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# Do not forget that you are not alone in Maintenance

## 1. Introduction

The aim of this article is to highlight the importance of being aware of what other maintenance team co-workers are doing, and where they are working on the aircraft at the same time. The potential consequences can be dramatic when this awareness is lost, as shown by this article.

Maintenance teams are working in an environment where they are faced with ever more complex aircraft systems and the increased interaction of co-workers performing different tasks at the same time on the same aircraft.

Being aware of who is doing what, and understanding the consequences of tasks being performed is essential, to avoid potentially dramatic situations.

## 2. Maintenance Event Description

Loss of situational awareness in maintenance operations can have serious consequences. In the least it can lead to damage to the aircraft, and in the worst case can result in fatal injuries to maintenance workers involved in the incident, as two recent cases have highlighted.

### Case No. 1: Accident with the Krueger flap

During a scheduled maintenance check, an experienced licensed mechanic was cleaning an area between the extended Krueger flap and the structure on an A300-600.

During the performance of this maintenance task, the slats started retracting, causing the head of the mechanic to be impacted by the moving Krueger flap at the end of the slat system retraction cycle.

The investigations performed further to this accident confirmed that the warnings and precautions as per the AMM were clear.

It was also confirmed that head set communication was present between the cockpit operator and the hangar area, and visual alert signs were located around the work areas.

Good standard maintenance practice would require to do a walk-around to be carried out. The person who activated the hydraulic system did not, through such a check, confirm that there was no risk to other personnel prior to energising the hydraulic system.

### Case No. 2: Injuries caused by the Nose Landing Door closure

A mechanic was working alone within the landing gear bay on an A320 Family aircraft. For an undetermined reason, the ground door opening handle was in the “closed” position, i.e. not corresponding to the actual position of the nose landing doors (fig. 1).

Another person, not being aware that a mechanic was already working within the landing gear bay, activated the hydraulic system; the doors closed accordingly and trapped the mechanic.

## 3. The Aircraft Maintenance Manual

The AMM is written with specific warnings and cautions detailing safety procedures and tooling that should be used. These Warning Notices typically ensure that the controls agree with the position of the surfaces they operate, and to operate the controls only when the related hydraulic systems are pressurized.

The use of the correct tooling will prevent the doors from closing, if the hydraulic system is pressurised Inadvertently.

The aim of these safety steps is to highlight particular risks, and to reduce the risk of injury to the mechanics.

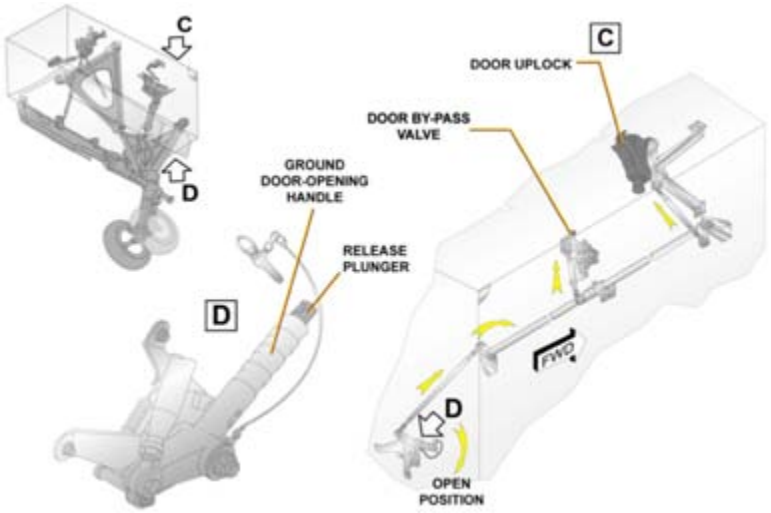


**Figure 1**
*A320 Nose Landing Gear operation mechanism*

## 4. The Lessons Learned

The common factor between the two described accidents was that even though the maintenance documentation provided clear warning advice, fatal injuries were caused to the workers in question.

