Moving Terrain

User Manual Version 6.3

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Warnings

The greatest of care has been taken in the compilation of text and illustrations for this manual. Nevertheless, the possibility of errors cannot be completely excluded. No form of liability or legal responsibility can be assumed by either the publisher or the authors for incorrect information or its consequences. The publisher is grateful for comments, suggestions and corrections.

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Important advice on the use and possible risks involved with Moving Terrain:

You have acquired a high-performance system for navigational support that will make flying easier than ever before. However, we feel obligated to make you aware of all the associated risks that have been identified by our test pilots.

We have made every effort to ensure that the Moving Terrain system is safe and reliable. The system has been tested under all conceivable flying conditions. However, although neither you nor we may detect any further defects, **no liability is accepted for correct functioning of the system**.

Even if our system proves to be one hundred percent error-free there may still be **dangers due to operating errors** and in particular **manipulation of GPS accuracy** by the operator, the US Ministry of Defense. We are unable to make any kind of prediction or warranty with regard to the **future licensing policy of the GPS operator**.

The Moving Terrain system is a VFR device. It is not safe to fly with this navigational aid under instrument flight conditions unless you have all the mandatory navigational equipment in operation and are flying according to instrument flight rules on instrument routes.

Any non-IFR trained and licensed pilot who flies in IMC is risking his life – with or without Moving Terrain!

Under aviation regulations you are obliged to keep the appropriate **up-to-date charts in paper form on board**. Although we place great trust in the system, our pilots always have the latest ICAO charts at hand.

Manufacturer : Airplus Maintenance GmbH
Flughafen 28
D-88046 Friedrichshafen - Germany

WARRANTY AND LIABILITY ADVICE

This software is to faciliate your terrestic navigation only. It is not a certified aviation equipment and does not replace any aircraft instrument. You are explicitly cautioned to verify that the hardware employed is functioning correctly and does not interfere with the aircraft or other vessel in a hazardous manner. Data errors and computer errors are possible. This also pertains to the IFR data and procedures implied in the respective modules. Human error can make the moving map, navdata or any supplemental information incorrect. The pilot in command remains the final authority on the accuracy and sufficiency of the hardware and software.

Warranty and Liability Disclaimer:
The manufacturer, distributor or sales agent resume no liability as to the correct function of the software, the availability of a reference signal (GPS) or the validity of the charts, navdata or any supplemental information like airport information a.o. Never will the manufacturer, producer, sales representative and neither of their staff be liable to you for any consequential incidential or indirect damages (including damages for loss of business profits, business interruption, loss of business information and the like) arising from the use of or inability to use the software even if any of the staff mentioned above has been advised.

There is no warranty, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose, regarding the software. The entire risk as to the results and performance of the hardware and software is assumed by you.

Notice:
For our Enhanced Navigation Database package a continuous improvement programm is being implemented. If applicable, please contact our Help Desk:
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Modular Structure of the Manual

This manual reflects the new modular structure of the Moving Terrain program and is set out as follows:

Moving Terrain Fundamentals

MT Basic Version Detailed description of the basic MT program

Software Modules

MT FMS
MT Enhanced Navigation Database
MT Flight Recorder / Automatic Flight Log
MT Rotating Chart
MT Charting Module
MT Special Coordinates

MT Update Utility

Moving Terrain MFD Modules

MT TCAS
MT-Satellite Radar

For a better understanding of your system please read the chapters applicable to your modular structure.
A table of contents is to be found at the beginning the respective chapter.

Important: **For convenience in the following manual the MT-Ultra Professional JTSO is called MT-Ultra and the MT-Ultra Professional JTSO (ETSO) is called MT-VisionAir**

Table of Contents

Moving Terrain Fundamentals

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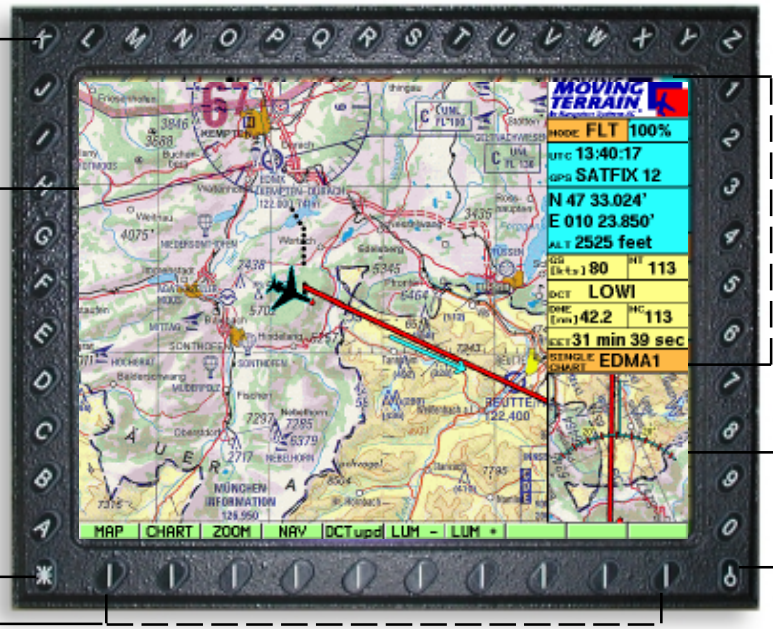
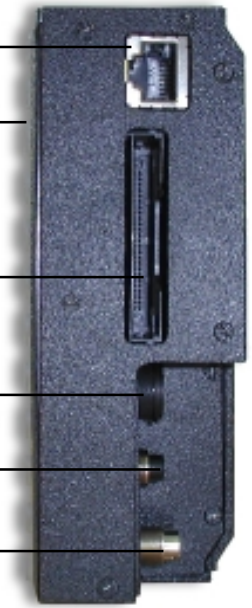
MT-VisionAir equipment

Front view



Rear view

Side views



Right

Left

MT-Integral GPS for MT-VisionAir and MT-Ultra

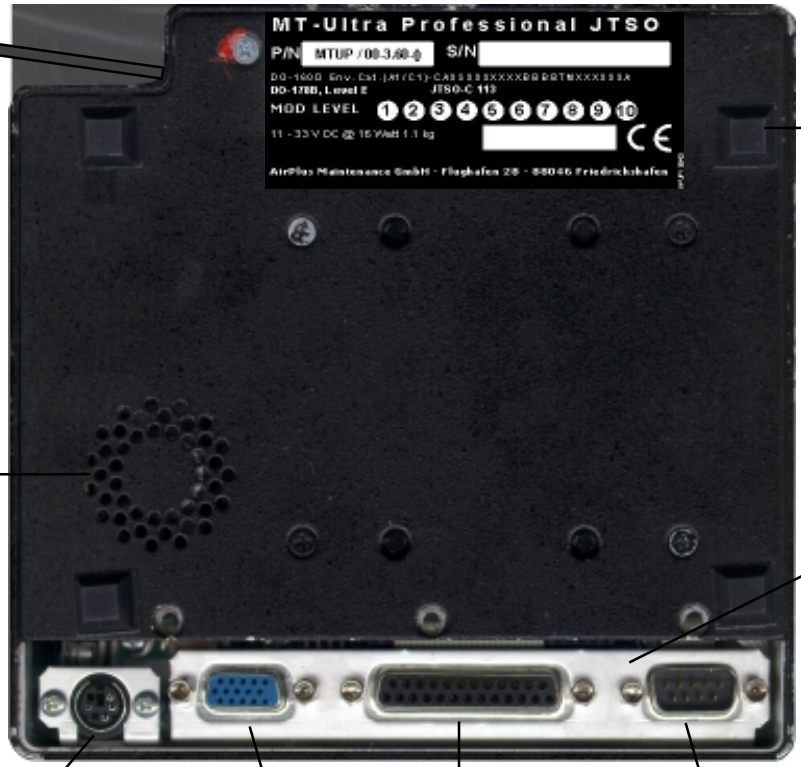
Straight plug for installing GPS in panel

Large, straight DIN plug for MT-Ultra (see Installation Manual)

MT-Ultra Equipment

Front view

Rear view


MT-Ultra Professional JTSO
P/N
S/N
MOD LEVEL
1 2 3 4 5 6 7 8 9 10
Cable to Y adapter:
power connection
GPS port
Rubber feet
(for mobile use only)
Fan
Service flap (removed
in illustration), closed
with 3 bright screws
Connections:
PS2 keyboard port
VGA port
Remote display
Parallel port
LPT 1
Serial port
COM 1

Connections

Connecting:	GPS		4-pole jack
	Power		2-pole connector (12-28 V aircraft system or 230V power supply unit)

Connecting a different GPS type:

- GPS must have a data output + cable (for transfer of data to your MT system).
- If this is not the case, please contact your GPS dealer to purchase a data cable.
- A special connector for MT systems must be soldered to the GPS.

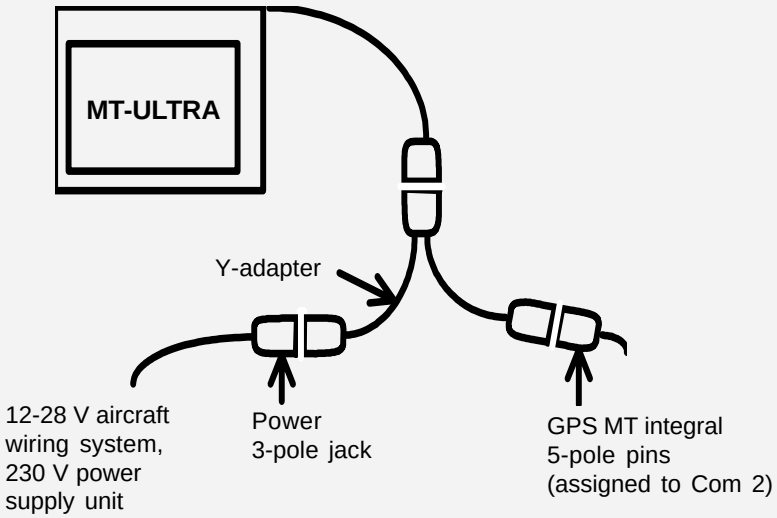
Switching on

Switching on: (also switching off!)	**Button**		(bottom right) **Keep depressed for approx. 3 seconds**

Device starts up and lthe following screen will shortly appear:
(continue p. 16)

Connections

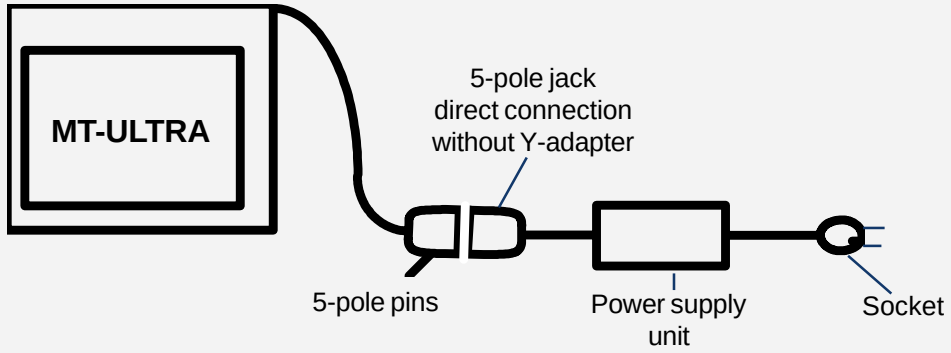
Connecting:



Connecting a different GPS type:

- GPS must have a data output + cable (for transfer of data to your MT system).
- If this is not the case, please contact your GPS dealer to purchase a data cable.
- A special connector for MT systems must be soldered to the GPS.

Direct connection of MT-Ultra via power supply unit to socket

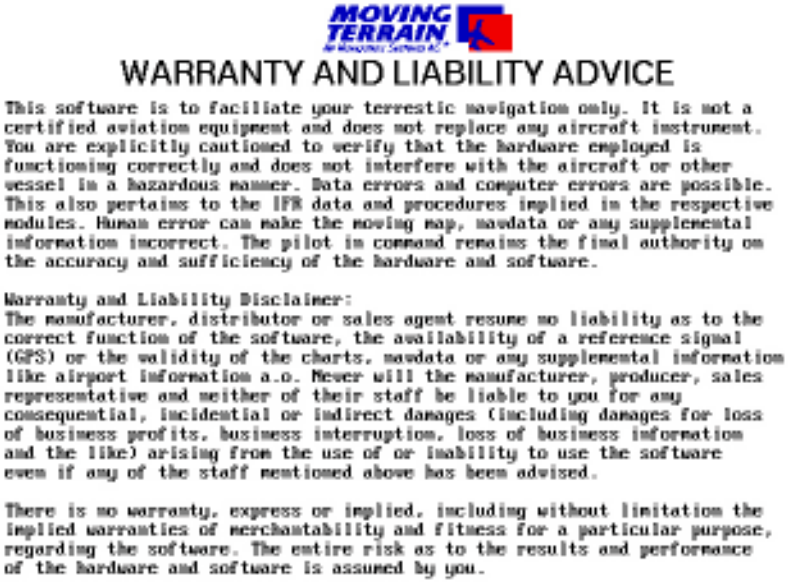


Switching on

Switching on: **Button**  (top left)
(also switching off!)

Device starts up and the following screen will shortly appear:

Software Release 6.3 — Your software release will be displayed top right



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Warranty and Liability Disclaimer:
The manufacturer, distributor or sales agent resume no liability as to the correct function of the software, the availability of a reference signal (GPS) or the validity of the charts, navdata or any supplemental information like airport information a.o. Never will the manufacturer, producer, sales representative and neither of their staff be liable to you for any consequential, incidential or indirect damages (including damages for loss of business profits, business interruption, loss of business information and the like) arising from the use of or inability to use the software even if any of the staff mentioned above has been advised.

There is no warranty, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose, regarding the software. The entire risk as to the results and performance of the hardware and software is assumed by you.

AGREE Press key
FLT Press key

Flight mode

The chart will now be positioned via GPS.

Once your aircraft is moving faster than 2 knots, the cross marking your position when stationary will become an aircraft symbol.

Normally no further input is necessary. We wish you a pleasant flight!

Flight mode
Map mode

We distinguish between two basic modes:

Map mode: The user controls the chart:
- Chart can be moved with direction keys (EAST/WEST/NORTH/SOUTH).
- GOTO function available at various levels.

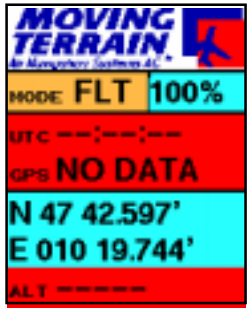
Flight mode: The GPS controls the chart:
- The chart cannot be moved by means of keys.
- GOTO function is deactivated at all levels.

The active mode is shown in the info box; switch-over using key panel.

Other operating modes are also shown at this point (e.g. TRK, TCAS, AP, with red background)

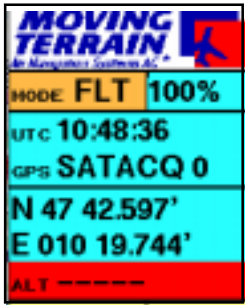
GPS messages

Should your system fail to position the chart immediately, please observe the following messages in the **info box**:

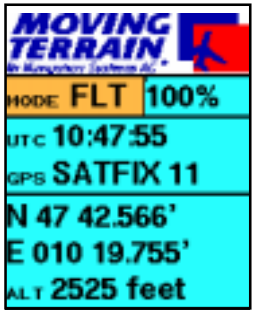


NO DATA:
Connection to GPS or GPS itself defective.

DISTORTED:
Errored data is being received from GPS (not shown).



SATACQ:
GPS is connected correctly:
"Acquisition" of satellite data (the number 0 is always independent of the number of satellites actually found).



SATFIX:
Positioning successful, the flashing number after SATFIX states the number of GPS satellites momentarily being tracked.

The Display

Chart

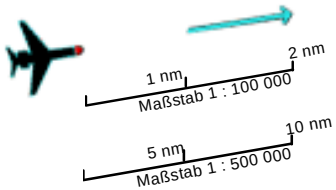
- Base charts in the running system, worldwide and at various scales.
- Single charts (e.g. DFS VFR approach charts)
- If the chart section is only displayed in gray, you are outside the active base chart.

Function keys

The buttons arranged at the lower edge of the display determine the function of the keys immediately below them.

Symbols

Position symbol — Position at center of the coordinate frame



Aircraft symbol — Appears when speed exceeds 2 knots. Your position is marked by the red dot.

Trend vector — Light blue arrow: projection of the aircraft. The tip of the arrow marks the point that will be reached if the present course is maintained.

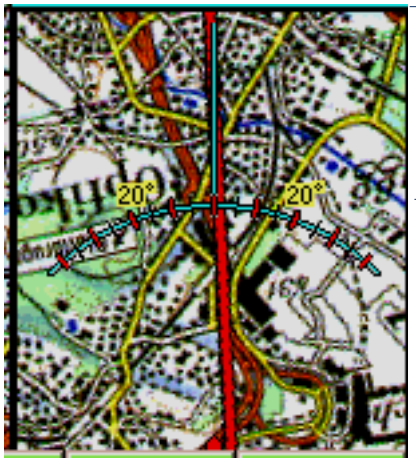
User waypoint — Green diamond: Identifier provided in box

Light blue vector — Direct (not shown)

TrackUp window

- Shows a chart section in perspective, as you will see the terrain from the cockpit.
- As soon as GS exceeds 2 knots, the chart will be displayed – rotated according to the track – in the TrackUp window.
- The red dot bottom center represents the point of your aircraft, i.e. the position of the GPS receiver.
- Depending on the chart scale, the space between red dot/compass rose, or compass rose/peak of the trend vector represents, e.g. the following distances:

Scale 1: 100 000



Trend vector

2 nm

Compass rose segment

1 nm

GPS receiver

Scale 1: 500 000

10 nm

5 nm

Switch-over from FMS and TrackUp window in flight mode (FMS module, IFR module)

- DCT vector and user waypoint symbol are both displayed in the TrackUp window.
- Zoom factor has no effect on the TrackUp window: rotated chart section is always displayed at 100%.
- Single charts are also displayed in the TrackUp window.
- Im map mode and at speeds under 2 knots the TrackUp window remains gray.

Info Box

MOVING TERRAIN Air Navigation Systems AG	MT logo	Upon reloading of charts: red panel with LOAD MAPS warning	
MODE FLT 100%	MT mode		Chart zoom factor
UTC 11:02:29 GPS SATFIX 11	GPS data:	UTC GPS status, number of satellites flashing	
N 47 48.575' E 010 25.100' ALT 2525 feet	Coordinates: Altitude	WGS84 True altitude in feet above MSL	
GS [kts] 70 / MT 29	Flight data:	Speed over ground in knots	Magnetic track: magnetic track over ground
DCT EDMA	Direct data:	Name (from database or TMPFIX)	
DME [nm] 41.9 / MC 28		DME: Distance measuring equipment in nm: distance to destination (DCT)	Magnetic track to DCT
EET 35 min 56 sec		EET Estimated enroute time (remaining time to destination)	
SINGLE CHART EDMA1	Single chart:	Name of activated chart, displayed or prepared for display	

Display

Altitude

Hide info box

ALT 2525 feet Altitude: in feet above MSL, implemented in Version MT 6.1

Hide info box and TrackUp window = advantage: more of chart is visible

✓ VIEW

✓ INFO (reappears with same key combination), with BACK return to main menu

Without info box/TrackUp window

With info box/TrackUp window

Center
OFF-center

Shift key Centr / OFF-C on the VIEW bar

- ✓ **VIEW**
- ✓ **Centr / OFF-C**
  = Key marking always destination
- ✓ **BACK** Return to main menu

Center mode: position in center of the chart

Advantages:
- ✓ Always at the same position
- ✓ Easily recognizable
- ✓ Good all-round view
- ✓ Steady chart movement

Disadvantage:
- ✓ Poor outward view

OFF Center mode:
Tip of the trend vector in center of the chart, position projected to edge of the chart

Advantages:
- ✓ Substantially better outward view on chart
- ✓ Better coverage of airspace structure
- ✓ More suitable for fast flying

Disadvantages:
- ✓ Unstable chart during change of course

Nav Data

Structure

VFR data

✓ **NAV Nav page is displayed**

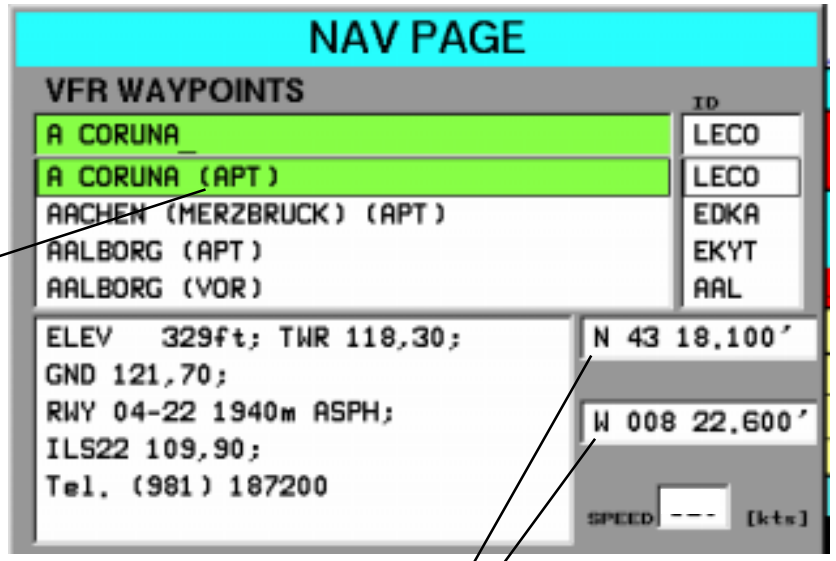
Basically, all waypoint and process databases are available on the Nav page:
VFR Navdata, Enhanced Navdata, hospital helipads, user waypoints u.a.

The following are important for the MT basic version:

VFR WAYPOINTS
(all VFR Nav data in one list)

Arranged alphabetically *by name* (Europe):

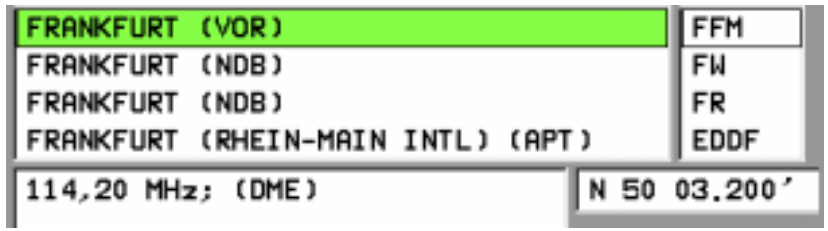
APT's Airfields (Text always in brackets)
Altitude of field
Radio frequency(ies)
Direction and surface of runway(s)
ILS
Telephone numbers



Coordinates always relate to the **point highlighted** in the database

VORs

with frequency



NDBs

with frequency

Data selection

Names or IDs are entered on the integrated keypad
or by pressing
- ✓ **UP** ✓ **DOWN** in the list.

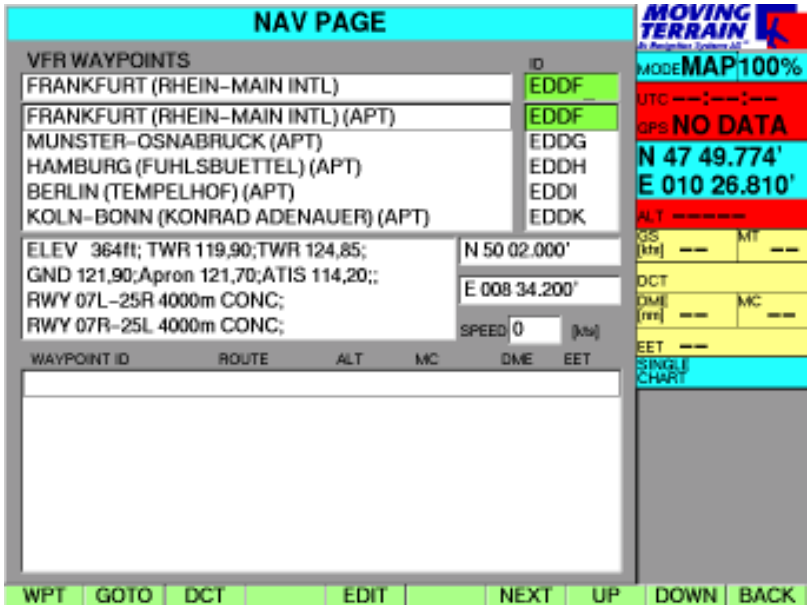
ID box

- ✓ **NEXT** Change to ID box:

Alphabetically sorted *by ID*
(4-letter code)

Enter ID or search with
- ✓ **UP**
- ✓ **DOWN**

Return to name box with
- ✓ **NEXT**



User waypoint database

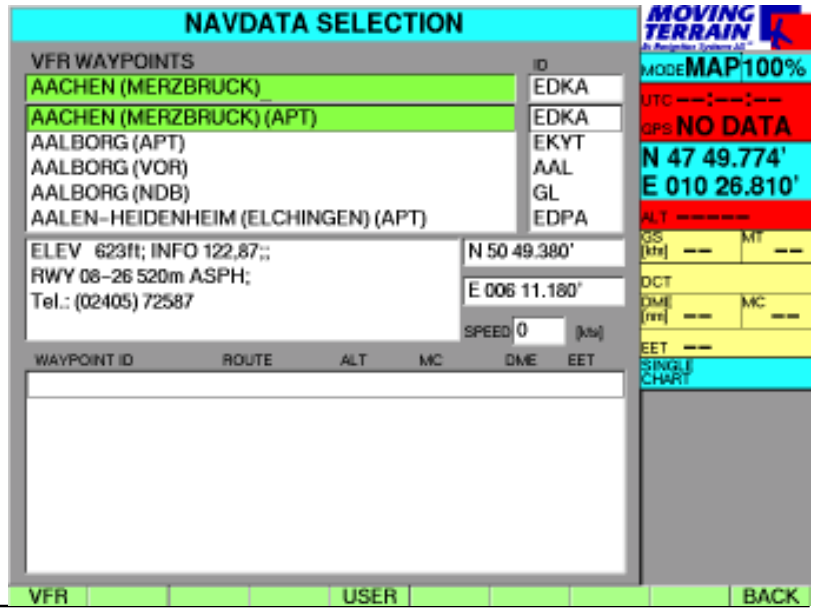
- ✓ **WPT**
- ✓ **USER** User waypoints

This database is created by you. Initially it is empty (see "Creating/changing waypoint")

IFR Nav data

The **WPT** key also enables you to switch over to IFR databases (IFR module).

- ✓ **BACK** Return to main menu



Reopening with last-used database

During operation the Nav page is always opened with the last-used Nav database.
Switch-over with ✓ **WPT**

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MT Basic

MT Basic

First steps with Moving Terrain (with examples), first of all without GPS

You want to look at your home airfield on the chart?

- ✓ Switch on
- ✓ Acknowledge warning signals with **AGREE**
- ✓ Press **NAV** in order to select a waypoint
- ✓ Now enter the name of your airfield on the integrated keyboard.
  As soon as the first letters have been entered, the highlighting bar (colored bar) will move to the appropriate waypoint => It is not necessary to enter the whole name.

Made an error?

- ✓ No problem: Press **UP** / **DOWN** and re-enter.

You wish to select the airfield using the 4-letter code?

- ✓ Press **NEXT** and enter the 4 letters in the ID box (data now sorted by ID)

For information on the airfield see the center of the screen:

- ✓ Frequencies, box height, length, direction and surface of runway, phone numbers, etc.

Press **GOTO**:

- ✓ Now the chart is positioned on your home airfield.

Use the keys **NORTH / SOUTH / EAST / WEST** to move the chart.

- ✓ Place the chart on your homebase, office or similar:
- ✓ Keep key pressed = chart moves very quickly
- ✓ Press key briefly = exact positioning possible

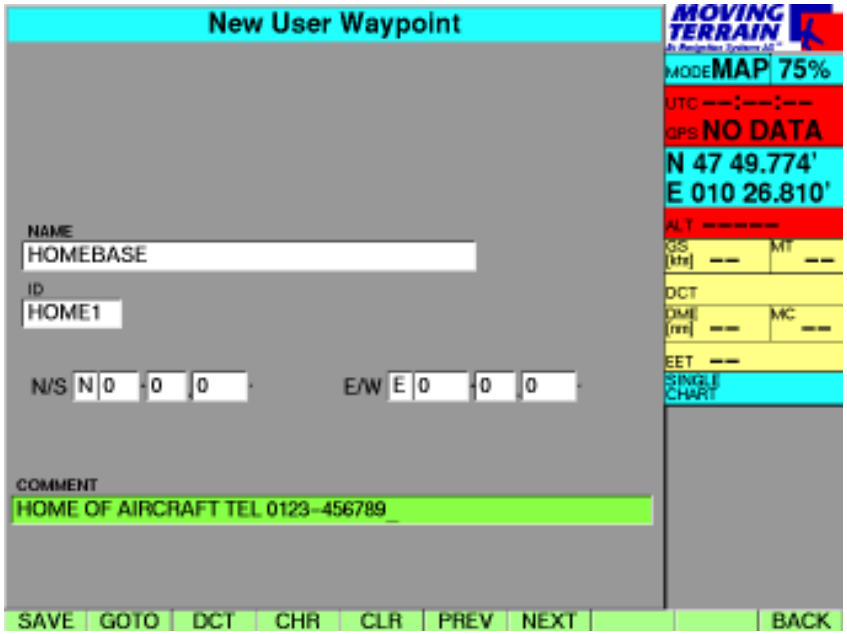
Enlargement of chart in various percentage steps from 100% (50% for VisionAir) to 600% (with ZOOM+ / ZOOM-) in VIEW menu. Return with **BACK.**

To save your homebase as a user-defined waypoint in your system for later use:

- ✓ **NAV** Nav page, for creating a waypoint
- ✓ **EDIT** User waypoint edit page
- ✓ **NEW** New user waypoint page

- ✓ **NEXT**

- ✓ Now enter an identification code in the “ID” box (e.g. “home”), max. 6 characters
  This identification code will be displayed on the chart together with the waypoint symbol. Beneath it you will see the coordinates of your homebase.



