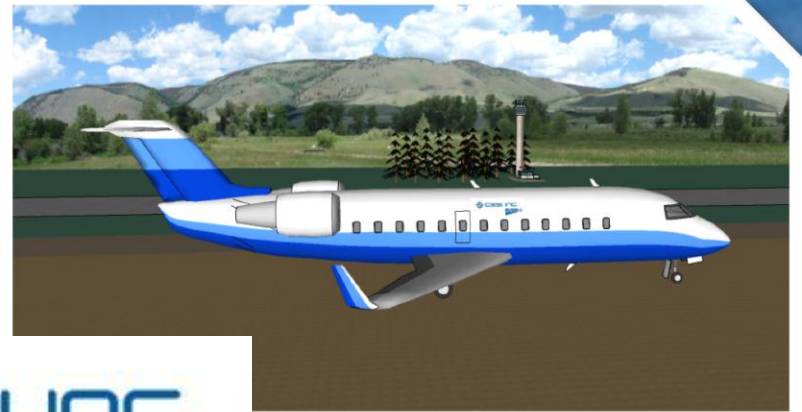




CSSI, INC.

Moving Research to Reality



CSSI, INC.

RVSM



E²GMU Enhanced² GPS Monitoring Unit (E²GMU) for Reduced Vertical Separation Minimum (RVSM) Monitoring

CARSAMMA Meeting, August 11, 2014



Office Locations:

CSSI, Inc. Headquarters

400 Virginia Avenue, SW | Suite 210 | Washington, DC 20024
202.863.2175 tel | 202.863.7400 fax | www.cssiinc.com

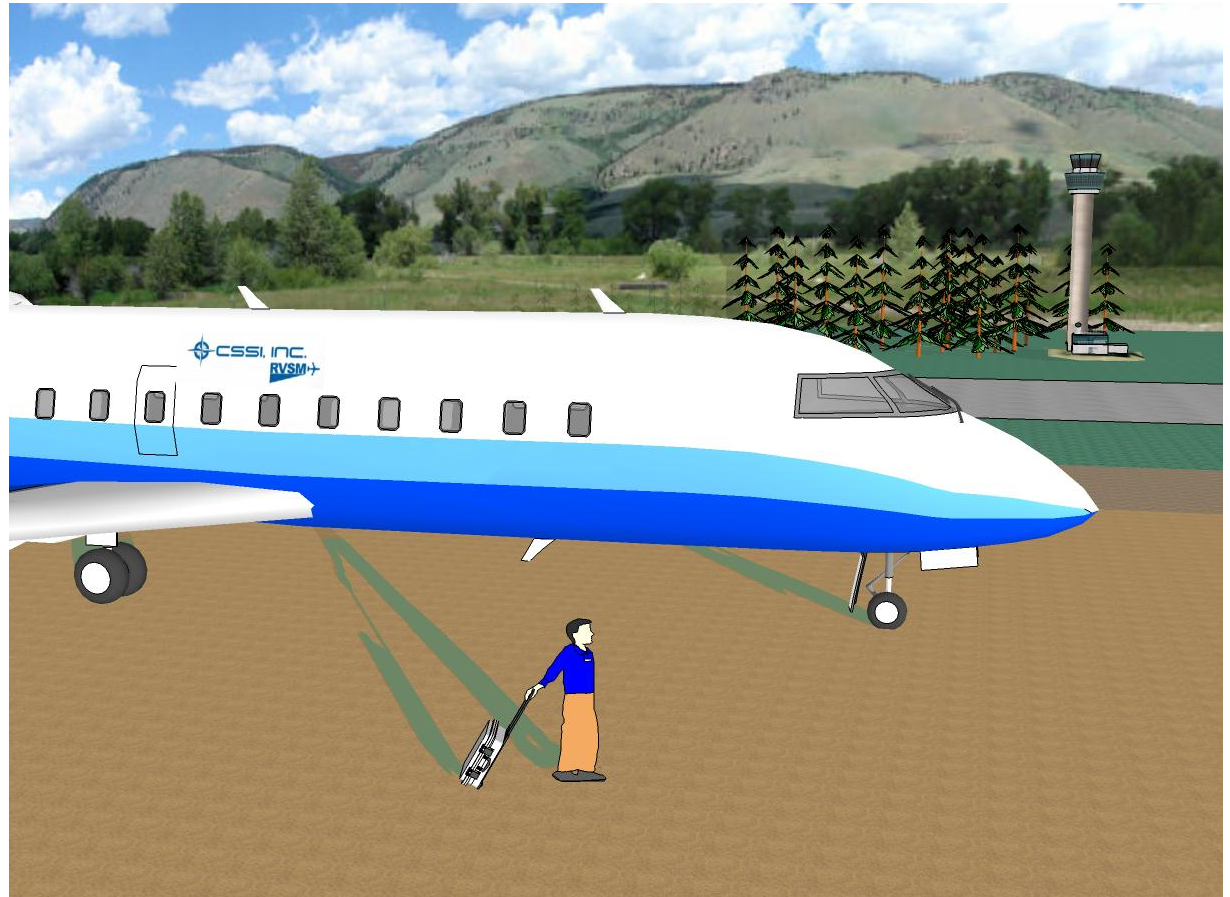
Capitol View
425 3rd St. Ste. 700
Washington, DC 20024
Tel: 202.600.7600
Fax: 202.600.7523

New Carrollton
8201 Corporate Dr.,
Ste. 750
Landover, MD 20785
Tel: 202.863.2175
Fax: 202.863.2398

New Jersey
1800 New Road
Northfield, NJ
08225
Tel: 609.910.3416
Fax: 609.910.0632

South Carolina
7011 Rivers Ave.,
Ste. 103
Charleston, SC 29406
Tel: 843.735.7020
Fax: 843.735.7002

E²GMU goes anywhere you fly

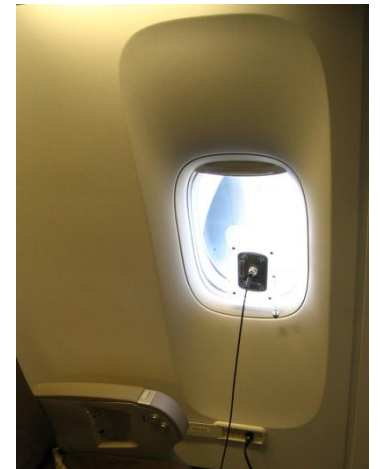


E²GMU works with any operation

- E²GMU monitoring can be performed during scheduled, ferry, cargo, or special flights



E²GMU RVSM monitoring inside Aircraft



E²GMU is World Ready with ARD

- **Altitude Recording Device (ARD)**
 - **MODE C** capture directly from Transponder
 - No data coordination required from ATC or Digital Flight Data Recorder (DFDR)



E²GMU is ready to fly

- E²GMU completely powered by internal batteries and requires no STC
- Tablet can be charged with E²GMU battery during flight

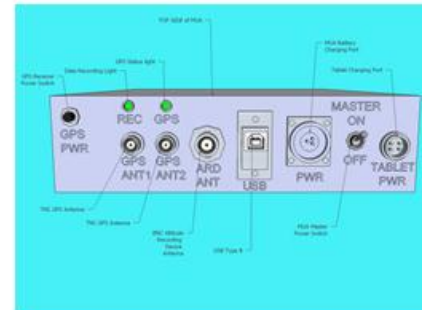
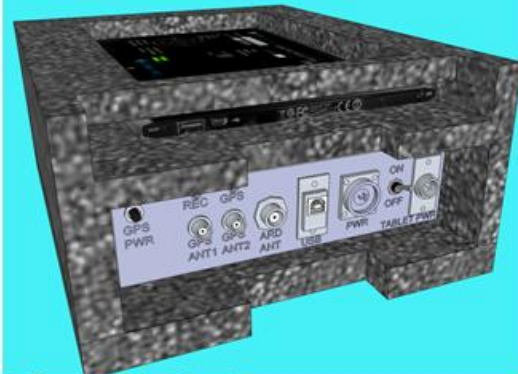
Device	Charge Time Needed	Maximum Run Time
E ² GMU Monitoring Unit Assembly (MUA)	8 Hours	10-16 Hours
E ² GMU Android Tablet	6 Hours	8.5 Hours

