**Gunther Todd**

---

**From:** forest kirst <[redacted]>
**Sent:** Monday, November 28, 2016 9:09 PM
**To:** Gunther Todd
**Cc:** forest kirst
**Subject:** ANC 14LA068 N-4827K

RE: Navion N 4827K crash 09/24/2014 Atigun Pass Alaska

Dear sir; I understand you are the investigator assigned to this accident.
I don't know if the FAA or Hartzell provided you with these emails. They suggest that Ottosen did not properly overhaul the propeller. They also indicate that the propeller clamp bolts may have failed in flight and caused the crash.
Neither Hartzell or American Testing looked at the clamp flange surfaces where the bolts contact for signs of bolt torque. Also neither one of them addressed the cause of the considerable rubbing in the fractured surfaces of the clamp.

I have attached an engineers analysis (propeller clamp-2) of the bolt connection which indicates the bolts were loose and one came out in flight causing the crash. He also addresses the rubbing in the fracture which also is consistent with inflight failure of the propeller.
I hope you will take this information into account while determining the accident cause.

sincerely
Forest Kirst

**Gunther Todd**

---

**From:** forest kirst <[redacted]>
**Sent:** Tuesday, November 29, 2016 2:11 PM
**To:** Gunther Todd
**Cc:** forest kirst
**Subject:** ANC14LA068

Hi Mr. Gunther, by the emails it would appear that the propeller failed in flight causing the crash. They strongly suggest that the overhaul shop Ottosen propeller did not properly return the propeller to service. Mr. Garcia confirms the propeller failure in his analysis.

The daily plot archive from the FAA shows the GPS system was not providing accurate signals on the day in question. .This can be further verified by the WAAS PAN 50 report published by the FAA. This would account for the witnesses all confirming my aircraft was higher than the recorded GPS data. I am assuming you have the witness statements of passengers and pipeline workers who all place me well above the GPS altitudes. If you do not I can provide them.
The warning from the 196 GPS manual states not to use it for vertical navigation.

One thing I have noticed in looking at other airplane crashes in Alaska is that when GPS equipped planes crashed in poor weather the daily plot archives and WAAS PAN reports show that there was poor GPS positioning on those days. The WAAS performance standards 2008 shows that there is no requirement for the Federal GPS system to provide altitude accuracy during enroute navigation and the horizontal accuracy is only 2 miles. This could account for many of the accidents we see in Alaska in poor weather.
The daily plot archives, WAAS Performance Standards 2008 and WAAS PAN reports indicate that GPS should not be used as an exacting method of navigation in Alaska.

thank you
Forest Kirst

**Gunther Todd**

**From:** forest kirst <[redacted]>
**Sent:** Thursday, December 01, 2016 4:02 PM
**To:** Gunther Todd
**Cc:** forest kirst
**Subject:** ANC14LA068

Hi, I sent you the papers yesterday by mail that we discussed. We are still trying to get the bolts analyzed by a laboratory. The bolts show signs of what looks like improper installation/assembly. One bolt is stretched, one shows signs of rotation like it was not tight enough and the bolt that lost its head in the fractured clamp looks like it also shows signs of considerable rubbing. Hartzell never examined the bolts.
I believe the damage to the bolts also supports inflight failure of the propeller causing the accident.
When we get the lab report on the bolts Mr. Garcia will be able to write a full report. I will furnish you with the lab report and Mr. Garcia's full report when I receive them.

sincerely
Forest Kirst

11/29/2016

Forest Kirst

[redacted]

[redacted]

RE: ANC14LA068

Hi Mr. Gunther, by the emails it would appear that the propeller failed in flight causing the crash. They strongly suggest that the overhaul shop Ottosen propeller did not properly return the propeller to service. Mr. Garcia confirms the propeller failure in his analysis.

The daily plot archive from the FAA shows the GPS system was not providing accurate signals on the day in question. .This can be further verified by the WAAS PAN 50 report published by the FAA. This would account for the witnesses all confirming my aircraft was higher than the recorded GPS data. I am assuming you have the witness statements of passengers and pipeline workers who all place me well above the GPS altitudes. If you do not I can provide them.

