Is Your Fall Protection System Fit for Purpose?

At Latchways nothing is left to chance. Each and every product undergoes a series of rigorous testing, which, along with innovative engineering design, has gained worldwide respect for Latchways products. The integrity of the system's performance is dependent on a comprehensive test program which meets the required international, national and local test standards.

Testing is carried out at the Latchways Devizes facility to the requirements laid down, overseen and approved by the relevant independent standards agencies. It is part of the Latchways regime that systems are tested above and beyond these to gain a full understanding of how their systems perform in extreme circumstances.

Latchways Wingrip system has been subject to a series of exacting tests to verify both its performance parameters and show customers that it more than meets the demands put upon it.

What Is Wingrip?

Wingrip is the Latchways fall protection system that is designed specifically for aircraft engineers. Wingrip allows access to all areas of any aircraft including wings, fuselage and stabilisers whether it is parked in the hanger or out on the apron. The system consists of a series of pads that give anchor points on the aircraft using vacuum via an intelligent module. The pads are connected by two lengths of protected cable which the engineers attach to via their safety harness and lanyard (see photograph below of Wingrip system in use). The system is quick and easy to set up and can be used in multiple or single pad mode depending on the area of the aircraft that needs to be accessed.

Why Were the Tests Carried Out?

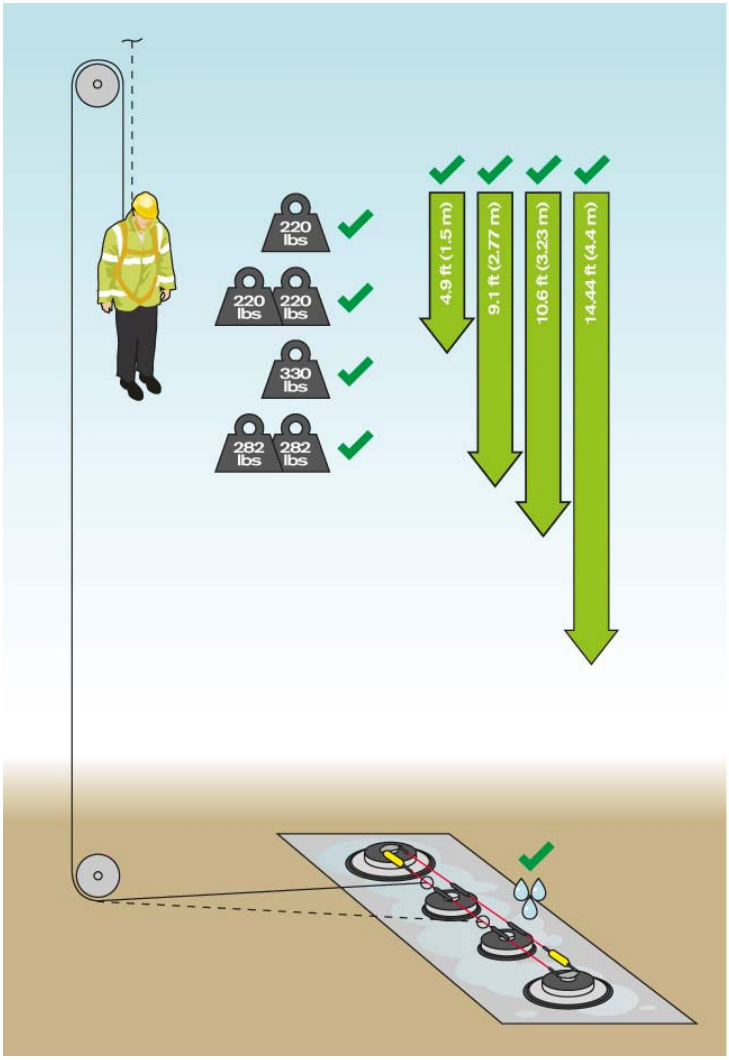
The tests were carried out to show:

1. The fall arrest capability of the system
2. The ground clearance requirements
3. The applied loads acting on the system.

What Is the Difference Between Fall Arrest and Fall Restraint?

A system designed with restraint capabilities will only ensure that operators are protected from reaching the area where a fall may occur. Restraint only systems cannot be guaranteed to ‘arrest’ a fall should one happen for any reason. A fall arrest system allows access to the hazard, and should a fall occur, has the capability to withstand the loads created by the fall and successfully ‘arrest’ the fall. Latchways have always set a principle of designing their systems to be fall arrest capable, but predominantly used in restraint.

How Was the Wingrip System Tested?



A four pad system was laid out in the configuration shown, spanning a total of 59.1 ft (18 m) – pads positioned at 19.7 ft (6 m) intervals. The tests were carried out externally in the wet and dry to evaluate system performance in typical conditions.

The tests were designed to cover:

1. Different fall distances
2. Different weights of an anthropometric dummy
3. Different points on the system where the fall occurred

The test mass/masses were each connected to the Wingrip system via their own energy absorbing packs, ropes and shuttles through a series of pulleys and a 11240 lbs (50 kN) load cell in line with the anthropometric dummy. An additional load cell was included in the line to which the shuttles were attached in order to measure the end loads exerted on the system.

The same fall distances were then used to complete drops on a single point anchor system using a 220 lbs (100 kg) anthropometric dummy.

The Detail

A range of free fall distances to replicate different fall arrest scenarios were simulated.