- ✓ **NEXT**

- ✓ You may enter notes on your user waypoint in the comment box. Special characters such as (), / or - can be created using the **CHR** key together with the respective function key.

- ✓ Made an error? No problem: press **PREV** / **NEXT**, then re-enter.

- ✓ Press **SAVE** to save the point

- ✓ Press **GOTO** (jump to this point) or 2 x **BACK** to return to the chart, where you will see the green user waypoint symbol with the identifier in an orange-colored box.

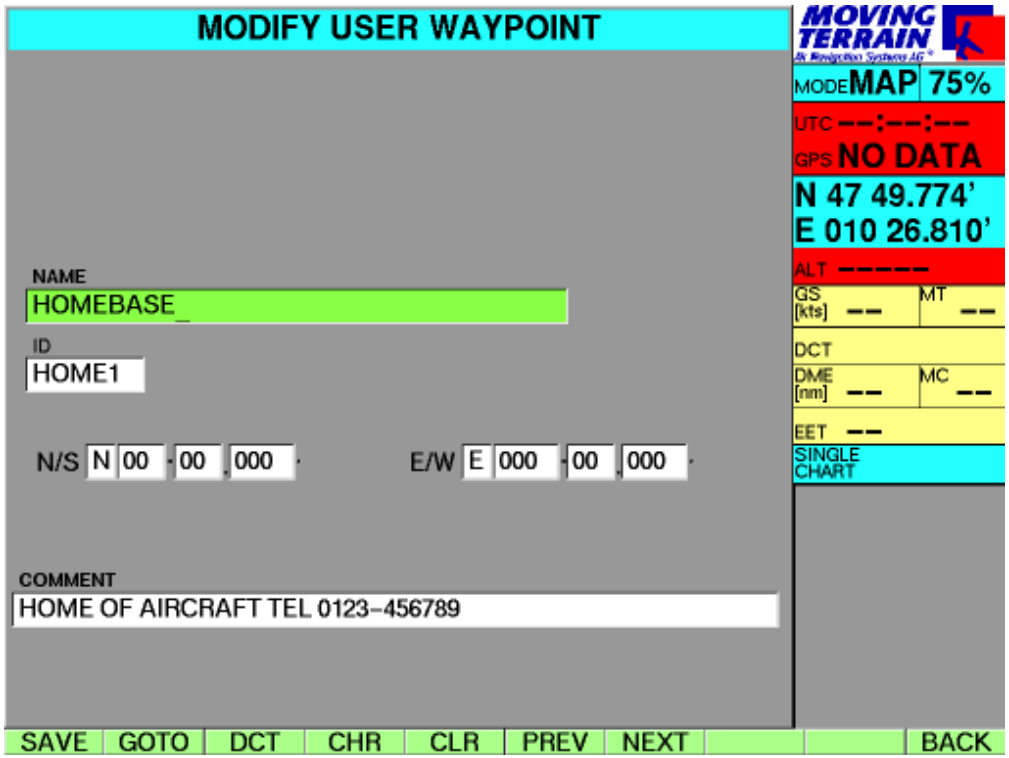
Changing a waypoint

The **VFR databases** are predefined, **user waypoint data** can be modified:

- ✓ **NAV**
- ✓ **EDIT** User waypoint edit page
- ✓ **MODIFY** Modify user waypoint page

Now you can change the name, ID and/ or coordinates and/or comment.

Use
- ✓ **PREV** or
- ✓ **NEXT** to jump from one box to another



Made an error?
No problem: Press **PREV / NEXT** and re-enter.

- ✓ **SAVE** Saves the point

- ✓ **GOTO** takes you straight to the specified point (only possible in Map mode) or
  2 x **BACK** returns you to the chart where you will see the green user waypoint symbol with the identification code in an orange-colored box.

Hiding the waypoint symbol

Does the symbol conceal too much of the chart?

- ✓ Waypoint symbols can be hidden with: **AUX, SETUP, WPT -**. This is particularly important when you have saved a large number of waypoints and they are obstructing your view of the chart. The waypoints will not be deleted - they can be made visible again with **WPT +**.

Tutorial

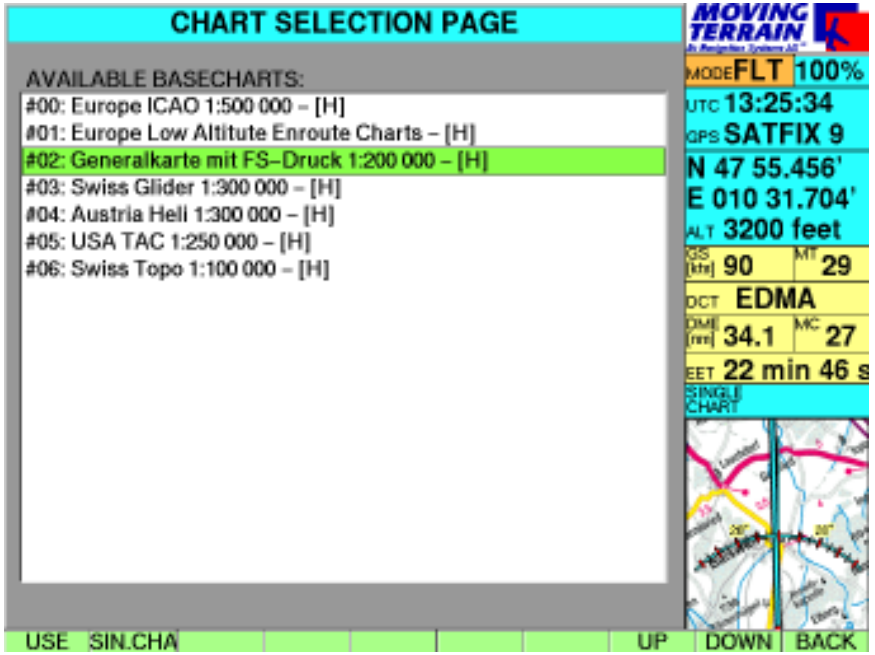
Changing base charts

Helicopter charts for Germany

Various base charts – with full coverage – at different scales.

- ✓ **CHART** Shows a list of available base charts (depends on configuration of your device)
- ✓ **UP/DOWN** Select desired chart (green bar)
- ✓ **USE** Confirm choice with USE, return to selected chart

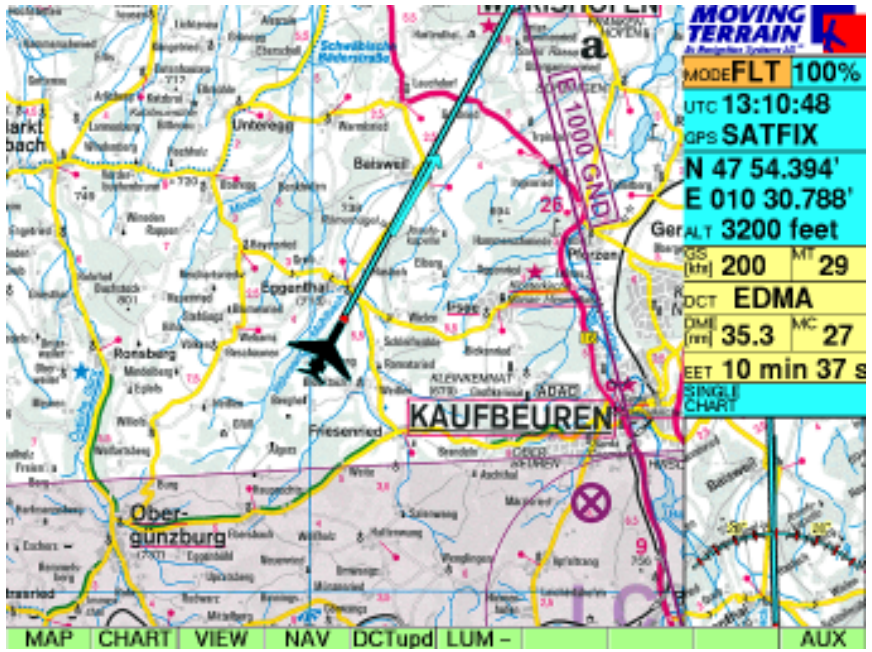
The base chart can be changed without interrupting flight mode.



Example of a base chart

- ✓ **CHART**
- ✓ Use **UP/DOWN** to select "German General Chart 1:200 000 with ATC Overprint"
- ✓ **USE**

The current base chart is also displayed in the TrackUp window.



Approach charts = circling approach

Selecting a chart

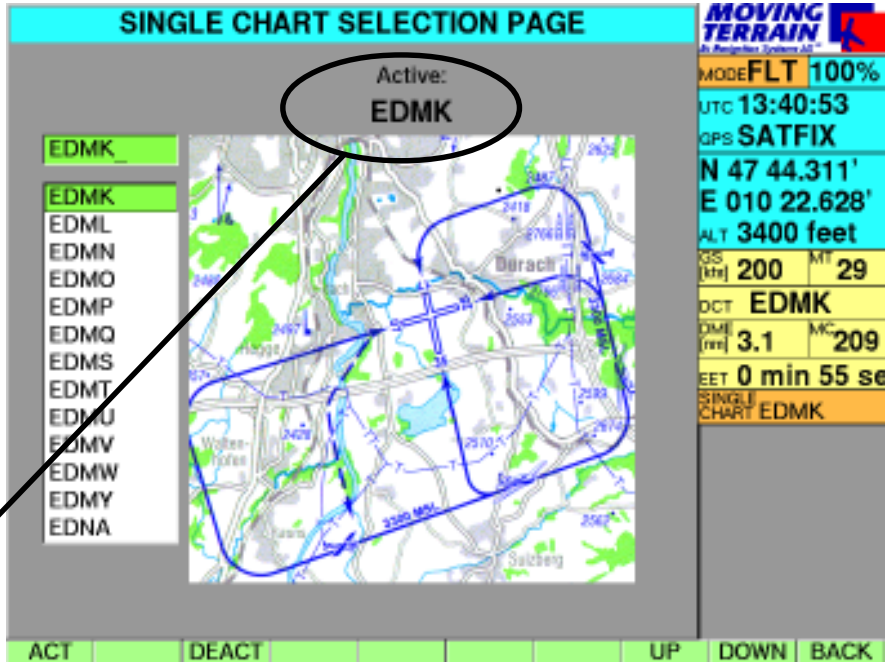
Deactivating a chart

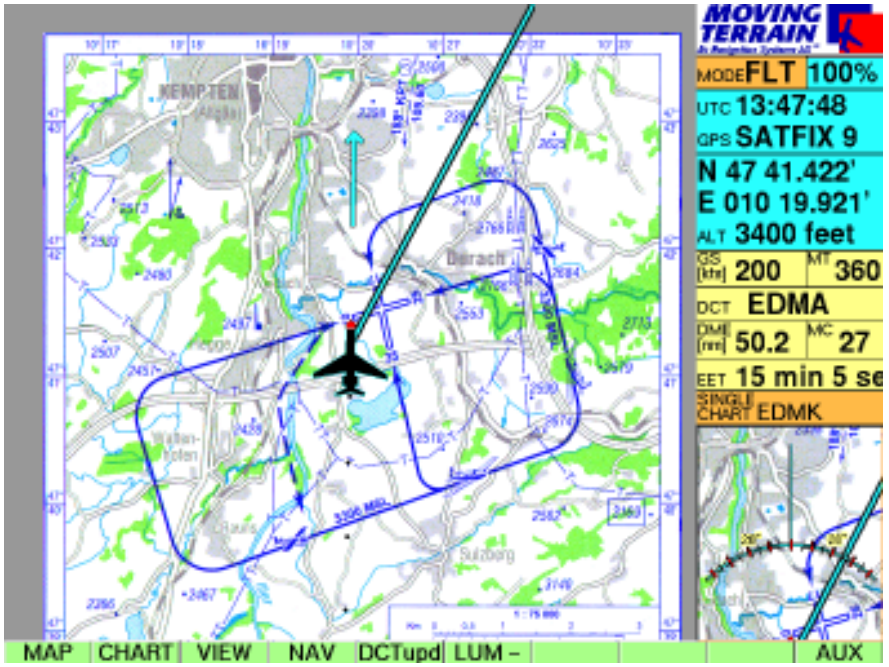
DFS VFR approach charts for all German airfields

- ✓ Named after identification code of airfield
- ✓ Several charts at different scales for an airfield are numbered consecutively (e.g. EDDM, EDDM2, EDDM3 etc.)
- ✓ **CHART**
- ✓ **SIN.CHA**
- ✓ Enter airfield identification code on the keyboard (e.g. “EDMK“)
- ✓ **ACT** Displays a preview of the approach chart on the screen. Name of the chart is shown under “Active“
- ✓ **BACK** returns to chart / current position (e.g. in-flight)

  The chart is ready for use and displayed when you fly into the area it covers,

  or
- ✓ **GOTO** takes you directly to the chart (e.g. during flight preparations)
- ✓ **CHART**
- ✓ **SIN.CHA**
- ✓ **DEACT** deactivates a single chart
- ✓ **BACK** displays the active base chart

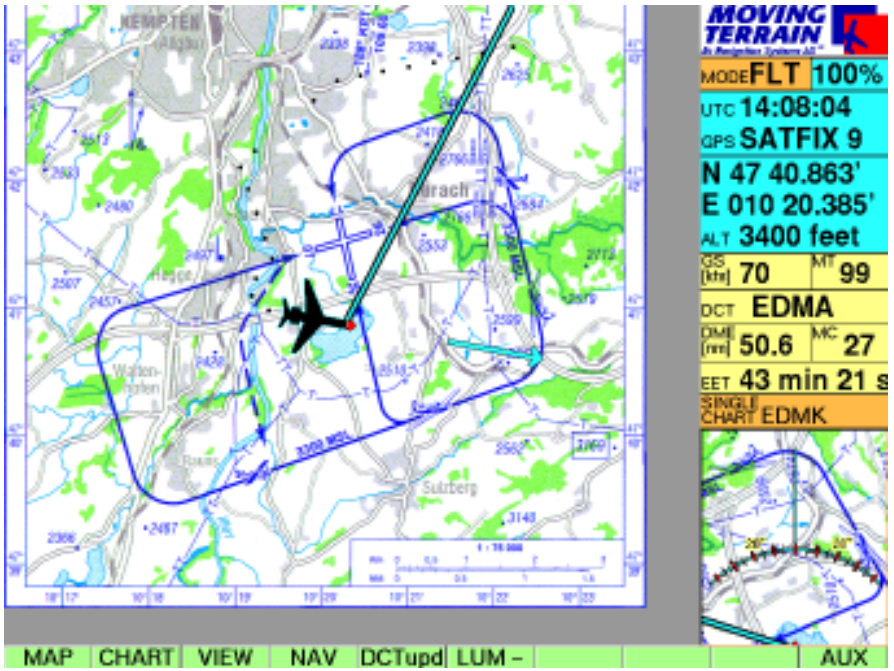




- Single charts are integrated into the system as **individual "pages"**, i.e. do not seamlessly abut each other. Each chart is a self-contained page. It goes without sayIng that your **exact** position will be displayed on the single chart by **GPS**. By the same system as for base charts, the single chart moves as your own position changes.
- The **activated single chart** (entry in info box) **will be displayed** instead of the base chart **as soon as your aircraft enters the area covered by the single chart**.
- Single charts may be displayed at (almost) **any scale**, from the taxi chart to the general continental overview.
- You will find a single chart for **Europe at a scale of 1 : 14 million** on your system under "2003EURO". This will give you an overview, e.g. of your route on long-distance flights, or how great-circle routes can be drawn up over long distances.
- We will also be pleased to integrate **your own charts** into your system as single charts. Ask us about it!

Important for all single charts:

- No more than one single chart may be active at the same time
- The single chart is also displayed in the TrackUp window
- Direct vectors will be displayed
- User waypoint symbols will be displayed
- The great-circle calculation of the direct vector will also be shown graphically as such (only relevant on charts covering large areas, e.g. EURO).



DIRECT

Any point contained in a database can be the destination of the direct vector

- ✓ Select database (VFR or USER waypoints)
- ✓ Select the desired waypoint with **UP** or **DOWN**
- ✓ **DCT**

This will imediately take you back to the base chart.

The chart will display:

DCT = light blue vector (great-circle calculation)

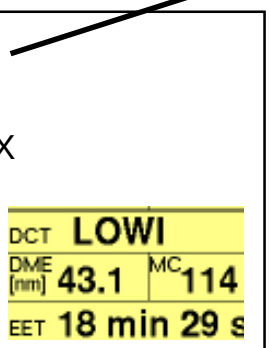
Information in the info box

DCT: ID of database or TMPFIX

DME: Distance to destination in nm

MC: Magnetic track to DCT

EET: Remaining time to destination at current GS



This data is continually updated.

The DCT vector is updated by

- ✓ **DCTupd** during flight mode

oben: <u>vor</u> **DCTupd** (Flight Mode)

above: <u>after</u> **DCTupd** (flight mode)

Tutorial

Direct Temp

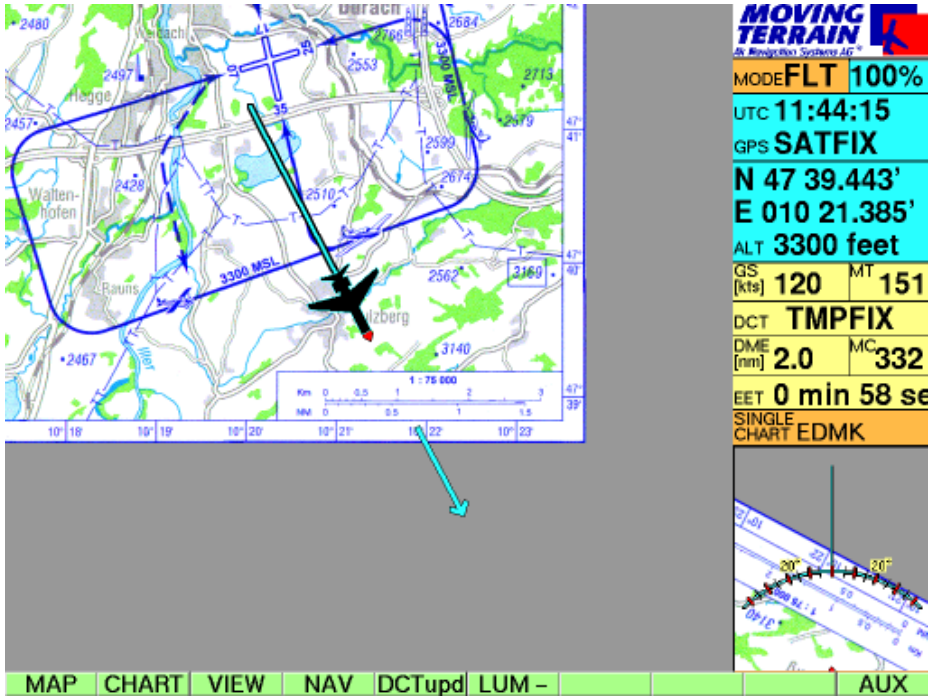
Quick selection of any desired destination for the direct vector

Move the chart to the desired destination (map mode):

- ✓ **WEST / EAST / NORTH / SOUTH**
- ✓ Press **DCTtmp**

When you move away from the point the light blue vector is displayed:

- It will be continuously “dragged along”
- When you change to flight mode, the point will become the destination (in the example it lies behind the aircraft)
- Referred to as **TMPFIX** in the info box



Linking DIRECT to VFR approach charts

Creating a DIRECT to a airfield selects the appropriate DFS VFR approach chart:

✓ **NAV**	Nav page: Select terminal airfield (must be marked with APT)
✓ **DCT**	Light blue line shows the path
✓ **CHART**	
✓ **SIN.CHA**	Approach chart **preselected** by internal combination of databases via 4-letter code. If several sheets are available for an airfield, the first sheet will be selected, Change to other sheets with UP / DOWN.
✓ **ACT**	Activates the approach chart
✓ **BACK**	Returns you to the base chart. A single chart will automatically be loaded when you enter the area of the destination airfield.

Preparation

Direct

Test flight with Moving Terrain: an example

- ✓ A cable with cigarette lighter connection is supplied with the standard equipment as a mobile device.

Preparation for a test flight

- ✓ The GPS must correctly plugged in and placed on the instrument panel (free “visibility” to the sky!).
- ✓ The power supply must be on: insert the cable with cigarette lighter plug into the device and cigarette lighter (for installation see Installation Manual)
- ✓ Switch on the device
- ✓ Acknowledge warning signals with **AGREE**
- ✓ The info box will display the GPS status: SATFIX (SATFIX may take a few minutes)
- ✓ Press **FLT**: your current position will be displayed

This is all the preparation normally required!

Additional preparation

Direct to the destination airfield:

- ✓ Press **NAV**
- ✓ Select the airfield on the keyboard (name of the airfield must be highlighted)
- ✓ Press **DCT**
- ✓ Automatic return to chart
- ✓ In the info box you will find details of DCT
- ✓ DCT vector on the chart shows the path

Test flight with MT

Circling (optional)

Pre-selection of VFR approach chart (circuit): DFS approach charts can be supplied by us.

- ✓ Press **CHART**
- ✓ Press the same key once again; it is now marked **SIN.CHA**
- ✓ By creating the DCT on the airfield the right approach chart is **already pre-selected**: the bar highlights the identification code (4-letter code)
- ✓ **ACT** Activates the chart (name is shown above)
- ✓ **BACK** Returns you to the chart: If you are not already in the immediate vicinity of the airfield, the approach chart will not yet be displayed
- ✓ With the procedure up until now it is ready for display and will be **automatically** displayed if the GPS supplies a position that is located within the area of this approach chart, e.g. in the approach.

Workload reduction

An approach is stressful enough – Moving Terrain helps ease the strain:

- ✓ You select the chart in a quiet phase during the flight
- ✓ It is automatically displayed in the difficult approach phase
- ✓ Position reports are simpler than ever: you just read the coordinates off the screen
- ✓ At the same time the chart shows you your exact current position. You always have a reliable reference to the ground.
- ✓ The trend vector facilitates forward viewing of your flight path

No need to worry about additional input during the approach phase!

- ✓ The info box will show the identification code of the highlighted single chart.

Start

If your speed is greater than/equal to 2 knots:

- ✓ The position symbol turns into an aircraft (or helicopter) symbol (red dot = your position)
- ✓ The trend vector points to the future: While maintaining your course and speed (with a chart scale of 1 : 500 000) in 10 nm you will have reached exactly the position currently marked by the tip of the arrow.
- ✓ The chart follows continuously, your position is in the center of chart (center mode) or off-center.
- ✓ The rotated chart is displayed in the TrackUp window; your position is at the lower edge of the chart section.

Recording of tracks

Track recording begins when you press FLT (with a valid SATFIX positioning)

- ✓ When flying over ground, trackpoints mark the distance covered, i.e. the track
- ✓ A dot is “dropped” every 10 seconds
- ✓ At higher speeds the dots are further apart, at lower speeds (in a car) they may overlap.

Note: Tracks can be saved and played back in quick motion when the tracking module is activated (facilitates post-flight work and logbook entry).

Direct Update

The direct vector can be updated in flight mode in relation to your current position by pressing the **DCTupd** key.

Adjusting the display

Display brightness can be quickly adjusted to prevailing light conditions:

- ✓ **LUM -** Decreases brightness
- ✓ **LUM +** Increases brightness

The standard setting is the brightest display. If the display has been set to maximum brightness, only **LUM -** will be shown in the menu bar. If the display is at its dimmest setting, only **LUM +** will be shown in the menu bar.

The following additional settings can be made in the screen menu:

✓ **MAP** ✓ **AUX** ✓ **SCR**

Night flying

RESET	Restore display to factory settings
NIGHT/DAY	Night display, dark setting Note: These options will only work correctly with MT VisionAir EP with auxiliary hardware dimming
LUM -	Reduces brightness of display
LUM +	Increases brightness of display
CON -	Reduces contrast
CON 0	Restores contrast to factory settings
CON +	Increases contrast
BACK	Returns to base level (map)

Test flight with MT

In principle, Moving Terrain is easy to operate:
Switch on, **select flight mode** and the **chart is already positioned**!

Working with MT during the flight

You **don't need to** enter data and are always correctly orientated.

Without leaving flight mode = without interrupting GPS positioning **you will be able to**:

- ✓ Change the base chart
- ✓ Select a single chart (e.g. approach chart) that will be displayed when you enter the area
- ✓ Use the Nav page to lay a DIRECT to an alternative airfield or reporting point
- ✓ Use the Nav page to plan or change routes (FMS / IFR module)
- ✓ Use the Nav page to create or edit a waypoint.
- ✓ Zoom in on the chart
- ✓ Adjust the display to lighting conditions in the cockpit.

Reducing the workload in the cockpit

It depends on you and your workload how much data you enter during the flight: Moving Terrain offers many options.
The prime objective in the cockpit is, however, to ease the strain on you!

Here are two examples:

Position reports Just read off the screen.

EET Read off the screen using the DCT function.

As a general rule you can simply switch off your Moving Terrain device.

However, to facilitate the resumption of work, e.g. after a refueling stop, you should save your information.

The following information will be saved:

- Position
- Activated base chart
- Settings for brightness and contrast
- Zoom level

In the course of flight preparations set the brightness to surrounding conditions, select the desired chart and determine your position by GPS (activate FLT mode!).

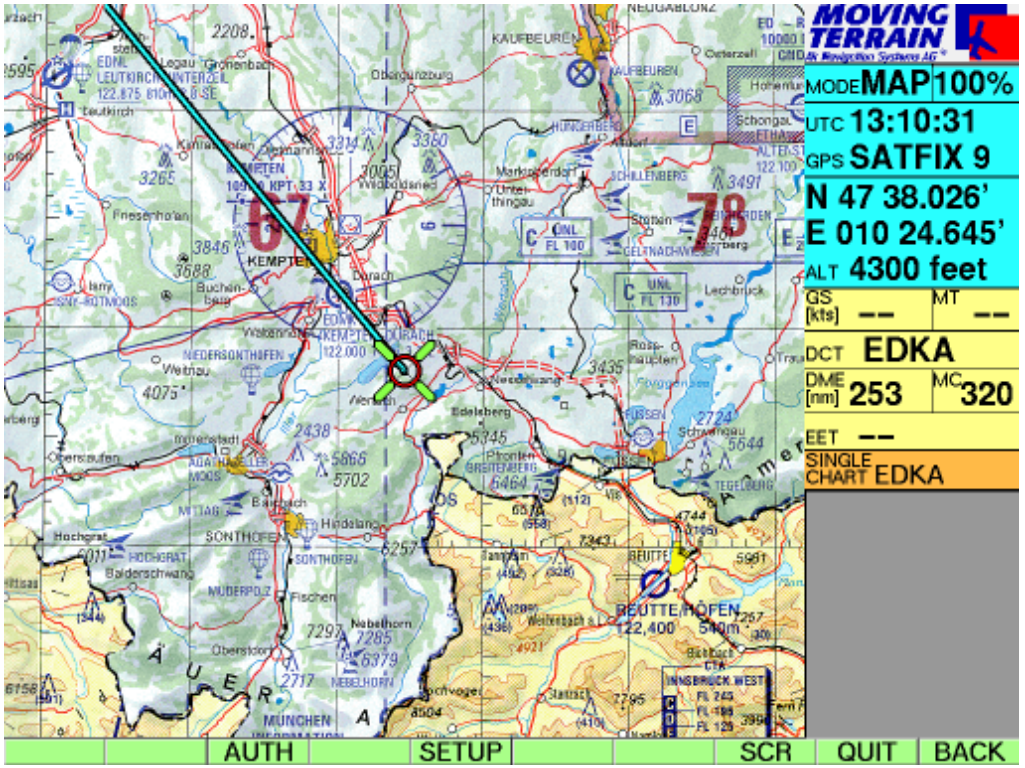
Quit the program with the following sequence of keys:

✓ **AUX**
✓ **QUIT** **keep key pressed for approx. 3 seconds!**

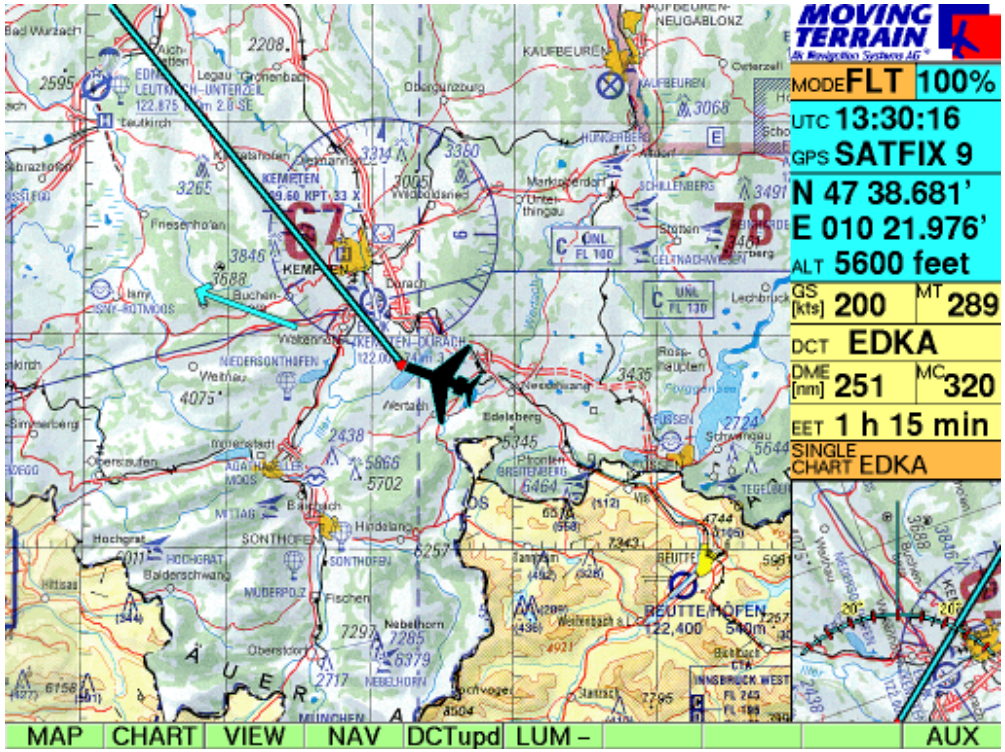
✓ Now you may switch off the device

When you next launch Moving Terrain you will find that the previous settings have been imported.

