REDBIRD FLIGHT SIMULATIONS

QUALIFICATION AND APPROVAL GUIDE (QAG)

CJ1+ AMENDED QUALIFICATION AND APPROVAL GUIDE
VERSION 3.0

ADVANCED AVIATION TRAINING DEVICE

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Log of Revisions

Description of Changes	Version	Edited By
Original	1.1	CG
Added Log of Revisions	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
Reformatted Section 2	2.0	WJ
Moved Figures and Photos to Section 2	2.0	WJ
Updated Image 21	2.0	WJ
Added Figure 22 (Pilot/Copilot seating)	2.0	WJ
Moved Statements of Compatibility to Section 3	2.0	WJ
Moved Hardware and Software Components to Section 3	2.0	WJ
Added Win10, Visual Display Type 2, Navigator, CL Rudder Pedals to Table 1	2.0	WJ
Included verbatim text from AC61-136A for Section 4	2.0	WJ
Moved Statement of Compliance to Section 4	2.0	WJ
Moved Aircraft Configurations to Section 5	2.0	WJ
Updated Avionics panel images for Section 5	2.0	WJ
Updated Performance table in Section 5	2.0	WJ
Added Visual Displays – Type 2 Figure 24 in Section 6	2.0	WJ
Updated for AC-136B Compliance	2.0A	WJ
Added images 26, 27, 28	2.0A	WJ
Added 27” (6) and (8) monitor options to Component List	2.0A	WJ
Updated Procedures and Tasks Test Checklist	2.0A	WJ
Updated description Section 2	2.0B	WJ
Enlarged image 2 & 21	2.0B	WJ
Updated description for Section 3 Component List	2.0B	WJ
Updated description for image 23, 24, 27, 28	2.0B	WJ
Updated Compliance Statement	3.0	MH
Updated Instructor Station Image	3.0	MH
Included monitor model numbers in component list	3.0	MH
Added List of Effective Pages and revised page numbers/table of contents	3.0	MH

LIST OF EFFECTIVE PAGES

The List of Effective Pages (LOEP) lists all the basic pages, with effective dates, of the Qualification and Approval Guide. Pages affected by the current revision are indicated by an asterisk (*) following the revision code.

Version 1, Rev 0..... December 11, 2015
Version 2, Rev 0..... April 23, 2019
Version 3, Rev 0..... February 2, 2024

Section	Pages	Version	Revision
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FAA APPROVED QAG
Signature and Date

ANDREW SELIGA

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Date: 2024.04.08 17:07:35 -04'00'

Andrew Seliga, Section Manager
Training and Simulation Group

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. CJ1+ model 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.

Redbird Flight Simulations, Inc. will 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 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 model CJ1+ is based on the dimensions and layout of a Cessna Citation Mustang II (525) production multi engine-land, turbine aircraft. This 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 CJ1+ provides realistic and true-to-scale cockpit design, avionics, and reliable hardware/software performance. This platform also provides an effective training environment for student and certificated pilots. This includes the capability of practicing scenario based flight training events, simulated equipment failure and emergency procedures, pilot evaluations, instrument procedures/ experience, and facilitating increased pilot proficiency overall.

The Redbird CJ1+ is a versatile and affordable device that has been designed to represent a Cessna Citation Mustang II (C525). It is equipped with the following notable features:

- Enclosed cockpit with pilot and copilot seating.
- 3-axis electric motion platform providing pitch, roll and yaw motions
- Wrap-around exterior visuals provided by 6 or 8 LCD screens
- Dual pilot controls including a 2-axis control-loaded yoke and interconnected rudder pedals
- 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 training device
- 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 and/or web browser enabled device.

