PLANNING FOR SUCCESS 101

System Design and Layout of your Dynon or Advanced Flight System in Experimental Aircraft

Planning for Success 101– Outline

- Before You Buy
- System Components
- Installation Fundamentals
  - Panels
  - ADAHRS
  - Remote Compass
  - EMS Module
  - GPS Receiver
  - Transponder
  - Transponder antenna

Before you buy

- What is your ***mission***?
  - VFR
  - IFR
  - VFR to IFR
    - Will the system you install be able to grow as your piloting skills grow?

1970 -Boeing 747-100 (What is this aircrafts capability?)

2016 – Boeing 747-800

1970 - Cessna 182 Skylane (again…capability?)

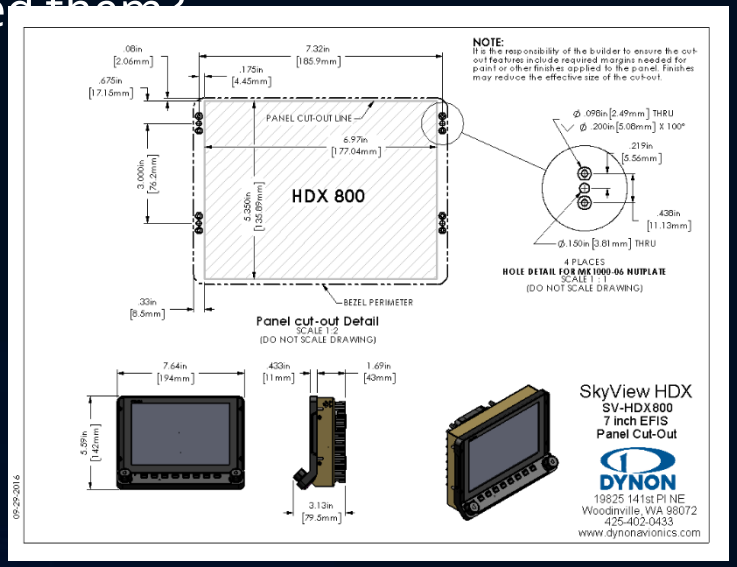
182 Skylane today

Before you buy…

- Budget?
  - Frugal budget
  - Highly capable VFR or even IFR
  - Grow into it

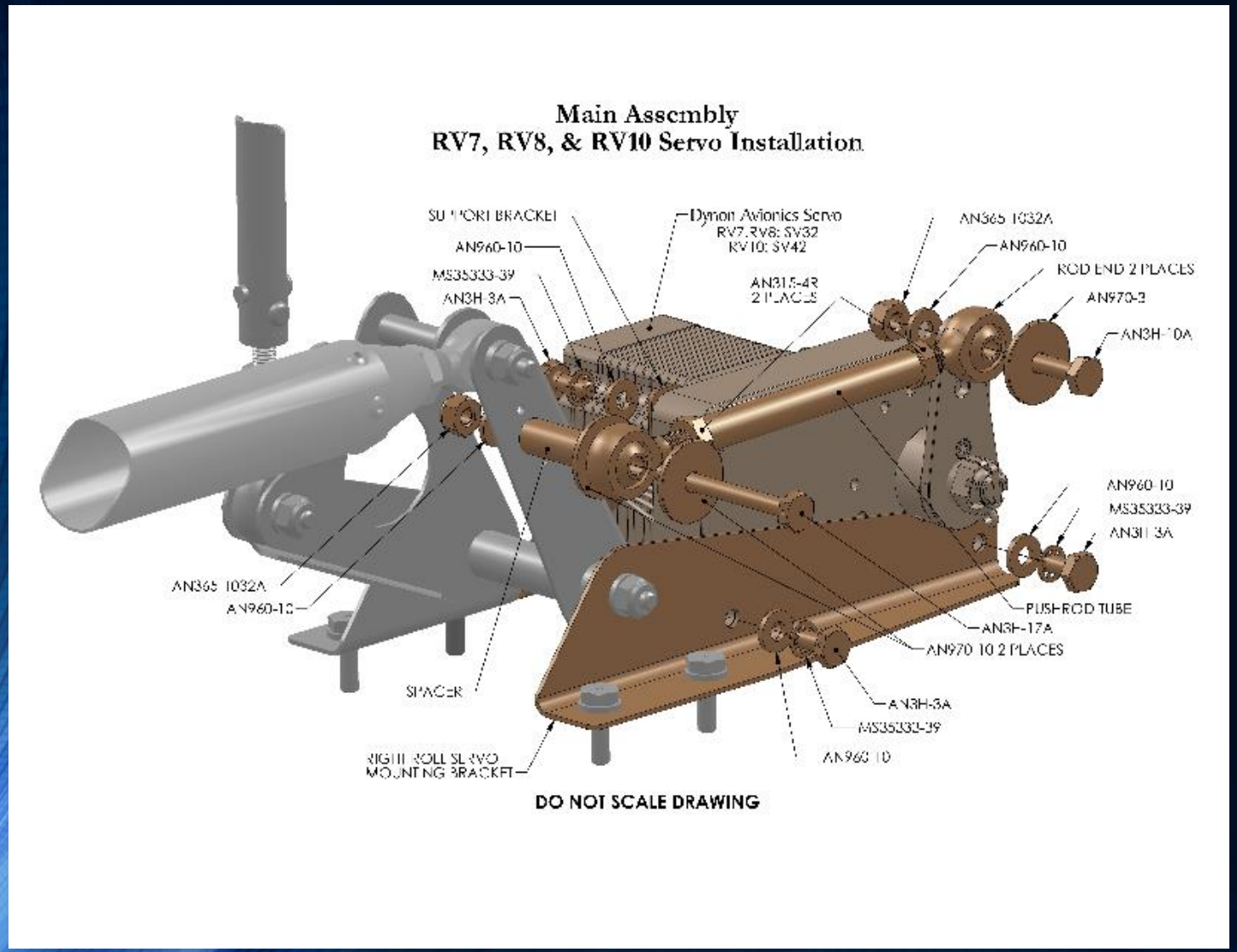
Before you Buy

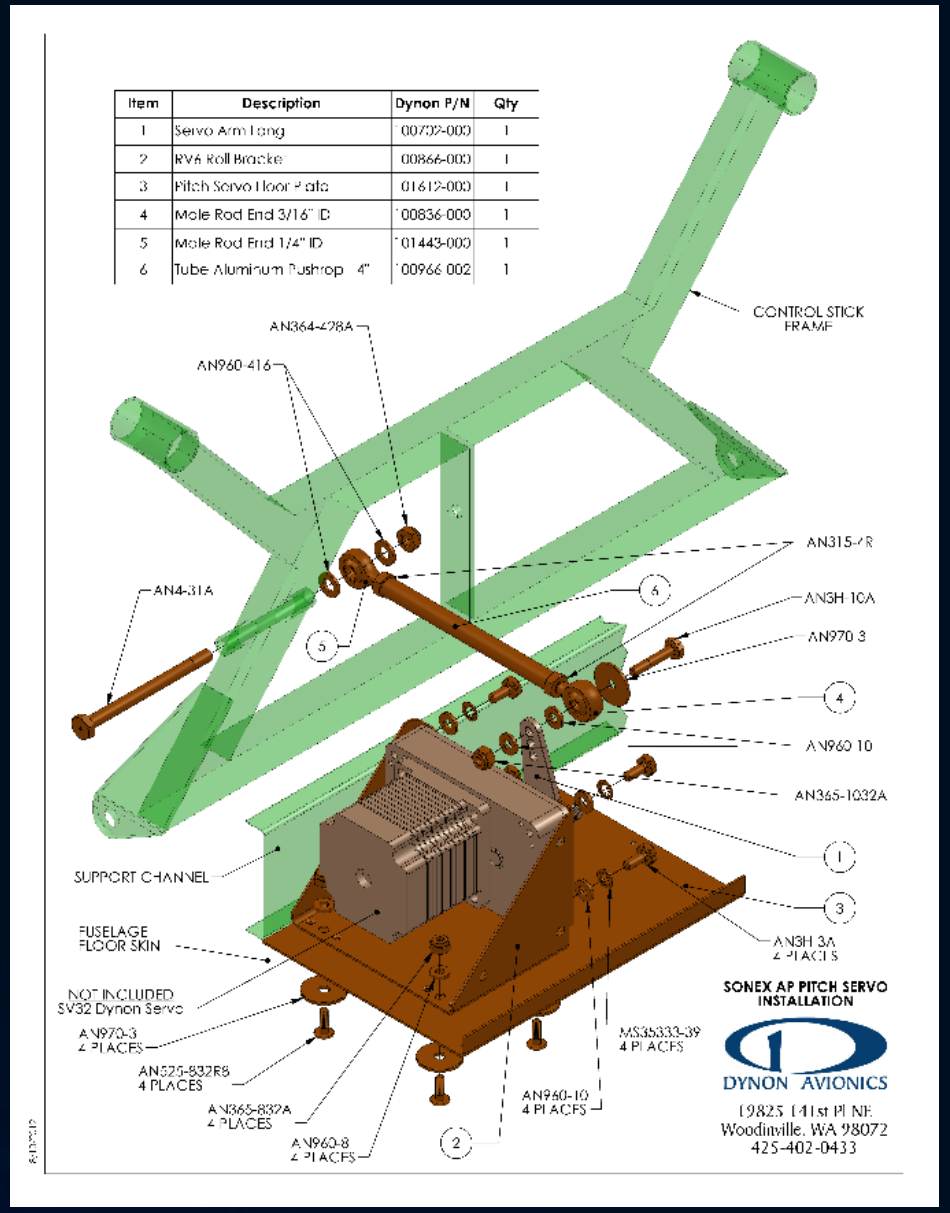
- Product and Company Research
  - You're not just buying a product, you're buying into a company DNA
  - Does the company understand the market it is in?
  - Does the company provide technical support?
  - Does the company support legacy products?
  - Does technical support cost $$?
  - How long has the company been doing business in the experimental market? (since 2000')
  - Is the company "sound"? Will it be there in 10 years when you need them?
  - Is there consistent product development from the company?
  - What kind of warranty comes with the products?
  - Does the company communicate with customers?
  - What is the quality of documentation provided for installation?



