ELITE SIMULATION SOLUTIONS

Functional Description

Elite iGATE G512

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1 General

1.1 Introduction

iGATE is an acronym for "integrated General Aviation Training Environment." It is integrated, meaning that all required digital devices, hardware components and software interface as an integral part of one system. This is not a new concept as older analogue electromechanical trainers manufactured in the 70's and 80's were powered by a single electrical source.

The uniqueness is that iGATE trainers with their digital components combine several new technologies to provide a simulator with state-of-the-art flight dynamics for several types of aircraft, and other training capabilities at a single training station. A station that can be used on a desktop or used in an enclosed cockpit environment.

1.2 Trainer certification

The iGATE G512 can be upgraded toward JAR STD 3A FNPT I or FNPT II. In case of an upgrade, the G512 will be modified with a control loading unit, mock up and a Qualification Test Guide to assure the quality at any time. All Software changes which are related to the certification are implemented as well.

1.3 Flight modeling

The iGATE's precise aerodynamic flight modelling assures that each aircraft's flight characteristics are predictable and expected. iGATE combines aircraft known "book" data with data collected from actual aircraft flight tests to form the foundation of each flight model. The lengthy design process yields an acceptable flight model only after numerous cycles of testing, refinement, and re-testing.

1.3.1 Aerodynamic and Performance

The aerodynamic flight simulation will widely reproduce the flight characteristics of above mentioned Aircraft.

The simulation of the flight performance is based upon a math model which has been constantly improved during the last ten years. Full consideration is given to all variable surfaces and their effects. Simulation includes:

- Variation of aeroplane longitudinal, lateral and directional stability with altitude, airspeed and gross weight
- Single engine Characteristics for one engine out is simulated (asymmetric thrust effects)
- Stall characteristics
- Ground handling characteristics
- Attitude Indicator has a range, Pitch +50° / -30°, Bank +/- 90° (Training of unusual attitudes)

1.3.1.1 Wind effects

The effect of wind from any direction, at speeds from zero to sixty knots is realistically simulated and controlled by the instructor. The wind shows the correct effect on the ground track display during in-flight operation.

1.3.1.2 Atmosphere

Variation of temperature, pressure and density with altitude does follow the ISA standard model.

1.3.1.3 Ground Handling

Simulation includes turning effects due to rudders, brakes and nose wheel steering, representative flare and touch down effects. Also asymmetric thrust effects are simulated.

1.3.1.4 Take-Off and Climb-Out

With parking brake set and applied power, proper air plane pitch effects are simulated. During take-off, heading control can be accomplished via the use of nose wheel steering and/or rudder.

1.3.1.5 Stalls

There is full representation of the ”**approach to Stall**” and the recovery from it. Stall is simulated by cockpit instruments and associated flight characteristics.

The influence of airplane attitude, gross weight, configuration and altitude is also simulated.

1.3.1.6 Landing

The following is simulated during the landing phase:

- Rate of descent versus speed, power setting and wind conditions
- Control approach response
- Stall speeds in the approach and landing configuration
- Ground roll and deceleration

Ground effects (including wind effects) and air to ground transients are simulated to the best available data, representative of the in-ground effect characteristics of the actual flight.

1.3.1.7 Instrument Responses

Instrument responses to actual air plane responses reflect, but are not limited to:

- Aeroplane slip and rate of turn
- Rate of turn, as a function of bank angle and airspeed
- Attitude, altitude, rate of climb and trim changes with gear position and flap setting changes
- Pitch attitude, as a function of gross weight and airspeed

1.4 Physical dimensions

The trainer iGATE G512 dimensions are (w/h/d) 1.4 m x 0.46 m x 0.72 m. The weight is approximately 50kg.

1.5 Trainer computer(s)

All computing is performed with standard Windows based PC computers.
In case of an external Visual System, a TCP/IP connection is used between the Computers.

1.6 Navigation computing

Navigation database and navigation computing is based on WGS84 system.

2 Trainer Systems

2.1 Visual system

An external Visual system RealView or GenView is optionally avialable for the following areas: Switzerland (Real View), Western Europe, USA, Australia, New Zealand, India, China, Turkey, South Amerika and South Africa.

