Diamond AIRCRAFT

SUPPLEMENT 7

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

OPERATION WITH UNDERWING CONTAINERS

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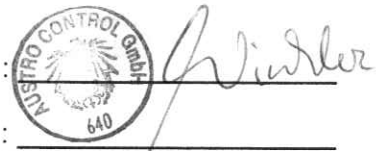
Signature : 

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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 RECORD OF REVISIONS

Rev No.	Sec.	Pages	Date of Revision	Approval	Date of Approval	Date Inserted	Signature
1	All	All, except Cover Page	23-Sep-2021	Revision No. 1 of the Supplement Doc. No. 3.01.25-E-07 is approved under the authority of DOA No. EASA.21J.052			
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0.2 LIST OF EFFECTIVE PAGES

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SECTION 1

GENERAL

1.1 INTRODUCTION

| Pages 9-7-0 through 9-7-31 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 EXPLANATIONS

1.4.1 ABBREVIATIONS

POD Underwing Container

1.5 DESCRIPTIVE DATA

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

Pod dimensions

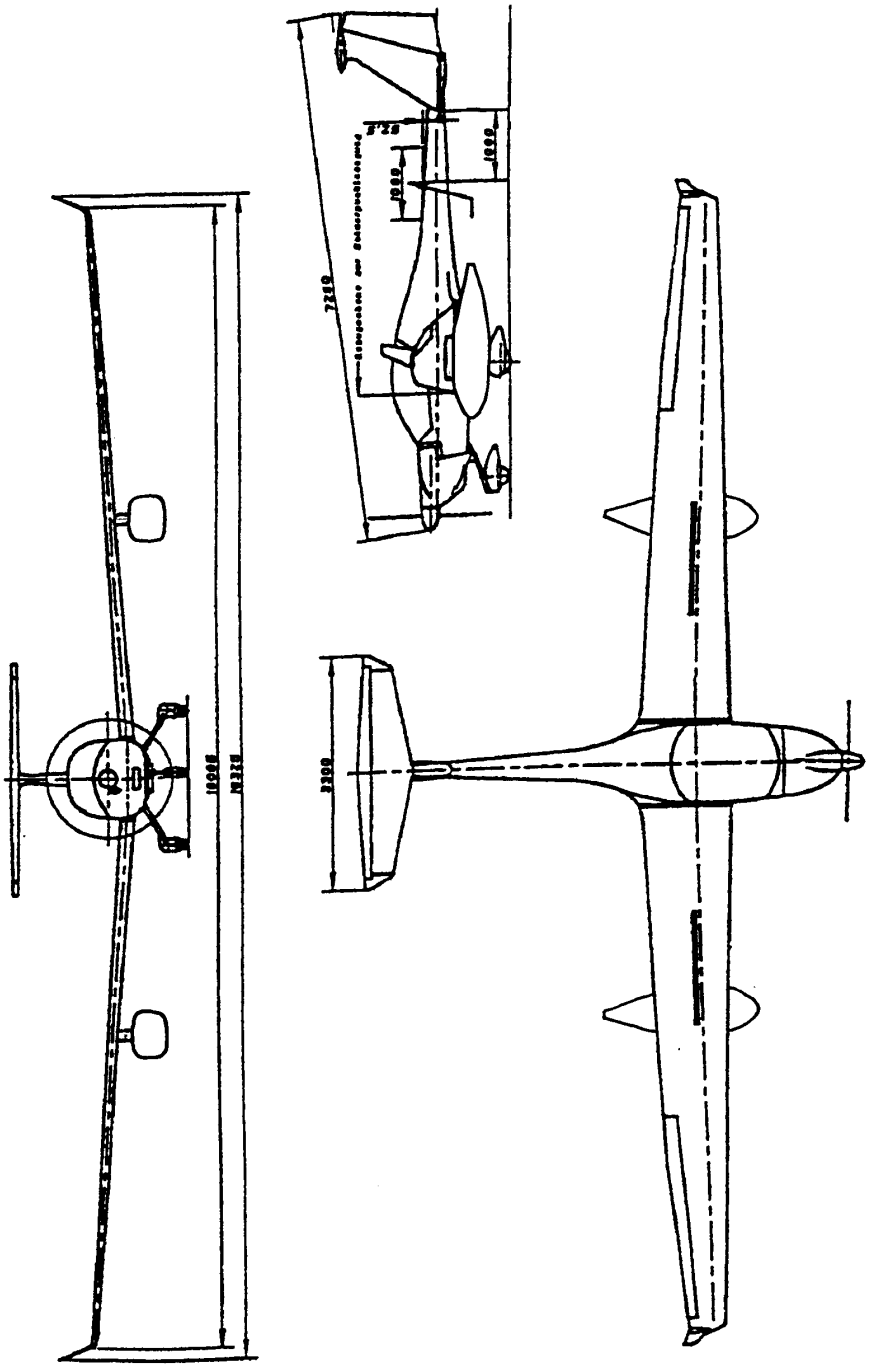
Length : 1.650 m (5.41 ft.)

