Amateur-Built Fabrication and Assembly Checklist (2011) Fixed Wing

Name(s)	SONEX AIRCRAFT LLC
Address:	511 AVIATION RD. OSHKOSH, WI 54902
Aircraft Model:	SONEX With Assy. Spar and Matched Holes
Date:	7/9/2013
Remarks:	
SONEX PACKIN	G LIST # SNX-KIT-ALL-MHP-070813

NOTE: This checklist is only applicable to fixed wing aircraft. Evaluation of other types of aircraft (i.e., rotorcraft, balloons, lighter than air) will not be accomplished with this form.

NOTE: This checklist is invalid for and will not be used to evaluate an altered or modified type certificated aircraft with the intent to issue an Experimental Amateurbuilt Airworthiness Certificate. Such action violates FAA policy and DOES NOT meet the intent of § 21.191(g).

Instructions For Using The Amateur-Built Fabrication and Assembly Checklist (2011):

A point (each task equals 1 point) can be divided over multiple categories (Manufacturer, Commercial Assistance, Amateur Builder Assembly and Amateur Builder Fabrication) into 1/10 fractions. A Manufacturer may be a kit manufacturer, a component manufacturer or a part(s) manufacturer. Commercial assistance (for hire or compensation) may include assistance provided by kit manufacturers, commercial assistance centers, individuals (e.g. A& P mechanics or avionics technicians).

For example, 0.5 (half point) can be assigned to the Manufacturer, 0.3 (3/10 - 3 tenths) as Commercial Assistance, 0.2 to the Amateur Builder as Fabrication, for a total of 1 point.

Enter "N/A" in any box where a listed task is not applicable to the particular aircraft being evaluated. Use the "Add item" boxes at the end of each section to add applicable unlisted tasks and award credit.

Г	FABRICATION AND ASSEMBLY TASKS		A	В	C	D
F			Mfr Kit/Part/	Commercial	Am-Builder	Am-Builder
			Component	Assistance	Assembly	Fabrication
7	Γask	Fuselage – 22 Listed Tasks				
	#					
	F1	1 Fabricate Longitudinal Members	0.5			0.5
	F2	Fabricate Composite Cores or Shells, Skins	N/A			
	F3	1 Fabricate Bulkheads or Cross members	0.7			0.3
	F4	1 Fabricate Flt Control Push Pull Tubes/Cables	0.9			0.1
	F5	1 Assemble Flt Control Push Pull Tubes/Cables	0		1.0	
	F6	1 Assemble Fuselage Basic Structure	0		1.0	

		A	В	C	D
FABRICATION	Mfr Kit/Part/	Commercial	Am-Builder	Am-Builder	
		Component	Assistance	Assembly	Fabrication
F7 1 Fabricate F	Brackets and Fittings	0.6			0.4
F8 1 Assemble 1	Brackets and Fittings	0		1.0	
F9 1 Fabricate (Cables, Wire, and Lines	1			0.0
F10 1 Assemble	Cables, Wire, and Lines	0		1.0	
F11 Fabricate F	Fuselage Fuel System Components	*			*
F12 Assemble 1	Fuselage Fuel System Components	*		*	
F13 1 Fabricate F	Fuselage Skin	0.8			0.2
F14 1 Assemble 1	Fuselage Skin	0		1.0	
F15 1 Fabricate V	Vindshield	0.3			0.7
F16 1 Assemble	Windshield to Fuselage	0		1.0	
F17 Fabricate V	Vindows	N/A			
F18 Assemble	Windows to Fuselage	N/A			
F19 1 Fabricate (1.0	0.3			0.7
F20 1 Assemble (Canopy to Fuselage	0		1.0	
F21 Fabricate N	Mast and Strut Assembly	N/A			
F22 Assemble 1	Mast and Strut Assembly	N/A			
F23 1 Add Fab it	em: Fabricate Fuel Tank	0.9			0.1
F24 1 Add Assy	item: Assembly of Fuel Tank	0		1.0	
F25 Add Fab i	tem:				
F26 Add Assy	item:				
Total # of Fuselage Tasks	<u>Fuselage Subtotal</u>	Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
17	Fuselage Total Points >	6.0	0.0	8.0	3.0

