

Mech

THE NAVAL AVIATION MAINTENANCE SAFETY REVIEW



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P-2, P-3, S-2, S-3, whatever . . . The lesson is obvious and applicable to all.

ONE UP, ONE DOWN, TOO BAD

A *NEPTUNE* was being prepared for a functional check-flight upon completion of a calendar inspection. The check pilot was briefed by the QA chief and all UP discrepancies were discussed. It appeared the flight would be routine and no problems were anticipated. The preflight inspection did not reveal any unknown discrepancies and the P-2 launched.

The first portion of the flight was uneventful. Functional checks proceeded satisfactorily until the landing gear checks were commenced. Gear down was selected but only the nose and the starboard MLG extended — the port MLG did not come down, though the port wheelwell doors did open about 3 to 4 inches. The gear handle was cycled to UP. The nose gear came up but the starboard gear remained down. The gear handle was recycled a few more times but the results were the same — nose gear cycling, port gear remaining up and the starboard gear staying down.

The NATOPS manual was consulted and it was agreed that the possibility existed that the bicycle chain which opens the wheelwell doors might have broken. With this

a possibility, G force was exerted on the aircraft but the attempt to force the gear down was unsuccessful.

Tower was notified of the emergency and the parent activity was informed. A radio link was established with the squadron and suggestions were received as to what attempts should be made in getting the port gear to extend. During the conversation, information was passed that a hydraulic line was missing from the port landing gear actuation system.

The squadron placed another aircraft on jacks, removed and capped off the subject hydraulic line, then cycled the gear and was able to duplicate the port MLG condition which existed on the airborne aircraft. However, they were not able to duplicate the starboard gear condition or come up with any suggestions as to what was preventing it from retracting.

After all suggestions had been tried, it was determined that a "one gear up" landing would be attempted. A request was made to have the left side of the runway foamed, starting at a point approximately 4000 feet from the approach end. As the request was



ALL AROUND

being carried out, the pilot made four or so practice approaches to the runway, simulating the feathering of the port engine, and with the jets secured to reduce the fire hazard. During this time, the crew secured their flight stations, stowed all loose gear in the bow, and then assumed ditching positions forward of the wing beam.

As the last practice approach was being made, the pilot noted the foam was being spread 2000 feet *closer* to the approach end of the runway than he had requested. He felt he could adjust his final approach to accommodate this unexpected condition.

Final approach was started, the port engine feathered, and the propeller positioned for minimum damage. At about 1 mile out, it appeared to the pilot that they would land long, so he extended the flaps to 30 degrees in an attempt to land in the first 200 feet. At an altitude of 200 feet, the pilot decided to abort the approach and take it around. He applied full power on the starboard engine and instructed the copilot to start the jets for a waveoff. He then retracted the flaps to 20 degrees but the aircraft continued to settle. Both jets were

windmilling but the copilot *could not get them started*. By this time, over half of the runway had been used up and the aircraft continued to lose altitude and airspeed.

At this point, the pilot notified the crew that they were going in. Though still flying, they were rapidly approaching the trees at the far end of the runway. In an attempt to clear the trees and make a water ditching, the pilot pulled back on the yoke, while maintaining a wings-level attitude. They barely cleared the trees, impacted the water in a near stall condition and came to a stop almost immediately. The raft deployed automatically, the crew climbed aboard and safely paddled to the beach. The aircraft sank in about 10 feet of water. No injuries were sustained by any crewmember.

Whew — hairy! But *why* did this happen? *What* were the reasons for the gear failing to function as expected? Although all endorsements haven't been received, the basic AAR gives us a good picture of the various elements which lead to this mishap. A look at these items should not only enlighten our readers but hopefully prevent the reoccurrence of such errors and miscalculations in other activities.

One Up

The aircraft had just completed its eleventh odd calendar inspection. During the period in check, a partial inspection by a QAR revealed a discrepancy that he reported as, "Check port main landing gear actuating cylinder for a leak (Note: Check hydraulic line above cylinder for a crack)." The discrepancy was assigned a JCN by the check crew supervisor and put into work shortly thereafter.

