

Scaling New Heights

Preventing falls in the air transport industry

Each year, the Health & Safety Executive (HSE) receives about 40 reported incidents of air transport industry staff injuring themselves after falling from height¹. About 15 of these are major injuries such as fractures.

Many of these accidents occur airside during aircraft maintenance, accessing or egressing the aircraft and working on or from service equipment - with falls from height and workplace transport incidents causing the majority of air-transport related accidents reported by the HSE.² A significant proportion of the most serious accidents occur during aircraft turnaround. The scenario is broadly similar throughout Europe, though statistical data is hard to come by.

A high risk environment

Global expansion of the aviation industry in recent years, along with ever increasing pressures to keep costs down (which means tighter turnarounds for aircraft), makes an airport a hazardous environment to work in, bringing new health and safety challenges for staff on the ground.

“accessing the aircraft and working on or from service equipment - falls from height cause the majority of air-transport related accidents”

During a turnaround (a Boeing 747 typically has 45 minutes to complete this manoeuvre), usual activities will include passenger disembarkation, baggage/cargo handling, aircraft maintenance, fuelling, de-icing, catering provision, cleaning and re-embarkation of passengers. Many of these activities will be undertaken by different companies, all wanting to get their part of the procedure completed on time. If caterers don't restock >



Mobilok from Capital Safety Group



an aircraft on time, or cleaners don't get it cleaned, it holds up the aircraft and there can be serious repercussions for the service operator.

When the aircraft lands and gets turned around, set checks have to be carried out by the engineering maintenance team. Virtually all maintenance on an aircraft turnaround has got to be done at height. And because aircraft designers haven't traditionally considered how the engineers will gain access to maintain different parts of the aircraft, it's sometimes difficult to get to the place you need to, when you need to. Access equipment needs to be flexible, lightweight and easily towable and be able to reach all the aircraft's nooks and crannies.

A changing climate

When I joined the industry from the pharmaceuticals industry seven years ago (a highly compliant industry in terms of the health and safety of its employees), I was surprised at the safety standards that were being accepted at airports. Without adequately designed access equipment, engineers were placing boxes of oil cans, or whatever else they could get hold of, on top of steps and stepping on them to access the parts of the aircraft they needed to reach. >

Improving working at height in the hangar

Virgin Atlantic took out a lease at Gatwick on an 18-year-old hangar that had been empty for a number of years. Hangars of this time did not have the same safety features as they would have today - to all intents and purposes this 'hangar' was a large shed in which to park an aircraft! This posed a number of problems when it came to working at height, as engineers sometimes have to work on the aircraft wings and on the crown of the fuselage. To get round these problems, we fitted a network of fall-arrest systems to the ceiling of the hangar, which allowed the engineers to work on the wings and aircraft crown. Our engineering training department arranged for the engineers to be trained in the fitting of the harnesses and operation of the system.

To enable safe access to the nose of the aircraft to work on the windscreen and radom and to provide safe access to the aircraft interior we also put a nose dock into the hangar. This not only improved working at height; it also improved manual handling, as the docking incorporated an overhead crane. ■

One of the reasons for this was that safety at airports had not been clearly delineated. Until 1998 that is, when the HSE and Civil Aviation Authority (CAA) signed a Memorandum of Understanding (MoU). The CAA Safety Regulation Group (SRG) was given the responsibility of ensuring that risks to civil aviation safety were properly controlled and the HSE to ensure that risks to people's health and safety from work activities while the aircraft was on the ground were properly controlled. As a result of this, in recent years the airports have been a major focus for the HSE and a lot of good work has been done to improve the safety of the turnaround process.

New legislation - working at height

When it comes to aircraft maintenance, the industry has used one particular design of steps for all tasks for the past 20-25 years. They are very versatile and allow access into, under and around the aircraft engine, along with access to the cargo hold. From a safety point of view, however, the design is poor. The employee can be working nearly 2.5 metres off the ground, with little or no protection from falling and when accessing the cargo hold, a large unprotected gap is left. Virgin's own accident statistics showed that over a four-year period we had 11 working-at-height lost time accidents (with 10 of these involving access steps). One of these accidents almost resulted in a death. These accidents resulted in a significant number of lost working days, to the extent that, in 2004, we decided to look at the step design and try and find a better solution.