The visual display database allows to fly in the virtual world with accurate digital elevation models (DEM) and vector data accurately depicting rivers, lakes, highways, railroads and built up areas. In addition, every airport environment is highly rendered with runway designators, appropriate runway lighting, approach light systems and properly lighted generic taxiways. Inherent to the DEM is a fully programmable dynamic weather system that further enhances the realism of flight by providing 3-D obstructions to visibility, cloud coverage and several transition zones or layers for IFR, MVFR, SVFR or VFR on top. While utilizing actual downloadable METAR reports, it is possible to create a real-time flight experience and save the most challenging weather scenarios for recurrent training.

2.2 Instructor station

The instructor has access to the following pages, where he can also edit the relevant parameters via Keyboard and/or Mouse input.

- Initial Position
- Weather / Atmospheric Conditions
- Aircraft Conditions
- Map Page (Displays Airports and facilities for quick selection)
- Visual Control
- METAR Page
- Malfunction Page
- Control Page
- Configuration Page

2.2.1 Initial Position

The Initial Position (map page) gives the Instructor access to predefined positions on ground as well as in the air with defined aircraft loading, Cockpit Instrument settings, weather conditions and malfunctions.

2.2.2 Weather Page

The weather page contains information concerning the atmospheric conditions in the simulated environment. Parameters such as sea level temperature, sea level pressure, wind speed and direction, air turbulence, etc. are variable and the instructor has the possibility to modify these by inserting the desired values using the mouse. ISA standard day parameters are default values. All conditions can be saved and stored within a time frame where changes occur.

Variable limits are as follows:

- Sea Level Temp. -55°C to +55°C
- Sea Level Pressure 28.00 to 31.00 in./Hg (also displays in HPA)
- Wind Direction 0° to 359°
- Wind Speed 0 to 60 knots
- Wind turbulence level 1 to 12
- Pressure Altitude -1000 ft to aeroplanes ceiling

2.2.3 Control Page

The control page displays those parameters which apply to the simulated air plane. The instructor is able to modify certain parameters and where applicable, those changes automatically update related parameters affected by the change.

Parameters which are changeable by the Instructor:

- ZERO FUEL WEIGHT
- LEFT USABLE FUEL
- RIGHT USABLE FUEL
- LOAD

2.2.4 MAP Page

The map Page contains all facilities and airports, based on Navigational Databases. The instructor is able to select the Runway, reposition the air plane to any map position and also to modify all facilities.

2.2.5 Visual Control Page

The Visual Control Page contains all the means to set up the Visual Scene. It features high resolution runways and taxiways and a complete approach light system including PAPI/VASI, EFAS and REIL – systems.

Fog, haze, cloud layers and day to night transition allow to create realistic weather situations. The positions of sun and moon are calculated from the current time and date. The Visual System such as the RealView™ or GenView™ is an option to the iGATE G512.

2.2.5.1 Weather Page / Visual Scene

The Weather page is used to set weather conditions for the visual scene.

Parameters which are changeable by the Instructor:

- Visibility
- Cloud Layer definition height and depth (up to three layers)
- Cloud type few sct bcn ovc

Pre-selected Weather conditions can be saved and stored.

2.2.6 Failure description

2.2.6.1 Engine

Engine power loss selectable time frame between 0 and 99 min

Oil pressure	as above
Oil temperature	as above
Cylinder temp.	as above
Engine power loss	as above
Oil pressure	as above
Oil temp.	as above
Cylinder temp	as above

2.2.6.2 Electric & Instruments

Attitude Indicators	as above
Directional Gyro	as above
HSI	as above
Vertical Speed	as above
Airspeed Indicator	as above
Turn/bank coordinator	as above
Vacuum pump	as above
Static system	as above
Pitot freeze	as above
Pitot & drain freeze	as above
Electrical system	as above
Nav1 receiver	as above
CDI/LOC	selectable time frame between 0 and 99 min
GS	as above
Nav2 receiver	as above
CDI/LOC	as above
GS	as above
DME	as above
ADF receiver	as above
ADF antenna	as above
Transponder	as above

2.2.6.3 Gear / Flaps

Gear	as above
Flaps	as above

The malfunction page displays all armed and failed instruments. The Instructor is able to clear any malfunction individually and also clear all malfunctions with one input.

