XSPEC Aviation LLC
Airplane XSPEC 142
Qualification and Approval Guide (QAG)

Advanced Aviation Training Device

Aaron J. Hill – President
XSPEC Aviation LLC
1315 Hervey Ln. Joplin, MO 64801
www.xspecaviation.com
(ahill@xspecaviation.com) 479-418-2184

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FAA APPROVED QAG
Signature and Date

EVERETTE C ROCHON JR

Digitally signed by EVERETTE C ROCHON JR
Date: 2023.08.31 15:25:45 -04'00'

Everette C. Rochon, Jr
Manager, Training and Certification Group

List of Effective Pages

This lists all current pages, with effective dates for this Qualification and Approval Guide. It should be used after posting changes to ensure the manual is complete and up-to-date.

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Compliance Statement

This Qualification and Approval Guide (QAG) includes a detailed description of all components, functions, and capabilities for the XSPEC Aviation "XSPEC 142". This includes any optional aircraft configurations with quality color pictures and diagrams. This QAG is provided by XSPEC Aviation 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 the current advisory circular, AC 61-136A / *FAA Approval of Aviation Training Devices (ATD) and Their Use for Training and Experience* is provided within this document. This includes listing all 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 as specified in 14 CFR §61 or 141. Additionally, FAA Order 8900.1 Volume 11 Chapter 10 Section 1 provides guidance to aviation safety inspectors facilitation ATD evaluations, approvals and oversite.

XSPEC Aviation 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. XSPEC Aviation 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 this FAA approval or use of ATDs should be directed to the General Aviation and Commercial Division.

Aviation Training Device (ATD) Description and Pictures

The XSPEC Aviation “XSPEC 142” is based on the dimensions and layout of a BE-76 Duchess, Piper PA-23 Aztec, Piper PA-44 Seminole, Piper PA-34 Seneca II, Piper PA-38 Tomahawk, Piper PA-28R Arrow, Cessna 172 RG Cutlass II and Cessna 172 N production Single/Multi-Engine Land aircraft. This trainer closely represents the overall functionality, performance, and instrumentation for the airplane. The platform 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 “XSPEC Aviation LLC”. All hardware components are designed and installed so the flight deck has the appearance and feel of an actual airplane.

The “XSPEC 142” provides 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 ”XSPEC 142” represents a BE-76 Duchess, Piper PA-23 Aztec, Piper PA-44 Seminole, Piper PA-34 Seneca II, Piper PA-38 Tomahawk, Piper PA-28R Arrow, Cessna 172 RG Cutlass II and Cessna 172 N

Image 1: Interior showing the overall flight deck configuration

Image 2: Exterior picture of the ATD enclosure

Image 3: Detail view of overhead panel switches and mechanical compass

Image 4: Detail view of flight instruments with optional KA51B Indicator below HSI

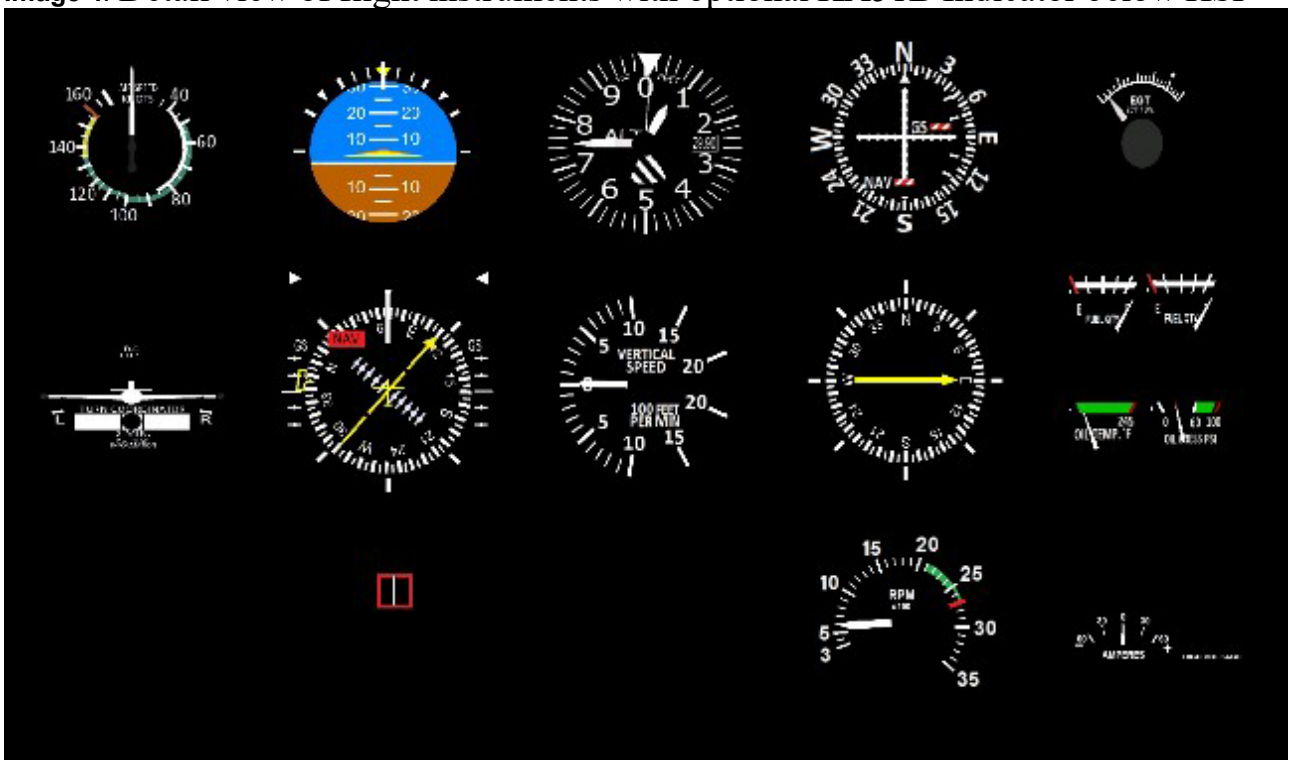


Image 5: Detail view of Alternate Avionics Panel “MegaRadioStack” KX155, KR87, KT76C and KFC150 below an alternate “XSPEC” GNS530. KMA24 Audio Panel.

Image 6: Engine start panel and switches with optional KA-51B Slaving Panel in Multi-Engine Configuration (PA-23)

Image 7: Optional Co-Pilot Package, KA-51B, KX155, KR87, KT76C, KFC150 GNS530. (PA-23)

Image 8: View of annunciator and auto pilot system.