The warning from the 196 GPS manual states not to use it for vertical navigation.

In photos of the left side of the aircraft taken at the landing site it is evident that the entire lower motor mount has detached from the aircraft. This can be verified by checking against the navion Structural repair maual. This is consistent with propeller failure.

One thing I have noticed in looking at other airplane crashes in Alaska is that when GPS equipped planes crashed in poor weather the daily plot archives and WAAS PAN reports show that there was poor GPS positioning on those days. The WAAS performance standards 2008 shows that there is no requirement for the Federal GPS system to provide altitude accuracy during enroute navigation and the horizontal accuracy is only 2 miles. This could account for many of the accidents we see in Alaska in poor weather. While poor visibility was not a factor in my accident this is something investigators may want to look at in weather related accidents where GPS is used. The WAAS PAN reports and Daily plots are products of the FAA Navigation Branch.

The daily plot archives, WAAS Performance Standards 2008 and WAAS PAN reports indicate that GPS should not be used as an exacting method of navigation in Alaska.

thank you

Forest Kirst [redacted]

Omar Garcia
[redacted]

November 22, 2016

Re: Navion Propeller and Clamp pictures you shared

Forest Kirst
[redacted]

Forest,

I've taken an interest in this when you mentioned that bolt failures were involved. As you know, I have some background in mechanical joints with an undergraduate degree in Mechanical Engineering from California State University Long Beach. While working at Honeywell's turbomachinery division in Torrance, CA, I was exposed to how meticulously the aerodynamicists worked to design airfoils to achieve proper airflow. In addition, my occupation as a Mechanical Engineer in the Aerospace Industry over the last fifteen years has provided experience with bolted joint design. I've been selected to investigate hardware failures are various points in my career and several have involved bolted joint failures. For example, while working at Raytheon in El Segundo, CA, I was part of an analysis team that reviewed, among other items, SEM and fractography evidence for a Navy sensor that flew on the F/A-18 C/D and E/F aircraft.

I've summarized below what I regard as the most notable things from the pictures you've shared with me thus far.

The propeller clamp, indicated "B" below, was reported to have one of the two mounting bolts missing at and around the crash site. This bolt has not been found to date.

It is evident that at lower-right bolt location on propeller clamp "B" that the paint wear was limited. The location at the lower-left exhibits exposed metal, indicating that this interface has been exposed to significant relative motion (sliding motion) under the bolt or nut. This would be caused by insufficient bolt preload, that is, a loose bolted joint. The bolt at this location has not been recovered to date. This indicates that significantly higher bolt preload existed at this bolt location.

**Significant Paint Wear** (missing bolt location)

**Minimal Paint Wear**

**This bolt site exhibits significant paint wear, base metal has been exposed.**

**Close-up of Clamp "B", missing bolt site.**

The assessment by American Testing of the propeller clamps exhibiting ductile fractures is consistent with the SEM images in the report. This was clearly not caused by fatigue failure, which would exhibit striation patterns in the SEM artifacts. The rubbing damage they noted in their report of the propeller clamp seems to indicate that the clamp fracture occurred during flight, since this would provide the vibration and cyclical loading would both cause the fracture surfaces to contact, or rub, each other. If the clamp rupture occurred upon impact, it seems less likely to produce the rubbing phenomena found in the report.

The broken propeller clamps, however, are both effects of the crash that must be explained by a root cause, which precedes simply that "the plane crashed". The question at issue is, "Why did the plane crash?" If the propeller clamp bolt was loose during flight and backed out, this would explain why this bolt has not been found by the FAA investigation efforts and may also explain the root cause of the aircraft crash. The propeller clamp is designed to clamp the propeller to the hub at the correct blade incident angle for proper operation. Because of the way this propeller is designed, a loose or missing bolt would allow the propeller blade to lose its angle of incidence of 14-23 degrees and destabilize the aircraft.

Based on the pictures of the propeller clamp, the missing paint at the bolt interface indicates that the propeller clamp bolt at location "B" did not have sufficient preload. This could be due to either insufficient (low) installation torque or torqueing the bolt past the yield point (too much torque), both of which could cause bolt failure during flight. The bolt backing out during flight vibration would be expected and may explain why the bolt has not been recovered to date.

