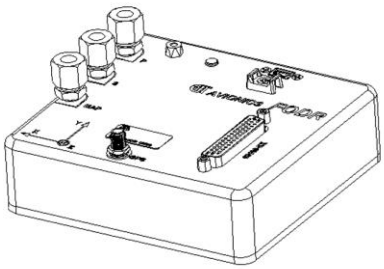
FODR SYSTEM PILOTS GUIDE



FODR®

ESAID®

This document provides information intended for use by persons who, in accordance with current regulatory requirements, are qualified to operate and/or install the equipment described herein. For further information, please contact: info@eitavionics.com or 309 Kelly's Ford Plaza, SE, Leesburg, VA 20175.

REFER TO WWW.EITAVIONICS.COM FOR REVISION STATUS

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Approvals

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Rev	ECN	Date	Description	By
C	81359	9/30/2019	Production Release	mjm
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References

93259 INSTALL, FODR SYSTEM MANUAL

93279 SOFTWARE, FODR VIEWER

www.eitavionics.com

Definitions and Abbreviations

Table 1: Definitions and Abbreviations

Abbreviation	Definition
Aircraft	A device that is used or intended to be used for flight in the air. Inclusive of: AIRPLANE, GLIDER, ROTORCRAFT, BALLON, POWERED-LIFT, LIGHTER THAN AIR
AFM	Aircraft Flight Manual, FAA approved and required reference for aircraft operating information and limitations
DA	Density Altitude
ESAID	Enhanced Situational Awareness Information Display.
EXCEEDANCE	An event outside of approved limitations that affects safety of flight
FODR	Flight Operational Data Recorder
FOQA	Flight Operations Quality Assurance
GAMA	General Aviation Manufacturers Association
GWT	Gross Weight. The operational flight weight used to calculate performance and limitations in the applicable POH.
HFDM	Helicopter Flight Data Monitoring
IAS	Indicated Airspeed
IGE	In Ground Effect Hover ceiling
LRU	Line Replaceable Unit. A modular component of an aircraft or system.
MAP	Manifold Pressure
MCP	Maximum Continuous Power. Defined by aircraft Operating Limitations
OAT	Outside Air Temperature
OEM	Original Equipment Manufacturer
OGE	Out of Ground Effect Hover ceiling
POH	Pilots Operating Handbook, FAA approved and required reference for aircraft operating information and limitations. A GAMA defined document format which includes information required in an AFM/RFM, plus additional information.
RA	Radar Altitude
RFM	Rotorcraft Flight Manual, FAA approved and required reference for rotorcraft operating information and limitations
SMS	Safety Management System
TSO	Technical Standard Orders. A minimum performance standard which may be referenced for FAA design and production approval.

Table 1: Definitions and Abbreviations

Abbreviation	Definition
VNE	Never Exceed Speed
VSI	Vertical Speed Indicator
5MP	Five Minute Power. Defined by aircraft OEM in Operating Limitations

IMPORTANT: READ ALL OF THIS DOCUMENT, REFERENCES AND INFORMATION SPECIFIC TO THE AIRCRAFT MODIFIED WITH THE FODR SYSTEM BEFORE ATTEMPTING FLIGHT.

WARNING: These products are not designed or intended to provide primary reference for flight.

WARNING: In the event of an unexpected aural alert or warning provided by these products, the pilot should cross-check with primary flight instruments and visual references. Typically, a critical performance limitation has been alerted or a low altitude is alerted during a period of pilot distraction or high workload. It is the pilot's responsibility immediately to expand his/her situational awareness and take appropriate action, and if warranted, proceed to a safe flight or ground condition prior to troubleshooting. Use the FODR System at your own risk.

WARNING: These products do not contain any field serviceable parts. Opening units will void warranty. Return products to EIT for service. For RMA: contact www.eitavionics.com

WARNING: Do not fly with a unit that appears to have been opened or damaged. Return to EIT for diagnostics and recalibration or repair.

WARNING: Tampering with or causing destruction of data contained in these units may carry civil and criminal penalties in a court of law. The USB interface to FODR is to be used for user download of data only.

Information in this document is subject to change without notice. EIT Avionics reserves the right to make changes to this document without obligation to notify any persons or organizations of such changes. For up to date information, see our website www.eitavionics.com

Warranty

EIT Avionics warrants the FODR and ESAID units to be free from defects in materials and workmanship for one year from the date of purchase. EIT Avionics will, at its sole option, repair or replace any FODR or ESAID unit that fails in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is responsible for shipping and/or transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs to the units.

To register your purchased products for warranty, visit www.eitavionics.com

To obtain warranty service, contact us at www.eitavionics.com and follow the RMA, packaging and shipping instructions provided. EIT Avionics, at its sole discretion, reserves the exclusive right to repair, replace or offer a full refund for any unit. Such remedy shall be your sole and exclusive remedy for any breach of warranty.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE, AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSSED OR IMPLIED, INCLUDING ANY LIABILITY ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL EIT AVIONICS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THESE PRODUCTS OR FROM DEFECTS IN THE PRODUCTS. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

1. Preamble to FODR System Flight Safety Enhancement

The FODR System was designed with rotorcraft operations in mind. The FODR System component size, power and weight requirements are modest enough to be used even on light, two seat helicopters. The safety enhancements offered by proper use of the FODR System functions are compelling.

The design premise of the FODR System is that the complex, interrelated and changing nature of various performance limitations, combined with high workload situations and in-flight distractions, often results in pilots exceeding POH performance limitations unintentionally. Exceeding performance limitations is a key factor found in both minor and catastrophic fatal accidents. Additionally, during circumstances of in-flight task saturation, the pilot may be operating closer to the surface than intended. Low altitude flight is a widely recognized safety of flight risk factor. By recording operational data, providing supplemental information displays and aural alerts, the FODR System can greatly improve pilot situational awareness, reduce the chance of exceedances, reduce the chance of unintended collision with terrain, reduce operational costs, and increase safety. Once simple touchscreen inputs are made during pre-flight, the FODR System is designed to provide its functions without further pilot input.

The FODR System provides *supplemental* information to enhance pilot situational awareness. Any discrepancies in-flight or on the ground must be reconciled with the existing primary systems on the aircraft. If the FODR System provides an aural alert or displays information indicating an exceedance or low altitude, the pilot must take appropriate action to reduce risk and cross check with primary references.

The FODR System *does not* provide aircraft envelope protection, it functions to support pilot situational awareness to enhance safety. In the event of an FODR System alert or altitude callout, controlled flight away from terrain and known obstacles, and adjusting speed or power are among the likely corrective actions. The pilot is fully responsible to know and take the appropriate action in all cases.

The highest and best safety benefit from use of the FODR System can be realized by changing pilot habits to remain *as far as practical* from performance limitations in a given situation, to include declining a flight. Sound aeronautical decision making and conservative expectations of aircraft performance remain paramount to flight safety with the FODR System installed.

FODR System recorded data can be downloaded by the user to support post flight review to understand and resolve such events, especially in the case of exceedances that impact airworthiness or safe operational practices.

The FODR system recorded data is designed to directly support maintenance providers and formal flight operation safety programs (FOQA, SMS, HFDM and others). Participating in such programs may reduce insurance costs in addition to other benefits.

Installing the FODR System may enable the individual owner or fleet operator to recover the associated installation cost many times over. Adapting improved operational practices to reduce and eliminate exceedances not only reduces risk, but also reduces stress on components and cost. Reduced maintenance costs can be realized by directly reducing instances of required operational exceedance

inspections and improved component service life. Maintenance providers can inform decision making by looking at real data, a complete record of up to 2200 hours of high fidelity 5Hz operational data, from the time of installation.

Upon installation, it is likely the FODR System will indicate exceedances during flight operations that the pilot may think are false due to task saturation or unfamiliarity with an operational limitation. If the FODR System is operating normally, it is most likely that the alert was real, and the pilot should cross check with primary instruments and take the most appropriate action. Therefore, EIT Avionics strongly recommends that a pilot new to the FODR System fly with an experienced instructor with make/model experience and thorough knowledge of the approved POH in order to observe and learn FODR System behavior and, if needed, modify their flying technique while under the supervision of an instructor. The full contents of this Pilot's Guide as it applies to each specific installation should be reviewed and understood.

Likewise, owners and maintenance personnel new to this system should familiarize themselves with the system functions in this document, particularly those related to exceedances and operational data that would aide troubleshooting and airworthiness dispositions.

2. General Description

The FODR *System* refers to the Flight Operations Data Recorder System designed to digitally record air data, aircraft and engine sensors and optionally interface with additional equipment. The FODR System is designed for aircraft that previously would not be able to support the weight, power and cost of a typical data recorder, supplemental display or radar altimeter. It is intended to permanently record 2200 hours of operational data and provide owner/operator access to data for maintenance, enhance flight crew performance and flight training. FODR recorded data can assist in maintenance evaluation of airworthiness should exceedances occur. FODR recorded data can be fully integrated into existing formal flight safety and maintenance programs. FODR recorded data can assist crash investigation.

