

# CALLBACK

From NASA's Aviation Safety Reporting System



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Charles Taylor, the “first aviation mechanic in powered flight,” is credited with designing and building the engine for the Wright brothers’ aircraft. The Charles Taylor Master Mechanic Award is presented by the FAA to recognize the lifetime accomplishments of senior aviation mechanics who have worked for a period of 50 years in aviation maintenance.

While recipients of the Award have demonstrated extraordinary knowledge, skill and integrity throughout their careers, it is doubtful that any of them would say they were perfect. More likely, they would be the first to say that errors are always possible; that the idea is to learn from your own or others’ mistakes; that errors need to be recognized and corrected before an aircraft takes flight.

The Aircraft Maintenance Technicians (AMTs) who submitted the following reports all learned valuable lessons and, by sharing them, contributed to improved maintenance practices. Whether or not any of them go on to win professional awards for their work, their contributions to aviation safety definitely embody the spirit of the Charles Taylor Award.

## EXCESSIVE FORCE

A landing gear bushing was significantly over-torqued when three AMTs, a Lead Technician, and a Shift Supervisor all misinterpreted a torque setting.

■ *I was assigned to work on securing an A320 right main landing gear Side Stay Bushing. I was directed by my Lead Mechanic to work with [two other AMTs].... We briefly went over the paperwork for this phase and Lead showed us the torque was 500 foot-pounds.... I set the tooling in place, put the nut and locking tab washer in place, spun it down by hand, and then engaged the tooling to begin the final torquing of the retaining nut. [The other AMTs] read that the final torque setting was 500 foot-pounds and that the initial torque setting was 440 foot-pounds. The torque wrench was set to 440 foot-pounds, shown to our inspector, and then attached to the tooling. Once the initial torque was reached, we (myself and our Inspector) checked the tab lock positions and it was necessary to advance the position of the retaining nut by close to 1/4 inch to align the lock tab. Once we reached 500 foot-pounds, the tab lock was still not aligned. The Inspector instructed us to back the collar off*

*and then reapply the minimum torque of 440 foot-pounds and recheck the tab lock position. We continued this through four break/reset sequences with no better luck.*

*We went to the incoming midnight Supervisor and explained the dilemma. He took the paperwork and briefly perused it and then said that we should turn the issue over to the incoming crew. We turned the paperwork over to [the midnight shift Lead] and explained the problem we were having. He left with the paperwork and returned approximately 15 minutes later to show me that he read that the torque was to be no more than 500 INCH-pounds. The paperwork had “500 lbf. in” in the text. Because of this misinterpretation, the applied torque was 12 times greater than was intended in the operation.*

*There is a difference between the way Boeing and Airbus present this information. Boeing uses “lb-ft” for foot-pounds and “lb-in” for inch-pounds. Airbus references foot-pounds with “LBF.FT” and inch pounds with “LBF.IN”. I believe that “LBF.IN” is very confusing and led to our mistake in applying the improper torque for the job. Perhaps “LB.IN”, or spelling out “foot-pounds” or “inch-pounds” would be clearer.*

## AN ARRAY OF ASSUMPTIONS

When you assume that you have the right parts and you assume they are going on the correct engine, what could go wrong? Verification of the paperwork associated with the job could have saved a lot of time, labor and embarrassment in this wrong engine, wrong parts incident.

■ *I started my service on [a B737 aircraft]...#1 engine. Another AMT was to start the fuel nozzle replacement. After I completed my service, I noticed the #2 engine cowlings were opened up so I assumed that must be the engine getting the fuel nozzles.... When the nozzles arrived, one AMT took the left side of the engine and another took the right side and they began removing the fuel nozzles to replace them. I was the third person so I was handing tools to them and getting whatever they needed....*

*After the Inspector had checked the engine for safety and security, I closed the #2 engine cowlings. It wasn't until the next day that I was informed that the nozzles were the wrong part number and the work was supposed to have*

been done on the #1 engine. I had never looked at any of the paperwork to verify the part numbers or which engine we were supposed to work on.

## REVERSED ROCKER ARMS

It is understandable to assume that an engine would be properly assembled when received from an overhaul facility. This AMT learned, however, that it is best not to make any assumptions when it comes to aircraft maintenance.

