

The Great Arctic Air Adventure, LLC



Approximate Circumnavigation Route

3.0 Purpose and Scope

The purpose of this document is to evaluate the aircraft related risks for the proposed trip, and to develop mitigating actions as required to establish an acceptable level of risk. This analysis applies to the aircraft related failures only, and does not include other risk factors such as weather and pilot error.

4.0 Methods and Assumptions

Risk will be evaluated as a function of two factors: probability and severity.

Probability – This is the probability that a given failure will happen through the course of the trip. This is calculated from two factors, the probability of failure per hour of a

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given component, and the duration of the trip. For example, if the probability of a cylinder failure is 1 per 1000 ($P = .001$), and the length of the trip is 100 hours, then

$$\text{Probability for the Trip } (P_{\text{trip}}) = .001 \times 100 = 0.10, \text{ or } 10 \%$$

Severity - This is the effect on the airworthiness on the aircraft, and can be broken down per the following categories:

No Safety Effect – No effect on operational capabilities or crew.

Minor – Slight reduction in functional capabilities and slight increased workload on crew

Major – Significant reduction in functional capabilities and safety, physical discomfort or significant workload increase on crew.

Hazardous – Large reduction in functional capabilities and safety, physical distress or excessive workload on crew impairs ability to perform tasks.

Catastrophic – Complete loss of airworthiness resulting in an immediate landing.

Total risk is a function of both factors, and has an inverse relationship between probability and severity. In other words, it is acceptable to have a relatively high probability of occurrence for a minor severity failure, while it is desirable to have a very low probability for a catastrophic failure.

The following table defines the acceptable risk relationship for this trip. The allowable probabilities are derived from AC 23.1309-1C,

Allowable Relationship between Failure Severity & Probability

Severity of Failure	Allowable Probability for 200 hour trip.
No Safety Effect	No requirement
Minor	.2 (20%)
Major	.02 (2%)
Hazardous	0.002 (0.2%)
Catastrophic	0.0002 (0.02%)

5.0 Risk Analysis

Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
Engine & Prop Related									
	Carburetor	0.07	Hazardous	.002	Yes	Visually inspect at annual, should have less then 800 hrs SMOH	Parts: <ul style="list-style-type: none"> • Rebuilt Carb Docs: <ul style="list-style-type: none"> • Carb IPC • Carb Manual 	Supplies: <ul style="list-style-type: none"> • Silk Thread • Fuel lube (EZ Turn) Tools: <ul style="list-style-type: none"> • Combination Wrenches • Combination wrenches stubby • Combo wrench set, ratcheting & swivel • 1/4" ratchet w/ universal sockets & extensions • 3/8" ratchet with sockets & long extensions • Screw driver, std • Phillips screwdriver, med • Phillips screwdriver, short • Offset Screwdriver • Dikes • Razor Blade • Head lamp 	Dry run removing and installing carb at VSI

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Magneto	.01X.01=.0001	Hazardous	.002	No	Bench test & inspect at annual, should have less than 800 hrs SMOH	Parts: <ul style="list-style-type: none"> • Rebuilt Mag • 3 Drive Discs, 0, +1/32, & -1/32 thicknesses • 3/8" Lock washers (3) Special tools: <ul style="list-style-type: none"> • Time-Rite with R985 scale • Mag synchronizer • Removal and replacement instructions written by Doug & Mark. 	Docs <ul style="list-style-type: none"> • Mag maintenance manual • Mag IPC • Engine maintenance manual Tools <ul style="list-style-type: none"> • Combination wrenches. • Spark Plug wrench, but large & small barrel • Screwdrivers. • 1/4" ratchet set with extensions & universal socket set. 	Dry run removing and installing at VSI. Instructions on repairing at KAH