E²GMU Benefits

E²GMU Diagram – 2 Devices



Android
Tablet
+
E²GMU
Monitoring
Unit
Assembly
(MUA)



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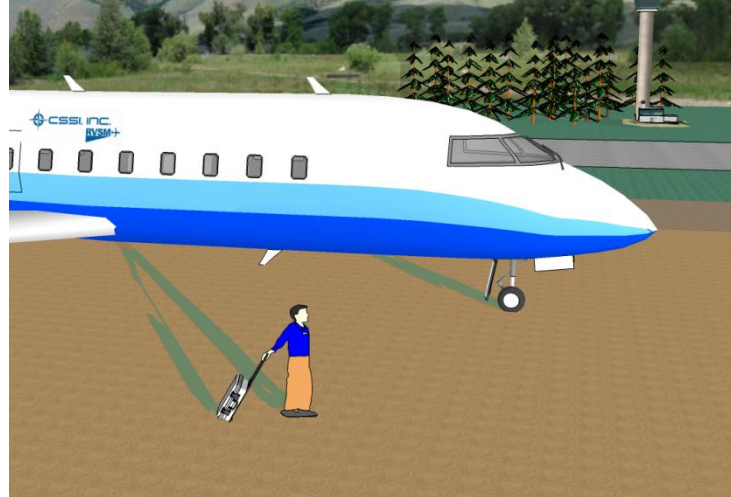
E²GMU Benefits

- E²GMU kit is portable
- Collapsible handle and rolling luggage wheels
- Designed to fit in most aircraft overhead storage bins



E²GMU Benefits

- Quick to Install
- Easy to Operate



E²GMU Benefits

- Intuitive Software and Simple Touchscreen operation

E2GMU

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171711**

Squawk code **2525** Set Squawk

Time: **00:00:00** Date: **10/17/13**

Latitude: **3856.7518128N** Altitude: **37M (122)**

Longitude: **07651.8309468W** ARD Altitude: **ARD N/A !!!**

Satellite: **07** in view **07**

Mode **3D** Course **311.438**

PDOP **2.02** Speed **0.0195 knots**

HDOP **1.00** **0.0362 km/h**

VDOP **1.76**

Free Space: **13,023,133,696**

Battery Tablet: **100% No charging**

Battery EGMU: **100.0% 16.93V**

50 50 38 43 46 49 37

02 04 10 12 17 20 28

USB Start Charge

Exit Check

/usb/001/004 EEGMU201

CSSI, INC.

17:13

E²GMU Benefits

- E²GMU data stored in Tablet memory
- E²GMU data can be transferred using:
 - Wireless Network (**Wi-Fi**)
 - Portable Hot Spot
 - Cell Phone Tethering
 - **Bluetooth**
 - PC USB ports
 - Micro SD Card



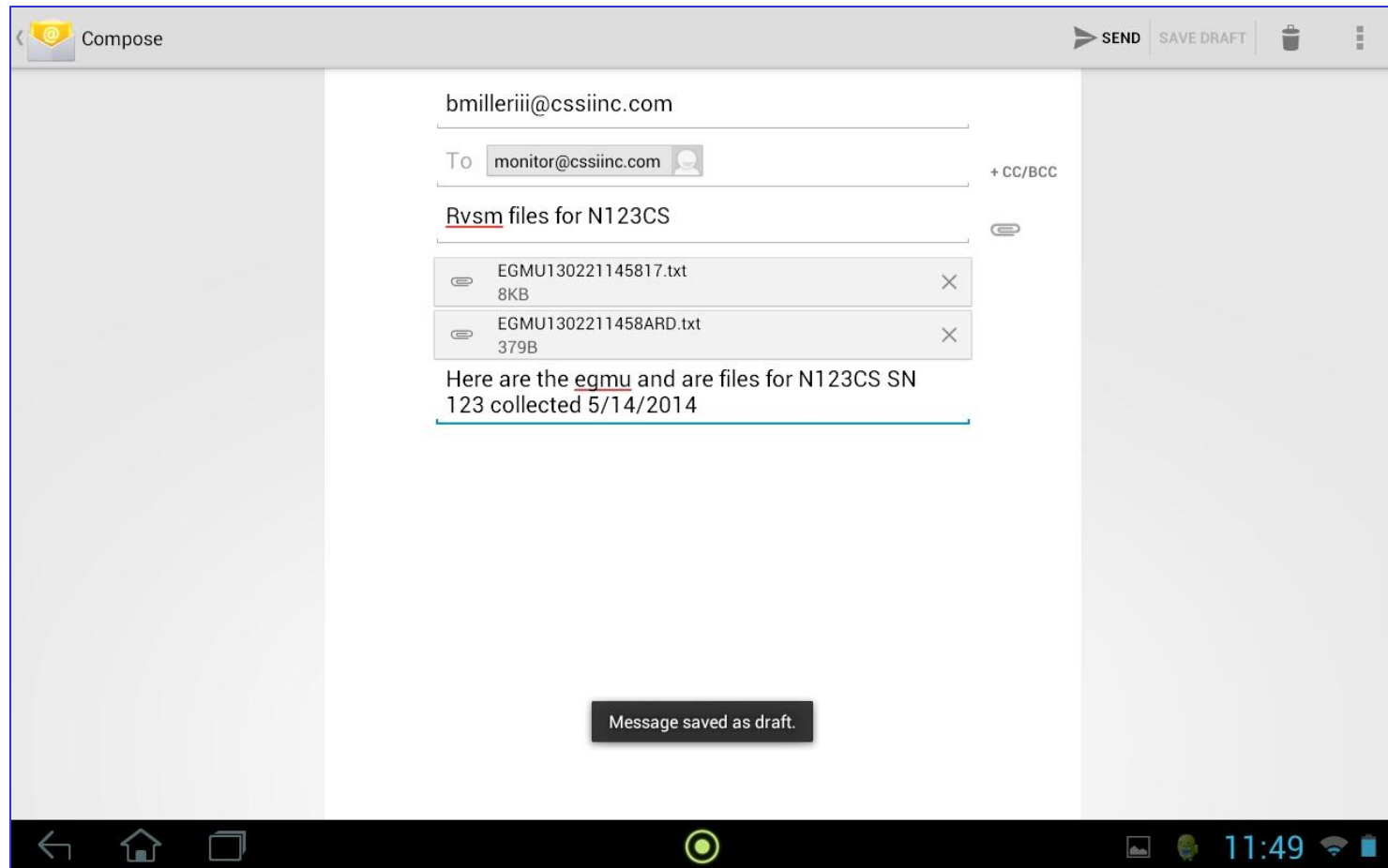
E²GMU Benefits

- E²GMU can transfer data with Tablet Applications from Google Play Store
 - Gmail
 - Google Drive
 - Dropbox
 - Outlook
 - Email



E²GMU Benefits

- E²GMU Wi-Fi Tablet enables direct transfer of data via Email or Apps (Tablet Applications)




E²GMU Benefits

- Online Training and Troubleshooting Support 24 Hours a day / 7 Days a week

Browse Page Bobby Miller III ▾

Welcome to New E²GMU Self Guided Training Online!

