



Naval Safety Command

SAFETY AWARENESS DISPATCH



SA 22-13

AIRCRAFT DAMAGED DURING LANDING GEAR OP CHECKS

“Great ideas need landing gear as well.” – Chester Douglas Jackson

Have you ever heard the old saying about great ideas: “Great ideas need landing gear as well?” Those who listened to the phrase can recall the wise teacher who bestowed this bit of wisdom onto them. Most people don’t realize the intent of the message right away. It isn’t just a saying; this piece of intellectual advice (or at least an interpretation of it) applies to aircraft maintenance. We all have great ideas on accomplishing things, regardless of how large or dynamic they may be. We often overlook essential details in our grand scheme of completing the task. The aircraft we work on always have some sort of fine details that are ignored during the initial manual writing. Over time those who write our maintenance publications have incorporated these fine details into our manuals as a new step or note of caution. This evolving process includes additional risk management and mitigation items which are leveraged by following the maintenance publication.



Just as important as the landing gear is to a pilot, these fine details help us complete a maintenance task without injuring personnel or damage to an aircraft. While sanitizing an individual Safety Investigation Report (SIR) for a mishap, we stumbled across similar instances during landing gear maintenance evolutions that made it clear that this is a topic worth discussing in a safety awareness dispatch format. Landing gear maintenance events are incredibly dynamic and require significant manpower. Each platform has details outlined in its maintenance and service publications. All of these fine details are important! Always read each step and any associated note of caution or warning. Below are a couple of examples that illustrate the point.

SCENARIO 1

An MV-22 maintenance team was assigned to perform a jack and cycle of the landing gear during an operational check. The guiding maintenance publication states in a caution to, “ensure all areas around the landing gear are free from obstructions and verify tip doors are secured in the maintenance position. Failure to secure tip doors in maintenance position will cause tip doors to strike the ground and result in aircraft damage.” After successfully lifting the aircraft on jacks, the Collateral Duty Inspector (CDI) leading the maintenance evolution, directed the team to “remove the gear pins.” Two of the maintainers removed the landing gear down-and-lock pins, which is what they thought the CDI asked for, but isn’t what the book called for. The CDI didn’t physically check (*i.e.*, “inspect” – *it’s in the job title*) to ensure all the necessary pins were removed, so he was unaware that the technicians left the pins for the landing gear tip doors, and the tip doors were secured in the maintenance position. The CDI proceeded to cycle the landing gear, which crushed the landing gear doors. The damaged doors were removed and turned in for repair.

The technicians’ procedural non-compliance and the CDI’s failure to physically and personally verify that the tip doors were secured resulted in four extra hours of work for the squadron technicians, added work for supply support personnel, numerous additional hours of work for I-level technicians, and a mission-capable aircraft being in an extended non-mission capable status (*not to mention \$47K of your tax dollars*). This mishap was preventable if at least one of two layers of the maintenance team had performed their task as they were supposed to.

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SCENARIO 2

Five maintainers were assigned to check the installation and rigging of a landing gear door on an EA-18G. The maintenance team of a CDI, a starboard-safety observer, a port safety observer, an operator for the A/M27T-15 hydraulic power test unit (T-15), and the cockpit operator set out to complete the task. The applicable maintenance publication procedure directed the nose landing gear (NLG) right-forward door connecting link to be disconnected from the bell crank by removing the bolt, washers, bushing, nut, and cotter pin, and then restraining the door in the open position. Later in the procedure, it states to regulate external hydraulic pressure up to 3000 psi with the warning, "to prevent death or injury to personnel or damage to aircraft, make sure door and NLG right door rigid connecting link are restrained in fully open position and area surrounding NLG is clear of personnel and obstructions." The follow-on step is to set the landing gear control handle to UP, and immediately reduce pressure from the external hydraulic power source after the NLG drag brace unlocks and starts to retract.

During the procedure, the CDI turned around to assist the T-15 operator, who had difficulties regulating the pressure. Once the pressure was readjusted, the landing gear began to move. Since he was distracted assisting the T-15 operator, the CDI didn't see the landing gear moving, but when he turned to face the aircraft again, he saw the NLG's right tire had damaged the landing gear door. Why? Because the door was never restrained in the open position. It was disconnected and free-hanging from its hinge, so it obstructed the right NLG tire as the gear retracted (*just like the warning said*) and bent the bottom portion of the door.

Upon seeing the damage, the CDI directed the team to secure hydraulic power and electrical power and stopped the evolution. The damage was repaired at the squadron level, but it was readily apparent to the team that more damage could've occurred or someone could have been injured.

The cumulative cost of the two scenarios was over \$50K (*probably more*). Scenario 2's report didn't cover the extra maintenance hours to remove, repair, and replace the damaged components, the time taken away from other maintenance (*or keeping everyone at work longer*), or the significant damage to their stellar reputations as the best maintainers in the squadron.

Key Takeaways

The causal factors for both mishaps were nearly identical. The involved maintenance personnel didn't ensure the area around the aircraft was clear of obstructions or take note of the caution in the maintenance task – in other words, they overlooked essential details.

1. Pay attention to the fine details. Whether you're working with a helicopter or fixed-wing aircraft, before you cycle the landing gear, verify the area is clear and ensure all procedural tasks, notes, cautions, and warnings are followed. If a director or safety observer can't confidently confirm the area is clear from where they are, don't assume that it is safe, have them reposition to verify.

2. Safety observers are there for a reason. Safety observers must be able to observe the area they are responsible for and signal that the applicable areas are fully clear before taking action to cycle the gear. Those simple acts of following the procedures line-by-line and ensuring clear communication between directors and the entire safety team will improve the outcome of every landing gear maintenance evolution, therefore saving time and unnecessary expenditures (*not to mention saving you from having to explain things to your supervisor*).

3. "Slow is smooth and smooth is fast." That saying sounds backward, but it isn't. Have you ever heard the saying developed from the story about the tortoise and the hare? —"Slow and steady wins the race." That saying rings true every time, and has morphed into the newer version, which means that when you go a little slower and follow the procedures to a "T," no rework is required, the chance of an error is reduced, and the task gets completed much faster. History shows again and again – if technicians don't follow the procedures, errors are more likely to occur – which in the worst case, may injure a teammate, or in the best case, damages equipment requiring additional maintenance and more time than it should've taken in the first place.

And remember, "Let's be careful out there"