*F11 and F12 not evaluated but necessary for flight. NOTE: F2 composite N/A. Skins covered under F13.	*F11 and F12 not evaluated but necessary for flight. NO	OTE: F2 composite N/A. Skins covered under F13.	
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	NOTE	A	В	C	D
	NOTE	Mfr Kit/Part/	Commercial	Am-Builder	
Task	Wings – 47 Listed Tasks	Component	Assistance	Assembly	Fabrication
#	Wings – 47 Listed Tasks				
W1	1 Fabricate Right Wing Spars	0.5			0.50
W2	1 Fabricate Right Wing Ribs	0.7			0.30
W3	1 Assemble Wing Spars and Ribs to Form Right Wing Primary Structure	0		1.00	
W4	1 Fabricate Left Wing Spars	0.5			0.50
W5	1 Fabricate Left Wing Ribs	0.7			0.30
W6	Assemble Wing Spars and Ribs to Form Left Wing Primary Structure	0		1.00	
W7	Fabricate Composite Cores	N/A			
W8	Assemble Composite Cores to Wing	N/A			
W9	1 Fabricate Wing Leading and Trailing Edges	0.8			0.20
W10	1 Assemble Wing Leading & Trailing Edges to Wing	0		1.00	
W11	Fabricate Drag/Anti-drag Truss Members	N/A			
W12	Assemble Drag/Anti-drag Truss Members to Wing	N/A			
W13	1 Fabricate Wing Brackets and Fittings	0.6			0.40
W14	1 Assemble Wing Brackets and Fittings to Wing	0		1.00	
W15	1 Fabricate Wing Tips	0.8			0.20
W16	1 Assemble Wing Tips to Wings	0		1.00	
W17	Fabricate Special Tools or Fixtures	N/A			
W18	Fabricate Aileron Spars	N/A			
W19	1 Fabricate Aileron Ribs	0.7			0.30
W20	Assemble Aileron Spars, Ribs to Form Aileron Primary Structure	0		1.00	
W21	1 Fabricate Aileron Brackets and Fittings	0.7			0.30
W22	1 Assemble Aileron Brackets & Fittings to Aileron	0		1.00	
W23	Fabricate Aileron Skin (Includes Leading and Trailing Edges)	0.7			0.30
W24	1 Assemble Aileron Skin to Aileron	0		1.00	
W25	1 Assemble Aileron to Wing	0		1.00	
W26	Fabricate Flap Spars	N/A			
W27	1 Fabricate Flap Ribs	0.7			0.30
	1 Assemble Flap Spars, Ribs to Form Flap Primary Structure	0		1.00	3.00
W29	1 Fabricate Flap Bracket and Fittings	0.7			0.30
W30	1 Assemble Flap Brackets & Fittings to Flap	0		1.00	

				В	C	D
	FABR	ICATION AND ASSEMBLY TASKS	Mfr Kit/Part/	Commercial	Am-Builder	
			Component	Assistance	Assembly	Fabrication
W31	1 Fabricate F	Flap Skin (Includes Leading and Trailing Edges)	0.7			0.30
W32	1 Assemble	Flap Skin to flap	0		1.00	
W33	1 Assemble	Flaps to Wing	0		1.00	
W34	Fabricate V	Wing External Lighting Components	N/A			
W35	Assemble '	Wing Ext Lighting Components to Wing	N/A			
W36	1 Assemble	Basic Wing Structure	0		1.00	
W37	Fabricate V	Ving Fuel System components	N/A			
W38	Assemble '	Wing Fuel System Components to Wing	N/A			
W39	Fabricate F	Pitot Lines	*			*
W40	Assemble	Pitot Lines to Wing	*		*	
W41	1 Fabricate V	Ving Skin	0.8			0.20
W42	1 Assemble	Wing Skin to Wing	0		1.00	
W43	Fabricate V	Ving Struts/Wires	N/A			
W44	Assemble '	Wing Struts/Wires	N/A			
W45	Fabricate F	Fuel Tanks	N/A			
W46	Assemble	Fuel Tanks to Wing	N/A			
W47	1 Assemble	Wings to Next Higher Structure	0		1.00	
W48	Add Fab it	em:				
W49	Add Assy	item:				
W50	W50 Add Fab item:					
W51	W51 Add Assy item:					
	l # of Wing Tasks	Wings Subtotal	Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	30	Wings Total Points ▶	9.6	0	16	4.4

