Qualification and Approval Guide

Basic Aviation Training Device

Model – **ESP CAL-1000**

Configuration: Cessna 172, Single Engine, Land, Fixed Gear, Fixed Pitch Propeller Airplane

Details: G1000 Layout

Force Feedback Standard Yoke

Vernier Control Throttle and Mixture

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ORIGINAL
September 23, 2025

Engineering Support Personnel, Inc., is requesting FAA evaluation and approval of a Basic Aviation Training Device (BATD). This device meets or exceeds the criteria outlined in the FAA Advisory Circular 61-136B Appendix B.

In the interest of clarity, accuracy, and brevity, we have repeated the relevant portions of the Advisory Circular 61-136B, Appendix B detailing the requirement for the BATD.

Those portions are shown in BLUE, underlined and in italics, as shown here

Followed by our explanation of compliance with those requirements

Shown in BOLD and surrounded by a box, as shown here

Log of Revisions

Rev.	Nature of changes	Approval	Date
0	Original release.	John Russell	9/23/2025

List of Effective Pages

Page	Revision	Date	Page	Revision	Date
1	Original	09/23/2025			
2	Original	09/23/2025			
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FAA APPROVED QAG
Signature and Date

STEPHEN H DUNN

Digitally signed by STEPHEN H DUNN
Date: 2026.06.12 14:36:46 -07'00'

for Daniel Kelman, Acting Manager
Training and Simulation Group

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1.0 CALYPSO OVERVIEW

Engineering Support Personnel, Inc. (ESP) has developed an affordable, self-contained flight simulator, utilizing X-Plane 12 Professional®. Meet the ***"CALYPSO".***

CALYPSO is an affordable system used for basic airmanship, flight procedures, aircraft startup, flight, and shut down. Users can perform landing approaches, holding procedures, VOR tracking, fly pre-loaded missions or "Free Fly".

CALYPSO is based on the basic dimensions and layout of the Single Engine Cessna 172SP G1000. CALYPSO closely represents the overall functionality, performance, and instrumentation for this aircraft. The training device consists of a flight deck, instrument panel, avionics panel, and associated flight and instrument controls. A combination of hardware and software components are assembled and functionally checked by ESP, Inc. All hardware components are designed and installed so CALYPSO has the appearance and feel of the actual aircraft.

CALYPSO provides the ability to accomplish scenario-based flight training activities, instrument procedures and experience, pilot proficiency evaluations, simulated equipment failure, emergency procedures, and facilitates increased pilot competency. CALYPSO closely represents the overall functionality, performance, and instrumentation for a Cessna 172SP G1000 equipped aircraft.

CALYPSO is a Basic Aviation Training Device and may not replicate all systems in the Cessna 172, the aircraft platform highlighted on this device. CALYPSO is designed to be used by anyone. No special training is required. The training device comes complete with all features offered by X-Plane 12 Professional®.

CALYPSO can easily be transported and set up anywhere. If a standard 15amp outlet power is available, CALYPSO can be utilized. An internet connection is necessary to verify the X-Plane license at startup. CALYPSO utilizes off-the-shelf hardware, all internally installed.

2.0 HARDWARE AND SOFTWARE COMPONENTS LIST

Item	Component Name	Manufacturer	Model	Qty	Details
1	CALYPSO	Engineering Support Personnel, Inc.	ESP-CAL-1000	1	Simulator Platform. Functions as the mounting assembly for all controls and instruments. Contains the power supply and PC interconnection hardware (USB and HDMI)
2	Flight Controls (elevator and ailerons)	Brunner	CLS-E NG Yoke, CAN, USB, w wheel V024	1	Standard Option
3	Rudder Pedals/Brakes	Brunner	CLS-E MK II Rudder with Brakes	1	Standard Option
4	Switches and systems selectors	RealSimGear	Generic Switch Panel (No landing gear)	1	Panel mounted switch panel containing starter, flap, fuel pump, selector switches, flap position / indicator and trim wheel.
5	Engine controls Single	Virtual Fly	V3RNIO+	1	Throttle, Mixture Standard Option
Instrument panel with the following flight instruments, avionics, and other miscellaneous airplane systems controls					
6	Avionics Interfaces (G1000 Suite)	RealSimGear	G1000XFD	2	Includes interfaces for radio, autopilot, and G1000 manipulation for both PFD and MFD modes
7	Audio Panel	RealSimGear	GMA Audio Panel	1	Interface to audio panel
8	Visual Monitor	ASUS or equivalent	ROG Strix XG49VQ	1	49” Ultrawide curved LCD monitor used for all visual Elements and audio of the simulator.
9	LCD Display	LESOWN	P50C	1	Displays flap settings and pitch trim setting
10	Operating System	Microsoft	Windows 11	1	
11	Primary Flight Computer	GIGABYTE	GA-AB350M Gaming 3	1	Typical computer system using Intel CPU and nVidia graphics, Windows 11
12	Open Air Computer Case	Yoqanr	B0CGZNLP61	1	ATX Motherboard PC Chassis
13	PC Power Supply	CORSAIR or equivalent	RM850X	1	PC Power Supply
14	10 Port USB Hub	I-Tikol or equivalent	10 Port	1	Powered USB Hub
15	Operating System	Microsoft	Windows 11	1	