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Cylinder Ass'y	0.086	Hazardous	.002	Yes	At annual, compression check, bore scope, visual inspection. Should have less than 800 hrs SMOH	Parts: <ul style="list-style-type: none"> • Cyl Ass'y, <u>Bottom</u> • Exhaust & Intake Gaskets, 3503 or equiv. • Cyl base O-Ring • Cyl nuts 110514 (10) • PAL nuts 7635 (10) • SS locknuts for exhaust & intake tube connection (6) Special tools: <ul style="list-style-type: none"> • PWA 1392 Rocker Arm • PWA 1395, Fiber Drift • PWA 1500, Crows foot for intake tube • PWA 1393, Cyl nut wrench • PWA-249D Ring compressor or equiv from Gordon. • PWA 1424 Crows foot for push rod tube • PWA 5630-1 push rod tube tool • Removal and Replacement instructions written by Doug & Mark 	Supplies <ul style="list-style-type: none"> • High Temp RTV silicone gasket maker (Ultra Copper avail from NAPA) • DC-4 Lubricant • C5-A Anti-seize compound Basic Tools: <ul style="list-style-type: none"> • Combination wrench set. • Feeler gage set • Screwdriver • Ratchet, 3/8" drive, extensions up to 15", swivel socket set. Docs: <ul style="list-style-type: none"> • Engine IPC • Engine Service Manual 	Dry run removing and installing at KAH.

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Cyl Hd Studs	.069	Hazardous	.002	Yes	At annual, visual inspection. Should have less then 800 hrs SMOH			Dry run removing and installing at KAH.
	Crankshaft crack, not failure	.017	Hazardous	.002	Yes	We're screwed - Ship engine and mechanic to plane.			
	Starter	.012	Major	.02	No				
	Oil cooler	.082	Major	.02	Yes	Visually inspect at annual, should have less then 800 hrs SMOH	Parts: <ul style="list-style-type: none"> Spare cooler (check to see if Beavs use the same type.) Temp regulator 	Tools: <ul style="list-style-type: none"> TBD Parts: <ul style="list-style-type: none"> Hose, fittings, TBD 	Dry run removing and installing cooler at VSI or KAH
	Oil Temp Regulator	.058	Major	.02	Yes	See above			
	Spark Plugs	.086	Major	.02	Yes	Install fine wire plugs, inspect and clean before trip, fine wire plugs should have < 500 hours		Bring 4 spare plugs, gaskets, and tools. NEED BOTH LARGE & SMALL BARREL PLUGS, LARGE ON FRONT	Remove, gap, install at VSI. Set timing.
	Exhaust ring leaking	.023	Minor	.2	No				
	Tail Pipe	.023	Minor	.2	No				
	Prop Governor	.012	Major	.02	No				
	Prop	.088	Major?	.02	Yes	Thorough prop inspection, prop should have less then 1000 hrs SMOH	Send out new prop & mechanic from Seattle if req'd	Tools: <ul style="list-style-type: none"> Metal files Docs <ul style="list-style-type: none"> Prop Manual 	

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
Fuel System	Fuel tanks leaking	0.07	Major	.02	Yes	Thorough visual inspection		Supplies: <ul style="list-style-type: none"> Two-part fuel tank sealant caulking-ay it up with a bit of fabric reinforcing tape. Bring spare hoses, fittings, & clamps. Docs: <ul style="list-style-type: none"> Beav IPC Beav maintenance manual Tools <ul style="list-style-type: none"> Basic 	
	Tip tank leaking	.035	Major	.02	Yes	Thorough visual inspection		See above	
	Fuel Primer Manual	.023	Minor	.2	No				
	Valve, Tip tanks	.0035	Major	.02	No				
	Valve, main fuel	.07	Major	.02	Yes	Install STC'd Andair Valve?	Parts <ul style="list-style-type: none"> Main fuel valve 	Tools: <ul style="list-style-type: none"> Basic Docs <ul style="list-style-type: none"> Beav IPC Beav Maintenance Man Parts: <ul style="list-style-type: none"> Hose, clamps Hose Repair tape such as fiberglass or Rescue Tape 	

