RENSCHLER
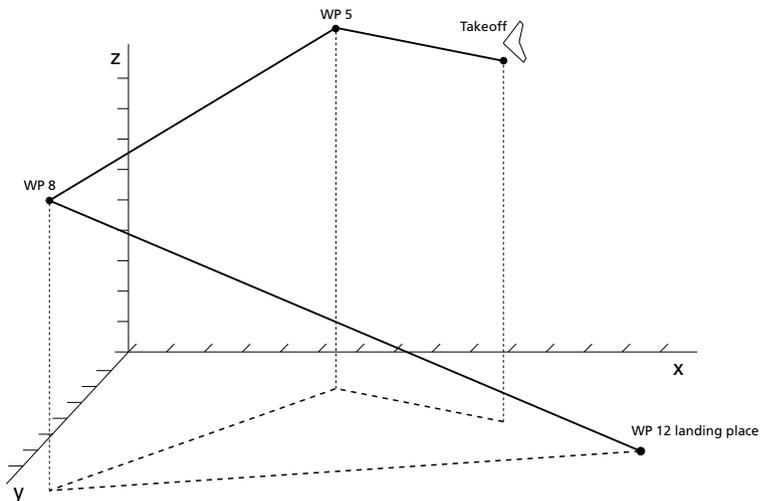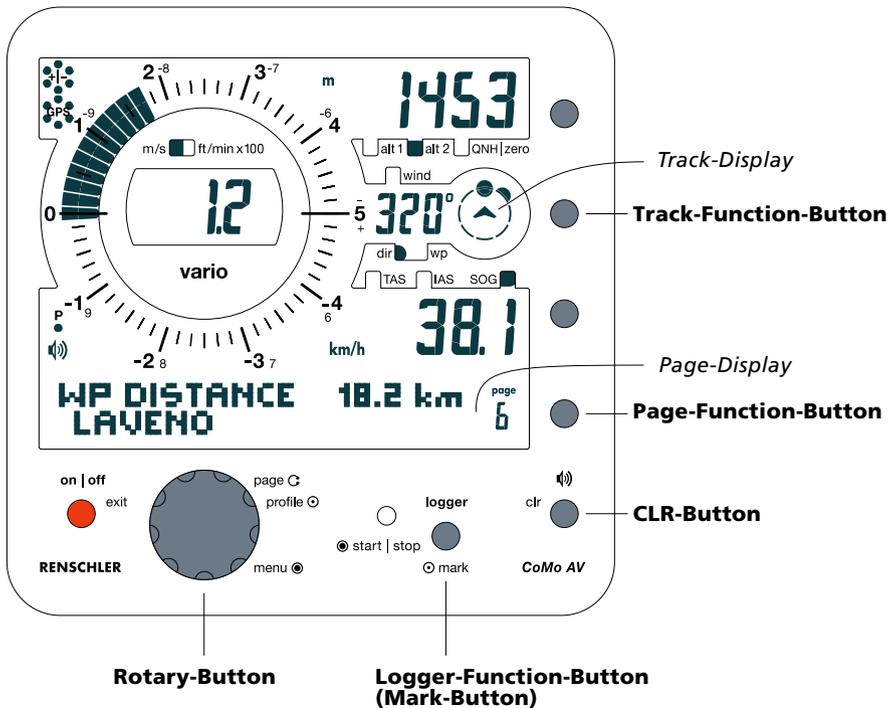
Navigation Instruction Manual
Additional manual to the standard instruction manual

IMPORTANT: Alt2 MUST be setup correctly for navigation, because ALL navigation is done using alt2

This manual describes the new navigation functions, and should be used in conjunction with the standard manual.