Before you Buy

Technical Documentation





Before you Buy

Technical Documentation

Connection Tables

Aircraft Specific Installation Guides

DYNON

Intercom Harness

SV-HARNESS-INT (102791-000) Hook-up table

SV-HARNESS-INT LABEL	COLOR	FUNCTION	SV-INTERCOM-2S PIN	CONNECTION
10-30 VDC	RED	POWER	13	SHIP PWR (+)
GND	BLACK	GROUND	1	SHIP GND (-)
RADIO AUDIO INPUT	WHT	RADIO AUDIO INPUT (HIGH)	14	SV-COM-425 Pin 10
	WHT/BLU	RADIO AUDIO INPUT (LO)	GND	SV-COM-425 Pin 9
	SHLD	NO CONNECTION	GND	NO CONNECTION
RADIO MIC OUT	RED	RADIO MIC OUTPUT	25	SV-COM-425 Pin 1
	BLU	MIC GND	GND	SV-COM-425 Pin 2
	YLW	RADIO MIC PTT OUTPUT	12	SV-COM-425 Pin 5
	SHLD	NO CONNECTION	GND	NO CONNECTION
PILOT PHONES	RED	PILOT RIGHT	22	PILOT PHONE JACK
	YLW	PILOT LEFT	9	
	BLU	PILOT GND	GND	
	SHLD	NO CONNECTION	GND	NO CONNECTION
COPILOT PHONES	RED	COPILOT RIGHT	21	COPILOT PHONE JACK
	YLW	COPILOT LEFT	8	
	BLU	COPILOT GND	GND	
	SHLD	NO CONNECTION	GND	NO CONNECTION
PILOT MIC	RED	PILOT PTT	10	PILOT MIC JACK
	YLW	PILOT MIC	23	
	BLU	PILOT GND	2	
	SHLD	NO CONNECTION	GND	NO CONNECTION
COPILOT MIC	RED	COPILOT PTT	16	COPILOT MIC JACK
	YLW	COPILOT MIC	3	
	BLU	COPILOT GND	2	
	SHLD	NO CONNECTION	GND	NO CONNECTION
EFIS AUDIO L	BRN	EFIS AUDIO LEFT	19	SkyView D37 Pin 13
EFIS AUDIO R	GRY	EFIS AUDIO RIGHT	6	SkyView D37 Pin 31
EFIS AUDIO GND	BLK	EFIS AUDIO GND	20	SkyView D37 Pin 30
EFIS DIM	WHT	EFIS DIMMING INPUT	5	SkyView D37 Pin 26
MUSIC IN	RED	MUSIC IN LEFT	24	MUSIC INPUT JACK
	YLW	MUSIC IN RIGHT	11	
	BLU	MUSIC IN GND (LO)	18	
	SHLD	NO CONNECTION	GND	NO CONNECTION
NON-MUTING INPUT	WHT	HIGH	17	USER DEFINED
	WHT/BLU	LOW	20	USER DEFINED
	SHLD	NO CONNECTION	GND	NO CONNECTION
MUTING INPUT	WHT	INPUT (HIGH)	4	USER DEFINED
	WHT/BLU	GND (LOW)	20	USER DEFINED
	SHLD	NO CONNECTION	GND	NO CONNECTION

Thank you for your purchase!
The most up to date documentation is always available online at: doc.dynonavionics.com
For support email: support@dynonavionics.com or call 425-402-0433

Mast Slot

Use a ¼" drill bit to cut the upper radius of the mast slot using the template as the guide for drilling. Use a 3/16" drill bit to cut the lower radius of the mast slot, again using the template to guide. Preferably using a nibbler, cut out the remaining edge of the slot for the mast. Absolute precision in not necessary and it is suggested you leave excess material since it can always be filed down if necessary. Use a hand file to smooth the edges of the mast slot and trim to size until the mast can slide through the slot.

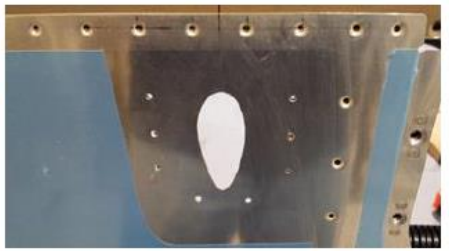


Figure 9 – Mast Installation in Progress

Rivet Mounting Holes

Now that the mast has a secure slot to fit in, use any type of clamp or soft mounting technique to hold the mast in place with the bracket against the spare and wing skin in the position that it will be permanently mounted. You can even simply use your hand to hold it place temporarily. Once positioned correctly, use a #40 drill bit to match drill the four holes on top which correspond to the spare. We suggest starting with drilling the two outside holes and then using Clecos to hold the bracket in place while the rest of the holes are drilled. After match drilling the four holes that align with the spare, continue on the drill the remaining eight rivet holes through both the skin and the bracket. Use Clecos as desired to maintain the bracket's position.

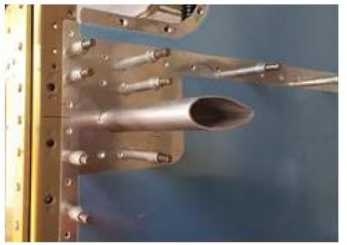
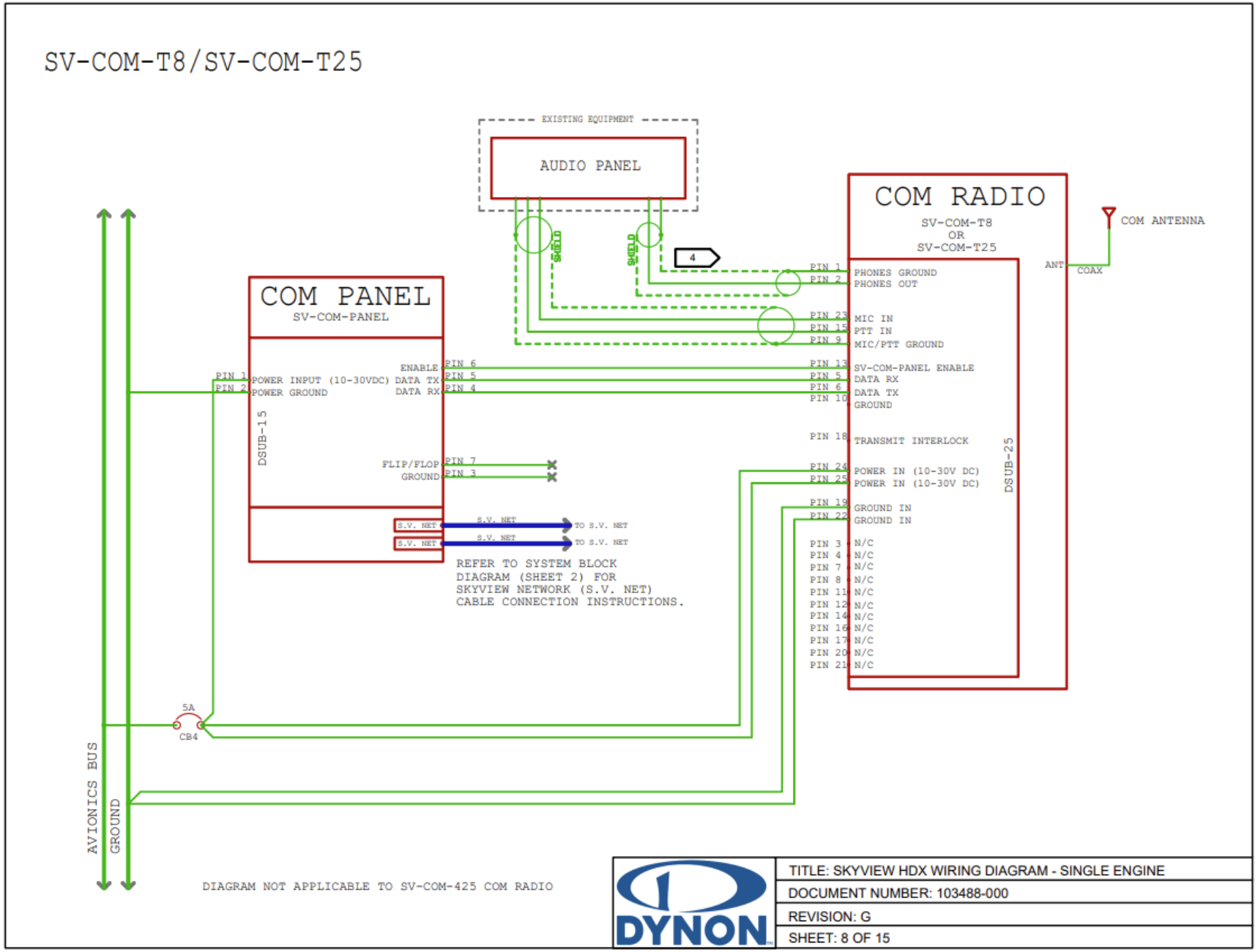
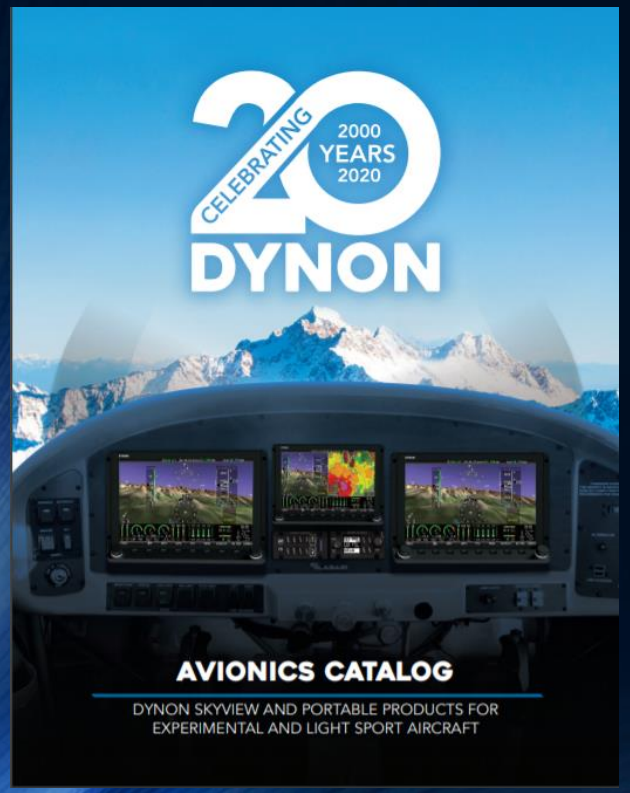


Figure 10 – Mast Installed (with Clecos)