Item	Component Name	Manufacturer	Model	Qty	Details
16	Instructor Operating System (IOS)	Laminar Research	Control Pad	1	iPad app that provides IOS functionality via an iPad.
17	Environment Simulation Control Software including NAVAID, approaches, and navigational database.	Laminar Research	X-Plane 12 Pro	1	Software used to create terrain location and control, aircraft performance data, instrumentation, navigation, visuals, sound, weather functions, etc.
18	Database Updates	Navigraph	FMS Data	1	Optional subscription provided monthly AIRAC database updates via Jeppesen.
19	Air Manager	Siminnovations		1	Provides Flap and Pitch Trim setting graphics
20	Model IISX Voice Activated Portable Aviation Intercom	Flightcom		1	Provides Instructor/Student communication via aircraft headsets.

Figure 1: CALYPSO Hardware and Software Components

3.0 COMPLIANCE STATEMENT

This Qualification and Approval Guide (QAG) includes a detailed description of all components, functions, and capabilities for CALYPSO. This includes any optional aircraft configurations, and it includes color pictures and diagrams. The required information as described in the current advisory circular, AC 61-136B / FAA Approval of Aviation Training Devices (ATD) and Their Use for Training and Experience, required for FAA approval, is contained within this document. This QAG lists all required qualifying items, functions, and capabilities. This QAG is used to clearly describe and verify the functionality of this aviation training device platform confirming its suitability for airman training and experience. A valid FAA Letter of Authorization (LOA) specifying the ATD allowances accompanies the CALYPSO when utilized for airman training or experience requirements as specified in 14 CFR §61 or 141.

This ATD must maintain its original performance and function without degradation. The operator of this device is required to maintain its condition and functionally when used to satisfy airmen training or experience requirements. Only the configurations approved for this model, as described within this QAG, can be utilized when satisfying FAA experience or training requirements. Any changes, or revisions to the model or to the available configurations described within this document must be approved in writing by The General Aviation and Commercial Division, AFS-800. Operators who use these trainers to satisfy FAA pilot training or experience requirements are obligated to allow FAA inspection to ensure acceptable function, qualification, and compliance.

Any questions concerning FAA approval or use of ATDs should be directed to the General Aviation and Commercial Division, AFS-800.

4.0 BATD DESIGN CRITERIA

Appendix B, Section B.3.1 General Control Requirements.

B.3.1.1 The aircraft physical flight and associated control systems must be recognizable as to their function and how they are to be manipulated solely from their appearance. These physical flight control systems cannot use interfaces such as a keyboard, mouse, or gaming joystick to control the aircraft in simulated flight.

B.3.1.2 Virtual controls are those controls used to set up certain aspects of the simulation (such as selecting the aircraft configuration, location, weather conditions, etc.) and otherwise program, effect, or pause the training device. These controls are often part of the instructor station or independent computer interface.

Meets Requirement(s)

The keyboard/mouse device, provided with CALYPSO, is used for setting flight location, and flight conditions before a flight simulation session begins. Once CALYPSO is initialized and the training session has begun, the mouse is used only to display the pilot's performance, pause flight, end flight, introduce aircraft system failures and weather events. The pilot manipulates instruments and avionics presented on the virtual instrument displays by using a physical switch or dial located on the CALYPSO's housing.

CALYPSO is designed with all computer and electronic components housed in an all-metal case. This approach provides a training device with no external computer required. The flight instruments are virtual.

B.3.1.3 Except for the initial setup, a keyboard or mouse may not be used to set or position any feature of the ATD flight controls for the maneuvers or training tasks to be accomplished. See the control requirements listed below as applicable to the aircraft model represented. The pilot must be able to operate the controls in the same manner as it would be in the actual aircraft. This includes the landing gear, wing flaps, cowl flaps, carburetor heat, mixture, propeller, and throttle controls appropriate to the aircraft model represented.

Meets Requirement(s)

During a flight training session, the student operates all flight controls in the same manner as in the aircraft being simulated. Any required student manipulation of the instruments is accomplished with physical switches, dials, rotary knobs in the same manner as in the actual aircraft and instrument panel.

B.3.1.4 The physical arrangement, appearance, and operation of controls, instruments, and switches required by this appendix should closely model the aircraft represented. Manufacturers are expected to recreate the appearance, arrangement, operation, and function of realistically placed physical switches and other required controls representative of an aircraft instrument panel that includes at least the following:

- Master/battery;
- Magnetos for each engine (as applicable);
- Alternators or generators for each engine;
- Auxiliary power unit (APU) (if applicable);
- Fuel boost pumps/prime boost pumps for each engine;
- Avionics master;
- Pitot heat; and
- Rotating beacon/strobe, navigation, taxi, and landing lights.

Figure 2: CALYPSO Avionics Panel

Meets Requirement(s)
The switches and controls listed above closely represent CALYPSO's avionics panel in Figure 2 above in look/feel of the actual aircraft being simulated.

