

Loss of Electrical System over the Rocky Mountains: And that was the Good News!

17 January, 2024
VASI Meeting, Venice, FL

Jack Henion

Family Ercoupe on the Farm in the 1950's

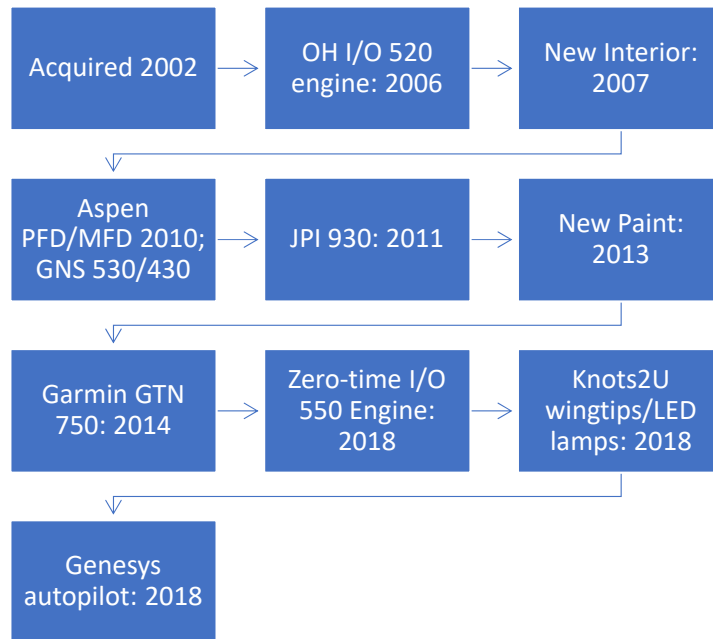


1979 Cessna 210N Model



Engine and Equipment Status for N5379A

Installations/Upgrades



TCM IO 550 Tuned-Induction Engine



New Interior and Panel



Duncan Interiors, Lakeland, FL



New Paint: 2013



Scheme Designers, and KD Aviation, Inc. KSWF

'Cover Girl': CPA Cover story in 2016



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The
consumer
resource for
pilots and
aircraft
owners

The Aviation Consumer[®]

USED AIRCRAFT GUIDE

Cessna 210

With decent payload, respectable cruise speed and good support, all Centurions are up in value.



That's a 1979 210N wearing a handsome Scheme Designers paint scheme. The pod under the right wing houses a weather radar.

and one that can verify all of the ADs have been complied with.

While many airplanes are draggy or underpowered enough that speed mods are marketable options,

Scheme Designers
Mr. Craig Barnett, Owner

The Aviation
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Course – Jackson, TN 2023

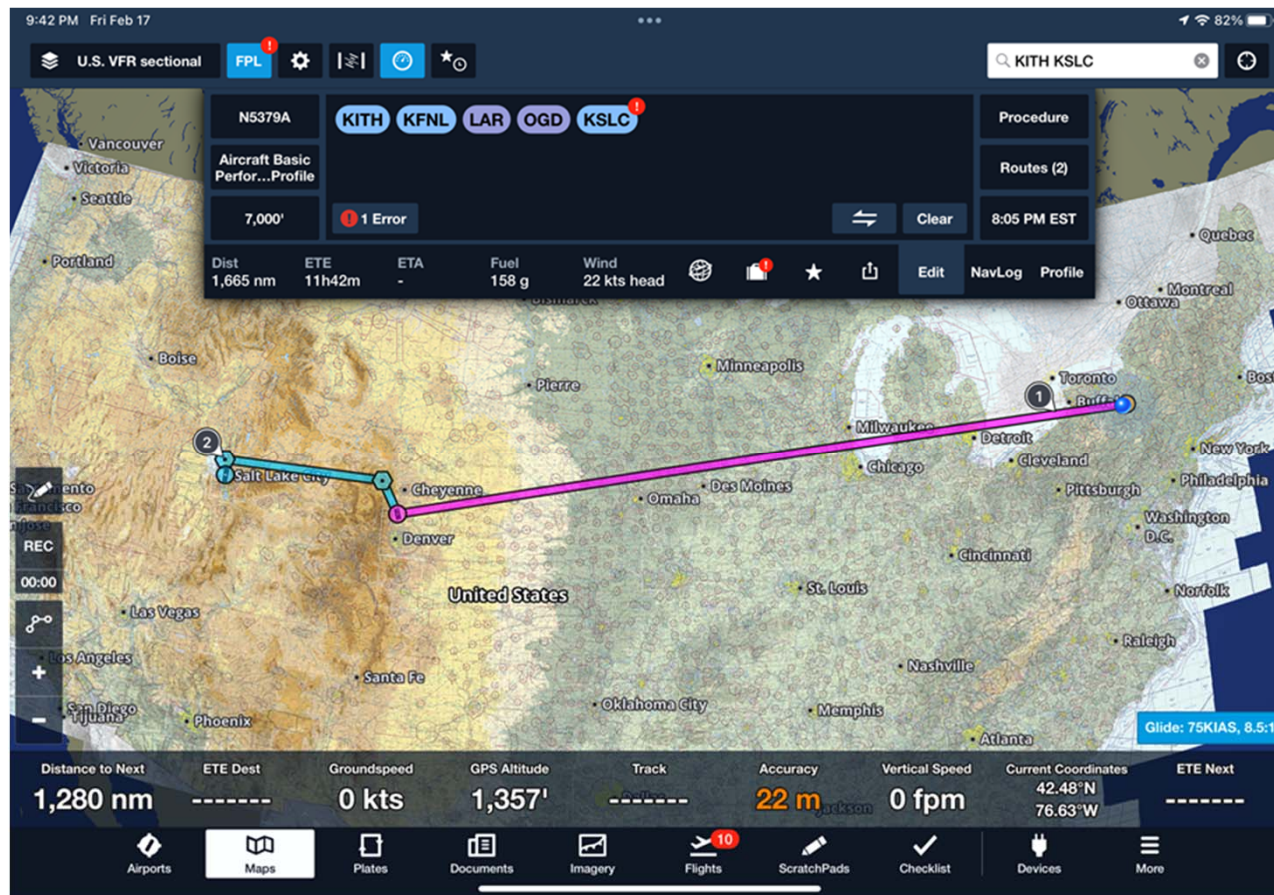


210 (1972 and
later) Systems and
Procedures
Course – Jackson,
TN 2023

\$1,025.00

Pr

The Opportunity: Fly to Salt Lake City for a BOD Meeting June, 2021: All expenses paid



