

ADVANCED AVIATION TRAINING DEVICE  
APPROVAL QUALIFICATION GUIDE  
FOR AZURE COMPUTING, INC (d.b.a. **ELITE** Simulation Solutions)  
. **ELITE**<sup>®</sup> ATD SYSTEMS

**A. MODEL: ELITE AATD S623 Helicopter**

The purpose of this guide is to provide information to the FAA for evaluation of the **ELITE**<sup>®</sup> S623 Helicopter ATD system. This trainer is a generic single engine turbine rotary wing aircraft modeled after the Eurocopter AS 350B. It has dual controls and is dual instrumented for MCC as well as instrument and visual flight training. All guidance and standards specified in AC 61-136 have been met.

**B. CONTROL REQUIREMENTS: PHYSICAL CONTROLS**

All physical and virtual control requirements are met:

1. A cyclic stick that tilts the main rotor disk by changing the pitch angle of the blades in their cycle of rotation.
2. Anti-torque tail rotor pedals that allow continuous adjustment of the tail rotor/heading.
3. Collective pitch control that changes the pitch angle of all main rotor blades simultaneously.
4. Mixture and throttle control that allows engine start / shutdown and allows for continuous movement from idle to full power settings. Also allows for proper corrective action for hot and hung starts.
5. Physical controls applicable to the aircraft for the following:
  - a. Engine start with igniters
  - b. Warning horn and reset for hydraulic failure and low rotor RPM
  - c. Pitot heat
  - d. Fuel pump
  - e. Standby attitude indicator
  - f. Auto engine crank
  - g. Inverters
  - h. Battery
  - i. Generator
  - j. Radio master and avionics cooling fan noise
  - k. Hydraulic test switch (affects master caution only)
  - l. Taxi, landing, anti-collision and position light switches (procedural only)
  - m. Dual NAV/COM radios
  - n. ADF
  - o. DME
  - p. Transponder
  - q. Flight Director / autopilot
  - r. GPS
  - s. Timer / stopwatch
  - t. Audio panel
  - u. Radar altimeter
  - v. Master caution panel test switch
  - w. OAT gauge
  - x. Altitude/VSI preselect



6. Control Inputs: ELITE Simulation Solutions AG, a.k.a. Initiative Computing AG, Switzerland, has certified that the transport delay between the control inputs to recognizable system response is less than 150 milliseconds for all controls. Calculated transport delay is approximately 25 milliseconds or less.

6a. At each startup **ELITE** software runs a series of test and will display a conformation message if all controls are working properly or appropriate warning messages if any design parameter is out of tolerance.

## C. DISPLAY REQUIREMENTS

All aircraft modules listed in this qualification guided meet or exceed the display requirements of AC61-136:

1. Instruments and indicators:
  - a. Flight instruments are in a Standard Configuration, represented as separate traditional round flight instruments or as an electronic primary flight instrument display with reversionary/backup flight instruments.
  - b. An adjustable altimeter that operates throughout the normal operating range of the aircraft being replicated which has incremental markings of 20 feet.
  - c. A magnetic compass which displays incremental markings typical of that shown in the family of airplanes represented
  - d. Heading indicator with incremental markings of 5 degrees and display on a 360 circle (for Standard Configuration) and Arc segments (on EFIS equipped trainers)
  - e. An airspeed indicator with incremental markings appropriate to the aircraft being replicated.
  - f. Vertical speed indicator (instantaneous) with incremental markings of 100 feet for the range of  $\pm 1000$  feet and incremental markings of 500 feet for the remaining  $\pm 2000$  feet or appropriate to the aircraft being replicated.
  - g. The function of a gyroscopic rate-of-turn indicator is provided by a standby altimeter with an independent power source.
  - h. All aircraft modules have a skid and slip indicator with coordination information displayed in the conventional skid ball format with markings for the center position.
  - i. The attitude indicator is appropriate to the aircraft being replicated with incremental markings for each 5 degrees of pitch, from 25 degrees pitch up to 25 degrees pitch down. Left and right bank angles are marked at 10, 20, 30, and 60 of bank.
  - j. Engine instruments and markings for normal ranges and minimum and maximum limits applicable to the helicopter being replicated.
  - k. N1 and N2 displays with appropriate transient and red line limitations.
  - l. Suction gauge not applicable
  - m. Flap indicator not applicable
  - n. Pitch trim indicator not applicable