B.3.1.5 When an FAA-approved ATD is in use, only the software evaluated by the FAA may be loaded for use on that computer system. This does not preclude providing software updates that do not otherwise change the appearance of the systems operation.

Meets Requirement(s)
The startup file for CALYPSO has software that has been tested and approved within the device and is the only startup sequence used on CALYPSO.

B.3.2 Additional Controls and Functional Requirements. Physical flight and aircraft system controls must be provided as follows:

B.3.2.1 For Airplane:

1. A self-centering displacement yoke or control stick that allows continuous adjustment of pitch and bank.

2. Self-centering rudder pedals that allow continuous adjustment of yaw and corresponding reaction in heading and roll.

3. Throttle or power control(s) that allows continuous movement from idle to full-power settings and corresponding changes in pitch and yaw, as applicable.

4. Mixture/condition, propeller, and throttle/power control(s) as applicable to the M/M of aircraft represented.

5. Controls for the following items, as applicable to the category and class of aircraft represented:

- Wing flaps,
- Pitch trim,
- Communication and navigation radios,
- Clock or timer,
- Gear handle (if applicable),
- Transponder,
- Altimeter,
- Carburetor heat (if applicable), and
- Cowl flaps (if applicable).

Meets Requirement(s)

The yoke and rudder pedals (Figure 3) used are force feedback, self-centering devices and exceed the requirements outlined above. The instrument panel for the C-172 showing the PFD and MFD displays with the GMA Audio panel are shown in Figure 4. Mixture and power provide full range control from idle to full power (Figure 5).

The Flap switch setting and Elevator Trim indicator display are shown in Figure 6. All other controls applicable for the aircraft being represented and listed above are represented either by a physical control device or virtual device.

Figure 3: Force Feedback Yoke and Rudder Pedals

Figure 4: CALYPSO C172 PFD, GMA AUDIO PANEL AND MFD

Figure 5: CALYPSO C-172 Throttle/Mixture

Figure 6: Flap / Elevator Trim Indicator

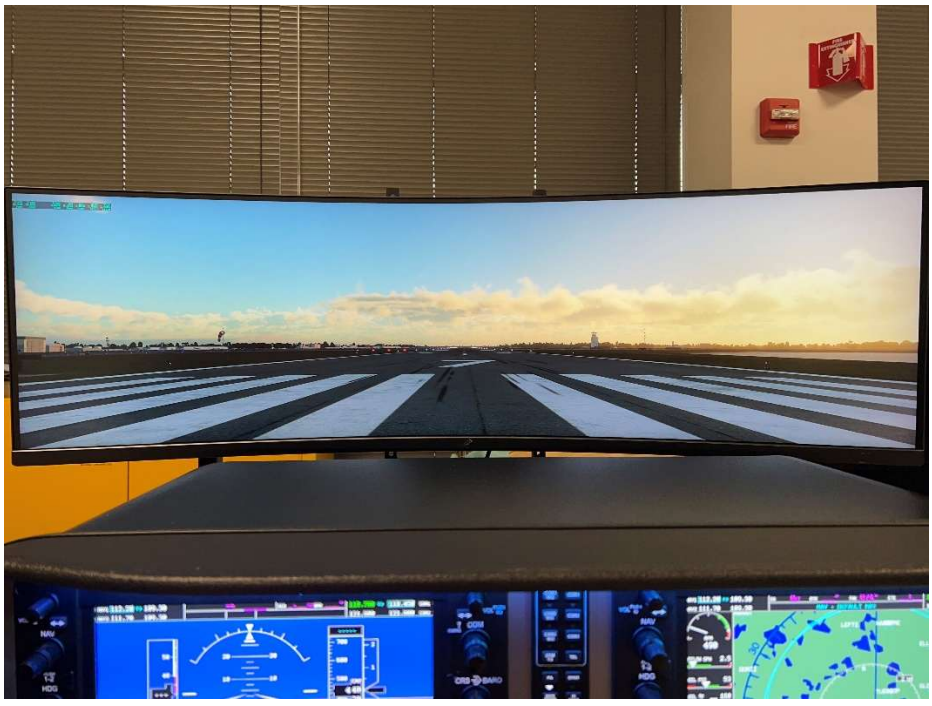

Figure 7: Visual Display

Meets Requirement(s)

The visual display (Figure 7) is a single 49" curved screen. The visual parameters in X-Plane 12 for this display are setup as Native and have a:

Lateral Field of View of 90.21 degrees
Vertical Field of View of 31.53 degrees above.

B.3.3 Control Input Functionality and Response Criteria.

B.3.3.1 Time from control input to recognizable system response must be without delay (i.e., not appear to lag in any way). The manufacturer must verify this performance criteria in the QAG submitted for FAA approval.

B.3.3.2 The control inputs must be tested by the computer and software program at each startup and displayed as a confirmation message of normal operation or a warning message that the transport delay time or any design parameter is out of tolerance. It should not be possible to continue the training session unless the problem is resolved and all components are functioning properly.

