Reduced minimum cockpit load by fitting removable trim ballast in front of the pedal assembly: see Section 7.13

The baggage compartment load must not exceed 15 kg = 33 lb

Baggage compartment load max. 15 kg (33 lbs)
As the steerable tailwheel is installed so far behind the C.G. it must be observed in any case for C.G. determination when installed!
An additional placard must be affixed in the cockpit:

Reduced minimum cockpit load
without steerable tailwheel
see flight manual - Page 6.5

See also Section 7.13.
Page intentionally left blank.
procedure cannot be accomplished with the control springs hooked in, they may be unhooked at the wheel fork of the steerable tail wheel.

Finally the fairing has to be installed. Therefore the wheel has to be disassembled from the wheel fork to plus the fairing from the bottom on. The fairing is clicked in the axle bolt hollow on the fuselage and taped all-round. The wheel has to be reassembled afterwards.

When the steerable tailwheel is installed in the rear of the engine compartment, the minimum seat load may be higher than 70 kg or 154 lbs (including the parachute). The necessarily increased minimum load will then be indicated on the Data and Loading Placard in the cockpit. The possible reduced minimum cockpit load without steerable tail-wheel installed is given only in the Mass and Balance Form in Section 6.2.

If the steerable tail wheel is dismantled in order to fly again with the standard tail wheel, the connecting unit for the control springs at the rudder must also be removed!

If rubber skids are fitted at the wing tips these must be removed (two hexagonal socket head screws A/F 5 respectively) and replaced by the wing tip wheels. Pay attention to the correct mounting (left and right wheels are different).

**NOTE:** The original screws only must be used otherwise damage to the wing skin cannot be excluded.
Fig. 7.6-1  Exemplary Cockpit View
For safety reasons - if the baggage bag is installed - only a maximum load of 2 kg (4.4 lb) is allowed, the **Data and Loading Placard in the cockpit** has to show the higher minimum load due to the 2 kg (4.4 lb) of baggage.

If the steerable tailwheel is installed, the **Data and Loading Placard in the cockpit** has to show the higher minimum load due to the steerable tailwheel.

A placard affixed near the **Data and Loading Placard** in the cockpit had to point to the **flight manual section 6.2**. Here a lower minimum cockpit load without trim ballast in the fin, baggage bag or steerable tailwheel is registered.

**EXAMPLES for using the Diagram of Empty Mass and Mass and Balance Form:**

The following examples are supposed to supply information to inspector’s how to fill in a Mass and Balance Form.

Examples of in-flight C.G. calculations for pilots are given in section 6.8.

(1) A weighing with 21 m (68.9 ft) according to Section 6.2 resulted in following values:

\[
\begin{align*}
    m_E &= 445\text{kg} \quad (981\text{ lb}) \quad \text{(Empty Mass)} \\
    x_E &= 525\text{mm} \quad (20.67\text{ inch}) \quad \text{(Empty Mass C.G. position)} \\
    m_{nlp} &= 235\text{kg} \quad (518\text{ lb}) \quad \text{(Mass of non-lifting parts, without useful load as given in section 6.2)}
\end{align*}
\]

By use of Fig. 6.4-1 it is found that:

The measured point \( P_1 \) is below the line with 70 kg (154 lb) minimum cockpit load in the seat and over the line of the maximum cockpit load of 120 kg (265 lb).

\[
365\text{kg} - 235\text{kg} = 130\text{kg} \quad (805\text{ lb} - 518\text{ lb} = 287\text{ lb})
\]

The aircraft is within the required limits and may therefore be flown by a pilot weighing from 70kg (154 lb) to 120kg (265 lb) (including parachute).

The amount of water ballast which is allowed with both wing span versions may be derived from the tables given in section 6.3 in the **flight manual**.
(2a) A second weighing with 21 m (68.9 ft) resulted in following values:

\[ m_E = 455\text{kg} \quad 1003\text{ lb} \quad (\text{Empty Mass}) \]

\[ x_E = 550\text{mm} \quad 21.65\text{ inch} \quad (\text{Empty Mass C.G. position}) \]

\[ m_{npl} = 245\text{kg} \quad 540\text{ lb} \quad (\text{Mass of non-lifting parts, without useful load as given in section 6.2}) \]

By use of Fig. 6.4-1 follows:

The point \( P_{2a} \) is now above the line of 70kg (154 lb), but below the line of 84kg (185 lb). The minimum cockpit load now would be 83kg.

