City Talk

SAFE LANDINGS REQUIRE LOTS OF FINE ENGINEERING

Nuts and bolts

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Just like the tires on a road vehicle the safety of an aircraft depends heavily on the landing gear, which holds the wheels to support the aircraft when it's on solid ground.

The landing gear is usually a retractable structure that allows it to be stowed within the fuselage or wings to minimize aerodynamic drag for energy efficiency when it's aloft.

For a large commercial aircraft the landing gear comprises the main gear located beneath the centroid of the plane for carrying most of the weight, and a smaller nose gear in front to provide steering control on ground.

Under normal landing exercises the main gear touches down before the nose gear. Hence we often see the aircraft tilting slightly upward as it lands.

In the same way that the tires must support the weight of the plane and to absorb shocks to provide comfort to passengers during touchdowns the weight and shock must be effectively transferred from the landing gear to the main structure, while ensuring the plane will remain stable for safe maneuvering.

The main struct of the landing gear is usually manufactured from high-strength steel, and hydraulic or pneumatic shock absorbers are fitted to provide the damping force for smooth landing.

Although landing gears are designed to be light structures it's unavoidable that the robust construction still accounts for some 3-5 percent of the total weight.

Together with the need for reliable retracting after taking-off and extending for every landing operation, all of these components must be inspected and maintained to high safety standards, and needless to say this will occupy a lot of maintenance time and effort.

Pilots usually move the retracted landing gear to the landing position only a few kilometers before landing, when the speed is lower, to avoid excessive drag. They must ensure that the gear is fully extended before landing for total safety.

This is why for smaller aircraft and other specialist types such as seaplanes and those that land on icy surfaces the wheels, floats and skis are attached rigidly to a plane and are not retractable. For slower-speed aircraft this is a more efficient setup.

As the aircraft touches down on the runway brakes in the wheels are applied smoothly to reduce the speed of the aircraft so it can safely enter rapid exit taxiways that lead it to a parking apron.

Unlike road vehicles there is no driving force from the wheels.

This is to reduce unnecessary weight and to minimize components that require maintenance. Forward movement of a plane on the ground is provided by the engine thrust. The pilot must therefore maintain enough momentum to drive the aircraft to its final docking position.

As there is no mechanism for reverse drive, any reverse movement needs the help of ground tractors, hence the need for pushback action every time the plane leaves an air bridge for taking off.

The aircraft is an extremely efficient and reliable piece of fine machinery.

It is designed to be light but robust enough for service. Safety is the first priority, and redundant systems ensure that in the event of a rare failure an aircraft can still be controlled and brought to the ground safely and reliably at all times.

Veteran engineer Edmund Leung Kwong-ho weighs up the dynamics that go into takeoffs and landings