Overnight Stay with Friends in Loveland, CO

The view out their window to the West



Departure for KSLC June 28, 2021

Northern Route as MEA's are a bit lower



MEA's directly west 16,000; MEA's Northern route 10,000

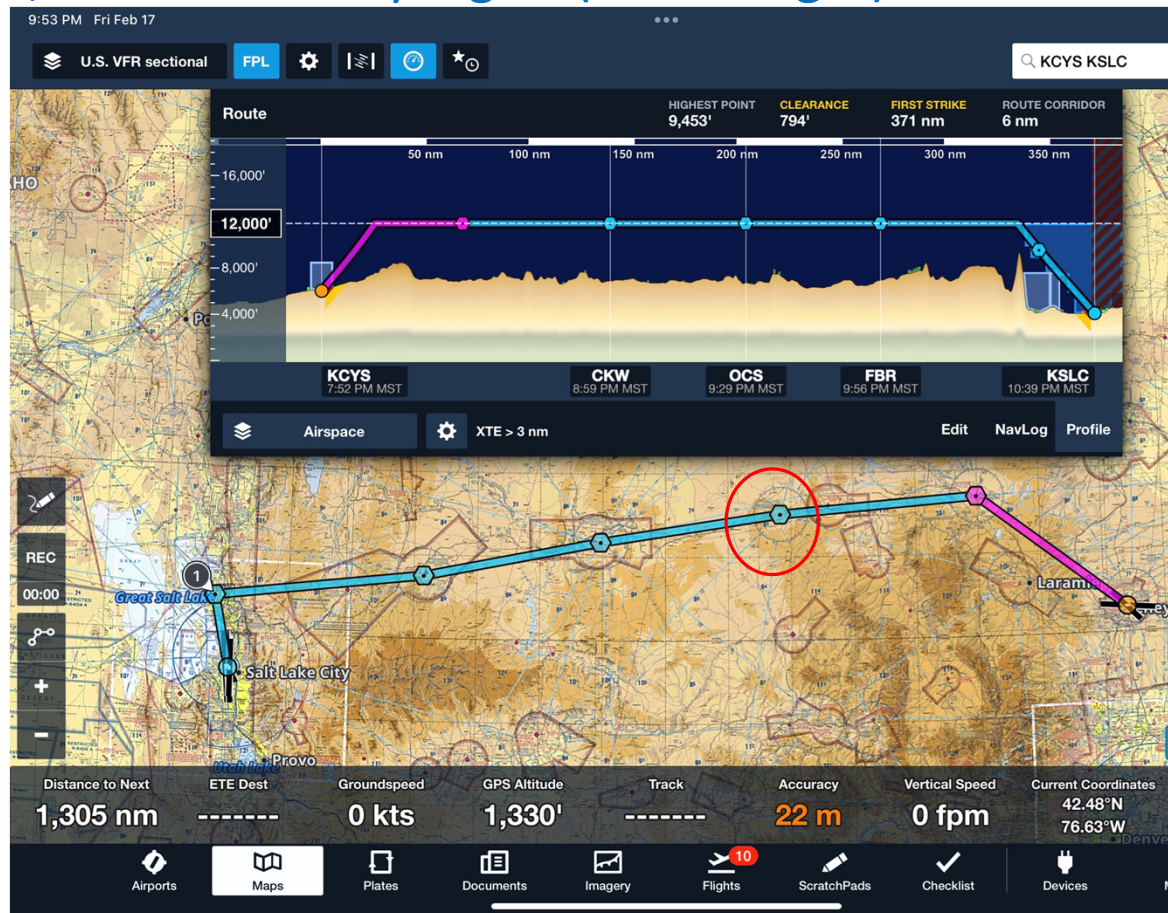
Landed at Cheyenne, WY to Resolve an Oxygen Problem

- While climbing to 12,000 ft after departing from KFNL I noticed a major oxygen leak in my on-board oxygen tank valve
- Since I would be at 12,000 for nearly 2.5 hours, I decided I needed to repair my oxygen supply
- Landed at Cheyenne, WY airport, KCYS, and found limited maintenance facilities
 - I asked ATC to hold my IFR flight plan until I continued on; no problem
- A mechanic was called in from home and together we repaired the oxygen valve
- I departed KCYS for KSLC not knowing about the next problem I would have!



Continued Flight from Cheyenne, WY to KSLC

Climbed to 12,000 for an 'easy flight' (so I thought) to KSLC



After reaching 12,000 ft I suddenly saw this and major discharge on the JPI 930 EDM alternator meter

PFD



MFD



JPI 930 EDM immediately showed alternator failure



This arrow dropped into the red!

Issues to be dealt with:

- **Reported electrical failure to Denver ATC**
 - One soul on board (SOB), plenty of fuel, not an emergency (so I thought)
 - The engine was running fine, VFR conditions, so I advised of return to KFNL
 - Denver ATC gave me their phone number to call upon landing
 - Turned off all electrical components except for GTN 750 NAV/COM
 - Headed back direct to KFNL using iPad Foreflight
- **Turned on ICOM hand-held radio to KFNL and Denver ATC**
 - ICOM did not have exterior antenna, so transmission/reception failed until within about 5 miles of KFNL
- **Panel went dark (everything off) within 10 min**
- **Denver asked if I wanted to land at Laramie, WY**
 - I declined because it was VFR and engine was running ok
 - And I feared limited maintenance services
 - **Should I have declared an emergency?**
 - **Probably but I did not know about my larger problem of metal in the engine**



Landing at KFNL: Northern Colorado Regional

Within 5 miles of KFNL my ICOM transmission was acknowledged by the 'remote tower' at KFNL

KFNL had one of the first 'remote towers' in the US!

