

**Functional Description**

**Elite iGATE G1000 Part Task Trainer**



*Image 1: Diamond DA-42 Version*

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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 G1000 PTT meets requirements of the FAA as Advanced ATD. The iGATE G1000 PTT can be upgraded toward JAR STD 3A FNPT I in Europe. In case of an upgrade, the G1000 PTT 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 be based on reproducing the flight characteristics of above mentioned aircraft simulated.

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)

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### **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 airplane 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 airplane responses reflects, but 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 G1000 PTT dimensions are (w/h/d) 1.4 m x 0.46 m x 0.72 m. The weight is approximately 70kg.

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### **1.5 Trainer computer(s)**

All computing is performed with ELITE Host computer PCs.

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.

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## 2 Trainer Systems



*Image 2: Beech Baron G58 version*

### 2.1 Visual system

An external Visual system GenView or RealView is optionally available for the following areas: Switzerland (RealView), Western Europe, USA, Australia, New Zealand, India, China, Turkey, South America 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 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

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- ◆ 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 airplane. 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 airplane to any map position and also to modify all facilities.

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## 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 G1000 PTT.

### 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 Fallure 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

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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 airplane 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

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- ◆ **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 airplane 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 airplane'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**

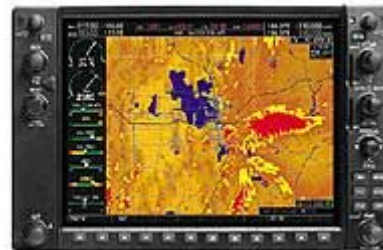
An external Intercom is available at customer request.

## **2.4 Avionics / Radio System Simulation**

### **2.4.1 General**

The training devices are outfitted with the actual G1000 hardware utilizing the now familiar 10.4" GDU 1040 PFD/MFD displays and being offered as standard equipment from several airframe manufacturers. Each device can be specifically configured with performance data for a single aircraft module selected from various models currently available. Performance data for additional aircraft models will be available as the G1000-equipped family of aircraft grows.

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### 2.4.2 Standby Instruments

The following Standby Instruments are displayed:

- ◆ Airspeed Indicator
- ◆ Artificial Horizon
- ◆ Altitude Indicator

A circuit breaker board is implemented as shown below

### 2.4.3 Aircraft types available

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

- ◆ Cessna C172SP
- ◆ Beech Baron G58
- ◆ Diamond DA-40
- ◆ Diamond DA-42



Image 3: Cessna 172SP version

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### 3 Documentation

- ◆ operating manual

### 4 Training

- ◆ Basic 1-day Instructor training at ELITE HQ included
- ◆ Basic 1-day Hardware maintenance training at ELITE HQ included

### 5 Spare Parts

Spare parts package available at optional costs

### 6 Screen Shots Instructor Station

#### 6.1 Configuration Page

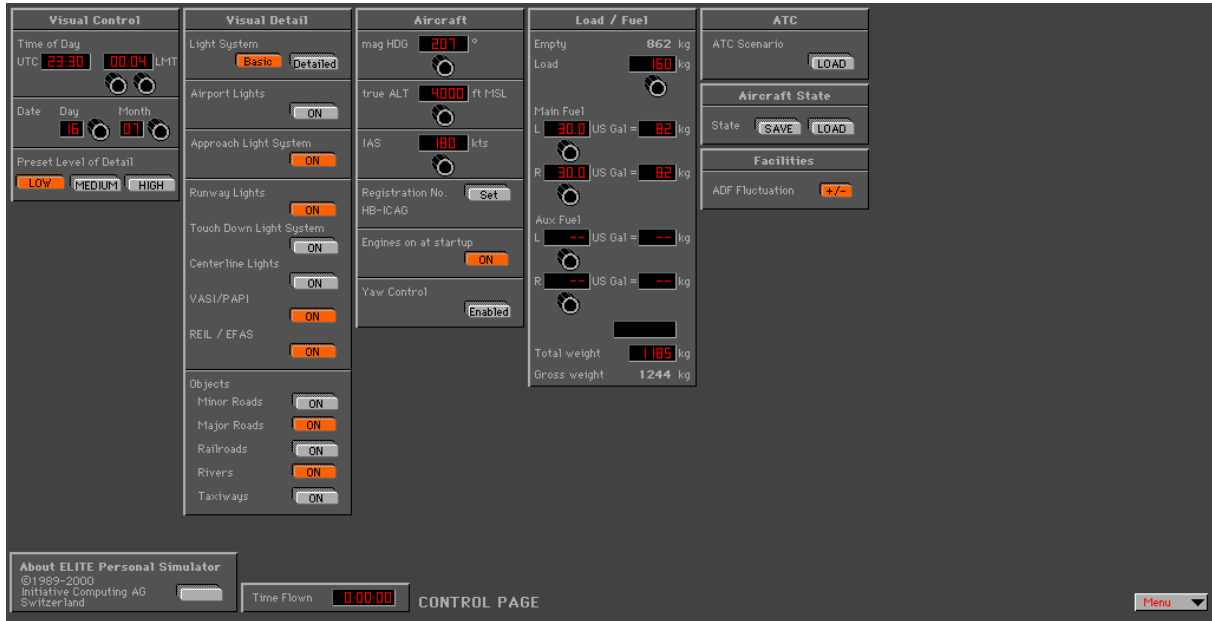
The screenshot shows the configuration page for the Elite iGate G1000 PTT. The interface is organized into several panels:

