Diamond AIRCRAFT

AIRPLANE FLIGHT MANUAL

FOR THE POWERED SAILPLANE

HK 36 TTC - ECO

Engine	**: Rotax 914 F3 or 914 F4**
Model	**: HK 36 TTC - ECO**
Serial No.	**: _____**
TC Data Sheet No.	**: ACG SF 3/82**
Doc. No.	**: 3.01.25-E**
Date of Issue	**: 1998-10-30**

Pages identified by "ACG-appr." in the List of Effective Pages are approved by:

Signature	:
Authority	:
Stamp	: AUSTRO CONTROL GmbH Abteilung Flugtechnik Zentrale A-1030 Wien, Schnirchgasse 11
Original date of approval	: 10. Juni 1998

This powered sailplane must be operated in compliance with the information and limitations contained herein.

Prior to operating the powered sailplane, the pilot must take notice of all the information contained in this Airplane Flight Manual.

This powered sailplane manual is FAA approved for U.S. registered aircraft in accordance with the provisions of 14 CFR Section 21.29, and is required by FAA Type Certificate Data Sheet No. G07CE.

DIAMOND AIRCRAFT INDUSTRIES GMBH
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PREFACE

Congratulations on your choice of the HK 36 TTC-ECO powered sailplane.

Skillful operation of the airplane will ensure your safety and provide you with hours of enjoyment. Therefore, you should take the time to get familiar with your new HK 36 TTC-ECO.

We ask you to read this manual thoroughly and to pay attention to the recommendations given in it. If you do, you can expect many hours of safe and pleasant flying with your powered sailplane.

0.1 RECORD OF REVISIONS

Any revision of the present manual, except current weighing data, must be recorded in the following table and, in the case of approved sections, endorsed by Austro Control GmbH (ACG).

The new or amended text on the revised page will be indicated by a black vertical line in the left hand margin, and the revision no. and the date will be shown on the bottom of the page.

If you have purchased a second hand HK 36 TTC-ECO, please let us know your address to enable us to supply you with the publications you need for the safe operation of the Powered Sailplane.

Rev. No.	Sec.	Pages	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
1	0	0-3, 0-4, 0-5, 0-6	2015-04-05 (MÄM 36-219, MÄM 36-225/b, MÄM 36-314/a, MÄM 36-339/b, MÄM 36-451, SB 65, SB 36-066/1, MSB 36-080, MSB 36-083/1)	Revision 1 of AFM Doc. No. 3.01.25-E is approved under the authority of DOA ref. EASA. 21J.052	22-Apr-2015		
	2	2-8, 2-9, 2-11, 2-12					
	4	4-8, 4-19, 4-24					
2	all	all except cover page	2015-05-05	Revision 2 of AFM Doc. No. 3.01.25-E is approved under the authority of DOA ref. EASA. 21J.052	26-May-2015		

0.2 LIST OF EFFECTIVE PAGES

Section	Page No.	Date
0	0-0	1998-10-30
	0-1	2015-05-05
	0-2	2015-05-05
	0-3	2015-05-05
	0-4	2015-05-05
	0-5	2015-05-05
	0-6	2015-05-05
	0-7	2015-05-05
1	1-1	2015-05-05
	1-2	2015-05-05
	1-3	2015-05-05
	1-4	2015-05-05
	1-5	2015-05-05
	1-6	2015-05-05
	1-7	2015-05-05
	1-8	2015-05-05

Section	Page No.	Date
2	2-1	2015-05-05
	ACG-appr. 2-2	2015-05-05
	ACG-appr. 2-3	2015-05-05
	ACG-appr. 2-4	2015-05-05
	ACG-appr. 2-5	2015-05-05
	ACG-appr. 2-6	2015-05-05
	ACG-appr. 2-7	2015-05-05
	ACG-appr. 2-8	2015-05-05
	ACG-appr. 2-9	2015-05-05
	ACG-appr. 2-10	2015-05-05
	ACG-appr. 2-11	2015-05-05
	ACG-appr. 2-12	2015-05-05
	ACG-appr. 2-13	2015-05-05
	ACG-appr. 2-14	2015-05-05
	ACG-appr. 2-15	2015-05-05
	ACG-appr. 2-16	2015-05-05
	ACG-appr. 2-17	2015-05-05
	ACG-appr. 2-18	2015-05-05
	ACG-appr. 2-19	2015-05-05

Section	Page No.	Date
3	3-0	2015-05-05
	ACG-appr. 3-1	2015-05-05
	ACG-appr. 3-2	2015-05-05
	ACG-appr. 3-3	2015-05-05
	ACG-appr. 3-4	2015-05-05
	ACG-appr. 3-5	2015-05-05
	ACG-appr. 3-6	2015-05-05
	ACG-appr. 3-7	2015-05-05
	ACG-appr. 3-8	2015-05-05
	ACG-appr. 3-9	2015-05-05
	ACG-appr. 3-10	2015-05-05
	ACG-appr. 3-11	2015-05-05
	ACG-appr. 3-12	2015-05-05
	ACG-appr. 3-13	2015-05-05
	ACG-appr. 3-14	2015-05-05
	ACG-appr. 3-15	2015-05-05
	ACG-appr. 3-16	2015-05-05
	ACG-appr. 3-17	2015-05-05
	ACG-appr. 3-18	2015-05-05
	ACG-appr. 3-19	2015-05-05
	ACG-appr. 3-20	2015-05-05
	ACG-appr. 3-21	2015-05-05
	ACG-appr. 3-22	2015-05-05

Section	Page No.	Date
4	4-1	2015-05-05
	ACG-appr. 4-2	2015-05-05
	ACG-appr. 4-3	2015-05-05
	ACG-appr. 4-4	2015-05-05
	ACG-appr. 4-5	2015-05-05
	ACG-appr. 4-6	2015-05-05
	ACG-appr. 4-7	2015-05-05
	ACG-appr. 4-8	2015-05-05
	ACG-appr. 4-9	2015-05-05
	ACG-appr. 4-10	2015-05-05
	ACG-appr. 4-11	2015-05-05
	ACG-appr. 4-12	2015-05-05
	ACG-appr. 4-13	2015-05-05
	ACG-appr. 4-14	2015-05-05
	ACG-appr. 4-15	2015-05-05
	ACG-appr. 4-16	2015-05-05
	ACG-appr. 4-17	2015-05-05
	ACG-appr. 4-18	2015-05-05
	ACG-appr. 4-19	2015-05-05
	ACG-appr. 4-20	2015-05-05
	ACG-appr. 4-21	2015-05-05
	ACG-appr. 4-22	2015-05-05
	ACG-appr. 4-23	2015-05-05
	ACG-appr. 4-24	2015-05-05
	ACG-appr. 4-25	2015-05-05
	ACG-appr. 4-26	2015-05-05
	ACG-appr. 4-27	2015-05-05
	ACG-appr. 4-28	2015-05-05
	ACG-appr. 4-29	2015-05-05
	ACG-appr. 4-30	2015-05-05

Section	Page No.	Date
5	5-0	2015-05-05
	ACG-appr 5-1	2015-05-05
	ACG-appr 5-2	2015-05-05
	ACG-appr 5-3	2015-05-05
	ACG-appr 5-4	2015-05-05
	ACG-appr 5-5	2015-05-05
	5-6	2015-05-05
	5-7	2015-05-05
	5-8	2015-05-05
	5-9	2015-05-05
	5-10	2015-05-05
	5-11	2015-05-05
6	6-0	2015-05-05
	6-1	2015-05-05
	6-2	2015-05-05
	6-3	2015-05-05
	6-4	2015-05-05
	6-5	2015-05-05
	6-6	2015-05-05
	6-7	2015-05-05
	6-8	2015-05-05
	6-9	2015-05-05
	6-10	2015-05-05
	6-11	2015-05-05
	6-12	2015-05-05
	6-13	2015-05-05

Section	Page No.	Date
7	7-1	2015-05-05
	7-2	2015-05-05
	7-3	2015-05-05
	7-4	2015-05-05
	7-5	2015-05-05
	7-6	2015-05-05
	7-7	2015-05-05
	7-8	2015-05-05
	7-9	2015-05-05
	7-10	2015-05-05
	7-11	2015-05-05
	7-12	2015-05-05
	7-13	2015-05-05
	7-14	2015-05-05
	7-15	2015-05-05
	7-16	2015-05-05
	7-17	2015-05-05
	7-18	2015-05-05
8	8-1	2015-05-05
	8-2	2015-05-05
	8-3	2015-05-05
9	Supplements	

0.3 TABLE OF CONTENTS

SECTION

SECTION 1
GENERAL

Page No.

1.1 INTRODUCTION

The Powered Sailplane Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the powered sailplane.

This manual includes the material required to be furnished to the pilot by JAR-22. It also contains supplementary data supplied by the powered sailplane manufacturer.

This Airplane Flight Manual conforms to the actual version of the customer's airplane. However, any optional equipment (COM, NAV, etc.) is not considered. For their operation, the operating manual of the respective manufacturer must be followed.

This manual must always be kept on board the airplane.

1.2 CERTIFICATION BASIS

The HK 36 TTC-ECO powered sailplane has been type certified by Austro Control GmbH (ACG) in accordance with JAR-22 for sailplanes and powered sailplanes, Change 5 dated 28-Oct-1995 as a derivative of the HK 36 TTC. The Type Certificate and Type Certificate Data Sheet No. SF 3/82 have been amended.

Category of Airworthiness: Utility.

1.3 WARNINGS, CAUTIONS AND NOTES

The following definitions apply to warnings, cautions and notes used in the Flight Manual.

WARNING

Means that the non-observation of the corresponding procedure leads to an immediate or important degradation of flight safety.

CAUTION

Means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of flight safety.

NOTE

Draws the attention on any special item not directly related to safety but which is important or unusual.

1.4 EXPLANATIONS

1.4.1 ABBREVIATIONS

ACG	Austro Control GmbH (Austrian Civil Aviation Authority, formerly BAZ)
AGL	Above Ground Level
CFRP	Carbon Fiber Reinforced Plastic
CG	Center of Gravity
EGT	Exhaust Gas Temperature
GFRP	Glass Fiber Reinforced Plastic
IAS	Indicated Airspeed
ISA	International Standard Atmosphere
MAC	Mean Aerodynamic Chord Length
MCP	Maximum continuous power
OAT	Outside Air Temperature
TAS	True Airspeed

1.4.2 PHYSICAL UNITS

	SI units		US units		conversions
length	[mm] [m]	millimeters meters	[in.] [ft.]	inches feet	[mm] / 25.4 = [in.] [m] / 0.3048 = [ft.]
velocity	[km/h] [m/s]	kilometers per hr. meters per second	[kts.] [mph] [fpm]	knots miles per hour feet per minute	[km/h] / 1.852 = [kts.] [km/h] / 1.609 = [mph] [m/s] * 196.85 = [fpm]
rotary speed	[min^{-1}]	revolutions per minute	[RPM]	revolutions per minute	[min^{-1}] = [RPM]
mass	[kg]	kilograms	[lbs.]	pounds	[kg] * 2.2046 = [lbs.]
force, weight	[N]	Newtons	[lbs.]	pounds	[N] * 0.2248 = [lbs.]
power	[kW] [DIN-hp.]	Kilowatts DIN-horsepowers (German horsep., non-SI unit)	[h.p.]	horse powers	[kW] * 1.36 = [DIN-hp.] [kW] * 1.341 = [h.p.]
pressure	[hPa] [mbar] [bar]	Hectopascal millibar bar	[inHg] [psi]	inches mercury column pounds per square inch	[hPa] = [mbar] [hPa] / 33.86 = [inHg] [bar] * 14.504 = [psi]
current intensity	[A]	Ampères			-
electrical charge, capacity	[Ah]	Ampère hours			-
voltage	[V]	Volts			-

1.4.3 SPECIAL TERMS

IAS = Indicated Airspeed	Airspeed read from airspeed indicator without any correction of errors
TAS = True Airspeed	IAS corrected for errors due to instrument, system, altitude and temperature
Pressure altitude	Altitude indicated by the altimeter when the subscale is adjusted to 1013.25 mbar or 1013.25 hPa (29.92 inHg)
Service ceiling	Maximum altitude that can be reached with a climb rate of at least 0.5 m/s (approximately 100 ft./min.)
Take-off roll	Distance between the start of the take-off run and the lift-off point
Take-off distance	Distance between the start of the take-off run and the point above which the airplane is able to clear a 15 m (approximately 50 ft.) obstacle
Non-lifting parts	Fuselage, rudder, horizontal tail surfaces and useful load
Useful load	Occupants, baggage and fuel

1.5 DESCRIPTIVE DATA

The HK 36 TTC-ECO is a two-seated powered sailplane of fiber composite construction, designed in compliance with JAR-22; category of airworthiness: Utility.

It is a low wing airplane with T-tail, side-by-side seating configuration, tricycle landing gear and Schempp-Hirth type air brakes in the upper surface of the wings. The two fuel tanks are integrated in the wings.

The power plant is a Rotax R 914 F engine with an mt-Propeller MTV-21-A-C-F/CF175-05 hydro-mechanically variable pitch propeller.

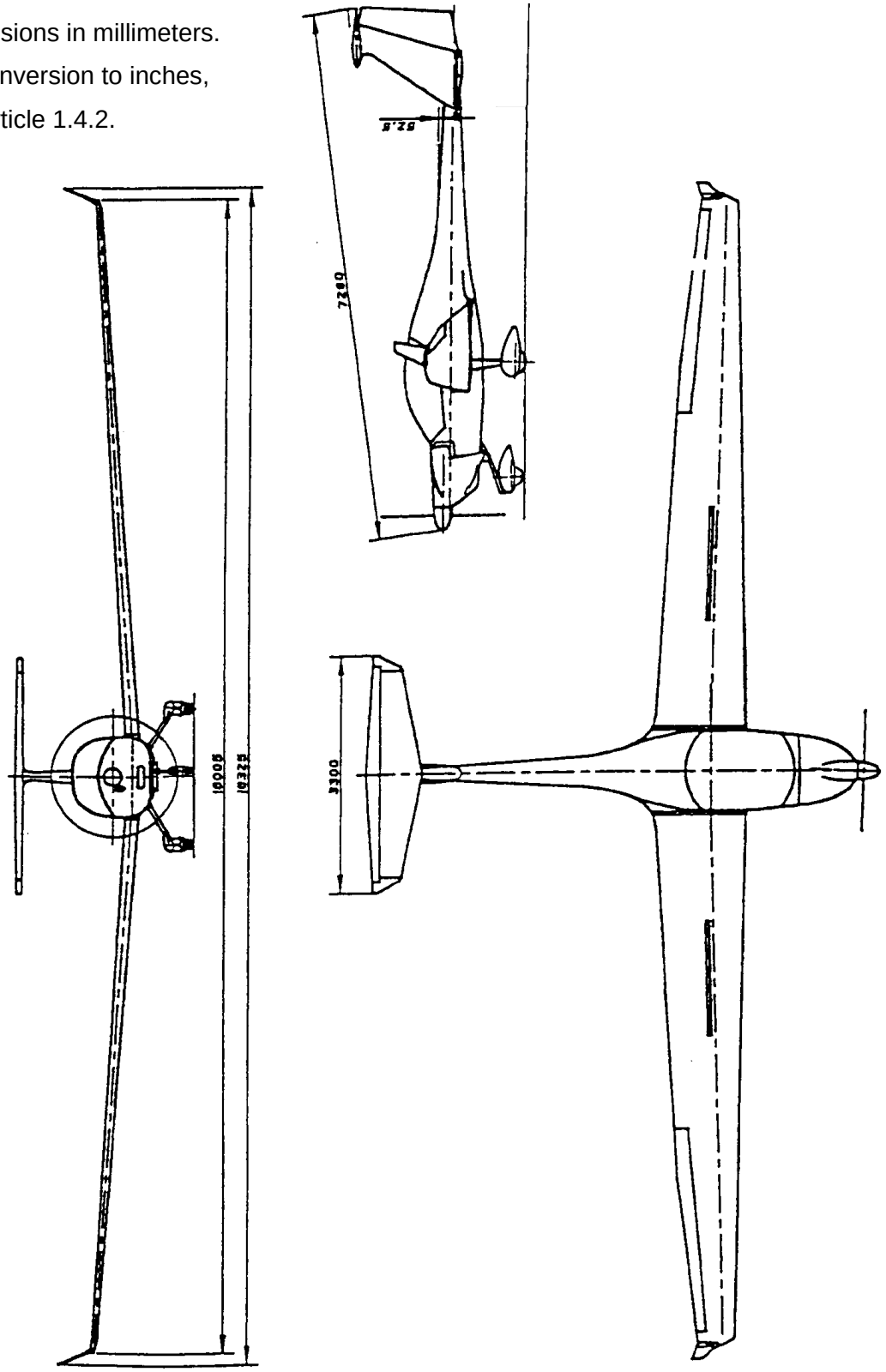
Span	with winglets	: 16.33	m	53.58	ft.
	without winglets	: 16.01	m	52.53	ft.
Length		: 7.28	m	23.88	ft.
Height		: 1.78	m	70.08	in.
MAC		: 1.004	m	39.53	in.
Wing area		: 15.30	m^2	165.7	sq.ft.
Max. wing loading		: 50.30	kg/m^2	10.30	lbs./sq.ft.
Aspect ratio		: 17.11			
Airfoil		: Wortmann FX 63-137			

1.6 THREE-VIEW DRAWING

Dimensions in millimeters.

For conversion to inches,

see Article 1.4.2.



SECTION 2
LIMITATIONS

Page No.

2.1 INTRODUCTION

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the powered sailplane, its engine, standard systems and standard equipment.

The limitations included in this section and in Section 9 have been approved by Austro Control GmbH (ACG).

WARNING

All operation values must be kept within the limits stated herein during flight.

2.2 AIRSPEED

NOTE

The airspeeds shown below must be understood as IAS.

Airspeed limitations

Airspeed limitations and their operational significance are shown below:

Airspeed		IAS			Remarks
		km/h	kts.	mph	
v_{NE}	Never exceed speed	261	141	162	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection. (Do not use more than 1/3 of the travel between position of the controls for unaccelerated flight and deflection to stop.)
v_{RA}	Rough air speed	210	113	130	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotors, thunderclouds, etc.
v_{A}	Maneuvering speed	176	95	109	Do not make full or abrupt control movements above this speed, as the powered sailplane could become overstressed by full control movement under certain conditions.
v_{ABF}	Maximum admissible speed with air brakes fixed in half extended position	150	81	93	Above this speed, the air brakes could become extended inadvertently over the half extended position by aerodynamic forces.

The WARNINGS on the following page must be complied with.

WARNING

In order to ensure the flutter safety of the airplane, the never exceed speed v_{NE} is reduced at pressure altitudes above 2000 meters or 6500 ft. (see Article 4.5.7).

WARNING

At airspeeds beyond the rough air speed v_{RA}, the airplane may become overstressed by heavy gusts (lee-wave rotors, thunderclouds, whirlwinds and turbulence at close range to mountain ridges).

WARNING

The maneuvering speed v_A stated on the previous page applies to the maximum T/O mass (max. T/O weight) of 770 kg (1698 lbs.) only. At lower flight masses, the following limits must be applied:

T/O mass	**T/O weight**	**Maneuvering speed v_A**		
kg	**lbs.**	**km/h**	**kts.**	**mph**
700	1543	168	91	104
650	1433	162	87	101
600	1323	155	84	96

WARNING

These speeds are not marked on the airspeed indicator. Simultaneous full deflection of elevator and rudder can overstress the airplane, even at speeds below maneuvering speed v_A.

Diverse airspeeds

Airspeed		IAS			Remarks
		km/h	kts.	mph	
v_y	Best rate-of-climb speed	110	59	68	At this airspeed, the airplane climbs with the maximum possible *rate* of climb. This airspeed is marked on the airspeed indicator with a blue radial line.
v_x	Best angle-of-climb speed	97	52	60	At this airspeed, the airplane climbs with the maximum possible *angle* of climb. This airspeed is not marked on the airspeed indicator.
	Recommended lowest speed for approach	105	57	65	See NOTE below.

NOTE

Conditions such as strong headwind, danger of wind shear, turbulence, or wet wings require a higher approach speed.

Stalling speeds

see Article 5.2.2

2.3 AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color-code significance are shown below:

Marking	Value or Range (IAS)			Significance
	km/h	kts.	mph	
green arc	86 - 210	46 - 113	53 - 130	Normal operating range. Lower limit is 1.1 v_{S1} at max. flight mass (weight) and most forward CG. Upper limit is rough air speed v_{RA}.
yellow arc	210 - 261	113 - 141	130 - 162	Caution range, rough air speed v_{RA} to never exceed speed v_{NE}. Maneuvers must be conducted with caution and only in smooth air.
red line	261	141	162	Maximum speed for all operations, never exceed speed v_{NE}.
blue line	110	59	68	Best rate-of-climb speed v_y.
yellow triangle	105	57	65	Approach speed at max. flight mass (weight).

2.4 POWER PLANT

2.4.1 ENGINE

Engine manufacturer : Bombardier Rotax
Engine model : Rotax 914 F3 or 914 F4

Power, RPM and manifold pressure limitations

NOTE

The engine drives the propeller through a speed-reducing gear with a gear ratio of 2.4286:1.
The built-in tachometer indicates the engine speed. Consequently, all speeds given in this manual are engine speeds.

Max. T/O power (5 minutes) : 84.5 kW (115 DIN hp.)
Max. T/O RPM : 5800 RPM at 38.4 inHg

Max. continuous power : 73.5 kW (100 DIN hp.)
Max. continuous RPM : 5500 RPM at 34 inHg

Idle RPM : 1400 RPM
Power check RPM : 5700 ± 100 RPM at 38.4 inHg

CAUTION

At high ambient temperatures or at high altitudes, the maximum admissible manifold pressure cannot be reached, as the turbo control unit prevents excessive airbox temperatures by decreasing the manifold pressure.

Outside air temperature (OAT) at high altitude		Deviation from International Standard Atmosphere (ISA)		Max. manifold pressure obtainable up to altitude	
[°C]	[°F]	[°C]	[°F]	[m]	[ft.]
-1	30	ISA	ISA	2440	8000
17	63	ISA + 10°	ISA + 18°	1220	4000
35	95	ISA + 20°	ISA + 36°	0	0

NOTE

During normal operation, take-off power should only be selected until a safe altitude is reached. The engine wear at take-off power is higher compared to maximum continuous power.

Temperature and pressure limits

Maximum cylinder head temperature : 135 °C (275 °F)
If MÄM 36-314 is installed:
Maximum cylinder head temperature : 130 °C (266 °F)
Minimum oil temperature : 50 °C (122 °F)
Maximum oil temperature : 130 °C (266 °F)
Favorable oil temperature : approx. 90 °C - 110 °C (194 °F to 230 °F)

For engine S/N through 4.420.085:

Minimum oil pressure : 1.5 bar (22 psi) at 1250 RPM

Maximum oil pressure : 7 bar (102 psi), for a short time only during cold-start

Normal oil pressure : 1.5 to 5 bar (22 to 73 psi)

For engine S/N 4.420.086 and subsequent:

| Minimum oil pressure : 0.8 bar (12 psi) below 3500 RPM only

Maximum oil pressure : 7 bar (102 psi), for a short time only during cold-start

Normal oil pressure : 2.0 to 5 bar (29 to 73 psi)

Lubricants

Max. oil consumption : 0.1 liters per hour (approximately 0.1 US quarts per hour)

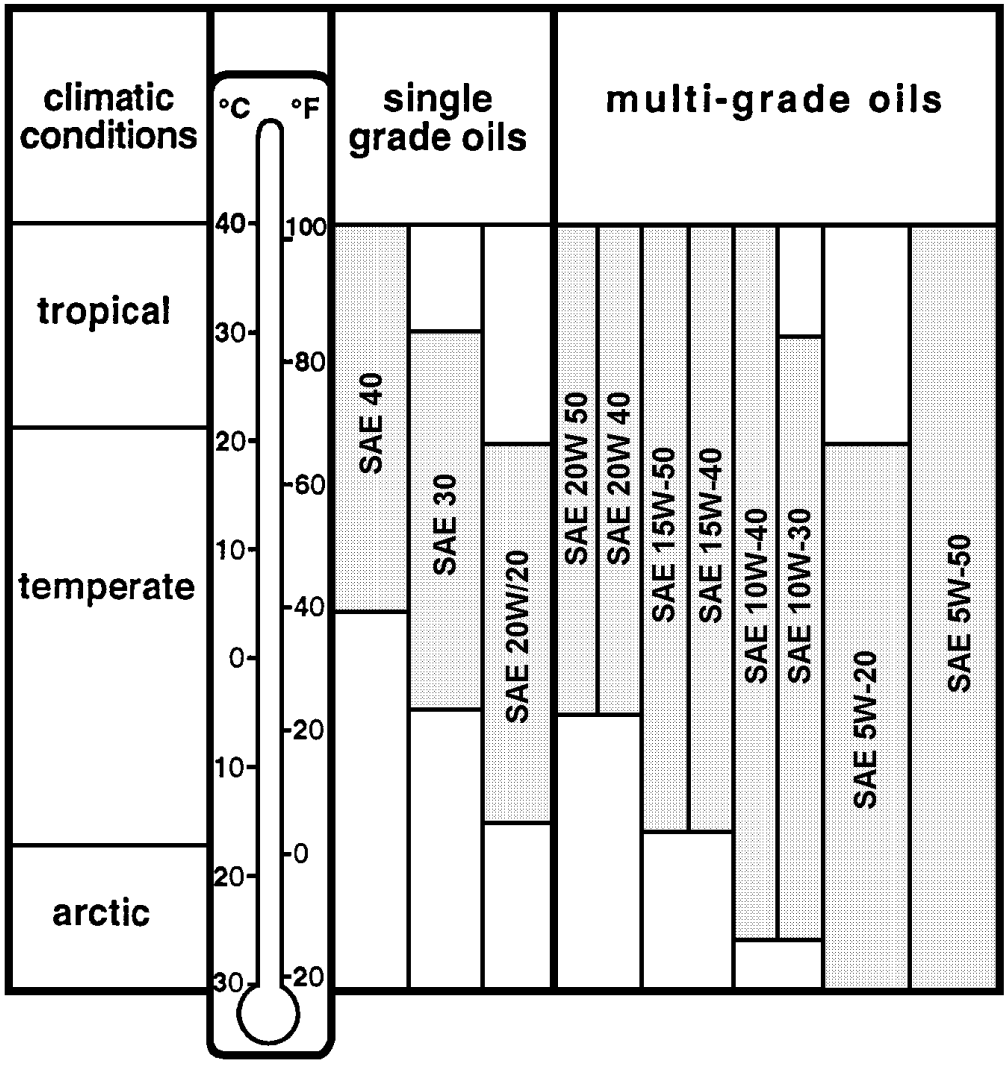
Oil quantity, minimum : 3.0 liters (3.2 US quarts)

maximum : 3.4 liters (3.6 US quarts)

Table of recommended engine oils:

Brand	Product	API Classification	SAE Viscosity
Castrol	GPS	SG	10 W-40
	RS Superbike	SG	10 W-50
			10 W-40
	4-Stroke Motorcycle Oil	SG	10 W-40
			15 W-50
	4-Stroke Full Synthetic	SG	5 W-50
Elf	MOTO XT 4	SG	10 W-50
Shell	Advance VSX 4	SG	20 W-40
	Advance Ultra 4	SG	10 W-40
Mobil	Mobil 1	SJ/CF	5 W-50

The oil viscosity should be selected using the following table:



CAUTION

The use of AVGAS 100 LL requires the following maintenance work to be performed every 50 hours of operation:

- oil filter change
- oil change
- oil level check

Additionally, the following rules must be observed:

- avoid continuous use of carburetor heat
- avoid prolonged idling of the engine

Approved Coolant: 'EVANS NPG+', or equivalent coolant must be used without water or other additives

If MÄM 36-314 is installed:

Approved Coolant: A blend of Glysantin G48 and clean water (mixture 1:1) without any other additives must be used.