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.)

For operation in Japan:
Maximum take-off mass (max. T/O weight) : 850 kg (1874 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 CRUISE (INCLUDING IN-FLIGHT ENGINE STOP/START PROCEDURES)

3. Airspeed . . . . . maintain 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. oor 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 at Maximum Take-Off Weight 930 kg (2050 lbs) according to ICAO Annex 16 Volume 1 Chapter 10:

- Take-off noise level: 62.2 dB(A)
- Max noise level according limit per 10.4 a) : 82.2 dB(A)

For operation in Japan under the provision of JCAB Civil Aeronautics Regulation (CAR) Annex 1 with a Maximum Take Off Weight (MTOW) of 850 kg (1874 lbs):

- Take-off noise level: 62.2 dB(A) is conservative and remains valid.
- Max noise level according limit per 10.4 a) : 80.9 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	87	-	-	-	-
100	34	5450	27	71	209 113/130	213 115/132	217 117/135	3:56 (17)
90	32	5300	24	63	203 110/126	206 111/128	209 113/130	4:25 (20)
75	30	5050	20	53	190 103/118	193 104/120	196 106/122	5:18 (24)
60	28	4800	17	45	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 (1874 lbs.).

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

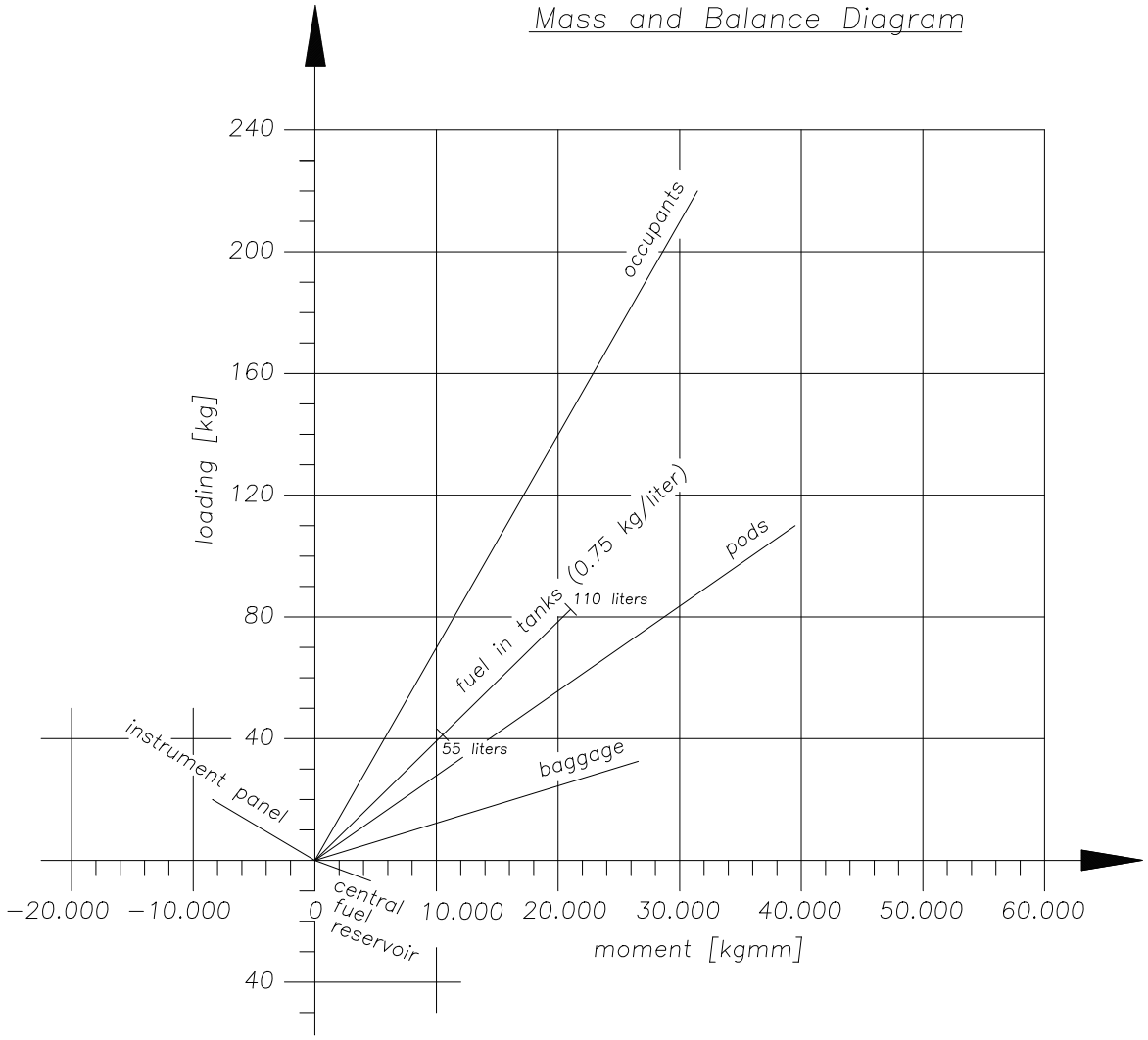
The following table is a supplement to the Mass and Balance Form. It enables the pilot to verify whether a loading configuration is permissible as regards maximum useful load, minimum useful load on the seats, and CG position.