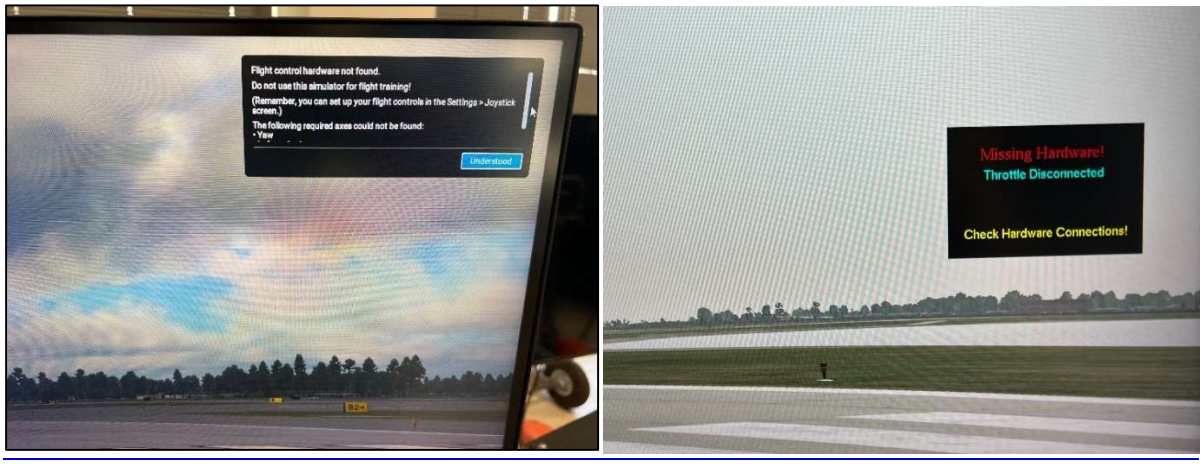

Figure 8: Missing Hardware Notification

Meets Requirement(s)

The time from control input to recognizable system response is without delay and does not appear to lag in any way. The control inputs are tested by computer software (X-Plane 12) at each startup session and displayed as confirmation on the main screen. This is an X-Plane message to state that flight control hardware is not found. In addition, a "script" tests the HID port for the Yoke, Rudder and Throttle to ensure these controls are connected. A box will appear showing which control input is missing if this condition exists. It is not possible to continue the training session unless the problem is resolved, and all control inputs (Yoke, Rudder and Throttle) are connected and functioning properly.

B.3.4 Display Requirements.

B.3.4.1 The following instruments and indicators must be replicated and properly located as appropriate to the aircraft represented:

1. Flight instruments in a standard configuration representing the traditional "round" dial flight instruments. An electronic primary flight display (PFD) with reversionary and backup flight instruments is also acceptable.

2. A sensitive altimeter with incremental markings each 20 feet or less, operable throughout the normal operating range of the M/M of aircraft represented.

3. A magnetic direction indicator.

4. A heading indicator with incremental markings each 5 degrees or less, displayed on a 360-degree circle. Arc segments of less than 360 degrees may be selectively displayed if desired or required, as applicable to the M/M of aircraft represented.

5. An airspeed indicator with incremental markings as shown for the M/M aircraft represented; airspeed markings of less than 20 knots need not be displayed.

6. A vertical speed indicator (VSI) with incremental markings each 100 feet per minute (fpm) for both climb and descent, for the first 1,000 fpm of climb and descent, and at each 500 fpm climb and descent for the remainder of a minimum ±2,000 fpm total display, or as applicable to the M/M of aircraft being represented.

Figure 9: Backup Instruments and wet compass

7. A gyroscopic rate-of-turn indicator or equivalent with appropriate markings for a rate of 3 degrees per second turn for left and right turns. If a turn and bank indicator is used, the 3 degrees per second rate index must be inside of the maximum deflection of the indicator.

8. A slip and skid indicator with coordination information displayed in the conventional inclinometer format where a coordinated flight condition is indicated with the ball in the center position. A split image triangle indication as appropriate for PFD configurations may be used.

9. An attitude indicator with incremental markings each 5 degrees of pitch or less, from 20 degree pitch up to 40-degree pitch down or as applicable to M/M of aircraft represented. Bank angles must be identified at “wings level” and at 10, 20, 30, and 60 degrees of bank (with an optional additional identification at 45 degrees) in left and right banks.

10. Engine instruments as applicable to the M/M of aircraft being represented, providing markings for the normal ranges including the minimum and maximum limits.

11. A suction gauge or instrument pressure gauge with a display applicable to the aircraft represented.

12. A flap setting indicator that displays the current flap setting. Setting indications should be typical of that found in an actual aircraft.

13. A pitch trim indicator with a display that shows zero trim and appropriate indices of airplane nose down and airplane nose up trim, as would be found in an aircraft.

14. Communication radio(s) with a full range of selectable frequencies displaying the radio frequency in use.

15. Navigation radio(s) with a full range of selectable frequencies displaying the frequency in use and capable of replicating both precision and nonprecision instruments, including approach procedures (each with an aural identification feature), and a marker beacon receiver. For example, an instrument landing system (ILS), non-directional radio beacon (NDB), Global Positioning System (GPS), Localizer (LOC) or very high frequency omni-directional range (VOR).