2 -8   3 -7   m

GPS   -9

1   -6   4

m/s | ft/min x100

1.2

0   5 +/-

vario

-1 9   -4 6

P

-2 8   -3 7

km/h

WP DISTANCE   18.2 km

LAVENO

1453

alt 1 ■ alt 2 | QNH | zero

wind

320°

dir ● wp

TAS | IAS   SOG ■

38.1

page 6

Track-Display — **Track-Function-Button**

Page-Display — **Page-Function-Button**

CLR-Button

on | off   page ↻
exit   profile ☉

logger

● start | stop

RENSCHLER   menu ◉   ☉ mark   CoMo AV

clr

Rotary-Button   **Logger-Function-Button (Mark-Button)**

Table of Contents

1. Quick Guide to the navigation functions

With the first navigation release the CoMo supports 15 programmable waypoints (WP 01 - WP 15) and one temporary waypoint (TP 16). Current positions like takeoff or landing places can be stored. You have to be physically at a location in order to store it. The TP 16 can be used to store a position (such as the last thermal) in order to return to it later. To store a location the MARK button is used.
You also have access to stored WPs through the menu under "settings" "wp manage".
Stored WPs can be selected and activated directly from the WP distance page. This page shows after activating the distance to the WP.
The Track-Display shows both the direction of North (half filled point) and also the direction to the WP (filled point). The 3 remaining digits can be switched between compass direction, direction to the WP, and temperature.
The new glide ratio display is a useful feature to use alongside the actual glide ratio, the glide ratio needed to get to the waypoint and the arrival altitude at the WP.

NOTE: To use the navigation functions it is necessary to have alt2 setup correctly.
All WPs use alt2 because it is more instantly accurate than the GPS alt.

2. The navigation displays

2.1 The WP distance page (page 6)
Shows the distance to the selected WP.

```
WP DISTANCE   18.2 km   page
 LAVENO                  6
```

2.2 The WP coordinates page (page 7)
Shows the coordinates and altitude of the selected WP

```
WP 07      N  43.54272°   page
 3422 m    E 114.03523°    7
```

2.3 The glide ratio page (page 4)
Shows the current glide ratio and the necessary glide ratio to get to the next WP, as well as altitude required to get to the waypoint (details see 4.2).

```
 8.4 GR   7.8 REQ m   page
                - 267   4
```

2.4 The Track-Display

Shows your direction, the position of North (half filled circle) and the waypoint position (full filled circle). The 3 digit display on the left shows the same thing digitally, with a greater accuracy of 1 degree. (see under 4.1)

Track-Display
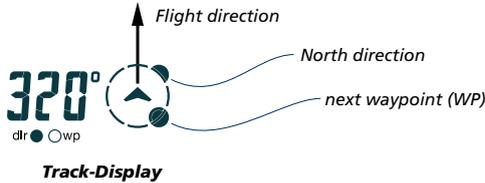
3. Detailed description of the new functions

3.1 How to store a position as a WP

You can only store a position if the GPS has reception. If the GPS is off or there is no reception the display shows:

If there are sufficient satellites and good reception, then a landing place can be stored as follows:

IMPORTANT: Ensure that alt2 is set correctly, because this altitude value will be stored in the WP memory.

Hint: If you don't know your altitude, you can use the GPS altitude. Because the GPS altitude is not instantly very accurate, it is a good idea to wait some minutes until it settles down. Always remember that GPS altitude readings could easily be 100 ft different from the real altitude.

Push the MARK button (short push), the storage menu will open and the following display appears:

You now have 2 possibilities to store the Waypoint:

3.1.1 Fast storage (temporary WP, TP16)

Just press the MARK button a second time and the current position is stored as temporary waypoint (TP16), and is also activated. The name of this waypoint consists of the date and the UTC (universal time cone). See page 6:

`SET WP    @ MARK set` / `+ NAME @ PAGE` *second short push on MARK button:*

```
WP DISTANCE        2 m   page
23.08 – 21:34:13         6
```

The temporary WP is useful if you want to mark a position quickly (e.g. the last thermal, man over board, etc). This is done by simply pressing the MARK key twice, and it is automatically named using the timestamp name. By activating this again, or by activating a WP out of the WP memory, this temporary WP will be lost. A temporary WP can be stored permanently in the main menu.

3.1.2 Permanent WP storage with name

If, instead of the MARK button, you press the PAGE button (on the right of the Page display), the display enters the name entry mode. The following appears:

`SET WP    @ MARK set` / `+ NAME @ PAGE` *short push on PAGE button:*

```
NAME:        SELECT: A  set
             ENTER WITH +
```

You can select a character or number by rotating the ROTARY button and choose it by pressing either the ROTARY or the PAGE button. You can use to CLR button to cancel incorrect entries. Use the Exit button to abort an entry.
Apart from the characters and numbers there are 2 special symbols:
_ underscore (to create a space)
← RETURN symbol (to enter a name and finish name entry)

```
…0123…89 _ A B C D E…X Y Z + 0…
```

underscore   *Finish name entry with (ENTER) RETURN symbol*
Default letter starting 1st position   *Default letter starting 5th position*

```
NAME:       SELECT: A
LAV  ENTER WITH +
```

*Text entry f.e. " **LAV**ENO "*

After entering 5 symbols the ENTER / RETURN symbol (←) is shown automatically.
A name can have a maximum of 16 symbols, and the entry is finished by selecting the RETURN symbol, which is found at the end of the alphabet.

