System 6 in 2	EXTRA/Sky Dynamics	63104A0	7.65	-0.40		R
2	Exhaust Silencer	Gomolzsig	EA300 NSD GO3-606500	9.60	0.79		O
1	Exhaust System 6 in 1 with Silencer	Gomolzsig	EA300-606000	8.20	-0.39		A
1	Fuel Injector	Bendix	RSA-10 AD 1	3.90	-0.68		R
1	El. Fuel Pump	Weldon Tool	8120-M or B8120-M	1.10	-0.04		R
1	Oil Cooler	Stewart Warner	8406 R	1.40	-0.90		R
1	2. Oil Cooler	Stewart Warner	8406 R	1.40	-0.20		R
1	Single Oilcooler, rear	Niagara NDM	20009A	1.81	-0.22		A
1	Single Oilcooler, rear	Aero Classics	8000353	1.65	-0.22		A
1	Set Fuel, Oil & Sens. Hoses in Eng. Comp.	div.	MS28741 with firesleeve	6.30	-0.21		R
1	Set Fuel, Oil & Sens. Hoses in Eng. Comp.	Parker/Stratoflex or Aeroquip	PTFE Type 124J or AE466	4.90	-0.21		A
1	Set Fuel, Oil & Sens. Hoses in Eng. Comp. single Oil Cooler Sys.	Parker/Stratoflex or Aeroquip	PTFE Type 124J or AE466	3.70	-0.15		A
1	Set Fuel Hoses in Cabin Comp.	div.	MS28741	1.37	0.30		R
1	Set Fuel Hoses in Cabin Comp.	Parker/Stratoflex or Aeroquip	PTFE Type 124 or 666	0.91	0.30		A
1	Sens. Hoses (Cabin) (Oil, Fuel & MA Press)	Knapp/Hoerbiger	HS3MA OR H3MM	0.30	0.87		R
1	RPM Vernier Control	ACS Products Co.	A-750-30-1200	0.71	0.55		R
1	Mixture Vernier Control	ACS Products Co.	A-750-20-1080	0.65	0.70		R
1	Throttle Control	Teleflex Marine	F303 02000	0.45	0.01		R
1	Propeller	MT-Propeller	MTV-9-B-C/C200-15	30.40	-1.15		R
1	Spinner	MT-Propeller	P-208-B				R
1	Spinner	MT-Propeller	P-810-2				A
1	Propeller	MT-Propeller	MTV-14-B-C/C190-17	29.80	-1.15		O
1	Spinner	MT-Propeller	P-238-A				O
1	Spinner	MT-Propeller	P-967				A
1	Cowling (GRP) incl. Air Intake Screen	EXTRA EXTRA	23205.01 & .02 83802.1	9.80	-0.52		R
1	Cowling (CRP) incl. Air Intake Screen	EXTRA EXTRA	23205.301 & .302 83802.1	8.80	-0.52		A
1	Cowling incl. Air Intake Screen	EXTRA	83001.0	9.20	-0.53		A

QTY	ITEM	MANUFACT.	P/N	WEIGHT (KG)	ARM (m)	MARK IF INSTALLED	REQUIRED (R) OPTIONAL (O) ALTERNAT. (A)
1	Governor	Woodward	X-210988 or A-210988	1.10	-0.91		R
1	Governor	MT-Propeller	P-880-5	1.10	-0.91		A
7	Switches	Cutler Hammer	div.	0.28	1.76		R
7	Switches	Kissling	div.	0.28	1.76		A
11	Circuit Breaker	Potter&Brumfield	div.	0.50	1.75		R
11	Circuit Breaker	ETA or Klixon	div.	0.30	1.75		A
1	Main Bus Fuseholder Main Bus Strip Fuse (40 Amps)	MTA	03.00360	0.03	0.02		O
1		MTA	02.00300				O
1	PCB Auto Fuse	EXTRA	83290.1	0.01	0.03		O
1	Fuel Cont. Probe Wing Tank	VDO	226 801 015 001 G	0.12	0.50		R
1	Fuel Cont. Probe Header Tank	VDO	224 082 008 021R	0.20	0.55		R
1	Fuel Cont. Ind. Wing Tank	VDO	301 271 036 001 K or 301 030 001 G	0.08	1.75		R
1	Fuel Cont. Ind. Header Tank	VDO	301 272 052 001 K or 301 030 002 G	0.14	1.75		R
1	Ammeter	VDO	190 004 039 002 or 190 037 002 G	0.08	1.75		R
1	Volt/Ammeter	Electronics Intern.	VA-1A	0.26	1.75		A
1	Shunt Volt/Ammeter	Electronics Intern.	S-50	0.09	1.65		A
1		Electronics Intern.	VA-1A-50	0.22	1.75		A
1	RPM Indicator	VDO	333 230 115 002 or 333 035 001 G	0.31	1.73		R
1	RPM Indicator digital	Horizon	P100-230-643-00	0.68	1.73		A
1	Magn. Dir. Ind.	Airpath	C 2300	0.25	1.75		R
1	Oil Press./ Oil Temp. Ind.	AMITEK or Christen	61943	0.51	1.75		R
1	Oil Press./ Oil Temp. Ind. (3 1/8") Oil Temp. Sender Oil Press Sensor	Westach	3DA3-3MM or 3DA3-3KV	0.14	1.75		A
1		Westach	W399-S9	0.08	-0.11		A
1		Mediamate	387-100MM or 387-100KV	0.12	0.04		A
1	Oil Press / Oil Temp Ind. (2 1/4") Oil Temp. Sender Oil Press Sensor	Westach	2DA3-3MM or 2DA3-3KV	0.09	1.75		A
1		Westach	W399-S9	0.08	-0.11		A
1		Mediamate	387-100MM or 387-100KV	0.12	0.04		A
1	Stall Sensor	EXTRA	73106.1	0.07	0.57		R
1	Stall Warning Horn	EMAG	EM-S 110P	0.13	1.60		R
1	G-Meter	EXTRA	DSA 12	0.37	1.73		O
1	G-Meter	Kollsman or Pioneer or Bendix	AN5745	0.40	1.73		O
1	G-Meter	EZE Technologies	DA-55	0.16	1.74		O
1	ELT and Antenna	Pointer	3000-10	0.90	1.71		O
1	Turn & Bank Ind.	United Instruments	9501-2 / TSO C3b	0.55	1.67		O
1	Turn & Bank Ind.	Castleberry	C101 / TSO C101T	0.55	1.67		O

QTY	ITEM	MANUFACT.	P/N	WEIGHT (KG)	ARM (m)	MARK IF INSTALLED	REQUIRED (R) OPTIONAL (O) ALTERNAT. (A)
1	Altimeter, front	United Instruments	UI5934PD-3 A.134	0.60	0.82		O
1	Altimeter, front	TAI	10-04500	0.60	0.82		O
1	Altimeter, front metric	Winter	4110	0.33	0.84		O
1	Altimeter, rear	United Instruments	UI5934PD-3 A.134	0.60	1.75		R
1	Altimeter, rear	TAI	10-04500	0.60	1.75		A
1	Altimeter, rear metric	Winter	4110	0.33	1.77		A
1	Altitude Encoder	ACK	A-30	0.15	1.50		O
1	Airspeed Ind., front	Winter	6533-321	0.21	0.82		O
1	Airsp. Ind., front metric	Winter	6531-321	0.21	0.84		O
1	Airspeed Ind., front	United Instruments	UI8030 B.835	0.22	0.82		O
1	Airspeed Ind., rear	Winter	6533-321	0.21	1.77		R
1	Airsp. Ind., rear metric	Winter	6531-321	0.21	1.74		O
1	Airspeed Ind., rear	United Instruments	UI8030 B.835	0.22	1.75		A
1	EGT/CHT	Westach	2 DA 1	0.07	1.75		O
1	EGT Probe	Westach	712-2 DWK	0.06	-0.37		O
1	CHT Probe	Westach	712-7 DK	0.05	-0.20		O
1	Manifold Press. Fuel Flow Ind.	United Instruments	UI6331-H.186	0.49	1.73		R
1	VHF Radio	Becker	AR 3201	0.90	1.67		R
1	VHF Radio	Becker	AR 4201	0.67	1.67		A
1	GPS / NAV / COM	Garmin	GNS 430	2.95	1.61		O
1	Transponder	Filser	TRT-600 (LAST)	0.70	1.61		O
1	Transponder	Filser	TRT-800	0.70	1.61		O
1	Transponder	Becker	BXP6401-1	0.80	1.67		O
1	Transponder	Becker	BXP6401-2	0.80	1.67		O
1	Transponder	Becker	ATC-2000	1.20	1.61		O
1	Transponder	Becker	ATC-4401	0.73	1.67		O
1	Transponder Antenna	Comant Industries	CI 105	0.11			O
1	Transponder Antenna	Bendix/King	KA 60	0.11			O
1	COM Antenna	Moba	210FA	0.10	4.90		R
1	COM Antenna	Extra	83205A	0.10	4.90		A
1	COM Antenna	Pointer	P1 3001-10	0.05	4.90		A
1	Starter	B&C Speciality	BC 315-100-2	4.63	-0.85		R
1	Starter	SKYTEC (Lycoming)	149-12LS (31A22 104)	3.65	-0.85		A
1	Alternator 60 Amps with bracket	Electrosystems	ALX 8421 LS	5.90	-0.86		R
1	Voltage Regul.	Lamar	B-00371-25	0.15	0.02		R
1	Low Volt. Monitor	Lamar	B-00378-4				R
1	Alternator 65 Amps	Bosch	0 120 489 935	4.60	-0.86		A
1	Alternator 55 Amps	Bosch	0 120 489 917	4.20	-0.86		A
1	Alternator 55 Amps	Bosch	0 120 489 469	4.20	-0.86		A
1	Battery	Sonnenschein	Dryfit A 212/28G	10.70	0.08		R
1	Battery	Concorde	RG-25XC	10.40	0.08		A

QTY	ITEM	MANUFACT.	P/N	WEIGHT (KG)	ARM (m)	MARK IF INSTALLED	REQUIRED (R) OPTIONAL (O) ALTERNAT. (A)
1	Batt. Charger Plug	EXTRA	146 19 20	0.02	0.95		O
1	External Power Recept	Div.	AN2552-3A	1.46	1.07		O
1	Ext. Power Solenoid	Switches Kidde	22735	0.40	0.03		O
1	Ext. Power Solenoid (cont. operation)	White-Rodgers	70-111-225-5	0.40	0.03		O
1	Main Bus Solenoid	White-Rodgers	70-111-226-5	0.40	0.03		R
1	Starter Solenoid	Switches Kidde	22735	0.40	0.03		R
1	Low Voltage Light	OAK	MS25041-2	0.02	1.76		R
1	Ignition Switch	TCM	10-357200-1	0.15	1.76		R
2	Wheel	Cleveland	40-151	4.00	0.41		R
2	Main Wheel Tires	Div	5.00-5 / 6PR	3.90	0.41		R
1	Tail Wheel 5"	EXTRA	53200	5.50	5.73		R
1	Tail Wheel 5"	EXTRA	steerable	5.50	5.73		A
1	Tail Wheel 6" Assy (Soft)	Special Products Aviation Inc.		5.90	5.73		A
2	Brake Assy	Cleveland	30-164	1.40	0.41		R
2	Brake Cyl., front	Cleveland	10-20 or 10-20E	0.55	0.40		R
2	Brake Cyl., front	Matco	MC-4E	0.55	0.40		A
2	Brake Cyl., rear	Cleveland	10-20 or 10-20E	0.55	1.40		R
2	Brake Cyl., rear	Matco	MC-4E	0.55	1.40		A
1	Brake Fluid Reservoir	EXTRA	53301.1	0.20	0.03		R
1	Brake Fluid Reservoir	ACS	A-315	0.20	0.04		A
1	Seat rear Standard	EXTRA	73201.4	2.70	2.46		R
1	Seat rear (CFK)	EXTRA	83403.10/11	2.60	2.46		A
1	Seat front Standard	EXTRA	73201.3	2.60	1.39		R
1	Seat front (CFK)	EXTRA	83404.1	2.50	1.39		A
1	Safety Belt Assy Rear	Hooker	1 011 230 with ratchet	3.30	2.20		R
1	Safety Belt Assy Front	Hooker	1 011 230	2.90	1.03		R
1	Safety Belt Assy Front	Hooker	1 011 230 with ratchet	3.30	1.03		A
2	NAV/STROBE LTS	Whelen	A 600-PG/PR-14	0.23	0.87		R
2	Power Supply	Whelen	A490T	0.54	0.87		R
1	Standard Canopy	EXTRA	26301.000-LV	15.00	2.00		R
1	Standard Rudder Pedal System	EXTRA		2.20	1.26		R
1	Electric Rudder Pedal Adjustment incl.:	EXTRA	83600A0	7.45	1.69		A
2	Electric Actuator Pedal Adjust.	SKF	CARR 22x200x1/D12B				A
1	Long Range Tank	EXTRA	83901	1.80	0.59		O
1	Fuel Shut Off Valve	Spruce	104HD-04x4	0.28	0.75		R
1	Fuel Shut Off Valve	Allen	6 S 122	0.19	0.75		A



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SECTION 7

DESCRIPTION AND OPERATION  
OF AIRCRAFT AND SYSTEMS

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## SECTION 7

### DESCRIPTION AND OPERATION OF AIRCRAFT AND SYSTEMS

#### 7.1 THE AIRCRAFT

The aircraft EXTRA 300 is designed and developed by EXTRA Flugzeugproduktions- und Vertriebs- GmbH, Flugplatz Dinslaken, 46569 Hünxe, Federal Republic of Germany, in accordance with the U.S. Federal Aviation Regulations, part 23, categories normal and acrobatic to fulfill the primary flight training, normal operation rules and acrobatic training up to the unlimited acrobatic level.

EXTRA 300 is a light weight, robust, single piston-engined, two-seat aircraft with a fuselage structure in tig-welded steel-tube construction.

The landing gear, wing, and tail are made of epoxy, reinforced with glass- and carbonfiber. The items are qualified up to 72°C (161,6°F). Not to exceed this temperature limit an appropriate colour specification for composite structure is given by the manufacturer document EA-03205.19.

To check the temperature inside the cockpit (potential "green house" effect) a reversible temperature indicator (*STRUCTURAL OVERHEAT INDICATOR*) is applied on the rear web of the wing main spar in the carry-through section. After reaching the temperature limit of 72°C (161,6°F) the word "*RISK*" appears on the red spot of this structural overheat indicator immediately and flying is prohibited. When the structure cools down below this temperature limit the word "*RISK*" disappears and you may go on with the preflight checklist.

a) Below 72°C (161,6°F)



b) At 72°C (161,6°F) or above



The standard aircraft is designed to operate within a range of ambient air temperature from -20°C to +44°C (-4°F to 111°F) at sea level. It is possible to start the engine using the aircraft battery at -20°C (-4°F) without preheating. Below -10°C (+14°F) OAT a special oil breather line must be adapted (available as kit).

#### 7.2 FUSELAGE

The fuselage structure consists of a steel tube construction integrating the wing and empennage connections as well as the seats. The front part of the fuselage, the lower side and the sides below the wings are faired with aluminium sheet metal. In the area of the rear seat there are Lexan® windows in the fairing. The rear part of the fuselage is covered with Ceconite® 102. The upper fuselage body surface consists of a kevlar laminate. The canopy is one part. The canopy frame is constructed by carbon laminate, the correlated frame on the fuselage by GRP. The canopy opens to the right and is held in the open position by a belt. Emergency jettisoning is achieved by simply unlatching the canopy.

### **7.3 WINGS**

The wing is of CRP construction. The dual chamber main spar - fulfilling the requirement for fail safe design - consists of carbon roving caps combined with CRP webs. Core foam is a PVC foam (Divinycell HT 50). The wing shell is built by a Honeycomb sandwich with CRP Laminates. On the surface there is a protective layer of GRP. To prevent buckling of the shell plywood ribs are used. In the area of the wingtanks is a layer of CRP laminate with an incorporated aluminium thread bonded to the metal fuselage structure as means of lightning protection.

The connection to the fuselage is arranged by two bolts piercing through the spar parallel to the centerline of the fuselage and two brackets at the rear spars. Integral fuel cells are provided in the leading edge of the wing extending from the root ribs to half the span of each R/L and L/H wing. The ailerons are supported at three points in spherical bearings pressed into aluminium brackets. To reduce pilot's hand forces the hinge line of the ailerons is positioned 25% of the aileron depth. Furthermore the ailerons are equipped with "spades" to decrease pilot forces. Ailerons are controlled via the center bracket. To prevent flutter the ailerons are weight balanced in the overhanging leading edge.

### **7.4 EMPENNAGE**

The EXTRA 300 possesses a cruziform empennage with stabilizers and moveable control surfaces. The rudder is balanced aerodynamically at the tip. Spars consist of PVC foam cores, CRP caps and GRP laminates. The shell is built by honeycomb sandwich with GRP laminates. Buckling is prevented by plywood ribs.

Deviating from the other control surfaces the spar webs of the surfaces of the elevator is built by CRP. On the R/H elevator half a trim tab is fitted with two hinges. The control surfaces are mounted in spherical bearings (exception: Trim tab). To prevent flutter rudder and elevator are mass balanced. The balance weight for the rudder is installed in the rudder tip while the balance weight for the elevator is mounted on the elongated center bracket of the elevator extending into the fuselage.

## **7.5 FLIGHT CONTROL SYSTEM**

### **7.5.1 PRIMARY CONTROL SYSTEM**

The EXTRA 300 is standard equipped with full dual primary flight controls including conventional stick-type control columns and adjustable rudder pedals. The primary control surfaces are operated through a direct mechanical linkage.

### **7.5.2 LONGITUDINAL FLIGHT CONTROL SYSTEM**

The two control columns are interconnected by a torque tube. The control movements are from there transferred to the elevator by a push rod.

### **7.5.3 LATERAL FLIGHT CONTROL SYSTEM**

Push and pull rods are connected by sealed ball bearings from the torque tube to the ailerons.

The ailerons are statically as well as dynamically balanced. (Dynamically with spades).

The ailerons are supported by lubricated, sealed bearings.

### **7.5.4 DIRECTIONAL FLIGHT CONTROL SYSTEM**

The dual rudder pedals with brake pedals are adjustable and operate the rudder through a cable system. Springs keep the cables under tension when they are not operated.

### **7.5.5 SECONDARY CONTROL**

The elevator trim control is located on the right side in the rear cockpit.

The canopy lock is operated from the outside by a handle on left side of the canopy by reaching into the cockpit through the window. Inside a handle is located in both cockpits, used for locking as well as for normal operation and for emergency release.

The starter/magneto switch is located on the lower edge of the instrument panel in front of the rear seat.

## 7.6 INSTRUMENTATION

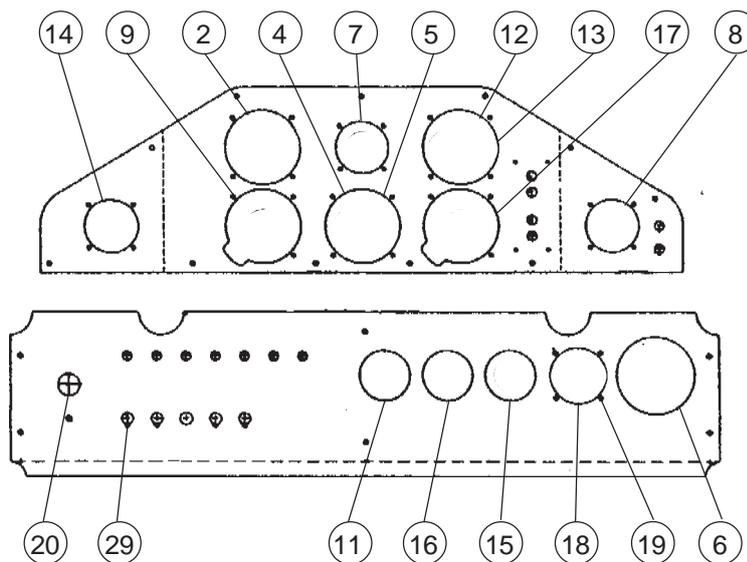
The Extra 300 is equipped with flight instruments in both cockpits.

Instruments and placards can be provided with markings in either metric or English units. The colour markings in instruments follow US-FAR, part 23 recommendation ( see section 2 ).

### 7.6.1 INSTRUMENT PANEL (REAR COCKPIT)

For instrument panel arrangement of the rear cockpit refer to Fig. 7.6.1, which includes standard and optional equipment marked as such.

Fig. 7.6.1:



Standard	Optional	Position	Item
	x	1	Vertical speed indicator
x		2	Air speed indicator
	x	3	Turn and bank indicator
x		4	Manifold pressure
x		5	Fuel Flow
x		6	RPM indicator
x		7	Magn. Direction indicator
x		8	COM
x		9	Altimeter
	x	10	Artificial horizon
x		11	Amperemeter
x		12	Oil pressure
x		13	Oil temperature
	x	14	Fuel pressure
x		15	Fuel Quantity Wing Tank
x		16	Quantity Aero Tank
x		17	g-meter
x		18	EGT
x		19	CHT
x		20	Magneto Selector switch & starter
x		21	RPM control, Prop governor
x		22	Mixture control
x		23	Throttle lever
x		24	Intercom button
x		25	Stick
x		26	Radio button
x		27	Fuel shutoff valve
x		28	Trim lever and indicator
x		29	Master switch
x		30	Boost pump
	x	31	Directional gyro

**NOTE**

**This list may be modified by the minimum equipment requirements of individual certifying authorities!**

### **7.6.2 INSTRUMENT PANEL (FRONT COCKPIT)**

Normally the instrument panel in the front cockpit is only equipped with the following positions.

2	Airspeed indicator
9	Altimeter indicator
23	Throttle
24	Intercom button
25	Stick
26	Radio button
27	Fuel shutoff valve

### **7.7 LANDING GEAR**

The landing gear is a composite construction with a multichamber fiberglass spring in a tail-wheel design.

The main wheels have a size of 5-5.50 and they are equipped with hydraulic disc brakes.

The tail wheel has a solid rubber tire with full-swivel capability.

## **7.8 SEATS, SEAT BELTS**

The seat in the rear cockpit is mechanically adjustable on the ground. The seat angle can be adjusted on the ground with 2 quickpins, there are different seat angle possibilities. The back rest is also adjustable on the ground in different positions.

Seat to pedal distance can be varied on the ground in different positions, which can be adjusted with the bolts located on the r/h and l/h pedal adjustment. In the front cockpit there is no possibility to adjust either the pedals nor the seat. The seat belt assembly consists of right and left shoulder straps, two right and two left lap belts and a negative G-strap.

All belts are adjustable. The lap belts have a separate single point release for redundant safety during acrobatic maneuvers. If one release is opened unintentionally the second one guarantees full safety. To assure safe operation one release must be closed to the right the other one to the left. During acrobatic maneuvers the seat belt system should be tightened firmly.

## **7.9 CANOPY**

The canopy of front and rear cockpit is manufactured in one section. The canopy can be manually operated and opened by lifting to the right.

In the open position there is a rod mounted to the fuselage rear of the canopy which must be connected to the canopy preventing slam down unintentionally.

Interior canopy locking handles, located on the left side on the canopy of each cockpit must be pulled together to unlock the canopy from the inside.

To open the canopy from the outside there are no separate handles, this means it must be opened by reaching through the small window (bad weather window) and proceed as mentioned above (interior opening).



### 7.10.2 OIL SYSTEM

The oil is cooled by a Two Cooler System mounted on the left hand side in the engine compartment.

Alternatively a Single Cooler System is available. In this case the oil is cooled by one oil cooler mounted on the aft, right hand side of the engine.

The oil level is determined by a dip-stick.

A thermostatic valve is fitted upstream of the oil cooler. This valve ensures a quick warm-up of the oil after engine start.

Oil capacity and grades:

Oil:

Max sump capacity	16 qts.
Min sump capacity	Acrobatic 12 qts. Normal 9 qts.