The display (brightness/contrast) can be restored to factory settings with **RESET**.

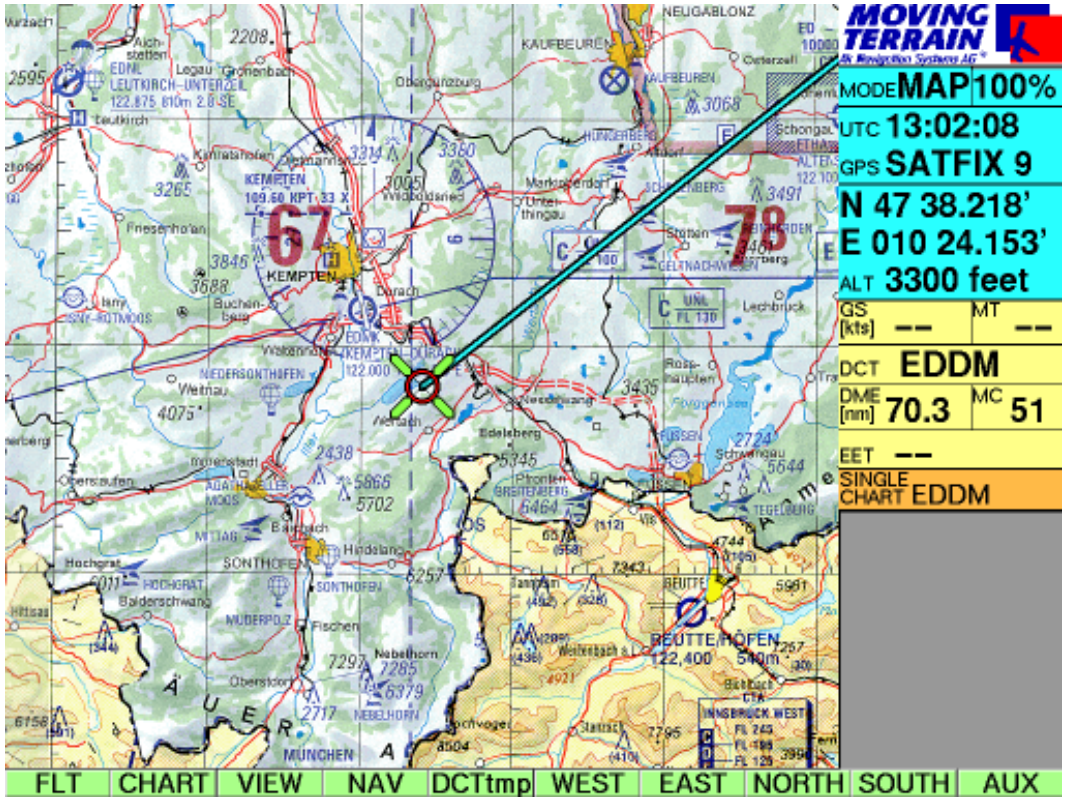


Flight mode = operating mode with GPS chart guidance



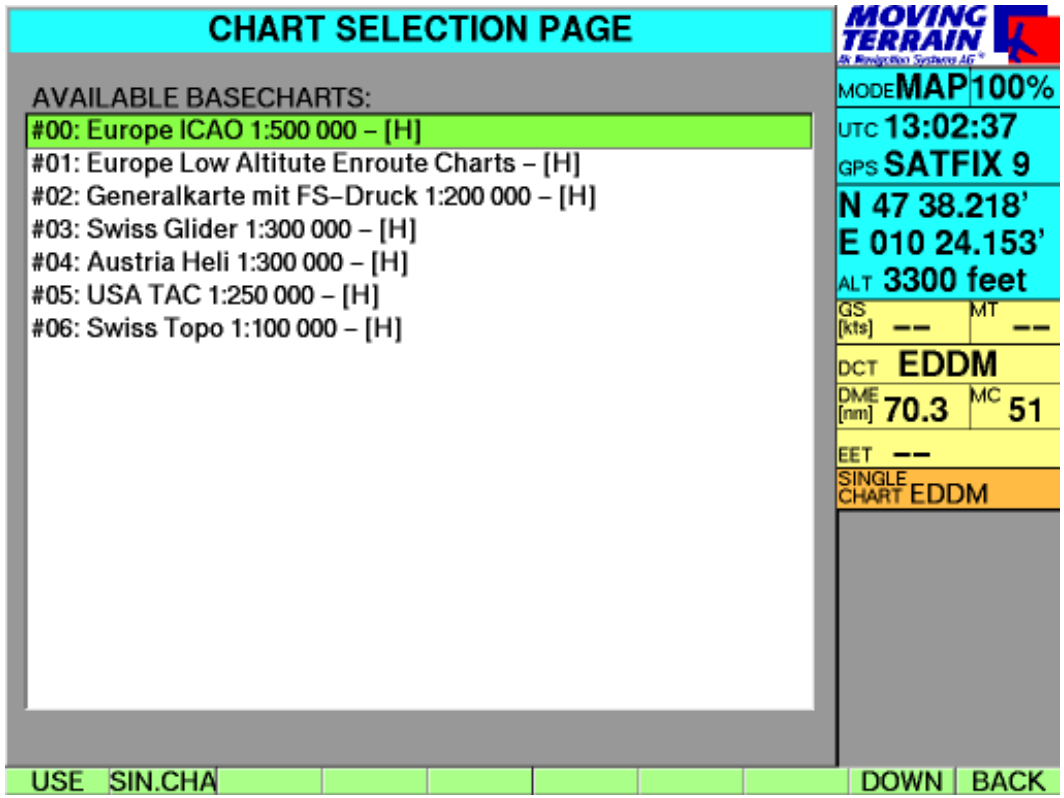
MAP	Changes to map mode
CHART	Changes to chart selection page: Selection of base and single charts ..... Basic – 6
VIEW	Increases scale of chart, Info off, Center - Off center mode, rotating chart ..... Basic – 3
NAV	Nav page ..... Basic – 4
DCTupd	Updates direct vectors relative to current position ..... Basic – 9, 13
LUM -	Reduces display brightness (infinitely variable) ..... Basic – 14
LUM +	Increases display brightness (infinitely variable)

Map mode = The user controls the chart, for flight preparations



FLT	Changes to flight mode
CHART	Turns to chart selection page: Selection of base and single charts
VIEW	Enlarges chart section, MFD screen, hide info box, Center/OFF-Center
NAV	Nav page
DCTtmp	Fast selection of a destination for the direct vector directly on the chart (without naming WPT)
WEST	Moves location symbol on the chart towards the west
EAST	Moves location symbol on the chart towards the east
NORTH	Moves location symbol on the chart towards the north
SOUTH	Moves location symbol on the chart towards the south
AUX	Switches over to further options

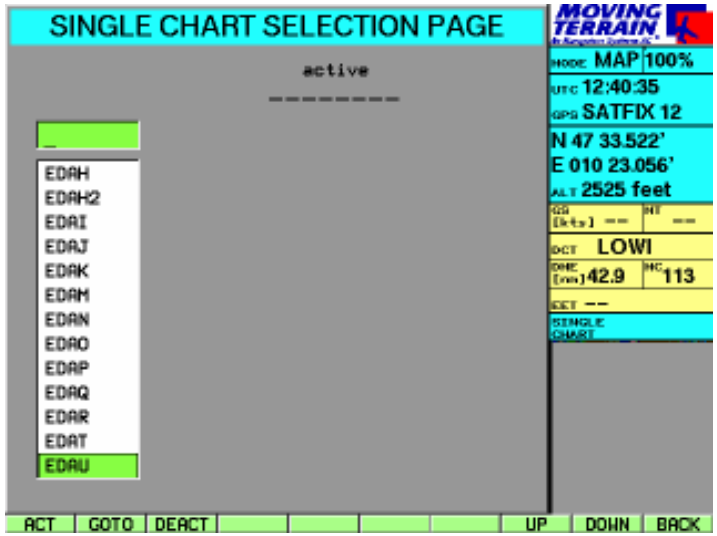
Chart selection



USE Selection of base chart as highlighted ..... Basic – 6
SIN.CHA Change to single chart selection page ..... Basic – 7

UP Move upwards in menu (only visible when cursor is not already at top)
DOWN Move downwards in menu (only visible when cursor is not already at bottom)

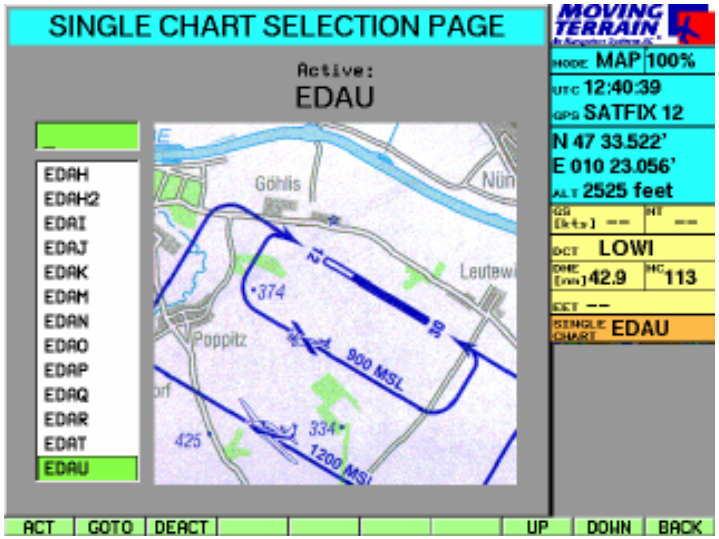
BACK Return to previous level (Flight/Map)



not active

ACT

DEACT



active:
Preview

ACT Activates selected single chart. The active single chart is displayed in a preview (section of single chart). The single chart is automatically displayed on the base level (map/flight mode) as soon as you fly into the area.

GOTO Jumps to center of the selected single chart: The single chart is simultaneously activated (only available in map mode).

DEACT Deactivates the single chart

UP Moves upwards in the selection

DOWN Moves downwards in the selection

BACK Returns to base level (map/flight)

VIEW

ZOOM - Reduces size of chart up to max. 100%, VisionAir up to 50% (ZOOM50)

ZOOM + Increases size of chart in stages up to max. 600%

MFD Multi functional display (see below)

100 % Returns to original display size (100%)

INFO-/ INFO+ Shows/hides info box

CENTR/ OFF-C Displays position sysmbol centre or off-center (only visible in FLT mode)

BACK Returns to base level (Map/Flight)

The zoom factor has no relevance for the TrackUp window, where the chart is always displayed at 100%.

MFD

RNG+ Increases the radius of the full circle or segment in which data can be displayed.

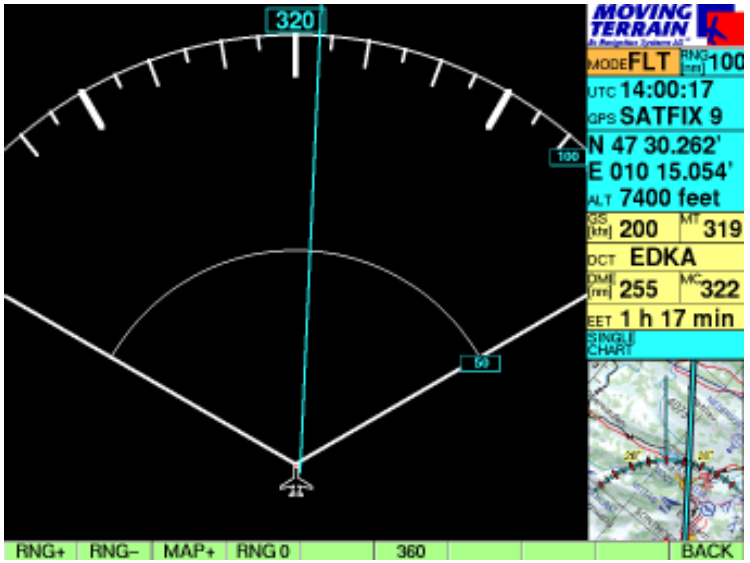
RNG- Reduces the radius of the full circle or segment in which data can be displayed

MAP+ Quits dedicated mode. Colored charts are displayed again

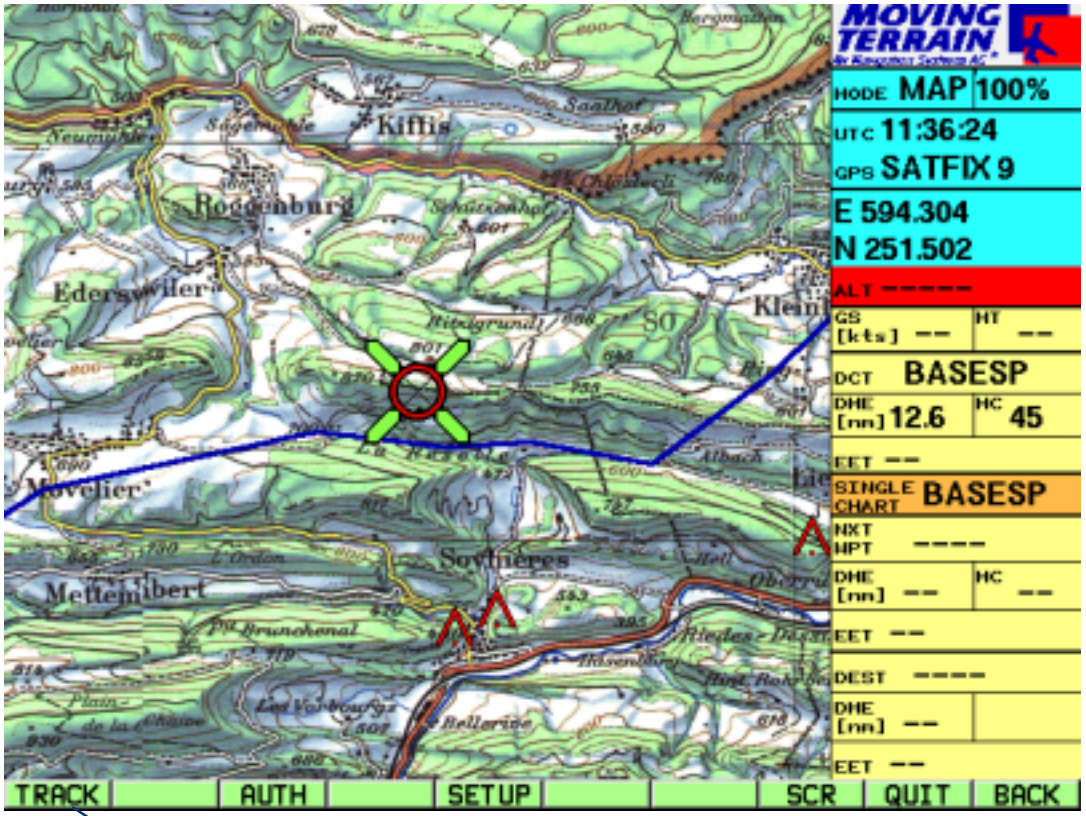
RNG0 Sets standard radius for the circle (100 nm)

360/ ARC Displays the full circle or segment

BACK Returns to base level (Map/Flight)



AUX
SETUP

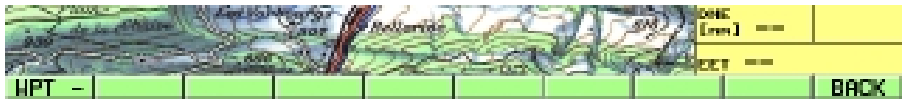


Appears only when the track module is activated

SETUP enables you to switch the WPT symbols for user waypoints on or off:

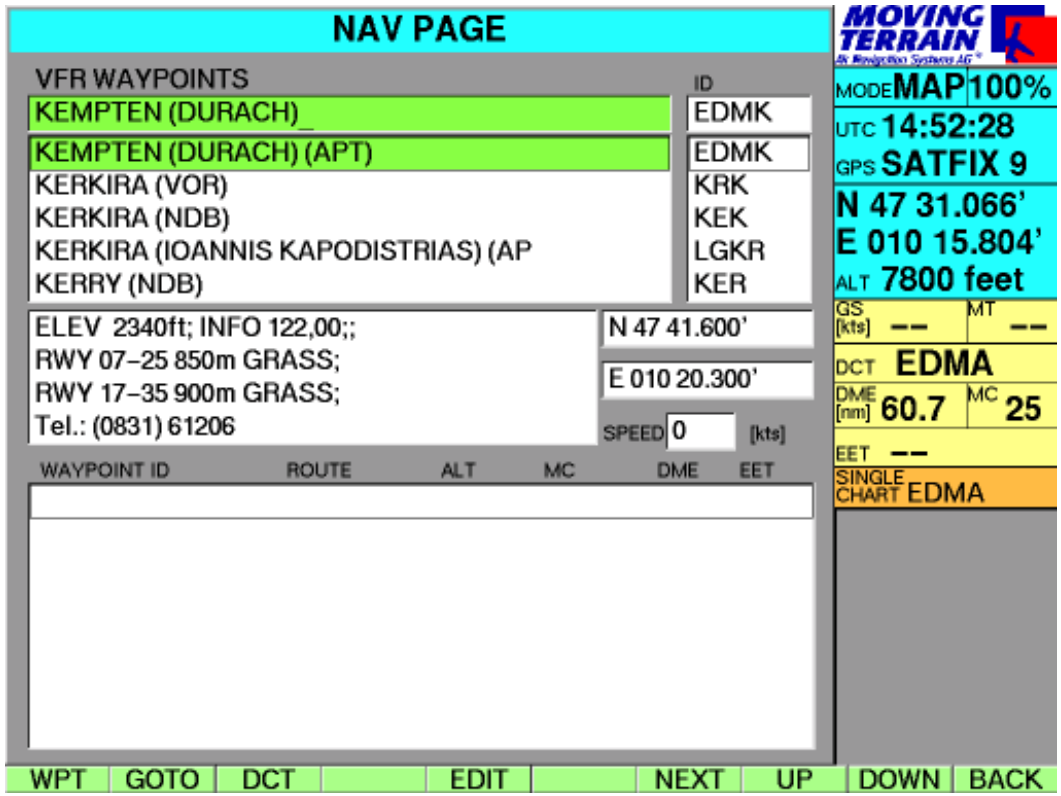
This function is important if too many user waypoints make the chart difficult to read.

Hide waypoints
WPT -



Show waypoints
WPT +

NAV Page



WPT Changes to selection of waypoint type = NAV DATA selection

GOTO Positions the chart on the selected waypoint (function not available in flight mode)

DCT Direct vector from the current position to the selected waypoint, with simultaneous display of MC/DME/EET in info box

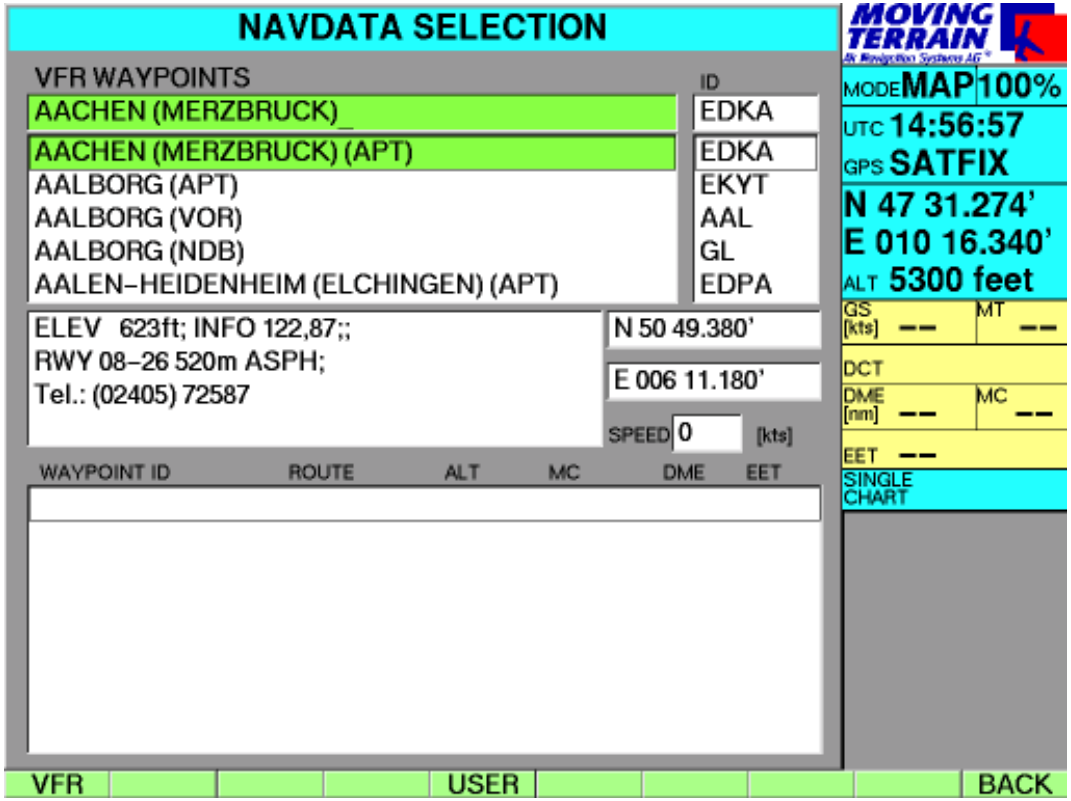
EDIT Changes to user waypoint edit page

NEXT Moves to next box on the Nav page

UP Moves upwards within the active listbox

DOWN Moves downwards in the active listbox

BACK Returns to base level (map/flight)

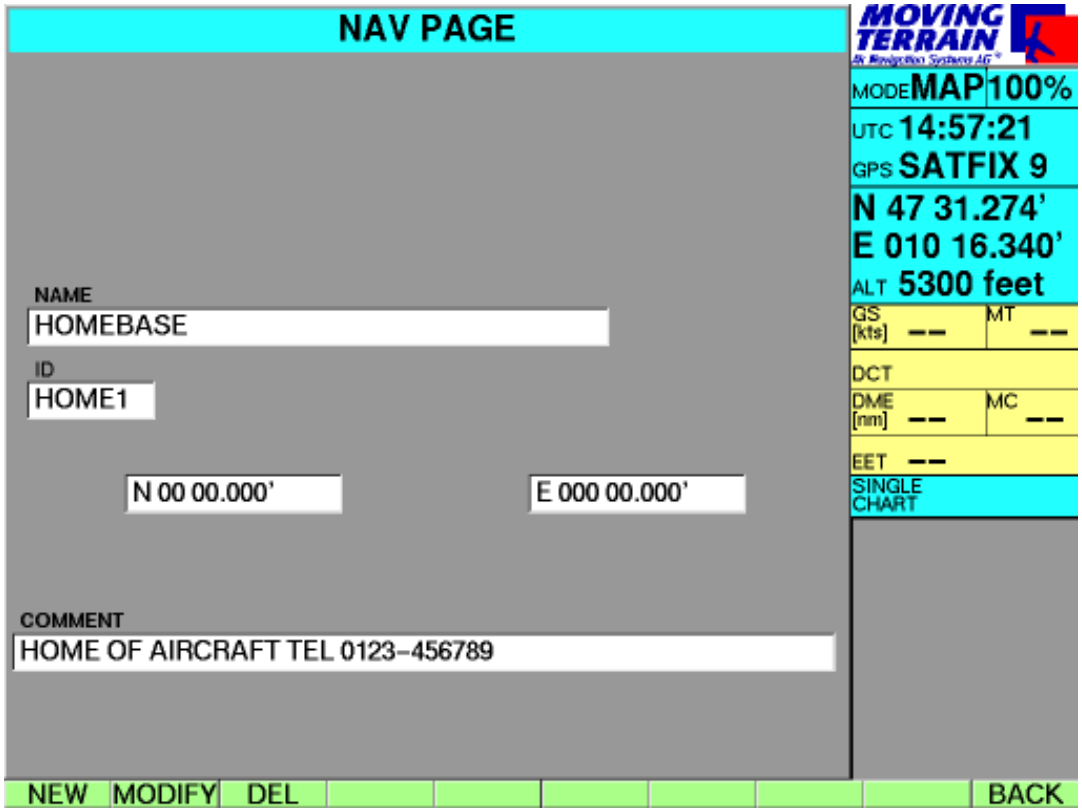


VFR VFR database APTs, VORs, NDBs
Waypoints are marked in each case by the abbreviation shown in brackets

USER Changes to USER waypoint page

BACK Returns to Nav page

User waypoint edit page



Basic – 4

NEW Changes to User Waypoint Edit Page (new):
Enables creation of a new waypoint, MT suggests a waypoint name with consecutive number (WPT000, WPT001 etc.); assignment of an individual name and identification code possible.

MODIFY Changes to user waypoint edit page (modify):
Enables modification of the displayed waypoint.

DEL Deletes user waypoint

BACK Returns to base level (map/flight)

Quick Reference

New user waypoints

Modifying a user waypoint

SAVE Saves waypoint under the name as entered

GOTO Positions the chart on the selected waypoint (understandably not available in flight mode!)