When you finish the name entry with ENTER / RETURN (←), the next display will give you a selection of the WP you may wish to overwrite, starting with the temporary TP 16.

ENTER / RETURN symbol

```
TP 16 SAVE AS        ↑
LAVENO              set
                     ↓
```
temporary TP 16

Use the ROTARY-Button to select which of the memorised WP is to be overwritten by the new WP. Confirm with the ROTARY- or PAGE-Button.

WP 01, WP 02 ,…, WP 15 + TP 16

```
WP 09 SAVE AS        ↑
LAVENO              set
                     ↓
```
select WP with ROTARY-Button

rotate

brief push

The new WP will automatically be activated and displayed on page 6.

```
WP DISTANCE   18.2 km    page
 LAVENO                   6
```

The CoMo has 15 fixed WP memory locations and one temporary one (TP 16).
The menu suggests the temporary TP16 as the first selection. For permanent storage one of the 15 fixed memory locations is selected with the ROTARY key and confirmed by pressing the ROTARY or PAGE button. In our example the WP 09 Andelsbuch LP is overwritten. (On a new CoMo the WPs are named FREE_WP1, … FREE_WP9, FREE_WPA to FREE_WPF.)

Marking and storing a WP
a) as temporary WP (TP 16) (ends et step 2.a)
b) as permanent WP (ends et step 5.a)

2.b ⊙ *To enter a name press the PAGE button*

3.b ⊙ *Symbols are also confirmed using the PAGE button*

4.b ⊙ *Finish name entry with RETURN symbol "←"*

5.b ⊙ *or confirm with PAGE button - done and activated*

⊙ *Clr: erase the last entered character*

exit

leave the menu without storing changes (push repeatedly if necessary)

1. ⊙ *Mark the location*

2.a ⊙ *A second press stores location as temporary TP16 - done and activated*

3. ↻⊙ *Select a symbol and confirm*

4.a ⊙ *Finish name entry with RETURN symbol "←"*

5.a ↻⊙ *Select a place in the fixed WP memory to be overwritten, and confirm - done and activated*

explanation of the symbols

↻ *rotate*

⊙ *brief push*

◉ *long push*

We recommend giving all Waypoints simple and memorable names. "Laveno_landing" is easier to memories than "R17G39".

If you want to store a WP permanently this can also be done in the WP manage menu

3.2 How to activate a WP

Fast selection:
From the WP distance page (page6), a long push on the PAGE button will display the WP selection menu. By rotating the ROTARY button you can select a WP and confirm the selection by pressing the ROTARY or PAGE button. As confirmation the display will show "wp activated" for 2 seconds before returning to the previous page display.

Menu selection:
You can also activate a WP through the Menu. The main menu is activated by a long push of the ROTARY button, then the following path is selected:

"settings"
- "wp manage"
- "activated wp"
- "wp activation menu"

In this menu the desired WP can be selected and confirmed.

3.3 How to show details of a stored WP
(coordinates and altitude page)

To show the coordinates and altitude of a WP it must first be activated. Page 7 shows the coordinates in WGS 84 decimal format the altitude (alt2), when the WP was stored

3.4. How to rename a stored WP

To rename a stored WP, it must first be activated. Then open the main menu and select the following path:

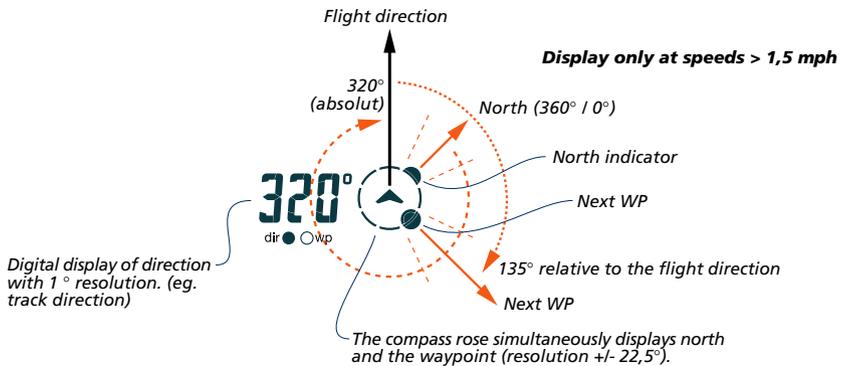"settings"
- "wp manage"
- "rename wp"

A new name can be entered. The old name will be overwritten.