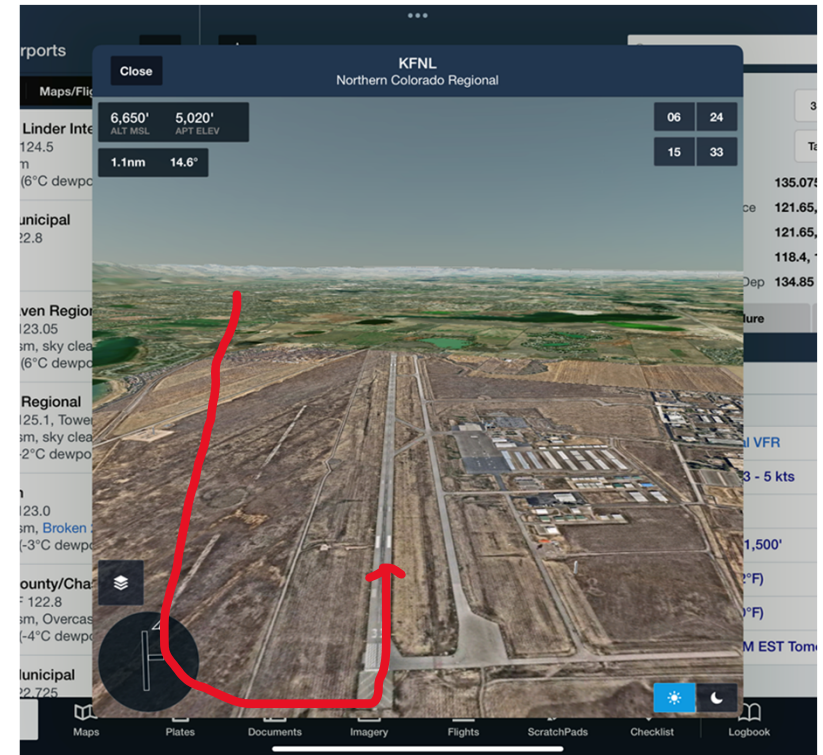
This 'remote tower' was recently decommissioned.

I Hand-pumped the landing gear down

Landed with no flaps as they are electrical

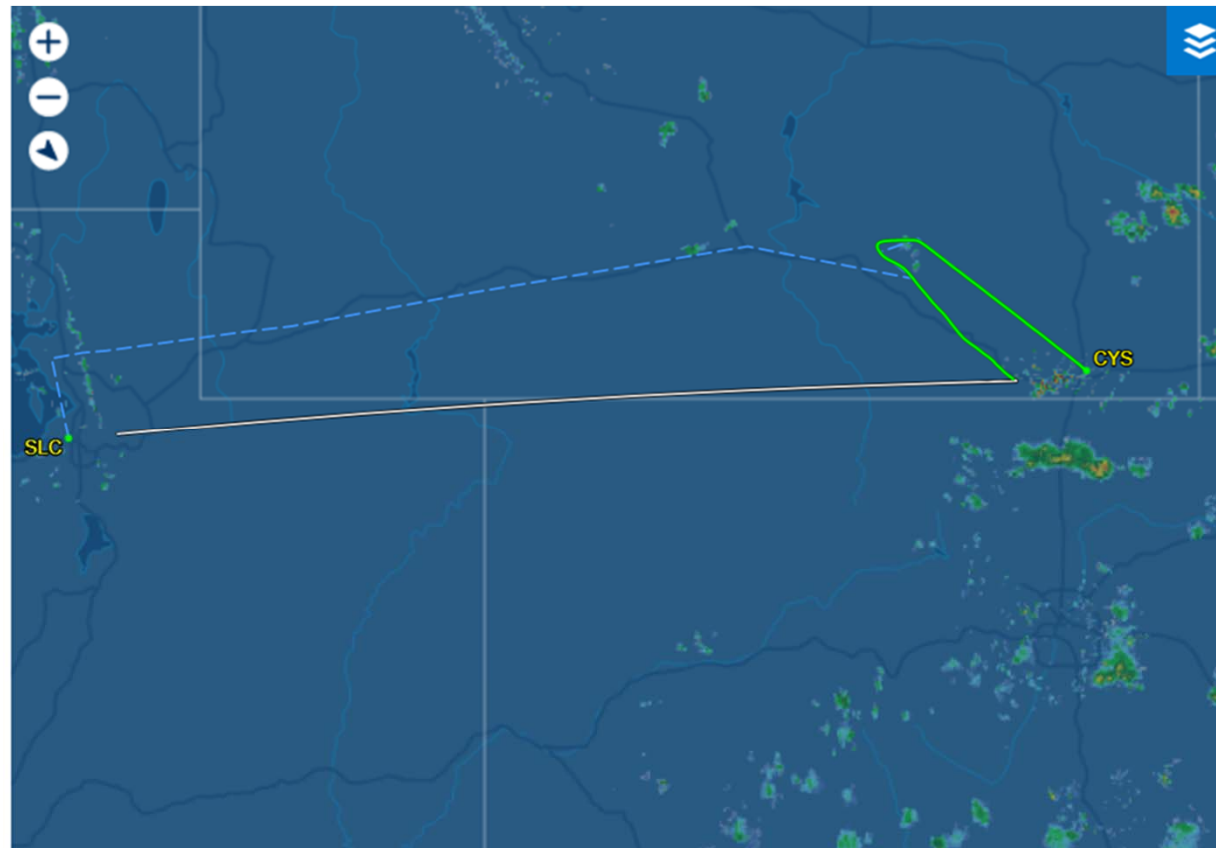
Touched down at the mile-high KFNL airport at about 100 kts ground speed

Taxied to the FBO ramp and called Denver ATC that 'all was fine' (so I thought) and thanked them for their help