DCT Direct vector to the coordinates entered

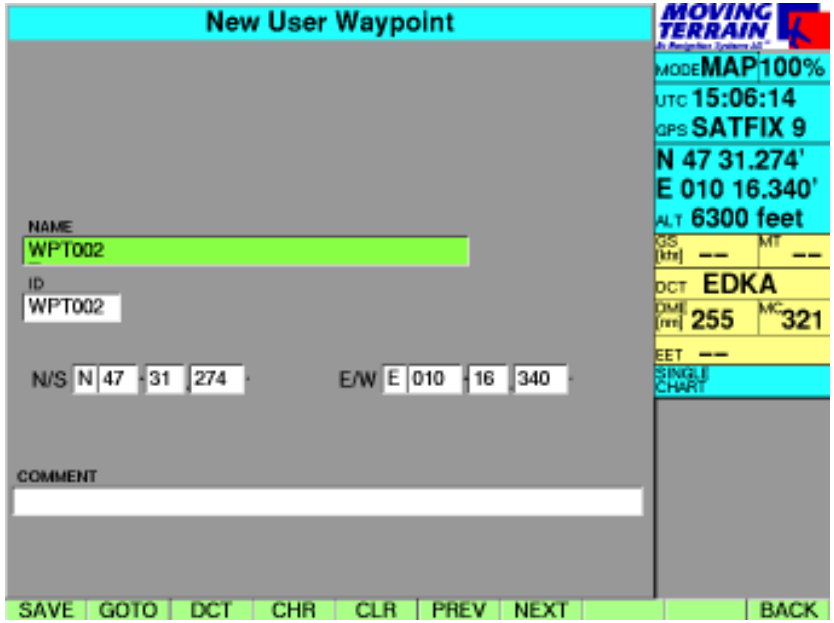
CHR Enables special characters such as (,),/ or - to be entered

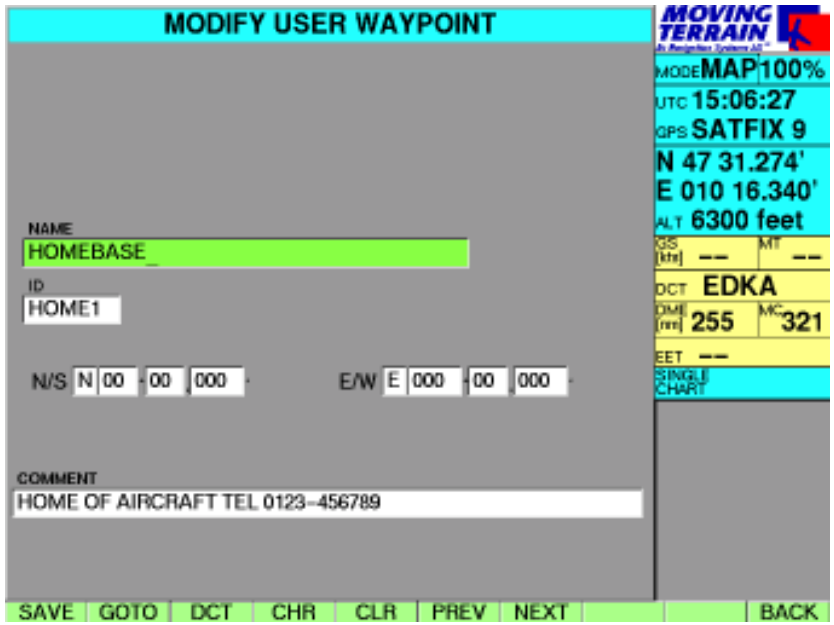
CLR Deletes data in all boxes

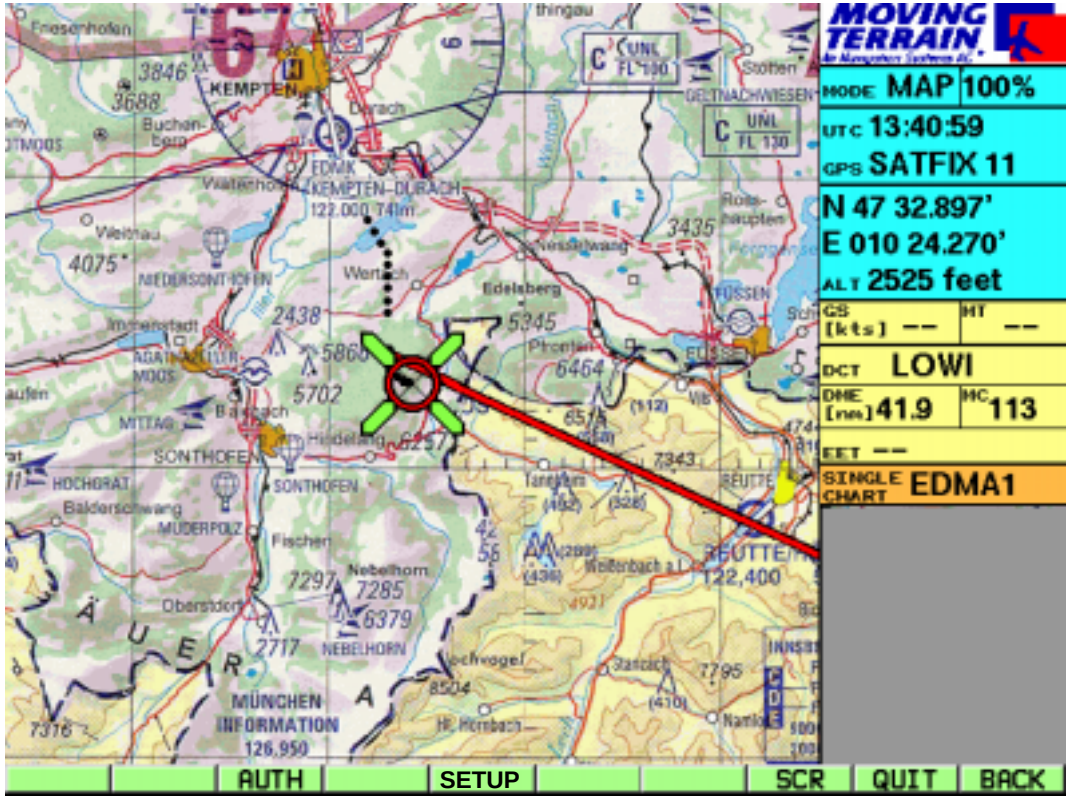
PREV Moves back to previous box

NEXT Moves on to next box

BACK Return to Nav page







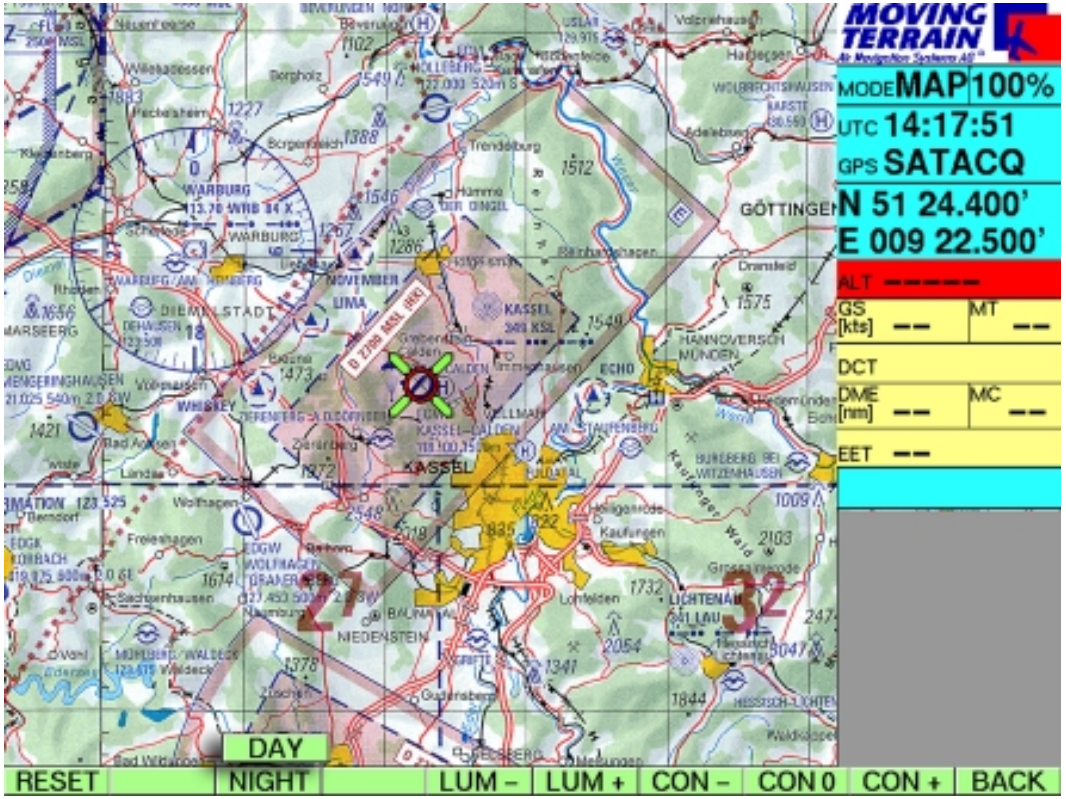
AUTH Switches to authorization page (keep key depressed approx. 3 secs.)

SETUP Shows or hides waypoint symbols ..... Basic – 22

SCR Adjusts screen settings to ambient conditions (brightness/contrast) ..... Basic – 14

QUIT Quits Moving Terrain:
Last geographical position, active base chart, zoom level and settings for brightness and contrast will be saved ..... Basic – 16
Important: Keep key pressed until program quits (protective mechnism against unintentional shutdown of Moving Terrain)

BACK Returns to base level (map)



RESET Restores factory settings for display

NIGHT/DAY Nighttime display (low luminosity)
Note: These options will only function correctly with MT VisionAir EP with auxiliary hardware dimming

LUM - Infinitely variable reduction of display brightness
LUM + Infinitely variable increase in display brightness
CON - Reduces contrast
CON 0 Restores contrast to factory settings
CON + Increases contrast
BACK Returns to base level (map)

Contrast settings improve legibility when viewed at an angle from above.

MT Flight Management System

MT Flight Management System

MT FMS consists of 3 components

- ✓ **Flight planning** via the Nav page
- ✓ **Display of the flight plan** = route on the chart
- ✓ **Flight management** in the FMS window

Flight planning

The flight plan consists of :

- ✓ individual waypoints from the various databases (VFR, IFR, USER, etc.)

and / or

- ✓ routes or route segments already saved.

Composition, storage and loading take place on the Nav page.

Back on the chart, the FMS provides:

Flight management in FMS window (bottom right) - Alternatively this window becomes the TrackUp display. Switch-over knob **TrkUp/PLAN** in **VIEW** menu in flight mode.

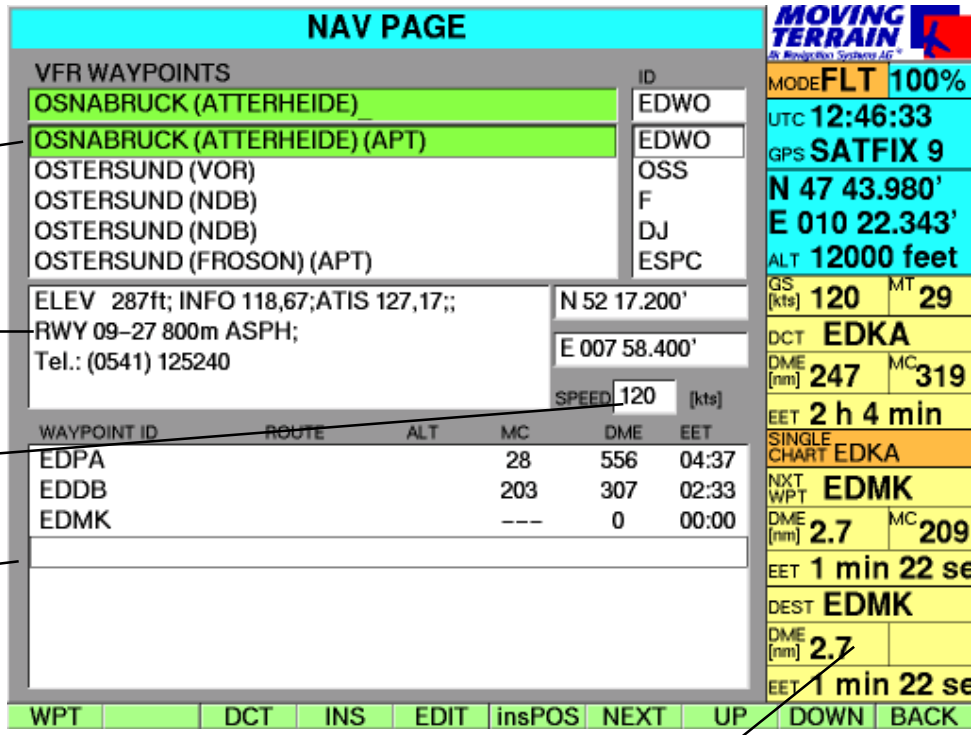
The flight plan is displayed on the chart as a chain of vectors.

If the two vectors coincide, the DIRECT vector (light blue) will superimpose the route vector (white, active leg = magenta).

Selecting waypoints from the databases

All points may be selected from any Nava data (VFR, IFR, USER).

✓ **NAV** Nav page



Waypoint listing (without Umlauts e.g. Ä=A)

Information

Speed

Flight plan

FMS window

✓ **Name** entered on the integrated keypad
✓ In the event of an error, press UP /DOWN and re-enter

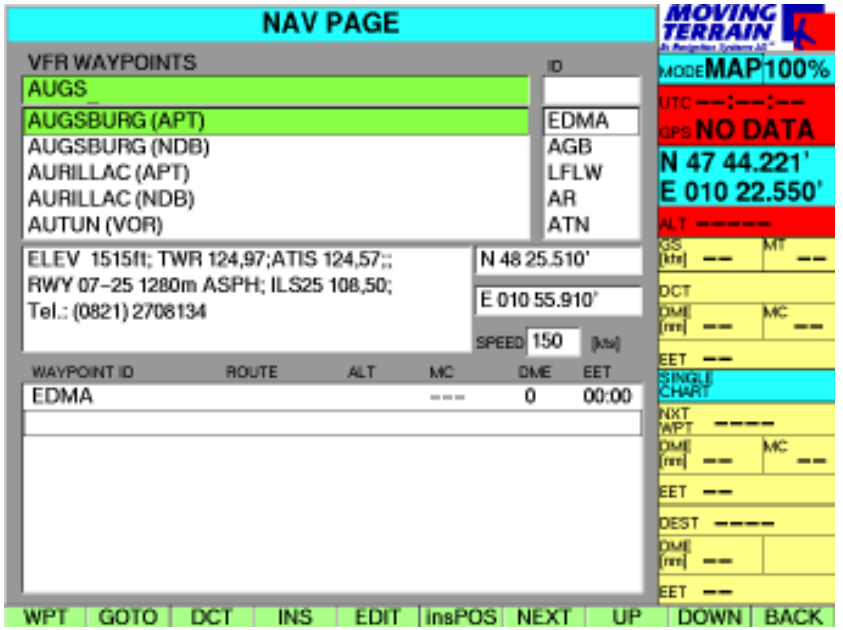
To **input identification code** (4-letter code):
✓ **NEXT**
✓ Enter identification code in ID box

The **coordinates** always relate to the highlighted waypoint, either in the upper waypoint box or in the flight plan box.
Coordinates cannot be entered on this page.

Adopting waypoints in the flight plan

✓ **INS** Waypoint will be imported into the flight plan box (added at end)

Flight plan Augsburg EDMA to Nuremberg EDDN
via Walda VOR
Allersberg VOR
Röthenbach NDB



✓ **NAV** Nav page

Enter "AUGS..." => Augsburg (APT)
will be highlighted

✓ **INS** Add to the flight plan

Enter "WAL..." => Walda (VOR)
will be highlighted

✓ **INS** Add to the flight plan

WAYPOINT ID	ROUTE	ALT	MC	DME	EET
EDMA			39	12	00:04
WLD			---	0	00:00

Enter „ALLERS..." => Allersberg (VOR)
will be highlighted

✓ **INS** Add to the flight plan

WAYPOINT ID	ROUTE	ALT	MC	DME	EET
EDMA			39	50	00:20
WLD			4	38	00:15
ALB			---	0	00:00

Enter "ROTHE..." => Rothenbach (NDB)
will be highlighted ✓

INS Add to the flight plan

WAYPOINT ID	ROUTE	ALT	MC	DME	EET
EDMA			39	67	00:26
WLD			4	54	00:21
ALB			3	16	00:06
RTB			---	0	00:00

✓ **NEXT** Jump to ID box => database is now sorted by ID

Enter "EDDN" => Nuremberg (APT)
will be highlighted

✓ **INS** Add to the flight plan

WAYPOINT ID	ROUTE	ALT	MC	DME	EET
EDMA			39	74	00:29
WLD			4	61	00:24
ALB			3	23	00:09
RTB			276	7	00:02
EDDN			---	0	00:00

Flight plan on the Nav page

WAYPOINT ID	ROUTE	ALT	MC	DME	EET
EDMA			39	74	00:29
WLD			4	61	00:24
ALB			3	23	00:09
RTB			276	7	00:02
EDDN			---	0	00:00

WAYPOINT ID Identifier entry

ROUTE Name of route / segments, particularly important for IFR planning

ALT Minimum flight altitude => IFR

MC Magnetic course

DME Accumulative calculation of (remaining) distance to destination (= last route point in the flight plan) in nautical miles

EET Estimated enroute time, calculated using speed in knots shown in the "speed" box. Speed is entered on the keyboard or imported in flight mode from the GPS (see chapter "Speed").

Flight plan on the chart

✓ **BACK** Return to chart

Flight plan = route = white lines from one waypoint to the next

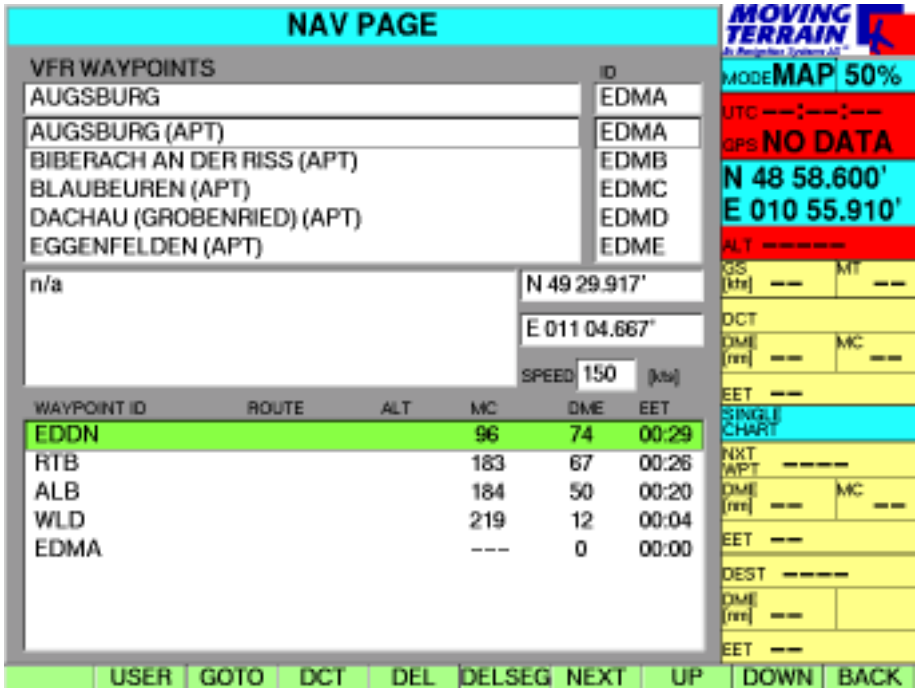
Active leg: Active part of the route from current position (to the next waypoint), shown in magenta

Waypoints => marked with green diamonds and ID: makes flight plan more comprehensible

Editing a flight plan

Deleting a waypoint

- ✓ **2 x NEXT** The highlighting bar is positioned in the flight plan box
- ✓ **USER** For loading, saving and deleting user routes, inverting routes
- ✓ **GOTO** "Jump" to the flight plan waypoint (in map mode)
  In Flight mode GOTO becomes ICPT, i.e. an interception course to the selected point is shown
- ✓ **DCT** Waypoint of the flight plan can become destination of the direct vector
- ✓ **DEL** Deletes highlighted waypoint
- ✓ **DELSEG** Deletes route/route segment from screen
- ✓ **NEXT** Goes to next box, "Speed", return to waypoint list
- ✓ **UP / DOWN** Selects waypoints, positions highlighting bar



Inserting a waypoint

- ✓ Position colored bar on the waypoint of the flight plan ***before which*** the waypoint is to be inserted.
- ✓ **2 x NEXT** Return to waypoint database, select point
- ✓ **INS** Insert into route.

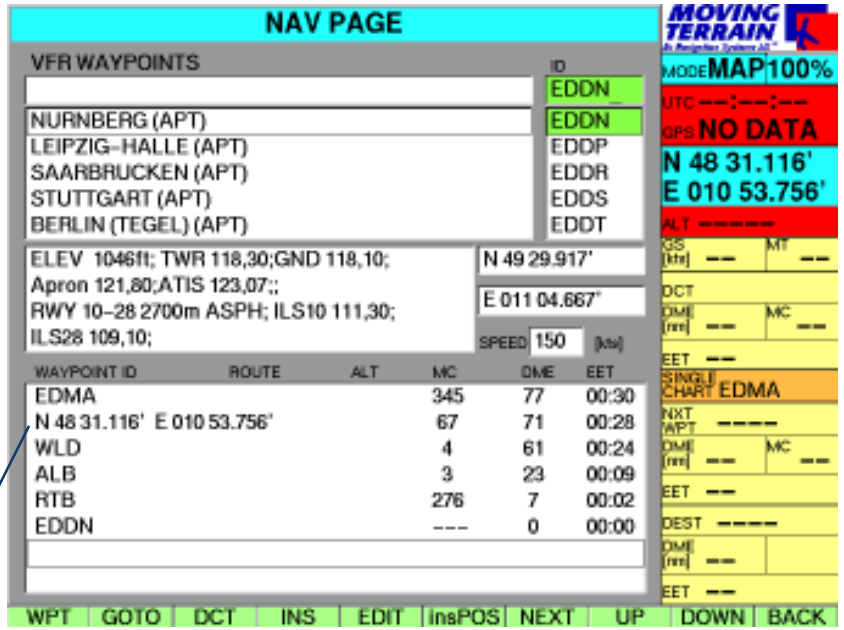
Insert position = InsPOS

Example

After takeoff from Augsburg, the point NOVEMBER is to be overflown.
The point is not in the database.
Position highlighting bar on EDMA using **UP** / **DOWN** in the flight plan

- ✓ **GOTO** Return to chart (green vectors mark the flight plan)
- ✓ Use **WEST/EAST/NORTH/SOUTH** buttons to move to the point NOVEMBER on the chart
- ✓ **NAV**
- ✓ Position highlighting bar in the flight plan (you may need to press **NEXT**)
- ✓ **UP/DOWN** Position highlighting bar on WLD (position ***before which*** the waypoint is to be inserted)
- ✓ **2 x NEXT** = freplaces highlighting bar in waypoint box
- ✓ **insPOS** Inserts current position ito plan

=> Effect on calculations



On the chart:

Note:

The position determined by GPS in flight mode can also be incorporated into the flight plan with **insPOS**.

Editing a flight plan

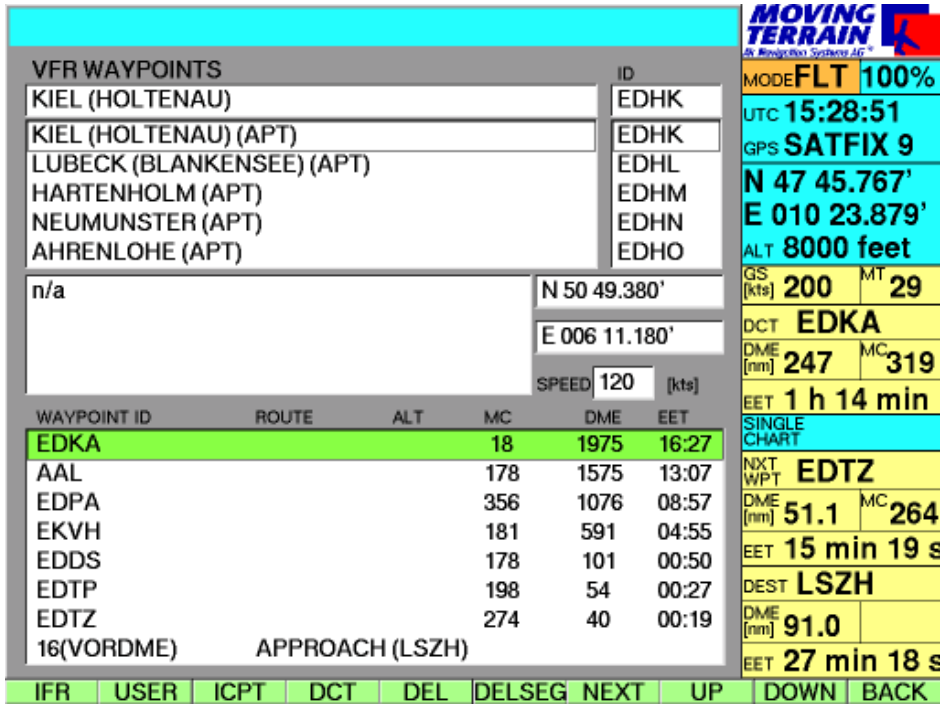
Manual setting of the next waypoint

Pressing the key

✓ **ICPT**

defines the current position as the stating point for the route and the selected route point will become the next waypoint.

The route point above the selected point will be ignored.



Note:
The ICPT key is only visible when FLIGHT mode is active and the cursor is in the flight planning box.

Deleting a route / route segment from the screen

✓ **DELSEG** **Deletes** a flight plan from the memory or loaded routes/route segments **from the screen** (not from the memory!) => particularly important in IFR planning.

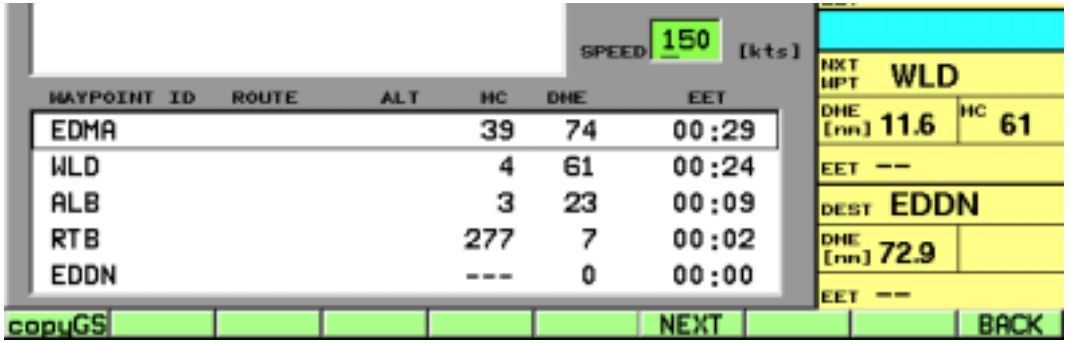
Routes (segments) are loaded additively.
Not all dots can be made visible on the screen.
=> If the calculations in the flight plan box are not correct, please make sure that only the desired route (only 1 x) is loaded (scroll through list with **UP** / **DOWN**!)

Field speed

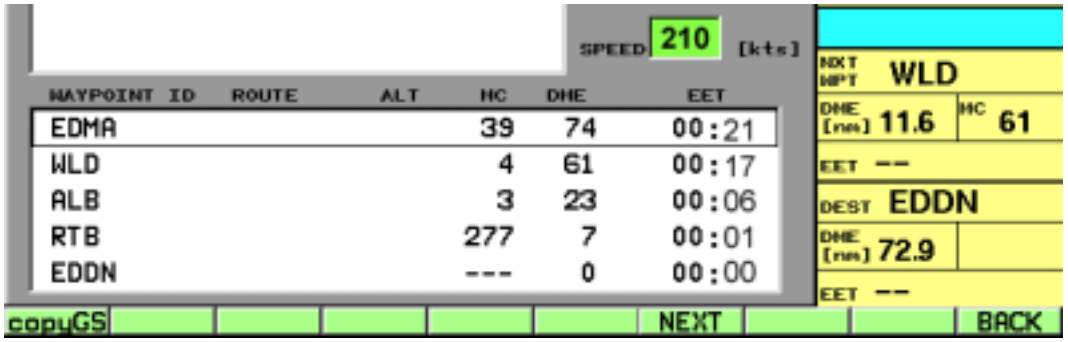
✓ **NEXT** (several times if needed) until highlighting bar is on SPEED

Enter average GS in this box
✓ using the keypad.

Calculation of EET (hh:mm) with the given speed.



GS 150 kts



GS 210 kts

Adjustment of EET to actual cruising speed

✓ **copyGS** Accepts GS from GPS => Updates EET during the flight.
CopyGS only available in flight mode (GPS signals).

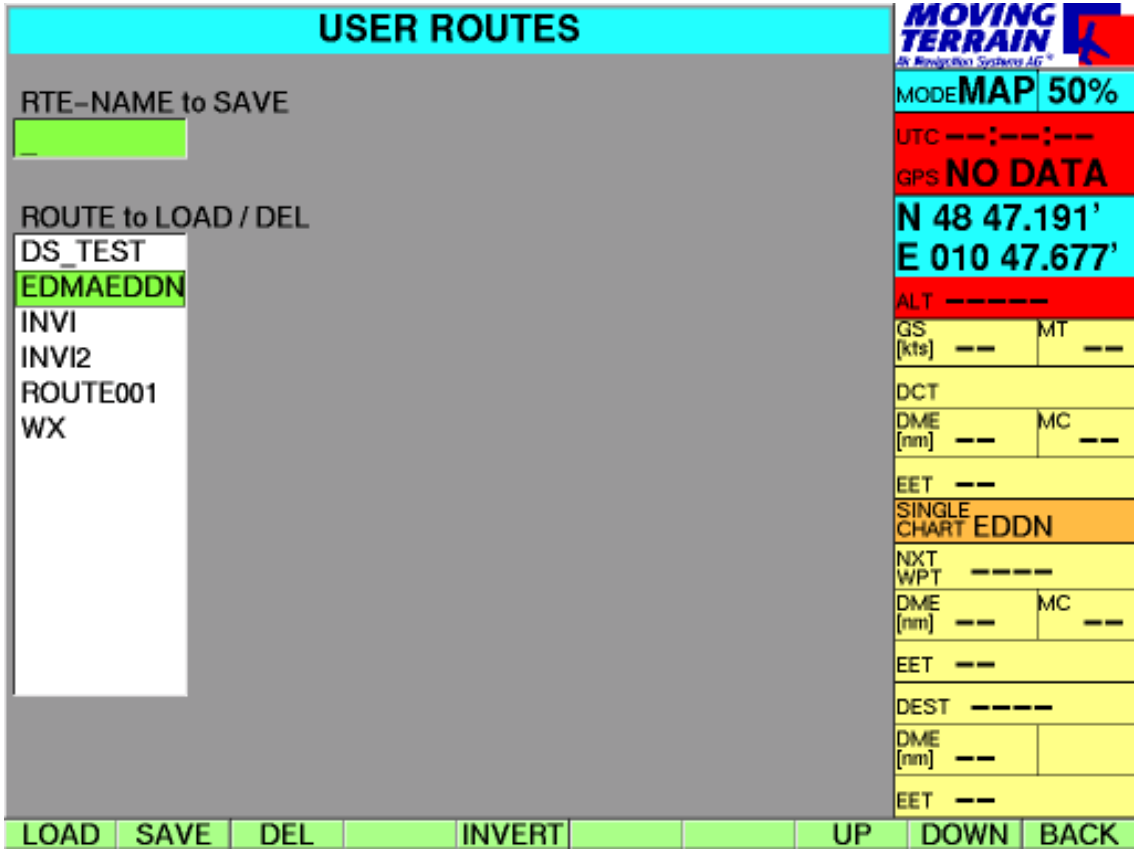
Saving and loading flight plans

Saving routes / route segments

Preparations: Draw up a flight plan

✓ Highlighting bar must be positioned in the flight plan box

✓ **USER ROUTES page**



✓ Enter a name for the route
- max. 8 characters
- Assignment of a unique name makes it easier to find
- Route001, Route002 => auxiliary name (predefined by system)

Made an error?

