

# EXTRA

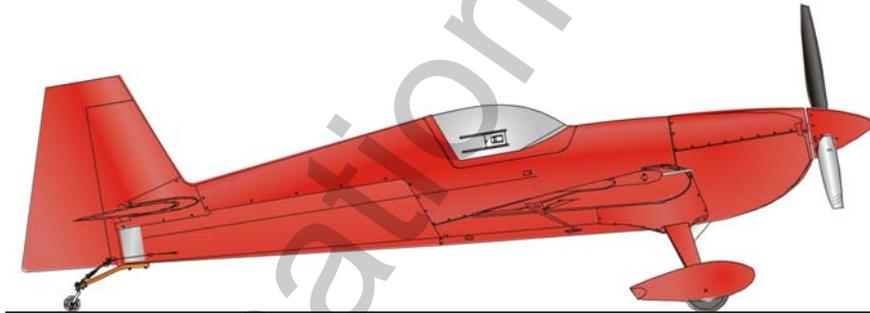
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## INFORMATION MANUAL

# *EXTRA 330SX*

### 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 EASA Approved Pilot's Operating Handbook required for operation of the airplane.**

# Information Manual

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## PILOT'S OPERATING HANDBOOK AND EASA APPROVED AIRPLANE FLIGHT MANUAL

Doc-No. EA - 0F701

NATIONALITY AND REGISTRATION MARKS

DESIGNATION OF AIRCRAFT

# EXTRA 330SX

SERIAL NO / YEAR OF MANUFACTURE

MANUFACTURER

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

EASA approved in the normal and acrobatic category based on FAR-23 AMDT. 34.  
This document must be carried in the airplane at all times.

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE EASA REGULATIONS AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER AND CONSTITUTES THE EASA APPROVED AIRPLANE FLIGHT MANUAL.

This Handbook meets GAMA Specification No. 1 for Pilot's Operating Handbook and is EASA approved.

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The official POH/AFM can be ordered at [Parts@ExtraAircraft.com](mailto:Parts@ExtraAircraft.com)

## LOG OF REVISIONS

Dates of issue for original and revised pages:

Original ..... 19. January 2024

Revision 1 ..... 17. May 2024

Revision 2 ..... 17. January 2025

Revision 3 ..... 6. March 2025

Date and sign of approval:

EASA MAJOR CHANGE APPROVAL 10084029  
Date of Approval ..... 29. February 2024

Approved under the authority of DOA  
N° EASA.21J.073 ..... 17. May 2024

Approved under the authority of DOA  
N° EASA.21J.073 ..... 21. January 2025

Approved under the authority of DOA  
N° EASA.21J.073 ..... 17. March 2025

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i thru ii .....	6. March 2025		
iii thru 2-11 .....	19. January 2024		
2-12 .....	17. May 2024		
2-13 thru 6-11 .....	19. January 2024		
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## INTRODUCTION

This handbook contains 9 sections, and includes the material required to be furnished to the pilot by FAR-23. It also contains supplementary data supplied 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.

## NOTES

This Flight Manual applies only to the aircraft whose nationality and registration marks are noted on the title page.

This Flight Manual is only valid in connection with the latest EASA approved revision. Refer to the EXTRA Homepage (direct link: <http://www.extraaircraft.com/techserv.asp>), where the POH Revision Index always shows the current revision status.

It is the responsibility of the pilot to be familiar with the contents of this Flight Manual including revisions and any relevant supplements.

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/EASA approval.

The editor has the copyright of this Flight Manual and is responsible for edition of revisions/ amendments and supplements.

Amendments, which affect the airworthiness of the aircraft will be announced in the mandatory Service Bulletins issued by the manufacturer EXTRA Flugzeugproduktions- und Vertriebs- GmbH coming along with the "Airworthiness Directive" (AD) publication issued by the EASA. The owner is responsible for incorporating prescribed amendments and should make notes about these on the records of amendments.

Should this Flight Manual get lost, inform EXTRA Flugzeugproduktions- und Vertriebs- GmbH, Flugplatz Dinslaken 46569 Hünxe, Federal Republic of Germany.

Should this Flight Manual be found, kindly forward it to the civil board of aviation in the country the aircraft is registered.

## NOTES AND SAFETY NOTES

Safety notes in this manual are marked by a boxed textmarker in the middle of the page and written in semi-bold characters. This manual distinguishes three warning levels:

### **DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Additional information given in this manual are also marked by boxed textmarkers in the middle of the page and are written in semi-bold characters:

### **NOTICE**

Is used to address practices not related to physical injury.

### **NOTE**

Represents a useful or remarkable hint.

## TERMINOLOGIE

The words "shall", "must" or "will" are used to express a mandatory requirement.

The word "should" is used to express nonmandatory provisions.

The word "may" is used to express permissible.

The term "page approved" on a page's footer means, that this page is approved by the applicable Aviation Authority.

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## SECTION 1

### GENERAL

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## 1.0 DESCRIPTION

The airframe of the EXTRA 330SX is built of a tig-welded steel-tube construction. Wing, empennage and landing gear are manufactured of composite material. The aircraft is a single seater.

## 1.1 SPECIFICATION OF CLASS

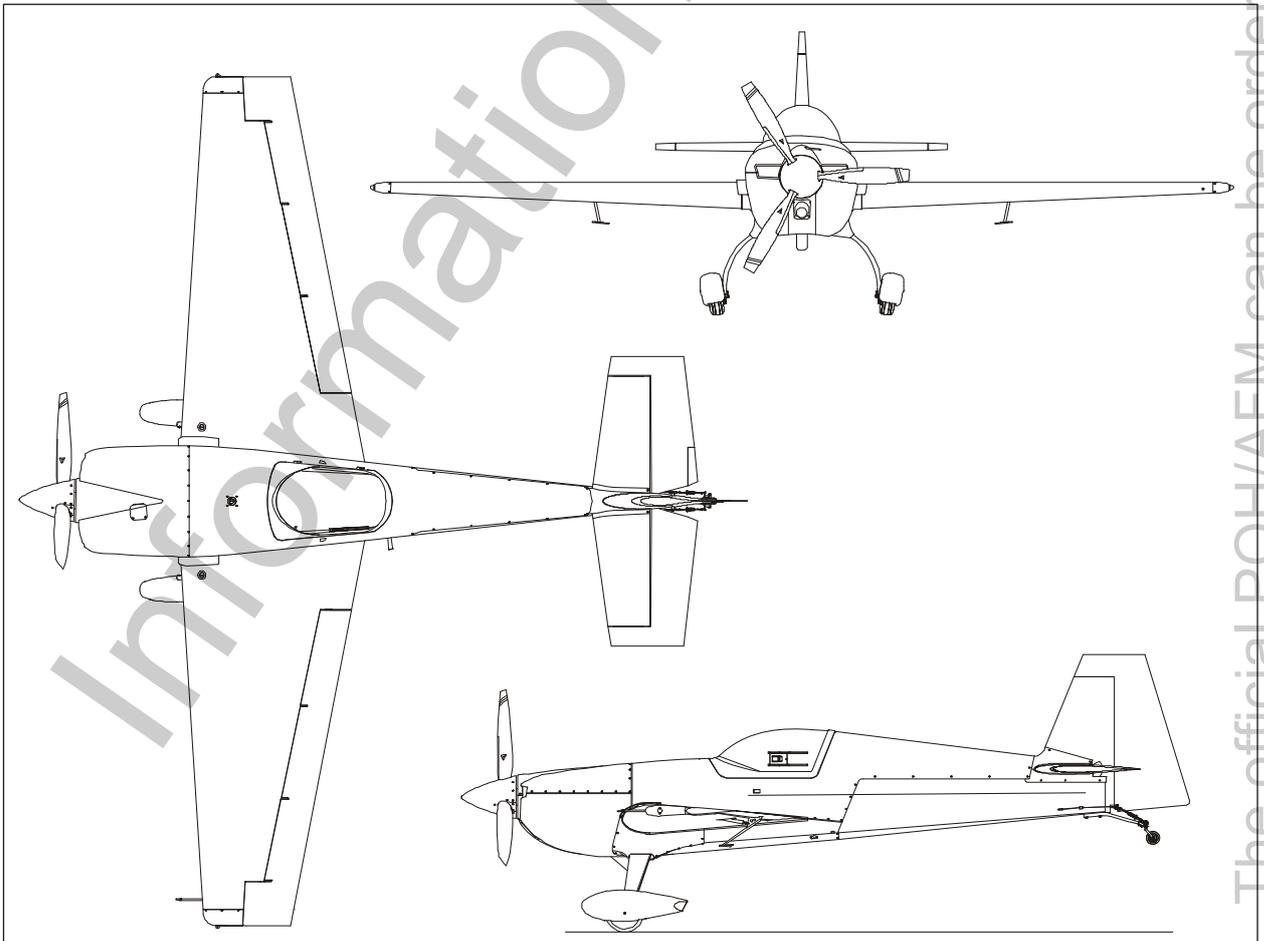
The aircraft is certified in normal and acrobatic category.  
EASA TC No.: EASA.A.362

## 1.2 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	6.65 m	(21.82 ft)
- Height	2.55 m	(8.36 ft)
- Span	7.80 m	(25.59 ft)
- Wheel-base	4.87 m	(15.98 ft)
- Wheel-track	1.80 m	(5.91 ft)

## 1.3.3 Wing

- Wing span	7.80 m	(25.59 ft)
- Wing-area	10.03 m <sup>2</sup>	(108.0 ft <sup>2</sup> )
- Chord Root:	1.786 m	(5.86 ft)
Tip:	0.792 m	(2.60 ft)
- MAC 1.353 m	(4.44 ft)	
- Aileron deflection	up/down 30°, tolerance ±2°	

## 1.3.4 Horizontal Tail

- Span	2.66 m	(8.73 ft)
- Area	2.13 m <sup>2</sup>	(22.92 ft <sup>2</sup> )

## 1.3.5 Elevator

- Area	1.04 m <sup>2</sup>	(11.19 ft <sup>2</sup> )
- Elevator-deflection	up/down 25°; tolerance ±1°	
- Trim-tab-deflection	up/down 32°; tolerance ±2°	

## 1.3.6 Vertical Tail

- Area	1.55 m <sup>2</sup>	(16.68 ft <sup>2</sup> )
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## 1.3.7 Rudder

- Area	0.75 m <sup>2</sup>	(8.07 ft <sup>2</sup> )
- Rudder deflection	left/right 30°, tolerance +0°/-2°	

## 1.4 ENGINE

Manufacturer: Textron-Lycoming Williamsport Plant PA 17701 USA.  
 Type: Lycoming AEIO-580-B1A  
 Rated power: 234.9 kW (315 HP) @ 2700 RPM  
 226.0 kW (303 HP) @ 2600 RPM

## 1.5 PROPELLER

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

- a) Standard: MTV-9-B-C/C198-25, 3-blade constant speed
- b) Alternative: MTV-14-B-C/C190-130, 4-blade constant speed

### 1.5.1 Exhaust System

- a) Standard: EA300-606000, Complete "6 in 1" system, with integrated silencer.  
Manufacturer: ACC Columbia Jet Service GmbH, Schwelm, Germany
- b) Alternative: Extra330-12-02C, "6 in 2" System, w/o silencer, Inconel 625  
Manufacturer: Atelier Chabord, Epagny, France

## 1.6 FUEL

Type: AVGAS 100/100 LL  
(for alt. fuel grades see latest issues of Textron Lyc. S.I. No 1070)  
Minimum 100/130 octane. Maximum 100/130 octane

- Total fuel volume	189 L	(49.9 US Gallon)
- Main tank	69 L	(18.2 US Gallon)
- Aux tank	120 L	(31.7 US Gallon)
- Usable fuel in the system	187.5 L	(49.5 US Gallon)
- Usable fuel for acrobatic	67.5 L	(17.8 US Gallon)

## 1.7 OIL

Maximum sump capacity: 16 qts.  
Minimum sump capacity: 9 qts.

Average ambient air temperature	MIL-L-6082 or SAEJ1966 Spec Mineral Grades	MIL-L-22851 or SAEJ1899 Spec 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 50
- 1°C til 32°C (30°F - 90°F)	SAE 40	SAE 40
- 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 20W50 or 15W50
< -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	(Normal Cat.)	86.74 kg/m <sup>2</sup> (17.76 lbs./sqf)
	(Acrobatic II Cat.)	81.75 kg/m <sup>2</sup> (16.74 lbs./sqf)
	(Acrobatic I Cat.)	77.77 kg/m <sup>2</sup> (15.93 lbs./sqf)
Powerloading	(Normal Cat.)	3.70 kg/kW (6.09 lbs./HP)
	(Acrobatic II Cat.)	3.49 kg/kW (5.74 lbs./HP)
	(Acrobatic I Cat.)	3.32 kg/kW (5.46 lbs./HP)

## 1.9 TERMINOLOGY

ADAHRS	Air Data Attitude Heading Reference System
COM	Communication
EFIS	Electronic Flight Instrument System
EMS	Engine Monitoring System
IBBS	Integrated Backup Battery System
PFD	Primary Flight Display
XPDR	Transponder
Air Speeds	
CAS	Calibrated air speed. CAS is the same as TAS (True Air Speed) in std. 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. Is equal to CAS compensated for altitude, temperature and density
V <sub>A</sub>	Maneuvering speed
V <sub>NE</sub>	Never exceed speed
V <sub>NO</sub>	Maximum structural cruising speed
V <sub>S</sub>	Stalling speed or minimum steady flight speed
V <sub>X</sub>	Best angle-of-climb speed
V <sub>Y</sub>	Best rate-of-climb speed

## Meteorological terminology

ISA International standard atmospheric condition

OAT Outside air temperature

### 1.10 SECONDARY TERMINOLOGY

fpm Feet/minute

ft Feet = 0.3048 m

in Inch = 2.54 cm

m Meter

L Litres

gal (US) liquid gallon = 3.79 litres

qts (US) liquid quart = 0.946 litres

hp Horse power (english)

h Hour

kts Knots (NM/h) = 1.852 kilometer per hour

km/h Kilometer per hour

lb English pound = 0.4536 kg

hPa Hecto Pascal

inHg 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 Weight of an item multiplied by its arm.

## 1.11 CONVERSIONTABLE

knots <> km/h		km/h <> knots		ft <> m		m <> ft		Nm <> km		km <> Nm	
60	111	100	54	500	152	250	820	10	19	10	5
65	120	110	59	1000	305	375	1230	20	37	20	11
70	130	120	65	1500	457	500	1640	30	56	30	16
75	139	130	70	2000	610	625	2051	40	74	40	22
80	148	140	76	2500	762	750	2461	50	93	50	27
85	157	150	81	3000	914	875	2871	60	111	60	32
90	167	160	86	3500	1067	1000	3281	70	130	70	38
95	176	170	92	4000	1219	1125	3691	80	148	80	43
100	185	180	97	4500	1372	1250	4101	90	167	90	49
105	194	190	103	5000	1524	1375	4511	100	185	100	54
110	204	200	108	5500	1676	1500	4921	110	204	110	59
115	213	210	113	6000	1829	1625	5331	120	222	120	65
120	222	220	119	6500	1981	1750	5741	130	241	130	70
125	232	230	124	7000	2134	1875	6152	140	259	140	76
130	241	240	130	7500	2286	2000	6562	150	278	150	81
135	250	250	135	8000	2438	2125	6972	160	296	160	86
140	259	260	140	8500	2591	2250	7382	170	315	170	92
145	269	270	146	9000	2743	2375	7792	180	333	180	97
150	278	280	151	9500	2896	2500	8202	190	352	190	103
155	287	290	157	10000	3048	2625	8612	200	370	200	108
160	296	300	162	10500	3200	2750	9022	220	407	250	135
165	306	310	167	11000	3353	2875	9432	240	444	300	162
170	315	320	173	11500	3505	3000	9843	260	482	350	189
175	324	330	178	12000	3658	3125	10253	280	519	400	216
180	333	340	184	12500	3810	3250	10663	300	556	450	243
185	343	350	189	13000	3962	3375	11073	320	593	500	270
190	352	360	194	13500	4115	3500	11483	340	630	550	297
195	361	370	200	14000	4267	3625	11893	360	667	600	324
200	370	380	205	14500	4420	3750	12303	380	704	650	351
205	380	390	211	15000	4572	3875	12713	400	741	700	378
210	389	400	216	15500	4724	4000	13123	420	778	750	405
215	398	410	221	16000	4877	4125	13533	440	815	800	432
220	407	420	227	16500	5029	4250	13944	460	852	850	459
225	417	430	232	17000	5182	4375	14354	480	889	900	486
230	426	440	238	17500	5334	4500	14764	500	926	950	513
235	435	450	243	18000	5486	4625	15174	520	963	1000	540

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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 EASA. Observance of these operating limitations is required by national aviation regulations.

#### NOTE

In case of the EXTRA 330SX is equipped with specific options additional information required for safe operation will be contained in Section 9 "Supplements".

EASA TC No.: EASA.A.362

Any exceedance of given limitations have to be reported by the pilot and considered by corresponding maintenance or inspection procedure according to *MAINTENANCE MANUAL EXTRA 330SX*.

#### 2.2 AIR SPEED (IAS)

Never Exceed Speed	$V_{NE}$	217 knots	(402 km/h)
Max. Structural Cruising Speed	$V_{NO}$	154 knots	(285 km/h)
Maneuver speed (Acrobatic Cat.)	$V_A$	154 knots	(285 km/h)
(Normal Cat.)	$V_A$	138 knots	(256 km/h)
Max. Aileron Control Inputs (Acrobatic Cat.)		up to 182 knots	(337 km/h)

#### 2.3 CROSS-WIND COMPONENT

Max. demonstrated cross-wind component for take-off and landing is 15 knots (27 km/h).

#### 2.4 ENGINE

Engine-type Textron-Lycoming Lycoming AEIO-580-B1A with rated maximum 315 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 (main and aux tank)	189 L (49.9 US Gallon).
Usable fuel capacity (main and aux tank)	187.5 L (49.5 US Gallon).
Acrobatic flight only with main tank.	
Total fuel capacity for acrobatic (main tank)	69 L (18.2 US Gallon).
Usable fuel capacity for acrobatic (main tank)	67.5 L (17.8 US Gallon).

## 2.4.2 Engine Limitations

a) RPM		
- Max. Take-Off		2700 RPM
- Max. Continuous		2700 RPM
b) Oil temperature		
- Max	118°C	245°F
c) Oil capacity		
- Maximum sump capacity:		16 qts.
- Minimum sump capacity:		9 qts.
d) Oil pressure		
- Minimum Idling	172 kPa	25 psig
- Normal	379 - 655 kPa	55 - 95 psig
- Starting, Warm up Taxi and Take-Off	793 kPa	115 psig

 **WARNING**

It is normal for the oil pressure to "flicker" from 10 to 30 psi (69 to 207 kPa) 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 (kPa) 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 at inlet to fuel injector		
- Max		65 psig
- Min		29 psig
- Min Idle		12 psig
f) Cylinder head temperature		
- Max	240.6°C	465°F

## 2.5 PROPELLER

MT-Propeller Entwicklung GmbH, Federal Republic of Germany

a) Standard: MTV-9-B-C/C198-25, 3-blade constant speed

b) Alternative: MTV-14-B-C/C190-130, 4-blade constant speed

Maximum rotational speed

- Take-Off and Maximum Continuous: 2600 rpm\*

### NOTE\*

**RPM limitation due to compliance with applicable noise protection requirements (ICAO Annex 16 and FAR 36). However for non-US registered airplanes an enhanced rotational speed limitation of 2700 RPM may be permissible when registered in the Acrobatic Category only as ICAO Annex 16 grants an exception for airplanes specially designed for acrobatic purposes.**

## 2.6 WEIGHT LIMITS

Max. allowed empty weight:

- Normal category 658 kg (1451 lbs)

- Acrobatic category II 685 kg (1510 lbs)

- Acrobatic category I 645 kg (1422 lbs)

Max. allowed T/O weight:

- Normal category 870 kg (1918 lbs)

- Acrobatic category II 820 kg (1808 lbs)

- Acrobatic category I 780 kg (1720 lbs)

Max allowed landing weight: 870 kg (1918 lbs)

## 2.7 WEIGHT AND C.G. ENVELOPE

Vertical reference = fire-wall.

Horizontal reference = upper longerons in cockpit.

Category	Max. T/O Weight	forward C.G.	rear C.G.
Normal	870 kg (1918 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")
Acrobatic II	820 kg (1808 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")
Acrobatic I	780 kg (1720 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")

## 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 acrobatics. Inverted flight maneuvers are limited to max 4 minutes. Recommended basic maneuver entry speeds are listed in the following list:

Maneuvers	Recommended entry speeds (IAS)		Symbol	Remarks
	min knots (km/h)	max knots (km/h)		
Segment: Horizontal Line	$V_S$	$V_{NE}$		
45° climbing	80 (148)	$V_{NE}$		
90° up	$V_A$	$V_{NE}$		
45° diving	$V_S$	190 (352)		reduce throttle
90° diving	$V_S$	190 (352)		reduce throttle
1/4 Loop climb.	100 (185)	190 (352)		
Looping	100 (185)	190 (352)		
Stall turn	100 (185)	190 (352)		
Aileron roll	80 (148)	$V_A$		full deflection
Snap roll	80 (148)	140 (259)		
"Tail slide"	100 (185)	190 (352)		
Spin	$V_S$			
Inverted spin	$V_S$			
Knife edge	>150 (278)			< 10 s
Inverted Flight	> $V_S$	190 (352)		< 4 min

### WARNING

Particular caution must be exercised when performing maneuvers at speeds above  $V_A$  [154 KIAS (285 km/h)]. 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 positive and negative flight attitude.

## 2.9 LOAD FACTOR

### 2.9.1 Normal Flight

Normal Category: + 6 g / - 3 g for MTOW 870 kg (1918 lbs)

### 2.9.2 Acrobatic Flight

Acro Category I: + 10 g / - 10 g for MTOW 780 kg (1720 lbs)  
Acro Category II: + 8 g / - 8 g for MTOW 820 kg (1808 lbs)

## 2.10 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 +38°C (100°F). Flight in known icing-conditions is prohibited. Flights close to thunderstorms are prohibited. Smoking is prohibited.

## 2.11 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. In order not to exceed this temperature limit, color specification for composite structure (manufacturer document EA-03205.19) has to be complied with.

## 2.12 MAXIMUM OPERATING ALTITUDE

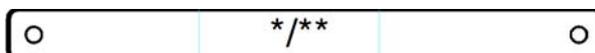
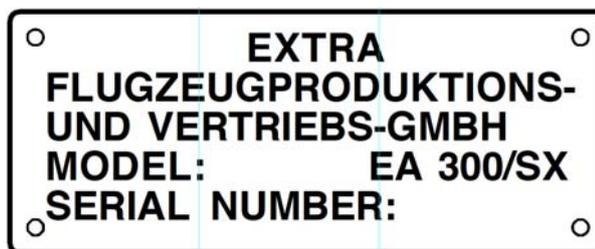
Max. certified operating altitude is 10,000 ft MSL (3048 m).

## 2.13 TIRE PRESSURE

The tire pressure is 4.3 bar (62 psi).

## 2.14 MARKINGS AND PLACARDS

### 2.14.1 Aircraft Identity Placard



\*) The latest national aviation regulations must be observed in determining whether the placard is required.

\*\*\*) Call sign placard

## 2.14.2 Operating Placards

**V<sub>A</sub> = 154 KTS (ACRO)**  
**V<sub>A</sub> = 138 KTS (NORMAL)**

or

**V<sub>A</sub> = 285 km/h (ACRO)**  
**V<sub>A</sub> = 256 km/h (NORMAL)**

(near the 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.

(in the cockpit)

This airplane is certified for VFR day operation. Operation under known icing conditions or close to thunderstorms is prohibited.

(on the instrument panel)

**FUEL**  
**AVGAS 100/100LL**

(near each filler cap)

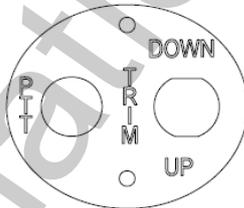
**OIL**

(on the separate hatch / upper cowling)

**ELEV. TRIM**  
**DOWN**

(Next to the trim switch)

or



**UP**

(Next to the trim switch)

(On the control stick grip)

**EXTERNAL POWER 12 V**

(Next to external power receptacle, if installed)

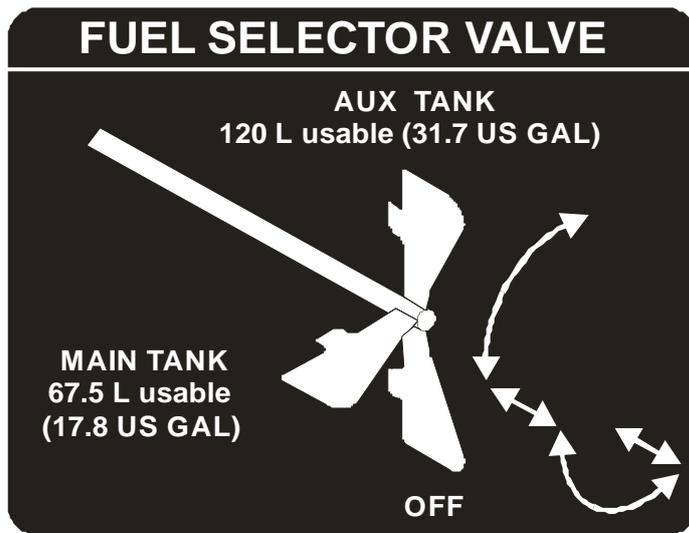
**EXTERNAL POWER 12 V**  
**DO NOT CRANK FOR MORE THAN 10 SECONDS!**  
Allow 20 seconds to cool-down between attempts.  
Repeat up to 6 times. Then let starter cool for 30 minutes.