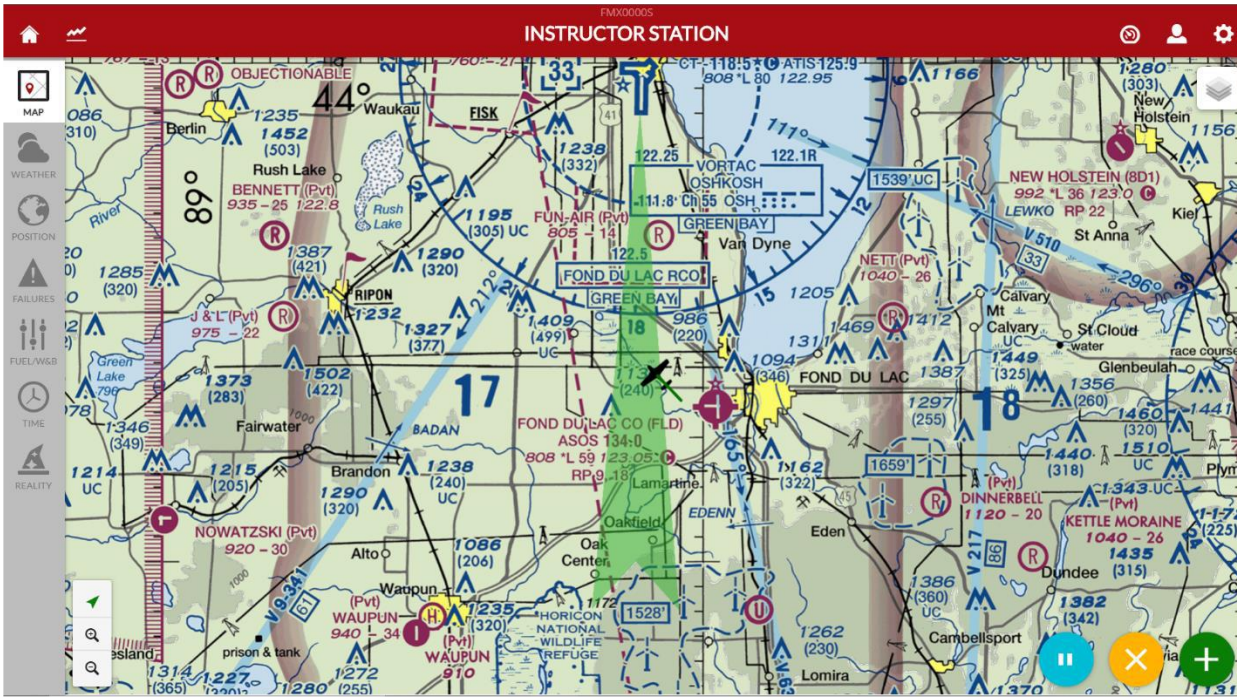

Image :21 Instructors PC/Tablet or Mobile Device

Aircraft Instrument Configurations

Image 2: Instrument Panel

Controls

Image 5: Pilot Yoke Switches – Left

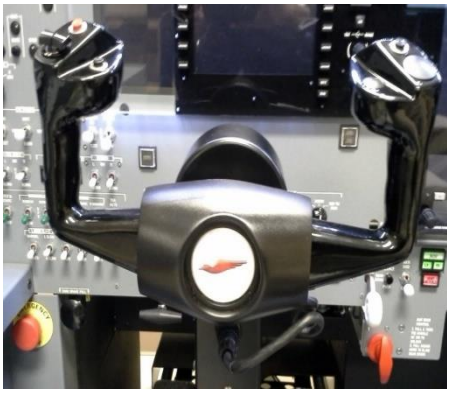

Image 4: Pilot Yoke

Image 6: Pilot Yoke Switches – Right

Image 8: Copilot Yoke Switches – Left

Image 7: Copilot Yoke

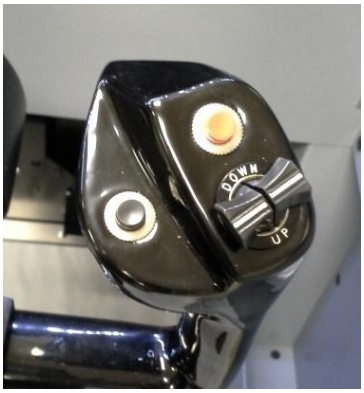

Image 9: Copilot Yoke Switches – Right

Image 10: Thrust Lever Quadrant

Image 13: FMS

Image 15: Pilot Circuit Breaker Panel

Image 19: Co-Pilot Circuit Breaker Panel

Image 14: Overhead Switch Panel

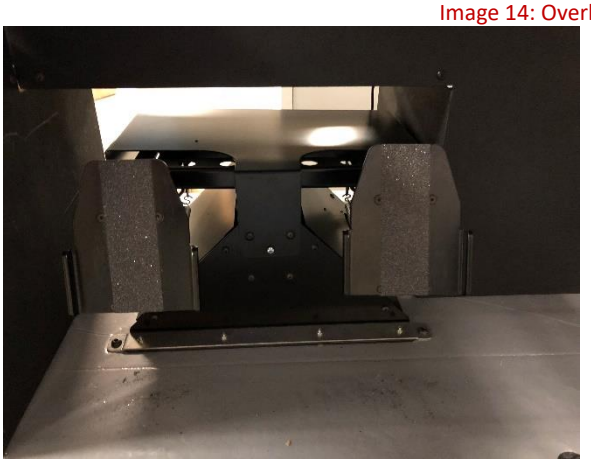

Image 11: Pilot Rudder Pedals

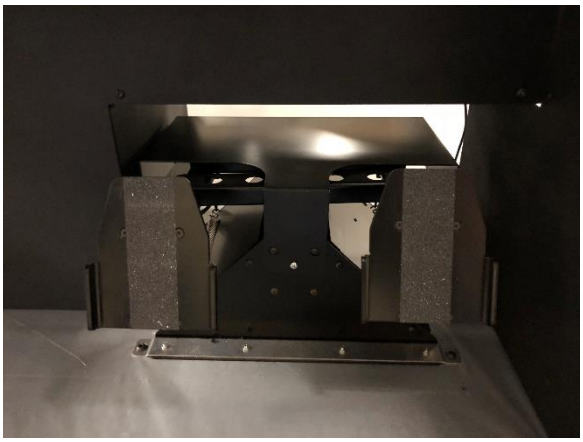

Image 12: Copilot Rudder Pedals

Image 17: Pilot Lower Switch Panel (Right)

Image 20: Co-Pilot Lower Switch Panel (Right)

Image 18: Landing Gear/ Emergency Landing Gear Handles

Image 16: Pilot Lower Switch Panel (Left)