Subsequent to maintenance action on the JCN, the maintenance/material control officer, the check crew work center supervisor and the QA inspector mutually decided to leave the suspected line installed and have it checked for leaks during aircraft turnup. A drop check would have been required if the hydraulic line were removed and replaced.

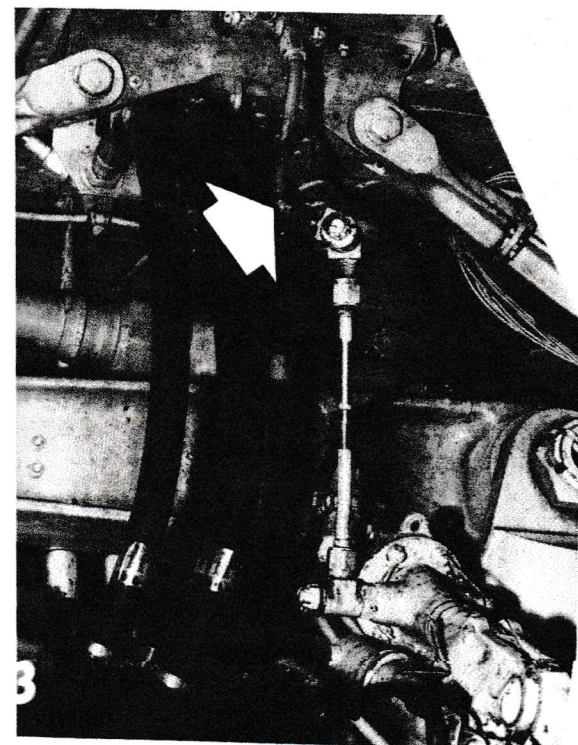
The aircraft check supervisor was notified of this decision and noted it in the master JCN listing, however, this information *was not passed* to the person assigned to remove the hydraulic line. Consequently, the line was removed, the line fittings capped off, and the line sent to AIMD accompanied by a work request form with instructions to manufacture a replacement line.

The function of the subject line was to provide a return path for hydraulic fluid ported from the port main landing gear actuating cylinder when the gear is actuated to the down position. Capping off the hydraulic fittings interrupted all hydraulic fluid flow from the up side of the gear actuating cylinder, forcing the gear to remain in the up position.

Continued

lected from the production work centers, including the subject JCN. An airframes supervisor apparently remembered the requirement for installation of the bolt and link assembly and assigned the task to a second class PO. The PO specifically remembers the assignment, but the supervisor does not recall assigning the job.

The PO was not familiar with the installation, nor was he aware that a drop check was a requirement after installation. When the strut assembly was put back in place and the new bolt installed, the swing joint assembly was inadvertently *reversed* (a Murphy) with the link forward rather than aft. The new link was found to be in tolerance and was not replaced. Upon completion of the installation, the man was reassigned to another



twisted and crimped line due to Murphy (reverse) installation.

maintenance function and he assumed the work would be documented by a co-worker. No drop check was performed nor was a maintenance document initiated to properly record the installation of the bolt.

The man who won't ask has to fake an answer or duck the question. In either case he limits his future. Who wants a man in a position of responsibility who is too dumb to seek answers from those who know more about some matters than he does? Asking a question reveals that you don't know the answer. But the failure to ask questions about what you want or need to know, reveals much more; all bad.

Malcolm S. Forbes,
Forbes Magazine

Duplicated Murphy

Original Murphy

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Had the aircraft been drop checked, the Murphied swing joint assembly would have been discovered. The first cycle of the gear would have deformed the hydraulic line, precluding a subsequent retraction and completion of the required 5 cycles.

A visual inspection of the starboard wheelwell of the salvaged aircraft revealed the swing joint tube assembly for the main gear strut was twisted, crimped and cracked (see Photo 3). The aircraft was placed on jacks and hydraulic pressure applied up-stream to the swing joint. The over-center downlock would not release. The swing joint was then bypassed and hydraulic pressure was applied directly to the downlock actuator; the downlock released normally.

To further clarify the situation, another aircraft was then drop checked with the apex of its swing joint installed in the forward position. The gear retracted and extended normally, however, it would not retract when recycled. The swing joint assembly was found deformed identically to that of the line found on the crashed aircraft (see Photo 4).