(in cockpit, if external power receptacle installed)

**BATTERY CHARGE 12 V**  
**(BATTERY SWITCH OFF)**

(Next to the 12 V power jack, if installed)

The official POH/AFM can be ordered at Parts@ExtraAircraft.com



(in cockpit next to fuel selector)

**AUX TANK  
MUST BE EMPTY FOR AEROBATICS.  
USABLE FUEL 120L (31.7 US GAL).**

(On the instrument panel beneath wing tank fuel capacity indicator)

**ACROBATIC I: +10G / -10G MTOW 780 KG (1720 LBS)  
ACROBATIC II: +8G / -8G MTOW 820 KG (1808 LBS)**

(In cockpit)

**NORMAL: +6G / -3G MTOW 870 KG (1918 LBS)  
ACROBATICS INCL. SPIN NOT APPROVED!**

(In cockpit)

**NO SMOKING**

(In cockpit)

**Use of headset is required.  
Use of parachute is recommended.**

(On the right side of instrument panel)

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**HIGH RPM ← PROP → LOW RPM**

(Near RPM control in the cockpit)

**RICH ← MIXTURE → LEAN**

(Near mixture control in the cockpit)

**CLOSE ← THROTTLE → OPEN**

(Near throttle control in the cockpit)

**CANOPY LOCK**  
**LOCK ← ● → UNLOCK**

(Near canopy locking handles in the cockpit)



(Near the eyeball-type adjustable vents)

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

(In cockpit)

**EA 300/SX**

(In cockpit)

**CALLSIGN**

(In cockpit)

For	N	030	060	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

(near magnetic direction indicator)

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## AUX TANK DRAIN

(Near the LH drain valve in the bottom fuselage cover)

## MAIN TANK DRAIN

(Near the RH drain valve in the bottom fuselage cover)

## GASCOLATOR DRAIN

(Near the drain valve on the RH lower side of the firewall)

## USE STRAIGHT MINERAL OIL FOR A MINIMUM OF 50 HOURS

(On the inside of the separate hatch / upper cowling)

## 4.3 BAR 62 PSI

(On the outside of the wheelpants)

## TORQUE TUBE LUBRICATION

(Near opening in middle of bottom fuselage cover)

## ////////// NO STEP! \\\\\\\\\\\

(In the cockpit, on the aileron control rods)



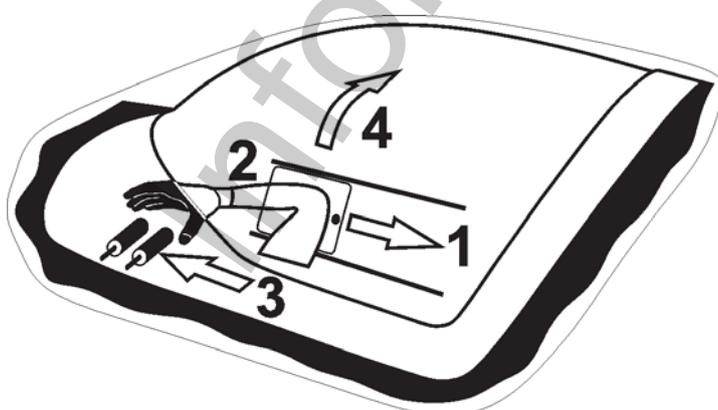
(In cockpit, on the RH side)

Approved acrobatic maneuvers and recommended entry airspeeds					
Maneuvers	Airspeeds		Maneuvers	Airspeeds	
	min KIAS	max KIAS		min KIAS	max KIAS
<b>Segment:</b>					
Horizontal Line	$V_S$	$V_{NE}$	Aileron roll	80	$V_A$
45° climbing	80	$V_{NE}$	Snap roll	80	140
90° up	$V_A$	$V_{NE}$	"Tail-slide"	100	190
45° diving	$V_S$	190	Spin	$V_S$	----
90° diving	$V_S$	190	Inverted spin	$V_S$	----
1/4 Loop climb.	100	190	Inverted flight (Less than 4 min)	$>V_S$	190
Loop	100	190	Knife edge (Less than 10 s)	$>150$	----
Stall turn	100	190			

or

Approved acrobatic maneuvers and recommended entry airspeeds					
Maneuvers	Airspeeds		Maneuvers	Airspeeds	
	min	max		min	max
<b>Segment:</b>					
Horizontal Line	$V_S$	$V_{NE}$	Aileron roll	148km/h	$V_A$
45° climbing	148 km/h	$V_{NE}$	Snap roll	148km/h	259km/h
90° up	$V_A$	$V_{NE}$	"Tail-slide"	185km/h	352 km/h
45° diving	$V_S$	352 km/h	Spin	$V_S$	----
90° diving	$V_S$	352 km/h	Inverted spin	$V_S$	----
1/4 Loop climb.	185km/h	352km/h	Inverted flight (Less than 4 min)	$>V_S$	352km/h
Loop	185km/h	352 km/h	Knife edge (Less than 10 s)	$>278$ km/h	----
Stall turn	185km/h	352 km/h			

(In cockpit)



(on outside canopy frame or adjacent, on the LH side; color choice in contrast to aircraft design)

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## 2.14.3 Instrument Markings

### AIRSPPEED INDICATOR

green range	63 KIAS (117 km/h) - 154 KIAS (285 km/h)
yellow range	154 KIAS (285 km/h) - 217 KIAS (402 km/h)
red line	217 KIAS (402 km/h)

### OIL PRESSURE INDICATOR

#### **NOTE**

Oil pressure indicator shows psig values even when labelled 'Psi'.  
Range markings depending on instrument installed.

red line	25 psig
yellow range	25 psig - 55 psig
green range	55 psig - 95 psig
yellow range	95 psig - 115 psig
red line	115 psig

### OIL TEMPERATURE INDICATOR

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

### CYLINDERHEAD TEMPERATURE INDICATOR

yellow range	< 150 °F
green range	150 °F - 435 °F
yellow range	435 °F - 465 °F
red line	465 °F

### RPM INDICATOR

green range	700 rpm - 2600 rpm	(2700 rpm*)
red line	2600 rpm	(2700 rpm*)

### G-METER

red line	-10 g	
yellow range	-10 g	- 3 g
green range	-3 g	+6 g
yellow range	+6 g	+10 g
red line	+10 g	

### FUEL FLOW INDICATOR

green range	0 gal/h - 35 gal/h
-------------	--------------------

### MANIFOLD PRESSURE INDICATOR

green range	10 "Hg - 30 "Hg
-------------	-----------------

\*) for aerial work

2.15 KINDS OF OPERATION EQUIPMENT LIST

The aircraft may be operated in day-VFR when the appropriate equipment is installed and operable. No Pilot's Operating Handbook Supplement grants approval for IFR operation. Flight in icing conditions is prohibited.

The following equipment list identifies the systems and equipment upon which certification was predicated.

The following systems and items of equipment must be installed and operable for the particular kind of operation indicated.

**NOTE**

The zeros ( 0 ) used in the below list mean that either the equipment or system, or both were not required for type certification.

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

\*) The asterisk used in the below list means that latest national aviation regulations must be observed in determining whether the equipment and/or system is 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.

	NORMAL	ACROBATIC
<b>COMMUNICATION</b>		
1. Transceiver-VHF	*	*
<b>ELECTRICAL POWER</b>		
1. Battery	1	1
2. Alternator	1	1
3. Ampermeter	1	1
<b>FLIGHT CONTROL SYSTEM</b>		
1. Elevator-trim control (electric)	1	1
<b>FUEL</b>		
1. Boost pump	1	1
2. Fuel quantity indicator (MAIN tank)	1	1
3. Fuel quantity indicator (AUX tank)	1	1
4. Manifold pressure	1	1
5. Fuel flow indicator	1	1
6. Fuel pressure	0	0

	NORMAL	ACROBATIC
<b>LIGHT</b>		
1. Wing-tip strobe light	*	*
<b>NAVIGATION</b>		
1. Altimeter	1	1
2. Airspeed indicator	1	1
3. Mag. direction indicator	1	1
4. Transponder <sup>1</sup>	1	1
<b>ENGINE CONTROL</b>		
1. RPM indicator	1	1
2. Exhaust gas temperature ind.	0	0
3. Cylinder head temperature ind.	0	0
<b>OIL</b>		
1. Oil temperature indicator	1	1
2. Oil pressure indicator	1	1
<b>FLIGHT CREW EQUIPMENT</b>		
1. Parachute	0	*/**
2. Seat belt	1	1
3. Headset	1	1

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

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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 pilot and/or aircraft. Refer to the Supplement Sections for emergency procedures associated with optional systems or equipment.

Thorough knowledge of these procedures will enable the pilot to better cope with an emergency. The steps should be performed in the listed sequence. However the procedures do not restrict the pilot from taking any additional action necessary to deal with the emergency.

##### 3.0.2 GENERAL BEHAVIOUR IN EMERGENCY SITUATIONS

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.

#### WARNING

Make only one attempt to restore an automatically disconnected power source or reset or replace an automatically disconnected CPD (circuit protection device) that affects flight operations or safety. Each successive attempt to restore an automatically disconnected power source, or the resetting of an automatically disconnected CPD can result in progressively worse effects.

## 3.1 AIRSPEEDS FOR EMERGENCY OPERATION

Stall speed	63 KIAS (117 km/h)
Engine failure after take-off	90 KIAS (167 km/h)
Best recommended gliding speed ( glide angle 1 : 6,2 )	
-Acrobatic cat. (780 kg (1720 lbs))	90 KIAS (167 km/h)
-Normal cat. (870 kg (1918 lbs))	90 KIAS (167 km/h)
Precautionary landing with engine power	90 KIAS (167 km/h)
Landing without engine power	90 KIAS (167 km/h)
Maximum demonstrated cross wind component	15 Knots (27 km/h)

## 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. BACKUP BATTERY switch	OFF
6. BATTERYswitch	OFF

### 3.2.2 ENGINE FAILURE IMMEDIATELY AFTER TAKE-OFF

Stall speed	63 KIAS (117 km/h)
1. Airspeed	90 KIAS (167 km/h)
2. Mixture	IDLE CUT OFF
3. Fuel selector valve	OFF (Pull & Turn)
4. Ignition switch	OFF
5. BACKUP BATTERY switch	OFF
6. BATTERYswitch	OFF
7. Forced landing	PERFORM AS PRACTICABLE

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

1. Aircraft attitude	UPRIGHT
2. Airspeed	90 KIAS (167 km/h)
3. Fuel quantity indicators	CHECK
4. Fuel selector valve	SELECT TANK with highest fuel level
5. Mixture	RICH
6. Boost pump	ON
7. Ignition switch	BOTH (or START if propeller has stopped)

### 3.2.4 OIL SYSTEM MALFUNCTION

*If oil pressure indicates low:*

1. Aircraft Apply positive "g"

*If oil pressure is not regained then:*

2. Airspeed 90 KIAS (167 km/h)
3. Throttle REDUCE TO IDLE
4. Engine oil temperature OBSERVE INDICATION
5. Land ASAP

#### NOTE

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

### 3.2.5 ALTERNATOR FAILURE

#### I. ALTERNATOR annunciation on EFIS:

1. Ammeter indication CHECK

*if indication is negative:*

2. Land ASAP  
an overvoltage situation has occurred;  
batteries are the only power source

*if indication is positive:*

2. Land AS SOON AS PRACTICAL  
EFIS annunciation is defective
3. Ammeter MONITOR

#### II. Ammeter has negative indication:

1. RPM INCREASE  
and/or electrical load REDUCE

*if ammeter indication is still negative*

2. Land ASAP  
batteries are the only power source

#### III. ALTERNATOR circuit breaker has tripped (ammeter indication negative):

1. ALTERNATOR circuit breaker RESET

*if ALTERNATOR circuit breaker trips again:*

2. Land ASAP  
batteries are the only power source

## 3.2.6 EFIS FAILURE

The failure of the EFIS may have different causes:

- Loss of electrical power (Avionics Bus or Main Bus)
- Defective screen

In case of electrical power loss the EFIS can be recovered by activating the backup battery. The EFIS is installed for situational awareness only and the primary source for flight data is the mechanical instrumentation. Loss of flight instrumentation in the EFIS is therefore not an emergency. The aircraft may be flown without further limitations.

Although all engine and system indications are lost, this failure does not cause any harm.

The engine cannot be operated outside its limitations.

However: Fuel needs to be checked by time-check.

Landing on appropriate airfield as soon as practical is recommended.

*If EFIS is black:*

1. BACKUP BATTERY switch CHECK ON

*If screen recovers:*

2. Land AS SOON AS PRACTICAL backup battery will ensure screen indication for 30 minutes.

*if screen does not recover:*

3. Fuel quantity CHECK by time-check
4. Land AS SOON AS PRACTICAL on appropriate airfield. Consider possible loss of COM and XPDR.

## 3.2.7 LOSS OF NAVIGATION FUNCTIONALITY OF GPS OR NAVIGATION RADIO

The EFIS is installed for situational awareness only and the primary source for flight data is the mechanical instrumentation. Loss of flight instrumentation in the EFIS is therefore not an emergency.

The aircraft may be flown without further limitations.

## 3.2.8 FAILURE OR ERROR OF MANIFOLD PRESSURE INDICATION

Follow RPM/fuel-flow setting as per Performance Chart in Section 5 of this POH.

## 3.2.9 FAILURE OR ERROR OF ONE OR SEVERAL CHT INDICATIONS

CHT indication is not essential for flight. The aircraft may be flown without further limitations.

## 3.2.10 FAILURE OR ERROR OF OIL PRESSURE INDICATION

Oil temperature may be used as backup.

With stable oil and cylinder head temperature and without oil leak a sensor failure is likely. Continue flight and land on appropriate airfield to determine the reason for the oil pressure indication loss.

### 3.2.11 FAILURE OR ERROR OF OIL TEMPERATURE INDICATION

Oil pressure may be used as backup: With stable oil pressure and cylinder head temperature and without oil leak a sensor failure is likely.  
Continue flight and land on appropriate airfield to determine the reason for the oil temperature indication loss.

### 3.2.12 FAILURE OR ERROR OF FUEL QUANTITY INDICATION

Fuel needs to be checked by time-check.  
Landing on appropriate airfield recommended.

### 3.2.13 FAILURE OR ERROR OF FUEL PRESSURE INDICATION

Fuel flow may be used as backup; manifold pressure and RPM indications can be used as an emergency backup to control power.  
With stable fuel flow and without fuel leak a sensor failure is likely.  
Landing on appropriate airfield recommended.

## 3.3 FORCED LANDINGS

### 3.3.1 EMERGENCY LANDING WITHOUT ENGINE POWER

- |                                   |                    |
|-----------------------------------|--------------------|
| 1. Seat belts, shoulder harnesses | SECURE             |
| 2. Airspeed                       | 90 KIAS (167 km/h) |
| 3. Mixture                        | IDLE CUT OFF       |
| 4. Fuel selector valve            | OFF (Pull & Turn)  |
| 5. Ignition switch                | OFF                |
| 6. BACKUP BATTERY switch          | OFF                |
| 7. BATTERY switch                 | OFF                |
| 8. Touchdown                      | SLIGHTLY TAIL LOW  |
| 9. Brakes                         | OPTIMUM BRAKING    |

### 3.3.2 PRECAUTIONARY LANDING WITH ENGINE POWER

- |                                |   |
|--------------------------------|---|
| 1. Seat belt, shoulder harness | SECURE  |
| 2. Airspeed                    | 90 KIAS (167 km/h)  |
| 3. Selected field              | FLY OVER,<br>noting terrain and obstructions, then<br>reaching a safe altitude and airspeed |
| 4. BACKUP BATTERY switch       | OFF   |
| 5. BATTERY switch              | OFF   |
| 6. Touchdown                   | SLIGHTLY TAIL LOW   |
| 7. Ignition switch             | OFF   |
| 8. Mixture                     | IDLE CUT OFF  |
| 9. Fuel selector valve         | OFF (Pull & Turn)   |
| 10. 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. |
| <i>If engine starts:</i>         |   |
| 2. Fuel selector valve           | OFF (Pull & Turn)   |
| 3. Power                         | 1700 RPM for one minute.  |
| 4. Engine                        | SHUT DOWN   |
| <i>If engine fails to start:</i> |   |
| 2. Cranking                      | CONTINUE, hold elevator up and apply brakes   |
| 3. Fuel selector valve           | OFF (Pull & Turn)   |
| 4. Throttle                      | FULL OPEN   |
| 5. Mixture                       | IDLE CUT OFF  |
| 6. BACKUP BATTERY switch         | OFF   |
| 7. BATTERY switch                | OFF   |
| 8. Ignition switch               | OFF   |

 **WARNING**

Risk of burns due to flames shooting out.

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

- |                      |   |
|----------------------|---|
| 9. After engine stop | ABANDON aircraft                                |
| 10. Fire             | EXTINGUISH using fire extinguisher if available |
| 11. Aircraft         | INSPECT   |

### 3.4.2 ENGINE FIRE IN FLIGHT

- |                          |  |
|--------------------------|--|
| 1. Mixture               | IDLE CUT OFF   |
| 2. Fuel selector valve   | OFF (Pull & Turn)  |
| 3. BACKUP BATTERY switch | OFF  |
| 4. BATTERY switch        | OFF  |
| 5. Airspeed              | 90 KIAS (167 km/h), find your airspeed/attitude which will keep the fire away from the cockpit |
| 6. Land                  | ASAP   |

## 3.5 ICING

### 3.5.1 INADVERTED 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:

1. Reduce speed to 90 Kts (167 km/h) if possible
2. Pull mixture to lean
3. Open canopy (push forward to jettison canopy if applicable)
4. Take off headset
5. Open seat belt
6. Leave airplane to the left side
7. Try to avoid wing and tail
8. Open parachute

## 3.8 EMERGENCY EXIT AFTER TURN OVER

- |   |                   |
|---|-------------------|
| 1. BACKUP BATTERY switch                        | OFF               |
| 2. BATTERY switch                               | OFF               |
| 3. Fuel selector valve                          | OFF (Pull & Turn) |
| 4. Seat belts                                   | OPEN              |
| 5. Parachute harnesses (if wearing a parachute) | OPEN              |
| 6. Canopy handle                                | PULL TO OPEN      |

*if canopy fails to open:*

- |             |               |
|-------------|---------------|
| 7. Canopy   | BREAK         |
| 8. 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 descent with engine power.

For landing trim nose up and establish a shallow descent 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 PROCEDURE

#### 4.0 GENERAL

##### 4.0.1 AIRSPEEDS FOR OPERATION

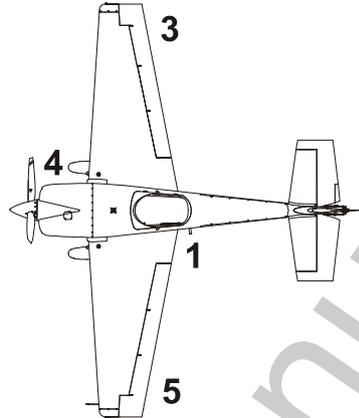
	<b>NORMAL</b> <b>870 kg</b> <b>(1918 lbs)</b> <b>KIAS (km/h)</b>	<b>ACRO II</b> <b>820 kg</b> <b>(1808 lbs)</b> <b>KIAS (km/h)</b>	<b>ACRO I</b> <b>780 kg</b> <b>(1720 lbs)</b> <b>KIAS (km/h)</b>
Start:			
Rotate Speed	70 (130)	68 (126)	66 (122)
Climb:			
V <sub>X</sub>	89 (165)	86 (159)	84 (156)
V <sub>Y</sub>	98 (181)	95 (176)	93 (172)
Recommended Normal Climb Speed	106 (196)	103 (191)	100 (185)
Max. Cruise Speed	183 (339)	185 (343)	187 (346)
Landing:			
Approach	85 (157)	83 (154)	80 (148)
On Final	85 (157)	83 (154)	80 (148)
Go-Around Speed	95 (176)	92 (170)	90 (167)
Recommended Airspeed (maximum) For Flight In Rough Air (V <sub>NO</sub> )	138 (256)	154 (285)	154 (285)
Max. Demonstrated Cross Wind Component	15 kts (27)	15 kts (27)	15 kts (27)

##### 4.0.2 CHECKLIST AND PROCEDURES

This handbook contains the checklists and procedures to operate the aircraft. The pilot should be familiar with all procedures contained in this Pilot's Operating Handbook, which must be carried on board. The pilot has to comply with the checklists for daily checks and inspections (see Section 8, Handling, Servicing and Maintenance). Refer to the Supplement Sections for normal procedures associated with optional systems or equipment.

## 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. Ignition switch	OFF
4. BATTERY switch	ON
5. Fuel quantity indicator main tank	CHECK
6. Fuel quantity indicator aux tank	CHECK
7. BATTERY switch	OFF
8. Fuel selector *	MAIN TANK

#### NOTE\*

Although safe operation does not require the use of the tanks in a specific sequence, it is recommended to set fuel selector to "MAIN TANK" position!

### 2) Empennage

1. All-round inspection: canopy, surfaces, stabilizers, elevator, trim tab, 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 |

### 4) Nose

- |                                     |   |
|-------------------------------------|---|
| 1. Engine oil dipstick              | CHECK   |
| 2. Propeller and spinner            | CHECK   |
| 3. Air inlet                        | CHECK   |
| 4. Fuel tank filler caps            | CHECK   |
| 5. Fuel drain for main and aux tank | DRAIN FOR AT LEAST 4 SECONDS TO CLEAR SUMP OF POSSIBLE WATER;<br>CHECK CLOSED   |
| 6. Gascolator drain                 | DRAIN FOR AT LEAST 4 SECONDS TO CLEAR FILTER OF POSSIBLE WATER;<br>CHECK CLOSED |

### 5) Left wing

- |  |        |
|--|--------|
| 1. Left landing gear, wheel and brake        | 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. Parachute                           | CHECK SECURED  |
| 3. Seat, seatbelts, shoulder harnesses | ADJUST AND LOCK  |
| 4. Canopy                              | CLOSE AND LOCK<br>Verify aft handle entirely within LOCK position <sup>1</sup> .<br>Check gap between canopy frame and fuselage fairing. |
| 5. Brake                               | APPLY  |
| 6. BACKUP BATTERY switch               | ON   |
| 7. Electrical equipment                | OFF  |
| 8. AVIONICS switch                     | OFF  |
| 9. BATTERY switch                      | ON   |

<sup>1</sup>) Refer to Section 7.9

## 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. Ensure pre-flight inspection completed.
2. Set propeller governor control in "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             |
| 4. Electrical equipment | ON                            |
| 5. Radio                | Set and test                  |
| 6. 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.

## 4.5 TAKE-OFF PROCEDURE

### 4.5.1 BEFORE TAKE-OFF

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

- |   |  |
|---|--|
| 1. Oil pressure and oil temperature   | CHECK ALL GREEN  |
| 2. Magnetos   | CHECK as follows:  |
| Engine RPM:   | Set to 1800 min <sup>-1</sup>  |
| Ignition switch position:   | LEFT   |
| Display:  | Shows RPM drop   |
| Ignition switch position:   | RIGHT  |
| Display:  | Shows RPM drop   |
| Ignition switch position:   | BOTH   |
| <br><b>NOTE</b><br>   |  |
| The maximum allowed RPM drop at 1800 min <sup>-1</sup> is 175 min <sup>-1</sup> . The maximum difference between the magnetos shall not be more than 50 RPM . |  |
| 3. Alternator Output  | CHECK ammeter indication is positive   |
| 4. Propeller control  | MOVE through its complete range to check operation and return to full HIGH RPM position. |
| 5. BOOST PUMP   | ON (check indicator movement on the fuel flow gauge).                                    |
| 6. Flight controls  | CHECK free and correct   |
| 7. Trim   | SET to appropriate takeoff position (half way nose down)                                 |

### 4.5.2 TAKE-OFF

Set throttle smoothly to max. and let the airspeed go up to 65 to 70 KIAS (120 to 130 km/h).

A light pressure on the stick lifts the tail to the horizontal position.

Rotate the aircraft at 70 KIAS (130 km/h).

Proceed climbing at recommended climb speed.

*When rate of climb positive and altitude 500 ft above ground:*

- |            |                     |
|------------|---------------------|
| Throttle   | REDUCE to 2400 rpm. |
| BOOST PUMP | OFF                 |

## 4.6 CLIMB

RPM above 2400 should be used only when necessary for maximum performance in order to avoid unnecessary noise.

## 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          |
| 5. Fuel selector* | MAIN TANK       |

#### NOTE\*

Although safe operation does not require the use of the tanks in a specific sequence, it is recommended to set fuel selector to "MAIN TANK" position!

### 4.8.2 APPROACH

- |                    |                              |
|--------------------|------------------------------|
| 1. BOOST PUMP      | ON                           |
| 2. Mixture         | set to "Rich"                |
| 3. Airspeed        | reduce to approach speed     |
| 4. Propeller pitch | set to High RPM (low angle). |

#### 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 at 85 KIAS (157 km/h) |
| 2. Airspeed on final | maintain 85 KIAS (157 km/h)   |
| 3. Elevator trim     | adjust                        |

#### NOTE

Stall speed at MTOW = 870 kg will be: 63 KIAS (117 km/h)

## 4.8.4 NORMAL LANDING

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

**NOTE**

The rudder is effective down to 30 KIAS (56 km/h)

- |             |                  |
|-------------|------------------|
| 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 (167 km/h)<br>rotate and climb 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. Electrical equipment  | OFF                        |
| 5. AVIONICS switch       | OFF                        |
| 6. Mixture               | IDLE CUT OFF               |
| 7. Ignition switch       | OFF                        |
| 8. BACKUP BATTERY switch | OFF                        |
| 9. BATTERY 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.

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 the pilot. This fact must be considered when pulling or pushing high g's.

### 4.12.2 MANEUVERS

#### WARNING

Particular caution must be exercised when performing maneuvers at speeds above  $V_A$  [154 KIAS (285 km/h)]. Large or abrupt rudder and elevator control inputs above this speed as well as full aileron control inputs above 182 KIAS (337 km/h) 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 (148 km/h).
- Segment line 90° up:  
Any entry speed may be used. Out of a horizontal pull-up at 200 KIAS (370 km/h) 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 or snap rolls.  
Watch  $V = 182$  KIAS (337 km/h) for aileron rolls with max. deflection.  
Snap rolls should not be performed at speeds above 140 KIAS (259 km/h).

- Segment 1/4 loop, climbing:  
The minimum recommended speed is 100 KIAS (185 km/h). 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 (185 km/h).

---

## NOTE

---

Since the maximum horizontal speed is 183 KIAS (339 km/h), 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.

---

## NOTE

---

Fuel consumption during acrobatic maneuvers is higher than stated in Section 5.

## 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

After one turn of spinning the plane will recover within about 1/2 turn.

After six turns of spinning the plane will recover within about 1 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 thru 1 turn. The plane will be in a steep dive in a side-slip. Recovery to normal flight can be performed easily.

### NOTE

After one turn of spinning the altitude loss including recovery is within about 1500 ft.

After six turns of spinning the altitude loss including recovery is within about 3300 ft.

## 4.13 NOISE LEVEL

a) EASA approved noise level for MTV-9-B-C/C198-25 @2600RPM: 76.4 dB(A)  
The noise level has been established with the standard Gomolzig (6 in 1) exhaust system incl. silencer (EA300-606000) in accordance with ICAO Annex 16, Volume I, Aircraft Noise; 8th Edition, July 2017; incl. Amendment 13, January 2021.

b) EASA approved noise level for MTV-14-B-C/C190-130 @2600RPM: 72.3 dB(A)  
The noise level has been established with the standard Gomolzig (6 in 1) exhaust system incl. silencer (EA300-606000) in accordance with ICAO Annex 16, Volume I, Aircraft Noise; 8th Edition, July 2017; incl. Amendment 13, January 2021.

No determination has been made by the EASA 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.

## 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. It should be noted that the performance information presented in the range and endurance charts allow for 30 minutes reserve fuel at specified conditions. 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 is 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. Take-off Weight 870 kg (1918 lbs)
2. Take-off and landing on concrete surface.
3. No wind.
4. Standard atmospheric condition.

##### 5.1.2 Definitions of Terms

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

##### 5.1.3 Sample Problem

Except in § 5.6 all examples presented in the performance charts refer to the conditions of the sample problem outlined here.

#### CONDITIONS

<b>Takeoff:</b>	Weight (MTOW):	870 kg (1918 lbs)
	Field Pressure Alt:	2000 ft (610 m)
	Temperature (ISA):	15°C
	Wind Component (Headwind):	10 KT
	Field Length:	3000 ft
	Runway:	concrete
<b>Cruise:</b>	Total Distance:	400 NM
	Pressure Altitude:	8000 ft (2438 m)
	Power Setting:	65 %
	Temperature (ISA):	-1°C

<b>Landing:</b>	Weight:	750 kg (1653 lbs)
	Field Pressure Alt:	2000 ft (610 m)
	Temperature (ISA):	15°C
	Wind Component (Headwind):	5 KT
	Field Length:	2000 ft
	Runway:	concrete

## TAKE-OFF

§ 5.5 shows the Take-Off Distance.

Results for the sample conditions:

Ground Roll:	138 m (453 ft)
(decreased by 8% due to headwind):	127 m (417 ft)
Total Distance to clear a 50 ft obstacle:	298 m (978 ft)
(decreased by 8% due to headwind):	274 m (899 ft)

These distances are well within the available field length in this sample problem.

## CLIMB

§ 5.6 shows the Rate Of Climb Performance.

(Aircraft weight and temperature in Fig. 5.6 deviate from the sample conditions given here).

Result:

Climb Rate:	1895 ft/min
-------------	-------------

§ 5.7 shows the Time, Fuel and Distance to Climb.

Results for the sample conditions (climb from 2000 ft (610 m) to 8000 ft (2438 m)):

Time to Climb:	2.6 min
Distance to Climb:	4.7 NM
Fuel to Climb:	5.5 Liters (1.45 US Gal.)

## CRUISE

§ 5.8 shows the Cruise Speed:

Result for the sample conditions:

Cruise Speed:	166 kts (307 km/h)
---------------	--------------------

§ 5.9 shows the Cruise Performance data for a T/O Weight of 870 kg (1918 lbs) with maximum fuel (189 l).

