

# ***SEAREY HARNESS***

## **INSTALLATION MANUAL for SEAREY AMPHIBIAN AIRCRAFT**

P/N 2076 SeaRey

SPECIFICATION IP-2076-SeaRey

REV. 4

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Approved

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**For Experimental Category Aircraft Only. Not FAA Approved**

## I. INTRODUCTION

This manual provides information for installing and operating the ACI SeaRey Harness on a SeaRey or similar experimental aircraft. All installation work should be performed in accordance with this manual and applicable sections of AC 43.13 - 1B.



## II. SYSTEM DESCRIPTION

**THE BASIC HARNESS:** The ACI SeaRey Harness is composed of bundled lengths of shielded and unshielded Tefzel wire precut and branched according to a pre-established layout plan, service loads and SeaRey systems locations. It includes #4 starter and ground cable, transponder and transceiver coax, pitot, AOA and manifold pressure tubing. The Harness breaks at wing root connectors and then extends through both wings for LED nav/strobes. The port wing harness includes wiring for an HID or LED landing light.

Assuming the complexity of a Rotax 914 turbo-powered SeaRey with a full options list, the Harness is downwardly compatible with less complex Rotax 912-powered aircraft. This harness provides for headset jacks in the baggage area, turbo shutoff and panel floods on the windscreen support and a cabin heater in the nose. Choosing different locations for these services may require additional wiring by the builder with recalculation of circuit length voltage losses.

**THE WIRE LIST DOCUMENT:** There is a separate Wire List pdf providing detailed information on each wire in the harness. The harness has identification on both ends of each wire. The labeling refers to the origin and destination areas (as indicated on the “SeaRey Harness Plan”, below.) The Wire List document locates the ends of each wire according to each designated area on the Harness Plan and provides specific information on the DB connector pin or connection terminal.

**Dynon FlightDEK-D180:** The **PN2076 SeaRey Harness** replaces Dynon cables that are usually purchased with the Dynon FlightDEK-D180. Connectors “J1” and “J2” plug into the back of the D180. Connectors “J3”, “J4” and “J5” refer to DB female connectors mounted on the Harness Support Tray. “J6” plugs into the Gear Alert. “J7” plugs into the Dynon remote compass and “J8” is for Dynon firmware updating. Except for “J7” (included with the Gear Alert), all DB connectors are now included in the Harness Installation Kit.

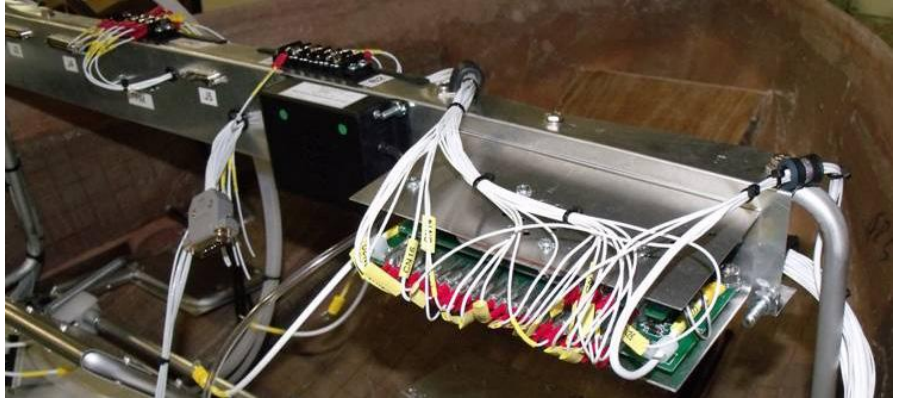
**Dynon Skyview:** The **SeaRey Skyview D1000 and D700 Harnesses** supplement the Dynon SV-Harness-D37 cable and two Dynon DB-9 Network Cables with additional DB connectors similar to the D-180 list. The harness installation kit is modified accordingly.

Builders can also choose to supplement the harness with a Harness Support Tray, Harness Installation Kit, engine warning LED’s, gear position LED’s and an Electric Gear Relay Board.

The harness is also designed to be used in conjunction with the ACI Power Buss, ACI Gear Alert and ACI *eFlaps* electric flap controller, as installed.