For temperatures and oil grades refer to Section 1.7.

### 7.10.3 ENGINE INSTALLATION

The engine is supported by four shock mounts (type LORD or BARRY CONTROLS), to the tig-welded steel tube engine mount which is attached to the fuselage with four bolts on the firewall axis.

The engine cowling is divided into two parts, a lower and an upper part both made of glass-fibre/carbonfibre reinforced epoxy. The parts are fixed by a number of screws and the upper cowling has a separate hatch for easy access to the oil dip-stick.

### 7.10.4 PROPELLER

The standard propeller is a 3-blade wood composite, constant speed propeller type MTV-9-B-C/C200-15. The propeller has a diameter of 2,0 m. A 4-blade propeller type MTV-14-B-C/C190-17 with a diameter of 1,9 m is also available as an optional equipment.

### 7.10.5 THROTTLE

Dual control (cub-type) mounted on the left side in cockpit.

#### **7.10.6 MIXTURE**

Vernier-control located at left side of rear cockpit (red knob).

#### **7.10.7 RPM-CONTROL**

Vernier-control on the left side of the rear cockpit.  
Preselection of RPM possible due to constant speed governor (blue knob).

#### **7.10.8 FUEL SHUTOFF VALVE**

Dual control. A rotary fuel shut-off is mounted behind the firewall. A torque tube is mounted in both cockpits at the right side and a 90° turn on the handle opens the valve.  
Position left = closed. Position up = open.

#### **7.10.9 EXHAUST SYSTEMS (OPTIONAL)**

Optionally the EA 300 can be equipped with an additional silencer system type Gomolzig. The attachment is integrated in the fuselage structure. Thus no modifications are necessary to install the silencer system.  
Alternatively a complete 6 in 1 System with integrated silencer is available.

#### **7.11 FUEL SYSTEM**

The root section of each wing - in front of main spars forms an integral fuel tank providing two tanks each with 60 litres, (total 120 Ltr ; 31,7 US Gal). The tanks can be completely emptied in flight but the normal amount of unusable fuel is approximately 2 Liters (0.5 US Gallon).

Each wingtank has a 2" diameter filler cap for gravity refueling. An acro tank 40 litres (10.6 US Gal) is mounted in the fuselage just behind the firewall. The acro tank is connected with the wingtanks in a gravity feed system.

Adequate venting is provided in each tank to a main ventilation-tube, ending outside the fuselage at the right side.

In addition to the engine driven fuelpump an electrically driven auxiliary fuel pump (boost pump) with by-pass and having sufficient capacity to feed the engine at take-off power is fitted as a safety device against failure of the engine-driven pump. The auxiliary pump switch is located on the instrument panel in the rear cockpit.

A fuel filter with drain is installed between the fuel shut-off and the valve auxiliary fuel pump. At the lowest point of the fuel system - bottom of acro tank - the water can be drained with another drainer.

Normal float type transducers and electrically operated fuel indicators are used.

## 7.12 ELECTRICAL SYSTEM

The electrical system is supplied by a 12 V alternator with rectifier, transistor voltage regulator. The alternator is mounted on and driven by the engine.

The field current is controlled by the voltage regulator to nominal 14 V under all load conditions. The masterswitch is located on the rear instrument panel.

Circuit protection against overvoltage is provided by the voltage regulator.

The maximum load taken from the alternator is 40 amp.

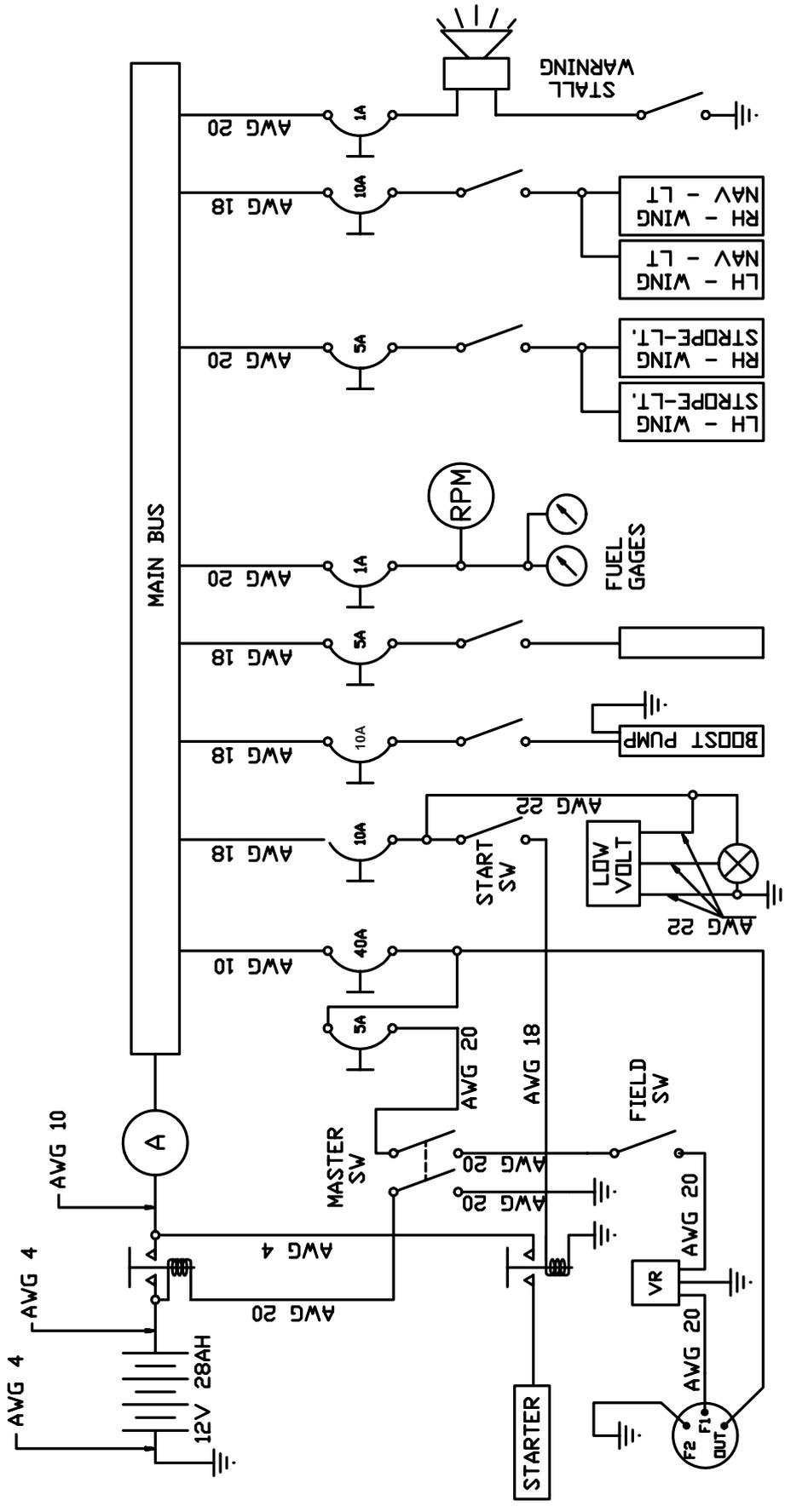
A 12 V leak proof battery is connected across the alternator output to stabilize the supply and to maintain all essential services in the event of an alternator failure and when the engine is not operating. The battery is mounted behind the firewall.

All electrical circuits are protected by circuit breakers located on the rear instrument panel and they are easily accessible to the pilot during flight.

The electrical system is adequately noise suppressed to ensure satisfactory operation of the radio equipment.

All wires, switches, circuit breakers etc. are manufactured to related aeronautical specifications.

Standard Equipment shown only



### **7.13 CABIN ENVIRONMENT CONTROL**

A ventilation system in the canopy on the left side is provided for the supply of fresh air to the cabin. Left and right at the rear seat are eyeball-type adjustable vents.

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**SECTION 8**

**HANDLING, SERVICING AND MAINTENANCE**

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## **SECTION 8**

### **HANDLING, SERVICING AND MAINTENANCE**

#### **8.1 INTRODUCTION**

- a) The airplane owner should establish contact with the dealer or certified service station for service and information.
- b) All correspondence regarding the airplane must include its serial number which is stamped on a plate on the L/H rear part of the fuselage.
- c) A service manual with revision service may be procured from the manufacturer.

#### **8.2 AIRPLANE INSPECTION PERIODS**

As required by national operating rules all airplanes must pass a complete annual inspection every twelve calendar months. In addition to the annual inspection airplanes must pass a complete inspection after every 100 flights hours with a minor check after 50 hours.

The Airworthiness Authority may require other inspections by the issuance of airworthiness directives applicable to the aircraft, engine, propeller and components. The owner is responsible for compliance with all applicable airworthiness directives and periodical inspections.

#### **8.3 PILOT CONDUCTED PREVENTIVE MAINTENANCE**

Pilots operating the airplane should refer to the regulations of the country of certification for information of preventive maintenance that may be performed by pilots. All other maintenance required on the airplane is to be accomplished by appropriately licensed personnel. Airplane dealer should be contacted for further information

Preventive maintenance should be accomplished with the appropriate service manual.

#### **8.4 ALTERATIONS OR REPAIR**

Alterations or repairs of the airplane must be accomplished by licensed personnel.

## **8.5      SERVICING**

In addition to the airplane inspection periods (8.2) information for servicing the aircraft with proper oil and fuel is covered in Section 2 (Limitations) and Section 7 (Descriptions and Operation).

## **8.6      GROUND HANDLING**

a) Due to its low weight and the free swiveling tail wheel two persons can easily move the airplane by hand.

b) To tie down the airplane M6 nut plates are provided in the wing tips where ring bolts can be screwed in. The tail wheel leg can be used as third point to tie down the airplane. If the aircraft is parked in the open, it must be protected against the effects of weather, the degree of protection depending on severity of the weather conditions and the expected duration of the parking period. When the airplane is parked in good weather conditions for less than a half day park the aircraft headed into the wind and place wheel chocks at the main wheels.

c) To level the aircraft, the tail wheel is rested on a balance and jacked to a position that the fuselage reference line (upper fuselage stringer tube) is horizontal. There are two engine hoists provided on the top of the engine which can be used to lift the airplane with a crane. (Tail wheel resting on ground)

**SECTION 9**

**SUPPLEMENTS**

Doc-No. EA-03701.1

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## 9 SUPPLEMENTS

### 9.1 INTRODUCTION

Section 9 "Supplements" of the Pilot's Operating Handbook contains all information, necessary for a safe and efficient operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

### 9.2 NOTES

The described systems and equipment are certified by the LBA for the *EXTRA 300*. Pages and contents of this section may not be exchanged and alterations of or additions to the approved contents may not be made without the EXTRA Flugzeugproduktions- und Vertriebs-GmbH/LBA approval. The editor has the copyright of this Supplements and is responsible for edition of revisions. The log of effective pages is found under section 0.4 of this Pilot's Operating Handbook.

Each Supplement section (e.g. steerable tailwheel) covers only a single system, device, or piece or equipment and is a self-contained, miniature Pilot's Operating Handbook. The owner is responsible for incorporating prescribed amendments and should make notes about these on the records of amendments. It is responsibility of the pilot to be familiar with the contents of relevant supplements.

POH Supplements must be in the airplane for flight operations when the subject equipment is installed or special operations are to be performed.

The Table of Contents shows all EXTRA Supplements available for the EXTRA 300. A check mark in the *Section* column indicates that the corresponding supplement must be included in this POH.

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**SECTION 901**

**STEERABLE TAIL WHEEL**

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## **901 STEERABLE TAIL WHEEL**

### **901.1 GENERAL**

To improve taxi and handling quality, the EXTRA 300 can be equipped with an optional steerable tailwheel. The deflection angle of this tailwheel is arranged by the rudder control up to plus/minus 30°. Exceeding this deflection the tailwheel has a full-swivel capability by a release mechanism.

### **901.2 LIMITATIONS**

The operation limitations are not effected due to the use of the steerable tailwheel.

### **901.3 EMERGENCY PROCEDURES**

There is no change of basic emergency procedures with the installation of the steerable tailwheel.

### **901.4 NORMAL PROCEDURES**

There are no changes for the described normal procedures after installation of the steerable tailwheel. In addition to the existing normal procedures the light precompression of connector springs and movement of the rudder have to be checked during the preflight check.

### **901.5 PERFORMANCE**

Changes in flight performance due to installation of the steerable tailwheel are not noticeable. The given basic performance data under section 5 are still valid.

### **901.6 WEIGHT AND BALANCE**

A change of the running empty weight and resulting C/G position after installation of the steerable tailwheel is neglectable, because of minor differences in weight and C/G between standard and optional steerable tailwheel.

### **901.7 DESCRIPTION OF THE SYSTEM**

The 5 inch tailwheel has a solid rubber tire and is rotatable by means of a wheelfork, which is connected to a bearing steelsleeve. This steelsleeve itself contains also the release mechanic, which gives the wheelfork a full-swivel capability exceeding plus/minus 30° deflection. The steelsleeve is glued into the glasfiberspring, which is bolted to the tail hardpoint of the aircraft. The steering of the tailwheel is accomplished by a direct mechanic link (rudder control cable) from the rudder pedals. The steering deflection of the tailwheel is controlled by the rudder movement and damped by anti shimmy connector springs.

## **901.8 HANDLING, SERVICING AND MAINTENANCE**

During 50 hour inspection, the bearing steelsleeve has to be lubricated on the point of lubricating. Additionally all parts of the tailwheel have to be inspected visually for deformations, cracks and corrosion.

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**SECTION 902**

**ELECTRIC PEDAL ADJUSTMENT**

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## **902 ELECTRIC PEDAL ADJUSTMENT**

### **902.1 GENERAL**

To improve seat and control convenience, the EXTRA 300 can be equipped with an optional elect. pedal adjustment system. The pedal adjustment system provides an in-flight capability to adjust the pedals according to the pilot's size and operation. For example, a more relaxed, stretched seating position for long cross-country flights is possible.

### **902.2 LIMITATIONS**

An adjustment of the pedal position during takeoff and landing is not allowed.

### **902.3 EMERGENCY PROCEDURES**

In case of an electric failure occurring during adjustment procedure (e.g. unintentional continued adjustment by failure of a control switch), try to move the pedals to the opposite direction immediately. If this measure is unsuccessful, the circuit breaker has to be pulled without delay. The relative low actuation velocity enables the pilot to sufficient rudder control input.

### **902.4 NORMAL PROCEDURES**

Check rudder control system for impeccable, easy operation during preflight inspection. For that purpose the pedals have to be adjusted to a position, which allows full control inputs of rudder and aileron simultaneously as well as full rudder control input in conjunction with full applied brakes. The pedals may be stepless adjusted in-flight independently by two switches located on the instrument panel. Pay attention to symmetrical adjustment of left and right pedal.

### **902.5 PERFORMANCE**

Not affected.

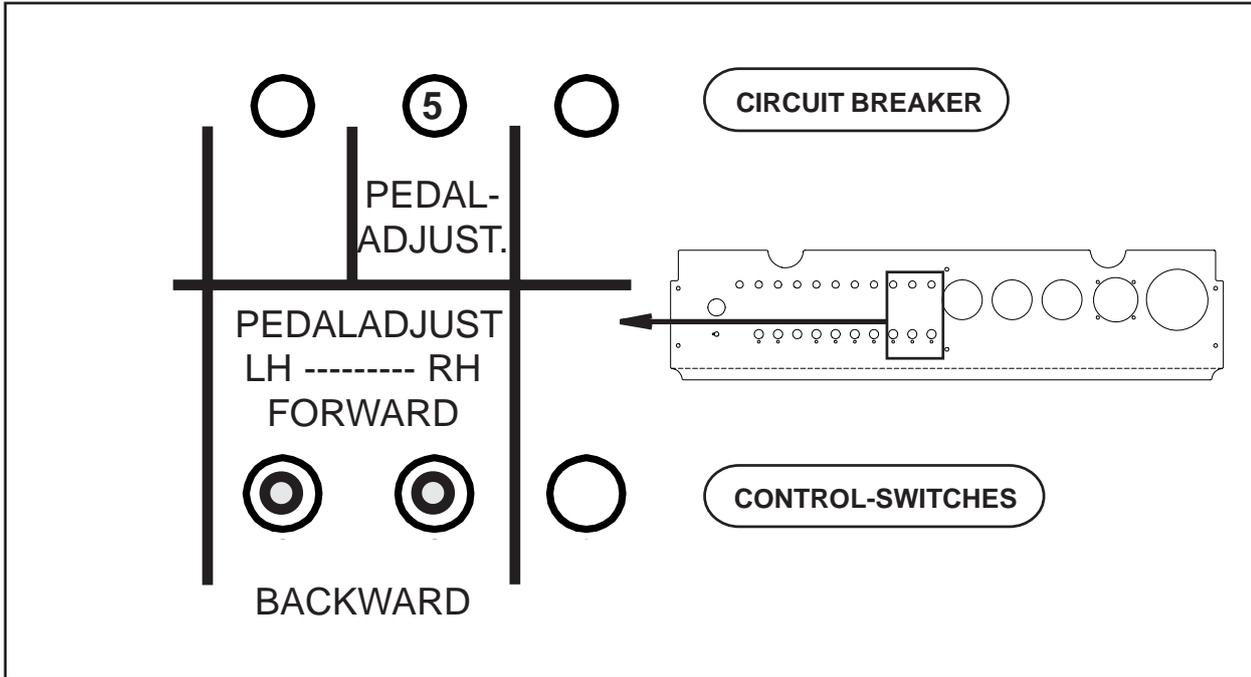
### **902.6 WEIGHT AND BALANCE**

Not affected.

### **902.7 DESCRIPTION OF THE SYSTEM**

The optional electrical pedal adjustment system which is guided on slide tubes, replaces the rear mechanical rudder pedal adjustment. Such a pedal system consists of a foot rest and the rudder pedal itself, including brake pedal and brake cylinder. An S-shaped cable leader is attached to the rudder pedal, through which the control cable runs from the rudder actuator arm to the front cable attachment at the steel frame. The connection to the front seat pedals is realized by a further cable, which is fixed to the control cable by two Nicopress oval sleeves. The stepless pedal adjustment is realized by electromechanical actuators which are controlled separately by switches on the rear instrument panel (refer to figure below). The total travel of the system is limited to 6.3" by a front and a rear stop switch at

the slide tube attachment. A full travel from the most rearward to the most forward position takes approximately 15sec.



**902.8 HANDLING, SERVICING AND MAINTENANCE**

Not affected.

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**SECTION 903**

**ELECTRONIC ACCELEROMETER**

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**903 ELECTRONIC ACCELEROMETER**

**903.1 GENERAL**

The standard equipped accelerometer typ AN 5745 can be replaced by an optional "Digital Solid State Accelerometer DSA 12".

**903.2 LIMITATIONS**

The instrument markings and placards are provided for the acrobatic category (1 seat) only; for the acrobatic category (2 seat) and for the normal category refer to corresponding limitations.

Any exceedance of given limitations have to be reported by the pilot and considered by corresponding maintenance or inspection procedure according to the *SERVICE MANUAL EA 300*.

Instrument markings

Electronic Accelerometer DSA 12

red range	-12 g	-	-10 g
yellow range	> -10 g	-	-8 g
green range	> -8 g	-	< +8 g
yellow range	+ 8 g	-	< +10 g
red range	+10 g	-	+12 g

**903.3 EMERGENCY PROCEDURES**

Not affected.

**903.4 NORMAL PROCEDURES**

Not affected.

**903.5 PERFORMANCE**

Not affected.

**903.6 WEIGHT AND BALANCE**

Not affected.

**903.7 DESCRIPTION AND OPERATION OF THE SYSTEM**

The DSA 12 accelerometer measures acceleration in one certain direction. The measuring range is between +20g and -20g. A clock inside the instrument measures time and date. One of the output-displays is an LCD with two lines and eight positions per line. Positive values of accelerations are always shown in the upper line of the LCD, and negative values of acceleration always in the bottom line.

The other output display are twentyfive LEDs which are arranged in a semicircle. The upper twelve LEDs show positive acceleration, the lower twelve LEDs show negative acceleration. The middle LED is on line all time long.

### INSTANTANEOUS ACCELERATION

The current value of acceleration is called **Instantaneous Acceleration**. It is shown by the LED-display if the value is between +12g and -12g. If the "Instantaneous Acceleration" is zero g, only the middle LED lights up. Every single g illuminates one more LED in positive (up) or negative (down) direction. For example:

The "Instantaneous Acceleration" is +5g, the middle LED and five LEDs in positive direction are illuminated. If the "Instantaneous Acceleration" is -7g, the middle LED and seven LEDs in negative direction are illuminated. In case the absolute value of the "Instantaneous Acceleration" is greater then 12g all twelve LEDs of this range are turned on.

### CURRENT EXTREME VALUES "A"

A permanently illumination of two LEDs, one for positive acceleration and another one for negative acceleration, shows the **Current Extreme Values**. They are signed by two illuminated LEDs, one in the positive and one in the negative range. These two "Current Extreme Values" are shown furthermore on the LC-Display in case of normal operation (the positive "Current Extreme Value" is shown in the upper line, and the negative "Current Extreme Value" is shown in the lower line).

They are both signed by an "A" as first character of every line. The "Current Extreme Values" change, if the "Instantaneous Acceleration" is greater than the last positive or lower than the last negative "Current Extreme Value" (the positive or the negative). The "Current Extreme Values" can be reset to 0g by pushing the buttons.

### TOTAL EXTREME VALUE "B"

Eventhough the two "Current Extreme Values" are reset to 0g, there will remain a positive and a negative **Total Extreme Value** in the memory. As soon as a "Current Extreme Value" occurs that is greater than the positive or lower than the negative "Total Extreme Value", the corresponding "Total Extreme Value" is exchanged with the "Current Extreme Value". This is a possibility to store the positive and the negative "Total Extreme Value" during different actions, while the "Current Extreme Values" are reset to 0g after every single action.

The "Total Extreme Values" can be shown or reset to 0g by pushing the buttons. They are signed with a "B" as the first character on every LC-Display line.

The "Total Extreme Values" only change if one of them is lower than the corresponding "Current Extreme Value" or if they are reset to 0g.

Here is an example: Since the last reset of the "Current Extreme Values" and the "Total Extreme Values" the maximum of the positive acceleration was +9g and the maximum of the negative acceleration was -5g. The "Instantaneous Acceleration" is +3g. Therefore the middle LED and the first three positive LEDs are illuminated for the "Instantaneous Acceleration". Furthermore the ninth LED in positive direction is illuminated for the positive "Current Extreme Value", and the fifth LED in negative direction for the negative "Current Extreme Value".

The LC-Display shows:

<b>A</b>	<b>+ 9.0 g</b>
<b>A</b>	<b>- 5.0 g</b>

After resetting the "Current Extreme Values", the LC-Display shows

A	+ 3.0 g
A	- 0.0 g

and only the middle LED and three LEDs in the positive range of the LED-Display are shining. If the display presents the "Total Extreme Value" you will see

A	+ 9.0 g
A	- 5.0 g

on the LC-Display, because the "Total Extreme Values" has not changed.

The "Total Extreme Values" only change if one of them is lower than the corresponding "Current Extreme Value" or if they are reset to 0g.

#### ABSOLUTE EXTREME VALUES "C"

Two further extreme acceleration values are the positive and the negative **Absolute Extreme Value**. These values are the greatest acceleration values that ever occurred. They can not be reset and they are stored in the long-term memory inside the instrument. Additionally, time and date these "Absolute Extreme Values" occurred are stored. These dates can be shown by the LC-Display by pushing the buttons.