1. **4.9 ft** (1.50 m) – this is the free fall distance with the system setback from the edge of wing, in line with the user instructions and the user(s) adjusting their lanyard(s) so that they are deliberately standing on the edge of the wing. The distance of 4.9 ft is based on the height of harness D-ring dorsal connection point above the wing surface.
2. **9.1 ft** (2.77 m) – this simulates a free fall distance minus a setback distance (1.5 ft) for the system from the edge of a wing at the narrowest point. The distance of 9.1 ft includes the ANSI regulated free fall distance of 6 ft plus 4.6 ft that allows for a foot mounted anchorage and covers the 95th percentile male from foot to dorsal position.
3. **10.6 ft** (3.23 m) – this is the free fall distance with the system effectively positioned on the edge of the wing (i.e. no set back distance). The distance of 10.6 ft includes the ANSI 6 ft free fall plus 4.6 ft distance as described above.
4. **14.4 ft** (4.44 m) – this includes a free fall of 9.84 ft (3 m) plus 4.6 ft (1.50 m). This assumes there is no set back distance for the system and the user(s) are stood on the edge of the wing with the lanyard adjusted at maximum length.

Free fall distances of 9.1 ft (2.77 m), 10.6 ft (3.23 m) and 14.4 ft (4.44 m) reflect conditions of misuse, providing useful information regarding the performance of the system.

Each of these tests were conducted on the system at four different points,

1. End anchor – as close to the end vacuum pad as the shuttle will travel
2. Mid span – halfway between the large end pad and smaller intermediate pad
3. Intermediate anchor – directly on the intermediate cable guide
4. Mid span – halfway between two intermediate anchors

During the series of tests the following test masses were used

1. 1 x 220 lbs (100 kg) anthropometric drop test dummy
2. 2 x 220 lbs (100 kg)
3. 1 x 330 lbs (150 kg)
4. 2 x 282 lbs (128 kg).

The anthropometric test dummy used in this series of tests represents the 95th percentile of the male population and was selected for the 1 x 220 lbs drop as being the closest replication of a human body during a fall arrest event. The dummy was fitted with a medium size full body harness in line with the manufacturer's user instructions.

For the 2 x 220 lbs drop tests a second rigid steel test weight was employed. The test dummy and steel mass were released at the same time, however to replicate a realistic fall by two users the steel mass loaded the system followed by the test dummy shortly after. To achieve this lag or delay the length of the lanyard attached to the steel test mass was reduced in length by 2.5 ft (0.75 m).

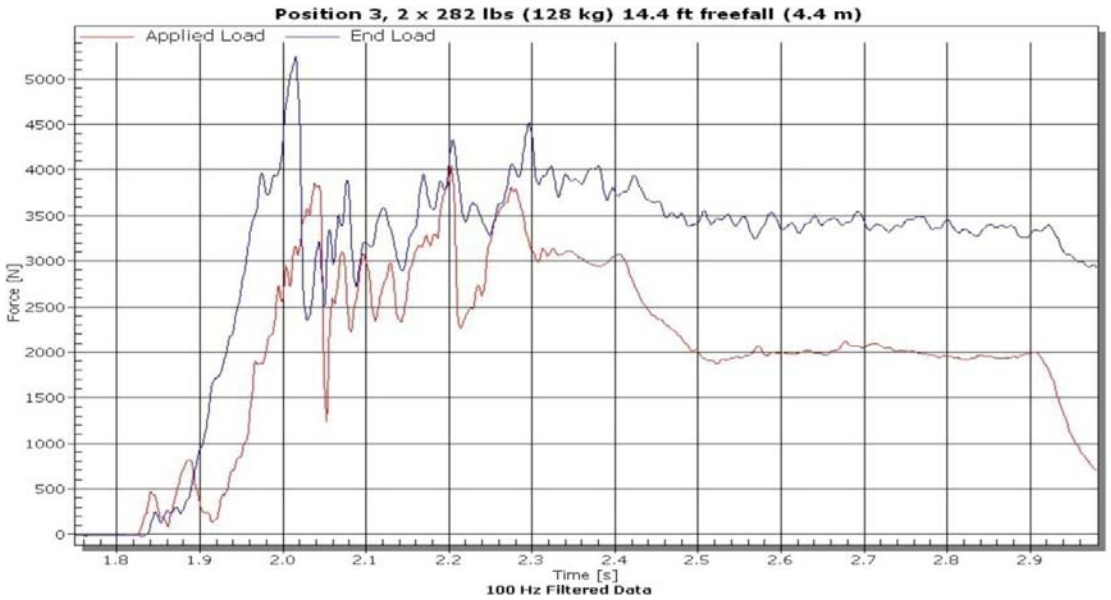
A limited number of tests were initially conducted using a 1 x 330 lbs test mass. This was set-up using the test dummy with an extra two sand bags attached at the abdomen and lower back positions of the dummy.

However, these tests were superseded by the 2 x 282 lbs on the basis that due to the geometry created by the cable deflection, the sequential double impact provided a more onerous test for the Wingrip system.

The tests employing 2 x 282 lbs test masses were conducted as per the 2 x 220 lbs tests, however, a sand bag weighing 62 lb was added to the test dummy and an extra 62 lbs weight was added to the rigid steel test mass.

Conclusions

From the test results, we can see that the Wingrip system has successfully arrested the test mass(es) and controlled the resultant loads to acceptable limits under all test conditions evaluated e.g. wet, dry, various positions on the system, single mass and sequential masses.



Maximum arrest distance recorded was 11.48 ft (3.5 m) with a minimum recorded arrest distance 1.97 ft (0.6 m).

Although the system when installed should be used to prevent a fall i.e. fall restraint, even under conditions of such misuse as evaluated in these tests the system still retains the capability to arrest the falls with no failure of the system in wet and dry conditions provided there is adequate ground clearance.

To find out more about the Wingrip system or to see video coverage of the tests conducted, please see www.latchways.com.