Runway 15-33: 8,500 ft
Airport Elevation: 5020 ft

Flight Aware Record of my Return to KFNL



Professional Aircraft Services (PAS)

Excellent maintenance shop on the KFNL Field



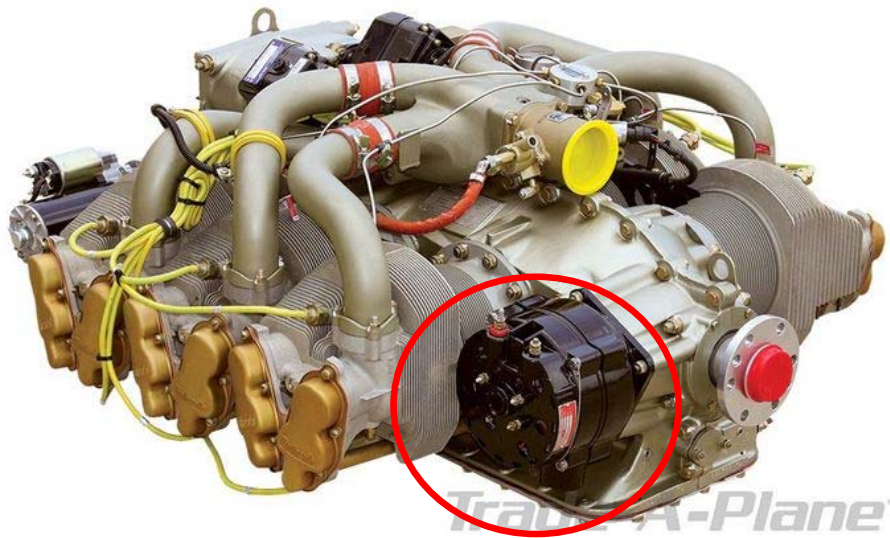
I assumed all I needed was a new Direct Drive Alternator

Overnight delivery, cost: \$2,800.00

- Met with PAS shop owner/manager, Larry Hallock
- Aircraft admitted to his maintenance shop
- Alternator was removed while a new one was ordered for overnight delivery
- But when alternator was removed it was discovered the engine was full of metal pieces.

Direct Drive vs. Belt-Driven Alternators

Direct Drive Alternator
IO 550 Engine



Belt-Driven Alternator
Skylane O 470 Belt-Driven Alternator



Removal of Direct-Drive Alternator while I was there

Noticed the Alternator Drive Gear was missing its Cotter pin and was Loose!