In both events, investigation showed that more than one individual was working on the aircraft at the time, but on different assigned tasks.

None of them had made a maintenance error related to the tasks he was working on. However, a combination of actions taken led to the situation that put one of the workers lives at risk.

All of these difficulties point to a lack of having a clear and up to date understanding of what was going on around the aircraft. It demonstrates the importance of being aware all the time of the state of the aircraft systems, and sub-systems, that may be being working on.

A common situation is that personnel carrying out part of a major maintenance task, without the awareness and knowledge as to how their actions are affecting the overall task, or aircraft technical configuration, i.e. having

Taking the two examples above, details of the warnings and cautions are as follows:

- MAKE SURE THAT THE CONTROLS AGREE WITH THE POSITION OF THE ITEMS THEY OPERATE BEFORE YOU PRESSURIZE A HYDRAULIC SYSTEM. UNWANTED MOVEMENT OF HYDRAULICALLY OPERATED ITEMS CAN LEAD TO SERIOUS INJURY AND / OR CAUSE DAMAGE.

- ONLY OPERATE CONTROLS WHEN THE RELATED HYDRAULIC SYSTEMS ARE PESSURIZED.
- IF YOU OPERATE A CONTROL WHEN THE RELATED HYDRAULIC SYSTEM IS NOT PRESSURIZED, THERE IS A RISK THAT:
  - THE CONTROL WILL BE IN A POSITION THAT DOES NOT AGREE WITH THE ITEM(S) IT OPERATES.
  - WHEN HYDRAULIC PRESSURE IS RESTORED, UNWANTED MOVEMENT OF THE HYDRAULICALLY OPERATED ITEM(S) MAY OCCUR AND CAUSE SERIOUS INJURY AND / OR CAUSE DAMAGE.

In addition, the “Doors Closing Preparation” of the Technical Training Manual includes a caution, which highlights the following messages:

ON THE GROUND
- MAKE CERTAIN THAT THE GROUND DOOR OPENING CONTROL HANDLE IS LOCKED IN THE OPEN POSITION,
- REMOVE THAT THE SAFETY PIN FROM THE DOORS,
- MAKE CERTAIN THAT THE DOOR TRAVEL RANGES ARE CLEAR

lost the "big picture", also commonly known as "tunnel tasking". Often technicians are given only their piece of the puzzle, for example, being assigned tasks with deadlines without explanation or direction – a "just do it" assignment.

The difficulty in ensuring safety whilst working on aircraft systems is increased by the fact that many different individuals may be working on the aircraft. The presence of multiple individuals increases the need for good and clear communication between them, and clear understanding of responsibilities.

In addition to the awareness of what the different team members within one given team are doing, another important task for maintenance teams is the co-ordination and information transfer across different teams, for example during shift hand-over.

**Figure 2**
*A possible consequence of the lack of awareness in the hangar*

## 5. Conclusion

A recurring source of accidents or incidents during maintenance is caused by loss of situational awareness. Technicians are often made aware of only part of a major maintenance task. Problems can occur when they are not trained or explanations are not provided of how their activities could affect other people working at the same time on the aircraft.

As part of preventive measures, individuals, training organisations, and management should ensure effective shift preparations, communications between all involved working on the aircraft, and avoid being trapped in a "tunnel task" situation, which can have fatal consequences.

# Safety First

**The Airbus Safety Magazine**
**For the enhancement of safe flight through increased knowledge and communications**

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**A400M**
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**Safety First,** #14 June 2012. Safety First is published by Airbus S.A.S. - 1, rond point Maurice Bellonte - 31707 Blagnac Cedex/France. Editor: Yannick Malinge, Chief Product Safety Officer, Nils Fayaud, Director Product Safety Information. Concept Design by Airbus Multi Media Support Ref. 20121045. Computer Graphic by Quat'coul, Fixion, Abac Effect. Copyright: GS 420.0029 Issue 14. Photos copyright Airbus. Photos by Pascal Chenu, ExM Company: P. Masclet. Printed in France by Airbus Print Centre.