✓ **UP** / **DOWN**, then re-enter

✓ **SAVE** Adds saved route to the list

✓ **INVERT** Inverts a route already loaded into the flight planning box

✓ **BACK** Returns to NAV page

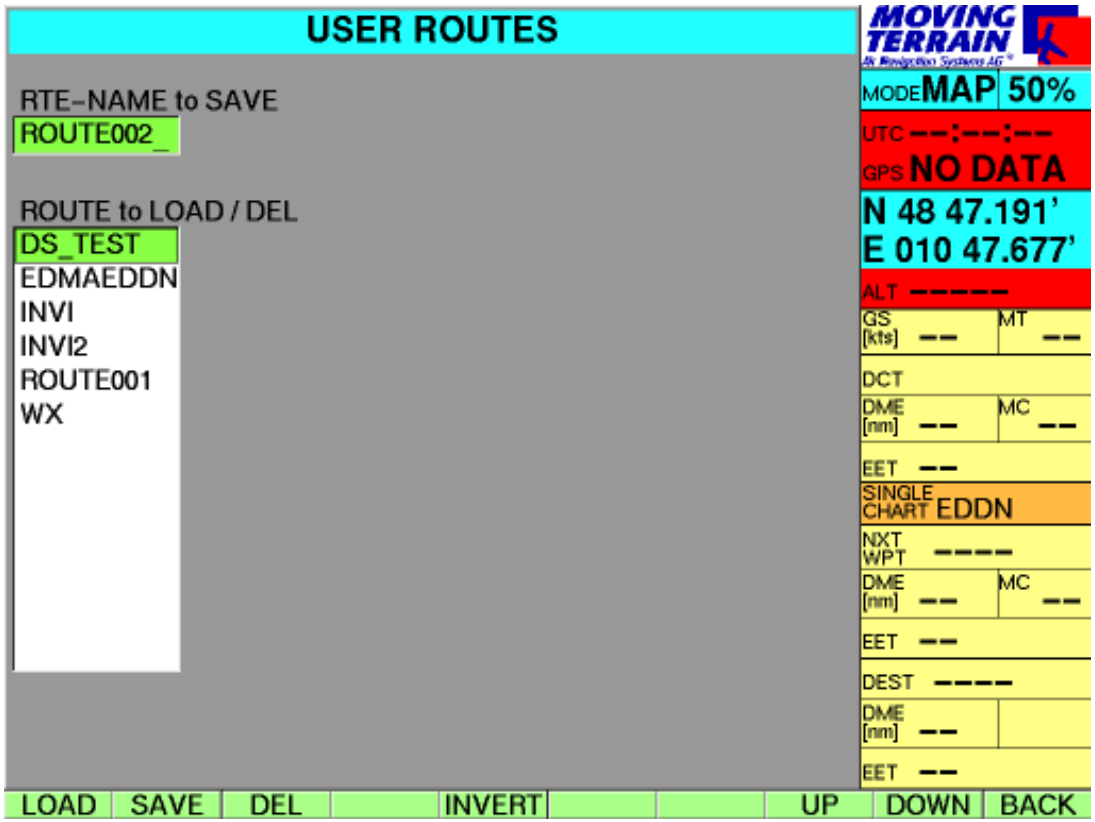
Loading routes / route segments

Preparation: At least one flight plan must have been previously saved
✓ Highlighting bar must in be positioned in the flight plan box

✓ **USER** USER ROUTES Page

✓ **UP / DOWN** Route selection by positioning highlighting bar

✓ **LOAD**



Routes are loaded additively

If a route has already been loaded, the next route will be ***added*** or ***inserted before*** the highlighted flight plan.

=> Easy **combination of route segments** (arrivals, departures, etc.) (esp. IFR planning)

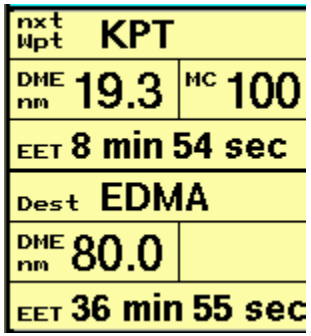
Deleting routes

✓ **DEL** Deletes the highlighted flight plan from the memory

FMS window

Next waypoint

Flight management system



Next waypoint — Identifier

DME in nautical miles — Magnetic track over ground

Estimated enroute time: remaining time to next waypoint (at maintained GS)

Destination waypoint — Identifier

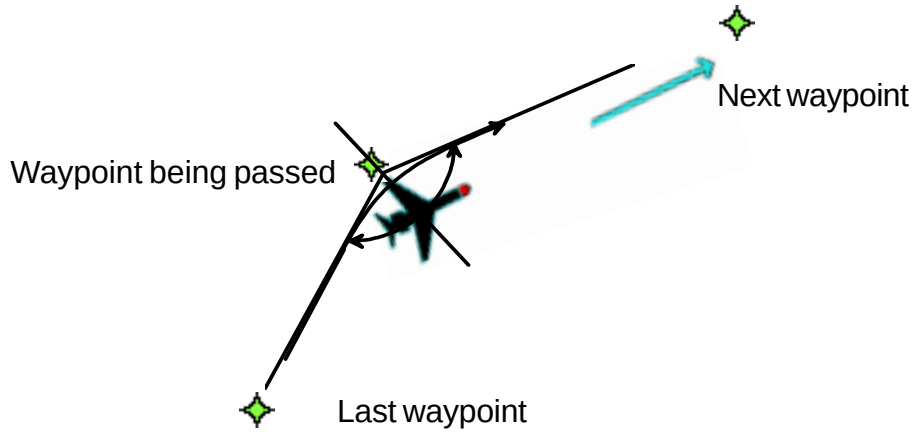
DME in nm: Remaining distance to destination on planned route in nautical miles*
EET to destination waypoint (at maintained GS)*

The information in the FMS window always relates to the current position shown on the chart, i.e.:

1. the position determined by the GPS receiver *or*
2. the targeted position on the chart in map mode.

When you switch to map mode in order to “explore” the surrounding area on the chart, waypoint data will be continuously recalculated.

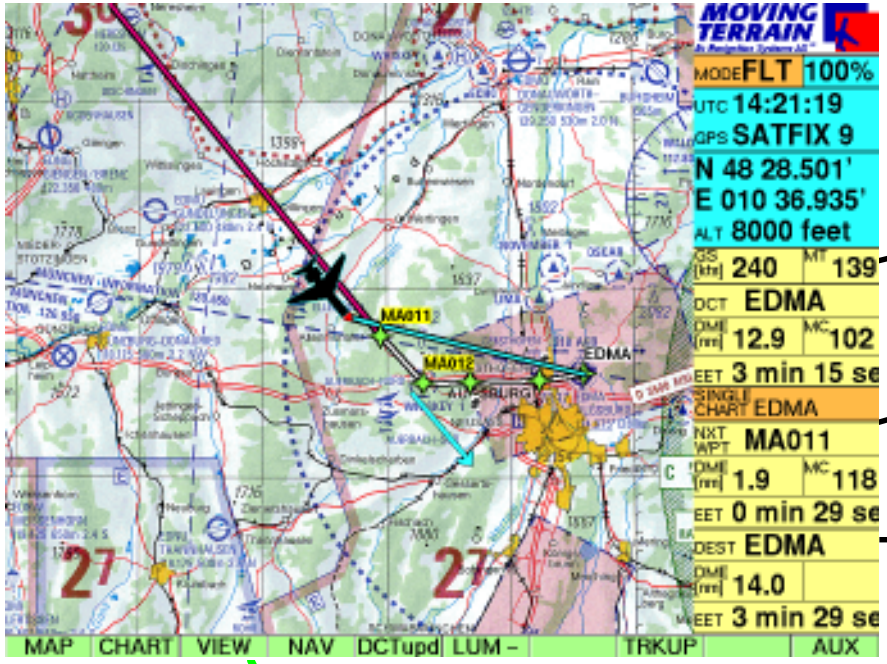
The waypoint ahead of your present position in the entered flight plan.
The system determines the next waypoint when it is flying over or past a point in the flight plan.
Specifically, flying past means flying over the bisector of the angle formed by the waypoints which are behind, level and ahead of you = next waypoint.



Destination waypoint

The last point in flight planning (route destination).

Calculation of navigational data DME, MC, EET

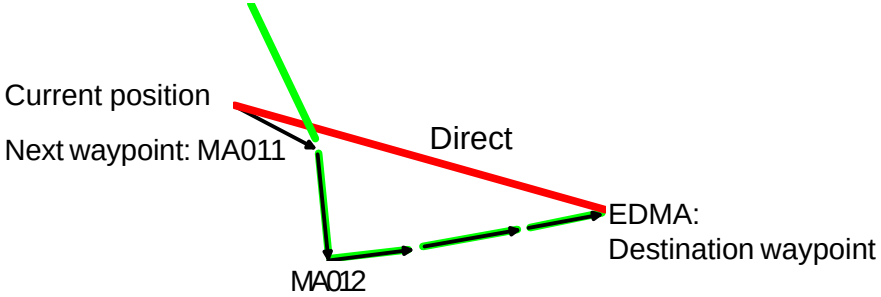


Difference in route calculation DCT / flight plan

Direct: Shortest distance (great circle) between current position and destination (red line)

Next waypoint: Data determined as direct to next waypoint.

Destination waypoint:
Direct from position to next waypoint. From here the route and time to destination are calculated point for point according to entered flight plan (specification of an MC is not necessary).



Switching to TrackUp window

- ✓ Switch to TrackUp window in flight mode ✓ **TrkUp** return with ✓ **FMS**.
- ✓ Once a mode is active, it will always be displayed at all levels in map or flight mode.
- ✓ It will remain active until you change to another mode.

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MT Enhanced Navigation Database ENav Data

MT ENav Data

MT ENav Data based on the MT FMS module

Please read the information in the previous chapter about:

- ✓ **Flight planning** via the Nav page
- ✓ **Flight management** via the FMS window
- ✓ **Display of flight plan** = route on the chart

In this part of the manual the emphasis is placed only on extension to include ENav Data navigation.

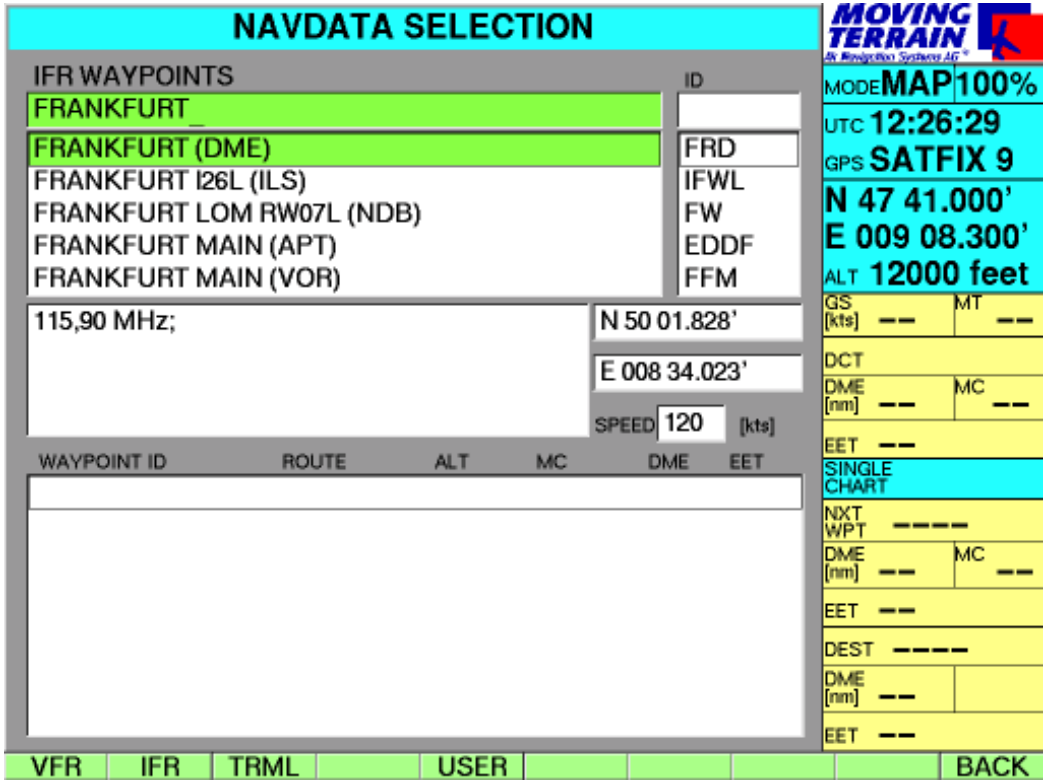
ENav Data enroute + Nav data

Stored Nav data can be retrieved in the Nav page:

- ✓ **NAV**
- ✓ **WPT**

- ✓ **ENav Database** consists of:
  - **Enroute waypoints** (ENR)
  - **Airports** (APT) *
  - **VOR**s (VOR)
  - **NDB**s (NDB)
  - **DME** (DME)
  - **ILS** (ILS)
  - **TACAN** (TAC)

* APTs with ENav Data procedure and **RWY longer than 4000 ft**



ENav Data terminal waypoints

✓ **TRML** Terminal waypoints are selected through the APT*

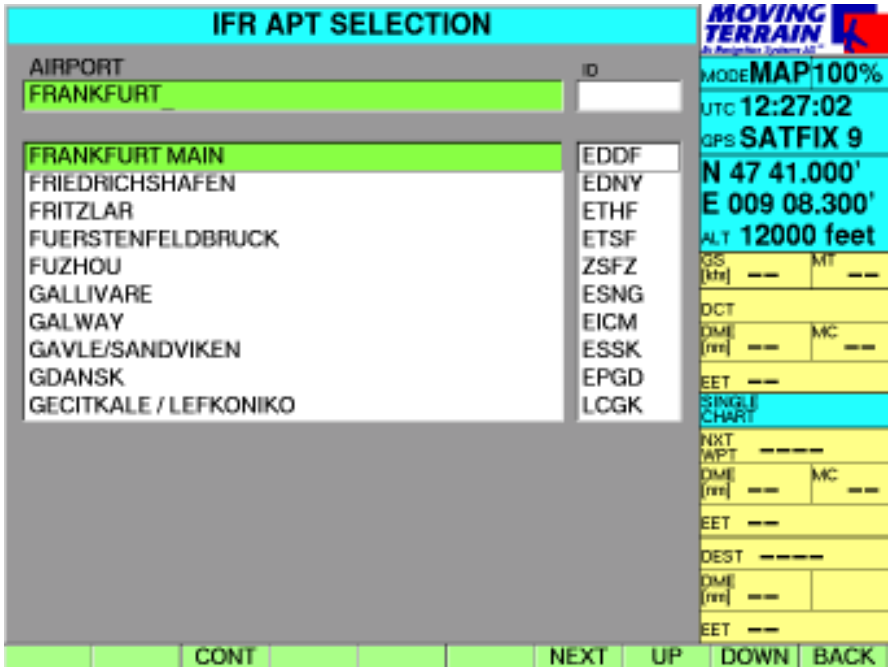
*APTs with ENav Data procedure and RWY longer than 4000 ft

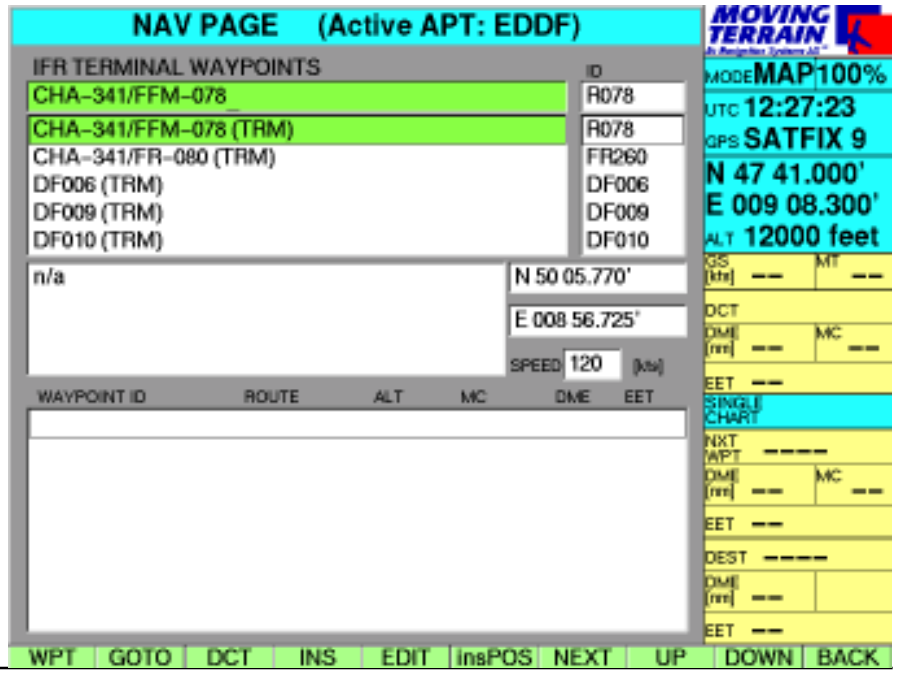
The airport must be selected on the:
IFR APT Selection Page
using the **UP** / **DOWN** keys on the integrated keypad
or
✓ **NEXT** ID box
Enter ID, then data by ID = 4-letter-code
=> Highlighting bar must be on the desired airport

✓ **CONT**
Listing of terminal waypoints to the selected APT (by name or ID)
Select a waypoint

The terminal waypoint database contains
Terminal waypoints (TRM)
Locators (LOC)
Runway waypoints (RWY)

The "**Active APT**" relates to the:
Terminal waypoint database (TRML





ENav Data Procedures

Active airport

Terminal procedure

SIDs
STARs
Approaches

Once selected, the APT remains the "**active APT**" until you select a different one of quit the MT program.

"**Active APT**" simplifies your work: all selected the waypoints and procedures apply to this airport.
=> Your selection does not need to be repeated!

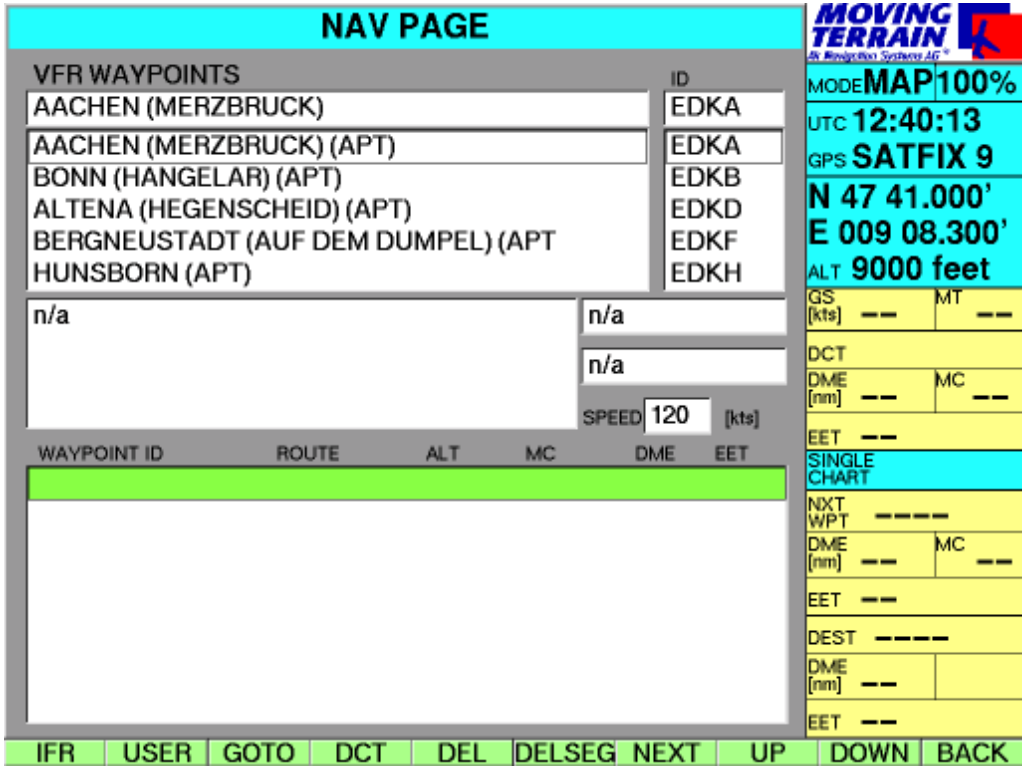
ENav Data procedures

ENav Data procedures are basically treated as routes / route segments
(see FMS User Manual)

and are thus stored in their own completely separate database.

- ✓ **NAV**
- ✓ **NEXT**
- ✓ **NEXT** highlighting bar must be over flight plan window

- ✓ **IFR**

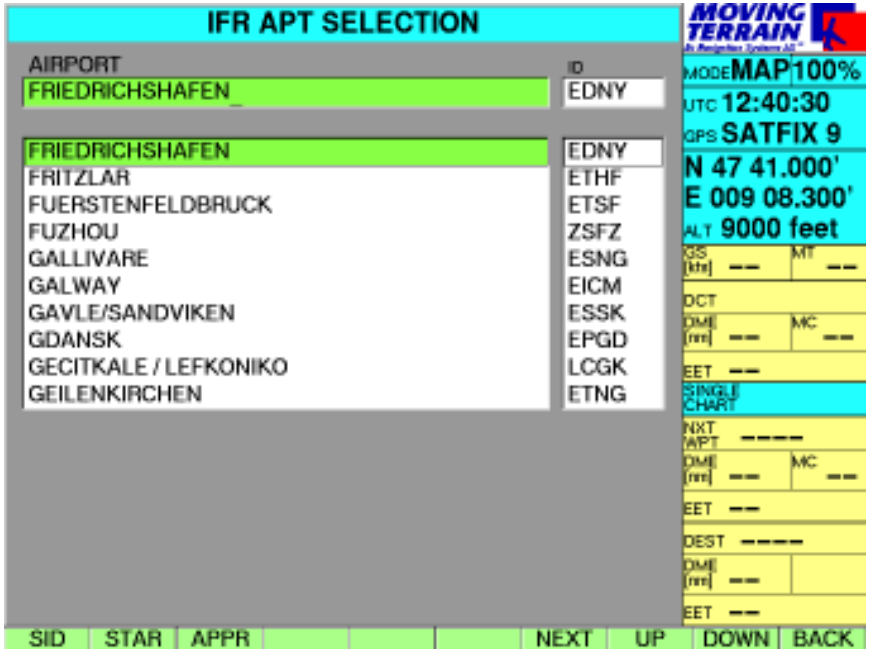


SIDs
STARs
Approaches

The choice now includes:

- ✓ **SID** Standard Instrument Departures
- ✓ **STAR** Standard Arrival Routes
- ✓ **APPR** Approaches

Important: The SID, STAR and APPR keys are only visible if this procedure is available for the selected APT. For Eggenfelden (EDME) the STAR key would not be visible.



Loading procedures

Example **SID**
The “active APT” has been preselected (in our example Friedrichshafen EDNY).

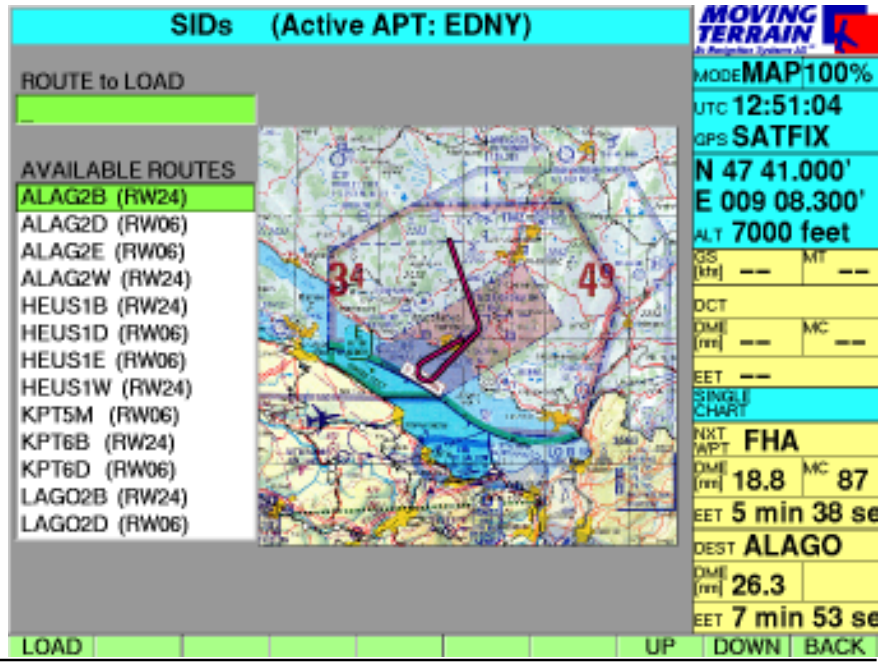
MT lists all procedures of one type (here **SID**)

A detailed section on the chart gives you an overview of the procedure to be flown.

Scroll through the various procedures with **UP** / **DOWN**

Select the desired procedure by entering the name or scrolling **UP** /**DOWN**

- ✓ **LOAD** Example **ALAG2B**



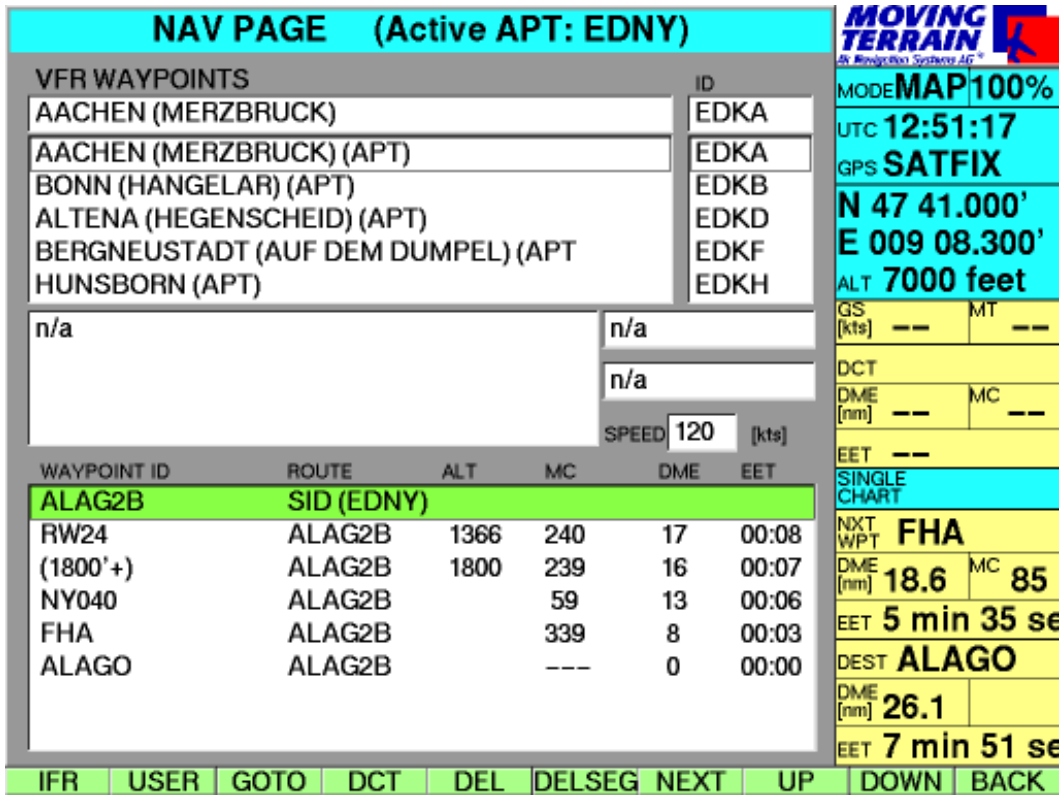
Once the procedure has been activated, you will see it in the route box as shown here.

The procedure consists of more waypoints than can be displayed in succession on the screen at one time.

Go to the start (title) of the route with **UP**

Go to the end of the route with **DOWN**

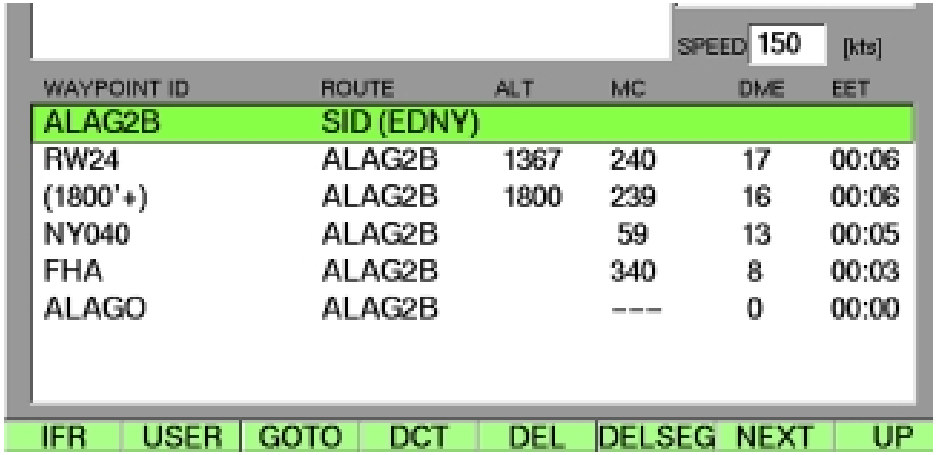
To see the route on the desired chart, press **GOTO** to jump to a point (map mode) marked with **UP/ DOWN**



Display of the procedure on the Nav page

Description of the flight plan box

Title of every route (procedure) saved in the fixed database



Example:

Name of the route (6 characters)
ALAG2B
Type of procedure
SID
followed by APT in brackets
(EDNY)

Below this is the waypoint listing

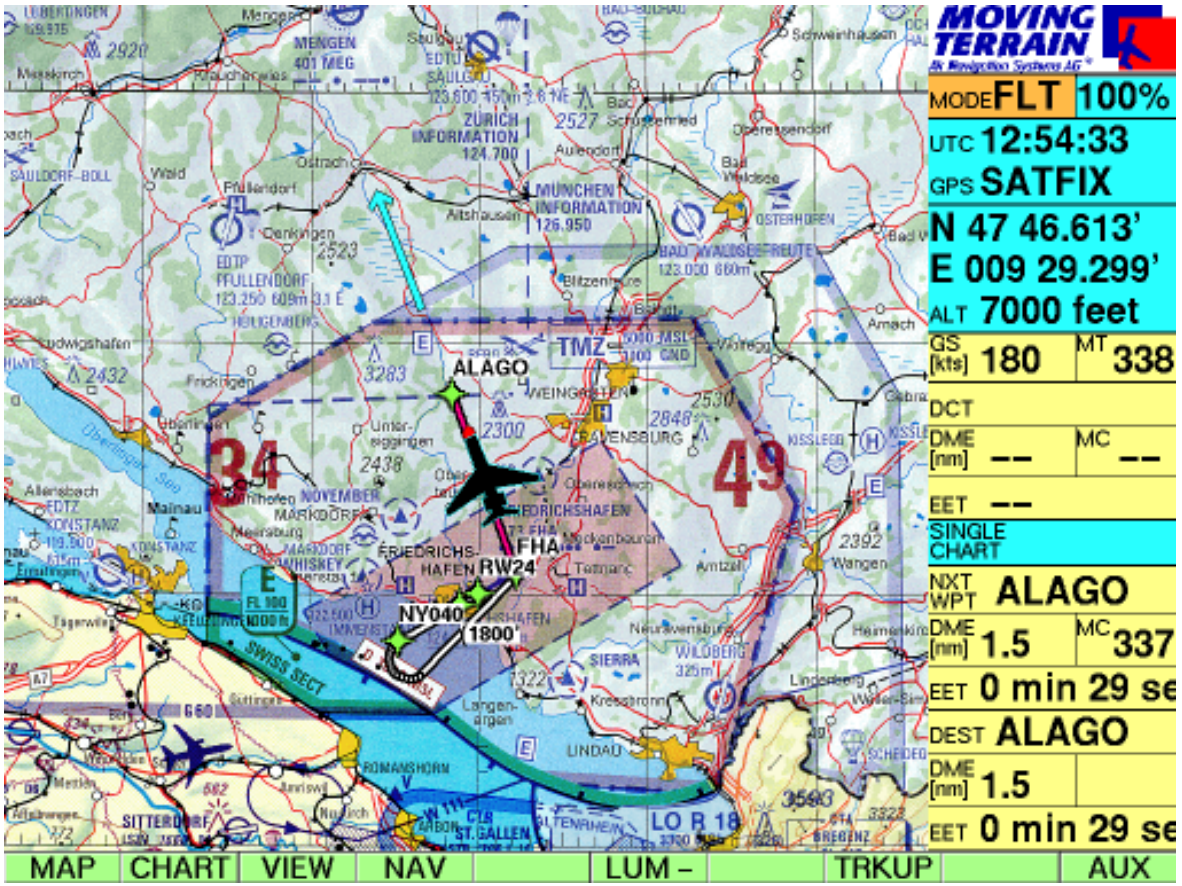
Waypoint ID
Name of the **route**
ALT Minimum altitude
MC Magnetic track
DME in nm
EET calculated from the GS entered in the “Speed” box

Recommended/ minimum altitudes

Minimum altitudes are provided by way of recommendation only.

