REDBIRD FLIGHT SIMULATIONS

Citation Mustang C510

QUALIFICATION AND APPROVAL GUIDE (QAG)

ADVANCED AVIATION TRAINING DEVICE

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FAA APPROVED QAG
Signature and Date

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Shawn Hayes
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VERSION 2.1A

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LOG OF REVISIONS

Description of Changes	Version	Edited By
Original	1.0	CG
Added Log of Revisions	2.0	WJ
Updated Section 1 Device Overview	2.0	WJ
Moved Figures and Photos to Section 2	2.0	WJ
Updated Panel images Figure 1 and Figure 2	2.0	WJ
Added Visual Displays – Type 2 Figure 6.4	2.0	WJ
Moved Hardware and Software Components to Section 3	2.0	WJ
Added Win10, Visual Display Type 2, Navigator to Table 1	2.0	WJ
Moved Statements of Compatibility to Section 3	2.0	WJ
Moved Statement of Compliance to Section 4	2.0	WJ
Updated Display Requirements (1) and (2)	2.0	WJ
Added Performance table to Section 4	2.0	WJ
Edited redundant information from aircraft configuration	2.0	WJ
Added new configuration for approval	2.0	WJ
Added Section 6 Visual System details	2.0	WJ
Renamed Section 1 to Compliance Statement	2.0	WJ
Renamed Section 2 Aviation Training Device (ATD) Description and Pictures	2.0	WJ
Moved Figures 1.1 and 1.2 to Section 5	2.0	WJ
Reformatted Section 2	2.0	WJ
Moved Aircraft Configurations from Section 2 to Section 5	2.0	WJ
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Created separate Tables for Hardware (Table 1)& Software (Table 2) in Component List	2.1	WJ
Updated Cover page according to FAA template	2.1	WJ
Added TRACON and Corvus to Section 3 Component List	2.1	WJ
Deleted Statements of Compatibility of Software and Hardware in Section 3	2.1	WJ
Updated Section to statements in the Affirmative according to new FAA template	2.1	WJ
Removed individual aircraft configurations from ToC	2.1	WJ
Removed W&B Information from A/C Configuration	2.1	WJ
Updated Performance Table, added V_G per new FAA template and 19,000ft performance	2.1	WJ
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Included verbiage from updated (12/15/19) FAA Template	2.1A	WJ
Updated Engine Failure to oil pressure loss in Section 7	2.1A	WJ

SECTION 1: COMPLIANCE STATEMENT

This Qualification and Approval Guide (QAG) provides a detailed description of all the required components, features, functions, and capabilities for the Redbird Flight Simulations, Inc. model C510 aviation training device. This includes any optional airplane configurations with quality color pictures and diagrams. This QAG is provided by Redbird Flight Simulations, Inc. to clearly describe and verify the required functionality of this aviation training device platform confirming its suitability for airman training and experience. The information as described in advisory circular AC 61-136, FAA Approval of Aviation Training Devices (ATD) and Their Use for Training and Experience is provided within this document. This includes listing all of the required qualifying items, functions, and capabilities. A valid FAA Letter of Authorization (LOA) specifying the credit allowances must accompany the training device when utilized for satisfying airman training or experience requirements specified in 14 CFR §61 or 141. Additionally, FAA Order 8900.1 Volume 11 Chapter 10 Section 1 provides guidance to aviation safety inspectors facilitating ATD evaluations, approvals and oversite.

The manufacturer must provide a detailed operations manual with each aviation training device model produced. This will include how to properly start, operate, and shut down the trainer. This must include how to operate and maintain the trainer as originally designed and tested. Redbird Flight Simulations, Inc. will ensure that the operator of this training device is familiar and proficient with all the features and capabilities of this trainer, and how to correct any malfunctions that may occur.

The operator of this aviation training device is expected to become proficient in it operation before using it to satisfy any pilot experience requirements specified in the code of federal regulations. This includes maintaining its condition and functionally. This ATD must be maintained to its original performance and functionality, as demonstrated during the original FAA functional evaluation. This trainer cannot be used to log pilot time unless all of the components of the trainer are in normal working order.

Only the airplane configurations approved for this model can be utilized when satisfying FAA experience or training requirements. Any additions, changes, or modifications to this model, or the associated configurations, must be evaluated and approved in writing by the General Aviation and Commercial Division. This does not prohibit software updates that do not otherwise change the appearance of the systems operation. Operators who use these trainers to satisfy FAA pilot training or experience requirements specified in part 61 or 141 are obligated to allow FAA inspection ensuring acceptable function and compliance.

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

SECTION 2: AVIATION TRAINING DEVICE (ATD) DESCRIPTION AND PICTURES

The Redbird C510 model is based on the dimensions and layout of a Cessna Citation Mustang C510 production turbine multi-engine land aircraft. This model closely represents the overall functionality, performance, avionics, and instrumentation. The platform consists of a cockpit section, instructor's control station, visual display system and an audio system. It incorporates a combination of hardware and software components that is assembled and checked by Redbird Flight Simulations. All hardware elements are permanently installed and designed so the cockpit has the appearance and feel of an actual aircraft. From the pilot's seated position, there are no computer hardware elements such as keyboards, pointing devices, etc. for his or her use.

The C510 model provides a realistic flight deck design, avionics interface, and reliable hardware/software performance. This platform provides an effective training environment for students and pilots in training. This includes 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.

