

Scott Arnold

From: [REDACTED]
Sent: Wednesday, October 9, 2019 8:36 PM
To: 'Bob Jackson'
Subject: N2XF Governor/Prop Testing Report

Hi Bob,

Upon receiving the governor(MT Propeller Governor Model P420-023, Serial 03116 last overhauled Oct 20, 2014)- we performed an operational function test. The governor performed within operation parameters. Upon disassembly, governor was visually inspected with no defect noted. A functional test was performed on 4 bladed MT propeller. Propeller noted to be functioning within normal limits.

Let me know if you need any additional information.

Thank you,

[REDACTED]
Air Prop Specialists, Inc
[REDACTED]

From: Bob Jackson [REDACTED]
Sent: Wednesday, October 9, 2019 9:12 AM
To: [REDACTED]
Cc: [REDACTED]
Subject: FW: Red Prop Color + Governor/Prop Testing Report

Good Morning Chris,

I had a good talk with (the other) Chris yesterday, and it sounds like the hub is in good shape and that the red color shouldn't be a problem, especially with the prop in the back! I think the glossy polyurethane will be a lot easier to clean up, and it's a color I can patch when needed.

I would appreciate your summary of the prop governor test, disassembly, and the testing with did of the prop operation whenever you can get it written up so I can close out the discussion with the FAA.

Thanks,
Bob

From: Bob Jackson (JaxTech) [REDACTED]
Sent: Monday, October 7, 2019 3:22 PM
To: [REDACTED]
Cc: 'Bob Jackson'; [REDACTED]
Subject: Red Prop Color + Governor/Prop Testing Report

Hello Chris,

On second thought I would like to paint the overhauled MT 3-blade prop for my Velocity with AWL Grip Polyester Urethane topcoat gloss in their Vivid Red (G7367) color:



which is a two part poly-urethane paint. I think it's available online or at any PPG or Marine supply paint store. I believe it required the G3010 converter, and can be thinned for spraying with the AWL Grip T0003 (or other) reducers.

The color card with the Vivid Red (G7367) color that matches our plane is attached.

Also, it would be helpful if you could get me the brief write-up on the results of our Bench Testing, disassembly and prop testing that we did to me in the next day or so.

Thanks,
Bob Jackson

Scott Arnold

From: Bob Jackson [REDACTED]
Sent: Thursday, January 9, 2020 10:46 AM
To: Scott Arnold
Cc: [REDACTED]
Subject: N2XF Overspeed Incident - Root Cause Analysis
Attachments: N2XF Governor/Prop Testing Report

[CAUTION] This email originated from outside of the organization. Do not click any links or open attachments unless you recognize the sender and know the content is safe.

Good Morning Scott and Happy New Year to you!

Last year on Sep 3, 2019 I had an overspeed incident climbing out of Grand Junction with my Experimental Velocity (N2XF) that necessitated an emergency landing at the Mack Mesa (10CO) airport. I believe you gave the incident the following NTSB tracking # CEN19LA313.

Enclosed below is the Root Cause analysis that we have performed.

Attached is a copy of the Air Prop Specialists, Inc. propeller and propeller governor bench testing report. Their testing of the governor and propeller itself revealed that both are still operating normally, as verified on their MT test bench. After the successful bench testing, a complete tear down inspection of the governor also revealed no damaged internal parts, metal shavings, or any other evidence of failure.

The root cause of the incident has been determined to be a mechanical failure of the electronic ignition timing plate, which stopped normal engine function and indirectly resulted in the engine overspeed.

Description of Overspeed Incident

While climbing out on a cross country leg in my Experimental Velocity, N2XF, from the Grand Junction, KGJT airport, and while passing through 15,000' MSL and without provocation, I suddenly experienced an engine overspeed over 2700 rpm for about six seconds, including up to ~3450 for about 3 seconds. The engine was not producing power sufficient for continued flight after the overspeed, and most likely not even during the ten second period preceding the overspeed (as seen from the engine monitoring data and in the analysis discussion below).

I was able to land safely at the (private) Mack Mesa (10CO) airport, from where we removed the wings and canard and trucked the airplane back to our hangar at the Orlando Apopka, FL airport (X04) for repair.