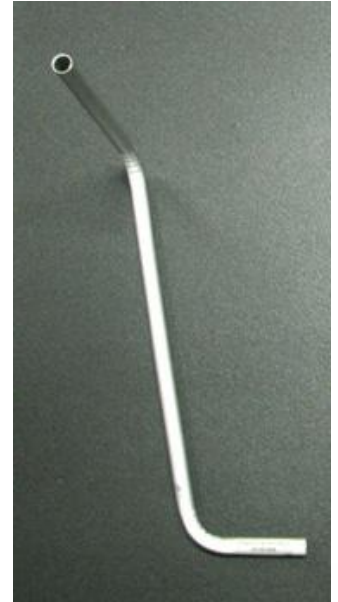
#### **HARNESS SUPPORT TRAY:**

This pre-drilled aluminum tray is designed to be installed above and ahead of the rudder pedals. The Tray prevents interference with the rudder pedals and provides connections for the harness to various panel switches, instruments, radios etc. The Support Tray is also an excellent mounting platform for the 22,000 uf 25v capacitor, a manifold pressure module, ground terminal strips, the ACI Power Buss, terminal strips for Buss 1 & 2, the Ray Allen REL-2 trim relay deck, and the ACI Gear Alert.

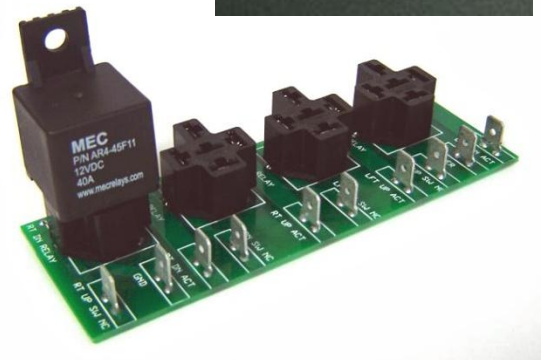


The Harness Support Tray is best supported by a support tray arm kit available from Progressive Aerodyne. (**Note:** Tray component installation is subject to change and may not be as depicted.)

**2086 HARNESS INSTALLATION KIT:** This kit provides: support tray grommets, (2 ) 1/4" SS bolts nuts and washers for ground connections, (5) terminal strips, (40) terminal strip jumpers, (2) double connectors for gear micro switches, (12) ring connectors (pre-installed on #4 cables), (1) capacitor/MP transducer mounting plate, (1) mounting screws for power buss and gear alert, (1) 6 pin and (1) 3 pin Molex connector for wing wiring, (2) 1 amp fuses for shunt wiring (4) DB female connectors for the Dynon D-180 and (3) DB male and female connectors with covers for mounting on the Harness Support Tray. (Depending on what is ordered with the harness, some of these items may be already installed by ACI.)



**2085 GEAR RELAY BOARD:** This Circuit Board has mounting sockets for the four relays that come with the electric gear. As all the circuitry is contained on the compact board, the builder needs only to connect actuators, micro switches, power and ground to the Relay Board's spade terminals. The mounting tangs on the four relays provide the means to attach the board and relays to the aircraft main bulkhead.



**2090 GEAR POSITION & 2091/92 ENGINE WARNING LIGHTS:** These 12v LED kits are appropriately sized for use on the instrument panel and/or center console. The Gear position LED's have an extra wire for use with the ACI gear alert system. The engine warning LED's (not shown) are red for charging and EFIS/EMS warnings. The 914 engine kit also includes red and yellow turbo warning LED's.



### III. APPLICABILITY

This table provides information on Harness design assumptions, flexibility and limitations.