The Redbird C510 is a versatile and affordable device that has been designed to represent the Cessna Citation Mustang C510. It is equipped with the following notable features:

- Dual pilot controls including a 2-axis control-loaded yoke and interconnected rudder pedals (Control-loaded rudder pedals optional)
- Enclosed cockpit with pilot and copilot seating
- Wrap-around exterior visuals provided by 6 LCD screens (8 screen optional)
- Realistic switches, buttons, knobs, circuit breakers and other cockpit controls that are designed to match the aircraft wherever possible
- An interchangeable instrument panel to allow development of future configurations
- Closed Circuit intercom system, allowing for communication between the pilot, co-pilot and instructors using standard aviation headsets
- A portable instructors station, allowing the instructor to operate from inside or outside the simulator
- Optional 3-axis electric motion platform providing pitch, roll and yaw motions
- Optional supplemental oxygen system for the pilot and/or co-pilot

Configuration Components

Instructor's Station

The Redbird Instructor Station interface is operated through any PC or browser enabled device.

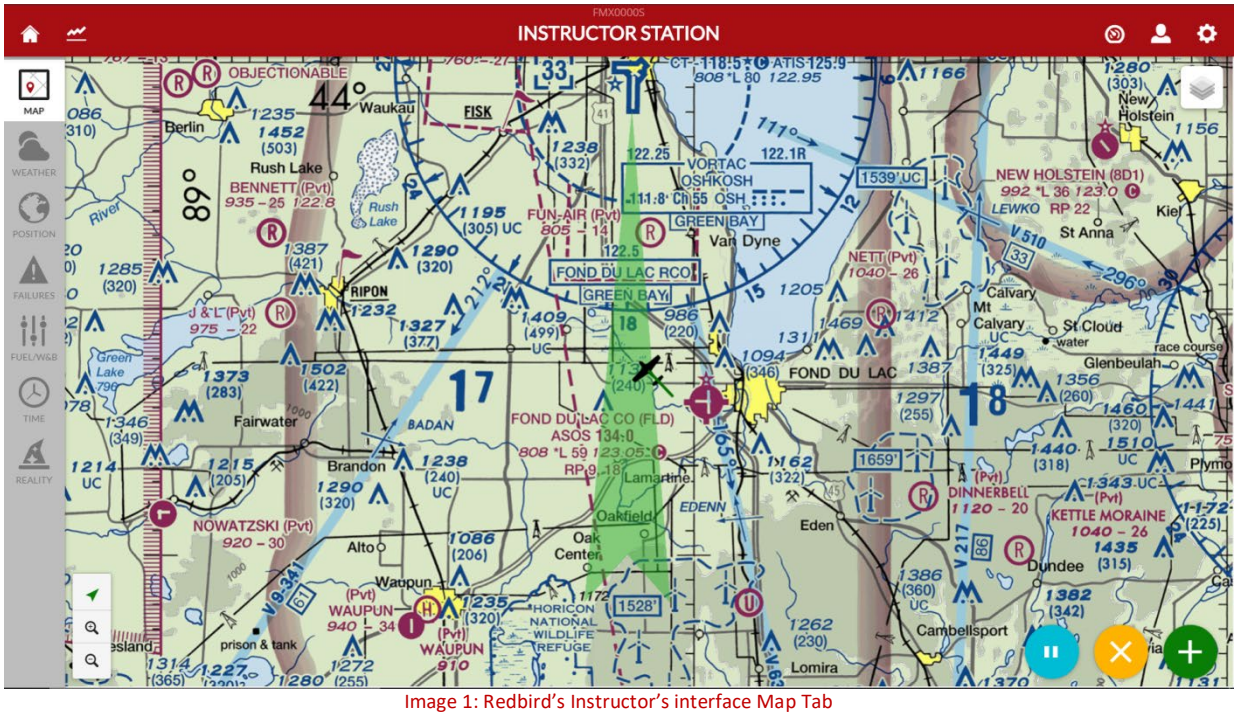

Image 1: Redbird's Instructor's interface Map Tab

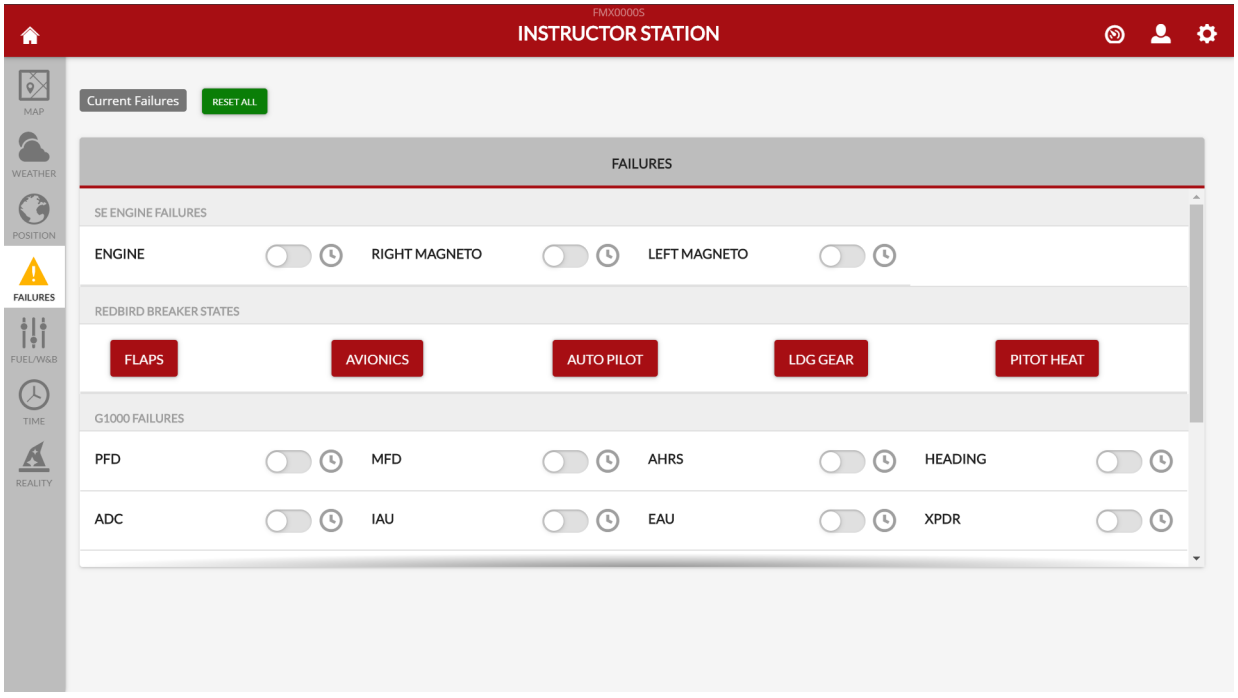

Image 2: Redbird's Instructor's interface Failure Tab

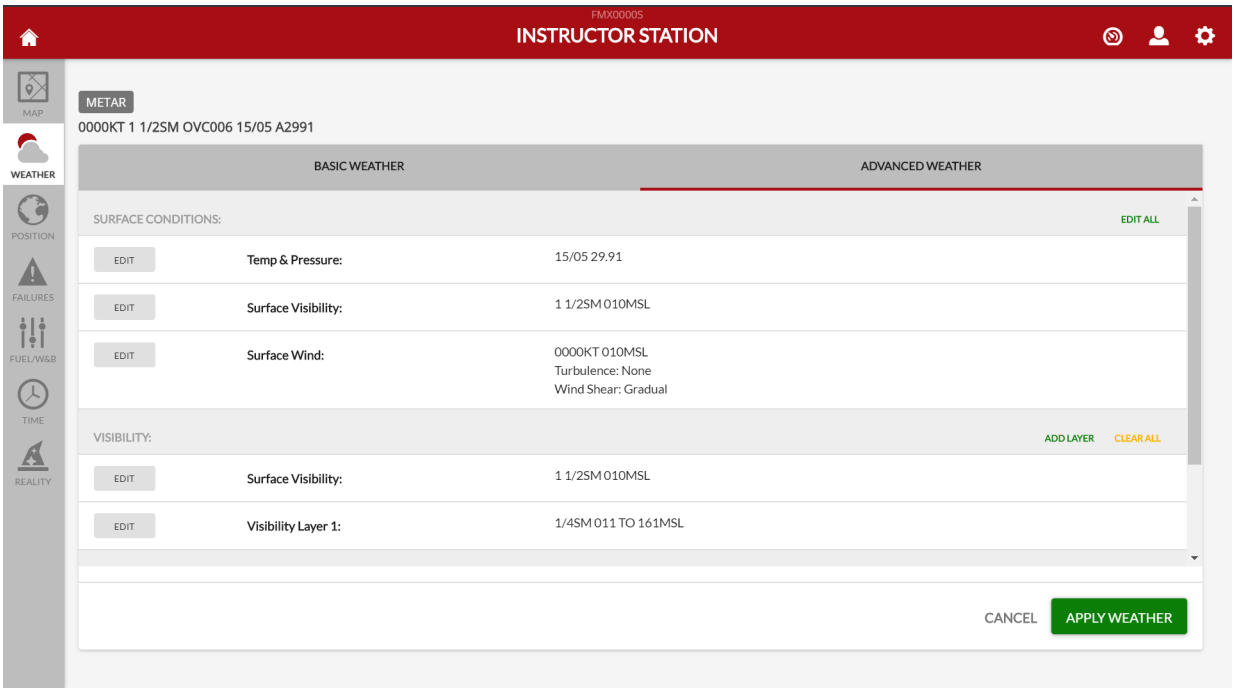

Image 3: Redbird's Instructor's interface Weather Tab

Aircraft Instrument Configurations

The Redbird C510 simulator represents a twin engine turbofan, land, retractable gear, low wing, glass-cockpit airplane representative of a Cessna Citation Mustang, equipped with a three-screen G1000 avionics package.