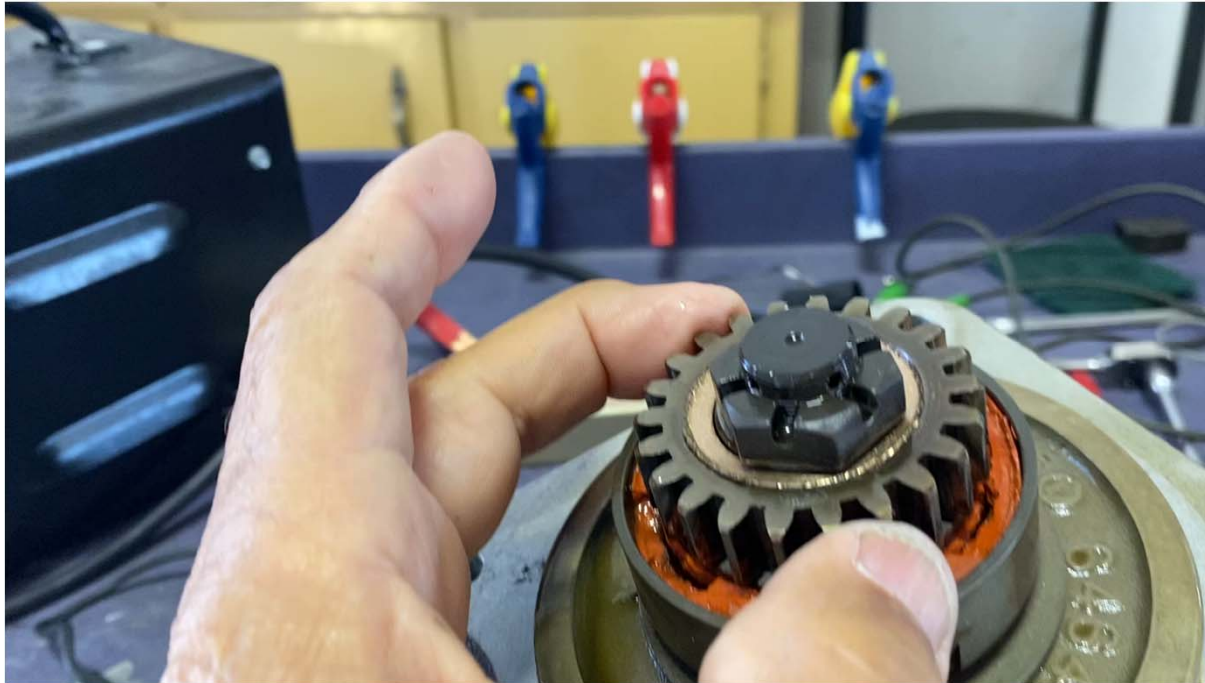


No Cotter Pin

What it should look like with with Cotter Pin in Place



IO 550 Direct Drive Alternator Gear

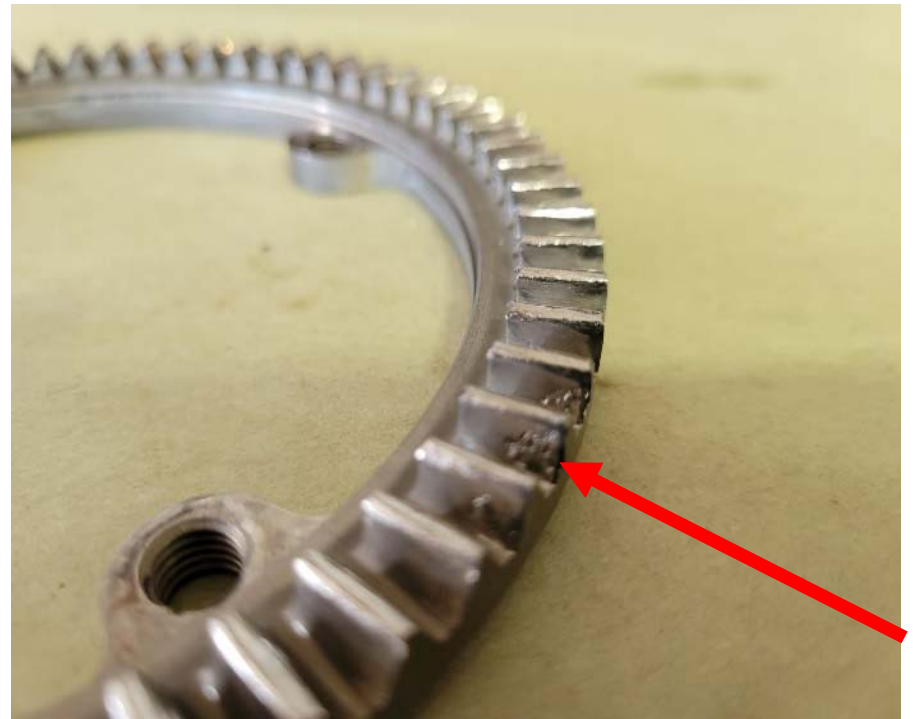


Four Loose bolts on Crankshaft Face Gear!