Image 22: Pilot / Copilot Seating

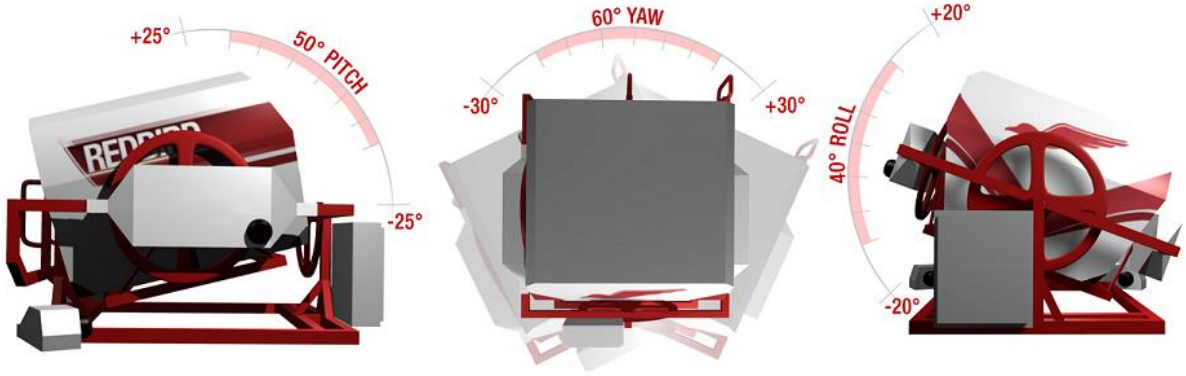

Image 26

SECTION 3: TRAINING DEVICE COMPONENTS LIST

Qty	Type	Manufacturer	Name	Description/Function	Configuration
1	Software	Microsoft	Windows OS	Operating system. (depending on serial number)	All
1	Software	Microsoft	ESP	Simulation engine. (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. (depending on serial number)	All – Except when configured as non-motion
1	Software	Redbird Flight Simulations	Instructors Station	Environmental, location and failure controls with map, track and glideslope display.	All
1	Software	Redbird Flight Simulations	Navigator	Simulation control and component integration. Environmental, location and failure controls with map, track and glideslope display.	All
1	Software	Mindstar Aviation	Redbird Proline 21	Virtual replication of the Proline21 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	RealNav Data	Instrument Procedures Database	Provides for FAA published instrument navigation procedures, database per 14 CFR 97 (enroute, approach)	All
1	Software	Redbird Flight Simulations	Parrot and Cygnus	Optional software providing ATC and location services	All
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 – Except when configured as non-motion
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.	All – Except when configured as non-motion
1	Hardware	Redbird Flight Simulations	Cockpit Enclosure	Cockpit enclosure to exclude distractions.	All
6	Hardware	22” ASUS VW22A or equivalent	Visual Display - Type 1	Flat Panel displays for exterior views.	All – Varies by configuration
8	Hardware	22” ASUS VW22A or equivalent	Visual Display - Type 2	Flat Panel displays for exterior views.	All – Varies by configuration
6	Hardware	27” ASUS VE278H or equivalent	Visual Display - Type 3	Optional large Flat Panel displays for exterior views.	All – Varies by configuration
8	Hardware	27” ASUS VE278H or equivalent	Visual Display - Type 4	Optional large Flat Panel displays for exterior views.	All – Varies by configuration
FMX3	Hardware	19” AUO M190PW01 or equivalent	LCD	Flat Panel displays for virtual instruments.	All

1	Hardware	Redbird Flight Simulations	Dual Yoke	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 lever, propeller pitch lever, condition lever, flap position lever and pitch, aileron and rudder trim controls with indicators for each.	All
1	Hardware	Redbird Flight Simulations	Rudder Pedals - Dual	Dual Rudder control pedals with toe brakes.	All – Varies by configuration
1	Hardware	Redbird Flight Simulations	Rudder Pedals (CL) - Dual	Optional dual control loading rudder pedals with toe brakes.	All – Varies by configuration
1	Hardware	Redbird Flight Simulations	Instrument Controls	Flight instruments, radios, airplane configuration and systems controls.	All
1	Hardware	Redbird Flight Simulations	FMS Panel	FMS controls, keypad and display screen. Includes airplane cabin pressurization system controls.	All
1	Hardware	Redbird Flight Simulations	Switch Panel 1	Lower switch panel with airplane configuration and systems controls.	All
1	Hardware	Redbird Flight Simulations	Switch Panel 2	Overhead switch panel with airplane systems controls.	All
1	Hardware	Redbird Flight Simulations	Fuel System Control	Pilot side panel with controls for airplane fuel system.	All
1	Hardware	Redbird Flight Simulations	Circuit Breaker Panel 1	Pilot side circuit breaker panel.	All
1	Hardware	Redbird Flight Simulations	Circuit Breaker Panel 2	Co-Pilot side circuit breaker 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	All

Table 1: Training Device Component List (Above)

Statements of Compatibility of Software and Hardware

AC 61-136B, Appendix A.6.2

The device and all configurations included in this Qualification and Approval Guide (QAG) meet the requirements for the Compatibility of Software and Hardware.

Microsoft Windows (Operating System)

This is to certify that Microsoft Corporation, the owner and developer of the Windows operating system, has evaluated that their operating system works with industry standard PC's and USB flight control devices. Redbird Flight Simulations, Inc., utilizes industry standard USB flight control devices for all pilot input. All input control devices meet the USB 2.0 industry standard specified interfaces. Redbird Flight Simulations, Inc., the component integrator, has determined that the transport delay time is less than 300 milliseconds, and that all analog and digital input signals meet the performance criteria established for the software.