Interestingly, the FAA email dated September 23, 2014 below has noted that the missing clamp bolt may have fallen out during flight (underlines are my emphasis):

**From:** Major, Jason M (FAA)
**Sent:** Tuesday, September 23, 2014 9:53 AM
**To:** Gunther Todd
**Subject:** RE: info

Ok, I'm pretty sure it's all impact related. However, the bolts holding the prop clamps appeared to be re-used and there was multiple witness marks behind the hub indicating that the missing bolt possibly fell out before the crash . not that it had anything to do with it, just a curiosity. Actually, it might be a hit on the prop shop Ottesen out of AZ

Do you know if Jason from the CA NTSB is going to interview Darrel and Marcene as well?

As an additional point, it's evident that Clamp "A" also shows significant paint wear at one bolt location (bare metal) and minimal paint wear at the opposite side. This indicates that this clamp also has been flown with an improperly torqued clamp bolt. It has been exposed to enough vibration cycles to expose the base metal as with Clamp "B".

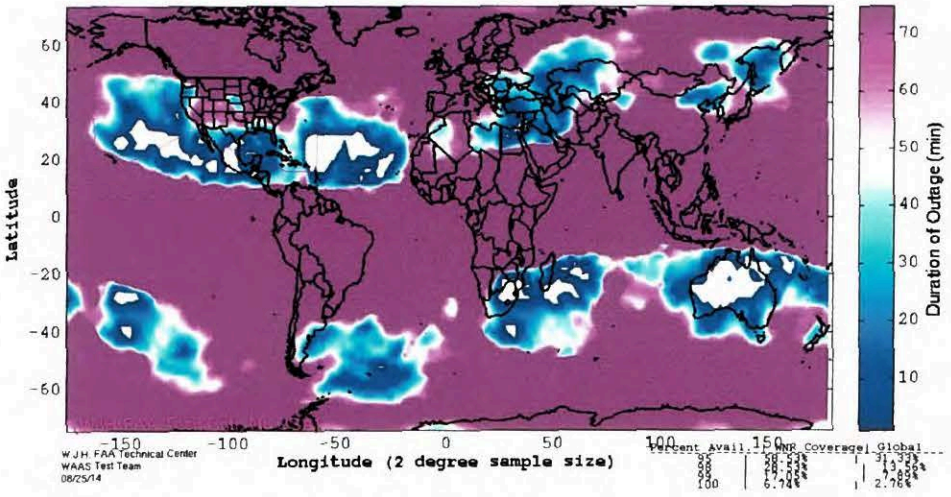

**Clamp "A" wear at bolted joint interfaces.**

If you require more details or explanation of my findings, let me know.

Best Regards,

Omar Garcia

SPS RAIM (HAL=100m) Unavailability
FD Only, SA Off, without Baro-Aiding
08/24/14
Week 1807 Day 0



# Caution

**Failure to avoid the following potentially hazardous situations may result in injury or property damage.**

The GPSMAP 196 is designed to provide you with route suggestions. It does not reflect road closures or road conditions, traffic congestion, weather conditions, or other factors that may affect safety or timing while driving.

Use the GPSMAP 196 only as a navigational aid. Do not attempt to use the GPSMAP 196 for any purpose requiring precise measurement of direction, distance, location, or topography. This product should not be used to determine ground proximity for aircraft navigation.

The Global Positioning System (GPS) is operated by the United States government, which is solely responsible for its accuracy and maintenance. The government's system is subject to changes which could affect the accuracy and performance of all GPS equipment, including the GPSMAP 196. Although the GPSMAP 196 is a precision navigation device, any navigation device can be misused or misinterpreted and, therefore, become unsafe.

**Map Data Information:** One of the goals of Garmin is to provide customers with the most complete and accurate cartography that is available to us at a reasonable cost. We use a combination of governmental and private data sources, which we identify in product literature and copyright messages shown to the consumer. Virtually all data sources contain inaccurate or incomplete data to some extent. This is particularly true outside the United States, where complete and accurate digital data is either not available or prohibitively expensive.