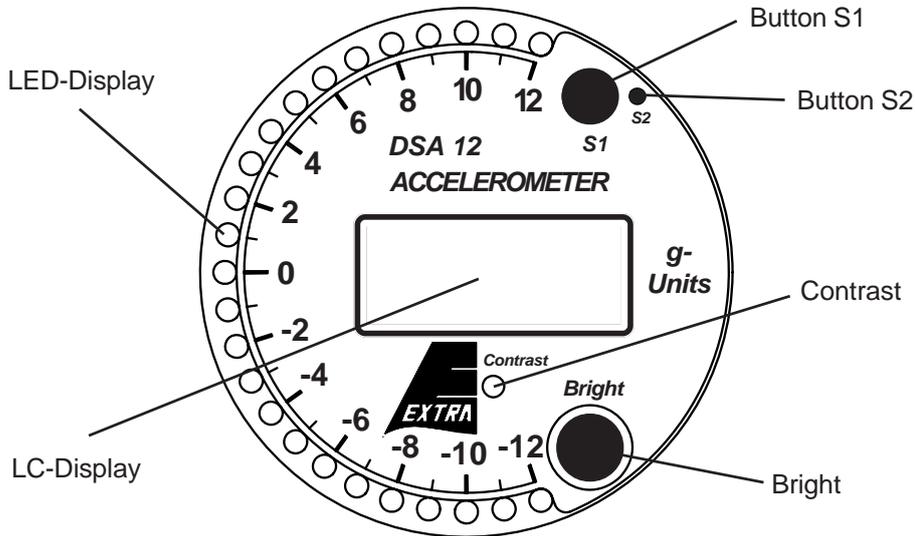
The Output of the "Absolute Extreme Values" is signed by a "C" as first character of the two LC-Display lines. The "Absolute Extreme Values" only change, if an "Instantaneous Value" occurs that is greater than the positive "Absolute Extreme Value" or lower than the negative "Absolute Extreme Value".

#### TIME AND DATE

You can recall the current **time** and **date** by pushing the buttons. If you want to change the current time and date of the clock, you have to enter the security code by the buttons. In Case the code is wrong or you wait too long, the instrument will return into the "Normal Operating Mode". The clock module has its own battery power supply backup, preventing the clock from stopping even in case of turning off the master switch or disconnecting the DSA 12 from the electrical system of the aircraft.

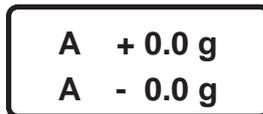
**OPERATING INSTRUCTIONS**

The left button of the instrument will be called S1 and the right button will be called S2 during the following text. If the LC-Display shows acceleration values, then the upper line exhibits the positive acceleration, and the lower line shows the negative acceleration. If the LC-Display presents time and date, you will see the time in the upper line, and in the lower line you will see the date.



**1) THE FIRST SECONDS AFTER THE POWER ON**

All LEDs are lighted up during the first two seconds after the power on of the instrument. Both the "Current Extreme Value" and the "Total Extreme Value" are reset to 0g. The LCD shows:



After two seconds the Instrument changes automatically into the "Normal Operating Mode".

**2) THE "NORMAL OPERATING MODE"**

In the "Normal Operating Mode" the instrument outputs the "Instantaneous Acceleration" and the "Current Extreme Values". The "Instantaneous Acceleration" is shown as a bar on the LED-Display. Furthermore one LED indicates the positive and another one indicates the negative "Current Extreme Value". The "Current Extreme Values" are also shown on the LC-Display and signed with an "A", for example:



---

### 3) RESET OF THE "CURRENT EXTREME VALUES"

Push button: once S1

If you want to reset the "Current Extreme Value" to 0g (for example you want to measure the extreme values of the next flight figure), you have to push S1 once. In this case, all LEDs are lighting up for two seconds, the LC-Display is showing:

<b>A + 0.0 g</b>
<b>A - 0.0 g</b>

and the "Current Extreme Value" is reset to 0g.  
On condition you push S1 for another time during this two seconds, you get to other submenus, else the instrument returns into the "Normal Operating Mode".  
All LEDs are illuminated during the submenus.

### 4) DISPLAY OF THE "TOTAL EXTREME VALUES"

Push button: twice S1

Reset of the "Total Extreme Values"

Push button: twice S1 and once S2 you push S1 twice, the LC-Display shows the "Total Extreme Values". These values are the maximums of positive and negative acceleration that occurred since the last reset of these values. They are signed with a "B" as first character of a line, like the following example:

<b>B + 8.4 g</b>
<b>B - 4.2 g</b>

In case you want to reset these two values, you have to press S2 and the instrument sets the "Total Extreme Values" to 0g and returns into the "Normal Operating Mode". Provided you pushed S1 instead of S2, the LC-Display will show the "Absolute Extreme Values".  
If there is no button pushed, the instrument will return into the "Normal Operating Mode".

### 5) DISPLAY OF THE "ABSOLUTE EXTREME VALUES"

push button: three times S1  
Display of time and date of the "Absolute Extreme Values"

push button: three times S1 and once S2

After pushing S1 for three times, the LC-Display shows the greatest positive and the greatest negative acceleration the instrument ever measured. These two values are stored in the long-term memory of the instrument and signed with a "C" as first character of the LC-Display:

<b>C + 9.6 g</b>
<b>C - 8.3 g</b>

Additionally the long-term memory stores the times and dates when new "Absolute Extreme Values" occur. They are shown if you push S2 next. In this case during the next twelve seconds the LC-Display shows under the title "MAX-DATE" the time and date of the positive "Absolute Extreme Value" and under the title "MIN-DATE" the time and date of the negative "Absolute Extreme Value". Afterwards the instrument returns into the "Normal Operating Mode".

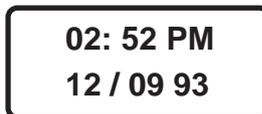
If you push S1 instead of S2, the LC-Display will show the current time and date.

If there is no button pushed for about five seconds, the instrument will return into the "Normal Operating Mode".

## 6) OUTPUT OF TIME AND DATE

push button: four times S1

The LC-Display will exhibit time and date after you have pushed S1 for four times. For example:



02: 52 PM  
12 / 09 93

is the ninth December 1993 at 2 o'clock and 52 minutes in the afternoon. If you want to set the clock, you have to push S1 for another time, otherwise the instrument returns into the "Normal Operating Mode".

## 7) SETTING OF THE CLOCK

push button: five times S1

You can only set the clock, if you know the right four digit code.

If you push S1 for five times, the LC-Display shows a request to enter the code. You can change the code-digit by pushing S2. To confirm your input of a digit you have to push S1. If the entered code-digits are wrong, or you wait longer than six seconds, the instrument will return into the "Normal Operating Mode".



CODE  
0 \_ \_ \_

Provided it was the right code, the LC-Display shows the current time and date with a cursor under the first digit. By pushing S2 you can change the digit. The change can be confirmed by pushing S1. In this case the cursor moves to the next digit. The instrument changes into the "Normal Operating Mode", if you have stepped through all digits with the cursor, or you waited more than six seconds without pushing a button. In this case the time and date on the display are transferred into the clock. If you try to enter an impossible number ( like 18 as months or 35 as days), the instrument turns

back into the "Normal Operating Mode" and the clock will be programmed with the correct changed numbers. The wrongly changed number is exchanged by its old value.

### **903.8 HANDLING, SERVICING AND MAINTENANCE**

If the absolute extreme value "C" indicates that the operating limits have been exceeded, the manufacturer must be informed. The battery inside, which is used for the clock power supply backup, is expected to have a lifetime of 5 to 10 years. A weak battery can be exchanged by the manufacturer only.

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**SECTION 904**

**EMERGENCY LOCATOR TRANSMITTER**

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**904 EMERGENCY LOCATOR TRANSMITTER**

**904.1 GENERAL**

To improve the passive security, the EXTRA 300 can be equipped with an optional Emergency Locator Transmitter POINTER 3000 ELT. This POINTER 3000 ELT transmits automatically after a crash or manual activity on the emergency frequencies of 121.5 MHz (civilian) and 243.0 MHz (military).

**904.2 LIMITATIONS**

The operation limitations are not effected due to the installation of the POINTER 3000 ELT. For the location and operation of the transmitter the following placards have to be attached in the aircraft:

**ELT located here** - placard outside on the left fuselage board in height of the ELT-unit,

**ELT** - placard below the ELT- circuit breaker (see Fig.1) ,

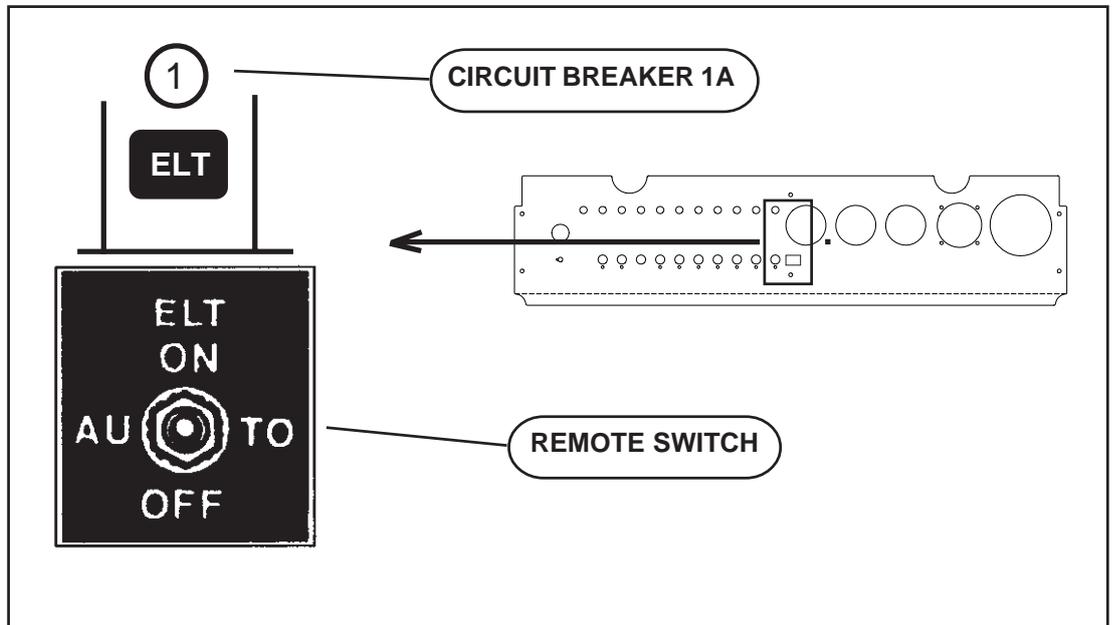
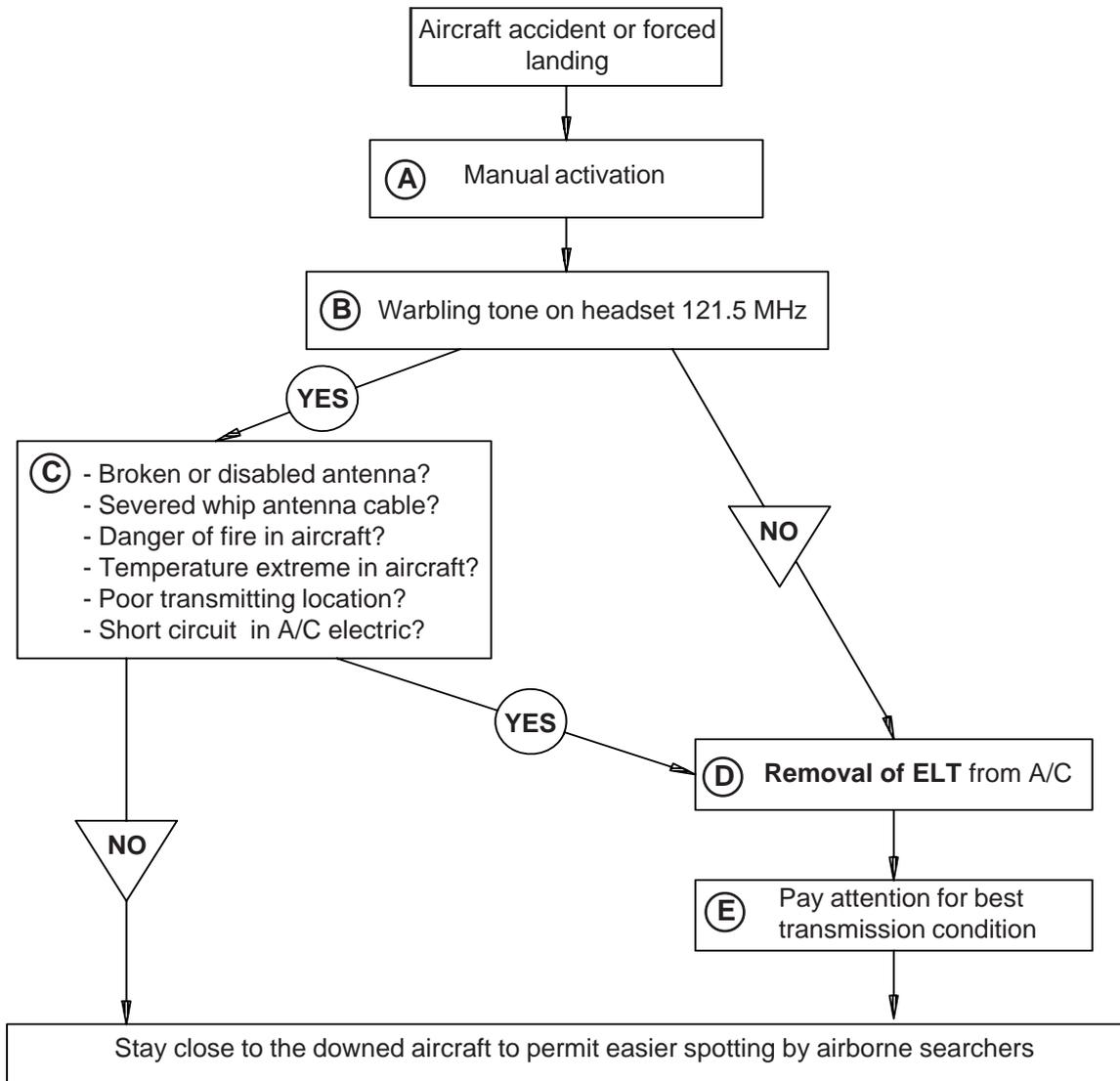


Figure 1

**904.3 EMERGENCY PROCEDURES**



**A ) Automatic and manual activation**

Although the ELT will be activated automatically by a *ROLAMITE* Type INTERTIA switch after an aircraft accident or forced landing with high G-force, turn additionally the remote switch (optional) in the rear panel or the unit master switch at the ELT unit to "ON" position. The ELT will send a signal on the emergency frequencies of 121.5 MHz and 243.0 MHz.

**B ) Control of the ELT**

If the aircraft receiver is operable listen on 121.5 MHz for ELT transmission. Ensure that whip antenna is clear of obstruction.

### C ) Operating of the ELT in the portable mode

After forced landing or aircraft accident it may be desirable to use the transmitter in the portable mode. Various reasons may necessitate this, such as:

- |  |   |                       |
|--|---|-----------------------|
| - Broken or disabled whip antenna:         | P | Ⓓ REMOVE ELT FROM A/C |
| - Severed whip antenna cable:              |   | "                     |
| - Danger of fire or explosion in aircraft: |   | "                     |
| - Temperature extremes in aircraft:        |   | "                     |
| - Poor transmitting location:              |   | "                     |

### D ) Removal of ELT from aircraft:

**NOTE**

Accomplish as quickly as possible to resume or start emergency signal.

1. Turn the unit master switch to "**OFF**"-position
2. Disconnect whip antenna cable and remote switch cable
3. Turn winged nut on rear bracket clip to release transmitter (remove ELT)
4. Remove the telescope antenna from the stowage clips and insert into the ANT receptacle. Extend antenna fully.

**CAUTION**

5. Turn unit master switch to "**ON**" position. Do not use the "AUTO"position!

### E ) Best transmission may be obtained by:

- Keeping antenna vertical,
- Standing transmitter upright on a metallic surface, such as an aircraft wing or stabilizer
- If terrain prohibits good transmission (such as a deep valley or canyon) place the Transmitter on the high ground or hold in hand on high place
- Stay close to the downed aircraft
- In freezing weather, place transmitter inside jacket or coat to keep the battery warm. Let the antenna extend outside jacket.
- Keep all moisture and ice away from the antenna connection and the remote connector pins.

**CAUTION**

Do not turn POINTER portable "**OFF**" - even by night as search aircraft may be enroute around the clock. Even when you have been sighted or think you have, the spotting aircraft may not be able to relay an accurate or timely "fix" on your position without a continued signal.

Only when the rescue team appears discontinue signalling by using the "OFF" position.

**904.4 NORMAL PROCEDURES**

There is no change of basic normal procedures with the installation of the POINTER 3000 ELT. In addition to the existing normal procedures the "AUTO" position of the unit master switch or the remote switch has to be checked during the preflight check.

**904.5 PERFORMANCE**

Not affected.

**904.6 WEIGHT AND BALANCE**

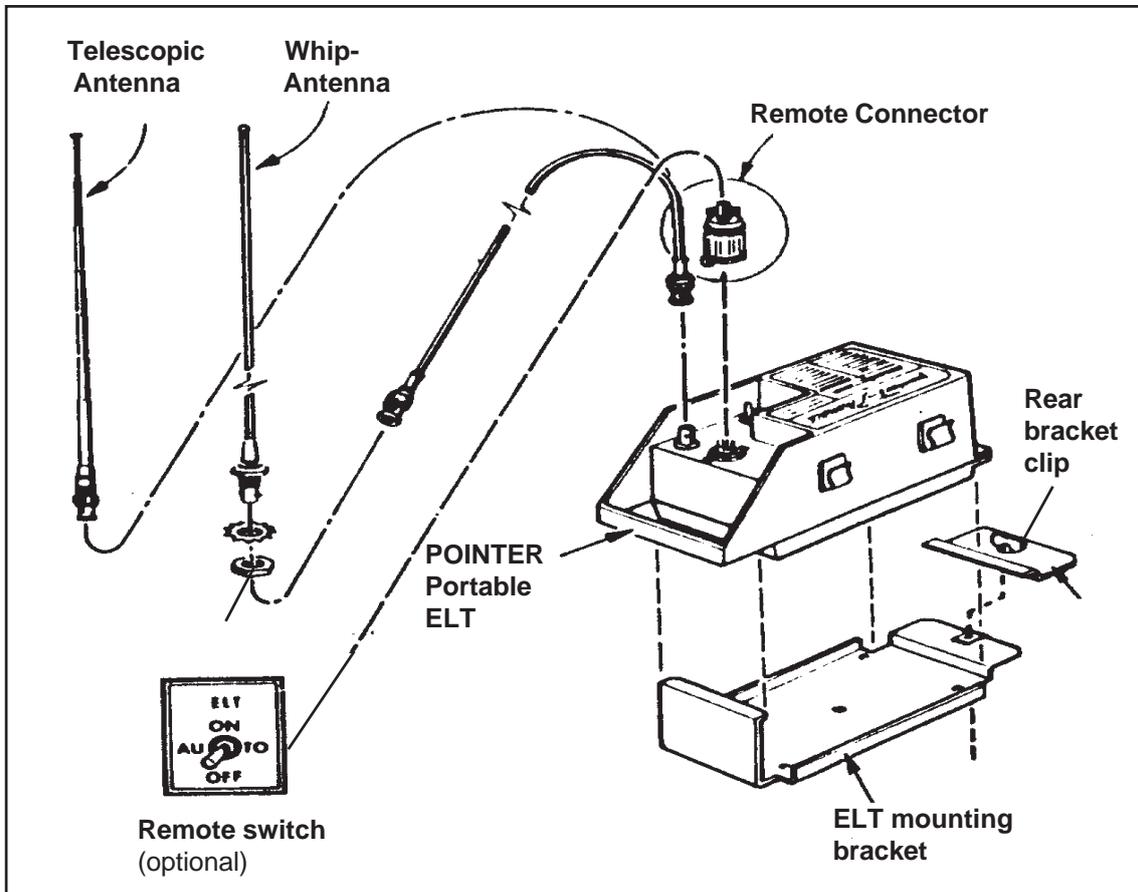
Not affected.

**904.7 DESCRIPTION AND OPERATION OF THE SYSTEM**

The used Emergency Locator Transmitter is a POINTER 3000 ELT from the POINTER INC., Tempe, Arizona. After an activation the necessity signal is transmitted on the 121,5 MHz and the 243.0 MHz for a period of 48 hours at -20° respectively 2 hours at +50°. The inertia-switch releases the necessity signal after a G-force of  $5 \pm 2/0$  g in aircraft-longitudinal axis and a duration of  $11 \pm 5/0$  milliseconds. When properly installed, parallel to the line of flight, the ELT will not activate due to turbulence, normal operation, or aerobatics.

**POINTER PORTABLE ELT MAYOR SYSTEM COMPONENTS**

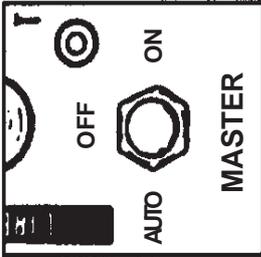
The POINTER PORTABLE ELT System consists of the following components:



## OPERATING INSTRUCTION OF THE TRANSMITTER

The operation of the ELT is possible over the master unit switch or over the remote switch (optional) in the panel.

### UNIT MASTER SWITCH



**ON:** used to activate the transmitter for test or emergency situations

**OFF:** used to deactivate transmitter or to insure non-activation by handling

**AUTO:** used to arm the Pointer Portable for automatic activation by the "G" switch only.

### REMOTE SWITCH (optional)



**ON:** used to remotely activate the transmitter for test or emergency situation. An example of such an emergency situation would be forced landing with an impact insufficient to activate the Rolamite "G"-switch.

**AUTO:** used to arm the Pointer Portable for automatic activation by the "G" switch only.

**OFF:** used to deactivate transmitter after automatic activation by the "G"-switch

## 904.8 HANDLING, SERVICING AND MAINTENANCE

Visually inspect the unit at regular intervals for cleanliness and secureness.

Check whip antenna mounting and cable connections for tightness.

In accordance with FAA regulations, batteries must be replaced after 2 years shelf or service life or for any of the following reasons:

- after the transmitter has been used in emergency situation (including any inadvertent activation of unknown duration),
- after the transmitter has been operated for more than one cumulative hour,
- on or before battery replacement date.

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**SECTION 905**

**EXTERNAL POWER**

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## 905 EXTERNAL POWER

### 905.1 GENERAL

The EXTRA 300 can be equipped with two versions of an optional external power receptacle system. The "normal" system (PN 93102.16-01) provides the capability to start the engine independent of the board battery and is limited to this use. The "continuous operation" system (PN 93102.16-02) further allows feeding the electrical system for longer periods.

### 905.2 LIMITATIONS

The operation limitations are not affected due to the installation of the external power receptacle system. For the location of the external power receptacle and protection of the electrical connection cable against overheating the following placard has to be attached on the rear instrument panel with an indicator arrow to the receptacle:

**EXTERNAL POWER 12V**  
**DO NOT CRANK FOR MORE THAN 10 SECONDS!**  
Allow 20 seconds to cool-down between attempts. Repeat up to 6 times.  
Then let starter cool for 30 minutes.

### 905.3 EMERGENCY PROCEDURES

Not affected.

### 905.4 NORMAL PROCEDURES

The following starting procedures are recommended, however, the starting conditions may necessitate some variation from these procedures.

1. Perform Pre-flight inspection.
2. Set propeller governor control to "High RPM" position.
3. Open throttle approximately 1/4 travel.
4. **Master switch "OFF"**
5. Put the external power plug into the board receptacle
6. Turn boost pump "ON".
7. Move mixture control to "FULL RICH" until a slight but steady fuel flow is noted (approximately 3 to 5 seconds) and return mixture control to "IDLE CUT-OFF".

Turn boost pump "OFF".