Image 4: Assembled Cockpit

Image 5: Assembled Cockpit

Image 6: Assembled Cockpit

Controls

Image 7: Pilot Yoke

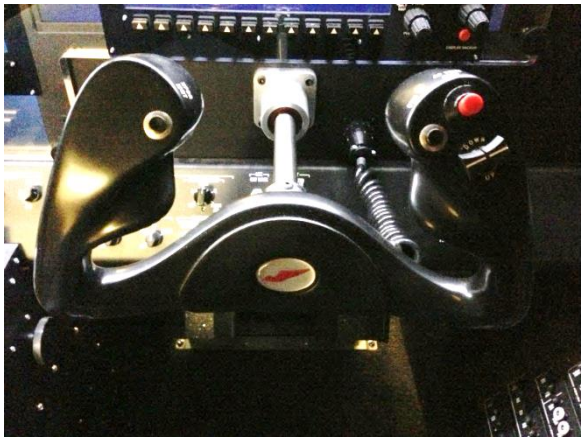

Image 8: Co-Pilot Yoke

Image 9: Pilot Yoke Switches – Left

Image 10: Pilot Yoke Switches – Left

Image 11: Pilot Yoke Switches – Right

Image 12: Co-Pilot Yoke Switches – Left

Image 13: Co-Pilot Yoke Switches – Left

Image 14: Co-Pilot Yoke Switches – Right

Image 15: Throttle Quadrant

Image 16: FMS Keypad

Image 17: Circuit Breaker Panel Pilots Side

Image 18: Circuit Breaker Panel Co-Pilots Side

Image 19: Autopilot Control Panel

Image 20: Lower Switch Panel Pilots Side 1

Image 21: Lower Switch Panel Pilots Side 2

Image 22: Lower Switch Panel Co-Pilots Side

Image :23 Emergency Gear Extension Handle

Image 24: Gear Handle

Image 25: Lower Switch Panel Center

Image 26: Motion Platform and Cockpit Enclosure


Image 27: Pilot & Co-pilot Seats

SECTION 3: TRAINING DEVICE COMPONENTS LIST

Software Components					
Qty	**Type**	**Manufacturer**	**Name**	**Description/Function**	**Configuration**
1	Software	Microsoft	Windows 7 or 10	Operating system. (depending on serial number)	All
1	Software	Lockheed Martin	Prepar3D	Simulation engine. (depending on serial number)	All
1	Software	Redbird Flight Simulations	RB Sim	Simulation control and component integration. (depending on serial number)	All
1	Software	Redbird Flight Simulations	FMX Control	Motion system control and component integration.	Optional
1	Software	Redbird Flight Simulations	Instructors Station	Environmental, location and failure controls with map, track and glideslope display. (depending on serial number)	All
1	Software	Redbird Flight Simulations	Navigator	Simulation control and component integration. Environmental, location and failure controls with map, track and glideslope display. (depending on serial number)	All
1	Software	Redbird Flight Simulations	TRACON	Optional ATD Network Management Console	All
1	Software	Redbird Flight Simulations	Cygnus/Cygnus Pro	Optional software providing location services	Optional
1	Software	Redbird Flight Simulations	Corvus	Optional software providing location services	All
1	Software	RealNav Data	Instrument Procedures Database	Provides for FAA published instrument navigation procedures, database per 14 CFR 97 (enroute, approach)	All
1	Software	Mindstar Aviation	Redbird G1000 (C510) and C510 Gauge	Virtual flight instruments, radios, gauges, indicators, alerts, misc. instruments and logic controls for simulated systems.	All
1	Software	Redbird Flight Simulations	Miscellaneous Gauges	Virtual Miscellaneous Gauges	All
1	Software	Mindstar Aviation	Miscellaneous Gauges	Virtual Miscellaneous Gauges	All
1	Software	Flight 1	Compass	Virtual Compass	All
1	Software	Redbird Flight Simulations	Insight	Optional package that provides instructors live video feed of the cockpit and instrumentation through Prepar3D software	Optional
1	Software	Redbird Flight Simulations	Parrot	Optional software providing ATC services	Optional

Table 1: Training Device Software Component List

Hardware Components					
Qty	**Type**	**Manufacturer**	**Name**	**Description/Function**	**Configuration**
1	Hardware	Redbird Flight Simulations	Simulation Computer	Host computer for flight simulation engine, simulation control software, airplane systems and instruments.	All
1	Hardware	Redbird Flight Simulations	Motion Control Computer	Host computer for FMX Control.	All
1	Hardware	Industry Standard	Instructors Station Computer or Wireless Mobile Device	Host computer for Instructors Station.	All
1	Hardware	Redbird Flight Simulations	Motion Platform: Type 1	Gimbaled, steel motion platform with movement in pitch, roll and yaw. Includes all motors, sensors and safety controls.	Optional
1	Hardware	Redbird Flight Simulations	Cockpit Enclosure	Cockpit enclosure to exclude distractions.	All
6	Hardware	22" LCD Industry Standard Monitor	Visual Display - Type 1	Flat Panel displays for exterior views.	All – Varies by configuration
8	Hardware	22" LCD Industry Standard Monitor	Visual Display - Type 2	Flat Panel displays for exterior views.	All – Varies by configuration
6	Hardware	27" LCD Industry Standard Monitor	Visual Display - Type 3	Flat Panel displays for exterior views.	All – Varies by configuration
8	Hardware	27" LCD Industry Standard Monitor	Visual Display - Type 4	Flat Panel displays for exterior views.	All – Varies by configuration
3	Hardware	19" LCD Industry Standard Monitor	LCD	Flat Panel displays for virtual instruments.	All
1	Hardware	Redbird Flight Simulations	Yoke (Dual)	Dual, Control loaded pitch and roll controller with switches and buttons for airplane systems operation.	All
1	Hardware	Redbird Flight Simulations	Throttle Quadrant	Twin, turbine engine controls with throttle levers, flap position lever and pitch, elevator, aileron and rudder trim controls with indicators for each, FMS Keypad and Emergency gear extension handle.	All
1	Hardware	Redbird Flight Simulations	Rudder Pedals (Dual)	Pilot and co-pilot rudder control pedals with toe brakes.	All – Varies by configuration
1	Hardware	Redbird Flight Simulations	Rudder Pedals (Dual) – Control Loading	Optional Control loading pilot and co-pilot rudder control pedals with toe brakes.	Optional – Varies by configuration
1	Hardware	Redbird Flight Simulations	Instrument Controls Overlay	Flight instruments, radios, airplane configuration and systems controls as required for each configuration.	See Configuration
1	Hardware	Redbird Flight Simulations	Switch Panel	Lower switch panel with airplane configuration and systems controls.	All
1	Hardware	Redbird Flight Simulations	Left Switch Panel	Left side switch panel with airplane systems	All
1	Hardware	Redbird Flight Simulations	Circuit Breaker Panel	Pilot side circuit breaker panel.	All
1	Hardware	Redbird Flight Simulations	Overhead Control Panel	Overhead control panel.	All
1	Hardware	Redbird Flight Simulations	Oxygen System	Optional oxygen system for the pilot and/or copilot	All
1	Hardware	Redbird Flight Simulations	Insight	Optional package that provides instructors live video feed of the cockpit and instrumentation through Prepar3D software	Optional

Table 2: Training Device Hardware Component List

SECTION 4: AVIATION TRAINING DEVICE (ATD) DESIGN CRITERIA LIST

The following section provides the detailed "word for word" listing and design criteria of each of the required items, functions, and capabilities (listed in AC 61-136, for BATD requirements Appendix B and the additional AATD items of Appendix C) and operational performance value/scale (as applicable) for each of the functions described for the Redbird C510.