Graduated markings as indicated below must be present on each course deviation indicator (CDI) as applicable. The marking should include:

- One-half dot or less for course/glideslope (GS) deviation (i.e., VOR, LOC, or ILS), and
- Five degrees or less for bearing deviation for automatic direction finder (ADF) and radio magnetic indicator (RMI), as applicable.

16. A clock with incremental markings for each minute and second, or a timer with a display of minutes and seconds.

17. A transponder that displays the current transponder code.

18. A fuel quantity indicator(s) that displays the fuel remaining, either in analog or digital format, appropriate for M/M of aircraft represented.

Note: The minimum instrument and equipment requirements specified under 14 CFR part 91, § 91.205 for day visual flight rules (VFR) and instrument flight rules (IFR) must be functional during the training session. This does not prohibit simulating failures for training purposes.

Meets Requirement(s)

All the above conditions are met as standard outputs from X-Plane 12 software. In the conditions where the above instruments/gauges are manipulated with physical controls, the appropriate control position is represented on the PFD and MFD. Backup instrumentation and wet compass are positioned on the main screen for easy access and viewing. These can be positioned, sized or hidden on the screen per customer requirements. Figure 9 above displays these instruments.

B.3.4.2 All instrument displays listed above must be visible during all flight operations. Allowances can be made for multifunction electronic displays that may not display all instruments simultaneously. All of the displays must provide an image of the instrument that is clear and:

1. Does not appear to be out of focus or illegible.

2. Does not appear to "jump" or "step" during operation.

3. Does not appear with distracting jagged lines or edges.

4. Does not appear to lag relative to the action and use of the flight controls.

Meets Requirement(s)

The clarity of instruments and G1000 displays are of very high quality. All instruments are focused, do NOT jump or step and are not distracting.

B.3.4.3 Control inputs should be reflected by the flight instruments in real time and without a perceived delay in action. Display updates must show all changes (within the total range of the replicated instrument) that are equal to or greater than the values stated below:

1. Airspeed indicator: change of 5 knots.
2. Attitude indicator: change of 2 degrees in pitch and bank.
3. Altimeter: change of 10 feet.
4. Turn and bank: change of ¼ standard rate turn.
5. Heading indicator: change of 2 degrees.
6. VSI: change of 100 fpm.
7. Tachometer: change of 25 rpm or 2 percent of turbine speed.
8. VOR/ILS: change of 1 degree for VOR or ¼ of 1 degree for ILS.
9. ADF: change of 2 degrees.
10. GPS: change as appropriate for the model of GPS-based navigator represented.
11. Clock or timer: change of 1 second.

Meets Requirement(s)

Control inputs are properly reflected by the flight instruments in real time and without a perceived delay in action. Display updates or actions show all changes (within the total range of the replicated instrument) that are equal to or greater than the values identified above. CALYPSO PFD and/or MFD displays are representative of those avionics systems and the associated instrument display information.

B.3.4.4 Displays must reflect the dynamic behavior of an actual aircraft (e.g., a VSI reading of 500 fpm must reflect a corresponding movement in altitude, and an increase in power must reflect an increase in the rpm indication or power indicator.)

Meets Requirement(s)

CALYPSO exceeds the performance requirements listed above.

B.3.5 Flight Dynamics Requirements.

B.3.5.1 Flight dynamics of the ATD should be comparable to the way the represented training aircraft performs and handles. However, there is no requirement for an ATD to have control loading to exactly replicate any particular aircraft.

B.3.5.2 Aircraft performance parameters (such as maximum speed, cruise speed, stall speed, maximum climb rate, and hovering/sideward/forward/rearward flight) should be comparable to the aircraft being represented. A performance table will need to be included in the QAG for each aircraft configuration for sea level and 5,000 feet using standard atmosphere and gross weight conditions. An alternate performance altitude for 6,000 feet can be used if the manufacturer of that aircraft has a performance chart reflecting that altitude; otherwise the ATD manufacturer will need to interpolate the performance for the chart. Performance at altitude for turboprop or turbojet configurations should reflect 18,000 ft.

A/C PERFORMANCE TABLE (for the airplane configurations available)

Aircraft Model	Vso	Vs1	Vx	Vy	Best Glide Speed	Va	Vne	Vmc	KTAS at Cruise at 75% power setting	Rate of climb (fpm) at best rate (Vy), at full power or as recommended	Single Engine Climb rate (at Vyse)
(1)C172S	40	48	62	74	68	105	163	N/A	113	SL-785	SL N/A
								6,000 feet→	117	515	N/A

NOTE: Standard atmosphere and gross weight is used for performance. Airplane performance table for sea level *and* 6,000 feet