Results for the sample conditions:

Endurance:	2.76 h
Range:	459 NM (850 km)

The desired total distance in this sample problem is well within this value.

## DESCENT

§ 5.12 shows Descent Time, Distance and Fuel data.

Results for the sample conditions (descent from 8000 ft (2438 m) to 2000 ft (610 m)):

Time to Descent:	6 min
Distance to Descent:	17.4 NM
Fuel to Descen:	3 Liters (0.79 US Gal.)

## LANDING

§ 5.11 shows the Landing Distance.

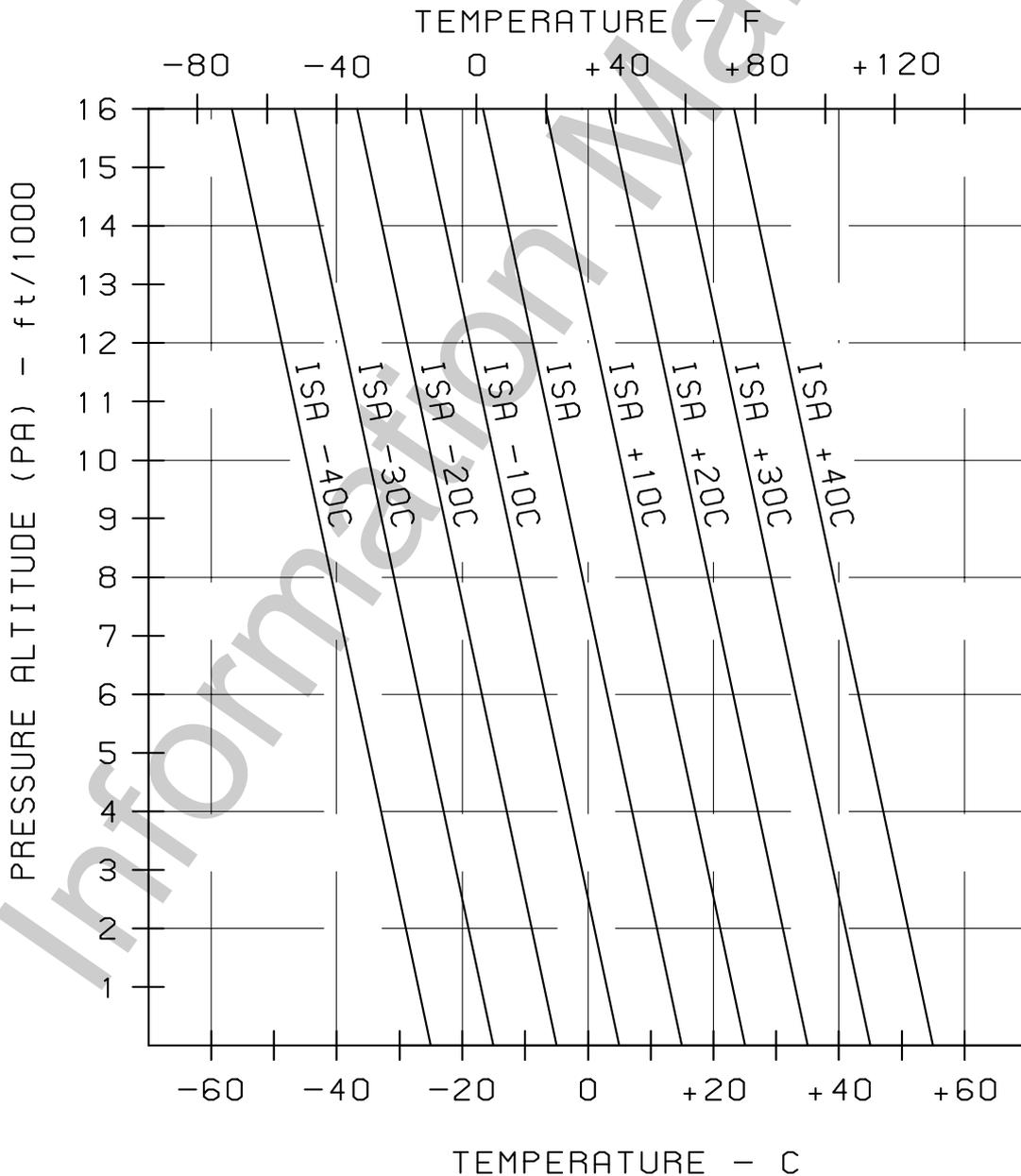
Results for the sample conditions:

Ground Roll:	166 m (545 ft)
(decreased by 15% due to headwind):	141 m (463 ft)
Total Distance to clear a 50 ft obstacle:	511 m (1677 ft)
(decreased by 15% due to headwind):	434 m (1424 ft)

These distances are well within the available field length in this sample problem.

## 5.2 ISA CONVERSION

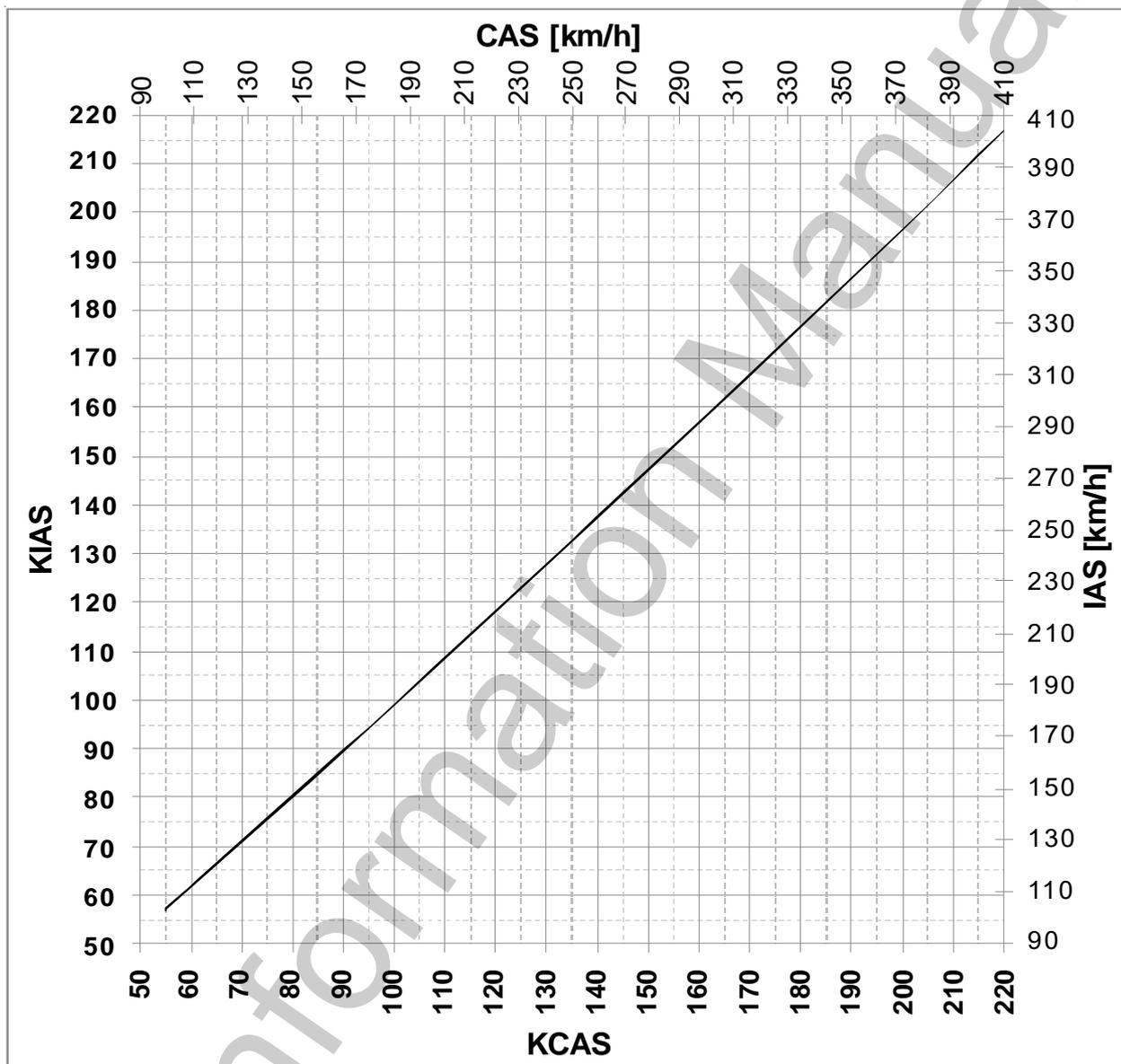
ISA Conversion of pressure altitude and outside air temperature.



## 5.3 AIRSPEED CALIBRATION

**NOTE**

Indicated airspeed assumes zero instrument error.



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## 5.4 STALL SPEED

CONDITION:

POWER IDLE  
FORWARD C/G

STALL SPEEDS  
ANGLE OF BANK

WEIGHT	CATEGORY	0°	30°	45°	60°
		1g KIAS (km/h)	1,15g KIAS (km/h)	1,41g KIAS (km/h)	2g KIAS (km/h)
870 kg (1918 lbs)	NORMAL	63 (117)	68 (126)	75 (139)	89 (165)
820 kg (1808 lbs)	ACRO II	61 (113)	66 (122)	73 (135)	86 (159)
780 kg (1720 lbs)	ACRO I	60 (111)	64 (119)	71 (131)	85 (157)

Max altitude loss during stall recovery is approximately 100 ft

## 5.5 TAKE-OFF PERFORMANCE

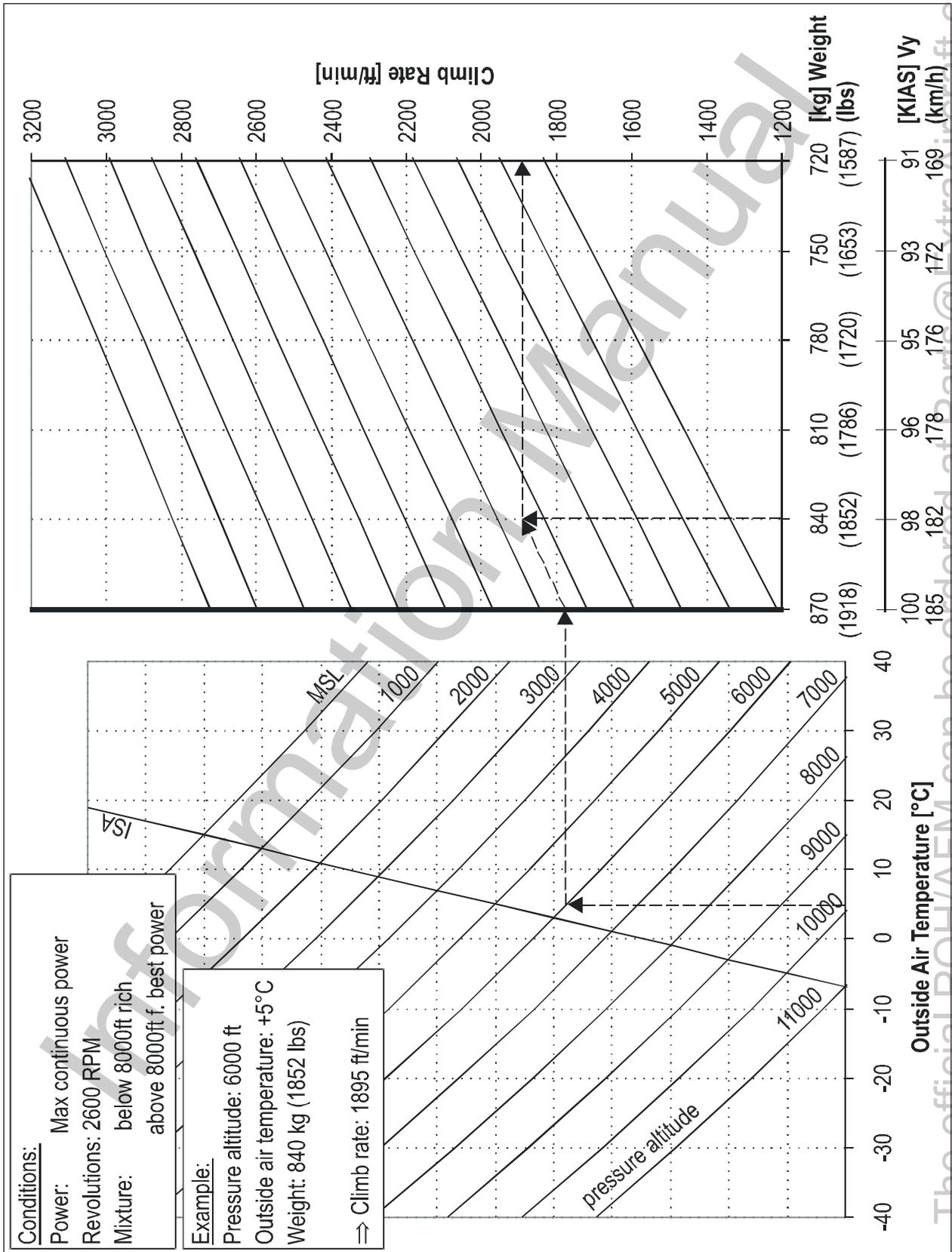
Power : T/O Power  
Runway: Concrete

### NOTE

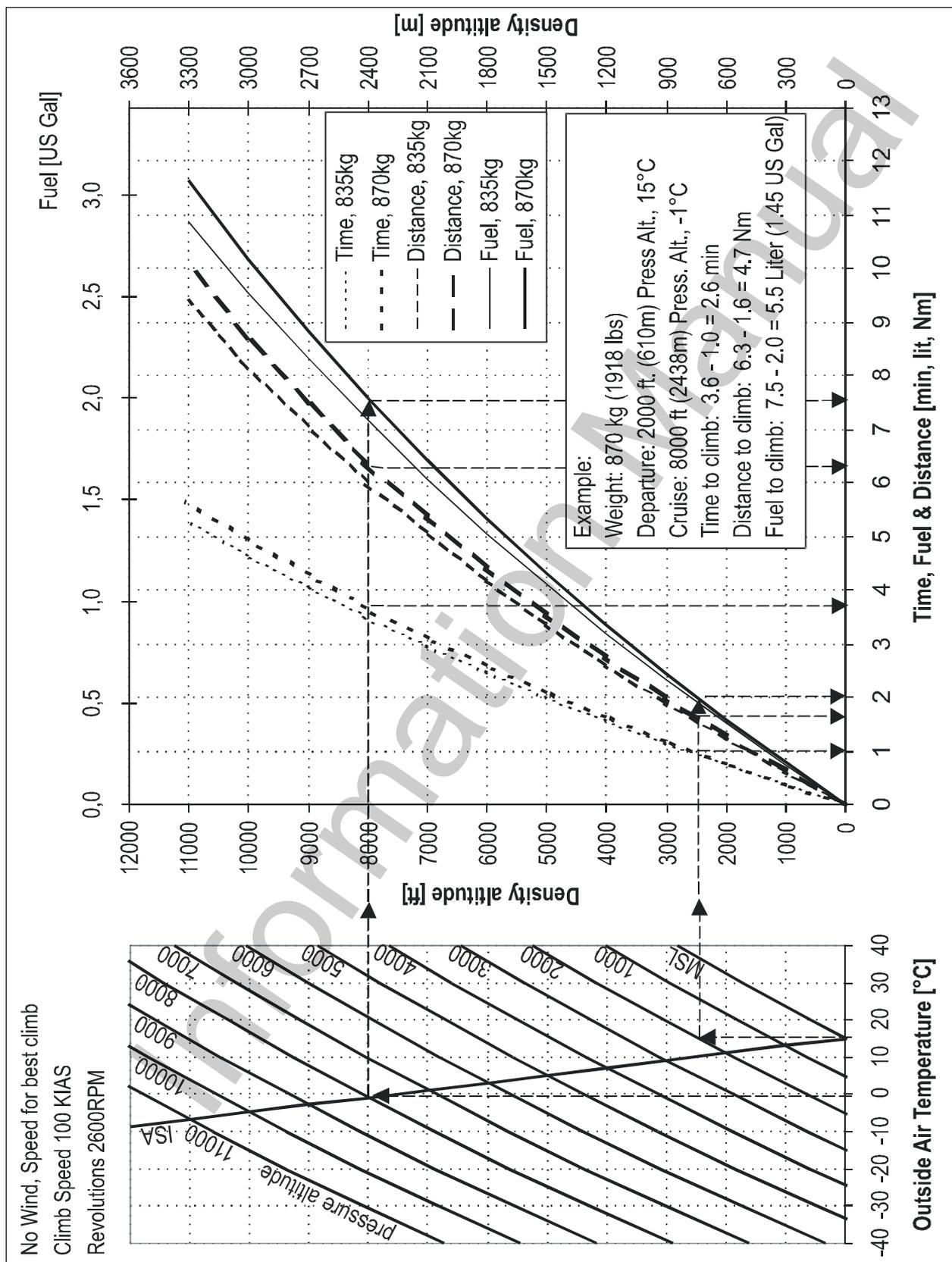
**For every 5 kts (9.3 km/h) headwind, the T/O distance can be decreased by 4%.  
For every 3 kts (5.6 km/h) tailwind [up to 10 kts (18.5 km/h)], the T/O distance is increased by 10%.  
On a solid, dry and plain Grass Runway, the T/O is increased by 15%.**

OAT			0°C (32°F)		15°C (59°F)		30°C (86°F)	
T/O weight	Rotation 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)
870 (1918)	70	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)
800 (1764)	68	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)
750 (1653)	66	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

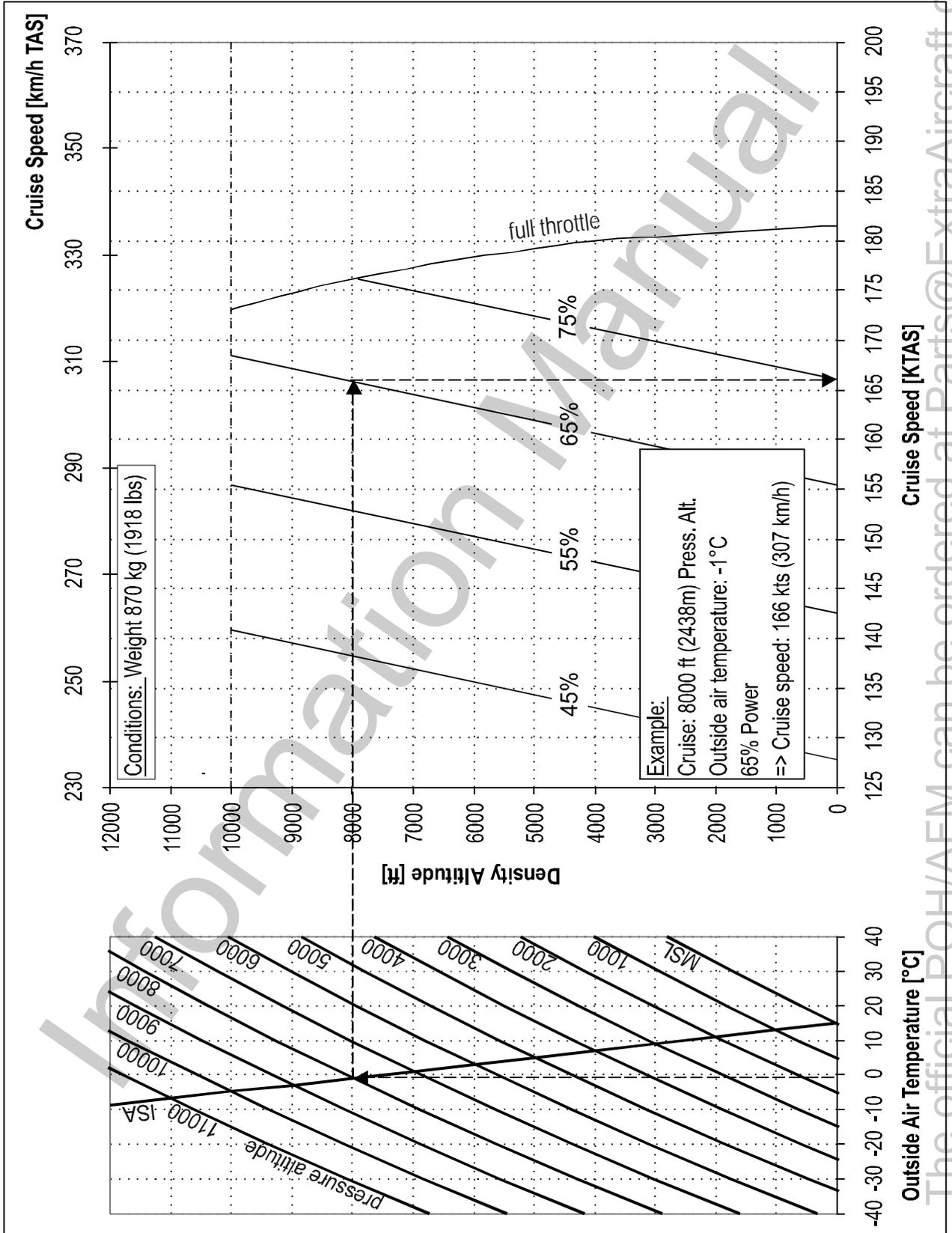


## 5.7 TIME, FUEL & DISTANCE TO CLIMB



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## 5.8 CRUISE SPEED



## 5.9 CRUISE PERFORMANCE

Range and Endurance values for a T/O Weight of 870 kg (1918 lbs). Fuel for warm up and Take-Off from SL, max continuous Power climb (2600 RPM) to cruising altitude, a reserve of 22 liter (5.8 US Gal.) for 30 minutes with 45% Power, 5 liters (1.3 US Gal.) for warm up and taxi, and 2 liters (0.53 US Gal.) unusable fuel are taken into account. (At ISA - Conditions.)

PA ft (m)	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	2600	27.3	91	288	86.7	22.9	180	176	1.83	329	Power
	2500	26.5	85	268	79.7	21.1	176	172	1.99	350	Power
	2400	24.9	75	236	71.5	18.9	169	165	2.22	375	Power
	2200	23.9	65	205	55.2	14.6	158	154	2.87	454	Economy
	2000	23.4	55	173	48.9	12.9	145	141	3.24	470	Economy
	2000	20.1	45	142	43	11.4	130	126	3.69	479	Economy
	4000	2600	25.3	85	268	79.7	21.1	179	169	1.96	351
2400		24.9	75	236	71.5	18.9	171	161	2.19	374	Power
2200		23.9	65	205	55.2	14.6	161	151	2.84	456	Economy
2000		23.4	55	173	48.9	12.9	148	138	3.20	474	Economy
2000		20.1	45	142	43	11.4	133	123	3.64	484	Economy
6000		2600	22.6	75	236	71.5	18.9	174	161	2.16	376
	2200	23.9	65	205	55.2	14.6	163	150	2.80	456	Economy
	2000	23.4	55	173	48.9	12.9	150	137	3.16	474	Economy
	2000	20.1	45	142	43	11.4	136	123	3.59	489	Economy
	8000	2600	20.1	65	205	55.2	14.6	166	151	2.76	459
2000		23.4	55	173	48.9	12.9	153	138	3.12	477	Economy
2000		20.1	45	142	43	11.4	138	123	3.55	489	Economy
10000	2600	17.3	55	173	48.9	12.9	156	135	3.08	480	Economy
	2000	20.1	45	142	43	11.4	141	120	3.50	494	Economy

### NOTE

**\*1** For temperatures above/below Standard (ISA), increase/decrease Range 1,7% and Endurance 1,1% for each 10°C (18°F) 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).



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

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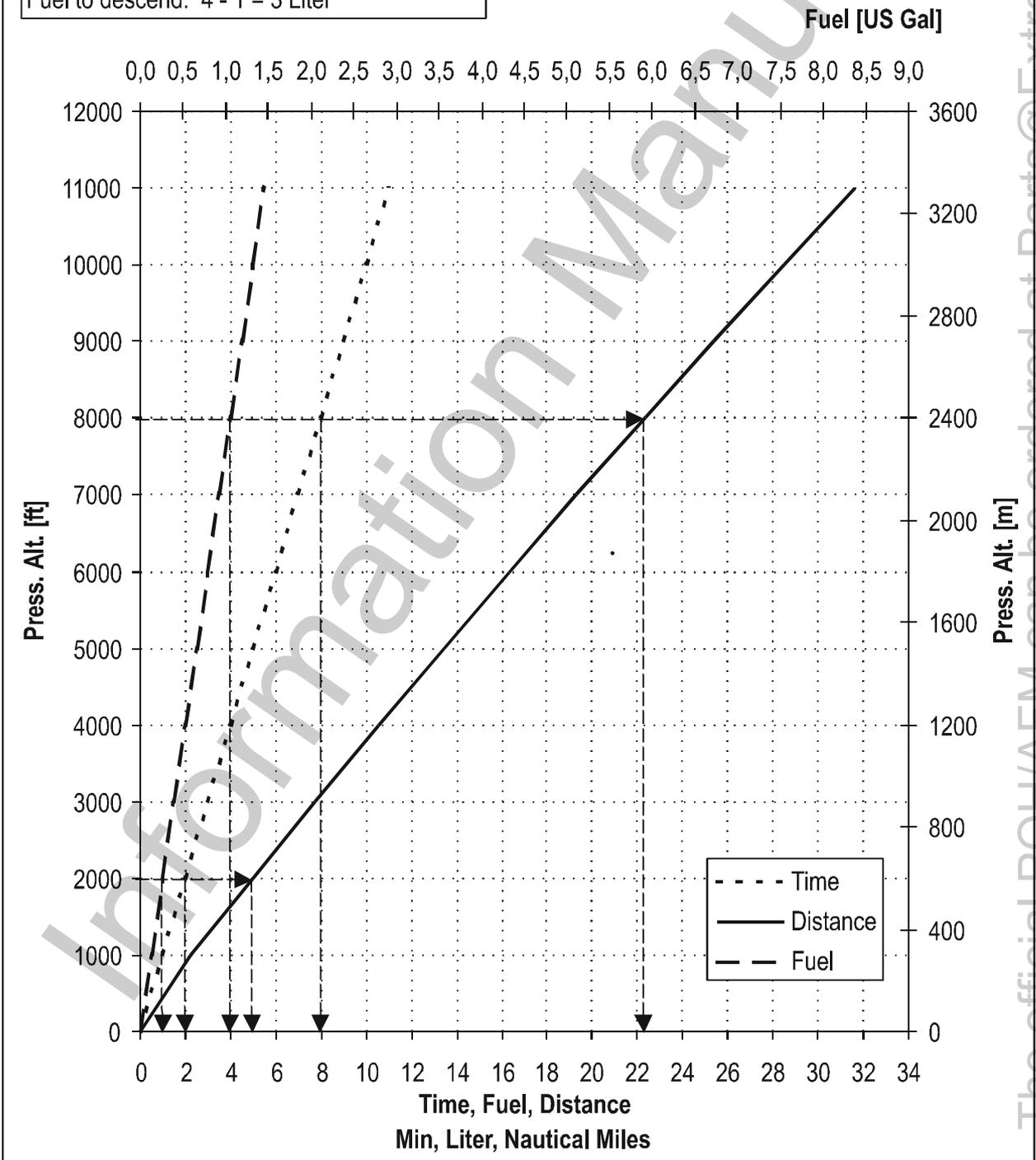
## 5.10 TIME, FUEL & DISTANCE TO DESCEND

**Example:**

Cruise at 8000 ft (2438m) Press Alt.  
 Descend to: 2000 ft (610m) Press. Alt.  
 Time to descend: 8 - 2 = 6 min  
 Distance to descend: 22.4 - 5 = 17.4 NM  
 Fuel to descend: 4 - 1 = 3 Liter

**Associated conditions:**

Descend speed: 150 KIAS  
 Descent rate: 1000 ft/min  
 MP: as required (ca. 15" Hg, 2500 RPM)  
 valid for all aircraft weights and all OATs, no wind



## 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)
870 (1918)	85	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)
800 (1764)	83	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)
750 (1653)	81	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)

## 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

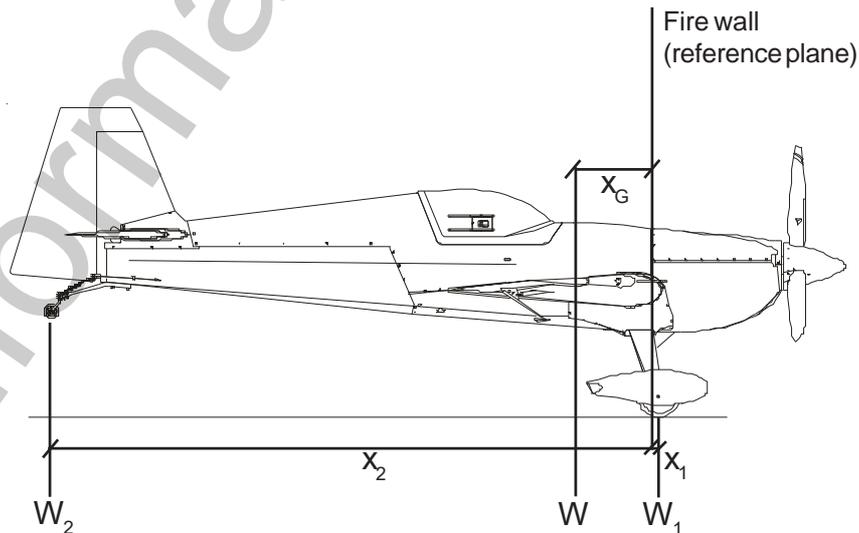
$X_G$  = distance: fire wall - Center of Gravity

$W_1$  = 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 =  $W_1 + W_2$

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



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

If a new weight is added to the known old weight and C/G position the resulting new weight and C/G can be obtained by a simple calculation.