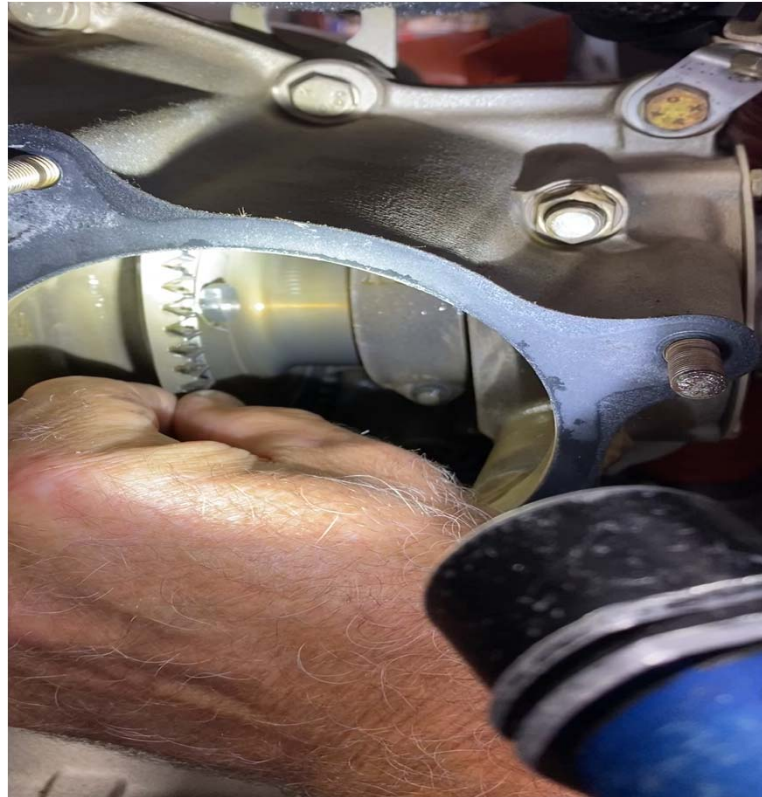
Loose Bolts



Damage to Face Gear Teeth



IO 550 Crankshaft Face Gear

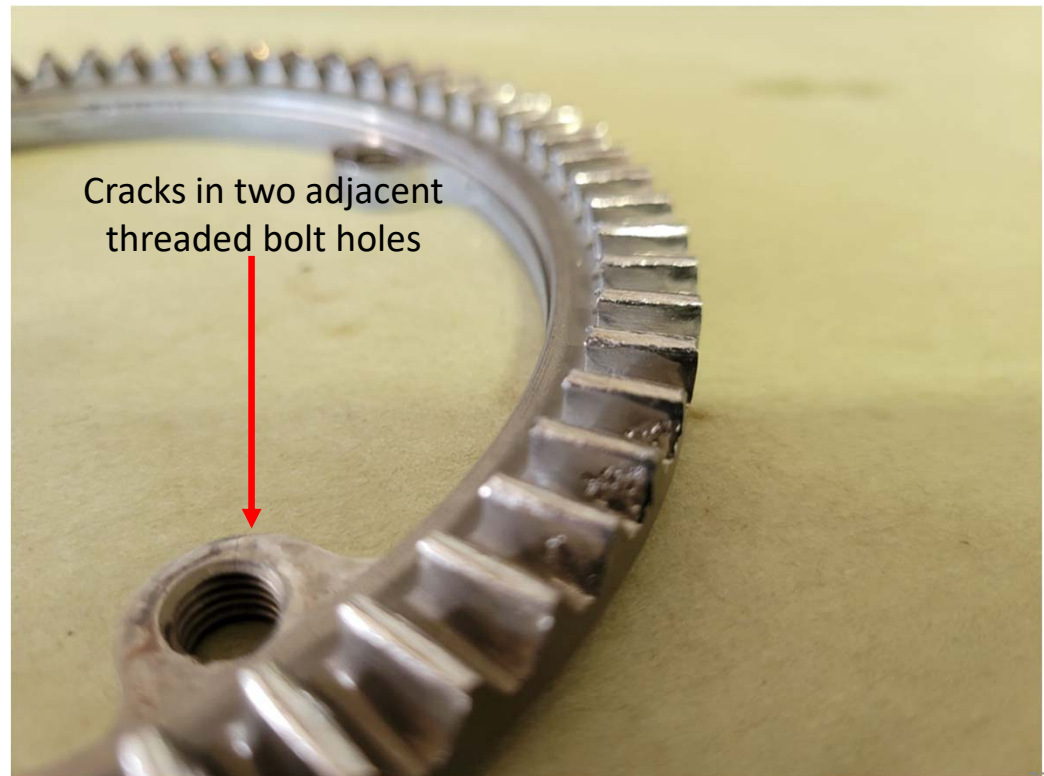


Damaged Face Gear Removed from Crankshaft

Face Gear Removed from Crankshaft



Crack in two of the Threaded Bolt Holes



Oil was Drained into Screen to Reveal Metal and Elastomer Pieces

Metal and Elastomer Pieces in Oil Screen



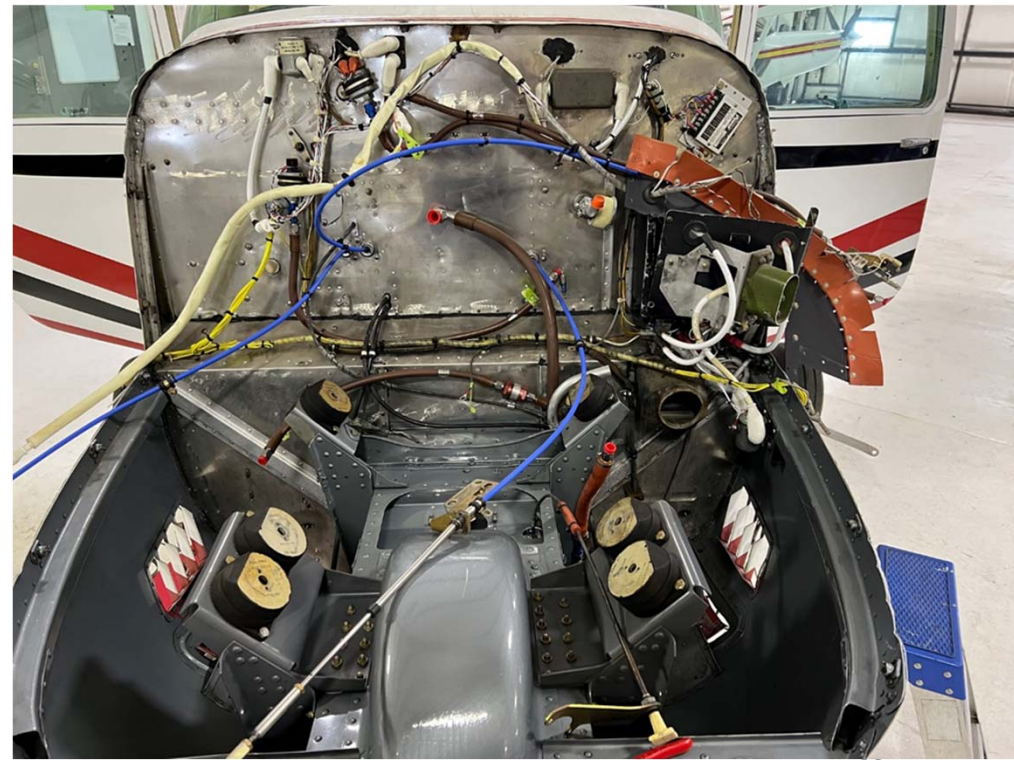
Metal Pieces from Oil Attracted to Magnet



Cotter Pin Found in Crankcase and Metal in Oil Filter



Engine was removed and delivered nearby to 'The New Firewall Forward Shop' to 'Repair' it



My Airplane 'waiting' for its Repaired Engine in a Rented Hangar for 11 Months

Sandbags added to keep the nose down in the absence of the engine!



While the C-210 was grounded....

I still had my 1966 Cessna Skylane while the repairs and paperwork commenced



FAA Malfunction or Defect Report

Department of transportation, FAA

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION				OPER. Control No.	8. Comments (Describe the malfunction or defect and the circumstances under which it occurred. State probable cause and recommendations to prevent recurrence.)	DISTRICT OFFICE	OPERATOR DESIGNATION						
MALFUNCTION OR DEFECT REPORT				ATA Code									
Enter pertinent data				1. A/C Reg. No.									
2. AIRCRAFT	MANUFACTURER	MODEL/SERIES	SERIAL NUMBER	N-	Pilot/Owner, John D. Henion, was on an IFR flight plan from Cheyenne, WY (KCYS) to KSLC at 11,000 ft. About 10 miles West of Medicine Bow (MBW) VOR the pilot noticed red flags on the Aspen PFD/MFD avionics as well as red discharge voltage and amperage signal indications on the JPI 930 engine monitor. The pilot immediately informed Denver Center of an electrical failure and received a clearance to return to KFNL via Laramie/V-4/Bargr/ intersection/KNFL. The pilot immediately turned off the Genesys 3100 autopilot and all other avionics except the GTN 750 Nav/Com. The pilot reported plenty of fuel and no passengers to Denver Center and continued towards KFNL via the above indicated route. Denver ATC advised the pilot that the KFNL tower would be advised of the emergency situation and protect that airspace for his landing. Shortly after passing the LAR VOR the pilot observed the GTN 750 turning to a black screen with lost radio communication with Denver Center. The pilot used his ICOM hand-held radio which he attached to his Lightspeed headset and turned to the Denver Center frequency. The pilot continued radio calls to Denver to no avail. The pilot finally made radio contact with KFNL tower as he entered left downwind on RWY 33 and made a safe landing at KFNL. The pilot met with Larry Hallock of PAS to make arrangements for repairs.	OTHER	COMPUTER	FAA	MFG.	AIR TAXI	MECH.	OPER.	REP. STA.
3. POWERPLANT	Cessna	210/N	210 63403										
4. PROPELLER	IO 550	R-10550P3B	1034137										
	Hartzell	PHC-J3YF/F7691	FP8845B										
5. SPECIFIC PART (of component) CAUSING TROUBLE					<i>Optional information:</i> <input type="checkbox"/> Accident; Date _____ <input checked="" type="checkbox"/> Incident; Date 28 June 2021	SUBMITTED BY:	TELEPHONE NUMBER						
Part Name	MFG. Model or Part No.	Serial No.	Part/Defect Location.										
Alternator/Clutch assembly	TCM R 649305;		Bolted to front of engine										
6. APPLIANCE/COMPONENT (Assembly that Includes part)													
Comp/Appl Name	Manufacturer	Model or Part No.	Serial Number										
Alternator clutch assembly	TCM	24 V, 100 Amp	017CAO57R										
Part TT	Part TSO	Part Condition	7. Date Sub.										
430 hours	??	gear shaft badly worn and crank gear loose	30 June 2021										

e mails and Phone calls to Continental.....