This website will guide you through the New E²GMU or EEGMU Training Basic Concepts and provide links to further information in the online manual.



This self paced course will guide you through installing, operating, and downloading data from the EEGMU system.

[Click here to Start Training!](#)

E²GMU Benefits

- Customer Service Training and Mission Support
 - Email monitor@cssiinc.com
 - Phone 1-866-468-8111
 - On-site Equipment Training Services
- RVSM Regional Monitoring Agency (RMA) coordination





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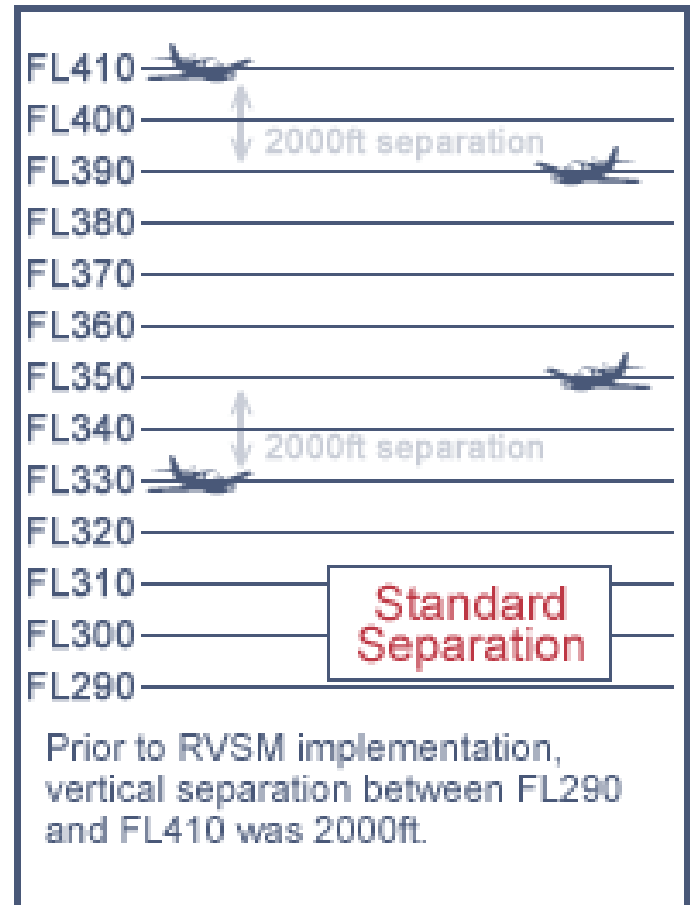
CSSI, INC.

RVSM →

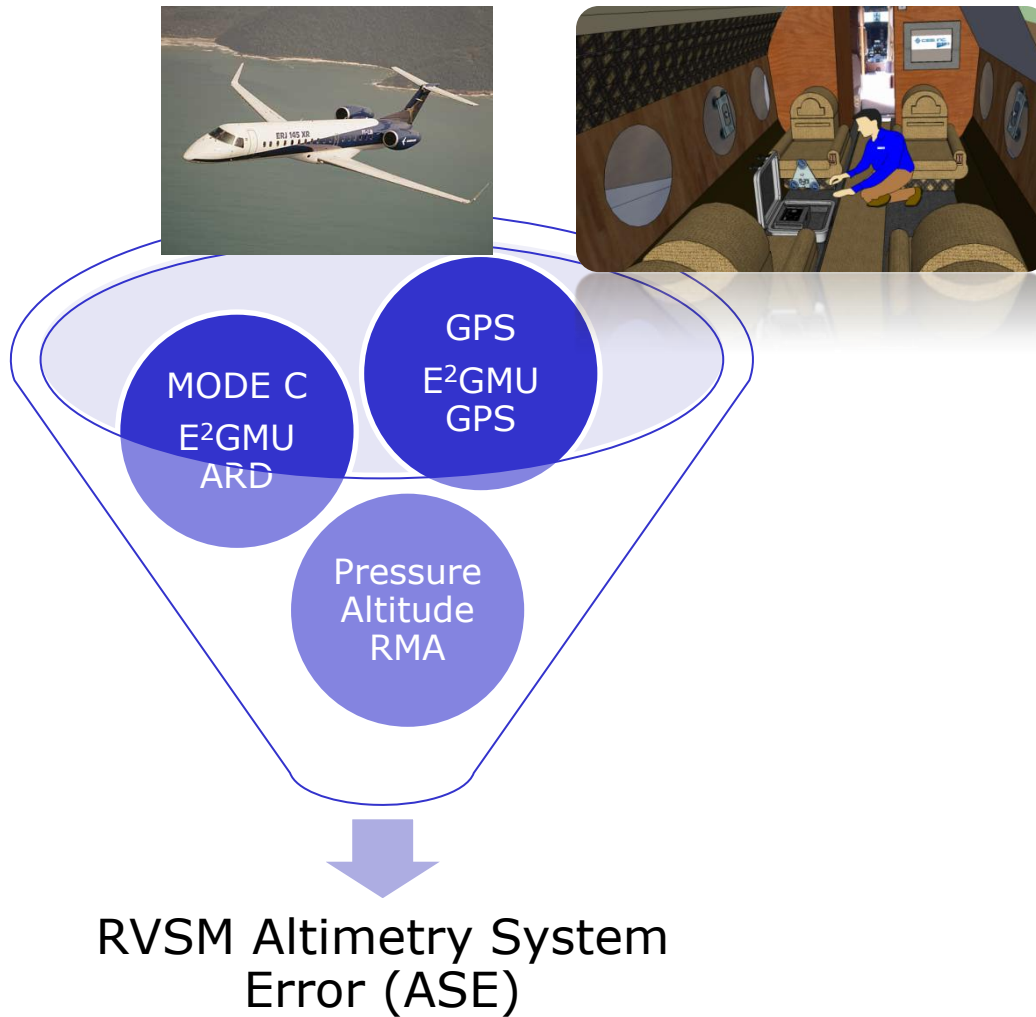
**E²GMU for
Reduced Vertical
Separation Minimum
(RVSM) Monitoring**

RVSM Data & Altitude Requirements

- RVSM flight levels
 - 29,000 feet to 41,000 feet, inclusive
- E²GMU designed to collect aircraft height data independent of aircraft systems