Image 9: Co-Pilot side of instrument panel with optional Co-Pilot Package. (PA-38)

Image 10: Optional KA51B Slaving Panel

XK51-01 In the Components List

Image 11: Single-Engine Configuration Switch Cover

Image 12: Control Yoke showing yoke mounted switches. (MEL)

Image 13: Rudder pedals

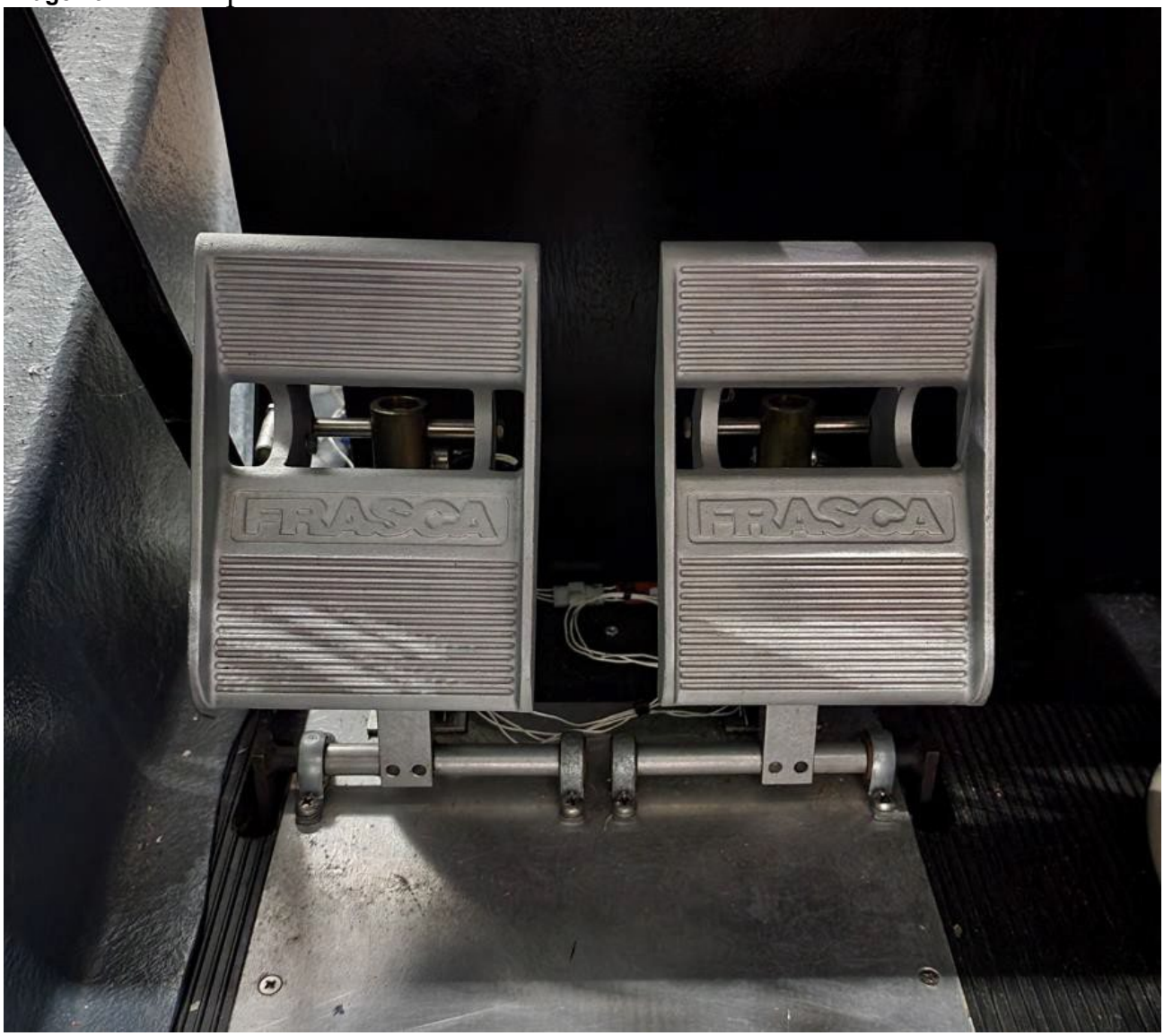


Image 14: Center console showing engine control levers for Multi-Engine Configuration

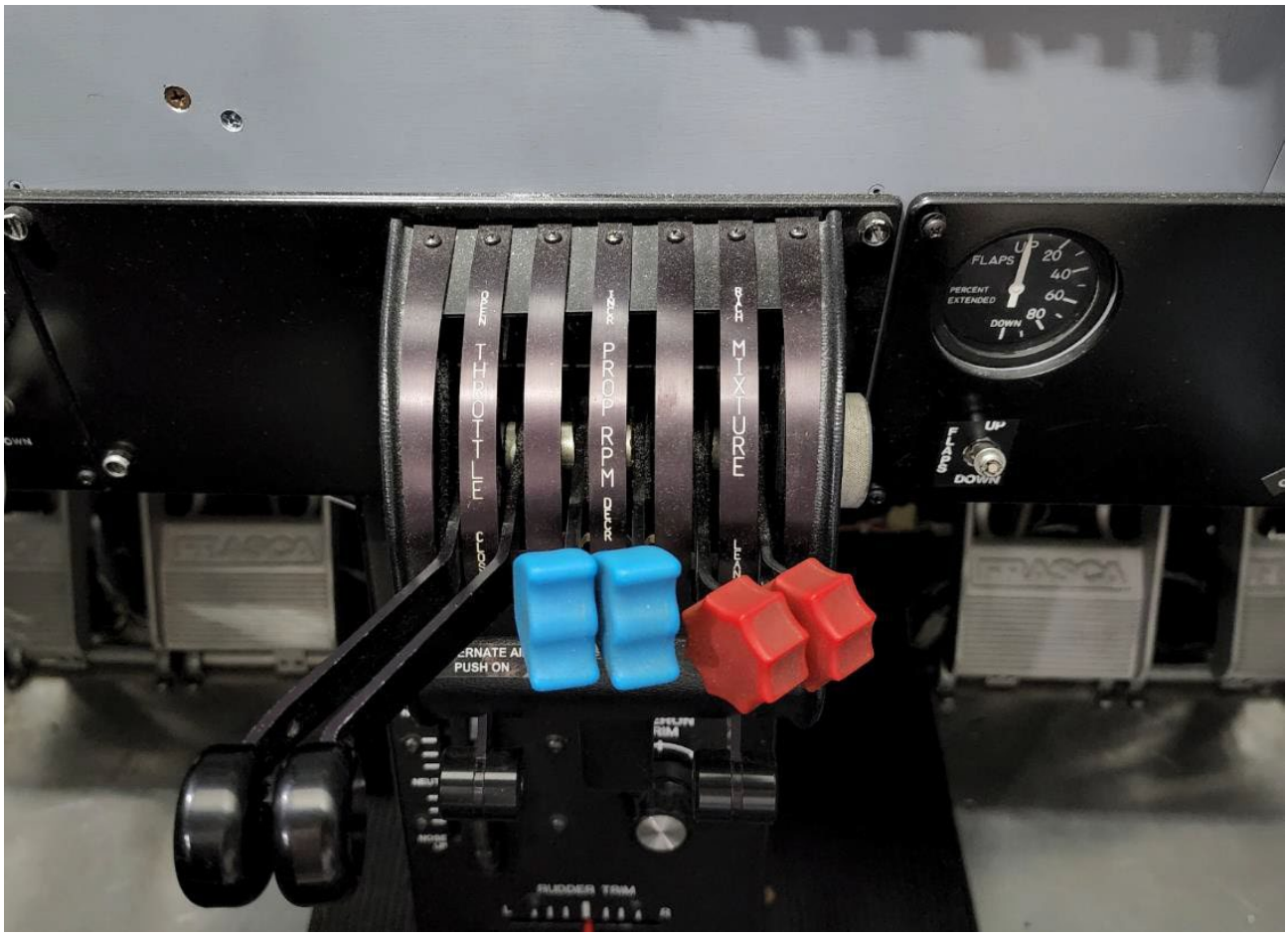


Image 15: Fuel selector.