Microsoft ESP (Simulation Engine)

"This is to certify that Microsoft Corporation, the owner and developer of the ESP Simulation Engine, has evaluated that their software application works with industry standard PC's and USB flight control devices. Redbird Flight Simulations, Inc., utilizes industry standard USB flight control devices for all pilot input. All input control devices meet the USB 2.0 industry standard specified interfaces. Redbird Flight Simulations, Inc., the component integrator, has determined that the transport delay time is less than 300 milliseconds, and that all analog and digital input signals meet the performance criteria established for the software."

Lockheed Martin Prepar3D (Simulation Engine)

This is to certify that Lockheed Martin, the owner and developer of the Prepar3D Simulation Engine, has evaluated that their software application works with industry standard PC's and USB flight control devices. Redbird Flight Simulations, Inc., utilizes industry standard USB flight control devices for all pilot input. All input control devices meet the USB 2.0 industry standard specified interfaces. Redbird Flight Simulations, Inc., the component integrator, has determined that the transport delay time is less than 300 milliseconds, and that all analog and digital input signals meet the performance criteria established for the software

Mindstar Aviation Redbird Virtual Instrument Suite

This is to certify that Mindstar Aviation, the developer of the Redbird Virtual Instrument Suite, including the Redbird Proline 21, Redbird FMS 3000, Redbird SFDS, Redbird Radios and Redbird Flight Simulations, the hardware manufacture and component integrator, have demonstrated that the Redbird Virtual Instrument Suite software package is fully compatible with the Redbird Flight Simulation model Redbird CJ1+ and all configurations of that model. Mindstar Aviation and Redbird Flight Simulations can assure that the communications/transport data delay is not greater than 300 milliseconds and all analog and digital input signals meet the performance criteria established for the software performance by Redbird Flight Simulations.

Flight 1 Compass

This is to certify that Flight 1, the owner and developer of the Compass and Redbird Flight Simulations, the hardware manufacturer and component integrator, have demonstrated that the Compass software is fully compatible with the Redbird Flight Simulations model Redbird CJ1+. Redbird Flight Simulations can assure that the communications/transport data delay is not greater than 300 milliseconds and all analog and digital input signals meet the performance criteria established for the software performance by Redbird Flight Simulations.

The device and all configurations included in this Qualification and Approval Guide (QAG) meet the requirements for the Compatibility of Software and Hardware.

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 61-136B, for ATD 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 CJ1+.

Basic ATD Requirements List [Appendix B items]

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

The Redbird CJ1+ meet the following (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.

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.

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.

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.

The Redbird CJ1+ meets the following Control Requirements (For Airplane):

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 CJ1+ meets the following (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).

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.

The Redbird CJ1+ meets the following (Display Requirements):

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

B.3.4.1.1 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.

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 may be selectively displayed if desired or required, 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 must be 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 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.

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 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.

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 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:

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 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:

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.

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 CJ1+ meets the following (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.

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.

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.

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.

The Redbird CJ1+ meets the following (Instructional 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.

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.

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.

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.

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.

Advanced ATD Requirements List [Appendix C items]

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

The Redbird CJ1+ 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) permitting indicator movement either electrically or analog in an acceptable trim ratio (airplane only).

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 to permit 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:

(a) 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).

(b) 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.

(c) 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 CJ1+ meets the following additional encouraged (not required) AATD CRITERIA:

C.3.2.1 Multi-panel or wrap-around visual system providing a 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 CONFIGURATIONS

List of Previously Approved Configurations (QAG v1.0):

Cessna Citation CJ1+ (Proline 21)

Image 25: CJ1+ Instrument Panel

MTOW	FWD/AFT CG Limit
10,700 lbs	244.4in. / 248.4in.