Wing Comments: W1 and W4 consist of forward and aft Spars. W39 and W40 Pitot statis cystem not evaluated but necessary for flight

	EADDICATION AND ACCOMPLY TACKS	A	В	C	D
	FABRICATION AND ASSEMBLY TASKS	Mfr Kit/Part/	Commercial		Am-Builder
T. 1		Component	Assistance	Assembly	Fabrication
Task #	Empennage – 42 Listed Tasks				
E1	1 Fabricate Horizontal Stabilizer Spars	0.7			0.3
E2	1 Fabricate Horizantil Stabilizar Ribs	0.7			0.3
Е3	Assemble Horizontal Stabilizer Ribs to Form Primary Horz-Stab Structure	0		1.0	
E4	1 Fabricate Horizontal Stabilizer Brackets & Fittings	0.7			0.3
E5	Assemble Horizontal Stabilizer Brackets and Fittings to Stabilizer	0		1.0	
E6	Fabricate Horizontal Stabilizer Lead/Trailing Edges	N/A			
E7	Assemble Horizontal Stabilizer Lead/Trailing Edges to Stabilizer	N/A			
E8	Fabricate Horizontal Stabilizer Cables, Wires and Lines	N/A			
E9	Assemble Horizontal Stabilizer Cables, Wires and Lines to stabilizer	N/A			
E10	1 Fabricate Horizontal Stabilizer Empennage Skin	0.7			0.3
E11	Assemble Horizontal Stabilizer Empennage Skin to Stabilizer	0		1.0	
E12	1 Assemble Horizontal Stabilizer Structure to Fuselage	0		1.0	
E13	Fabricate Elevator Spars	N/A			
E14	1 Fabricate Elevator Ribs	0.7			0.3
E15	1 Assemble Elevator Ribs to Form Primary Elevator Structure	0		1.0	
E16	1 Fabricate Elevator Brackets and Fittings	0.9			0.1
E17	1 Assemble Elevator Brackets and fittings to Elevator	0		1.0	
E18	Fabricate Elevator Skins (Includes Leading and Trailing Edges)	0.7			0.3
E19	1 Assemble Elevator Skins to Elevator	0		1.0	
E20	Fabricate Elevator trim Tab	N/A			
E21	Assemble Elevator Trim Tab to Elevator	N/A			
E22	1 Assemble Elevator to Horizontal Stablizer	0		1.0	
E23	1 Fabricate Vertical Stabilizer Spars	0.7			0.3
E24	1 Fabricate Vertical Stabilizer Ribs Cores	0.7			0.3
E25	Assemble Spars, Ribs to Form Primary Vertical Stabilizer Structure	0		1.0	
E26	1 Fabricate Vertical Stabilizer Brackets and Fittings	0.7			0.3
E27	Assemble Brackets and Fittings to Vertical Stabilizer	N/A			
E28	Fabricate Vertical Stabilizer Cables, Wires and Lines	N/A			
E29	1 Assemble Cables, Wires, Lines to Vertical Stabilizer	0.7		0.3	
E30	Fabricate Vertical Stabilizer Skin (Includes Leading and Trailing Edges)	0			1.0

FARR	ICATION AND ASSEMBLY TASKS	A	В	C	D
		Mfr Kit/Part/	Commercial	Am-Builder	Am-Builder
				Assembly	Fabrication
E31 1 Assemble	Vertical Stabilizer Skin to Vertical Stabilizer	0		1.0	
E32 1 Assemble	Vertical Stabilizer to Next Higher Structure	0		1.0	
E33 Fabricate 1	Rudder Spar	N/A			
	Rudder Ribs	0.7			0.3
E35 1 Assemble	Rudder Spars, Kios to Porin Friniary Rudder	0		1.0	
E36 1 Fabricate 1	Rudder Brackets	0.7			0.3
E37 1 Assemble	Rudder Brackets to Rudder	0		1.0	
E38 1 Fabricate 1	Rudder Skin (Includes Leading and Trailing Edges)	0.7			0.3
E39 1 Assemble	Rudder Skin to Rudder	0		1.0	
E40 1 Fabricate 1	Rudder Trim Tab	0.7			0.3
E41 1 Assemble	Rudder Trim Tab to Rudder	0		1.0	
E42 1 Assemble	Rudder to Vertical Stabilizer	0		1.0	
E43 1 Fabricate	Vertical Stabilizer Tips	0.5			0.5
E44 1 Assemble	Vertical Stabilizer Tips	0		1.0	
E45 1 Fabricate 1	Horizontal Tips	0.5			0.5
E46 1 Assemble Horizontal Tips		0		1.0	
Total # of Empennage <u>Empennage Subtotal</u> Tasks		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
36	Empennage Total Points ▶	11.7	0	18.3	6