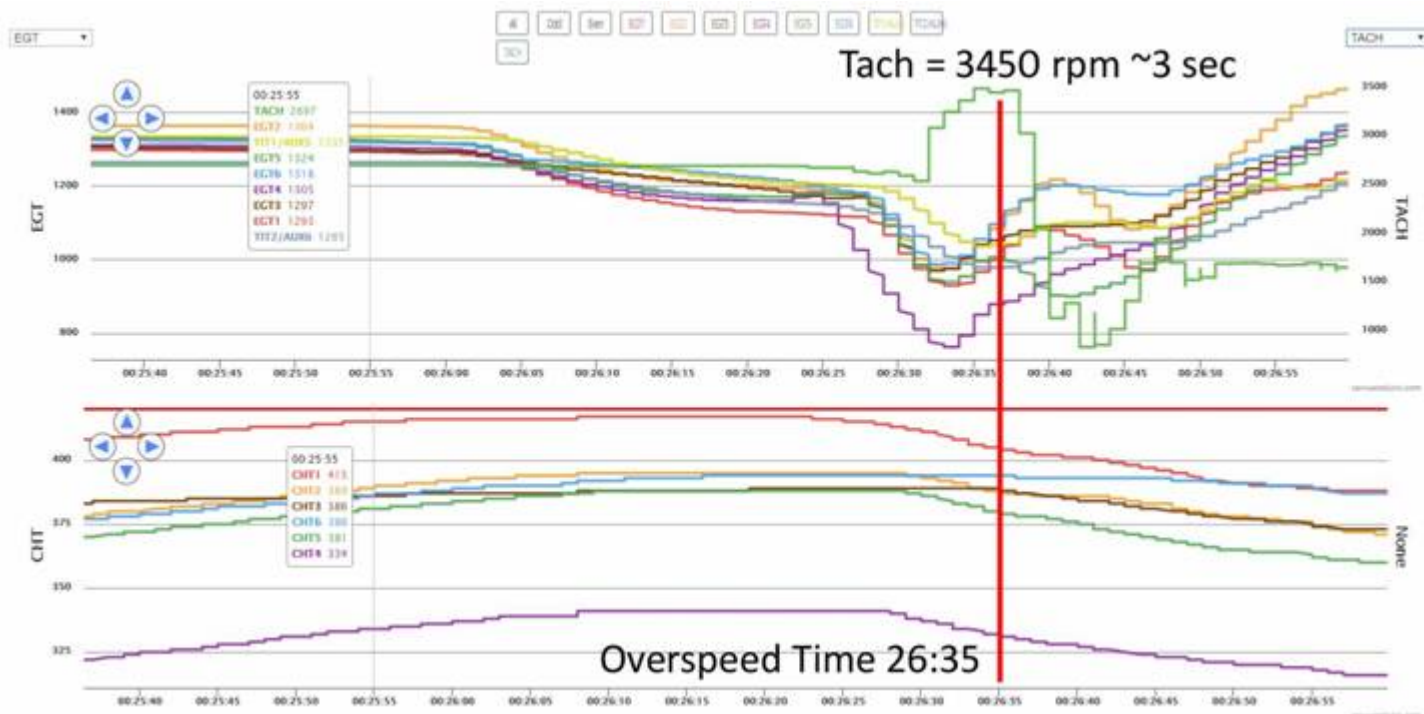
Overspeed Root Cause Analysis

Air Prop Specialists, Inc. of Marianna, FL recently performed full post incident bench testing of the MT propeller governor and propeller mentioned above. The bench testing and a subsequent full tear down inspection of the governor verified that both the propeller and governor are still operating normally and are therefore not the direct cause of the overspeed incident.

Post flight visual inspection of the N2XF engine compartment, revealed that the only visible engine component damage apparent was to the electronic timing magnet trigger ring (that spins with the propeller), and to the two Hall Effect timing pickup sensors that are fix-mounted to the engine crankcase.

Close analysis of the engine monitoring data traces (like the one included below) indicates that the damage to the electronic ignition timing disk and timing sensors discovered on post flight most likely occurred just prior to the overspeed, and not as a result of the overspeed or of the landing rollout.

The root cause of the overspeed has been determined to be the failure of the attachment screws of the electronic ignition timing ring which secure the timing ring to the three brackets bolted to the crankshaft at the propeller stud flange.