- **Yoke – Center (See Images 2-9)**
- **Throttle – Multi-Engine (See Image 10)**
- **Glass Cockpit Proline, PFD, MFD, FMS (See Image 2, 13)**

Additional configurations included in this version (QAG v 3.0)

None

Performance Table

Aircraft Model	V_{SO}	V_{S1}	V_X	V_Y	V_{MO}	V_{MCA}	KTAS @ Cruise Approx. 75% Fan RPM	(ME) Cruise Climb FPM @ MCT	(SE) Enroute Climb FPM @ V_{ENR}
Cessna Citation CJ1+ (525)	86* KIAS	98* KIAS	113 KIAS	167 KIAS	263 KIAS	77** KIAS	239 KTAS (5000')	2969 FPM @ 220 KIAS (5000')	755 FPM @ 128 KIAS
						12,000' -->	239 KTAS	2592 @ 220 KIAS	354 FPM @ 131 KIAS

Table 2: Performance Table

*Idle Thrust

**Flaps 15°

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

Redbird CJ1+ 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 CJ1+ provides a means of recording the visual response time for the visual system that is installed.
- The Redbird CJ1+ 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 (36.5 cm x 63.5cm OPTIONAL) wide. Based upon the designated Pilot Eye Point, these monitors provide a horizontal FOV of at least 220 (6 monitors) to 260 (8 monitors) degrees and a vertical FOV of minimally 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 training device 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.