- General settings:** Includes a 'SET' button and 'Stick' set to 'Standard'.
- Hardware Configuration:** Includes 'User panel' and 'Computer' buttons, both set to 'SET'.
- Controls:** Includes 'Calibration' (SET), 'Dampening' (0.00), 'Pitch' (0.00), 'Roll' (0.00), and 'Yaw' (0.00) controls.
- Units:** Includes 'Weight' (LBS/KG) and 'Fuel' (LITRE/US G/IMP G) settings.
- Color for Digits:** Includes 'RED' and 'YELLOW' options.
- Sounds:** Includes 'Intro', 'Engine', 'Gear', 'Flaps', and 'ATC' settings, all currently set to 'ON'.
- Aircraft Information:** The central panel, titled 'NEW ACFT MODULE', shows 'Aircraft module' as 'Mooney pho'. It contains a warning: 'AIRCRAFT DATA BELOW IS FOR INFORMATION PURPOSES ONLY. THESE VALUES ARE PART OF THE AIRCRAFT CONFIGURATION AND CANNOT BE CHANGED BY THE USER.' Below this, it lists various aircraft parameters:
  - Aircraft: Mooney M20J (v8)
  - Engines: 1
  - Propeller: Constant speed
  - Gear: Retractable
  - Gross weight: 1244 kg
  - Usable fuel: 64.0 US gal = 174.1 kg
  - Rated power: 200 HP
  - Service ceiling: 18000 ft
  - Speed: Never exceed speed 196 kts, Best single engine rate of climb --- kts, Minimum single engine control speed --- kts, Maximum structural cruising speed 174 kts, Zero flaps stalling speed 58 kts, Flaps extended stalling speed 54 kts, Maximum speed for flaps extended 112 kts, Maximum speed for gear extended 132 kts, Maximum speed for gear operation 107 kts.
- Instrument Configuration:** Includes a 'SAVE' button, 'Resolution' (Mooney M20J, 1024 x 768), 'Altimeters' (Standard), 'Fuel boost/Pitot switch' (No external switch), 'Fuel selector' (No external selector), and 'External Avionics' (Non-digital Avionics).