Area	Service	Amps	Duty	Wire	PTC/CB	GND	Remarks
<b>Nose &amp; Panel</b> X Y Z	Heater	< 3A	C	22	3A to 5A	Panel	
	TCU LEDs	< 0.1A	I	22	1A to 5A	Panel	B2 (share power source)
	Trim Indicator	< 1A	I	22	n/a	Panel	(use trim actuator power)
	Flap Indicator	< 1A	I	22	n/a	Panel	(use flap actuator power)
	Gear LEDs	< 1A	C	22	1A to 5A	Panel	B2 (share power source)
	Hour Meter	< 1A	C	20 (c)	1A to 5A	Engine	B2 (share power source)
	Master Relay	< 1A	C	22	n/a	Panel	
	Starter Relay	< 1A	I	22	n/a	Panel	(use Regulator "C" power)
	Charge LED	< 0.1A	C	22	n/a	Panel	(use Regulator "C" power)
	GPS	< 4A	C	22 (e)		Panel	Avionics Bus (as installed)
	Intercom	< 0.2A	C	22 (e)	1A to 5A	Panel	Avionics Bus (as installed)
	Transponder	< 2A	C	22 (e)	2A to 5A	Panel	Avionics Bus (as installed)
	Gear Alert	< 1A	C	22 (e)	1A to 5A	Panel	Avionics Bus (as installed)
	VHF	< 3A	C	22 (e)	3A to 5A	Panel	Avionics Bus (as installed)
	Aux Outlet	< 7 A	C	20 (e)	7A	Panel	Avionics Bus (as installed)
	Avionics Ovrld.	< 0.3A	I	22 (e)	1A to 5A	CN2 (f)	(use Regulator "C" power)
	Gear CB sense	< 0.1A	I	22	n/a	CN22 (f)	ACI Power Buss only.
	Gen. CB sense	< 0.1A	I	22	n/a	CN23 (f)	ACI Power Buss only.
	Dynon D-180	2.2A	C	22	3A to 5A	Panel	B1 (share power source)
	Dynon LED	< 0.1A	C	22	1A to 5A	Panel	B1 (share power source)
	TruTrak ADI	2A	C	22	2A to 5A	Panel	B1 (share power source)
	Engine Inst.	< 1A	C	22	1A to 5A	Engine	B1 (share power source)
	Inst. Lights	< 1A	C	22	1A to 5A	Panel	
	Rmt. Compass	n/a	C	22 (g)	n/a	Panel	To Dynon D-180
	Shunt Hi & Low	< 1A		22	1A fuses	n/a	To Dynon D-180
	Power Buss	< 0.5	C	10	n/a	Panel	Circuit integrity system
	<b>Bulkhead</b> P N M R K A	Panel Flood	< 1A	I	12	1A to 5A	Bulkhead
Gear Actuators		< 25A	I	12	25A	Bulkhead	
Gear Control		0.3A	I	22	1A to 5A	Bulkhead	B2 (share power source)
Fuel Sensor		< 1A	C	20 (c)	1A to 5A	Bulkhead	B1 (share power source)
Trim Actuator		< 5.6A	I	20	5A	Bulkhead	
Bilge Pump		< 2A	C	22	2A to 5A	Bulkhead	
Fuel Pump aux		1 A	C	20	1A to 5A	Bulkhead	
Fuel Pump 914		< 5A	C	20	5A	Bulkhead	
Fuel Pump 914		< 5A	C	20	5A	Bulkhead	
Flap Actuator		< 5.6A	I	20	5A	Bulkhead	
<b>Wing &amp; Engine</b> W G B C E	Strobe LEDs	< 1A	C	20	7A	Engine	
	Nav. LEDs	< 1A	C	20	7A	Engine	
	Land. HID	< 7A	C	14	11A	Engine	
	TCU	< 2A	C	20	2A to 5A	Engine	B2 (share power source)
	TCU Isolation	< 2A	C	18/20	n/a	Engine	(uses power from TCU)
	Gen. Output	22A	C	10	25A	Engine	
	Alternator	40A	C	8	50A	Engine	(as installed)
	Regulator "C"	1A	C	18 (h)	3A to 5A	Engine	C (share power source)
Ignition Cutoff	n/a	C	18 (g)	n/a	Panel		
<b>Other</b> T U L	PTT (sticks)	n/a	I	22	n/a	Panel	To avionics ground
	Headset Jacks	n/a	C	22 (g)	n/a	Panel	To avionics ground