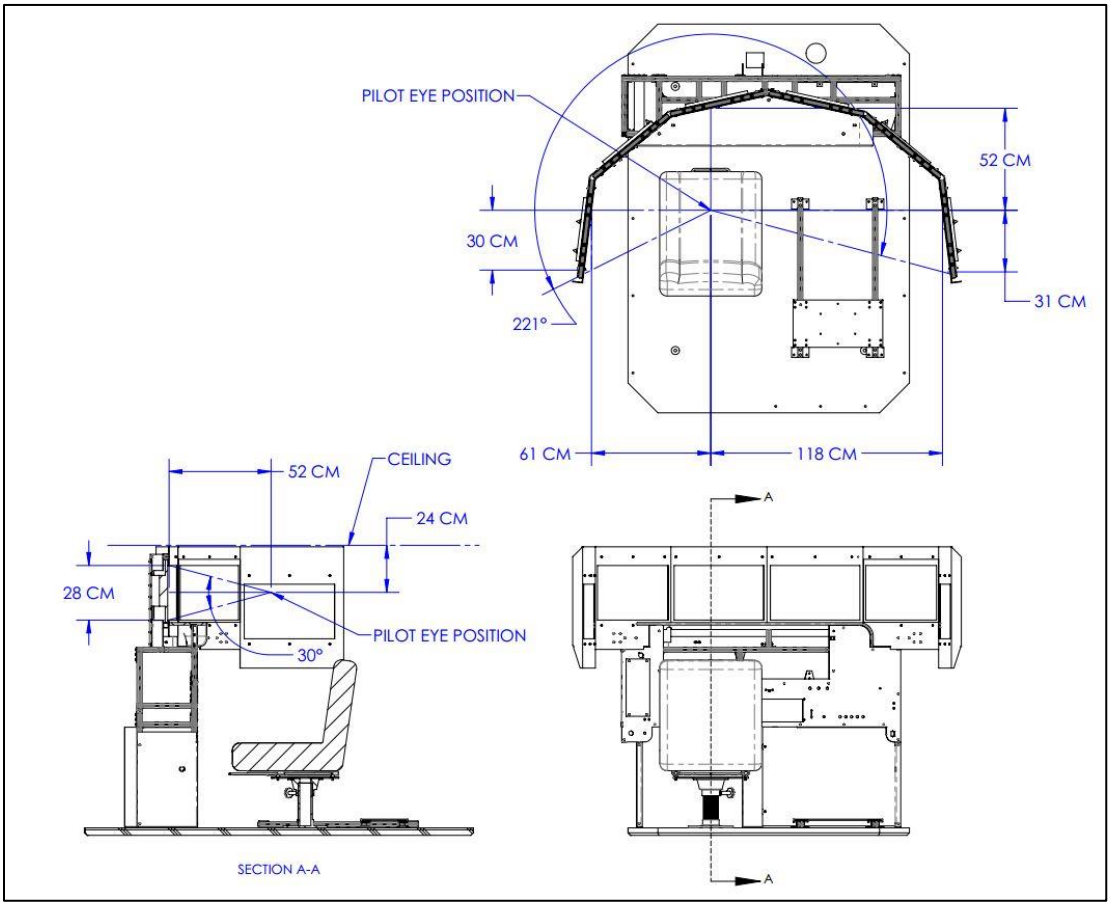

Figure 1: Designated Eye Point Diagram

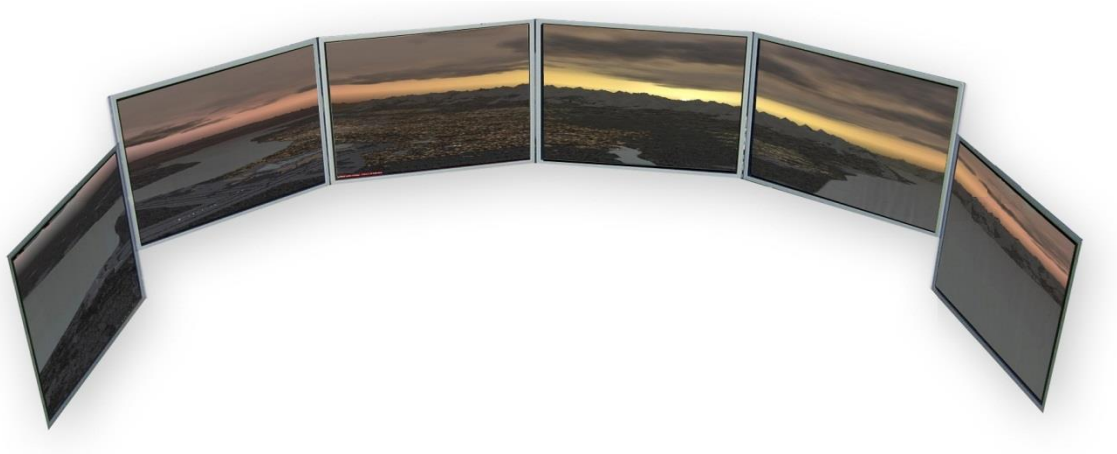