Schematics

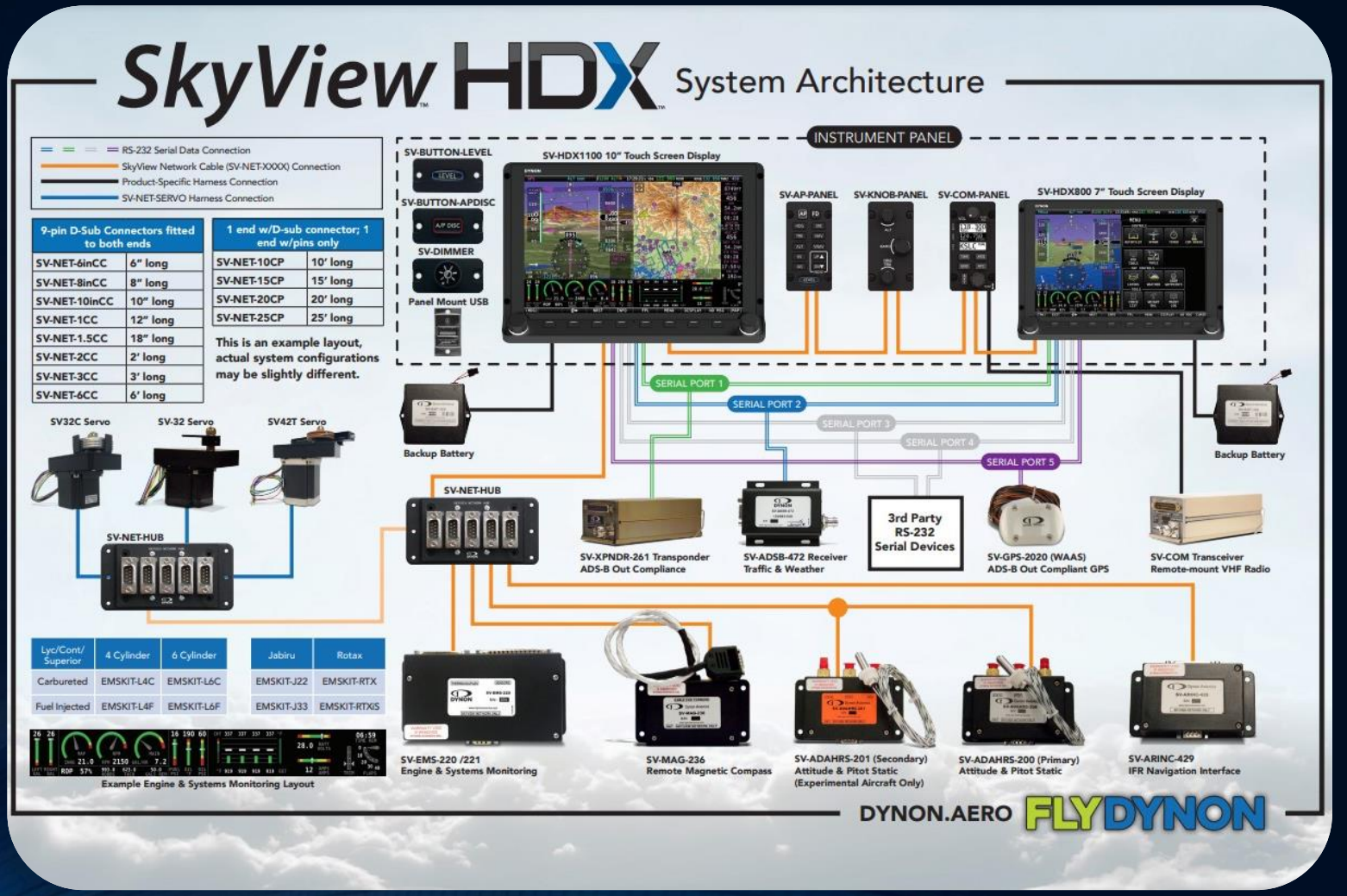

SV-COM-T8/SV-COM-T25
EXISTING EQUIPMENT
AUDIO PANEL
COM RADIO
SV-COM-T8
OR
SV-COM-T25
COM ANTENNA
ANT
COAX
SHIELD
SHIELD
4
COM PANEL
SV-COM-PANEL
PIN 1
PIN 2
POWER INPUT (10-30VDC)
POWER GROUND
ENABLE
DATA TX
DATA RX
PIN 6
PIN 5
PIN 4
DSUB-15
FLIP/FLOP
GROUND
PIN 7
PIN 3
S.V. NET
S.V. NET
S.V. NET
S.V. NET
TO S.V. NET
TO S.V. NET
REFER TO SYSTEM BLOCK
DIAGRAM (SHEET 2) FOR
SKYVIEW NETWORK (S.V. NET)
CABLE CONNECTION INSTRUCTIONS.
PIN 1
PIN 2
PHONES GROUND
PHONES OUT
PIN 23
PIN 15
PIN 9
MIC IN
PTT IN
MIC/PTT GROUND
PIN 13
PIN 5
PIN 6
PIN 10
SV-COM-PANEL ENABLE
DATA RX
DATA TX
GROUND
PIN 18
TRANSMIT INTERLOCK
PIN 24
PIN 25
POWER IN (10-30V DC)
POWER IN (10-30V DC)
PIN 19
PIN 22
GROUND IN
GROUND IN
PIN 3 N/C
PIN 4 N/C
PIN 7 N/C
PIN 8 N/C
PIN 11 N/C
PIN 12 N/C
PIN 14 N/C
PIN 16 N/C
PIN 17 N/C
PIN 20 N/C
PIN 21 N/C
DSUB-25
5A
CB4
AVIONICS BUS
GROUND
DIAGRAM NOT APPLICABLE TO SV-COM-425 COM RADIO
DYNON
TITLE: SKYVIEW HDX WIRING DIAGRAM - SINGLE ENGINE
DOCUMENT NUMBER: 103488-000
REVISION: G
SHEET: 8 OF 15

Questions…
-Before You Buy



System Components

- The amount of system components can be overwhelming



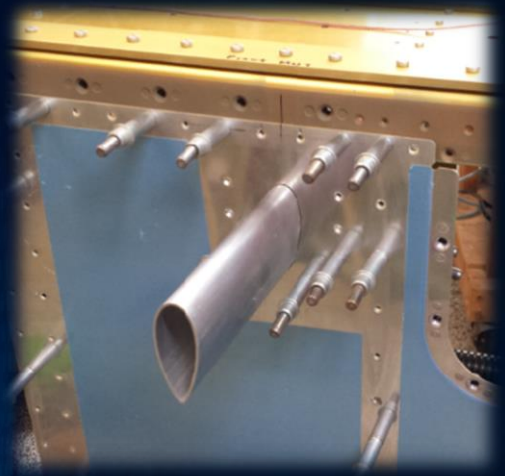
System Components

- Glass systems *can* require more components because they do more! BUT…
- They are more flexible and expandable
- If desired can be very simple
- A simple EFIS component list may be as little as:
  - Display Panel
  - ADAHRS (Air Data and Attitude Heading Reference System)
  - OAT (Outside Air Temp Sensor)
  - GPS receiver

System Components

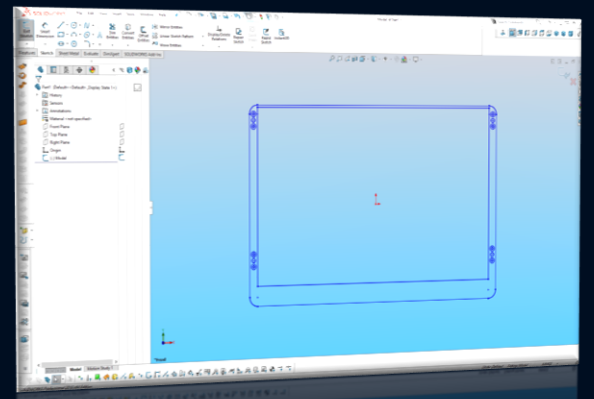
- Highly Capable EFIS Installations can include:

- Everything previously noted plus…
- Second and or third screen
- Second ADARHS
- ARINC 429 conversion module
- Transponder
- ADS-B transmitter
- ADS-B receiver
- IFR - GPS Navigator
- Back-up battery (each screen)
- COM 1 and Com 2
- Intercom/Audio panel
- Engine monitoring module
- Manifold pressure sensor
- EGT sensors (each cylinder)
- CHT sensors (each cylinder)
- Oil temperature sensor
- Oil pressure sensor
- Fuel flow sensor
- Fuel pressure sensor
- Voltage
- Amp shunt
- Carb temp sensor
- Tach sensor
- Flap position sensor
- Trim position
- Remote magnetometer
- Angle of Attack (pitot)
- Knob control panel
- Autopilot control panel
- Autopilot servos (up to 3)
- Video input adapter
- Gear Indicator
- Cowl flap indicator
- Canopy latch indicator
- Squat switch
- Level button
- Heated Pitot tube
- A/P Disconnect Button
- WiFi adapter



Questions…
-System Components

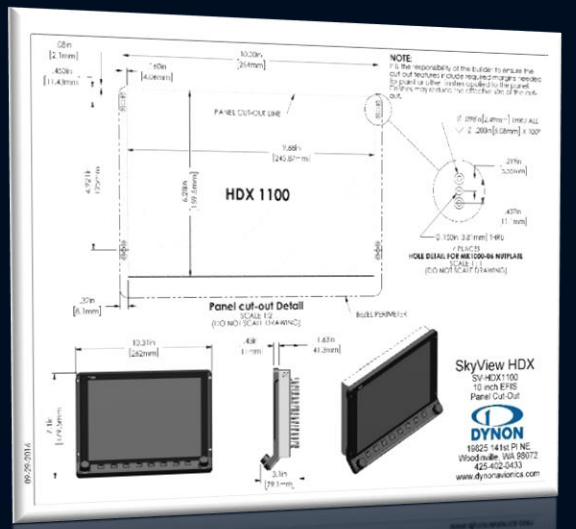
Installation Fundamentals - *Panel*



1. Acquire the 1:1 Panel Planner from Dynon/AFS (get several!)
2. Design your layout
   - Play with it. Sleep on it. Find examples.
3. Software – Panel Planner($445), XPANEL($79.95), SolidWorks or SolidEdge (EAA $49.50)
4. Acquire the Panel Cutout drawing from the manufacturer and other CAD files if available
5. Cut your panel (better to have one cut for you)
   - Aircraft Specialty Flightlines (www.aircraftspecialty.com)
   - Aircraft Panel (www.aircraftpanel.com)
6. Advanced Panel option - Prebuilt

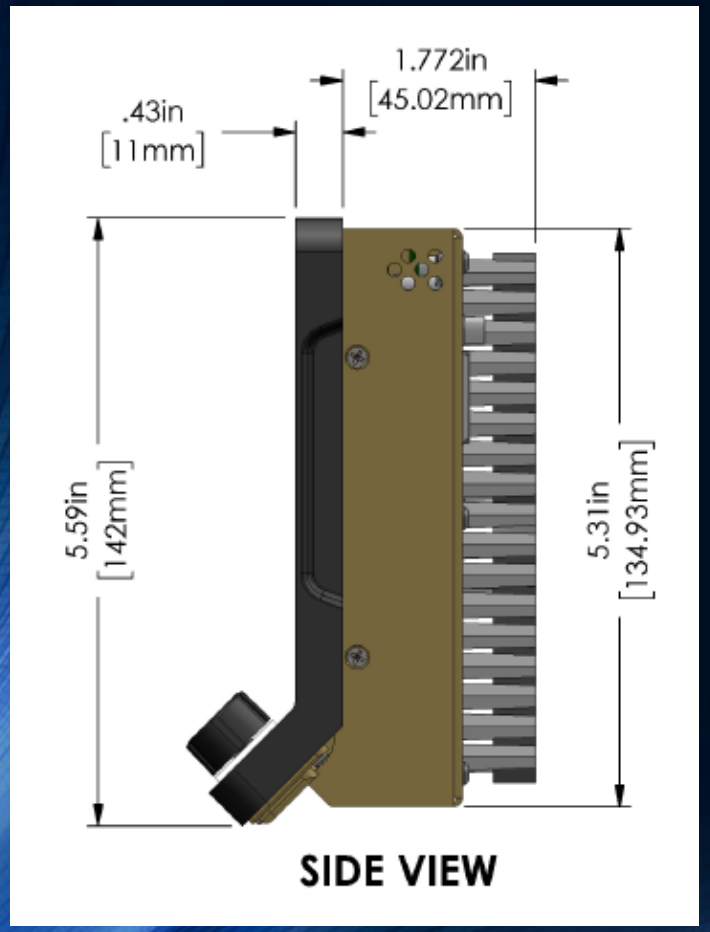
   Advanced Flight Systems (www.advanced-flight-systems.com)