Image 16: Instructor station showing moving map, victor airways and current airplane position.

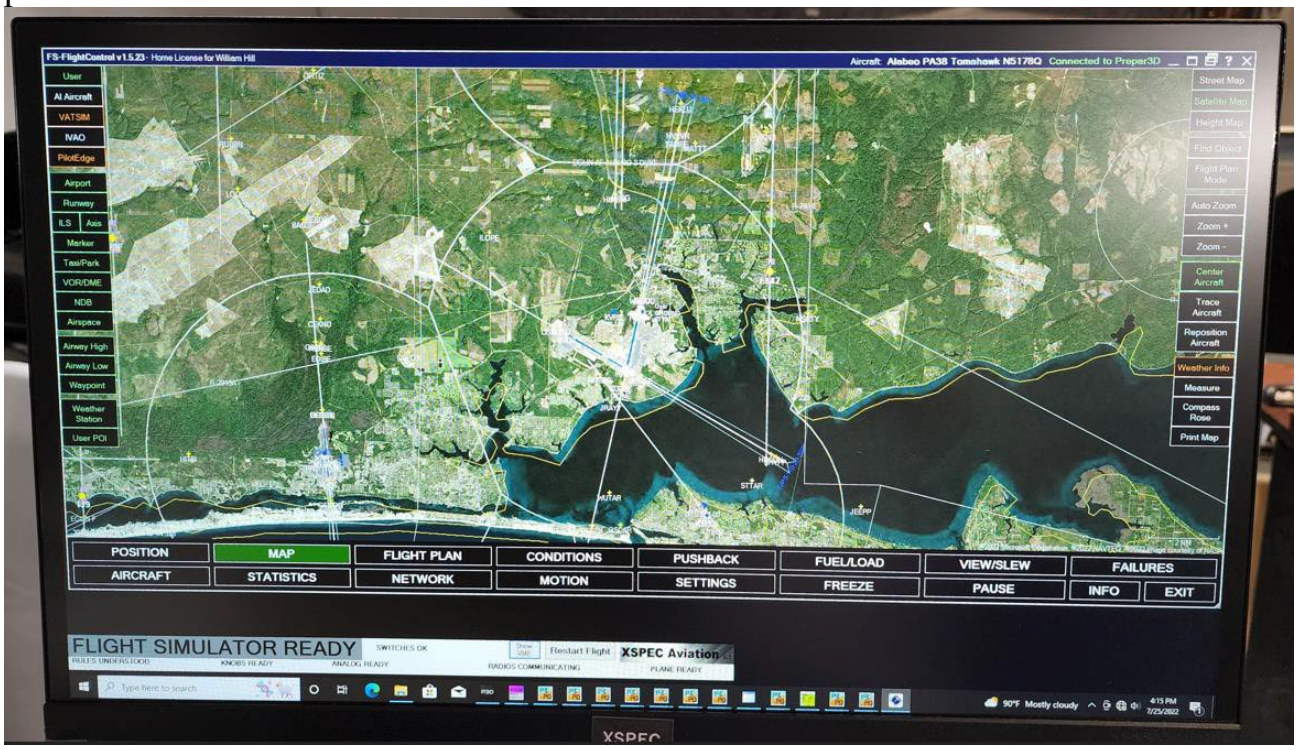
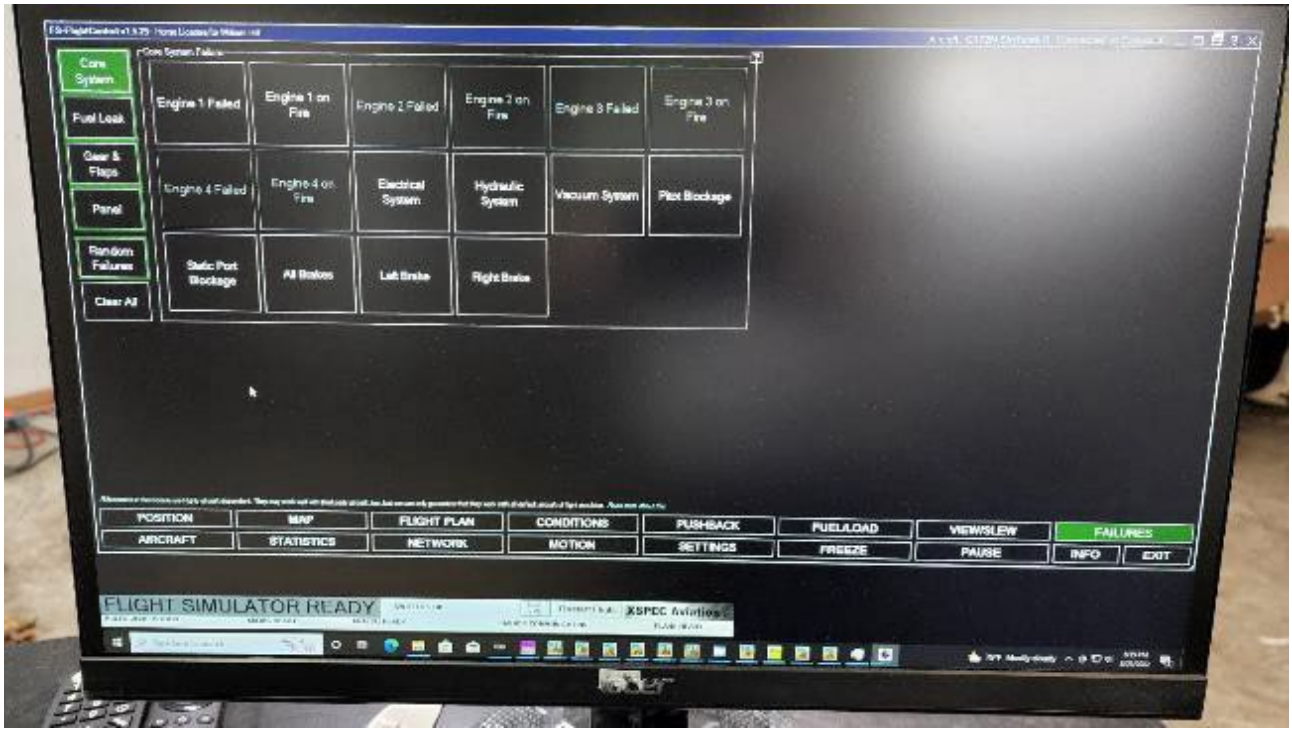


Image 17: Instructor station displaying weather controls and systems malfunction controls interface.