Basic ATD Requirements List [Appendix B items]

All configurations for this model, as noted, meet AC 61-136, Appendix B requirements

The Redbird C510 model meets the following Control Input Requirements:

B.3.1.1. The aircraft physical flight and associated control systems ARE recognizable as to their function and how they are to be manipulated solely from their appearance. These physical flight control systems DO NOT 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 part of the instructor station or independent computer interface.

B.3.1.3. Except for the initial setup, a keyboard or mouse IS 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 IS 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.

B.3.1.4. The physical arrangement, appearance, and operation of controls, instruments, and switches closely MODELS the aircraft represented. The Redbird K35 and K9X recreates the appearance, arrangement, operation, and function of realistically placed physical switches and other required controls representative of an aircraft instrument panel that includes 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.

B.3.1.5. ONLY the software evaluated by the FAA may be loaded for use on that computer system. This does not PROHIBIT software updates that do not otherwise change the appearance of the systems operation.

The Redbird C510 model meets the following additional airplane physical flight and airplane systems controls:

B.3.2.1.1 A **self-centering displacement yoke or control stick** that allows continuous adjustment of pitch and bank.

B.3.2.1.2 **Self-centering rudder pedals** that allow continuous adjustment of yaw and corresponding reaction in heading and roll.

B.3.2.1.3 **Throttle or power control(s)** that allows continuous movement from idle to full-power settings and corresponding changes in pitch and yaw, as applicable.

B.3.2.1.4 **Mixture/condition, propeller, and throttle/power control(s)** as applicable to the M/M of aircraft represented.

B.3.2.1.5 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).

The Redbird C510 model meets the following Control Input Functionality and Response Criteria:

B.3.3.1 Time from control input to recognizable system response IS without delay and DOES NOT appear to lag in any way. Redbird Flight Simulations, Inc. verifies that the Redbird K35 and K9X meet this requirement.

B.3.3.2 The control inputs ARE tested by the computer and software program at each startup and displayed as a confirmation message of normal operation or a warning message IF the transport delay time or any design parameter is out of tolerance. It IS NOT possible to continue the training session unless the problem is resolved and all components are functioning properly. This test considers all the items listed in the display and control requirements.

The Redbird C510 model meets the following Display Requirements:

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

B.3.4.1.1 Flight instruments ARE in a standard configuration representing the traditional “round” dial flight instruments or as an electronic primary flight instrument display (PFD) and multi-function display (MFD) with reversionary and back-up flight instruments.

B.3.4.1.2 A sensitive **altimeter** with incremental markings each 20 feet or less, operable throughout the normal operating range of the M/M of aircraft represented.

B.3.4.1.3 A **magnetic direction indicator**.

B.3.4.1.4 A **heading indicator** with incremental markings each 5 degrees or less, displayed on a 360 degree circle. Arc segments of less than 360 degrees ARE selectively displayed as applicable to the M/M of aircraft represented.

B.3.4.1.5 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.

B.3.4.1.6 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.

B.3.4.1.7 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 IS inside of the maximum deflection of the indicator.

B.3.4.1.8 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.

B.3.4.1.9 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 ARE 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.

B.3.4.1.10 **Engine instruments** as applicable to the M/M of aircraft being represented, providing markings for the normal ranges including the minimum and maximum limits.

B.3.4.1.11 A **suction gauge** or instrument pressure gauge with a display applicable to the aircraft represented.

B.3.4.1.12 A **flap setting indicator** that displays the current flap setting. Setting indications should be typical of that found in an actual aircraft.

B.3.4.1.13 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.

B.3.4.1.14 **Communication radio(s)** with a full range of selectable frequencies displaying the radio frequency in use

B.3.4.1.15 **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 ARE present on each course deviation indicator (CDI) as applicable. The marking 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.
- If equipped with a Primary Flight Display (PFD) and/or Multifunction Flight Display (MFD), the flight and navigation information and guidance replicates the avionics manufactures same scales and navigation information presentation.

B.3.4.1.16 A clock with incremental markings for each minute and second, or a timer with a display of minutes and seconds.

B.3.4.1.17 A transponder that displays the current transponder code.

B.3.4.1.18 A fuel quantity indicator(s) that displays the fuel remaining, either in analog or digital format, appropriate for M/M of aircraft represented.

B.3.4.2 All instrument displays listed above ARE 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:

B.3.4.2.1 Does not appear to be out of focus or illegible.

B.3.4.2.2 Does not appear to "jump" or "step" during operation.

B.3.4.2.3 Does not appear with distracting jagged lines or edges.

B.3.4.2.4 Does not appear to lag relative to the action and use of the flight controls.

B.3.4.3 Control inputs ARE PROPERLY 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:

B.3.4.3.1 Airspeed indicator: change of 5 knots.

B.3.4.3.2 Attitude indicator: change of 2 degrees in pitch and bank.

B.3.4.3.3 Altimeter: change of 10 feet.

B.3.4.3.4 Turn and bank: change of ¼ standard rate turn.

B.3.4.3.5 Heading indicator: change of 2 degrees.

B.3.4.3.6 VSI: change of 100 fpm.

B.3.4.3.7 Tachometer: change of 25 rpm or 2 percent of turbine speed.

B.3.4.3.8 VOR/ILS: change of 1 degree for VOR or ¼ of 1 degree for ILS.

B.3.4.3.9 ADF: change of 2 degrees.

B.3.4.3.10 GPS: change as appropriate for the model of GPS-based navigator represented.

B.3.4.3.11 Clock or timer: change of 1 second.

Note: Airplane configurations with 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.)