The FODR System has multiple configurations. When interfaced with optional components, the FODR System can further enhance operational safety by providing real time display and aural annunciation of aircraft limitations by correlating dynamic flight conditions with published limitations (FAA approved and required data from Placards, AFM, RFM, and POH) and display of radar altitude. This improves the pilot's ability to adhere to complicated operational limitations in flight and enhances pilot situational awareness to promote avoidance of unintentional operational exceedances, unintentional low altitude flight, hazardous flight conditions and mishaps.

Greater detail on FODR System installation and components is found in 93259 INSTALL, FODR SYSTEM MANUAL

2.1. FODR System Configurations

There are two FODR System LRU configurations, defined in Table 2: FODR System LRU Configurations:

Table 2: FODR System LRU Configurations

Top Kit Number	FODR System LRU Configuration
93235-01x-xxx	FODR
93235-02x-xxx	FODR + ESAID

The FODR only configuration is a FODR data recorder that permanently records 2200 hours of operational data and provides owner/operator access to recorded data. The system is ruggedized but it is not designed to meet TSO crashworthy flight recorder standards. FODR functions to measure, store, and provide information on aircraft operations to pilots, ground and maintenance personnel. Using provided software, FODR data may be accessed via a laptop through a USB data port. If equipped with a radar altimeter, height above terrain data is recorded by FODR.

The FODR + ESAID configuration provides the pilot with display of supplemental air data and engine data plus display and aural alert of performance limitations from the aircraft POH. ESAID captures certain limitation exceedances for review and operator disposition. FODR does not record Alerts generated by ESAID. If equipped with a radar altimeter, display of height above terrain data and fixed altitude callouts to the pilot are provided. Altitude callouts are provided by ESAID over the aircraft audio system.

3. FODR

This section describes the operation and specifications of the FODR LRU. FODR satisfies the recording capability requirements of 14 CFR §135.607.

The FODR system records magnitude and duration of events for improved maintenance evaluation, required inspection, overhaul, or replacement. Additionally, data can be saved or emailed to subject matter experts or OEMs for guidance on expensive or complicated matters.

3.1. Overview

FODR automatically records 2200 hours of operational data, when powered. No pilot action is required for the unit to function normally in a typical installation. FODR data can be downloaded.

3.2. Operation

During normal operation, FODR automatically collects and permanently records all available data channels. Refer to section 3.3 Specifications for a complete description of the recorded channels. The FODR Status Indicator indicates the operational status of FODR to the pilot. Refer to Table 3: FODR Operational Status for descriptions of possible Status indicator behavior.

Data is organized and indexed by power-on events. Each start-up sequence, following a power-on event, initiates the creation of a new data entry in FODR memory. If power is interrupted and restored in-flight, FODR will restart automatically, and data will be recorded in a new timestamped file. Device information and remaining capacity information may be viewed using the data download software.

Table 3: FODR Operational Status

FODR Status	Status Indicator Behavior
Power-on/Start-up sequence	Blinks fewer than ten (10) times
Normal Operation	Steady ON
Full Memory	Continuously flashes with 50% duty cycle
Malfunction, powered	Continuously flashes with 50% duty cycle
Unpowered or malfunctioning	OFF

3.2.1. Data Download

Post-flight, FODR data can be downloaded to a computer using the EIT Avionics FODR Data Viewer software (P/N: 93279). The FODR Data Viewer software provides basic data downloading, viewing, and exporting functionality. Downloading FODR data will not erase any data stored in FODR.

Software and installation instructions are available here: www.eitavionics.com

For guidance and/or instructions on using the FODR Data Viewer, refer to the User Manual that accompanies the software. It is accessible through the HELP menu, and a PDF viewer may be required. The FODR Data Viewer allows users to analyze recorded data for various purposes, including, but not limited to, flight training, maintenance, and a review of the aircraft's operational history since the FODR installation was completed. Data is converted to file formats that may be easily imported into custom or third-party software for further analysis.

Note: Any physical, digital or other means of tampering with the FODR, FODR data or other aircraft systems is not authorized and may be subject to criminal prosecution.

FODR DOWNLOAD Procedure:

1. Turn OFF aircraft power.
2. Connect FODR to the computer via a USB cable.
3. Follow download instructions provided in the FODR Data Viewer User Manual.

3.3. Specifications

FODR automatically records the sensor data listed in Table 4: FODR Data Descriptions. Recorded acceleration data may require additional processing, depending on the orientation and/or position of the installed FODR.

Table 4: FODR Data Descriptions

Chan No.	Channel Name	Sample Rate, [Hz]	Performance Range	Accuracy/Threshold	Description
1	Digital Discrete Input 1 (Low Fuel)	5	0-28VDC	OFF < 1.0VDC ON > 3.0 VDC	LOW FUEL recorded as discrete (ON/OFF) status of the existing Low Fuel warning system.
2	Time	0.0167 (1/minute)	N/A	±2 minutes/year[6]	Internal Real Time Clock synced to GPS time, when available, and maintained by internal battery while the unit is un-powered.
3	Date	0.0167 (1/minute)	N/A	See Time channel.	Internal Real Time Clock synced to GPS time, when available, and maintained by internal battery while the unit is un-powered.
4	Manifold Pressure	5	5.0 – 32.0 inHg	±0.4 inHg[1] ±0.8 inHg[2]	Absolute measurement of engine manifold pressure inHg
5	Static Pressure	5	8.0 – 32.0 inHg	±0.1 inHg[2]	Absolute measurement of sensed static pressure in inHg.
6	Outside Air Temperature	5	-40 – 50 °C	±1 °C[1] ±2 °C[2]	FODR system measurement of outside air temperature in degrees C.
7	Density Altitude	5	-6000 – 15000 feet	±500 feet[2]	Calculated density altitude in feet
8	Airspeed	5	20 – 60 kts 61 – 90 kts 91 – 160 kts 161 – 200 kts	±5 kts[1,3] ±4 kts[1,3] ±3 kts[1,3] ±5 kts[1,3]	Pneumatic measurement of airspeed in knots via the pitot-static system.
9	DC Motor Status (Clutch Belt Tensioner)	5	0-28VDC	OFF < 1.0VDC ON > 5.0 VDC	Indication of DC motor status, recorded as OFF, FORWARD, or REVERSE

Table 4: FODR Data Descriptions

Chan No.	Channel Name	Sample Rate, [Hz]	Performance Range	Accuracy/Threshold	Description
10	Acceleration, Gx	5	-8 – 8 g	±0.1 g[4] ±0.08 g[5]	Accelerometer measurement in g's, relative to FODR chassis, for longitudinal forces.
11	Acceleration, Gy	5	-8 – 8 g	±0.1 g[4] ±0.08 g[5]	Accelerometer measurement in g's, relative to FODR chassis, for lateral forces.
12	Acceleration, Gz	5	-8 – 8 g	±0.1 g[4] ±0.08 g[5]	Accelerometer measurement in g's, relative to FODR chassis, for vertical forces.
13	Rotor RPM	5	5 – 400 Hz signal	±0.5% of reading[2]	Rotor RPM sensed by the existing sender
14	Engine RPM	5	5 – 400 Hz signal	±0.5% of reading[2]	Engine RPM sensed at the R magneto
15	Radar Altitude	5	N/A	N/A	Data is provided by external sensor.
16	GPS Altitude	1	N/A[7]	Varies[8]	GPS height in feet above the MSL geoid (GPS uses WGS 84 to estimate Mean Sea Level as of 2017)
17	GPS Ground speed	1	N/A[7]	Varies[8]	GPS ground speed, in knots
18	GPS Latitude	1	N/A[7]	Varies[8]	GPS latitude, in degree decimal minutes
19	GPS Longitude	1	N/A[7]	Varies[8]	GPS longitude, in degree decimal minutes
20	Pressure Altitude	5	-2000 – 15000 feet	±500 feet[2]	Pressure Altitude in feet on a standard day with the local pressure adjustment set to 29.92inHg.
21	Vertical Speed	5	-5000 – 5000 FPM	±100 FPM[2]	Rate of change of pressure altitude

Notes:

1. Standard test conditions are ambient pressure and temperature of 29.921 inHg and 20 to 25°C, respectively.
2. Full operating temperature range is ambient temperature from -40 to +70 °C.
3. Add ±3 knots for operation at full operating temperature extremes.
4. Accelerometer error, at zero g.
5. Non-linearity specification.
6. Without GPS correction.
7. Depends entirely on the received signal.
8. Depends on the number of satellites, their relative positions, signal strengths, environment, etc.

4. ESAID

This section describes the operation and specifications of the ESAID LRU. ESAID must be interfaced to FODR to receive data for proper operation. The aircraft OEM provides guidance for safe flight in the Pilot Operating Handbook (POH), which is typically presented as graphs and charts that may not be convenient to reference during flight. ESAID provides dynamic calculations of this information.

ESAID is intended to provide aural and graphic indications of exceedances and early indications to the pilot of risks to flight safety. However, the pilot must not become complacent or assume safe flight is possible because ESAID has not yet provided an alert.

The highest and best safety benefit from the use of the FODR System can be realized by changing pilot habits to remain as far from performance limitations as possible. Sound aeronautical decision making and conservative expectations of aircraft performance remain paramount to flight safety with the FODR System installed.

Warning: The FODR System provides no aircraft envelope protection against an exceedance or potential catastrophic or fatal event.