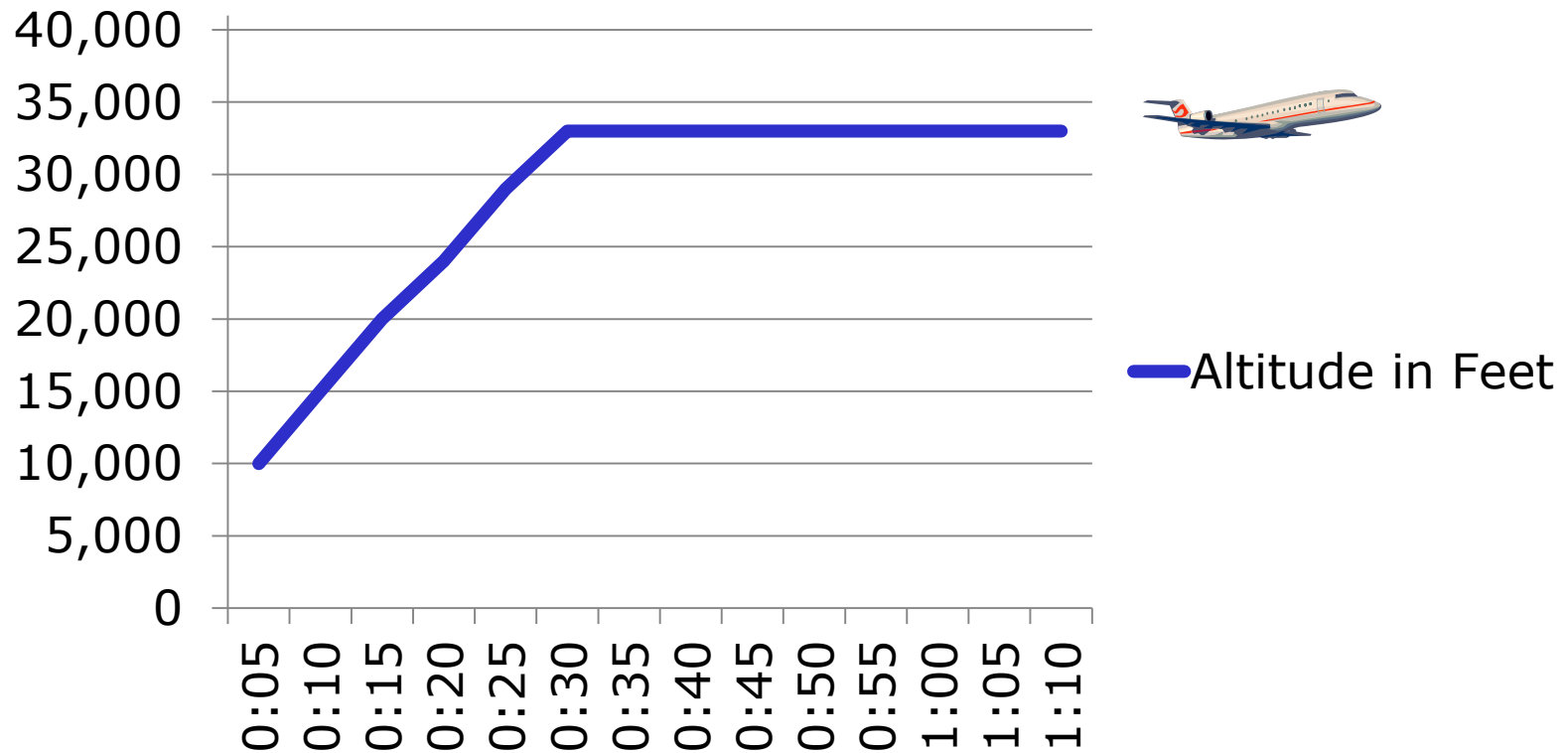
E²GMU provides RVSM data components for Altimetry System Error (ASE)



E²GMU Flight Operations Requirements

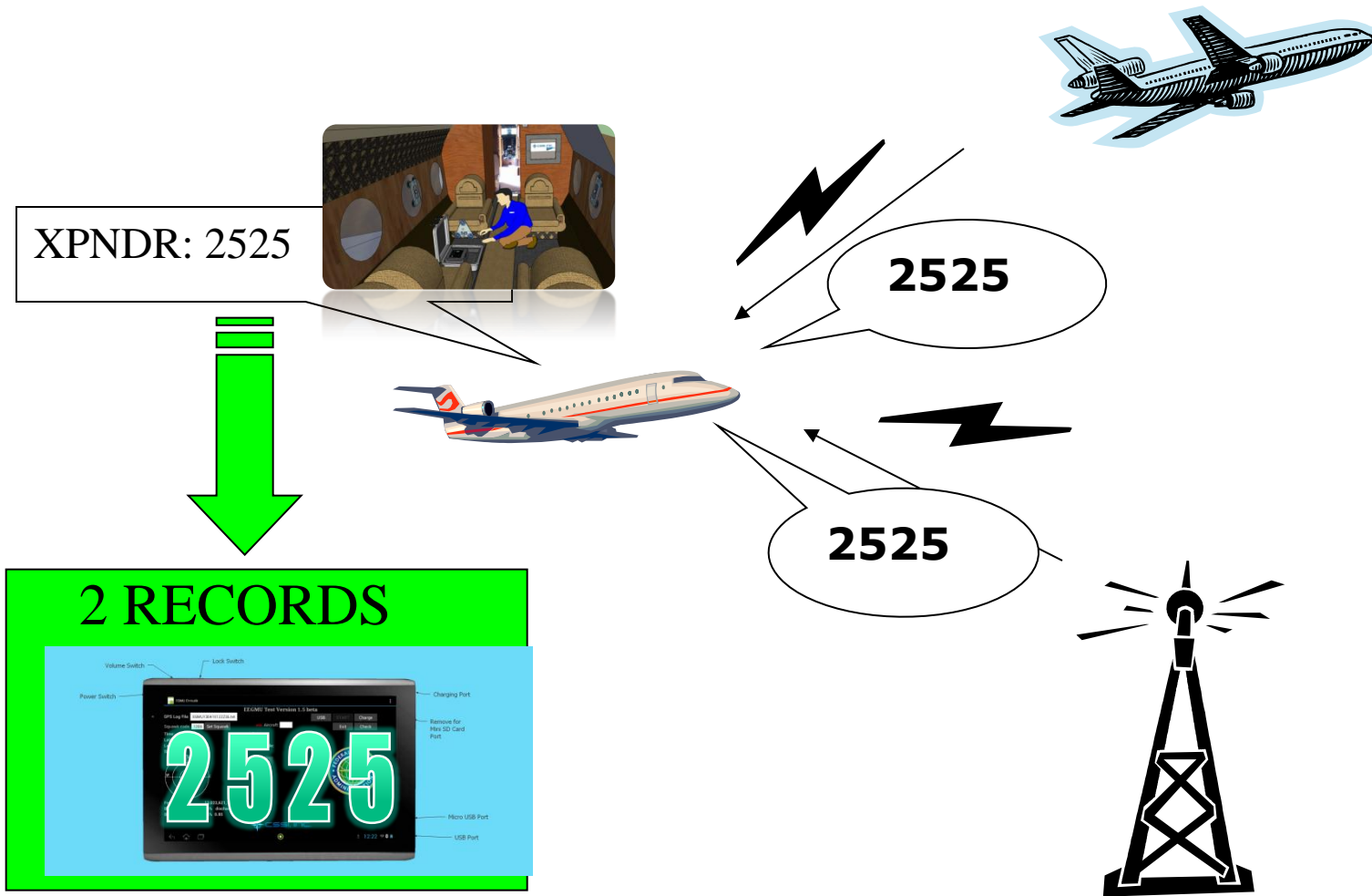
- E²GMU data collected for minimum 30 minutes during straight and level flight between FL290 and FL410

RVSM Flight Operation



E²GMU MODE C Data Capture with ARD

- Altitude Recording Device ARD



Altitude Recording Device (ARD)

The screenshot displays the E2GMU Version 2.1.3 interface. At the top left, it shows 'E2GMU' and a logo. The main title is 'E2GMU Version 2.1.3'. Below this, the 'GPS Log File' is 'EGMU2011310171711'. The device ID is 'Javad /dev/bus/usb/001/007' with serial number '0287X2ZTDQ3VH10K8PFAJ6M1J0'. The ARD ID is 'ARD /usb/001/006' with serial number 'A901AGJV'. The aircraft name is 'Aircraft: [redacted]'. There are buttons for 'USB', 'START', 'Charge', 'Exit', and 'Check'. The 'Squawk code' is '2525' with a 'Set Squawk' button. The 'Time' is '00:00:00' and the 'Date' is blank. The 'Latitude' is '3856.7519106N' and the 'Altitude' is '37M (122)'. The 'Longitude' is '07651.8310865W' and the 'ARD Altitude' is 'ARD N/A !!!'. The 'Satellite' count is '07 in view 07'. A heading indicator shows '12' and '20' degrees. A table of flight data is shown: Mode 3D, Course, PDOP 2.03, 195.073, HDOP 1.00, and Speed. A numeric keypad is visible at the bottom, with a 'Done' button. The bottom status bar shows the time '17:12' and various system icons.