The Redbird C510 model meets the following Flight Dynamics Requirements:

B.3.5.1 Flight dynamics of the ATD ARE 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) ARE comparable to the aircraft being represented. A performance table IS included in the QAG for each aircraft configuration for sea level and 5,000 feet using standard atmosphere and gross weight conditions, to verify the appropriate performance. An alternate performance

altitude for 6,000 feet can be used if the manufacturer of that aircraft has a performance chart reflecting that altitude. Performance at altitude for turboprop or turbojet configurations should reflect 18,000 ft.

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

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

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

The Redbird C510 model meets the following Instructional Management Requirements:

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

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 IS 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.

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

B.3.6.4 The instructor IS able to disable any of the instruments prior to or during a training session and IS 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.

B.3.6.5 The ATD HAS 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 ARE based on procedures as published per 14 CFR part 97. This device uses Navigraph or RealNav Data to support the instrument approach and navigation capabilities.

Advanced ATD Requirements List [Appendix C items]

All configurations, as noted in AC 61-136, Appendix C meet these additional AATD design criteria items listed.

The Redbird C510 model meets the following additional AATD CRITERIA:

C.3.1.1 A realistic shrouded (enclosed) or unshrouded (open) cockpit design and instrument panel arrangement representing a specific model aircraft cockpit.

C.3.1.2 Cockpit knobs, system controls, switches, and/or switch panels in realistic sizes and design appropriate to each intended functions, in the proper position and distance from the pilot's seated position, and representative of the category and class of aircraft being represented.

C.3.1.3 Primary flight and navigation instruments appropriately sized and properly arranged that exhibit neither stepping nor excessive transport delay.

C.3.1.4 **Digital Avionics** Panel

C.3.1.5 Global Positioning System **(GPS) navigator** with moving map display.

C.3.1.6 **Two-axis autopilot**, and, as appropriate, a flight director (FD). This is only required when an autopilot is original standard equipment from the aircraft manufacturer.

C.3.1.7 **Pitch trim** (manual or electric pitch trim) IS AVAILABLE permitting indicator movement either electrically or analog in an acceptable trim ratio.

C.3.1.8 An **independent visual system**, panel, or screen that provides realistic cues in both day and night visual flight rules (VFR) and instrument flight rules (IFR) meteorological conditions to enhance a pilot's visual orientation in the vicinity of an airport including:

- Adjustable visibility parameters; and
- Adjustable ceiling parameters.

C.3.1.9 A fixed pilot seat appropriate to the aircraft configuration, including an adjustable height and an adjustable forward and aft seat position.

C.3.1.10 **Rudder pedals** secured to the cockpit floor structure, or that can be physically secured to the floor beneath the device in proper relation to cockpit orientation.

C.3.1.11 **Push-to-talk switch** on the control yoke.

C.3.1.12 A **separate instructor station** PERMITTING effective interaction without interrupting the flight in overseeing the pilot's horizontal and vertical flight profiles in real time and space. This must include the ability to:

1. Oversee tracks along airways, holding entries and patterns, and Localizer (LOC) and glideslope (GS) alignment/deviation (or other approaches with a horizontal and vertical track).
2. Function as air traffic control (ATC) in providing vectors, etc., change in weather conditions, ceilings, visibilities, wind speed and direction, light/moderate/severe turbulence, and icing conditions.
3. Invoke failures in navigation and instruments, radio receivers, landing gear and flaps, engine power (partial and total), and other aircraft systems (pitot, electric, static, etc.) by using either a keyboard or mouse.

The Redbird C510 model meets the following additional encouraged (not required) AATD CRITERIA:

C.3.2.1 Multi-panel or wrap-around visual system providing 120 degrees or more of horizontal vision.

C.3.2.2 Automated ATC communications, scenario-based training (SBT), or line-oriented type training in which the instructor can evaluate pilot performance without having to act as ATC.

C.3.2.3 Simulated loss of performance and aerodynamic changes from ice accretion.

C.3.2.4 Realistic aircraft engine sound appropriate to the aircraft configuration, power settings, and speed.

C.3.2.5 A magnetic compass with incremental markings each 5 degrees, that displays the proper lead or lag during turns, and displays incremental markings typical of that shown in the aircraft.

SECTION 5: AIRCRAFT CONFIGURATION

List of Previously Approved Configurations

C510

Image 28: Instrument Display Panel

- **Yoke – Center (See Figures 4-14)**
- **Throttle – Twin Engine Turbine Throttle (See Figure 4-6, 15)**
- **Glass Cockpit G1000 (3)PFD/MFD & Autopilot**

Additional configurations included in this version

- **None**

Performance Table

Aircraft Model	V_{S0}	V_{S1}	V_X	V_Y	V_{MO} (SL - 27,120')	V_G	V_{MCA}	KTAS @ Cruise Thrust MAX Range	(ME) Cruise Climb FPM @ MCT	(SE) Enroute Climb Gradient @ V_{ENR}
Cessna Mustang (C-510)	76 KCAS	91 KCAS	114 KIAS	150 KIAS	250 KIAS	145 KIAS	92 KIAS	218 KTAS (5000')	2706 @ 170 KIAS (5000')	4.9% @ 118 KIAS
							19,000' -->	267 KTAS	2054 @ 170 KIAS	0.1% @ 118 KIAS

Table 3: Performance Table

SECTION 6: VISUAL SYSTEM WITH IFR, VFR, DAY, AND NIGHT CAPABILITY

Redbird C510 Visual System
The visual system is capable of providing a field-of-view of a minimum of 45 degrees horizontally and 30 degrees vertically, simultaneously for each pilot, including adjustable cloud base and visibility in night, dusk and day scenes.