empennage Comments:.			

	EA DDIC	NATION AND ACCEMBLY TACKS	A	В	C	D
	FABRIC	CATION AND ASSEMBLY TASKS	Mfr Kit/Part/	Commercial	Am-Builder	Am-Builder
			Component	Assistance	Assembly	Fabrication
Task #	Landi	ng Gear – 14 Listed Tasks				
LG1	Fabricate I	anding Gear Struts or Major Components	0.8			0.2
LG2		Landing Gear Struts or Major Components to ary Landing Gear Structure	0		1.0	
LG3	Assemble l Structure	Landing Gear System Components Next Level	0		1.0	
LG4	Fabricate E	Brake System Components	0.9			0.1
LG5	Assemble 1	Brake System Components to Wheels/Gear	0		1.0	
LG6	Assemble '	Wheels and Tires to Landing Gear	0		1.0	
LG7	Fabricate I	Landing Gear Bracket and Fittings	0.7		0.3	0.3
LG8	Assemble l Gear	Landing Gear Bracket and Fittings to Landing	0		1.0	
LG9	Fabricate I	Landing Gear Actuation System Components	N/A			
LG10		Landing Gear Actuation System Components to er Structure	N/A			
LG11	Fabricate I	Landing Gear System Cables, and Lines	*			*
LG12	Assemble l Structure	Landing Gear Cables, and Lines to Next Level	*		*	
LG13	Fabricate I	anding Gear Fairings and wheel pants	0.4			0.6
LG14	Assemble 1 Structure	Landing Gear Fairings/wheel pants to Next Level	0		1.0	
LG15	Add Fab it	em:				
LG16	Add Assy i	item:				
Total # of Land Gear Tasks L		Landing Gear Subtotal	Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	10	Landing Gear Total Points ▶	2.8	0	6.3	1.2

^{*} LG11 and LG12 not evaluated not supplied with kit

		RICATION AND ASSEMBLY TASKS	A	В	C	D
	FABR		Mfr Kit/Part/	Commercial	Am-Builder	Am-Builder
			Component	Assistance	Assembly	Fabrication
Task #	Pro	pulsion – 26 Listed Tasks				
P1	1 Fabricate I	Engine Mounts	0.9			0.1
P2	1 Assemble	Engine Mounts to Next Level Structure	0		1.0	
Р3	Fabricate I	Engine Cooling System/Baffles	*			*
P4	Assemble	Engine Cooling System Baffles to Engine	*		*	
P5		Engine Compartment Overheat/Fire Detection	N/A			
P6	Assemble	Engine Compartment Overheat/Fire Detection Engine Compartment	N/A			
P7		nduction System	*			*
P8		Induction System to Engine	*		*	
P9	_	Exhaust System	*			*
P10		Exhaust System to Engine	*		*	
P11	_	Engine Control Installation Brackets	*			*
P12	_	Engine Controls to Next Level Structure	*		*	
P13		Brackets and Fittings	*			*
P14		Brackets and Fittings to Next Level Structure	*		*	
P15		Cables, Wires and Lines	*			*
P16		Cables, Wires and Lines to next Level Structure	*		*	
P17	_	Engine (Likely N/A)	*		*	
P18	_	Engine to Engine Mount	*		*	
P19	_	Engine Propeller (Likely N/A)	*		*	
P20		Propeller Spinner Components	1			0.0
P21		Propeller and Spinner to Engine	0		1.0	
P22	_	Engine Cowling	0.7			0.3
P23		Engine Cowling to Airframe	0		1.0	
P24		Engine Fuel System Components to Next Level	0		1.0	
P25	1 Fabricate I	Firewall	0.6			0.4
P26	1 Assemble	Firewall To Next Level Structure	0		1.0	
P27	Add Fab it	em:				
P28	Add Assy	item:				
P29						
P30	Add Assy	item:				
	otal # of		MC Wide	C . 1	A D 11	A D 111
	opulsion Tasks	Propulsion Subtotal	Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	9	Propulsion Total Points ►	3.2	0	5	0.8
<u> </u>		٠.٥				