This mishap is a good example of how *bypassing normal maintenance procedures and policies* can lead to a major mishap. *Every bit* of maintenance effort exerted must be documented, inspected and functionally tested (where required), otherwise events depicted in this article are bound to be repeated. *Doing a professional job* on every assignment is the only way to go. This lesson has been learned before. The only fortunate thing about this mishap is that there were no injuries or fatalities.

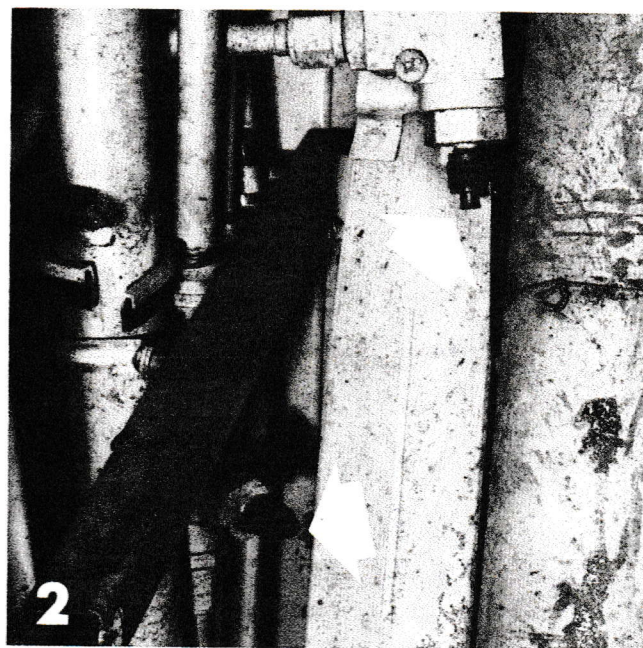
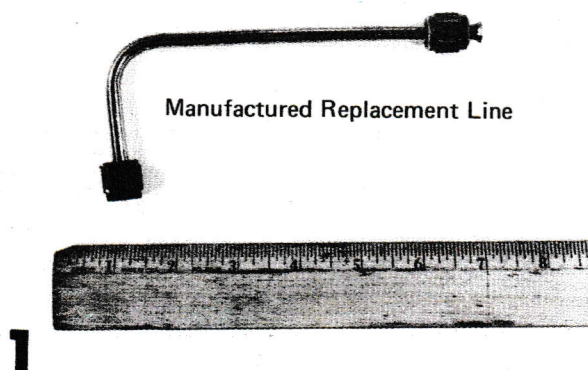


Following removal of the hydraulic line, the aircraft check supervisor was notified and he, in turn, annotated the organizational register (OPNAV Form 4790/1) of the appropriate JCN as "line being manufactured." At this time only four persons were aware of the line removal: three airframes personnel and the aircraft check supervisor.

Early the next day it was decided that a postmaintenance functional check flight would be feasible and action on all fix phase/look phase JCNs was accelerated. The maintenance/material control officer directed that all fix phase/look phase JCNs be completed in order to check fly the aircraft at 1300. The original aircraft check supervisor *departed on leave at 1000 that date*, so another supervisor assumed his duties and started to screen all organizational registers. He noted the JCN on the hydraulic line, set it aside for further study, and then was interrupted to perform another task. Upon his return to his duties he noted the registers had been disturbed and the fact about the specific JCN slipped his mind.

The *replacement* aircraft check supervisor continued screening the available registers, simultaneously listing all 'awaiting parts' and UP discrepancies on the back of the functional flight check card (which was subsequently lost in the wreckage). Questioned later, he could not recall having seen the subject JCN with the registers. The aircraft check crew supervisor then picked up all 'awaiting parts' registers and gave them to the maintenance control VIDS board operator, who was told to hold them for review by the maintenance control CPO. The rationale behind this was that Maintenance Control would better control the work being conducted on the aircraft. The VIDS board operator posted all 'awaiting parts' discrepancies on the VIDS board *without showing them* to the maintenance control CPO, therefore not affording him an opportunity to review the registers prior to the check flight.

