

Portland Area RV Builder's Group Newsletter

Issue 92.4

December 1992

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November Meeting:

Our November meeting was held at Doug Stenger's home & shop. He is working on a very nice RV—6A that was just about ready for a primer coat. Doug joggled all of lap joints which results in a super smooth exterior.

Some of the other things that we talked about included samples of some sound deadening material used in semi trucks brought by Don Wentz, an example of powder coating on the steel parts, and a list of all the extra parts you may need to buy to finish your plane. I have enclosed a copy of the spreadsheet done by Dave Hull (South Bay RVators) I also enclosed a copy of the information form for the RV Aircraft yearbook for you to fill out and send in if you would like to be included.

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December Meeting

Place: Bill Kenny's shop **Date:**

Thursday, Dec 10th. Time:

7:00 PM

Directions: Go South West on Scholls Ferry Rd from Washington Square to Beef Bend Road. Head south on Beef Bend Road, house and workshop are on the right just before the road curves around to the West (about 1 mile south of Scholls Ferry Road).

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Tool Crib - Brent Ohlgren

Last year I proposed a tooling crib and information source for jigs and special equipment. Well... I need more input as to what you have and are willing to loan. Jigs etc you have finished with.

Another service or resource I'm starting to set up is a reference book for equipment. Rocky mountain instruments sent me brochures on their equipment

and also two construction manuals so you can see how simple the construction is. I will bring this to our next meeting and if you have any info please bring it to add to our book. When anyone purchases these items please put your name in the book with the item, that way a person can contact you to find out, was it hard to install, does it really work, is it holding up and how much maintenance does it require etc.

On the tooling jig side I have:

4x4 for empennage construction
(horiz)

"V" jigs for elevators & rudder
Jigs to hold wing ribs to make
lightening holes.

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Where is Neutral - - Harold Smith, Puget Sound RVators

Rigging flight controls can have you adjusting rod ends or cables several times before you have things just right. While building my RV-6 wings and before riveting the skins, I thought about how rigging could be made a little easier come final assembly time. I clamped the aileron bellcrank in the neutral position at the dimension given in the drawings. With a 3/16" drill, I drilled a hole through the aileron bellcrank support angle, bellcrank, and the other support angle. Now I had a hole for a rig pin to secure the bellcrank in the neutral position. With the aileron attached to the wing in the wing jig and the wing template secured in place, install the rig pin and adjust the aileron to the bellcrank push rods.

The wings can now be stored on a wing rack with the flaps and ailerons attached secured with the rig pin for the ailerons and the wing template for the flaps. Adjusting the pushrods from the bellcranks to the control stick for neutral is easier with the use of rig pins. **Caution: for best results remove rig pins before flight!**

The control stick on RV aircraft don't stay in neutral for very long, but it is nice to know where it is supposed to be.

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An autopilot in a homebuilt? -- Pete Stevenson, Twin Cities RV builders group

At first glance it may seem an unnecessary extravagance. After all, the reason we build our RV's is to fly! The thought of turning over that pleasure to a machine goes against our grain. The truth is, on a long VFR trip it is truly appreciated as you hunt for that elusive frequency on the chart plus just being able to relax for a few minutes. IFR is another matter. I have logged quite a few instrument hours in my RV—6 and while it is easily stable enough for VFR flight, it only takes a few moments of inattention to establish an "unusual attitude" when on the gauges. Actually for the mission it was designed for, the aircraft does an admirable job IFR. However, having an autopilot, or a simple wing leveler, is like adding a second pilot. Having flow with and without it, I now feel it is indispensable.

I had been flying my "6" about a year and a half when I finally decided to install an autopilot. After speaking with the designer of the Navaid Devices Autopilot, seeing the unit at Oshkosh, and reading an article in the August 1992 issue of *Kitplanes*, I decide to try their unit. It is very light, small, and at \$1098 relatively inexpensive.