2.3 Approach / Profile MAP

The **Approach / Profile MAP** displays the geographical area, in respect to latitude and longitude, with all navigational aids displayed that are present in the NAV DATA BASE. The following data's are displayed on the same page:

- aeroplane position (lat., long.)
- aeroplane heading
- aeroplane altitude
- indicated airspeed
- aeroplane track
- Transponder code and mode

The area map is used to follow the air plane over an area selectable from 1.0 to 300 NM. zoom range. The NAV Aids are displayed as Symbols and the identifier are also visible on screen. To prevent the map from becoming too cluttered, it is possible to switch off NAV facilities according to the selected zoom level.

The following instructor controllable functions are available on the Map page:

- MAP SCALE 1.0 to 300 NM
- After the aeroplane flies past the area map boundary, it will hold the previous selected map scale
- TRACK ERASE This clears the current track and will begin a new one
- RADIAL/BEARING DISPLAYS This feature will enable the instructor to read the Radial or Bearing of the flight of NAV AIDS (ILS, VOR, NDB, etc.) from the map
- SWITCH TO PROFILE VIEW When selected, the area map will automatically display aeroplane speed, Flaps position, Gear position, Altitude and deviation to Glide Slope. The profile view is scalable

The **Profile view** displays the ILS capture area and shows both vertical and horizontal track relative to the glide slope and localizer position. It shows the air plane position in relationship of the selected ILS. Also, all associated marker beacons are displayed on both approach plans.

In relationship to the glide slope and localizer, the air plane's altitude and position is indicated as line on both approach plans. Along the bottom of the approach profile the map range is been displayed.

The following information is also displayed:

- Distance to touchdown in NM or KM
- Aeroplane height in feet above ground level, IAS, HDG
- Localizer deviation
- Glide slope deviation (half- and full deflection)

2.3.1 Auto Lesson

Duplication of mission for all trainees. Trainee can be confronted with a well defined training scenario. A utility is available for easy set up of these lessons.

2.3.2 Record / Replay

Part of the lesson can be recorded and replayed for debriefing purposes. The maximum recording time is 60 minutes.

2.3.3 Snapshot

This will create a file with all map related parameters, which can saved or printed for debriefing purposes.

2.3.4 Communication System

An external Intercom is available at customer request.

2.4 Avionics / Radio System Simulation

2.4.1 General

All avionics operate as they would in the actual air plane, except as explained in this section.

- Audio Panel (Software only)
- NAV/COM Receiver (Bendix/King KX 165 - 25)
- ADF Receiver (Bendix/King KR 87)
- DME Display/Control (Bendix/King KDI 572)
- GPS Receiver (Trimble 2000 Approach Plus)
- Marker Beacon Receiver (Bendix/King KR 21)

2.4.2 Audio System

The audio control system simulates NAV, COMM, ADF, Marker Audio and Intercom.

2.4.3 VHF Navigation / Communication System

The KX 165 - 25 operates as in the actual air plane with the exception that the COMM part does only display the Frequency and has no effect on communication between Instructor and pilot. An ATIS System is installed.

2.4.4 Marker Beacon System

The KR 21 marker beacon receiver simulates the aural outputs distributed to the respective audio systems.

2.4.5 DME System

The DME system simulates according to the approved airplane data. The Distance Measuring system provides digital readout of slant distance to a DME or VOR/TACAN ground facility.

2.4.6 Transponder System

The KT 71 Transponder reply light illuminates when the IDENT button is pressed, after release of this button it extinguishes after approx. 10 seconds. The Transponder mode and code is display in the instructors map page.

2.4.7 ADF System

The ADF system simulates according to the approved airplane data.