- The Redbird C510 provides a means of recording the visual response time for the visual system that is installed.
- The Redbird C510 visual system is free of optical discontinuities and artifacts that create non-realistic cues.
- The visual system is directly displayed on six (6) or (8) LCD monitors inside the cockpit enclosure, situated in an arc around the Pilot. Each monitor is 28 cm tall, and 47 cm wide. Based upon the designated Pilot Eye Point, these monitors provide a horizontal FOV of 220 (6 monitors) to 260 (8 monitors) degrees and a vertical FOV of 30 degrees.

Daylight: The visual system provides full color presentations and sufficient surfaces with appropriate textural cues to conduct a visual approach, landing and airport movement. Surface shading effects are consistent with the simulated sun position.

Twilight: The visual system provides full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement. Scenes include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative ownship lighting.

Night: The visual system provides the same as above except the portrayal of reduced ambient intensity; therefore, there is no ground cues that are not self-illuminating or illuminated by ownship lights.

Designated Eye Point: The designated Pilot Eye Point is located 52 cm from the center of the forward most external view monitor, 61 cm from the left most external view monitor and 24 cm from the ceiling of the simulator enclosure. This point is roughly centered over the pilot's seat when it is adjusted to the forward most position, at a height consistent with the height of the pilot's head.

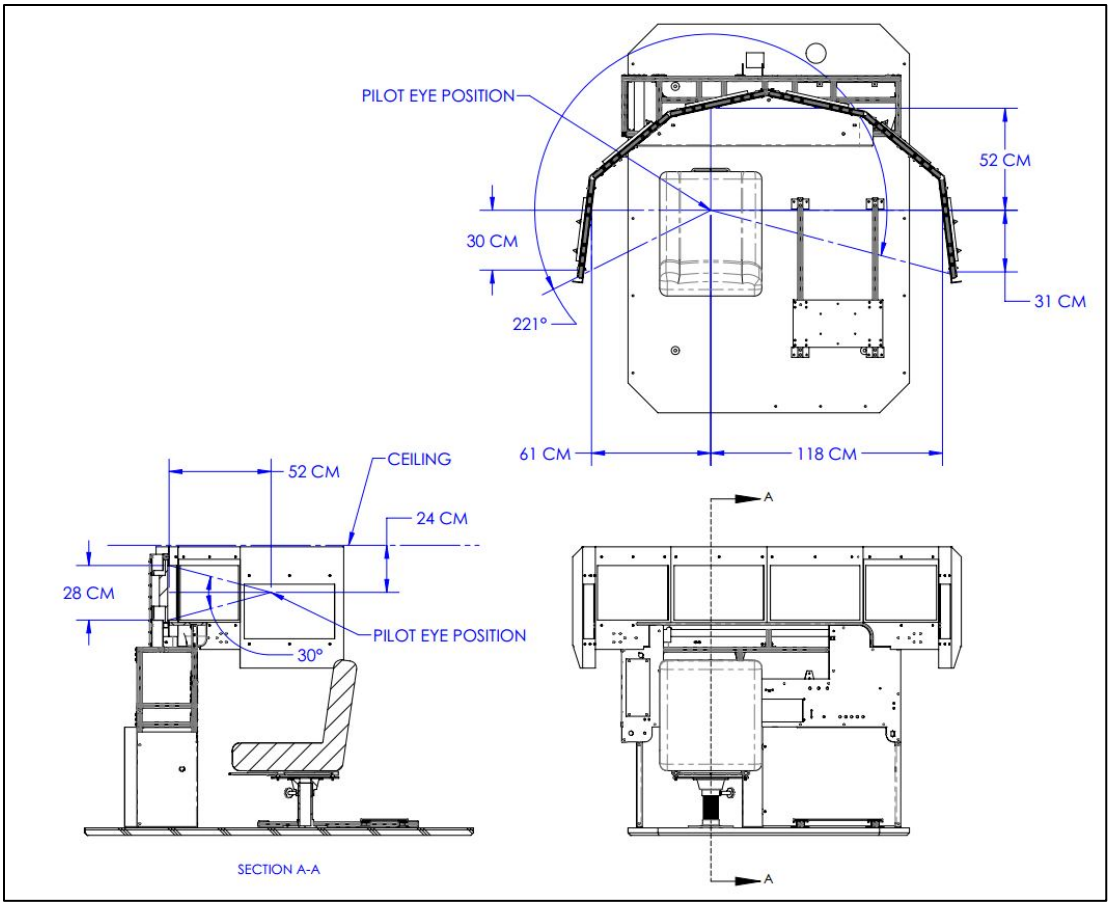

Image 29: Designated Eye Point Diagram

Image 30: Visual Displays – Type 1 (22” Display Monitors)

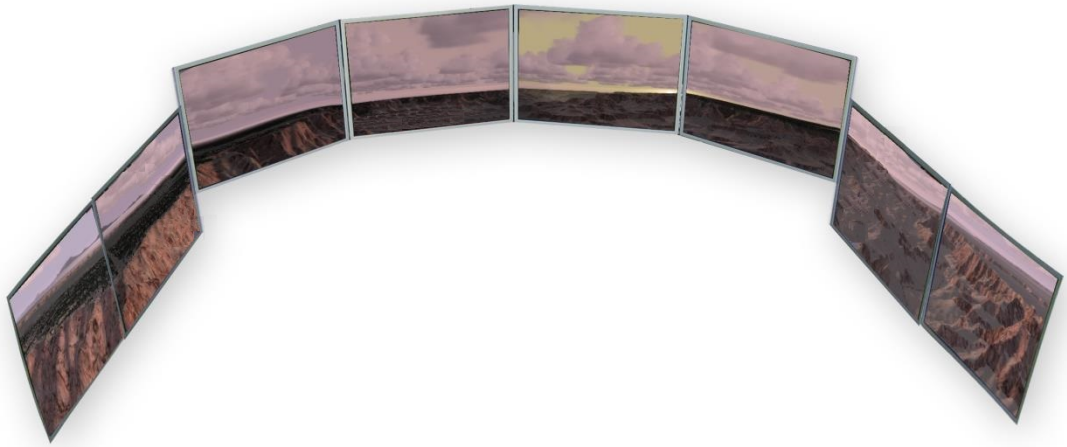

Image 31: Visual Displays – Type 2 (22” Display Monitors)