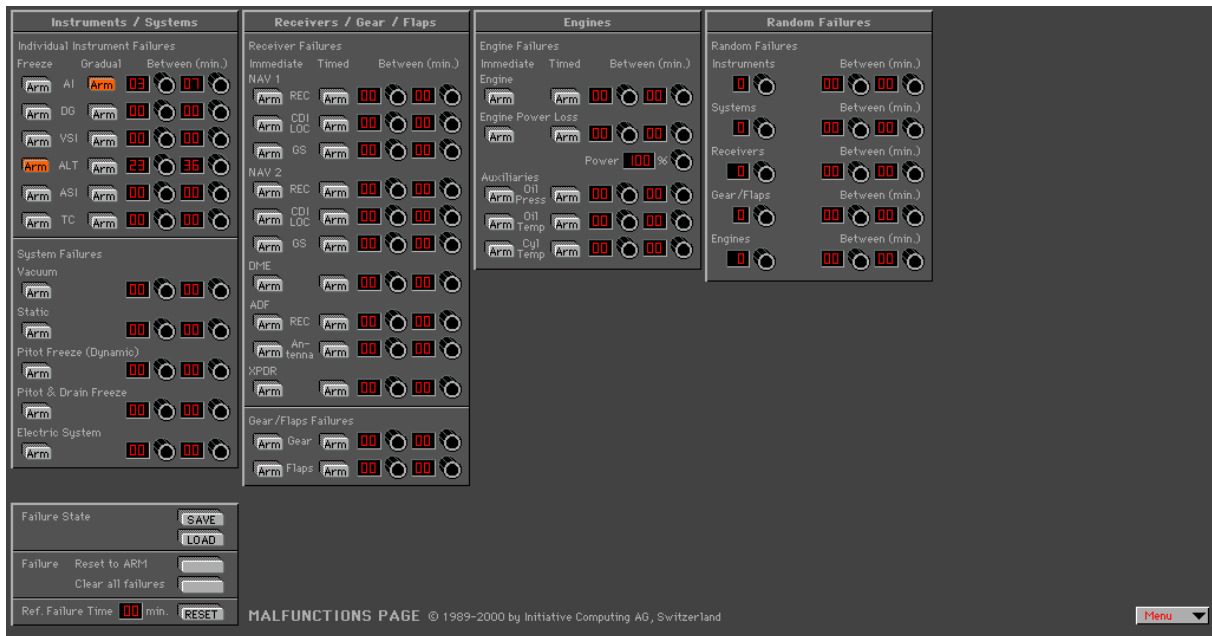
At the bottom of the page, it reads 'CONFIGURATION PAGE © 1989-2000 by Initiative Computing AG, Switzerland' and has a 'Menu' button.

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## 6.2 Control Page



## 6.3 Malfunction Page



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### 6.4 Navigation Modification Page

The screenshot displays the 'MODIFICATION PAGE' for a VOR station. The central pop-up window contains the following data:

- Identification code: **ZUE** (with a yellow 'DME EQUIPPED' indicator)
- Location: **N47 35.530** (Latitude) and **E008 49.059** (Longitude)
- Variation: **000.0** °
- Station elevation: **1130** ft
- Frequency: **110.05** MHz
- DME bias: **0.0** nm

The map background shows a grid of latitude (N47-20 to N47-50) and longitude (E008-10 to E009-20) with various navigation aids marked by blue triangles and labels such as ANELA, GOPAN, RASIK, ALAGO, and others. A scale bar at the top right indicates 0 to 9 nm. The right sidebar includes buttons for 'MOD. FAC.', 'NEW', 'vor', 'dme', 'ndb', 'mkr', 'fix', 'track', 'holding', 'rwy', 'loc / gs', 'MODIFY', 'delete', and 'modify', along with a directional pad. The bottom status bar includes a 'show' button and a 'Menu' dropdown.

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## 6.5 Metar Page

connect FSTD to Internet to download hourly METAR updates

The screenshot displays a METAR map interface. The map shows a geographical area with various airports marked by colored dots and labeled with their ICAO codes and elevation. The airports include LFJL, EDSB, EDDS, ETL, EDMA, ETSF, ETSL, ETSAT, ETSM, LFSX, LSZH, LSZG, EDNY, LSER, and LIPB. The map also shows contour lines and a scale bar in nautical miles (0 nm to 30 nm). On the right side, there is a 'SHOW' menu with buttons for clouds, wind, airport id, temp, dewpoint, visibility, pressure, border, and water. Below the map, there is a control panel with buttons for 'clear', 'd-load', 'load', 'print', 'engage', and 'save'. A digital display shows '25.0' and 'UNITS' with options for '°C', '°F', 'hPa', and 'iHg'. A 'Menu' button is located at the bottom right.

## 6.6 Meteo Clouds & Visibility Page

## 6.7 Meteo Wind & Turbulence Page

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### 6.8 Map Page

The screenshot displays the 'Map Page' interface for the Elite iGate G1000 PTT. A central window titled 'Initial settings for Replay functions' is open, showing various options for instrument display and alignment. The main map area shows a flight path with waypoints such as ONNER, DALTY, HAMIMY, ELLAN, GLOSI, MINCO, and BR HERNY. Instrument gauges on the right include MAG HDG (233), TRUE ALT (2020), IAS (144), and several speed and altitude indicators. The bottom of the screen features a control bar with buttons for DATABASE, ATC, AIRCRAFT STATE, REPLAY, and FACILITY, along with a radial distance indicator and a search function.