EET calculation in the flight plan

Example SID ALAG2B
Friedrichshafen



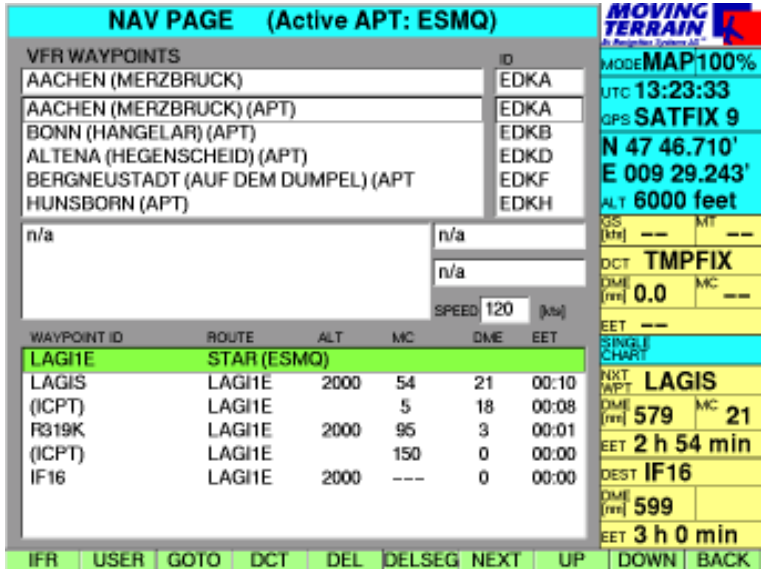
The route display is not a point-to-point guide, but rather the conversion of instructions into vectors that accurately project flight management onto the chart:

The display functions on charts of various scales, likewise on DFS approach charts.

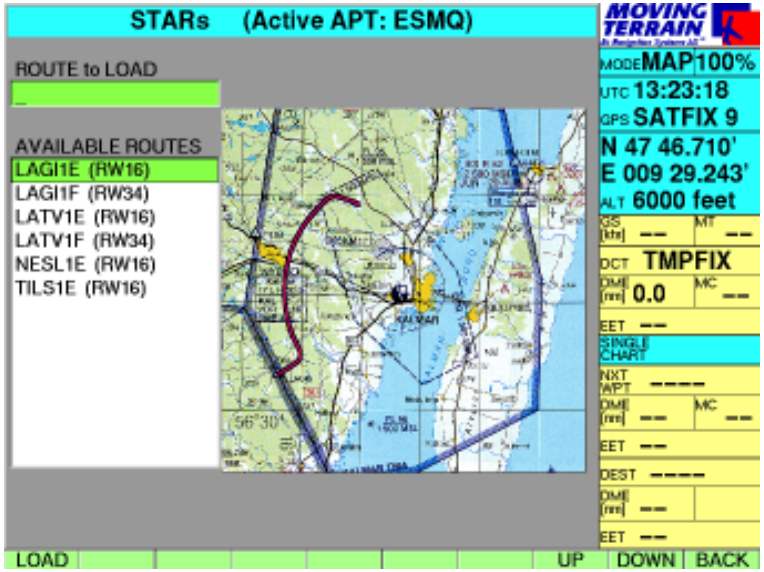
Besides the green routing, the IDs of the terminal waypoints are also shown. This ensures perfect orientation. The DCT to a waypoint further ahead can easily be traced on the chart and created on the NAV page at the touch of a button.

Example of a STAR

Example**STAR LAGI1E**
Kalmar (ESMQ)
on the Nav page



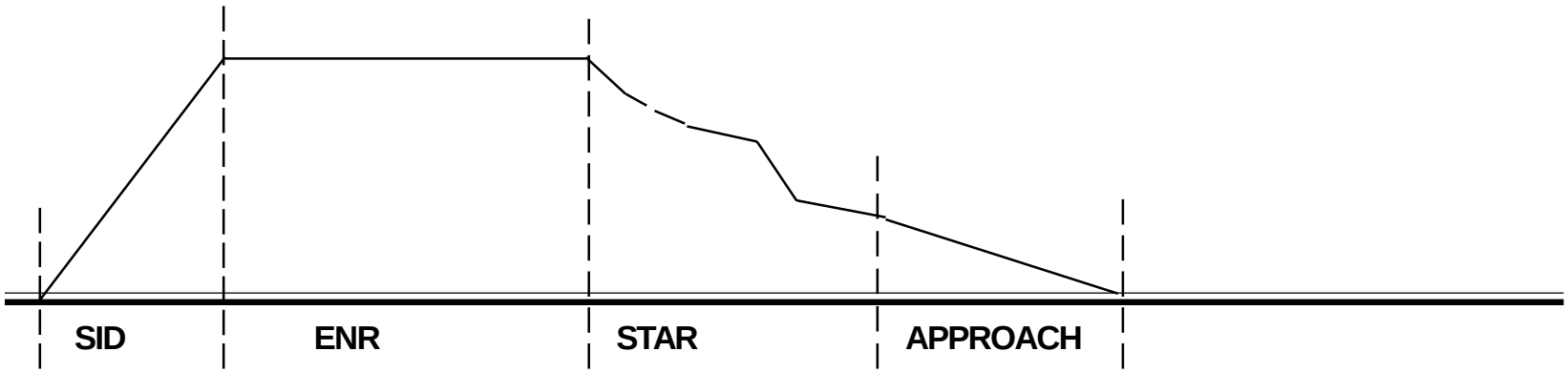
Eample **STAR LAGI1E**
Kalmar (ESMQ)
on the STAR page with preview



Example **STAR LAGI1E** **ARC DME**
Kalmar (ESMQ)
ARC DME on the chart

Der ENav Data Flight Plan

Combining procedures to a complete flight plan



Route segments

SID, **STAR**, **APPR** are predefined procedures:
- for finding in the database under the name
- for combining by additive loading.

Procedures are always tacked together **additively**.
Complete procedures cannot be inserted into a procedure which has already been loaded. In this case the newly selected procedure replaces the one originally selected (**DELSEG** is then superfluous).

Enroute

ENROUTE waypoints are addied individually to the route as required:

✓ **NAV**

highlighting bar must be in the route box ***on the point*** (waypoint or name of a procedure), ***before*** which the **ENROUTE** waypoints are to be inserted.

✓ **NEXT (2 x)**
✓ **WPT**
✓ **IFR** Selects WPT database ENav Data
Selects (**ENR)** waypoints
✓ **INS**

Subsequent enroute waypoints are treated as a **route segment**:
=> can be deleted altogether with **DELSEG**.

Inserting waypoints

<u>Single waypoints may be inserted into existing procedures (not complete procedures)</u>

1. Highlight the waypoint of the RTE ***<u>before</u>*** which the new waypoint is to be inserted.
2. 2 x NEXT highlighting bar must be in the waypoint window
3. Select waypoints (name, ID or **UP** and **DOWN**)

If waypoints are inserted into fixed procedures, no procedure turns can be calculated and plotted for these points on the chart.
=> Plotting of **point-to-point guidance** known from VFR FMS flight management.

Deleting waypoints

An individual waypoint can be deleted with
✓ **DEL** after it has been highlighted.

Since procedural instructions may be distorted by inserted or deleted waypoints, if a misleading display appears the finished procedure should be reloaded.

Deleting complete procedures

Procedures no longer required can be deleted with
✓ **DELSEG** aus dem Flight Plan (bleiben im Speicher bestehen).

Putting together and saving your own flight plans

All ENav Data waypoints can be used to put together **USER** routes.

USER routes / route segments are displayed in point-to-point routing.

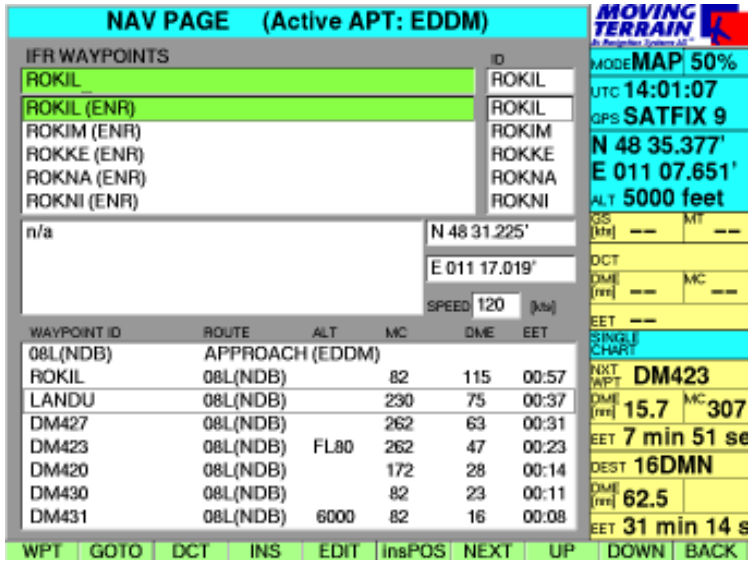
The ENav Data Flight Plan

Inserting a position – an example

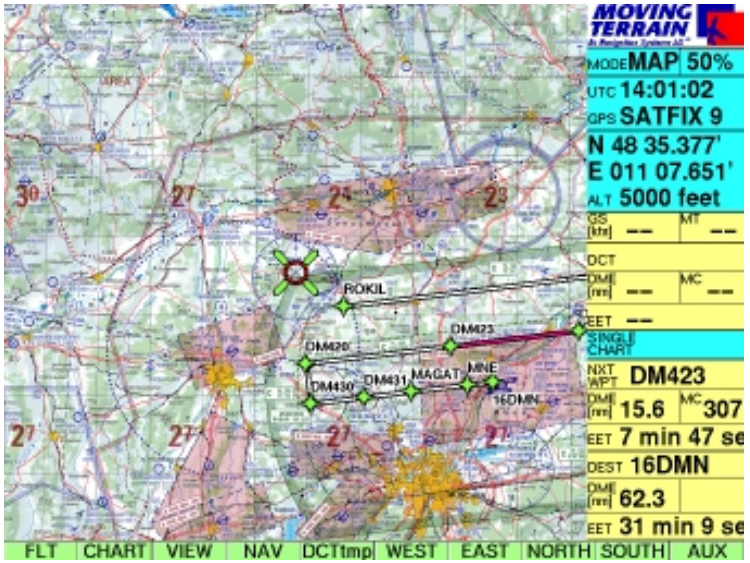
Waypoints may be inserted into an existing procedure

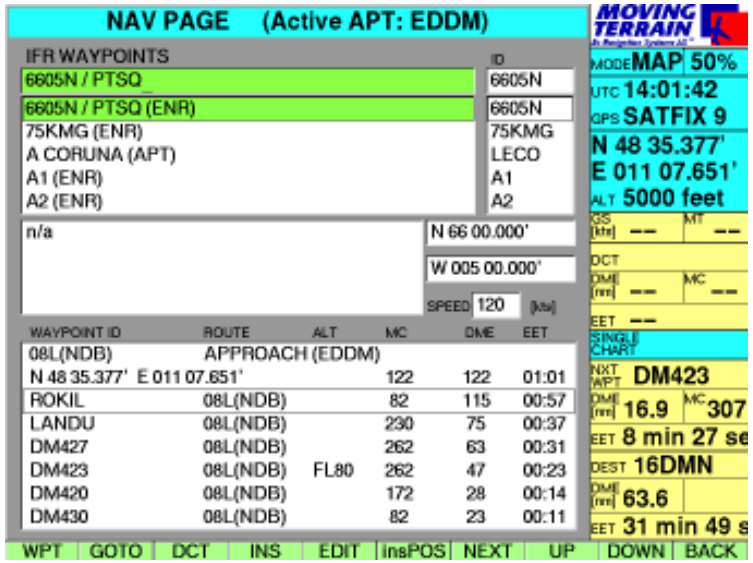
Example with InsPOS

No procedure turns are plotted on the chart, but the point-to-point routing already familiar from VFR FMS flight management.

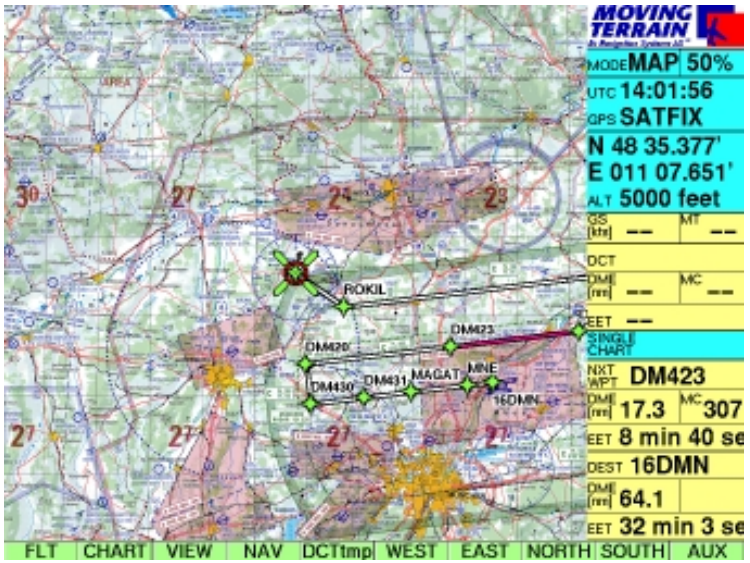


vorher

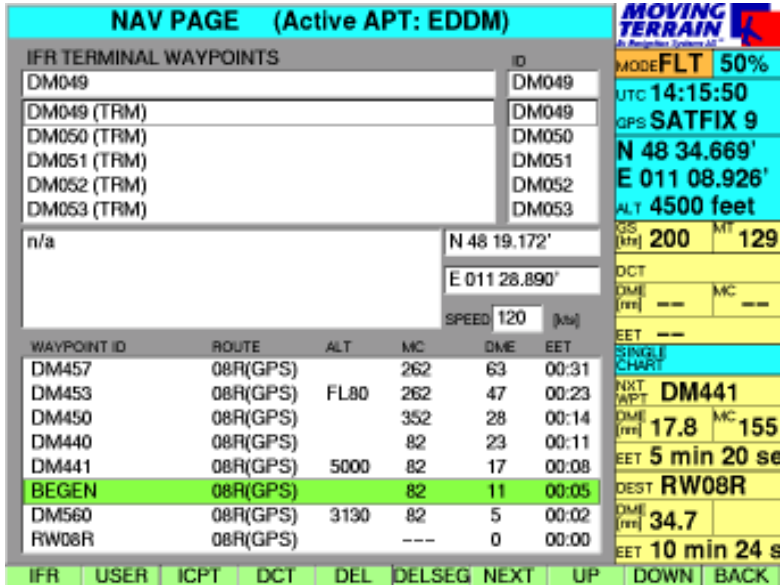


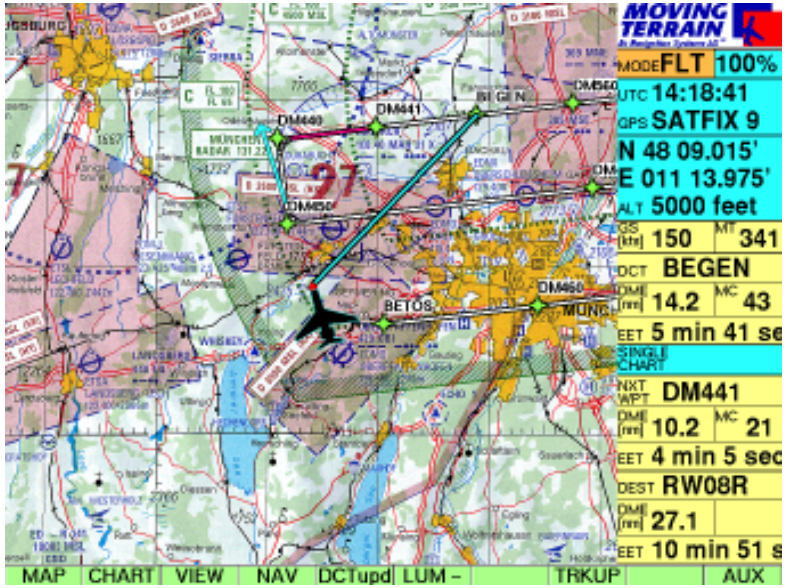


before **insPOS**



Direct from the flight plan – an example

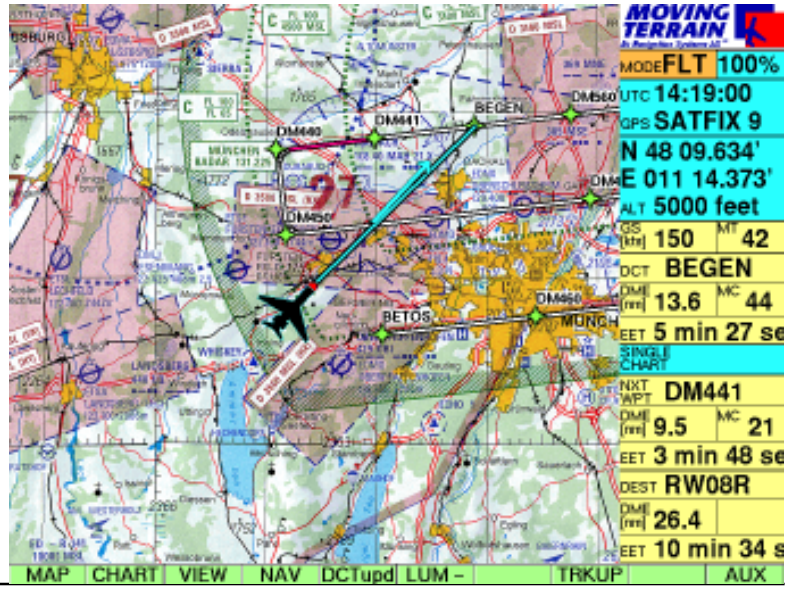




Abbreviating GPS approach to waypoint BEGEN

- ✓ **NAV** Nav page
  highlight **Begen** in the flight plan box
- ✓ **DCT** The system immediately reverts to the chart
  - ✓ Light blue vector shows the path
  - ✓ Flight management in the info box

- ✓ **The course can be immediately corrected to the DCT.**



Please refer to page FMS - 12 for information on flight management in the FMS window.

Fight management to the NEXT waypoint by ENav Data navigation is only really practical during the ENROUTE part.

During landing and takeoff procedures the dots are sometimes so close together that point-to-point guidance is not possible.

During turns the NEXT waypoint cannot be determined by FMS.

MT Track / Automatic Logbook

MT Track / Automatic Logbook

MT Flight Recorder

MT Track = Flight path actually covered

- ✓ Start of recording with valid position (SATFIX) in flight mode
- ✓ Position (track points) recorded every 10 seconds
- ✓ Track is deleted when device is turned off. It must thus be saved beforehand if you wish to replay the track at some time in the future.

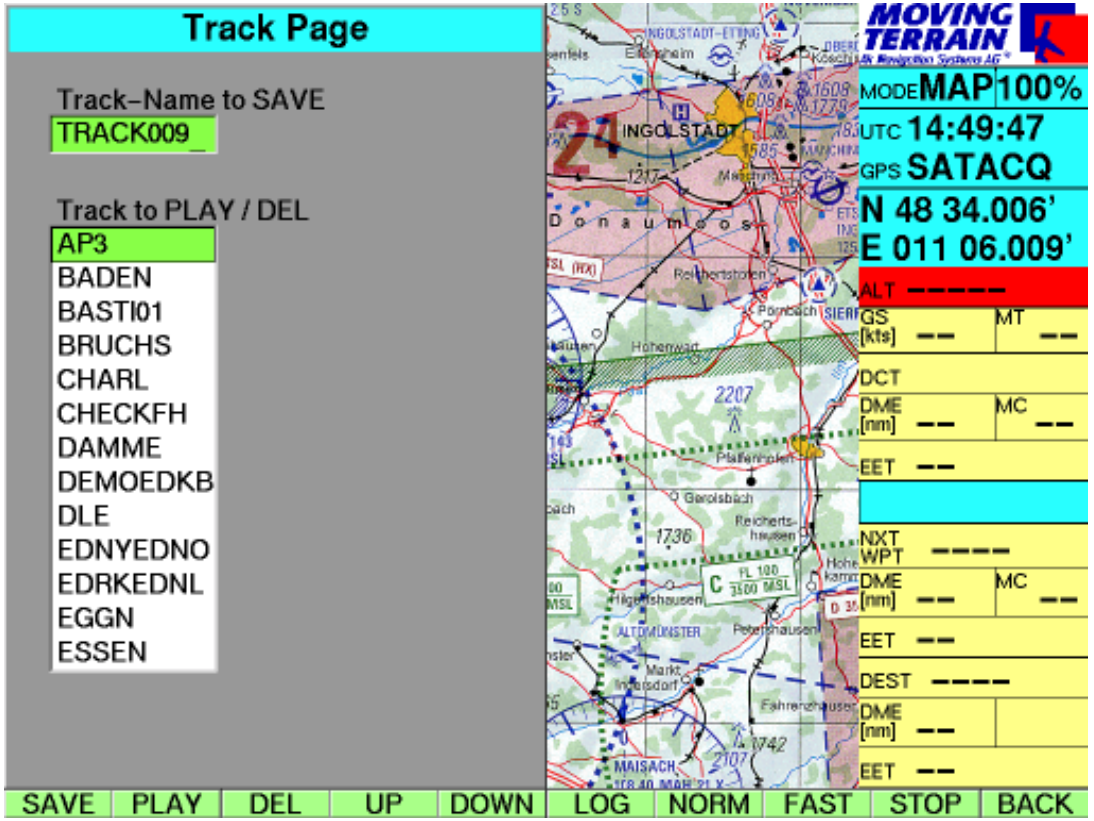
Saving and replaying a track

Retrieving the track page

- ✓ **AUX**
- ✓ **TRACK**

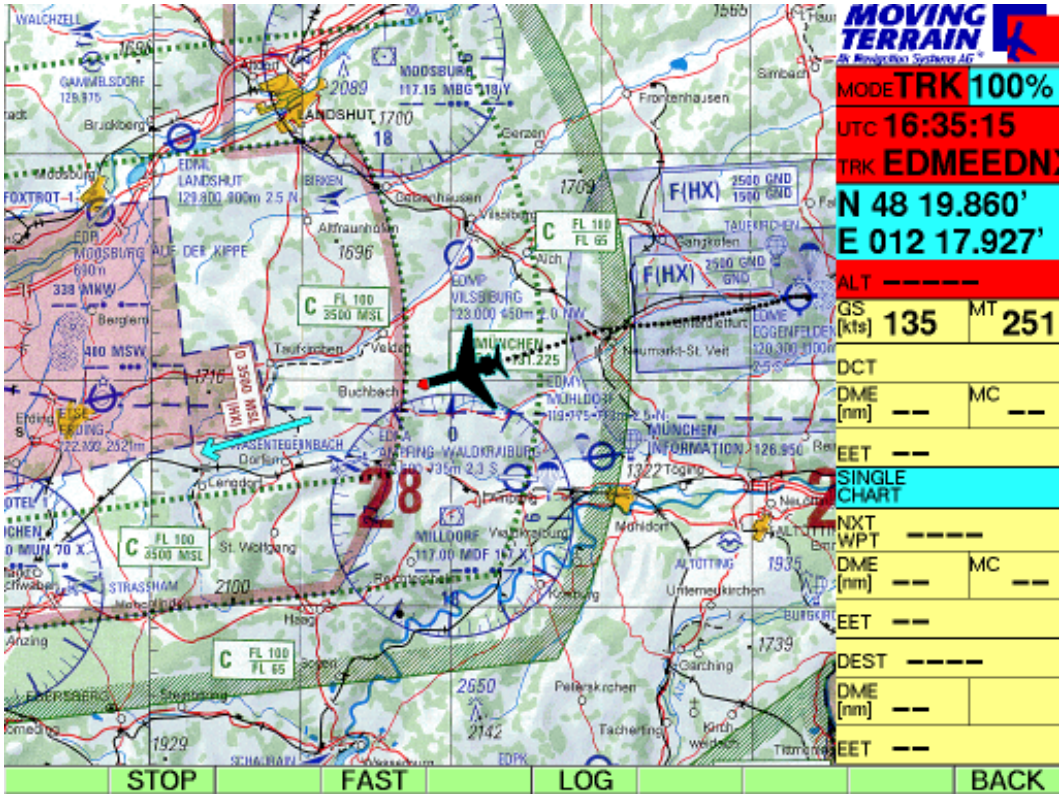
Key functions:

- ✓ **SAVE** Saves tracks you have just recorded (flown) – before switching off device! – under a unique name (or one provided by system)
- ✓ **PLAY** Replay a track
- ✓ **DEL** Delete a track
- ✓ **UP**
- ✓ **DOWN**
- ✓ **BACK** Returns to map mode



Replay mode with keys

- ✓ **FAST / NORM** Fastest possible/ delayed replay of recorded track
- ✓ **STOP** Ends replay
- ✓ **BACK** Returns to map mode
- ✓ **LOG** Flight log



Without interrupting replay mode you can

- ✓ **VIEW** Zoom into the chart, hide the info box
- ✓ **CHART** Change the base chart
- ✓ **CHART/SIN.CHA** Select a single chart
- ✓ **DCT** Select direct
- ✓ **NAV** Work with the Nav page.

Replay is ended when you change to flight mode.