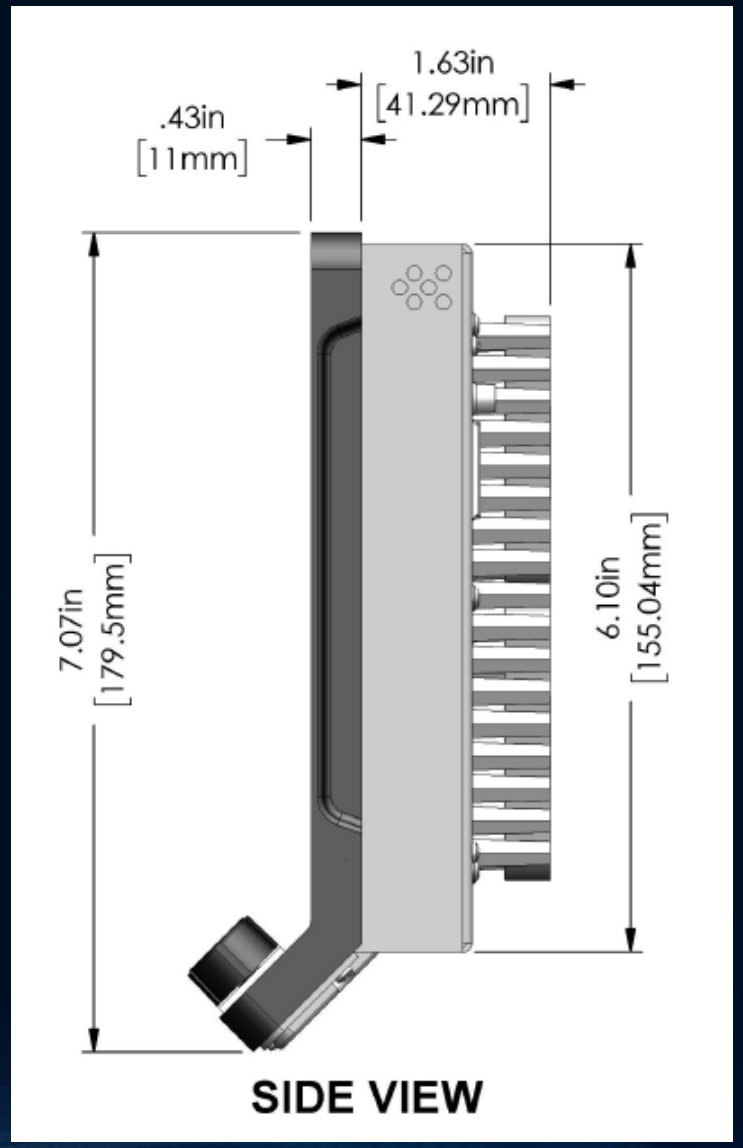
FAA DOES NOT consider the avionics parts of the 50% Builder Requirement!

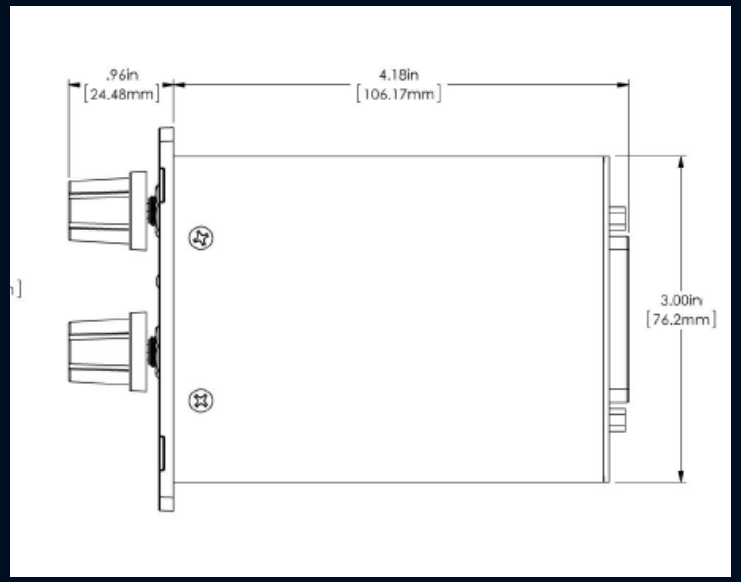


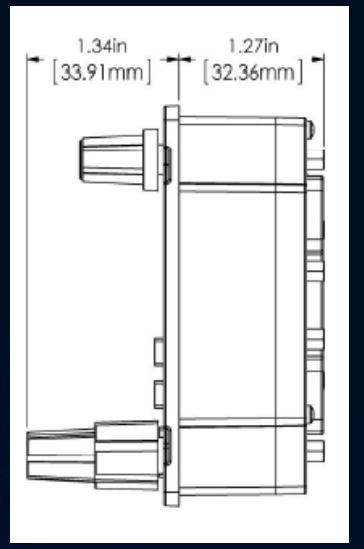
ADVANCEDPANEL

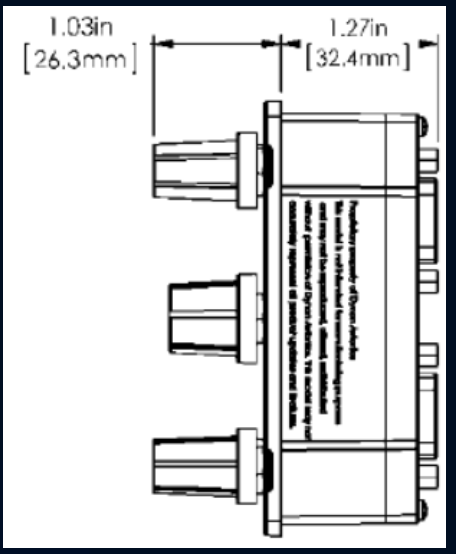
Installation Fundamentals – ***Panel Depth***