Figure 10: Aircraft Performance Parameters

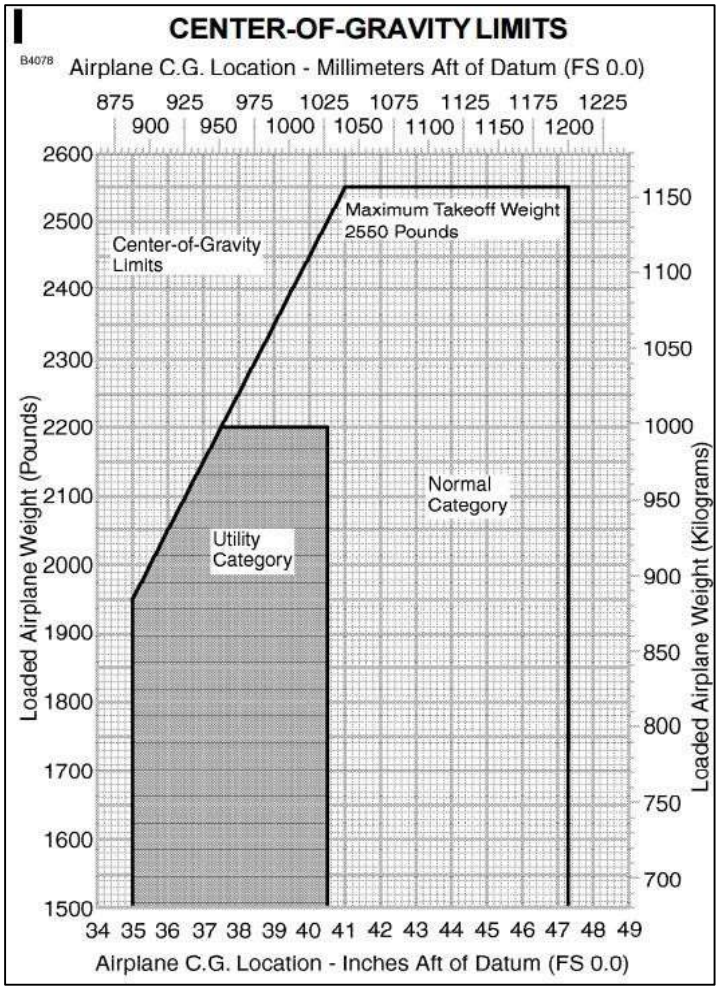

Figure 11: C172 Center of Gravity (CG) Chart

Meets Requirement(s)

CALYPSO's flight dynamics are comparable to the way actual aircraft perform and handles. CALYPSO exceeds this requirement by having force feedback (control loading) on the yoke and rudder pedals. The performance chart is shown above in Figure 10 for the Cessna 172 aircraft.

B.3.5.3 Aircraft vertical lift component must change as a function of bank comparable to the way the aircraft being represented performs and handles.

Meets Requirement(s)

CALYPSO flight dynamics are comparable to the way actual aircraft perform and handles.

B.3.5.4 Changes in flap setting, slat setting, gear position, collective control, or cyclic control must be accompanied by changes in flight dynamics comparable to the way the M/M of aircraft represented performs and handles.

Meets Requirement(s)

CALYPSO flight dynamics are comparable to the way actual aircraft perform and handles.

B.3.5.5 The presence and intensity of wind and turbulence must be reflected in the handling and performance qualities of the simulated aircraft and should be comparable to the way the aircraft represented performs and handles.

Meets Requirement(s)

CALYPSO flight dynamics are comparable to the way actual aircraft perform and handles.

B.3.6 Instructor Management Requirements.

B.3.6.1 The instructor must be able to pause the system at any time during the training simulation for the purpose of administering instruction or procedural recommendations.

Meets Requirement(s)

The instructor can pause/freeze the flight/system at any time using the X-Plane IOS view or the iPad IOS.

B.3.6.2 If a training session begins with the "aircraft in the air" and ready for the performance of a particular procedural task, the instructor must be able to manipulate the following system parameters independently of the simulation:

• Aircraft geographic location,

• Aircraft heading,

• Aircraft airspeed,

• Aircraft altitude, and

• Wind direction, speed, and turbulence.

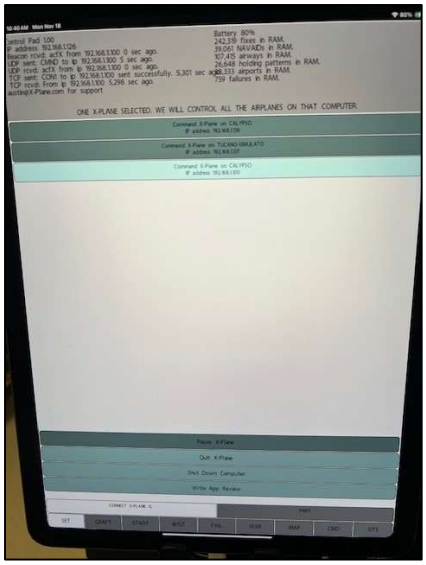

Figure 12: X-Plane IOS on iPad.

Meets Requirement(s)

The aircraft parameters can be manipulated at any time independent of the simulation by use of the X-Plane IOS or the iPad IOS system (Figure 12).

B.3.6.3 The system must be capable of recording both a horizontal and vertical track of aircraft movement during the entire training session for later playback and review.