- o. Communication radios with digital displays of the radio frequency in use.
  - p. Two navigation radios with digit displays for VOR/ILS frequency in use, and one radio display for the NDB frequency in use. Each navigation radio is equipped with an aural identification feature and all aircraft modules have a marker beacon receiver with appropriate graduated markings.
  - q. Stop watch/ timer that display minutes and seconds.
  - r. Magnetic compass with incremental markings of 5 degrees that display proper lead and lag during turns.
  - s. Transponder which displays the current transponder setting.
  - t. Fuel quantity indicator which displays the fuel remaining.
2. All instrument displays listed above are visible during all flight operations. The update rate of all displays provide an image that:
- a. Does not appear to be out of focus.
  - b. Does not appear to jump or step to a distracting degree during operation.
  - c. Does not appear with distracting jagged lines or edges.
3. The display update varies with the speed of the computer processor, memory, and graphics card. If the computer system being used meets or exceeds the programs minimum system requirements, then the refresh rate will be faster than 10 Hz (approximate refresh rate will be 20 Hz or faster). Minimum IBM-compatible system requirements 2.6Ghz processor, 512 Mb RAM, 80 GB HD, 128 Mb nVidia or open GL compatible video card; USB, DVD drive, LAN connection (10/100) and Windows 2000, XP or Windows 7 operating system.

“Display updates” display all changes that meet or exceed the values listed in AC61-136 . The “display updates” display the following changes for each of the instruments listed below.

- a. Airspeed indicator: Displays ½ to 1 knot of change.
  - b. Attitude indicator: Displays 1/3 to ½ degree of pitch change and ½ to 1 degree of bank change.
  - c. Altimeter: Displays 2.78 feet of change.
  - d. Turn and Bank: Displays 1/20 of standard rate turn changes.
  - e. Heading Indicator: Displays ½ degree of change.
  - f. VSI: Displays 10 fpm of change.
  - g. Tachometer: Displays 20 RPM of change.
  - h. VOR/ILS: Displays ½ degree of change for VOR or 1/8 degree of change for ILS.
  - i. ADF: Displays 1/2 degree of change.
  - j. Timer: Displays 1 second of change.
4. All displays reflect the dynamic behavior of an actual aircraft display.

## **D. FLIGHT DYNAMICS**

1. The flight dynamics are comparable to the aircraft being replicated.
2. The aircraft performance parameters are comparable to the aircraft being replicated (including hovering/sideward/forward/rearward flight, IGE and OGE).
3. The vertical lift component changes as a function of bank comparable to the aircraft being replicated.
4. Changes of gear settings changes (as applicable) cause changes in flight dynamics comparable to the aircraft being replicated.



5. The presence and intensity of wind and turbulence are reflected in the handling and performance qualities comparable to the aircraft being replicated.

## **E. INSTRUCTIONAL MANAGEMENT**

1. The instructor has the ability to freeze the simulation at any point using the following controls listed: keyboard, mouse, and avionics panel.
2. The instructor can manipulate the following system parameters via virtual controls independent of the simulation with the following methods or devices.
  - a. Aircraft geographic location: mouse
  - b. Aircraft heading: mouse
  - c. Aircraft airspeed: mouse
  - d. Aircraft altitude: mouse
  - e. Wind direction and speed: mouse
  - f. Turbulence: mouse
3. The system is capable of recording both horizontal and vertical tracks of the aircraft movement and can be stored and played back for review using: mouse and primary monitor or secondary monitor.
4. The instructor can disable any of the instruments prior to the beginning of a training session and can simulate failure during a training session without stopping or freezing the simulation to effect the failure using: mouse and secondary monitor, or keyboard.
5. The software has navigational databases, obtained and compiled from the FAA National Flight Data Center and/or Jeppesen, for the entire United States. All navigational data is based on procedures as published in 14 CFR Part 97 and is updated and maintained by ELITE Simulation Solutions AG.

## **F. TASK REQUIREMENT LIST**

Using the **ELITE®** ATD configuration in this guide a flight school could incorporate all of the items listed in AC61-136 under the Task Requirement List into an integrated ground and flight instrument training curriculum. Course syllabuses developed companies such as AOPA's Air Safety Foundation, ASA, Jeppesen, or by the school its self, should be acceptable, as long as it incorporates the items listed under the Task Requirement List in AC61-136.

## **G. ADVANCED ATD DESIGN CRITERIA**

The **ELITE® Model AATD S623 Helicopter** exceeds the requirements for Basic ATD approval criteria appropriate for Advanced ATD simulation technology:

1. A realistic cockpit design and instrument panel arrangement representing a generic model rotary wing aircraft cockpit;
2. Cockpit knobs/system controls/switches/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 class of airplane being represented;
3. Primary flight and navigation instruments approximately life sized that exhibit neither stepping nor excessive transport delay and arranged so as to observe trends and provide a realistic scan pattern.
4. Digital avionics panel (Optional OEM PFD and MFD which may provide functions of the digital avionics panel).
5. Three axis auto pilot and flight director as appropriate.
6. Pitch trim not applicable
7. A visual system that provides acceptable cues in both day and night VFR/IFR conditions to enhance a pilot's visual orientation in the vicinity of an airport;