NOTE

The Supplement No. 5, Winterization Kit (latest Revision) must be incorporated into the AFM (if applicable).

NOTE

Coolant exchanges must be performed by authorized personnel.

Admissible OAT range:

For starting engine : -25 °C to +50 °C (-13 °F to +122 °F)
At OATs below -25 °C (-13 °F), the engine must be pre-warmed.

2.4.2 PROPELLER

Propeller manufacturer : mt-propeller, Straubing, Germany
Propeller model : Hydro-mechanically variable pitch propeller MTV-21-A-C-F/CF175-05
Propeller governor : Woodward A210790 or McCauley DCFU290D17B/T2
Oil pressure accumulator : P-447

Propeller pitch:
- Low pitch : 16.5° ± 0.2°
- Starting pitch : 19° ± 1°
- Feathered pitch : 83° ± 1°

Position of counterweights:
- At low pitch : 32.5° ± 1°
- At high pitch : 28° ± 1°

2.5 POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown below:

Indicator	Red Line	Green Arc	Yellow Arc	Red Line
	Minimum Limit	Normal Operating Range	Caution Range	Maximum Limit
RPM indicator [1])	-	1400 - 5500 RPM	0 - 1400 RPM 5500 - 5800 RPM	5800 RPM
RPM indicator [2])	-	600 - 2260 RPM	0-600 RPM 2260 - 2385 RPM	2385 RPM
Oil temperature indicator	50 °C	50 - 130 °C	-	130 °C
Cylinder head temperature indicator	-	-	-	135 °C
If MÄM 36-314 is installed: Cylinder head temperature indicator	-	-	-	130 °C
Oil pressure indicator [3])	1.5 bar	1.5 - 5 bar	5 - 7 bar	7 bar
Oil pressure indicator [4])	1.5 bar	1.5 - 5 bar	5 - 7 bar	7 bar
Manifold pressure indicator (TCU 966.470)	-	-	34 - 38.4 inHg	38.4 inHg
Manifold pressure indicator (TCU 966.741)	-	-	35.4 - 39.9 inHg	39.9 inHg
Fuel quantity indicator	-	-	-	-

[1]) If crankshaft RPM is shown

[2]) If propeller RPM is shown

[3]) engine serial numbers through 4,420.085

[4]) engine serial numbers 4,420.086 and subsequent

Significance of warning lights (red):

Warning Light (red)	Significance
Manifold pressure	continuous : manifold pressure exceeds 1500 hPa (44.3 inHg) flashing : T/O power selected for more than 5 minutes
Fuel pressure	fuel pressure less than 0.15 bar above airbox pressure
Generator	voltage exceeds 16.2 V or generator failure

Significance of caution lights (amber):

Caution Light (amber)	Significance
Turbo	flashing : sensor defective
Temperature	EGT exceeds 950 °C (1740 °F) or airbox temperature exceeds 72 °C (162 °F)
Low fuel	remaining fuel in central fuel reservoir is 5 liters (1.3 US gal.) or less

2.6 MASS (WEIGHT)

Maximum take-off mass (max. T/O weight)	: 770 kg	(1698 lbs.)
Maximum landing mass	: 770 kg	(1698 lbs.)
Maximum mass of all non-lifting parts	: 610 kg	(1345 lbs.)
Maximum useful load in baggage compartment	: 30 kg	(66 lbs.)
Maximum useful load (including fuel)	: see Paragraph 6.6	
Maximum useful load on left seat	: 110 kg	(243 lbs.)
Maximum useful load on right seat	: 110 kg	(243 lbs.)

WARNING

Exceeding the mass limits can lead to overstressing of the airplane and to a degradation of flying characteristics and flight performance.

2.7 CENTER OF GRAVITY

The datum plane for the center of gravity (CG) specifications lies perpendicular to the center axis of the conical fuselage tube. It contacts the wing leading edge at the root rib to define its position in longitudinal direction. Procedures for a horizontal alignment and empty mass CG specifications can be found in the Airplane Maintenance Manual, Section 4.

The permissible flight CG range is:

Maximum forward CG : 318 mm (12.52 in.) aft of datum plane
Maximum rearward CG : 400 mm (15.75 in.) aft of datum plane

WARNING

A flight CG which lies outside the permissible range reduces the controllability and stability of the airplane.

The procedure for determining the CG position is included in Section 6.

2.8 APPROVED MANEUVERS

This powered sailplane is certified in the 'Utility' category.

CAUTION

Aerobatics and spinning are not permissible.

2.9 MANEUVERING LOAD FACTORS

Table of maximum permissible load factors:

	at v_A	at v_{NE}
positive	5.3	4.0
negative	-2.65	-1.5

WARNING

Exceeding the maximum permissible load factors may overstress the airplane.

2.10 FLIGHT CREW

Solo flights must be conducted from the left seat.

2.11 KINDS OF OPERATION

The HK 36 TTC-ECO is certified for DAY-VFR operation. Night VFR operation, if permitted by the competent authority, requires additional equipment in accordance with national regulations.

IFR, flights in clouds, flights into known icing conditions and aerobatics are not permitted.

2.12 FUEL

Fuel capacity:

Wing tanks : 110 liters (2 * 55 liters)
: 29 US gal. (2 * 14.5 US gal.)

Usable fuel : 106 liters (2 * 53 liters)
: 28 US gal. (2 * 14 US gal.)

Approved fuel grades:

* Automotive Super, min. octane rating: 95 ROZ, unleaded
* EN 228 Super
* EN 228 Super Plus
* Aviation Grade (AVGAS) 100 LL

NOTE

Due to its high lead concentration, AVGAS causes increased wear of the valve seats and produces more residue in the combustion chambers. It should therefore only be used at high ambient temperatures (to prevent vapor bubbles) or when other fuel grades are not available. The CAUTION on page 2-10 must be observed.

2.13 AEROTOW, WINCH AND AUTOTOW LAUNCHING

The powered sailplane is designed for self-take-off only.

2.14 OTHER LIMITATIONS

Landing and position lights:

Landing and position lights (optional equipment) may only be used during 10 % of the engine operating time. Otherwise, adequate battery charging cannot be guaranteed.

WARNING

The charging of the battery is of great importance to the prevention of the risk of engine failure, since the engine has no mechanical fuel pump.

Limitations for soaring when using a battery with a capacity of 18 Ah:

The capacity of the lead-accumulator is highly dependent on temperature. Therefore, the duration of continuous soaring at low temperatures is restricted to:

4 hours at 0 °C (32 °F) and
2 hours at -10 °C (14 °F).

Good maintenance and charging of the battery are prerequisites.
Average current requirement: 0.3 A.

Limitations for soaring when using a battery with a capacity of 30 Ah:

There are no such limitations when a 30 Ah battery is installed.

2.15 LIMITATION PLACARDS

The following placard is attached to the left-hand section of the instrument panel. The maneuvering speed v_A may be specified in a different unit, depending on the airspeed indicator.

Maneuvering speed at maximum gross weight	v_A = 176 km/h
Minimum useful load on seat, 10 kg (22 lbs.) fuel, no baggage	[redacted]
Minimum useful load on seat, 10 kg (22 lbs.) fuel, 30 kg (66 lbs.) baggage	[redacted]
	[redacted]

The following placard is attached to the instrument panel. The airspeed may be specified in a different unit, depending on the airspeed indicator.

WARNING
Use air brake fixture (hands off) only up to **150 km/h**!
A/B may extend beyond fixture at higher speeds.

The following placard is attached to the instrument panel if the affected equipment is installed:

Landing Light and Position Lights
may only be used for
10 % of engine operating time

The following placard is attached near the fuel selector valve and near the fuel quantity indicators:

max. difference L/R:
50 % = 27 l (7.1 US gal.)

SECTION 3

EMERGENCY PROCEDURES

Page No.

3.1 INTRODUCTION

Section 3 provides checklists and recommended procedures for use in the case of an emergency.

Since it is impossible to foresee all kinds of emergencies and consider them in the Airplane Flight Manual, it is absolutely necessary for the pilot to know the airplane and to have knowledge and experience in solving problems that may occur. It will only be possible to handle emergency situations safely if the emergency procedures have been practiced.

Emergency procedures related to optional equipment are given in the corresponding supplements (Section 9).

Any problems which occur must be recorded, along with their remedy, in compliance with the applicable national regulations.

3.2 CANOPY JETTISON

1. Red canopy locks (LH and RH) . . . . swing 180° rearward
2. Canopy . . . . . push up and rearward with both hands

3.3 BAILING OUT

1. Canopy . . . . . jettison
2. Seat harness . . . . . release
3. Evacuate airplane

NOTE

When using a manual parachute, wait two seconds after exiting the airplane before pulling the rip-cord.

3.4 STALL RECOVERY

3.4.1 BEHAVIOR WITH POWER OFF

Under all loading conditions, air brakes extended or retracted, in straight and level or in banked flight, the HK 36 TTC-ECO enters a horizontal stall, during which the ailerons remain effective, even with maximum elevator deflection.

A partial loss of positive control in the stick and pedals, buffeting, and a pitch angle of 20° to 30° occur during this condition.

NOTE

During the horizontal stall, the airspeed indication rises to approximately 85 km/h (46 kts. / 53 mph).

3.4.2 BEHAVIOR WITH POWER ON

See behavior with power off.
Exception: at 50 % to 100 % power, straight and level flight, and maximum rearward center of gravity, the airplane may perform a stall dive over the left or right wing after entering the horizontal stall if the control stick is pulled even further.

NOTE

During a horizontal stall, the airspeed indicator readings fluctuate and are too high.

3.4.3 RECOVERY

The horizontal stall can be terminated immediately by relaxing the force on the elevator control.

NOTE

If the airplane performs a stall dive, immediately relax the force on the elevator control and pull out the airplane smoothly. If the stick is pulled further, the airplane may start to spin.

* Altitude loss resulting from stationary horizontal stall described above: approximately 10 - 20 m (33 - 65 ft.).
* Altitude loss resulting from stall dive over a wing: approximately 40 m (130 ft.).

3.5 SPIN RECOVERY

1. Rudder . . . . . apply fully opposite to spin direction
   Elevator . . . . . control stick forward
   Ailerons . . . . . neutral, if necessary apply in direction of spin

2. After spin movement has terminated:
   Flight controls . . . . . move to neutral, pull airplane out smoothly

3.6 SPIRAL DIVE RECOVERY

There is no tendency to a spiral dive.
The standard recovery procedure is:

1. Rudder . . . . . apply fully opposite to spiral dive rotation
2. Ailerons . . . . . apply fully opposite to spiral dive rotation
3. Pull airplane out smoothly

3.7 ENGINE FAILURE

3.7.1 ENGINE FAILURE DURING TAKE-OFF

1. Fuel valve . . . . . check if OPEN
2. Fuel booster pump . . . . . check if ON
3. Fuel selector valve . . . . . check if tank with more fuel is selected
4. Propeller speed control . . . . . TAKE-OFF
5. Ignition switch . . . . . BOTH
6. Choke . . . . . OFF

WARNING

If the symptoms cannot be eliminated immediately and the engine refuses to deliver enough power, a straight-in landing must be performed if below 80 m (260 ft.) AGL.

Before touchdown:

- Fuel valve . . . . . CLOSED
- Ignition . . . . . OFF
- Master switch . . . . . OFF

3.7.2 ENGINE FAILURE DURING CRUISE

1. Fuel valve . . . . . check if OPEN
2. Fuel quantity indicator . . . . . check fuel quantity
3. Fuel selector valve . . . . . check if tank with more fuel is selected
4. Fuel booster pump . . . . . ON
5. Choke . . . . . check if OFF
6. Carburetor heat . . . . . ON at power settings below 75 %

NOTE

When the carburetor heat is activated at a high power setting, the maximum admissible airbox temperature may be exceeded, resulting in increased engine wear.

7. Ignition . . . . . check if switch is in “BOTH” position

NOTE

If the symptoms cannot be eliminated and the engine refuses to deliver enough power, proceed as follows:

1. Throttle control . . . . . IDLE
2. Ignition . . . . . OFF
3. Propeller . . . . . feather
4. Fuel valve . . . . . CLOSED
5. Master switch . . . . . OFF
6. Airspeed . . . . . speed for best glide ratio: (105 km/h, 57 kts., 65 mph)
7. Look for a suitable landing field
8. Cowl flap . . . . . CLOSED

3.7.3 ENGINE RESTART WITH A DISCHARGED BATTERY (during flight)

1. Electrical consumers . . . . . OFF
2. Fuel valve . . . . . OPEN
3. Fuel selector valve . . . . . select tank with more fuel
4. Master switch . . . . . ON
5. Mode select switch . . . . . POWER FLIGHT
6. Choke . . . . . as required
7. Throttle control . . . . . IDLE
8. Ignition switch . . . . . BOTH
9. Airspeed . . . . . increase to 180 - 200 km/h (97 - 108 kts. / 112 - 124 mph)
10. Propeller speed control . . . . . very slowly move from FEATHER to TAKE-OFF
11. Oil pressure . . . . . should be available within 10 seconds
12. Choke . . . . . re-adjust if required
13. Propeller check:
    - Throttle control . . . . . adjust to 4800 RPM
    - Propeller speed control . . . . . CRUISE (pull back to cam before FEATHER position), wait until speed drops to approximately 4600 RPM; reset to TAKE-OFF position

    Repeat procedure at least three times.

CAUTION

Without repeating this procedure, it is not ensured that the pitch change mechanism will operate faultlessly.

14. RPM and throttle . . . . . set as required to continue flight

CAUTION

After prolonged soaring periods, adequate altitude reserve must be ensured for engine warm-up.

15. All electrical consumers
    essential for flight operation . . . . . ON

WARNING

When the charge of the battery is already very poor, it cannot be recharged. However, the electric main fuel pump and the on-board electrical network are supplied with power by the generator.

16. Ammeter . . . . . check if battery is being charged
    (indicator clearly in positive range)

WARNING

If the battery is not being charged, land on next airfield and correct the fault. Without a serviceable battery, a generator failure will lead to engine failure.

17. Continue flight normally
18. Determine reason for battery discharge

CAUTION

The engine is started due to windmilling. Because of the high airspeed required for this process, an altitude loss of up to 300 m (1000 ft.) must be expected. The airspeed limitations must not be exceeded.

3.7.4 PROPELLER STUCK IN FEATHERED POSITION

NOTE

The propeller requires hydraulic pressure for pitch *reduction*. The hydraulic pressure is supplied by a pressure accumulator. If this accumulator is empty, pressure must be built up by the oil pump of the engine. The engine is started with the propeller in feathered pitch and the throttle control in IDLE position.

1. Electrical consumers . . . . . OFF
2. Fuel valve . . . . . OPEN
3. Fuel selector valve . . . . . select tank with more fuel
4. Master switch . . . . . ON
5. Mode select switch . . . . . POWER FLIGHT
6. Fuel booster pump . . . . . ON
   Check if the red warning light extinguishes after fuel pressure has built up.
7. Choke . . . . . as required
8. Throttle control . . . . . IDLE
9. Ignition switch . . . . . BOTH
10. Propeller speed control . . . . . TAKE-OFF
11. Ignition switch . . . . . turn clockwise to start engine until propeller is in the working position

CAUTION

It is possible to start the engine with the propeller in the feathered position, this however increases engine wear.

12. Oil pressure . . . . . should be available within 10 seconds
13. Choke . . . . . re-adjust as required
14. RPM and throttle control . . . . . set as required to continue flight
15. Fuel booster pump . . . . . OFF
16. Electrical consumers . . . . . ON
17. Continue flight normally
18. After landing, determine the reason for the loss of oil pressure and correct the fault.

3.7.5 SUDDEN DROP IN MANIFOLD PRESSURE AND RPM

If a loud noise or bang is heard, it is likely that the turbocharger is damaged.

1. Keep watching oil pressure and, if possible, proceed to next airfield
2. Throttle control . . . . . keep manifold pressure in admissible range
3. Propeller speed control . . . . . keep RPM in admissible range

NOTE

If the symptoms cannot be eliminated and the engine refuses to deliver enough power, proceed as follows:

1. Throttle control . . . . . IDLE
2. Ignition switch . . . . . OFF
3. Propeller . . . . . feather
4. Fuel valve . . . . . CLOSED
5. Master switch . . . . . OFF
6. Airspeed . . . . . for best glide ratio:
   (105 km/h, 57 kts., 65 mph)
7. Look for a suitable landing field
8. Cowl flap . . . . . CLOSED

3.7.6 FLUCTUATING MANIFOLD PRESSURE AND RPM

1. TCU . . . . . OFF
2. Propeller speed control . . . . . make slight RPM changes in order to bleed system
3. TCU . . . . . ON

If manifold pressure and RPM do not stabilize:

1. TCU . . . . . OFF
2. Throttle control . . . . . keep manifold pressure in admissible range
3. Propeller speed control . . . . . keep RPM in admissible range
4. Land on nearest airfield and determine reason for malfunction

3.7.7 MANIFOLD PRESSURE WARNING (RED) LIGHT CONTINUOUSLY ON

The manifold pressure limit has been exceeded.

1. Throttle control . . . . . keep manifold pressure in admissible range
2. Propeller speed control . . . . . keep RPM in admissible range
3. Land on nearest airfield and determine reason for malfunction

3.7.8 MANIFOLD PRESSURE WARNING LIGHT (RED) FLASHING

The time limit for engine take-off power has been exceeded.

1. Throttle control . . . . . keep manifold pressure in admissible range
2. Propeller speed control . . . . . keep RPM in admissible range
3. Continue flight normally

3.7.9 TURBO CAUTION LIGHT (AMBER) FLASHING

Defect in the area of the sensors, sensor wiring, or Turbo Control Unit or leakage of the airbox.

1. Throttle control . . . . . keep manifold pressure in admissible range
2. Propeller speed control . . . . . keep RPM in admissible range

CAUTION

If it is impossible to control RPM and manifold pressure manually: Turbo Control Unit OFF

3. Land on nearest airfield and determine reason for malfunction

3.7.10 FUEL PRESSURE WARNING LIGHT (RED) CONTINUOUSLY ON

Fuel pressure has dropped below the minimum.

1. Fuel booster pump . . . . . ON
2. Fuel quantity indicators . . . . . check fuel quantity
3. Fuel selector valve . . . . . select other tank if possible
4. Fuel valve . . . . . check if OPEN
5. Ammeter . . . . . check if in positive range, otherwise switch OFF all equipment that is not needed

If light extinguishes

Land on nearest airfield and determine reason for malfunction.

WARNING

The main fuel pump is supplied with power by the generator. A generator failure will lead to the failure of the main fuel pump, causing the warning light to come on. Therefore, the illumination of the fuel pressure warning light can be an indication of generator failure. In this case, the on-board network, including the fuel booster pump, is supplied with power only from the battery. All electrical consumers which are not essential to flight operation must be switched OFF. The load on the battery must be monitored by means of the ammeter which should not be too far in the negative range. The current requirement with all switchable consumers switched OFF is approximately 6 A. With a charged, well maintained battery, the fuel booster pump will be supplied with power for another 30 minutes.

If light does *not* extinguish

The required fuel pressure cannot be maintained, or the fuel pressure switch is defective. Be prepared for an engine failure at any time. See NOTES in Article 3.7.2, ENGINE FAILURE DURING CRUISE.

3.7.11 LOW-FUEL CAUTION LIGHT (AMBER) CONTINUOUSLY ON

1. Fuel quantity indicators . . . . . check
2. Fuel selector valve . . . . . check if selector is in full left or full right position
   if yes . . . . . select other tank
   if not . . . . . select full left or full right position
3. Wait for about 1 minute
4. If low-fuel caution light does not extinguish:
   - reduce power as far as possible and
   - look for suitable landing field

NOTE

When the low-fuel caution light illuminates, there are approximately 5 liters (1.3 US gal.) of fuel left.

3.7.12 GENERATOR WARNING LIGHT (RED) CONTINUOUSLY ON

The generator does not deliver power to the on-board network.

1. Fuel booster pump . . . . . ON
2. All electrical consumers not essential for flight operation . . . . . OFF
3. Land on nearest airfield and determine reason for malfunction

WARNING

The engine has no mechanical fuel pump. In case of generator failure, the fuel booster pump is supplied with power from the battery. The remaining flight duration with the engine running depends on the charge state of the battery. With a charged, well maintained battery and the electrical consumers switched OFF, the remaining flight duration is approximately 30 minutes.

3.7.13 TEMPERATURE CAUTION LIGHT (AMBER) CONTINUOUSLY ON

The admissible exhaust gas temperature (EGT) or the admissible airbox temperature has been exceeded. Excessive EGT will cause damage to the exhaust system. Excessive airbox temperatures lead to increased engine wear.

1. Carburetor heat . . . . . OFF
2. Throttle control . . . . . as soon as the situation allows reduce power until caution light extinguishes

NOTE

When the carburetor heat is on, the airbox temperature will increase. At a power setting above 75 %, the use of carburetor heat is unnecessary and not recommended, as the maximum admissible airbox temperature can be exceeded.

3.7.14 INSUFFICIENT OIL PRESSURE

1. Throttle control . . . . . reduce manifold pressure as far as the situation allows
2. Land on nearest airfield and determine reason for insufficient oil pressure

WARNING

Be prepared for engine failure at any time.

3.7.15 EXCESSIVE OIL OR CYLINDER HEAD TEMPERATURE

1. Cowl flap . . . . . check if OPEN
2. Throttle control . . . . . reduce manifold pressure as far as the situation allows
3. Propeller speed control . . . . . reduce RPM as far as the situation allows
4. Land on nearest airfield and determine reason for high temperature

WARNING

Be prepared for engine failure at any time.

3.7.16 EXCESSIVE RPM

1. Propeller speed control . . . . . reduce RPM as far as the situation allows
2. Throttle control . . . . . reduce manifold pressure as far as the situation allows
3. Land on nearest airfield and determine reason for high temperature

WARNING

Be prepared for engine failure at any time.

3.7.17 CARBURETOR ICING

NOTE

Carburetor icing can be recognized by a drop in the engine RPM and/or loss of manifold pressure and/or irregular running of the engine without a change in the throttle control position, the choke position, the propeller setting, the airspeed, or the altitude.

CAUTION

Since the turbocharger increases the effect of intake air heating, the activation of the carburetor heat is not recommended at power settings above 75 %.

1. Carburetor heat . . . . . ON at power settings below 75 %

NOTE

The engine output will slightly drop, due to the intake air heating, and fuel consumption will slightly increase.

2. Carburetor heat . . . . . OFF as required

3.8 FIRE

3.8.1 FIRE ON GROUND

1. Fuel valve . . . . . CLOSED
2. Throttle control . . . . . FULL POWER
3. Master switch . . . . . OFF
4. Cabin air . . . . . CLOSE
5. Cabin heat . . . . . OFF

3.8.2 FIRE DURING TAKE-OFF

1. Master switch . . . . . OFF
2. Cabin air . . . . . CLOSE
3. Cabin heat . . . . . OFF

After reaching a safe altitude:

4. Fuel valve . . . . . CLOSE
5. Engine . . . . . shut down
6. Perform landing in soaring configuration (see Section 4)

3.8.3 FIRE DURING FLIGHT

1. Fuel valve . . . . . CLOSE
2. Throttle control . . . . . FULL POWER
3. Master switch . . . . . OFF
4. Cabin air . . . . . CLOSE
5. Cabin heat . . . . . OFF
6. Engine . . . . . shut down
7. Perform landing in soaring configuration (see Section 4)

3.9 OTHER EMERGENCIES

3.9.1 MALFUNCTION OR FAILURE OF PROPELLER SPEED CONTROL

1. Throttle control . . . . . keep RPM in admissible range
2. Airspeed . . . . . reduce

3.9.2 ICING

1. Leave icing area
2. Constantly move the controls to prevent them from being locked by ice
3. If ice accumulates on canopy:
   weather window . . . . . open
   cabin heat . . . . . ON

3.9.3 FIELD LANDING

1. Engine . . . . . shut down
2. Perform landing in soaring configuration (see Section 4)

WARNING

Ensure that landing area is clear of obstacles. Touch-down with lowest possible airspeed and apply brakes carefully.

3.9.4 EMERGENCY LANDING ON WATER

Emergency landings on water should be performed in extreme emergency situations only. It must be assumed, from trials with sailplanes, that the airplane will submerge immediately after touching the water and then surface again.

1. Parachute harness . . . . . open
2. Seat harness . . . . . tighten
3. Airspeed . . . . . normal approach speed
4. Touchdown . . . . . with minimum speed and air brakes retracted

NOTE

Conditions such as strong headwind, danger of wind shear, turbulence or wet wings require a higher approach speed.

WARNING

On touchdown, protect your face with one arm!

5. Seat harness . . . . . release
6. Red canopy locks (LH and RH) . . . . swing 180° rearward
7. Canopy . . . . . push up and away
8. Evacuate airplane as quickly as possible

3.9.5 BAGGAGE COMPARTMENT DOOR OPEN

1. During take off: abort take off
2. In flight: reduce airspeed, land on nearest airfield

SECTION 4
NORMAL PROCEDURES

Page No.

4.1 INTRODUCTION

Section 4 contains checklists and a description of the normal operating procedures which is based on the results of flight tests. Normal procedures associated with optional systems can be found in Section 9.

The refilling of operating fluids must be recorded in compliance with national regulations.

4.2 RIGGING AND DE-RIGGING

4.2.1 GENERAL

Each wing is connected to the fuselage by three bolts. The two main bolts are located at the center of the spar tunnel. They are accessible between the backrests and can be inserted from the front side. A spring loaded hook is placed over the bolt handles to secure the bolts.

The A- and B-bolts are fixed to the fuselage at the wing root. The A-bolt is placed in front of the spar tunnel and the B-bolt lies near the trailing edge. Self locking units are screwed onto the B-bolts, which are accessible through handholes on the upper surface of the wing. Locking rings are integrated in the B-bolt locking units, which therefore do not require any further safetying.

The connectors for stall warning and position lights are located at the root ribs. The connectors for the fuel lines are located at the tanks. The connectors for fuel vent lines, fuel tank ground straps and signal wires of the fuel sensors are located under the seats.

The horizontal stabilizer is attached to the vertical stabilizer by means of three bolts. The two bolts at the rear are fixed to the mount in the vertical stabilizer. The threaded bolt located at the front is fitted with a hexagonal socket. When screwed in, it is automatically secured by means of a locking ring integrated into the horizontal stabilizer.

4.2.2 WING INSTALLATION

NOTE

While installing the wings, ensure that the airplane will not drop onto its nose wheel or tail skid as the center of gravity shifts.

1. Clean all bolts and bushes and the B-bolt locking unit and apply a light coat of grease.
2. Lift one wing (two persons at the root rib, one at the wing tip) and insert spar stump into spar tunnel until root rib is about 30 cm (about 1 ft.) from fuselage. Connect position and strobe lights (optional).
3. Screw fuel line to tank connector. Route fuel tank vent line, signal wire of fuel sensors and ground strap into fuselage through fuselage root rib.
4. Insert wing completely (ensure the smooth insertion of the A- and B-bolts).
5. Insert main bolt while moving the wing tip in small circles. The aileron and air brake control systems are automatically connected. Do not release the wing before the main bolt has been inserted completely.
   The wide track of the landing gear supports the attached wing; no support of the wing tip is required.
6. Screw the B-bolt locking unit onto the B-bolt and tighten it by hand.
7. Connect fuel tank ground strap under seat. Connect fuel tank vent line to T-fitting under seat. Connect signal wire of fuel sensors under seat. Fasten fuel line to designated rings with ty-rap (line loops around elbowed airbrake lever in order to avoid squeezing of hose).
8. Install the other wing in a similar manner.
9. Tighten both B-bolt locking units with a wrench (size 17 mm), applying moderate hand torque (approximately 6 Nm (4.5 ft.lbs.)).
10. Secure main bolts with spring loaded hook.
11. Apply water resistant adhesive tape to the gap between fuselage and wing and to the covers on the access holes.