“in 2005, new working at height regulations were introduced, placing new legal responsibilities on employers”

In 2005, new working at height regulations were introduced, placing new legal responsibilities on employers to ensure that equipment (such as ladders and platforms) used to facilitate working at any height minimised the risk of falling and offered sufficient protection to workers. These consolidated previous legislation on working at height and implemented the European Council Directive 2001/45/EC covering minimum safety and health requirements for the use of equipment for work at height (the Temporary Work at Height Directive). These regulations gave us added impetus to find a compliant solution. In addition a new European standard EN 12312-8 Aircraft maintenance stairs and platforms came out, so any new steps we created would need to meet this standard too.

Virgin steps up its levels of safety

We brought in an outside supplier (Surrey-based specialist design and engineering firm Semmco) to help us find solutions. The challenge was to find steps that were easily towable, that could be used at variable height (from 2.2 to 3.25 metres), that could withstand the harsh working environment of the airport and that could be easily manoeuvred by one person. They also had to >

Figure 1. Original steps



Figure 2. Cargo bay access steps



work on all three aircraft types that Virgin operated (the Airbus A340 - 300 and 600 and the Boeing 747).

In the first instance we tried to design one set of steps to do all tasks. We gave Semmco a design brief and they designed and built a set of steps. The resulting steps proved to be much larger than expected; they were fine for accessing the cargo hold of the three aircraft types, but too big to work under and around the aircraft engines. We also made the mistake of trying to design the steps, rather than tell the supplier what the problem was and let them come up with the design. It was around this time that we had a serious accident (an engineer fell from the cargo hold, sustaining serious back and head injuries). This made us rethink the steps that had been designed.

“because both the swing out gate and the height were adjustable, they could be fitted to all our aircraft types”

Version 1: cargo-bay access steps

We modified the top of the steps with swing-out adjustable gates. The result was a lightweight, easily manoeuvrable, height-adjustable set of steps capable of giving total protection to those working in the cargo hold. Also, because both the swing out gate and the height were adjustable, they could be fitted to all our aircraft types. ►

Facts and figures: working at height

- Falls from height are the biggest single cause of death in the workplace, and the second biggest cause of major injuries at work in Great Britain
- There were 91,000 fall from height accidents in the UK in the seven year period 1997-2003, resulting in three or more days off work. Around 54,000 of these were low-level falls, 18,000 were high-level falls, and the rest were unclassified
- Forty-five people died in 2006/7 as a result of a fall at work. In the same time there were 3750 major injuries, (350 every month)
- The Work at Height Regulations 2005 (as amended) set out a set of rules that must be followed when you are planning work at height
- The most common factors where falls from height occur involve a failure to: recognise a problem; provide safe systems of work; ensure that safe systems of work are followed; provide adequate information, instruction, training or supervision; use appropriate equipment, or provide safe equipment
- The main causes of accidents and ill-health for air transport staff are musculoskeletal disorders; slips and trips; being struck by a falling object; falls from height and workplace transport ■



We trialled the steps and they were very successful with the engineers - not only at the cargo hold but also for other jobs. They could also be used under the wing and over the engine, which meant they could also be effective for a range of other maintenance tasks.

Version 2: engine access steps

We had solved one problem, but it was clear that one solution was not going to solve all problems. So we went back to the supplier and showed them the problems we had. We revealed the areas we wanted to be able to get to - the front of the engines (to access fan blades) and underneath the engine (the engine cowls). This is a very limited space - there's a lot of equipment around you, so it's quite difficult to get access steps that fit in this space and that are fully compliant with both the legislation and the EN standard.

They came up with a design and manufactured a set of trial steps. We put the steps on trial and handed out feedback forms to the engineers. Following their feedback, some modifications were carried out and the steps put back on trial.

The feedback was positive, as these steps provided a flexible, safe working platform up to 3.2 metres, allowing full access for two engineers under the engine cowls and around the outboard engines on the A340-600. The design incorporated folding railings, allowing better access while maintaining the engines, while the platform and access steps had excellent protective padding, preventing any accidental damage to the aircraft while manoeuvring the steps into place.

