



National Transportation Safety Board

Washington, DC 20594

Response to Petition for Reconsideration

Date: November 28, 2018

Mr. Ryan Crawl, Petitioner
President
Loyd's Aviation and Loyd's Aircraft Maintenance
P.O. Box 80958
Bakersfield, California 93380

In accordance with Title 49 *Code of Federal Regulations (CFR)* 845.32, the National Transportation Safety Board (NTSB) has reviewed the September 29, 2017, petition for reconsideration and modification of the probable cause for the aircraft accident involving a Cessna 340A airplane, N346MC, on January 27, 2016, in Bakersfield, California (WPR16LA058). On the basis of this review, the NTSB hereby denies the petition in its entirety.

On January 27, 2016, a Cessna 340A airplane, N346MC, was attempting to land at Meadows Field Airport (BFL), Bakersfield, California, when the right main landing gear (MLG) collapsed. The flight was operated by Pacific FBO Properties under the provisions of 14 *CFR* Part 91. The pilot was not injured, and the airplane was substantially damaged. Visual meteorological conditions prevailed during the flight, which departed from Santa Barbara Municipal Airport (SBA), Santa Barbara, California, 39 minutes before the accident occurred.

The probable cause of the accident was adopted on August 16, 2016. The probable cause was as follows: "Maintenance personnel's repeated failure to re-rig the main landing gear (MLG) in accordance with the airplane manufacturer's service manual requirements, which resulted in the collapse of the right MLG."

The petitioner is the president of Loyd's Aircraft Maintenance, the company that performed maintenance on the accident airplane. He asserted that the NTSB's report contained "inaccurate statements" and that the investigation was "incomplete." He also asserted that "the findings within the NTSB report cannot be confirmed, and should be revised."

Background

The pilot reported that he configured the airplane to land at BFL, but, during his instrument panel scan, he observed a "gear unlocked" warning light. The right MLG was not locked in the extended position, so the pilot departed the traffic pattern and attempted to troubleshoot the problem by cycling the landing gear but was unsuccessful. The pilot then

re-entered the traffic pattern and used the hand crank to manually deploy the gear, but the “gear unlocked” warning remained illuminated. The airplane touched down normally at BFL, but, as the pilot attempted a right turn to exit the runway, the right MLG collapsed, which resulted in substantial damage to the right aileron.

Postaccident examination of the landing gear revealed that the right MLG aft tube assembly, which supplies overcenter tension to the aft bellcrank and side brace lock link when the MLG is in the extended position, failed in tensile overload. According to a Cessna representative, low overcenter tension causes the MLG to collapse when it is under load in the extended position, which causes the aft tube assembly to fracture in tensile overload. The Cessna representative also stated that low overcenter tension is typically the result of improper rigging.

According to the *Cessna Aircraft Company Model 340 Service Manual*, the landing gear must be re-rigged after any adjustment to the gear downlock tension. However, the pilot’s maintenance provider reported that maintenance personnel did not re-rig the landing gear after adjusting the MLG downlock tension during maintenance and inspections between 2011 and 2013. Thus, the NTSB determined that maintenance personnel’s failure to re-rig the MLG in accordance with the manual requirements led to the MLG being improperly rigged, which resulted in the subsequent collapse of the right MLG.

Petitioner’s Claims

The petitioner presented four main points to support his position. First, the petitioner did not agree with the finding that the re-rigging procedure was not accomplished after the MLG downlock tension was adjusted during annual inspections between 2011 and 2013 (as indicated in the docket for this accident in a record of conversation with a company airframe and powerplant mechanic). As evidence, the petitioner provided a statement, dated September 6, 2017, from the company’s director of maintenance (who was also the company airframe and powerplant mechanic referenced above) indicating why the NTSB’s finding was not correct. The director of maintenance/mechanic’s statement indicated the following:

Every annual inspection includes a detailed landing gear inspection, ref chapter 2A-129 of the Cessna 340 service manual which states ‘The following procedures provide detailed inspection instructions for the landing gear system to assure that the system is properly rigged.’ So when the annual inspection was accomplished...the landing gear was in rig.... If the landing gear rigging check per chapter 2A or chapter 4 is accomplished the end result is the same. The landing gear is in rig.