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Arrows indicate capped off connectors where line was removed.

Shortly after the aircraft had launched, an airframes man approached the maintenance control CPO with the manufactured hydraulic line (see Photo 1) and inquired as to the whereabouts of the aircraft. After checking the VIDS board, the CPO ascertained that the hydraulic line may have been missing from the aircraft and notified the squadron duty officer of the situation.

After salvage of the aircraft, the port main landing gear was extended to the down-and-locked position by relieving the pressure from the up side of the gear hydraulic actuating cylinder. A visual inspection of the wheelwell verified the subject line was in fact missing and the hydraulic fittings capped off (see Photo 2).

One Down

Investigation into the cause for the *starboard* main landing gear malfunction revealed the following:

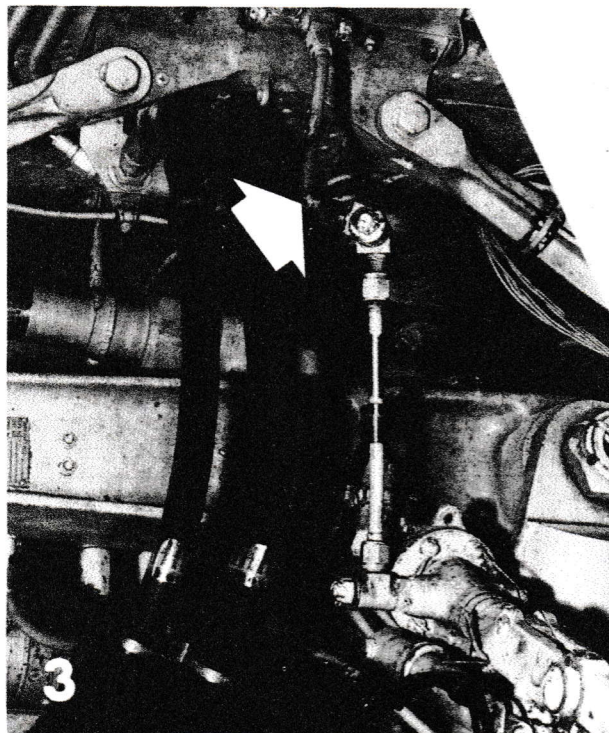
Interim Airframes Bulletin 123 had been performed on the ill-fated *Neptune*, a bulletin which required a one-time inspection of the main landing gear drag brace assembly, link assembly, and bolt (on both main gear assemblies) for excessive wear. During the required inspection, the bolt and the link assembly on the starboard gear were found to be worn beyond limits but considered safe for use until replacement parts were received. As a result, a MAF was initiated as the document for ordering the required parts, and an organizational work center register was sent to the airframes work center.

Upon receipt of the parts, it was decided to install them during the calendar inspection. When the aircraft was inducted into the calendar inspection, all outstanding organizational work center registers were

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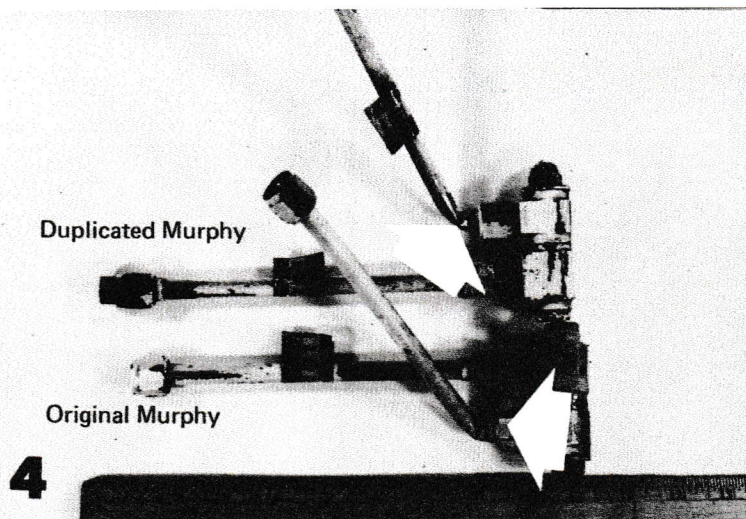


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