The Navaid Autopilot is a single axis unit which operates in either wing leveler mode or a tracking mode using inputs from a VOR or Loran receiver. It consists of two separate boxes. The AP—1 is the control unit, mounts in the instrument panel in a standard 3 1/8" hole, and replaces the turn coordinator. It includes the control switches, a slip ball, and an electronic turn coordinator. The other box is the servo which is attached to the aileron control system. The entire package only adds about 2 pounds to the aircraft. An installation kit with pushrod and mounting hardware is included but plan on designing your own servo mount.

The servo can be mounted quite easily in the RV—4 below the floorboards and is attached to the torque tube connecting the control sticks. It can also be mounted similarly in the RV—6, but due to the control design, I was concerned there could be induced some elevator deflection.

During the time I was deciding what to buy, my brother John Stevenson was completing the wings for his new RV—6. As he also wanted to install an autopilot, he designed a mount for the Navaid servo in the left wing, outboard of the aileron bell-crank. With a simple modification to the bellcrank,

he was able to drive it directly with an 8" pushrod. This design allows the servo to be installed through the wing access hole.

I wanted to copy John's design, but all work would have to be accomplished through the access hole. It is tight but do-able. A right angle drill is necessary and I used Cherry Max rivets and #8 screws instead of AN rivets as John Had. It's much sun-pier to build the mount before closing the wing!

The AP—1 control installation consists of installing the unit in the panel and running the wires. A power wire and inputs from the VOR and/or Loran are required.

In the air the unit functions very well. In the wing leveler mode, it will hold a heading indefinitely in smooth air and within 5° in turbulence. This mode is useful when you just want your hands free for a few minutes. The real usefulness of the system comes in the "track" mode. When a VOR or way-point is selected, the autopilot will faithfully track directly to it. I've found in smooth air, the aircraft can be easily trimmed for level flight. In turbulence it tends to wander up and down 100' depending on how rough the air is. The Navaid Autopilot will also do a good job of tracking a localizer.

The two primary controls of the AP—1 are the trim and turn controls. The trim is used for roll trim to correct for lateral loading conditions. The turn control is used to command turns of up to 30° of bank while in the wing leveler mode. At full deflection, a standard rate turn results.

The system has several redundant safety features. First and most important is the switch on the control panel. This can be mounted remotely on the stick if desired.

The servo has an internal solenoid which holds it in gear. Any power failure or internal jamming causes the solenoid to disengage. Finally, there is an adjustable clutch on the output shaft that slips at a preset force. In my RV—6, I have it set as tightly as possible. This yields a maximum roll rate of about 2.5 to 3 seconds per 60° of roll. The FAA allows 3.5 seconds per 60° of roll for a hardover failure in certified aircraft. I have mine set a little faster as it maintains level flight better in turbulence. The stick pressure to override the autopilot at this setting is moderate.

I do quite a bit of mild aerobatics with my "6" and have had no trouble with the autopilot gyro. Cling McHenry has one installed in his Extra an apparently has had no problems in 400 hours of use. All things considered, I am completely satisfied with the Navaid Autopilot. It has certainly made my cross country fling more enjoyable.