Also, the petitioner stated that, whenever the landing gear tension was adjusted, it was done so in accordance with the maintenance manual procedure.¹ In addition, the petitioner stated that the MLG downlock tension was not adjusted during the 2011 annual inspection.

¹ The petitioner stated that the landing gear tension would be adjusted “in accordance with the maintenance manual...procedure on page 2A-142.” The procedure on that page was titled “Checking Download Tension.”

Second, the petitioner stated that the NTSB had not provided any evidence to support the finding that the rigging of the landing gear was out of tolerance or that it caused the accident. As evidence, the petitioner referenced the *Landing Gear Examination Factual Report* (in the docket for this accident), which indicated that the left MLG downlock tension was within the manufacturer's limitations.

Third, the petitioner stated that the NTSB did not consider that the accident pilot knew that a problem existed with the landing gear before departing SBA on the day of the accident. The statement from the mechanic indicated that, on the morning of the accident, the pilot "called and said he was going to bring the aircraft to Bakersfield to have us check the landing gear due to problems with the right main."

Last, the petitioner stated that the NTSB did not consider the effects that the marine environment at Santa Barbara had on the accident airplane, which was housed outside at SBA. The petitioner indicated that logbook entries showed that the airplane had developed corrosion (which the petitioner attributed to the "harsh elements") but that no inspection of the landing gear joints and linkages was done to see if corrosion within the joints could have caused or contributed to the right MLG collapse. The petitioner explained that "corrosion of one or more of the mechanisms can cause drag on the entire landing gear that no cable tension, or motor, can overcome." The petitioner also explained that such corrosion can be "extensive" and "occur relatively suddenly."

NTSB's Response

Rigging of the Main Landing Gear

The petitioner asserted that the MLG downlock tension was not adjusted during the 2011 annual inspection. The NTSB notes that the docket for this accident and the information that the petitioner provided do not include a shop order for the airplane's 2011 annual inspection; thus, the NTSB could not determine whether the petitioner's claim was accurate. However, the docket for this accident included a shop order addressing maintenance that Loyd's Aircraft Maintenance performed in July 2011 that appeared to be separate from the annual inspection.

The discrepancy listed on the 2011 shop order stated the following:

After extending landing gear the red unsafe light remained on and did not have three green down and lock lights. Engaged hand crank and cranked gear as far as possible. On landing roll three green illuminated and red light extinguished.

The corrective action taken by Loyd's Aircraft Maintenance, according to the shop order, was the following:²

² During a March 15, 2016, interview, the accident pilot stated that, about 2 years before the accident, he observed an "identical" right MLG indication as that on the day of the accident. The accident pilot also stated that the reason for the indication, according to a mechanic, was an "overcenter problem." No evidence in the docket or

Checked left and right main gear down lock over center adjustment. Found right main gear too tight. Adjusted over center as required and safetied. Performed several fault free gear cycles including emergency extension. Landing gear functions normal.

The docket for this accident also included shop orders for annual inspections performed by Loyd's Aircraft Maintenance in April 2012 and May/June 2013. For the annual inspection performed in April 2012, the shop order indicated, "Completed an Annual inspection this date in accordance with Cessna 340A Maintenance Manual Inspection check list and F.A.R. [Federal Aviation Regulations] 43 appendix D."³ The *Cessna Aircraft Company Model 340/340A Service Manual* stated that "landing gear rigging and [an] operational check" were required every 12 months or 400 hours.⁴ Title 14 *CFR* 43 Appendix D, "Scope and Detail of Items (as Applicable to the Particular Aircraft) To Be Included in Annual and 100-Hour Inspections," stated that the landing gear retracting and locking mechanisms should be inspected for improper operation. The shop order indicated that, during the inspection, the mechanic found that "both main gear downlock tension out of tolerance." In response, the mechanic "adjusted left and right main gear retraction mechanisms to achieve proper downlock tension," which, according to the manufacturer, was 40 to 60 pounds.