MT Logbook

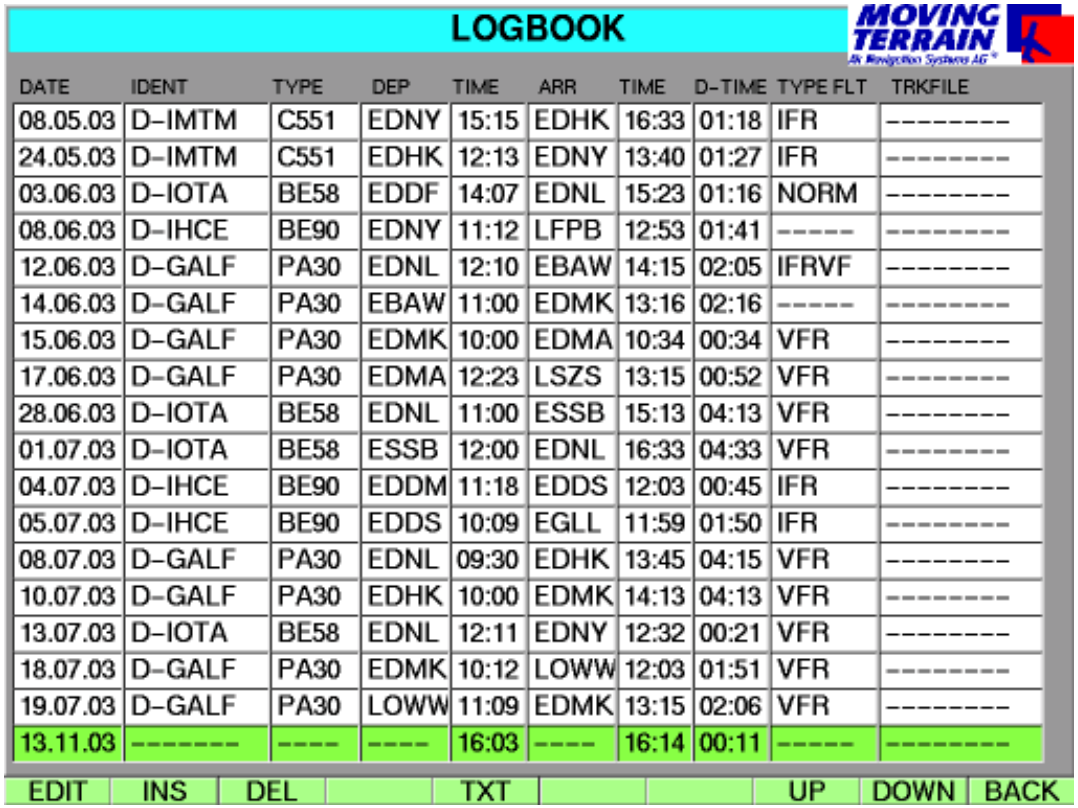
Automatic entries at speeds of > 40 knots

MT Automatic Flight Log

✓ **LOG**

The following data is assumed from the GPS:

- ✓ **DATE** Flight data
- ✓ **(Dep) TIME** Takeoff time: recorded when ground speed is greater than 40 knots
- ✓ **(Arr) TIME** Arrival time: Ground speed less than 40 knots
- ✓ **D-TIME** Total flying time HH:MM (calculated)



LOGBOOK

MOVING TERRAIN

DATE	IDENT	TYPE	DEP	TIME	ARR	TIME	D-TIME	TYPE FLT	TRKFILE
08.05.03	D-IMTM	C551	EDNY	15:15	EDHK	16:33	01:18	IFR	--------
24.05.03	D-IMTM	C551	EDHK	12:13	EDNY	13:40	01:27	IFR	--------
03.06.03	D-IOTA	BE58	EDDF	14:07	EDNL	15:23	01:16	NORM	--------
08.06.03	D-IHCE	BE90	EDNY	11:12	LFPB	12:53	01:41	-----	--------
12.06.03	D-GALF	PA30	EDNL	12:10	EBAW	14:15	02:05	IFRVF	--------
14.06.03	D-GALF	PA30	EBAW	11:00	EDMK	13:16	02:16	-----	--------
15.06.03	D-GALF	PA30	EDMK	10:00	EDMA	10:34	00:34	VFR	--------
17.06.03	D-GALF	PA30	EDMA	12:23	LSZS	13:15	00:52	VFR	--------
28.06.03	D-IOTA	BE58	EDNL	11:00	ESSB	15:13	04:13	VFR	--------
01.07.03	D-IOTA	BE58	ESSB	12:00	EDNL	16:33	04:33	VFR	--------
04.07.03	D-IHCE	BE90	EDDM	11:18	EDDS	12:03	00:45	IFR	--------
05.07.03	D-IHCE	BE90	EDDS	10:09	EGLL	11:59	01:50	IFR	--------
08.07.03	D-GALF	PA30	EDNL	09:30	EDHK	13:45	04:15	VFR	--------
10.07.03	D-GALF	PA30	EDHK	10:00	EDMK	14:13	04:13	VFR	--------
13.07.03	D-IOTA	BE58	EDNL	12:11	EDNY	12:32	00:21	VFR	--------
18.07.03	D-GALF	PA30	EDMK	10:12	LOWW	12:03	01:51	VFR	--------
19.07.03	D-GALF	PA30	LOWW	11:09	EDMK	13:15	02:06	VFR	--------
13.11.03	--------	----	----	16:03	----	16:14	00:11	-----	--------

EDIT | INS | DEL | TXT | UP | DOWN | BACK

Completing the logbook

You can enter this data in the logbook:

- ✓ **IDENT** ID of your aircraft
- ✓ **TYPE** Aircraft type
- ✓ **DEP** ID of the departure airport
- ✓ **ARR** ID of the destination airport
- ✓ **TYPE FLT** 5 characters for your own notes e.g. IFR
- ✓ **TRACKFILE** Respective track stored in the MT system for replaying

Entries can be made in each line by pressing the key:

- ✓ **EDIT**

Enter data on the assigned keys of the integral keypad using the special characters:

- ✓ _
- ✓ **:**
- ✓ **.**

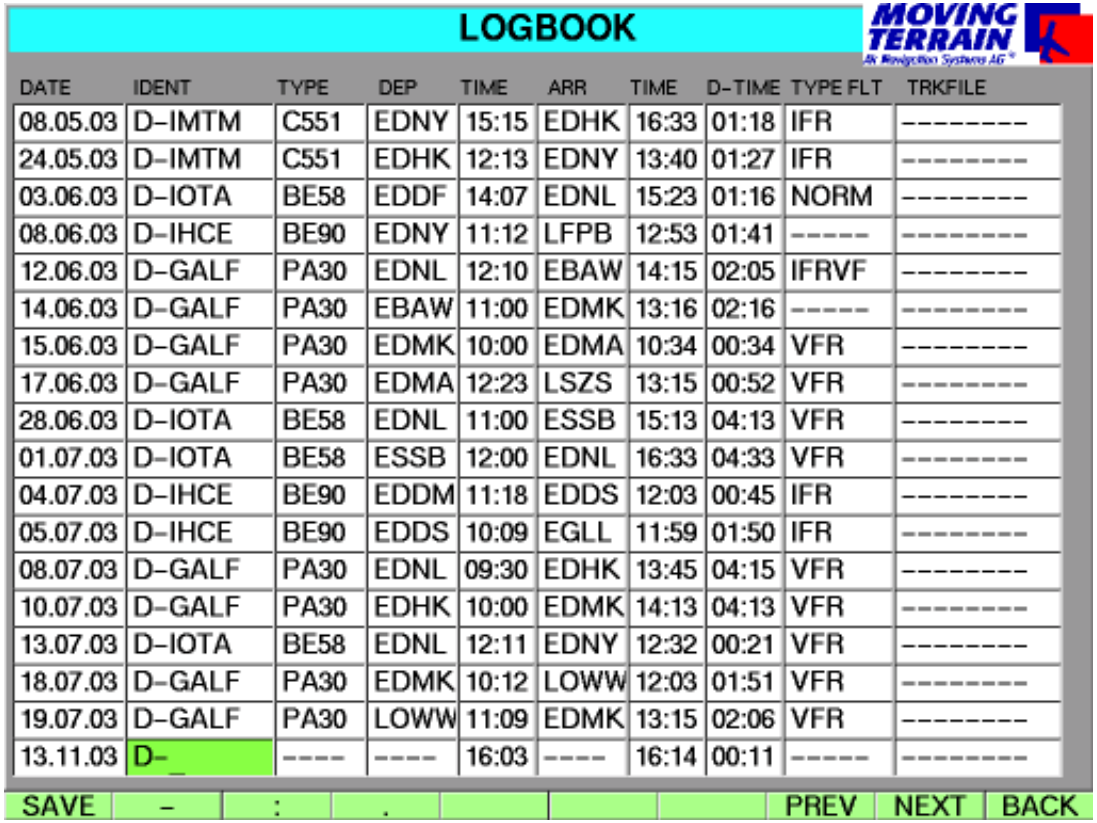
Move from one box to another with

- ✓ **PREV**
- ✓ **NEXT**

Confirm entries with

- ✓ **SAVE**

You will automatically be returned to the main page of the logbook.



If you wish to edit a further page, select it with:

- ✓ **UP** ✓ **DOWN**

Deleting / inserting flights

Delete whole entries with

- ✓ **DEL**

Insert flights with

- ✓ **INS**

Further processing as a TXT file

Press ✓ **TXT**
to enter the current status in a universally readable TXT file:
fltlog.txt in the MOVTER.PRO\TRACKS directory. You will then be able to edit this file.

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MT Rotating Chart

MT Rotating Chart

Fundamentals

Chart in 150% ZOOM only!

MT Rotating Chart

This module can only be activated on MT-VisionAir and MT-VisionAirEP

- ✓ **VIEW**
- ✓ **ROTATE**

In the main window the chart will rotate according to the direction in which you are flying.
All charts, base charts and single charts will be rotated independently of the scale.

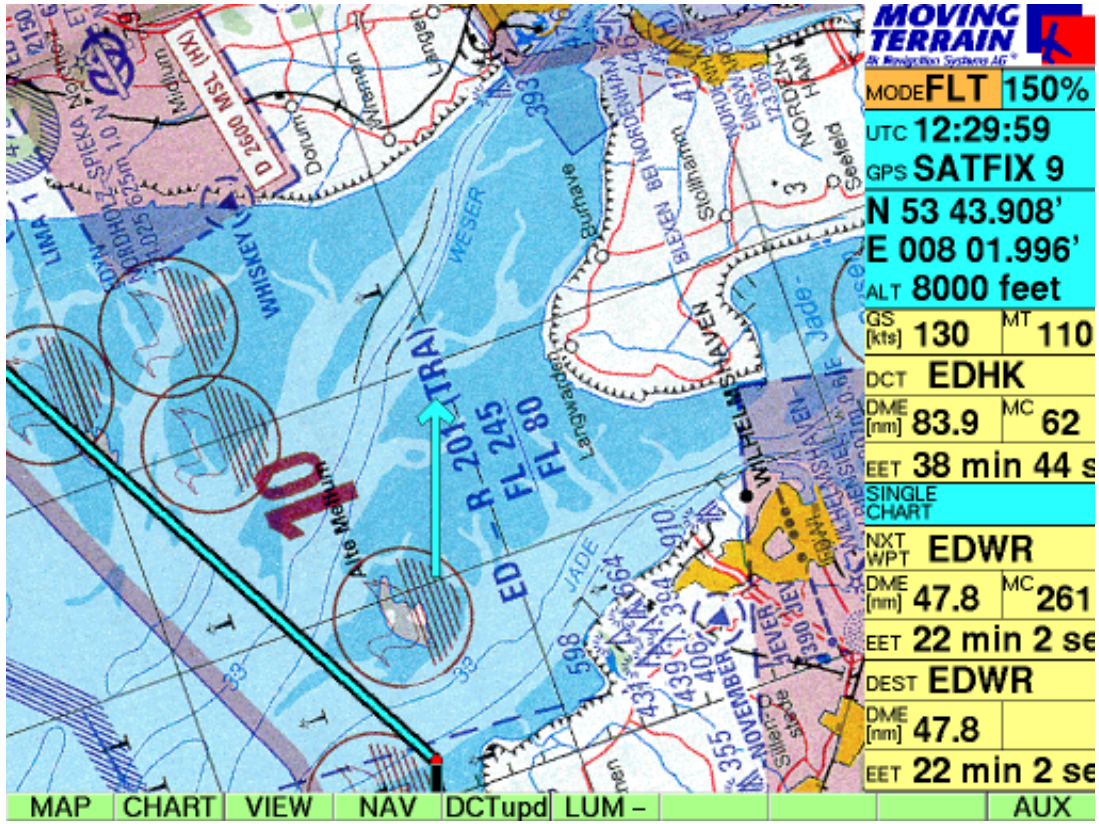
In flight mode the chart will be displayed in 150% ZOOM only (VisionAir can also display 75 %).

In map mode you have the option of zooming in or out of the chart

All Nav page functions are as usual.

You may switch to NorthUp mode at any time:

- ✓ **VIEW**
- ✓ **N-UP**



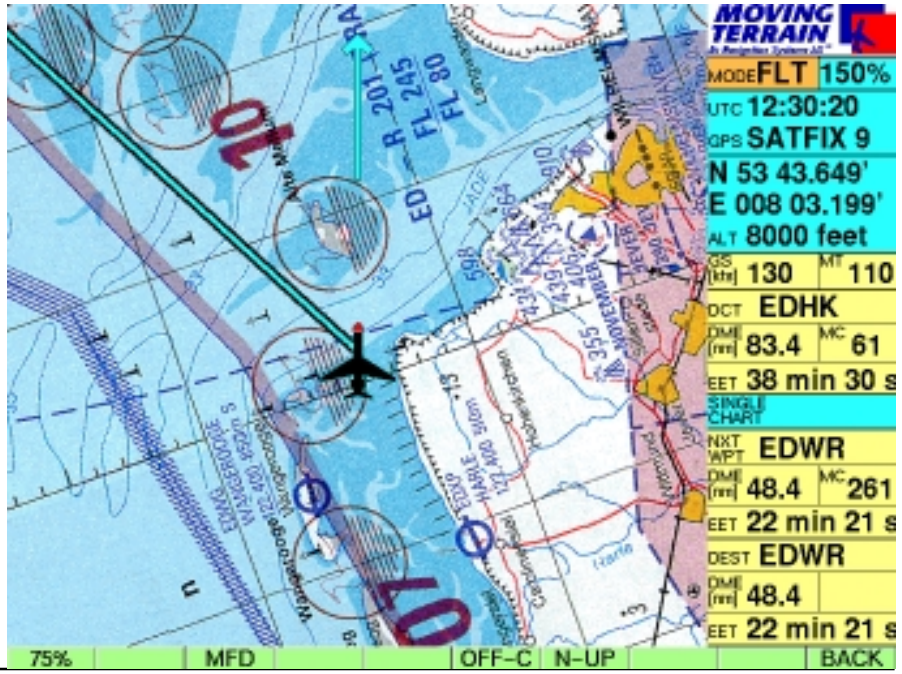
- ✓ Your own position can be shown in the center of the screen (upper Fig.)
  - ✓ **CENTER** (in the VIEW bar)

or at the lower edge (lower Fig.)

  - ✓ **OFF-C** (in the VIEW bar)

- ✓ In rotating mode the chart can be displayed in two zoom stages:
  - ✓ **75 %** (upper Fig.) - VisionAir only
  - ✓ **150 %** (lower Fig.)

- ✓ The display can be returned to NorthUp mode by pressing **N-UP**



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MT Charting Module

MT Chart Program

With MT Chart you can reference your own charts (scans). Using the assigned coordinates these can be controlled from the MT main program. MT Chart is a Windows program.

Scanning

Before launching MT Chart, the needed chart must be scanned. For interfacing with Moving Terrain, the chart must be prepared as a bitmap file in Windows BMP format (files with ending *.BMP). In addition, color resolution must be 24-bit, i.e. 16 million colors = true colors.

Otherwise it does not matter whether you scan the chart with a hand-held scanner at home, at a service center close by or send it to us for conversion to this type of file. You may use any standard scanner, as long as your file is saved as a 24-bit BMP file. For good, color-accurate and undistorted results it is best to use a color flatbed scanner.

Your original charts must satisfy the following prerequisites:

- They must be **to scale** (not distorted)
- **Latitude / longitude** must be readable on the **grid** or other points must be capable of exact referencing.
- For large areas it is important to make sure that the chart is based on a **cylindrical projection** (e.g. Mercator). Conic (section) projections are not suitable.

The program also tolerates rotated scans. For the sake of clarity they should be north-up, although the software compensates for errors caused by rotation.

Referencing

Upon launching MT Chart you will see a special referencing symbol (diagonal crosshairs) in the center of the screen, an as yet empty Navdata box and three menu items. In the map (Alt + A) choose the "**Open**" function or press F2. The "**Load Custom Chart**" file dialog will appear. Now select the drive, directory and file (in BMP format!) you wish to reference. You can move within the rectangular areas with the direction arrows, to the next box by pressing the tabulator and back to the previous box by simultaneously pressing Shift and Tab.

Once you have selected the chart you wish to reference (its name must be visible in the single-line box under file name), confirm by pressing Enter. The file will then be automatically converted to the Moving Terrain MTC format. You now have the choice of deleting or saving the BMP file. From now on you will only need the MTC file. We recommend deleting the BMP file from your hard disk. If you lack the means to scan charts yourself and had the file created externally, it is advisable to make a backup copy on another storage medium before you start work.

Now comes the most important part in the preparation of your chart for using with Moving Terrain: referencing. The more carefully you perform this step, the better will be the results you achieve subsequently together with the GPS. For referencing you must exactly reference three points on the chart (longitude and latitude). Move the chart with the direction arrows or the right mouse button to place the referencing symbol at a point whose coordinates are known to you or which can be read off the chart. For visual approach charts we recommend, e.g. the grid at the edge of the chart. If no coordinates are provided on the chart (e.g. street map), you can also drive/fly/walk to several points on the chart and measure the coordinates with the GPS.

You must reference **3 points**. Please note: your reference points should be distributed as far as possible over the chart. They should not be too close together and not lie in a straight line. The MT program will also run if you have referenced only 2 points, but you will be forfeiting an important safety backup and verification of accuracy.

To create a reference point, move the desired chart point beneath the referencing symbol and select the referencing menu (Alt + R) or press F8. In the dialog that appears you can give this reference point a name and enter its coordinates (up to 1/1000 angular minute). Again you can move from one box to another by pressing the tabulator and to the previous box by simultaneously pressing Shift and Tab. The point can be saved by pressing Enter (Save). Save three points in this manner. The program will now evaluate the accuracy of your input and the deviation of the chart from the rectangular reference due to the projection. The following evaluations will be provided:

Comments:	very good	good	medium	poor but useful	unuseable
del psi *	0-1	1-2	2-6	6-10	>10

(* Del psi is an internal evaluation criterion calculated from the relative angles of rotation of the chart between the earth coordinate system and the pixel system ensuing in each case from the straight line between the input points. The program simultaneously evaluates projection and reference errors).

Confirm this message by pressing Enter. The referencing quality can also be seen at MAP/ INFO.

Now save the correctly referenced chart with the Save function in the map menu (Alt + A) or by pressing function key F3. This will save the chart in the Moving Terrain format together with your referencing and it is ready for use in the Moving Terrain program.

Further functions in MT Chart

Map menu

In addition to the functions as outlined in Chapter 3.1 – Open, for opening BMP or MTC files, Save for saving MTC files with referencing, and Info for showing the quality of your referencing – the map menu (Alt + A) also contains the following functions:

Goto...

This function is used to check the chart into which you have entered coordinates. The referencing symbol is displayed precisely over the point stipulated by you. However, if the coordinates are off the edge of your chart, an error message will be displayed.

Zoom...

As in the main Moving Terrain program you can also view your own charts, except in the standard display, at a magnification factor of 200% or a reduction factor of 50%.

The charts on your Moving Terrain system

The charts prepared with the MT Charting module are available as single charts on your system. They must first of all be copied into your system's \MOVTER.PRO\CUSTOM directory.

Saving single charts in the MT system

To replay self-digitized, referenced single charts on your MT-VisionAir:

Create a ZIP file (e.g. WINZIP) from your *.MTC files and name it

SINGLECH.ZIP

Any number of charts may be combined in this ZIP file.
Now copy the SINGLECH.ZIP to the existing directory

\DATA

on the Microdrive (Compact Flash Type II) prepared by Moving Terrain
That is all the preparation needed.
Now insert the microdrive (Compact Flash Type II) into the **switched off** MT-VisionAir device and switch it on.
The updating process will start automatically.
Wait a few minutes (depending on the size of the file) until all the charts have been loaded onto the device.
Now **switch** the device **off** and remove the microdrive (Compact Flash Type II).
Upon restart you can activate your single charts with

- ✓ **CHART**
- ✓ **SIN.CHA**

Importing single charts into your MT-VisionAir with a Microdrive or Compact Flash

In the event that this procedure does not run correctly, the most probable reason is that insufficient space is available for the charts on your device's hard drive (or partition thereof). In this case please contact us. We will be pleased to help you find a solution.

To replay self-digitized, referenced single charts on your MT-ULTRA:

Start a burn prorgram in order to burn a CDR. Create a new directory on this CDR called **CUSTOM.** Now attach the *.MTC files you made in the directory CUSTOM. Burn the CD. Using the MT UPDATE UTILITY ,corresponding to your software version, you can now install the new charts you made onto your system. Choose option 1. Update from Moving Terrain CD in the update program.

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MT Special Coordinates

MT Special Coordinates

Fundamentals

Additional coordinate systems

Special Coordinates

Further coordinate formats are available in addition to the coordinates displayed in the latitude-longitude system.

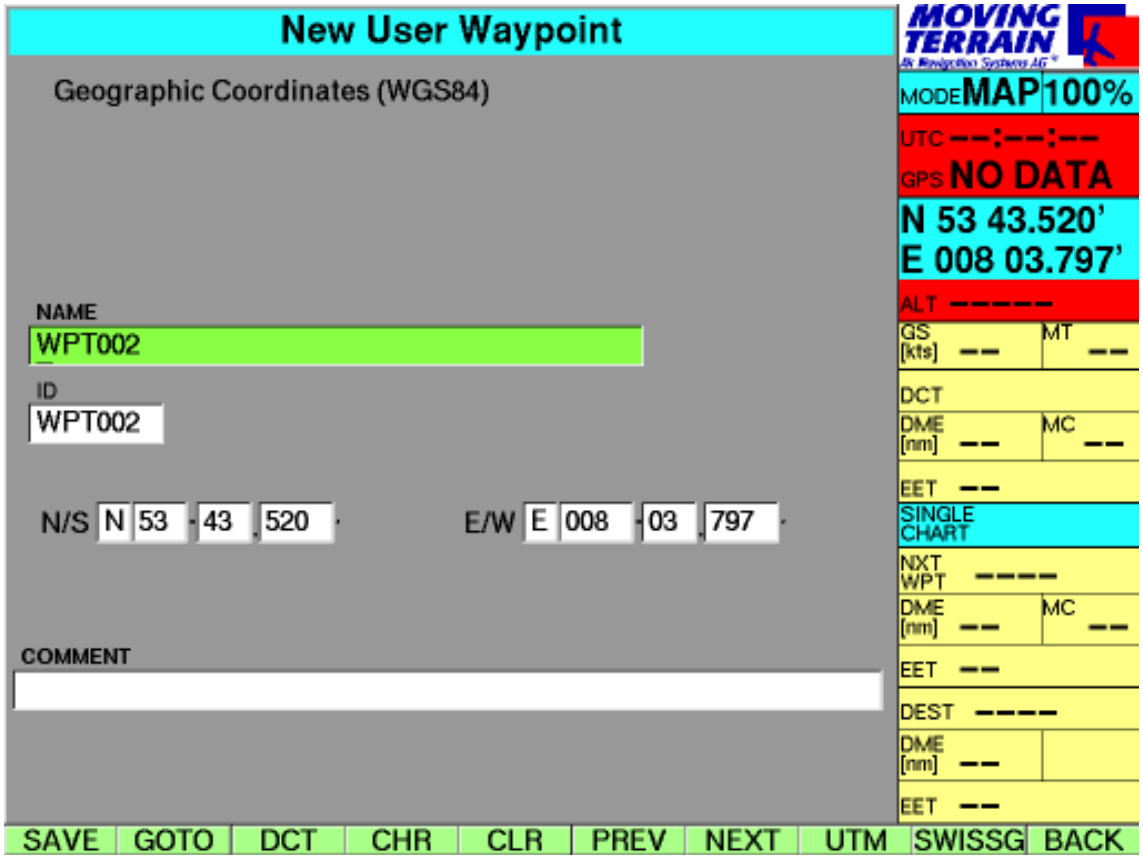
- ✓ **NAV**
- ✓ **EDIT**
- ✓ **NEW/MODIFY**

The choice now includes the following:

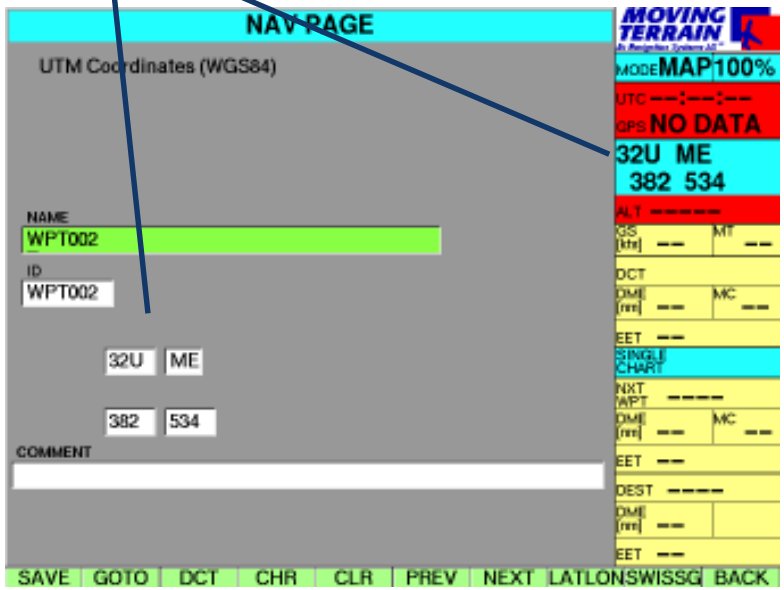
- ✓ **LAT/LON**
- ✓ **UTM**
- ✓ **SWISSG**

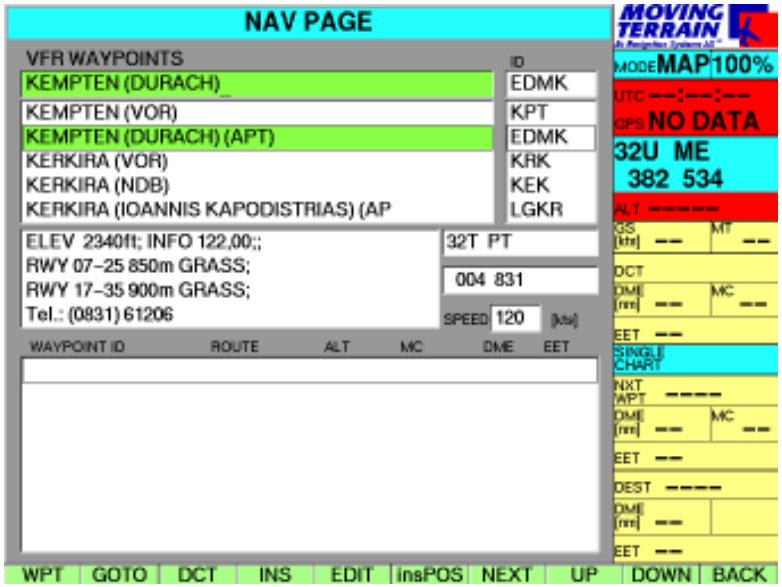
Once selected, a coordinate system remains active until it is switched off again.
The settings should be made when the system is started.

The coordinates must be entered into the INFO BOX in the selected format.

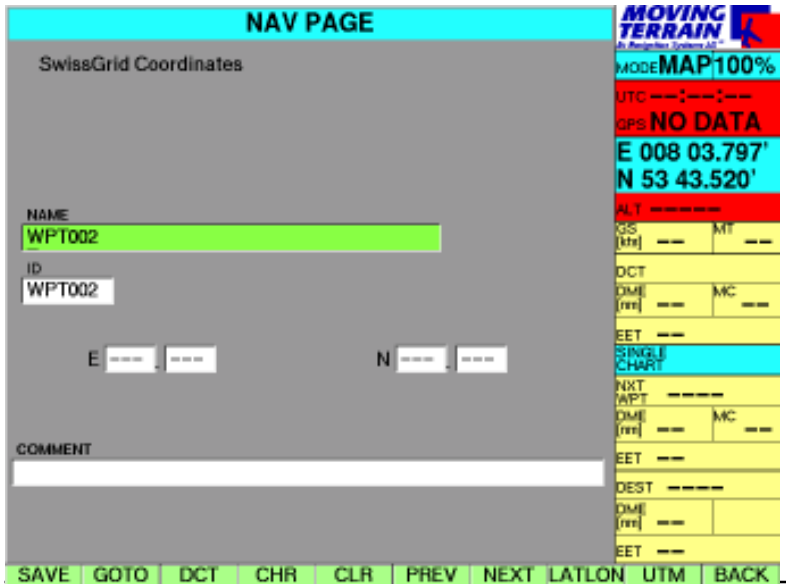


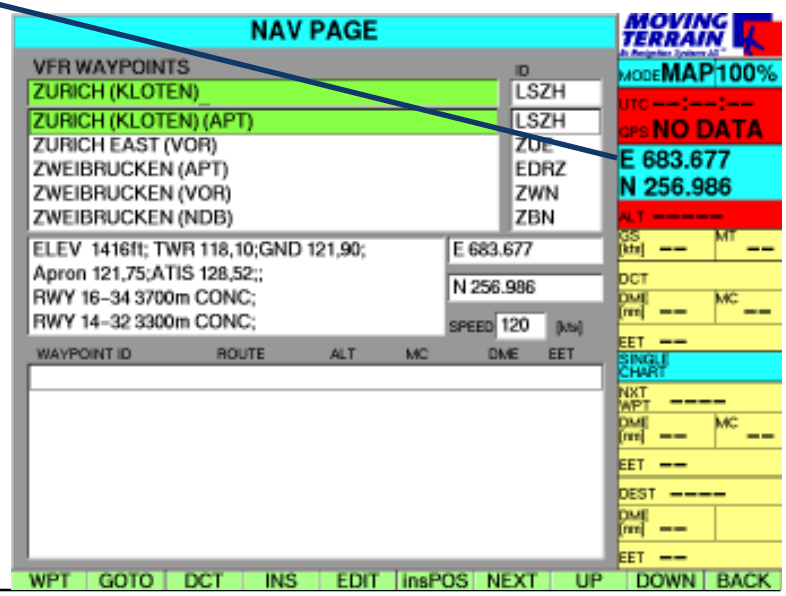
UTM:





SWISS Grid applies to Switzerland only





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Update of data, charts and program versions

Update of Charts, Data and Program Versions

MT-VisionAir

Updates are made using a **microdrive** or **Compact Flash Type II**.
The data carriers must have either been purchased directly from us or submitted to us for configuration after purchase elsewhere.

The updating procedure itself is simple and convenient:

- Insert the microdrive into the switched-off device (reverse side up)
- Switch on the device. The update will run automatically and can be monitored on the basis of status reports shown on the display.
- When the final message “Update successful“ appears, switch the device off and remove the microdrive.

Your device now contains the latest data and is ready for operation.

In the event that the data carrier is not recognized when the device is switched on (this will be the case if Moving Terrain is launched!), switch the device off and try again. Data carriers sometimes have start-up problems.