Situation before adding item:

$W_o, X_o$  = Airplane weight, C/G position

$W_n, X_n$  = Weight, distance from fire wall of item to add

New Weight of airplane and new C/G:

$$W = W_o + W_n$$

$$XG = \frac{W_o \times X_o + W_n \times X_n}{W} = \text{C/G position}$$

### 6.2.1 Weight and Balance Record

Enter below all weight change data from aircraft log book.

EXTRA 330SX		SERIAL NUMBER:				
Date	Description of modification	Weight change Added (+), Removed (-)			Running empty weight	
		Wt./kg [lb]	Arm/cm [in]	Moment/kg cm [in lb]	Wt./kg [lb]	Moment/kg cm [in lb]
	Basic empty weight (incl. unusable fuel)	_____	_____	_____		

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

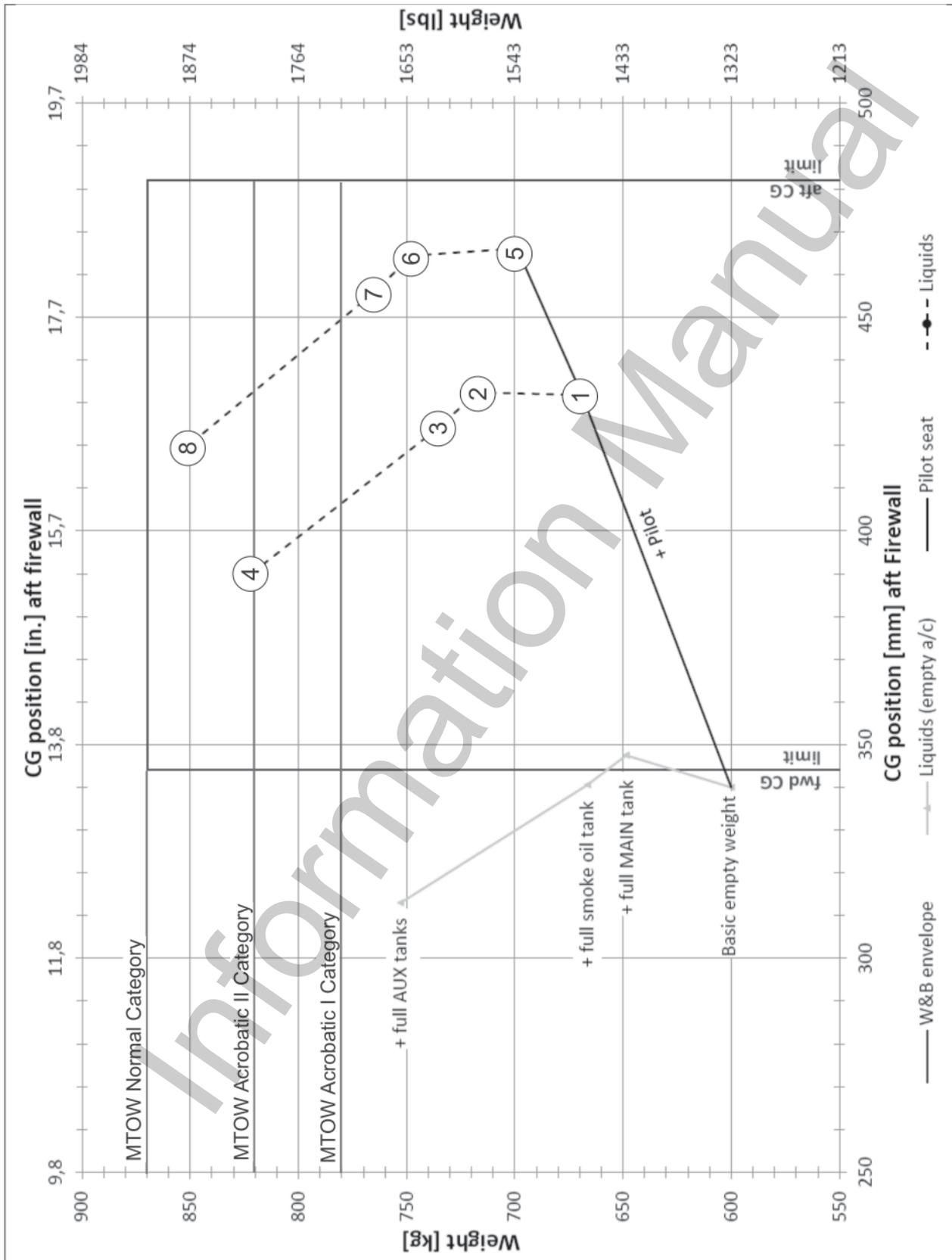
Position	PILOT & PARACHUTE		FUEL IN MAINTANK 67.5 LTR (17.8 US GAL)		OIL IN SMOKE TANK 21 LTR (5.5 US GAL)		FUEL IN AUX TANK 120 LTR (31.7 US GAL)	
	(kg)	(lb)	(kg)	(lb)	(kg)	(lb)	(kg)	(lb)
①	69	152.1	-	-	-	-	-	-
②	69	152.1	48.6	107.1	-	-	-	-
③	69	152.1	48.6	107.1	17.9	39.5	-	-
④	69	152.1	48.6	107.1	17.9	39.5	86.4	190.5
⑤	99	218.3	-	-	-	-	-	-
⑥	99	218.3	48.6	107.1	-	-	-	-
⑦	99	218.3	48.6	107.1	17.9	39.5	-	-
⑧	99	218.3	48.6	107.1	17.9	39.5	86.4	190.5

Refer to figure on next page

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## 6.3 CENTER OF GRAVITY CALCULATION (SAMPLE PROBLEM)(CONT.)



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### 6.3.1 Sample

Refer to Center of Gravity Calculation Figure in § 6.3:

	Weights	Moments
Take-off Condition:		
Basic Empty Weight	600.0 kg (1322.8 lbs)	20400 kg cm (17726 in lbs)
(5) Pilot & Parachute	99.0 kg (218.3 lbs)	12177 kg cm (10566 in lbs)
(6) Fuel Main Tank (67.5 L)	48.6 kg (107.1 lbs)	2138 kg cm (1853 in lbs)
(7) Oil in Smoke Tank (Section 902)	17.9 kg (39.5 lbs)	161 kg cm (138 in lbs)
(8) Fuel in AuxTank (120L)	86.4 kg (190.5 lbs)	864 kg cm (743 in lbs)
-----	-----	-----
Sums	851.9 kg (1878.1 lbs)	35740 kg cm (31026 in lbs)

To find C/G follow line "Pilot & Parachute 99 KG" from Empty Weight to Point 5. Now follow line via points 6 thru 7 to point 8.

Refer to formula in 6.3.2 to find:

$$\frac{\text{Moment } 35740 \text{ kg cm (31026 in lbs)}}{\text{Weight } 851.9 \text{ kg (1878.1 lbs)}} = \text{C/G} \sim 42 \text{ cm (16.5 in)}$$

C/G value and Weight are well within limits of Normal Category (see Section 6.5).

### 6.3.2 Weight and Balance Loading Form

	WEIGHT (W)	ARM (X)	MOMENT (W x X)
BASIC EMPTY WEIGHT			
PILOT		123 cm (48.4")	
MAIN TANK		44 cm (17.3")	
SMOKE OIL TANK (See Section 902)		9 cm (3.5")	
AUX TANK		10 cm (3.9")	
	$\Sigma W =$	$\Sigma (W \times X) =$	

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

Check if values are within limits (refer to Section 6.5)

6.4 LOADING WEIGHTS AND MOMENTS

**NOTE**

Refer to Section 902 for smoke system data.

PILOT & Parachute ARM = 123 cm (48.8")			
kg	(lb)	kg cm	(in lb)
70	154	8610	7515
75	165	9225	8052
80	176	9840	8589
85	187	10455	9126
90	198	11070	9662
95	209	11685	10199
100	220	12300	10736
105	231	12915	11273
110	242	13530	11810
115	253	14145	12346
120	264	14760	12883

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MAIN TANK					
Arm = 44 cm (17.3")					
L	(US gal)	kg	(lb)	kg cm	(in lb)
5	1.3	3.6	7.9	158	137
10	2.6	7.2	15.9	317	275
15	4.0	10.8	23.8	475	412
20	5.3	14.4	31.7	634	549
25	6.6	18.0	39.7	792	687
30	7.9	21.6	47.6	950	824
35	9.2	25.2	55.6	1109	961
40	10.6	28.8	63.5	1267	1098
45	11.9	32.4	71.4	1426	1236
50	13.2	36.0	79.4	1584	1373
55	14.5	39.6	87.3	1742	1510
60	15.9	43.2	95.2	1901	1648
65	17.2	46.8	103.2	2059	1785
67.5	17.8	48.6	107.1	2138	1853

AUX TANK					
Arm = 10 cm (3.9")					
L	(US gal)	kg	(lb)	kg cm	(in lb)
5	1.3	3.6	7.9	36	31
10	2.6	7.2	15.9	72	62
15	4.0	10.8	23.8	108	93
20	5.3	14.4	31.7	144	124
25	6.6	18.0	39.7	180	155
30	7.9	21.6	47.6	216	186
35	9.2	25.2	55.6	252	217
40	10.6	28.8	63.5	288	248
45	11.9	32.4	71.4	324	279
50	13.2	36.0	79.4	360	310
55	14.5	39.6	87.3	396	340
60	15.9	43.2	95.2	432	371
65	17.2	46.8	103.2	468	402
70	18.5	50.4	111.1	504	433
75	19.8	54.0	119.0	540	464
80	21.1	57.6	127.0	576	495
85	22.5	61.2	134.9	612	526
90	23.8	64.8	142.9	648	557
95	25.1	68.4	150.8	684	588
100	26.4	72.0	158.7	720	619
105	27.7	75.6	166.7	756	650
110	29.1	79.2	174.6	792	681
115	30.4	82.8	182.5	828	712
120	31.7	86.4	190.5	864	743

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## 6.5 WEIGHTS AND MOMENTS LIMITS

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

Category	Max. T/O Weight	forward C.G.	rear C.G.
Normal	870 kg (1918 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")
Acrobatic II	820 kg (1808 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")
Acrobatic I	780 kg (1720 lbs) or below:	34.4 cm (13.54")	48.2 cm (18.98")

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## 6.6 EQUIPMENT LIST

EXTRA 330SX S/N:

Qty.	Item	Manufacturer	Model No	Part No	Weight (kg)	Arm (m)	R O A*	Inst
<b>23 Communications</b>								
1	COM unit	TRIG Acionics	TY91	35021	0.350	0.464	R	
1	. Panel Mount Controller	TRIG Acionics	TC90		0.090	0.667	R	
1	COM Antenna	Pointer	3001	FE4254	0.050	0.750	R	
1	Transponder (Mode S)	TRIG Avionics	TT22 (class 1)	35031	0.350	0.464	R	
1	. Panel Mount Controller	TRIG Avionics	TC20		0.090	0.667	R	
1	XPDR Antenna	Garmin	010-10160-00	30336	0.110	1.700	R	
<b>24 Electrics</b>								
1	Alternator (14V; 8 Amps)	B&C	SD-8	31726	1.320	-0.150	R	
1	Battery (24 Ah)	Concorde	RG-25XC	03617	10.52	1.977	R	
1	Battery (11 Ah)	Concorde	RG-12LSA	33697	5.900	1.977	A	
1	Backup batterie, IBBS	TCW Technologies	IBBS-12v-3aH	35037	0.510	0.495	R	
1	External Power Receptical (Piper Type Socket)	Cole Hersee		31731	1.300	1.750	O	
<b>25 Cockpit</b>								
1	Safety Belt Assy (seat belts, single ratchet, shoulder harness, crotch strap)	Hooker	grey red	FK0002 or FK0019	3.300	1.300	R	
1	Safety Belt Assy (seat belts, double ratchets, shoulder harness, crotch strap)	Hooker		31856	3.700	1.300	A	
1	ELT 406 AF INTEGRA	KANNAD		34422	0.990	2.086	O	
1	ELT Antenna	Rami	AV-200	33965	0.080	2.380	O	
<b>28 Fuel</b>								
1	Fuel Level Sensor	Westach	P-H20.5-D120-5V	36454	0.200	0.393	R	
2	Fuel Qty. Probe AUX Tank	VDO	226 801 015 001G	FM4006	0.120	0.090	R	
<b>31 Ind./Rec. Systems</b>								
1	Instrument Panel	Extra		8F503.0	0.400	0.695	R	
1	PFD/MFD/EIS	Garmin	G3X TOUCH System					
1	. GDU 450 Display Unit 7"	Garmin	010-01056-00	35413	1.230	0.670	R	
1	. GDU 450/455 Install Kit	Garmin	010-12150-01	34792			R	
1	Standard LRU Kit	Garmin	K10-00016-14	35009			R	
1	. System Config. Module	Garmin	010-12253-00					
1	. GSU 25C, AHRS Unit	Garmin	010-01071-50		0.217	0.488		
1	. GMU 11, Magnetometer	Garmin	010-01788-00		0.073	3.247		
1	. GTP 59, OAT Probe	Garmin	011-00978-00		0.136	1.200		
1	GSU 25 C/D Conn Kit	Garmin	K10-00181-00	34789			R	
1	GMU 11 Install Kit	Garmin	011-04349-90	34997			R	
1	GDL39R Connector kit only	Garmin	010-11825-20	35053			R	
1	GPS 20A,GPS/WAAS Rec.	Garmin	010-01546-00	34998	0.254	0.387	R	
1	GPS 20A Connector Kit	Garmin	011-03914-00	34999			R	
1	GA 35, GPS/WAAS Antenna	Garmin	013-00235-00	32620	0.227	3.247	R	
1	AHRS CB 2A	Klixon	7277-2-2				R	
1	PFD CB 5A	Klixon	7277-2-5				R	

\*) R = required, O = optional, A = alternative

Qty.	Item	Manufacturer	Model No	Part No	Weight (kg)	Arm (m)	R O A*	Inst
1	Dig. Accelerometer (2 1/4")	TL	TL-3424_EXT	32582	0.520	0.644	O	
1	Dig. Accelerometer (57 mm)	LX navigation	G-meter 57	36719	0.195	0.644	A	
1	Flighthour Counter	Winter		01605	0.150	0.681	O	
1	Digital Clock	Astrotech		F10004	0.113	0.681	O	
1	Digital Clock	Mid-Continent	6420093-0	36222	0.142	0.681	A	
<b>32 Landing Gear</b>								
2	Main Wheel Tires	Misc.		02323	2.447	0.080	R	
1/1	Wheel fairing (CFK)	Extra		51102.10/20-LV/LK	1.500	0.080	O	
<b>33 Lights</b>								
2	Strobe Lights	AeroLEDs		36421	0.055	0.250	O	
<b>34 Navigation</b>								
1	Slip and Skid ind. (Libelle)	Rieker		F10009	0.050	0.700	O	
1	Magnetic Compass	Airpath	C2300	00189	0.260	0.667	R	
1	Magnetic Compass	SIRS Navigation Ltd	PG2A	33085	0.132	0.667	A	
1	Air Speed Indicator	United Instr.	UI8030 B.882	32811	0.322	0.664	R	
1	Air Speed Indicator (dual scale)	United Instr.	UI8030 B.896	33630	0.322	0.664	A	
1	Air Speed Indicator (metric)	Winter	6531-559	32812	0.205	0.664	A	
1	Airspeed Indicator	Mikrotechna Praha	LUN1106.K2B4/SC	34155	0.500	0.664	A	
1	Airspeed Indicator (metric)	Mikrotechna Praha	LUN1106.P2B4/SC	34156	0.500	0.664	A	
1	Altimeter	United Instr.	UI5934PD-3 A.134	30416	0.610	0.664	R	
1	Altimeter	United Instr.	UI5934PD-3M A.665	33652	0.610	0.664	R	
1	Altimeter (metric)	Winter	4FGH10	31393	0.330	0.664	A	
1	Altimeter	Mikrotechna Praha	LUN1128.10B6	34159	0.590	0.664	A	
1/1	Sighting device (45°/90°)	Extra		8F801.10	0.25	0.950	O	
<b>53 Fuselage</b>								
1	Belly fairing	Extra		2F203.020-VF	4.700	0.950	R	
1	Belly Fairing with window	Extra		8F416.020	5.300	0.950	A	
<b>61 Propeller</b>								
1	Propeller (3-blade)	MT-Propeller	MTV-9-B-C/C198-25	32285	30.5	-1.150	R	
1	Spinner	MT-Propeller	P-810-2	31415	0.8	-1.200	R	
1	Propeller (4-blade)	MT-Propeller	MTV-14-B-C/C190-130	33970	30.6	-1.150	A	
1	Spinner	MT-Propeller	P-967	31560	0.8	-1.200	A	
1	Governor (2700RPM)	MT-Propeller	P-880-5	31509	1.10	-0.910	R	
1	Governor (2600RPM)	MT-Propeller	P-880-41	32941	1.10	-0.910	A	
1	Governor (2700RPM)	Woodward	A-210 988	01209	1.10	-0.910	A	
<b>71 Power Plant</b>								
4	Shock Mount	Barry	94016-02	01817	0.425	-0.29	R	
4	Shock Mount	Lord	J-7764-20	31093	0.535	-0.29	A	

\*) R = required, O = optional, A = alternative

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Qty.	Item	Manufacturer	Model No	Part No	Weight (kg)	Arm (m)	R O A*	Inst
<b>72 Engine</b>								
1	Engine, AEIO-580-B1A; . includ. vacuum pump drive at pad #1	Lycoming	ENPL-RT10568 or RENPL-RT10568 or HENPL-RT10568	31429 34097 34098	191.8	-0.720	R A A	
1	Engine, AEIO-580-B1A;	Lycoming	ENPL-RT10427 or RENPL-RT10427 or HENPL-RT10427	32712 34099 34100	191.8	-0.720	A A A	
4	. Stud, 1/4-20 x 2-5/8 long		25C-21	34059			R	
1	. Vacuum pump driven gear		72974	32759			R	
1	. washer, drive gear acc.		71596	34929			R	
1	Inverted oil pickup; (at pad #1 of engine vacuum pump)	B&C	VAC-2/6	32425	0.31	-0.220	R	
1	Ignition switch	TCM	10-357200-1	00185	0.15	0.667	R	
1	Ignition switch	ACS Products Co.	A-510-2	35595	0.15	0.667	A	
<b>73 Engine Fuel &amp; Control</b>								
1	Throttle Control Cable (8 ft)	Teleflex	CCX633	36499	0.400	0.100	A	
1	Fuel Injector	Precision/Avstar	RSA 10 AD 1	61M26404	3.90	-0.680	R	
1	Mech. Fuel Pump	Crane Lear Romec	RG9080-J4A	62E22581	0.57	-0.300	R	
1	Mech. Fuel Pump	Hartzell Engine Tech.	PN 200F-5002	62E23186	0.57	-0.300	A	
<b>77 Engine Indicating</b>								
1	Engine Info. System	Garmin G3X	see 31 Ind./Rec. Sys				R	
1	GEA 24 EIS Unit	Garmin	010-01042-00	36502	0.322	0.095	R	
1	GEA 24 EIS Conn Kit	Garmin	011-02886-00	34790			R	
1	G3X Sensor Kit	Garmin	K00-00513-00	34793			R	
6	. CHT Sensor	Garmin	494-70000-00					
6	. EGT Sensor	Garmin	494-70001-00					
1	. Oil Temp Sensor	Garmin	494-70004-00					
1	. Fuel Flow Sensor	Garmin	494-10001-00					
1	. Ammeter, Shunt	Garmin	909-D0000-00					
1	. Oil Pressure Sensor	Garmin	011-05783-30					
1	. Manifold Pressure Sensor	Garmin	494-30004-01					
1	Fuel Pressure Sensor	Garmin	011-05783-10	35458			R	
1	RPM Sensor, Slick Magneto	Garmin	494-50005-00	34795			R	
1	EMS CB 2A	Klixon	7277-2-2	31508			R	
<b>78 Exhaust</b>								
1	Exhaust System "6 in 1" (incl. Silencer) with	Gomolzic	EA300-606000	33891	8.48	-0.390	R	
1	2" inlet/outlet cooling shroud	Gomolzic	EA300-606009	32153				
1	Exhaust System "6 in 2" (w/o Silencer)	Chabord	Extra330-12-02C	35886	5.93	-0.390	A	

\*) R = required, O = optional, A = alternative

Qty.	Item	Manufacturer	Model No	Part No	Weight (kg)	Arm (m)	R O A*	Inst
<b>79 Oil Systems</b>								
1	Oil Cooler RH	Aero Classics	8000353	31417	1.65	-0.200	R	
1	Oil Cooler RH	Niagara Thermal Prod.	20009A	34674	1.65	-0.200	A	
1	Oil Cooler LH	Meggitt/Stewart Warner	8406R	00107	2.00	-0.180	R	
1	Oil Cooler LH	Niagara Thermal Prod.	20002A	34675	2.00	-0.180	A	
1	Oil Cooler LH	Aero Classics	8001602	34676	2.00	-0.180	A	
<b>96 Smoke</b>								
1	Single Pump Smoke System	Extra		8F111.001-VM	4.766	0.089	O	

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\*) R = required, O = optional, A = alternative

## 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 330SX is designed and developed by EXTRA Flugzeugproduktions- und Vertriebs- GmbH, Dinslaken 46569 Hünxe, Federal Republic of Germany, in accordance with the Joint Aviation Authorities FAR-23 acrobatic category to fulfill the acrobatic training and competition up to the unlimited acrobatic level.

The EXTRA 330SX is a light weight, robust, single piston engine, single 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.

The aircraft is designed to operate within a range of ambient air temperature from -20°C to +38°C (-4°F => 100°F) at sea level. It is possible to start the engine using the aircraft battery at -20°C (-4°F) without preheating.

#### 7.2 FUSELAGE

The fuselage structure consists of a steel tube construction integrating the wing and empennage connections as well as the seat. The lower part of the fuselage and the sides below the wing are covered with a carbon belly fairing. Within the exhaust area aluminum sheet metal is used. The rear part of the fuselage is covered with Ceconite® 102.

The upper fuselage body surface is one part from firewall to vertical stabilizer including the correlated frame for the canopy. It consists of a carbon sandwich laminate.

The canopy itself is a single part. The canopy frame is a carbon laminate construction. For additional pilot protection a roll bar is installed behind the pilot's seat.

#### 7.3 WINGS

The wing is a CRP construction. The dual chamber main spar - being a fail safe design - consists of carbon roving caps combined with CRP webs. Core foam is a PVC foam. The wing shell is built from a Honeycomb sandwich with CRP laminates. Wing box ribs are made of carbon fiber composite with honeycomb core. The ribs in the nose section are made of wood. 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.

The ailerons are supported at four points in spherical bearings. In addition the aileron tip has a shielded horn balance.

To reduce pilot's hand forces the hinge line of the ailerons is positioned 25% of the aileron chord. Furthermore the ailerons are equipped with "spades" to decrease pilot's forces. The aileron control push-pull rods are connected to the aileron at the second bearing point (in span-wise direction). To prevent flutter, the ailerons are mass balanced at the leading edge of the shielded horn.

## 7.4 EMPENNAGE

The EXTRA 330SX possesses a cruziform empennage with stabilizers and moveable control surfaces. The spars consist of PVC foam cores, CRP caps and webs. The shell is built from honeycomb sandwich with CRP laminates. The control surfaces are mounted in spherical bearings and balanced aerodynamically with unshielded horns at the tip. To prevent flutter, the rudder and the elevator are mass balanced. The balance weights are installed in the leading edges of the unshielded horns.

The R/H elevator side incorporates a trim tab supported by two piano type hinges.

## 7.5 FLIGHT CONTROL SYSTEM

### 7.5.1 PRIMARY CONTROL SYSTEM

The EXTRA 330SX is equipped with a conventional control stick and mechanically adjustable rudder pedals. The primary control surfaces are operated through a direct mechanical linkage.

### 7.5.2 LONGITUDINAL FLIGHT CONTROL SYSTEM

The control stick bearing is housed in a torque tube, which is also linked to the lateral flight controls. The stick movements are transferred to the elevator by carbon push-pull rods.

### 7.5.3 LATERAL FLIGHT CONTROL SYSTEM

Aluminium push-pull rods connect the torque tube to the ailerons. The connections feature sealed rod ends. 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 rudder pedals with brake pedals are mechanically adjustable and operate the rudder through a control cable system. Springs keep the cables under tension when the pedals are not operated.

### 7.5.5 SECONDARY CONTROL

The elevator trim uses a trim servo connected to the trim tab by a double Bowden cable. The trim switch is located on the right upper side of the instrument panel or on the control stick. The double cable actuation of the trim tab is a fail safe design to prevent flutter in case of a single control joint failure.

The canopy is operated from the inside and outside by the interior locking handles. These handles are used for locking as well as for normal and emergency operation. See also Section 7.9.

The starter/magneto switch is located on the left side of the instrument panel.

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## 7.6 INSTRUMENT PANEL

Refer to the following figures and the related lists for the instruments, switches, lamps and circuit breakers installed in the EXTRA 330SX.