**APPLICABILITY TABLE NOTES**

- a. **Voltage Drop:** AC 43.13-1B specifies wire sizing to limit voltage drop attributable to circuit length. The SeaRey Harness assumes that each circuit essentially ends where it joins #4 ground cable in one of three locations: the Instrument Panel/Nose, Main Bulkhead behind the seats or the Engine. If the installer lengthens the circuit by locating or grounding the service at a different location the wire gauge may have to be increased.
- b. **Circuit Protection:** The generic term “current limiter” will be used to designate a fuse, circuit breaker or PTC (Polyswitch). PTCs carry overloads slightly longer than thermal breakers. A 5 amp PTC will carry a 200% overload for about 90 seconds and a 400% overload for 5 seconds before tripping. A 5 amp current limiter protects #22 gauge (and heavier) wire. A 7 amp current limiter protects #20 gauge (and heavier) wire. When installing the harness and its accessories in experimental aircraft the largest current limiter in the “PTC/CB” column must not be exceeded. The current limiter always protects the wire, not the service.
- c. **High Vibration Circuits:** #22 gauge of wire is considered too fragile unless it is 19 strand Tefzel and it is in a wire bundle containing at least three other #22 wires. The SeaRey Harness uses #20 gauge wire in high vibration areas.
- d. **Service Flexibility:** The table makes reference to a number of specific services such as Rotax TCU, Dynon D-180 and TruTrak ADI. The installer can choose to substitute equipment as long as power demand does not exceed the capability of the circuit. Several low amperage services can be powered by a common (current limiter protected) buss. The Table “Remarks” column suggests B1 and B2, two terminal strips, each protected by a 5 amp current limiter.
- e. **Avionics Bus:** The installer may choose to power avionics on separately protected circuits but from a common switched avionics bus. The table shows the services that could be powered from the avionics bus on the ACI Power Buss.
- f. **CN2 CN22 CN23:** These are ACI Power Buss sensing circuits (as installed.)
- g. **Shielded Wires:** These wires have a shield that should be grounded (normally to a ground terminal strip near the battery.) Radio and intercom grounds and shields should always be grounded at the same point.
- h. **The Regulator C Terminal:** The “C” terminal on the Rotax voltage regulator uses sensed voltage (normally at the instrument panel) to regulate voltage output. The #18 gauge harness wire from the panel to the “C” terminal insures a voltage drop of less than 0. 2v. Normally a 3 to 5 amp current limiter supplies power through a Cessna type Split Master Switch to “B+” terminal on the Ignition Switch. In the “Suggested Wiring with SeaRey Power Buss” diagram we directly connect the B+ terminal to the Regulator “C” terminal and the red “no-charging” LED. When the start switch is activated B+ is also connected to the starter solenoid coil and the avionics override on the Power Buss.

#### IV. INSTALLATION

Installation of the harness begins at the nose of the aircraft and works back on both sides. The heavy #4 cables should be cable-tied to the main harness where applicable. The use of plastic loom to cover the harness in cockpit areas will improve esthetics and prevent abrasion. .

Where the harness divides, the installer should choose the most appropriate route for the specific application. The harness and each harness branch must be protected from abrasion using stand-offs as necessary. In areas of vibration or movement single wires should be looped. In all cases AC 43.13 is governing.

Harness installation aft of the main bulkhead proceeds up around the Turtle Deck arch and then up through the pylon. From that point the left and right side harness bundles proceed along the root tube as far as the engine sensors.

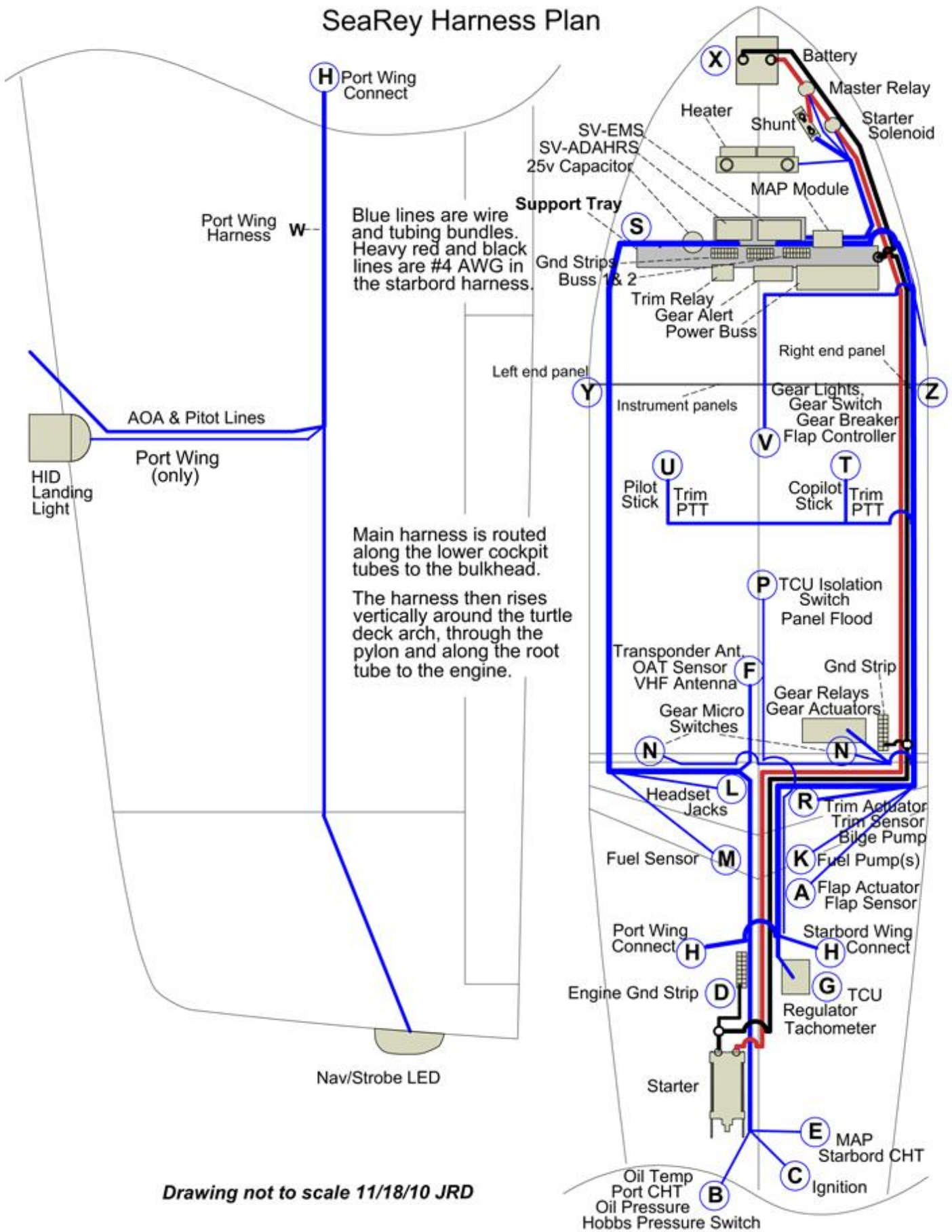
#### **Refer to the separate Wire List Document.**