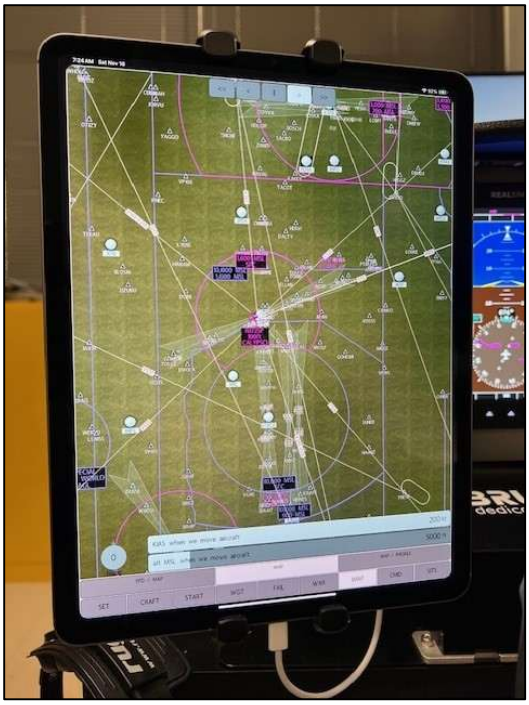

Figure 13: X-Plane IOS Map iPad.

Meets Requirement(s)

CALYPSO can display and record both horizontal and vertical aircraft movement for immediate or post flight playback and review (Figure 12).

B.3.6.4 The instructor must be able to disable any of the instruments prior to or during a training session and be able to simulate failure of any of the instruments without stopping or freezing the simulation to affect the failure. This includes simulated engine failures and the following aircraft systems failures: alternator or generator, vacuum or pressure pump, pitot static, electronic flight displays, or landing gear or flaps, as appropriate.

Meets Requirement(s)

The instructor can disable instruments prior to or during a training session and is able to simulate failure of the instruments without Pausing or Freezing the simulation to insert/activate the failure. This is done via the IOS failures tab.

B.3.6.5 The ATD must have at least a navigational area database that is local (25 nautical miles (NM)) to the training facility to allow reinforcement of procedures learned during actual flight in that area. All navigational data must be based on procedures as published per 14 CFR part 97.

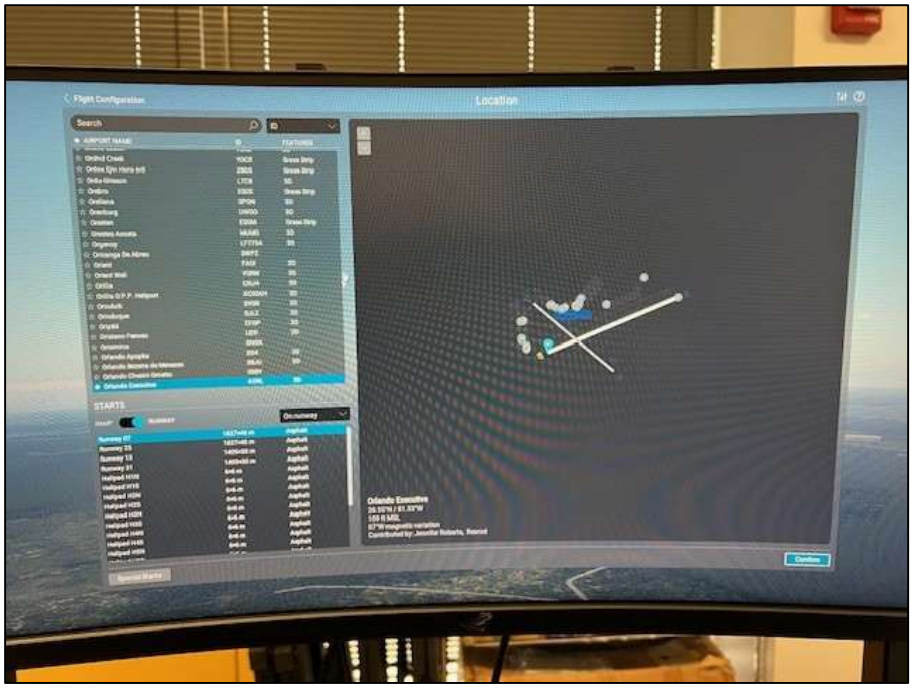

Figure 14: X-Plane IOS Worldwide Database.

Meets Requirement(s)
CALYPSO includes a worldwide navigational database and is based on procedures as published in 14 CFR Part 97. Navigational data is presented on the G1000. ESP also includes a subscription of Navigraph which includes flight charts, navigation data, etc.