Warning: When the FODR System is operating, the pilot remains responsible and must be fully aware of POH limitations, terrain, obstacles, existing conditions, personal limitations, and all factors affecting safety of flight.

Warning: The supplemental information provided by ESAID or any component of the FODR System is not a substitute for mission risk analysis nor is it intended to be used as a guarantee of performance, or safety.

Warning: Using ESAID or the FODR System to deliberately operate closer to aircraft limitations, terrain, obstacles, performance limitations, personal limitations, or in any manner decreasing flight safety, may cause catastrophic loss of the aircraft and fatal injury.

Note: Accurate ESAID operation is dependent on the correct ESAID setup and correct FODR operation.

Note: The pilot should cross-check ESAID values with primary references and the aircraft's POH. The pilot should adjust expectations of aircraft performance accordingly.

4.1. Overview

ESAID displays real-time performance data, alerts the pilot to potentially hazardous conditions, identifies when select parameters are exceeded, notifies the pilot of specific situations, and interfaces to the pilot using the aircraft's existing audio system and a touchscreen display.

Alerts are provided using visual and audible cues of varying severity and are calculated using the charts and limitations found in the aircraft manufacturer's POH. Select limitations are provided for easy review and verification.

Exceedances are flagged and time-stamped when the aircraft is operated outside of specific, defined limitations; thus, allowing for easy identification and post-flight review.

Notifications provide supplemental information regarding situational awareness to the pilot.

Data is presented in a compact form, designed to enhance pilot situational awareness by allowing quick, at-a-glance, determination of operational performance relative to calculated limitations.

4.2. Alert Descriptions

Alerts are intended to warn pilots that performance limitations are being approached or violated. Once aware of a potentially dangerous situation, the pilot should take appropriate action. ESAID provides alerts that are make/model specific, described in three levels of urgency below. A summary of alerts are provided in Table 5: Alert Definitions.

Alerts are composed of two components: a visual cue and audible component. The visual cues are defined in the ALERT column of Table 5: Alert Definitions. The audible component of ESAID alerts are played in their entirety, in the same order as the triggering events.

4.2.1. Warning Alerts

WARNING Alerts mean that immediate pilot action should be taken to remedy a potentially dangerous situation. WARNING alerts are abbreviated in RED font and audible announcements associated with the specific alert. The Warning aural alert is generated upon alert activation and repeated every 60 seconds from previous activation until the condition is corrected.

To reduce nuisance aural alerts, if the Warning Alert is deactivated and then activated again within 30 seconds, the warning aural alert is not repeated until at least 60 seconds from previous activation.

4.2.2. Caution Alerts

CAUTION Alerts mean that action may be required. CAUTION alerts are abbreviated in YELLOW font and announced by an audible attention tone once, only upon activation. The aural component of Caution Alerts is not repeated while the alert is active.

To reduce nuisance aural alerts, if the Caution Alert is deactivated and then activated again within 30 seconds, the audible attention tone is not repeated.

4.2.3. Advisory Alerts

ADVISORY Alerts provide situational information. ADVISORY alerts are abbreviated in WHITE font with no audible component.

4.2.4. Available Alerts Summary

The following table summarizes the available alerts, their types, abbreviated text, audible component and displayed descriptions. The displayed descriptions are provided as a reminder to the meaning of the alert abbreviation on a supplemental screen. Refer to section 4.5.8, Supplemental Info Screen, for more information. Alert activation conditions are provided in section 4.10 Aircraft-specific Definitions.

Table 5: Alert Definitions

ALERT	TYPE(1)	AUDIBLE COMPONENT(2)	DISPLAYED DESCRIPTION
VNE	W	Attention tone + “Warning: VNE Exceeded”	VNE: NEVER-EXCEED SPEED
MCP	C	Attention tone	MCP: OPERATION ABOVE MAXIMUM CONTINUOUS POWER
	W	Attention tone + “Warning: MCP Duration Exceeded”	MCP: 5 MINUTES OF OPERATION ABOVE MCP

Table 5: Alert Definitions

ALERT	TYPE(1)	AUDIBLE COMPONENT(2)	DISPLAYED DESCRIPTION
5MP	**W**	Attention tone + "Warning: Five Minute Power Exceeded"	5MP: EXCEEDED FIVE MINUTE POWER
DAHI	**W**	Attention tone + "Warning: Max Density Altitude Exceeded"	DAHI: MAXIMUM DENSITY ALTITUDE EXCEEDED
OGE	**C**	Attention tone	OGE: OPERATION ABOVE OGE CEILING
	W	Attention tone + "Warning: OGE Hover Exceeded"	OGE: HOVER ATTEMPT ABOVE OGE CEILING
IGE	**C**	Attention tone	IGE: OPERATION ABOVE IGE CEILING
	W	Attention tone + "Warning: IGE Hover Exceeded"	IGE: HOVER ATTEMPT ABOVE IGE CEILING
FRZ	**A**	No audible component.	FRZ: FREEZING CONDITIONS POSSIBLE
LO-G	**W**	Attention tone + "Warning: Low G"	LO-G: LOW G EVENT DETECTED
EHI	**W**	Attention tone + "Warning: Engine Over-speed"	EHI: ENGINE OVER-SPEED
RHI	**W**	Attention tone + "Warning: Rotor Over-speed"	RHI: ROTOR OVER-SPEED
SLIP	**W**	Attention tone + "Warning: Clutch Belt Slippage"	SLIP: CLUTCH BELT SLIPPAGE DETECTED
CLCH	**W**	Attention tone + "Warning: Clutch Over-tension"	CLCH: CLUTCH MOTOR
FUEL	**W**	Attention tone + "Warning: Low Fuel"	FUEL: LOW FUEL DETECTED
EXC	**A**	No audible component.	EXC: EXCEEDANCE DETECTED
GWT	**C**	Attention tone	GWT: GROSS WEIGHT UNCONFIRMED OR OUT OF RANGE
SINK	**W**	Attention tone + "Warning: Sink Rate, Sink Rate."	SINK: EXCESSIVE DESCENT RATE

1) 'W' indicates WARNING; 'C' indicates CAUTION; 'A' indicates ADVISORY.
2) Attention tone is ~0.25sec, single tone.

4.3. Exceedance Descriptions

The ESAID Exceedance function is designed to capture transient conditions that might have escaped pilot notice or conditions which occur during periods of high pilot workload. All exceedances are associated with specific alerts and are, therefore, make/model specific.

For a given exceedance, ESAID logs the time and date information of only the *first* occurrence. Additional exceedances may exist, and the first occurrence is used to provide a starting point when analyzing and reviewing stored FODR data. A comprehensive maintenance review should begin at the first occurrence and consider all the FODR operational data thereafter.

Table 6: ESAID Exceedance Details

ESAID EXCEEDANCE DETAILS		
Type	**SUPPLEMENTAL INFORMATION FORMAT**	**ACTIVATION CONDITIONS**
Rotor Over-speed	"RHI" + GMT + DATE	Active RHI Alert
Engine Over-speed	"EHI" + GMT + DATE	Active EHI Alert
Excessive Power	"5MP" + GMT + DATE	Active 5MP Alert
Excessive Power	"MCP" + GMT + DATE	Active MCP Warning Alert
Clutch Belt Slippage	"SLIP" + GMT + DATE	Active SLIP Alert

4.4. Notification Descriptions

Notifications provide an audio message to the pilot of either a change in ESAID operation state, or additional non-alerting notification function.

4.4.1. Radar Altitude Callouts

If the FODR system is equipped with a radar altimeter, RA height callouts are announced at the radar altitudes presented in Table 7: RA Height Callouts.

Table 7: RA Height Callouts

RA Height Callouts (ft)
300(1)
200
100
60
15

(1) Reset threshold value is 400ft

4.5. Displayed Screen Descriptions

This section describes the general screen arrangement and defines the arrangement of each available screen.

4.5.1. General Screen Layout

The general ESAID screen layout is shown in Figure 1: ESAID General Screen Layout. The ESAID display is updated twice per second.