4.2.3 WING REMOVAL

NOTE

While removing the wings, ensure that the airplane will not drop onto its nose wheel or tail skid as the center of gravity shifts.

To remove the wings, empty both fuel tanks completely, then reverse the above procedure.

4.2.4 WINGLET INSTALLATION

1. Clean the bolts and bushes if necessary.

CAUTION

Do not lubricate the bolt threads!

2. Install winglet with washers and self locking nuts.
3. Tighten self locking nuts with moderate hand torque (approximately 6 Nm (4.5 ft.lbs.)).
4. Apply water resistant adhesive tape to the gap.

4.2.5 WINGLET REMOVAL

To remove the winglet, reverse the above procedure.

4.2.6 HORIZONTAL STABILIZER INSTALLATION

1. Clean all bushes and bolts and apply a light coat of grease.
2. Move trim knob to full NOSE DOWN position.
3. Remove the Pitot tube.
4. Position the horizontal stabilizer over the stabilizer mount; the elevator control rod must be connected by a second person.

WARNING

The elevator control system is not connected automatically!

5. Slip the horizontal stabilizer onto both rearward bolts.
6. Screw in the fastening bolt to the stop with an 8 mm hexagon key, applying moderate hand torque (approximately 6 Nm (4.5 ft.lbs.)).
7. Check the horizontal stabilizer for insecure attachment and inspect load transmission of elevator control system.
8. Install the Pitot tube.
9. Apply water resistant adhesive tape to the gap between the horizontal stabilizer and the vertical stabilizer.

4.2.7 HORIZONTAL STABILIZER REMOVAL

To remove the horizontal stabilizer, reverse the above procedure.

4.3 DAILY INSPECTION

WARNING

Master switch OFF, ignition OFF!

1. Fuel tank drain check: on each drain port, drain off about 1/8 liter (approximately 1/8 US quart) of fuel using a transparent drain cup (see Paragraph 7.10). Inspect for dirt or water.

NOTE

In order to prevent the water deposited in the tanks from dispersing, the airplane should not be agitated prior to the drain check.

2. Ensure completeness of the onboard documents and ensure that the remaining operating time before the next scheduled inspection (100, 200 or 600 hrs.) allows for the intended flight.

3. Inspect left fuselage skin for damage or cracks.

4. Inspection of vertical stabilizer:
   - Check skin for damage or cracks.
   - Check rudder for improper or insecure mounting.
   - Check for excessive play.
   - Check rudder control system for improper connection and interference.
   - Remove Pitot tube cover.
   - Check Pitot tube for improper mounting and blockage of bores.

5. Inspection of horizontal stabilizer:
   - Check horizontal stabilizer and tips for improper mounting and insecure attachment and inspect skin for damage and cracks.
   - Check elevator for improper mounting, play, damage and cracks.
   - Check elevator control system for improper connection, lack of load transmission and interference.

6. Inspect right fuselage skin for damage and cracks.

7. Inspection of right wing:
   - Check wing, aileron and winglet for improper or insecure mounting, excessive play, damage, and cracks.
   - Check aileron control system for improper connection, lack of load transmission and interference.
   - Check air brakes for incomplete retraction; ensure flushness with the wing surface.
   - Check air brake control system for improper connection, lack of load transmission and interference.
   - Check air brake case for foreign bodies.
   - Check fuel tank for obvious damage and leakage, obstruction of vents, defective or missing inspection covers, defective or leaking filler cap.

8. Inspection of right main landing gear:
   - Check landing gear strut for damage and cracks.
   - Check wheel fairing for damage and looseness.
   - Visually check tires and brakes.
   - Ensure correct inflation (2.3 bar (33 psi)).

9. Inspection of propeller:
   - Check propeller blades for damage, cracks and excessive play.
   - Check spinner for damage and insecure mounting.

10. Inspection of nose landing gear:
    - Check nose wheel strut for damage and cracks.
    - Check wheel fairing for damage and looseness.
    - Visually check tire.
    - Ensure correct inflation (1.8 bar (26 psi)).
11. Oil and coolant check:
    - Remove upper engine cowling.
    - Check oil level.

NOTE

Prior to the oil level check, remove the oil tank cap and turn the propeller by hand in the direction of normal rotation to transfer all the oil from the engine crankcase to the oil tank. The process is finished when crankcase air can be heard being forced back to the oil tank. This will be noticed as a gurgle sound, coming from the oil tank with the cap removed, verifying the crankcase is purged of residual oil.
Fill up oil o the maximum prior to long flights. Required oil grade: see page 2-9.

CAUTION

The propeller must not be turned in reverse of the normal direction of rotation.

NOTE

The oil consumption is minor, but becomes somewhat greater with a full oil tank. Therefore, only refill engine oil when the oil level reaches or falls below the minimum marking.
-Ensure coolant level in equalizing reservoir is more than 1/3.

NOTE

The coolant equalizing reservoir should not be more than 2/3 full.

- Ensure coolant dispatcher vessel is full.
- Check engine compartment for obvious defects.
- Check coolers for obstruction.
- Check air intake opening for foreign bodies.

12. Inspection of left main landing gear:
    - Check landing gear strut for damage and cracks.
    - Check wheel fairing for damage and looseness.
    - Visually check tires and brakes.
    - Ensure correct inflation (2.3 bar (33 psi)).

13. Inspection of left wing:
    - Check wing, aileron and winglet for improper or insecure mounting, excessive play, damage, and cracks.
    - Check aileron control system for improper connection, lack of load transmission, and interference.
    - Check air brakes for incomplete retraction; ensure flushness with the wing surface.
    - Check air brake control system for improper connection, lack of load transmission and interference.
    - Check air brake case for foreign bodies.
    - Check fuel tank for obvious damage and leakage, obstruction of vents, defective or missing inspection covers, defective or leaking filler cap.
    - Check stall warning.

14. Check in the cabin:
    - Check if loading is admissible (refer to Section 6).

NOTE

Ensure compliance with loading restrictions by changing and/or rearranging the useful load.

- Master switch . . . . . ON
- Mode select switch . . . . . POWER FLIGHT
- All circuit breakers . . . . . pushed in
- Fuel quantity . . . . . check using fuel quantity indicators and log book entries; refuel if necessary

NOTE

Usable fuel quantity and approved fuel grades: see Paragraph 2.12, FUEL.

- Master switch . . . . . OFF
- Cabin . . . . . check for foreign bodies and loose objects
- Canopy . . . . . check for dirt and damage
- Cowl flap . . . . . check for improper operation
- Main bolts . . . . . verify that bolts are properly secured

15. Check of propeller FEATHER position:
    - Rudder pedals . . . . . adjust
    - Canopy . . . . . closed & locked
    - Fuel valve . . . . . OPEN
    - Fuel selector valve . . . . . select tank with more fuel
    - Parking brake . . . . . set
    - Electrical consumers . . . . . OFF
    - Master switch . . . . . ON
    - Mode select switch . . . . . POWER FLIGHT
    - Propeller speed control . . . . . TAKE-OFF
    - Cowl flap . . . . . OPEN
    - Fuel booster pump . . . . . ON; verify red warning light extinguishes after build-up of fuel pressure
    - Throttle control . . . . . IDLE
    - Choke . . . . . activate if engine is cold

WARNING

People must stay clear of the propeller danger zone!

- Ignition switch . . . . . turn clockwise to start engine
- Throttle control . . . . . adjust to approximately 2400 RPM
- Oil pressure . . . . . must reach green range within 10 seconds

CAUTION

If oil pressure is too low, turn off engine immediately!

NOTE

When the powered sailplane has been parked for long periods, or the hydraulic pressure accumulator is emptied for any other reason, a loss of oil pressure may occur after oil pressure build-up in the area of the oil pressure sensor. The reason for this is the filling process of the accumulator. The oil pressure indicator may drop to zero for a maximum of 15 seconds.

- Choke . . . . . push forward as required
- Fuel booster pump . . . . . OFF
- At increased idle speed (approximately 2400 RPM), turn off ignition and simultaneously pull propeller speed control all the way back to the FEATHER position.

NOTE

Unless the propeller speed control is actuated simultaneously with the ignition switch, the propeller will remain in the take-off position. Propeller feathering is only possible at 2000 RPM or above (see Article 7.9.5, PROPELLER SPEED CONTROL).

- Propeller speed control . . . . . TAKE-OFF

NOTE

If the propeller does not move to the take-off position, apply the emergency procedure described in Article 3.7.4, PROPELLER STUCK IN FEATHERED POSITION.

- Master switch . . . . . OFF
- Mode select switch . . . . . SOARING

4.4 PREFLIGHT INSPECTION

The following checklist with the most important items is located where it is well visible for both pilots:

START CHECK

1. Mass & Balance checked
2. Main bolts secured
3. Baggage door secured
4. Fuel valve OPEN
5. Fuel quantity checked
6. Fuller tank selected
7. Canopy locked
8. Seat harness on & secure
9. Propeller check
10. Magneto check
11. Carburetor heat OFF
12. Controls free
13. Trim neutral
14. Parking brake released
15. Air brakes locked
16. Turbo Control ON
17. Fuel booster pump ON

4.5 NORMAL PROCEDURES AND RECOMMENDED SPEEDS

4.5.1 STARTING ENGINE, RUN UP & TAXIING PROCEDURES

1.	Rudder pedals	adjust
2.	Seat harnesses	fasten
3.	Canopy	closed & locked
4.	Fuel valve	OPEN
5.	Controls	free
6.	Parking brake	set
7.	Air brakes	verify proper operation, lock
8.	Electrical consumers	OFF
9.	Master switch	ON
10.	Mode select switch	POWER FLIGHT
11.	Warning and caution lights	All warning and caution lights light on; some extinguish automatically after approximately 2 seconds.
12.	Propeller speed control	TAKE-OFF
13.	Fuel quantity indicators	check
14.	Fuel selector valve	select tank with more fuel
15.	Cowl flap	OPEN
16.	Fuel booster pump	ON; verify red warning light extinguishes after build-up of fuel pressure
17.	Throttle control	IDLE
18.	Choke	ON if engine is cold

WARNING

People must stay clear of the propeller danger zone!

19. Ignition switch . . . . . turn clockwise to start engine
20. Throttle control . . . . . adjust to approximately 2400 RPM
21. Oil pressure . . . . . must reach green range within 10 seconds

CAUTION

If the oil pressure is too low, turn off engine immediately!

NOTE

When the powered sailplane has been parked for long periods, or the hydraulic pressure accumulator is emptied for any other reason, a loss of oil pressure may occur after oil pressure build-up in the area of the oil pressure sensor. The reason for this is the filling process of the accumulator. The oil pressure indicator may drop to zero for a maximum of 15 seconds.

22. Choke . . . . . push forward as required

WARNING

If the engine is warm, the activated choke will considerably reduce the engine output!

23. Fuel booster pump . . . . . OFF
24. Fuel pressure warning light . . . . . verify main fuel pump maintains fuel pressure
25. Electrical consumers . . . . . ON or OFF as required
26. Altimeter . . . . . set

27. Oil temperature . . . . . check

CAUTION

Before loading the engine, allow the oil temperature to rise to 50 °C (122 °F) with the cowl flap open at 2400 to 3600 RPM (also possible during taxiing).

28. Choke . . . . . OFF
29. Ignition circuits check:
    - Throttle control . . . . . adjust to 3900 RPM
    - Ignition circuits . . . . . check; drop should be 100 to 350 RPM; difference between circuits 1 and 2 should not exceed 100 RPM.

CAUTION

If RPM drop is too high at low ambient temperatures, repeat check with the carburetor heat ON.

30. Carburetor heat . . . . . check at 3900 RPM; drop should be approximately 50 RPM
31. Propeller check:
    - Throttle control . . . . . adjust to 4800 RPM
    - Propeller speed control . . . . . CRUISE (carefully pull back to cam before FEATHER position)
      wait until speed drops to approximately 4600 RPM
      reset to TAKE-OFF position

    Repeat procedure at least three times.

CAUTION

Without repeating the procedure, it is not ensured that the pitch change mechanism will operate faultlessly.

32. Power plant instruments . . . . . verify all indicators are in admissible range

4.5.2 TAKE-OFF AND CLIMB

1. Cowl flap . . . . . OPEN
2. Fuel booster pump . . . . . ON
3. Propeller speed control . . . . . TAKE-OFF
4. Throttle . . . . . FULL (5700 ± 100 RPM, manifold pressure in yellow range)

CAUTION

The manifold pressure for take-off power is set with the throttle control in the foremost 1/2 cm (1/5 in.) of the setting range. The TCU sets the take-off manifold pressure. In this range, it is not possible to control the manifold pressure with the throttle control. With high outside air temperatures at high field elevations, the maximum permissible manifold pressure will not be reached.

5. Start take-off run with elevator neutral, maintaining direction with rudder.
6. Lift nose wheel at approximately 80 km/h (43 kts. / 50 mph); airplane will lift off by itself at approximately 90 km/h (49 kts. / 56 mph).
7. Perform climb with at least 97 km/h (52 kts. / 60 mph); monitor oil pressure, oil temperature and cylinder head temperature, which must all stay within the green range.
8. At a height of 100 m (330 ft.) AGL:
   - Fuel booster pump . . . . . OFF

   If the fuel system is intact, the red warning light must not illuminate, since the main fuel pump maintains the fuel pressure.
9. After reaching a safe altitude:
   - Propeller speed control . . . . . set RPM below yellow range
   - Throttle control . . . . . set manifold pressure below yellow range

For best angle of climb, adjust airspeed to 97 km/h (52 kts. / 60 mph). For best rate of climb, adjust to 110 km/h (59 kts. / 68 mph). Figures apply to maximum T/O mass (max. gross weight).

CAUTION

The manifold pressure for maximum continuous power is set in the range from 1/2 to 1 1/2 cm (1/5 to 3/5 in.) behind the foremost throttle control position. In this range, the TCU sets the manifold pressure between 32 and 34 inHg and it is not possible to control the manifold pressure with the throttle control.

4.5.3 CRUISE (INCLUDING IN-FLIGHT ENGINE STOP/START PROCEDURES)

NOTE

Economic power settings can be found in Article 5.3.7.

WARNING

When setting the power in turbulent air, make sure not to exceed the rough air speed v_{RA}.

CAUTION

In order to avoid overheating the bearings in the turbocharger, the engine must be cooled down at idle power for a minimum of two minutes before being turned off.

Fuel management

Check fuel quantity indicators and fuel selector valve at regular intervals. Select fuel tank with more fuel if necessary.

CAUTION

The difference between the fuel quantity “left” and the fuel quantity “right” must not exceed 50 % (i.e. 27 liters / 7.1 US gal.).

In-flight engine stop

1. Throttle control . . . . . IDLE

CAUTION

In order to avoid overheating the bearings in the turbocharger, the engine must be cooled down at a low power setting for approximately one minute before being turned off.

2. Electrical consumers . . . . . OFF

WARNING

Starting the engine with the electric starter can become impossible:

- After prolonged soaring with several electrical consumers switched ON (mis-operation of mode select switch)
- In extreme cold (see Paragraph 2.14, OTHER LIMITATIONS)
- If the battery is in a poorly maintained condition or barely charged

3. Airspeed . . . . . maintain approximately 100 km/h (54 kts. / 62 mph).

NOTE

At airspeeds below 100 km/h (54 kts. / 62 mph), the windmilling propeller RPM becomes very low or the propeller stops. However, the propeller will only feather at a sufficient RPM (above 2000).

4. Ignition . . . . . OFF

5. Propeller speed control . . . . FEATHER (pull all the way back over the cam)

NOTE

The propeller rotates after ignition shut-off due to windmilling. Feathering will occur with the propeller rotating.

6. Mode select switch . . . . . SOARING

7. Cowl flap . . . . . CLOSE

In-flight engine start

1. Electrical consumers . . . . . OFF
2. Master switch . . . . . ON
3. Mode select switch . . . . . POWER FLIGHT
4. Propeller speed control . . . . TAKE-OFF
5. Cowl flap . . . . . OPEN
6. Choke . . . . . ON if engine is cold
7. Fuel selector valve . . . . . select tank with more fuel
8. Fuel booster pump . . . . . ON
9. Throttle control . . . . . IDLE
10. Ignition switch . . . . . turn clockwise to start engine
11. Oil pressure . . . . . check

NOTE

The hydraulic pressure accumulator is not full after the propeller pitch change. After pressure build-up, there might be a loss of oil pressure in the area of the oil pressure sensor. The reason for this is the filling process of the pressure accumulator. The oil pressure indicator may drop to zero for a maximum of 15 seconds.

12. Choke . . . . . OFF if necessary
13. Fuel booster pump . . . . . OFF
14. Fuel pressure warning light . verify main fuel pump maintains fuel pressure
15. Electrical consumers . . . . . ON as required
16. Oil temperature . . . . . check
17. Propeller check:

- . . . . . Throttle control adjust to 4800 RPM
- . . . . . Propeller speed control C R U I S E (carefully pull back to cam before F E A T H E R position)

wait until speed drops to approximately 4600 RPM

reset to TAKE-OFF position

Repeat procedure at least three times.

CAUTION

Without repeating the procedure, it is not ensured that the pitch change mechanism will operate faultlessly. The propeller system becomes bled by this procedure. If this check is not carried out, the propeller pitch could fluctuate.

4.5.4 DESCENT

1. Throttle control . . . . . reduce power as required

WARNING

When setting the power in turbulent air, make sure not to exceed the rough air speed v_{RA}.

2. Carburetor heat . . . . . ON if required
3. Trim . . . . . adjust as required
4. Air brakes . . . . . apply as required

4.5.5 APPROACH AND LANDING

Power-on landing

1. Propeller speed control . . . . TAKE-OFF
2. Fuel selector valve . . . . . select tank with more fuel
3. Fuel booster pump . . . . . ON
4. Throttle control . . . . . reduce power
5. Carburetor heat . . . . . ON
6. Cowl flap . . . . . OPEN
7. Trim . . . . . adjust as required
8. Air brakes . . . . . apply as required

NOTE

The air brake lever is arrested when the air brakes are extended half way. With slightly increased force, this position can be overtraveled in either direction. With the air brakes locked in the half extended position, it is possible to control the glide path with the throttle control. The maximum airspeed for air brakes fixed in the half extended position (v_{ABF}) must not be exceeded.

9. Sideslip . . . . . possible, but not necessary

NOTE

The speed range in which sideslips can be performed depends on the strength of the pilot, since significant rudder control forces are required at higher airspeeds. Usually, the upper limit is approximately 150 km/h (81 kts. / 93 mph).

A control force reversal can occur when the rudder is fully deflected and the ailerons are deflected opposite to the rudder. To recover, either release the aileron control or apply approximately 30 N (7 lbs.) to the rudder pedal to overcome the control force reversal.

10. Approach speed . . . . . 105 km/h (57 kts. / 65 mph) during final approach

NOTE

Conditions such as strong headwind, danger of wind shear, turbulence, or wet wings require a higher approach speed.

11. Touchdown . . . . . on main landing gear
12. Wheel brakes . . . . . apply as required, using toe brakes

CAUTION

The wheels have a differential braking system. Apply toe brakes symmetrically to avoid skidding.

13. Fuel booster pump . . . . . OFF

Balked landing with the engine running

1. Air brakes . . . . . retract
2. Carburetor heat . . . . . OFF
3. Throttle control . . . . . FULL

WARNING

When approaching with the air brakes fixed in the half extended position, one hand on the control stick and the other on the throttle control, FIRST select full throttle, then retract the air brakes.

NOTE

Climbing is possible with the air brakes fixed in the half extended position.

4. Perform climb with at least 97 km/h (52 kts. / 60 mph). Monitor oil pressure, oil temperature, and cylinder head temperature which must all stay within the green range.

5. At a height of approximately 100 m (330 ft.) AGL:
   - . . . . . Fuel booster pump OFF

   If the fuel system is intact, the red warning light must not illuminate, since the main fuel pump maintains the fuel pressure.

Power-off landing

NOTE

If the propeller is feathered, sufficient height must be allowed on approach to ensure that the landing field is reached, since starting the engine takes too much time during final approach!

1. Trim . . . . . adjust as required
2. Air brakes . . . . . apply as required

NOTE

The air brake lever is arrested when the air brakes are extended half way. With slightly increased force, this position can be overtraveled in either direction.

3. Approach speed . . . . . 105 km/h (57 kts. / 65 mph) during final approach

NOTE

Conditions such as strong headwind, danger of wind shear, turbulence, or wet wings require a higher approach speed.

4. Touchdown . . . . . on main landing gear
5. Wheel brakes . . . . . apply as required, using toe brakes

CAUTION

The wheels have a differential braking system. Apply toe brakes symmetrically to avoid skidding.

4.5.6 (omitted)

4.5.7 HIGH ALTITUDE FLIGHT

The never exceed speed is reduced at pressure altitudes above 2000 meters (6500 ft.), as shown in the following table.

Pressure altitude		Never exceed speed (v_{NE})		
meters	**feet**	**km/h**	**kts.**	**mph**
0 to 2000	0 to 6500	261	141	162
2000 to 3000	6500 to 9800	246	133	153
3000 to 4000	9800 to 13100	233	126	145
4000 to 5000	13100 to 16400	221	119	137
5000 to 6000	16400 to 19600	210	113	130

WARNING

Due to the lack of oxygen at high altitudes, perception and reaction become greatly reduced and even unconsciousness may occur. The use of oxygen apparatus is strongly advised for flights above 3500 m (11500 ft.). National legislation for flights at high altitudes should be referred to.

WARNING

During the flight tests, the powered sailplane was only tested up to altitudes of 5000 m (16000 ft.).

4.5.8 FLIGHT IN RAIN

NOTE

Flight performance deteriorates in rain. The impact on the flying characteristics is minor. Flight in very heavy rain should be avoided because of the reduced visibility.

4.5.9 AEROBATICS

NOTE

Aerobatics and spinning are not permitted.

4.5.10 ENGINE SHUT-DOWN

1. Propeller speed control . . . . TAKE-OFF
2. Throttle . . . . . IDLE

CAUTION

In order to avoid overheating the turbocharger bearings, the engine must be cooled down at idle power for a minimum of two minutes before being turned off. This should be observed especially after engine test running. Sufficient cooling usually occurs through landing approach and subsequent taxiing.

3. Parking brake . . . . . set
4. Fuel booster pump . . . . . OFF
5. Electrical consumers . . . . . OFF
6. Ignition . . . . . OFF
7. Master switch . . . . . OFF
8. Mode select switch . . . . . SOARING
9. Air brakes . . . . . lock

4.5.11 PARKING

When parking for a short time, the airplane should be oriented in headwind direction with the parking brake set and the air brakes fixed in the half extended position. In case of longer unattended parking or in unpredictable wind conditions, the airplane should be moored or stored in a hangar. It is also advisable to cover the Pitot tube.

CAUTION

Avoid outdoor parking for prolonged periods of time.

NOTE

The powered sailplane should not be parked with the propeller in the feathered pitch position. With an empty oil pressure accumulator, the propeller cannot assume the take-off position. Starting the engine with the propeller in feathered pitch is possible, but significantly increases engine wear.

SECTION 5
PERFORMANCE

Page No.

5.1 INTRODUCTION

Section 5 provides ACG approved data for airspeed calibration, stall speeds and take-off performance, along with additional information which does not require approval.

The data in the charts has been computed from actual flight tests with the powered sailplane and power-plant in good condition, with wheel fairings, winglets and spinner installed and using average piloting techniques.

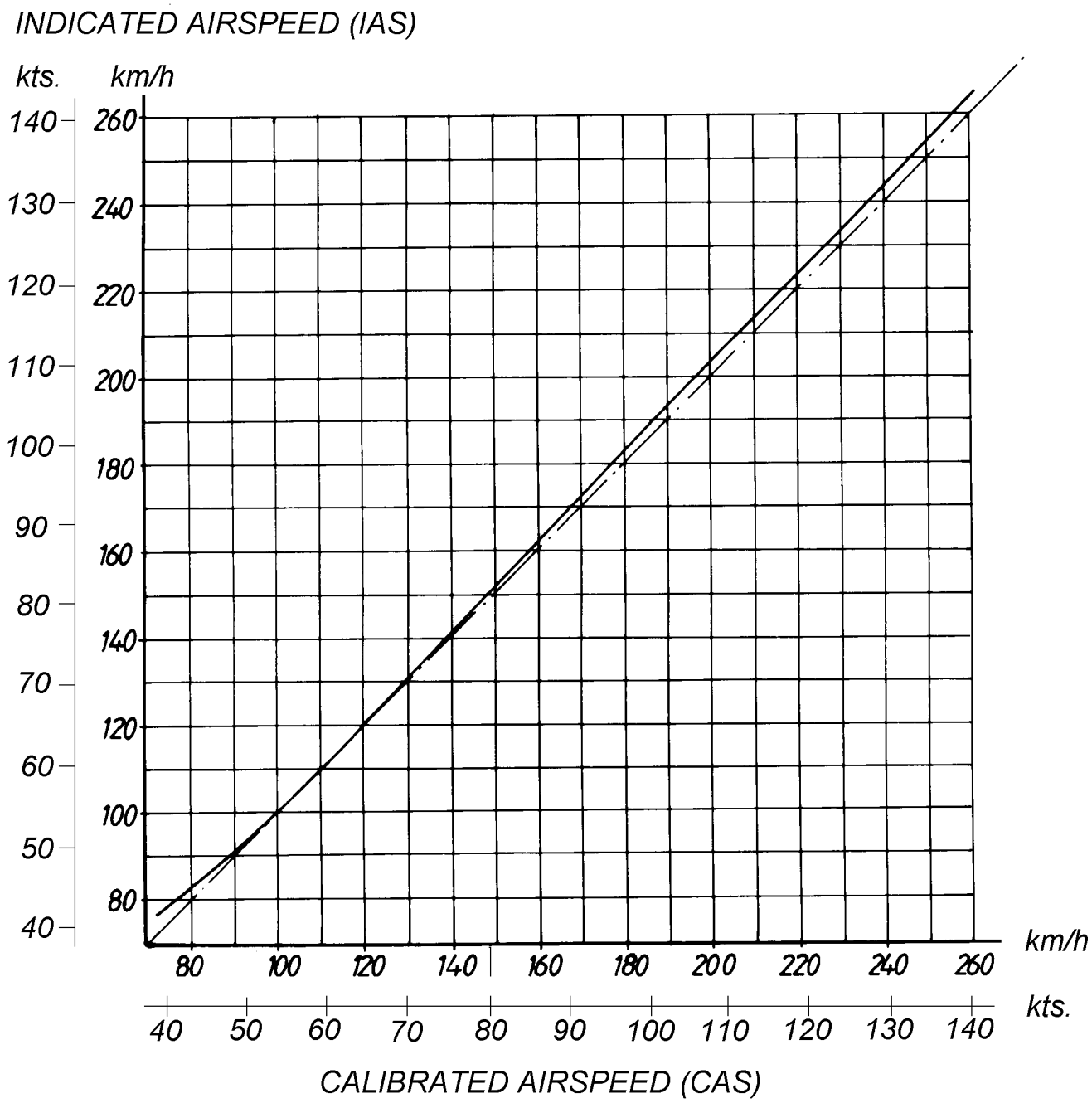
The specified airspeeds must be understood as IAS. The performance data has been evaluated using the normal procedures described in Section 4.

NOTE

A poor maintenance condition of the airplane and unfavorable external circumstances (high temperature, rain) can considerably deteriorate the specified performance values.