5.0 PROCEDURES AND TASKS TEST CHECKLIST

Maneuvers and Tasks	Yes/No/NA
a) Pretakeoff	
1) Engine start	Yes
2) Taxi and brake operation	Yes
b) Takeoff	
1) AIRPLANE Takeoff	
i) Run-up and powerplant checks	Yes
ii) Acceleration characteristics	Yes
iii) Nosewheel and rudder steering	Yes
iv) Effect of crosswind	Yes
v) Instrument	Yes
vi) Landing gear, wing flap operation	Yes
2) HELICOPTER Takeoff	
i) Powerplant checks	N/A
ii) From hover	N/A
iii) From ground	N/A
iv) Vertical	N/A
v) Running	N/A
c) In-Flight Operation	
1) AIRPLANE In-Flight Operation	
i) Climb	Yes
(a) Normal and max. performance	Yes
(b) One-engine-inoperative procedures (multiengine)	N/A
ii) Cruise	
(a) Performance characteristics (speed vs. power)	Yes
(b) Normal and steep turns	Yes
(c) Approach to stalls (i.e., stall warning), stalls, and recovery. Execute from takeoff, cruise, and approach and landing configurations.	Yes
(d) In-flight engine shutdown (multiengine)	N/A
(e) Fuel selector function	Yes
(f) In-flight engine start	Yes

Maneuvers and Tasks	Yes/No/NA
iii) Approach	
(a) Normal (with and without flaps) (check gear warning, if applicable)	Yes
(b) Best glide no power	Yes
iv) Landings	Yes
2) HELICOPTER In-Flight Operation	
i) Hovering and air taxi	N/A
(a) Forward	N/A
(b) Rearward	N/A
(c) Sideward	N/A
(d) Turns	N/A
ii) Climb	N/A
iii) Cruise	N/A
(a) Performance characteristics (speed vs. power)	N/A
(b) Turns	N/A
(i) Recovery	N/A
(ii) Skidding	N/A
(iii) Slipping	N/A
(iv) Steep turns	N/A
(c) In-flight engine shutdown and start (multiengine)	N/A
(d) Descents	N/A
(e) Straight in and 180º autorotation	N/A
(f) Landings	N/A
d) Instrument Approaches	
1) Nonprecision	
i) GPS and LPV	Yes
ii) GPS-WAAS (optional)	N/A
iii) All engines operating	Yes
iv) One or more engines inoperative	Yes
v) Approach procedures (VOR, VOR/DME, LOC procedures on an ILS, LDA, RNAV (RDP) or RNAV (GPS) to LNAV, LNAV/VNAV or LPV)	Yes

Maneuvers and Tasks	Yes/No/NA
2) Precision	
i) ILS	Yes
ii) GLS (optional)	N/A
iii) Effects of crosswind	Yes
iv) With engine inoperative (multiengine)	N/A
v) Missed approach	
(a) Normal	Yes
(b) With engine(s) inoperative (multiengine)	N/A
e) Surface Operations	
1) AIRPLANE Surface Operations (Post Landing)	
i) Approach and landing roll	Yes
ii) Braking operation	Yes
iii) Reverse thrust operation, if applicable	N/A
2) HELICOPTER Surface Operations	
i) Landings	N/A
ii) Landing area operations	N/A
f) HELICOPTER Emergency Operations	
1) Power failure at hover	N/A
2) Power failure at altitude	N/A
3) System and equipment malfunctions	N/A
4) Settling with power (optional)	N/A
5) Low rotor RPM recovery (optional)	N/A
6) Antitorque system failure	N/A
7) Dynamic rollover (optional)	N/A
g) Any Flight Phase	
1) Aircraft and Powerplant Systems	
i) Electrical, mechanical, or hydraulic	Yes
ii) Flaps (airplane)	Yes
iii) Fuel selector and oil temp/pressure	Yes
iv) Landing gear (if applicable)	N/A
2) Flight Management and Guidance Systems	

Maneuvers and Tasks	Yes/No/NA
i) Autopilot (if standard equipment)	Yes
ii) Flight director (AATD only)/system displays (if installed)	N/A
iii) Navigation systems	N/A
iv) Stall warning systems avoidance (airplane)	N/A
v) Multi-function displays (if applicable)	N/A
3) Airborne Procedures	
i) Holding	Yes
ii) Uncoordinated turns – slipping and skidding demo	Yes
iii) Configuration and power changes and resulting pitch changes	Yes
iv) Compass turns and appropriate errors (if installed)	Yes, Virtual
4) Engine Shutdown and Parking	
i) Systems operation	Yes
ii) Parking brake operation (if installed) (airplane)	Yes
h) Can simulate engine failure, including failures due to simulated loss of oil pressure or fuel starvation.	Yes
i) Can simulate the following equipment or system failures:	
1) Alternator or generator failure.	Yes
2) Vacuum pump/pressure failure and the associated flight instrument failures.	Yes
3) Gyroscopic flight instrument failures.	Yes
4) Pitot/static system malfunction and the associated flight instrument failures.	Yes
5) Electronic flight deck display malfunctions.	Yes
6) Landing gear (if retractable) or flap malfunctions.	Yes
j) Independent Instructor Station Requirements (AATD Only)	
1) Displays published airways and holding patterns.	Yes
2) Displays aircraft position and track.	Yes
3) Displays aircraft altitude and speed.	Yes
4) Displays NAVAIDs and airports.	Yes
5) Can record and replay aircraft ground track history for entire training session.	Yes
6) Can invoke instrument or equipment failures.	Yes