E2GMU

E2GMU Version 2.1.3

GPS Log File EGMU2011310171711

Javad /dev/bus/usb/001/007
0287X2ZTDQ3VH10K8PFAJ6M1J0

ARD /usb/001/006 Aircraft: [redacted]
A901AGJV

USB START Charge

Squawk code 2525 Set Squawk Exit Check

Time: 00:00:00 Date:

Latitude: 3856.7519106N Altitude: 37M (122)

Longitude: 07651.8310865W ARD Altitude: **ARD N/A !!!**

Satellite: 07 in view 07

Mode 3D Course
PDOP 2.03 195.073
HDOP 1.00 Speed

Tab - + . 1 2 3

* / , 4 5 6 Done

() = 7 8 9

* 0 #

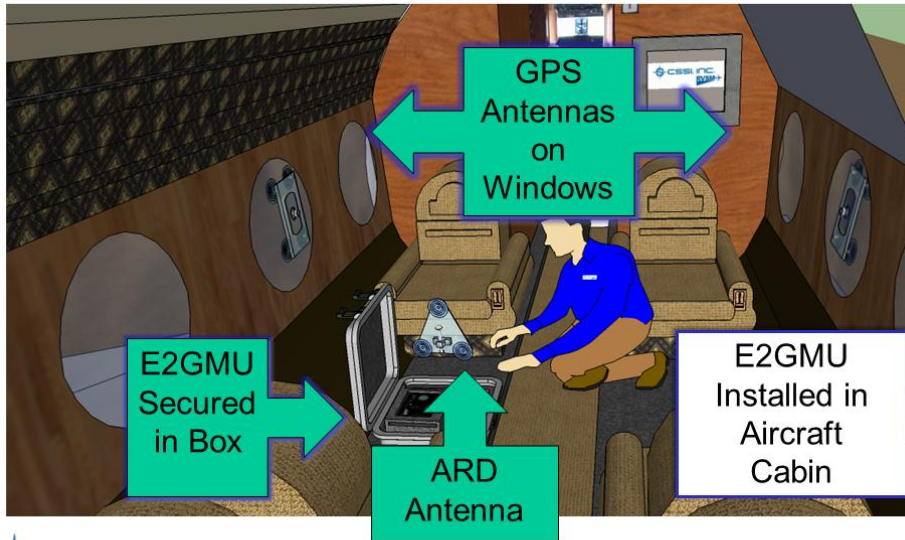
17:12



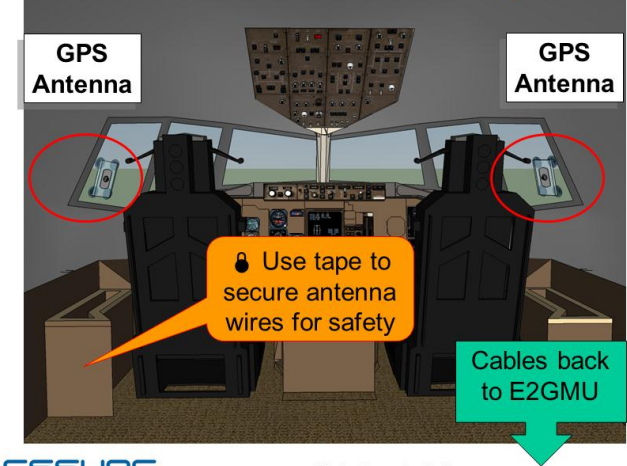
E²GMU Tablet Application Software Walkthrough

E²GMU Hardware Installation

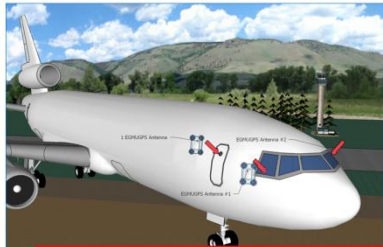
Recommended E²GMU Installation



Alternative E²GMU Installation: Flight Deck



Cargo Aircraft Installation



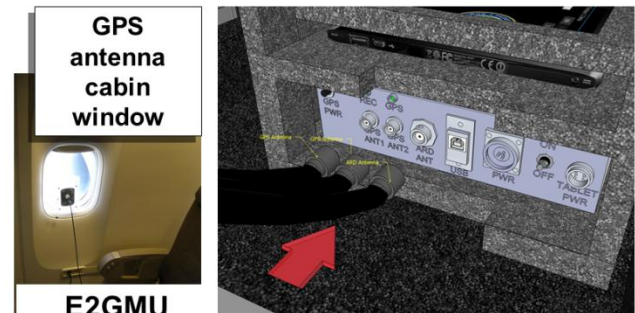
2 Antennas
Rear
Cockpit
Windows*

OR

1 Antenna
Cargo Door

*Cockpit windows may contain heating elements restricting GPS signal pass through


E²GMU MUA Cable Connections



E2GMU
Antenna
Setup

Antenna Cables connected to E2GMU MUA

E²GMU App Start-Up

 E2GMU ⋮

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171718** *Javad /dev/bus/usb/001/013
0287X2ZTDQ3VH10K8PFAJ6M1J0* **USB** **START** **Charge**

Squawk code **Set Squawk** *ARD /usb/001/012 Aircraft:* **Exit** **Check**

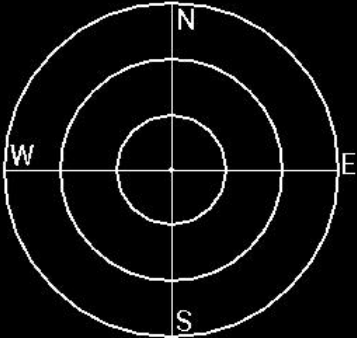
A901AGJV

Time: 00:00:00 Date:


Latitude: Altitude:

Longitude: **ARD Altitude: ARD N/A !!!**

Satellite: 00





Mode
Fix not available

Course 


Speed




Free Space: 13,022,261,248

Battery Tablet: 100% No charging 

Battery EGMU: 100.0% 16.93V 

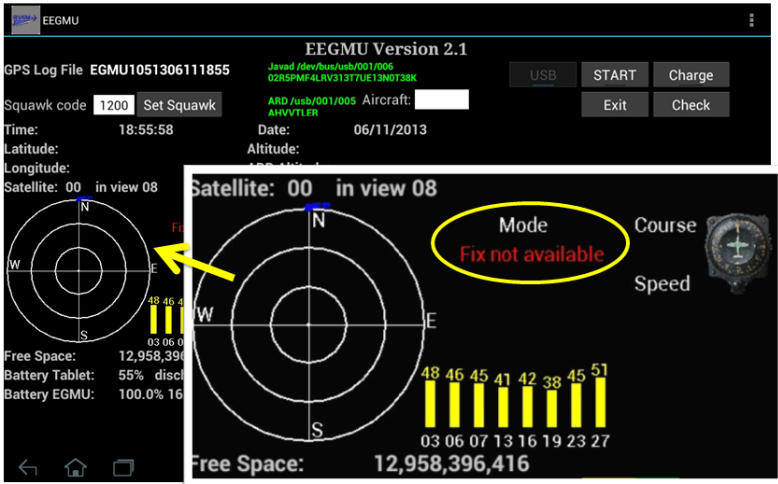
/usb/001/004 EEGMU201



17:18   

E²GMU Satellite Data/Position Quality

EEGMU does not have GPS Signal



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EEGMU Application: SATELLITE STATUS