- First response was 'it is out of our 18-month warranty and is not covered'
- I sent detailed photos of the missing cotter pin and associated photos
 - I also referenced the SAIB (Special Airworthiness Information Bulletin) that documented a fatal crash due to the same cause (see next slide on this)
- TCM asked if anyone had removed the direct drive alternator since engine installation?
 - I sent my scanned engine log books which showed the alternator had not been removed
- Has the aircraft had regular annual inspections?
 - I sent scanned copies of both aircraft and engine logs documenting regular annual inspections from a Sarasota Avionics, reputable shop

SAIB NE-18-16: Fatal A-36 Bonanza Crash

SAIB = Special Airworthiness Information Bulletin

June 20, 2018: [three years earlier!](#)

- Background
- This SAIB is prompted by a June 28, 2015, fatal accident in Plainville, Massachusetts involving a Beechcraft A36 airplane with an IO-550 engine installed. The National Transportation Safety Board (NTSB) accident investigation report (ERA15FA254) “revealed that the alternator drive coupling had failed, which resulted in damage to other internal engine components and ultimately resulted in a catastrophic engine failure due to a lack of oil lubrication.” The NTSB report goes on to say, “Either an out-of-tolerance coupling or an improperly installed one can result in insufficient clamping force holding the coupling against the alternator. If there is insufficient clamping force, the coupling can rotate on the shaft and cause unusual wear and the ultimate failure of the coupling.” The NTSB report is available at: <https://app.nts.gov/pdfgenerator/ReportGeneratorFile.ashx?EventID=20150628X90626&AKey=1&RType=Final&IType=FA>.
- In the accident engine, the unusual wear of the coupling led to the introduction of metal particles and elastomer material into the engine oil system.

Do I Need a 'Plan B' Cost Reimbursement Plan?

- While struggling to get TCM to agree to pay for my costs I decided to approach Avemco, my aircraft insurance company, in the event TCM did not agree to help
- I provided exactly the same documentation of photos and explanations to Avemco and asked if they would cover my costs if TCM would not
- Avemco agreed to cover all costs if TCM would not!
- I advised Avemco to 'stand by' and I would advise them of TCM's response.

Finally a Continental Letter of Commitment

- 18 Aug 2021
-
- Jack,
-
- Good morning. I enjoyed our phone conversation this morning. As we discussed, Continental will compensate for the engine removal and replacement per our warranty labor allowance. This is 29 hours with an additional 3 hours for multi probe EGT/CHT.
-
- We will also provide the parts that The New Firewall Forward will need to repair your engine. Jerry Doyle will need to get a list of parts required to us and we will have the parts shipped. After we inspect the crankcase we will ship it back if it is determined to be airworthy.
- You mentioned that you had already purchased a replacement alternator drive hub. Send us the invoice for compensation.

Thank you,

Mark

I then contacted Avemco to thank them and to tell them that TCM had agreed to cover my costs!

My engine 'repaired' and reassembled 11 months Later



New Direct
Drive
Alternator



Aeroshell Piston Engine Oil, Mineral lube oil
for engine break-in for flight home

Continental ACH Payment for removal and reinstallation labor of the engine by PAS

TCM Provided all needed parts

CONTINENTAL AEROSPACE TECHNOLOGIES

04/21/2022

ACH Payment Detail

JOHN HENION (916342)

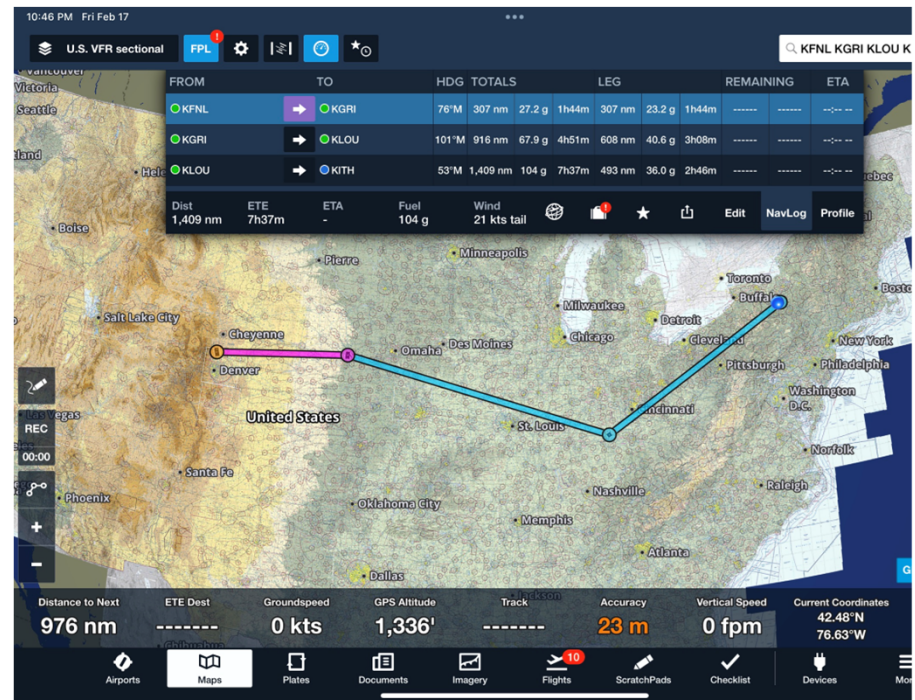
Payment Date: 04/22/2022 Net Payment: 11,869.47