In order to stay within the Airworthiness Requirements limits, either a fixed trim ballast mass may be fitted in the fuselage nose, or the Data and Loading Placard in the cockpit and the Mass and Balance Form in section 6.2 of the flight manual has to show a minimum cockpit load of 83kg (183 lb) (pilot including parachute).
\( x_E \) (mm) Empty mass C.G. position
\( m_E \) (kg) Empty mass
\( x_P \) (mm) Pilot mass arm
\( m_P \) (kg) Mass of pilot including parachute
\( x_W \) (mm) Distance of water ballast from datum point
\( m_W \) (kg) Mass water ballast (1 litre = 1kg or 2.2 lb)
\( x_{O2} \) (mm) Distance of oxygen bottle from datum point in standard fitting location
\( m_{O2} \) (kg) Mass of oxygen bottle
\( x_G \) (mm) Distance of baggage compartment
\( m_G \) (kg) Mass of baggage in baggage compartment
\( x_K \) (m) Mean mass arm of fuel in the fuselage tank
\( m_K \) (kg) Mass of fuel load (1 litre = 0.73 kg or 1.6 lb)
\( x_{GS} \) (m) Distance of baggage bag behind engine compartment from datum point
\( m_{GS} \) (kg) Mass of the baggage bag
\( x_I \) (m) Instrument mass arm in instrument panel
\( m_I \) (kg) Mass of instruments in instrument panel
\( x_{Tv} \) (m) Trim weights mass arm in front of pedals
\( x_{Th} \) (m) Trim weights mass arm in fin
\( x_{PPe} \) (m) Distance propeller extended
\( x_{PPr} \) (m) Distance propeller retracted
\( m_{PP} \) (kg) Mass of power-plant with propeller, coolant and engine oil
\( x_{MB} \) (m) Distance from datum of engine battery in the box in front of control stick (2 positions are listed as the battery may be located at the very front or very end inside the box).
\( m_{MB} \) (kg) Mass of engine battery in the box in front of control stick
\( x_T \) (mm) Trim weights in front of pedals
\( m_T \) (kg) Mass of trim weights in front of pedals
\( x_{st} \) (m) Distance of steerable tailwheel from datum point
\( m_{st1} \) (kg) Mass of steerable tailwheel original version
\( m_{st2} \) (kg) Mass of steerable tailwheel TM 2
## Table of established Arms and Masses:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Dimension</th>
<th>Value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x_W$</td>
<td>Meter</td>
<td>+0.201</td>
<td>Water ballast distance from datum</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+7.91</td>
<td></td>
</tr>
<tr>
<td>$x_{O2}$</td>
<td>Meter</td>
<td>+0.280</td>
<td>In factory-standard fitting location</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+ 11.02</td>
<td></td>
</tr>
<tr>
<td>$x_G$</td>
<td>Meter</td>
<td>+0.160</td>
<td>Baggage in baggage compartment top, front</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+ 6.30</td>
<td>of spar</td>
</tr>
<tr>
<td>$x_K$</td>
<td>Meter</td>
<td>+0.304</td>
<td>Mean mass arm of fuel in the fuselage tank</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+11.97</td>
<td></td>
</tr>
<tr>
<td>$x_{GS}$</td>
<td>Meter</td>
<td>+2,410</td>
<td>Baggage bag behind engine compartment</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+ 94.88</td>
<td></td>
</tr>
<tr>
<td>$x_I$</td>
<td>Meter</td>
<td>-1,120</td>
<td>Instrument mass arm in instrument panel</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>-44.09</td>
<td></td>
</tr>
<tr>
<td>$x_{Tv}$</td>
<td>Meter</td>
<td>-1,800</td>
<td>Trim weights in front of pedals</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>-70.87</td>
<td></td>
</tr>
<tr>
<td>$x_{Th}$</td>
<td>Meter</td>
<td>+4.581</td>
<td>Trim ballast** in fin</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+180.35</td>
<td></td>
</tr>
<tr>
<td>$x_{PPr}$</td>
<td>Meter</td>
<td>+ 1,026</td>
<td>Propeller retracted</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+ 40.39</td>
<td></td>
</tr>
<tr>
<td>$x_{PPe}$</td>
<td>Meter</td>
<td>+ 0,919</td>
<td>Propeller extended</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>+ 36.18</td>
<td></td>
</tr>
<tr>
<td>$m_{PPa}$</td>
<td>kg</td>
<td>66,0*</td>
<td>Power-plant with propeller</td>
</tr>
<tr>
<td></td>
<td>lb</td>
<td>145.5</td>
<td></td>
</tr>
<tr>
<td>$x_{MBv}$</td>
<td>Meter</td>
<td>- 1,150</td>
<td>in front of the box</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>- 45.28</td>
<td></td>
</tr>
</tbody>
</table>
** The exact mass of the battery (see section 2.8), of the trim ballast or the power-plant has to be weighed!