4. How to use the navigation functions

Before the navigation functions can be used, there must be at least one waypoint in the waypoint memory. After some WPs are marked, the following additional information is available (assuming that a WP is active and we have GPS reception)
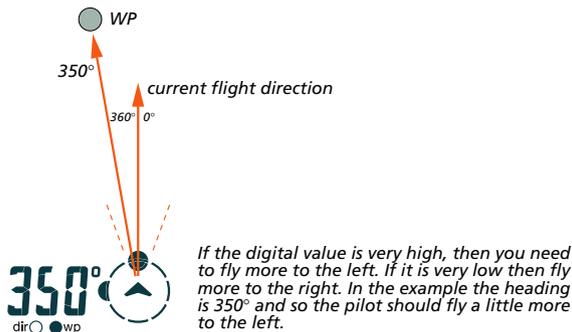
4.1 Using the Track-Display

The track display consists of a graphic representation of a compass rose and a digital section. Use the compass rose for coarse navigation (22.5 ° resolution), the digital display shows heading and WP direction with 1° resolution. The navigation key is used to switch between track direction, waypoint direction and finally the temperature.
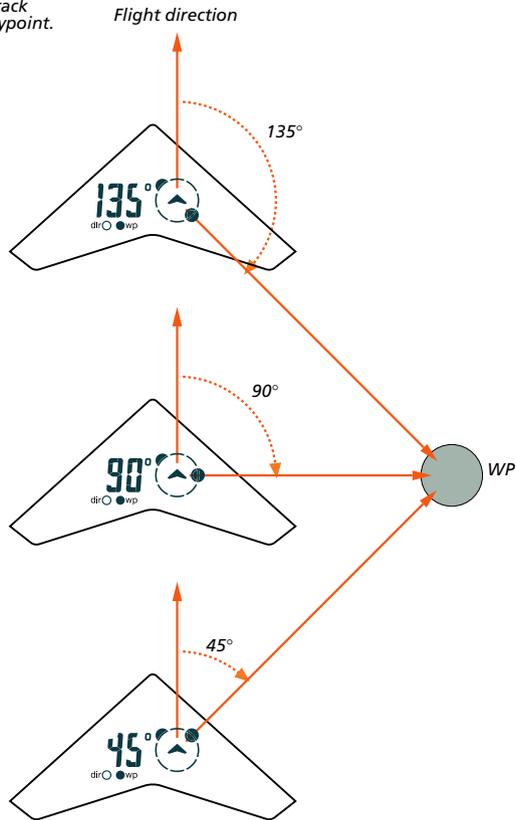

Flight direction

Display only at speeds > 1,5 mph

320°
(absolut)

North (360° / 0°)

North indicator

Next WP

Digital display of direction with 1 ° resolution. (eg. track direction)

135° relative to the flight direction

Next WP

The compass rose simultaneously displays north and the waypoint (resolution +/- 22,5°).

4.1.1 Approach to a waypoint using the Track-Display

Due to the low resolution of the compass rose, for a final approach the digital WP should be activated. The digital value should be as close as possible to 0° or 360° to get as close as possible to the waypoint.

WP

350°

current flight direction

360° 0°

If the digital value is very high, then you need to fly more to the left. If it is very low then fly more to the right. In the example the heading is 350° and so the pilot should fly a little more to the left.

Flight direction

135°

135°

dir○ ●wp

90°

90°

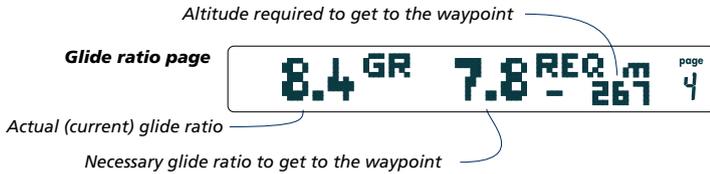dir○ ●wp

WP

45°

45°

dir○ ●wp

4.2 How to use the glide ratio display (page4)

This is one of the most important displays for hang glider and
paragliding pilots. The actual glide ratio is shown on the left of
the display, with the necessary glide ratio to the waypoint
displayed immediately to its right. The altitude required to get
to the waypoint is displayed on the far right.
The actual glide ratio is a measured value, variations being
averaged to provide a more consistent display using the same
value as the digital variometer. Thus, if the digital variometer is
set to 1 second, you get a very direct glide ratio reading and if
the filter is set to 10 seconds it will be much smoother.