8. 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, change weather conditions (ceilings, visibilities, wind speed, direction, turbulence and icing conditions) and invoke failures in navigation, instruments, radio receivers, landing gear and flaps, engine power (partial and total) and other airplane systems.
9. Cockpit seating accommodates proper ergonomics and spatial orientation for the pilot in relation to the cockpit, instruments and glare shield.
10. Anti torque pedals are secured to the cockpit floor structure in proper relation to cockpit orientation

## **H. FUNCTION AND SUBJECTIVE TEST CRITERIA**

The ELITE Model S623 helicopter meets the criteria established for Basic and Advanced ATD status and complies with the checklist performance regulatory tasks/maneuvers and /or procedures as outlined in AC 61-136 as applicable under 14 CFR parts 61 and 141.





**APPENDIX A – Components, Model ELITE AATD S623 Helicopter**



**S623 Instrument Panel with GNS 430 GPS and Dual EFS-40 (EFIS)**



**S623 Instrument Panel with Apollo GPS and HSI / RMI**





**S623 Helicopter Cockpit Enclosure**



**S623 Instructor Station**







**S623 Helicopter AATD Pilot Instrument Panel with Master Caution Panel**



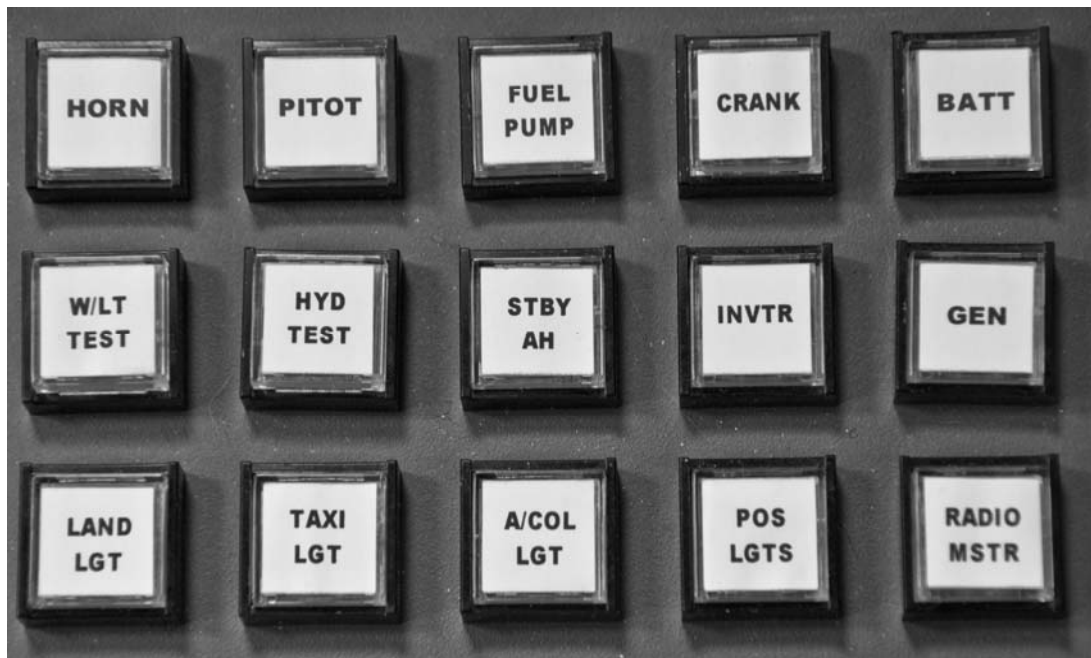
**S623 Helicopter AATD Engine Instruments, Alt/VSI Preselect and Radar Altimeter**

ELITE Simulation Solutions AATD Qualification and Approval Guide, Model S623 Helicopter, April 2009