5.2 ACG-APPROVED DATA

5.2.1 AIRSPEED INDICATOR SYSTEM CALIBRATION



5.2.2 STALL SPEEDS

Stall speeds at different bank angles in **km/h**:

Air brakes		**Bank angle**			
		0°	**30°**	**45°**	**60°**
retracted	v_{SO}	78 km/h	84 km/h	93 km/h	110 km/h
extended	v_{S1}	81 km/h	87 km/h	96 km/h	115 km/h

Stall speeds at different bank angles in **kts.**:

Air brakes		**Bank angle**			
		0°	**30°**	**45°**	**60°**
retracted	v_{SO}	42 kts.	45 kts.	50 kts.	60 kts.
extended	v_{S1}	44 kts.	47 kts.	52 kts.	62 kts.

Stall speeds at different bank angles in **mph**:

Air brakes		**Bank angle**			
		0°	**30°**	**45°**	**60°**
retracted	v_{SO}	48 mph	52 mph	58 mph	69 mph
extended	v_{S1}	50 mph	54 mph	60 mph	71 mph

NOTE

Conditions such as turbulence, wet wings, or high load factors increase the stall speeds.

5.2.3 TAKE-OFF PERFORMANCE

Conditions:
- Outside air temperature: 15 °C (59 °F)
- Atmospheric pressure: 1013 hPa (1013 mbar / 29.92 inHg)
- Wind: calm
- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting: TAKE-OFF
- Rotation at : approximately 80 km/h (43 kts. / 50 mph)
- Lift-off speed : approximately 90 km/h (49 kts. / 56 mph)
- Speed during climb : approximately 97 km/h (52 kts. / 60 mph)
- Level runway, asphalt surface

Take-off roll : 182 m (597 ft.)
Take-off distance to clear a 15 m (50 ft.) obstacle : 274 m (899 ft.)

NOTE

For take-off distances under circumstances different from those described above, refer to the charts in Article 5.3.3.

WARNING

The take-off distances given here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3 ADDITIONAL INFORMATION

5.3.1 DEMONSTRATED CROSSWIND PERFORMANCE

Take-off : 15 km/h (8 kts. / 9 mph)
Landing : 15 km/h (8 kts. / 9 mph)

5.3.2 GLIDE PERFORMANCE AND FLIGHT POLAR

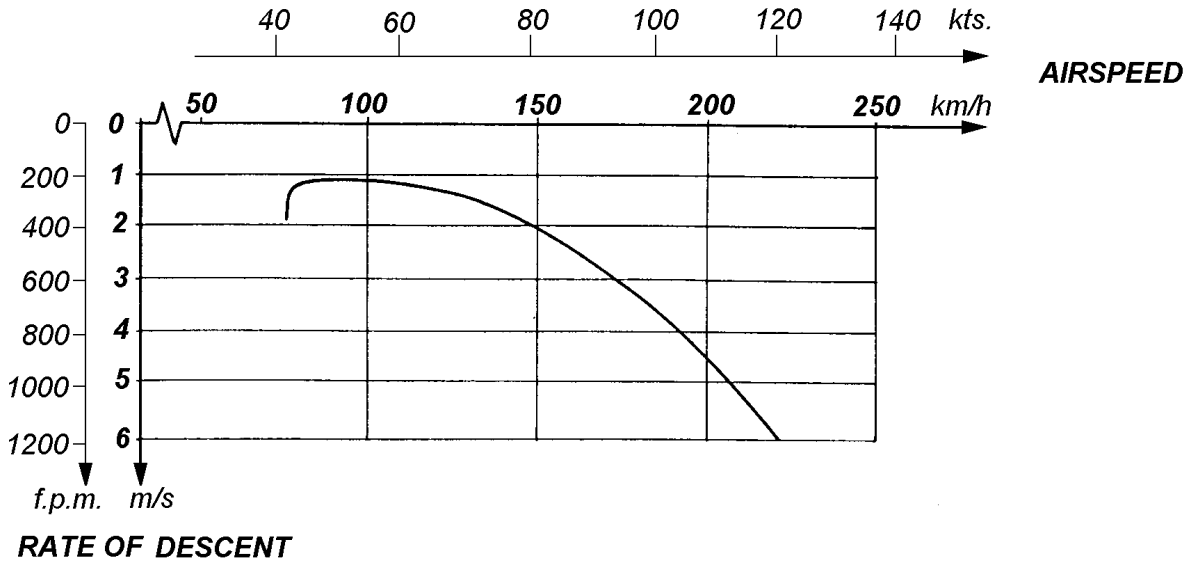
Glide performance

Minimum rate of descent : 1.19 m/s (234 ft./min) at 97 km/h (52 kts. / 60 mph)
Maximum lift drag ratio : 27 at 105 km/h (57 kts. / 65 mph)

NOTE

These figures as well as the graph below are valid for maximum flight mass (max. gross weight) with winglets, wheel fairings and spinner installed and the propeller feathered.

Flight polar



5.3.3 TAKE-OFF CHARTS

Conditions:
- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting: TAKE-OFF
- Lift-off speed : approximately 90 km/h (49 kts. / 56 mph)
- Speed during climb : approximately 97 km/h (52 kts. / 60 mph)
- Level runway, asphalt surface
- TCU switched ON

s_1 = Take-off roll;

s_2 = Take-off distance to clear a 15 m (50 ft.) obstacle

Head-wind comp. [kts.]	OAT [°C]	Pressure altitude above MSL QFE							
		0 m / 0 ft. 1013 hPa		400 m / 1310 ft. 966 hPa		800 m / 2620 ft. 921 hPa		1200 m / 3940 ft. 877 hPa	
		s_1 [m]	s_2 [m]	s_1 [m]	s_2 [m]	s_1 [m]	s_2 [m]	s_1 [m]	s_2 [m]
0	0	158	244	172	260	186	277	202	297
	15	182	274	197	292	214	314	231	336
	30	208	307	225	328	251	363	282	400
5	0	129	206	141	220	153	235	167	253
	15	149	232	162	248	177	267	192	287
	30	171	261	186	280	209	309	236	344
10	0	103	171	112	183	123	197	135	212
	15	119	193	130	208	143	224	157	241
	30	137	218	150	236	170	261	193	291

Head-wind comp. [kts.]	OAT [°F]	Pressure altitude above MSL QFE							
		0 ft. 29.9 inHg		1310 ft. 28.5 inHg		2620 ft. 27.2 inHg		3940 ft. 25.9 inHg	
		s_1 [ft.]	s_2 [ft.]	s_1 [ft.]	s_2 [ft.]	s_1 [ft.]	s_2 [ft.]	s_1 [ft.]	s_2 [ft.]
0	32	518	801	564	853	610	909	663	974
	59	597	899	646	958	702	1030	758	1102
	86	682	1007	738	1076	823	1191	925	1312
5	32	423	676	463	722	502	771	548	830
	59	489	761	531	814	581	876	630	942
	86	561	856	610	919	686	1014	774	1129
10	32	338	561	367	600	404	646	443	696
	59	390	633	427	682	469	735	515	791
	86	449	715	492	774	558	856	633	955

WARNING

A grass surface will extend the take-off distances by at least 20 %, depending on its characteristics (softness, grass length). The take-off distances given here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3.4 NOISE DATA

The evaluation of noise emission was carried out according to the Noise Regulations of ICAO Annex 16, with the DAI-1 exhaust system installed.

Annex 16, Chapter 10:

59.9 dB(A)

Annex 16, Chapter 6 (for Austria only):

62.3 dB(A); for basic training and towing flight

(Austrian Federal Law Gazette, 29 Oct 1993, 738th Decree)

5.3.5 CLIMB PERFORMANCE

Conditions:
- Sea level
- Power setting: 34 inHg at 5500 RPM
- Maximum flight mass (max. gross weight)
- Airspeed: v_y = 110 km/h (59 kts. / 68 mph)

Max. rate of climb: 5.4 m/s (1063 ft./min)

5.3.6 SERVICE CEILING

Service ceiling is above 5000 m (16400 ft.).

NOTE

For flights at high altitude, attention should be paid to Article 4.5.7, HIGH ALTITUDE FLIGHT.

5.3.7 FUEL CONSUMPTION, CRUISING SPEED, ENDURANCE

NOTE

The endurance data shown below applies to full wing tanks. The reserve that is available when the wing tanks are emptied is given in parentheses. It results from the fuel in the central fuel reservoir (about 9 liters / 2.4 US gal.). When determining range, attention must be paid to the influence of wind, as well as safety reserves.

Conditions:
- Flight in still air
- ISA conditions
- Airplane in good maintenance condition and correctly adjusted

Power	Manif. press.	Engine speed	Fuel consumption		True airspeed v_{TAS} at altitude			Endurance with both wing tanks full (+ reserve)
					1000 m 3300 ft.	2000 m 6600 ft.	3000 m 9800 ft.	
[% MCP]	[inHg]	[RPM]	[l/h]	[US gal./h]	[km/h] [kts. / mph]			[h:min] ([min])
115	38	5800	33	8.7	-	-	-	--
100	34	5450	27	7.1	217 117/135	222 120/138	227 123/141	3:56 (17)
90	32	5300	24	6.3	210 113/131	215 116/134	219 118/136	4:25 (20)
75	30	5050	20	5.3	197 106/122	201 109/125	205 111/127	5:18 (24)
60	28	4800	17	4.5	184 99/114	187 101/116	190 103/118	6:14 (28)
45	26	4600	14	3.7	168 91/104	170 92/106	173 93/108	7:34 (34)

NOTE

As a simplified rule for reducing power below the maximum continuous power, manifold pressure (throttle control) should be reduced by approximately 2 inHg per 250 RPM engine speed reduction (propeller speed control).

SECTION 6
MASS (WEIGHT) AND BALANCE / EQUIPMENT LIST

Page No.

6.1 INTRODUCTION

Section 6 describes the range of loading in which the HK 36 TTC-ECO be operated safely.

Descriptions of the weighing procedure, the determination of the admissible empty mass CG range and a list of the equipment that must be present in the airplane during the weighing process are included in the Airplane Maintenance Manual, Section 4.

WARNING

Exceeding the maximum mass (maximum gross weight) can lead to overstressing of the airplane. Falling short of the minimum useful load on the seats will impair controllability and stability.

6.2 WEIGHING PROCEDURES

The weighing procedures are described in the Airplane Maintenance Manual, Paragraph 4.2. The purpose of weighing the airplane is to evaluate the empty mass (empty weight) and the corresponding CG lever arm (i.e. CG position). It may be carried out by authorized personnel only.

6.3 WEIGHING REPORT

The Weighing Report shows the current empty mass (empty weight) and the corresponding CG position. The Weighing Report is preserved in the Airplane Maintenance Log.

NOTE

After equipment changes, repair work, repainting, etc. the airplane must be reweighed in compliance with the Airplane Maintenance Manual by an authorized person, and the new empty mass (empty weight) CG position must be determined. The results must be recorded in the Mass and Balance Form.

6.4 BASIC EMPTY MASS (WEIGHT) CENTER OF GRAVITY

The empty mass (empty weight) CG limitations are defined in the Airplane Maintenance Manual, Section 4. The observance of these limitations is prerequisite for the validity of the Mass and Balance Form.

6.5 MAXIMUM MASS (WEIGHT) OF ALL NON-LIFTING PARTS

The maximum mass (weight) of all non-lifting parts is 610 kg (1345 lbs.). A list of all non-lifting parts is included in the Airplane Maintenance Manual, Paragraph 4.6.

NOTE

Due to the design of the HK 36 TTC-ECO, the mass (weight) of all non-lifting parts will not be exceeded unless the maximum flight mass (max. gross weight) of 770 kg (1698 lbs.) is overstepped.

6.6 MASS (WEIGHT) AND BALANCE FORM

The Mass and Balance Form shows the following data:

* Current empty mass
* Current empty mass CG position
* Current maximum useful load (including parachutes, seat cushions, fuel, and baggage)
* Minimum useful load on the seats for solo flights with 10 kg (22 lbs.) fuel and no baggage
* Minimum useful load on the seats for solo flights with 10 kg (22 lbs.) fuel and maximum baggage mass (30 kg (66 lbs.))

NOTE

Observance of the maximum useful load ensures that the center of gravity will not lie in front of the admissible range. Observance of the minimum useful load on the seats ensures that the center of gravity will not lie behind the admissible range.
Loading configurations which are not covered by the Mass and Balance Form must be calculated in accordance with Paragraph 6.8, MASS/CG ENVELOPES.

Additionally, the Mass and Balance Form is a record of all weighings. It must be updated by an authorized person using the data recorded in the currently effective Weighing Report. The corresponding instructions can be found in the Airplane Maintenance Manual, Paragraph 4.7.

NOTE

Weighing is carried out with the equipment shown in the Equipment Inventory installed. Airplane operation without winglets, spinner or wheel fairings is permissible in exceptional cases. The influence on the empty mass (weight) and the corresponding CG position is negligible.

MASS AND BALANCE FORM

SERIAL NO.: _____ CALL SIGN: _____

Date of weighing	Empty mass (weight)	Empty mass CG pos.	Max. useful load	Minimum useful load on seats with 10 kg (22 lbs.) fuel		A.M.E.
				no baggage	30 kg (66 lbs.) baggage	
	[kg]	[mm aft of datum]	[kg]	[kg]	[kg]	

6.7 USEFUL LOAD

The useful load comprises of the masses (weights) of the occupants, baggage, and fuel. The mass of the occupants includes the mass of the parachutes.

6.7.1 MAXIMUM USEFUL LOAD

The maximum permissible useful load is shown in the Mass and Balance Form and on the limitations placard on the instrument panel.

6.7.2 USEFUL LOAD ON THE SEATS

Minimum useful load on the seats

The Mass and Balance Form and the limitations placard in the cockpit show the following data:

* Minimum useful load on the seats for solo flights with 10 kg (22 lbs.) fuel and and no baggage;
* Minimum useful load on the seats for solo flights 10 kg (22 lbs.) fuel and maximum baggage mass (30 kg (66 lbs.)).

The minimum useful load on the seats is in no case less than 55 kg (121 lbs.).

NOTE

Pilots with a mass (a weight) between 55 kg (121 lbs.) and the minimum useful load on the seats must install a trim weight in the case of solo flights.

Maximum useful load on the seats

The useful load on one seat must not exceed 110 kg (243 lbs.).

Lever arm of useful load on the seats

A lever arm of 143 mm (5.63 in.) aft of datum plane is assumed for all CG computations.

6.7.3 USEFUL LOAD IN BAGGAGE COMPARTMENT

Maximum useful load in the baggage compartment

The maximum useful load in the baggage compartment is 30 kg (66 lbs.).

NOTE

When loading baggage, make sure not to exceed the maximum permissible useful load.

CAUTION

Additional equipment (e.g. measuring equipment) installed in the baggage compartment must be treated as useful load. It must be installed in such a way that it does not endanger occupants in an emergency landing with a forward load factor of 9. When installing additional equipment, the corresponding appendices to this manual must be observed.

Lever arm of useful load in the baggage compartment

A lever arm of 824 mm (32.44 in.) aft of datum plane is assumed for all CG computations.

6.7.4 FUEL LOAD

The fuel capacity is given in Paragraph 2.12.

NOTE

When refuelling, make sure not to exceed the maximum permissible useful load.

NOTE

When determining the flight mass (weight) and the corresponding CG, the fuel in the central fuel reservoir must be considered. The reservoir holds 9 liters (2.4 US gal.) of fuel at a station (lever arm) of 680 mm (26.77 in.) aft of datum plane.

Lever arm of the wing fuel tanks

A lever arm of 255 mm (10.04 in.) aft of datum plane is assumed for all CG computations.

6.7.5 ADDITIONAL EQUIPMENT IN THE INSTRUMENT PANEL

Maximum permissible mass (weight) of equipment in the instrument panel

The mass (weight) of all equipment installed in the instrument panel (including measuring equipment) must not exceed 20 kg (44 lbs.).

Lever arm of the additional equipment in the instrument panel

A lever arm of -421 mm (-16.54 in.) is assumed for all CG computations. The negative sign means that the equipment is located *in front of* the datum plane.

6.8 MASS / C.G. ENVELOPES

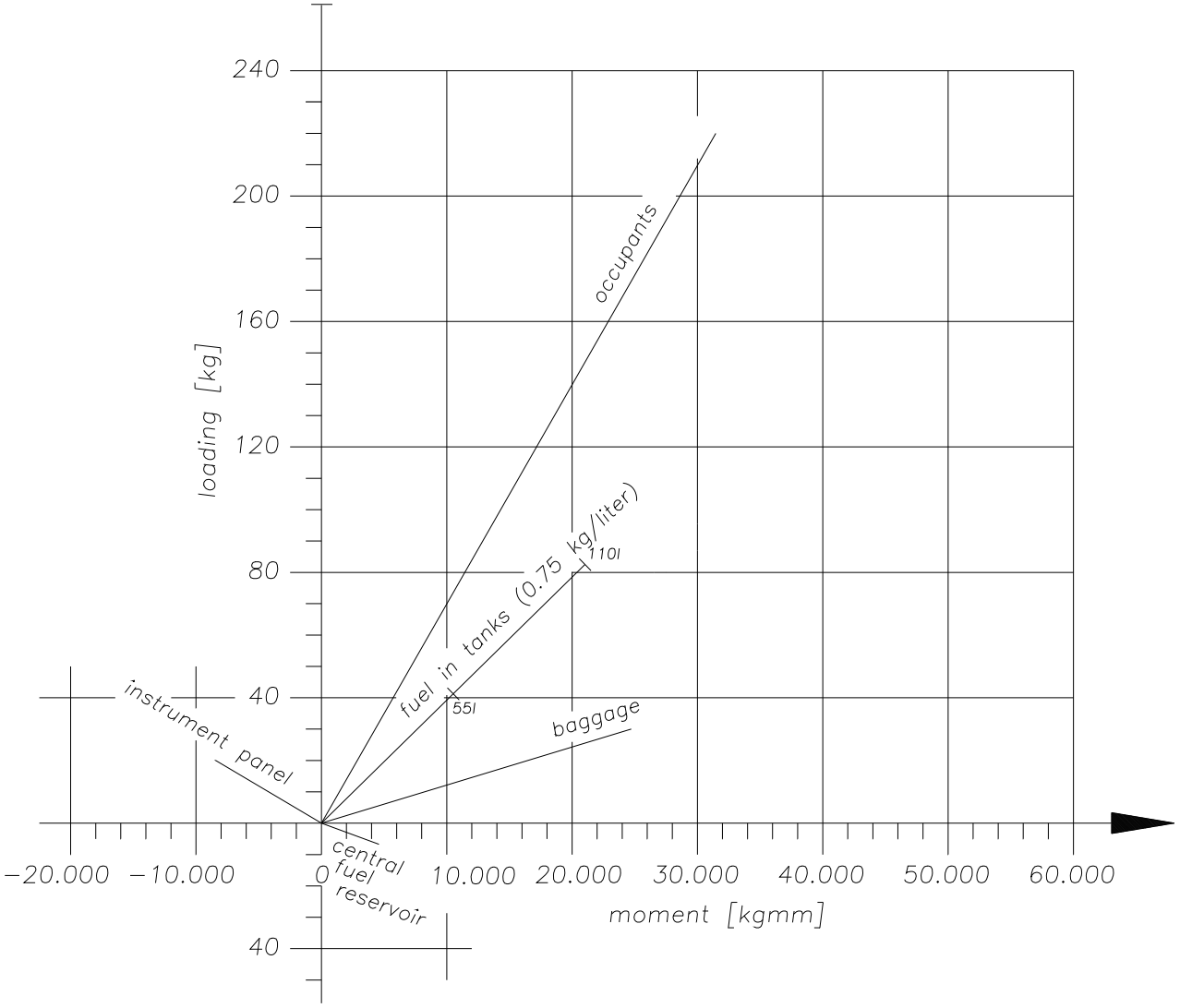
The following table is a supplement to the Mass and Balance Form. It enables the pilot to verify whether a loading configuration is permissible as regards maximum useful load, minimum useful load on the seats, and CG position.

Calculation of Loading Configuration	HK 36 TTC-ECO (example)		Your HK 36 TTC-ECO	
	Mass [kg]	Moment [kgmm]	Mass [kg]	Moment [kgmm]
1. empty mass (taken from Mass and Balance Form)	590	215940		
2. occupants lever arm: 143 mm	143.5	20521		
3. baggage lever arm: 824 mm	0	0		
4. additional equipment in instrument panel lever arm: -421 mm	3.75	-1579		
5. total mass & total moment with empty fuel tanks (add lines 1 through 4)	737.25	234882		
6. 9 liters of fuel in central fuel reservoir (mass density: 0.75 kg/l) lever arm: 680 mm	6.75	4590		
7. 28 liters of usable fuel (mass density: 0.75 kg/l) lever arm: 255 mm	21	5355		
8. total mass & total moment with fuel tanks filled (add lines 5 through 7)	765	244827		
9. Find the combinations of total mass and total moment (737 kg, 234822 kgmm and 765 kg, 244827 kgmm) in the Mass and CG Envelope (page 6-12). Since both combinations are within the envelope, the loading configuration is permissible.				

NOTE

Divide weights in pounds (lbs.) by 2.2046 to obtain kilograms (kg). Multiply lever arms in inches (in.) by 25.4 to obtain millimeters (mm). Also refer to Article 1.4.2, PHYSICAL UNITS.

Mass and Balance Diagram

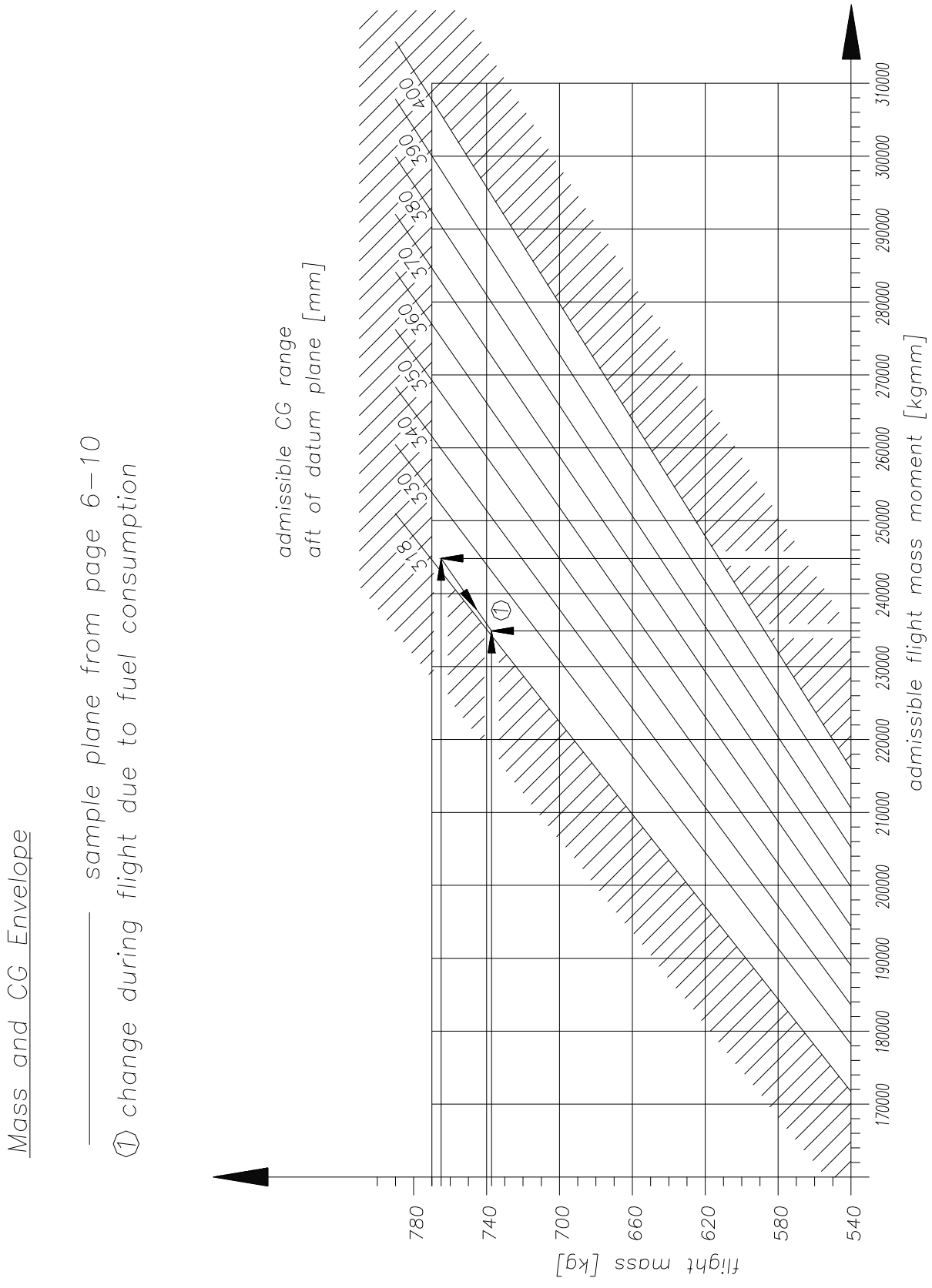


Example from table:

occupants: 143.5 kg
9 liters in central fuel reservoir: 6.75 kg
28 liters in tanks (0.75 kg/l): 21 kg

Result:

loading moment, occupants: 20521 kgmm
loading moment, central fuel reservoir: 4590 kgmm
loading moment, tanks: 5355 kgmm


Mass and CG Envelope
sample plane from page 6-10
① change during flight due to fuel consumption
admissible CG range
aft of datum plane [mm]
admissible flight mass moment [kgmm]
flight mass [kg]
780
740
700
660
620
580
540
170000
180000
190000
200000
210000
220000
230000
240000
250000
260000
270000
280000
290000
300000
310000
310
320
330
340
350
360
370
380
390
400
①

6.9 EQUIPMENT LIST

Minimum equipment (VFR)

1 Altimeter
1 Airspeed indicator
1 Magnetic compass
1 Deviation table
1 RPM indicator
1 Running time meter
1 Manifold pressure indicator
1 Oil pressure indicator
1 Oil temperature indicator
1 Cylinder head temperature indicator
2 Fuel quantity indicators
1 Ammeter
1 Manifold pressure warning light
1 Fuel pressure warning light
1 Generator warning light
1 Turbo caution light
1 Temperature caution light
1 Low fuel caution light

Additional equipment

A list of the currently installed equipment is provided in the Equipment Inventory which is preserved in the Airplane Maintenance Log.

SECTION 7

POWERED SAILPLANE & SYSTEMS DESCRIPTION

Page No.

7.1 INTRODUCTION

Section 7 provides a description of the Powered Sailplane and its systems, together with notes for the user. Refer to Section 9, Supplements, for details of optional systems and equipment.

7.2 AIRFRAME

7.2.1 WINGS

The GFRP/CFRP wings are manufactured in semi-monocoque sandwich construction. A fuel tank made from GFRP is integrated in each wing. The ailerons are made of CFRP and are attached to the wing by means of five hinges, also made of CFRP. Schempp-Hirth type air brakes are provided on the upper surface of the wings.

Each wing is connected to the fuselage by three bolts.

The winglets are manufactured from CFRP and are attached to the wing tips with two threaded bolts each.

7.2.2 FUSELAGE

The GFRP fuselage is manufactured in semi-monocoque construction. A special fire-resistant fabric sheet is sandwiched between a stainless steel barrier and the firewall. The main bulkhead is made of CFRP/GFRP.

The instrument panel allows the installation of instruments up to a total mass (weight) of 20 kg (44 lbs.).

7.2.3 TAIL PLANE

The rudder, elevator and horizontal stabilizer are manufactured in semi-monocoque sandwich construction. The folded-top COM antenna and the Pitot tube mount are located in the vertical stabilizer. The horizontal tail surfaces are attached with two bolts and a fastening screw.

7.3 FLIGHT CONTROLS

7.3.1 PRIMARY CONTROLS

The ailerons and elevator are driven by push-rods and the rudder is driven by control cables. Elevator control forces can be compensated by means of a spring trim system.