Image 23: Visual Displays – Type 1 (22” Display Monitors)

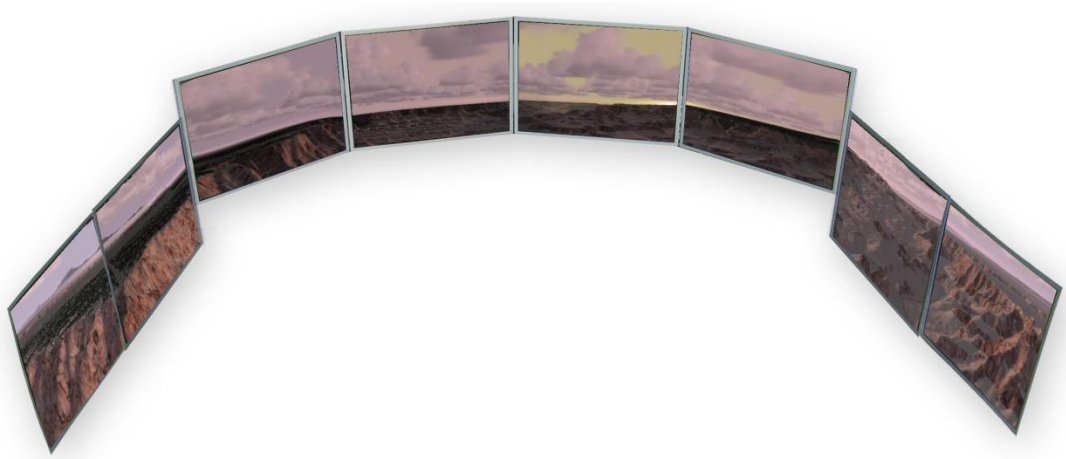

Image 24: Visual Displays – Type 2 (22” Display Monitors)