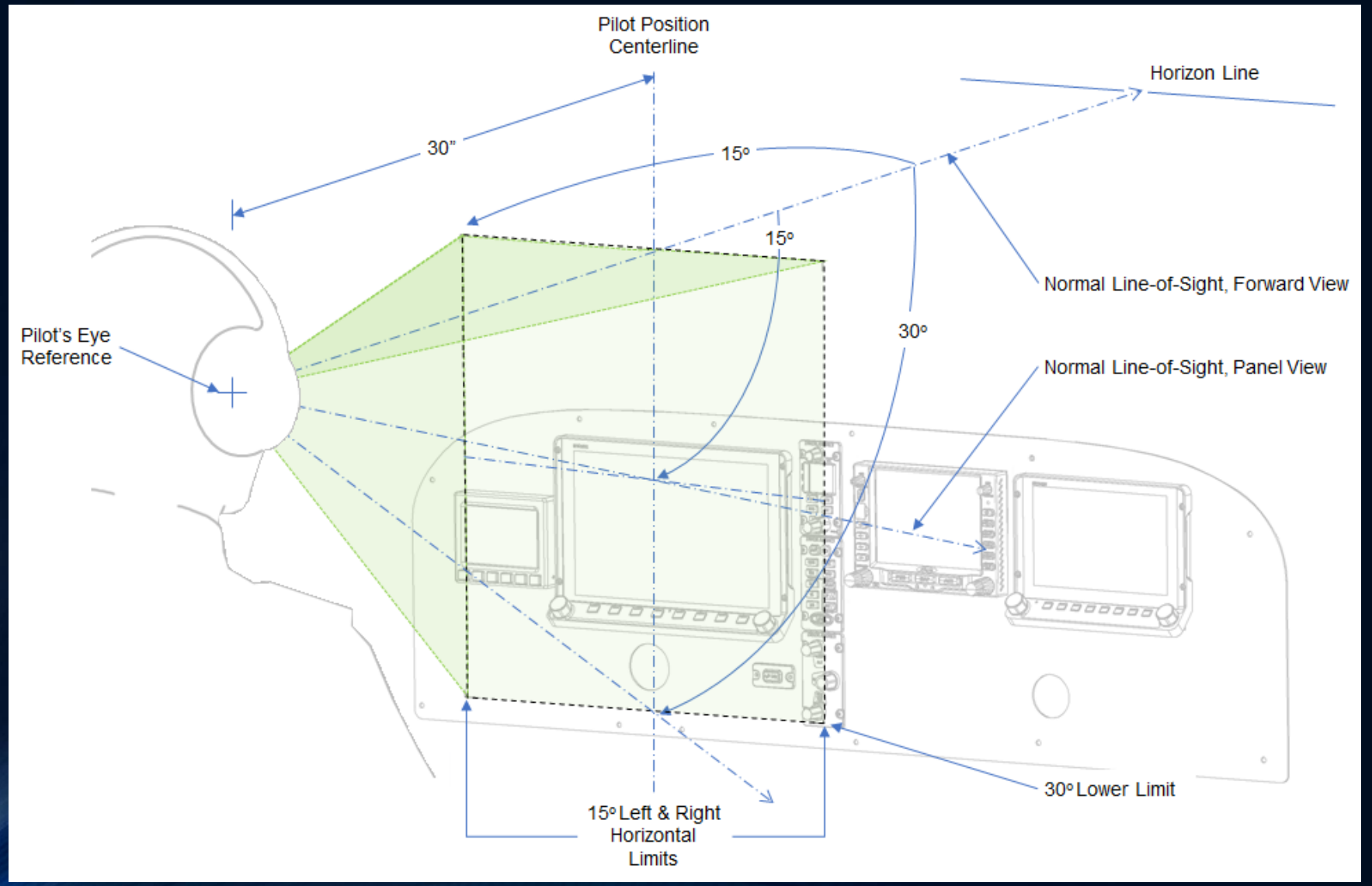






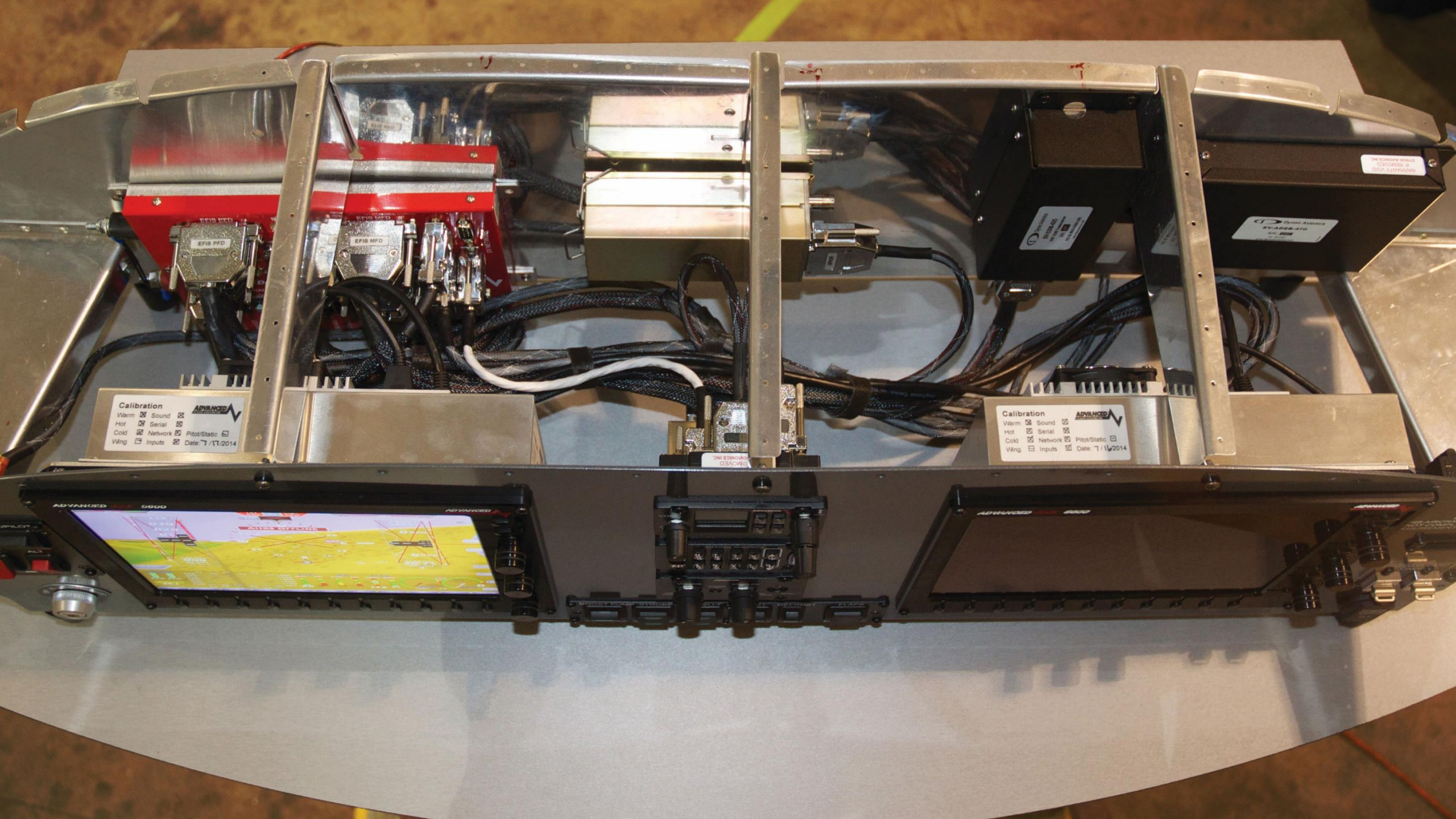


Field of View – Instrument Layout Guidance



Example of IFR panel layout

- Primary instruments are within Pilots FOV
- RNAV Annunciations are within Pilots FOV


EFIS PFD
EFIS MFD
Calibration
Warm Sound
Hot Serial
Cold Network Pitot/Static
Wing Inputs Date: 7 / 11/2014
ADVANCED
Calibration
Warm Sound
Hot Serial
Cold Network Pitot/Static
Wing Inputs Date: 7 / 11/2014
ADVANCED

Panel Installation Zenith 650

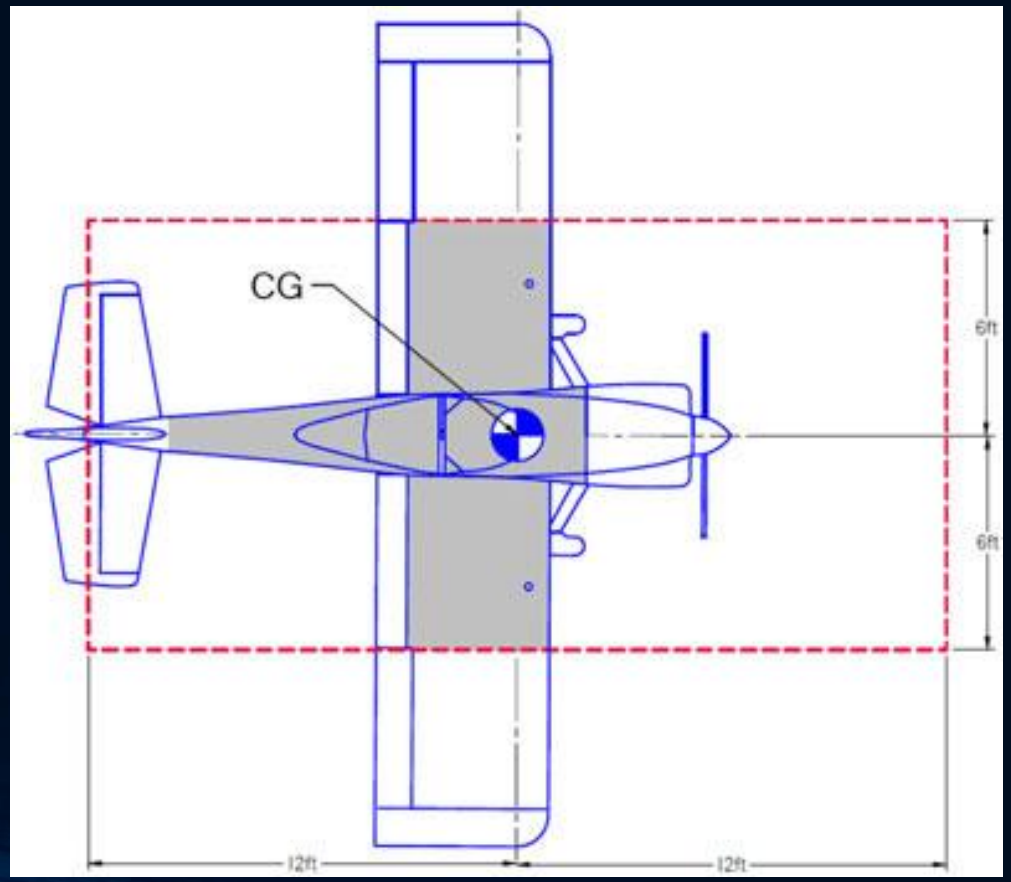
Panel Installation Sonex Model A

Panel Installation Van's RV-7

Questions...
-Panel Layout

Installation Fundamentals – ***ADAHRS with Internal Magnetometer***

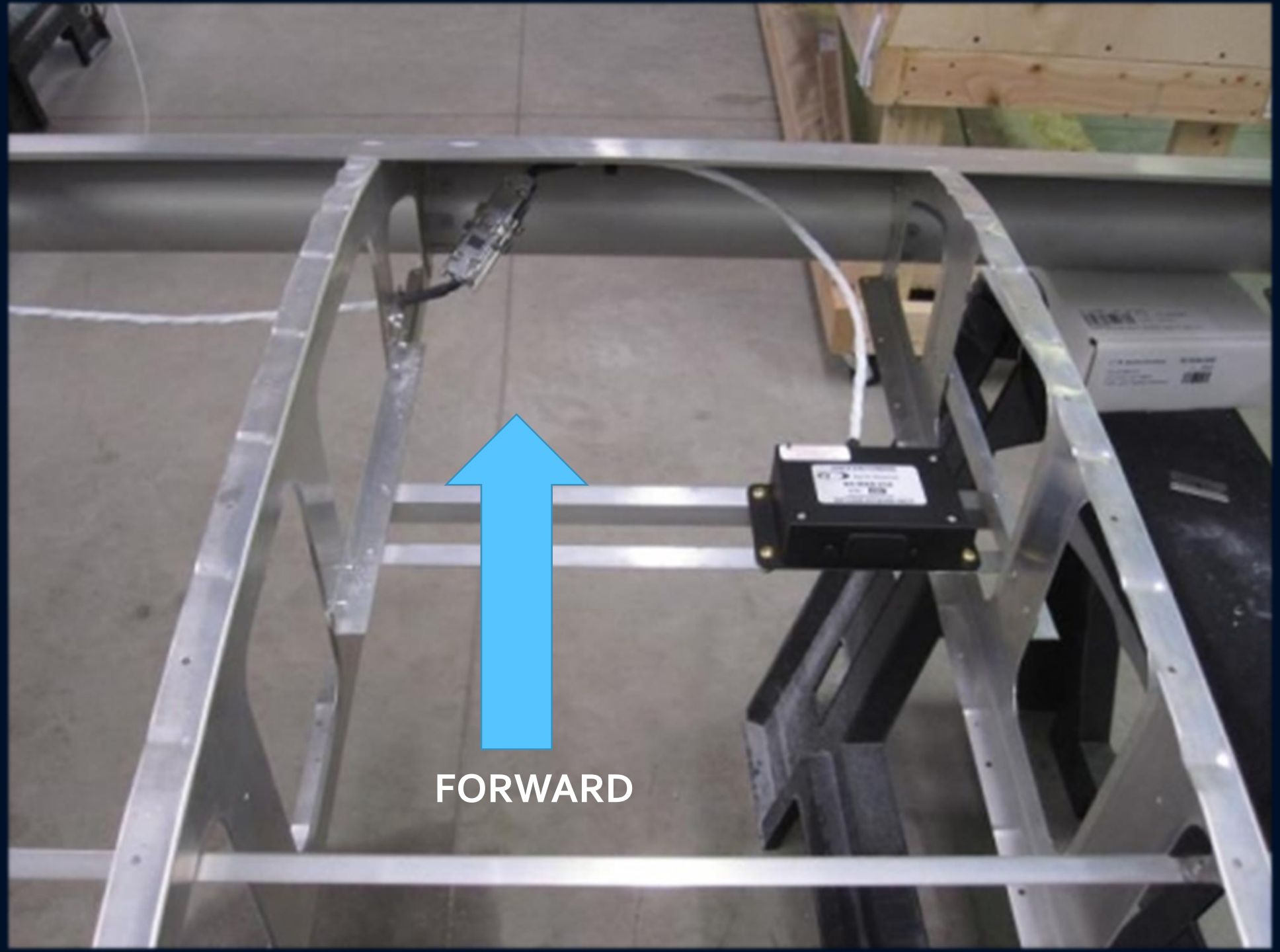
- Rigid surface – vibration is ***very*** *undesirable!*
- As close to aircraft CG as practical, within 12 feet longitudinally and 6 feet laterally
- No closer than 24" to ferrous metal
  - Static ferrous metals can be tolerated with calibration
  - Dynamic (moving) ferrous metals must be avoided
  - *Does not apply if using remote magnetometer*
- Minimum 36" from transmitting antenna's
  - ELT? yes
- Stay away from electronic devices
  - Distance depends on strength of EMI radiation
- Orientation is required
  - Air Connections toward direction of flight
  - Parallel with flight level