- a. Note the difference between your service locations and the assumed service locations in the Wire List. There are separate Wire Lists for D-180, D700 and D7000
- b. Note the differences in your services, instruments etc. from those in the Wire List.
- c. Now note any wires that can be better used for your unique installation. For example, you may not have the Electric Flap and Flap Controller options and therefore all flap wiring in areas “V” and “A” may now be redundant. However, if you have installed a micro switch on a cam at the manual flap horn to indicate a Gear Alert landing flap signal (GND), you might decide to use one of the V to A flap wires to carry the ground signal to the Gear Alert. (The harness already assumes a Flap Controller in area “V” and has a Gear Alert flap signal wire “V2” in that location.)

The installer will have to trim the end of each service wire to length and then implement connections to services as appropriate.

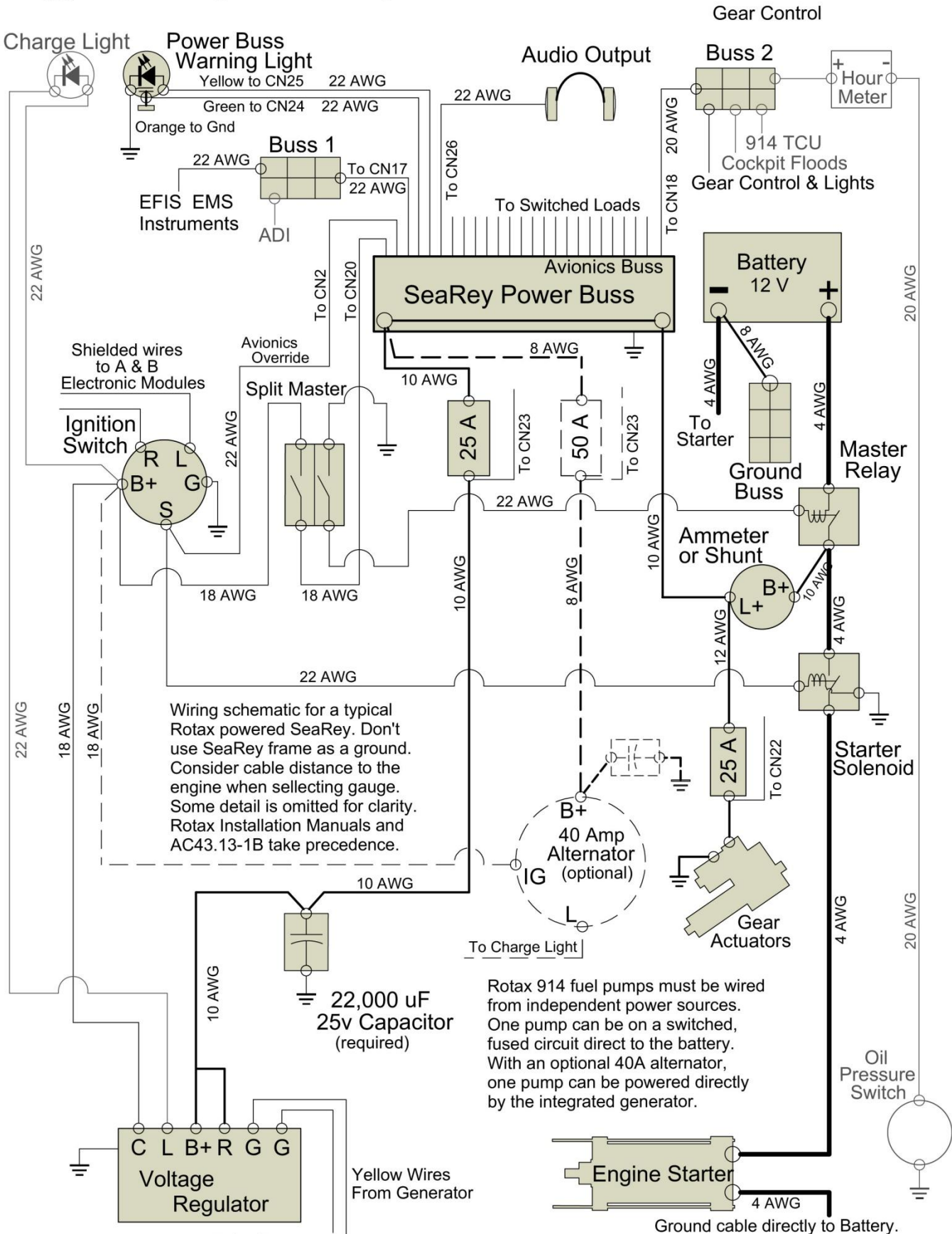
Accessing instrument panel wiring for service is an important consideration! The use of a Harness Support Tray will divide the harness ahead of the instrument panel and hold it clear of the rudder pedals. It is the installer’s decision on how and whether to provide wire loops and/or connectors between the tray and the instrument panel (or sub panels) to facilitate maintenance. (The optional Harness Installation Kit includes DB multi-pin connectors to facilitate disconnecting the panel(s) from the harness, Gear Alert, Power Buss and the Support Tray itself.)