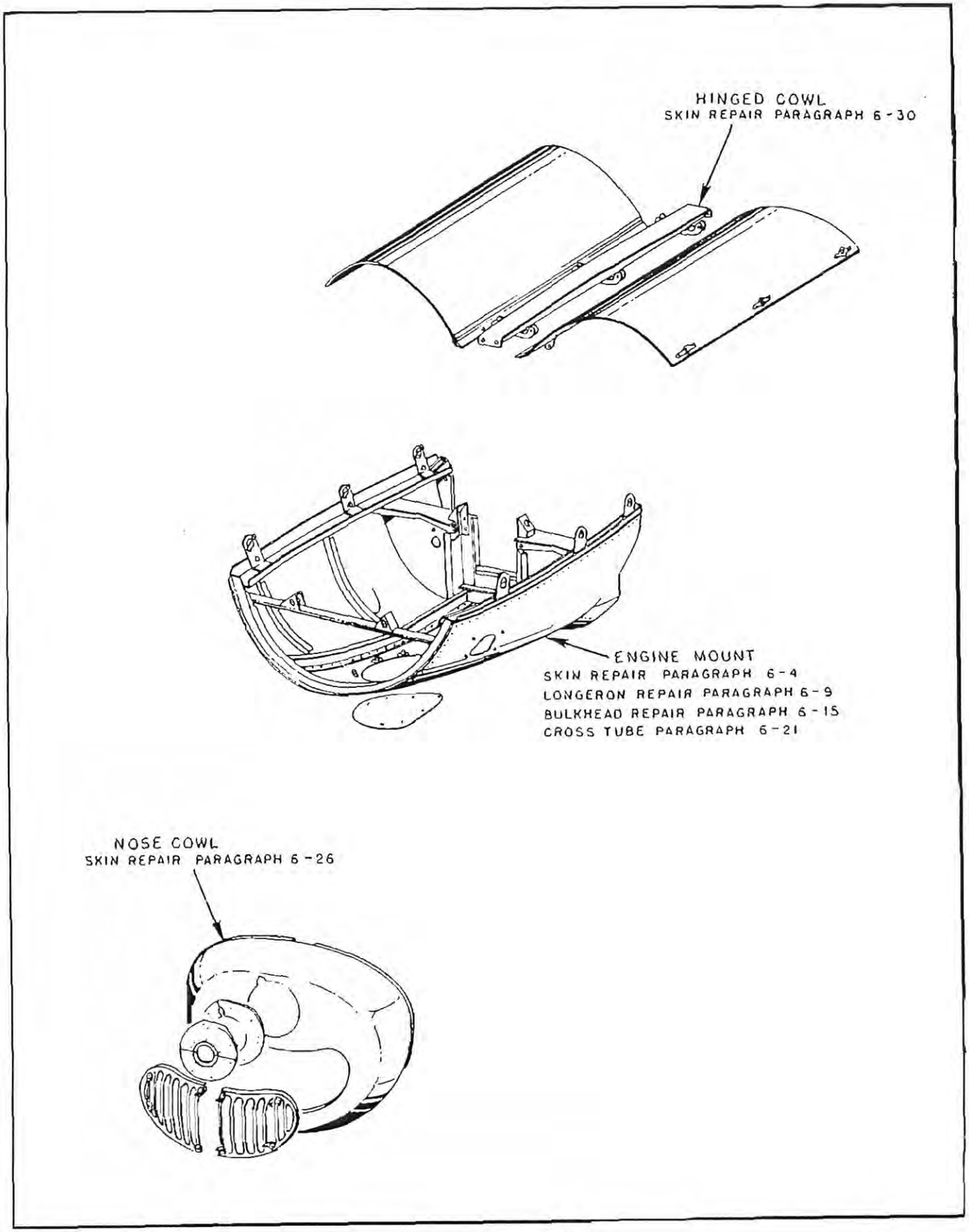



FIGURE 6-1. ENGINE MOUNT AND COWLI[redacted]

**Subject:** RE: Report

These?