** The maximum permissible mass of 6 kg (13.23 lb) for trim ballast in the fin must not be exceeded!

**EXAMPLES** for the calculation of the in-flight C.G. position:

1. For the following examples the results of this **Empty Mass C.G. weighing** are applied:

\[
X_E = \frac{m_2 \cdot b}{m_E} - a
\]

\[
m_E = 439\text{kg from weighing of all components (18m!) (59.1 ft!)}
\]

\[
m_2 = 61.7\text{kg}
\]

\[
b = 4659\text{mm}
\]

\[
a = 57\text{mm}
\]

For weighing the sailplane was levelled correctly.

\[
X_E = \frac{61.7\text{kg} \cdot 4659\text{mm}}{439\text{kg}} - 57\text{mm}
\]

\[
X_E = 598\text{ mm (23.54 inch) aft of datum}
\]

It may not be calculated in different measurements. In one formula only use either metrical dimensions [mm/m] or American dimensions [inch]. If applicable convert at the end of the calculation.
2. Example of changes to empty mass and empty mass C.G.:

In the ASH 31 Mi in example 1 with the weighing results \( m_E = 439 \text{ kg (968 lb)} \) and \( x_E = 598 \text{ mm (23.5 in)} \) a pneumatic variometer \( (m_{l1} = 0.3 \text{ kg / 0.66 lb}) \) is exchanged for an electronic variometer \( (m_{l2} = 1.3 \text{ kg / 2.86 lb}) \); the capacities will not be changed.

How do the data of this ASH 31 Mi change?

Prior to the exchange of the vario's the mass of the non-lifting parts was \( m_{nlp} = 240 \text{ kg (529 lb)} \). The maximum mass of the non-lifting parts being \( m_{nlp MAX} = 365 \text{ kg (805 lb)} \), the aircraft could be loaded in the fuselage with \( 125 \text{ kg (276 lb)} \).

Due to of the exchange of the instruments the mass of the non-lifting parts increases by (without useful load, see section 6.2):

\[
m_{l2} - m_{l1} = 1.3 - 0.3 = 1.0 \text{ kg to } m_{nlp} = 241 \text{ kg (531.3 lb)}.
\]

The new maximum load in the fuselage is now
\[
125 \text{ kg} - 1.0 \text{ kg} = 124 \text{ kg (273.4 lb)}.
\]

The C.G. changes accordingly:

\[
m_{E new} = m_{E old} + m_{l2} - m_{l1}
\]

\[
m_{E new} = 439 + 1.3 - 0.3 = 440 \text{ kg (970.0 lb)}
\]

\[
x_{E new} = \frac{(m_E \cdot x_E)_alt + (m_{l2} - m_{l1}) \cdot x_l}{m_{E new}}
\]

\[
x_{E new} = \frac{439 \text{ kg} \cdot 598 \text{ mm} + 1.0 \text{ kg} \cdot (-1120 \text{ mm})}{440 \text{ kg}}
\]

\[
x_{E new} = 594 \text{ mm (23.38 inch)}
\]

It may not be calculated in different measurements. In one formula only use either metrical dimensions [mm/m] or American dimensions [inch]. If applicable convert at the end of the calculation.
24a Reduced minimum cockpit load without steerable tailwheel see flight manual - Page 6.5

This placard is affixed, if applicable, right beside the Data and Loading placard (20)

25 Prior to take-off check the weight of the trim plates and their secure fixing

Only fitted, when the mounting support for trim weights has been installed

26 One trim plate equals a pilot mass of 3.0 kg (6.6 lbs)

Only fitted, when the mounting support for trim weights has been installed

27 Maximum loading of 2 kg (4.4 lbs) must not be exceeded!

This placard is affixed on the mounting support of the luggage bag

28 Baggage compartment load max. 15 kg (33 lbs)

This placard is affixed between the shoulder strap fittings

29 LANDUNG LANDING nur im Endteil for final only THERMIK THERMALLING 6 5 4 SCHNELLFLUG FAST 3 2 1

The appropriate of these placards is affixed close to the air-speed indicator
Placards regarding the Power-plant:

With a permanently installed fuel filling equipment, this placard is affixed right beside the refuelling coupling in the rear engine compartment.

When equipped with an external fuel filling equipment, this placard is affixed on the front cross tube next to the filling hose.

This placard is affixed right beside the red flashing diode in the instrument panel.

This placard is affixed right beside the Circuit Breaker in the instrument panel.

This placard is affixed on the right wall of the engine compartment near the oil tank.

This placard is affixed on the right wall of the engine compartment right beside the “Oil Placard” (35)