SUPPLEMENTARY PARTS LIST

DESCRIPTION	Qty	MFC/MODEL	SIZE	WEIGHT	PRICE
FLIGHT INSTRUMENTS					
AIR SPEED GAUGE	1	IFR-20-25	3-1/8 DIA		144.00
ALTIMETER	1	IFH-46-20	3-1/8 DIA		220.00
VERTICAL SPEED	1	IFR-33-20	3-1/8 DIA		144.00
TURN COORDINATOR	1	IFR-52 14VDC	3-1/8 DIA	22	247.00
ATTITUDE GYRO		IFR-85	3-1/8 DIA	40	408.00
DIRECTIONAL GYRO		IFR-80	3-1/8 DIA	40	408.00
INST VACUUM GAUGE		SPRUCE 10-01100	1 INCH DIA		51. SO
VALVE, VAC RESTRICTOR		SPRUCE AN5829-2	2IN-HG		16.45
FILTER, VACUUM		SPRUCE AIRBORNE 147-1	.3 MICRON, 3/8 HOSE		28.95
MAGNETIC COMPASS		IFR-31PED			63.00
OAT GAUGE		SPRUCE 10-15500	3/8 HOLE, CANOPY MTC		18.60
G-METER		IFR-5	2-1/4 DIA B		232.00
	0				
ENGINE INSTRUMENTS	0		1 1/4-		
TACHOMETER/TIMER		IFR-?			80.00
TACH DRIVE CABLE		SPRUCE	APPROX 52 IN. 7		24.30
TACH RIGHT ANGLE DRIVE	0	SPRUCE A-1111	Not req'd?		54.70
OL PRESSURE GAUGE	0				
OL TEMP GAUGE	0				
CM. TEMP/PRESSURE		WESTACH2DA3	2-1/4 DIA	3	
EGT/CHT GAUGE KIT		WESTBERG 2DA1 .71 2-2DWI	2-1/4 DIA	4	79.95
FUEL OTY GAUGE, DUAL		WESTACHWESBERG 2DA4	2-1/4 DIA	3	58.65
FUEL PRESSURE GAUGE	0	WESTACHK37X	2-1/4 DIA		265.00
MAMFOLD/FUEL PRESS		UNITED INST1 0-1 0300	2-1/4		98.00
VOLT/AMMETER GAUGE		WESTACH 2DA10-18	2-1/4 DIA	3	98.25
INTERNAL GAUGE LIGHTS	1	WESTACH 186-12A2			3.85
THROTTLE QUADRANT		VAN'S 42F	2 LEVER		29.50
THROTTLE CABLE					
MIXTURE CABLE					
PRWRPUMP		ESSEX FENGPRI (2)			65.00
FUEL SWITCH (4-WAY)		VAN'S (KIT REPLACEMENT)			15.00
STATIC SOURCE, ALT	1	JUST PUT A TEE AND AVAL	VE IN THE	77	
STATIC AIR KIT	1	VAN'S STATIC-KIT			14.00
	0				
PANEL PLACARDS	0			2	
	0				
NAVCOM & ANT	0	TERRA TXN920		34	
COM* AMI		TERRA TX720 (PKG DEAL)	TOOBIGIII	20	2765.00
LORAN&ANT		TERRA TLC1 20 (PKG)		40	
TRANSPONDER		TERRA TRT250 (PKG)		27	
BUND ENCODER		TERRA AT3000 (PKG)		8	
ELT		ARTEX ELT-110-6			386.00
INTERCOM		SIGTROMCS STEREOCOM S	T-400		233.00
AM/FM CASSETTE STEREO	0				
	0				
	0				
ELECTRICAL BUS	1				
CIRCUIT BREAKER&SWITCH	10	POTTER-BRUMFIELD			20.50
FUSE PANEL	0				
CIRCUIT SWITCHES	0				