General precautions to reduce the risk of a fall

- Where possible, avoid work at height
- Provide working platforms with suitable edge protection
- Ensure that any adjustable edge protection has been properly set
- Provide suitable edge protection or keep shut any openings in the aircraft fuselage (eg doors)
- Make sure that the access equipment used is stable
- Maintain the access equipment
- Train the people using the access equipment to use it in a safe and proper manner
- Monitor the people undertaking the work to ensure that they follow your procedures in a safe manner ■

They were also height adjustable (they can slide to a height of 1.5, 2.5 and 3.2 metres), which meant you could get to the inboard engines as well. The mid-platform also gave good access to the front of the engine, to check the fan blades.

What became clear when we trialled them, however, was that what the engineers really wanted was the old familiar set of steps - or at least the principle of them - for everyday use. So we >

Figure 3. Engine access steps



went back to the drawing board, and the supplier came up with another design using the same template as the existing steps, but we had to 'stretch' them slightly so they complied with the new standard. And in order to meet the new health and safety specifications, Semmco added some adjustable hand rails too.

Version 3: fixed height steps

So this third set of steps was for general use - quite versatile, lightweight, based on the same footprint as the old steps, but compliant with the regulations and the standard. They gave good access under the engines and outside the engines to top up the oil on turnarounds. The principle was that when you are under the engine you would be protected, because you have the engine on one side of you and the cowl the other side. So when you put the step under the engine you're protected by the structure of the aircraft.

So we trialled the new general purpose steps and they seemed to fit the task. The supplier also made a small extendable 'hop up' inside the steps to get a bit more height - an extra step that pulls out of the top step, that can be used when you're right inside the engine. These steps can be extended to fit just about any space in our three types of aircraft. So we now have three sets of steps fit for purpose - cargo access steps, height adjustable steps for special tasks requiring access to difficult-to-reach areas, and a set of steps for everyday tasks such as engine oiling. We also included a small set of hop-up steps that can be towed behind the everyday steps for even greater flexibility.

The pressure's still there in turnaround - it just means now that, rather than taking short cuts, engineers have equipment that is fit-for-purpose, easily towable and that enables them to get where they want to more easily, when they need to get there.

Managing change

It has been quite a culture change for some of them, though. Some of those who had been around the industry for some time didn't see a need for change. They felt that they could manage the health and safety aspects of their jobs themselves. There had been quite a number of fall-from-height accidents with other airlines though, and so many of those that showed the most resistance eventually came on board (although there is still work to do on improving the safety culture and getting compliance).

Virgin Engineering has invested a significant amount in improving health and safety for staff in terms of health and safety equipment and training. Now we're working on the culture change - getting people to accept that the way the industry works needs to change and that we need to be compliant and work safely. Above all else it makes good business sense.

Project outcomes

There have been no falls in the hangars at Gatwick or Heathrow since the steps have been introduced. Out in the airport it's really too early to tell how successful they've been (the steps were only introduced in April this year). >



Figure 4. Fixed height steps

General precautions to be taken (by companies involved in aircraft turnaround) to reduce the risk of injury:

- Assess the risks to their own employees and put in place measures to control these risks
- Assess the risks to other employees and put in place measures to control these risks
- Co-operate and coordinate with all of the other employers involved in turnaround
- Have in place a system to control and manage any contractors, and
- Have in place a system to monitor the activity at the turnaround ■

Semcco Tail Docking System



Other access steps are now starting to appear on the market as customers are putting more pressure on suppliers to design compliant steps.

I've enjoyed doing this project; it's been quite a challenge. And it's nice to see that the industry is changing possibly as a result of this work. I have set up an interest group for industry members in the UK, the Aviation Engineering Safety Advisors' Forum, which meets quarterly and shares problems and best practice solutions. Pooling our resources will help us avoid 're-inventing the wheel'. And I'm hoping to be able to extend this group to become an international network in the near future. ■

References

- 1 Figures taken from HSE website at <http://www.hse.gov.uk/airtransport/falls.htm>
- 2 Figures taken from HSE website at <http://www.hse.gov.uk/airtransport/falls.htm>

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