The digital variometer is set in the Menu under:

- settings
          - digitalvario
                    - integration time

Glide ratio page

$$\boxed{8.4^{\text{GR}} \quad 7.8^{\text{REQ}}_{-267}\,^{\text{m}} \quad 4^{\text{page}}}$$

Actual (current) glide ratio

Necessary glide ratio to get to the waypoint

The glide ratio is the ratio between horizontal and vertical speed.
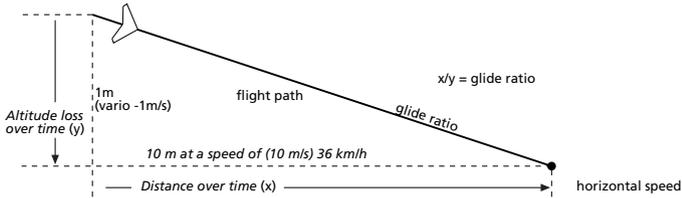
HINT: The CoMo Profiles feature allows you to easily switch between a fast and a smooth glide ratio value whilst in flight. For example, you could set up Profile 1 at 4 seconds to give a very direct glide ratio display for optimising speed during valley crossings and Profile 2 at 15 seconds for a long final approach. In flight you can switch between Profile1 and Profile 2 with a single keystroke.

profil 1 aktiviert *Valley crossing*	profil 2 aktiviert **long final glide (thermal setup)**
digitalvario setting of 4 seconds	*Final approach glide with setting of 15 seconds.*

The number shown to the right of the actual glide ratio is the necessary glide ratio. The necessary glide ratio is the ratio between the distance to the waypoint and the difference between current altitude and the altitude of the waypoint.
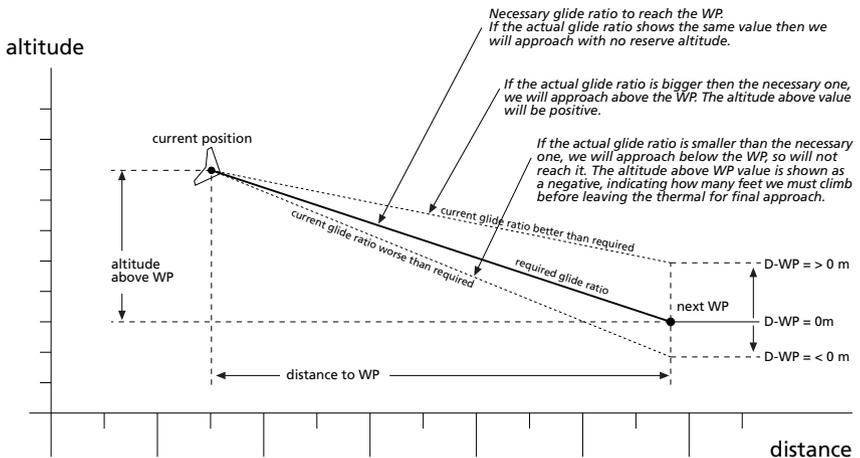
Example:
alt2 is 1500 ft. Our landing place is at 500 feet and is 5 miles away. The necessary glide ratio is calculated:

$$\frac{\text{Distance to waypoint}}{\text{alt2 (real)} - \text{alt2 (wp)}} = \text{glide ratio (nec)} \qquad \frac{9000\ \text{m}}{1500\ \text{m} - 500\ \text{m}} = 9$$

HINT: If you have marked a landing place in an unfamiliar area, the necessary glide ratio is useful in assessing how easily you can reach the landing area.

IMPORTANT: You must always be aware that thermals and changes in wind will affect the glide ratio. So the necessary glide ratio can change significantly during a long final approach.

The evaluation of the necessary altitude to get to a WP is shown below. In this example we are assuming that the actual glide ratio is 5, and the altitude difference is 10 000 ft. With 5 miles (9,26 km) distance and a glide ratio of 5 we get an altitude loss of 6062 ft (1852 m). The necessary altitude is: 10 000 ft minus 6062 ft = 3938 ft., which means that with the current glide ratio we will reach the landing place 3938 ft above ground.

altitude

Necessary glide ratio to reach the WP.
If the actual glide ratio shows the same value then we will approach with no reserve altitude.

If the actual glide ratio is bigger then the necessary one, we will approach above the WP. The altitude above value will be positive.