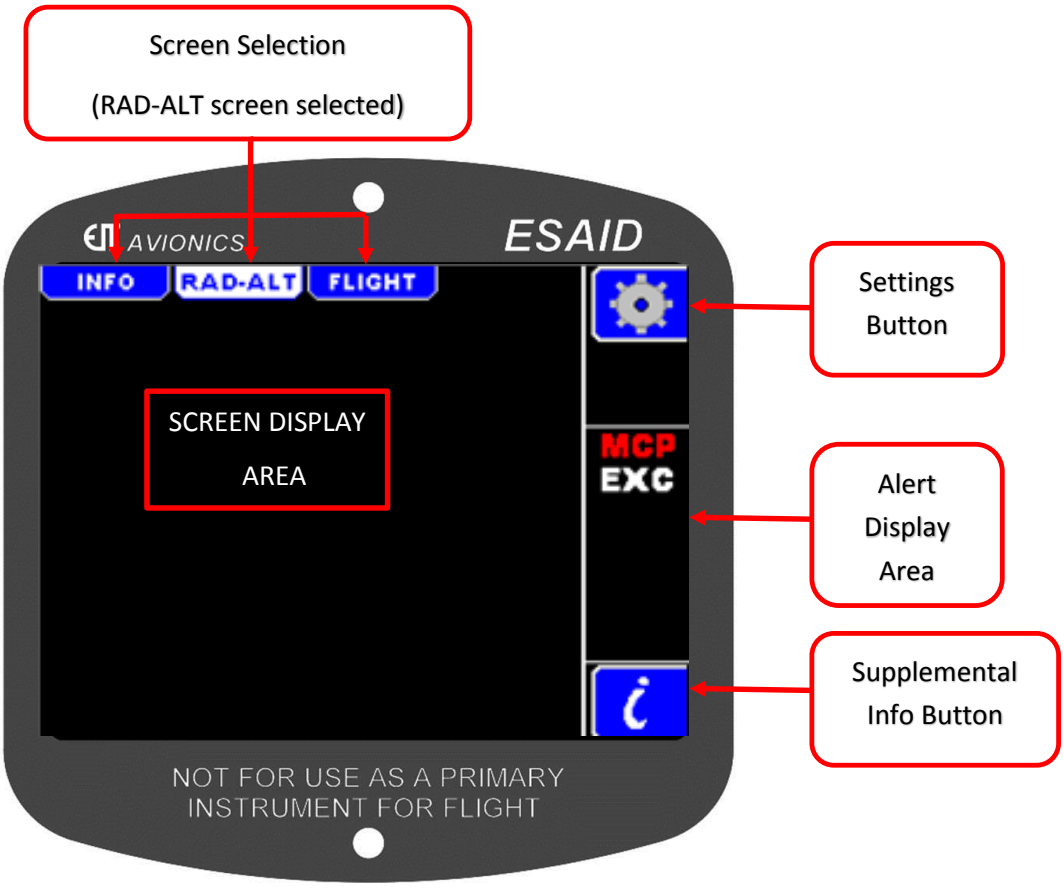


Figure 1: ESAID General Screen Layout

4.5.1.1. Screen Selection Tabs

The SCREEN SELECTION tabs are present on all screens, except the GROSS WEIGHT, SETTINGS, START-UP, and SUPPLEMENTAL INFO screens. The SCREEN SELECTION tab associated with the active screen appearing in the SCREEN DISPLAY AREA is highlighted white.

4.5.1.2. Settings Button

The SETTINGS BUTTON is present on all screens, except the GROSS WEIGHT and START-UP screens.

4.5.1.3. Alert Display Area

The ALERT DISPLAY AREA is present on all screens, except the START-UP screen. ESAID alerts are displayed in the Alert Display Area on the right side of the display. The display area supports up to six alerts at one time. In the event that more than six alerts are active, only the active alerts with the highest priorities are visible. The display priority, starting with highest, is as follows: VNE, MCP, 5MP, DAHI, OGE, IGE, FRZ, SINK, GWT, SLIP, CLCH, LO-G, FUEL, RHI, EHI, EXC.

NOTE: ESAID will provide aural alerts for all active alerts, even though the display may only show six alerts.

4.5.1.4. Supplemental Info Button

The SUPPLEMENTAL INFO BUTTON is present on all screens, except the GROSS WEIGHT and START-UP screens.

4.5.1.5. Screen Display Area

The SCREEN DISPLAY AREA is the primary location where data, information and graphics are displayed.

4.5.2. Start-up Screen

The Start-up Screen provides information about the installed unit. An example Start-up Screen is shown in Figure 2: Example ESAID Start-Up Screen. The following information is displayed:

- Manufacturer information
- Unit part number
- Software part number
- Software version
- Aircraft type code
- PDIF number

Figure 2: Example ESAID Start-Up Screen

Note: Information provided on the Start-Up Screen may differ depending on installation.

4.5.3. Settings Screens

All settings are accessible from the SETTINGS screens. The SETTINGS screen is composed of one or more pages, identified by page number and total pages at the bottom of the screen. The ESAID SETTINGS pages are aircraft make/model specific.

See typical ESAID SETTINGS screens are shown in Figure 3: ESAID Settings Page 1 Screen and Figure 4: ESAID Settings Page 2 Screen. The NEXT PAGE button is depicted in the lower-right corner of the SCREEN DISPLAY AREA.

Settings may be one of three types: a slider, a checkbox, or entry. The slider-type setting allows the user to adjust a variable within a given range and is typically accompanied by a button or symbol. A checkbox-type setting allows the user to select one of possibly several options. An entry-type setting displays a different screen to allow the user to view or adjust one or more parameters.

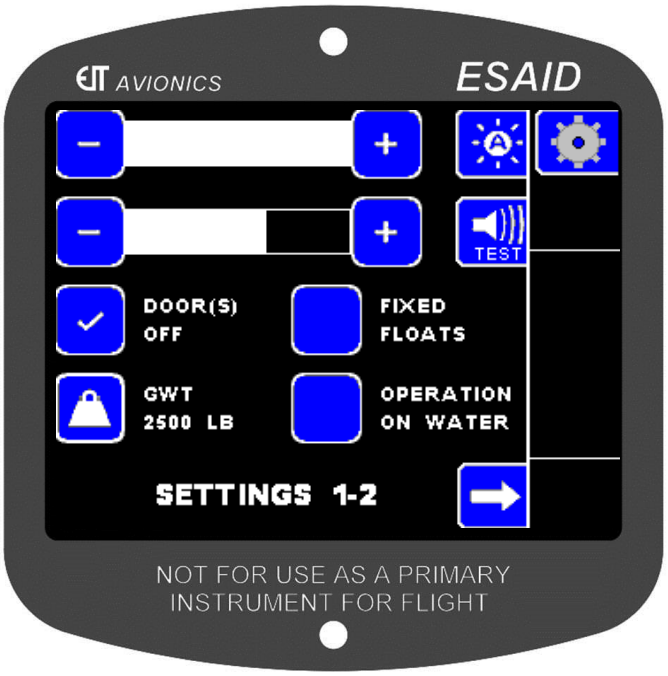


Figure 3: ESAID Settings Page 1 Screen

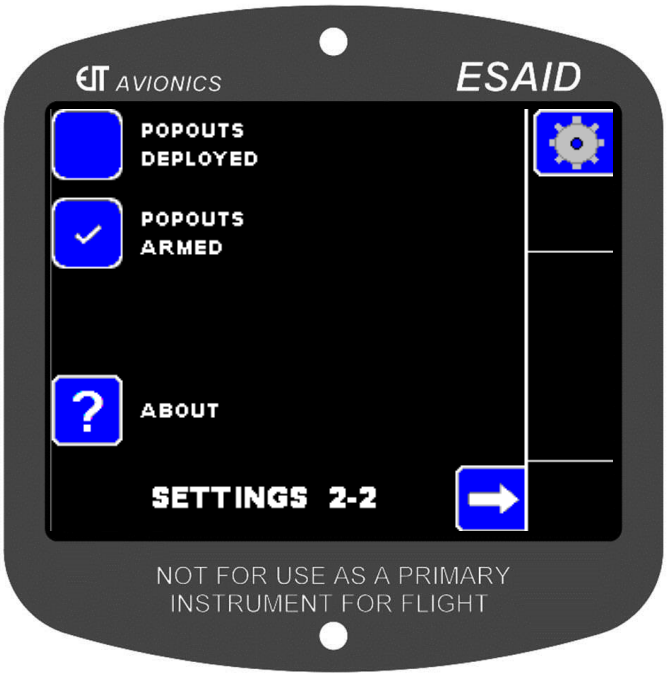


Figure 4: ESAID Settings Page 2 Screen

4.5.3.1. Volume Control

The volume control allows the user to increase or decrease the volume setting. The horizontal slider depicts the current setting relative to the minimum and maximum settings. When the setting is changed, a tone at the new volume setting is generated as feedback. The TEST button, located to the right of the volume control, will play a test audio file at the current volume setting, without changing the setting. The volume control is depicted in Figure 3: ESAID Settings Page 1 Screen.

4.5.3.2. Brightness Control

The brightness control allows the user to manually adjust the brightness of the screen for various lighting environments. The horizontal slider depicts the current setting relative to the minimum and maximum settings, when the brightness is set for manual control. The BRIGHTNESS MODE button to the right of the slider bar allows the user to enable or disable automatic control of the brightness setting by means of an external dimmer input signal. Automatic control is enabled when the brightness symbol is shown with an “A”, as shown in Figure 3: ESAID Settings Page 1 Screen.

4.5.3.3. Door(s) off

The DOOR(S) OFF setting indicates to the software whether or not the aircraft has had one or more doors removed. A visible check mark indicates that one or more doors has been removed.

Accurate usage of this setting allows for the correct calculation of those limitations which depend on this aspect of the aircraft.

4.5.3.4. Gross Weight (GWT)

The GROSS WEIGHT setting provides the user with the means to update the current GWT of the aircraft. The current GROSS WEIGHT setting is displayed adjacent to its associated button. The button associated with this setting is used to display the appropriate screen for user input of a new value. Refer to section 4.7.1.2 Update the Gross Weight, for more information.

Accurate usage of this setting allows for the correct calculation of those limitations which depend on this aspect of the aircraft.

4.5.3.5. Fixed Floats

The FIXED FLOATS setting indicates to the software whether or not the aircraft has fixed floats installed. A visible check mark indicates that fixed floats have been installed.