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	1435	20521		
3. Baggage lever arm: 824 mm	20	16480		
4. Additional equipment in instrument panel Lever arm: -421 mm	375	-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	675	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

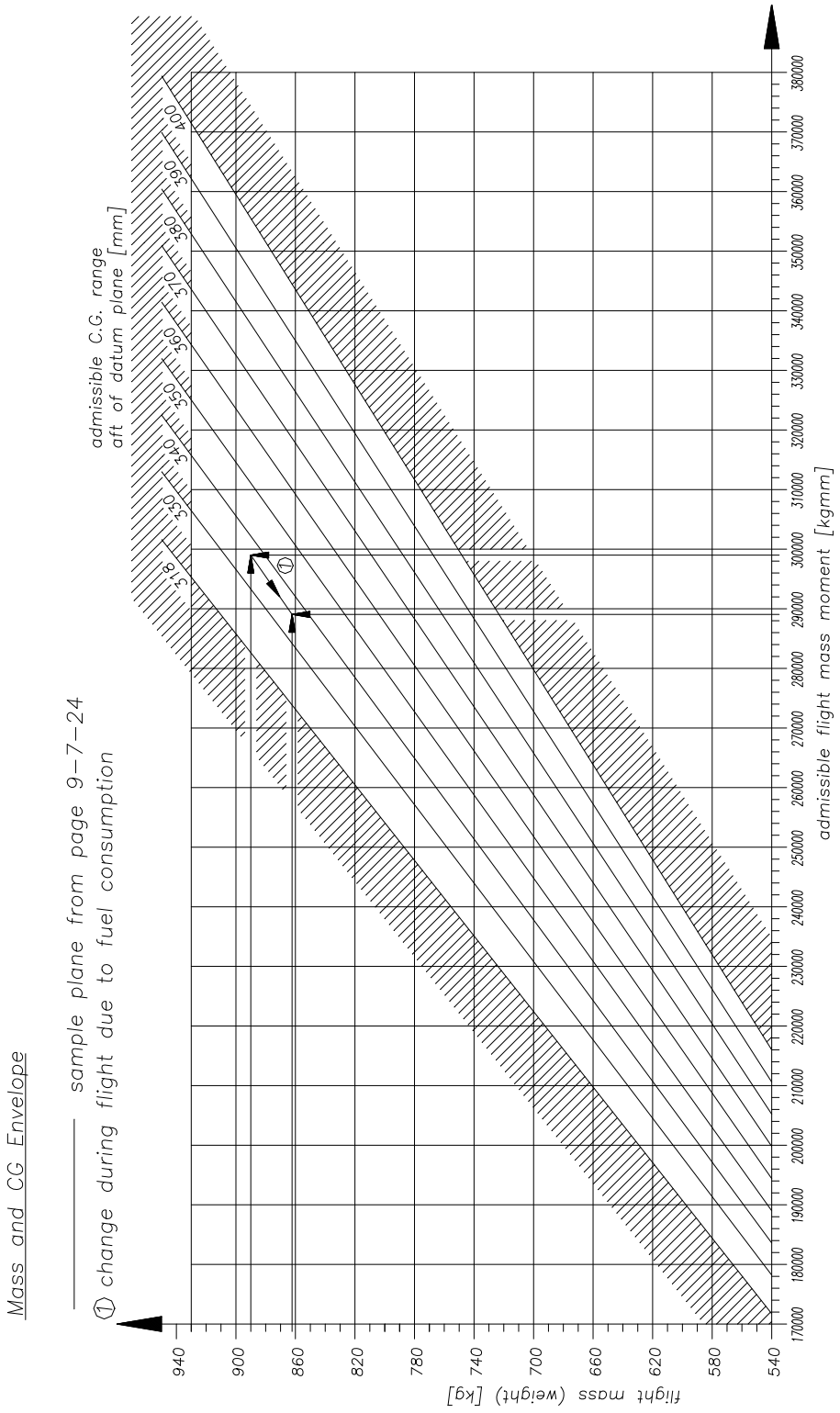


Example from table

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]
admissible flight mass moment [kgmm]
flight mass (weight) [kg]
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
940
900
860
820
780
740
700
660
620
580
540

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.

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