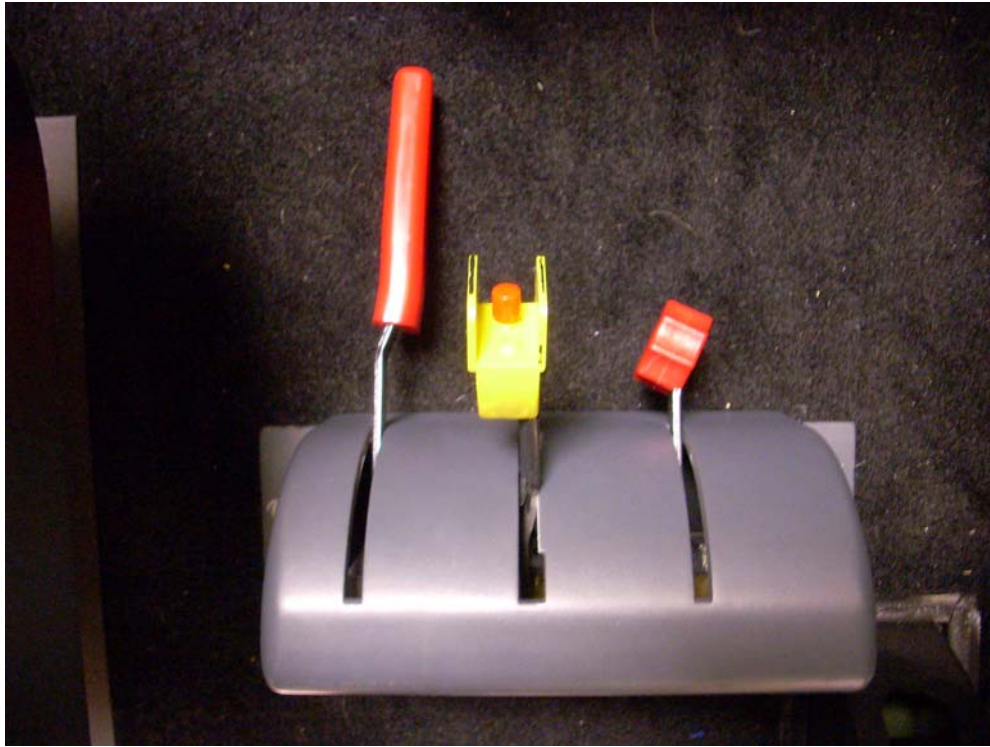


**S623 Helicopter AATD Co Pilot Instrument Panel**



**S623 Helicopter AATD Switch Control Panel**





***S623 Throttle Assembly (Rotor brake, throttle w/starter and fuel cut off lever***



***S623 Cyclic and adjustable anti-torque pedals***





***S623 Pilot Collective Lever***

**Aircraft Performance Information – S623 Single Engine Turbine Helicopter**

<b>Instruments</b>	<b>Markings</b>	<b>Range</b>
<b>Airspeed Indicator</b>  (Note)	<b>Red with white hatching</b> <b>Red line</b> <b>Green Arc</b>	<b>125 kt/ 231 km/hr /144 mph</b> <b>155 kt/ 287 km/hr / 178 mph</b> <b>From 40 to 155 kt</b> <b>74 to 287 km/hr – 46 to 178 mph</b>
<b>Torque Indicator</b>	<b>Green arc</b> <b>Yellow arc</b> <b>Red line</b>	<b>10 to 83%</b> <b>83 to 88%</b> <b>88%</b>
<b>Rotor Tachometer</b>	<b>White triangle</b> <b>Red line</b> <b>Yellow arc</b> <b>Green arc</b> <b>Yellow arc</b> <b>Red line</b>	<b>170 rpm</b> <b>320 rpm</b> <b>320 – 375 rpm</b> <b>375 - 394 rpm</b> <b>394 -430 rpm</b> <b>430 rpm</b>
<b>Gas Generator (Ng) Tachometer</b>	<b>Red line</b> <b>Green arc</b> <b>Yellow arc</b> <b>Red line</b> <b>Red triangle</b>	<b>67%</b> <b>67 – 98%</b> <b>98 – 100%</b> <b>100%</b> <b>105%</b>
<b>Exhaust Gas Temperature (t4) Indicator</b>	<b>Green arc</b> <b>Yellow arc</b> <b>Red line</b> <b>Red triangle</b>	<b>300 deg C – 775f deg C</b> <b>775f deg C – 810 deg C</b> <b>810 deg C</b> <b>840 deg C</b>
<b>Engine Oil Pressure Indicator</b>	<b>Red line</b> <b>Yellow arc</b> <b>Green arc</b> <b>Yellow arc</b>	<b>1.9 bar (27 psi)</b> <b>1.9 to 3.2 bars (27 – 46 psi)</b> <b>3.2 to 9 bars (46 to 130 psi)</b> <b>9 to 10 bars (130 to 145 PSI)</b>
<b>Engine Oil Temperature</b>	<b>Green arc</b> <b>Red line</b>	<b>30 – 110 deg C</b> <b>110 deg C</b>
<b>Fuel Pressure Indicator</b>	<b>Yellow arc</b>	<b>0 – 0.4 bar (0 to 5.8 psi)</b>
<b>Voltmeter</b>	<b>Green arc</b> <b>Yellow arc</b> <b>Red line</b>	<b>26 – 29 volts</b> <b>29 – 31.5 volts</b> <b>31.5 volts</b>
<b>Ammeter</b>	<b>Red line</b>	<b>150 amperes</b>





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