For the annual inspection that Loyd's Aircraft Maintenance performed in May/June 2013, the shop order indicated, "Completed an annual inspection this date in accordance with F.A.R. 43 appendix D." The Cessna 340/340A service manual was not specifically referenced on the shop order, but the order noted "left and right main gear downlock tension high"; the action taken in response was "right side [started] at 70lbs adjusted to 50lbs. left side started at 80 lbs adjusted to 50 lbs."

During a March 16, 2016, postaccident interview, the Loyd's Aircraft Maintenance mechanic stated that he normally used the landing gear rigging check (as opposed to the full landing gear rigging procedure) during annual inspections.⁵ The mechanic's September 2017 statement provided with the petition indicated that "the landing gear rigging inspection involves disconnecting and reconnecting the mechanical assembly" and that the "main gear down tension is checked." The statement also indicated that adjustments are made if the gear tensions "drop off" or the overcenter force is not within specifications. The statement further indicated that these and other related procedures were "all part of the annual inspection" completed by Loyd's Aircraft Maintenance.

In addition, the mechanic's September 2017 statement indicated that, if the landing gear rigging check per chapter 2A or chapter 4 was accomplished, the end result would be the same as

from the petitioner indicated that this problem occurred 2 years before the accident. Thus, given the available evidence, it is likely that this problem and the resulting maintenance occurred in 2011.

³ The regulations found in Title 14 of the *CFRs* are also referred to as *FARs*.

⁴ The revised manual page that contained this information showed that the name of the manual included a reference to Cessna model 340A (in addition to model 340).

⁵ As previously stated, the landing gear rigging check is found in chapter 2A, page 2A-129, "Nose and Main Landing Gear Rigging Inspection," of the Cessna 340 service manual. Chapter 4 addresses the landing gear and brake system.

a re-rig because the landing gear would be in rig. As a result, the petitioner did not agree with the NTSB's finding that the re-rigging procedure was not accomplished after the MLG downlock tension was adjusted between 2011 and 2013.

The NTSB does not agree with the petitioner's claim. According to Cessna, chapter 2 of the Cessna 340 service manual describes how to check the MLG system to ensure that the system is within rig specifications, but chapter 4 describes specifically how to rig the MLG system. The NTSB's review of chapter 2 found that page 2A-129 stated, "Refer to landing gear Section 4, for required disassembly/assembly procedures and required rigging procedures." Also, page 4-2B of the manual, dated April 1, 2006, included the following warning in bold face type: **"anytime a landing gear retraction or extension system component has been removed, replaced or the tension on the downlocks adjusted, the entire landing gear system must be re-rigged."** Thus, because the landing gear downlock tension was adjusted during the maintenance in 2011 and the annual inspections in 2012 and 2013, the full landing gear rigging procedure in chapter 4 of the manual should have been performed.

The docket for this accident included a shop order for an annual inspection completed by Loyd's Aircraft Maintenance in June 2014. The mechanic's statement that was included as part of the petition for reconsideration referenced an annual inspection completed on August 7, 2015, about 5 months before the accident.⁶ Because this inspection was the last maintenance performed before the accident, the NTSB requested, and Loyd's Aircraft Maintenance provided, the detailed shop order for the August 2015 annual inspection. The shop orders for the 2014 and 2015 inspections indicated that they were performed in accordance with 14 *CFR* Part 43 Appendix D. The shop orders did not include any information about the MLG downlock tension needing adjustment at those times.

The petitioner claimed that the NTSB did not present any evidence indicating that the rigging of the landing gear (the overcenter tension) was out of tolerance. As stated in the final report, the NTSB's postaccident landing gear examination found that the left MLG downlock tension was within the manufacturer's limitations. Specifically, the examination report stated that the tension was 43 pounds; the manufacturer's prescribed tension was 40 to 60 pounds. The right MLG downlock tension could not be measured because the aft tube assembly had fractured during the accident.