Hardware and Software Components List

Detailed list with description of the hardware and software components

Item	Component Name	Manufacturer	Model #	Version #	Quantity	Details
01	Enclosure Assembly	XSPEC Aviation	<142>	v1.0	1	Fiberglass enclosure resembling the nose of an aircraft. Optional: 'Double Wide' Fiberglass enclosure
02	Flight Controls (elevator and ailerons)	FRASCA	<142>	v1.0	1	Anodized aluminum extrusion, shaft and yoke with sleeve bearings.
03	Rudder Pedals/Brakes	FRASCA	<142>	v1.0	1	Aluminum extrusion with precision linear potentiometer circuitry and individual toe brakes.
04	Trim control and indicator	FRASCA	<142>	V1.0	1	Yoke mounted electric trim provides electrical signal to adjust elevator control realistically. Mechanical trim indicator painted red showing through instrument panel cut-out. Optional: Center console mounted Elevator Trim Wheel for Enhanced Visuals Systems and/or Co-Pilot System equipped models.
05	Flap control and indicator	FRASCA	<142>	V1.0	1	Mechanical "steam-gauge" style flaps indicator showing flaps extension in percentage. Realistic 'pull-out' flaps switch with flaps retract lock mechanism. This mechanical style gauge can be calibrated via 'VisualMasterEngine' integration software on the Instructor Station.
06	Engine start panel & switches	FRASCA	<142>	V1.0	1	Plastic capped electronic toggle switches for most switches except starter switch which is a momentary switch with 2 positions for starting multi-engine configurations (left & right). Press momentary buttons for the primers and gear horn warning. Optional: Toggle switches for KCS55 'Auto/Man' and 'CW/CCW' switches.
07	Engine Controls Single (with "Toggle Bolt" Clamping System)	FRASCA	<142>	v1.0	1	PVC enclosure with powder coated aluminum throttle/propeller/mixture controls for single/multi – engine applications with precision linear potentiometers. Uses a modified toggle bolt to allow quick; easy and permanent installation in Single-Engine Configuration. Toggle Bolts are metal, spring-loaded screws with winged ends. Only a screwdriver is required to secure/remove clamps.
08	Engine Controls Single (without "Toggle Bolt" clamping system)	FRASCA	<142>	V1.0	1	PVC enclosure with powder coated aluminum throttle/propeller/mixture controls for single/multi – engine applications with precision linear potentiometers.
09	Gear selector (retract only)	FRASCA	<142>	v.1.0	1	Two-position electronic switch with realistic circular handle and pull-out mechanical style mechanism.
10	Fixed Pilot seat	FRASCA	<142>	V1.0	1 or 2	Fabric or leather captain style chairs with or without armrests. Seats feature height and forward/back adjustment. Adjustment mechanism varies among seats.
Instrument panel components with the following flight instruments, avionics, and other miscellaneous airplane systems controls						
11	Flight Instrumentation	XSPEC AVIATION	X22-01, X23-01, X22-02, X23-02, X22-XX, X23-XX	V3.9	1	22" and 23" Class LCD screens designed to fit precisely behind the instrument panel. Uses XSPEC AVIATION "P3PD" orthogonal 3D instrument rendering software. Flight instruments move smoothly and do no stutter, jump or lag noticeably.

12	NAV/COM 1	XSPEC AVIATION / RealityXP	XNS530W	V1.0	1	XSPEC Aviation custom hardware fabricated GNS530 Emulation with twin dual-concentric knobs and realistic Garmin shape and resemblance. RealityXP GNS530 software emulation is built on actual Garmin PC trainer software technology. Features 1:1 operation and frequency flip-flop from active to standby.
13	NAV/COM 2	XSPEC AVIATION	MegaRadio Stack	V1.0	1	XSPEC Aviation custom hardware fabricated Silver Crown KX155 Emulation with twin dual-concentric knobs and realistic Bendix/King shape and resemblance. XSPEC Aviation 'P3PD' software provides 7-segment display emulation via 7" LCD screen. Features frequency flip-flop from active to standby. Push to turn 25K allows for 25K frequency selections with COM 2.
14	GPS 530	XSPEC AVIATION/ RealityXP	XNS530W	V1.0	1	XSPEC Aviation custom hardware fabricated GNS530W emulation with twin dual-concentric knobs and realistic Garmin shape and resemblance. RealityXP GNS530 software emulation is built on actual Garmin PC trainer software technology. Features 1:1 operation with moving map, TAWS and WAAS.
15	Autopilot / Flight Director	XSPEC AVIATION	MegaRadio Stack	V1.0	1	XSPEC Aviation custom hardware fabricated KFC150 emulation with realistic autopilot mode selector and mode annunciator. Selected modes perform as they should and there is an audible Autopilot disconnect tone.
16	Primary Flight Computer	XSPEC AVIATION	PFC-142	V1.0	1	XSPEC Aviation custom fabricated x86 class computer with advanced 3D rendering technology. Primary flight computer drives all software from visuals, flight dynamics, instrumentation display, avionics and instructor station.
17	Visual display monitors	XSPEC AVIATION	VDM-142, X32-01, X32-02, X32-03, X32-XX, X55-01, X55-02, X55-03, X55-XX	V1.0	3 or 5	XSPEC Aviation selected and approved 32" class LCD televisions. Optional selected and approved 55" class LCD television for front main visual on Enhanced Visual System equipped models. 32" class monitors are at least 720p and 55" class monitors are at least 1080p and features 60Hz (60 frames per second) refresh rate. Standard Visuals systems feature 3 (three) 32" monitors. Enhanced Visuals systems feature 4 (four) 32" class monitors and 1 (one) 55" class monitor.
18	Electrical Switches	FRASCA / XSPEC AVIATION	<142>	V1.0	26	XSPEC Aviation inspected and installed electrical switches that control various aspects of the aircraft. Toggle switches for most controls except starter which is momentary with auto-center. Dual throw switch allows for L and R engine starter. Potentiometer aileron trim affects aileron input needed to fly level. Toggle light control switches. Toggle alternators. Toggle Battery Master. Toggle Fuel Pumps. Toggle Pitot Heat. Toggle Landing Gear with realistic white-circle handle. Toggle trim switch with realistic pull-out, trim-up hold mechanism. Acutal Klixon aircraft breakers provide circuit breaker emulation. KCS55A system features realistic toggle switches.
19	Audio System	XSPEC AVIATION	<142>	V1.0	1	Realistic aircraft sounds are produced from front facing visual built in (VDM-142) stereo speakers. Optional high-performance stereo and surround sound options available with or without additional subwoofer for sonic effects.
20	Operating System	Microsoft	Windows	10/11	1	Primary flight computer 'Operating System' allows for high-level software to be ran securely and reliably. Windows operating system natively supports DirectX and Direct3D for maximum Flight Instrument and Simulation software performance and compatibility. Windows operating system natively supports XSPEC