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SUPPLEMENTARY PARTS LIST

IGNITION SWITCH	1	A-S10-2K	7/8 IN HOLE		49.00
MASTER SWITCH, SPLIT		SPRUCE 11-15900			12.35
MASTER SWITCH MOUNT		SPRUCE 11-15910			2.58
POST LAMPS	8				
DIMMER RHEOSTAT, PANEL					
ANNUNCIATOR SYSTEM					
TIME METER, ENGINE		USE THE METER N THE TACH ONLY??			
CLOCK, ELECT					
ELECT BONDING JUMPERS	0				
MFGNAMEPLATE		SPRUCE 09-33200	3X4-1/4		2.60
COCKPIT WARNING PLATE		SPRUCE 09-33300	1-1/4X3-3/4		0.95
RREXTMGLISHER					
	0				
	0				
	0				
	0				
RREW ALL FORWARD	0				
	0				
ENGINE	1	LYCOMING O-320-D1A			13995.00
ENGINE PRESERVATIVE	1				165.00
PROPELLER	1	FIXED PITCH, WOOD	ESTIMATE		600.00
EXTENSION HUB	1	VAN'S EXT-4	4 INCH		180.00
CRUSH PLATE	1	VAN'S PCP-320			24.75
FOP BOLT	6	VAN'S AN6-60A			4.75
EXTENSION BOLT	6	VAN'S AN1 032-24	DEPENDS ONE	Note	3.50
SPINNER SET (REPLACE FRC	1	ESTIMATE	ALUMNUM		150.00
ISOLATOR ENG MTG	4	VAN'S 94011-20			65.00
ENGNE MTG BOLTS, DYNAF	4	VAN'S			24.00
GASCOLATOR	1	VAN'S GAS-1			51.75
CARS BOX/VALVE	1	VAN'S DL-01	2 INCH		60.00
AIR LINE (SCAT TUBING)	0				
AIR CLEANER	1				
EXHAUST MANFOLD SET	1	CROSSOVER, NO MUFFLER-	STAINLESS	AN	421.00
EXHAUST MANFOLD GASKE	4	LYCOMING 77611	???REQ'D???		2.25
HEAT MUFF	1	VAN'S DL-02		12 OZ	92.00
THROTTLE BODY WJ	0	ELUSON			
CARS	0	COMES WITH OEM ENGINE			
JGHTWEK3HT STARTER	0	SKYTEC HI-TORQUE	122/149 TOO'	H	345.00
LIGHTWEIGHT ALTERNATOR	1	VAN'S 4300	40 AMP		360.00
BAFFLE SET	1				
COWUNG FASTENERS	0				
	0				
HOSE CLAMPS	0	VARIOUS???			
SAFETY WIRE	0				
VACUUM PUMP	1				
VOLTAGE REGULATOR	1				
OL COOLER	1	STEW ART WARNER 8406R/	WILL THIS W	3RK7??	256.75
OIL LINES TO/FROM COOLER	2		3/8 INCH		
OL SEPARATOR ft RTN	1				
OL PRESSURE SWITCH	1	VAN'S M-4006-4			17.00
OL FILTER (SPECIAL?)	0				
BRAKE FLUID RESERVOIR	1	'ART OF KIT???			

SUPPLEMENTARY PARTS LIST

<u>PRIMER LINE > FITTINGS</u>		
<u>FUEL LINE* FITTINGS</u>		
FUEL DRAINS AT ENGINE		
EUECTMC FUEL PUMP	FACET BOOST PUMP 40108	29.95
HEAT SHIELDS		
<u>BLAST COOLING TUBES</u>		
<u>FIREWALL Feedthru's</u>	???	
<u>ELECTRICAL WIRE, 22 AWG</u>		
<u>ELECTRICAL WIRE, 10 AWG</u>		
WIREMARKER3		
<u>CAB-ETIES</u>		
TERMMALLUGS	100	0.34
HEAT SHRINK TUaNG		
<u>ELECTRICAL CONNECTORS</u>		
<u>BATTERY, GEL CELL</u>		
STROBE SYSTEM	<u>VAN'S 8Y81-B</u>	85.00
NAV LIGHT SYSTEM	<u>INCLUDED IN 8Y81-8 KIT</u>	490.00
LANDMG LIGHT	PUT IN WINGTIP	
<u>LEN3.WINGTP-FLUSH</u>	VAN'S LEN-KIT	82.50
<u>DOMEUGHT-BAGGAGE</u>		
VENT INLETS	VAN'S SV-4	17.00
<u>VENTDUCTING</u>		
CANOPY LOCK	VAN'S 777	
<u>CANOPY GAS SPBtJQ</u>		
<u>WEATHER 3TRIPPHQ</u>	<u>FOR CANOPY FITUP</u>	
<u>SEAT BELT - SHOULDER SE</u>	[VAN'S SBH-4	160.00
UPOlSTRY		
<u>SEAT FOAM fTEMPERFOAM)</u>		
<u>SOUND DAMPHO MATERIAL</u>		
<u>MET ALT APE FLAP GUARD</u>		
<u>STICK QRP</u>		0.00
<u>DUST BOOT. CONTROL STD</u>		
TIRES	5:00X5 8-PLY	33.25
TUBE. NCR	<u>5:00X5</u>	28.25
<u>TAH.WHEEL FAIRING</u>	VAMSTWF-T	29.00
BRAKE PUCKS	DO THESE COME WITH THE KJT77	
<u>ELECTRIC FLAP ACTUATOR</u>		
<u>REAR SEAT BRAKE PEDALS</u>	<u>VAN'S RSR-PED</u>	84.00
GEAR FAIRING KIT	<u>VAN'S LOL-KIT</u>	22.00

