Don't Call It A
CALLBACK
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Installed Backwards — Errors Across the Maintenance Envelope

Installed
Backwards

Maintenance Errors Across the Aviation Maintenance Envelope

Among the most persistent categories of aviation maintenance error is one that defies easy prevention: a component or system installed in the wrong orientation. The part fits. The fasteners torque to spec. The operational check passes. The aircraft is released for service. And then, somewhere between the gate and altitude, something fails in a way that was entirely predictable — if anyone had noticed the installation was backwards.

This issue presents five reports from NASA's Aviation Safety Reporting System, drawn from a collection of 44 confirmed backwards-installation events in Part 121 air carrier operations spanning 1999 through 2025. Each report is selected for what it reveals about the contributing factors behind this error type: ambiguous maintenance manuals, inadequate inspection procedures, component design that permits incorrect installation, and the persistent role of human factors. The closing observation for each section identifies the contributing factors, the crew or maintenance response, and the systemic gap the event exposed.

Part 121 — Cargo Door Seal

(ACN: 1927849)

Two technicians working separate aircraft during the same check period installed cargo door seals backwards — independently, on the same shift. Both aircraft experienced in-flight pressurization failures.

Technician:

Aircraft X was in for a check, it had a pressurization issue where the flight had to do a descent and the masks were deployed. It was found that the aft cargo door seal was installed backwards causing the pressurization loss. [I suggest] proper training and inspection, also follow published procedures.

Technician:

Aircraft Y was in for a check, during the check the forward cargo door seal was installed backwards. Aircraft returned to the field for pressurization issues. The Forward Cargo door seal was installed backwards. [I suggest to] follow proper published procedures.

Two independent backwards seal installations on two aircraft in a single check event points to a systemic failure, not individual error. Contributing factors: procedure compliance, component design permitting reversed installation. Safety consequence: emergency cabin depressurization, oxygen mask deployment, air turnback. Systemic gap: no installation verification step that would catch seal orientation before aircraft release.

Part 121 — Landing Gear Torque Link

(ACN: 983512)

During a CRJ-900 main landing gear strut repack, a washer and apex spacer were installed in transposed positions at the torque link assembly. The aircraft was dispatched. On landing, the right main gear collapsed.

Inspector:

If we did install the washer and apex spacer backwards, I am not sure really how, it does not seem it would have looked correct to me and I would have caught it. But I am human and we were being pressured to get the aircraft out as soon as possible. I reviewed the history of Aircraft X and [gear] shimmy seemed to be an issue before the strut repack was accomplished. It may be possible this was installed incorrectly, before we disassembled. Then [again], may have been second nature [for mechanics] to reinstall the same way they took it apart.

Technician:

I don't recall the exact way Mechanic Z and I reassembled the shimmy damper, we didn't take it apart. Maintenance Control was pressuring us to get it done, to get the aircraft out. I don't recall the way Mechanic Z and I put the torque link back together, but looking at another torque link on another aircraft, I don't think we could have, but we are human and we didn't disassemble it [torque link], but we could have; it was a long day. The drawings on the jobcard are not real clear.

Contributing factors: time pressure, unclear job card drawings, component parts that could be assembled in the incorrect order without obvious visual indication. Safety consequence: main landing gear structural failure on landing, runway excursion, aircraft destroyed. Systemic gap: the apex spacer and washer are physically interchangeable in the assembly — error-proofing the design would prevent recurrence.

Part 121 — Aileron Control Servo

(ACN: 772287)

A DHC-8-200 maintenance technician replaced a failed aileron servo, passed all required operational checks, and released the aircraft for service. Minutes before departure, he discovered that the control wheel moved opposite to heading bug commands. The servo was wired backwards — by the manufacturer.

Technician:

I ran out and found to my horror that the aileron servo is moving the control wheel on Aircraft X backwards to the heading bug commands. The aircraft was 10 minutes from departure. I explained my concern to the flight crew and confirmed the control wheel was indeed turning backwards to heading bug commands. I called Maint Control and we agreed that we could put the autopilot on MEL. I don't believe that I made any mistakes in the installation, as the cables were transferred one at a time, and they are threaded differently between the top and bottom cables. I suspect that the aileron servo is wired backwards. I made a recommendation to Maint Control that this aircraft be taken off line ASAP. If a flight crew attempts to engage the autopilot as it is, it will put the aircraft into a roll.

The manufacturer's subsequent teardown confirmed the servo was internally wired backwards. A recall found 13 additional units with the same defect. Contributing factors: manufacturing quality control failure; operational check that passed despite the error. Safety consequence: potential uncommanded roll if autopilot engaged. Systemic gap: the return-to-service check for an aileron servo replacement did not include the full autopilot engagement transfer test that would have detected the reversed response.

Part 121 — Landing Gear Proximity Sensor Targets

(ACN: 750908)

During replacement of CRJ-700 main landing gear torque links, a mechanic transferred the Weight-on-Wheels proximity sensor targets from the removed link to the replacement — and installed them backwards. The aircraft departed, and the flight crew was unable to retract the landing gear.

Technician:

One of the mechs swapped over the prox sensor targets, from the removed upper torque link to the serviceable torque link. In doing so, he installed them backwards. With the shock strut compressed, there was no difference of results in the adjustment test of the sensor. Aircraft was released for revenue flight. Aircraft took off and the flight crew were unable to retract the landing gear. Aircraft returned to field with no further incidents and returned to hangar and the targets were reinstalled correctly with a successful landing gear retraction test. Aircraft manual states to install target with a note: Make sure that you install the target in its correct position. When the landing gear is extended, the sensor will be above the longer notch aft of the sensor face. We think it should read: when the strut or sliding member is extended.

Contributing factors: ambiguous AMM language ('landing gear extended' vs. 'strut extended' is a critical distinction on the ground); operational check that passed because the strut was compressed during ground testing. Safety consequence: gear retraction failure, overweight landing. Systemic gap: the adjustment test does not replicate in-flight strut extension conditions — a design limitation in the verification procedure.

Part 121 — Aileron Idler Arms

(ACN: 525249)

An inspector signed off the installation of left aileron idler arm bushings on a Jetstream 41. On the aircraft's first flight, it entered a hard bank. The aircraft returned safely, and investigation found the idler arms installed backwards — exactly as shown in the maintenance manual.

Inspector/Technician:

I performed an inspection on the left-hand aileron idler arms after remove and replace to change bushings. On the aircraft first flight it entered into a hard bank. The aircraft returned safely. Upon inspection of the left-hand aileron, it was found that the idler arms were installed backwards. Upon further investigation it was found that the figure in the maintenance manual was incorrect and showed the idler arms installed backwards. The aircraft manufacturer was notified and the affected pages are being changed.

This report stands apart from the others in this collection: the maintenance manual illustration was wrong. The technician and inspector installed the component exactly as depicted, and exactly wrong. Contributing factors: incorrect published data. Safety consequence: uncontrolled bank on first flight, declared emergency, diversion. Systemic gap: the operational check did not detect reversed aileron authority before the aircraft was released. The manufacturer updated the manual, but only after a flight crew declared an emergency.