The aileron and air brake control systems are automatically connected when the wing is installed. However, the strobe and position lights (optional equipment) and the fuel tanks must be connected manually (see Paragraph 4.2). The elevator control system is not connected automatically, and must be connected by hand.

Co-pilot's control stick

A removable control stick on the co-pilot's side is optional equipment.

Removal:
1. open jacket around stick
2. disconnect wire for the COM transmit button
3. open fly nut
4. remove stick
5. close jacket

For installation, reverse the procedure.

7.3.2 ELEVATOR TRIM SYSTEM

The trim lever with a green knob is located on the center console behind the throttle quadrant. To trim the airplane, unlock the knob by pulling it upwards, then move it to the desired position. The knob is spring-loaded and locks when it is released.

Knob forward = NOSE DOWN

7.3.3 RUDDER PEDAL ADJUSTMENT

CAUTION

The rudder pedals must be adjusted on the ground.

The pedals are unlocked by pulling the black T-grip in front of the control stick.

Move forward: Push pedals forward with your heels while pulling the grip. Release the grip and allow the pedals to lock perceptibly.

Move rearward: Pull pedals rearward with the grip. Release the grip, using your feet to push the pedals forward until they lock.

7.4 AIR BRAKE SYSTEM

There is a blue air brake lever on either side panel. By pulling the lever rearward, the air brakes are unlocked and extended. They may be extended at all speeds up to the never exceed speed v_{NE}.

The air brake lever is arrested when the air brakes are extended half way. This position can be overtraveled in either direction with slightly increased force. To lock the air brakes, the lever must be pushed to the forward stop, overcoming the resistance which occurs after the air brake is retracted. The air brakes have oil dampers.

WARNING

When exceeding the maximum admissible speed with the air brakes fixed in the half extended position, v_{ABF}, the air brakes can become extended by aerodynamic forces.
The extension of the air brakes produces a nose down moment which is more intense at higher airspeeds.
At v_{NE}, the air brakes must be extended slowly in order to avoid excessive deceleration.

7.5 LANDING GEAR SYSTEM

7.5.1 GENERAL

The landing gear consists of a resilient main gear with spring steel struts, and a resilient castering nose wheel. An elastomer damper provides suspension for the nose wheel.

7.5.2 WHEEL BRAKE

The main wheels are equipped with hydraulically actuated disk brakes which are individually operated through toe pedals.

7.5.3 PARKING BRAKE

The draw-button is located on the center console behind the trim lever. The parking brake is released when the button is in the inserted position.

To set the parking brake, draw the button to the stop and actuate the brake pedals a few times. This procedure builds up the required pressure in the brake system which will be maintained until the parking brake is released.

To release the parking brake, step on the toe brakes again, in order to relieve the shut-off valve, and push the button in.

CAUTION

Pushing the button in without stepping on the toe brakes leads to overstressing of the operating circuit. Excessive wear may result.

7.6 SEATS AND SAFETY HARNESSES

The seat shells are removable in order to permit maintenance and inspection of the control system parts beneath. Jackets on the control sticks and on the air brake levers prevent foreign bodies from falling into the area of the control gear.

The seats are furnished with removable cushions. Parachutes with manual release can be used instead of the cushions. There is no fixture for the release cord of parachutes with automatic release. Therefore, these parachutes cannot be used.

Each seat is provided with a four-part harness. To fasten the harness, the end pieces must be inserted into the lock. To open the harness, turn the twist handle on the lock.

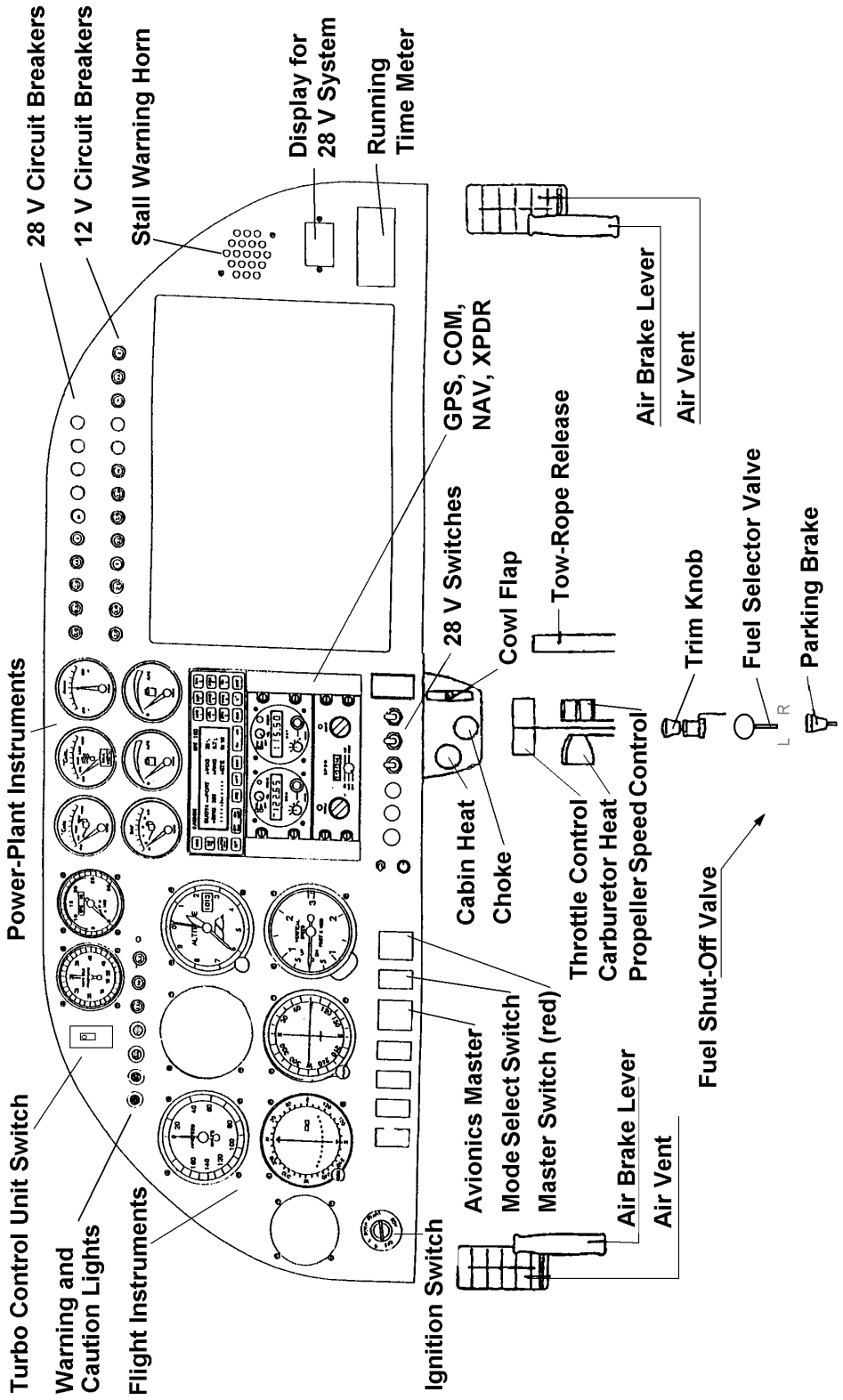
7.7 BAGGAGE COMPARTMENT

The baggage compartment is located behind the backrest and can be reached from the cockpit and through the baggage door. Baggage pieces should be distributed evenly over the compartment. For safety reasons, the baggage pieces must be tied down.

CAUTION

Before loading the baggage compartment, pay attention to the maximum useful load, or, in case of solo flights, the minimum useful load on the seats. Refer to the Mass and Balance Form.

7.8 COCKPIT


28 V Circuit Breakers
12 V Circuit Breakers
Stall Warning Horn
Display for 28 V System
Running Time Meter
GPS, COM, NAV, XPDR
Air Brake Lever
Air Vent
28 V Switches
Cowl Flap
Tow-Rope Release
Trim Knob
Fuel Selector Valve
Parking Brake
Power-Plant Instruments
Cabin Heat
Choke
Throttle Control
Carburetor Heat
Propeller Speed Control
Fuel Shut-Off Valve
Avionics Master
Mode Select Switch
Master Switch (red)
Air Brake Lever
Air Vent
Turbo Control Unit Switch
Warning and Caution Lights
Flight Instruments
Ignition Switch
L R

7.8.1 MODE SELECT SWITCH

When the mode select switch is in the SOARING position, only the COM equipment and the electric vertical speed indicator (optional) are supplied with battery power. All other electrical consumers are switched off.

7.8.2 TCU SWITCH

This switch is only operated in emergency procedures (see Section 3). It is used to switch the TCU off. With the TCU switched off, the manifold pressure must be set manually by the pilot. The switch is shielded by a red cover in order to prevent accidental operation.

7.8.3 FLIGHT INSTRUMENTS

The flight instruments are installed in the left hand section of the instrument panel.

7.8.4 STALL WARNING

If the airspeed is less than 10 % above the stalling speed, the stall warning horn which is installed in the instrument panel will sound. The horn becomes louder as the airspeed comes closer to the stalling speed. A partial vacuum on the bore in the LH wing nose (marked with a red circle) activates the horn through a hose line.

7.8.5 CABIN HEAT AND CABIN AIR

The draw-button for the cabin heat is located in the center console under the instrument panel. Pull the button to turn the cabin heat on.

The cabin can be aerated through the swivelling nozzles on the side panels. The two sliding/knockout windows in the canopy can be opened for additional aerating.

7.8.6 CANOPY

Canopy lock

To close the canopy, pull shut with the black grips located on the front of the canopy frame. The canopy is locked by pushing forward the two red levers attached to the frame on either side. To open the canopy, reverse the sequence.

CAUTION

Before starting the engine, close and lock the canopy!

Canopy jettison

By forcefully swinging the two red levers 180° rearward, the canopy is disconnected from the brackets. Then the pilot must place both hands above his head against the canopy and push it away in upward direction.

7.8.7 BAGGAGE DOOR

The baggage door is located on the LH side behind the canopy. It is unlocked from the cockpit and can then be opened by pulling from outside.

The baggage door must be locked from inside and secured with a locking pin.

7.9 POWER-PLANT

7.9.1 ENGINE

Information about the engine can be found in the Operator's Manual for the engine.

The engine operating instruments are located in the center and left hand section of the instrument panel.

The ignition is operated by a key switch. The ignition is switched on by turning the key clockwise. The starter is operated by turning the key all the way to the stop.

7.9.2 TURBO CONTROL UNIT (TCU)

The manifold pressure is controlled by an electronic control unit. This unit controls a flap (waste gate) parallel to the turbocharger. Independent of the altitude, the same manifold pressure is always set for a given throttle control position, and the manifold pressure is kept within the limits. At high outside air temperatures, the maximum permissible manifold pressure will not be reached, since the TCU prevents excessive airbox temperatures by reducing the manifold pressure. By switching off the TCU (see Emergency Procedures), the waste gate is no longer controlled. Further details can be found in the Operator's Manual for the engine.

7.9.3 POWER PLANT CONTROLS

Throttle quadrant

Carburetor heat, throttle control, and propeller speed control are combined in a unit (throttle quadrant) on the center console.

Carburetor heat: Small rectangular lever

Lever fully rearward = CARBURETOR HEAT ON

The carburetor heat is normally OFF (lever fully forward)

Throttle control: Large round lever

Lever fully forward = FULL THROTTLE

Propeller speed control: Black star shaped lever

Lever fully forward = TAKE-OFF

Lever rearward to cam = CRUISE

Lever fully rearward = FEATHER

Choke

The choke button (self-resetting) is installed in the center console under the instrument panel.

Choke button pulled = CHOKE ACTIVATED

7.9.4 COWL FLAP

For the operation of the cowl flap, there is a T-grip on the center console next to the cabin heat button. To arrest the T-grip, turn it 90° clockwise.

T-grip pulled = cowl flap CLOSED

The cowl flap is closed during soaring in order to reduce drag. At outside temperatures below 0 °C (32 °F), partial closing of the cowl flap avoids continuous operation with an oil temperature below 80 °C (176 °F).

NOTE

Continuous operation with oil temperatures below 80 °C (176 °F) may lead to increased accumulation of condensation, which can be recognized by white foam in the oil tank.

CAUTION

Leave the cowl flap at least half open while the engine is running in order to avoid overheating. Pay special attention to the engine temperatures.

7.9.5 PROPELLER SPEED CONTROL

NOTE

The propeller speed control works differently from the usual systems in so far as hydraulic pressure is needed to *reduce* the blade pitch.

Small pitch is achieved by applying hydraulic pressure supplied by the governor. A spring moves the propeller to the feathered pitch position.

Propeller adjustments are made through the propeller speed control installed into the center console on the right of the throttle control. Pulling the control back to the cam (the point where the resistance increases) causes an RPM reduction. The governor keeps the selected RPM constant, independent of airspeed and throttle control position. If the engine power selected with the throttle control is not sufficient to maintain the selected RPM, the propeller blades will move to the lowest possible pitch (maximum RPM at this power setting).

If the propeller speed control is moved fully rearward over the cam (FEATHER position) and the engine speed is higher than 2000 RPM, the blades will move into the feathered pitch position. At too low RPMs, claws controlled by centrifugal force extend and keep the blades in low pitch position. Thus, it is impossible to feather the propeller at engine standstill or at very low engine speeds. During flight at a speed of 100 km/h (54 kts. / 62 mph) or more, the propeller carries on rotating due to windmilling, even with the ignition switched OFF. The propeller stops rotating only when it is feathered.

The propeller governor is flanged to the engine. It is driven directly by the engine. The propeller control circuit is part of the engine oil circuit.

In case of defects in the oil system, the propeller is supplied with hydraulic pressure from the pressure accumulator. Without the engine running, the propeller pitch change mechanism will remain operative for at least two minutes.

CAUTION

The propeller speed control must not be moved over the cam to the FEATHER position as long as the engine is running.

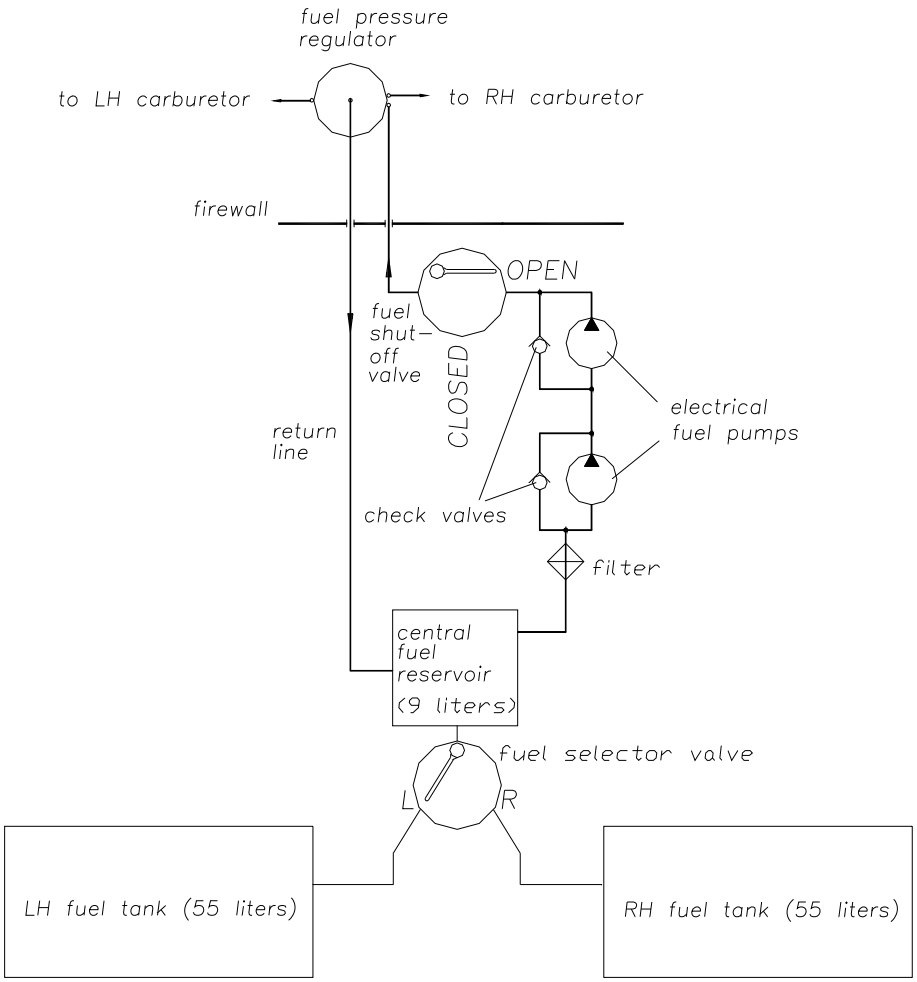
7.10 FUEL SYSTEM

7.10.1 GENERAL

A fuel tank made from GFRP is integrated in each wing. The two fuel tanks feed a central fuel reservoir in the fuselage. Their total capacity is 2 * 55 liters = 110 liters (2 * 14.5 US gal = 29 US gal.), 106 liters (14 US gal.) of which are usable.

Drain ports at the lowest point of the tanks and the central fuel reservoir are provided for fuel drainage and fuel inspection.

The fuel passes through a finger filter in each tank and through a fine filter behind the central fuel reservoir before it reaches the electric fuel pumps. The main fuel pump works automatically as soon as the engine is running. The fuel booster pump is switched ON or OFF manually.



7.10.2 FUEL SELECTOR VALVE

The fuel selector valve is installed on the central console behind the trim lever. It has two positions: LEFT and RIGHT. Fuel is drawn only from the selected tank.

7.10.3 CENTRAL FUEL RESERVOIR

The fuel system has a central fuel reservoir which is installed under the baggage compartment. It is supplied with fuel from the selected wing tank. The fuel pumps deliver fuel from the central fuel reservoir to the engine.

The central fuel reservoir is not a tank and is therefore not considered for endurance calculations. It constitutes an additional reserve of 9 liters (2.4 US gal.). If the level in the fuel reservoir drops below 5 liters (1.3 US gal.), the Low Fuel caution light (amber) is illuminated.

7.10.4 FUEL SHUT-OFF VALVE

The fuel shut-off valve is located on the left side of the center console near the pilot's feet.

Tap in flight direction = valve OPEN

7.10.5 FUEL DRAINAGE

To drain the fuel system, activate the spring loaded drains by pushing in the brass valves. The valves protrude approximately 10 mm (0.4 in.) from the airplane contour. The drains for the wing tanks are located on the wing underside near the fuselage. The drain for the central fuel reservoir is located in the fuselage bottom on the right side.

7.10.6 FUEL QUANTITY INDICATION

The fuel quantity indicators are adjusted for cruising attitude. The indication is too high during climb and too low during descent (up to 6 liters / 1.6 US gal. per tank).

7.11 ELECTRICAL SYSTEM

The master switch is a rocker type. The mode select switch is situated to the left of the master switch.

CAUTION

Starting the engine is only possible if the mode select switch is in the POWER FLIGHT position.
In the SOARING position, all electrical consumers, except for the COM equipment and the electric vertical speed indicator (optional), are currentless.

The electric main fuel pump is supplied with current directly from the generator. The actuation of the master switch has no influence on this current supply. Failure of the generator leads to failure of the main fuel pump.

The NAV and COM equipment is located in the center section of the instrument panel. The transmit button for the radio is integrated into the control stick. The radio loudspeaker is installed in the baggage compartment. A backrest-mounted connection set for two headsets is optional.

7.12 PITOT AND STATIC SYSTEM

Static pressure, total head and the pressure for the compensation of the vertical speed indicator are measured by means of a Pitot tube which is mounted to the vertical stabilizer. The tube is removable. A safe connection of the lines is established automatically when the Pitot tube is inserted all the way to the stop in the mount.

The lowest point in the Pitot and static lines is bridged by means of bypass lines. Water that might have entered the system can accumulate there. Removal of water must be done during scheduled inspections (refer to the Airplane Maintenance Manual).

7.13 MISCELLANEOUS EQUIPMENT

For the operation of additional avionics, refer to the manuals of the respective manufacturers.

7.14 PLACARDS / INSCRIPTIONS

The limitation placards are presented in Paragraph 2.15. Placards for optional equipment are shown in the corresponding Supplements to the Airplane Flight Manual. A list of all placards and inscriptions is included in the Airplane Maintenance Manual.

SECTION 8
POWERED SAILPLANE HANDLING, CARE AND MAINTENANCE

Page No.

8.1 INTRODUCTION

Section 8 contains the manufacturer's recommended procedures for proper ground handling and servicing of the powered sailplane. The Airplane Maintenance Manual lists certain inspection and maintenance requirements which must be followed if the Powered Sailplane is to retain a new plane performance and reliability. It is wise to adhere to the Lubrication Schedule and perform preventative maintenance based on climatic and flying conditions encountered.

8.2 POWERED SAILPLANE INSPECTION PERIODS

Inspections are scheduled every 100, 200 and 600 hours. The respective inspection checklists are prescribed in the Airplane Maintenance Manual, Section 3.

8.3 POWERED SAILPLANE ALTERATIONS OR REPAIRS

Alterations or repairs of the powered sailplane may only be carried out as prescribed in the Airplane Maintenance Manual and only by authorized personnel. In exceptional cases (e.g. ferry flights or test flights after maintenance), airplane operation without winglets, spinner, or wheel fairings is admissible.

CAUTION

The installation of additional measuring equipment is described in the corresponding Supplements to the Airplane Flight Manual.

8.4 GROUND HANDLING / ROAD TRANSPORT

For ground handling, a tow bar attached to the nose wheel should be used. Road transport using a trailer is described in the Airplane Maintenance Manual, Paragraph 1.2.

8.5 CLEANING AND CARE

It is advisable to remove insects with a wet sponge at the end of every flying day.

CAUTION

Extreme dirt accumulation degrades flight performance.

Refer to the Airplane Maintenance Manual, Paragraph 1.4, for further care measures.

SECTION 9
SUPPLEMENTS

At this time, the following Supplements are available:

Supplement No. 1	Tow-Plane Operation
Supplement No. 3	Electrical Power Socket for Additional Equipment
Supplement No. 7	Operation With Underwing Containers
Supplement No. 8	28 V Electrical System

Diamond AIRCRAFT

SUPPLEMENT 7

TO THE AIRPLANE FLIGHT MANUAL FOR THE POWERED SAILPLANE HK 36 TTC-ECO

OPERATION WITH UNDERWING CONTAINERS

Doc. No. : **3.01.25-E**

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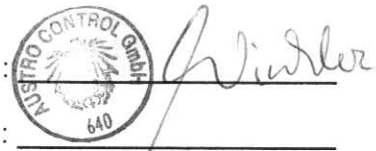
Signature : 

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Original date of approval : 19. Jan. 1999

This powered sailplane must be operated in compliance with the information and limitations contained herein.

Prior to operating the powered sailplane, the pilot must take notice of all the information contained in this Airplane Flight Manual.

DIAMOND AIRCRAFT INDUSTRIES GMBH
N.A. OTTO-STR. 5
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AUSTRIA / EUROPE

0.1 LIST OF EFFECTIVE PAGES

Section	Pages	Date
0	9 - 7 - 0 9 - 7 - 1 9 - 7 - 2 9 - 7 - 3	1998-06-10 1998-06-10 1998-06-10 1998-06-10
1	9 - 7 - 4 9 - 7 - 5 9 - 7 - 6	1998-06-10 1998-06-10 1998-06-10
2	ACG-appr. 9 - 7 - 7 ACG-appr. 9 - 7 - 8 ACG-appr. 9 - 7 - 9	1998-06-10 1998-06-10 1998-06-10
3	ACG-appr. 9 - 7 - 10	1998-06-10
4	ACG-appr. 9 - 7 - 11 ACG-appr. 9 - 7 - 12 ACG-appr. 9 - 7 - 13	1998-06-10 1998-06-10 1998-06-10
5	9 - 7 - 14 ACG-appr. 9 - 7 - 15 ACG-appr. 9 - 7 - 16 9 - 7 - 17 9 - 7 - 18 9 - 7 - 19 9 - 7 - 20	1998-06-10 1998-06-10 1998-06-10 1998-06-10 1998-06-10 1998-06-10 1998-06-10
6	9 - 7 - 21 9 - 7 - 22 9 - 7 - 23 9 - 7 - 24 9 - 7 - 25 9 - 7 - 26	1998-06-10 1998-06-10 1998-06-10 1998-06-10 1998-06-10 1998-06-10
7	9 - 7 - 27 9 - 7 - 28 9 - 7 - 29	1998-06-10 1998-06-10 1998-06-10
8	9 - 7 - 30	1998-06-10

0.2 TABLE OF CONTENTS

SECTION 1

GENERAL

1.1 INTRODUCTION

Pages 9-7-0 through 9-7-30 constitute Supplement No.7 of the Airplane Flight Manual for the Powered Sailplane HK 36 TTC-ECO, Doc. No. 3.01.25-E, and are valid only for the operation of the Powered Sailplane at increased take-off mass (weight) and/or carrying underwing containers.

1.2 CERTIFICATION BASIS

Operation of the Powered Sailplane at increased take-off mass (weight) and/or carrying underwing containers has been approved within the framework of the Austrian type certification in compliance with national operational requirements, CRI - A4, "Operation with Underwing Containers".

Certain points diverge from JAR-22 requirements. This will be noted in each particular case.

1.4 ABBREVIATIONS / EXPLANATIONS

pod underwing container

1.5 DESCRIPTIVE DATA

Max. wing loading : 60.78 kg/m^2 (12.45 lbs./sq.ft.)

Pod dimensions

Length : 1.650 m (5.41 ft.)

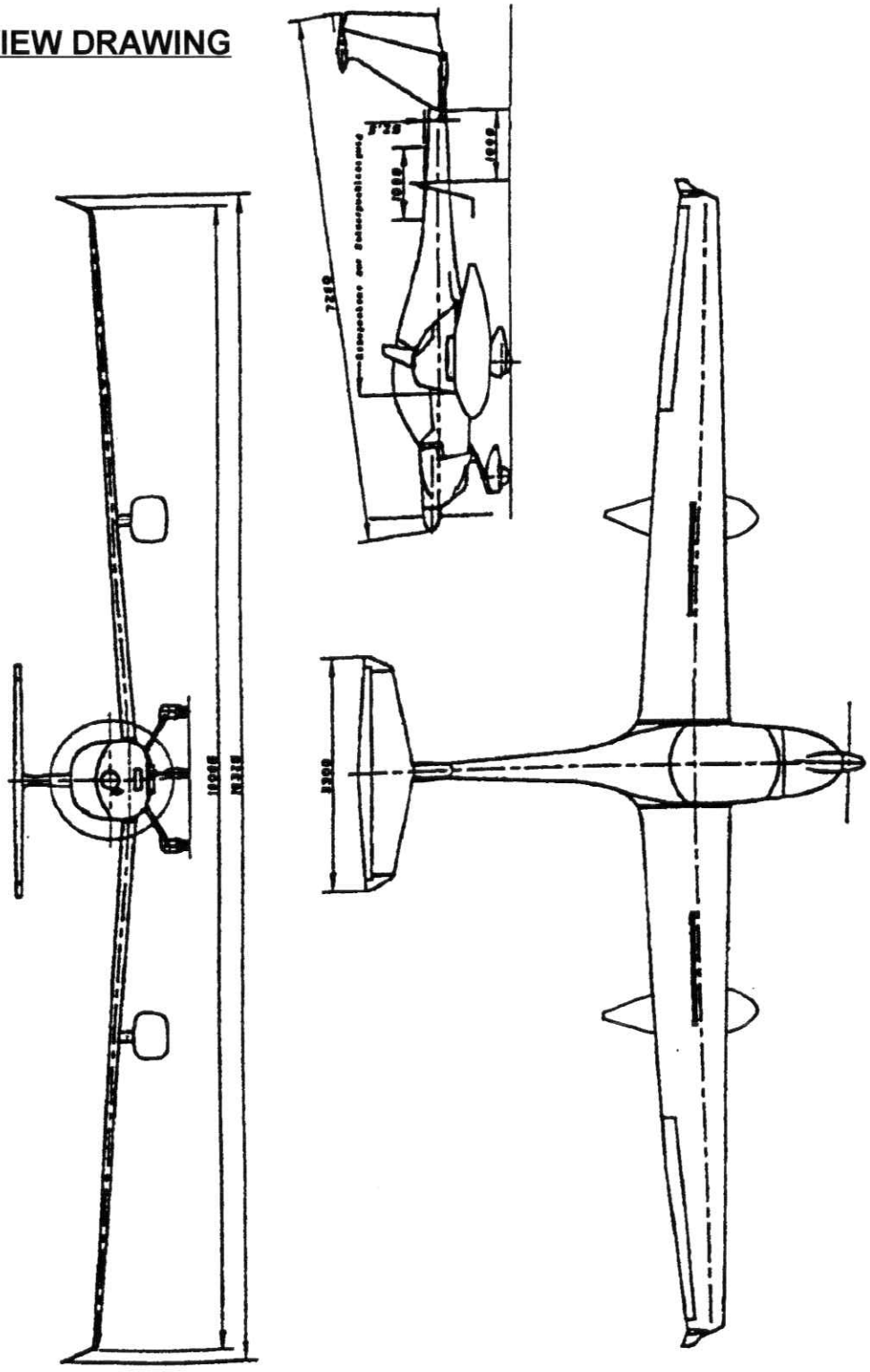
Width : 0.500 m (1.64 ft.)