P3-P4-P7-P8-P9-P10-P11-P12-P13-P14-P15-P16-P17-P18- and P19 Not evaluated parts not part of kit

	EADDI	ICATION AND ACCEMBLY TACKS	A	В	C	D
	FABR	ICATION AND ASSEMBLY TASKS	Mfr Kit/Part/	Commercial	Am-Builder	
			Component	Assistance	Assembly	Fabrication
Task #	Cockp	it Interior – 23 Listed Tasks				
C1	1 Fabricate I	nstrument Panel	0.1			0.9
C2	1 Fabricate I	nstrument Sub Panels, Brackets and Fittings	0.3			0.7
С3	11	Instrument Panel, Sub Panels and Brackets and Next Higher Structure	0		1.0	
C4	Assemble	Avionics to Instrument Panel	N/A			
C5	1 Fabricate S	Seats	0			1.0
C6	1 Fabricate S	Seat Brackets and Fittings	0.1			0.9
C7	1 Assemble 3	Seats and Brackets and Fittings to Cockpit	0		1.0	
C8	Fabricate S Brackets	Seat Belts and Shoulder Harness Fittings and	0.6			0.4
С9	Assemble 3 Brackets to	Seat Belts and Shoulder Harness Fittings and Structure	0		1.0	
C10	Fabricate I	Electrical Wiring, Controls and Switches	*			*
C11	Assemble Level Struc	Electrical Systems Controls and Switches to Next cture	*		*	
C12	1 Fabricate	Control Yokes/Sticks	0.9			0.1
C13	1 Assemble	Control Yokes/Sticks to Flight Control System	0		1.0	
C14	Fabricate A	All Flight Control Push Pull Tubes and/or Cables	N/A			
C15		Flight Control Push Pull Tubes and/or Cables to er Structure	N/A			
C16	1 Fabricate F	Rudder Pedals	0.9			0.1
C17	1 Assemble	Rudder Pedals to Next Higher Structure	0		1.0	
C18	Fabricate 1	Roll-Pitch and Yaw Trim Systems	N/A			
C19	Assemble	Roll-Pitch and Yaw Trim Systems to Next Higher	N/A			
C20	1 Fabricate F	Flap/Spoiler Controls	0.8			0.2
C21	1 Assemble	Flap/Spoiler Controls to Next Higher Structure	0		1.0	<u> </u>
C22		Closeout Panels/Floor Panels	N/A			
C23 Assemble Closeout Panels/Floor Panels		N/A				
C24	Add Fab it	em:				
C25	Add Assy	item:				
	otal # of kpit Tasks	Cockpit Interior Subtotal	Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	14	Cockpit Interior Total Points ▶	3.7	0	6	4.3

C10-C11 Not evaluated not part of Kit.

Total # of Aircraft Tasks	
116	<u>◀ SUM #1</u>

TOT
TOT

D only, together.

TOTAL TASKS AND LINE ITEMS

		1		1	T
FABRICATION AND ASSEMBLY SUMMARY	A	В	C	D	
		Mfr Kit/Part/ Component	Commercial Assistance	Am Builder Assembly	Am Builder Fabrication
1. Total Number of Aircraft Tasks (Note	e 1)	(SUM#1)		116.00	
2. Total Points for Each Category. (Note	2)	37.0	0.0	59.6	19.7
3. Total Points for Complete Aircraft Construction (SUM # 2 should equal SUM # 1 above). (Note:	3)	(SUM #2) ►		116.3	
4. Percentage of Each Category as Part of Total Aircraft Construction (Note 4)	31.81%	0.00%	51.25%	16.94%	
5. Total Percentages for Complete Aircraft Construction (Add all percentages in row 4) Total should equal 100% (± . 5%). (Note 5)			100.0%		
6. Total Builder Points – Add points in row 2, column C and D only, together. (Note 6)				79	9.3