**CAUTION**

**Pay attention to objects and persons in the propeller operating area!  
Hold the canopy tight!**

8. Apply the brakes.
9. Engage starter.
10. When engine fires release the ignition switch back to "BOTH".
11. Pull the external power plug from the board receptacle.
12. Move mixture control slowly and smoothly to "FULL RICH".

13. Check the oil pressure gauge. If minimum oil pressure is not indicated within 30 seconds, shut off the engine and determine trouble.

**14. Master switch "ON".**

**905.5 PERFORMANCE**

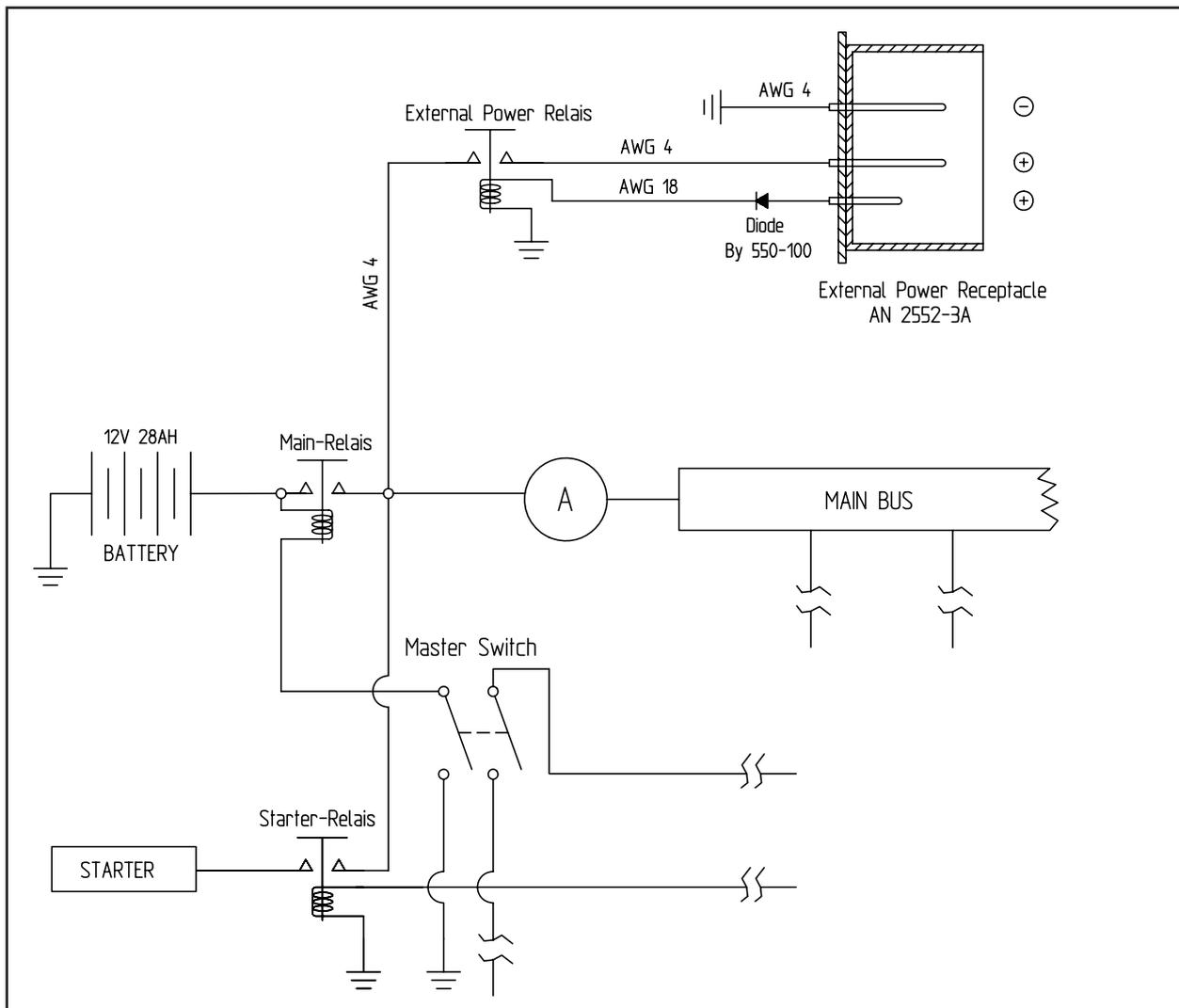
Not affected.

**905.6 WEIGHT AND BALANCE**

Not affected.

**905.7 DESCRIPTION OF THE SYSTEM**

The external power receptacle is attached left under the rear seat. The main-relais is located at the left side of the firewall, above the starter-relais. For the avoidance of sparks, this relais does not switch before a safe contact from plug to receptacle will be ensured. During the engine start, the master switch has to be switched in "OFF"-position for the disconnection of the battery from the aircraft electric circuit.



**905.8 HANDLING, SERVICING AND MAINTENANCE**

Not affected.

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**SECTION 906**

**DIGITAL RPM INDICATOR**

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**906 DIGITAL RPM INDICATOR**

**906.1 GENERAL**

The EXTRA 300 can be equipped with the optional "P-1000" Digital RPM indicator alternativ to the mechanical VDO RPM indicator.

**906.2 LIMITATIONS**

The operation limitations are not affected due to the installation of the "P-1000" Digital RPM indicator. The face of the indicator is placarded with the unchanged Engine RPM operating range. Additional the operating RPM ranges are indicated on the large green, yellow, and red LEDs. These LEDs are located on the upper right corner of the indicator face.

Green	$\frac{2400}{700}$	Yellow	$\frac{2700}{2400}$	Red	$\frac{3500}{2700}$
-------	--------------------	--------	---------------------	-----	---------------------

**906.3 EMERGENCY PROCEDURES**

Not affected.

**906.4 NORMAL PROCEDURES**

The *Normal Procedures* have to be changed in Chapter "4.5 Take-Off Procedure" section "4.5.1. Before take off". If the P-1000 RPM indicator is installed, the mag-drop test has to be carried out in the following manner:

**Magneto check**

Engine RPM: 1800 min<sup>-1</sup>

Pay attation to the three small LEDs in the "Status" area on the upper left corner of the P-1000 face:

Ignition switch position:	LEFT
Status area:	Left red LED illuminates
Display:	shows RPM drop

Ignition switch position:	RIGHT
Status area:	Right red LED illuminates
Display:	shows RPM drop

Ignition switch position:	BOTH
Status area:	Right and left red LED off illuminate
	The middle LED is not allowed to alert, otherwise the difference is more than permissible.

**NOTE**

During the short circuit (grounding) of a single magneto, the respective red LED has to be illuminated. The maximal allowed RPM drop at 1800 min<sup>-1</sup> is 175 min<sup>-1</sup>. The maximal difference between the magnetos has not to be over 50 RPM (identify with the illuminated yellow LED).

**906.5 PERFORMANCE**

Not affected.

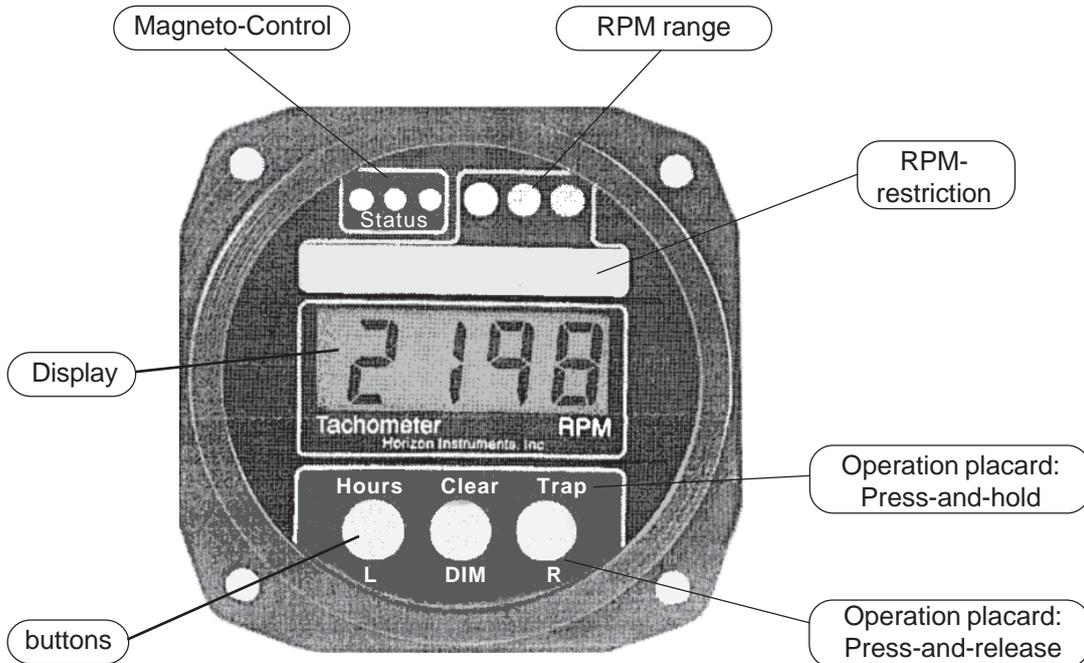
**906.6 WEIGHT AND BALANCE**

Not affected.

**906.7 DESCRIPTION AND OPERATION OF THE SYSTEM**

The operation of the indicator is straightforward. After power is supplied to the indicator, the engine is started, and the self tests are performed, the default display of the engine RPM appears on the display. The default display is insured via the use of internal timers that will restore the display to the current RPM even in the event that one of the panel buttons becomes stuck or defective.

Internally, two independent tachometers watch the pulses received from each magneto. Each tachometer is accurate to less than 1 RPM and can be individually enabled/disabled via buttons on the face of the indicator.



**RPM RANGES**

Engine operating ranges are indicated on the large green, yellow, and red LEDs. This LEDs are located on the upper right corner of the indicator face.

**MAGNETO-CHECK**

Three small LED magneto system alert indicator lights are located within the "Status" area on the upper left corner of the indicator face.

The left and right red LED alert indicator lights, when illuminated, indicate, because of loss of ignition signal to the tachometer, a possible malfunction of the respective left or right

magneto ignition system.

While performing a magneto check during engine run-up, the red alert indicator lights will illuminate, thus identifying the grounding of the respective right or left magneto systems.

Ignition switch	Tachometer Magneto	
	Right	Left
Both OFF	ON	ON
Left ON, Right OFF	OFF	ON
Right ON, Left OFF	ON	OFF
Both ON	OFF	OFF

Between the left and right magneto ignition system alert indicators is a yellow **RPM Synchronization indicator**. This small yellow indicator is illuminated when there is a difference of more than 50 RPM between the right and left tachometers.

This indicator also may flicker during extreme RPM excursions of the engine.

## OPERATION BUTTONS

There are three panel buttons. Each button has two modes of operation.

### **PRESS-AND-HOLD operation mode**

(press and hold for more than 2/3 of a second)

This operation mode is placarded above each button. (*Hours, Clear, Trap*)

#### **Engine time (Hours)**

The left button, upon depression, will cause the tachometer to display the non-fractional portion (0000.) of the current accumulated engine hours. When the button is released, the fractional part of the engine hours (.00) is displayed for a short period of time. The clock is started whenever the engine RPM exceeds 800 RPM and is recorded in real hours.

#### **Clear (Clear)**

The middle button clears the RPM trap. During depression of the switch, the RPM trap is zeroed. When the button is released, the trap will record the current engine RPM.

#### **Engine RPM (Trap)**

The right button will cause the tachometer to display the current contents of the RPM trap. This trap records the **highest engine RPM** achieved before the button was pressed.

### **PRESS-AND-RELEASE operation mode**

(press and release in less than 2/3 of a second)

This operation mode is placarded below each button. (*L, DIM, R*)

#### **Masks (L, R)**

During normal operation, the tachometer presents the average of the left and right internal tachometers on the display. However, a mechanism **exists to mask** either tachometer from the display, leaving the remaining tachometer to determine magneto/ignition problems.

Quickly pressing and releasing the left button ( *L* ), causes the tachometer to mask the left tachometer.

Quickly pressing and releasing the right button ( *R* ), causes the tachometer to mask the right tachometer.

**Dimmer** (*DIM*)

Quickly pressing and releasing the middle button (*DIM*), causes the tachometer to alternately dim or brighten the LED indicators (except the large red LED of the RPM Range).

**906.8 HANDLING, SERVICING AND MAINTENANCE**

Not affected.

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**SECTION 907**

**LONG RANGE WING TANK CAPACITY**

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**907 LONG RANGE WING TANK CAPACITY**

**907.1 GENERAL**

The leading edge wing tank on the EA 300 equipped with the long range tank capacity features two tank compartments on either wing side. The compartments are separated by a slosh rib.

**907.2 LIMITATIONS**

**FUEL**

Minimum grade aviation gasoline: 100/100LL;  
for alternate fuelgrades see latest revision of Lyc. S.I. No. 1070

Total fuel capacity	<b>194 L</b>	<b>(51,2 US Gallons)</b>
- Wingtanks:	<b>154 L (2 x 77 L)</b>	<b>(40,6 US Gallons)</b>
- Acro & Center Tank:	<b>40 L</b>	<b>(10.5 US Gallons)</b>

Usable fuel capacity in the system: **192 L (50,7 US Gallons)**.

For acrobatic flight wing tanks must be empty.  
Usable fuel capacity for acrobatic: **38 L (10,0 US Gallons)**.

**WEIGHT LIMITS**

Max. allowed **empty** weight:

- Normal category                      724 kg (1596lbs)

**PLACARD**

The existing "WINK TANK"- placard has to be replaced by the following placard:



(in the rear instrument panel under the fuel capacity indicator)

**907.3 EMERGENCY PROCEDURES**

Not affected.

**907.4 NORMAL PROCEDURES**

Not affected

**907.5 PERFORMANCE**

**RANGE AND ENDURANCE**

Range and Endurance values for a T/O Weight of 950 kg (2095 lbs) including fuel for warm up and Take-Off from SL, max. continuous Power climb to cruising altitude, and a reserve of 21 litre (5.5 US Gal.) for 45 minutes with 45% Power. 2,0 litres (0.53 US Gal.) unusable fuel is taken into account. (At ISA-Conditions).

PA [ft]	Eng. [RPM]	Manif. Press. [IN HG]	Power Setting		Fuel Consumption		TAS [Kts]	IAS [Kts]	Endur. ① [h]	Range ① [NM]	Mixture ② Best ...
			[%]	[Hp]	[l/h]	[gal/h]					
2000	2400	25,1	75	225	68,7	(18,2)	167,6	160	2.40	401	Power
	2200	24,2	65	195	50,5	(13,3)	159,3	152	3.27	520	Economy
	2000	23,5	55	165	42,6	(11,3)	150,2	144	3.88	582	Economy
	2000	20,2	45	135	36,5	(9,6)	139,9	134	4.52	632	Economy
4000	2400	24,6	75	225	68,7	(18,2)	170,9	158	2.40	408	Power
	2200	23,7	65	195	50,5	(13,3)	162,4	150	3.26	527	Economy
	2000	23,0	55	165	42,6	(11,3)	153,1	142	3.86	589	Economy
	2000	19,7	45	135	36,5	(9,6)	142,6	133	4.52	640	Economy
6000	2200	23,2	65	195	50,5	(13,3)	165,6	149	3.24	533	Economy
	2000	22,5	55	165	42,6	(11,3)	156,1	141	3.84	598	Economy
	2000	19,3	45	135	36,5	(9,6)	145,4	131	4.46	647	Economy
8000	2350	21,5	65	195	52,0	(13,7)	169,0	147	3.14	525	Economy
	2050	21,4	55	165	43,0	(11,4)	159,3	139	3.78	598	Economy
	2000	18,8	45	135	36,5	(9,6)	148,4	130	4.44	655	Economy
10000	2150	19,9	55	165	43,7	(11,5)	162,5	138	3.70	595	Economy
	2000	18,4	45	135	36,5	(9,6)	151,4	129	4.41	663	Economy
12000	2300	18,3	55	165	45,2	(11,9)	165,9	136	3.56	583	Economy
	2000	17,9	45	135	36,5	(9,6)	154,5	127	4.37	681	Economy
14000	2075	17,7	45	135	37,1	(9,8)	157,8	122	4.27	664	Economy

**NOTE**

① For temperatures above/ below Standard (ISA), increase/decrease Range 1,7% and Endurance 1,1% for each 10°C above/below Standard Day Temperature for particular altitude.

② **Leaning with exhaust gas temperature (EGT) gage**

For the adjustment "**Best Power**", first lean the mixture to achieve the top exhaust temperature (peak EGT) and then enrich again until the exhaust temperature is 100°F lower than peak EGT.

For the adjustment "**Best Economy**", simply lean the mixture to achieve the top exhaust temperature (peak EGT).

**Leaning without exhaust gas temperature (EGT) gage and flowmeter**

Slowly move mixture control from "Full rich" position towards lean position. Continue leaning until slight loss of power is noted (Loss of power may or may not be accompanied by rough engine run). Then enrich until engine runs smoothly and power is regained.

**CAUTION**

Always return the mixture to full rich before increasing power settings.

**907.6 WEIGHT AND BALANCE**

**LOADING WEIGHTS AND MOMENTS**

FUEL MAX **194 L** (51.2 US GAL.)

CAPACITY		WEIGHT		MOMENT	
Liter	US GAL.	KG	LBS	KG CM	IN LBS
20	5,3	14,4	31,7	792	688
40	10,6	28,8	63,5	1584	1375
60	15,9	43,2	95,3	2333	2025
80	21,2	57,6	127,0	3082	2675
100	26,4	72,0	158,8	3830	3325
120	31,7	86,4	190,5	4579	3975
140	37,0	100,8	222,3	5328	4625
160	42,3	115,2	254,0	6077	5275
180	47,5	129,6	285,7	6825	5928
194	51,2	139,6	63,3	7345	6380

**907.7 DESCRIPTION OF THE SYSTEM**

Wing tank:

The leading edge section of each wing in front of main spars forms an integral fuel tank providing two interconnected tanks with 154 litres (40,7 US GAL.) total capacity. Each side of the wing has a 2" diameter filler cap for gravity refuelling. The long range tank has two compartments in either wing which are separated by a slosh rib. Due to the interconnection the fuel level of the left and right integral tank will equalize during refuelling within reasonable time. For max. fuel capacity, the first filled side have to be filled once again!

The wing tank can be completely emptied in flight.

**907.8 HANDLING, SERVICING AND MAINTENANCE**

Not affected.

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**SECTION 908**

**AIRTOW HOOK**

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**908 AIRTOW HOOK**

**908.1 GENERAL**

The EXTRA 300 can optionally be equipped with a "TOST" glider air-tow release Typ E 85. The release mechanism is mounted at the tail spring end and actuated from the cockpit by a yellow knob.

The following combinations are certified:

**Aircraft**

- Engine: AEIO 540-L1B5 or AEIO 540-L1B5D
- Propeller: MTV-14-B-C/C190-17
- Exhaust system: Typ Gomolzig EA 300-606000 or standard exhaust PC-63104 with silencer: NSD GO3-606500
- Air-tow release system according to replacement instruction: UA-300-4-95
- Air-tow release: "TOST, E 85"

**Glider**

- MTOW of the glider: 765Kg
- Max. air towing speed of the glider: min. 152 Km/h

**Air tow cable and breaking piece (weak links)**

- Length of the synthetic tow between 40 m and 60 m
- Ultimate load of the air-tow max. 850 kp (1875 lbs)
- If tows with higher ultimate load are used a breaking piece (weak links) of max. 850 kp (1875 lbs) needs to be interconnected.

**908.2 LIMITATIONS**

For a safe air towing the following points must be observed:

	1-seat	2-seats *
Max. Takeoff Weight	820 kg (1813 lbs)	870 kg (1924 lbs)
Max. Empty Weight	701 kg (1546 lbs)	665 kg (1466 lbs)
Min. Air-Towing Speed	66 KIAS	68 KIAS
Best Air-Towing Speed	72-76 KIAS	74-78 KIAS

**NOTE \***

2-seats only in case of an instruction flight!

- 1.) Maximum air-towing speed = maximum permissible air-towing speed of the glider.
- 2.) The maximum permissible cylinder head temperature is 500° F (red line).
- 3.) Interior mirror mounted.

For the location of the yellow release knob the following placard has to be attached in the near of the knob:

**AIR TOW**

**908.3 EMERGENCY PROCEDURES**

**A) ABORTED TAKE OFF**

- |                        |                    |
|------------------------|--------------------|
| 1. Pilot of the glider | INFORM             |
| 2. Throttle            | IDLE               |
| 3. Mixture             | IDLE CUT OF        |
| 4. Brakes              | APPLY AS PRACTICAL |

**B) ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF**

Stall speed: 60 KIAS

- |                        |                      |
|------------------------|----------------------|
| 1. Pilot of the glider | INFORM               |
| 2. Air tow             | RELEASE              |
| 3. Airspeed            | 80 KIAS              |
| 4. Mixture             | IDLE CUT OFF         |
| 5. Fuel shutoff valve  | OFF                  |
| 6. Ignition switch     | OFF                  |
| 7. Master switch       | OFF                  |
| 8. Forced landing      | PERFORM AS PRACTICAL |

**C) EXCESSIVE "CLIMB OVER" BY THE TOWING GLIDER**

- |                        |                      |
|------------------------|----------------------|
| 1. Pilot of the glider | INFORM               |
| 2. Air tow             | RELEASE              |
| 3. Landing             | PERFORM AS PRACTICAL |

**D) TOW BREAK**

- |                        |                      |
|------------------------|----------------------|
| 1. Pilot of the glider | INFORM               |
| 2. Landing             | PERFORM AS PRACTICAL |

**908.4 NORMAL PROCEDURES**

Preflight inspection, starting procedures, take-off procedure and the following climbing flight have to be carry out in accordance with Chapter 4 "Normal Procedures". In addition to this procedures the following points have to be observed:

**A) PRIOR TO THE TAKE OFF**

A release test needs to be conducted to determine safe release operation. The test shall be made on both, aircraft and glider.

**B) TAKE OFF**

After air-tow hook up the tow shall be tightened gently. During the following take-off and climb the maximum air-tow speed of the glider must be observed.

**C) CLIMB**

While climbing the max C.H.T. must be observed. Towing light gliders, the intial climb angle may be very steep. Information of the glider pilot is recomended.

**D) RELEASE**

After the release of the glider a gently left handed descent shall be flown to avoid collision of glider and air-tow.

**E) DESCENT AND LANDING**

While descending the engine temperatures shall be observed (Avoid overcooling). Final approach should account for the air-tow hanging below the aircraft flight path.

**908.5 PERFORMANCE**

The existing POH-Data remain valid with the exception of:

**TAKE-OFF DISTANCE** (in Meter)

Conditions:

Power: over 2600 Rpm and full throttle, mixture rich,  
short grass, dry and paved level runway, no wind,  
takeoff weight of the towing aircraft: 820Kg (1808lbs)

Liftoff speed (T/O): 65 KIAS = 120 Km/h indicated

Obstacle clearance speed over 15m (50ft) : 70 KIAS = 130 Km/h indicated

For every 5 kts headwind, the takeoff (T/O) distance can be decreased by 5%.

For every 2kts tailwind (up to 10) kts, the (T/O) distance is increased by 10%.

**CAUTION**

All values are valid for **single-pilot** air-towing operation (820kg TOW). In case of an instruction flight with copilot, the higher takeoff weight has to be considered!  
The maximum permissible air-towing speed of the glider needs to be observed!