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Fuel Pres Switch	.047	Minor	.2	No				
	Fuel Level Xmitter	.047	Minor	.2	No				
	Fuel Pump Main	.058	Minor because of back up wobble pump*	.2	No	Add back-up electric fuel pump in Mark's plane?			*N67DN has back up electric pump, add to Mark's plane?
	Fuel Pump aux elect	.035	Minor	.2	No				
Controls	Elevator soft failure	.012	Minor	.2	No				
	Elevator cable soft failure	.023	Minor	.2	No			Parts: <ul style="list-style-type: none"> • 10' 5/32" cable • 10' 3/32" cable • 10' 1/16" cable • (4) cable clamps 3465T11 • (4) cable clamps 3465T12 Tools: <ul style="list-style-type: none"> • Cable cutter 	
	Flap actuator	.023	Major	.02	Yes	Visually inspect, should have less than 500 SMOH	Parts: <ul style="list-style-type: none"> • Flap actuator 	Docs: <ul style="list-style-type: none"> • Beav Maintenance Man. Supplies: <ul style="list-style-type: none"> • 5606 hydraulic fluid 	Review R&R instructions in manual

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						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Flap Pump	.035	Major	.02	Yes	Visually inspect, should have less than 500 SMOH	Parts: <ul style="list-style-type: none"> Flap Pump 	Docs: <ul style="list-style-type: none"> Beav Maintenance Man. Supplies: <ul style="list-style-type: none"> 5606 hydraulic fluid 	Review R&R instructions in manual
Electrical Systems	Master Solenoid	.047	Major	.02	Yes	Visually inspect, should have less than 1000 hrs since new.		Parts: <ul style="list-style-type: none"> Solenoid for master or starter Tools <ul style="list-style-type: none"> DVM Wire cutter/stripper Supplies: <ul style="list-style-type: none"> Wire Ring Terminals Electrical tape 	
	Starter Solenoid	.023	Major	.02	Yes	Visually inspect, should have less than 1000 hrs since new.		See Above	
	Master Switch	.012	Major	.02	No			None req'd, but bring spare switch	
	Mag Switch	.012	Major	.02	No			None req'd	

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Aircraft System	Failure	Probability	Risk Severity	Allowable Probability	Mitigation Req'd?	Mitigation			
						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Alternator	.058	Major	.02	Yes	Inspect drive bushings every 250 hrs. Alternator should have less than 1000 hrs since new or rebuild.	Parts: <ul style="list-style-type: none"> • 7555T 24V 50A ALTERNATOR • J12M24SP CONTROLLER Documents: <ul style="list-style-type: none"> • Jasco alternator trouble-shooting guide 	Tools: <ul style="list-style-type: none"> • Ignition wrenches • Combo wrench set, ratcheting & swivel • Crescent wrench, Med • Screwdrivers • 3/8" Ratchet, extensions, universal sockets • Crowfoot wrench set • Extension Mirror • Light • Fuel Lube • DVM • Wire cutter/stripper Supplies: <ul style="list-style-type: none"> • Wire • Ring Terminals • Electrical tape 	R&R at VSI
	Voltage Regulator	.047	Major	.02	Yes	Regulator should have less than 1000 hrs since new.	See Above	See above	R&R at VSI
	Battery	.28	Major	.02	Yes	Install new battery before the trip. Install aux. power receptacle on Beavs., NOTE: Does Mark's Beaver have aux pwr connection		Jump cable (aux connector to clips) so we can remove battery from one plane and jump the dead battery through the aux connector.	

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						Preventative Maintenance	Special Tools & Parts to be staged in Seattle	Parts, docs, and tools to be taken on board	Training
	Landing Lamp	1	Minor	.2	Yes	Install new HID lamps before trip			
Instruments & related systems	Engine 3 in 1	.035	Minor	.2	No				
	Vac. Gage	.012	Minor	.2	No				
	Airspeed Ind	.023	Minor	.2	No				
	Altimeter	.0012	Minor	.2	No				
	Attitude Ind.	.047	Minor	.2	No				
	DG	.105	Minor	.2	No				
	Vac Pump	.035	Minor	.2	No				
	Cyl Hd Temp	.012	Minor	.2	No				
	Man. Pres	.082	Minor	.2	No	None req'd, mark throttle label w/ approx settings			
	Tach	.012	Minor	.2	No	None req'd mark prop control label w/ approx settings			
	Turn Coordinator	.035	Minor	.2	No				
	Carb Heat Gage	.012	Minor	.2	No				
Floats						Full inspection		Bring sheet metal patch kit, cable patch kit, spare pump-out plugs.	