Image 32: Visual Displays – Type 3 (27” Display Monitors)

Image 33: Visual Displays – Type 4 (27” Display Monitors)

SECTION 7: ATD FUNCTIONS & MANEUVERS CHECKLISTS

AIRPLANE ATD FUNCTION VERIFICATION CHECKLIST

Functions and Maneuvers	Yes, No, or N/A
a. Pre-Takeoff	
(1) Engine start	Yes
(2) Taxi and brake operation	Yes
b. Takeoff	
(1) Run-up and powerplant checks	Yes
(2) Acceleration characteristics	Yes
(3) Nose wheel and rudder steering	Yes
(4) Effect of crosswind	Yes
(5) Instrument	Yes
(6) Flap operation	Yes
(7) Landing gear operation (if retractable)	Yes
c. In-Flight Operations	
(1) **Climb**	
(i) Normal and max. performance	Yes
(ii) One engine inoperative procedures (Multiengine only)	Yes
(2) **Cruise**	
(i) Correct performance characteristics (speed vs. power)	Yes
(ii) Normal and steep turns	Yes
(iii) Approach to stalls, (i.e. stall warning), stalls. Execute from takeoff, cruise, and approach and landing configurations.	Yes
(vi) In flight engine shutdown (multi-engine only)	Yes
(v) In flight engine start (multi-engine only)	Yes
(vi) Fuel selector function	Yes
(3) **Approach**	
(i) Normal (with & without flaps) Check gear horn warning if applicable	Yes
(ii) Single engine approach and landing (multi-engine)	Yes
(iii) Best glide no power	Yes
(iv) Landings	Yes
d. Instrument Approaches	
(1) **Nonprecision**	
(i) GPS and LPV	Yes
(ii) GPS - WAAS (optional)	Yes
(iii) All engines operating	Yes
(iv) One engine inoperative (Multi-engine only)	Yes
(v) Approach procedures (VOR, VOR/DME, LOC procedures on an ILS, LDA, RNAV (RNP) or RNAV (GPS) to LNAV, LNAV/VNAV or LPV)	Yes
(2) **Precision**	
(i) ILS	Yes
(ii) GLS (optional)	No
(iii) Effects of Crosswind	Yes
(iv) One Engine Inoperative (Multi-engine only)	Yes
(v) Missed Approach	Yes
(A) Normal	Yes
(B) With One Engine inoperative (Multi-engine only)	Yes

e. Surface Operations (Post Landing)	
(1) Approach and landing roll	Yes
(2) Braking operation	Yes
(3) Reverse thrust operation, if applicable	Yes
f. Any Flight Phase	
(1) **Airplane and Power Plant Systems**	
(i) Electrical, mechanical, or hydraulic	Yes
(ii) Flaps	Yes
(iii) Fuel selector and oil temp/pressure	Yes
(vi) Landing gear (if applicable)	Yes
(2) **Flight Management and Guidance Systems**	
(i) Two axis auto pilot (if standard equipment)	Yes
(ii) Flight director (AATD only) and system displays (if installed)	Yes
(iii) Navigation systems and optional display configurations	Yes
(iv) Stall warning systems avoidance	Yes
(v) Multi-function displays (PFD/MFD) if applicable	Yes
(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
(4) Simulated Turbulence in Flight (light, moderate, severe)	Yes
(4) **Parking and Engine Shutdown**	
(i) Systems operation	Yes
(ii) Parking brake operation (if installed)	Yes
g. Can simulate engine failure, including failures due to simulated loss of oil pressure or fuel starvation.	Yes (Separate Functions)
h. Can simulate the following equipment or system failures:	
(1) Alternator or generator failure.	Yes
(2) Vacuum pump/pressure failure and associated flight instrument failures.	Yes
(3) Gyroscopic flight instrument failures.	Yes
(4) Pitot/static system malfunction and associated flight instrument failures.	Yes
(5) Electronic flight deck display malfunctions.	Yes
(6) Landing gear (if retractable) or flap malfunctions	Yes
i. Independent Instructor Station Requirements (AATD only)	
(1) Displays published airways and holding patterns.	Yes
(2) Displays airplane position and track.	Yes
(3) Displays airplane altitude and speed.	Yes
(4) Displays NAVAIDs and airports.	Yes
(5) Can record and replay airplane ground track history for entire training session.	Yes
(6) Can invoke instrument or equipment failures.	Yes

Table 4: Device Checklist

During the initial start of the trainer, the computer component "self-check" program verifies that all the features of the trainer are in working order. It is not possible to continue the training session unless the problem is resolved, and all the components are functioning properly.

During the initial start-up the ATD has the following **Screen Statement** is displayed on the instructor station or visual display before the trainer is used for training.

"All the flight instruments required for visual and instrument flight rules listed in part 91.205 must be functional at the start of the simulated flight session. Temporary instrument or equipment failures are permitted when practicing emergency procedures. If this simulated flight session will be used for instrument experience or currency requirements, the visual component must be configured to Instrument Meteorological Conditions [IMC] during the simulated flight session, including execution of instrument approaches from the final approach fix until reaching Decision Height [DH], Decision Altitude [DA], or Minimum Decent Altitude [MDA] as appropriate."

Notice: Any changes or modifications to this training device that have not been reviewed, evaluated, and approved in writing by General Aviation and Commercial Division will terminate FAA approval.