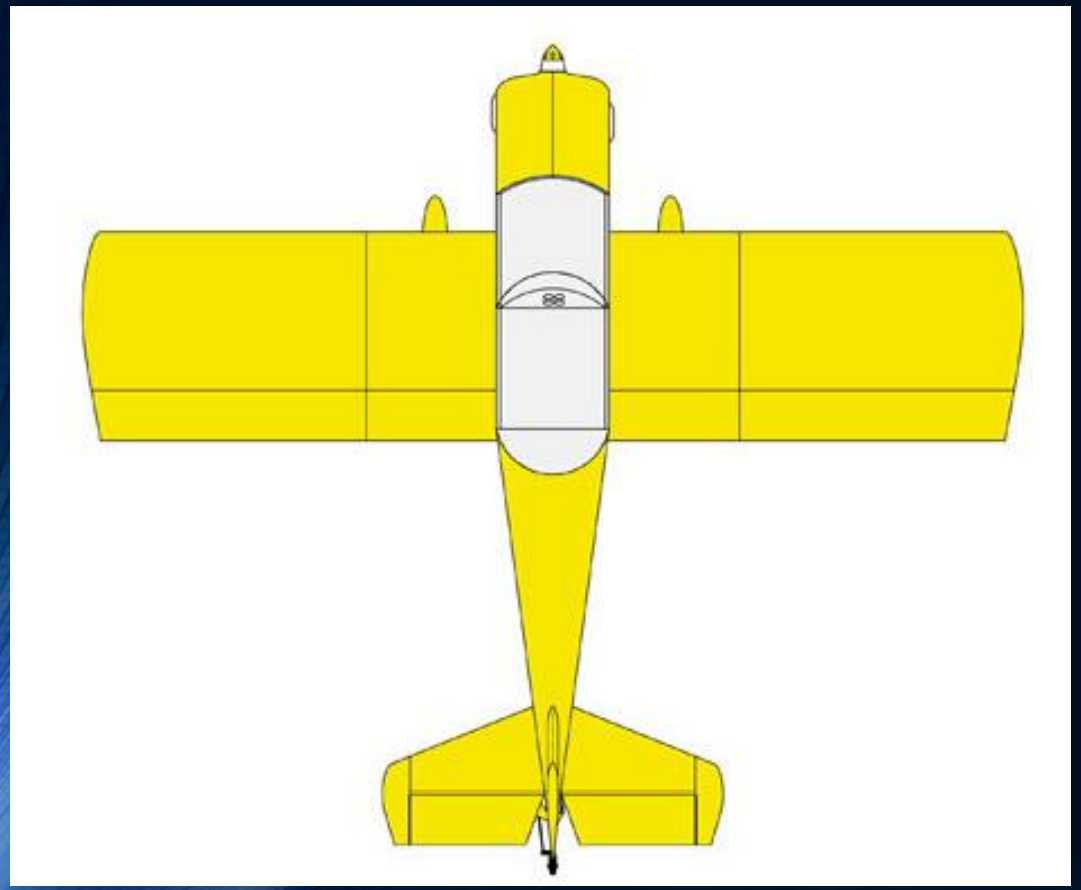
ADAHRS Installation

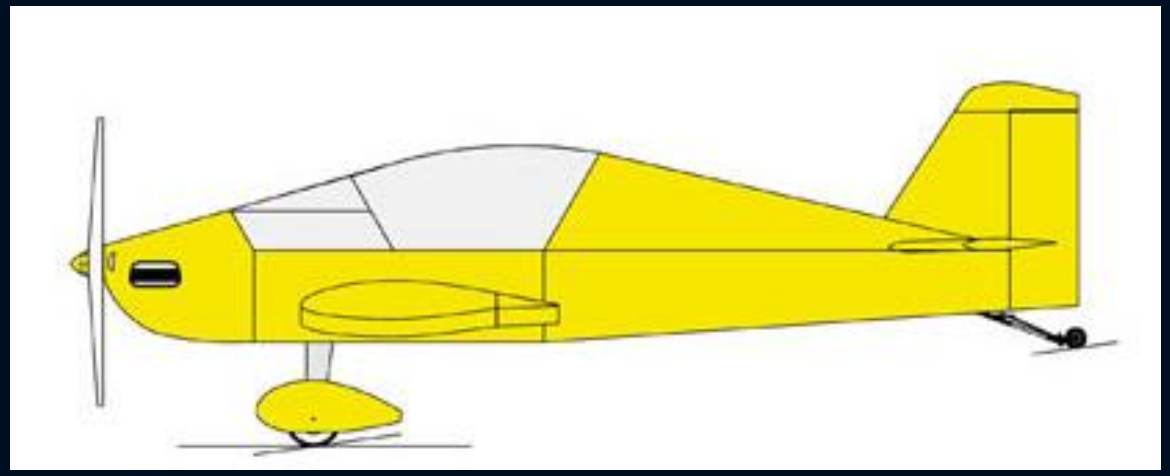
Installation Fundamentals – *Remote Magnetometer/Compass*

- If it is ferrous stay away from it
  - Static ferrous materials *may* be accommodated for in calibration
- If it is ferrous and it moves stay even further away from it
  - Dynamic ferrous materials have serious affects and can not be accounted for in calibration
- Not location specific
- Pigtail toward direction of flight
- "Pig-tail" cable should be at extended length
- OAT connection here is optional, one is required


FORWARD

Questions on ADAHR/Magnetometer Installation?





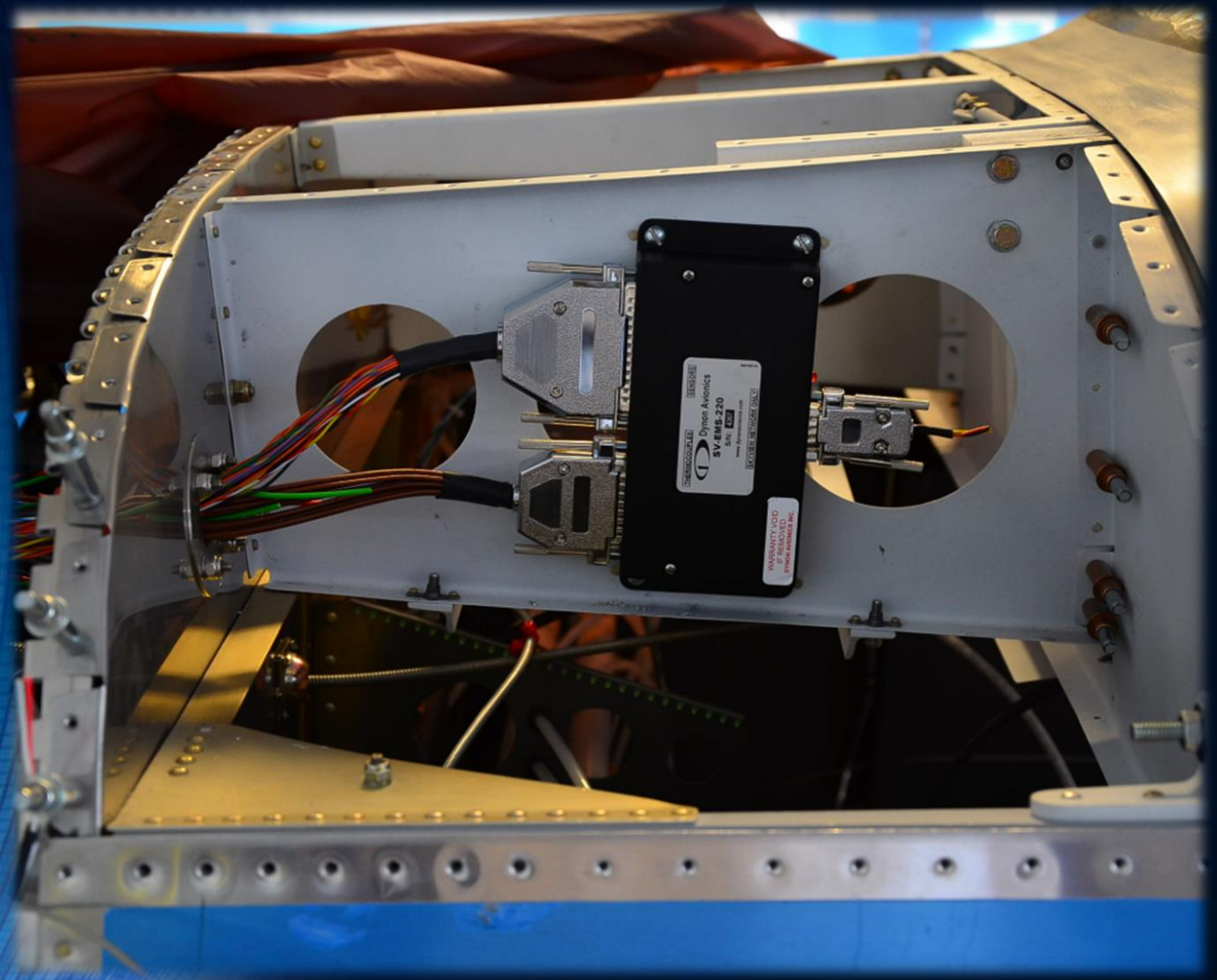
Installation Fundamentals – *Engine Monitoring Module*

- Avoid severe vibration
- Avoid excessive heat. High temperatures can:
  - cause electronic components to drift, giving inaccurate readings
  - reduce life span of electronic components
- The further away from high energy EMI the better (spark plugs, magneto's)
- No specific orientation
- Common question: "Can I cut the wire length of the thermocouple?"
  - Yes – but make sure you cut the right end and we suggest all wires are equal length for troubleshooting purposes
  - If you need to extend the length of the wire contact Dynon tech support 425-402-0433
- Do not install on the "HOT" side of the firewall