If the actual glide ratio is smaller than the necessary one, we will approach below the WP, so will not reach it. The altitude above WP value is shown as a negative, indicating how many feet we must climb before leaving the thermal for final approach.

current position

current glide ratio worse than required

current glide ratio better than required

required glide ratio

altitude above WP

next WP

D-WP = > 0 m

D-WP = 0m

D-WP = < 0 m

distance to WP

distance

4.3 How to use the WP distance page (page6)

The distance page has 2 items of essential information. One is the distance to the waypoint. Distances less than 1000 m are displayed as xxx m. Distances over 1000 m are displayed in kilometers as yy.y km or in the imperial version as 0.5 miles. The distance page also shows the name of the active waypoint, simplifying the WP selection. You can select a WP with a long press of the Page Key, when the following display appears:

```
WP 09   ROT ⊙ SELECT  ↑
ANDELSBUCH LP         set
                      ↓
```

You can select another Waypoint from memory by rotating the ROTARY switch.

4.4. The WP data page (page7)

On the waypoint data page, the coordinates and altitude (alt2) of the current waypoint are displayed. In a future release you will be able to change the values. At the moment this is just for control purposes.

5. FAQ Questions about the navigation software

How can I change the name of a WP?

To change the name of a waypoint, first it must be activated. (eg. if you want to rename from Andelsbuch: LP to Andelsbuch_lande then you select first Andelsbuch_LP). Then in the menu under "settings", "wp manage" and "wp name" you can change the name

How can I store a location quickly?

If you want to store a location quickly, simply press the MARK button 2 times. Then the current position is stored as temporary Waypoint TP16. The name of this WP is generated automatically from the date and the time. UTC time is used, so this time has an offset of 1-2 hours in Germany (depending on daylight saving time).

How can I permanently store and name a WP?

First press the MARK button and then the PAGE button (right beside the page display). Then the name entry screen will allow you to enter a name. The name entry is done by selecting the RETURN symbol (←) and you will be asked if the waypoint should be stored. You have to overwrite one memory location in the permanent waypoint memory and you can select this by rotating the ROTARY button (WP 01 - WP 15). Push the Rotary button to confirm the selection.
At the next turn on, this waypoint will be activated automatically.

How can I use the 3-digit Track-Display ?

The graphic compass rose shows the location relative to the flight direction with a low resolution of +/- 22,5°. The digital display has a high resolution of 1°. During final approach you want to maximise your accuracy, so you should have a look at the digital display.
If the digital display shows 355° then you have to fly 5° more to the left. If the display shows 5° then you have to fly 5° more right.
The heading is based on the real track direction and this value can change a little bit.

How does the waypoint direction work at speeds below 1,5 mph or 3 km/h?

The GPS cannot calculate a direction at speeds below 3 km/h or 1,5 mph. If the direction indicator of the GPS is not working the waypoint direction displayed will be incorrect.
NOTE: If we fly backwards (cause of strong headwind) the waypoint will be shown behind us. The GPS only knows the speed and direction over ground, but cannot know whether we are flying forward or backwards!

How can I make sense of the Track-Display when circling ?

To make real sense of the waypoint display we have to fly straight. If we circle in thermals then the waypoint dot also circles. After a direction change it will take some time for the GPS direction to settle, so it is best to fly straight for at least 10 seconds before checking where a waypoint is located.

How precise is the distance calculation ?

For distances below 1000 m the accuracy is 1 m. Above 1000 m we have approximately 1% error. The closer we get to a waypoint the more precise are the values (eg it is possible that the distance is calculated as 39.8 km instead of the real value of 39.5 km. But the error reduces as we get closer to the waypoint. The distance value is calculated as line of sight, and does not correct for the earth's curvature.

How does a beginner use the navigation displays ?

We recommend storing all potential landing places in the permanent waypoint memory, with their correct alt2 settings! The CoMo will then show the distance and direction to the landing place and, most importantly, the glide ratio.
The glide ratio page indicates the necessary glide ratio to the next WP (landing place), so we can appreciate how to reach the landing place in different wind conditions. If the necessary glide ratio to a landing place is higher than the actual glide ratio, then you need some landing alternatives!

Why is alt2 stored, rather than the GPS altitude ?

Alt2 is normally also used for the logger. Alt2 has a QNH setting and can be set much more accurately than the GPS altitude. Furthermore, if the GPS reception is poor it is possible to get the location data, but no GPS altitude. In this situation, Alt2 is still available.
On final approach to a waypoint it is recommended to have some reserve of altitude, because alt2 can change slightly due to changes in the weather.

Next software steps:
The CoMo will be continuously improved. The next step in the navigation will be the download of waypoints.