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CRUISE _____ STALL _____ EMPTY WEIGHT _____

SPECIAL
EQUIPMENT/MODIFICATIONS _____

PAINT COLORS _____

AWARDS _____

BUILDING COST _____

-----Order Form-----

<u>QTY</u>	<u>ITEM</u>	<u>PRICE</u>	<u>AMOUNT</u>
	1993 RV AIRCRAFT CALENDAR	\$10.00	
	1993 RV AIRCRAFT YEARBOOK	\$16.95	
	1992 RV AIRCRAFT CALENDAR	\$16.95	
	Calendar Shipping	1.50	
	<i>Total</i>		

RV AIRCRAFT EARBOOK PRtICE INCLUDES SHIPPTNG CHARGES LIMITED AMOUNT OF 1992 RV AIRCRAFT YEARBOOKS LEFT. WE WILL REFUND MONEY IF SOLD OUT 3 OR MORE CALENDERS - NO SHIPPING CHARGES MAKE CHECKS PAYABLE TO

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Calendar & Miscellaneous

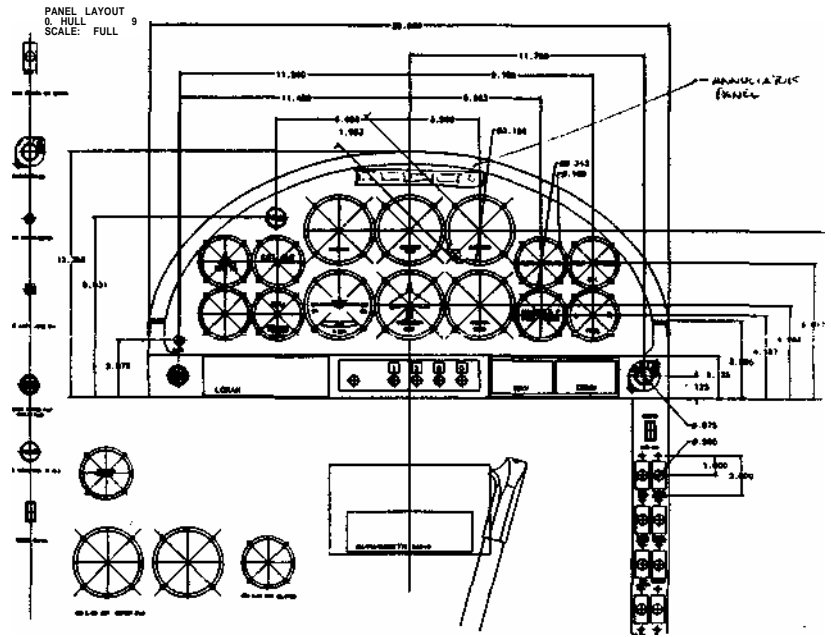
- Don't forget, EAA Chapter 105 meetings are every month on the third Thursday, 7:00 PM. Twin Oaks airpark.

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Trading Post

- leading—edge Landing light kits for RV4/6/6A. Retrofittable, easy installation. Single kit \$69 + shipping, fits either wing. Complete kit includes plexiglass lense, halogen light, all mounting hardware, detailed instructions. Don Wentz, 50641 Firridge Ave, Scappoose, OR 97056 503-543-2298 for info/photos/price list. Discount for Ptd Area RV Builder's Group.

- Aluminum RV—6 Fuselage jig. Kit includes all aluminum, rivets and hardware needed to build one jig, plus plans and manual. \$550 plus \$40 for crating. DJB Engineering & Development (215) 866-6913. (I have brochure and more information if anyone is interested— Steve.)



Merry Christmas and happy holidays

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