Sonex

RV8

EMS Module Installation

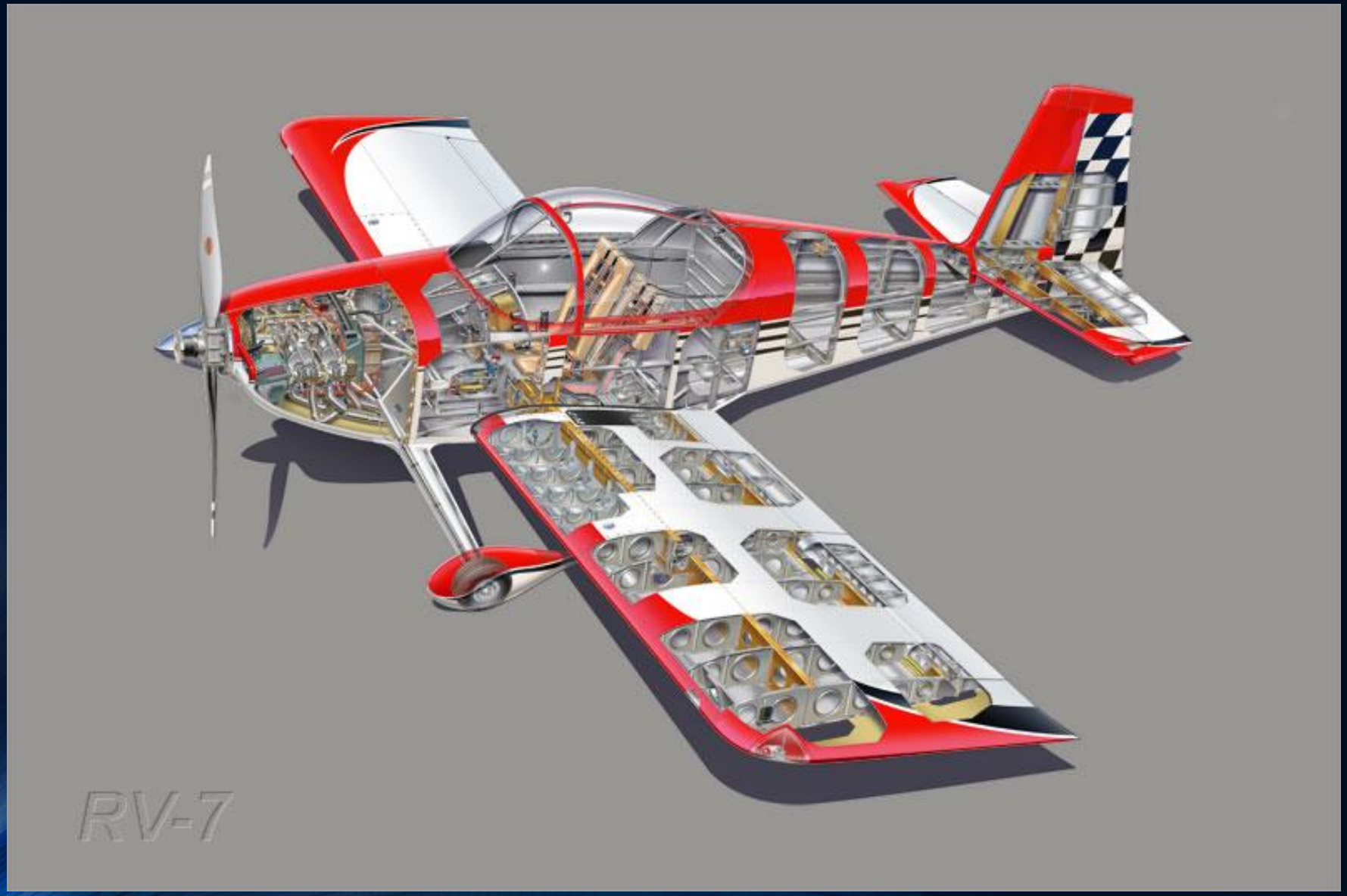


RV7

RV14

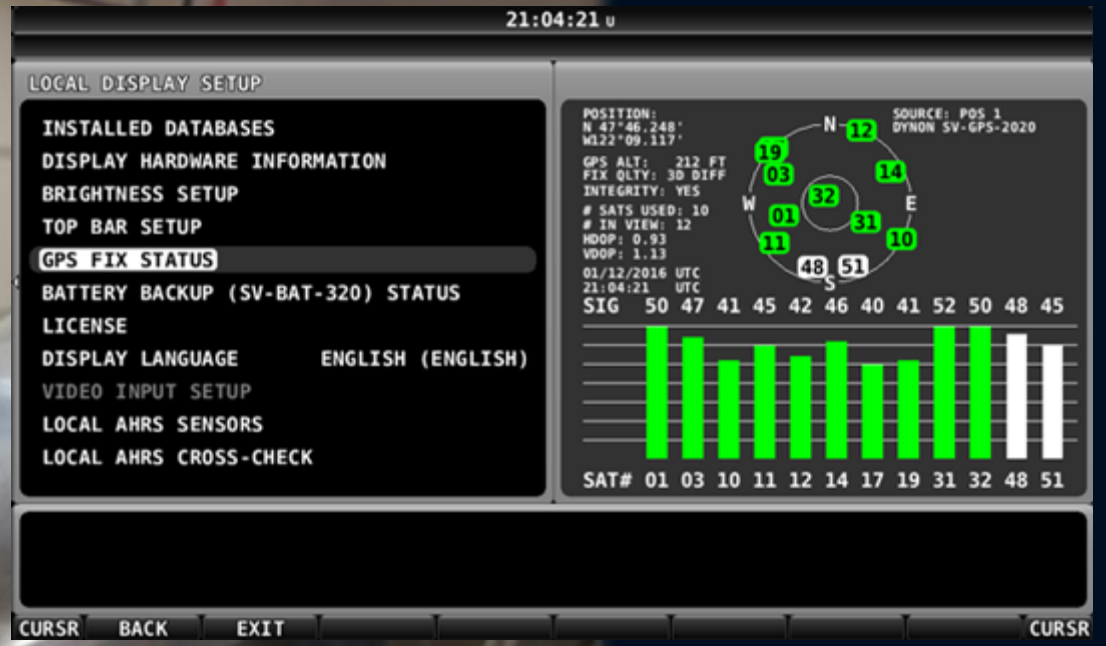
EMS Module Installation

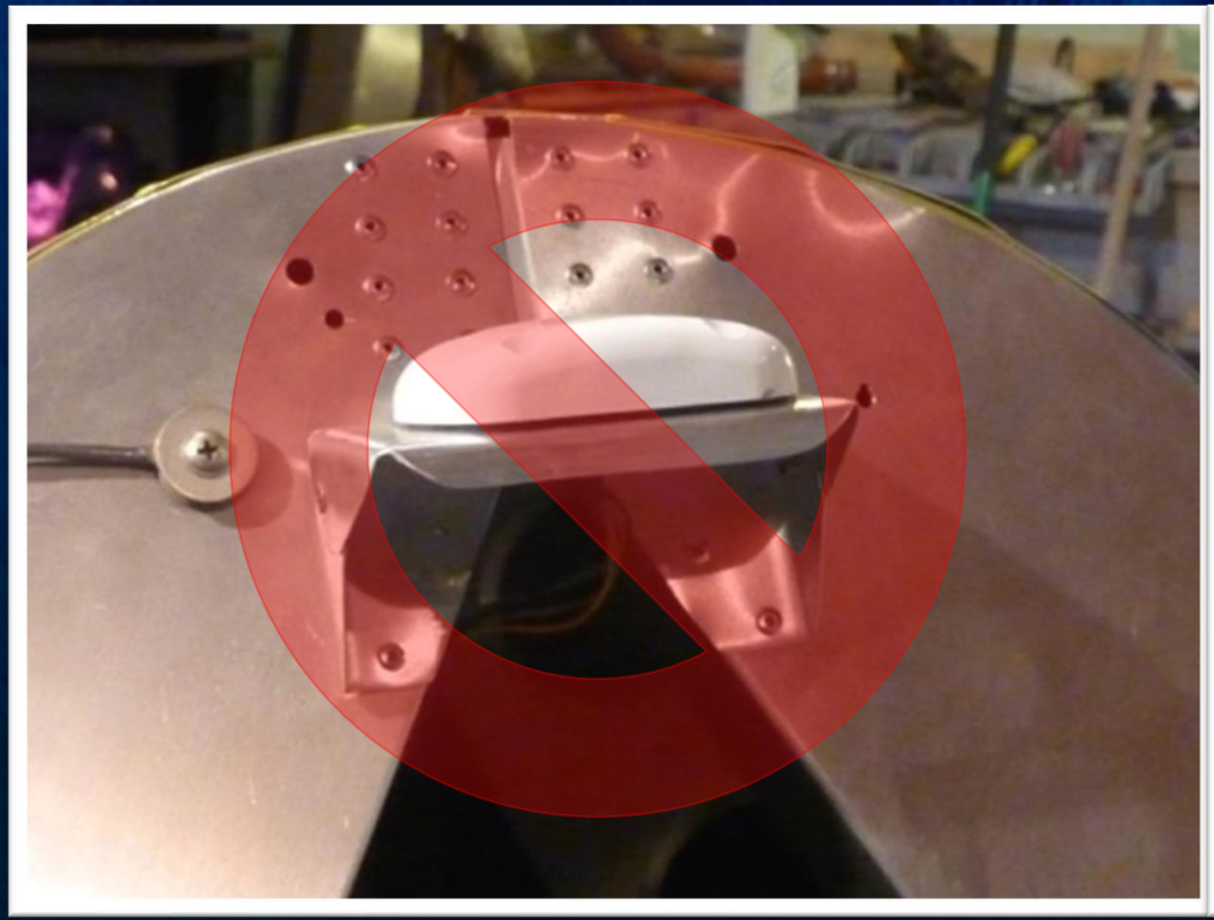
Questions on EMS Installations?