Height : 0.480 m (1.57 ft.)

Position of pods in y-direction

(distance from center lane) : ± 3.385 m (±11.11 ft.)

1.6 THREE-VIEW DRAWING



SECTION 2

LIMITATIONS

2.3 AIRSPEED INDICATOR MARKINGS

CAUTION

During flights at maximum take-off mass (weight) the following speeds are 10 % higher than marked on the airspeed indicator:

- 1.1 v_{S1} (beginning of green arc)
- v_y (blue radial line)
- approach speed (yellow triangle)

2.6 MASS (WEIGHT)

Maximum take-off mass (max. T/O weight) : 930 kg (2050 lbs.)

NOTE

A maximum take-off mass of 930 kg (max T/O weight of 2050 lbs.) does not comply with the maximum take-off mass specified in JAR-22.

Maximum landing mass	: 930 kg (2050 lbs.)
Maximum mass of all non-lifting parts	: 650 kg (1433 lbs.)
Maximum useful load in baggage compartment	: 30 kg (66 lbs.)
Maximum mass of pods	: 2 * 55 kg (2 * 121 lbs.)
Maximum useful load (including fuel and pods)	: see Chapter 6.6
Maximum useful load in fuselage	: see chapter 6.6
Maximum useful load on seat	: 110 kg (243 lbs.)

WARNING

Exceeding the mass limits (weight limits) can lead to overstressing of the airplane and to a degradation of flying characteristics and flight performance.

2.9 MANEUVERING LOAD FACTORS

Table of maximum permissible load factors:

	at v_A	at v_{NE}
positive	4.4	4.0
negative	-2.2	-1.5

WARNING

Exceeding the maximum permissible load factors may overstress the airplane.

NOTE

The maximum permissible load factors do not comply with the maximum permissible load factors required by JAR-22.

2.11 KINDS OF OPERATION

The HK 36 TTC-ECO is certified for DAY-VFR operation. The scope of the approved kinds of operation is defined in detail in the national special certification.

IFR, flights in clouds and aerobatics are not permitted.

SECTION 3

EMERGENCY PROCEDURES

3.1 INTRODUCTION

All emergency procedures remain unchanged.

SECTION 4

NORMAL PROCEDURES

4.1 INTRODUCTION

The following section includes checklists as well as operational procedures for the operation with underwing containers as developed during flight tests.

4.2 RIGGING AND DE-RIGGING

For the attachment of the pods two sockets are mounted in tandem in direction of flight in each wing. They are situated at the outboard end of the air brakes forward of the air brake case.

Installation of underwing containers (pods)

(1) Insert mounting frame into sockets from below, oriented such that the longer bar is at the rear. Fasten mounting frame with self-locking nuts (size M8) from above, using a torque of 8 to 16 Nm (10.8 to 21.7 ft.lbs.).

(2) Cover the hollows for the screws on the upper surface of the wing with adhesive tape.

(3) Attach the right hand fairing (the larger one) to the frame using the four camlocs.

(4) Attach the left hand fairing to the frame using the four camlocs.

(5) Close the remaining camlocs which link both fairings to each other.

WARNING

The airplane must not be operated with only one pod mounted.

Removal of underwing containers (pods)

To remove the pods, reverse the installation procedure. After removal, cover all openings in upper and lower surface of each wing with adhesive tape.

4.3 DAILY INSPECTION

* Check LH and RH pod for obvious damage, insecure attachment, and open camlocs.
* Check tape covers over LH and RH pod mounting sockets for damage and looseness.

4.5 NORMAL PROCEDURES AND RECOMMENDED SPEEDS

4.5.2 TAKE-OFF AND CLIMB

6. Rotate at a speed of at least 100 km/h (54 kts. / 62 mph). Airplane will lift-off on its own at about 105 km/h (57 kts. / 65 mph).
7. Minimum climb speed is 105 km/h (57 kts. / 65 mph). Monitor oil pressure, oil temperature and cylinder head temperature which must stay within the green range.

Best angle-of-climb speed : 105 km/h (57 kts. / 65 mph)

Best rate-of-climb speed : 120 km/h (65 kts. / 75 mph)

Figures apply to maximum take-off mass (T/O weight).

4.5.3 IN-FLIGHT ENGINE STOP

3. Maintain an airspeed of approximately 110 km/h (59 kts. / 68 mph).

NOTE

At airspeeds below 110 km/h (59 kts. / 68 mph), the windmilling propeller RPM becomes very low or the propeller stops. However, the propeller will only feather at a sufficient RPM (above 2000 engine RPM).

4.5.5 APPROACH AND LANDING

CAUTION

Due to the special operational conditions, landing in soaring configuration is not permissible.

Power-on Landing

9. Approach speed . . . . . 115 km/h (62 kts. / 71 mph) during final approach.

NOTE

Conditions such as strong headwind, danger of wind shear, turbulence, or wet wings require a higher approach speed.

Balked landing

Perform climb with at least 105 km/h (57 kts. / 65 mph). Monitor oil pressure, oil temperature, and cylinder head temperature which must stay within the green range.

SECTION 5

PERFORMANCE

5.1 INTRODUCTION

Section 5 provides data for the airplane carrying pods at the maximum take-off mass of 930 kg (max T/O weight of 2050 lbs.). It includes ACG approved data regarding airspeed indicator system calibration, stall speeds and take-off performance, as well as data and additional information which do not require approval.

The data in the charts has been computed from actual flight tests with the powered sailplane and power-plant in good condition, with wheel fairings, winglets and spinner installed and using average piloting techniques.

The specified airspeeds must be understood as IAS. The performance data has been evaluated using the normal procedures described in Section 4.

NOTE

A poor maintenance condition of the airplane and unfavorable external circumstances (high temperature, rain) can considerably deteriorate the specified performance values.

5.2 ACG-APPROVED DATA

5.2.1 AIRSPEED INDICATOR SYSTEM CALIBRATION

Airspeed indicator system calibration remains unchanged.

5.2.2 STALL SPEEDS

Air brakes retracted : v_{S0} = 87 km/h (47 kts. / 54 mph)

Air brakes extended : v_{S1} = 95 km/h (51 kts. / 59 mph)

NOTE

Conditions such as turbulence, wet wings, banked flight, or high load factors increase the stall speeds.

NOTE

The stall speeds do not comply with the stall speeds required by JAR-22.

5.2.3 TAKE-OFF PERFORMANCE

Conditions:
- Outside air temperature: 15 °C (59 °F)
- Atmospheric pressure: 1013 hPa (1013 mbar / 29.92 inHg)
- Wind: calm
- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting: TAKE-OFF
- Rotation at : approximately 100 km/h (54 kts. / 62 mph)
- Lift-off speed : approximately 105 km/h (57 kts. / 65 mph)
- Speed during climb : approximately 110 km/h (59 kts. / 68 mph)
- Level runway, asphalt surface

Take-off roll	: 232 m (761 ft.)
Take-off distance to clear a 15 m (50 ft.) obstacle	: 337 m (1106 ft.)

NOTE

For take-off distances under circumstances different from those described above, refer to the charts in Article 5.3.3.

WARNING

The take-off distances given here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3 ADDITIONAL INFORMATION

5.3.1 DEMONSTRATED CROSSWIND COMPONENT

Demonstrated crosswind component remains unchanged.

5.3.2 GLIDE PERFORMANCE AND FLIGHT POLAR

Minimum rate of descent : 1.7 m/s at 105 km/h (335 ft./min at 57 kts. / 65 mph)

Best glide ratio : 1:17 at 120 km/h (65 kts. / 75 mph)

NOTE

These figures are valid for maximum flight mass (max. gross weight) with winglets, wheel fairings and spinner installed and the propeller feathered.

NOTE

The minimum rate of descent does not comply with the minimum rate of descent required by JAR-22.

5.3.3 TAKE-OFF CHARTS

Conditions:

- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting: TAKE-OFF
- Rotation at : approximately 100 km/h (54 kts. / 62 mph)
- Lift-off speed : approximately 105 km/h (57 kts. / 65 mph)
- Speed during climb : approximately 110 km/h (59 kts. / 68 mph)
- Level runway, asphalt surface

s_1 ...take-off roll

s_2 ...take-off distance to clear a 15 m (50 ft.) obstacle

Head-wind comp.	OAT		Pressure altitude above MSL QFE							
			0 m / 0 ft. 1013 hPa		400 m / 1310 ft. 966 hPa		800 m / 2620 ft. 921 hPa		1200 m / 3940 ft. 877 hPa	
			s_1	s_2	s_1	s_2	s_1	s_2	s_1	s_2
[kts.]	[°C]	[°F]	[m]	[m]	[m]	[m]	[m]	[m]	[m]	[m]
0	0	32	200	291	221	322	245	355	271	394
	15	59	232	337	257	373	283	411	314	456
	30	86	266	386	295	428	325	472	359	522
5	0	32	133	207	147	229	162	253	180	280
	15	59	154	240	171	265	188	292	208	324
	30	86	176	275	196	304	216	336	239	371
10	0	32	79	136	88	151	97	167	108	185
	15	59	92	158	102	175	112	193	124	214
	30	86	105	181	117	201	129	221	142	245

NOTE

Divide distances in meters [m] by 0.3048 to obtain feet [ft.].

WARNING

A grass surface will extend the take-off distances by at least 20 %, depending on its characteristics (softness, grass length). The take-off distances given here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3.4 NOISE DATA

The evaluation of noise emission was carried out according to the Noise Regulations of ICAO, Annex 16.

According to Chapter 10 : 62.2 dB(A)

5.3.5 CLIMB PERFORMANCE

Conditions:
- Sea level
- Power setting: 34 inHg at 5500 RPM
- Maximum flight mass (max. gross weight)
- Airspeed: v_y = 120 km/h (65 kts. / 75 mph)

Max. rate of climb: 4.70 m/s (925 ft./min)

5.3.7 FUEL CONSUMPTION, CRUISING SPEED, ENDURANCE

NOTE

The endurance data shown below applies to full wing tanks. The reserve that is available when the wing tanks are emptied is given in parentheses. It results from the fuel in the central fuel reservoir (about 9 liters / 2.4 US gal.). When determining range, attention must be paid to the influence of wind, as well as safety reserves.

Conditions:
- Flight in still air
- ISA conditions
- Airplane in good maintenance condition and correctly adjusted

Power	Manif. press	Engine speed	Fuel consumption		True airspeed v_{TAS} at altitude			Endurance 2 * 55 l Tank (+ reserve)
					1000 m 3300 ft.	2000 m 6600 ft.	3000 m 9800 ft.	
[% max. cont. power]	[inHg]	[RPM]	[l/h]	[US gal./hr.]	[km/h] [kts. / mph]			[h:min] ([min])
115	38	5800	33	8.7	-	-	-	-
100	34	5450	27	7.1	209 113/130	213 115/132	217 117/135	3:56 (17)
90	32	5300	24	6.3	203 110/126	206 111/128	209 113/130	4:25 (20)
75	30	5050	20	5.3	190 103/118	193 104/120	196 106/122	5:18 (24)
60	28	4800	17	4.5	178 96/111	180 97/112	181 98/112	6:14 (28)

NOTE

As a simplified rule for reducing power below the maximum continuous power, manifold pressure (throttle control) should be reduced by approximately 2 inHg per 250 RPM engine speed reduction (propeller speed control).

SECTION 6
MASS (WEIGHT) AND BALANCE / EQUIPMENT LIST

6.1 INTRODUCTION

Section 6 describes the range of loading in which the HK 36 TTC-ECO carrying pods will be operated safely.

WARNING

Exceeding the maximum mass (maximum gross weight) can lead to overstressing of the airplane. Falling short of the minimum useful load on the seats will impair controllability and stability.

6.4 BASIC EMPTY MASS (WEIGHT) CENTER OF GRAVITY

The empty mass (empty weight) CG limitations are defined in the Airplane Maintenance Manual.

Pods are not included in the empty mass. They must be treated as useful load for mass and CG calculations.

6.5 MAXIMUM MASS (WEIGHT) OF ALL NON-LIFTING PARTS

The maximum mass (weight) of all non-lifting parts is 650 kg (1433 lbs.). A list of all non-lifting parts is included in the Airplane Maintenance Manual.

NOTE

Due to the design of the HK 36 TTC-ECO, the mass (weight) of all non-lifting parts will not be exceeded as long as the total mass (total weight) minus the mass (weight) of both pods does not exceed 850 kg (1874lbs.).

6.7 USEFUL LOAD

Trim weights

The difference in mass (weight) between the loaded pods must not exceed 5 kg (11 lbs.). Otherwise the difference in mass must be compensated using trim weights.

Maximum mass (weight) of pods

The maximum mass (weight) of each pod is 55 kg (121 lbs.). The center of gravity of each pod shall lie below the rear frame bar. When this requirement is met, the lever arm shown below is valid.

Lever arm

Useful load in pod : 359 mm (14.13 in.)

Loading of pods

Angle brackets with mounting holes are fixed to the bar frame for the installation of equipment.

Installation of equipment must be accomplished in such a way that is able to withstand the following load factors with adequate safety:

positive	: 4.4
negative	: - 2.2
sideward	: 1.5

CAUTION

Installation of additional equipment (e.g. measuring equipment) is explained in Supplement 8 to the Airplane Flight Manual.

6.8 MASS / C.G. ENVELOPES

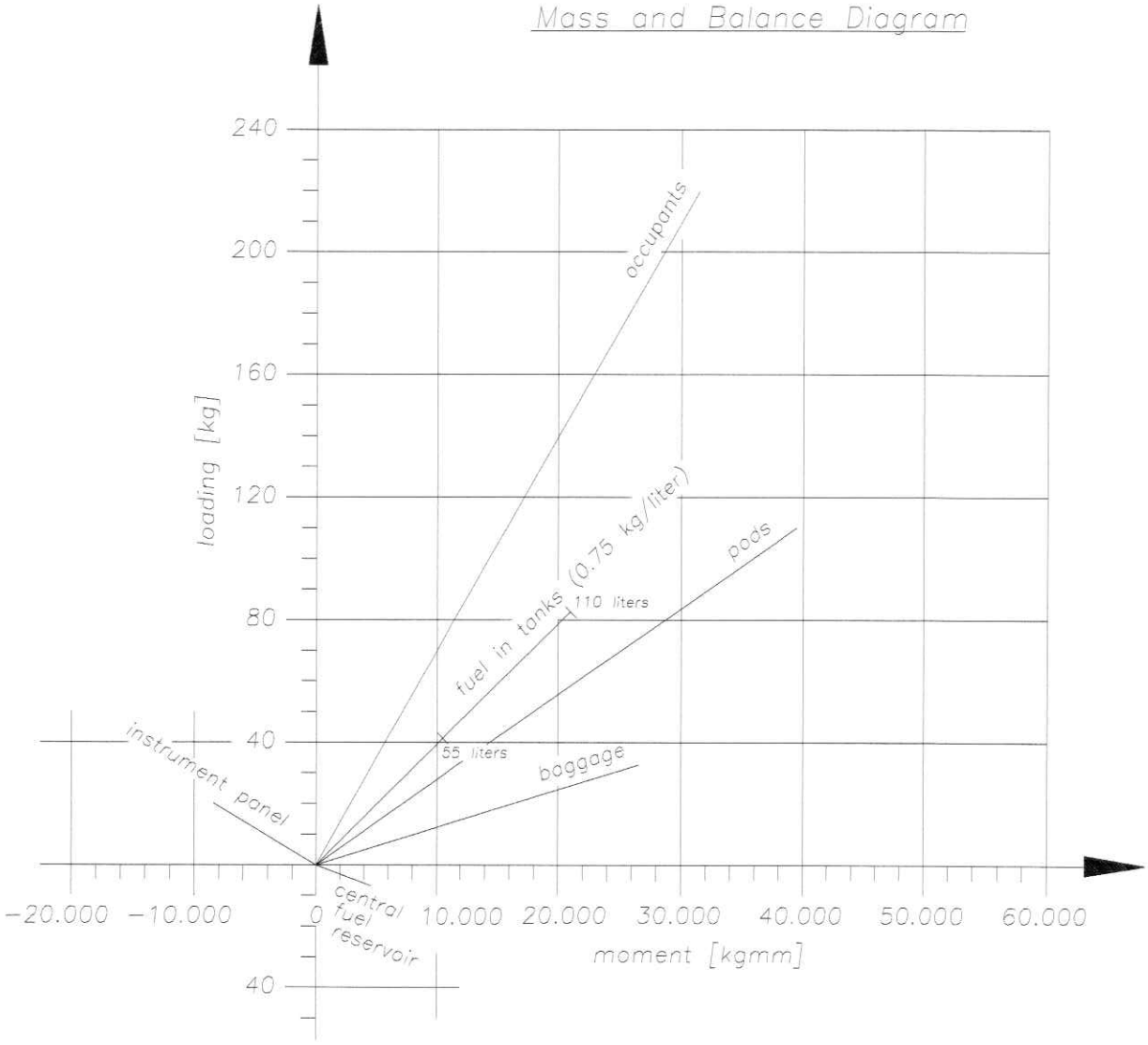
The following table is a supplement to the Mass and Balance Form. It enables the pilot to verify whether a loading configuration is permissible as regards maximum useful load, minimum useful load on the seats, and CG position.

Calculation of Loading Configuration	HK 36 TTC-ECO (example)		Your HK 36 TTC-ECO	
	Mass [kg]	Moment [kgmm]	Mass [kg]	Moment [kgmm]
1. empty mass (taken from Mass and Balance Form)	590	215940		
2. occupants lever arm: 143 mm	143.5	20521		
3. baggage lever arm: 824 mm	20	16480		
4. additional equipment in instrument panel Lever arm: -421 mm	3.75	-1579		
5. pods lever arm: 359 mm	105	37695		
6. total mass & total moment with empty fuel tanks (add lines 1 through 5)	862.25	289057		
7. 9 liters of fuel in central fuel reservoir (mass density: 0.75 kg/l) lever arm: 680 mm	6.75	4590		
8. 28 liters of usable fuel (mass density: 0.75 kg/l) lever arm: 255 mm	21	5355		
9. Total mass & total moment with fuel tanks filled (add lines 6 through 8)	890	299002		
10. Find the combinations of total mass and total moment (890 kg, 299002 kgmm and 862 kg, 289057 kgmm) in the Mass and CG Envelope (page 9-7-26). Since both combinations are within the envelope, the loading configuration is permissible.				

NOTE

Divide weights in pounds (lbs.) by 2.2046 to obtain kilograms (kg). Multiply lever arms in inches (in.) by 25.4 to obtain millimeters (mm). Also refer to the main part of the Airplane Flight Manual, Article 1.4.2 PHYSICAL UNITS.

Mass and Balance Diagram

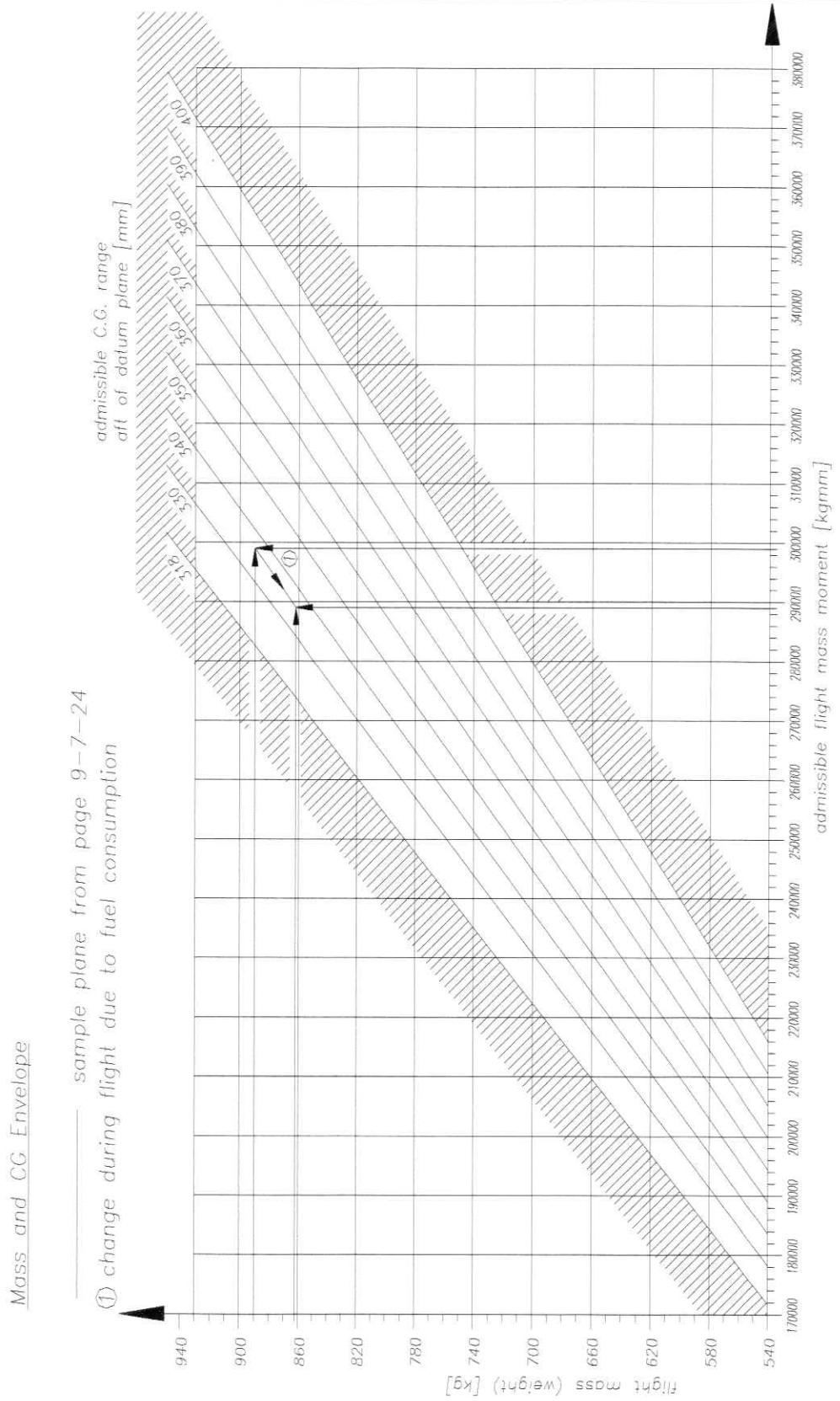


Example from table

occupants: 143.5 kg
9 liters in central fuel reservoir: 6.75 kg
28 liters in tanks (0.75 kg/liter): 21 kg
pods: 105 kg

Result:

loading moment, occupants: 20521 kgmm
loading moment, central fuel reservoir: 4590 kgmm
loading moment, tanks: 5355 kgmm
loading moment, pods: 37695 kgmm


Mass and CG Envelope
① change during flight due to fuel consumption
sample plane from page 9-7-24
admissible C.G. range aft of datum plane [mm]
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
admissible flight mass moment [kgmm]
3800000
3700000
3600000
3500000
3400000
3300000
3200000
3100000
3000000
2900000
2800000
2700000
2600000
2500000
2400000
2300000
2200000
2100000
2000000
1900000
1800000
1700000
940
900
860
820
780
740
700
660
620
580
540
flight mass (weight) [kg]

SECTION 7
POWERED SAILPLANE & SYSTEMS DESCRIPTIONS

7.1 INTRODUCTION

Section 7 provides a description of the Powered Sailplane carrying pods and its systems, together with notes for the user

7.2 AIRFRAME

7.2.1 WINGS

In each wing there are two pod mounting points in tandem arrangement. Two inspection holes in the lower wing skin allow access to the cable conduit. One hole is located between the two mounting points, the other one lies next to it on the inboard side. Hoses and electrical wiring can be routed from the cockpit to the pod through the cable conduit.

The cable conduit ends at the wing's root rib. It is accessible after removing the seat shell.

7.8 COCKPIT

Room for installation of additional equipment

In the right hand section of the instrument panel there is room reserved for the installation of additional equipment.

CAUTION

Installation of additional equipment (e.g. measuring equipment) is explained in Supplement 8 to the Airplane Flight Manual.

7.13 MISCELLANEOUS EQUIPMENT

For handling and operation of additional equipment installed in the pods refer to the manuals of the respective manufacturers.

7.14 PLACARDS / INSCRIPTIONS

In addition to the placards listed in the Airplane Maintenance Manual, the following placards are required:

On each pod:

Maximum total mass of pod: 55 kg (121 lbs.) Center of gravity below rear frame bar.

Within pilot's field of vision:

CAUTION Before operating at increased T/O mass (T/O weight), check mass and balance according to Airplane Flight Manual! Note increase in stall speed, best rate-of-climb speed and approach speed!

SECTION 8

POWERED SAILPLANE HANDLING, CARE AND MAINTENANCE

8.2 POWERED SAILPLANE INSPECTION PERIODS

At each 100 hour inspection, inspect pods and attachment points in wing structure for damage and excessive wear.

Diamond AIRCRAFT

SUPPLEMENT 8

TO THE AIRPLANE FLIGHT MANUAL FOR THE POWERED SAILPLANE HK 36 TTC-ECO

28 V ELECTRICAL SYSTEM

Doc. No. : **3.01.25-E**

Date of Issue : **1998-10-30**

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Signature : Winkler

Authority : AUSTRO CONTROL GmbH

Stamp : AUSTRO CONTROL GmbH Abteilung Flugtechnik Außenstelle Ost A-1300 Wien-Flughafen, Hangar 2

Original date of approval : 26. Jan. 1999

This powered sailplane must be operated in compliance with the information and limitations contained herein.

Prior to operating the powered sailplane, the pilot must take notice of all the information contained in this Airplane Flight Manual.