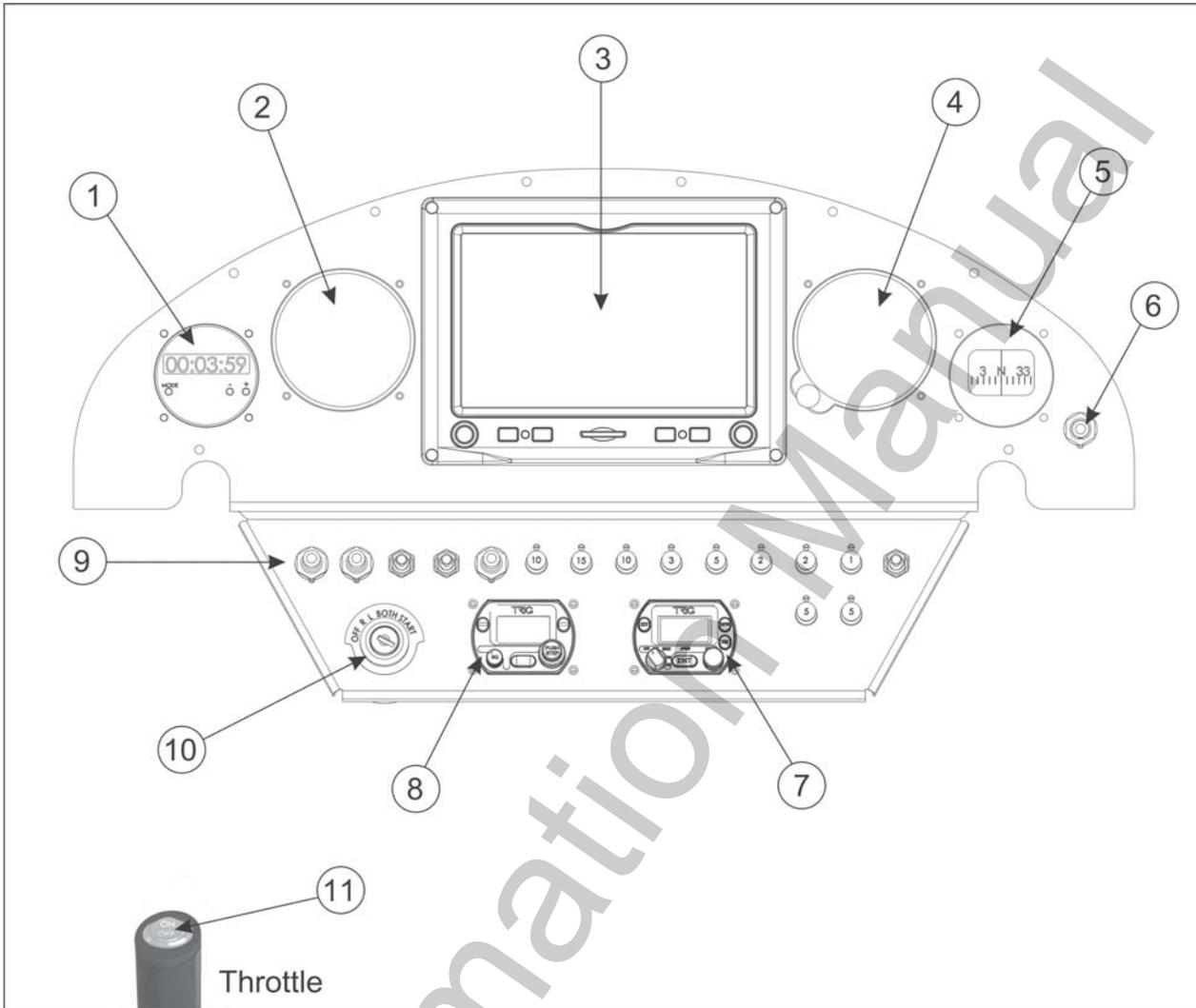


Figure 7-1: Instrument panel

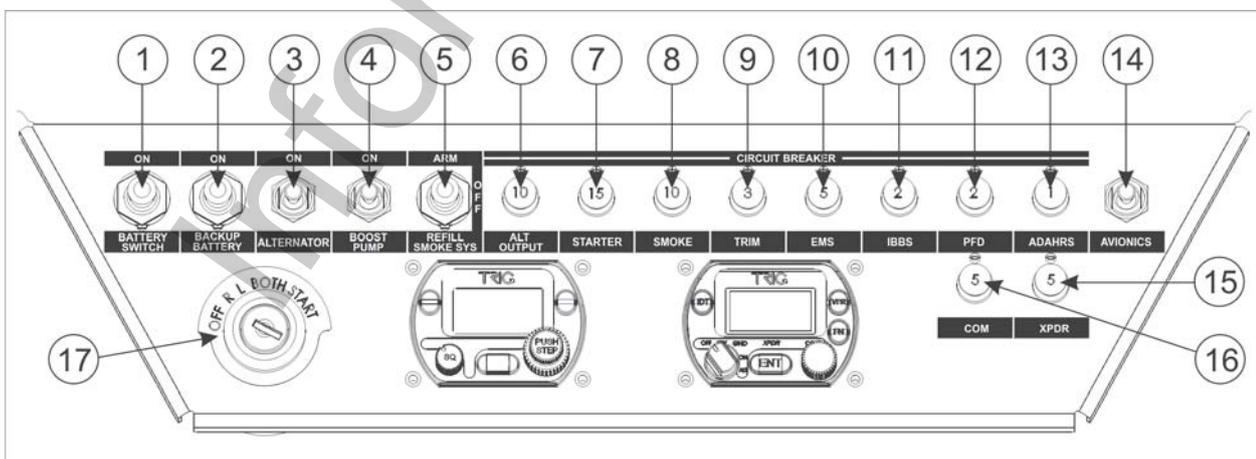


Figure 7-2: Switches, circuit breakers

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Instrument Panel (refer to Figure 7-1)

<i>Position</i>	<i>Item</i>
1	Clock (or other option)
2	Air speed indicator
3	EFIS
4	Altimeter
5	Magn. direction indicator
6	Trim switch (optional on control stick)
7	XPDR
8	COM
9	Switches, circuit breakers as listed below
10	Ignition switch / Magneto selector switch & starter
11	Smoke activation switch

Switches, Circuit Breakers (refer to Figure 7-2)

<i>Position</i>	<i>Item</i>
1	BATTERY SWITCH
2	BACKUP BATTERY switch
3	ALTERNATOR circuit breaker switch
4	BOOST PUMP circuit breaker switch
5	SMOKE SYStem switch <sup>1</sup>
6	ALternator OUTPUT circuit breaker
7	STARTER circuit breaker
8	SMOKE system circuit breaker <sup>1</sup>
9	TRIM circuit breaker
10	EMS <sup>2</sup> circuit breaker
11	IBBS <sup>2</sup> circuit breaker
12	PFD <sup>2</sup> circuit breaker
13	ADAHRS <sup>2</sup> circuit breaker
14	AVIONICS circuit breaker switch
15	XPDR circuit breaker
16	COM circuit breaker
17	Magneto selector switch & starter

**NOTE**

These lists may be modified by the minimum equipment requirements of individual certifying authorities!

7.7 LANDING GEAR

The EXTRA 330SX is designed as a conventional tail-wheel airplane. The main gear is a composite construction with a multichamber spring made of glass fiber webs and caps. The main wheels have a size of 5.00-5 and they are equipped with hydraulic disc brakes. The tail wheel has a solid rubber tire with full-swivel capability.

<sup>1</sup>) optional equipment

<sup>2</sup>) for abbreviations refer to Section 917

## 7.8 SEATS, SEAT BELTS

The seat is a shaped carbon composite construction. It's back rest position and angle is mechanically adjustable on ground by quickpins and bolts. The lower seat surface itself is fixed.

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 and the other one to the left. For acrobatic maneuvers the seat belt system should be tightened firmly.

## 7.9 CANOPY

The canopy is manufactured in one section and can be manually operated by interior locking handles located on the left front side of the canopy.

*To open the canopy from inside proceed as follows:*

Pull together the interior locking handles and lift canopy to the right.

The canopy strap will limit the opening angle.

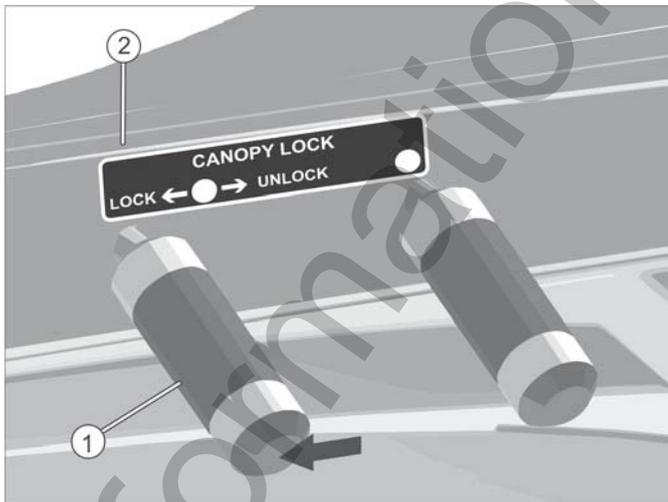
*To open the canopy from the outside:*

Use the interior handles by reaching through the small window (bad weather window) and proceed as mentioned above.

*To lock the canopy:*

Pull together the interior locking handles and then release.

Pull the aft locking handle (1) fully rearward to the end stop (LOCK position (2)).



Generally the emergency operation is equal to the normal procedure. When opening the canopy in normal flight the low pressure over the canopy will flip the canopy fully open immediately. However, complete jettison of the canopy is possible. In this case the canopy can be fully unlatched at its RH hinge line by the following action:

Push canopy slightly forward while opening.

## 7.10 POWER PLANT

### 7.10.1 ENGINE

The power plant consists of one Textron-Lycoming six-cylinder, horizontally opposed, aircooled, direct drive, fuel injection engine type with inverted oil system.

The rated power at 2700 RPM is 315 HP (234.9 kW).

The rated power at 2600 RPM is 303 HP (225.9 kW).

The rated power at 2400 RPM is 286 HP (213.3 kW).

Engine specification: Textron - Lycoming AEIO-580-B1A

The AEIO-580-B1A engine is equipped with special antivibration counterweights.

The following accessories are included in the power plant installation:

-Fuel Injector:	Precision/Avstar
-Magnetos:	Slick
-Alternator:	B&C
-Starter:	Sky-Tec/Hartzell E.T.
-Fuel pump:	Crane Lear Romec/Hartzell E.T.
-Shielded ignition system	
-Propeller governor drive	
-Transistor voltage regulator	B&C

The engine is operated with the following manual controls:

- Throttle control
- RPM control
- Fuel mixture control

The propeller governor monitors the RPM automatically and prevents overspeeding. In the event that oil pressure is lost the propeller is automatically adjusted to coarse pitch in order to avoid overspeeding.

100/130 aviation grade fuel (AVGAS 100/100LL) is the minimum grade recommended by the manufacturer of the engine.

100/130 aviation fuel is also the maximum grade.

### 7.10.2 OIL SYSTEM

The engine oil is cooled using a double oil cooler system. The oil coolers are mounted on the aft, right and left hand side of the engine. The oil level is determined by a dip-stick which is accessible through an opening in the upper cowling.

Oil capacity:	
Max. sump capacity:	16 qts.
Min. sump capacity:	9 qts.

#### NOTE

With the engine in good condition the minimum engine oil capacity is safe for maximum endurance in the acrobatic category.

For temperatures and oil grades refer to Section 1.7.

### 7.10.3 ENGINE INSTALLATION

The engine is mounted with four shock-mounts to the tig-welded steel tube engine support, which is attached to the fuselage with four bolts on the firewall plane.

The engine cowling is divided into two parts, a lower and an upper part both made of carbon fibre 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 propeller is either a 3-blade wood composite, constant speed propeller type MTV-9-B-C/C198-25 with a diameter of 1,98 m (77.95 in), or a 4-blade wood composite, constant speed propeller type MTV-14-B-C/C190-130 with a diameter of 1,90 m (74.80 in).

### 7.10.5 THROTTLE

Control lever (cub-type) mounted on the left side of the cockpit.

### 7.10.6 MIXTURE

Vernier control located at the right side of the cockpit (red knob).

### 7.10.7 RPM-CONTROL

Vernier control located at the right side of the cockpit (blue knob).  
Preselection of RPM possible due to constant speed governor.

### 7.10.8 FUEL SELECTOR VALVE

A rotary fuel selector valve is mounted behind the firewall on the right side of the fuselage. A torque tube connects the valve to the cockpit handle. Pull and turn the handle 90° to open the valve to the MAIN tank. A further 90° turn switches to the AUX tank fuel supply.

Position down = CLOSED  
Position left = MAIN TANK  
Position up = AUX TANK

### 7.10.9 EXHAUST SYSTEM

The EXTRA 330SX is equipped with a Gomolzig 6 in 1 exhaust system with integrated silencer.

As an option the EXTRA 330SX can be equipped with a complete 6 in 2 Inconel exhaust system manufactured by Chabord. The system is made from stainless steel and has no silencer. If it is installed, the aircraft can receive an airworthiness certificate only in the Acrobatic Category.

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## 7.11 FUEL SYSTEM

The fuel system consists of two separate, independent tank systems (refer to Figure 7-3).

- MAIN tank system
- AUX tank system

### Main tank system:

A combined center & acro tank with a total capacity of 69 liters (18.2 US Gal.) is mounted in the fuselage just behind the firewall.

The main tank has a 2" diameter filler cap for gravity refueling on top of the forward fuselage. The cap is labelled "FUEL AVGAS 100/100LL". Usable fuel in the main tank is 67.5 liters (17.8 US Gal.).

The main tank is made from aluminum and is covered by a separate shell made of GRP for safety. The space between the aluminum tank and the safety GRP shell is vented and drained overboard. In case of a crack in the aluminium tank, the leaking fuel is dumped overboard, while the GRP shell will indicate the location of the leak by coloring blue.

### Wing tank system:

The root section of each wing in front of the main spars forms an integral fuel tank providing two interconnected tanks with 120 liters (31,7 US GAL.) total capacity. Each side of the wing has a 2" diameter filler cap for gravity refueling. The caps are labelled "FUEL AVGAS 100/100LL". The wing tank can be completely emptied in flight.

### NOTE

The wing tank must be empty when flying aerobatic maneuvers.

Adequate venting is provided in each tank by ventilation-tubes.

All ventilation and GRP shell drain lines merge at the right side of the fuselage and end at the upper main gear leg.

In addition to the engine driven fuel pump, 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 boost pump switch is located on the instrument panel.

A fuel filter with drain is installed between the fuel selector valve and the boost pump.

Separate drains are located at the lowest point of each tank system: the main tank drain on the right underside and the aux tank drain on the left underside of the fuselage just behind the main gear attachment.

Normal float type transducers are used in the aux tanks. A variable capacitance type transducer is used for the main tank.

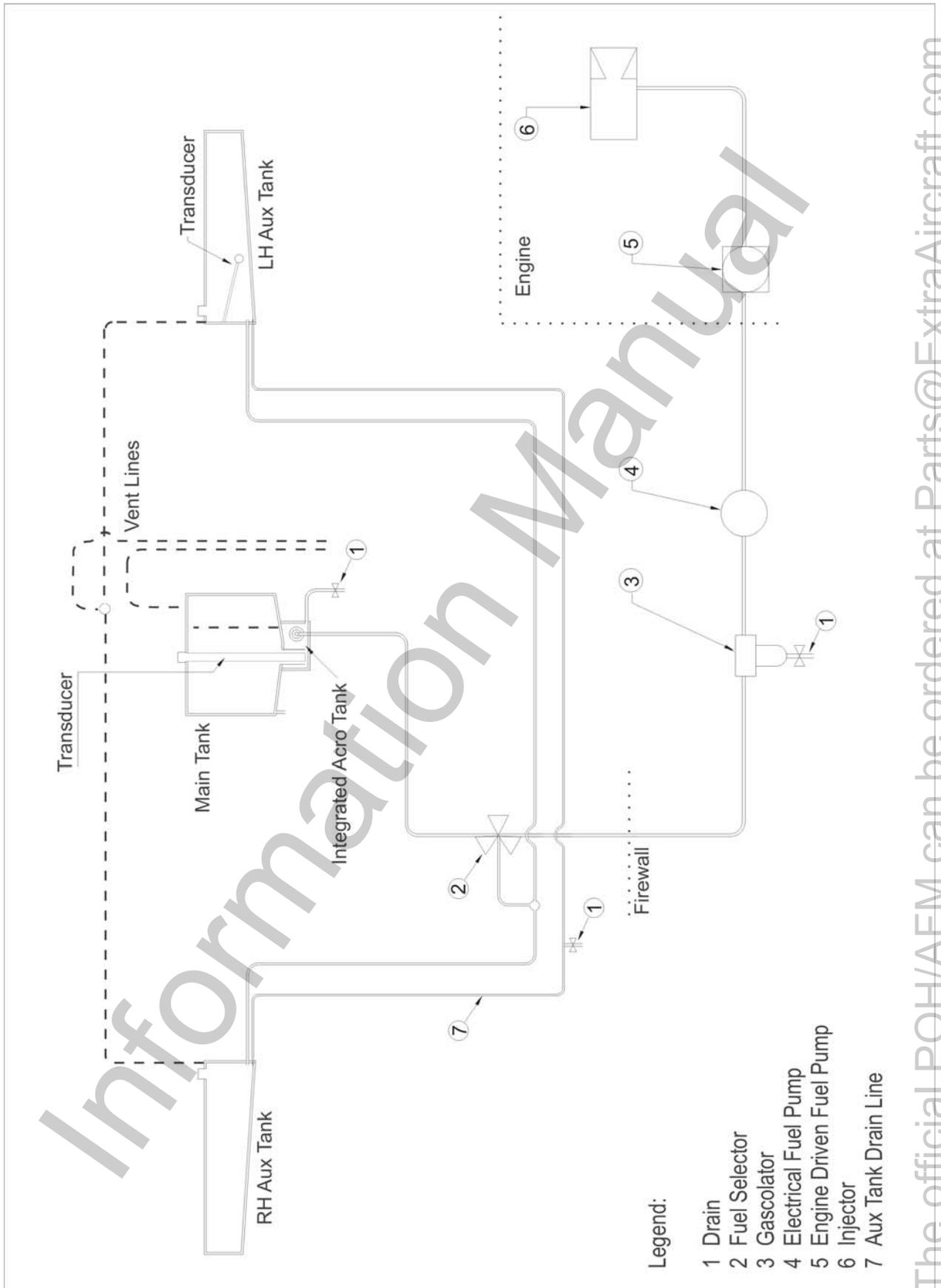


Figure 7-3, Fuel system

## 7.12 ELECTRICAL SYSTEM

The electrical power generation system (refer to Figure 7-4) consists of a 12 V alternator with rectifier and transistor voltage regulator. The alternator is mounted on and driven by the engine.

The field current is controlled by the voltage regulator to give a nominal output of 13,8 V under all load conditions.

Circuit protection against over-voltage is provided by the voltage regulator.

The regulator disconnects the alternator from the aircraft system and activates the alternator warning indication on the EFIS. The alternator will be off-line until power is cycled by turning OFF and ON the ALTERNATOR circuit breaker switch.

Consider that in flight with active alternator warning the battery is the only power source.

The maximum load supplied by the alternator is 8.4 Amps (@2700 RPM).

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 pilot seat.

The battery switch is located on the instrument panel.

A backup battery is installed in front of the instrument panel to ensure the power supply for EMS, PFD, ADAHRS and Magnetometer during engine start and in case of electrical system failure. The backup battery switch is located on the instrument panel.

The system is equipped with an ammeter on the EFIS, which allows monitoring the battery usage (amps). The battery state of charge can be monitored using the voltmeter indication.

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

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

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

## 7.13 CABIN ENVIRONMENT CONTROL

A ventilation system in the fuselage is provided for the supply of fresh air to the cabin. The bad weather window is equipped with a ventilation scoop to provide supply of fresh air to the cabin. Additionally, on the right and left side of the cockpit an eyeball-type adjustable vent is installed.

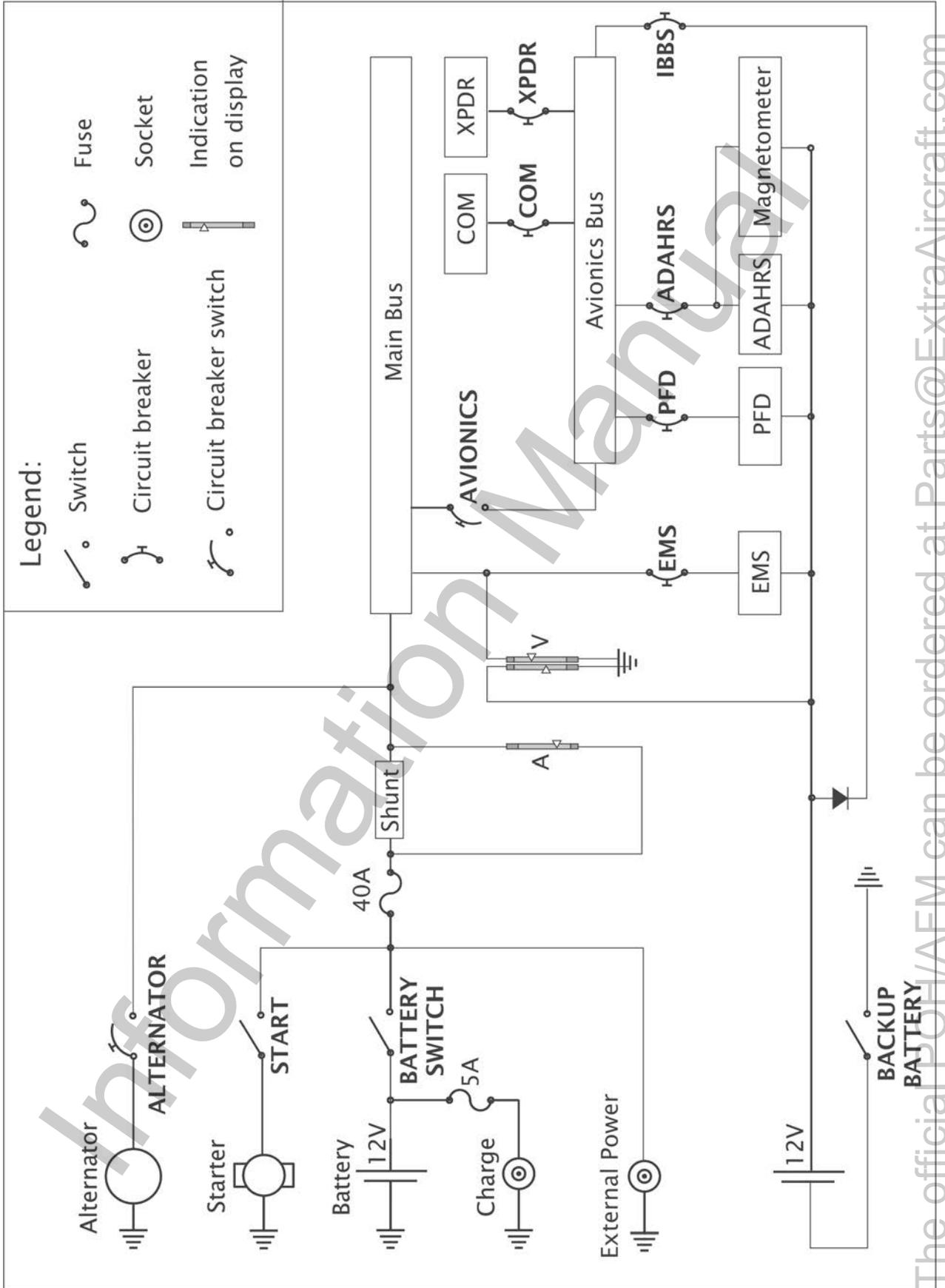


Figure 7-4, Electrical system

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## SECTION 8

### HANDLING, SERVICING AND MAINTENANCE

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Information Manual

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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 maintenance 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 flight hours with a minor check after 50 and 25 hours each.

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 on 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 an 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) 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.

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## SECTION 9

### SUPPLEMENTS

Doc-No. EA-0F701.1

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## 9 SUPPLEMENTS

### 9.1 INTRODUCTION

Section 9 "Supplements" of the Pilot's Operating Handbook contains all information necessary for 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 EASA for the EXTRA 330SX. Pages and contents of this section may not be exchanged and alterations of or additions to the approved contents may not be made without EXTRA Flugzeugproduktions- und Vertriebs-GmbH/EASA approval. The editor has the copyright of these Supplements and is responsible for edition of revisions. The Log of Effective Pages is found on the Preceding Pages of this Pilot's Operating Handbook.

Each Supplement section (e.g. steerable tailwheel) covers only a single system, device, or piece of 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 the 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 330SX. 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 330SX 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°. When exceeding this deflection, the tailwheel features a full-swivel capability using a release mechanism.

### 901.2 LIMITATIONS

The operation limitations are not affected 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 only 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 mechanism, which gives the wheelfork a full-swivel capability exceeding plus/minus 30° deflection. The steelsleeve is glued onto the glasfiber spring, 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 dampened 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

### SMOKE SYSTEM

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## 902 SMOKE SYSTEM

### 902.1 GENERAL

For performing at airshows, the EXTRA 330SX is equipped with a smoke system.

### 902.2 LIMITATIONS

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

- 1) **Specification** of the smoke oil: Straight paraffin oil, viscosity 30-50 cSt at 20°C (68°F), initial boiling point >330°C (626°F)  
For example: *Fauth FC05, Texaco Canopus 13* or equivalent
- 2) 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
- 3) Recommended **Manifold pressure**: min. 20" Hg
- 4) The activation of the smoke system **on ground is only allowable for a brief system test**. After brief ground system test wait 3 minutes before shutting down the engine.

#### Operating Markings & Placards:

**SMOKE REFILL  
STRAIGHT PARAFFIN OIL  
40 CST, 21 L (5.5 US GAL)**

External placard: Next to the smoke oil refill connector at the fuselage bottom



On smoke activation switch positioned on top of the throttle lever



On the instrument panel around the 3 position toggle smoke system control switch



On the instrument panel beneath the circuit breaker



Near the center drain valve in the bottom fuselage cover

## 902.3 EMERGENCY PROCEDURES

### FAILURE OF THE SMOKE-SYSTEM

- |                                |      |
|--------------------------------|------|
| 1. "SMOKE SYS" Switch:         | OFF  |
| 2. "SMOKE SYS" Circuit breaker | PULL |

### FIRE IN FLIGHT

- |                        |     |
|------------------------|-----|
| 1. "SMOKE SYS" Switch: | OFF |
|------------------------|-----|

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

- |  |  |
|--|--|
| 2. Mixture   | IDLE CUT OFF   |
| 3. Fuel selector valve   | OFF (Pull & Turn)  |
| 4. BATTERY switch  | OFF  |
| 5. Airspeed  | 90 KIAS (167 km/h), find your airspeed/<br>attitude that will keep the fire away from the<br>cockpit |
| 6. Land  | ASAP   |
| 7. If fire persists or aircraft is uncontrollable<br>and wearing a parachute | BAIL OUT   |

### SMOKE IN THE COCKPIT

- |   |                      |
|---|----------------------|
| 1. "SMOKE SYS" Switch:                    | OFF                  |
| 2. Bad weather window                     | OPEN                 |
| 3. Ventilation                            | OPEN                 |
| 4. If smoke persists in the cockpit, land | AS SOON AS PRACTICAL |

## 902.4 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<br>connector at the fuselage bottom;<br>IMMERSE the other end into the paraffin<br>oil in the canister/barrel |
| 2. "SMOKE SYS" Switch: | REFILL (pull to unlock)  |

### NOTE

The refilling should start within max. 30 sec. If this is not the case, the refill lines, fittings and filter (if installed) 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 float switch device which automatically switches the refilling off.

After automatic refill shut-off :

- |                        |            |
|------------------------|------------|
| 3. "SMOKE SYS" Switch: | 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 float switch in the smoke oil tank has to be checked accordingly.

### B) SMOKE GENERATION

- |   |                |
|---|----------------|
| 1. Bad weather window and ventilation                   | CLOSE          |
| 2. "SMOKE SYS" Switch:                                  | ARM            |
| 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.

### C) SMOKE TANK DRAINING

1. Place suitable container under the smoke tank drain
2. Open smoke tank drain
3. Close smoke tank drain when tank is empty

## 902.5 PERFORMANCE

Not affected.

## 902.6 WEIGHT AND BALANCE

Capacity		Mass		Moment	
Litre	US gal	Kg	lbs	Kgcm	in-lbs
5	1.3	4.3	9.4	39	33
10	2.7	8.5	18.7	77	65
15	4.0	12.8	28.1	115	98
20	5.3	17.0	37.5	153	131
21	5.5	17.9	39.3	161	138

Arm of Smoke Tank 9 cm (3,5"); 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).