						I/O BOX 'Serial' Communication protocol. Windows operating system allows for easy IOS use and remote factory maintenance.
21	Instructor Operating System (IOS)	XSPEC AVIATION / FS-FLIGHTCONTROL	<142>	V1.0	1	XSPEC 142 Airplane Instructor Operating System allows for various phases of flight to be set up for, recorded, replayed, and malfunctioned based on instructor input. IOS allows for top-down, moving map style view of aircraft alongside airways, NDBs, Navaids and ILS approach cardinals. ILS approaches can be profiled, reviewed, recorded, replayed with altitude information plotted alongside the glideslope during approach in GUI form. Weather can be modified allowing for custom cloud layers and visibilities, along with turbulence, precipitation, temperature and other conditions. IOS always tells the instructor if the Simulator is 'READY' or 'NOT READY' based on continuous systems checks and validations.
22	Environment Simulation Control Software	FS-FlightControl	<142>	V1.0	1	FS-FlightControl allows for terrain location creation, airplane performance data, instrumentation, navigation, visuals, sound and weather functions to be modified and/or created.
23	Instrument Procedures and Navigational Database used	ELITE / RealityXP	<142>	V1.0	1	GPS navigation database is updated to current published instrument navigation procedures and database per 14 CFR 97. Database can be updated up to 4 (four) times per year.
06	Com/Nav 2	DCI (Lenexa, KS)		n/a	1	Optional Digital NAV/COM radio equipment module with flip-flop functionality and ID feature.
07	Com/Nav 2	TRC "SimKits"	KX155A	RS372	1	Optional Digital NAV/COM radio equipment module with flip-flop functionality and ID feature.
08	ADF	TRC "SimKits"	KR87	RS372	1	Optional Provides tuning capability to the automatic direction finder to display the relative bearing to the NDB.
08	Transponder	DCI	Silvercrown KT-79	n/a	1	Optional Digital transponder module with altitude reporting and ident functions.
09	Transponder	TRC "SimKits"	KT76T	RS372	1	Optional Digital transponder module with altitude reporting and ident functions.
09	Autopilot/Flight Director	XSPEC Aviation	KFC150	v1.0	1	Optional Digital flight director and autopilot module with flight director, altitude hold, heading, NAV and approach, back course and pitch modes.
10	Autopilot/Flight Director	XSPEC Aviation	KFC150	V2.0	1	Optional Digital flight director and autopilot module with flight director, altitude hold, heading, NAV and approach, back course and pitch modes.
10	ATD Primary Flight Computer	ASUS		n/a	1	Optional Intel® Core™ i7-4790S CPU with 8GB DDR3 RAM. Microsoft Windows 7 Ultimate SP2.
11	Instrumentation Display Monitor	HANNS-G		n/a	1	Optional LCD display for flight, navigation and engine instrumentation gauges.
12	Visual Display Monitor	EMERSON	LF320EM4A	n/a	3	Optional 1080p LCD for front and side visuals.
13	Visual Display Monitor	SAMSUNG	UN32J5xxx	n/a	4	Optional Alternate equipment for "Enhanced Visuals System" that uses 4 32" LCDs to provide 180 degree continuous wrap around visuals with the 55" inch front main visual.
13	Instructor Station Monitor	ACER	G227HQL	n/a	1	Optional 1080p IPS LCD for extremely crisp; easy to read Instructor Station.
14	Enhanced Visual Display Monitor	SHARP	55LE64xx		1	Optional 55" (inch) 1080p front main visual)
14	"Phidgets" I/O	Phidgets Inc.			1	Optional Allows Optical Encoders to communicate with the Flight Controls Integration Software.

15	Optical Encoders		63R-256	n/a	10	Provides realistic tactile response for HDG, CRS, ILS and ADF
17	Audio System	Gigaware		n/a	1	Optional Provides amplified audio and subwoofer sounds
18	Audio Panel	TRC "SimKits"	KMA28	RS372	1	Optional Provides audio panel functionality to the avionics stack allowing to select audio channels from the COM, NAV and avionics systems.
18	Operating System	Microsoft	Windows 7	Service Pack 1	1	Optional Computer Operating System for ATD Primary Flight Computer
19	Simulation Engine Control Software	Lockheed Martin	PREPAR-3D	2.2, v3.x, v4.x	1	Software used to create and control aircraft performance data, instrumentation, navigation, visuals, sound and weather functions.
22	Flight Controls Integration	XSPEC Aviation	Master Engine		1	Optional Works with I/O to allow all Flight Controls, Knobs, Switches and Radios to communicate with the PREPAR3D Simulation Engine Control Software, as well as be monitored and tested in real time.
23	Measurement Computing I/O	Measurement Computing	USB-201 (3), USB-3015, USB-ERB08		5	Optional Allows various Flight Controls, Knobs, Switches, Gauges and Trim Systems to work with the Flight Controls Integration; Master Engine.
24	GP-Wiz I/O	IDVT Inc.	GP-WIZ, LEDWIZ		2	Optional Allows various Flight Controls, Knobs, Switches and Radios to work with the Flight Controls Integration; Master Engine.
25	XSPEC I/O BOX	XSPEC AVIATION LLC	142	1.00	1	Allows various Flight Controls, Knobs and Switches to work with the Flight Controls Integration; Master Engine or Visual Master Engine.
25	Uninterruptable Power Supply System	APC	APC-700		2	Optional Protects the device from power surges or outages; as well as integrates and unifies the initial powering up of the device.
26	Instructor Station	Flight1 Aviation	VISPRO		1	Optional Allows the separate instructor station to do all required flight management and training functions, including changing weather, time and flight parameters.
27	GNS-530 Software Emulation	Flight1 Tech	GNS530 Enterprise Edition		1	Optional Software that closely emulates a Garmin GNS-530; based off Garmin's 400/500W Trainer Software.
31	KX155 / KR87 / KT76C / KFC150 Replica	XSPEC Aviation	MRS-01, MRS-02, MRS-03, MRS-XX, "Mega Radio Stack"	n/a	1	Optional "MegaRadioStack" provides the following in one physical package maintaining physical resemblance to existing equipment. Digital NAV/COM radio module with flip-flop functionality and ID feature. Digital ADF that provides tuning capability to the automatic direction finder to display the relative bearing to the NDB. Digital transponder module with altitude reporting and ident functions. Digital flight director and autopilot module with flight director, altitude hold, heading, NAV and approach, back course and pitch modes.