Accurate usage of this setting allows for the correct calculation of those limitations which depend on this aspect of the aircraft.

4.5.3.6. Operation On Water

The OPERATION ON WATER setting indicates to the software whether or not water operations are planned. A visible check mark indicates that operations on water are planned.

Accurate usage of this setting allows for the correct calculation of those limitations which depend on whether or not the pilot is planning to land or take off from water.

4.5.3.7. Pop Outs Deployed

The POPOUTS DEPLOYED setting indicates to the software whether or not inflatable pop-out floats have been deployed. A visible check mark indicates that inflatable pop-outs have been deployed.

Accurate usage of this allows for the correct calculation of those limitations which depend on this aspect of the aircraft.

4.5.3.8. Pop Outs Armed

The POPOUTS ARMED setting indicates to the software whether or not inflatable pop-out floats have been ARMED. A visible check mark indicates that inflatable pop-out floats have been armed.

Accurate usage of this setting allows for the correct calculation of those limitation which depend on this aspect of the aircraft.

4.5.3.9. About

The ABOUT setting is provided to allow the user to view the part number and other information about the unit.

4.5.4. Gross Weight Entry Screen

The GROSS WEIGHT screen is composed of a keypad and a numerical display, with associated units. The cursor indicates the character which will be changed by the next press of the keypad. Characters may be deleted by using the back button in the bottom left corner of the keypad. The OK button is used by the pilot to acknowledge, or accept, the displayed GROSS WEIGHT value.

The valid range of the GROSS WEIGHT is make/model specific, and ESAID will not allow an invalid GROSS WEIGHT to be entered.

An example of the GROSS WEIGHT screen is depicted in Figure 5: ESAID Gross Weight Screen. Note, the GWT caution is active until a valid weight has been confirmed.

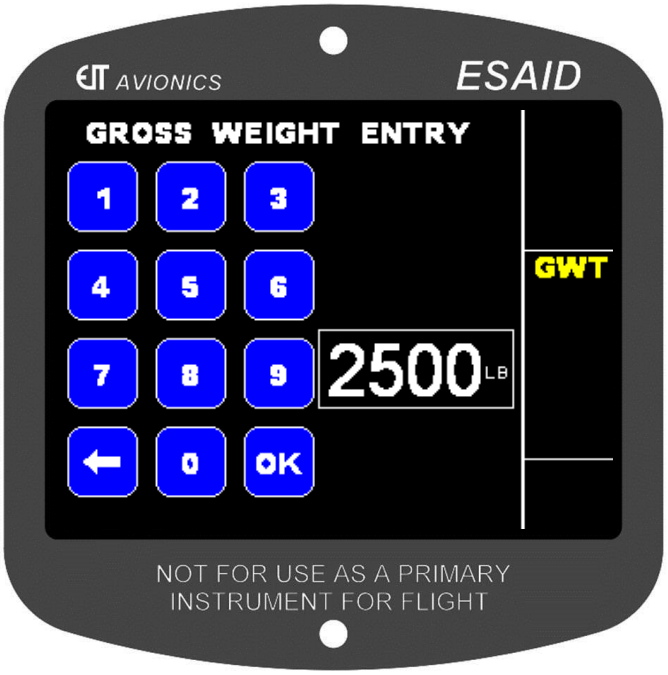


Figure 5: ESAID Gross Weight Screen

4.5.5. Info Screen

The INFO screen numerically displays select data and performance limitations. Values on the INFO screen are presented for convenient cross-check with primary instruments and expected POH limitations. For more detailed information regarding displayed data, refer to section 4.6 Displayed Data Descriptions.

The GROSS WEIGHT setting, OAT and DA are displayed in the upper portion of the screen. In the lower portion of the screen, calculated performance limitations, such as hover ceilings, engine power limits and airspeed limits are displayed. An example INFO screen is depicted in Figure 6: ESAID Info Screen.

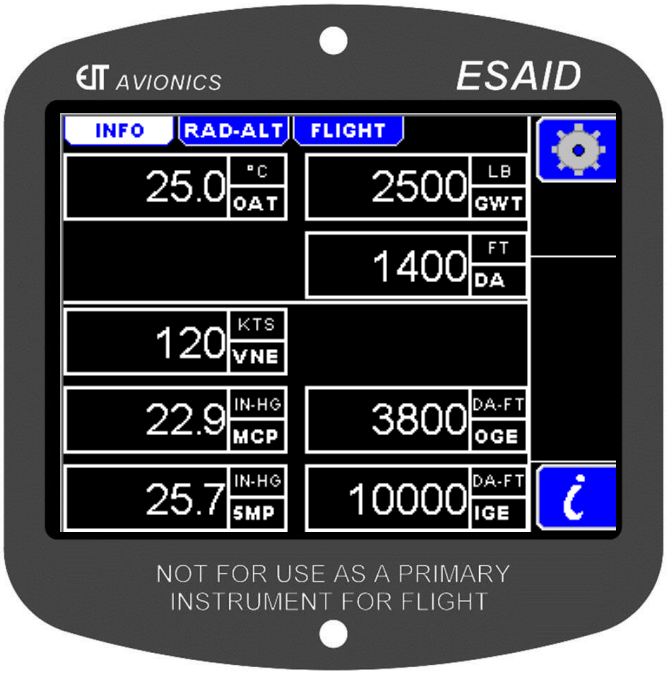


Figure 6: ESAID Info Screen

4.5.6. RAD-ALT Screen

The RAD-ALT screen depicts the Radar Altitude (RA). For more detailed information regarding displayed data, refer to section 4.6 Displayed Data Descriptions.

An example RAD-ALT screen is shown in Figure 7: ESAID RAD-ALT Screen.

NOTE: Screen selection tab RAD-ALT will change to RAD-INOP if radar altimeter is inoperable, or not installed.

Figure 7: ESAID RAD-ALT Screen

4.5.7. Flight Screen

The FLIGHT screen depicts Radar Altitude (RA), Density Altitude (DA), Indicated Airspeed (IAS), and Manifold Pressure (MAP). For more detailed information regarding displayed data, refer to section 4.6 Displayed Data Descriptions.

In the example in Figure 8: ESAID Flight Screen below, the white indicator is in the green, or 'normal' range, for DA, IAS and MAP.

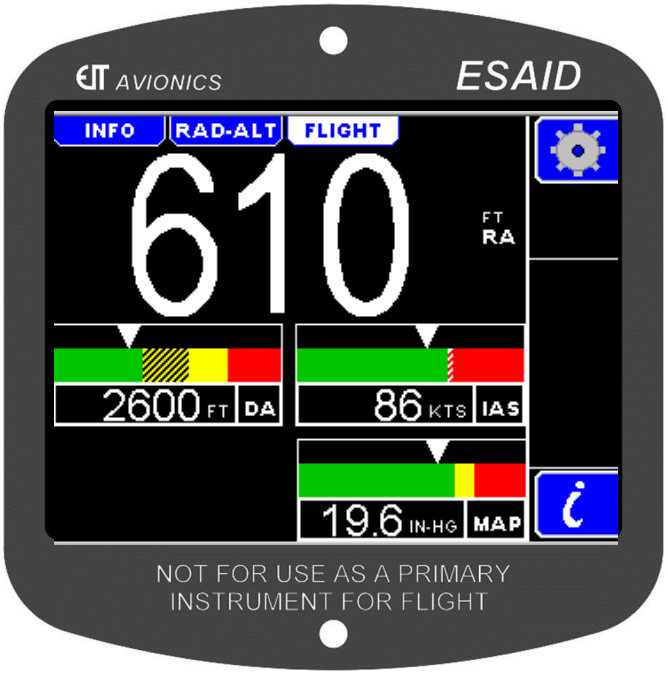


Figure 8: ESAID Flight Screen

4.5.8. Supplemental Info Screen

The SUPPLEMENTAL INFORMATION screen is intended to provide greater descriptive information about Active Alerts and Exceedances. The FONT is necessarily small and not optimized for in-flight viewing.

The SUPPLEMENTAL INFORMATION screen provides additional information regarding any active alerts or exceedances. The Displayed Description (see Table 5: Alert Definitions) of each active alert is listed in the left-hand column.

An example is provided in Figure 9: ESAID Supplemental Info Screen. It shows the following alerts are active: FRZ, RHI, and EXC. Additionally, a Rotor Over-speed (RHI) was detected.

Figure 9: ESAID Supplemental Info Screen

4.6. Displayed Data Descriptions

This section describes how individual data values are displayed and presented to the pilot. With few exceptions, data is displayed numerically using a basic display or presented as a Graphic Display.

4.6.1. Data Display

A Data Display is a basic numerical display that contains a data label, data value, and units. The format of the Data Display is presented in Figure 10: Data Display Format.

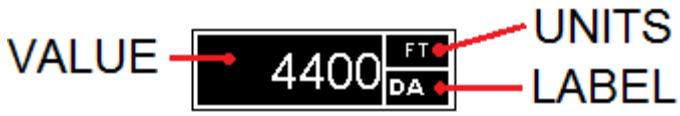


Figure 10: Data Display Format

4.6.2. Graphic Display

A Graphic Display provides all of the information found in a Data Display, but adds information in the form of a graphic.