## 902.7 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.

The system consists of (refer to Fig. 902-1):

- 1 Ventline fitting
- 2 Attachment belts
- 3 Overpressure/check valve
- 4 Refill line
- 5 Filter element
- 6 Quick refill connector in the belly fairing
- 7 Smoke tank drain
- 8 Drain line
- 9 Nozzle
- 10 Injector line
- 11 Refill/Injection pump
- 12 Smoke oil tank with floptube
- 13 Float switch for automatic shutoff during refilling
- 14 ON-OFF smoke activation switch
- 15 SMOKE SYS 3 position toggle control switch
- 16 SMOKE circuit breaker

The smoke oil tank is filled by a pump (reversed polarity) through a quick connector located in the aircraft belly fairing. This line includes a filter to prevent dirt to enter the smoke system. A filled smoke oil tank is detected by a float switch placed in the tank which shuts off the pump. The same pump (normal polarity) injects the smoke oil from the smoke oil tank through an overpressure/check valve and the injector nozzle into the hot exhaust gas to generate smoke. For refilling the smoke oil tank, the "SMOKE SYS" switch has to be switched to the "REFILL"-position (pull to unlock).

For smoke system activation, the "SMOKE SYS" switch has to be switched to the "ARM" position. Then the smoke „ON-OFF“ smoke activation switch on the throttle lever can be used to control the smoke pump.

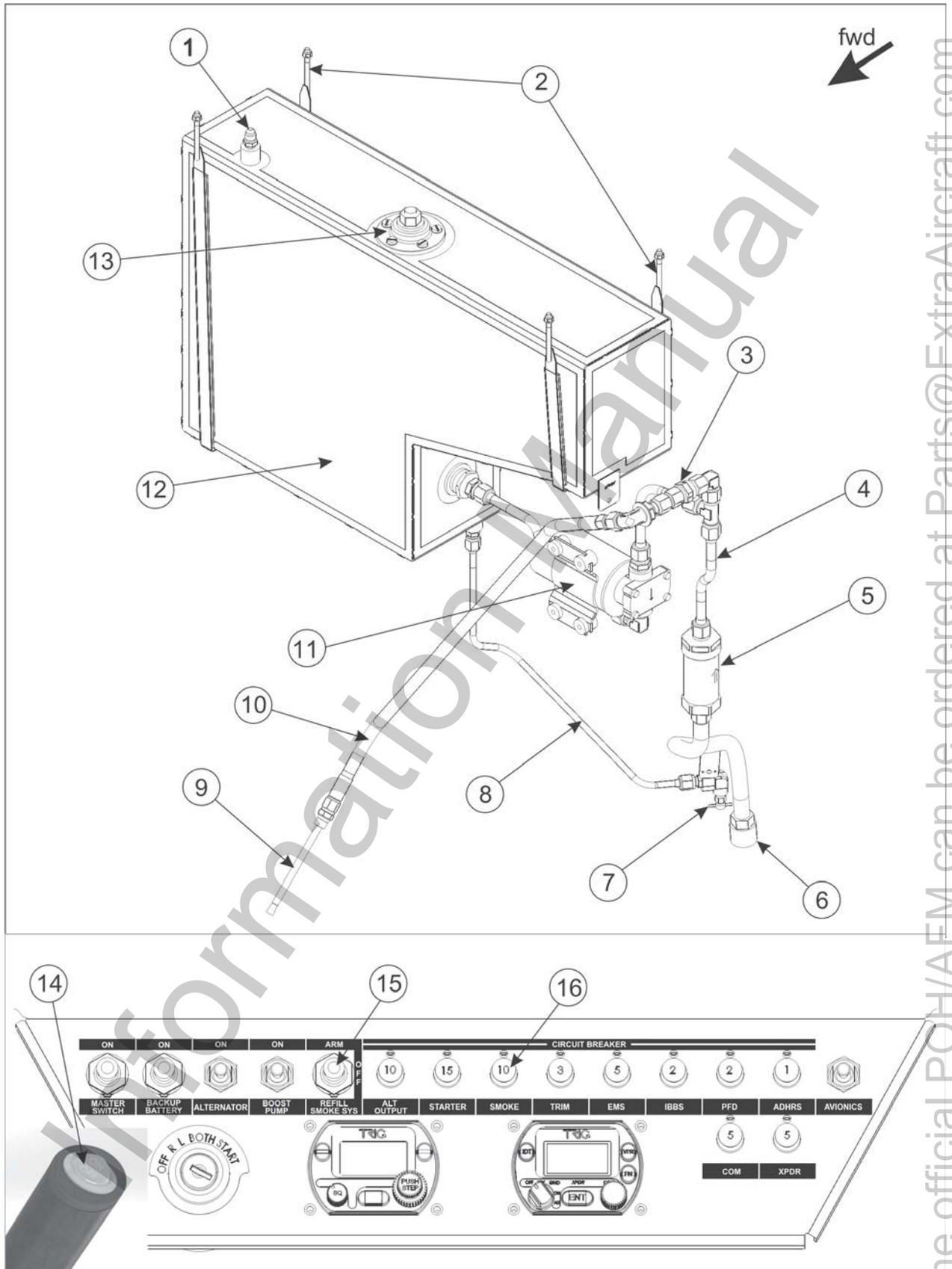


Figure 902-1, Smoke System Overview

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## 902.8 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
- Clean the overpressure/check valve: if required, remove oil residue
- Clean the injector nozzle: if required, remove carbon debris
- Clean the filter element

### After each flight with activated Smoke System

- Clean the aircraft belly fairing and the rudder control cables from smoke oil residue.

 **CAUTION**

Smoke oil contamination with foreign particle impingement will be a contributing factor on premature wear and frayed areas of the rudder control cables.

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**SECTION 903  
GARMIN G3X TOUCH**

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## 903.1 GENERAL

**NOTE**

This supplement describes only functions and capabilities which are part of the certification (i.e. Day VFR). For information about further features refer to G3X Touch Pilots' Guide. Those further features are NOT part of the certified scope and may only be used for additional information.

The G3X Touch provides one or more of the following functions:

- Primary Flight Display (PFD)  
Provides attitude, air data, heading, and navigation information to the pilot.
- Multi-Function Display (MFD)  
Provides pilot awareness of factors that may affect the overall conduct of the flight such as advanced moving map including terrain, obstacle and traffic alerts, and SafeTaxi® airport diagrams. Georeferenced FliteCharts® or Jeppesen® ChartView™ charts are optional features.
- Engine Indication System (EIS)  
Provides engine and airframe operating parameters to the pilot.

The G3X Touch is installed in the following configuration:

- One GDU 450, 7" touchscreen display, split-screened providing PFD, MFD and EIS functions.



Single 7" GDU 450

This display comes with a built-in GPS receiver (not in use, GPS 20A is installed and primary source) for VFR operations and native infrared touch screen interface.

PFD installation requires the installation of a GSU 25(C) ADAHRS, GMU 11 magnetometer, and the GTP 59 temperature probe.

The EIS functions installed require the installation of a remote mounted GEA 24(B) Engine Airframe unit and associated engine sensors.

MFD functions are supported by an external GPS receiver. The COM frequency and STBY frequency can be controlled from the G3X Touch Display.

Use of this supplement requires the installation of Garmin G3X Touch Electronic Flight Instrument hardware and system software version 9.22 or a later software version in the aircraft. Pilots are advised to carefully review the contents of this Airplane Flight Manual Supplement before operating the airplane.

The following table lists the Pilot's Guide applicable to the respective system software version.

System Software Version	Pilots Guide Part Number
9.31 or later	190-01754-00 Rev. Y or later

## 903.1.1 ABBREVIATIONS AND TERMINOLOGY

The following glossary is applicable within the airplane flight manual supplement:

AC	Advisory Circular
ADAHRS	Air Data Attitude Heading Reference System
ADC	Air Data Computer
ADS-B	Automatic Dependent Surveillance-Broadcast
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AHRS	Attitude Heading Reference System
ALT	Altitude
AMMD	Airport Moving Map Display
ATT	Attitude
Baro	Barometric
CDI	Course Deviation Indicator
COM	Communication
DG	Directional Gyro
EIS	Engine Indication System
EMS	Engine Monitoring System
FPM	Feet Per Minute
GDU	Garmin Display Unit
GEA	Garmin Engine and Airframe
GMU	Garmin Magnetometer Unit
GPS	Global Positioning System
GS	Ground Speed
GSU	Garmin Sensor Unit (ADAHRS)
GTP	Garmin Temperature Probe
HDG	Heading

---

HSI	Horizontal Situation Indicator
IAS	Indicated Airspeed
IBBS	Integrated Backup Battery System
K factor	Fuel flow transducer calibration factor
KPH	km/h indication on display
KT	knot indication on display
MFD	Multi-Function Display
N/A	Not Available
NAV	Navigation
NOTAM	Notice to Airmen
NRST	Nearest
PFD	Primary Flight Display
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
REV	Revision or Reversion
RPM	Revolutions per Minute
SD Card	Secure Digital Card
STBY	Standby
SYNC	Synchronize
TAS	True Airspeed
TAWS	Terrain Alert and Warning System
TFR	Temporary Flight Restriction
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range
VSI	Vertical Speed Indicator
WAAS	Wide Area Augmentation System
XTK	Cross Track Error

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## 903.2 LIMITATIONS

### 903.2.1 SYSTEM SOFTWARE REQUIREMENTS

The G3X Touch must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G3X Touch Electronic Flight Instrument	9.31

#### NOTE

This section is not intended to be a comprehensive list of approved software. It is intended to provide a means to determine if this AFMS revision is applicable to the software that is installed in the aircraft. Do not use this AFMS revision if the installation has a software version less than that shown in the table above.

### 903.2.2 DATABASES

Databases identified as intended for helicopters must not be used. These databases are identified by the word "HELI" or "HELICOPTER" in their title, as displayed on the database status page.

Database updates via SD card must be done while the aircraft is on the ground and stationary. Database transfers or updates are prohibited in flight.

### 903.2.3 AEROBATIC MANEUVERS

Do not conduct aerobatic maneuvers if uninterrupted attitude information is required on the PFD.

### 903.2.4 SYNTHETIC VISION

The synthetic vision presentation must not be used as the sole reference for aircraft control (without reference to the primary flight instruments).

The synthetic vision presentation must not be used as the sole reference for navigation or obstacle/terrain/traffic avoidance.

### 903.2.5 MOVING MAPS

Moving map displays (ownship position relative to map features) must not be used as the primary or sole means of navigation or course guidance.

### 903.2.6 TERRAIN DISPLAY

Maneuvers and navigation must not be based solely on the display of terrain or obstacles on the moving map terrain displays.

### 903.2.7 TERRAIN ALERTS

Terrain alerts must be inhibited when landing at an airport that is not in the airport database.

#### 903.2.8 TRAFFIC DISPLAY

The display of traffic is intended as an aid to visual acquisition and must not be used as the sole basis for aircraft maneuvering.

#### 903.2.9 SURFACE OPERATIONS

The optional SafeTaxi or Chartview functions shall not be used as the sole basis for ground maneuvering. SafeTaxi and Chartview functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview use is limited to airport surface orientation to improve flight crew situational awareness during ground operations.

#### 903.2.10 GLIDE RANGE RING

In the event of engine failure or engine malfunction, the Glide Range Ring must not be used to determine gliding distance. Refer to the airplanes' Pilot's Operating Manual / Airplane Flight Manual for engine failure emergency procedures and glide distance data.

#### 903.2.11 POWERPLANT GAUGE MARKINGS

Fuel flow values may be in error by as much as 15 % if the K factor calibration is improperly set. Do not depend solely on the fuel flow indication or the fuel totalizer to determine fuel used, fuel remaining, or fuel reserves.

The fuel computer functions must not be used as the primary means of determining the quantity of fuel in the tanks. The aircraft fuel quantity gauge(s) are the primary means of determining fuel quantity.

The Manifold Pressure gauge and the Propeller RPM gauge are the primary means for power setting as described in Section 5 of this Handbook.

The % power display is for information purposes only.

#### 903.2.12 WEIGHT AND BALANCE

The weight and balance tool provided by the G3X Touch is for flight planning purposes only. Consult the aircraft's Pilot's Operating Handbook for the official weight and balance data.

#### 903.2.13 GLOVE USAGE

No device or apparel may cover the pilot's fingers used to operate the G3X Touch display.

#### 903.2.14 SCREENSHOTS

Do not take screenshots of the G3X Touch displays while in flight.

#### 903.2.15 SERVICE REQUIRED

It is prohibited to initiate flight when a "Service Required" advisory is present on the PFD, MFD, or EIS display.

## 903.2.16 PORTABLE ELECTRONIC DEVICES

Data provided to a portable electronic device from the G3X Touch Bluetooth interface is not approved to replace any aircraft display equipment, including navigation or traffic/weather display equipment.

## 903.2.17 KINDS OF OPERATIONS

No change.

## 903.2.18 PLACARDS



(Trim Indication on PFD)

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## 903.3 EMERGENCY PROCEDURES

### 903.3.1 ADC FAILURE (GSU 25)

#### ADC FAIL

ADC failure is indicated by:

- Red X over the airspeed and altitude tapes.
  - Red X over the vertical speed tape.
  - Red X over the TAS and OAT fields.
- > Use primary/mechanical Airspeed Indicator and Altimeter.

### 903.3.2 ATTITUDE FAILURE (GSU 25)

#### AHRS FAIL

Attitude failure is indicated by:

- removal of the sky/ground presentation.
  - Red X over the sky/ground presentation.
  - "ATTITUDE FAIL" on the PFD display.
- OR Degraded Attitude is indicated by:
- Amber AHRS ALIGN displayed on the sky presentation
- > Use real horizon as usual.

### 903.3.3 ATTITUDE ALIGNING / KEEP WINGS LEVEL

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G3X Touch has detected an invalid attitude solution and will not display any attitude information.

- > Use the real horizon as usual to maintain 1° nose up pitch and wings level flight. The system will display attitude when internal accuracy tolerances have been met.
- > Limit aircraft attitude to +10° bank, +5° pitch, 200 KTAS or less.
- > If attitude does not return, continue to use the real horizon for aircraft attitude control.

### 903.3.4 AHRS ALIGN

This annunciation indicates that the AHRS is beginning to fail and the internal sensors are trying to realign themselves. The attitude presentation behind the annunciation is still valid but should be crosschecked using the real horizon.

### 903.3.5 EIS FAILURE

EIS failure is indicated by the loss of displayed information on the EIS, including a blank or frozen display, a red 'X' over the display, or an unresponsive display of EIS parameters.

Loss of EIS is not an emergency. The aircraft cannot be operated outside of the engine limitations.

### 903.3.6 G3X TOUCH FAILURE ANNUNCIATIONS

If a G3X Touch function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G3X Touch power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged the G3X Touch should be serviced by a Garmin-authorized repair facility.



Red Flags on G3X Screen

### 903.3.7 HEADING FAILURE, LOSS OF MAGNETOMETER DATA, OR MAGNETIC FIELD ERROR

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and an Amber "HDG" on the display.

-> Use primary magnetic compass.

#### NOTE

If the G3X Touch DG/HSI has a valid GPS signal the G3X Touch DG/HSI instrument will display the GPS track information in magenta.

### 903.3.8 PFD FAILURE

PFD failure is indicated by the loss of displayed information on the PFD, including a blank, frozen, or unresponsive display.

-> Use real horizon for attitude, primary flight instruments for airspeed, altitude and magnetic heading, and external navigation data for navigation reference.

### 903.3.9 NAVIGATION DATA FAILURE (GPS)

Navigation data failure may be indicated by any or all of the following:

- Loss of ADS-B OUT signal
- Loss of course deviation information on PFD
- Loss of glidepath information on PFD
- Loss of bearing pointer on HSI

-> Refer directly to external navigation data.

*If no alternate navigation sources are available and 'REV' is displayed on HSI:*

-> Use the CDI and compass for course information.

-> Use external navigation data for navigation reference.

### 903.3.10 TERRAIN ALERTS

Aural Alert	Visual Alert	Action
<p>"Terrain Ahead! Pull Up!"</p> <p>"Terrain, Terrain Pull up! Pull Up!"</p> <p>"Obstacle Ahead! Pull Up!"</p> <p>"Obstacle, Obstacle Pull Up! Pull Up!"</p> <p>"Sink Rate, Pull Up!"</p> <p>"Pull Up!"</p>	<p><b>TERRAIN</b></p> <p>-OR-</p> <p><b>OBSTACLE</b></p> <p>-OR-</p> <p><b>TERRAIN →</b></p> <p>NOTE: The arrow indicates the terrain is outside the Synthetic Vision field of view.</p>	<p>Initiate maximum performance climb (maximum takeoff power and best angle of climb airspeed)</p> <p>NOTE: Only the climb maneuver is recommended, unless it is determined, based on all available information, that turning in addition to climbing is the safest course of action.</p>
<p>"CAUTION, Terrain"</p> <p>"CAUTION, Terrain Ahead"</p> <p>"CAUTION, Obstacle"</p> <p>"CAUTION, Obstacle Ahead"</p> <p>"CAUTION, Sink Rate"</p>	<p><b>TERRAIN</b></p> <p>-OR-</p> <p><b>OBSTACLE</b></p> <p>-OR-</p> <p><b>← OBSTACLE</b></p> <p>NOTE: The arrow indicates the obstacle is outside the Synthetic Vision field of view.</p>	<p>Take corrective action until the alert ceases. Using all available information to determine the appropriate action, alter the flight path away from the threat by stopping descent, climbing, and/or turning.</p>

## 903.3.11 WARNINGS, AND CAUTIONS

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G3X Touch display.

### WARNING Annunciations - Red

<i>Annunciation</i>	<i>Pilot Action</i>	<i>Cause</i>
Red X	Reference the data source or alternate equipment.	A red X through any display field indicates that display field is not receiving data or is corrupted.
Red Engine Parameter	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the warning threshold.
	Select full screen mode on display to view WARNING annunciations.	Display is in split screen mode and WARNING annunciations are not displayed.

### CAUTION Annunciations - Amber

<i>Annunciation</i>	<i>Pilot Action</i>	<i>Cause</i>
HDG (amber background)	Use primary compass	Displayed heading is outside of the internal accuracy limits.
	Select full screen mode on display to view CAUTION annunciations.	Display is in split screen mode and CAUTION annunciations are not displayed.
AHRS ALIGN - Keep Wings Level	Crosscheck attitude indication with real horizon. Limit aircraft attitude to $\pm 10^\circ$ bank and $\pm 5^\circ$ pitch as AHRS Aligns - OK to taxi.	Attitude and Heading Reference System is aligning. AHRS may not align with excessive pitch/bank angles.
AHRS ALIGN	Crosscheck attitude indication with real horizon and other sources of attitude information (airspeed, heading, altitude, etc.)	The AHRS monitors have detected a possible AHRS malfunction or an error with the attitude presentation. The AHRS is attempting to realign itself.
AHRS FAIL ATTITUDE FAIL	Use real horizon.	The GSU 25 AHRS has failed.
ADC FAIL	Use primary airspeed and altimeter indicator.	The GSU 25 air data computer has failed.

<i>Annunciation</i>	<i>Pilot Action</i>	<i>Cause</i>
(Flashing) MESSAGE	Press the flashing message annunciation to view a new system message.	A new system message has annunciated.
Amber EIS Parameter	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the caution threshold.
TAWS N/A, TAWS FAIL	Use vigilance, terrain depiction and TAWS alerting is no longer provided.	Database errors or lack of required GPS position.

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## 903.4 NORMAL PROCEDURES

### 903.4.1 BEFORE STARTING ENGINE

Item	Condition
Database Acknowledgement (PFD)	Press CONTINUE button

#### NOTE

The data link weather advisory and current database information are displayed during power-up including valid operating dates, cycle number, and database type. When this information has been reviewed for currency (to ensure that no databases have expired), the pilot is prompted to continue.

Item	Condition
AVIONICS switch	OFF
BACKUP BATTERY switch	ON to power EIS

### 903.4.2 AFTER STARTING ENGINE

Item	Condition
Altimeters	SET (PFD and primary Altimeter)
AVIONICS switch	ON

- > Touch the Barometric Pressure Display on the PFD.
- > Enter the desired pressure using the keypad and touch ENTER.
- > Verify Barometric setting on the primary Altimeter matches the G3X Touch.  
or:
- > turn the knob associated with the PFD to set the barometric pressure.

### 903.4.3 COM RADIO TUNING

The COM Frequency Box is composed of two fields; one active frequency is on the left side and the standby frequency is on the right.

*To tune the COM radio:*

- > Touch STBY com display window
- > Enter the frequency using the keypad or dual concentric knob
- > Touch ENTER to enter the frequency in the STBY window, or,
- > Touch <-> to transfer the entered frequency directly into the COM window.

*To transfer STBY frequency to Active frequency:*

- > Touch the Active COM frequency field

#### 903.4.4 LATERAL NAVIGATION

##### GPS DIRECT TO

- > Press DIRECT TO button
- > Select Waypoint
- > Execute DIRECT TO

##### GPS OBS

- > Select GPS
- > Select waypoint and make it the active waypoint.

*To set the CDI to the desired course:*

- > Touch the Selected Course (OBS) window on the PFD.
- > Enter the desired GPS course. Press ENTER
- > Establish Intercept Heading

#### 903.4.5 BAROMETRIC MINIMUMS ALERT

A barometric minimums alert is provided in the G3X Touch to enhance the pilot's awareness of approaching altitude minimums.

*Setting the barometric minimums alert bug:*

- > On the PFD, Touch the HSI.
- > Touch the Highlight Minimums window.
- > Enter Barometric Altitude Minimums and touch ENTER

#### 903.5 PERFORMANCE

No change.

#### 903.6 WEIGHT AND BALANCE

See current weight and balance data.

#### 903.7 SYSTEM DESCRIPTION

The G3X Touch System increases situational awareness by complementing the traditional instruments on the panel with an easy-to-scan Primary Flight Display (PFD) that features information as listed in the 903.7.9 *Function Summary* paragraph.

The mechanical airspeed indicator, altimeter and compass remain the primary instruments.

### 903.7.1 SWITCH AND CIRCUIT BREAKER LABELS

The following labels are used on the instrument panel together with the GARMIN G3X:

Switches:



Circuit Breakers:



### 903.7.2 FLIGHT INSTRUMENTS

Attitude information is displayed over a virtual blue sky and synthetic ground with a white horizon line. The Attitude Indicator displays the pitch (indicated by the yellow symbolic aircraft on the pitch scale), roll, and slip/skid information.

The horizon line is part of the pitch scale. Pitch markings occur at 2.5° intervals through all pitch ranges.

The inverted white triangle indicates zero on the roll scale. Major tick marks at 30° and 60° and minor tick marks at 10°, 20°, and 45° are shown to the left and right of the zero. Angle of bank is indicated by the position of the pointer on the roll scale. Slip/skid is indicated by the location of the ball.



*Bezel Overview (GDU 450)*

- NRST key** Press to display the Nearest Page for viewing the nearest airports, intersections, NDBs, VORs, waypoints, frequencies, and airspaces
- Direct-To k.** Press to activate the Direct-To function, enter a destination waypoint and establish a direct-to course to the selected destination
- MENU key** Press once to view the Page Menu  
Press twice to view the Main Menu  
Press a third time to clear the Main Menu enabled.
- BACK key** Press to return to the previous screen  
Press and hold to return to the default MFD Page

## Pointers

The Standard Rate Turn Bank Angle Pointers are green pointers displayed on the roll scale that show the bank angle corresponding to a standard rate turn.



*Standard Rate Turn Bank Angle Pointers*

## Turn Rate Indicator

The Turn Rate Indicator is located at the top of the HSI. Tick marks to the left and right of the displayed heading denote standard turn rates (3 deg/sec). A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 6 seconds, based on the present turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid.

## Airspeed Indicator

The Airspeed Indicator may be displayed as a vertical tape or a round dial. When the Airspeed Indicator is displayed as a tape, it displays a range of 35 knots (or 70 KPH) on a rolling number gauge using a vertical tape. Numeric labels and major tick marks are shown at intervals of 10 KT (or 20 KPH). Minor tick marks are at intervals of 5 KT (or 10 KPH). The current airspeed is displayed in the black pointer. The True Airspeed (TAS) is displayed above the scale in white digits and the Ground Speed (GS) is displayed below the scale in magenta digits.

## Altimeter

The Altimeter may be displayed as a vertical tape or a round dial. When the Altimeter is displayed as a tape, it displays 400 feet (or 225 m) of barometric altitude values at a time on a rolling number gauge using a moving tape. Numeric labels and major tick marks are shown at intervals of 100 feet (or 25 m). Minor tick marks are at intervals of 20 feet (or 5 m). The current altitude is displayed in the black pointer. The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa) depending on setting.

The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. A bug corresponding to this altitude is shown on the altimeter; if the Selected Altitude exceeds the range shown on the tape, the bug appears at the corresponding edge of the tape.

The Altitude Alerting function provides the pilot with visual and aural alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The following will occur when approaching the Selected Altitude:

- Passing within 1000 feet (305 m<sup>1</sup>) of the Selected Altitude, the Selected Altitude (shown above the Altimeter) flashes for 5 seconds and an aural tone is generated.
- When the aircraft passes within 200 ft (61 m<sup>1</sup>) of the Selected Altitude, the Selected Altitude flashes for 5 seconds and an aural tone is generated to indicate that the aircraft is approaching the selected altitude.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band ( $\pm 200$  feet (61 m<sup>1</sup>) of the Selected Altitude), the Selected Altitude changes to Amber text on a black background, flashes for 5 seconds, and an aural tone is generated.

### Vertical Speed Indicator

The Vertical Speed Indicator (VSI) may be displayed as a tape or an arc segment. The VSI displays the aircraft vertical speed using a non-moving tape labeled at 500, 1000 and every 1000 fpm (or 2.5, 5 and every 5 m/s) up to the maximum with minor tick marks every 100 feet up to 1000 fpm (or 0.5 m up to 5 m/s). The current vertical speed is displayed using a white arrow along the scale.

### 903.7.3 COURSE DEVIATION INDICATOR (CDI)

The HSI contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The course pointer is a single line arrow (GPS1) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.

The Course Deviation Indicator (CDI) moves left or right from the course pointer along a lateral deviation scale to display aircraft position relative to the course. If the course deviation data is not valid, the CDI is not displayed.

Another Lateral Deviation Scale and combination Course Deviation and To/From Indicator is located below the slip/skid indicator.



*Lateral Deviation Indication*

The color indicates the current navigation source: magenta (for GPS). The full-scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. The CDI has the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while coupled to GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.

In addition to the flight instruments, the PFD also displays supplemental information, including the Outside Air Temperature (OAT), wind data, User Timer, and G-Meter.

<sup>1</sup>) indication can slightly differ from this value due to rounding reasons

#### 903.7.4 G-METER

When switching on the G3X the G-meter indication follows the preset, in which the G-forces are shown when they exceed +2.1 g or -0.5 g.

In the respective menu page you can change the indication of G-forces to permanently ON or OFF. This setting is switched back to the preset with each power cycle.

#### 903.7.5 ENGINE INDICATION SYSTEM

The G3X Touch EIS displays engine, electrical, and other system parameters. Additional EIS information can be viewed by selecting the Eng Page on the MFD.

Green bands on the instruments indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. When unsafe operating conditions occur, the corresponding caution readout will display solid amber and the warning readout will flash red. If sensory data to an instrument becomes invalid or unavailable, a red "X" is displayed across the instrument.

#### 903.7.6 COMMUNICATION / NAVIGATION / SURVEILLANCE SYSTEM

The Communication/Navigation/Surveillance (CNS) system includes the communication unit. This function can be accessed from the boxes that make up the CNS Data Bar located at the top of the PFD and/or MFD.



CNS Data Bar

#### 903.7.7 MINIMUM ALTITUDE DISPLAY AND ALERTING

When enabled by the pilot, an altitude minimums bug will be displayed in cyan on the barometric altitude tape. Altitude minimums are accessed under the PFD Options Menu -> Minimums sub menu and can be set by touchscreen keypad or dual-concentric knob.

Both visual and aural altitude minimums alerts are provided. During a descent to minimums, the minimums bug will change from cyan to white when the aircraft descends to within 100 ft (30 m<sup>1</sup>) of minimums. An aural "Minimums, Minimums" alert will be triggered when the aircraft's altitude descends through minimums and the minimums bug will change to Amber. As the aircraft altitude climbs back above minimums, the minimums bug will change to white 50 ft (15 m<sup>1</sup>) above minimums and cyan 150 ft (46 m<sup>1</sup>) above minimums. Alerting is rearmed once the aircraft is 150 ft (46 m<sup>1</sup>) or more above the minimum's altitude.