33	KA51B Replica	XSPEC Aviation	XK51-01, XK51-02, XK51-XX, XCS-55A	n/a	1	Optional Provides authentic KCS55A replication. Features realistic operation with deflecting magnetic compass heading deviation indicator graphics below the appropriate CW/CCW and AUTO/MAN switches.
36	Flight Controls Integration	XSPEC Aviation	Visual Master Engine	n/a	1	Works with I/O to allow all Flight Controls, Knobs, Switches and Radios to communicate with the PREPAR3D Simulation Engine Control Software, as well as be monitored, calibrated and tested in real time via easy-to-use GUI. Works with GPS (XGNS-530-XX) Master Engine and "MegaRadioStack" Master Engine.
37	Pneumatics Control Loading Box	XSPEC Aviation	PCL-01, PCL-02, PCL-XX	n/a	1	Works with variable pressure pneumatic cylinders that more accurately convey control surface input resistance at variable speeds during every phase of flight.
38	Audio Panel	XSPEC Aviation	XKMA-01, XKMA-02, XKMA-XX	n/a	1	Optional Provides authentic KMA24 replication with toggle buttons for selecting audio input from various avionics and illuminated OMI marker indicators.
39	XSPEC I/O BOARD "NESTBOARD"	XSPEC AVIATION LLC	NestBoard	V1.0, V1.1, V2.0, V2.1, VX.X	1	Optional Allows various Flight Controls, Knobs and Switches to work with the Flight Controls Integration; Visual Master Engine or Master Engine.
40	XSPEC I/O BOARD "KNOB BOARD"	XSPEC AVIATION LLC	KnobBoard	V1.0, V2.0, VX.X	2	Optional Allows for 'optical encoders' to work with the Flight Controls Integration; Visual Master Engine or Master Engine.

Design Criteria List

The following section provides the detailed “word for word” listing and design criteria of each of the required items, functions, and compliance listed in AC 61-136, (See Appendix B for BATD and Appendix C for AATD items “if applicable”) and the operational performance (as applicable) for each of the functions provided for the “XSPEC 142” airplane ATD.

Basic ATD Requirements

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

The “XSPEC 142” model meets the following Control Input requirements.

(1) The airplane physical flight and associated control systems are recognizable as to their function and how they are 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 airplane in simulated flight.

(2) Virtual controls are those controls used to set up certain aspects of the simulation (such as selecting the airplane 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.

(3) Except for the initial setup, a keyboard or mouse is not 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 airplane model represented. The pilot is able to operate the controls in the same manner as it would be in the actual airplane. This includes the landing gear, wing flaps, cowl flaps, carburetor heat, mixture, propeller, and throttle controls appropriate to the airplane model represented.

(4) The physical arrangement, appearance, and operation of controls, instruments, and switches closely models the airplane represented. This trainer recreates the appearance, arrangement, operation, and function of realistically placed physical switches and other required controls representative of an airplane 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.

(5) Only the software evaluated by the FAA is available for use on this computer system. Note: This does not prohibit software updates that do not otherwise change the appearance of the systems operation.

The “XSPEC 142” model meets the following additional airplane physical flight and airplane systems controls:

(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 make and model of airplane represented.

(5) Controls for the following items, as applicable to the category and class of airplane 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 "XSPEC 142" model meets the following Control Input Functionality and Response Criteria:

(1) Time from control input to recognizable system response is without delay and does not appear to lag in any way. XSPEC Aviation verifies that the "XSPEC 142" meets this performance requirement.

(2) The control inputs are tested by the computer software at each session 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.

"XSPEC 142" model meets the following Display Requirements:

(1) The following instruments and indicators are replicated and properly located in the instrument panel, as appropriate to the airplane represented:

• Flight instruments are in a standard configuration, represented as 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.

• A sensitive altimeter with incremental markings each 20 feet or less, operable throughout the normal operating range for the make and model of airplane represented.
• A magnetic direction indicator

• 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 airplane represented.

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

• 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 airplane represented.

• 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.

• 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 or as appropriate for a PFD configuration is used.

• 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 airplane 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.

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

• A suction gauge or instrument pressure gauge, if applicable, with a display appropriate to the airplane represented.

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

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

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

• Navigation radio(s) with a full range of selectable frequencies displaying the frequency in use and capable of replicating both precision and non-precision instruments, including approach procedures (each with an aural identification feature), and a marker beacon receiver. Examples include, 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 markings 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), if installed.

➢ 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.

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

• A transponder that displays the current transponder code.

• Fuel quantity indicator(s) that displays the fuel remaining, either in analog or digital format, as appropriate for the make and model of airplane represented.

(2) All instrument displays listed above are visible during all flight operations. All of the displays provide an image of the instrument that is clear and:

(a) Does not appear to be out of focus or illegible

(b) Does not appear to "jump" or "step" during operation.

(c) Does not appear with distracting jagged lines or edges.

(d) Does not appear to lag relative to the action and use of the flight controls.

(3) 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 following values:

(a) Airspeed indicator: change of 5 knots.

(b) Attitude indicator: change of 2 degrees in pitch and bank.

(c) Altimeter: change of 10 feet.

(d) Turn and bank: change of ¼ standard rate turn.

(e) Heading indicator: change of 2 degrees.

(f) Vertical speed indicator (VSI): change of 100 fpm.

(g) Tachometer: change of 25 rpm or 2 percent of turbine speed.

(h) VOR/ILS: change of 1 degree for VOR or ¼ of 1 degree for ILS.

(i) ADF: change of 2 degrees.

(j) GPS: change as appropriate for the model of GPS based navigator represented.

(k) 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.

(4) Flight Displays reflect proper dynamic behavior of the airplane represented. Examples: a

VSI reading of 500 fpm reflects a corresponding movement in altitude, and an increase in power reflects an increase in the rpm indication or power indicator.

"XSPEC 142" model meets the following Flight Dynamics requirements:

(1) Flight dynamics are comparable to the way the airplane performs and handles.

(2) Airplane performance parameters (such as maximum speed, cruise speed, stall speed, and maximum climb rate) are comparable to the airplane represented. A performance table is provided for each airplane configuration for sea level and 5,000 feet, to verify the appropriate performance. (Or 6,000 feet can be used. 25,000 feet should be used for turboprop or turbojet altitude performance)

(3) Airplane vertical lift component changes as a function of bank comparable to the way the airplane represented performs and handles.

(4) Changes in flap setting, slat setting, or gear position is accompanied by the appropriate changes in flight dynamics comparable to the way the make and model of airplane represented performs and handles.

(5) The presence and intensity of wind and turbulence is reflected in the handling and performance qualities of the simulated airplane and is comparable to the way the airplane represented performs and handles**.**

"XSPEC 142" model meets the following Instructional Management Requirements:

(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.

(2) If a training session begins with the "aircraft in the air" and ready for the performance of a particular procedural task, the instructor can manipulate the following system parameters independently of the simulation:

- Aircraft geographic location,
- Aircraft heading,
- Aircraft airspeed,
- Aircraft altitude, and
- Wind direction, speed, and turbulence.

(3) The system is capable of recording both a horizontal and vertical track of aircraft movement for the entire training session for later playback and review.

(4) The instructor can 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 airplane systems failures: alternator or generator, vacuum or pressure pump, pitot static, electronic flight displays, or landing gear or flaps, as appropriate.

(5) This ATD has an available navigational database that is local (within 25NM) to the training facility location. All navigational data is based on procedures as published per 14 CFR part 97. This device uses <name of software database, Examples, NavData, Jeppesen, etc.> to support the instrument approach and navigation capabilities.