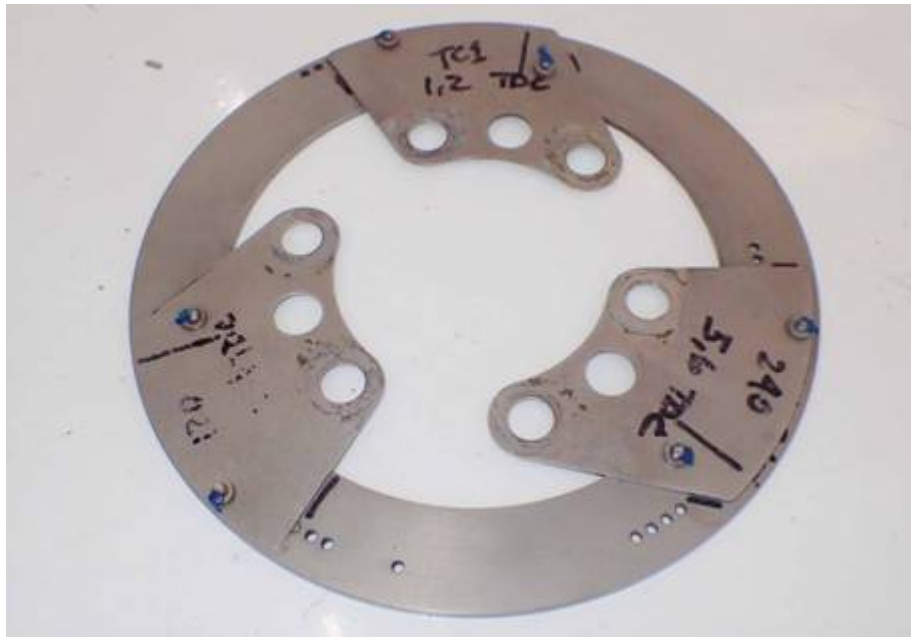


From close examination of the supporting engine data traces like the one above, as well as the physically damaged electronic ignition timing components, it is believed that the overspeed was caused by the prop governor's normal reaction to the slight slow down of engine speed (from climbout steady 2700 rpm shown by the green trace on the chart above down to ~2550 rpm – the slight 'droop' in the green trace evident on the chart) that occurred during the ten seconds prior to the overspeed.

It is believed that during the ten seconds prior to the overspeed the slow down was caused by the timing ring attachment screws backing out and striking and severely damaging the electronic ignition timing sensors. The interference to rotation and damage caused by the loose screws striking the Hall Effect senders caused the slowdown from ~2700 rpm to ~2550 rpm.

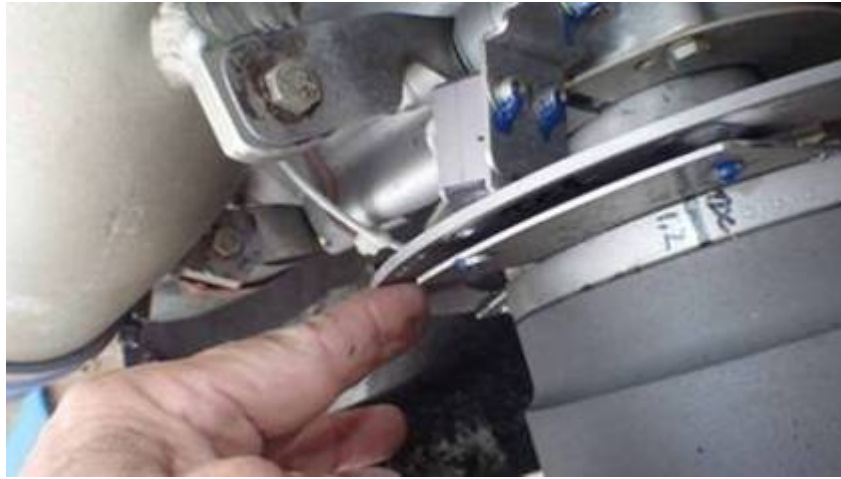
During this ten second slowdown, a normally operating propeller governor would decrease propeller pitch in an effort to bring the propeller rotation back up to speed. Once the obstruction of the ingested screws cleared away, the friction was released, and now the blades with way too little pitch allowed the prop to suddenly overspeed as shown in the trace. It can be seen from the rapidly falling EGT traces that the engine had quit firing correctly, even during the ten seconds prior to the overspeed, and was likely not producing any significant power during the overspeed.

Careful analysis of the timing ring and the Hall Effect timing sensors after the flight revealed that of the six total 6-32 flush head screws that attach the timing ring to the three standoff brackets, (2) had backed out and were missing, (2) were sheared off with the thread ends still in the threaded bracket inserts, and (2) were loose and backed out, but still captured in the threaded inserts of the third standoff bracket.



(2) timing ring attachment screws were missing, (2) were sheared off, and (2) were loose and partially backed out

The four missing screws caused significant damage to the Mini Sensor timing pickups of both electronic ignition systems as they came out.