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E²GMU App 3D NAV status – Ready to Fly

 E2GMU

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171711** **Javad /dev/bus/usb/001/007**
0287X2ZTDQ3VH10K8PFAJ6M1J0

Squawk code **Set Squawk** **ARD /usb/001/006** Aircraft:
A901AGJV

Time: 00:00:00 Date: 10/17/13

Latitude: 3856.7518128N Altitude: 37M (122)

Longitude: 07651.8309468W ARD Altitude: **ARD N/A !!!**

Satellite: 07 in view 07



Satellite ID	Signal Strength
02	50
04	50
10	38
12	43
17	46
20	49
28	37

Mode 3D Course 

PDOP 2.02 311.438

HDOP 1.00 Speed

VDOP 1.76 0.0195 knots
0.0362 km/h

Free Space: 13,023,133,696

Battery Tablet: 100% No charging 

Battery EGMU: 100.0% 16.93V 

/usb/001/004 EEGMU201



17:13  

E²GMU Application Detail

The screenshot displays the E2GMU application interface with the following callouts and data:

- GPS File Name:** EGMU2011310171711
- UTC Date:** 10/17/13
- Registration Number Entry:** NTEST
- GPS Data File Start:** /usb/001/006
- Charge Tablet:** 100% No charging
- Refresh MUA Battery Status Display:** 100.0% 16.93V
- EXIT App:** (Callout pointing to the Exit button)
- ARD MODE C Altitude:** ARD N/A !!!
- S/N Ratio:** (Callout pointing to the S/N Ratio bar chart)
- GPS Sky Plot:** (Callout pointing to the sky plot)
- Status of Batteries:** (Callout pointing to the battery status section)
- Satellite Count:** 07 in view 07
- UTC Time:** 00:00:00

Application Data:

E2GMU Version 2.1.3

GPS Log File EGMU2011310171711

Squawk code 2525 Set Squawk

Time: 00:00:00 Date: 10/17/13

Latitude: 3856.7518027N Altitude: 37M (122)

Longitude: 07651.8309307W ARD Altitude: ARD N/A !!!

Satellite: 07 in view 07

Mode 3D Course 164.842

PDOP 2.02 Speed 0.0178 knots

HDOP 1.00 0.0330 km/h

VDOP 1.76

Free Space: 13,023,436,800

Battery Tablet: 100% No charging

Battery EGMU: 100.0% 16.93V

ARD /usb/001/004 EGMU201

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Entering Aircraft Registration Number Text

The screenshot displays the E2GMU Version 2.1.3 interface. At the top left, it shows 'E2GMU' and 'GPS Log File EGMU2011310171711'. The center displays 'E2GMU Version 2.1.3'. On the right, there are buttons for 'USB', 'START', 'Charge', 'Exit', and 'Check'. The main display area shows various flight parameters: 'Squawk code 2525', 'Time: 00:00:00', 'Latitude: 3856.7518791N', 'Longitude: 07651.8310690W', 'Satellite: 07 in view 07', 'Date:', 'Altitude: 37 (21)', and 'ARD Altitude: N/A !!!'. A virtual keyboard is overlaid on the bottom half of the screen, with a hand pointing to the 'N' key. The keyboard has a dark background with white and blue text. The bottom status bar shows the time '17:12' and various system icons.

E2GMU

E2GMU Version 2.1.3

GPS Log File EGMU2011310171711

Javad /dev/bus/usb/001/007
0287X2ZTDQ3VH10K8PFAJ6M1J0

USB START Charge

Squawk code 2525 Set Squawk

ARD /usb/001/006 Aircraft: NTEST
A901AGJV

Exit Check

Time: 00:00:00 Date:

Latitude: 3856.7518791N Altitude: 37 (21)

Longitude: 07651.8310690W ARD Altitude: N/A !!!

Satellite: 07 in view 07

Mode 3D Course

TEST NEST

Tab Q W E R Y U I O P

?123 A S D F G H J K L

↑ Z X C V B N M , . ?

↓ / @ ' " - _ :)

17:12

Enter Transponder Code for ARD Recording

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171711** Javad /dev/bus/usb/001/007
0287X2ZTDQ3VH10K8PFAJ6M1J0

Squawk code **2525** Set Squawk ARD /usb/001/006 Aircraft:
A901AGJV

Time: 00:00:00 Date:

Latitude: 3856.7519106N Altitude: 37M (122)

Longitude: 07651.8310865W ARD Altitude: **ARD N/A !!!**

Satellites in view 07

Mode	3D	Course	
PDOP	2.03	195.073	
HDOP	1.00	Speed	

Hand icon pointing to the keypad.

Keypad: Tab, -, +, ., 1, 2, 3, *, /, ,, 4, 5, 6, (,), =, 7, 8, 9, *, 0, #, Done

Bottom status bar: 17:12, battery, signal, Wi-Fi icons.

E²GMU App 3D NAV status – Ready to Fly

 E2GMU

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171711**

Squawk code

Time: 00:00:00 Date: 10/17/13

Latitude: 3856.7518128N Altitude: 37M (122)

Longitude: 07651.8309468W ARD Altitude: **ARD N/A !!!**

Satellite: 07 in view 07

Javad /dev/bus/usb/001/007
0287X2ZTDQ3VH10K8PFAJ6M1J0

ARD /usb/001/006 Aircraft:
A901AGJV

Mode 3D Course 
PDOP 2.02 311.438
HDOP 1.00 Speed
VDOP 1.76 0.0195 knots
 0.0362 km/h



50	50	38	43	46	49	37
02	04	10	12	17	20	28

Free Space: 13,023,133,696

Battery Tablet: 100% No charging 

Battery EGMU: 100.0% 16.93V 

 **CSSI, INC.**





GPS Data Collection Started

 E2GMU ☰

E2GMU Version 2.1.3

GPS Log File **EGMU2011310171711** Javad /dev/bus/usb/001/007
0287X2ZTDQ3VH10K8PFAJ6M1J0

Squawk code ARD /usb/001/006 Aircraft:
A901AGJV

Time: 00:00:00 Date: 10/17/13

Latitude: 3856.7518027N Altitude: 37M (122)

Longitude: 07651.8309307W ARD Altitude: **ARD N/A !!!**

Satellite: 07 in view 07



Mode	3D	Course
PDOP	2.02	164.842
HDOP	1.00	Speed
VDOP	1.76	0.0178 knots 0.0330 km/h