Advanced ATD Requirements

All configurations, as noted in AC 61-136, Appendix C meet the following *additional* AATD design criteria.

The "XSPEC 142" model has the following additional AATD features and components.

(1) A realistic shrouded (enclosed) or unshrouded (open) flight deck design with a singular and uniform instrument panel design representing a specific model airplane flight deck.

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

(3) Primary flight and navigation instruments are appropriately sized and properly arranged that exhibit neither stepping nor excessive transport delay.

(4) A **digital avionics** panel.

(5) A Global Positioning System **(GPS) navigator** with moving map display

(6) A **Two-axis autopilot** is installed, and, as appropriate, a flight director (FD). (If standard equipment)

(7) **Pitch trim** (manual or electric pitch trim) is available permitting indicator movement either electrically or analog in an acceptable trim ratio.

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

- Adjustable visibility parameters; and

- Adjustable ceiling parameters.

(9) A fixed pilot seat appropriate to the airplane configuration, including an adjustable height and an adjustable forward and aft seat position. The pilot should be oriented so that the pilots line of sight is approximately at the same height of the top edge of the instrument panel.

(10) **Rudder pedals** secured to the cockpit floor structure or to the floor beneath the device in proper relation to cockpit orientation.

(11) A **push-to-talk switch** on the control yoke.

(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 includes the ability to:

(a) Oversee tracks along published 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 in providing vectors, etc., change the weather conditions, ceilings, visibilities, wind speed and direction, create light/moderate/ or 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 airplane systems (pitot static, electric, vacuum pump, etc.

List of Airplane Configurations

Available airplane configuration “instrument panel” pictures and any optional instrument or avionics panels for each airplane are shown here. The components list identifies any optional displays, controls, or avionics equipment.

A) BEECHCRAFT DUCHESS BE-76

Image 18: Detail view of ATD Panel in Beechcraft Duchess BE-76 Configuration (Pilot’s Perspective)

Image 19: ATD Panel from Pilot Perspective at an angle (BE-76)

Image 20: Detail view ATD Panel (BE-76)

B) PIPER AZTEC PA-23 250

Image 21: ATD Panel in Piper Aztec Configuration

Image 22: ATD Panel in Piper Aztec Configuration with optional Enhanced Visuals System and optional TRC "SimKits" avionics package

Image 23: ATD Panel in Piper Aztec Configuration with optional Co-Pilot System, XCS55A, XNS530W and MegaRadioStack Avionics package.

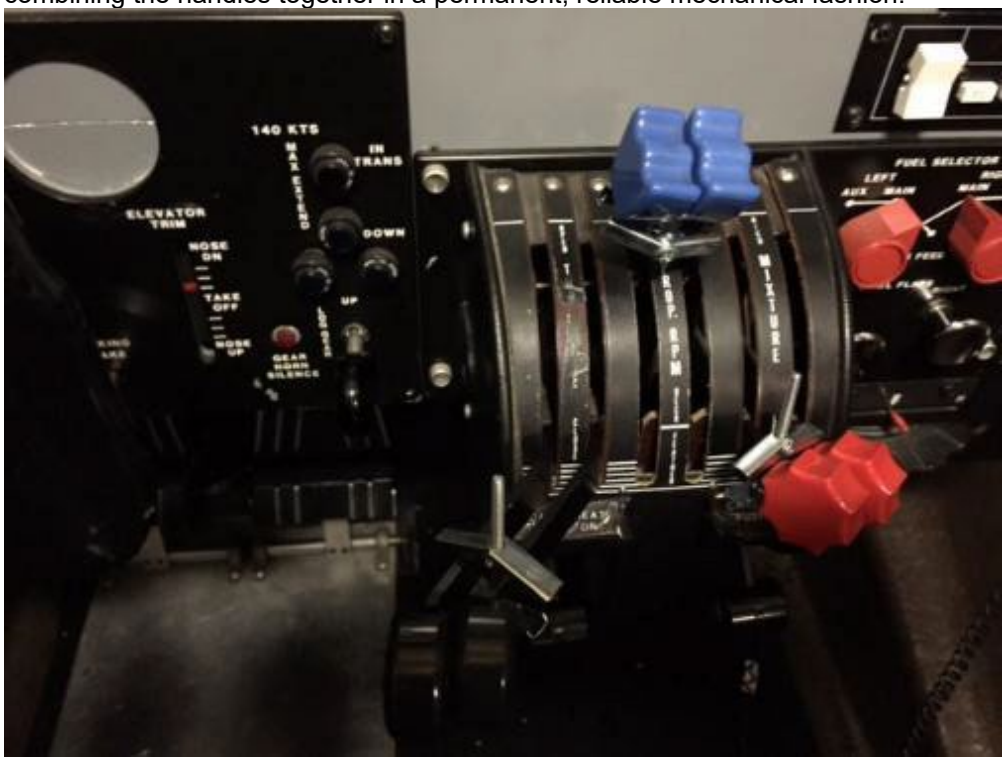
Image 24: Detail view of ATD Panel (PA-23)

C) CESSNA 172 RG Cutlass II

Image 25: ATD Panel in C172 RG “Cutlass II” Configuration

Image 26: Detail view of ATD Panel in C172RG Configuration

Image 27: Detail view of ATD Throttle Quadrant for the C172RG Configuration; note the metal clamps combining the handles together in a permanent; reliable mechanical fashion.