**Takeoff weight glider: 350 Kg**

Press.- altitude	-10°C OAT		0°C		10°C		20°C		30°C		40°C	
	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft
0 ft	134	219	150	244	166	271	184	300	202	331	223	364
2000 ft	156	256	174	285	194	316	214	350	236	386	260	424
4000 ft	183	299	204	333	226	370	251	409	276	451	304	497
6000 ft	214	350	239	390	265	434	294	480	324	530	357	583
8000 ft	252	411	281	459	312	510	346	565	382	624	421	687

**Takeoff weight glider: 600 Kg**

Press.- altitude	-10°C OAT		0°C		10°C		20°C		30°C		40°C	
	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft
0 ft	176	287	196	320	217	355	240	393	265	433	291	476
2000 ft	205	334	228	373	253	414	280	458	309	505	340	555
4000 ft	239	391	267	436	296	484	328	535	362	591	398	650
6000 ft	280	458	313	511	347	567	385	628	425	693	467	763
8000 ft	329	538	368	600	409	668	453	740	500	817	550	899

**Takeoff weight glider: 765 Kg**

Press.- altitude	-10°C OAT		0°C		10°C		20°C		30°C		40°C	
	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft	T/O	50 ft
0 ft	220	360	245	401	272	445	301	492	332	542	365	596
2000 ft	257	419	286	467	317	518	351	574	387	633	426	696
4000 ft	300	489	334	546	371	606	411	671	453	740	499	814
6000 ft	351	574	392	640	435	711	482	787	532	869	585	956
8000 ft	413	674	461	752	512	836	567	926	626	1023	690	1126

**CLIMBRATE**

Conditions:

Power: 2500 Rpm and full throttle, mixture rich,

Speed of the aircraft tow: 76 KIAS = 140 Km/h,

Weight of the towing aircraft: m = 820 Kg (1808 lb), (1 Pilot = 86 kg, Acro & Center Tank full 38 L, Wingtank 30 L)

**Tow force: glider with m = 350 Kg**

Pressure altitude	0°C OAT		10°C		20°C		30°C	
	ft/min	m/s	ft/min	m/s	ft/min	m/s	ft/min	m/s
0 ft	1610	8,2	1540	7,8	1480	7,5	1410	7,2
1000 ft	1540	7,8	1475	7,5	1410	7,2	1345	6,8
2000 ft	1475	7,5	1400	7,1	1340	6,8	1275	6,5
3000 ft	1400	7,1	1335	6,8	1270	6,4	1210	6,1
4000 ft	1330	6,8	1265	6,4	1200	6,1	1140	5,8
5000 ft	1260	6,4	1195	6,1	1130	5,7	1070	5,4
6000 ft	1190	6,0	1130	5,7	1065	5,4	1000	5,1
7000 ft	1120	5,7	1060	5,4	995	5,1	935	4,7
8000 ft	1050	5,3	990	5,0	925	4,7	865	4,4

**Tow force: glider with m = 600 Kg**

Pressure altitude	0°C OAT		10°C		20°C		30°C	
	ft/min	m/s	ft/min	m/s	ft/min	m/s	ft/min	m/s
0 ft	1280	6,5	1210	6,1	1150	5,8	1080	5,5
1000 ft	1210	6,1	1145	5,8	1080	5,5	1015	5,2
2000 ft	1140	5,8	1080	5,5	1010	5,1	950	4,8
3000 ft	1080	5,5	1005	5,1	940	4,8	880	4,5
4000 ft	1005	5,1	935	4,7	870	4,4	810	4,1
5000 ft	935	4,7	870	4,4	800	4,1	740	3,8
6000 ft	865	4,4	800	4,1	735	3,7	675	3,4
7000 ft	800	4,1	730	3,7	670	3,4	605	3,1
8000 ft	730	3,7	670	3,4	600	3,0	545	2,8

**Tow force: glider with m = 765 Kg**

Pressure altitude	0°C OAT		10°C		20°C		30°C	
	ft/min	m/s	ft/min	m/s	ft/min	m/s	ft/min	m/s
0 ft	920	4,7	850	4,3	785	4,0	725	3,7
1000 ft	850	4,3	780	4,0	720	3,7	655	3,3
2000 ft	780	4,0	715	3,6	650	3,3	585	3,0
3000 ft	710	3,6	645	3,3	580	2,9	515	2,6
4000 ft	645	3,3	575	2,9	510	2,6	450	2,3
5000 ft	575	2,9	505	2,6	445	2,3	380	1,9
6000 ft	505	2,6	440	2,2	375	1,9	310	1,6
7000 ft	435	2,2	370	1,9	305	1,5	240	1,2
8000 ft	365	1,9	300	1,5	235	1,2	180	0,9

**908.6 WEIGHT AND BALANCE**

Not affected.

**908.7 DESCRIPTION OF THE SYSTEM**

The release mechanism is a typ "E 85" of the "TOST" company, Munich. It is mounted at the tail spring rear end aft the tail wheel and activated with a yellow handle located at the rear seat cockpit via a bowden cable.

**908.8 HANDLING, SERVICING AND MAINTENANCE**

Service and maintenance needs to be conducted in accordance with the latest operation handbook (Typ E 85) of the manufacturer TOST GmbH, Germany. Additionally during the 100 h inspection the bowden cable and the release handle have to be checked.

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**SECTION 909**

**SMOKE SYSTEM**

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**909 SMOKE SYSTEM**

**909.1 GENERAL**

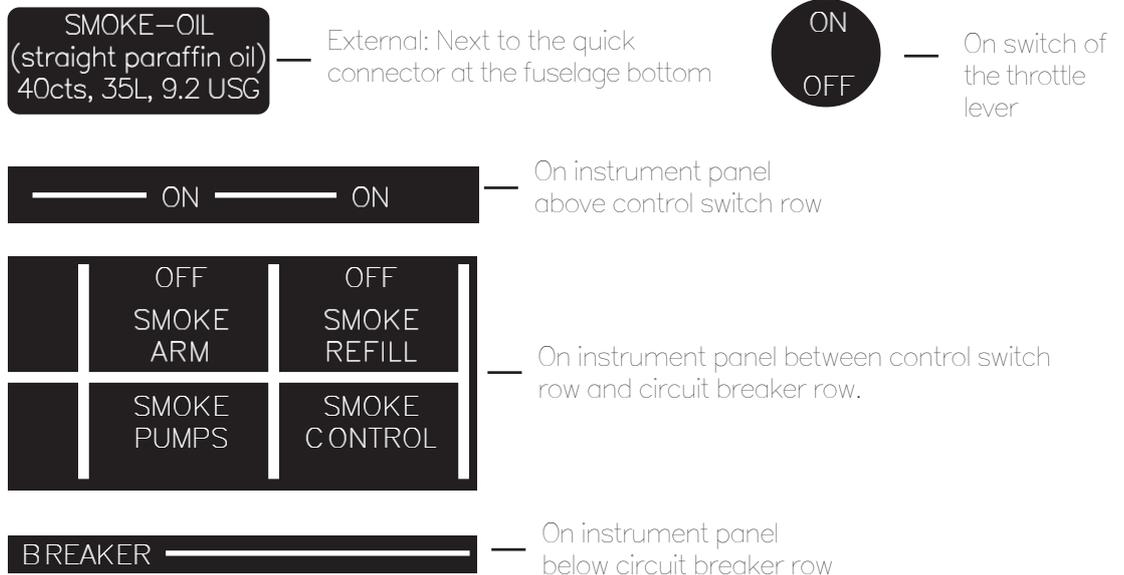
For performing at airshows, the EXTRA 300 may optionally be equipped with a smoke system.

**909.2 LIMITATIONS**

For safe operation of the smoke system the following limitations have to be considered:

- 1) The load factor is limited to: +8g/−8g
- 2) Max. takeoff weight "**MTOW**": 870 kg
- 3) **Specification** of the smoke oil: Straight paraffin oil, viscosity 30-50cts at 20°C (68°F), initial boiling point >330°C (626°F)  
For example: *Fauth FC05, Texaco Canopus 13* or equivalent
- 4) Local **airfield** and **weather conditions** have to be considered:  
For the prevention of a fire alarm, inform the flight control before you activate the smoke system
- 5) Recommended **Manifold pressure**: min. 20" Hg
- 6) The activation of the smoke system **on ground is only allowable for a brief system test.**
- 7) The operation of the smoke system is **not allowable** for the standard exhaust (6 into 2) PC-63104 **with** mounted, external silencer NSD GO3-606500
- 8) Wearing a parachute is strongly recommended

Operating Markings & Placards:



**909.3 EMERGENCY PROCEDURES**

**FAILURE OF THE SMOKE-SYSTEM**

1. Switch "SMOKE ARM" and "SMOKE REFILL": OFF
2. Circuit breaker PULL

**FIRE IN FLIGHT**

- |                       |     |
|-----------------------|-----|
| 1. Switch "SMOKE ARM" | OFF |
|-----------------------|-----|

CAUTION

If the fire (after the smoke system is shut off) will not extinguish proceed as follows:

- |   |   |
|---|---|
| 2. Mixture  | IDLE CUT OFF  |
| 3. Fuel shutoff valve   | OFF   |
| 4. Master switch  | OFF   |
| 5. Airspeed   | 100 KIAS, find your airspeed/attitude that will keep the fire away from the cockpit |
| 6. Land   | <i>AS SOON AS POSSIBLE</i>  |
| 7. If fire persists or aircraft is uncontrollable and wearing a parachute | BAIL OUT  |

**SMOKE IN THE COCKPIT**

- |   |                             |
|---|-----------------------------|
| 1. Switch "SMOKE ARM"                     | OFF                         |
| 2. Bad weather window                     | OPEN                        |
| 3. Ventilation                            | OPEN                        |
| 4. If smoke persists in the cockpit, land | <i>AS SOON AS PRACTICAL</i> |

**909.4 NORMAL PROCEDURES**

The smoke system includes features for refilling the smoke oil tank and smoke generation:

**A) REFILL**

A separate refill hose is delivered with the smoke system which has to be used for filling the smoke oil tank from the paraffin oil supply canister or barrel.

- |                          |   |
|--------------------------|---|
| 1. Refill hose           | CONNECT hose nipple to quick connector at the fuselage bottom; IMMERSE the other end into the paraffin oil in the canister/barrel |
| 2. Switch "SMOKE REFILL" | ON  |

NOTE

The refilling should start within max. 30 sec. If this is not the case, the refill lines and fittings have to be checked for soiling or leaks. Refilling procedure can be supported by reducing the suction height e.g. lifting the canister. The fully filled status is sensed by the floating device which automatically switches the refilling off.

After automatic refill shut-off :

- |                          |            |
|--------------------------|------------|
| 3. Switch "SMOKE REFILL" | OFF        |
| 4. Refill hose           | DISCONNECT |

CAUTION

A shut-off failure of the refill process can be recognized by smoke oil spilling out of the vent line. In this case, turn off refill switch. The floating device switch in the smoke oil tank has to be checked accordingly.

**B) SMOKE GENERATION**

- |   |                |
|---|----------------|
| 1. Bad weather window and ventilation                   | CLOSE          |
| 2. "SMOKE ARM" Switch                                   | ON             |
| 3. Manifold Pressure                                    | minimum 20" Hg |
| 4. Switch in the throttle lever<br>for smoke generation | ON - OFF       |

NOTE

It is recommended to operate the smoke system only in forward flight, because during reverse maneuvers (for example tail slide) smoke might enter the cockpit via the air vents.

**909.5 PERFORMANCE**

Not affected.

**909.6 WEIGHT AND BALANCE**

Capacity		Mass		Moment	
Litre	US gal	Kg	lbs	Kgcm	in-lbs
5	1.3	4.3	9.4	100	86
10	2.7	8.5	18.7	200	172
15	4	12.8	28.1	300	258
20	5.3	17	37.5	400	345
25	6.6	21.3	46.9	500	431
30	8	25.6	56.2	600	517
35	9.3	29.7	65.6	700	603

Specific Weight of the paraffin oil = 0.85 kg/Litre

NOTE

The smoke system does not feature a capacity dipstick. In the case of unknown filling, the smoke oil tank should be drained and refilled with a known quantity. If this is not possible, the most adverse case has to be taken for CG calculation. (This may be either completely full or completely empty tank).

**909.7 DESCRIPTION OF THE SYSTEM**

On pilot's demand the smoke system produces a trail of smoke by injection of smoke oil (straight paraffin oil) into the engine exhaust. The smoke oil is vaporised by the exhaust gas heat and is

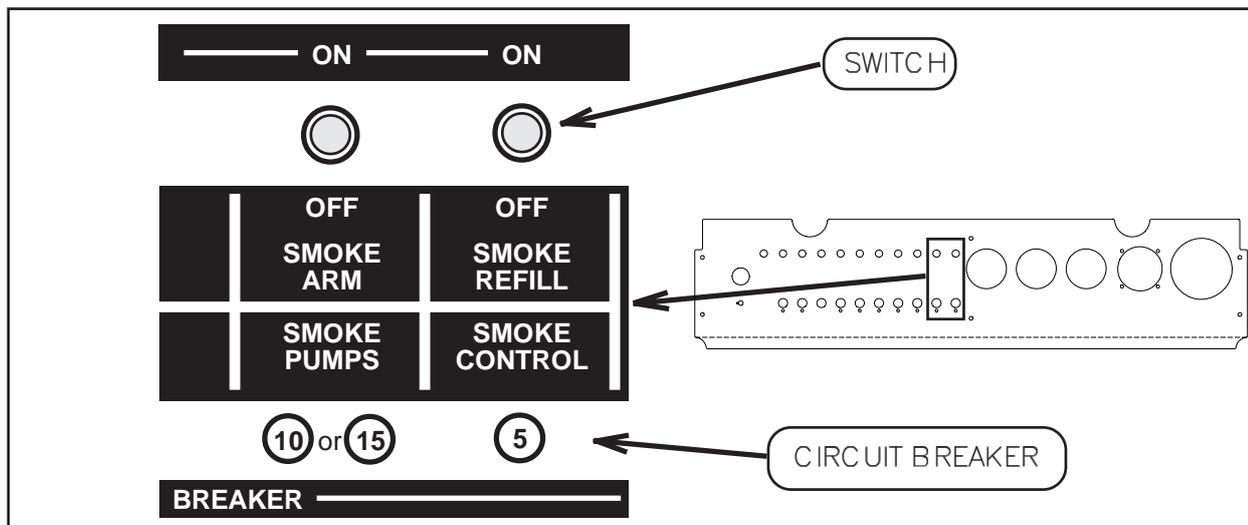
visible as dense smoke after leaving the exhaust.

For smoke system activation the "SMOKE ARM" switch located at the pilot instrument panel needs to be switched ON first. The smoke „ON-OFF“ toggle switch is located on top of the throttle lever. For filling the smoke oil tank the "SMOKE REFILL" switch needs to be ON. After the refill process is completed the "SMOKE REFILL" has to be switched OFF. When both switches ("SMOKE ARM" and "SMOKE REFILL") are in the ON position, the smoke system is not energized and will not run.

The smoke oil tank is filled by a refill pump through a quick connector located in the aircraft belly fairing. A filled smoke oil tank is detected by a float switch placed in the tank which shuts the refill pump off. An additional injection pump placed at the firewall within the engine compartment pumps the smoke oil from the smoke oil tank through a solenoid valve and the injector nozzle into the hot exhaust gas to generate smoke.

The system consists of:

- Floptube smoke oil tank with float switch
- Refill pump in the pilot compartment with quick connector in the belly fairing
- Injection pump in the engine compartment with a shut-off solenoid in the pilot compartment
- "ON-OFF" switch on the throttle lever
- Two relays (make contact type) for pumps and for the solenoid control
- "SMOKE ARM" switch to arm the system and "SMOKE REFILL" switch for refilling placed at the instrument-panel
- Circuit breaker for pumps and control placed at the instrument-panel



## 909.8 HANDLING, SERVICING AND MAINTENANCE

### At every refilling:

- Check automatic shut-off

### Additionally during the 100h Check

- Check the system for leakage (lines, fittings, tank)
- Check the smoke oil tank for proper attachment
- Check the function of the solenoid valve
- Clean the injector nozzle: if required, remove carbon debris

**After each flight with activated Smoke System**

- Clean the aircraft belly fairing and the rudder cable from oil slick

**NOTE**

The rudder cables might suffer from increased wear, when they are covered with smoke oil and dust.

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**SECTION 912**

**FILSER TRT 600 TRANSPONDER**

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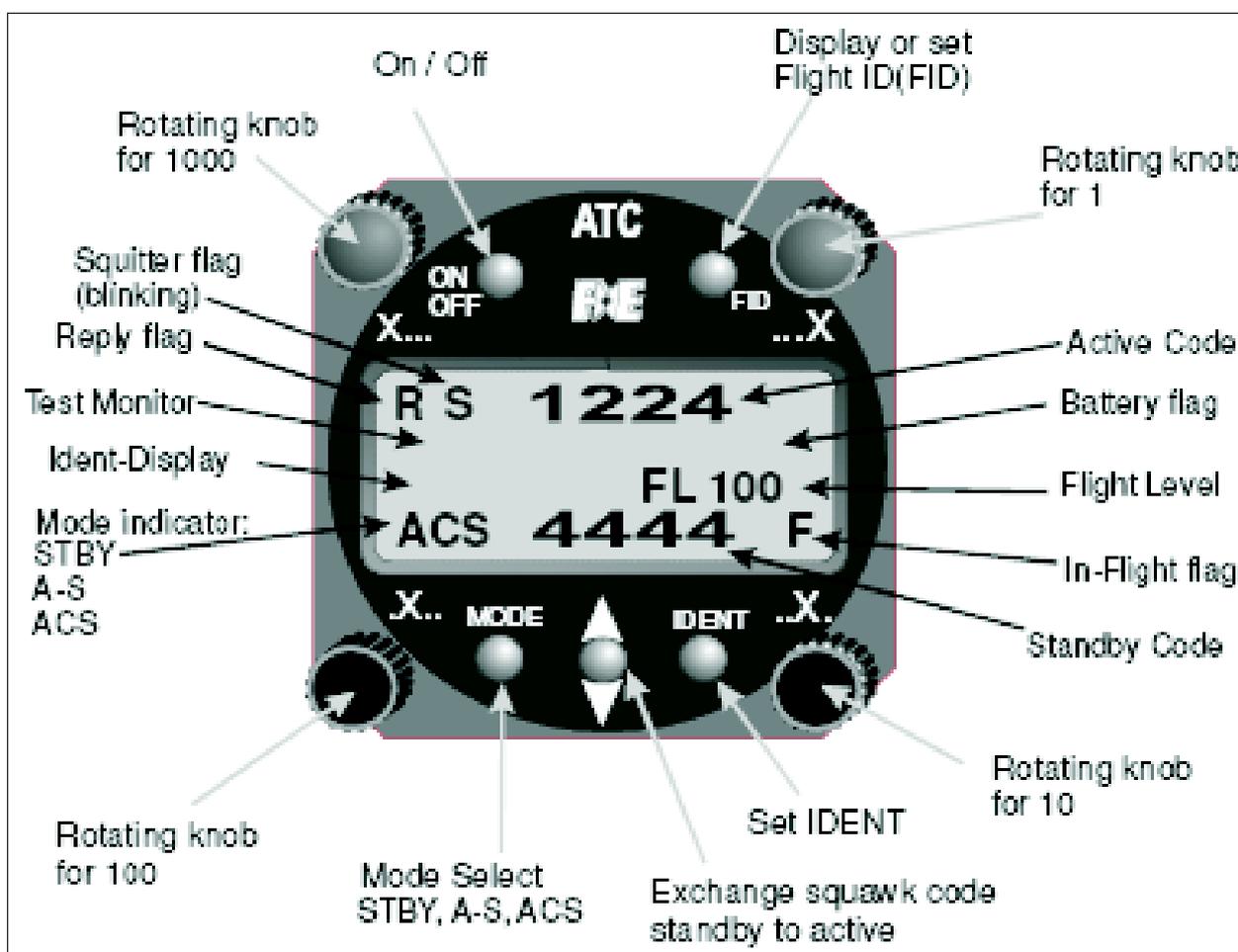
912.1 GENERAL

The TRT 600 is Level 2es Class2 (SSR Mode S Elementary Surveillance) Transponder. It has Mode A, Mode A/C and Mode S capability. In Mode S the transponder provides acquisition capability. Furthermore, the TRT 600 has a built-in barometric pressure altitude coder in 100 ft increments.

**NOTE**

Refer to latest edition of Filser TRT 600 Pilot's Operation Manual (Doc. No. 03.200.010.11) to get familiar with the TRT 600 Transponder.

The following illustration of the front panel of the TRT 600 will assist the operator to understand this Mode S Transponder.



912.1.1 FRONT PANEL OPERATION

The input elements consist of four rotating knobs and five push buttons.

## ROTATING KNOBS

Four rotating knobs are used to select the IDENT CODE.

The assignments **X... , .X.. , ..X. , ...X** indicate the position of the code number set by each knob.

## PUSH BUTTONS

### ON OFF

The unit can be turned on by pressing the **ON OFF** button for less than 1 second.  
The unit can be turned off by pressing the **ON OFF** button for more than 2 seconds.  
(also refer to the System Operation Paragraph 912.1.2).

### MODE

The following modes can be selected in sequence by pressing the **MODE** button:

STBY Standby Mode used for aircraft on ground with reduced squitter rate, only Mode S with altitude reporting all ZERO only

A-S Mode A active with Mode C frames only and Mode S with altitude reporting all ZERO only

ACS Mode A ,C and S full active

### ARROWS UP AND DOWN

To activate the inserted SQUAWK CODE from the lower standby line to the upper active position the button with the **UP AND DOWN ARROWS** shall be pressed.

### IDENT

The **IDENT** push button causes the special position identification pulse (SPI) to be transmitted for a period of 18 seconds.

### FID

In the Standby Mode, the Aircraft Identification (Flight Identification) and Aircraft Address can be checked by pressing the push button **FID**. The Flight Identification is displayed on the right side of the lower line. By pressing the button **FID** for more than 3 seconds the input mode can be set or the Flight Identification can be changed.

## FLAGS

### Squitter Flag

When the extended squitter is active the letter **'S'** is displayed on the left top side of the display. As the squitter is a periodic signal, the displayed **'S'** is blinking.

### Reply Flag

In case of the transponder replying to interrogations the letter **'R'** is displayed on the left top side of the display.

### **In-Flight Flag**

When there is an undercarriage switch installed, the display can toggle between the letters '**F**' whether the aircraft is in flight condition or the letter '**G**' whether the aircraft is in „on-ground“ condition. The flag is displayed on the right bottom side of the display.

### **Battery Flag**

If the power supply to the transponder drops below 10 Volts, the flag '**BAT**' appears and starts flashing.

## **912.1.2 SYSTEM OPERATION**

The transponder should be turned off before starting and shutting down aircraft engines.

### **ON /OFF**

After having switched on the **AVIONIC MASTER** switch the TRT 800 has to be turned on by hand by pressing the **ON OFF** button for less than 1 second. The display will first show the transponder type and the software and firmware version. To turn off the unit the button **ON/OFF** must be pressed for more than two seconds or the **AVIONIC MASTER** switch must be placed to the **OFF**-position. ACS is the default operation mode and the transponder replies to Mode A,C and S interrogations. The pressure altitude will be displayed as Flight Level.

## **SQUAWK SELECTION**

Squawk selection is done with the four rotating knobs to provide 4096 identification codes. The assignments of the knobs, starting at top left, are:

- X...** selection of thousands (0-7)
- .X...** selection of hundreds (0-7)
- ..X.** selection of ten (0-7)
- ...X** selection of one (0-7)

The code is entered in the lower line and remains inactive. By pushing the **UP AND DOWN ARROWS** button the squawk code is transferred to the upper line and becomes active. The code in the upper line is always the active one.

## **IMPORTANT CODES:**

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)
- 7600 Loss of communications
- 7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Care should be taken not to select the code 7500 and all codes in the 7600-7777 range, which trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

## STANDBY MODE

The standby mode is activated by pressing the **MODE** button once. This sets **'STBY'** in the mode indicator field. The transponder will now only reply to direct addressed Mode S interrogations. The squitter stays active at a lower rate.

## ALTITUDE OFF

Switching off altitude reporting will be necessary if the ATC controller requests it. For switching off altitude reporting the **MODE** button has to be pressed until **'A-S'** is displayed. The altitude display shows **'FL —'** to indicate that the altitude reporting is not active. Now the transponder will reply on Mode C interrogations with Mode C frames only and Mode S interrogations with FL000 (= 0000ft) instead of the actual altitude.