2.5 Aircraft types available

Currently the following aircraft configurations are available for the iGATE G1000 PTT:

- Cessna C172R
- Cessna C172RG
- Beech Baron B58
- Beech Bonanza A36
- Beech Duchess 76
- Beech King Air B200
- Piper Seneca III
- Piper Arrow
- Piper Arrow IV
- Piper Archer III

3 Documentation

- Software operating manual

4 Training

- Basic 1-day Instructor training at our workshops included
- Basic 1-day Hardware maintenance training at our workshops included

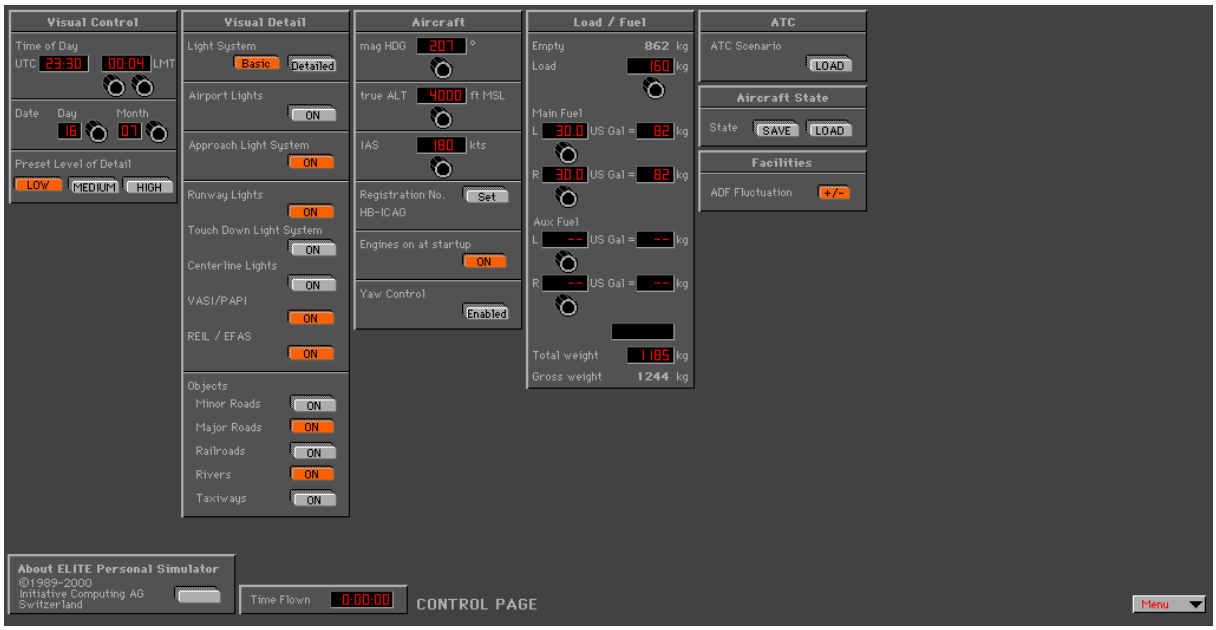
5 Spare Parts

Spare parts include heading bug module (Avionics Panel).