During the update procedure all data will be loaded into the device from the data carrier. This may take some time. Please allow for this in your schedule and avoid performing the update at the last moment.

Data updates from the Internet via microdrive

To import data downloaded from the Internet or received by e-mail to your MT-VisionAir device:

You will need a microdrive (Compact Flash) that has been **prepared by us**. Plug the microdrive into your office computer using the appropriate adapter.

We supply the data in the following forms:

VFR data: The data is named	VFR60.ZIP
ENav data	IFR60.ZIP
Obstacle data	OBSTACLE.ZIP

This data must be copied into the

\DATA

directory on your microdrive (Compact Flash). Do not unpack it!

Remove the microdrive (Compact Flash) from your office computer and adapter, plug it into the switched-off MT-VisionAir. When the device is switched on, the update will be started automatically. Once the procedure has been completed, switch the device off again, remove the microdrive and restart the device.

This procedure is basically the same as for single charts (*.MTC files) (see MT Charting).

MT Update Utility

MT Ultra

How does the installation program work?

Wozu braucht man das Installations-programm

MT-Ultra : Update of Data, Charts and Program Versions

MTUpdate Utility Version 6.0:
Instructions for the installation program

Basic concept:

A standard PC and the MT-Ultra device are connected via cable and software.
Data is read by a PC from a CD-ROM or directory on the hard drive and transferred to MT-Ultra by cable.

To enable the two devices to be connected, the PC must be booted up in DOS mode. This is in turn enabled by the enclosed disk.

Please follow the instructions carefully and **perform the installation step by step**. It is important to adhere to the sequence of individual steps to ensure successful installation.

- The program enables the following installations from Moving Terrain CDs:

  Installation of **base charts**
  Installation of **Navdata** (VFR and ENav Data, hospital data)
  Installation of **single charts** (special charts, e.g. hospital helipads)
  Installation of **obstacle data**
  Installation of later versions = **MT program updates**

- You can transfer self-generated data **from your computer's hard disk**:
  single charts (created with the MTChart program)

- You can transfer **from disk**:
  Navdata = **Hospital helipads (SPITAL)**
  = **USER**

Preparation

For the update you will need:

- PC or laptop with disk drive;
- Laplink cable;
- Keyboard with PS/2 connector (with MT version 3.6);
- Boot disk = MT Update Utility Disk from MT;
- CD-ROM from MT.

Connecting the two devices

Important: Both devices must initially be switched off.

Step 1: Open the service cover at the rear of your MT-ULTRA device.

Step 2: Connect the 1st parallel port (printer port) of your PC (LPT 1) and the parallel port of the MT-Ultra device with the supplied Laplink cable.

Step 3: Switch on your MT-Ultra device. Wait until it has completely run up. Then press the AGREE key.

Step 4: Switch MT Ultra to the update mode:

a) If you have **Moving Terrain software version 5.0** or later, quit the program with **AUX** -> **QUIT** (keep pressed).

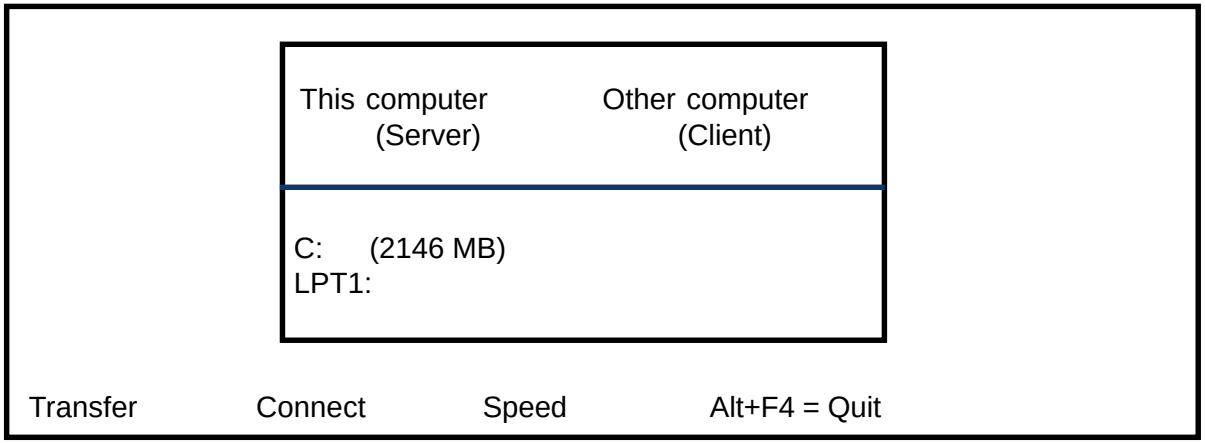
b) If you have **3.6x software** connect a standard PS/2 keyboard (adapter for other keyboards enclosed) to the respective keyboard outlet. Quit the MT program by keeping <F12> pressed for 5 seconds. Then press <ALT-F4> <ENTER> to exit Windows. At the DOS prompt enter the following line:

C:\>intersvr /lpt1 /v /x=a: /x=b: <ENTER>

or if you have a German DOS version and a US keyboard

C:\>intersvr &lpt1 &v &x)a> &x)b> <ENTER>

Independently of your MT software version, the following screen should appear:



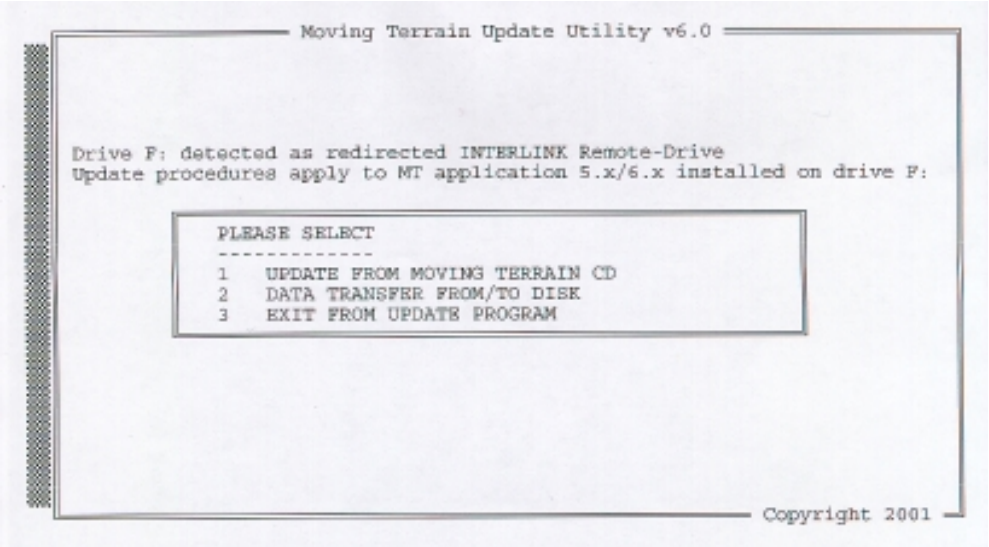
Your device is now ready to receive data.

Step 5: Insert the MT Update Utility disk into the disk drive of your PC.
Step 6: Switch on your PC.
Step 7: Set the keyboard options:

‘1’ = German keyboard
‘2’ = US keyboard
<ENTER>.

The program will now look for your MT application. Once successful, it will display the main menu:

The two devices have been successfully connected.

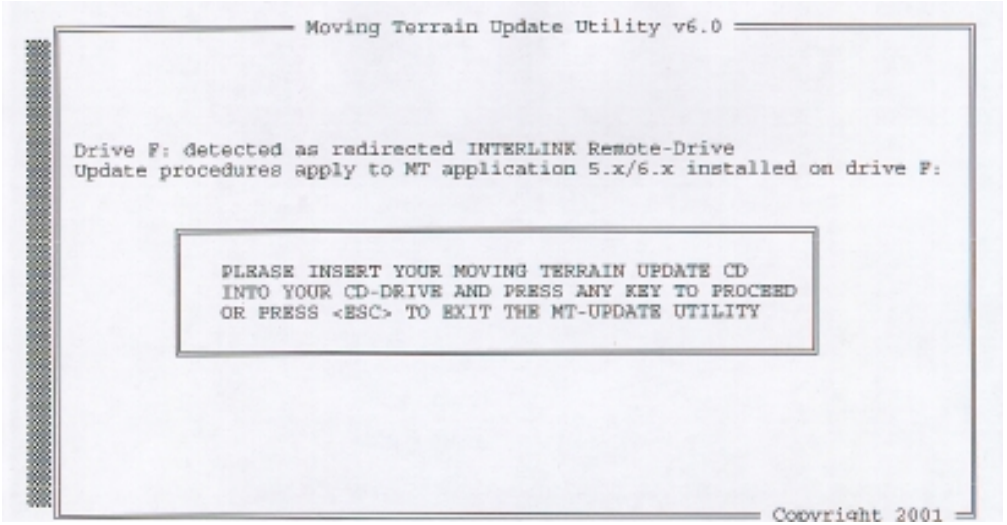


Installation options

Installation from CD

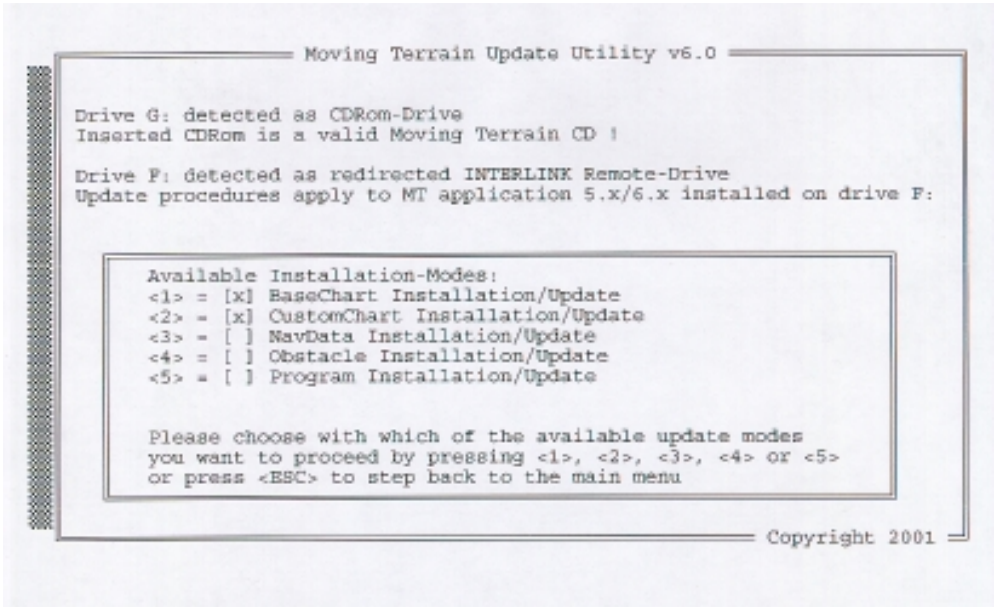
Now select the desired option by pressing the number preceding it.

To install data from a Moving Terrain CD select Option 1.
With the following screen you will be prompted to insert a Moving Terrain CD.



Insert the CD and press any key to continue the installation program.

Provided the CD is a valid MT installation CD, the program will display e.g. the following menu:

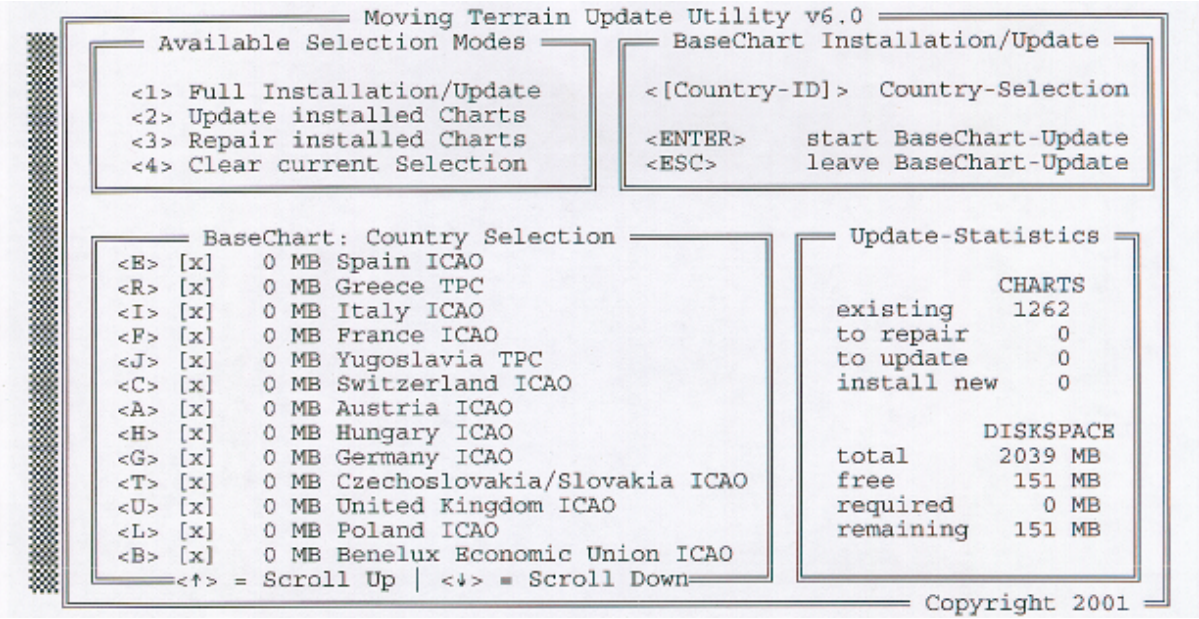


Installing/updating base charts

Active menu items are marked with an X.

- Now select your desired update or installation from the categories marked with (X) by **pressing number keys 1–5**.
- To return to the main menu press <ESC>.
- Obstacle installation/update is for the Rega version

Select 1: BaseChart Installation/Update



Make your choice on the number keys between:

<1> **Full installation/update**: Updates all existing charts and installation of new charts

<2> **Update installed charts**: Updates only existing charts (recommended for limited memory space)

<3> **Repair installed charts**: Repairs incomplete/defective charts.

<4> **Clear current selection**: Deletes your current chart selection.

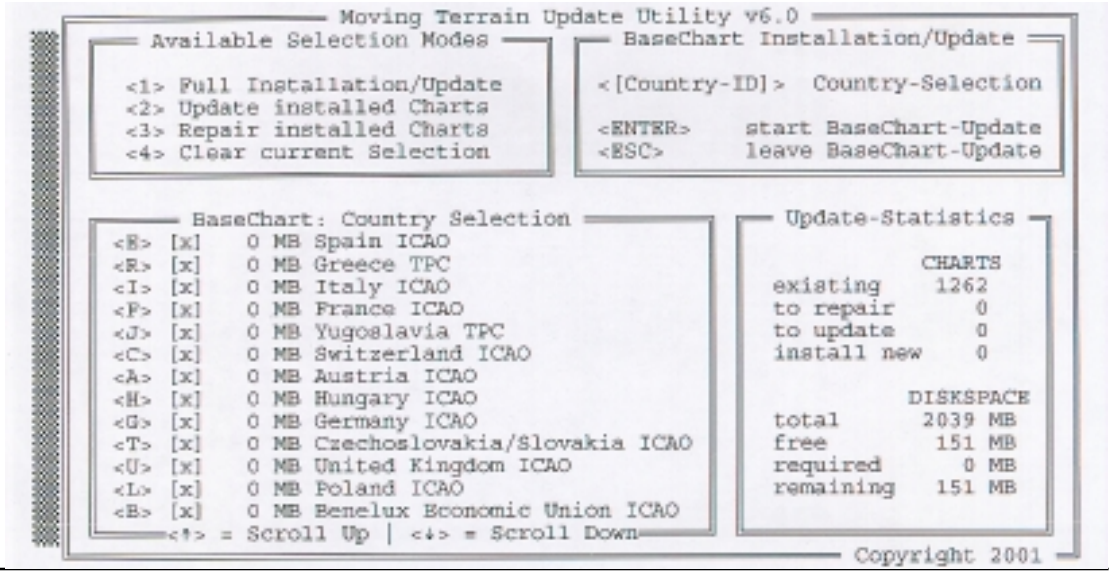
With this choice, a new window will open in the lower left half of the screen.

Activate the desired operation by **pressing ENTER**.

- The choice of countries enables you to put together precisely the combination you need for flight planning on your MT Ultra. Since your hard disk does not have unlimited space for the charts, you may need to limit your selection. All available countries will be shown in this list. Normally the complete data will be downloaded and the basic setting now active is for all countries.
- If you wish to define an individual choice, press <4> to deactivate the choice of all countries. Now you can select the countries applicable to you by pressing the respective letters (e.g. <E> for ICAO Spain, <G> for ICAO Germany).
- Please note: Since we fit together the available ICAO charts of European countries at their borders, the border zones can only be assigned to one country. For example, if you select Switzerland, you can be sure that the selected charts will not cover the complete territory, because the system has assigned some single files to France, Italy, Austria or Germany. In this case, please select the adjacent countries as well. If you want to fly into the Pyrennees, you should not forget to load the Spanish chart into your system.
- Exception: If you select Germany, the complete ICAO Germany will be loaded onto your system.

Important:
At the bottom right of your monitor you will see how much memory space is available on your device before and after installation (at least 10 MB must always be free!)

In this example installation cannot be started because insufficient space is available.



Select 2: CustomChart installation/update
All custom charts will be installed from an MT CD. Even when files have the same name, the older files will be replaced by newer versions. The selection of individual custom charts is not possible.

Select 3: NavData Installation/Update
Navdata is installed from an MT CD; older versions can be replaced by newer ones.
(applies only to Moving Terrain Standard VFR and ENav Data)

Installation or update of obstacle layers (Option 4) (see Updating from Disk)

To perform a software update of your MT-Ultra from Version 5.x to 6.x, or from version 6.x to a later version, choose Option 5.

Important: The user waypoint databases of the two basic versions 5.x and 6.x are incompatible. You must therefore delete your old database.
If you have already created a large number of user waypoints and do not want to lose them, you can save your database to disk (see also main menu item “Data transfer from/to disk” option “Load user waypoints from MT system”).
As a precaution, upon selecting the option “Program installation/update” if a user waypoint database exists in 5.x format the following window will be displayed:

```
THE USERWPT DB CAN NOT BE READ BY THE NEW PROGRAM
AND MUST BE DELETED!!!
PLEASE SPECIFY IF IT SHOULD BE SAVED ON DISK [Y/N]
OR PRESS <ESC> TO STEP BACK TO THE MAIN MENU
```

If you want to save your database to disk for converting later*, choose “Y”. If you have up until now hardly had occasion to record your own waypoints or your database has already been saved to disk, choose “N”. In case of doubt, you can press “ESC” to cancel and return to the main menu. No changes will have been made.

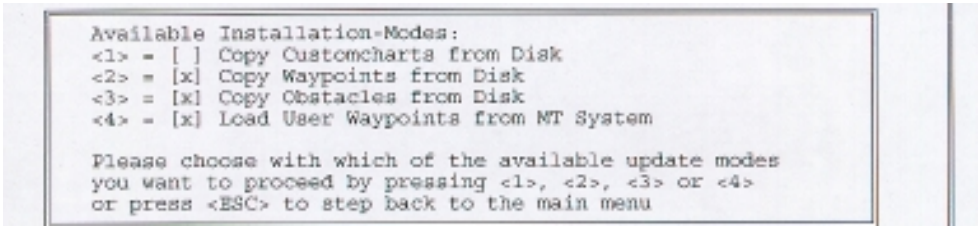
* If required, ask us about the conversion tool.

Registering the Moving Terrain version on your device

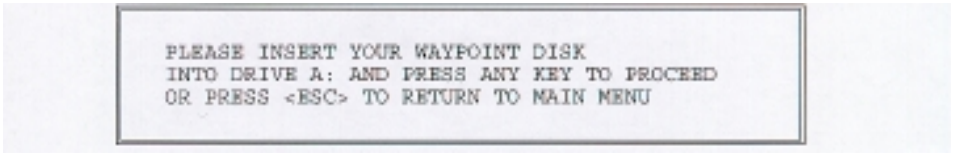
After installing a new program version, the device must be re-authorized (see Appendix: “Authorisation page”).

Installing/updating Navdata from disk

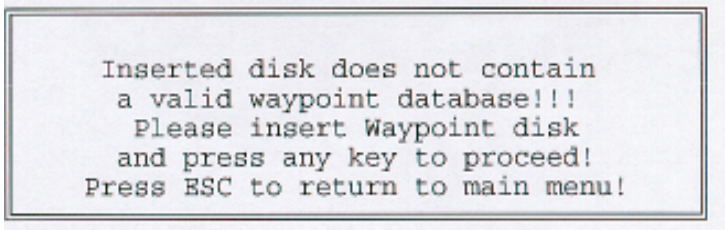
To installfrom a disk or backup of user waypoints select “Data transfer from/to disk” in the main menu 2:



Now select the desired installation.



The program will prompt you to insert the appropriate disk.
If you have inserted the wrong disk, the following error message will be displayed:



Now you may press ESC to return to the main menu or continue installation by inserting the valid disk and pressing any key.
Once installation has been completed, the program will prompt you to re-insert the update disk.

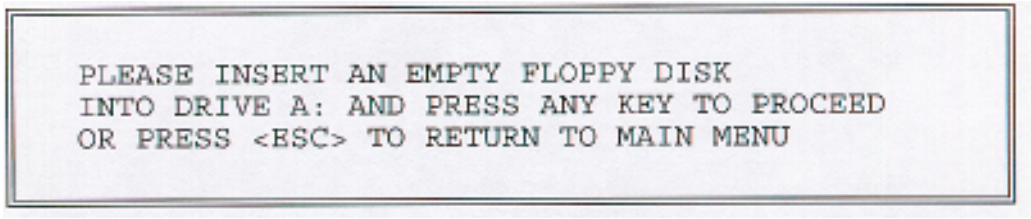
Installing/updating obstacles from disk

Select sub-item 3 “Copy Obstacle from Disk”

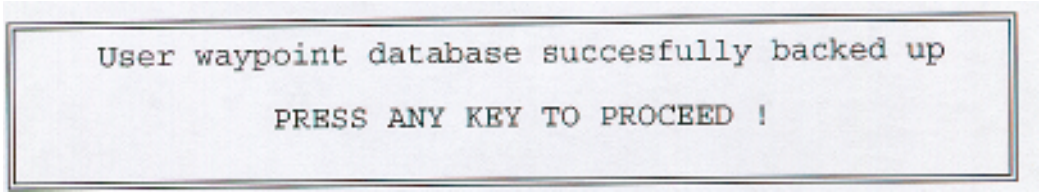
Important: Please quit the Update program only via the main menu EXIT in order to guarantee correct installation of the obstacle layer.

Backup of user waypoint database

Please keep an empty disk at hand.
Select sub-item 4 “Load user waypoints from MT system”.

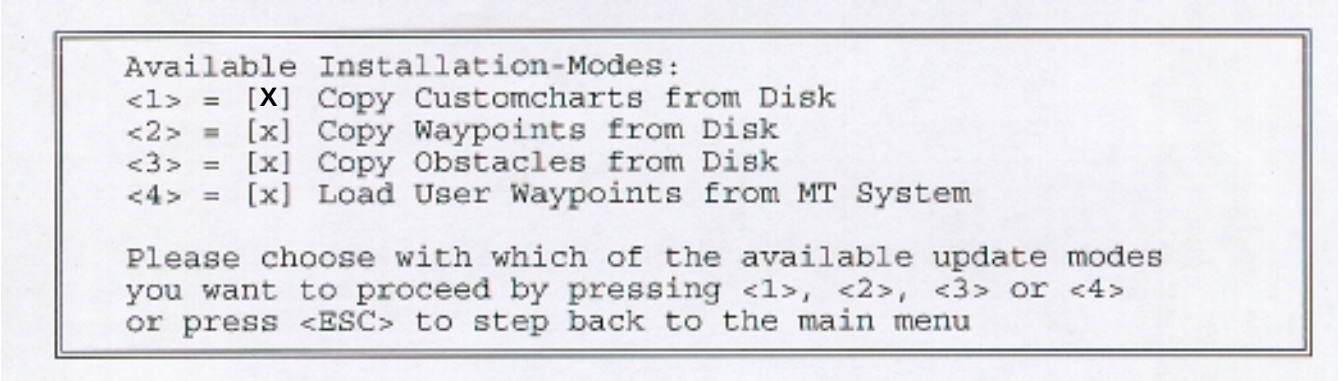


Now insert the empty disk and continue.



Installing single charts directly from the PC's hard drive

Important: Your referenced custom charts (*.mtc) must be stored in the directory **C:\MOVTER\CUSTOM.NEW**, otherwise the installation program will not find them. Please create a directory with this name on your PC's hard disk C: and save your custom charts to it.



Choose the option <Copy Customcharts from Disk>. The other functions given in this menu are not relevant for the serial version.

Completing the installation process

To finish the installation program choose option 3 in the main menu:
"Exit from Update Program"

Switch off the two devices and remove the interlink cable.

Remove the boot disk from your PC and keep it in a safe place. You will need it for further updates.

Close the service cover at the rear of your MT-Ultra with the three screws provided.

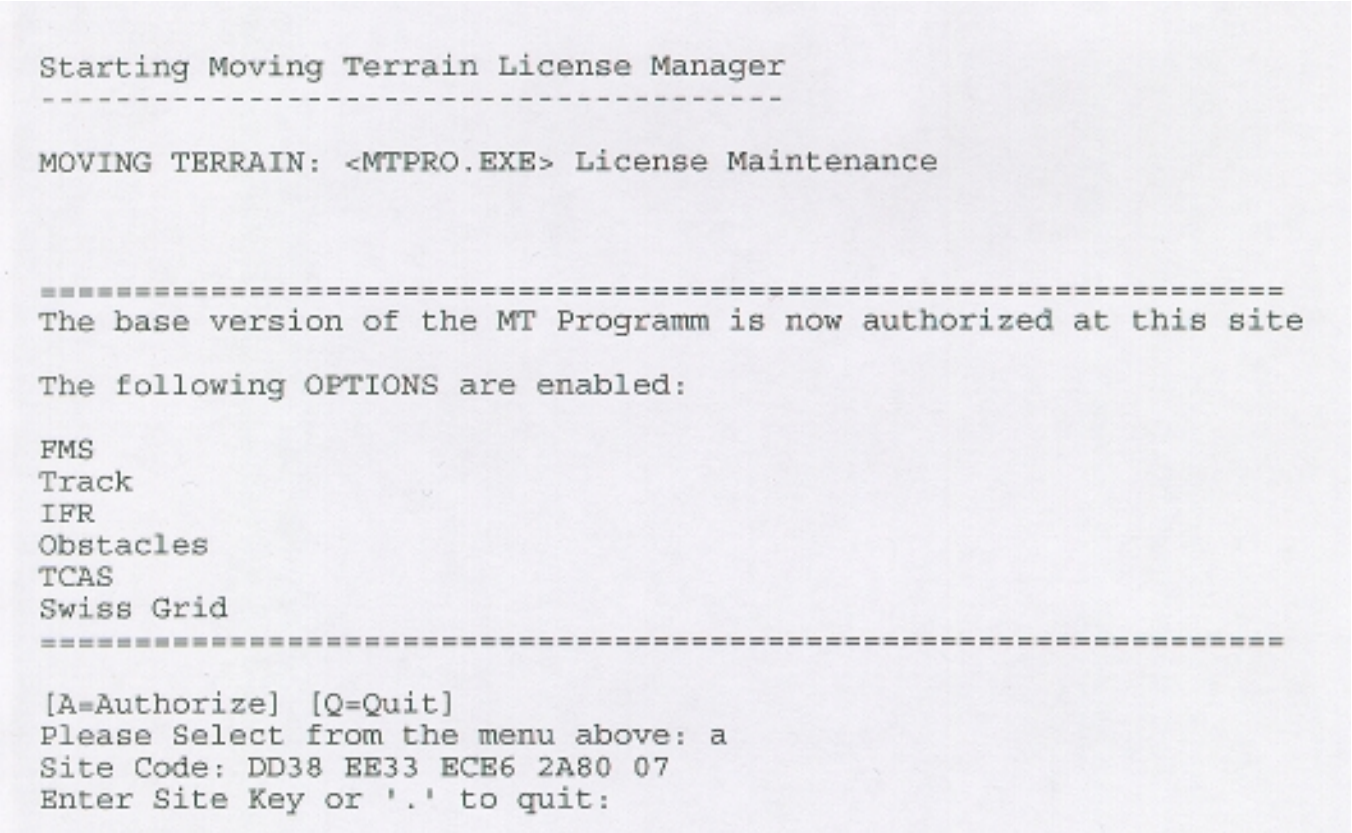
Authorization Page

Under

✓ **AUX** you will find:
✓**AUTH** Switch to Authorization Page

This function allows you to **enable further soft and/or hardware modules** on your system.
To enable these modules you will need a **code,** only obtainable from us.

✓ **AUTH** (**Keep pressed for approx. 3 seconds** = precaution against unintended activation!)
This will take you to the Moving Terrain Licence Manager.



Confirm with “Y”. Moving Terrain Licence Manager will now display information on modules currently enabled.

Close the MT License Manager by pressing “Q”.

Registration

Please enter the ‘site code’ in the enclosed form and fax it to Moving Terrain AG (08376 - 9214-14). Moving Terrain will send you your ‘site key’ by return fax.

This ‘site key’ must be entered and confirmed with <ENTER>. If you do not have a second keyboard, you may connect your PC keyboard temporarily to your MT-Ultra and use its ENTER key.

Please note: For version 6.1 d and later you will not need a 2nd keyboard. Confirm the site key by simply pressing a function key (buttons below the screen).

Finally, press ‘Q’ for QUIT to terminate the registration program and launch MT 6.x.

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