■ *The PA-28 aircraft was flying fine and compression on the two new cylinders was good. After approximately 10 hours of flight time, the pilot reported that the engine was making a knocking noise and elected to land.*

*The maintenance facility removed the rocker box cover on the suspect cylinder and found that the rocker arms were reversed causing a misalignment. The cylinders were received from the overhaul facility and placed on the aircraft. I should have checked to make sure the correct part number was on the correct side. I assumed that they were.*

## MISCONNECTIONS

A Maintenance Inspector's report reiterates the need for careful review and inspection in any maintenance procedure, but especially when manpower issues, workload, and time pressure are added to the process.

■ *I was the Inspector on the shift and two other Mechanics and I were finishing up the rigging and final checks after a scheduled engine change on a DHC-8 aircraft.... On top of this we had a spare [aircraft] being worked, which suddenly had to go out. The Lead was busy with other duties on the engine change, so I was also working on closing out the package and making sure all the paperwork was correct on the spare. When it came time to close the cowlings, I helped lift the lower cowl while the Mechanics secured it and hooked up the connectors, hoses, and jumpers. We "ops checked" the de-ice light and bypass door function. I inspected the lower cowling deck and internal area of the intake for FOD and cleanliness and we closed the cowling.*

*We found out the next day that the de-ice supply hose was connected to the oil cooler drain valve, which can be done since they are adjacent to each other and look similar.*

*The intake de-ice boot and one boot on the wing were found to be inoperative on the first flight of the day. The event occurred simply because we were in a hurry to get the engine change done, get the aircraft ready for an evaluation flight for another maintenance issue, and trying also to get the spare aircraft finished up to go out.*

*Slow down and take the time to review what you have just*

*done even when you are rushed by time constraints, lack of manpower, and a heavy workload.*

## CRJ-700 UNPLUGGED

Among other things, experienced Mechanics rely on good communication and careful attention to Job Card procedures in order to overcome adverse factors such as time pressure, stress, and fatigue. In the following incident, inexperience and poor communication exacerbated the other adverse factors confronting two AMTs. Both of them overlooked Job Card procedures that could have prevented this costly CRJ-700 oil leak.

■ *I was about to service an aircraft with [engine] oil when the Crew Lead asked me to help a co-worker in the Deferral Action of a hydraulic Shut-Off Valve (SOV). I approached my fellow Mechanic, asking what needed to be done. The Mechanic told me to take off the hydraulic pump from the #1 engine while he took the parts necessary for the deferral out of the Fly Away kit. The Mechanic instructed me to install the Blank-Off Plate in the mount [on the Engine Accessory Case] where the hydraulic pump was installed and to secure it along with the Cannon plug. After I installed this plate and capped the [hydraulic] quick disconnect outlets, I asked if any further assistance was needed....*

*With four minutes left before clock-out time, the other Mechanic approached me asking to sign a Job Card for the task. I signed the blocks required, but failed to see the part where it mentioned that a Spline Plug was to be installed before the Blank-Off Plate. The error was discovered when the aircraft had to make an emergency landing due to [engine oil] leakage.*

*This was a lack of communication between co-workers. I assisted my co-worker by following his instructions. I failed to pay the necessary attention to the Job Card when filling [out] the [sign-off] blocks. Lack of knowledge and experience was also a factor. I've been employed for several months in this company and have never worked on the engine section of the CRJ-700 aircraft. Also the other Mechanic explained to me that he has never performed this procedure either. Stress and fatigue may also have been factors because it was at the end of the night and my co-worker said the plane had to be at the gate in a half-hour.... An Engine Run/Leak Check was performed after the job was completed; however the required High Power Run was not accomplished.*

*[I recommend] better communication between mechanics when working as a team, especially if one joins another in the middle of the task. Pay more attention to Job Cards, especially when completing them under stress.*

ASRS Alerts Issued in March 2015	
Subject of Alert	No. of Alerts
Aircraft or Aircraft Equipment	12
Airport Facility or Procedure	26
ATC Equipment or Procedure	12
Maintenance Procedure	1
Company Policy	2
<b>TOTAL</b>	<b>53</b>

424

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March 2015 Report Intake	
Air Carrier/Air Taxi Pilots	5,354
General Aviation Pilots	1,234
Controllers	556
Flight Attendants	525
Military/Other	305
Mechanics	228
Dispatchers	138
<b>TOTAL</b>	<b>8,340</b>