## IDENT

Pressing the **IDT** push button causes the special position identification pulse (SPI) to be appended to the Mode A replies for a period of 18 seconds and sets **'IDT'** in the display.

## LOW POWER SUPPLY

If the power supply to the transponder drops below 10 Volts, the flag **'BAT'** appears and starts flashing.

## DISPLAYING AIRCRAFT ADDRESS AND FLIGHT IDENTIFICATION

By pressing, the **FID** button for less than 3 seconds, while the unit is in Standby-mode, the left side of the bottom line will show the aircraft address.

### NOTE

**Only an authorized service station is allowed to enter or change the ICAO aircraft address. If you do not have the ICAO aircraft address. Please refer to your national aviation authority to apply for your aircraft address.**

The Aircraft Identification (FID) code is displayed on the right bottom line and consists of seven alphanumerical characters.

### CAUTION

**The ICAO Flight Plan specifies only 7 characters as Flight Identification. Filsler reserves 8 characters as stated in ED- 73B for further expansion of the flight plan. The user shall only program 7 characters for FID.**

## SELECTING FLIGHT IDENTIFICATION

By pressing the button **FID** for more than 3 seconds, the unit will change into the Flight Identification input menu. This FID code is a changeable alphanumerical flight number. The right lower knob is used to set the cursor position (flashing ^) and with the left lower knob the figures A..Z, blank, and 0..9 can be selected. To enter the code, press the **MODE** button or the **FID** button again. The FID code is stored in the external aircraft connector.

- a. Factory setting for the FID is '**ZZZZZZZ**'
- b. The authorized service station should program a default FID that can be the tail-number of the aircraft.
- c. The pilot has to change the FID manually if necessary.

### 912.1.3 ERROR REPORTING / FAULT CODES

The transponder's reception, transmission, altitude and power supply are monitored periodically. This self-testing routine is permanently active in the background. If any error occurs due to an internal malfunction or from an external disturbance at the antenna, the transponder changes to the Standby mode and '**Error**' is displayed on the lowest line. Additionally the result of the internal analysis are displayed in the second line.

## LIST OF POSSIBLE ERRORS

1. '**ANT**' will appear if the antenna is defective (e.g. broken cable).
2. '**FLerr**' instead of the altitude appears on the display, if there is an error with the altimeter or if the aircraft is outside the altitude range(FL-010 to FL350). If the mode ACS was active before, it will change to mode A-S automatically.
3. '**DC**' for a faulty transmitter power supply
4. '**FPG**' for internal communication errors,
5. '**TRX**' will appear for transmitter error. In this case, the unit will change to '**STBY**' and will stop all transmission.

To meet ICAO specifications the TRT 600 uses an external memory inside the aircraft connector housing of the cable set, which is a part of the aircraft. Because this cable is installed permanent into the aircraft, a change of the transponder will not affect the aircraft address and the Flight ID. In the event there is a Cradle error, (empty memory or data error) **'OUT OF ORDER'** will be displayed. The first line shows which kind of error is present:

**'Cradle OFF'** displayed means no or defective data.

**'Cradle Data'** displayed means digital checksum error.

After a few seconds the display shows normal operating condition but with inhibited Mode S. The transponder will work with Mode A/C only. You will need to consult an authorized service station to enter the ICAO aircraft address (see TRT 600 Installation Manual). Please consult your airworthiness authority for national procedures.

**NOTE**

**If no valid ICAO 24 bit aircraft address is programmed to the unit or if the memory is inoperative the transponder will inhibit the Mode S functions. In this case only Mode A/C function will be available.**

**912.2 LIMITATIONS**

Not applicable

**912.3 EMERGENCY PROCEDURES**

The following emergency codes should be noted:

**7500** Hijacking

**7600** Loss of communication

**7700** Emergency

**912.4 NORMAL PROCEDURES**

Not applicable

**912.5 PERFORMANCE**

Not applicable

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**SECTION 913**

**FILSER TRT 800 TRANSPONDER**

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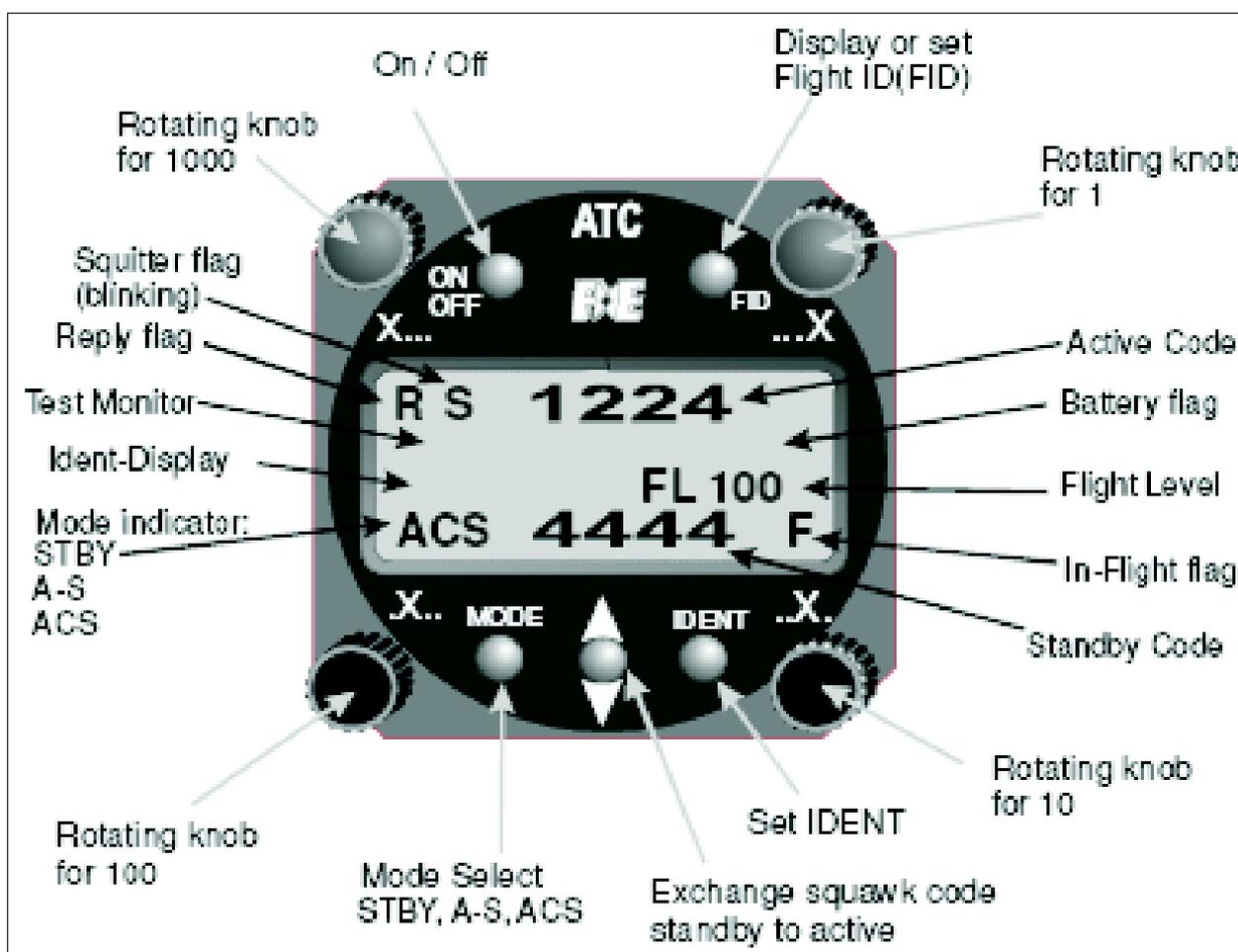
### 913.1 GENERAL

The TRT 800 is Level 2es Class2 (SSR Mode S Elementary and Enhanced Surveillance) Transponder. It has Mode A, Mode A/C and Mode S capability. In Mode S the transponder provides acquisition and extended squitter capability. Furthermore, the TRT 800 has a built-in barometric pressure altitude coder in 100 ft increments.

**NOTE**

Refer to latest edition of Filser TRT 800 Pilot's Operation Manual (Doc. No. 03.210.010.11) to get familiar with the TRT 800 Transponder.

The following illustration of the front panel of the TRT 800 will assist the operator to understand this Mode S Transponder.



#### 913.1.1 FRONT PANEL OPERATION

The input elements consist of four rotating knobs and five push buttons.

## ROTATING KNOBS

Four rotating knobs are used to select the IDENT CODE.

The assignments **X... , .X.. , ..X. , ...X** indicate the position of the code number set by each knob.

## PUSH BUTTONS

### ON OFF

The unit can be turned on by pressing the **ON OFF** button for less than 1 second. The unit can be turned off by pressing the **ON OFF** button for more than 2 seconds. (also refer to the System Operation Paragraph 913.1.2)

### MODE

The following modes can be selected in sequence by pressing the **MODE** button:

STBY Standby Mode used for aircraft on ground with reduced squitter rate, only Mode S with altitude reporting all ZERO only

A-S Mode A active with Mode C frames only and Mode S with altitude reporting all ZERO only

ACS Mode A ,C and S full active

### ARROWS UP AND DOWN

To activate the inserted SQUAWK CODE from the lower standby line to the upper active position the button with the **UP AND DOWN ARROWS** shall be pressed.

### IDENT

The **IDENT** push button causes the special position identification pulse (SPI) to be transmitted for a period of 18 seconds.

### FID

In the Standby Mode, the Aircraft Identification (Flight Identification) and Aircraft Address can be checked by pressing the push button **FID**. The Flight Identification is displayed on the right side of the lower line. By pressing the button **FID** for more than 3 seconds the input mode can be set or the Flight Identification can be changed.

## FLAGS

### SQUITTER FLAG

When the extended squitter is active the letter **'S'** is displayed on the left top side of the display. As the squitter is a periodic signal, the displayed **'S'** is blinking.

### REPLY FLAG

In case of the transponder replying to interrogations the letter **'R'** is displayed on the left top side of the display.

### IN-FLIGHT FLAG

When there is an undercarriage switch installed, the display can toggle between the letters '**F**' whether the aircraft is in flight condition or the letter '**G**' whether the aircraft is in „on-ground“ condition. The flag is displayed on the right bottom side of the display.

### BATTERY FLAG

If the power supply to the transponder drops below 10 Volts, the flag '**BAT**' appears and starts flashing.

## 913.1.2 SYSTEM OPERATION

The transponder should be turned off before starting and shutting down aircraft engines.

### ON /OFF

After having switched on the **AVIONIC MASTER** switch the TRT 800 has to be turned on by hand by pressing the **ON OFF** button for less than 1 second. The display will first show the transponder type and the software and firmware version. To turn off the unit the button **ON/OFF** must be pressed for more than two seconds or the **AVIONIC MASTER** switch must be placed to the **OFF** position. ACS is the default operation mode and the transponder replies to Mode A,C and S interrogations. The pressure altitude will be displayed as Flight Level.

## SQUAWK SELECTION

Squawk selection is done with the four rotating knobs to provide 4096 identification codes. The assignments of the knobs, starting at top left, are:

- X...** selection of thousands (0-7)
- .X...** selection of hundreds (0-7)
- ..X.** selection of ten (0-7)
- ...X** selection of one (0-7)

The code is entered in the lower line and remains inactive. By pushing the **UP AND DOWN ARROWS** button the squawk code is transferred to the upper line and becomes active. The code in the upper line is always the active one.

## IMPORTANT CODES:

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)
- 7600 Loss of communications

7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Care should be taken not to select the code 7500 and all codes in the 7600-7777 range, which trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

### **STANDBY MODE**

The standby mode is activated by pressing the MODE button once. This sets **'STBY'** in the mode indicator field. The transponder will now only reply to direct addressed Mode S interrogations. The squitter stays active at a lower rate.

### **ALTITUDE OFF**

Switching off altitude reporting will be necessary if the ATC controller requests it. For switching off altitude reporting the **MODE** button has to be pressed until **'A-S'** is displayed. The altitude display shows **'FL —'** to indicate that the altitude reporting is not active. Now the transponder will reply on Mode C interrogations with Mode C frames only and Mode S interrogations with FL000 (= 0000ft) instead of the actual altitude.

### **IDENT**

Pressing the **IDT** push button causes the special position identification pulse (SPI) to be appended to the Mode A replies for a period of 18 seconds and sets **'IDT'** in the display.

### **LOW POWER SUPPLY**

If the power supply to the transponder drops below 10 Volts, the flag **'BAT'** appears and starts flashing.

### **DISPLAYING AIRCRAFT ADDRESS AND FLIGHT IDENTIFICATION**

By pressing, the **FID** button for less than 3 seconds, while the unit is in Standby-Mode, the left side of the bottom line will show the aircraft address.

#### **NOTE**

**Only an authorized service station is allowed to enter or change the ICAO aircraft address. If you do not have the ICAO aircraft address. Please refer to your national aviation authority to apply for your aircraft address.**

The Aircraft Identification (FID) code is displayed on the right bottom line and consists of seven alphanumerical characters.

### CAUTION

**The ICAO Flight Plan specifies only 7 characters as Flight Identification. Filser reserves 8 characters as stated in ED- 73B for further expansion of the flight plan. The user shall only program 7 characters for FID.**

## SELECTING FLIGHT IDENTIFICATION

By pressing the button **FID** for more than 3 seconds, the unit will change into the Flight Identification input menu. This FID code is a changeable alphanumerical flight number. The right lower knob is used to set the cursor position (flashing ^) and with the left lower knob the figures A..Z, blank, and 0..9 can be selected. To enter the code, press the **MODE** button or the **FID** button again. The FID code is stored in the external aircraft connector.

- a. Factory setting for the FID is '**ZZZZZZZ**'
- b. The authorized service station should program a default FID that can be the tail-number of the aircraft.
- c. The pilot has to change the FID manually if necessary.

### 913.1.3 ERROR REPORTING / FAULT CODES

The transponder's reception, transmission, altitude and power supply are monitored periodically. This self-testing routine is permanently active in the background. If any error occurs due to an internal malfunction or from an external disturbance at the antenna, the transponder changes to the Standby Mode and „**Error**“ is displayed on the lowest line. Additionally the result of the internal analysis are displayed in the second line.

#### LIST OF POSSIBLE ERRORS:

1. '**ANT**' will appear if the antenna is defective (e.g. broken cable).
2. '**FLerr**' instead of the altitude appears on the display, if there is an error with the altimeter or if the aircraft is outside the altitude range(FL-010 to FL350). If the mode ACS was active before, it will change to mode A-S automatically.
3. '**DC**' for a faulty transmitter power supply
4. '**FPG**' for internal communication errors,
5. '**TRX**' will appear for transmitter error. In this case, the unit will change to '**STBY**' and will stop all transmission.

To meet ICAO specifications the TRT 800 uses an external memory inside the aircraft connector housing of the cable set, which is a part of the aircraft. Because this cable is installed permanent into the aircraft, a change of the transponder will not affect the aircraft address and the Flight ID. In the event there is a Cradle error, (empty memory or data error) „OUT OF ORDER“ will be displayed. The first line shows which kind of error is present:

**'Cradle OFF'** displayed means no or defective data.

**'Cradle Data'** displayed means digital checksum error.

After a few seconds the display shows normal operating condition but with inhibited Mode S. The transponder will work with Mode A/C only. You will need to consult an authorized service station to enter the ICAO aircraft address (see TRT800 Installation Manual). Please consult your airworthiness authority for national procedures.

**NOTE**

**If no valid ICAO 24 bit aircraft address is programmed to the unit or if the memory is inoperative the transponder will inhibit the Mode S functions. In this case only Mode A/C function will be available.**

**913.2 LIMITATIONS**

Not applicable.

**913.3 EMERGENCY PROCEDURES**

The following emergency codes should be noted:

7500 Hijacking

7600 Loss of communication

7700 Emergency

**913.4 NORMAL PROCEDURES**

Not applicable.

**913.5 PERFORMANCE**

Not applicable.

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**SECTION 914**

**GARMIN GTX 327 TRANSPONDER**

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## 914.1 GENERAL

The GARMIN GTX 327 is a panel-mounted TSO.d transponder with the addition of timing functions. The transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.



### NOTE

**The GTX 327 owner accepts all responsibility for obtaining the proper license before using the transponder.**

The coverage you can expect from the GTX 327 is limited to „line of sight“. Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

### CAUTION

**The GTX 327 should be turned off before starting or shutting down aircraft engine.**

The GTX 327 Transponder is powered on by pressing the **STBY**, **ALT** or **ON** keys, or by the **AVIONIC MASTER** switch. After power on a start-up page will be displayed while the unit performs a self test.

### 914.1.1 MODE SELECTION KEYS

#### OFF

Powers off the GTX 327.

#### STBY

Powers on the transponder in standby mode. At power on the last active identification code will be selected. When in standby mode, the transponder will not reply to any interrogations.

#### ON

Powers on the transponder in Mode A. At power on the last active identification code will be selected. In this mode the transponder replies to interrogations, as indicated by the Reply Symbol. Replies do not include altitude information.

#### ALT

Powers on the transponder in Mode A and Mode C. At power on the last active identification code will be selected. In ALT mode, the transponder replies to identification and altitude interrogations, as indicated by the Reply Symbol. Replies to altitude interrogations include standard pressure altitude received from a separate encoder.

### 914.1.2 CODE SELECTION

Code selection is done with eight keys (**0 - 7**) that provide 4,096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code will not be activated until the fourth digit is entered. Pressing the **CLR** key will move the cursor back to the previous digit. Pressing the **CLR** key when the cursor is on the first key of the code, or pressing the **CRSR** key during code entry, will remove the cursor and cancel data entry, restoring the previous code. The numbers **8** and **9** are not used for code entry, only for entering a Count Down time, and in Configuration Mode.

#### IMPORTANT CODES:

1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

7000 The VFR code commonly used in Europe (Refer to ICAO standards)

0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)

7500 Hijack code (Aircraft is subject to unlawful interference)

7600 Loss of communications

7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Care should be taken not to select the code 7500 and all codes in the 7600-7777 range, which trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

### 914.1.3 KEYS FOR OTHER GTX 327 FUNCTIONS

#### IDENT

Pressing the **IDENT** key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying your transponder return from others on the air traffic controller's screen. The word '**IDENT**' will appear in the upper left corner of the display while the IDENT mode is active.

#### VFR

Sets the transponder code to the pre-programmed VFR code selected in the Configuration Mode. Pressing the **VFR** key again will restore the previous identification code.

#### START/STOP

Starts and stops the Count Up and Count Down timers.

#### CRSR

Initiates entry of starting time for the Count Down timer and cancels transponder code entry.

**CLR**

Resets the Count Up and Count Down timers and cancels the previous keypress during code selection.

**8**

Reduces Contrast and Display Brightness when the respective pages are displayed. Also enters the number eight into the Count Down timer.

**9**

Increases Contrast and Display Brightness when the respective pages are displayed. Also enters the number nine into the Count Down timer.

**FUNC**

Changes the page shown on the right side of the display. Displayed data includes Pressure Altitude, Flight Time, Count Up timer, Count Down timer, and may include Contrast and Display Brightness, depending on configuration (refer to the screen description below):

**SCREEN DESCRIPTION:**

**'PRESSURE ALT'**

Displays the altitude data supplied to GTX 327 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration.

**'FLIGHT TIME'**

Displays the Flight Time, which is controlled by the **START/STOP** key.

**'COUNT UP TIMER'**

Controlled by the **START/STOP** and **CLR** keys.

**'COUNT DOWN TIMER'**

Controlled by **START/STOP**, **CLR**, and **CRSR** keys. The initial Count Down time is entered with the **0 - 9** keys.

**'CONTRAST'**

This page is only displayed if manual contrast mode is selected in Configuration Mode. Contrast is controlled by the **8** and **9** keys.

**'DISPLAY'**

This page is only displayed if manual backlighting mode is selected on Configuration Mode. Backlighting is controlled by the **8** and **9** keys.

**914.2 LIMITATIONS**

Not applicable.

### **914.3 EMERGENCY PROCEDURES**

#### **914.3.1 IMPORTANT CODES**

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

#### **914.4 NORMAL PROCEDURES**

Not applicable.

#### **914.5 PERFORMANCE**

Not applicable.

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**SECTION 915**

**GARMIN GTX 330 TRANSPONDER**

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## 915.1 GENERAL

The Garmin GTX 330 panel mounted Mode S Transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). Its functionality includes replying to ATCRBS Mode A and C and Mode S interrogations. The Mode S function will allow the ground station to individually select the aircraft by its Aircraft Address assigned to the aircraft by the aviation agency.



It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. The GTX 330 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds. Mode S transmit/receive capability also requires 1090 MHz transmitting and 1030 MHz receiving for Mode S functions.

In addition to displaying the code, reply symbol and mode of operation, the GTX 330 screen will display pressure altitude and timer functions. The displayed pressure altitude may not agree with the aircraft's baro-corrected altitude under non standard conditions. The unit also features flight timers.

The Traffic Information Service (TIS) is not available in this installation.

### NOTE

**The GTX 330 owner accepts all responsibility for obtaining the proper license before using the transponder.**

The coverage you can expect from the GTX 330 is limited to „line of sight“. Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

### CAUTION

**The GTX 330 should be turned off before starting or shutting down aircraft engine.**

The GTX 330 Transponder is automatically powered on by the respective **AVIONIC MASTER** switch or when previously manually powered off while **AVIONIC MASTER** switch is on by pressing the **STBY**, **ALT** or **ON** keys. After power on, a start-up page will be displayed while the unit performs a self test.

### 915.1.1 MODE SELECTION KEYS

#### **OFF**

Powers off the GTX 330.

#### **STBY**

Selects the standby mode displaying the last active identification code. When in standby mode, the transponder will not reply to any interrogations.

#### **ON**

Selects Mode A. At power on the last active identification code will be selected. In this mode the transponder replies to interrogations, as indicated by the Reply Symbol. Replies do not include altitude information.

#### **ALT**

Powers on the transponder in Mode A and Mode C. At power on the last active identification code will be selected. In ALT mode, the transponder replies to identification and altitude interrogations, as indicated by the Reply Symbol. Replies to altitude interrogations include standard pressure altitude received from a separate encoder.

### 915.1.2 CODE SELECTION

Code selection is done with eight keys (**0 - 7**) that provide 4,096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code will not be activated until the fourth digit is entered. Pressing the **CLR** key will move the cursor back to the previous digit. Pressing the **CLR** key when the cursor is on the first key of the code, or pressing the **CRSR** key during code entry, will remove the cursor and cancel data entry, restoring the previous code. You may press the **CLR** key up to five seconds after code entry is complete to return the cursor to the fourth digit. The numbers **8** and **9** are not used for code entry, only for entering a Count Down time, contrast and display brightness, and in the Configuration Mode.

#### **IMPORTANT CODES:**

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)
- 7600 Loss of communications
- 7700 Emergency
- 7777 Military interceptor operations (Never squawk this code)
- 0000 Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

### 915.1.3 KEYS FOR OTHER GTX 330 FUNCTIONS

#### **IDENT**

Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying your transponder return from others on the air traffic controller's screen. The word 'IDENT' will appear in the upper left corner of the display while the IDENT mode is active.

#### **VFR**

Pressing the VFR key sets the transponder code to the pre-programmed VFR code selected in the Configuration Mode. Pressing the VFR key again will restore the previous identification code.

#### **FUNC**

Pressing the FUNC key changes the page shown on the right side of the display. Displayed data includes Pressure Altitude, Flight Time, Count Up timer, Count Down timers. In the Configuration Mode, steps through function pages.

#### **START/STOP**

Starts and stops the Count Up, Count Down and flight timers. In the Configuration Mode, steps through functions in reverse.