Timing ring loose and separated from bracket

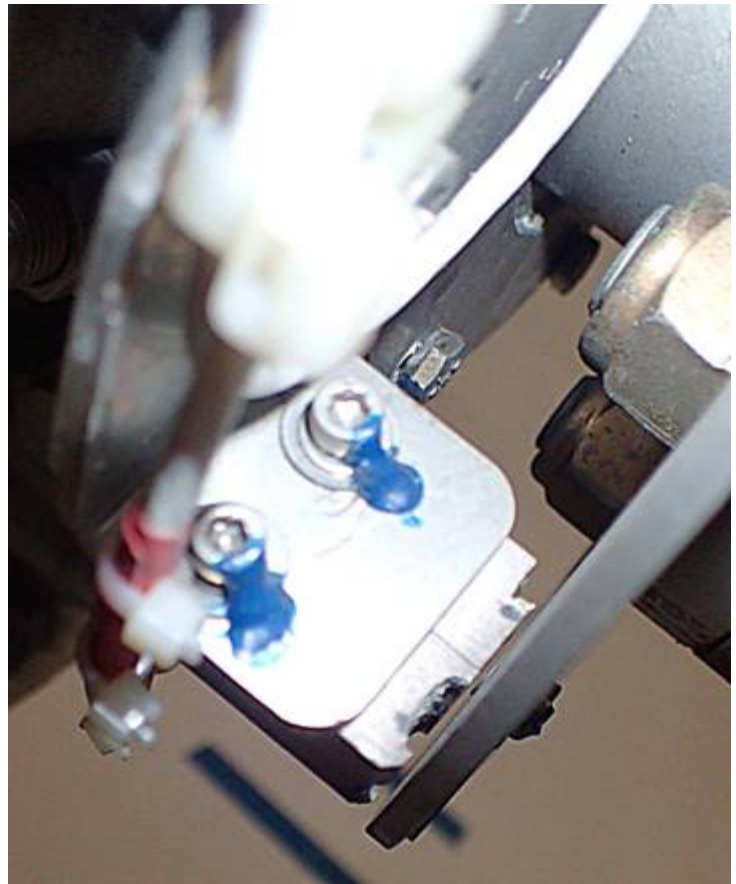


Bent CDI-1 bracket and damaged Hall Effect

sender



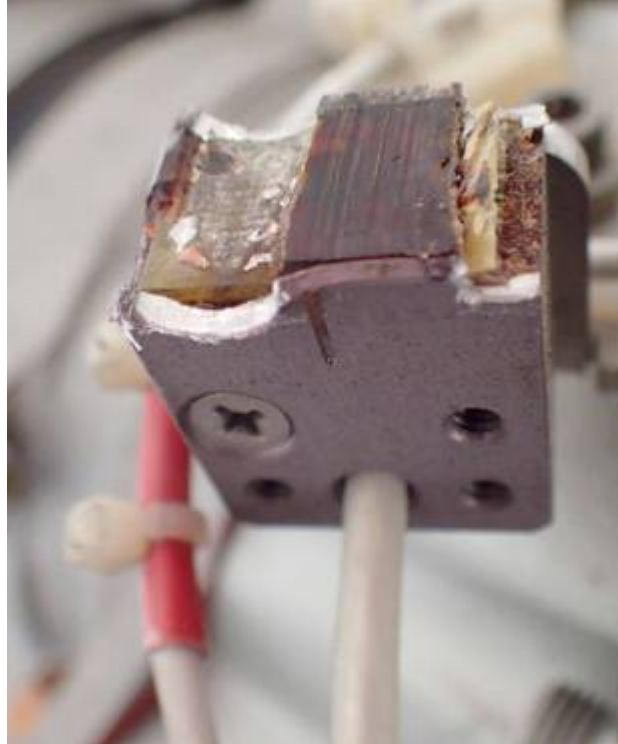
Threaded inserts for screws on back of bracket



Damaged CDI-2 Hall Effect senders



Flush head 6-32 attach screw



Damaged CDI Mini Sensor #2

Overspeed Root Cause Conclusion

The root cause of the overspeed has been determined to be the failure of the attachment screws of the electronic ignition timing ring which secure the timing ring to the three brackets bolted to the crankshaft at the propeller stud flange.

Please let me know if you have any further questions.

Thank you,
Bob Jackson

N2XF
Experimental Velocity TXL/RG/XC