<u>Vchr No</u>	<u>PO No</u>	<u>Invoice No</u>	<u>Invoice Dt</u>	<u>Due Dt</u>	<u>Invoice Amt</u>
716982		1034137/7720898	04/14/2022	04/14/2022	11,869.47

Net Payment: 11,869.47

Test Flight and Return Home to Ithaca

- Larry Hallock agreed to join me with the first test flight
 - One hour circling the KFNL airport
 - No leaks, all indications normal
- I departed for Ithaca making two stops instead of one enroute due to running the engine hard for break-in with higher fuel consumption
 - Oil: Aeroshell 100
 - RPM 2450
 - MP 2400
 - GPH = 22 ROP vs. 12 LOP normally



One Year After the Incident

Finally Back Home



Public Reports of this Incident

- I.L.A.F.F.T.: Avemco Sponsored Podcast by Rob Reiders

Story No. 44

- <https://podcasts.apple.com/us/podcast/44-more-than-just-an-alternator/id1544875746?i=1000581161397>

Published Reports of this Experience

Published mainly to alert other pilots of this IO 550 fault

November 2022 Flying Magazine



January 2023 CPA Magazine



Lessons Learned

- Always monitor and be alert to your aircraft's systems while in flight
- React calmly, promptly and efficiently to a system failure
- Fly the airplane!
- Communicate with ATC
- Be reasonable, honest and fair with maintenance shops and its personnel
- Work cooperatively and reasonably with aircraft system providers
 - Systematically and honestly document evidence for the source of the problem
 - TCM demonstrated its integrity with parts and labor cost reimbursement
 - Avemco paid for a year's hangar rent and some additional costs
 - PAS showed integrity, commitment and a sense of urgency throughout the ordeal
- The New Firewall Forward engine shop did the engine repair in an efficient and timely manner and worked in concert with TCM regarding the request and supply of engine parts
- Monitor SAIB's, AD's, etc. to be aware of problems already reported

After all this, a new AD for my 'repaired" IO 550 Engine!

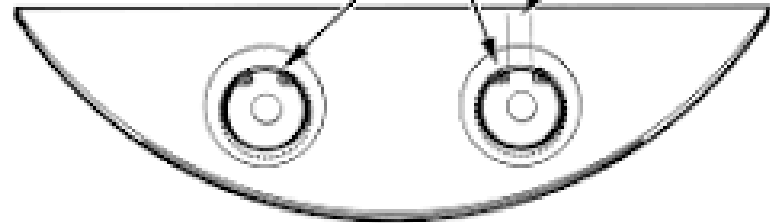
- Docket No. FAA-2023-0172; Project Identifier AD-2023-00265-E; Amendment 39-22355; AD 2023-04-08
- RIN 2120-AA64
- This AD and final rule is effective February 23, 2023 and affects **any crankshaft assembly on a Continental Engine**. Due to improper installation of the counterweight retaining rings during manufacture loosening of a counterweight retaining ring may result in the loss of retention of the counterweight. If not addressed, the condition could result in catastrophic engine damage and possible engine seizure.
- An inspection of the crankshaft is required prior to further flight or a ferry permit must be obtain to fly the aircraft to a place where the inspection can be performed.

What is a Retaining Ring? (sometimes called a 'Circlip)



INSTALL RETAINING RING EARS TOWARD THE CRANKSHAFT CENTERLINE AS SHOWN

MINIMUM GAP BETWEEN RETAINING RING EARS - 0.212 INCH



GTS10-520 COUNTERWEIGHT RETAINER PLATES HAVE A 0.0037 TO 0.0062 LOOSE FIT IN THE COUNTERWEIGHT RETAINER PLATE BORE



Is My Engine Affected by this AD?

- The New Firewall Forward shop that ‘repaired’ my IO 550 engine provided written documentation which was entered into my engine logbook that they properly installed the crankshaft counter weights
 - Whew! My AD is satisfied
 - Was this whole alternator incident a blessing in disguise?

Page 1 of 1


N5379A

03/02/2023

AD Compliance Report

Engine - Continental Motors - IO-550-P

S/N: 1034137

AD #	Subject	Date and Hours at Compliance	Recurring Yes/No	Next Due Date/Hours
2023-04-08	Counterweight Retaining Rings	4/18/2022 Hobbs.3607.9	No	
Description:	Engine - Continental Motors - IO-550-P	Category:	Engine	
Component:	Engine - Continental Motors - IO-550-P	Mechanic name:	Glenn Trostel	
Effective Date:	February 23, 2023	Certificate #:	3200072	
Supersedes:	N/A	Authorized Sign.:		
Superseded By:	N/A			
Compliance:	C/W para (j), actions performed before the effective date of this AD referencing Continental Maintenance Manual Publication M-0, Section 10-9.1 (per MSB23-01A). No further action necessary.			
Notes:	Reference: Crankshaft P/N: R-649900M010, S/N: N05BA111), and The New Firewall Forward Engine Repair Order #11565, dated 4/18/2022.			

Additional Lessons Learned for FAA Regulations and Insurance Carrier

- Continental had to be satisfied with my maintenance records
 - Maintain required FAA documentation
 - Annual inspection documentation
 - Ensure compliance with AD's and Service bulletins
- Avemco required
 - Current medical documentation
 - Current flight review documentation
 - Current payment of insurance premium
 - Satisfactory history of non-major claims

In Summary: Why This Title?

**“Loss of Electrical System over the Rocky Mountains:
And that was the Good News!”**

**If the alternator had not failed, I would have continued flying West and
likely had a forced landing in the
Rocky Mountains**

Or

**Perhaps the AD about the counterweights on my IO 550 engine would
have materialized and caused an engine failure!**

Questions?

Henion Family of Airplanes