#### **CRSR**

Initiates starting time entry for the Count Down timer and cancels transponder code entry. Returns cursor to last code digit within five seconds after entry. Selects changeable fields in Configuration Mode.

#### **CLR**

Resets the Count Up and Count Down timers. Cancels the previous keypress during code selection and Count Down entry. Returns cursor to last code digit within five seconds after entry. Used in Configuration Mode.

#### **8**

Reduces Contrast and Display Brightness when the respective pages are displayed and enters the number eight into the Count Down timer. Used in Configuration Mode.

#### **9**

Increases Contrast and Display Brightness when the respective pages are displayed. Also enters the number nine into the Count Down timer. Used in Configuration Mode.

### 915.1.4 FUNCTION DISPLAY

#### **'PRESSURE ALT'**

Displays the altitude data supplied to GTX 330 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration. An arrow to the right of the altitude indicates that the airplane is climbing or descending.

**'FLIGHT TIME'**

Displays the Flight Time controlled by the **START/STOP** and **CLR** keys when Automated Airborne Determination is configured as normal.

**'ALTITUDE MONITOR'**

The ALTITUDE MONITOR function is not available in this installation.

**'OAT/DALT'**

The OAT/DALT function is not available in this installation (no temperature input).

**'COUNT UP TIMER'**

The count up timer is controlled by the **START/STOP** and **CLR** keys. Pressing the **CLR** key zeros the display.

**'COUNT DOWN TIMER'**

The count down timer is controlled by **START/STOP**, **CLR**, and **CRSR** keys. The initial Count Down time is entered with the **0 - 9** keys. Pressing the **CLR** key resets the timer to the initial value.

**'STBY'**

The transponder will not reply to any interrogations.

**'GND'**

This page is not active.

**'CONTRAST'**

This page is only displayed if manual contrast mode is selected in Configuration Mode. Contrast is controlled by the **8** and **9** keys.

**'DISPLAY'**

This page is only displayed if manual backlighting mode is selected on Configuration Mode. Backlighting is controlled by the **8** and **9** keys.

### 915.1.5 CONFIGURATION MODE

The configuration is normally set at time of installation, including the unique Mode S aircraft address. The configuration Mode should not be used during flight. Refer to the GTX 330 Pilot's Guide PN 190-00207-00 latest revision.

### 915.1.6 ALTITUDE TREND INDICATOR

When the **'PRESSURE ALT'** page is displayed, an arrow is displayed to the right of the altitude, indicating that the altitude is increasing or decreasing. One of two sizes of arrows is displayed depending on the rate of climb/&descent. The sensitivity of these arrows is set using the Configuration Mode vertical speed rate.

### 915.1.7 FAILURE ANNUNCIATION

If the unit detects an internal failure, the screen displays **'FAIL'**.

**915.2 LIMITATIONS**

Not applicable.

**915.3 EMERGENCY PROCEDURES**

**915.3.1 IMPORTANT CODES**

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

**915.4 NORMAL PROCEDURES**

Not applicable.

**915.5 PERFORMANCE**

Not applicable.

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**SECTION 916**

**BENDIX/KING KT 76A TRANSPONDER**

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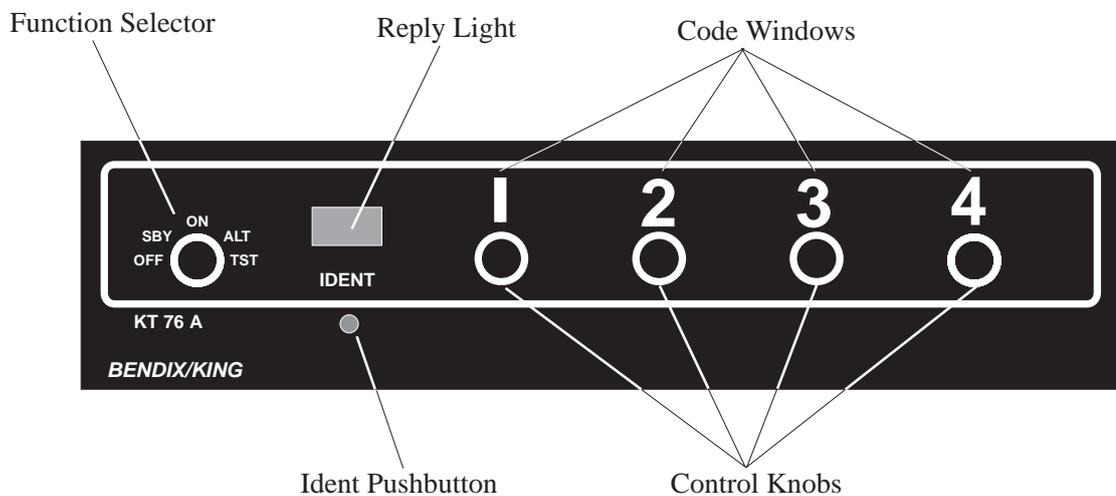
## 916.1 GENERAL

The BENDIX/KING KT 76A panel mounted transponder receives interrogations at 1030 MHz, and these trigger a coded response of radar pulses, which are transmitted back to ATC at 1090 MHz. The return reinforces your aircraft's image or „blip“ on the controller's radar screen.

The KT 76A can reply to radar in any of 4096 preselected codes. Each code is identified by a unique group of pulses. With either an separate encoder, the KT 76A also provides ground radar with a continuous report of your altitude, which are automatically updated in 100-foot increments.

### NOTE

**The KT 76A owner accepts all responsibility for obtaining the proper license before using the transponder.**



### 916.1.1 CODE SELECTION

The Identification Code selection is done with 4 ATCRBS Code Selector Knobs that provide 4,096 active identification codes. Each of the 4 Code Selector Knobs selects a separate digit of the identification code. There is no need to move the „caret“ back to the first digit; it will automatically return after about five seconds. The KT 76A will retain the reply code through power shutdowns if the code has not been changed during the 5 seconds prior to removing power.

#### IMPORTANT CODES:

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)

7600 Loss of communications

7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

### 916.1.2 REPLY LIGHT

During normal operation, the flashing Reply Light indicates that the KT 76A is functioning properly and replying to interrogations from ground radar. Interrogations occur at 10-15 second intervals, corresponding to each radar sweep. Frequently, the reply light will blink almost continuously, meaning that the transponder is responding to interrogations from several radar stations.

### 916.1.3 TESTING THE KT 76A

Allow a warm-up time of about 25 sec. before testing the KT 76A. Switching the function selector to the **TST** position a series of internal tests is performed to check the KT 76A. If no faults are detected the reply-light illuminates.

### 916.2 LIMITATIONS

Not Applicable.

### 916.3 EMERGENCY PROCEDURE

#### IMPORTANT CODES

7500	Use to report a hijacking.
7600	Signifies communication failure.
7700	Reserved for emergencies.

#### **916.4 NORMAL PROCEDURE**

After engine start-up, turn the function selector to the Standby (**SBY**) position. Then select the proper reply code by rotating the code select knobs.

As soon as aircraft is airborne, switch the function selector to **ON**. Your KT 76A is now operating in „Mode A“, or normal mode. To operate in „Mode C“, or altitude reporting mode, turn the function selector to **ALT** (if aircraft is equipped with altitude encoding equipment).

##### **916.4.1 SQUAWK IDENT**

When you are asked to „ident“ by ATC, briefly press the **IDENT** push-button. Your aircraft will be positively identified to the Air Traffic Controller.

#### **916.5 PERFORMANCE**

Not Applicable

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**SECTION 917**

**BENDIX/KING KT 73 TRANSPONDER**

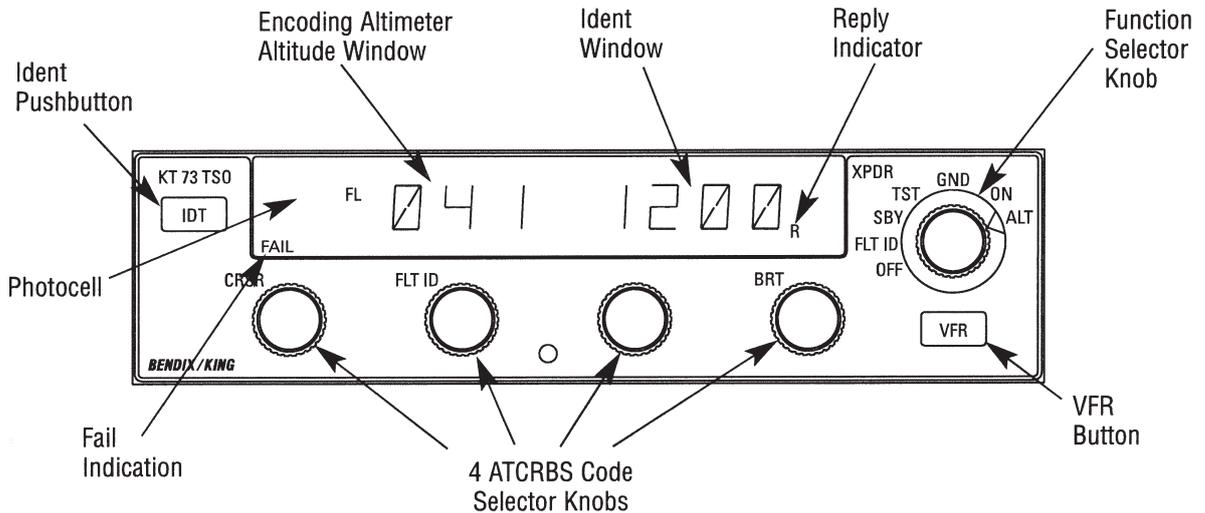
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917.1 GENERAL

The BENDIX/KING KT 73 panel mounted Mode S Transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). Its functionality includes replying to ATCRBS Mode A and C and Mode S interrogations. The Mode S function will allow the ground station to individually select the aircraft by its Aircraft Address assigned to the aircraft by the aviation agency.



It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

The KT 73 is equipped with IDT (ident) capability that activates the Special Position Identification (SPI) pulse for 18 seconds.

In addition to displaying the code, reply symbol and mode of operation, the KT 73 screen will display pressure altitude. The displayed pressure altitude may not agree with the aircraft's baro-corrected altitude under non standard conditions.

The Traffic Information Service (TIS) and Automatic Dependent Surveillance-Broadcast (ADS-B) is not available in this installation.

**NOTE**

**The KT 73 owner accepts all responsibility for obtaining the proper license before using the transponder.**

The coverage you can expect from the KT 73 is limited to „line of sight“. Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

**CAUTION**

**The KT 73 should be turned off before starting or shutting down aircraft engine.**

The KT 73 Transponder is powered on by rotating the Function Selector Knob from the **OFF** position to any functional mode position.

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## 917.1A FUNCTION SELECTOR KNOB

The following operating modes can be chosen by the Function Selector Knob:

### **OFF**

Powers off the KT 73. When the unit is turned to another mode, it will reply or squitter within two seconds, according to the selected mode.

### **FLT ID**

Selects the Flight ID mode displaying the 8 character Flight ID or registration marking of the airplane. When in Flight ID mode, the transponder will not reply to any interrogations.

### **SBY**

Selects the Standby mode displaying the last active identification code. When in Standby mode, the transponder is energized but will not reply to any interrogations.

### **TST**

Selects the Test mode displaying all display segments for a minimum of 4 seconds. A series of internal tests is performed to check its integrity, verify all aircraft specific configuration data and make hardware and squitter checks. When in Flight ID mode, the transponder will not reply to any interrogations. In addition the display brightness can be manually adjusted by rotating the **BRT** knob.

### **GND**

Selects the Ground mode displaying '**GND**' in the altitude window. When in Ground mode, the transponder will not reply to ATCRBS, ATCRBS/Modes S All-Call and Mode S-only All-Call interrogations. It will continue to generate Mode S squitter transmissions and reply to discretely addressed Mode S interrogations.

### **ON**

Powers on the transponder in Mode A, C and S. In this mode the transponder replies to interrogations, as indicated by the Reply Symbol. Replies do not include altitude information.

### **ALT**

Powers on the transponder in Mode A, C and Mode C. In ALT mode, the transponder replies to identification and altitude interrogations, as indicated by the Reply Symbol. Replies to altitude interrogations include standard pressure altitude received from a separate encoder.

## 917.1B CODE SELECTION

The Identification Code selection is done with 4 ATCRBS Code Selector Knobs that provide 4,096 active identification codes. Each of the 4 Code Selector Knobs selects a separate digit of the identification code.

### **IMPORTANT CODES:**

1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

7000 The VFR code commonly used in Europe (Refer to ICAO standards)

0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)

7500 Hijack code (Aircraft is subject to unlawful interference)

7600 Loss of communications

7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Changing the preset VFR code is done as follows:

Place the unit in SBY

Select the desired VFR code

While holding the **IDT** button in, momentarily press the **VFR** button.

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

#### 917.1C BUTTONS/SELECTORS FOR OTHER KT 73 FUNCTIONS

##### **IDT**

Pressing the **IDT** (Ident) button while in the GND, ON or ALT mode activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying your transponder return from others on the air traffic controller's screen. The word '**IDT**' will appear in the left lower corner of the altitude window while the IDT mode is active. When the Function Selector Knob in test mode (**TST**), pressing the **IDT** button will return the brightness to the default factory value.

##### **VFR**

Momentarily pressing the **VFR** Pushbutton sets the transponder code to the pre-programmed VFR code, superseding whatever code was previously entered. Pressing the **VFR** key again and holding it for two seconds will restore the previous identification code. When in TST mode pushing the **VFR** button will display the software revisions on the Altitude window and Ident window for a minimum of 4 seconds.

##### **FLT ID**

When in FLT ID mode, the flight ID can be entered or modified by rotating the **FLT ID** knob (= 2nd ATCRBS Code Selector Knob) to select desired character for each digit selected by the **CRSR** knob. Once the **CRSR** and **FLT ID** knobs have been idle for 5 seconds or the Function Selector Knob has been turned to the **SBY** position the flight ID will be saved.

##### **CRSR**

When in FLT ID mode, rotating the **CRSR** knob (= 1st ATCRBS Code Selector Knob) will position the cursor under the character of the flight ID to be changed.

**BRT**

When in TST mode, rotating the **BRT** knob (= 4th ATRBS Code Selector Knob) will manually adjust the display brightness. Clockwise rotating will increase display brightness and counterclockwise will decrease display brightness. The brightness of the display is determined by a photocell relative to the programmed or manual adjusted brightness level.

**917.1D FUNCTION DISPLAY**

**'FL'**

When the ALT mode is selected, the letters **'FL'** will be illuminated. The pressure altitude data supplied to the KT 73 is displayed in hundreds of feet (i.e., Flight Level) on the left side of the display, the altitude window. In addition the ID code is displayed in the right window, the ident window. A fault in the altitude interface or an invalid altitude input to the KT 73 will cause the display to show a series of dashes when the ALT mode is selected.

**'SBY'**

**'SBY'** is displayed in the altitude window when SBY mode is selected by the Function Selector Knob. In addition the ID code is displayed in the right window, the ident window.

**'GND'**

**'GND'** is only displayed on the left side (altitude window) when the aircraft is on ground. The ID code is shown on the right side, the ident window.

**'FLT IDT'**

The **'FLT IDT'** is annunciated and the flight ID is illuminated in the display area when the FLT ID mode is selected by the Function Selector Knob.

**'TEST OK'**

**'TEST OK'** is displayed in the Test mode if no faults are detected.

**'SBY FXYZ'**

If one or more fault is detected in the Test mode, **'SBY'** is displayed in the altitude window and the ident window will cycle through all detected faults indicated by **'FXYZ'**. The **'XYZ'** denotes the specific fault.

**917.1E PROGRAMMING MODE**

The programming mode is normally set at time of installation, including the unique Mode S aircraft address. The programming mode should not be used during flight. Refer to the KT 73 Installation Manual 006-10563-0004 latest revision.

**917.1F AIR/GROUND SWITCHING**

The AUTO GND (Automatic Ground Programming) function is not available.

### **917.1G FAILURE ANNUNCIATION**

If the unit detects an internal failure, FAIL annunciation light on the left side of the displays will illuminate.

### **917.2 LIMITATIONS**

Not applicable.

### **917.3 EMERGENCY PROCEDURES**

#### **IMPORTANT CODES**

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

### **917.4 NORMAL PROCEDURES**

Not applicable.

### **917.5 PERFORMANCE**

Not applicable.

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**SECTION 918**

**BECKER ATC 2000 TRANSPONDER**

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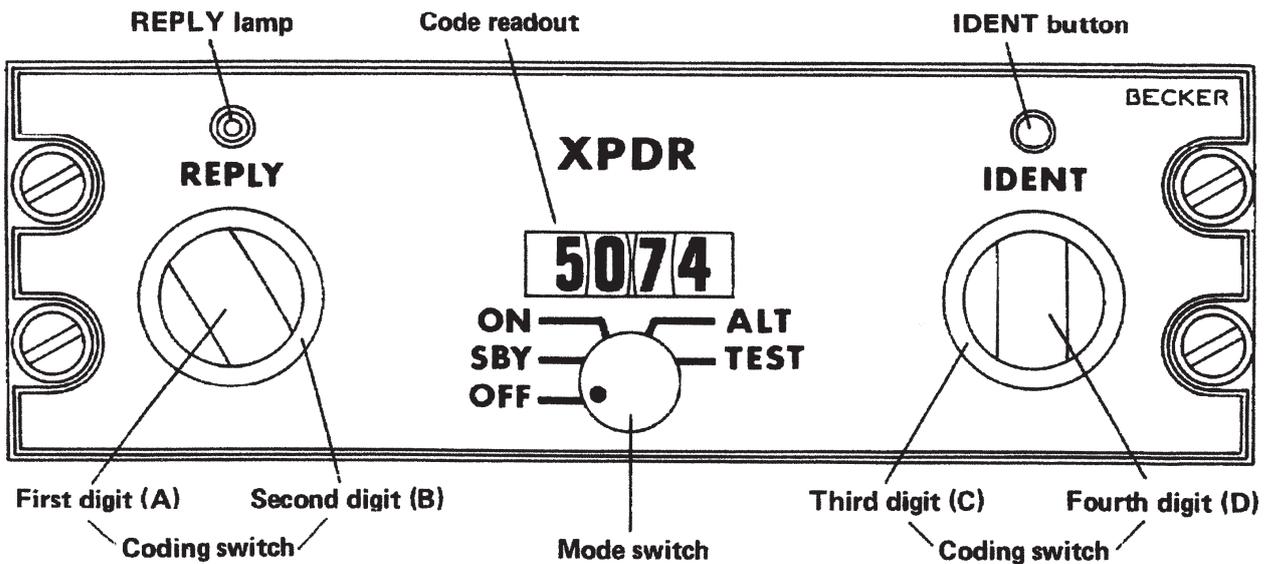
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**918.1 GENERAL**

The Becker panel mounted ATC 2000 Transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). Its functionality includes replying to ATCRBS Mode A and Mode C interrogations.

It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. The ATC 2000 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse.



Controls	Description	Function
OFF/SBY/ON/ALT/TEST mode switch	Four-Position rotary switch and one key position	OFF Transponder is switched off (with exception of panel lighting)
		SBY Transmitter tube warm-up
		ON Transponder responds to mode A interrogation with the set code
		ALT Transponder responds to mode A and mode C interrogation
TEST Built-in test by interrogation simulation, REPLY lamp must light up		
IDENT button	Pushbutton	Pressing the IDENT button the transponder transmits an SPI pulse
REPLY lamp	Lamp, orange, with dimmer	Lights up if transponder responds; intensity set by means of a mechanical dimmer
4 coding switches	Rotary switches with eight positions	Setting the code from 0000 to 7777 permitting 4096 different digit combinations
Code readout	Digital readout, each digit from 0 to 7	Indication of coding from 0000 to 7777

**NOTE**

The ATC 2000 owner accepts all responsibility for obtaining the proper license before using the transponder.

**Caution**

Do not switch on or off the transponder until the engines have been started or stopped respectively to avoid damage to the transponder due to current surges.

**918.1.1 BUILT-IN TEST**

- 1 Position mode switch from **OFF** to **SBY**. Operate the transponder approx. 60s in the SBY position since transmitting tube must warm up and stabilize prior to operation. It is, however, possible to skip the **SBY** position without danger for the transmitter tube, since the latter is safeguarded by cavity protection circuit which also requires approx. 60s to warm up.
- 2 Turn mode switch as far as it will go to **TEST** (key position) in which the transponder simulates interrogation, prompting a reply. The reply indication is given by the reply lamp illuminating.

**918.1.2 SQUAWK SELECTION**

Squawk selection is done with the four rotating knobs to provide 4096 identification codes. Important Codes:

1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

7000 The VFR code commonly used in Europe (Refer to ICAO standards)

0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)

7500 Hijack code (Aircraft is subject to unlawful interference)

7600 Loss of communications

7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

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### 918.1.3 MODE A OPERATION

- 1 Activate the transponder on ATC request only. To ensure instant readiness, position the mode switch to **SBY** (standby) during the flight.
- 2 Set the code requested by ATC using the four coding switches. Set two-digit code numbers in the first two windows of the readout.

#### **Caution**

**Only operate the coding switches in the SBY (standby) mode.**

- 3 Switch the mode switch **ON** on ATC request, the transponder then responding to mode A interrogation with dialed code, as indicated by the REPLY lamp coming on.
- 4 Only press the **IDENT** button briefly when requested by ATC, causing a special identification pulse (SPI pulse) being transmitted, permitting instant identification of the aircraft on the ATC radar system.

### 918.1.4 MODE A AND C OPERATION

- 1 Position mode switch to **ALT** on ATC request only. The transponder then responds with dialed code, causing REPLY lamp to light up and additionally transmits the height of the aircraft to ATC.
- 2 Press the **IDENT** button briefly when requested by ATC, causing a special identification pulse (SPI pulse) being transmitted, permitting instant identification of the aircraft on the ATC radar system.

### 918.2 LIMITATIONS

Not applicable.

### 918.3 EMERGENCY PROCEDURES

#### 918.3.1 IMPORTANT CODES

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

**918.4 NORMAL PROCEDURES**

Not applicable

**918.5 PERFORMANCE**

Not applicable

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**SECTION 919**

**BECKER ATC 4401 TRANSPONDER**

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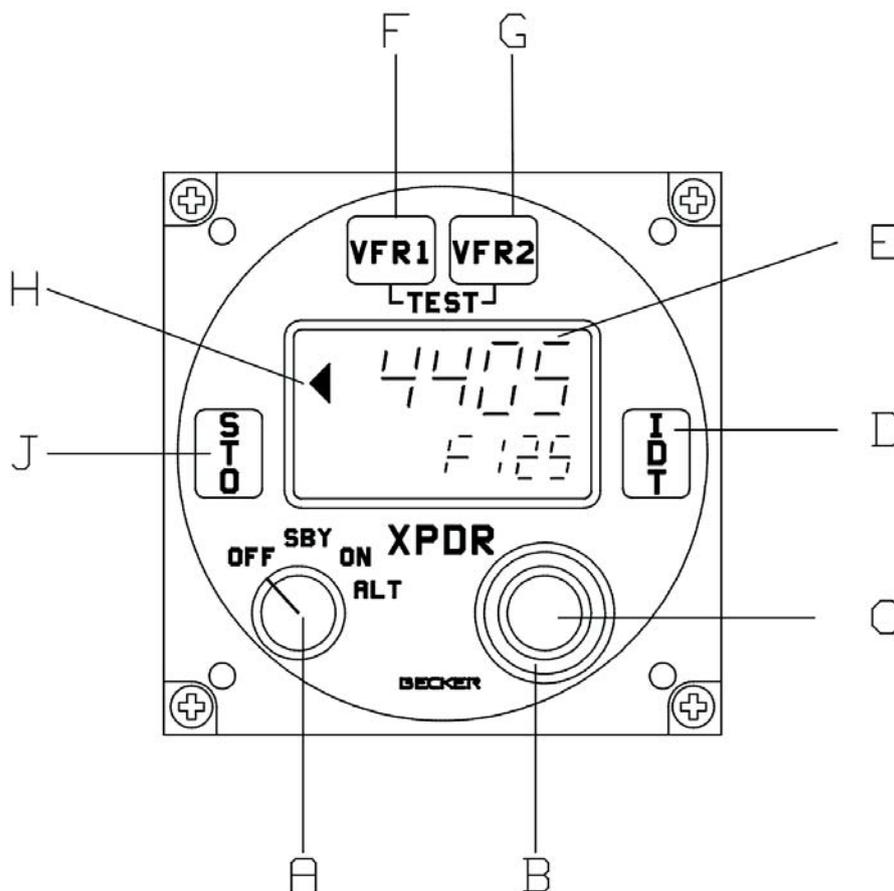
**919.1 GENERAL**

The Becker panel mounted ATC 4401 Transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). Its functionality includes replying to ATCRBS Mode A and Mode C interrogations.