# SeaRey Harness Plan



Drawing not to scale 11/18/10 JRD

# Suggested Wiring with SeaRey Power Buss



Drawing not to scale 05/02/10 JRD



## V. OTHER ACCESSORIES

**2075A SEAREY POWER BUSS:** The small Power Buss module provides overload monitoring and PTC protection for 18 electrical circuits. The Power Buss also monitors (high amperage) generator supply and landing gear actuator circuits.

Monitoring is provided by a red warning “switch-light” and an electronic voice annunciator system that warns of a tripped circuit through a small speaker and the pilot’s headset. The system also monitors system voltage and removes power from the regulator “C” terminal if generator voltage exceeds 16v. An optional feature can replace a split master switch by removing power to the regulator “C” terminal any time the master switch is turned off. During engine start the SeaRey Power Buss also automatically removes power from the sensitive avionics systems on its six circuit avionics buss. The SeaRey Harness is pre-wired for the Power Buss. (Please also refer to the Power Buss Installation Manual.)



**2070A SEAREY GEAR ALERT:** The Gear Alert system becomes active after the airspeed has increased above a user-determined activation speed (60 mph). On takeoff, the system will warn if the gear is accidentally left down after the flaps are up. On approach, selecting landing flap (20 or greater) or slowing to the activation speed, initiates the landing sequence of audio and visual prompts. To silence the prompts, the pilot must push one of two panel-mounted flashing “switch-lights”, one labeled for landings on water and the other for runways. The system then provides a voice warning of an unsafe condition (wrong gear position for the intended type of landing or an asymmetric gear condition.) Otherwise, the pilot hears confirmation of the type of safe landing selected. The SeaRey Harness is pre-wired for the SeaRey Gear Alert. (Please also refer to the Gear Alert Installation Manual.)



**2071 SEAREY *e-Flaps*:** The Flap Controller automatically positions SeaRey electric flaps in four selectable positions. Each position is calibrated to stop the flaps at a user determined flap angle. Flap positions are selected by pressing switch-lights on a module that can be mounted vertically or horizontally. Flap position is indicated by the steady illumination of one of the module switch-lights (a separate flap position indicator is not required.) *e-Flaps* provides a landing flap signal to the optional 2070 SeaRey Gear Alert system thereby eliminating the need to install a separate flap position cam and micro switch. The SeaRey Harness is pre-wired for the SeaRey Gear Alert. (Please also refer to the Gear Alert Installation Manual.)