NOTES: Instructions For Completing Fabrication and Assembly Checklist Summary

7. Total Builder Percentage – Add percentages in row 4, columns C and

1. TOTAL NUMBER OF AIRCRAFT TASKS (Sum #1): To find the total points awarded for all tasks, add together the six individual "Total # of Tasks" blocks located at the bottom left of each aircraft tasks section.

(Note 7)

2: TOTAL POINTS FOR EACH CATEGORY: [Columns A, B, C and D]. Each columns' total points are tallied by adding the sum of the points awarded in each respective column for each of the tasks in the section (Fuselage, Wings, Empennage, Landing Gear, Propulsion and Cockpit). Include points assigned to 'Additional Items' at the end of each section. Boxes with a N/A (not applicable) or an asterisk, have zero points.

68.19%

3: TOTAL POINTS FOR COMPLETE AIRCRAFT CONSTRUCTION: (SUM#2) In row 3 of the Summary section, add together the numbers in each block on row2, tallied from each of the four column category totals, (Columns A+B+C+D). Compare SUM #1 to SUM #2. SUM #1 should be equal to SUM #2, (Verify the two sums are equal within a deviation of \pm 0.5). Total points will vary from aircraft to aircraft depending on number of add items and N/As (Not Applicable) applied. (e.g., 133 listed task points, plus 5 Add items, minus 22 N/As = 116 tasks)

- **4: PERCENTAGE OF EACH CATEGORY AS PART OF TOTAL AIRCRAFT CONSTRUCTION:** To compute category percentages, divide the number in each individual block found on row 2 by Sum #2 on row 3. For example if the total points of Mfr Kit/Part/Component category (Column A) = 40 and Sum #2 = 120, then divide 40 by 120 to reach 33.3%. Do this for each invidual block on row 4 for each column. Percentages may be rounded to the nearest tenth, (22.86% is rounded to 22.9%).
- **5: TOTAL PERCENTAGES FOR COMPLETE AIRCRAFT CONSTRUCTION:** Add up the percentages of each of the four categories (Columns A+B+C+D) found on row 4. Total must be equal to 100% with a (±) deviation limited to ½ % (0.5%). Example; a derived percentage between 99.5% and 100.5% is acceptable. If this computation falls outside the accepted deviation then an error has occurred in row 2, 3 or 4.
- **6: TOTAL BUILDER POINTS:** Add together the two point tallies from row 2, Columns C and D blocks only. Total will vary from aircraft to aircraft depending on number of N/As applied.
- 7. TOTAL BUILDER PERCENTAGE: Add together the two percentage tallies from row 4 Columns C and D blocks only. Total must exceed 50% to be eligible for amateur built status and to meet major portion requirement under 14 CFR, Part 21.191(g) Operating amateur-built aircraft.

EXPLANATIONS AND EXAMPLES

- ▶ All Points are added at the end of the form in the Summary section under their respective categories. The point total is comprised of all the credits awarded for primary delineated tasks plus any credits given for 'Additional
- ▶ "Additional Items" may be assigned points the same as primary listed tasks if work or parts not reflected in the main entries need to be credited.
- ▶ The applicants completion of tasks can be documented in a number of ways and may include
- (1) Builder's logs.
- (2) Photographs/video/DVD.
- (3) Drawings.
- (4) Engineering data when necessary.
- (5) Relevant documentation (e.g., plans) and references (e.g., handbooks) used.
- (6) Documentation concerning any commercial assist
- (7) Documentation concerning any non-commercial assistance used.
- (8) Part inventories and histories.
- (9) Receipts, Catalogs.
- (10) Log book entries

In addition to using this checklist, the builder should document the entire fabrication and assembly process. To issue an airworthiness certificate the FAA must make a major portion determination (the major portion of an aircraft was fabricated and assembled by an amateur builder (s)). Making this finding requires sufficient, credible and adequate documentation.