**From:** Boggs, Daniel [redacted]
**Sent:** Monday, September 29, 2014 3:08 PM
**To:** Major, Jason M (FAA)
**Subject:** Re: Report

Yep. But I don't have our manual here and only going by memory so I cannot be sure of any of this right now. Everything needs to be verified and what exactly there work scope was on this prop.
Dan

Sent from my iPhone

On Sep 29, 2014, at 7:06 PM, "[redacted] wrote:

> Oh.. sounds foul. If I press the issue though and find something contrary to the regs, I'm going to have to commence with a full blown enforcement.
>
> **From:** Boggs, Daniel [redacted]
> **Sent:** Monday, September 29, 2014 2:30 PM
> **To:** Major, Jason M (FAA)
> **Subject:** Re: Report
>
> Our manual says regardless of hours. Every 6 years (72 months) it must be sent in over seals gaskets and other checks. You would think if he did that the clamps would be removed and grease cleaned out of it set on the shelf for years and years like they claim. Who really knows.
> Dan
>
> Sent from my iPhone
>
> On Sep 29, 2014, at 6:27 PM, "[redacted] wrote:
>
> > Being that it was done back in 05/11 I wasn't sure if they had copies of the 8130 or not. So I sent the one we had and he verified it was authentic. I didn't see anything in there about a complete overhaul unless it had to do with completing the service letters.

**From:** Major, Jason M (FAA)
**To:** Weingrd, Kyle (FAA)
**Subject:** FW: Report
**Date:** Thursday, February 11, 2016 6:00:41 PM

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**From:** Boggs, Daniel [mailto:[redacted]
**Sent:** Friday, October 03, 2014 5:51 AM
**To:** Major, Jason M (FAA)
**Subject:** RE: Report

I just looked at the photo's. the bolts were NOT turned around per the service letter.

Dan Boggs
Hartzell Propeller Inc.
Air Safety Investigation Manager
Office: [redacted]
Cell: [redacted]
E-mail: [redacted]

**From:** [redacted]
**Sent:** Thursday, October 02, 2014 7:44 PM
**To:** Boggs, Daniel
**Subject:** RE: Report

Perhaps this is why the bolts were loose???

**From:** Boggs, Daniel [redacted]
**Sent:** Tuesday, September 30, 2014 2:36 AM
**To:** Major, Jason M (FAA)
**Subject:** RE: Report

Here is our Overhaul manual that goes well with the Owner's manual. I am on the road the next couple weeks but if you want, I can contact our product support department and find the specific reference on what needs to be done every 6 years and what the work scope should be?

Hi Jason,
I have not finished the report yet. I am in Canada this week and DC next week so it may be a few weeks yet. I do have noted on the bolts loose and mounting bolt not to 400lbs and will make sure it's in there. Otterson prop called immediately after he hung up with you all nervous. I asked if he overhauled the prop like the 8130 stated he should have take off the clamps. If he didn't then what did he do per our overhaul manual?

Dan

Sent from my iPhone

On Sep 29, 2014, at 5:42 PM, '[redacted]' <[redacted]> wrote:

> Dan,
>
> Were you able to complete a report of Kirst's prop? If so I need it...I really need it pointed out that the "J" nut was easy to pull off and not at 400ft lbs.
>
> By the way, spoke with Ottosen Propeller who turned this one out to them. The other issues that concerned us, such as the loose clamp bolts or reused nuts, would have been original install from Hartzell or Forest himself monkeying with them. Ottosen just installed the hydro plate with a customer supplied bearing..
>
> Hope the trips are going smooth, and you got to spend a day or so with the new addition to the family.
>
> Jason

Oh.. sounds foul. If I press the issue though and find something contrary to the regs, I'm going to have to commence with a full blown enforcement.

**From:** Boggs, Daniel [redacted]
**Sent:** Monday, September 29, 2014 2:30 PM
**To:** Major, Jason M (FAA)
**Subject:** Re: Report

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>
> He was definitely worried talking to me.
>
> **From:** Boggs, Daniel [redacted]
> **Sent:** Monday, September 29, 2014 2:23 PM
> **To:** Major, Jason M (FAA)
> **Subject:** Re: Report
>
> He kinda skirted the issue. Said same to me as he did you but I said you did supply the 8130. I do know Ottosen is one of our best vendors and never had an issue with them. Not sure it is that much of a problem.
> Dan
>
> Sent from my iPhone
>
> [redacted]