#### 903.7.8 ADDITIONAL WARNINGS

The following additional warnings are displayed on the PFD:

Alternator warning: **ALTERNATOR**

Starter engaged warning: **STARTER**

Main bus low voltage warning: **MAIN BUS**

<sup>1</sup>) indication can slightly differ from this value due to rounding reasons

## 903.7.9 FUNCTION SUMMARY

### Flight Instrumentation

altimeter  
airspeed indicator  
magnetic heading indicator and directional gyro  
artificial horizon  
vertical speed indicator  
slip/turn coordinator  
synthetic vision  
HSI and GS indicator  
wind aloft  
OAT  
G-meter  
flight path marker  
trend indicators  
true airspeed and ground speed  
density altitude

### Engine Indication

engine speed  
manifold pressure  
oil temperature  
oil pressure  
fuel pressure  
cylinder head temperature  
exhaust gas temperature  
fuel flow  
fuel computer

### System Indication

fuel level  
ammeter  
trim indication  
system voltage  
alternator annunciation  
starter engaged annunciation  
low voltage annunciation  
timers and clock

**SECTION 904**  
**TRIG TY91 VHF Radio**

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## 904.1 GENERAL

The TY91 VHF radio system is an ED-23C compliant class C (25 kHz offset carrier) and class E (8.33 kHz single carrier) VHF radio.

The TY91 VHF radio is controlled using a separate front panel controller, called the TC90. This allows the radio to be mounted separately from the instrument panel, and reduces the amount of panel space taken by the VHF radio.

The TC90 is certified to ETSO 2C169a, and TSO C169a.

## 904.2 LIMITATIONS

The following table lists devices installed and their applicable system software versions.

Device	System Software Version
TY91 VHF Radio	1.12 or later
TC90 controller	1.8 or later

## 904.3 EMERGENCY PROCEDURES

Not affected.

## 904.4 NORMAL PROCEDURES

Not affected.

## 904.5 PERFORMANCE

Not affected.

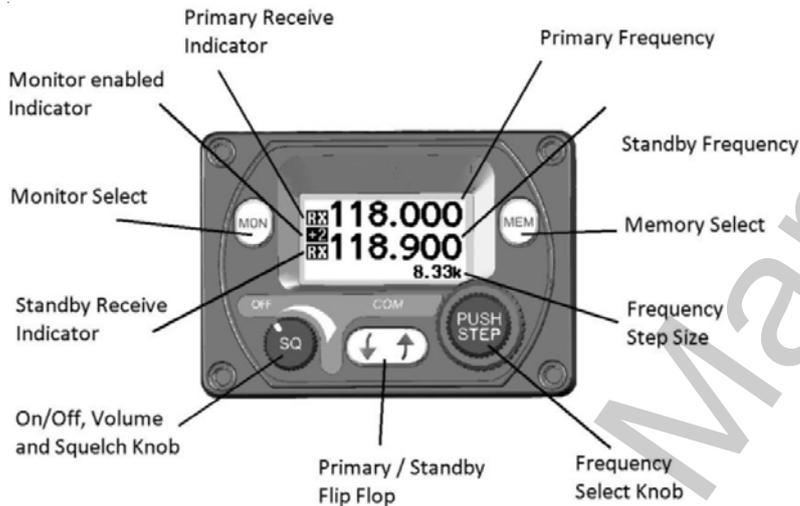
## 904.6 WEIGHT AND BALANCE

Not affected.

## 904.7 DESCRIPTION

### 904.7.1 CONTROLS AND INDICATORS

#### Front Panel



#### Display

The display shows the primary and standby frequencies and a series of icons to indicate the operating mode of the radio.

The primary frequency is at the top and the standby frequency is at the bottom half of the screen. The TX icon shows that the radio is transmitting. An RX icon shows that the frequency is active and the audio will be heard through the headphone and speaker outputs. The standby frequency will only be received during the MONITOR function which is indicated by a +2 icon when active.

The bottom right hand side indicates what frequency step size is selected.

#### On/Off, Volume and Squelch Knob

The left hand knob controls the power to the VHF radio, adjusts the audio volume, and controls the squelch. Turning this knob clockwise will switch on the radio and then increase the volume. Turning anticlockwise will reduce the volume and eventually will click off.

Pressing this knob toggles the automatic squelch on and off, which can be used to listen for faint stations and as a simple audio test.

#### Tuning Knobs

The right hand concentric knobs are used to tune the radio. The large knob adjusts the MHz portion of the standby frequency, and the smaller knob adjusts the kHz portion of the standby frequency.

Pressing the end of the small knob changes the channel spacing that the small knob operates through. If the radio is configured for 8.33 kHz operation, the steps toggle between 8.33 kHz

channels and 25 kHz channels. If the radio is configured only for 25 kHz operation, the steps toggle between 25 kHz and 50 kHz channels.

Changing the step size does not change the behaviour of the radio, only the tuning knob step size – it helps to quickly tune a frequency.

### Flip-flop Button

The flip-flop button swaps the frequency in the standby position into the active position, and moves the active frequency to the standby position.

### MON Button

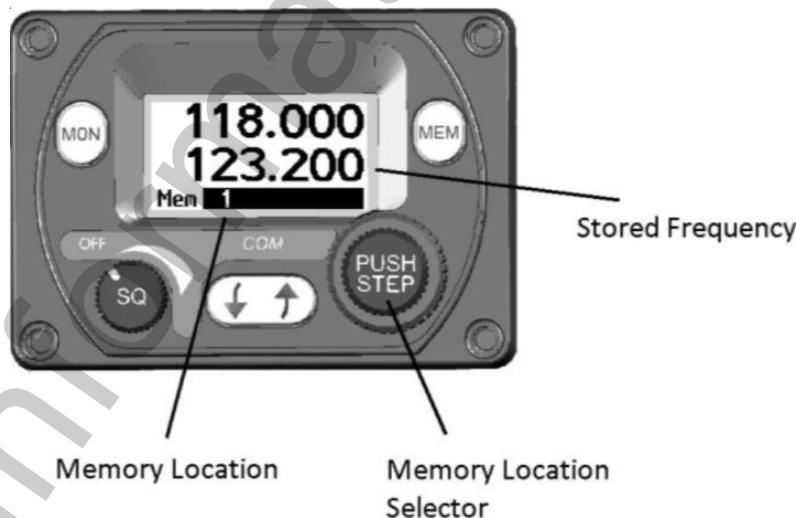
The VHF radio includes a dual-frequency listen feature; pressing the MON button toggles this feature on and off.

When the monitor is active, a +2 icon appears next to the standby frequency, and the radio will scan between the active and standby frequencies listening for transmissions. The primary channel has priority – a transmission on the primary channel will interrupt the secondary channel. As an aid to identifying which channel is active, the RX icon will light next to the active channel and the secondary channel will appear slightly quieter than the primary.

This is useful in an aircraft with only a single radio since it allows you, for example, to copy the ATIS whilst maintaining a listening watch on the ATC frequency.

## 904.7.2 FREQUENCY MEMORY

If no GPS is connected and the MEM button is pressed, or if the large knob is rotated beyond the remote database the controller will access the internal quick reference memory. There are 9 quick reference memory locations and the bottom edge of the screen will display which memory location is currently selected (1 – 9).



Rotating the small frequency selector knob will step through the memory locations. The standby frequency window will display the stored frequency.

To store a frequency in one of the memory locations it must first be tuned and active as the primary frequency. Press MEM to enter the memory mode in the usual way. Select the channel you want to overwrite with the tuning knobs.

Now press, AND HOLD, the MEM button for 2 seconds. The current active frequency will be moved to the selected memory location, overwriting the existing contents.

### 904.7.3 STUCK MIC FUNCTION

If the PTT switch is stuck in the ON or transmit position, the radio will automatically cut out after 35 seconds as a safety measure.

### 904.7.4 CONFIGURATION MODE

Additional setup items can be accessed by holding down the MON button for 5 seconds. The menu options can be selected using the larger inside tuning knob and the parameter value can be altered using the smaller outside tuning knob.



AUX In Volume	Sets the volume level of the auxiliary input
AUX In Mute	Mutes the auxiliary audio when a VHF transmission is received by the radio
Sidetone Volume	Sets the volume level of sidetone heard when transmitting
Radio Squelch	Sets the sensitivity of the radio squelch
Enable 8.33 kHz	Sets the frequency step size to 8.33/25 kHz or 25/50 kHz
Brightness	Sets the LCD backlight brightness

### 904.7.5 GENERAL LOW TEMPERATURE OPERATION

The TY91 is certified to operate correctly down to -20°C, but at low temperatures the controller display may be impaired. On a cold day you may need to wait for the cockpit to warm up to ensure normal operation.

## 904.7.6 WARNING MESSAGES

If the VHF radio detects a problem, the screen will indicate WARNING and a brief statement of the problem. Depending on the nature of the problem, your VHF radio may not be working properly. Note the message on the screen and pass that information to your avionics maintenance organisation. Press the flip-flop button to clear the message.

The following warnings may be seen:



Remote Hot	The remote radio is overheating
Stuck Mic	The PTT switch has been closed for more than 35 seconds.
Low Volts	The aircraft power input is below 10 volts.
No Radio	Connection between the controller and the remote radio has been lost.
Radio Fault	The remote radio is reporting an unspecified fault.

## 904.7.7 FAULT ANNUNCIATION

If the VHF radio detects a catastrophic internal failure, the screen will indicate FAULT and a brief statement of the problem. Note the FAULT message at the bottom of the screen and pass that information to your avionics maintenance organization. The fault may be cleared by re-cycling the power to the radio but if the fault is still present the message will reappear.

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**SECTION 905**  
**TRIG TT21/22 Transponder**

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905.1 GENERAL

The TT21/TT22 Mode S transponder system is an ED-73C compliant Mode S level 2els datalink transponder, with support for ADS-B extended squitter, elementary surveillance and SI codes, which also meets the relevant environmental requirements of ED-14F.

The TT21 has a nominal power output of 125 Watts, and meets the power output requirements for Class 2. The TT22 has a nominal power output of 250 watts, and meets the power output requirements for Class 1. The ADS-B function meets DO-260B class B0 for the TT21 and class B1S for the TT22. The TT21/TT22 is certified to ETSO 2C112b and ETSO C166a, and to FAA TSO C112c and C166b.

The TT21/TT22 transponder is controlled using a separate front panel controller, called the TC20. This allows the transponder to be mounted separately from the instrument panel, and reduces the amount of panel space taken by the transponder. The TC20 includes an altitude encoder. The TC20 is certified to ETSO 2C112b and ETSO C88a, and to FAA TSO C112c and TSO C88b.

905.2 LIMITATIONS

The following table lists devices installed and their applicable system software versions.

Device	System Software Version
TT21/22 transponder	2.13 or later
TC20 controller	1.14 or later

905.3 EMERGENCY PROCEDURES

Not affected.

905.4 NORMAL PROCEDURES

Not affected.

905.5 PERFORMANCE

Not affected.

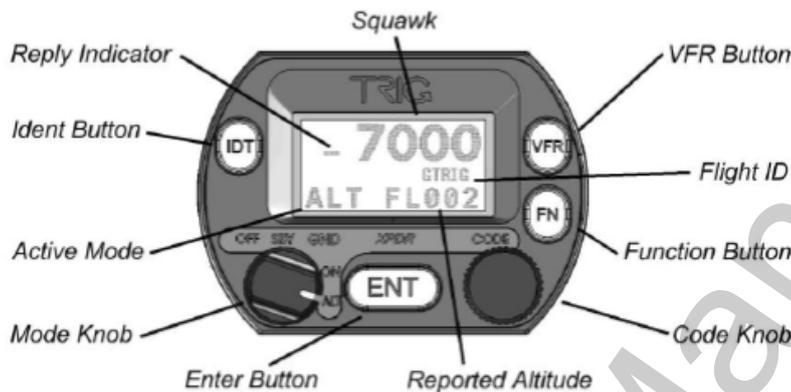
905.6 WEIGHT AND BALANCE

Not affected.

## 905.7 DESCRIPTION

### 905.7.1 CONTROLS AND INDICATORS

#### Front Panel



#### Display

The display shows the operating mode of the transponder, the reported pressure altitude, and the current squawk code and Flight ID. The reply indicator is active when the transponder replies to interrogations.

The pressure altitude is displayed as a Flight Level, which is the pressure altitude in hundreds of feet. When non-standard atmospheric conditions apply, this may not match the altimeter indicated altitude, but will be correctly displayed by the ATC radar.

#### Mode Selector Knob

The left hand knob controls the power to the transponder and the operating mode.

- OFF Power is removed from the transponder.
- SBY The transponder is on, but will not reply to any interrogations.
- GND The transponder will respond to Mode S ground interrogations from surface movement radar.
- ON The transponder will respond to all interrogations, but altitude reporting is suppressed.
- ALT The transponder will respond to all interrogations.

When airborne, the transponder should always be set to ALT unless otherwise directed by Air Traffic Control. When you are taxiing on the ground, the transponder should be set to GND mode. If your installation includes a squat switch or is configured with an automatic air/ground system it will switch automatically and you do not need to manually select the GND position.

## Push Buttons

- IDT** Press the IDT button when ATC instructs you to "Ident" or "Squawk Ident". This activates the SPI pulse in the transponder replies for 18 seconds. IDT will appear in the display.
- FN** Pressing the FUNC button provides access to changing the Flight ID and the ADS-B position monitor (depending on installation) and display brightness control.
- VFR** Pressing the VFR button sets the transponder to the pre-programmed conspicuity code. Pressing the button again restores the previous squawk code.
- ENT** The ENT button enters a digit in the code selector.

## Code Selector Knob

The right hand knob is used to set squawk codes and the Flight ID. The FN button selects which will be updated. Turning the knob will highlight the first digit on the display, and the digit can be changed as required. Press the ENT button to advance to the next digit. When ENT is pressed on the last digit, the new squawk code or Flight ID will replace the previous value. If the code entry is not completed within 7 seconds, the changes are ignored and the previous code restored.

- 1200 VFR code in the USA
- 7000 VFR code commonly used in Europe.
- 7500 Hijack code
- 7600 Loss of communications
- 7700 Emergency code

The Flight ID should correspond to the aircraft call sign entered on your flight plan. If no flight plan is active, the aircraft registration should be used as your Flight ID. Use only letters and digits. If the Flight ID is less than 8 characters long, entering a blank character will end it.

### 905.7.2 ALTITUDE ENCODER WARM UP

The built in altitude encoder uses a sensor that is temperature dependent. A small internal heater circuit keeps the sensor at the correct temperature. When the ambient temperature is below 0 °C there may be a delay between switching on the transponder and seeing an altitude reported. In very cold weather this delay can be several minutes. You should always switch on the transponder (usually to GND mode) before taxiing to the runway, to ensure that the sensor is operating before you become airborne.

### 905.7.3 GENERAL LOW TEMPERATURE OPERATION

The transponder is certified to operate correctly down to -25 °C, but at low temperatures the display may be impaired. On a cold day you may need to wait for the cockpit to warm up to ensure normal operation.

### 905.7.4 ADS-B MONITOR

The ADS-B Monitor is only available on installations that include an ADS-B position source. The ADS-B Monitor provides a display of the position information that is being transmitted in ADS-B position reports. This can provide confirmation that the correct information is being transmitted, particularly where the GPS source is remote from the transponder.

In the event that valid position information is NOT available from the GPS, the latitude and longitude display will be replaced by dashes; if no valid latitude and longitude is shown then ADS-B position information is NOT being transmitted.

Loss of ADS-B position information will also result in a WARNING message being displayed.

#### 905.7.5 DISPLAY BRIGHTNESS CONTROL

Pressing the FN button will allow access to change the display brightness. A bar will appear on the display with the title "Brightness" above the bar. Rotate the Code Knob to select the desired brightness level. Press FN to save the setting and return to the Squawk code display.

#### 905.7.6 WARNING MESSAGES

If the transponder detects a problem, the screen will indicate WARNING and a brief statement of the problem. Depending on the nature of the problem, your transponder may not be replying to interrogations. Note the message on the screen and pass that information to your avionics maintenance organisation. Press ENT to clear the message; if the fault is still present the message will reappear.

#### 905.7.7 FAULT ANNUNCIATION

If the transponder detects a catastrophic internal failure, the screen will indicate FAULT and a brief statement of the problem. No replies will be made to interrogations when a fault has been detected.

Some FAULT indications can be recovered by switching the transponder off and back on again, although in all cases a FAULT code implies that there is a fault with the transponder or the installation. Note the FAULT message at the bottom of the screen and pass that information to your avionics maintenance organization.

Information Module

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## SECTION 906

### ACCELEROMETER TL-3424\_EXT

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Information Manual

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## 906 ACCELEROMETER TL-3424\_EXT

### 906.1 GENERAL

The TL-3424\_EXT accelerometer can be installed as an option in the 330SX. It is used in a special password protected configuration. This configuration helps the pilot to operate the aircraft within limits and allows supervising the operation by the aircraft manufacturer or e.g. an air race jury.

In detail the TL-3424\_EXT accelerometer allows:

1. displaying current acceleration values,
2. displaying the minimum and maximum acceleration,
3. recording of all acceleration and speed values into the long-term memory,
4. recording of any exceedance of limits,
5. storing marks in the long-term memory,
6. warning the pilot before reaching load limits by a sound to hear on the head set,
7. indicating to the pilot, when he has exceeded a load or speed limit by a sound on the head set and the G/V LIMITS WARNING LIGHT and
8. transferring recorded data to a computer.

### 906.2 LIMITATIONS

Markings and Placards:

**G/V LIMITS  
WARNING  
LIGHT**

next to the red warning light.

### 906.3 EMERGENCY PROCEDURES

Not affected.

### 906.4 NORMAL PROCEDURES

Not affected.

### 906.5 PERFORMANCE

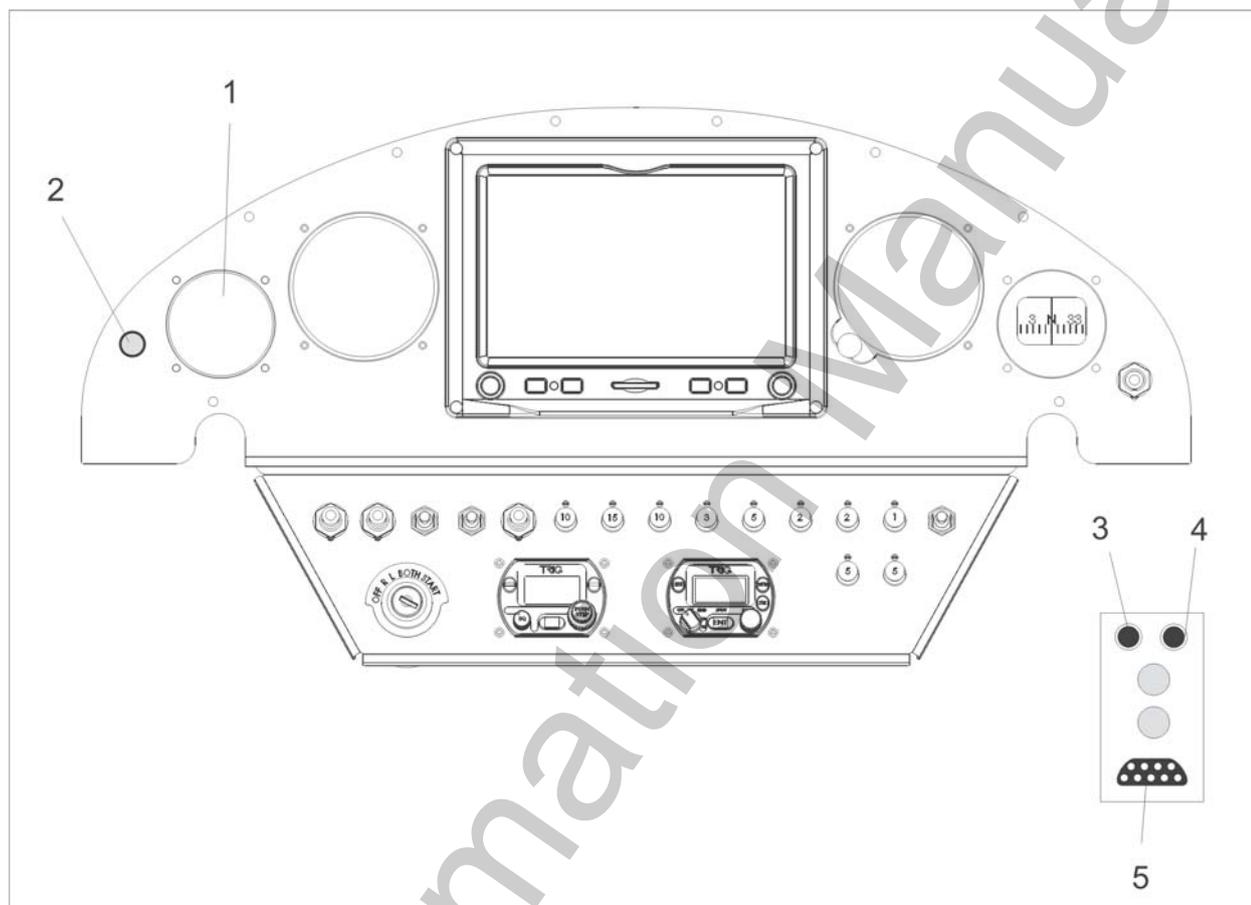
Not affected.

## 906.6 WEIGHT AND BALANCE

Refer to the Equipment List in Section 6 of this Handbook.

## 906.7 DESCRIPTION

The complete installation consists of:



- 1 TL-3424\_EXT Accelerometer
- 2 G/V LIMITS WARNING LIGHT
- 3 USER BUTTON
- 4 CONTROL AND MARKER BUTTON
- 5 RS-232c (D-SUB 9 pins [female])

The TL-3424\_EXT is complete weight acceleration management. The instrument incorporates a high-precision sensor for measuring acceleration in the vertical axis. The instrument also incorporates a sensor connected to the Pitot/static-system for measuring the indicated airspeed.

It is possible to download the measured values from the instrument via the serial cable RS-232c into a PC.

Pressing the Control and Marker Button enters marks into the memory records and enables the user manual control of the memory recording.

The TL-3424\_EXT checks all measured values at two levels - for a warning and an alarm limit signalization. If the measured values are above the warning limit and below the alarm limit an intermitted sound is heard on the head set and the G/V LIMIT WARNING LIGHT flashes. If the measured value exceeds the alarm limit a continuous sound is heard on the head set and the G/V LIMIT WARNING LIGHT illuminates continuously.

When the alarm warning has been activated, the instrument will display a service message after the next turn-on of the instrument to inform the user of the exceeded acceleration.

The USER BUTTON is programmed in the main set-up to display the minimum and maximum acceleration overview.

## MEMORY

The following memory types are included in the TL-3424\_EXT:

- 1.) A long-term memory storing the last recorded ~30 minutes (20,000 lines, entries every 0.1 seconds).
- 2.) A „Scheck“-Report storing all cases of limit exceedance and the values in the immediate vicinity of this event (160 lines per case).
- 3.) A Line Report storing the last 64 values of limit exceedance (acceleration and speed).

A rolling type memory is used. This means, that in case the available memory capacity is exceeded, the oldest memory lines will be overwritten.

## PRESETTINGS

The following values or definitions are preset in the special configuration of the TL-3424\_EXT:

WARNING MAX	+9.5 g
WARNING MIN	-9.5 g
ALARM MAX	+10.1 g
ALARM MIN	-10.1 g
SPEED LIMIT	220 KIAS
Record begins at	50 KIAS
LANGUAGE	English

SAMPLE RATE	0.1
USER BUTTON	Pressing the button shows the minimum and maximum acceleration on the display or turns out the G & V LIMITS WARNING LIGHT when lit.
CONTROL AND MARKER BUTN.	Pressing the button enters marks into the memory records

## SYMBOLS

The following symbols are used in the TL-3424\_EXT display.

Display Symbol	Meaning
▷	recording to memory
	Recording paused
ACC	Acceleration values indicated
up/down arrows	storing expected, release buttons when setting arrows vanish

## CONTROLLING THE INSTRUMENT VIA NAV-MENU

There are black labels on the display. Each is affiliated to the left and the right button. The left label is for the Left button. The right label is for the Right button. Before pressing a button, read the information on the label. Its functions are different in every menu.

To store a value into the memory, press both buttons simultaneously. Release buttons when the setting arrows vanish.

## SETTING THE DISPLAY BRIGHTNESS

Press and hold both buttons while switching on the TL 3424 to enter the setup.

Follow the menu navigation.

## SETTING A MARKER

When recording is indicated by the ▷ symbol press the CONTROL AND MARKER BUTTON to create an entry in the long-term memory.

The message „MARKER # HAS BEEN STORED“ is displayed for one second.

## SECTION 907

### EXTERNAL POWER

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Information Manual

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## 907 EXTERNAL POWER

### 907.1 GENERAL

The EXTRA 330SX can be equipped with an external power receptacle system (Piper Type socket). This system provides the capability to start the engine independent of the board battery and further allows feeding the electrical system for longer periods.

### 907.2 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 the following placard has to be attached next to the receptacle:

**EXTERNAL POWER 12 V**

For protection of the electrical connection cable against overheating the following placard has to be attached in the cockpit:

**EXTERNAL POWER 12 V  
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.**

## 907.3 EMERGENCY PROCEDURES

Not affected.

## 907.4 NORMAL PROCEDURES

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

1. Ensure pre-flight inspection completed.
2. Set propeller governor control to "High RPM" position.
3. Open throttle approximately 1/4 travel.
4. BATTERY switch "OFF"
5. ALTERNATOR switch „OFF“
6. BACKUP BATTERY Switch "ON"

### NOTICE

Risk of damage of electrical system due to reversion of polarity!  
Check correct polarity before connecting the power plug to the receptacle.

7. Connect the external power plug to the aircraft external power receptacle.
8. Check engine indicating to be operative
9. Turn boost pump "ON".
10. 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".
11. Turn boost pump "OFF".
12. Apply the brakes.

### DANGER

Propeller strike possible.

Do not allow any person to stay close to the propeller area!

### NOTICE

Risk of damage due to propeller strike or air stream.  
Remove any objects from the propeller operating area!  
Ensure canopy is closed and locked!

13. Start Engine.

14. When engine fires release the ignition switch back to "BOTH".
15. Move mixture control slowly and smoothly to "FULL RICH".
16. Check the oil pressure gauge. If minimum oil pressure is not indicated within 30 seconds, shut off the engine and determine trouble.
17. BATTERY switch "ON".
18. Disconnect the external power plug from the aircraft receptacle.

## 907.5 PERFORMANCE

Not affected.

## 907.6 WEIGHT AND BALANCE

Refer to the Equipment List in Section 6 of this Handbook.

## 907.7 DESCRIPTION OF THE SYSTEM

The external power receptacle with its spring-loaded door is attached left under the seat and reachable from outside. It is directly connected to the aircraft electrical system and does not feature an inverse-polarity protection (refer to Fig. 7-4). So it is advisable to check correct polarity of the external power plug.

During the engine start, the BATTERY switch has to be switched to "OFF" -position for the disconnection of the battery from the aircraft electric circuit.

## 907.8 HANDLING, SERVICING AND MAINTENANCE

Not affected.

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SECTION 908  
KANNAD 406 AF COM

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## 908.1 GENERAL

To improve the passive security, the EXTRA 330SX can be equipped with an optional Emergency Locator Transmitter KANNAD AF 406 COMPACT or INTEGRA ELT.

In the event of a crash, the AF 406 activates automatically (automatic fixed „AF“ configuration), and transmits the standard swept tone on 121.5 MHz lasting until the battery is depleted. This 121.5 MHz signal is mainly used to pinpoint the beacon during search and rescue operations. In addition, for the first 24 hours of operation, a 406 MHz signal is transmitted at 50-second intervals. This transmission lasts 440 ms and contains identification data programmed into the beacon and is received by Cospas-Sarsat satellites. The transmitted data is referenced in a database (maintained by the national authority responsible for ELT registration) and used to identify the beacon and owner.