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0.1 LIST OF EFFECTIVE PAGES

Section	Pages	Date
0	9 - 8 - 0	1998-10-30
	9 - 8 - 1	1998-10-30
	9 - 8 - 2	1998-10-30
1	9 - 8 - 3	1998-10-30
2	ACG-appr. 9 - 8 - 4	1998-10-30
3	ACG-appr. 9 - 8 - 5	1998-10-30
	ACG-appr. 9 - 8 - 6	1998-10-30
4	ACG-appr. 9 - 8 - 7	1998-10-30
5	ACG-appr. 9 - 8 - 8	1998-10-30
6	9 - 8 - 9	1998-10-30
	9 - 8 - 10	1998-10-30
	9 - 8 - 11	1998-10-30
7	9 - 8 - 12	1998-10-30
	9 - 8 - 13	1998-10-30
	9 - 8 - 14	1998-10-30
	9 - 8 - 15	1998-10-30
	9 - 8 - 16	1998-10-30
8	9 - 8 - 17	1998-10-30
	9 - 8 - 18	1998-10-30
	9 - 8 - 19	1998-10-30
	9 - 8 - 20	1998-10-30

0.2 TABLE OF CONTENTS

SECTION 1
GENERAL

1.1 INTRODUCTION

Pages 9-8-1 through 9-8-20 constitute Supplement No. 8 to the Airplane Flight Manual for the Powered Sailplane HK 36 TTC-ECO, Doc. No. 3.01.25-E and are valid only when the Powered Sailplane is equipped with the 28 V electrical system.

This system is intended to supply power to additional equipment (particularly measuring equipment). A detailed description of the system is given in Section 7.

CAUTION

Installation of additional equipment (e.g. measuring equipment) must be carried out in accordance with Chapter 8.3.

SECTION 2

LIMITATIONS

2.1 INTRODUCTION

The limitations remain unchanged.

SECTION 3
EMERGENCY PROCEDURES

3.1 INTRODUCTION

Some emergency procedures given in the main part of the manual require additional consideration of the 28 V system.

3.7 ENGINE FAILURE

3.7.1 ENGINE FAILURE DURING TAKE-OFF

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.7.2 ENGINE FAILURE DURING FLIGHT

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.7.3 ENGINE RESTART WITH A DISCHARGED BATTERY (DURING FLIGHT)

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.7.4 PROPELLER STUCK IN FEATHERED POSITION

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.7.12 GENERATOR WARNING LIGHT (RED) CONTINUOUSLY ILLUMINATED

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.8 FIRE

3.8.1 FIRE ON GROUND

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.8.2 FIRE DURING TAKE-OFF

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.8.3 FIRE DURING FLIGHT

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.9 OTHER EMERGENCIES

3.9.3 EMERGENCY LANDING

In addition to the standard procedure:

28 V electrical system . . . . . OFF

3.9.4 EMERGENCY LANDING ON WATER

In addition to the standard procedure:

28 V electrical system . . . . . OFF

CAUTION

When encountering failure or malfunction of an electric or electronic system which is necessary for the safe conduction of flight, switch off the 28 V electrical system.

SECTION 4

NORMAL PROCEDURES

4.3 DAILY INSPECTION

Additional inspection of the 28 V electrical system:

1. Master switch 28 V system . . . . . ON
2. All circuit breakers . . . . . pressed in
3. Additional equipment . . . . . check
4. Master switch 28 V system . . . . . OFF
5. Power sockets beneath seats . . . . . check

CAUTION

Any additional equipment (e.g. measuring equipment) in accordance with Section 8 must be checked during the daily inspection.

SECTION 5

PERFORMANCE

5.1 INTRODUCTION

Even when the maximum current is drawn from the 28 V system, the 28 V generator requires so little engine power that there is no measurable influence onto flight performance.

SECTION 6
MASS (WEIGHT) & BALANCE / EQUIPMENT LIST

6.1 INTRODUCTION

Mass (weight) and center of gravity limitations remain unchanged.

6.8 MASS (WEIGHT) / C.G. ENVELOPES

The 28 V electrical system is part of the airplane equipment. Its mass (weight) is therefore included in the empty mass (weight) which is recorded in the Mass and Balance Form, along with the corresponding center of gravity (CG).

CAUTION

Additional equipment (e.g. measuring equipment) must be treated as useful load for the determination of the flight mass (weight) and the corresponding CG. The required data (mass and location) is recorded in the Additional Equipment List (Chapter 6.9 of this Supplement).

6.9 EQUIPMENT LIST / ADDITIONAL INSTRUMENTS

The Additional Equipment List is a register of all additional equipment (e.g. measuring equipment) that is installed. It contains the following information:

- Consecutive number
- Description of equipment
- Serial number of equipment
- Mass (weight) of equipment
- Location of installation of equipment (lever arm)
- Mass moment of equipment (mass multiplied by lever arm)

CAUTION

Wires and hoses that are installed must also be recorded. Installation of additional equipment must be carried out in accordance with Chapter 8.3.

NOTE

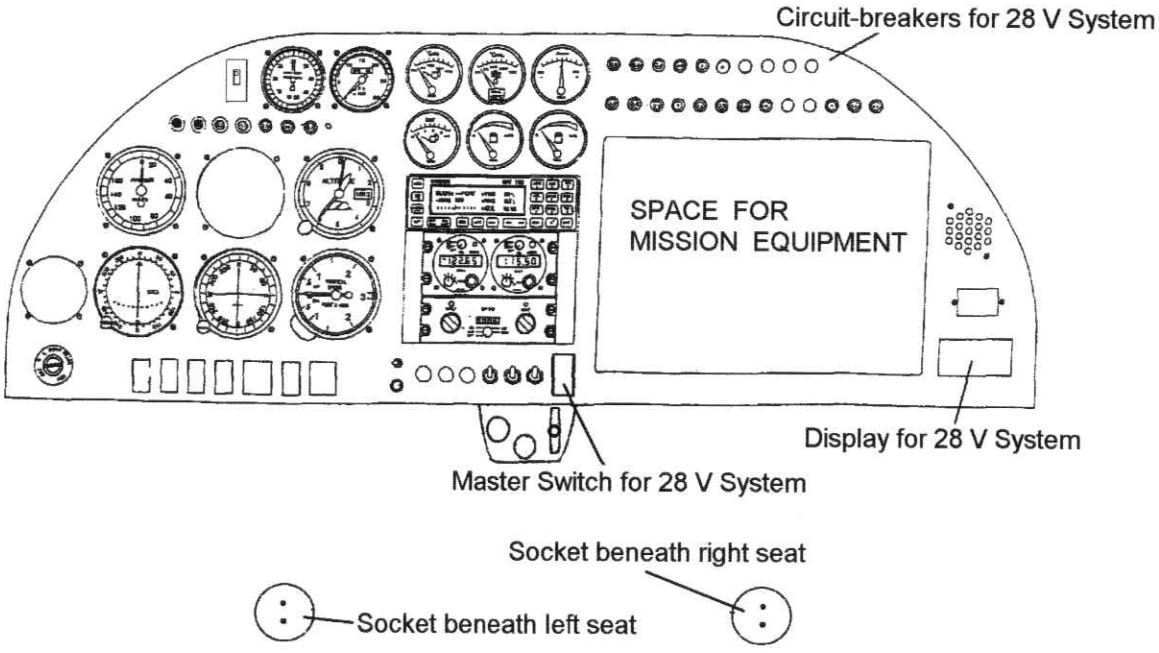
Lever arms for different locations are given in the Airplane Flight Manual, Chapter 6.7.

Additional Equipment List	**S/N:**	**Date:**	**Page:**
	Call sign:	**Signature:**	**/**

No.	Description Manufacturer	Serial Number	Mass [kg]	Lever arm [mm]	Moment [kg mm]

SECTION 7
POWERED SAILPLANE & SYSTEMS DESCRIPTION

7.8 COCKPIT



7.11 ELECTRICAL SYSTEM

General

The 28 V electrical system is a completely independent electrical power system and consists of its own generator, wiring, bus, circuit breakers, etc. The system is intended for the operation of additional equipment (e.g. measuring equipment). Room for such equipment is provided in the underwing containers (pods), in the enlarged baggage compartment, etc.

CAUTION

Installation of additional equipment (e.g. measuring equipment) must be carried out in accordance with Chapter 8.3.

Controlling and monitoring

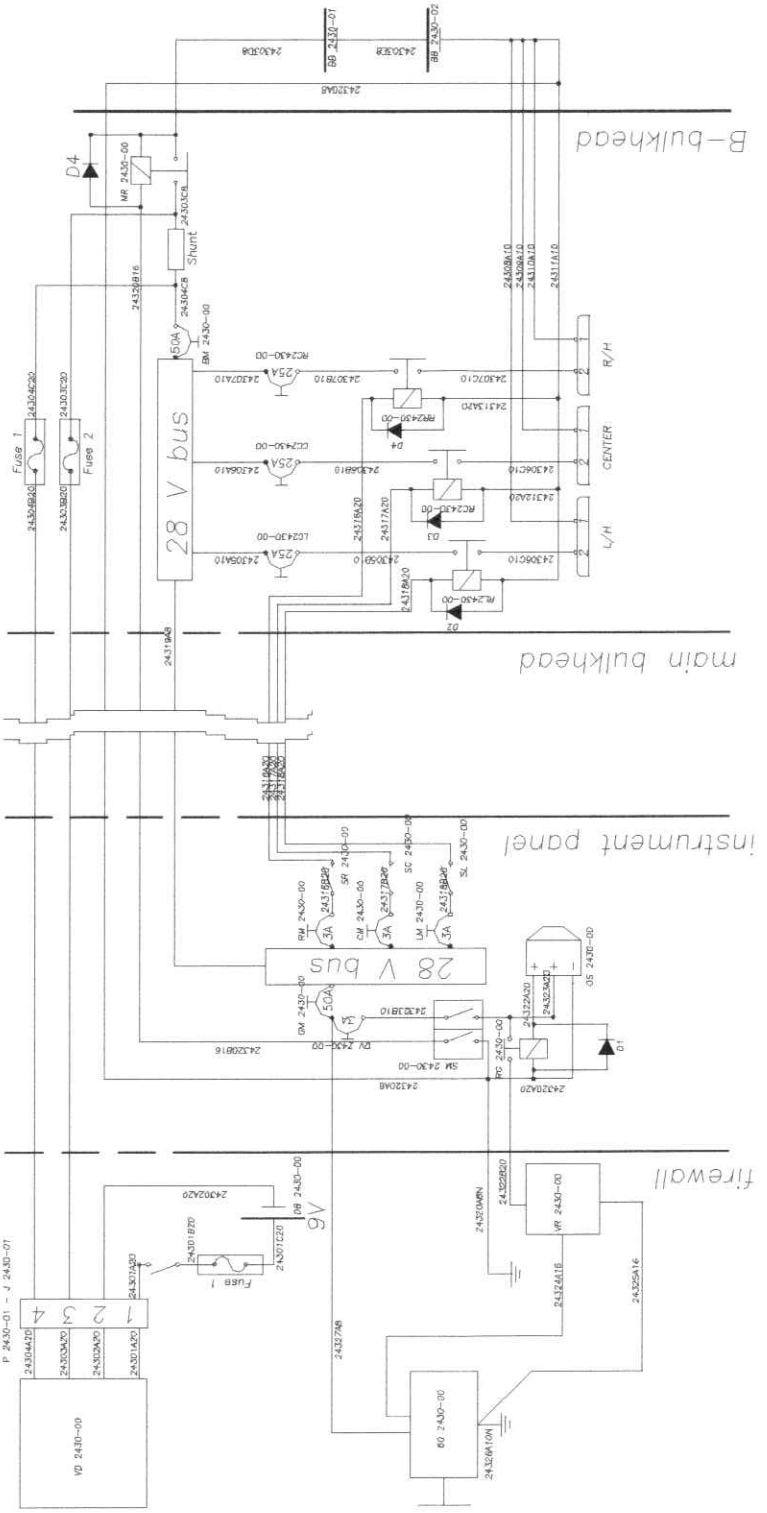
The 28 V system is controlled and monitored through switches, circuit breakers and a digital display which are located on the instrument panel and on the right hand side of the baggage compartment.

Power outlets

There are three electrical power outlets for the supply of additional equipment: one is located beneath each of the two seats and one in the baggage compartment. The maximum permissible current intensity for each power socket is 25 Ampères.

Generator

Manufacturer and model	: Electrosystems, Model No. ES-4040
Nominal voltage	: 28 V
Nominal current intensity	: 40 Ampères at 8000 RPM (engine speed: 5800 RPM)
RPM range	: 2180 to 8000 RPM (engine speed: 1580 to 5800 RPM)
Mass (including regulator)	: 4.98 kg (11.0 lbs.)



wiring diagram 28 V system

7.13 MISCELLANEOUS EQUIPMENT

For the operation of additional equipment, refer to manuals of the respective manufacturers.

7.14 PLACARDS / INSCRIPTIONS

Components of the 28 V system are marked with the following placards:

On the right hand lower side of the instrument panel next to the Ammeter

Amps
28 V System

On the instrument panel next to the switches:

28 VDC Electric System **Gen./Bat.**
ON ON ON

left center right
28 V Sockets **Master**

On the right hand side of the instrument panel next to the circuit breakers:

28 VDC Electric System				
Gener.	Gener. control	Bus Relays		
		left	center	right

On the right hand side of the baggage compartment next to the circuit breakers:

28 V Battery	28 V Sockets		
	left	center	right

Next to the 28 V sockets (left, center, right)

28 V
max. 25 A

CAUTION

When installing additional equipment (measuring equipment) in accordance with Section 8, additional placards may become necessary.

SECTION 8

HANDLING, CARE & MAINTENANCE

8.2 INSPECTION PERIODS FOR THE POWERED SAILPLANE

Every 100 hours the following inspection items must be carried out on the 28 V electrical system:

1. Check 28 V system for malfunction.

2. Check 28 V generator (engine compartment) for insecure attachment; check driving belt for excessive wear and insufficient tension.

3. Check 28 V relays (baggage compartment, beneath right hand sidewall) and batteries (aft of B-bulkhead) for looseness and damage.

4. Check wiring, connectors and sockets in engine compartment, instrument panel, beneath seats and in baggage compartment for heat damage and chafing. Check wire attachments and connectors for looseness by slightly pulling by hand.

8.3 POWERED SAILPLANE ALTERATIONS AND REPAIRS

Alterations or repairs of the powered sailplane may be carried out only by authorized personnel and only as prescribed in the Airplane Maintenance Manual.

The following rules which are not included in the Airplane Maintenance Manual must be adhered to when installing additional equipment (e.g. measuring equipment):

* Location of installation . . . . . see Airplane Flight Manual and Supplement 7, Chapter 6.7
* Maximum admissible mass (weight) . . . . . see Airplane Flight Manual and Supplement 7,Chapter 6.7
* Requirements for the installation of additional equipment . . . . . see Airplane Flight Manual and Supplement 7,Chapter 6.7

CAUTION

Other locations of installation (e.g. baggage compartment), masses (weights) or kinds of installation require consultation of the manufacturer and separate approval.

* All inspection panels must remain accessible.
* Additional equipment (e.g. measuring equipment) must be clearly identifiable to the pilot as such equipment.
* Additional equipment (e.g. measuring equipment) should only be supplied with power by the 28 V system.
* Additional equipment (e.g. measuring equipment) must be suitable for the operating conditions expected in service regarding altitude, temperature, and humidity.
* Additional equipment (e.g. measuring equipment) must not emit toxic substances.
* It must be ensured that emitted heat will not impair or damage the corresponding equipment, adjacent equipment, or structural members (max. 54 °C / 129 °F).
* Electric wires must meet an adequate standard (e.g. MIL-W-22759-16).

* Electric wires must have a cross-sectional area that is adequate for their load.
* Electric circuits which are not designed for 25 Amps require additional protection corresponding to their design load.
* Plug-type connectors must not open inadvertently due to vibration or high load factors; open connectors must not result in short-circuit.
* Electrical continuity must be provided between additional equipment (e.g. measuring equipment) and electrical ground.
* Wires must be routed through the provided conduits (see Airplane Flight Manual and Supplement 8).
* Wires must not interfere with parts of the control system under any circumstances, even if a wire becomes loose.
* Wires must be routed such as to prevent chafing.
* After installation work, a check for loose or foreign objects must be carried out.
* The empty mass CG must be checked for compliance with the CG limitations in accordance with the Airplane Maintenance Manual.

* Each item of additional equipment (e.g. measuring equipment) must be checked for interference (EMI-tests) with the following systems:

- altimeter
- airspeed indicator
- fuel quantity indicators
- engine instruments
- warning and caution lights
- magnetic compass
- ignition circuit 1
- ignition circuit 2
- turbo control unit (TCU)
- fuel main pump
- fuel booster pump
- voltage regulator
- COM equipment
- NAV equipment
- transponder (XPDR)
- other equipment of the airplane

Diamond AIRCRAFT

SUPPLEMENT 12

TO THE AIRPLANE FLIGHT MANUAL FOR THE POWERED SAILPLANE HK 36 TTC-ECO

OPERATION WITH CAMERA AND UNDERWING CONTAINER

Doc. No. : **3.01.25-E**

Date of Issue : **25-Nov-2000**

Pages identified by "ACG-appr." in the List of Effective Pages are approved by:

Signature : Winkler

Authority : AUSTRO CONTROL

Stamp : AUSTRO CONTROL GmbH

Original date of approval : 14. Dez. 2000

This powered sailplane must be operated in compliance with the information and limitations contained herein.

Prior to operating the powered sailplane, the pilot must take notice of all the information contained in this Airplane Flight Manual.

DIAMOND AIRCRAFT INDUSTRIES GMBH
N.A. OTTO-STR. 5
A-2700 WIENER NEUSTADT
AUSTRIA / EUROPE

0.1 LIST OF EFFECTIVE PAGES

Section	Pages		Date
1		9 - 12 - 0 9 - 12 - 1 9 - 12 - 2 9 - 12 - 3 9 - 12 - 4 9 - 12 - 5 9 - 12 - 6	25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000
2	ACG-appr. ACG-appr. ACG-appr.	9 - 12 - 7 9 - 12 - 8 9 - 12 - 9	25-Nov-2000 25-Nov-2000 25-Nov-2000
3	ACG-appr.	9 - 12 - 10	25-Nov-2000
4	ACG-appr. ACG-appr. ACG-appr. ACG-appr. ACG-appr.	9 - 12 - 11 9 - 12 - 12 9 - 12 - 13 9 - 12 - 14 9 - 12 - 15	25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000
5	ACG-appr. ACG-appr	9 - 12 - 16 9 - 12 - 17 9 - 12 - 18 9 - 12 - 19 9 - 12 - 20 9 - 12 - 21 9 - 12 - 22 9 - 12 - 23 9 - 12 - 24	25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000
6		9 - 12 - 25 9 - 12 - 26 9 - 12 - 27 9 - 12 - 28 9 - 12 - 29 9 - 12 - 30	25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000
7		9 - 12 - 31 9 - 12 - 32 9 - 12 - 33	25-Nov-2000 25-Nov-2000 25-Nov-2000
8		9 - 12 - 34 9 - 12 - 35 9 - 12 - 36 9 - 12 - 37 9 - 12 - 38 9 - 12 - 39 9 - 12 - 40	25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000 25-Nov-2000

0.2 TABLE OF CONTENTS

SECTION 1
GENERAL

1.1 INTRODUCTION

Pages 9-12-0 through 9-12-40 constitute Supplement No. 12 to the Airplane Flight Manual for the Powered Sailplane HK 36 TTC-ECO, Doc. No. 3.01.25-E and are valid only for the operation of the Powered Sailplane carrying underwing camera and container (at increased take-off mass)

1.2 CERTIFICATION BASIS

Operation of the Powered Sailplane carrying underwing camera and container at increased take-off mass (weight) has been approved within the framework of the Austrian type certification in compliance with national operational requirements, CRI - A8, „Aerial Photography".
Cerain points deverge from JAR-22 requirements. This will be noted in each particular case.

1.4 ABBREVATIONS / EXPLANATIONS

pod	underwing container
RH	right hand
LH	left hand

1.5 DESCRIPTIVE DATA

Max. wing loading : 60.78 kg/m² (12.45 lbs./s1.ft.)

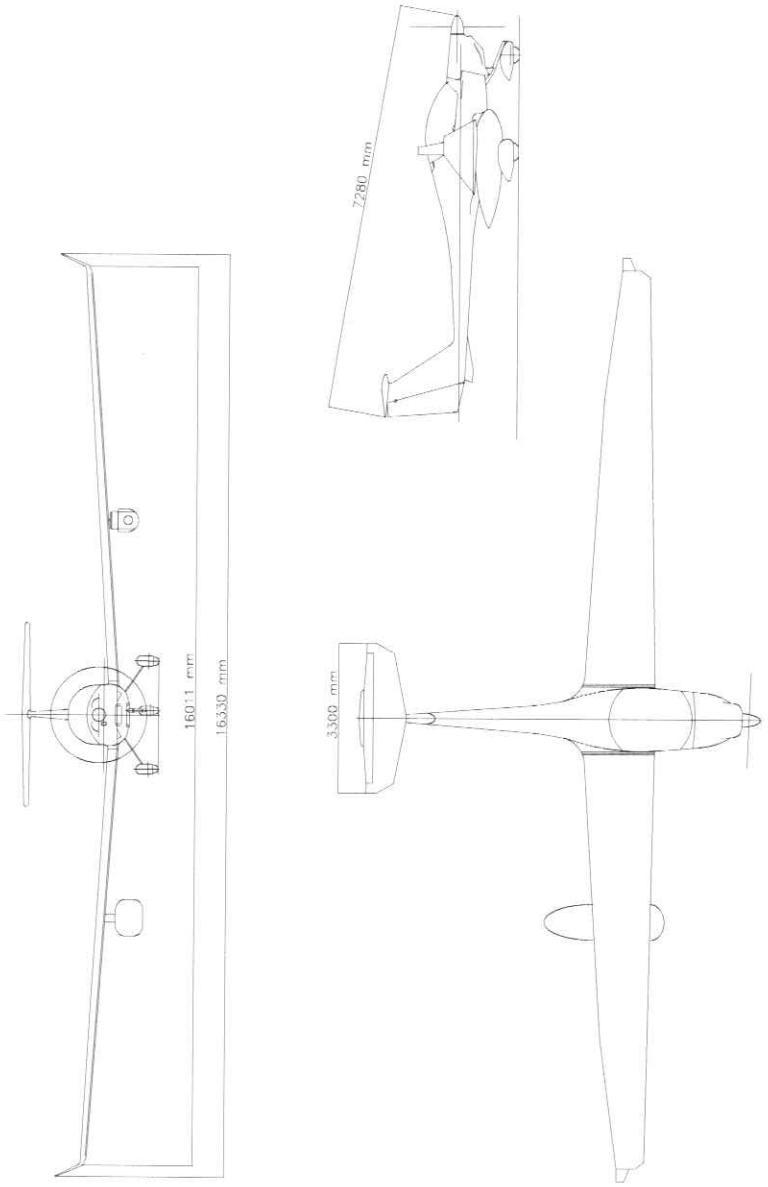
RH Pod dimensions

Length	: 1.650 m (5.41 ft.)
Width	: 0.500 m (1.64 ft.)
Height	: 0.480 m (1.57 ft.)

Position of RH pod in y-direction
(distance from center lane) : + 3.385 m (+11.11 ft.)

Position of LH camera in y-direction
(distance from center line) : - 3.385 m (- 11.11 ft.)

1.6 THREE-VIEW DRAWING



SECTION 2

LIMITATIONS

2.3 AIRSPEED INDICTOR MARKINGS

During flights with increased maximum take-off mass (weight) the following speeds are affected. On the airspeed indicator, the speeds for the standard maximum take-off mass (770 kg) are shown by the markings outside the arc. The speeds for increased maximum take-off mass (930 kg) are shown by the markings inside the arc. The lower limit of the normal operating range at 770 kg is indicated by the bottom of the green and white hatch. The lower limit of the normal operating range at 930 kg is indicated by the top of the green and white hatch.

Marking	**Value of Range (IAS) kts**		**Significance**
	770 kg	930 kg	
green arc	46-113	51-113	Normal operating range. Lower limit is 1.1_{vs1} at max. flight mass (weight) and most forward CG. Upper limit is rough air speed v_{RA}.
blue line	59	65	Best rate-of-climb speed v_y.
yellow triangle	57	63	Approach speed at max. flight mass (weight).

2.6 MASS (WEIGHT)

Maximum take-off mass (max. T/O weight) : 930 kg (2050 lbs.)

NOTE

A maximum take-off mass of 930 kg (max T/O weight of 2050 lbs.) does not comply with the maximum take-off mass specified in JAR-22.

Maximum landing mass : 930 kg (2050 lbs.)
Maximum mass of all non-lifting parts : 650 kg (1433 lbs.)
Maximum useful load in baggage compartment : 30 kg (66 lbs.)
Maximum mass of pod or camera : 55 kg (121 lbs.) EACH
Maximum useful load (including fuel and pod/camera) : see Chapter 6.6
Maximum useful load in fuselage : see chapter 6.6
Maximum useful load on seat : 110 kg (243 lbs.)

WARNING

Exceeding the mass limits (weight limits) can lead to overstressing of the airplane and to a degradation of flying characteristics and flight performance.

2.9 MANEUVERING LOAD FACTORS

Table of maximum permissible load factors:

	at v_A	at v_{NE}
positive	4.4	4.0
negative	-2.2	-1.5

WARNING

Exceeding the maximum permissible load factors may overstress the airplane.

NOTE

The maximum permissible load factors do not comply with the maximum permissible load factors required by JAR-22.

2.11 KINDS OF OPERATION

The HK 36 TTC-ECO is certified for VFR operation. The scope of the approved kinds of operation is defined in detail in the national special certification.

IFR, flights in clouds and aerobatics are not permitted.

SECTION 3

EMERGENCY PROCEDURES

3.1 INTRODUCTION

Some emergency procedures given in the main part of the manual require additional consideration with the addition of the camera / underwing container operations.

3.9 OTHER EMERGENCIES

3.9.3 EMERGENCY LANDING

In addition to the standard procedure:

WARNING

Camera and optional retractable antenna (if fitted), monitor and camera controls must be in the stowed position prior to landing

SECTION 4

NORMAL PROCEDURES

4.1 INTRODUCTION

The following section includes checklists as well as operational procedures for the operation with RH underwing container and LH camera.

4.2 RIGGING AND DE-RIGGING

For the attachment of the RH pod and LH camera two sockets are mounted in tandem in direction of flight in each wing. They are situated at the outboard end of the air brakes forward of the air brake case.

Installation of RH underwing container (pod)

(1) Insert mounting frame into sockets from below, oriented such that the longer bar is at the rear. Fasten mounting frame with self-locking nuts (size M8) from above, using a torque of 8 to 16 Nm (10.8 to 21.7 ft.lbs.).

(2) Cover the hollows for the screws on the upper surface of the wing with adhesive tape.

(3) Attach the right hand fairing (the larger one) to the frame using the four camlocs.

(4) Attach the left hand fairing to the frame using the four camlocs.

(5) Close the remaining camlocs which link both fairings to each other.

WARNING

The airplane must not be operated with only one pod and no camera mounted, or with only the camera mounted.

Removal of RH underwing container (pod)

To remove the pod, reverse the installation procedure. After removal, cover all openings in upper and lower surface of each wing with adhesive tape.

Installation of camera

(1) Insert mounting frame into sockets from below, oriented such that the longer bar is at the rear. Fasten mounting frame with self locking nuts (size M8) from above, using a torque of 8 to 16 Nm (10.8 to 21.7 ft. lbs.).

(2) Cover the hollows for the screws on the upper surface of the wing with adhesive tape. Attach the fairing around the mount, secure with screw.

Removal of underwing camera

To remove the camera, reverse the installation procedure. After removal, cover all openings in upper and lower surface of each wing with adhesive tape.

4.3 DAILY INSPECTION

- Check LH camera and RH pod for obvious damage, insecure attachment, open camlocs, and insecure hardware.
- Check camera and optional retractable antenna (if fitted) are in the stowed position
- Check tape covers over LH and RH pod mounting sockets for damage and looseness.

4.4 PRE-FLIGHT INSPECTION

- Check that additional equipment is correctly stowed and fixed.
- Check that additional equipment does not interfere with control system.
- Check C.G. position is within limits.