4.6.2.1. Standard Graphic Display

A standard Graphic Display adds a colored horizontal bar, or scale, to graphically show the data value relative to performance limitations. The white indicator represents the measured data, and the horizontal scale depicts the pertinent performance limitations. The basic format of the Graphic Display is presented in Figure 11: Graphic Display Format. The minimum and maximum graphically displayed values are represented by the left-most and right-most edges of the horizontal bar, respectively.

Figure 11: Graphic Display Format

When limits are unknown, the corresponding color ranges affected in the horizontal bar, or scale, are colored white. When data is unknown, the graphic portion is removed from the display and the data value is displayed as three dashes ("- - -").

4.6.3. Limitations

Limitations are displayed using a Data Display, or as part of a Graphic Display. When limitations are presented as part of a Graphic Display, they will be identified in the associated Graphic Display description, found in section 4.6.4 Data. Unknown, unavailable, or invalid limitation data values are displayed as three dashes ("- - -").

All performance limitations are aircraft make/model specific and are calculated, in real-time, according to the aircraft's POH.

4.6.3.1. Hover Out-of-Ground Effect Ceiling (OGE)

When available, the OGE Data Display depicts the current calculated OGE ceiling, see Figure 12: OGE Data Display.

a) Normal (b) Unknown limit

Figure 12: OGE Data Display

4.6.3.2. Hover In-Ground Effect Ceiling (IGE)

When available, the IGE Data Display depicts the current IGE value, see Figure 13: IGE Data Display

a) Normal (b) Unknown limit

Figure 13: IGE Data Display

4.6.3.1. Never-Exceed Speed (VNE)

Both Power-ON and Power-OFF VNE are calculated at all times, but only one is numerically displayed as VNE, when available. The VNE Display depicts the applicable VNE value, as determined by the current operational state of the aircraft (either Power-ON or –OFF). See Figure 14: VNE Data Display.

a) Normal (b) Unknown limit

Figure 14: VNE Data Display

4.6.3.1. Maximum Continuous Power (MCP)

When available, the MCP Data Display depicts the current MCP value, see Figure 15: MCP Data Display.

a) Normal (b) Unknown limit

Figure 15: MCP Data Display

4.6.3.2. Five Minute Power (5MP)

When available, the 5MP Data Display depicts the current 5MP value, see Figure 16: 5MP Data Display.

a) Normal (b) Unknown limit

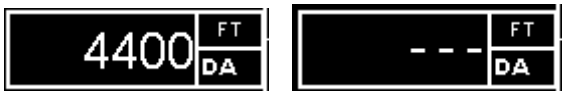
Figure 16: 5MP Data Display

4.6.4. Data

Data is displayed using a variety of methods, as presented in this section.

4.6.4.1. Density Altitude (DA)

When available, the DA Data Display presents the value of DA, see Figure 17: DA Data Display.



a) Normal (b) Unknown

Figure 17: DA Data Display

The DA Graphic Display presents DA data relative to OGE, IGE, and DAHI limitations. The minimum and maximum graphically displayed values are -6000 FT and 20000 FT, respectively.

The OGE hover ceiling is depicted as the left edge of the yellow section with black hatch-marks. The IGE hover ceiling is depicted as the left edge of the solid yellow section of the horizontal bar. The maximum operating DA authorized for flight is depicted as the left edge of the solid red section of the horizontal bar. For an example, refer to Figure 18: DA Graphic Display.

(a) Normal (b) Unknown limits (c) Unknown DA

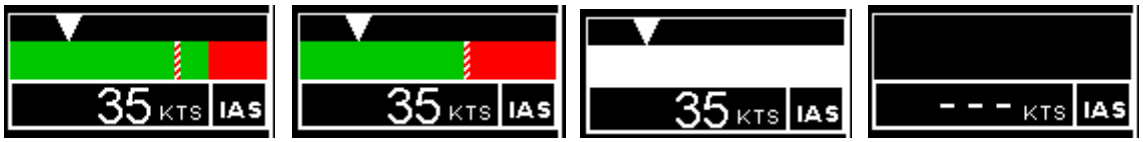
Figure 18: DA Graphic Display

4.6.4.2. Indicated Airspeed (IAS)

The IAS Graphic Display presents IAS data relative to VNE (power-ON and power-OFF) limitations. The minimum and maximum graphically displayed values are 0 KTS and 150 KTS, respectively.

IAS values below minimum performance range (Table 4: FODR Data Descriptions) will be displayed as "---".

When available, both the power-ON and power-OFF VNE limitations are depicted, as shown in Figure 19: IAS Graphic Display. The power-ON VNE limitation is depicted as the left edge of the solid red section of the horizontal bar. The power-OFF VNE limit is depicted as the left edge of the red-and-white hatched, vertical line on the horizontal bar.



(a) Normal (b) Power-OFF state (c) Unknown VNE (d) Unknown IAS

Figure 19: IAS Graphic Display

4.6.4.3. Manifold Pressure (MAP)

The MAP Graphic Display presents MAP data relative to MCP and 5MP limitations. The minimum and maximum graphically displayed values are 0 INHG and 32 INHG, respectively.

When calculated, the MCP and 5MP limitations are depicted as shown in Figure 20: MAP Graphic Display. The MCP limitation is depicted as the left edge of the solid yellow section of the horizontal bar. The 5MP limitation is depicted as the left edge of the solid red section of the horizontal bar.

(a) Normal (b) Unknown Limits (c) Unknown MAP

Figure 20: MAP Graphic Display

4.6.4.4. Outside Air Temperature (OAT)

The OAT Data Display depicts the measured OAT value, as seen in Figure 21: OAT Data Display.

(a) Normal (b) Unknown OAT

Figure 21: OAT Data Display

4.6.4.5. Radar Altitude (RA)

RA is the measured radar height above a surface or obstruction. The RA Display supports up to four numeral digits as seen in Figure 22: RA Data Display.

(a) Normal (b) RA Non Functioning (c) Unknown RA

Figure 22: RA Data Display

4.6.4.6. Gross Weight (GWT)

The GWT Data Display depicts the GWT setting, as seen in Figure 23: GWT Data Display.

Figure 23: GWT Data Display

4.7. Operation

This section describes the operation of ESAID. ESAID uses a touch screen to accept input directly from the pilot. In general, all icons and graphics containing the color BLUE are buttons.

4.7.1. Setup

All ESAID settings are selected by means of the SETTINGS SCREEN and retained after power-cycle, with exceptions of Volume and Gross Weight. Refer to section 4.7.2 Power-ON for additional details.

Additionally, ESAID uses a MAIN SCREEN (RAD-ALT or FLIGHT screens only) setting during normal operations. For more details regarding MAIN SCREEN usage, refer to section 4.7.7 Automatic Screen Behavior.

To setup ESAID,

1) Select the SCREEN SELECTION TAB (see section 4.5.1.1 Screen Selection Tabs) of the desired MAIN SCREEN;
2) Review the SETTINGS SCREEN settings, in section 4.5.3 Settings Screens;
3) Press the SETTINGS button, to view SETTINGS SCREEN (PAGE 1);
4) Adjust the volume control to the desired level, using an aircraft headset;
5) Adjust the brightness control to the desired level;
6) If AUTOMATIC DIMMING is desired, press the BRIGHTNESS MODE button so that an "A" is depicted on its icon;
7) Review and update remaining settings on PAGE 1 according to the existing aircraft configuration, except the GWT setting;
8) Press the NEXT PAGE button (RIGHT ARROW), to view SETTINGS SCREEN (PAGE 2);
9) Review and update settings on PAGE 2 according to the existing aircraft configuration;
10) Exit the SETTINGS SCREEN by pressing the SETTINGS button to save current settings.

4.7.1.1. Review Unit Information

To verify or review ESAID Unit information,

1) Press the SETTINGS button, to view SETTINGS SCREEN (PAGE 1);
2) Press the NEXT PAGE button (RIGHT ARROW), to view SETTINGS SCREEN (PAGE 2);
3) Press the ABOUT button, to view the START-UP SCREEN.
4) Review the displayed unit information

NOTE: The START-UP screen will timeout and exit after 10 seconds.

4.7.1.2. Update the Gross Weight

To update the GROSS WEIGHT manually,

1) Press the SETTINGS button, to view SETTINGS SCREEN (PAGE 1);
2) Press the GWT SETTING button, to view the GROSS WEIGHT ENTRY SCREEN;
3) Use the keypad to enter the GROSS WEIGHT;
4) Press OK, to save the entry.

Note: If the user selects an out-of-range gross weight, the ESAID will coerce the value to the nearest in-range value and request confirmation.

NOTE: After 10 seconds of inactivity, the GROSS WEIGHT ENTRY screen will timeout and return to the previously displayed screen.

4.7.2. Power-ON

Immediately following the application of power, ESAID enters its power-ON sequence, displays the START-UP SCREEN and restores applicable settings, while it performs a self-test.

If the ESAID self-test fails, ESAID will display error codes and remain on the START-UP screen until power is removed. If the error codes persist after ESAID power is cycled, record the error codes and contact the manufacturer.

If the ESAID self-test is successful, ESAID will begin AUTOMATIC SCREEN BEHAVIOR. Refer to section 4.7.7, Automatic Screen Behavior, for continued operation.