When the ELT is activated, the panel LED pulses periodically. The time between pulses lengthens after a predetermined transmitter 'on' time.

## ACCURACY

Doppler positioning is employed using both 121.5 MHz and 406 MHz signals. Position accuracy of the 121.5 MHz signal is within an area of approximately 15-20 km radius about the transmitter. Due to the better integrity of the 406 MHz signal, its location accuracy is within about a 3 km radius.

## 908.2 LIMITATIONS

The operation limitations of the aircraft are not affected by the installation of the KANNAD AF 406 COMPACT or INTEGRA ELT.

For the operation of the transmitter the following placard is on the front face of the remote switch:



(on the ELT remote switch)

## 908.3 EMERGENCY PROCEDURES

Although the ELT will be activated automatically after an aircraft accident or forced landing with high G-force:

- When expecting a forced landing switch the remote switch in the instrument panel to the "ON" position prior to touch down.

After sighting rescue aircraft:

- Switch the remote switch to the "ARM" position to prevent radio interference.
- Attempt contact with rescue aircraft with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, switch the remote switch to the "ON" position immediately.

If the function of the remote switch is in doubt proceed as follows:

- Use the master switch at the ELT unit analogously.

### FUNCTION CHECK OF THE ELT

- If the aircraft receiver is operable, check ELT function by listening on 121.5 MHz for ELT transmission. Ensure that the ELT antenna is clear of any obstructions.

## 908.4 NORMAL PROCEDURES

It is recommended by the manufacturer to test the ELT to detect any possible failures.

An operational check must be performed regularly by a pilot or maintenance personnel from the cockpit (Remote Control Panel). It is recommended to perform a self-test once a month but it **should not be done more than once a week**.

Each self-test consumes energy from the battery. Should self-tests be carried out more often than the maximum allowed, the battery life-time might be shorter than specified.

### SELF-TEST PROCEDURE

- Testing shall only be done in the first 5 minutes after any hour.
- Check that the antenna is correctly connected. Do not perform self-test without antenna connected.
- Tune aircraft radio to 121.5 MHz and adjust volume to ensure you can hear it.
- Switch from position „OFF“ to position „ARM“ or press RESET & TEST on the Remote Control Panel (ensure that the ELT switch is in position „ARM“).

Close to the end of the self-test a short (3-4 sweeps) 121.5 transmission is made.

- Confirm this on the aircraft radio.
- After a few seconds, the test result is displayed with the red visual indicator:
- One long flash indicates that the system is operational and that no error conditions were found.
- A series of short flashes indicates the test has failed.

Remark: The number of flashes gives an indication of the faulty parameter detected during the self-test.

Flashes	Meaning
3 + 1	Low Battery Voltage
3 + 2	Low RF Power
3 + 3	Faulty VCO Locking (Faulty Frequency)
3 + 4	No Identification Programmed

If self-test fails, contact the distributor as soon as possible. Unless a waiver is granted, flight should be cancelled.

## 908.5 PERFORMANCE

Not affected.

## 908.6 WEIGHT & CENTER OF GRAVITY

Refer to the equipment list in Section 6 of this Handbook.

## 908.7 SYSTEM DESCRIPTION

The ELT installation consists of

- the ELT unit fastened to the fuselage structure on the right-hand side behind the pilot's seat,
- an antenna located on the main fuselage cover behind the cockpit, and
- a remote switch with a red visual indicator (LED) located on the instrument panel.

The remote switch has the positions 'ON', 'ARMED' and 'RESET/TEST'. The switch on the ELT unit has the positions 'ARM', 'OFF' and 'ON'.

## 908.7.1 SWITCH OPERATION

In a crash, an acceleration activated crash sensor (G-switch) turns the ELT 'on' automatically. Activation is also accomplished by switching the cockpit mounted remote switch or the switch on the ELT to the 'ON' position. To deactivate the ELT switch the switch on the ELT unit to the 'OFF' position.

### NOTE

**With remote switch disconnected or during transport the ELT can still be manually activated using the local switch on the front of the ELT. Care should be taken when transporting or shipping the ELT not to move the switch or allow packing material to become lodged such as to toggle the switch.**

It is possible to stop the ELT in case of unintentional activation:

- Switch to 'OFF'.

Regulations state that no transmission must be interrupted unless all means are used to contact and inform the Air Traffic Controller of this action.

### NOTE

**As 406 MHz transmission is effective 50 seconds after the ELT activation, if it is switched off within this delay, no further radio contact will be necessary.**

## 908.8 HANDLING, SERVICING AND MAINTENANCE

Refer to the following applicable manufacturer instructions for further detailed information or when working on the Kannad 406 AF ELT:

- Installation and Operation Manual 406 AF-COMPACT ELT (P/N: DOC08038E Rev. 05)
- Initial Installation Manual 406 AF-INTEGRA ELT (P/N: DOC09081C Rev. 06)
- Operation Manual 406 AF-INTEGRA ELT (P/N: DOC09078C Rev. 06)
- SL-S18XX501-25-01-Rev01 Guidelines for Periodic Inspection

Manufacturer:

Kannad Aviation (McMurdo Group)  
Orolia SAS  
Z.I. des 5 Chemins BP 23  
56520 Guidel (F)

### 908.8.1 PERIODIC INSPECTION

Depending if the ELT is opened or not, PART 145 or FAR 145 (or equivalent) may be required. Refer to local regulations.

## 908.8.2 BATTERY REPLACEMENT

Carried out by an accredited PART 145 or FAR 145 (or equivalent) maintenance station.

### BATTERY REPLACEMENT REQUIREMENTS

Battery replacement is mandatory:

- after more than 1 hour of real transmission (cumulated duration);
- before or on the battery expiration date;
- after use in an emergency;
- after an inadvertent activation of unknown duration.

Only an original and approved battery pack included in battery KIT BAT200 (P/N S1840510-01) supplied by KANNAD must be installed. [SAFT-FRIWO, Lithium Manganese Dioxide, 2 x M20 (D-type) cells]

KANNAD refuses all responsibility and invalidates all warranty should other packs be installed.

Battery packs or KITS are available from any KANNAD distributor or dealer.

A list of distributors is available on <https://aviationpartners.rolia.com/>

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## SECTION 911

### DIGITAL ACCELEROMETER LX G-meter 57

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### 911.1 GENERAL

The LX G-meter 57 digital accelerometer from the manufacturer LX navigation can be installed as an option in the 330SX. It is a standalone unit designed to measure and indicate g-forces up to  $\pm 16g$  and is used in the basic 57 mm configuration. This instrument helps the pilot to operate the aircraft within limits.

In detail, the LX G-meter 57 allows:

1. displaying current acceleration values,
2. displaying the peak minimum and maximum acceleration,

### 911.2 LIMITATIONS

Not affected.

### 911.3 EMERGENCY PROCEDURES

Not affected.

### 911.4 NORMAL PROCEDURES

Not affected.

### 911.5 PERFORMANCE

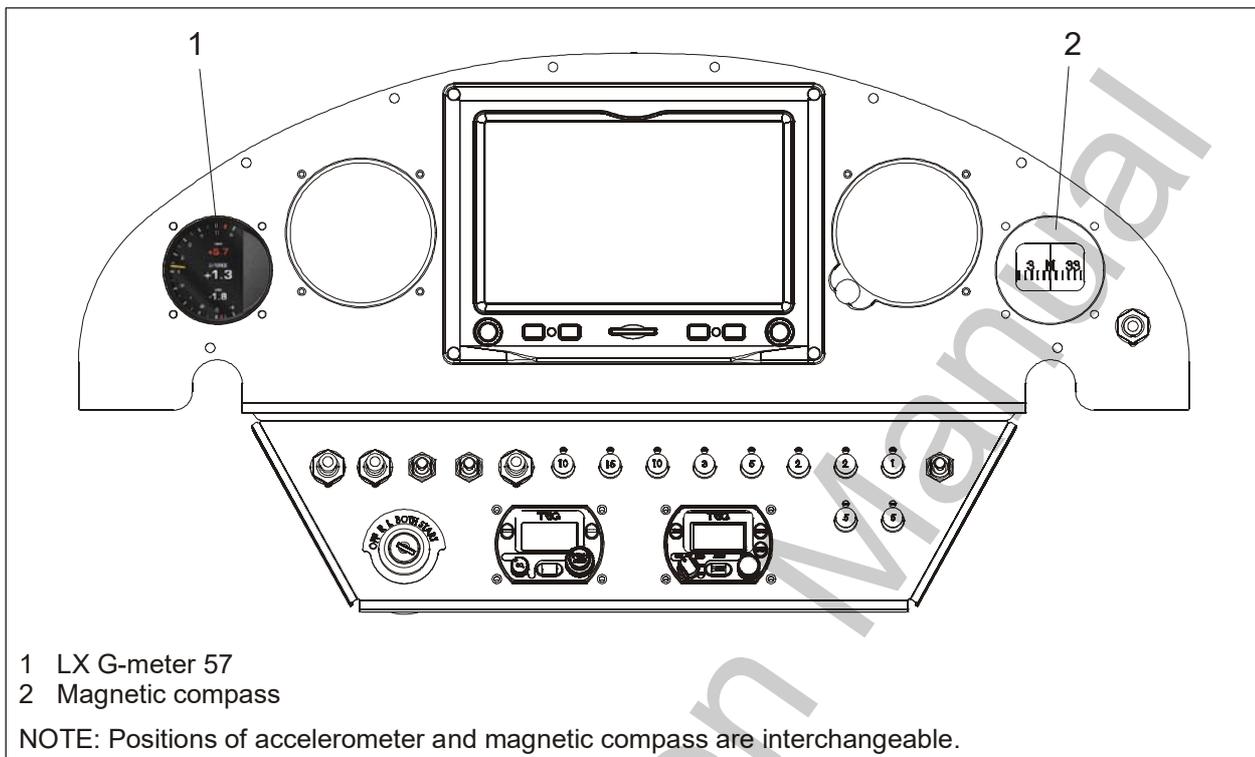
Not affected.

### 911.6 WEIGHT & BALANCE

Refer to the equipment list in Section 6 of this Handbook.

## 911.7 DESCRIPTION

The following Figure shows one of two possible installations:



The unit has an integrated inertial measurement system. The sensors are sampled more than 100 times per second. Real Time Data is displayed on a QVGA 320 x 240 pixel 2.5-inch high brightness color display. The unit also features an ambient light sensor to automatically adjust display brightness. To adjust values and settings the LX G-meter 57 has three push buttons.

Firmware updates of the unit are accomplished via Micro SD card.

Features of the LX G-meter 57 include:

- An extremely bright 2.5" QVGA color display readable in all sunlight conditions with the ability to adjust the backlight
- 320 x 240 pixels color screen for additional information such as minimum and maximum g-force
- Three push buttons are used for input:  
(Central push button for mode change and confirmation so as up and down push buttons)
- G-force up to  $\pm 16$  G
- 100 Hz sampling rate for very fast response.

The LX G-meter 57 has two operating modes: Main mode and Setup mode:

- Main mode: Shows g-force scale, with peak maximum and minimum value; quick access sub-menu
- Setup mode: For all aspects of the setup of the LX G-meter 57

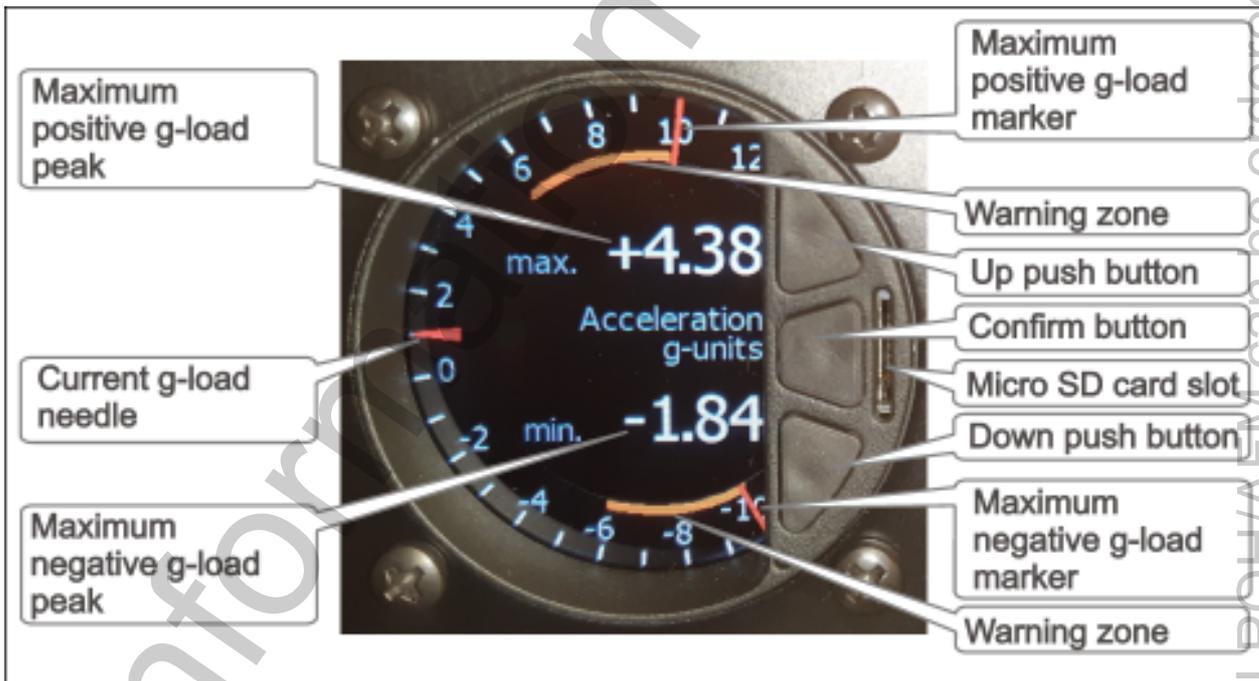
**Main Mode**



**Setup Mode**



### 911.7.1 Main Mode



### QUICK ACCESS MENU

To enter the quick access menu, press the up or down push button. Within the quick access menu, the displayed peak positive and negative g-load values can be reset or night mode can be activated.

**911.7.2 Setup Mode**

Used to configure the unit. The unit will be preset to aircraft specific values upon delivery as follows:

Parameter	Set to
<b>Indicator:</b>	
Needle range	12g
Filter value	Medium
Red cursor style	Medium thickness (small arrow)
Colour style – Gauge : Inner	Black : Black
<b>Display</b>	
Brightness	50%
Automatic brightness	Enabled
Minimum brightness (for automatic adjustment)	50%
Maximum brightness (for automatic adjustment)	100%
Get brighter in (time delay for auto adjustment)	3s
Get darker in (time delay for auto adjustment)	30s
Night mode brightness	40%
<b>Hardware – Limits</b>	
Min red zone limit	- 10 g
Max red zone limit	+10 g
Warning zone min – start	- 6 g
Warning zone min – end	- 10 g
Warning zone max – start	+ 6 g
Warning zone max – end	+10g

**NOTE**

The „Hardware – Limits“ may not be changed under any circumstances!

## SECTION 913

### GARMIN GTX 45R Transponder

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## 913.1 GENERAL

The GARMIN GTX 45R is a remote mounted Mode S (ES) transponder with ADS-B out and in functionality and an internal GPS SBAS position receiver. This transponder is controlled via the Garmin G3X Touch unit.

The GTX 45R performs the following functions:

### Transmission of ADS-B out data on 1090 extended squitter (1090ES) (1090 MHz)

- Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
  - GPS Position, Altitude, and Position Integrity
  - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
  - Air Ground Status
  - Flight ID, Call Sign, ICAO Registration Number
  - Capability and Status Information
  - Transponder Squawk Code, IDENT, and Emergency Status

### Reception of ADS-B In data on 1090 MHz

- ADS-B (Data directly from another transmitting aircraft)
- ADS-R (Rebroadcast of ADS-B data from a ground station)

### Reception of ADS-B In data on UAT (978 MHz)

- ADS-B (Data directly from another transmitting aircraft)
- ADS-R (Rebroadcast of ADS-B data from a ground station)
- TIS-B (Broadcast of secondary surveillance radar) (SSR) derived traffic information from a ground station.
- FIS-B (Broadcast of aviation data from a ground station)

### Provide ADS-B traffic information and alerting to the pilot via the Garmin G3X Touch display

- Correlation and consolidation of traffic data from multiple traffic sources
- Aural and visual traffic alerting

## Provide FIS-B data to the pilot via the G3X Touch display

- Graphical and textual weather products
  - NOTAM
  - CONUSNEXRAD
  - PIREPs
  - AIRMET/SIGMETs
  - METARs
  - TAFs
  - Winds/Temps Aloft
- Aviation Data
  - TFRs
  - NOTAMs

### 913.1.1 CAPABILITIES

The Garmin GTX 45R as installed in this aircraft has been shown to meet the equipment requirements of 14 CFR 91.227 when operating in accordance with sections 913.2.1 and 913.2.2 of this supplement.

### 913.1.2 INSTALLATION CONFIGURATION

The GTX 45R features an internal WAAS GPS receiver. The GPS information is also forwarded to the Garmin G3X Touch system. The GTX 45R is remotely controlled over the G3X Touch display. The ADAHRS (GSU 25) of the G3X Touch system supplies the GTX 45R with pressure altitude information.

### 913.1.3 DEFINITIONS

The following terminology is used within this document:

ADS-B	Automatic Dependent Surveillance-Broadcast
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
ATCRBS	Air Traffic Control Radar Beacon System
CFR	Code of Federal Regulations
ELS	Elementary Surveillance
ES	Extended Squitter
GNS	Garmin Navigation System
GPS	Global Positioning System
GTX	Garmin Transponder
ICAO	International Civil Aviation Organization
PABI	Pressure Altitude Broadcast Inhibit

PED	Portable Electronic Device
POH	Pilot's Operating Handbook
SBAS	Satellite-Based Augmentation System
SW	Software
TIS	Traffic Information Service
TX	Transmit

## 913.2 LIMITATIONS

### 913.2.1 MINIMUM EQUIPMENT

The GTX 45R must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Interfaced Equipment	Number required	Number installed
Uncorrected Pressure Altitude Source	1	1
GPS SBAS Position Source INTERNAL!	1	1
Remote Control Display	1	1

### 913.2.2 ADS-B OUT

The GTX 45R only complies with 14 CFR 91.227 for ADS-B Out when all required functions are operational. When the system is not operational, ADS-B Out transmit failure messages will be present on the Garmin G3X Touch display.

### 913.2.4 APPLICABLE SYSTEM SOFTWARE

This AFMS/AFM is applicable to the software versions shown in the following table.

Software Item	Software Version
GTX 45R Main SW Version	2.90 (or later approved versions)

### 913.2.5 PRESSURE ALTITUDE BROADCAST INHIBIT (PABI)

Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control while operating within airspace requiring an ADS-B Out compliant transmitter per 14 CFR 91.227. PABI is enabled by selecting the GTX to ON mode.

## 913.2.6 PORTABLE ELECTRONIC DEVICES

This POH Supplement does not relieve the operator from complying with the requirements of 91.21 or any other operational regulation regarding portable electronic devices.

The Connex interface and data provided by the GTX to a PED, if configured, is not approved to replace required aircraft equipment. The data presented on the PED may not have the required integrity to be used as the sole source of information to base tactical or strategic decision making. Use of the Connex interface during critical phases of flight by the pilot flying is prohibited.

## 913.3 EMERGENCY PROCEDURES

### 913.3.1 ABNORMAL PROCEDURES

#### Loss of Aircraft Electrical Power Generation

- > XPDR Circuit Breaker PULL  
Transponder, GPS SBAS position source and ADS-B Out functions will no longer be available.

**NOTE**

**This guidance is supplementary to any guidance provided in Section 3 of this POH for loss of power generation.**

#### Loss of GPS/SBAS Position Data

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GTX will no longer be transmitting ADS-B Out data.

Reference Display Device documentation for applicable annunciation:

- > G3X Touch display VERIFY VALID POSITION

## 913.4 NORMAL PROCEDURES

The Garmin G3X™ Touch Pilot's Guide (Doc. N°. 190-01754-00, latest rev.) will provide additional transponder operating information.

ADS-B Out functionality resides within the GTX transponder. The Garmin G3X Touch system is the single point of entry for Mode 3/A code, Flight ID, IDENT functionality and activating or deactivating emergency status for both transponder and ADS-B Out functions.

### 913.4.1 UNIT POWER ON

- > G3X Touch system ON
- > "ADS-B is not transmitting position" annunciation CONSIDERED

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**NOTE**

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The "ADS-B is not transmitting position" Annunciation may illuminate on the G3X Touch Display as the GTX unit powers on and begins to receive input from external systems, and receives enough GPS satellite signals to compute a valid SBAS position source.

## 913.4.2 BEFORE TAKEOFF

- > "ADS-B is not transmitting position" annunciation      EXTINGUISHED
- > GTX Mode      ALT

---

**NOTE**

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The G3X Touch unit must be turned on and the "ADS-B is not transmitting position" Annunciation must be EXTINGUISHED for the system to meet the requirements specified in 14 CFR 91.227.

This system must be operational in certain airspaces after January 1, 2020 as specified by 14 CFR 91.225.

## 913.5 PERFORMANCE

No change.

## 913.6 WEIGHT AND BALANCE

See current weight and balance data.

## 913.7 SYSTEM DESCRIPTION

Pilot's Guides for interfaced displays, part numbers and revisions listed below, provide additional operating information for the Garmin GTX 45R.

Title	Part number	Revision
Garmin G3X Touch Pilot's Guide	190-01754-00	Rev. Z ( or later)

Information Manual

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The official POH/AFM can be ordered at [Parts@ExtraAircraft.com](mailto:Parts@ExtraAircraft.com)

## SECTION 914

### GARMIN GTR 205xR Remote COM Radio

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## 914.1 GENERAL

The GTR 205xR Remote COM Radio series provides a powerful VHF communications transceiver controlled by the Communication/Navigation/Surveillance (CNS) System of the GARMIN G3X TOUCH (Find more information in the GARMIN G3X TOUCH Pilot's Guide).

In addition to the traditional COM features, the GTR 205xR series incorporates workload-reducing functions. Advanced auto squelch automatically senses the noise level in the cockpit and adjusts the mic squelch. G3X Touch interface allows access to emergency frequency tuning, saved frequencies list, music mute or push-to-talk.

The GTR 205xR (10 watt) COM radio operates in the aviation voice band, from 118.000 to 136.975 MHz, in 25 kHz or 8.33 kHz steps.

## 914.2 LIMITATIONS

Not affected.

## 914.3 EMERGENCY PROCEDURES

Not affected.

## 914.4 NORMAL PROCEDURES

### 914.4.1 COM WINDOW



### Displaying the COM Window:

-> Touch the **STBY** COM button on the CNS Data Bar.

Or:

-> From the Main Menu, touch **COM Radio**.

### Manually Tuning a COM Frequency:

-> Touch **STBY** on CNS Data Bar.

-> Enter the frequency using the keypad and touch **Enter**.

### Adjusting COM Volume:

-> Touch **STBY** on CNS Data Bar.

-> Touch **Volume**.

-> Touch the slider to adjust the percentage.

### Monitoring the Standby COM:

-> Touch **STBY** on CNS Data Bar.

-> Touch **Monitor**. A green 'M' is displayed in the Standby Field. Repeating steps 1 and 2 will stop monitoring the frequency.

### Transferring Standby to Active:

-> From the CNS Data Bar, touch the **COM** frequency field.

Or:

-> Press the **STBY** on the CNS Data Bar.

-> Touch **XFER**.

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#### 914.4.2 COM RADIO VOLUME SHORTCUT

The Data Bar Setup page can enable a COM Radio Volume Shortcut panel that appears while a COM panel is active. This shortcut panel displays touchscreen controls for volume and toggle on/off squelch for the currently displayed COM radio. The shortcut panel appears at the bottom of the PFD.



#### 914.4.3 COM FREQUENCY FINDING

The frequency finding feature allows the pilot to quickly select any displayed database COM frequency as the standby frequency.

##### Using COM Frequency Finding:

- > Touch COM STBY on CNS Data Bar.
- > Touch Find.
- > Touch the Recent, Nearest Airports, or Flight Plan Tab.
- > Touch the frequency or touch Select Frequency... for a list of available frequencies.

Or:

- > Touch Select an Airport.
- > Enter the four letter ICAO identifier for the desired airport.
- > Touch the frequency.

Or:

- > Touch COM STBY on CNS Data Bar.
- > Touch Find.
- > Touch the User Tab.
- > Touch the frequency or touch Select Frequency... for a list of available frequencies.

## 914.4.4 AUTOMATIC SQUELCH

Automatic Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. To disable Automatic Squelch, touch STBY > Squelch. When Automatic Squelch is disabled, COM audio reception is always on. Continuous static noise may be heard over the headsets and speaker, if selected. Touching STBY > Squelch again enables Automatic Squelch.

When Automatic Squelch is disabled, the COM frequency and the Squelch on the COM tuning page is highlighted green.

## 914.5 PERFORMANCE

Not affected.

## 914.6 WEIGHT AND BALANCE

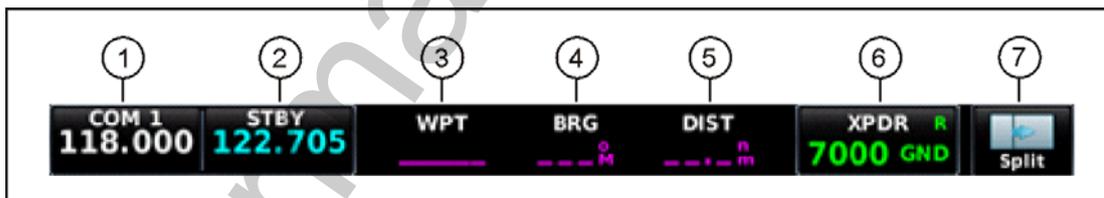
See current weight and balance data.

## 914.7 SYSTEM DESCRIPTION

### 914.7.1 PILOT INTERFACE

The G3X CNS system provides the pilot interface and includes the audio interface, communication radios, and Mode S transponder. These functions can be accessed from the Main Menu and from the buttons that make up the CNS Data Bar located at the top of the PFD.

#### CNS Data Bar



1	<b>COM button</b> Transfers the standby and active COM frequencies.	6	<b>XPDR button</b> Displays/removes the Transponder Page.
2	<b>STBY button</b> Displays/removes the COM Standby Page. The COM Standby Page is used to enter and transfer COM frequencies.	7	<b>Split button</b> Opens/closes the split screen
3 - 5	<b>WPT BRG DIST</b> Waypoint, bearing and distance annunciation only		

## 914.7.2 COM ANNUNCIATIONS

An active COM frequency displayed in green indicates the COM transceiver is selected.

### TX/RX

When receiving a transmission, 'RX' is displayed on the COM button. 'TX' is also displayed on the COM button while transmitting.



### SQ

'SQ' is displayed on the COM button when automatic squelch is overridden.



### M

The frequency monitoring function allows the pilot to listen to the standby frequency while monitoring the active frequency for activity.



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The official POH/AFM can be ordered at Parts@ExtraAircraft.com

**914.7.3 COM ERROR MESSAGES ON CNS BAR**



The following COM error messages may appear in the COM Radio button on the CNS Bar:

Message	Description	Action
PILOT PTT STUCK	The Pilot Push To Talk key has been in the pressed position for at least 35 seconds. This key will now be ignored.	Verify Push To Talk key is not stuck. Refer to the installation manual for installation wiring tests. Contact Garmin for service if this message persists.
TX HARDWARE FAULT	An internal hardware problem is preventing COM transmission.	Contact Garmin for service if this message persists.
TEMP TOO HIGH	Internal temperature is too high.	Wait for unit to cool. Add supplemental cooling if problem persists.
SUPPLY VOLTAGE LOW	Supply voltage is too low.	Verify supply voltage meets minimum requirement identified in installation manual. Contact Garmin for service if message persists.

Information

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