6 Screen Shots Instructor Station

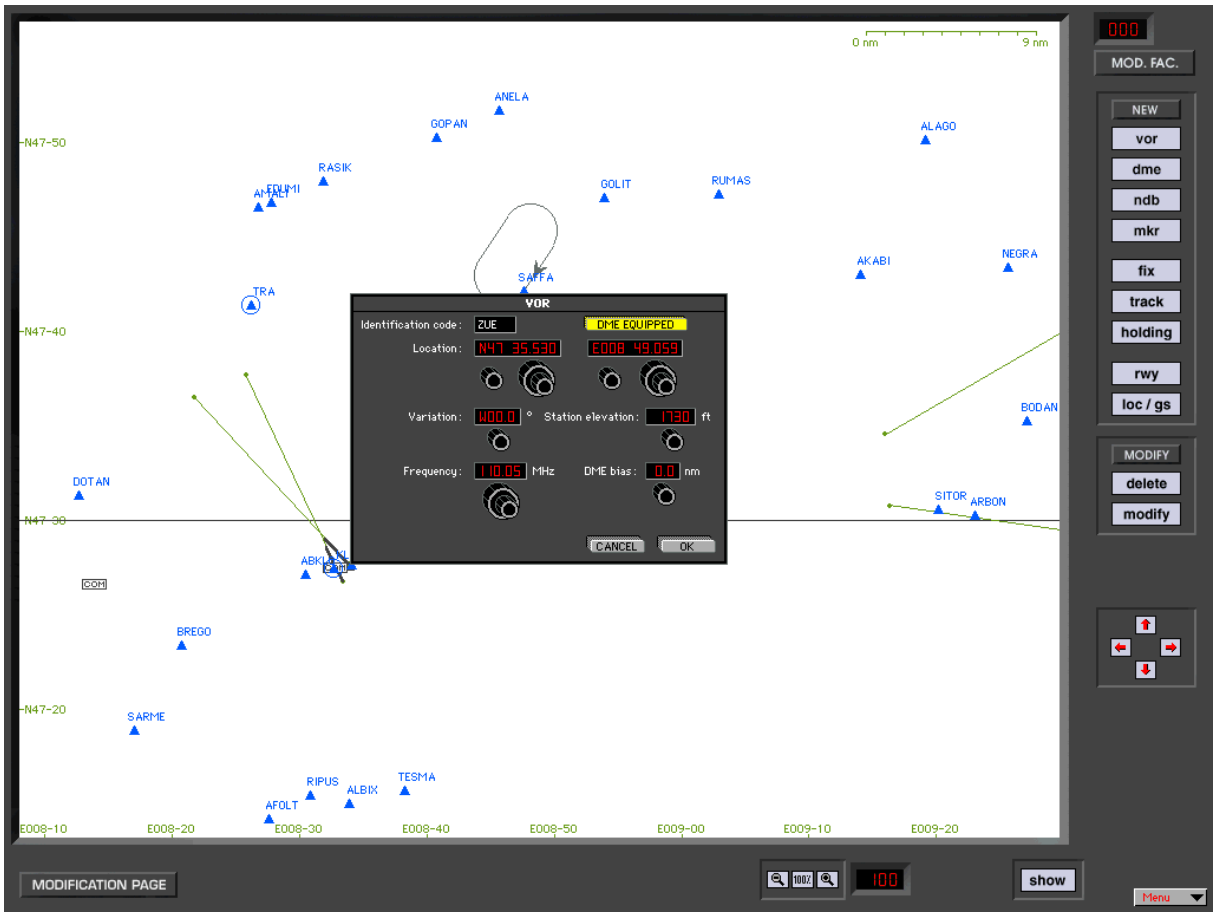
6.1 Configuration Page

6.2 Control Page



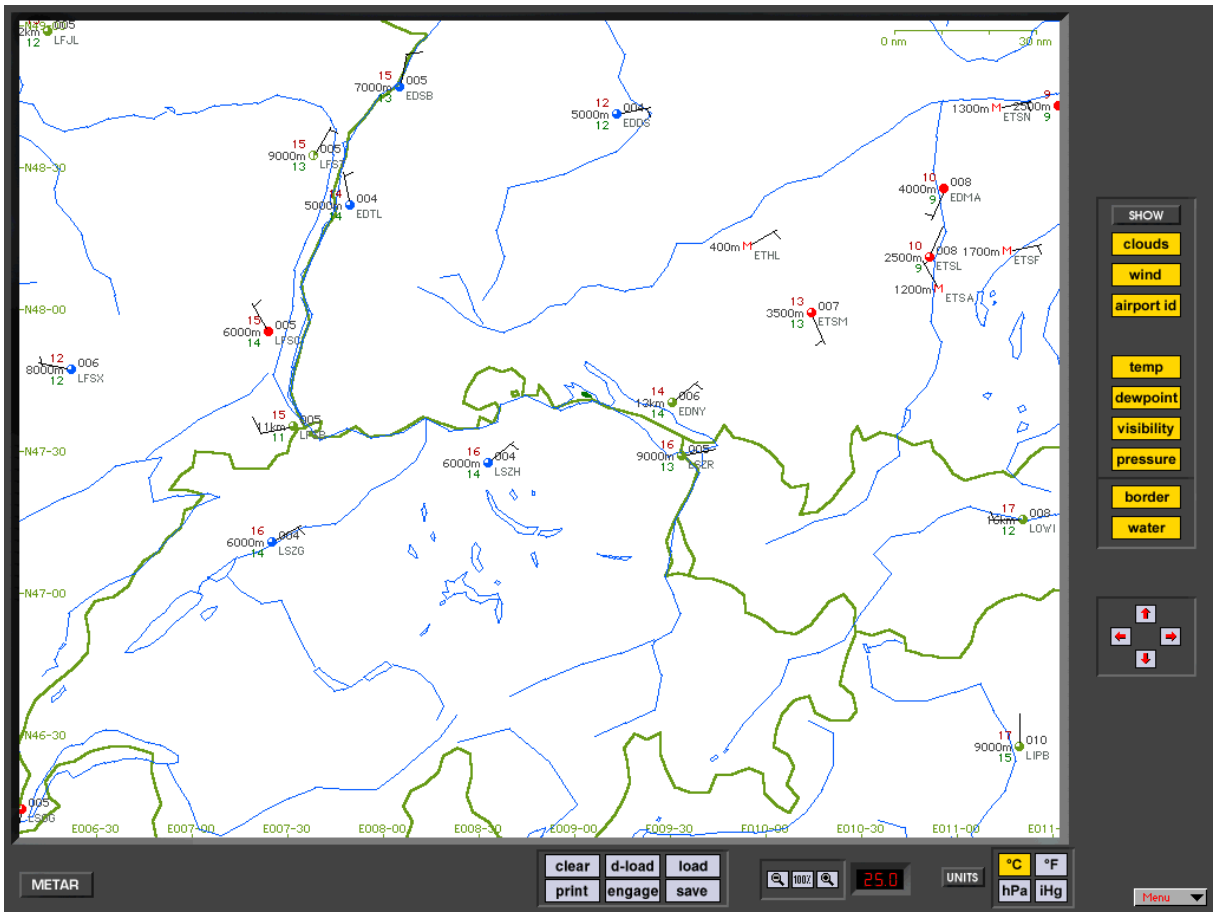
6.3 Malfunction Page

6.4 Navigation Modification Page

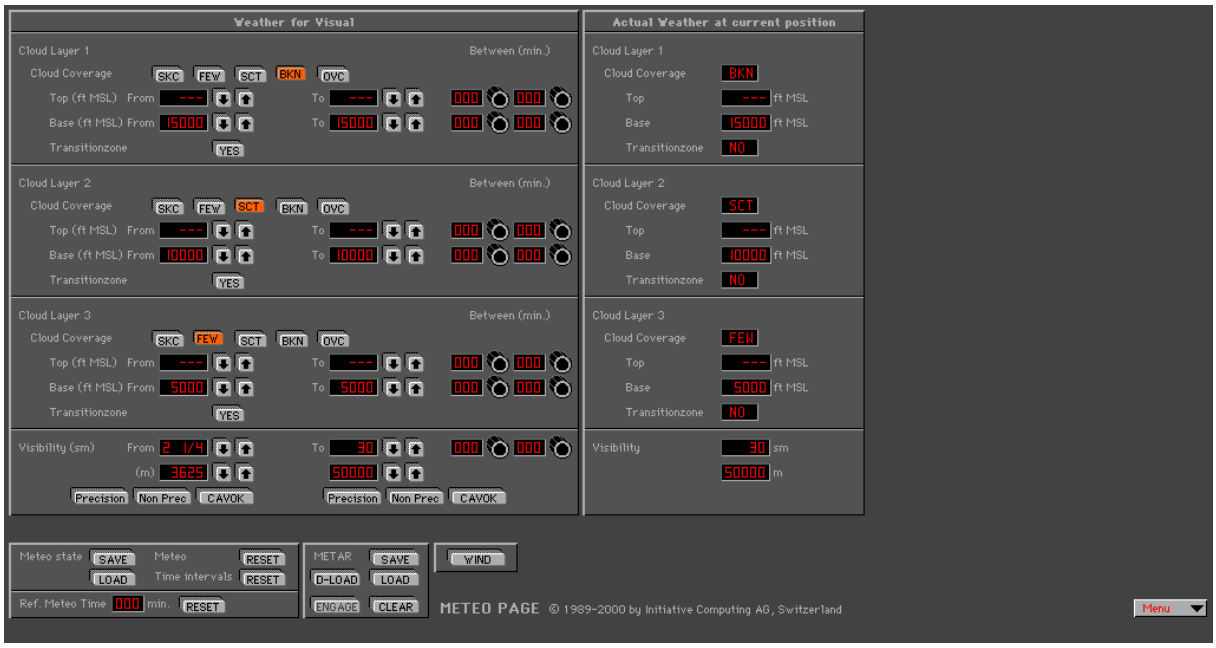


6.5 Metar Page

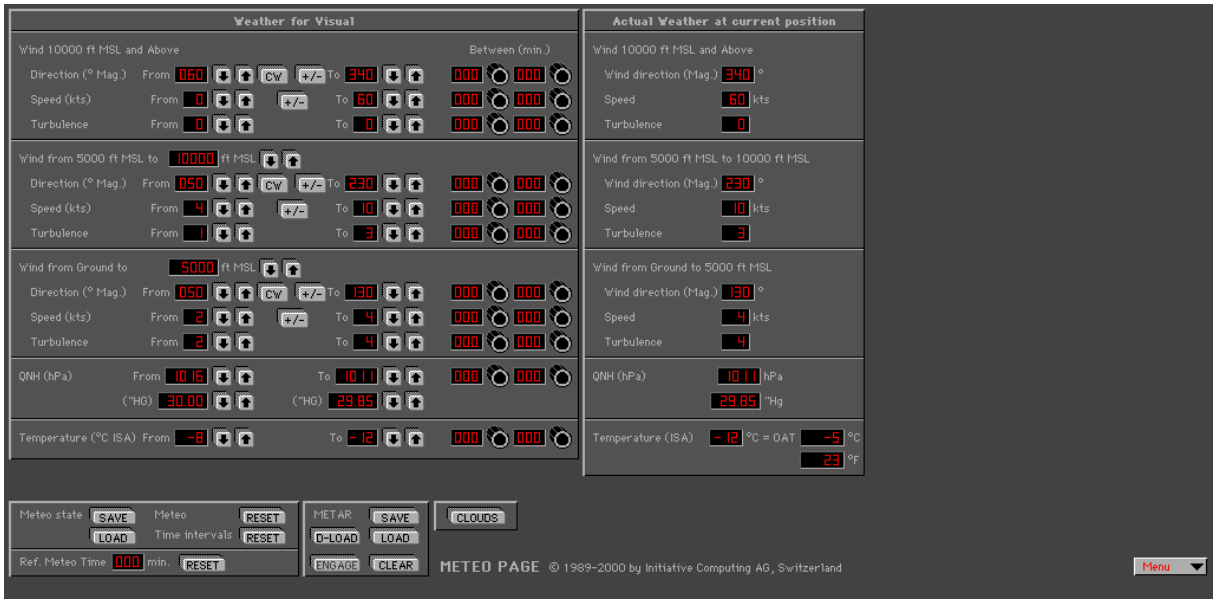
connect FSTD to Internet to download hourly METAR updates



6.6 Meteo Clouds & Visibility Page



6.7 Meteo Wind & Turbulence Page



6.8 Map Page


Initial settings for Replay functions
Replay with Instruments on Map
Instruments on Map
Instruments on Map aligned to the
TOP
or
RIGHT
Instruments on Map as in Cockpit
manual selection
AI
ASI
RMI
CDI 1
HSI
ALT
ADF
CDI 2
DG
VSI
CANCEL
OK
0 nm
3 nm
ONNER
DALTY
HAMMY
ELLAN
GLOSI
MINCO
KALEE
DR HERNY
CHRCH
UZLEL
6411
233
ESRAQ
YAJLU
LUMSS
MCO
V 537
V 533
V 267-295-531
N28-30
N28-25
W081-35
W081-30
W081-25
W081-20
W081-15
MAG HDG
TRUE ALT (ft)
IAS (kts)
clear
print
path
route
radial
profile
extended
REPLAY
slow
repos
RADIAL DISTANCE (nm)
DATABASE
load
ATC
load
AIRCRAFT STATE
load
save
REPLAY
settings
FACILITY
show
Menu

6.9 iGate G512

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