4.5 NORMAL PROCEDURES AND RECOMMENDED SPEEDS

4.5.1 STARTING ENGINE, RUN UP & TAXIING PROCEDURES

33. Camera, optional retractable antenna (if fitted), monitor and camera controls must be in the stowed position.

4.5.2 TAKE-OFF AND CLIMB

6. Rotate at a speed of at least 100 km/h (54 kts. / 62 mph). Airplane will lift-off on its own at about 105 km/h (57 kts. / 65 mph).
7. Minimum climb speed is 105 km/h (57 kts. / 65 mph). Monitor oil pressure, oil temperature and cylinder head temperature which must stay within the green range.

Best angle-of-climb speed : 105 km/h (57 kts. / 65 mph)

Best rate-of-climb speed : 120 km/h (65 kts. / 75 mph)

Figures apply to maximum take-off mass (T/O weight).

4.5.3 IN-FLIGHT ENGINE STOP

3. Maintain an airspeed of approximately 110 km/h (59 kts./68 mph).

NOTE

At airspeeds below 110 km/h (59 kts. / 68 mph), the windmilling propeller RPM becomes very low or the propeller stops. However, the propeller will only feather at a sufficient RPM (above 2000 engine RPM).

4.5.5 APPROACH AND LANDING

WARNING

Camera, optional retractable antenna (if fitted), monitor and camera controls must be in the stowed position prior to landing

CAUTION

Due to the special operational conditions, landing in soaring configuration is not permitted.

Power-on Landing

9. Approach speed.....115 km/h (62 kts. / 71 mph) during final approach.

NOTE

Conditions such as strong headwind, danger of wind shear, turbolence, or wet wings require a higher approach speed.

Balked landing

Perform climb with at least 105 km/h (57 kts. / 65 mph). Monitor oil pressure, oil temperature, and cylinder head temperature, which must stay within the green range.

SECTION 5

PERFORMANCE

5.1 INTRODUCTION

Section 5 provides data for the airplane carrying underwing LH camera and RH pod at the maximum take-off mass of 930 kg (max T/O weight of 2050 lbs.). It includes ACG approved data regarding airspeed indicator system calibration, stall speeds and take-off performance, as well as data and additional information which do not require approval.

The performance data are for a powered sailplane and power-plant in good condition, with wheel fairings, winglets and spinner installed and using average piloting techniques.

The specified airspeeds must be understood as IAS. The performance data has been evaluated using the normal procedures described in Section 4.

NOTE

A poor maintenance condition of the airplane and unfavorable external circumstances (high temperature, rain) can considerably deteriorate the specified performance values.

5.2 ACG-APPROVED DATA

5.2.1 AIRSPEED INDICATOR SYSTEM CALIBRATION

Airspeed indicator system calibration remains unchanged.

5.2.2 STALL SPEEDS

Air brakes retracted : v_{S0} = 87 km/h (47 kts. / 54 mph)

Air brakes extended : v_{S1} = 95 km/h (51 kts. / 59 mph)

NOTE

Conditions such as turbulence, wet wings, banked flight, or high load factors increase the stall speeds.

NOTE

The stall speeds do not comply with the stall speeds required by JAR-22.

5.2.3 TAKE-OFF PERFORMANCE

Conditions:
- Outside air temperature: 15 °C (59 °F)
- Atmospheric pressure: 1013 hPa (1013 mbar / 29.92 inHg)
- Wind: calm
- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting : TAKE-OFF
- Rotation at : approximately 100 km/h (54 kts. / 62 mph)
- Lift-off speed: approximately 105 km/h (57 kts. / 65 mph)
- Speed during climb : approximately 110 km/h (59 kts. / 68 mph)
- Level runway, asphalt surface

Take-off roll : 232 m (761 ft.)

Take-off distance to clear a 15 m (50 ft.) obstacle : 337 m (1106 ft.)

NOTE

For take-off distances under circumstances different from those described above, refer to the charts in Article 4.3.3.

WARNING

The take-off distances give here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3 ADDITIONAL INFORMATION

5.3.1 DEMONSTRATED CROSSWIND COMPONENT

Demonstrated crosswind component remains unchanged.

5.3.2 GLIDE PERFORMANCE AND FLIGHT POLAR

Minimum rate of descent : 1.7 m/s at 105 km/h (335 ft./min at 57 kts. / 65 mph)

Best glide ratio : 1:17 at 120 km/h (65 kts. / 75 mph)

NOTE

These figures are valid for maximum flight mass (max. gross weight) with winglets, wheel fairings and spinner installed ant the propeller feathered.

NOTE

The minimum rate of descent does not comply with the minimum rate of descent required by JAR-22

5.3.3 TAKE-OFF CHARTS

Conditions:

- Full throttle
- Maximum take-off mass (max. take-off weight)
- Propeller setting : TAKE-OFF
- Rotation at : approximately 100 km/h (54 kts. / 62 mph)
- Lift-off speed: approximately 105 km/h (57 kts. / 65 mph)
- Speed during climb : approximately 110 km/h (59 kts. / 68 mph)
- Level runway, asphalt surface

s_1 ...take-off roll

s_2 ...take-off distance to clear a 15 m (50 ft.) obstacle

Head-wind	OAT		Pressure altitude above MSL QFE							
			0 m / 0 ft. 1013 hPa		400 m / 1310 ft. 966 hPa		800 m / 2620 ft. 921 hPa		1200 m / 3940 ft. 877 hPa	
			s_1	s_2	s_1	s_2	s_1	s_2	s_1	s_2
[kts.]	[°C]	[°F]	[m]	[m]	[m]	[m]	[m]	[m]	[m]	[m]
0	0	32	200	291	221	322	245	355	271	394
	15	59	232	337	257	373	283	411	314	456
	30	86	266	386	295	428	325	472	359	522
5	0	32	133	207	147	229	162	253	180	280
	15	59	154	240	171	265	188	292	208	324
	30	86	176	275	196	304	216	336	239	371
10	0	32	79	136	88	151	97	167	108	185
	15	59	92	158	102	175	112	193	124	214
	30	86	105	181	117	201	129	221	142	245

NOTE

Divide distances in meters [m] by 0.3048 to obtain feet [ft.].

WARNING

A grass surface will extend the take-off distances by at least 20 %, depending on its characteristics (softness, grass length). The take-off distances given here contain no safety margins. Poor maintenance condition of the airplane, deviation from the procedures prescribed in this manual and unfavorable external conditions (rain, crosswind, wind shear, uneven terrain and, in particular, long grass) can considerably extend the take-off distance.

5.3.4 NOISE DATA

The evaluation of noise emission was carried out according to the Noise Regulations of ICAO, Annex 16.

According to Chapter 10 : 62.2 dB(A)

5.3.5 CLIMB PERFORMANCE

Conditions:
- Sea level
- Power setting: 34 inHg at 5500 RPM
- Maximum flight mass (max. gross weight)
- Airspeed: v_y = 120 km/h (65 kts. / 75 mph)

Max. rate of climb: 4.70 m/s (925 ft./min)

5.3.7 FUEL CONSUMPTION, CRUISING SPEED, ENDURANCE

NOTE

The endurance data shown below applies to full wing tanks. The reserve that is available when the wing tanks are emptied is given in parentheses. It results from the fuel in the central fuel reservoir (about 9 liters / 2.4 US gal.). When determining range, attention must be paid to the influence of wind, as well as safety reserves.

Conditions:
- Flight in still air
- ISA conditions
- Airplane in good maintenance condition and correctly adjusted

Power	Manif. press	Engine speed	Fuel consumption		True airspeed v_{TAS} at altitude			Endurance 2 * 55 l Tank (+ reserve)
					1000 m 3300 ft.	2000 m 6600 ft.	3000 m 9800 ft.	
[% max. cont. power]	[inHg]	[RPM]	[l/h]	[US gal./hr.]	[km/h] [kts. / mph]			[h:min] ([min])
115	38	5800	33	8.7	-	-	-	-
100	34	5450	27	7.1	209 113/130	213 115/132	217 117/135	3:56 (17)
90	32	5300	24	6.3	203 110/126	206 111/128	209 113/130	4:25 (20)
75	30	5050	20	5.3	190 103/118	193 104/120	196 106/122	5:18 (24)
60	28	4800	17	4.5	178 96/111	180 97/112	181 98/112	6:14 (28)

NOTE

As a simplified rule for reducing power below the maximum continuous power, manifold pressure (throttle control) should be reduced by approximately 2 in Hg per 250 RPM engine speed reduction (propeller speed control).

SECTION 6

MASS (WEIGHT) & BALANCE / EQUIPMENT LIST

6.1 INTRODUCTION

Section 6 describes the range of loading in which the HK 36 TTC-ECO carrying underwing LH camera and RH pod will be operated safely.

WARNING

Exceeding the maximum mass (maximum gross weight) can lead to overstressing of the airplane. Falling short of the minimum useful load on the seats will impair controllability and stability.

6.4 BASIC EMPTY MASS (WEIGHT) CENTER OF GRAVITY

The empty mass (empty weight) CG limitations are defined in the Airplane Maintenance Manual.

Camera, pod and other installed role equipment are not included in the empty mass. They must be treated as useful load for mass and CG calculations.

6.5 MAXIMUM MASS (WEIGHT) OF ALL NON-LIFTING PARTS

The maximum mass (weight) of all non-lifting parts is 650 kg (1433 lbs.). A list of all non-lifting parts is included in the Airplane Maintenance Manual.

NOTE

Due to the design of the HK 36 TTC-ECO, the mass (weight) of all non-lifting parts will not be exceeded as long as the total mass (total weight) minus the mass (weight) of camera and pod does not exceed 850 kg (1874 lbs.).

6.7 USEFUL LOAD

Trim weights

The difference in mass (weight) between the LH camera and the RH loaded pod must not exceed 5 kg (11 lbs.). Otherwise the difference in mass must be compensated using trim weights.

Maximum mass (weight) of camera and pod

The maximum mass (weight) of the camera or pod is 55 kg (121 lbs.). The center of gravity of the pod shall lie below the rear frame bar. When this requirement is met, the lever arm shown below is valid.

Lever arm

Useful load in pod/camera : 359 mm (14.13 in.)

Loading of pod

Angle brackets with mounting holes are fixed to the bar frame for the installation of equipment.

Installation of equipment must be accomplished in such a way that is able to withstand the following load factors with adequate safety:

positive	: 4.4
negative	: - 2.2
sideward	: 1.5

CAUTION

Installation of additional equipment (e.g. measuring equipment) is explained in Supplement 8 to the Airplane Flight Manual.

6.8 MASS / C.G. ENVELOPES

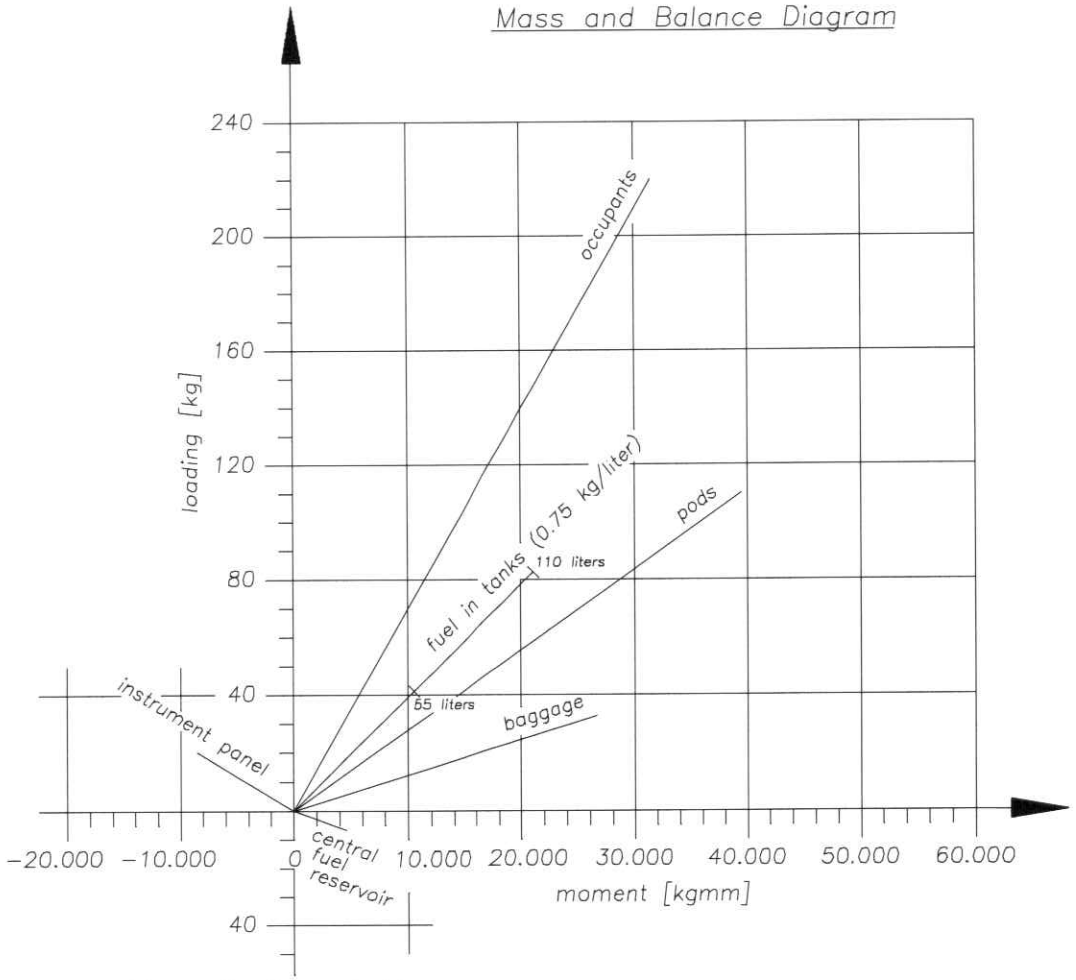
The following table is a supplement to the Mass and Balance Form. It enables the pilot to verify whether a loading configuration is permissible as regards maximum useful load, minimum useful load on the seats, and CG position.

Calculation of Loading Configuration	**HK 36 TTC-ECO (example)**		**Your HK 36 TTC-ECO**	
	Mass [kg]	**Moment [kgmm]**	**Mass [kg]**	**Moment [kgmm]**
1. empty mass (taken from Mass and Balance Form)	590	218532		
2. occupants lever arm: 143 mm	155.5	22237		
3. baggage lever arm: 824 mm	20	16480		
4. additional equipment in instrument panel Lever arm: -421 mm	3.75	-1579		
5. pod lever arm: 359 mm	49	17591		
6. Camera lever arm: 359 mm	44	15796		
7. total mass & total moment with empty fuel tanks (add lines 1 through 5)	862.25	289057		
8. 9 liters of fuel in central fuel reservoir (mass density: 0.75 kg/l) lever arm: 680 mm	6.75	4590		
9. 28 liters of usable fuel (mass density: 0.75 kg/l) lever arm: 255 mm	21	5355		
10. Total mass & total moment with fuel tanks filled (add lines 6 through 8)	890	299002		

NOTE

Divide weights in pounds (lbs.) by 2.2046 to obtain kilograms (kg). Multiply lever arms in inches (in.) by 25.4 to obtain millimeters (mm). Also refer to the main part of the Airplane Flight Manual, Article 1.4.2 PHYSICAL UNITS.

Mass and Balance Diagram

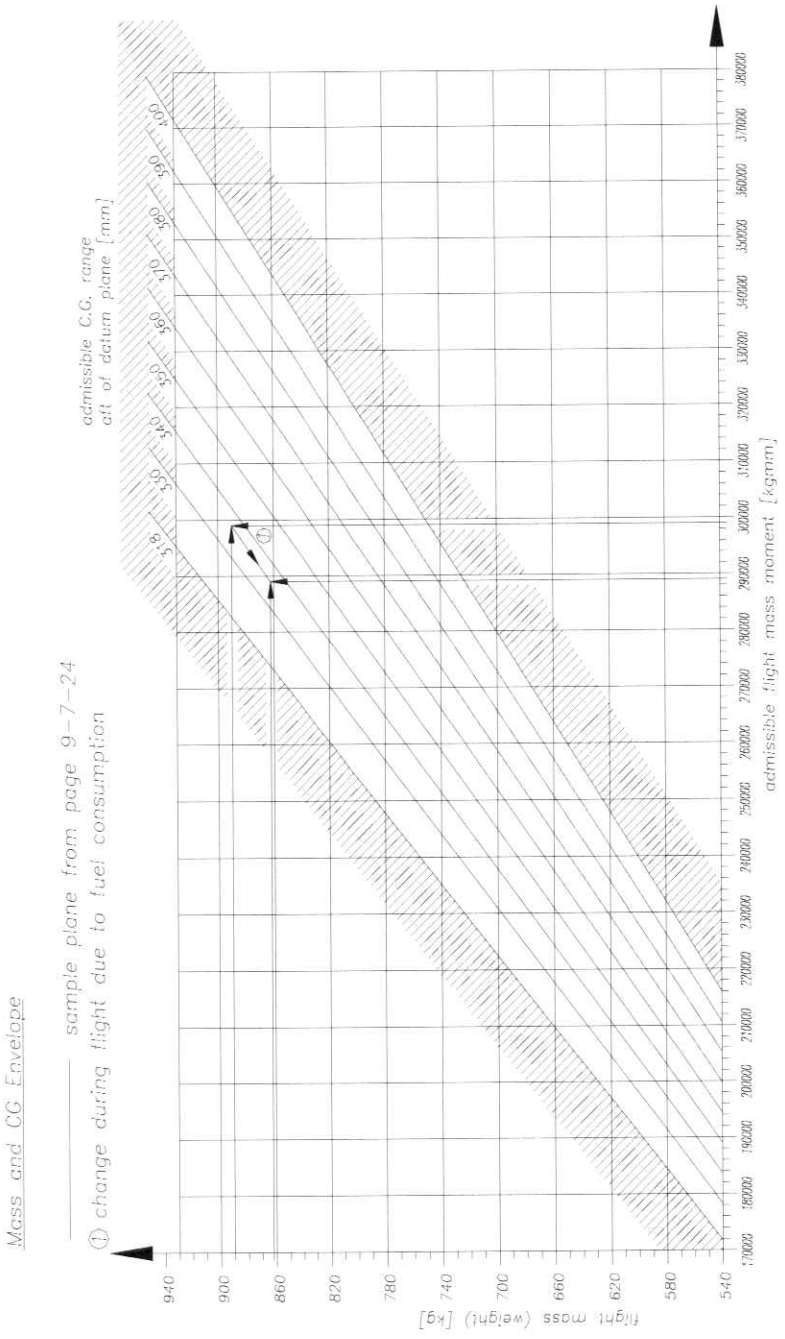


Example from table

occupants: 143.5 kg
9 liters in central fuel reservoir: 6.75 kg
28 liters in tanks (0.75 kg/liter): 21 kg
pods: 105 kg

Result:

loading moment, occupants: 20521 kgmm
loading moment, central fuel reservoir: 4590 kgmm
loading moment, tanks: 5355 kgmm
loading moment, pods: 37695 kgmm


Mass and CG Envelope
sample plane from page 9-7-24
① change during flight due to fuel consumption
admissible C.G. range
alt of datum plane [mm]
admissible flight mass moment [kgmm]
flight mass (weight) [kg]

SECTION 7

POWERED SAILPLANE & SYSTEMS DESCRIPTION

7.1 INTRODUCTION

Section 7 provides a description of the Powered Sailplane carrying underwing LH camera and RH pod and their systems, together with notes for the user:

7.2 AIRFRAME

7.2.1 WINGS

In each wing there are two mounting points for mounting either a pod or camera in tandem arrangement. Two inspection holes in the lower wing skin allow access to the cable conduit. One hole is located between the two mounting points, the other one lies next to it on the inboard side. Hoses and electrical wiring can be routed from the cockpit to the mounting through the cable conduit.

The cable conduit ends at the wing's root rib. It is accessible after removing the seat shell.

7.8 COCKPIT

Room for installation of additional equipment

To the right of the instrument panel there is room reserved for the installation of additional equipment. There is also room for additional equipment on rails in the baggage area. Provision is made for cable routing on the right side of the cockpit.

CAUTION

Installation of additional equipment (e.g. measuring equipment) is explained in Supplement 8 to the Airplane Flight Manual.

The right hand flight controls (control stick, rudder pedals and airbrake lever) may be optionally removed.

7.13 MISCELLANEOUS EQUIPMENT

For handling and operation of additional equipment installed refer to the manuals of the respective manufacturers.

7.14 PLACARDS / INSCRIPTIONS

In addition to the placards listed in the Airplane Maintenance Manual, the following placards are required:

On the pod:

Maximum total mass of pod: 55 kg (121 lbs.) Center of gravity below rear frame bar.

Within pilot`s field of vision:

CAUTION
Before operating at increased T/O mass (T/O weight), check mass and balance according to Airplane Flight Manual! Note increase in stall speed, best rate-of-climb speed and approach speed!

SECTION 8

POWERED SAILPLANE HANDLING, CARE AND MAINTENANCE

8.2 POWERED SAILPLANE INSPECTION PERIODS

At each 100-hour inspection:

- Inspect the camera and pod attachment points in wing structure for damage and excessive wear.
- Inspect rack in baggage compartment including fixtures for equipment.
- Inspect right hand rack, beside instrument panel.
- Inspect attachment points of antennas for damage and excessive wear.

8.3 POWERED SAILPLANE ALTERATIONS AND REPAIRS

Alterations or repairs of the powered sailplane may be carried out only by authorized personnel and only as prescribed in the Airplane Maintenance Manual.

The following rules which are not included in the Airplane Maintenance Manual must be adhered to when installing additional equipment (e.g. measuring equipment):

8.3.1 EXTERNALLY MOUNTED EQUIPMENT

All externally mounted equipment must be suitable for the following load factors, with adequate safety:

positive : 4.4

negative :-2.2

sideward : 1.5

All externally mounted equipment must be suitable for flight up to 141 KIAS.

Underwing-Mounted Equipment

- Location of installation — Use mounts provided under LH and RH wings ±3.385 m (±11.11 ft) from centerline
- Maximum installed weight — 55 kg per wing (including mounting pins)
- Lateral balance — Maximum difference side to side must not exceed 5 kg.
- Projection below wing — Must not project beyond 610 mm (24 in) below wing in stowed configuration (take-off & landing)
- Maximum frontal area — 0.22 m^2 (341 in^2) on each wing
- C.G. location — C.G. must be located between forward and aft mounts

Externally-Mounted Antennas

- Location of installation — Use mounts provided on center of belly aft of main landing gear
- Maximum installed weight — 10 kg
- Projection below belly — Must not project beyond 325 mm (12.8 in) below belly in stowed configuration (take-off & landing)
- Maximum frontal area — 0.083 m^2 (129 in^2)
- C.G. location — C.G. must be located between forward and aft mounts

External Video Cameras (POV)

- Location of installation — Use mounts provided on LH wing tip and on vertical stabilizer
- Maximum installed weight — 3 kg
- Maximum frontal area — LH wing tip 0.01 m^2 (16 in^2). Vertical stabilizer 0.003 m^2 (4.7 in^2).

Check Flight

A check flight must be performed for each configuration of externally mounted equipment to ensure that the aircraft can be trimmed, and to make the necessary trim adjustments.

Trim: The following must be demonstrated with all external equipment in their stowed position and the airbrakes retracted.

Lateral trim: It must be demonstrated at $1.4V_{s1}$ = 60 KIAS that the aircraft is capable of being so trimmed that there is no tendency to turn or bank when the aileron control is released and the rudder control held fixed in neutral position.

Directional trim: It must be demonstrated at $1.4V_{s1}$ = 60 KIAS that the aircraft is capable of being so trimmed that there is no tendency to yaw when the rudder control is released and the aileron control held fixed in neutral position.

Longitudinal trim: It must be demonstrated that the aircraft is capable of maintaining longitudinal trim in a maximum power climb at V_Y = 65 KIAS, and in cruise speeds between 65 and 100 KIAS.

Vibration and buffeting:

It must be demonstrated that the aircraft is free from excessive vibration and buffeting at all speeds up to V_{NE} = 141 KIAS. This must be demonstrated at 10 knot airspeed increments from 80 knots to V_{NE}, with the external equipment in the stowed position.

Trim Adjustment

To adjust directional trim, removed rudder trim-tab, firmly secure tab in soft jaw vice, bend tab approximately 5° for every 1/8 ball out.

To adjust lateral trim in case of light left rolling tendency: Open counternut of push-pull-rod (PPR) to left aileron horn at the side of the horn. Open bolt PPR-Horn and turn the rod end bearing a half turn out (counter clock wise) so that the zero position of the left aileron is more to the upside. Re-assemble control system.

If the half turn at the left aileron is not enough, turn the right aileron rod end bearing a half turn in (clockwise).

To adjust lateral trim in case of light right rolling tendency, reverse direction of adjustment.

When finished the adjustment of the ailerons check the maximum deflection of the ailerons in accordance to the adjustment table. If the maximum deflection is no longer within the limits adjust the center position of the control stick. Refer to the maintenance manual for more information.

8.3.2 INTERNALLY MOUNTED EQUIPMENT

All internally mounted equipment must be suitable for the following load factors, with adequate safety:

positive	: 5.7
negative	:-3.7
forward	: 9.0
sideward	: 1.5

Baggage Area

- Location of installation — Use adjustable mounting rails provided. Equipment must not block access to fire extinguisher or ELT. No loose baggage may be carried unless baggage net is installed.
- Maximum installed weight — 30 kg (including mounting equipment other than rails provided)
- C.G. location — C.G. must be located between the rail centerlines in plan view, and less than 210 mm (8.3 in) above the top of the lateral rails

RH Side of Cockpit

- Location of installation — Use mounting plates, rails, and sliding tray provided. Equipment must not block egress in stowed position.
- Maximum installed weight — 13 kg

CAUTION

Other locations of installation, masses (weights) or kinds of installation require consultation of the manufacturer and separate approval.

8.3.3 GENERAL

- All inspection panels must remain accessible.
- Additional equipment (e.g. measuring equipment) must be clearly identifiable to the pilot as such equipment.
- Additional equipment (e.g. measuring equipment) should only be supplied with power by the 28 V system.
- Additional equipment (e.g. measuring equipment) must be suitable for the operating conditions expected in service regarding altitude, temperature, and humidity.
- Additional equipment (e.g. measuring equipment) must not emit toxic substances.
- It must be ensured that emitted heat will not impair or damage the corresponding equipment, adjacent equipment, or structural members (max. 54 °C / 129 °F).
- Electric wires must meet an adequate standard (e.g. MIL-W-22759-16).
- Electric wires must have a cross-sectional area that is adequate for their load.
- Electric circuits which are not designed for 25 Amps require additional protection corresponding to their design load.
- Plug-type connectors must not open inadvertently due to vibration or high load factors;1 open connectors must not result in short-circuit.
- Electrical continuity must be provided between additional equipment (e.g. measuring equipment) and electrical ground.
- Wires must be routed through the provided conduits (see Airplane Flight Manual and Supplement 8).
- Wires must not interfere with parts of the control system under any circumstances, even if a wire becomes loose.

- Wires must be routed such as to prevent chafing.
- After installation work, a check for loose or foreign objects must be carried out.
- The empty mass CG must be checked for compliance with the CG limitations in accordance with the Airplane Maintenance Manual.
- Each item of additional equipment (e.g. measuring equipment) must be checked for interference (EMI-tests) with the following systems:
  - altimeter
  - airspeed indicator
  - fuel quantity indicators
  - engine instruments
  - warning and caution lights
  - magnetic compass
  - ignition circuit 1
  - ignition circuit 2
  - turbo control unit (TCU)
  - fuel main pump
  - fuel booster pump
  - voltage regulator
  - COM equipment
  - NAV equipment
  - transponder (XPDR)
  - other equipment of the airplane