Installation Fundamentals –*GPS Receiver (standard and 2020)*

- Rigid surface
- Doubler recommended
- Minimum 36” from transmitting antenna
- Orientation: Skyward
- 360 ° Unobstructed view to horizon
  - WAAS GPS (Wide Area Augmentation System)
  - High integrity 2020 ADS-B compliant GPS
- Stay away from electronic devices
  - Distance depends on EMI radiation
- 4-wire connection
- ADS-B 2020 PAPR Test performance may be affected



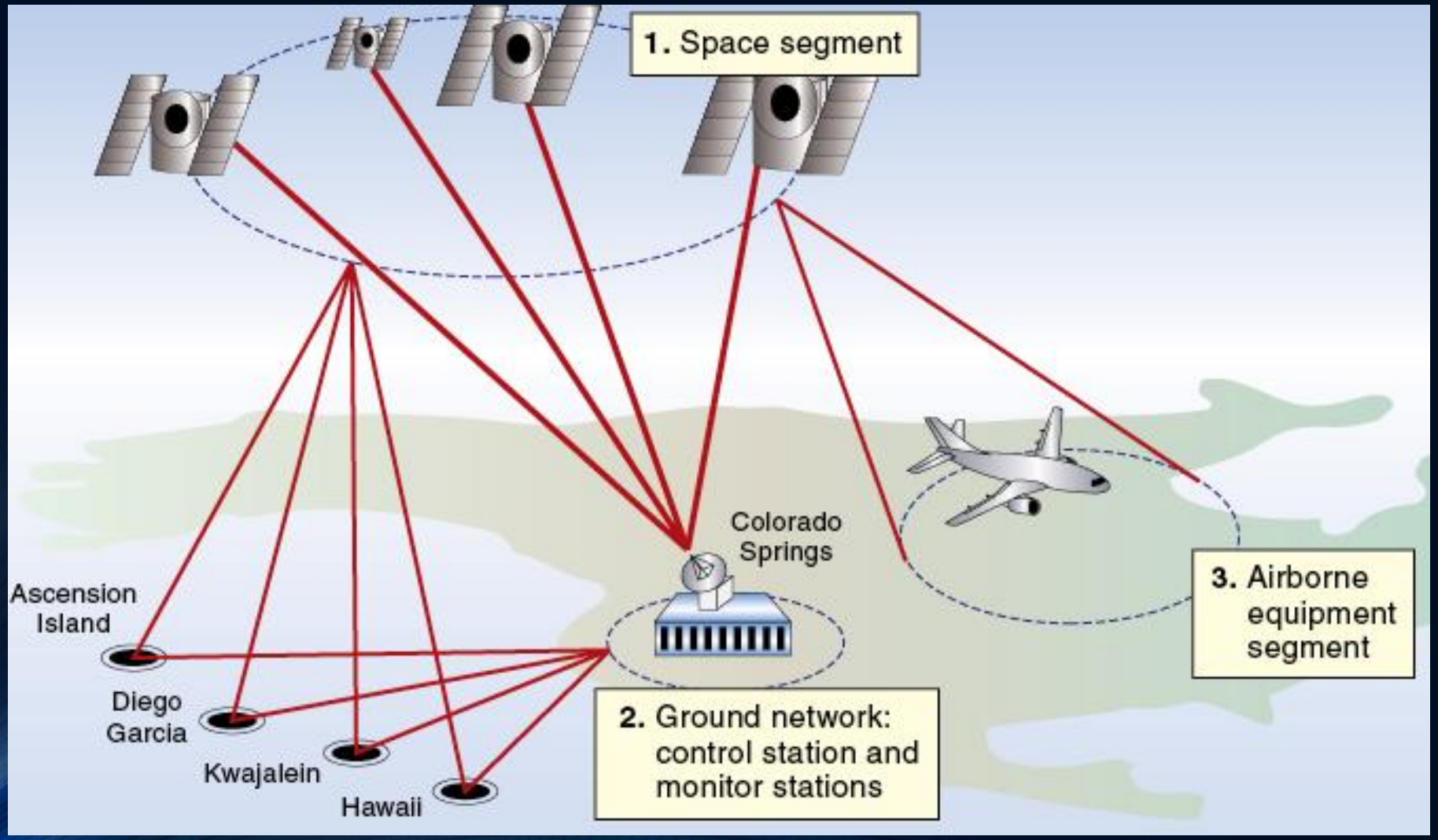


Onex

RV-12

Approved GPS Receiver Installation

Questions on GPS Installation?



Installation Fundamentals – *Transponder*

- Avoid severe vibration
- Avoid excessive heat
- RG400 coax cable routing
  - Do not run with bundles of other wires
  - Radius of cable no less than 10x diameter
  - Do not bend/kink cable during routing
  - Keep coax cable run to antenna to a minimum

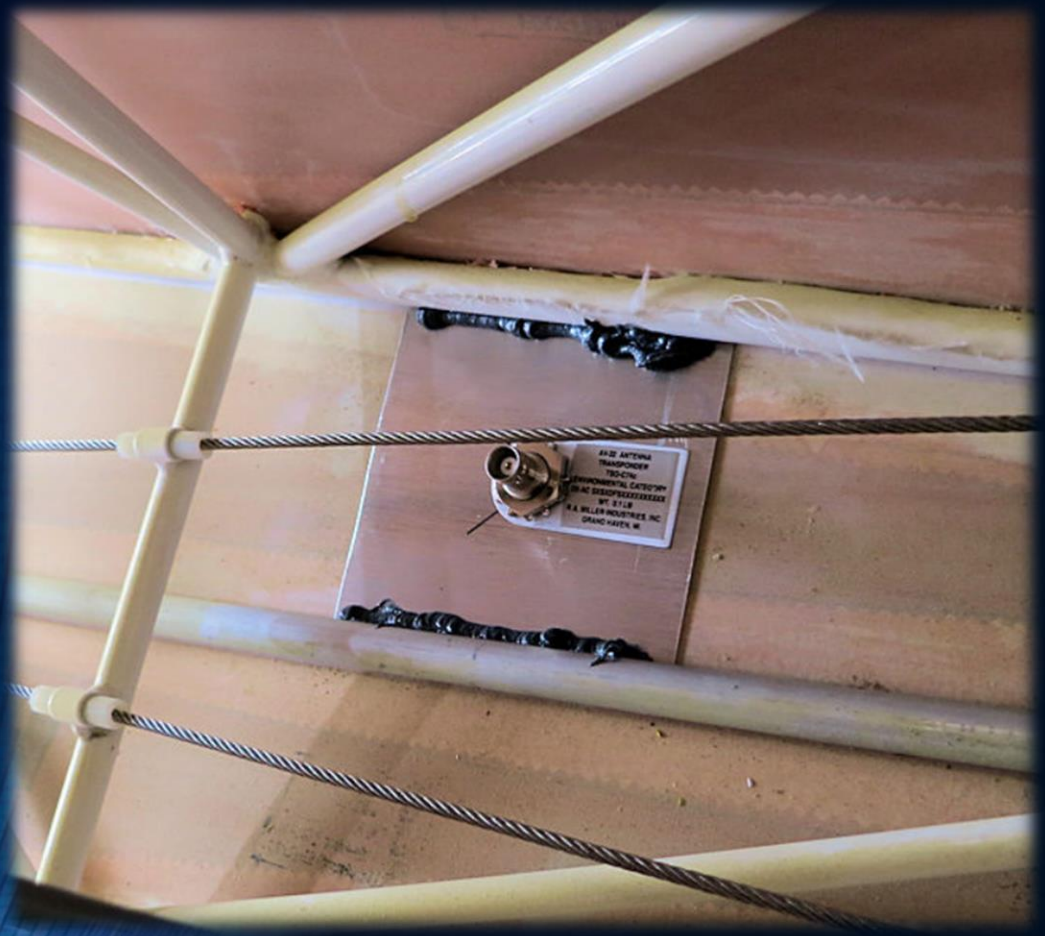
- TNC connector at module or use TNC to BNC converter
- The further away from high energy EMI the better (servos, motors, strobes)
- No specific orientation
- Antenna specific

Acceptable

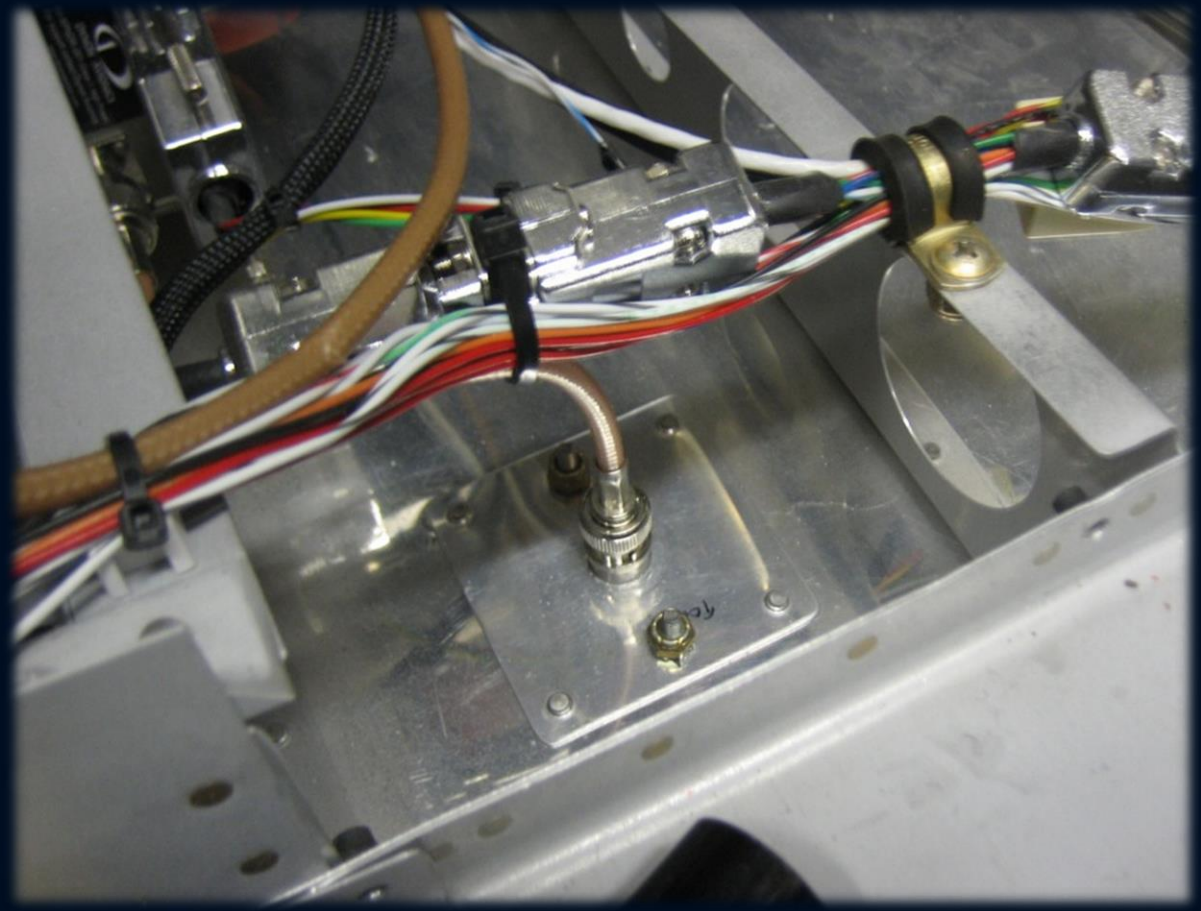
Transponder Installation

Installation Fundamentals – *Transponder Antenna*

- BNC connector at antenna
- The further away from high energy EMI the better (servos, motors, strobes)
- Keep coax cable run to antenna to a minimum
- No specific orientation
- Antenna located on bottom of aircraft
- Doubler recommended
- Antenna separation -
  - 3 ft from COM
  - 6 ft from DME
- Antenna ground plane



Ground Plane



Doubler

Questions on XPNDR Installation?

Thank You!

FLYDYNON