Satellite ID	Signal Strength
02	50
04	50
10	40
12	43
17	45
20	49
28	37

Free Space: 13,023,436,800

Battery Tablet: 100% No charging ████████████████████

Battery EGMU: 100.0% 16.93V ████████████████████

/usb/001/004 EEGMU201





CSSI, Inc.
The Leader in RVSM
Services

RVSM GPS Based Monitoring Systems



CSSI RVSM Monitoring Market Leadership



CSSI History of RVSM Monitoring Equipment

1996

● GMU



2004

● EGMU



2013

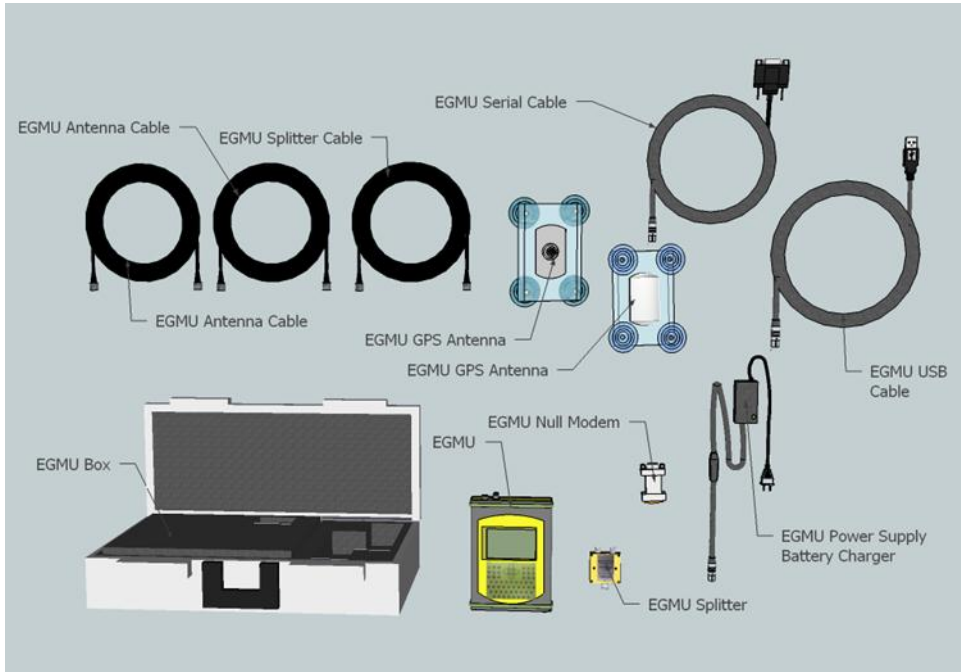
● E²GMU



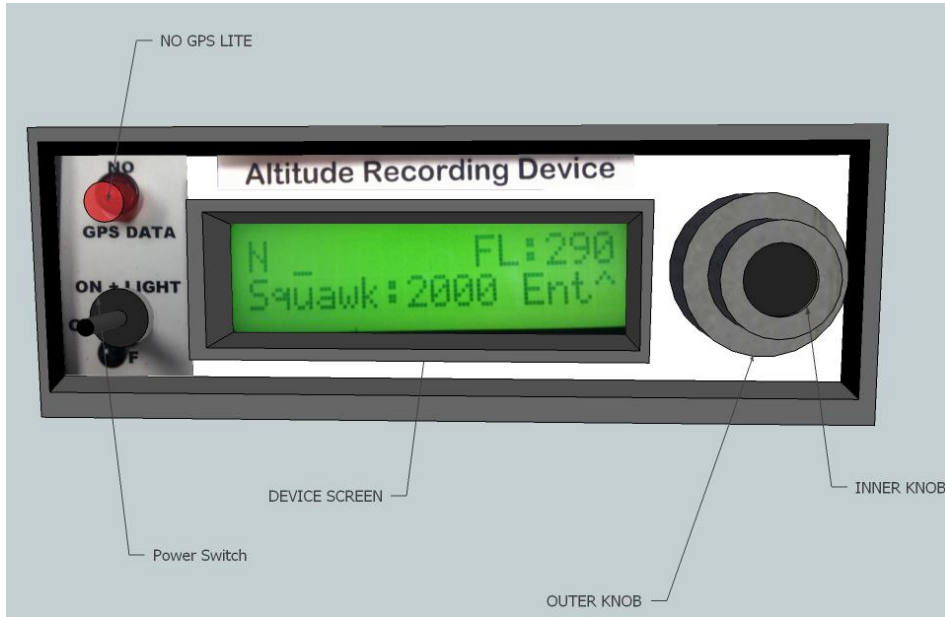
GPS-Based Monitoring System History



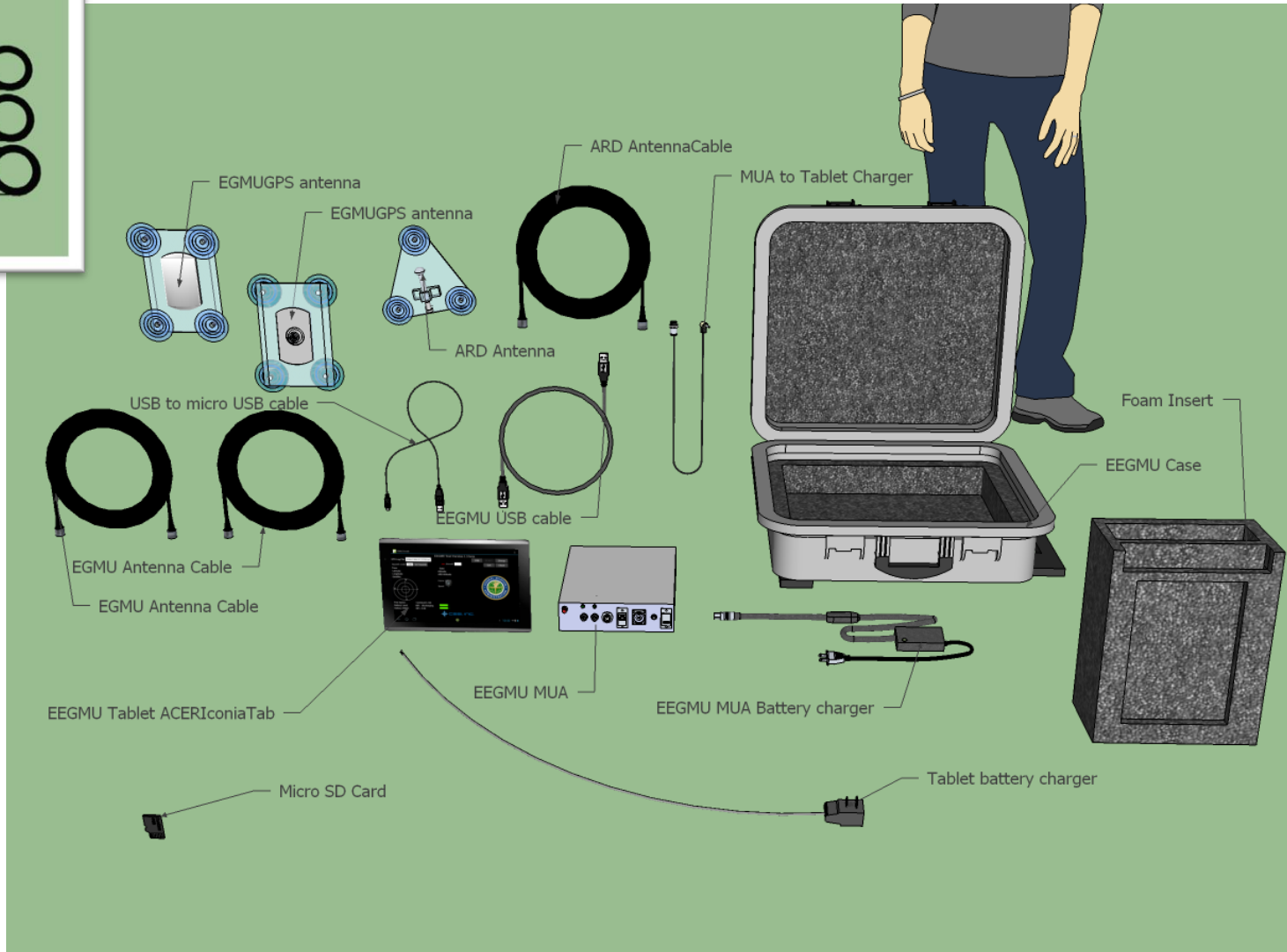
GPS-Based Monitoring System History



GPS-Based Monitoring System History



E²GMU Enhanced Generation GPS-Based Monitoring Unit



CSSI – Prototype Software and Hardware

- CSSI Designed and built E²GMU to meet US Federal Aviation Administration's FAA specifications