[redacted]

[redacted]

| | |
|---|---|
| From: | Major, Jason M (FAA) |
| To: | Weinzirl, Kyle (FAA) |
| Subject: | FW: info |
| Date: | Thursday, February 11, 2016 4:34:38 PM |

**From:** Major, Jason M (FAA)
**Sent:** Tuesday, September 23, 2014 9:53 AM
**To:** Gunther Todd
**Subject:** RE: info

Ok, I'm pretty sure it's all impact related. However, the bolts holding the prop clamps appeared to be re-used and there was multiple witness marks behind the hub indicating that the missing bolt possibly fell out before the crash ..not that it had anything to do with it, just a curiosity. Actually, it might be a hit on the prop shop Ottesen out of AZ.

Do you know if Jason from the CA NTSB is going to interview Darrel and Marcene as well?

**From:** Gunther Todd [redacted]
**Sent:** Tuesday, September 23, 2014 9:23 AM
**To:** Major, Jason M (FAA)
**Subject:** RE: info

I thought he just left the piece he an Lanier found

Let me talk with him about it.

If it appears it is all do to impact we may not want it.

If you would just hang on to everything for now

I will get back to you.

Sent with Good (www.good.com)

-----Original Message-----
**From:** [redacted]
**Sent:** Tuesday, September 23, 2014 11:01 AM Eastern Standard Time
**To:** Gunther Todd

He kinda skirted the issue. Said same to me as he did you but I said you did supply the 8130. I do know Ottosen is one of our best vendors and never had an issue with them. Not sure it is that much of a problem.
Dan

Sent from my iPhone

On Sep 29, 2014, at 6:19 PM, "[redacted]
<[redacted] wrote:

> Ok thanks. Ouch, so what was his response? Is this something I should press further with Ottosen?
>
> **From:** Boggs, Daniel [redacted]
> **Sent:** Monday, September 29, 2014 2:17 PM
> **To:** Major, Jason M (FAA)
> **Subject:** Re: Report
>
> Hi Jason,
> I have not finished the report yet. I am in Canada this week and DC next week so it may be a few weeks yet. I do have noted on the bolts loose and mounting bolt not to 400lbs and will make sure it's in there. Otterson prop called immediately after he hung up with you all nervous I asked if he overhauled the prop like the 8130 stated he should have take off the clamps. If he didn't then what did he do per our overhaul manual?
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**From:** Boggs, Daniel
**To:** Major, Jason M (FAA)
**Subject:** RE: Report
**Date:** Friday, October 03, 2014 5:51:15 AM

I just looked at the photo's. the bolts were NOT turned around per the service letter.

Dan Boggs
Hartzell Propeller Inc.
Air Safety Investigation Manager
Office: [redacted]
Cell: [redacted]
E-mail: dboggs@Hartzellprop.com

**From:** Jason.M.Major@faa.gov [mailto:[redacted]
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Dan Boggs
Hartzell Propeller Inc.
Air Safety Investigation Manager
[redacted]

**From:** Boggs, Daniel [redacted]
**Sent:** Wednesday, September 10, 2014 8:26 PM
**To:** Gunther Todd
**Subject:** RE: pic

If it did happen during the impact then the blade should be very close to the plane, like I said in my last email, the bolts are fractured but that could have happened during impact as well but it just looks different than the ones that do fracture during impact, definitely need to look closer at this.

Dan Boggs
Hartzell Propeller Inc.
Air Safety Investigation Manager
Office: [redacted]
Cell: [redacted]
E-mail: [redacted]

**From:** Gunther Todd [redacted]
**Sent:** Wednesday, September 10, 2014 8:20 PM
**To:** Boggs, Daniel
**Subject:** RE: pic

The pass is now under a blanket of snow but the airplane has been recovered to Fairbanks

I can't imagine it throwing a blade before it impacted.

They occupants did not report it and neither did anyone on the ground. Some of

From: [redacted]
To: [redacted]
Subject: [redacted]
Date: [redacted]

From: Boggs, Daniel [redacted]
Sent: Monday, September 29, 2014 2:02 PM
To: Major, Jason M (FAA)
Subject: Re: Report

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