It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. The ATC 4401 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse.

**NOTE**

**The ATC 4401 owner accepts all responsibility for obtaining the proper license before using the transponder. Refer to Becker Pilot's Guide.**



**919.1.1 CONTROLS AND INDICATORS**

A	OFF/SBY/ON/ALT rotary mode switch with 4 detent positions	OFF position : Transponder is switched off (expect panel lighting). SBY position : Standby mode is switched on. ON position : Mode A is switched on. ALT position : Mode A+C is switched on.
B	Rotary coding switch with 8 detents positions, continuously rotatable	Control of the cursor in one of the 4 code digits or from the display field
C	Rotary coding switch with 8 detents positions continuously rotatable	Setting the code digits from 0 to 7.
D	Ident push-button IDT	In Mode A and Mode A+C this triggers the transmission of an identification impulse additional to the Mode A reply code for approx. 18 seconds. During this time "ldt" appears in the bottom line of the LC display.
E	2-line LC display	Code indication (top line): Codes from 0000 to 7777 are possible.
		"Mode indication (bottom line) : SBY mode: ""SbY"" is displayed."
		"Mode A (ON): ""On"" appears in the display ""IDT"" is displayed the duration of the identification function."
		"Mode A+C (ALT):If a valid altitude is present, the flight level (height in steps of 100 ft) preceded by F (e.g.""F241""= 24100 ft) appears. If no valid altitude code is present, ""FN-"" is displayed. The flight level display can be switched off in the configuration mode. ""ldt"" is displayed for the duration of the identification function."
F	Code push-button VFR1	Activates a first user-specific VFR code
G	Code push-button VFR2	Activates a second user-specific VFR code.
H	Reply indication REPLY	The triangle signals a Transponder reply.
J	Store push-button STO	Stores user-specific VFR codes or changes in the configuration mode

**919.1.2 SWITCHING ON THE UNIT (PRE-FLIGHT CHECK)**

- 1 Check that the circuit breaker is set and switch on the aircraft power supply .

**CAUTION**

**Do not switch on the transponder if the motors or engines are being started or shut down.**

- 2 Using mode switch (A), switch the transponder from **OFF** to **SBY**. A test then follows automatically for 3 seconds. The display is flashing with all digits and the unit is subject to a self-test simultaneously.

- 3 After the switch-on test has elapsed and no error-message is written in the display, the transponder switches to the mode set on the mode switch (A).

**Note**

**The blind encoder is only powered if the transponder is not switched OFF (at least SBY). A blind encoder needs a warm-up time (sometimes a several minutes). Therefore although the solid state transponder needs no warm-up time, turn the transponder to SBY immediately after starting the engine.**

### 919.1.3 SQUAWK SELECTION

- 1 The transponder remains switched in the standby mode until requested by the ground station (ATC) to transmit a code, e.g. „squawk alpha 6426“.
- 2 Using the double rotary switch (B,C) set the 4-digit code requested by ATC as follows :
  - a Using switch (B) move the cursor to the particular digit. Digits 0 to 7 can then be set using switch (C).

**NOTES**

**If switch (B) is turned clockwise or counter-clockwise, the cursor is moved one position to the right or the left. The cursor appears only in the code display and is indicated by the flashing digit. If no cursor is visible, the first digit flashes after a clockwise rotation and the last digit after a counter-clockwise rotation. When the code is being changed in the ON or ALT position, the transponder temporarily switches to the standby mode.**

**The active time of the cursor and the rate of flashing can be changed in the configuration mode.**

- b If the cursor is not moved again within of 3 seconds (can be changed in configuration mode) or if the cursor is moved so far that it can no longer be seen in the display field or the identification switch is pressed (in the ON or ALT mode), the code currently set is switched active.

**NOTES**

**Whilst settings are taking place, the transmission branch of the transponder is inhibited to prevent unintentional transmission.**

**If only two digits were named by ATC, e.g. „Squawk alpha 64“, then a zero is to be used for positions three and four, i.e. „6400“.**

- c The last used code is stored in each case and is also activated when the transponder is switched on.

### SPECIAL VFR CODINGS

Two user-specific VFR codes can be stored and activated on the transponder.

- 1 Storing a new VFR code:
  - a Set the code to be stored in accordance with section B.

- b Press store push-button **STO** (J), the set code then flashes.
- c Press the **VFR1** push-button (F) or the **VFR2** push-button (G) within 3 seconds to store the code under the corresponding button.
- d If neither button (F) or (G) is pressed within 3 seconds, the flashing stops and the storage operation is aborted.

**NOTE**

**If one of the two buttons (F) or (G) is pressed without the STO button having been pressed beforehand, then the stored code allocated this button appears in the code display and is switched to active after 3 seconds (can be changed in the configuration mode). If the same button is again pressed within 3 seconds, the previous code appears.**

2 Activation of the VFR codes:

- a Press the **VFR** push-button **1** or **2** (F, G). The selected code is then displayed. After 3 seconds, the displayed code becomes active and overwrites the previously-set reply code.
- b Pressing button (F) or (G) again within 3 seconds reactivates the previously-set reply code.

**NOTE**

**When the unit is delivered, the store buttons are not assigned a code. This means that if these buttons are pressed for 0.5 seconds, „—“ is shown in the code display and the transponder then switches back to the previously-active code.**

**IMPORTANT CODES:**

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)
- 7600 Loss of communications
- 7700 Emergency
- 7777 Military interceptor operations (Never squawk this code)
- 0000 Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

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**Note**

**Unintentional transmission of an emergency code is prevented in that the transponder replies are inhibited whilst the code is being set. This applies particularly where the new code is being set in the ON or ALT modes. Also if a special code is called up, no transponder reply takes place during the period in which the previous code can be reactivated (approximately 3 seconds).**

**919.1.4 FLIGHT OPERATION IN MODE A (TRANSPONDER REPLY CODE ONLY)**

- 1 Select squawk as described above.
- 2 Set mode switch (A) from **SBY** to **ON**. The transponder immediately replies with the set code. A triangle on the left next to the code signals the transponder replies.

**919.1.5 FLIGHT OPERATION IN MODE A+C (REPLY CODE AND ALTITUDE CODE)**

- 1 Select squawk as described above.
- 2 ATC requests the transmission „alpha/charlie“ or „charlie“, switch the transponder to **ALT** using mode switch (A).
- 3 The transponder replies using the code set and in response to mode C requests it transmits the flight level of the aircraft to ATC. A triangle on the left next to the code signals the transponder replies.

**919.1.6 SQUAWK IDENT**

After a „squawk ident“ request from ATC, press Ident button **IDT** (D) briefly. This transmits an additional special pulse (SPI) for approx. 18 seconds, which enables the aircraft to be clearly identified on the radar screen of the controller. **'Idt'** appears in the bottom line of the LC display during this time.

**919.1.7 TEST**

The following different tests are integrated in the transponder or can be triggered at the transponder :

- 1 Automatic switching-on test, in which the display (E) is flashing with all digits for 3 seconds. The unit is subject to a self-test in this time.
- 2 A permanent test runs in the background of the transponder operation. The built-in FPGA organizes the required resources for this. The transmitter recognizes a mismatching or own abnormal behavior and delivers an alarm signal to the FPGA.

- 3 A further test of the unit is triggered, if the **VFR1** button (F) and **VFR2** button (G) are pressed simultaneously. At this test all segments must flash into display (E) as long as the buttons are pushed. Additionally the transmitter and evaluation are tested on correct function in the SBY, ON and ALT modes.
- 4 In case of a failure appears the report e.g. '**E10**' in the top line of the display. Switch OFF the transponder at such '**E**' fault indications.

### **919.1.8 CONFIGURATION MODE**

The configuration Mode is used to set the unit on the ground and must not be called up in flight. Refer to BECKER's Pilot's Guide for further information.

### **919.2 LIMITATIONS**

Not applicable.

### **919.3 EMERGENCY PROCEDURES**

#### **919.3.1 IMPORTANT CODES**

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

### **919.4 NORMAL PROCEDURES**

Not applicable

### **919.5 PERFORMANCE**

Not applicable

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**SECTION 920**

**BECKER ATC 6401 TRANSPONDER**

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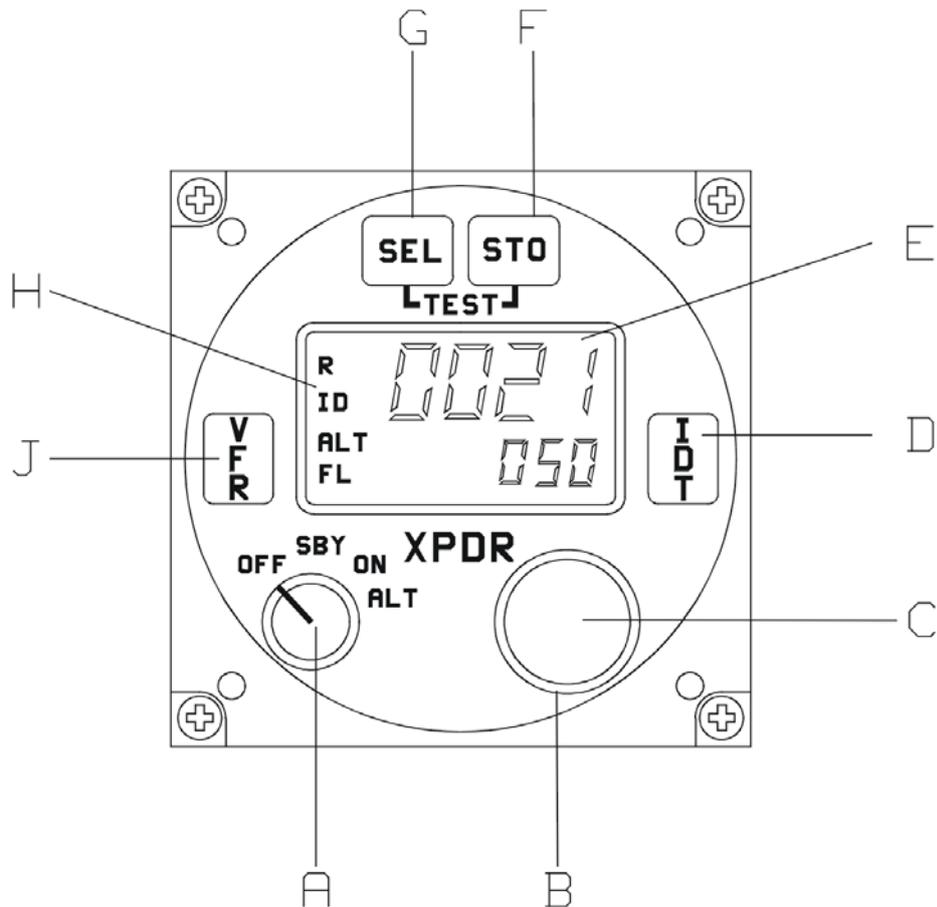
**920.1 GENERAL**

The Becker panel mounted ATC 6401 Transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). Its functionality includes replying to ATCRBS Mode A, C and Mode S interrogations.

It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. The ATC 6401 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse.

**NOTE**

**The ATC 6401 owner accepts all responsibility for obtaining the proper license before using the transponder. Refer to Becker Pilot's Guide.**



**920.1.1 CONTROLS AND INDICATORS**

A	Mode Selector	Rotary switch with 4 positions	OFF position : Transponder is switched off SBY position : Standby mode is switched on ON position: Mode A/S is switched on. Transmission of altitude information is suppressed ALT position: Mode A/C/S is switched on and the altitude information is transmitted.
B	Rotary switch	Rotary optical encoder (rotary mode of C)	Rotary switch to change settings (16 steps per turn)
C	Button	Push-button (mode of B)	Push to jump from digit to digit for settings or from one menu to the next; generally used as an enter key
D	IDT	Push-button	Activates the Special Identifier (SPI) in addition to the reply code for approx. 18 seconds; during this time "ID" appears in the LC display
E	Display, part 1	2-line LCD display	Displays the following informations: - code indication in the top row - flight level in the bottom row - various informations in the bottom row - additional indicators on the left side (see Ref. H)
F	STO	Push-button	Stores the selected values to the settings
G	SEL	Push-button	Opens and selects the menu
H	Display, part 2	LCD indicators	Displays additional indicators, (R for reply, ID for Ident, ALT for XPDR ALT mode or ON for XPDR ON mode, FL for flight level)
J	VFR	Push-button	Activates VFR code in the upper row of the display

**920.1.2 SWITCHING ON THE UNIT (PRE-FLIGHT CHECK)**

- 1 Check that the circuit breaker is set and switch on the aircraft power supply .

**CAUTION**

**Do not switch on the transponder if the motors or engines are being started or shut down.**

- 2 Using mode selector (A), switch the transponder from **OFF** to **SBY**. A test then follows automatically for 1 seconds. The display shows **'WAIT'** and the unit is subject to a self-test simultaneously.
- 3 After the switch-on test has elapsed and no error-message is written in the display, the transponder switches to the mode set on the mode selector (A).

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**Note**

**The blind encoder is only powered if the transponder is not switched OFF (at least SBY). A blind encoder needs a warm-up time (sometimes a several minutes). Therefore although the solid state transponder needs no warm-up time, turn the transponder to SBY immediately after starting the engine.**

### 920.1.3 DISPLAY

Transponder's code is displayed in the top line using high readability font, at all times in modes SBY, ON, ALT. Depending on the configuration settings, the Aircraft Identification (AI) or Flight Number (FN) is displayed in the bottom line. Flight level is displayed in ALT mode in the bottom line of the display (altitude= FL x 100 in ft).

### 920.1.4 SQUAWK SELECTION

- 1 The transponder remains switched in the standby mode until requested by the ground station (ATC) to transmit a code, e.g. „squawk alpha 6426“.
- 2 Using the rotary switch (B) and the button (C) set the 4-digit code requested by ATC as follows:
  - a Using switch (C) move the cursor to the particular digit. Digits 0 to 7 can then be set using the rotary switch (B).

**NOTES**

**Whilst settings are taking place, the transmission branch of the transponder is inhibited to prevent unintentional transmission.**

**If only two digits were named by ATC, e.g. „Squawk alpha 64“, then a zero is to be used for positions three and four, i.e. „6400“.**

- b The last used code is stored in each case and is also activated when the transponder is switched on.

#### **IMPORTANT CODES:**

- 1200 The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
- 7000 The VFR code commonly used in Europe (Refer to ICAO standards)
- 0021 The VFR code commonly used in Germany (default is set to 0021 at time of installation)
- 7500 Hijack code (Aircraft is subject to unlawful interference)
- 7600 Loss of communications
- 7700 Emergency

7777 Military interceptor operations (Never squawk this code)

0000 Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These trigger special indicators in automated facilities. Only the code 7500 will be decoded as the hijack code. An aircraft's transponder code (if available) is utilized to enhance the tracking capabilities of the ATC facility, therefore care should be taken when making routine code changes.

**Note**

**Unintentional transmission of an emergency code is prevented in that the transponder replies are inhibited whilst the code is being set. This applies particularly where the new code is being set in the ON or ALT modes. Also if a special code is called up, no transponder reply takes place during the period in which the previous code can be reactivated (approximately 3 seconds).**

### 920.1.5 SQUAWK IDENT

After a „squawk ident“ request from ATC, press Ident button **IDT** (D) briefly. This transmits an additional special pulse (SPI) for approx. 18 seconds, which enables the aircraft to be clearly identified on the radar screen of the controller. '**Idt**' appears in the bottom line of the LC display during this time.

### 920.1.6 SELFTESTS OF THE UNIT (BITS)

The following different tests are integrated in the transponder or can be triggered at the transponder:

- 1 The IBIT (Initiated Built-in Test) can be activated in any mode (excluding the configuration mode) with the push of (F) and (G) at the same time. The action starts with the leading edge of the second pushed button. The IBIT works as follows in all modes:

The test starts with all available test routines including the transmitter test routine. During the test, '**IBIT**' is indicated on the display. The test takes not longer than 1 second. If the IBIT was successful, the XPDR switches immediately into the normal operating mode. During the IBIT any action from other switches is not recognized.

Negative results of the IBIT are indicated on the display with '**FAILURE**'. The transponder may be not switched into ON or ALT mode if any failure was found.

- 2 The CBIT (Continuous Built-in Test) works as follows:

The continuous BIT acts as a kind of watchdog during operation. Negative results of the CBIT are indicated on the display with '**FAILURE**'. In this case the transponder may be not switched into ON or ALT mode (display indication of operating mode set to '**SBY**') if any failure was found.

- 3 The PBIT (Power-on Built-in Test) works as follows:

The XPDR has a power-on BIT after switching on. During the PBIT any action from other switches are not accepted.

During the PBIT the XPDR is in the SBY mode but this is not indicated on the display. The operating mode indication on the display starts immediately after finalisation of the PBIT.

Negative results are indicated on the display with '**FAILURE**'. The transponder may be not switched into ON or ALT mode if any failure was found.

The PBIT takes not longer than 1 second. If the test was successful, the XPDR switches immediately into the normal operating mode.

### 920.1.7 SELECTION MODE

Press **SEL** button (G) and rotate encoder (B) for selection. In selection mode additional information is displayed in the bottom line of the display. Some of the data are editable, some are read only:

VFR	4096 code presetting	editable
AI	Aircraft Identifier (Tail Number)	fixed; read only from address module (an be replaced by FN). If no valid AI is stored, "-----" is displayed.
FN	Flight Number or Company Call Sign	editable; can be replaced by AI (fixed) by selecting "AI DEF"
AA	Aircraft Address (24-bit ICAO)	fixed; read only from address module (unique number for each aircraft)
MA	Maximum Airspeed	fixed; read only from address module
AT	Aircraft Type	fixed; read only from address module
CFG	Configuration	available in SBY mode only
INS	Installation setup	available in SBY mode only; protected by password

### AIRCRAFT IDENTIFICATION (AI OR FN)

**With flight plan:**

The definition out of the flight plan: e.g. Flight Number or Company Call Sign

**Without flight plan (VFR):**

Tail Number (Call Sign)

The indication of '**AI**' in the bottom line of the display is in mode SBY and ON only if selected in configuration menu. The Aircraft Identifier (fixed) is available in any mode after pressing **SEL** button (G) and turning the rotary encoder (B). The default value for AI is the Tail Number of the aircraft and is stored in the Address Module.

If a flight plan exists, it has to be checked, which AI has to be used. If a Flight Number is assigned it has to be entered. If a Company Call Sign is mentioned, this has to be entered. To enter it see below. It will be stored in the EEPROM of the control head. In this case the indication on the display changes to '**FN**' (Flight Number). If the Call Sign (Tail Number) is mentioned, no change, as it is the default setting from the Address Module.

**SETTING THE FLIGHT NUMBER:**

- 1 Press **SEL** button (G) to enter the select mode.
- 2 Rotate (B) until '**AI**' is displayed.
- 3 Push (C) to switch to '**FN**'. The cursor is set on the first character.
- 4 Rotate (B) to change this character.
- 5 Push (C) to set the cursor to the next character.
- 6 Repeat steps 4 and 5 until the flight number is entered.
- 7 If the flight number consists of less than 7 characters, put a space at the end to fill the remaining characters with spaces.
- 8 Store the changes with **STO** button (F). For leaving the setting procedure without storing, push the **SEL** button (G).

**NOTE**

**Aircraft Identifier / Flight Number consists of max. 7 characters (on the left- hand side oriented). No dashes or spaces shall be included. If the FN consists of less than 7 characters, the remaining characters on the right side shall be filled with spaces.**

**SWITCHING BACK TO DEFAULT AI:**

- 1 Press **SEL** button (G) to enter the select mode.
- 2 Rotate (B) to the indication '**FN=XXXXXXXX**'.
- 3 First push on (C) indicates '**FN=AI DEF**' (inverted).
- 4 Can be set to '**AI=DEF**' with **STO** button (F).

**CHANGING THE FLIGHT NUMBER:**

- 1 Press **SEL** button (G).
- 2 Rotate (B) until '**FN**' is displayed.
- 3 Push (C) twice to enter the FN editing mode.
- 4 Change the FN as described above.

## VFR CODE PRESETTING

Press the **SEL** button (G) to get into configuration mode (selection is indicated in the left bottom corner of the display under the operating mode indication).

- 1 Rotate (B) to the indication '**VFR=XXXX**'.
- 2 First push to button (C) now left digit of the code is inverted.
- 3 Now the digit can be changed with (B).
- 4 Second push to button (C) now next left digit of the code is inverted.
- 5 The next digit can be changed with (B)
- 6 and the same for next digits.
- 7 Fifth push to button (C) now again first digit is inverted.
- 8 Changes can be stored with **STO** button (F) at any time, inversion stops in this case.
- 9 A VFR code that was preset in this way can be activated as described in chapter *VFR Code Activation*.
- 10 A timeout for inversion (10 sec) is introduced if no action happens. Nothing stored, as long as (F) is not pressed.

### NOTE

**It is possible to leave the setting procedure with SEL button (G) at any time and normal mode is available then. Indication SEL on the display changes back to mode indication. If STO button (F) was not used, no change has been stored.**

## 920.1.8 FLIGHT OPERATION IN MODE A/C/S (REPLY CODE AND ALTITUDE CODE)

- 1 When ATC requests the transmission „squawk“, switch the transponder to **ALT** using mode switch (A).

### NOTE

**In exceptions the altitude has to be turned off, i.e. switch the transponder to ON using mode switch (A).**

- 2 The transponder replies using the selected Code and in response to mode C interrogation it transmits the altitude of the aircraft to ATC. A 'R' on the left next to the Code on the display signals the transponder replies.

### NOTE

**Switch the transponder to Stand-by (SBY), if the Code has to be changed. Otherwise if could happen that a Code with a special meaning (see chapter K, e.g. hijack) will be transmitted and unwanted actions could take place.**

### 920.1.9 VFR CODE ACTIVATION

- 1 Press the **VFR** push-button (J). The preselected code is then displayed. After 3 seconds, the displayed code gets active and overwrites the previously-set reply code.
- 2 Pressing push-button (J) again within 3 seconds reactivates the previously-set reply code.

#### **NOTE**

**When the unit is delivered, the VFR button is not assigned a code. This means that if this button is pressed for 0.5 seconds, „—“ is shown in the code display and the transponder then switches back to the previously-active code.**

### 920.1.10 CONFIGURATION MODE

The configuration mode is available from SBY mode only. To get into configuration mode press button **SEL** (G), turn rotary encoder (B) until '**CFG**' appears in the bottom row of the display. Refer to BECKER's Pilot's Guide for available options.

### 920.2 LIMITATIONS

Not applicable.

### 920.3 EMERGENCY PROCEDURES

#### 920.3.1 IMPORTANT CODES

7600 Loss of communications.

7500 Hijacking.

7700 Emergency (All secondary surveillance radar sites are ready to receive this code at all times).

See the Airman's Information Manual (AIM) for a detailed explanation of identification codes.

### 920.4 NORMAL PROCEDURES

Not applicable

### 920.5 PERFORMANCE

Not applicable

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