After a successful power-on sequence, the GROSS WEIGHT is restored to its default value, which is aircraft make/model specific and set to the value that results in the most conservative operational limits. If the power-on sequence was initiated by an intermittent power fault, the current GROSS WEIGHT is retained to minimize the inconvenience of re-entering the GROSS WEIGHT while in flight.

If the VOLUME setting is below the power on MIN-VOLUME, the volume setting will revert to the power on MIN-VOLUME, see Section 4.10 Aircraft-specific Definitions.

4.7.2.1. Brightness Reset

If the display is too dark to read, it may be due to the previous brightness setting. To restore the brightness setting to maximum and disable AUTOMATIC DIMMING mode,

1) Gently press and hold the lower-right corner of the touchscreen display;
2) Power cycle ESAID;
3) Release the touchscreen display once the screen brightness is restored to maximum, typically within 10 seconds of the application of power.

IMPORTANT: The pilot must understand the consequences of the ESAID Power-ON behavior, which can cause ESAID to calculate inaccurate performance limitations using an obsolete GROSS WEIGHT.

4.7.3. User Interface

This section describes how data is presented to the pilot.

4.7.3.1. Alerting Functions

Upon activation, an alert will be added to the Alert Display Area, and the audible component of the alert is output to the pilot, through the connected audio system. Refer to Table 5: Alert Definitions for the audible components of the alerts. The audible components of alerts are repeated, according to their type, as defined in section 4.2 Alert Descriptions.

If system is equipped with a functioning radar altimeter, during an Autorotation and while below RA heights of 250', all aural alerts that have not already started playing are

suppressed, to reduce unnecessary audible distractions from RA height callouts. Normal aural alerts resume 5 seconds after the aircraft returns to powered flight.

4.7.3.2. Notifications

4.7.3.2.1. RA Callouts

During *decreasing* RA height, each height callout is announced when RA value descends below the nearest lower RA callout threshold, refer to section 4.4.1, Radar Altitude Callouts, for applicable RA values. To reduce nuisance callouts, the same height callout will not be repeated until the adjacent higher threshold value has been met. If RA values are not reported in the adjacent lower threshold range, the nearest lower RA height call out passed through will be announced. During *increasing* RA height, no callouts are made.

In unusual terrain or urban conditions, Height Callouts may occur more frequently. The following are examples of RA callouts:

Example 1: RA height decreases from 500' to 180' causing a height callouts at 300 and 200. RA height then increases to 250' then back to 180'. A height callout at 200 will ***not*** occur because the adjacent threshold of 300' will not be reached. Continuing descent to 90' will cause a height callout at 100.

Example 2: Level flight approaching a 500' tall building with a rooftop helipad, flying at 50' above the helipad may cause the height callouts for 300, 200, 100 and 60 to occur in immediate succession depending on how rapid the RA values change. Height callouts may skip to a lower callout if RA is decreasing extremely rapidly.

4.7.3.3. Displayed Data

All graphic or numerical data, that is visible on the currently displayed screen, is updated at 2Hz.

Three dashes ("- - -") indicate invalid data. INVALID data is data that is unknown, or otherwise unavailable, for any reason, including, but not limited to, hardware/sensor malfunction[(1)], or sensor data that is determined to be erroneous.

[(1)] RA data will display no value when the radar altimeter is not installed or non-functioning. Installed and functioning radar altimeter with either out of range, or unknown RA will display ("- - -").

4.7.4. Viewing Active Alerts and Logged Exceedances

To view active alerts and logged exceedances,

1) Press the SUPPLEMENTAL INFO button, located in the lower-right corner of the screen, to view the SUPPLEMENTAL INFO Screen.
2) To exit, press the SUPPLMENTAL INFO button.

NOTE: The SUPPLEMENTAL INFO SCREEN will timeout and exit after 10 seconds of inactivity. Refer to section 4.3, Exceedance Descriptions*, for exceedance details.*

4.7.4.1. Clearing Exceedances

Exceedances should be reviewed and dispositioned by appropriate maintenance personnel, referring to OEM approved data, before they are cleared. A thorough and accurate review of exceedance data is critical to continued safety of flight.

NOTE: Understanding the context of the operation that caused an exceedance and altering pilot operation of aircraft by proper training, with respect to specific POH limitations, is key to realizing the safety benefits offered by the FODR System.

To clear exceedances,

1) Press the SUPPLEMENTAL INFO button, located in the lower-right corner of the screen;
2) Press the CLEAR EXCEEDANCES (CLR EXC) button near the bottom of the SUPPLEMENTAL INFO SCREEN.

NOTE: Clearing exceedances in ESAID does <u>not</u> delete any FODR recorded data.

4.7.5. Pre-Flight Checklist

1. Review Active Alerts and Logged Exceedances. Refer to Section 4.7.4 Viewing Active Alerts and Logged Exceedances.
2. If Exceedances have been logged:
    a. Record exceedance, date, and time.
    b. Download FODR data for review and disposition of any exceedences, see 3.2.1 Data Download.
    c. After the logged exceedances are dispositioned, and if appropriate, clear the exceedances.
3. Verify the ESAID settings match the existing aircraft configuration. For setup instructions, refer to section 4.7.1 Setup.

NOTE: ESAID Alerts will be passed through the audio system. ESAID audio setting should be adjusted as necessary on the Settings Page prior to flight to insure sufficient volume.

NOTE: The ESAID display is capable of brightness levels which can interfere with pilot night vision. Display lighting should be adjusted as necessary on the Settings Page prior to flight.

4.7.6. Required Operational Entries

Following the power-ON sequence, the pilot is required to enter the GROSS WEIGHT.

4.7.7. Automatic Screen Behavior

This section describes the normal behavior of ESAID, which incorporates automatic screen transitions to allow for hands-free operation after the pre-flight entries are made. The automatic behavior does not affect the ALERT DISPLAY AREA. This Automatic Screen Behavior supports installations where ESAID may not be easy to reach during flight.

During normal operation, ESAID automatically transitions between the INFO, MAIN, and GROSS WEIGHT ENTRY Screens. The MAIN SCREEN is stored as a setting and is the primary screen, intended to be used during flight operations. Refer to section 4.7.1, Setup, for instructions on explicitly setting the MAIN SCREEN. Any subsequent changes to the MAIN screen selection

followed by entering, and exiting the SETTINGS SCREEN, will update the existing MAIN screen setting.

Figure 24: Automatic Screen Transitions depicts the automatic screen transitions A, B, and C.

After the Power-ON sequence successfully completes, ESAID automatically displays the GROSS WEIGHT ENTRY SCREEN. At this time, the correct GROSS WEIGHT should be entered.

TRANSITION A occurs when EITHER a GROSS WEIGHT is entered and accepted, OR ESAID detects that the aircraft is in a PRE-FLIGHT state, where the engine and/or rotor RPM are increasing, indicating run-up in preparation for take-off.

TRANSITION B occurs when ESAID detects that the aircraft is in a FLIGHT state, where engine and rotor RPM are approaching or near values indicating take off and/or flight.

TRANSITION C occurs when ESAID detects that the aircraft is in a JUST LANDED state, with the engine and rotor RPM at or below idle levels for at least 10 seconds. TRANSITION C will only occur if the previous state, detected by ESAID, was the FLIGHT state.

NOTE: When the GROSS WEIGHT ENTRY SCREEN is displayed as a result of TRANSITION C, the GROSS WEIGHT is NOT changed without manual input from the pilot. However, the GWT Alert will become active to indicate that the GWT was not confirmed.

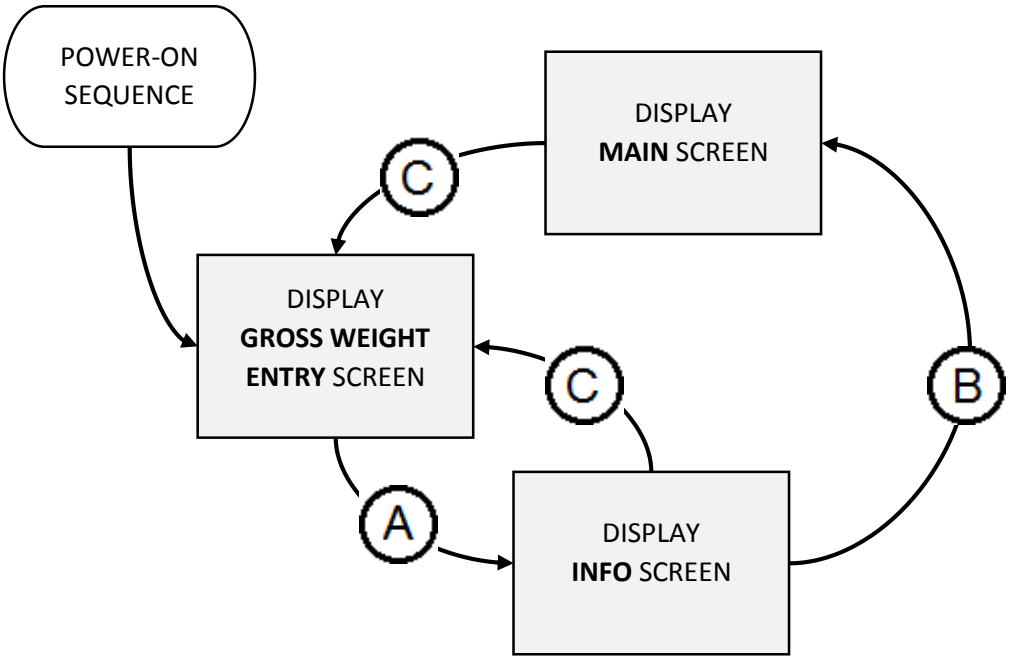


Figure 24: Automatic Screen Transitions

IMPORTANT: The pilot must understand the consequences of the automatic screen behavior which can cause ESAID to calculate inaccurate performance and limitations using obsolete GROSS WEIGHT.