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

Image 28: Visual Displays – Type 4 (27” Display Monitors)

SECTION 7: ATD FUNCTIONS & MANEUVERS CHECKLIST

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	NA
ii) From hover	NA
iii) From ground	NA
Maneuvers and Tasks	**Yes/No/NA**
iv) Vertical	NA
v) Running	NA
c) In-Flight Operation	
1) AIRPLANE In-Flight Operation	
i) Climb	Yes
(a) Normal and max. performance	Yes
(b) One-engine-inoperative procedures (multiengine)	Yes
ii) Cruise	Yes
(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)	Yes
(e) Fuel selector function	Yes
(f) In-flight engine start	Yes
iii) Approach	Yes
(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	NA

(a) Forward	NA
(b) Rearward	NA
(c) Sideward	NA
(d) Turns	NA
ii) Climb	NA
iii) Cruise	NA
(a) Performance characteristics (speed vs. power)	NA
Maneuvers and Tasks	**Yes/No/NA**
(b) Turns	NA
(i) Recovery	NA
(ii) Skidding	NA
(iii) Slipping	NA
(iv) Steep turns	NA
(c) In-flight engine shutdown and start (multiengine)	NA
(d) Descents	NA
(e) Straight in and 180º autorotation	NA
(f) Landings	NA
d) Instrument Approaches	
1) Nonprecision	
i) GPS and LPV	Yes
ii) GPS-WAAS (optional)	Yes
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
2) Precision	
i) ILS	Yes
ii) GLS (optional)	No
iii) Effects of crosswind	Yes
iv) With engine inoperative (multiengine)	Yes
v) Missed approach	Yes
(a) Normal	Yes
(b) With engine(s) inoperative (multiengine)	Yes
e) Surface Operations	
1) AIRPLANE Surface Operations (Post Landing)	
i) Approach and landing roll	Yes
ii) Braking operation	Yes
Maneuvers and Tasks	**Yes/No/NA**
iii) Reverse thrust operation, if applicable	NA
2) HELICOPTER Surface Operations	
i) Landings	NA
ii) Landing area operations	NA
f) HELICOPTER Emergency Operations	

1) Power failure at hover	NA
2) Power failure at altitude	NA
3) System and equipment malfunctions	NA
4) Settling with power (optional)	NA
5) Low rotor RPM recovery (optional)	NA
6) Antitorque system failure	NA
7) Dynamic rollover (optional)	NA
g) Any Flight Phase	
1) Aircraft and Powerplant Systems	Yes
i) Electrical, mechanical, or hydraulic	Yes
ii) Flaps (airplane)	Yes
iii) Fuel selector and oil temp/pressure	Yes
iv) Landing gear (if applicable)	Yes
2) Flight Management and Guidance Systems	Yes
i) Autopilot (if standard equipment)	Yes
ii) Flight director (AATD only)/system displays (if installed)	Yes
iii) Navigation systems	Yes
iv) Stall warning systems avoidance (airplane)	Yes
v) Multi-function displays (if applicable)	Varies* (Based on Configuration)
3) Airborne Procedures	Yes
i) Holding	Yes
ii) Uncoordinated turns – slipping and skidding demo	Yes
Maneuvers and Tasks	**Yes/No/NA**
iii) Configuration and power changes and resulting pitch changes	Yes
iv) Compass turns and appropriate errors (if installed)	Yes
4) Engine Shutdown and Parking	Yes
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 (Except oil pressure loss)
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

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."

Note: Any changes or modifications to this device which have not been reviewed, evaluated, and approved in writing by General Aviation and Commercial Division, AFS-800 may terminate FAA approval of this aviation training device.