EGMU Chmutik

EEGMU Test Version 1.5 beta

GPS Log File: EGMU130417150224.txt

Squawk code: 1200 Set Squawk

Time: 19:03:38 Date: 04/17/2013

Latitude: 3926.5920138N Altitude: -67M (-219)

Longitude: 07433.7652150W ARD Altitude: ??? Set Squawk

Satellite: 03 in view 07

Mode 3D Course

PDOP 18.76 152.841

HDOP 12.84 Speed

VDOP 13.68 6.2240 knots

11.5268 km/h

Free Space: 13,001,666,560

Battery Tablet: 100% Full

Battery EGMU: 93.96% 16.28V

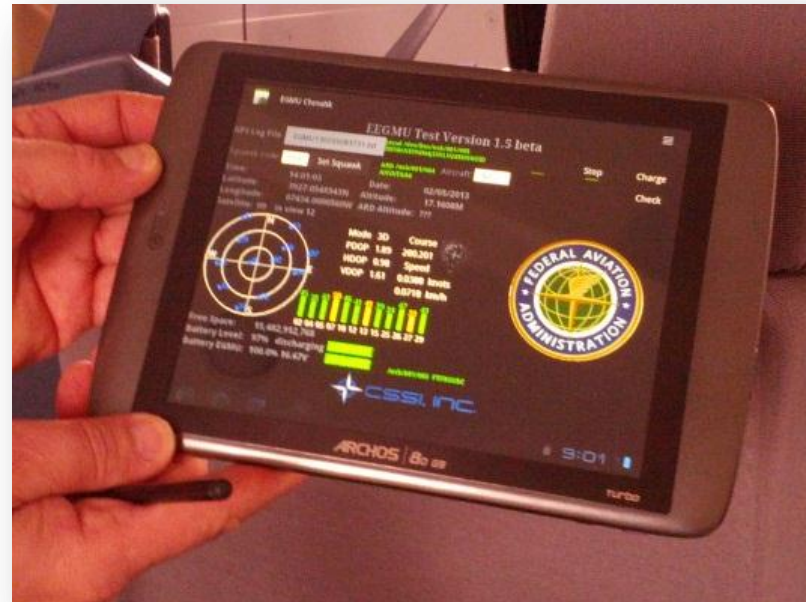
USB START Charge Exit Check

AVIATION FEDERAL ADMINISTRATION

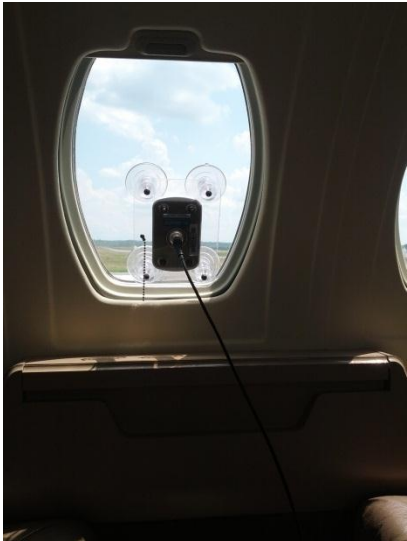
CSSI, INC.



CSSI Prototype Hardware



CSSI RVSM Monitoring Support



CSSI RVSM Monitoring Support – NASA T38



CSSI RVSM Monitoring Support - Antonov

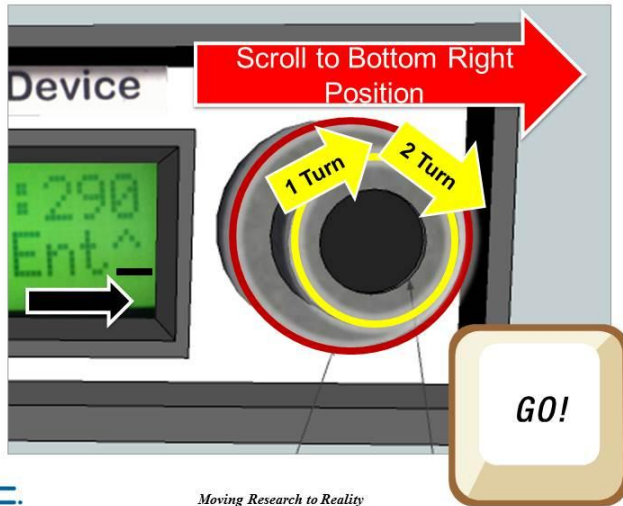




CSSI Intuitive Training Resources

Confirm Entry – Start Data Collection

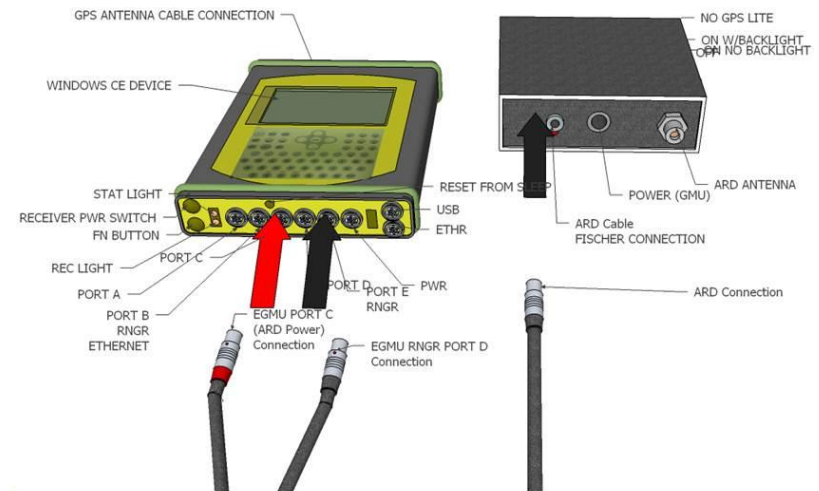
1. OUTER KNOB: Scroll to Bottom Right
2. INNER KNOB: TWO Turns to Right or Left to CONFIRM and GO!
3. Data Collection Screen Appears



Moving Research to Reality



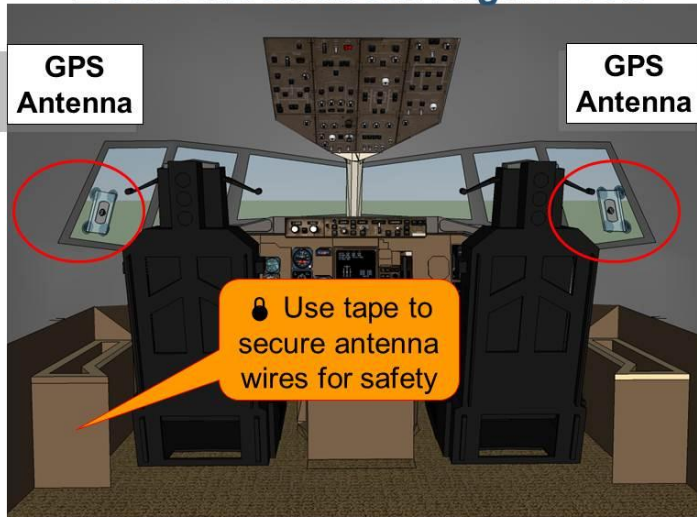
ARD File Download



Moving Research to Reality

CSSI Intuitive Training Resources

EGMU Installation: Flight Deck



Gulfstream 500 Installation in Flight Deck