4.7.8. Manual Screen Selection

Manual screen selection is always available. All screens and functions are touchscreen accessible in flight, at any power setting.

NOTE: After 10 seconds of inactivity, ESAID times out and reverts back to Automatic Screen behavior.

The INFO, RAD-ALT, and FLIGHT screens may be displayed by pressing the associated SCREEN SELECTION TAB.

NOTE: The active button area associated with the SCREEN SELECTION TABS are approximately twice the height of the visible SCREEN SELECTION TABS for ease of use.

The SETTINGS SCREEN may be displayed by pressing the settings button in the upper-right corner of the display. The different pages of the SETTINGS SCREENs may be cycled through by pressing the NEXT PAGE button at the bottom of each SETTINGS page.

The START-UP SCREEN may be displayed by pressing the ABOUT button on SETTINGS PAGE 2.

The SUPPLEMENTAL INFO SCREEN may be displayed by pressing the SUPPLEMENTAL INFO button in the lower-right corner of the display.

4.7.9. Post-Flight Checklist

1. Review Active Alerts and Logged Exceedances. Refer to Section 4.7.4 Viewing Active Alerts and Logged Exceedances.
2. If Exceedances have been logged:
    a. Record exceedance, date, and time.
    b. Download FODR data for review and disposition of any exceedences, see 3.2.1 Data Download.
    c. After the logged exceedances are dispositioned, and if appropriate, clear the exceedances.

4.8. Abnormal Operations

If power is interrupted and restored in-flight, ESAID will restart automatically and assume no changes to the last-entered settings. ESAID will sequence to the MAIN SCREEN according to the defined AUTOMATIC SCREEN BEHAVIOR.

If ESAID-displayed values appear to be in conflict with POH data or primary instruments, refer to the POH limitations and primary instruments, and remove power from ESAID.

If the ESAID display is distracting in any way, remove power from ESAID.

4.9. Specifications

Table 8: Specifications

Item No.	Description	Specification
1	Power-ON Sequence	<50 seconds
2	Input Voltage	10 – 32 VDC
3	Power Consumption	2W (typical)
4	Audio (Output)	≥ 16Ω load
5	Display	QVGA, 3.5” Color TFT LCD
6	Viewing Angle (typical)	±60° (horizontal); +50°/-60° (vertical)
7	Touchscreen Interface	Resistive (compatible with gloves)

4.10. Aircraft-specific Definitions

Alerts, notifications and settings may be make/model specific and are provided here to support multiple types.

4.10.1. TYPE 220

ESAID TYPE 220 LRUs are configured for ROBINSON R44 II, RAVEN II, CLIPPER II (fixed or pop out floats) R44 II POLICE, R44 II ENG (ELECTRONIC NEWS GATHERING), and will have the following aircraft-specific data.

4.10.1.1. Autorotation

The autorotation detection condition requires a descent rate of 1500fpm and a rotor RPM that is greater than the engine RPM by at least 5%.

4.10.1.2. Alerts

A summary of supported alerts and their alert activation conditions are provided in Table 9: Type 220 Alert Summary.

Table 9: Type 220 Alert Summary

Alert	ACTIVATION CONDITIONS(1)
VNE	**IAS** ≥ VNE
MCP Caution	MCP ≤ **MAP** < 5MP, and **ENG_RPM** > 50%
MCP Warning	5 minutes of active MCP caution(4).
5MP	**MAP** ≥ 5MP, and **ENG_RPM** > 50%
DAHI	**DA** ≥ Max Density Altitude
OGE Caution	OGE ≤ **DA** < IGE
OGE Warning	**IAS** < 30 knots, **RA** ≥ 30 feet(3), and active OGE Caution.
IGE Caution	IGE ≤ **DA** < Max Density Altitude
IGE Warning	**IAS** < 30 knots, and active IGE Caution.

Table 9: Type 220 Alert Summary

Alert	ACTIVATION CONDITIONS[1]
FRZ	**OAT** ≤ 4 °C[2]
LO-G	**GZ** < 0.5g
EHI	**ENG_RPM** > 105%
RHI	**RTR_RPM** > 107%
SLIP	**ENG_RPM – RTR_RPM** > 5%, and **ENG_RPM** > 70%.
CLCH	Clutch motor in FORWARD configuration for at least 10 seconds, and **ENG_RPM** > 80%[5]
FUEL	Low fuel condition detected.
EXC	One or more exceedances detected.
GWT	GROSS WEIGHT unconfirmed or out of range.
SINK	**Vertical Speed** ≤ -2000 FPM.

NOTES:

[1] VNE, MCP, 5MP, DAHI, OGE, and IGE are calculated using approved data from the aircraft's POH.
[2] Once FRZ alert is active, alert will clear at OAT>6°C.
[3] The RA condition is considered to be met if RA is INVALID, see section 4.7.3.3 Displayed Data.
[4] This Activation Conditions use a timer which increments to a maximum 10 minutes when the condition is active, and decrements when non-active.
[5] This Activation Conditions use a timer which increments to a maximum 60 seconds when the condition is active, and decrements when non-active.

4.10.1.3. Settings

The following settings are accessible for this aircraft TYPE, see Table 10: Type 220 Settings.

Table 10: Type 220 Settings

Setting	Range
Volume Control	0-100%
MIN-VOLUME	50%
Brightness Control	Varies
Door(s) Off	Y/N
Gross Weight	1600 - 2500 lbs
Fixed Floats	Y/N
Operation On Water	Y/N
Pop Outs Deployed	Y/N
Pop Outs Armed	Y/N

5. FODR SYSTEM TROUBLESHOOTING

The basic troubleshooting provided in this section is intended to provide users with a checklist to follow, in the hope that it helps to diagnose simpler issues and/or problems that may arise with the system.

Table 11: FODR LRU Troubleshooting

LRU: FODR **Issue:**	**Possible Causes/Suggested Actions**
FODR Remote Status Indicator not lit	• FODR not powered or functioning. • Remote indicator not powered. • Indicator not connected to FODR, verify cable pin to pin. • Indicator reversed, if polarized. Check orientation. • Indicator failed, remove/test/replace.
FODR local status indicator not lit	• FODR not powered. Check power. • FODR not functioning. No user serviceable items, contact to manufacturer.
FODR status indicator intermittent after ~5 second startup self-test period	• Check memory capacity using Data Viewer software. • If memory is not full, contact factory for additional guidance
FODR USB data download unsuccessful	• Verify USB cable is attached to FODR. • Retry with known good USB cable • Verify user computer and current application software
Status Input (Low Fuel)	• Verify connections to low fuel detection system.
Time/Date Inaccurate	• Verify GPS operation, real time clock synchronizes to GPS automatically.
Time/Date Not Functioning	• FODR LRU real time clock battery, return to EIT Avionics.
Manifold Pressure	• Verify pneumatic connection to manifold.
OAT	• Verify connection to OAT probe. • Verify within operating temperature range.
Density Altitude	• Verify OAT probe operation. • Verify pneumatic connection to static pressure. • Verify static pressure operation.
Air Speed	• Verify pneumatic connections to pitot and static pressure.
Clutch Tensioner	• Check wiring to clutch tensioner.
GX/GY/GZ	• FODR not operable, contact factory
Rotor RPM	• Confirm wiring to rotor sensor.
Engine RPM	• Confirm wiring to engine sensor.
Radar Height	• Confirm radar altimeter operation.
Latitude/Longitude	• Confirm GPS antenna connection to FODR. • Confirm GPS has clear view of sky and GPS satellite constellation.

Table 12: ESAID LRU Troubleshooting

LRU: ESAID **Issue:**	**Possible Causes/Suggested Actions**
ESAID display blank or corrupted	• Verify ESAID has power. • Verify display dimmer is disabled. • Reset brightness, see 4.7.2.1 Brightness Reset.
ESAID startup unsuccessful	• ESAID not functioning. No user serviceable items, contact manufacturer.
ESAID touchscreen not functioning or erratic	• ESAID not functioning. No user serviceable items, contact manufacturer.
ESAID data value appears as "---"	• FODR not providing valid data. Trouble shoot FODR.
ESAID alerts not audible	• Verify ESAID volume setting. • Verify audio panel is correctly configured for ESAID output. • Check audio wiring.
ESAID Density Altitude value appears high or low	• Verify OAT temperature provided on ESAID. Refer to FODR debugging if inaccurate.
ESAID parameter(s) appear inaccurate	• Refer to FODR debugging if inaccurate.