The NTSB recognizes that the right MLG downlock tension might have met the manufacturer's specifications at the time of the airplane's last maintenance before the accident. However, the aft tube assembly rod end fitting failed in tensile overload, causing the right MLG to collapse, because of the long-term effects of maintenance personnel's failure to re-rig the entire MLG system (in accordance with the warning in chapter 4 of the Cessna 340 service manual) during the airplane's maintenance in 2011, 2012, and 2013 when the downlock tension was adjusted. Accordingly, the probable cause and findings for this accident focused on maintenance personnel's failure to properly re-rig the MLG after the downlock tension was adjusted.

⁶ The docket included an undated document (with no shop order number) describing maintenance that was performed when the airplane had accumulated 4,149.5 hours. The NTSB determined that this maintenance was associated with the 2015 annual inspection.

Main Landing Gear Indication Before the Accident Flight

During a March 15, 2016, interview, the accident pilot reported that, during a flight a few weeks before the accident, he had received a similar right MLG indication as the one that he received on the day of the accident. The pilot also reported that the indication disappeared after he cycled the gear. The petitioner stated that the NTSB did not consider this information.

The NTSB notes that the information about the similar right MLG indication that the pilot received a few weeks before the accident was discussed in the factual section of the final report. The NTSB did not include this information in the analysis section of the report because the indication disappeared after the pilot cycled the gear, and he did not report receiving a similar indication during flights between the two indications.⁷ However, as part of the review of this petition, the NTSB examined the landing gear troubleshooting steps listed in chapter 4 of the Cessna 340 service manual, but none of the troubleshooting steps included actions to take for a “gear unlocked” warning light. Thus, it might have been reasonable for the pilot to continue flying his airplane without a maintenance visit if the indication that he received a few weeks before the accident disappeared after he cycled the gear.

As previously discussed, several years before the accident, the pilot observed an “identical” right MLG indication that necessitated maintenance action to resolve (adjusting the right MLG downlock overcenter tension). As part of this petition response, the NTSB also considered whether the pilot should have recognized that maintenance action would be necessary to address the indication that he received a few weeks before the accident. However, the NTSB determined that, even if the pilot had taken the airplane to the maintenance provider shortly after receiving the right MLG indication, it is likely that the MLG would not have been re-rigged given the maintenance provider’s actions during previous maintenance and inspections. Thus, the accident would most likely still have happened given that the right aft tube assembly failed in tensile overload because of the long-term effects of continued flight with an MLG system that was not properly rigged during previous maintenance.

Corrosion Issue

During the March 2016 interview, the accident pilot reported that the airplane had been stored in a large hangar until 2013, at which time he began storing the airplane outside at SBA. The petitioner stated that logbook entries showed that the airplane had developed corrosion as a result of Santa Barbara’s marine environment and that the NTSB did not consider whether corrosion within the landing gear joints and linkages could have caused or contributed to the accident.

The shop order for the 2015 annual inspection, which was completed about 5 months before the accident, referenced the following discrepancies related to corrosion and actions taken:

- Problem: Replace rusted or corroded hardware on all external panels. Action taken: Installed new stainless hardware as required.

⁷ The pilot reported that he flew 10 hours in the airplane during the 30 days that preceded the accident.

- Problem: Treat and paint any rusted or corroded structure. Action taken: treated and painted external areas of aircraft that had evidence of surface corrosion.
- Problem: Mags [magnetos] due internal corrosion inspection. Action taken: Removed all mags, disassembled, cleaned, and inspected all parts.

Thus, the shop order for the 2015 annual inspection contained no discrepancies related to corrosion of the landing gear joints and linkages. The MLG system would have been inspected, lubricated, and tested during this inspection. Further, the shop orders for the maintenance performed in 2011 and the annual inspections performed from 2012 to 2014 included no discrepancies related to corrosion. In addition, the NTSB's examination of the aft tube assembly rod end fitting found no indications of corrosion. As a result, corrosion was not a factor in this accident.

Disposition

After review of the evidence, the petition for reconsideration of the NTSB's probable cause in connection with the aircraft accident involving a Cessna 340A airplane, N346MC, on January 27, 2016, in Bakersfield, California, is denied in its entirety.

Chairman SUMWALT, Vice Chairman LANDSBERG, and Members WEENER, DINH-ZARR, and HOMENDY concurred in the disposition of this petition for reconsideration.