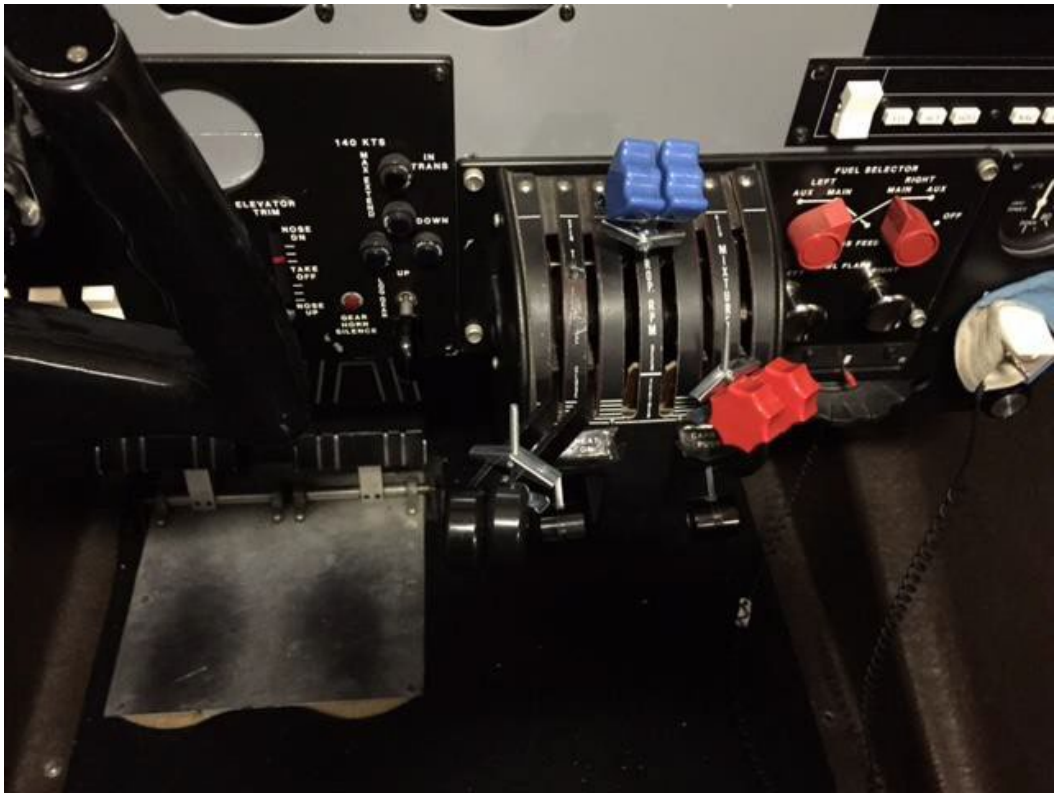


D) CESSNA 172 N

Image 28: View of C172N Panel.

Image 29: Detail View of C172N Panel with optional XSPEC GPS XNS530W, “Silver Crown” style ‘MegaRadioStack’ KX155, KR98, KT76C, KFC150, KA51B Slaving panel in optional “Double Wide” Enclosure with optional CoPilot Package.

Image 30: Detail view of ATD Throttle Quadrant for the C172N Configuration. Note the metal “toggle bolt” clamps providing a secure; permanent installation.



E) PIPER PA-44 SEMINOLE

Image 31: View of PA-44 panel and magnetic compass with Optional Enhanced Visuals System

Image 32: Detail view of ATD Panel (PA-44)

F) PIPER PA-34 SENECA II

Image 33: View of PA-34 panel with magnetic compass and optional Enhanced Visuals System.

Image 34: Detail view of ATD Panel (PA-34)

G) PIPER PA-38 TOMAHAWK

Image 35: View of PA-38 panel with magnetic compass and optional Enhanced Visuals System

Image 36: Detail view of ATD Panel (PA-38)

Image 37: Detail view of ATD Panel with Optional Co-Pilot Package, Optional MegaRadioStack Avionics and XCS55A system. (PA-38)

H) PIPER PA-28R ARROW

Image 38: View of PA-28R panel with magnetic compass and optional Enhanced Visuals System in Optional Double Wide Enclosure

Image 39: Detail view of ATD panel (PA-28R)

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

Aircraft Model	Vso	Vs1	Vx	Vy	Va	Vne	Vmc	KTAS at Cruise @ 75% power setting.	Rate of climb (fpm) at best rate (Vy), at full power or as recommended.	Single Engine Climb rate (at Vyse)
C172N	41 KIAS	47 KIAS	59 KIAS	73 KIAS	88 KIAS (1950 lbs.)	160 KIAS	N/A	SL: 114 KTAS	SL: 770 FPM	SL N/A
6,000 feet→								120 KTAS	485 FPM	N/A
C172RG II	42 KIAS	50 KIAS	67 KIAS	84 KIAS	98 KIAS (2250 lbs.)	164 KIAS	N/A	SL: 131 KTAS	SL: 800 FPM	SL N/A
6,000 feet→								136 KTAS	550 FPM	N/A
PA-38	47 KIAS	52 KIAS	61 KIAS	70 KIAS	90 KIAS (1277 lbs.)	138 KIAS	N/A	SL: 97 KTAS	SL: 770 FPM	SL N/A
6,000 feet→								106 KTAS	430 FPM	N/A
PA-28R	55 KIAS	60 KIAS	78 KIAS	90 KIAS	96 KIAS (1865 lbs.)	183 KIAS	N/A	SL: 131 KTAS	SL: 815 FPM	SL N/A
6,000 feet→								135 KTAS	520 FPM	N/A
BE-76	58 KIAS	68 KIAS	70 KIAS	85 KIAS	132 KIAS	194 KIAS	65 KIAS	SL: 101 KTAS	SL: 1300 fpm	SL: 200 FPM
6,000 feet→								121 KTAS	800 FPM	100 FPM
PA-23	60 KIAS	66 KIAS	93 KIAS	102 KIAS	129 KIAS	216 KIAS	80 KIAS	SL: 185 KTAS	SL: 1700 fpm	SL: 340 fpm
6,000 feet→								202 KTAS	1410 fpm	205 fpm
PA-44	55 KIAS	57 KIAS	82 KIAS	88 KIAS	112 KIAS (2700 lbs.)	202 KIAS	56 KIAS	SL: 145 KTAS	SL: 1610 fpm	SL: 410 fpm
6,000 feet→								159 KTAS	960 fpm	110 fpm

PA-34 II	61 KIAS	63 KIAS	76 KIAS	89 KIAS	135 KIAS (4407 lbs.)	195 KIAS	66 KIAS	SL: 155 KTAS	SL: 1600 fpm	SL : 330fpm
6,000 feet→								170 KTAS	1510 FPM	280 fpm

NOTE: Standard atmosphere and gross weight is used for performance.

Airplane performance table for sea level *and* 6,000 feet
(12,000 feet for turbo-charged, 25,000 feet for turboprop/turbojet).

Visual System Description and Configurations

Visuals are provided from PREAR3D Flight Simulation software from Lockheed Martin. PREPAR3D (all versions) is a Direct3D application that runs natively on Microsoft Windows. It uses the latest in 3D Graphics Technology to render realistic, psychosomatically convincing scenes. The XSPEC 142 uses 3 32” Class LCD Screens positioned as windows to the Visual System.

When configured with the optional equipment “Enhanced Visuals” the XSPEC 142 uses 5 LCD Screens positioned as windows to the Visual System. There are 4 32” screens turned 90 degrees sideways for side and corner viewability. There is 1 55” Class LCD screen as the main front visual.

The Instructor can adjust the time of day, season and weather conditions to affect the Visual System. This can be done to Instructors conditions or real-time METAR conditions.

VFR Conditions / DAY (BE-76)

Image 40: ATD Interior in BE-76 Configuration.

IFR Conditions / DAY (BE-76)

Image 41: ATD Interior in BE-76 Configuration

VFR Conditions / NIGHT (BE-76)

Image 40: ATD Interior in PA-23 Configuration on approach (5nm) with Optional Enhanced Visuals in a Double Wide Enclosure

Image 41: ATD Interior in PA-23 Configuration on runway

The **visual system** provides realistic cues in both day and night VFR and IFR meteorological conditions to enhance a pilot's visual orientation in the vicinity of an airport, to include the ability to adjust the visibility and ceiling conditions permitting the simulation of various meteorological weather conditions.

Functions and Maneuvers Checklist

FIGURE 1. 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

Functions and Maneuvers	Yes, No, or N/A
(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	N/A
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
(iv) 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	N/A
(v) Multi-function displays (PFD/MFD) 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
(4) Simulated Turbulence in Flight (light, moderate, severe)	YES
(**5**) **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
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.	N/A
(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

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.