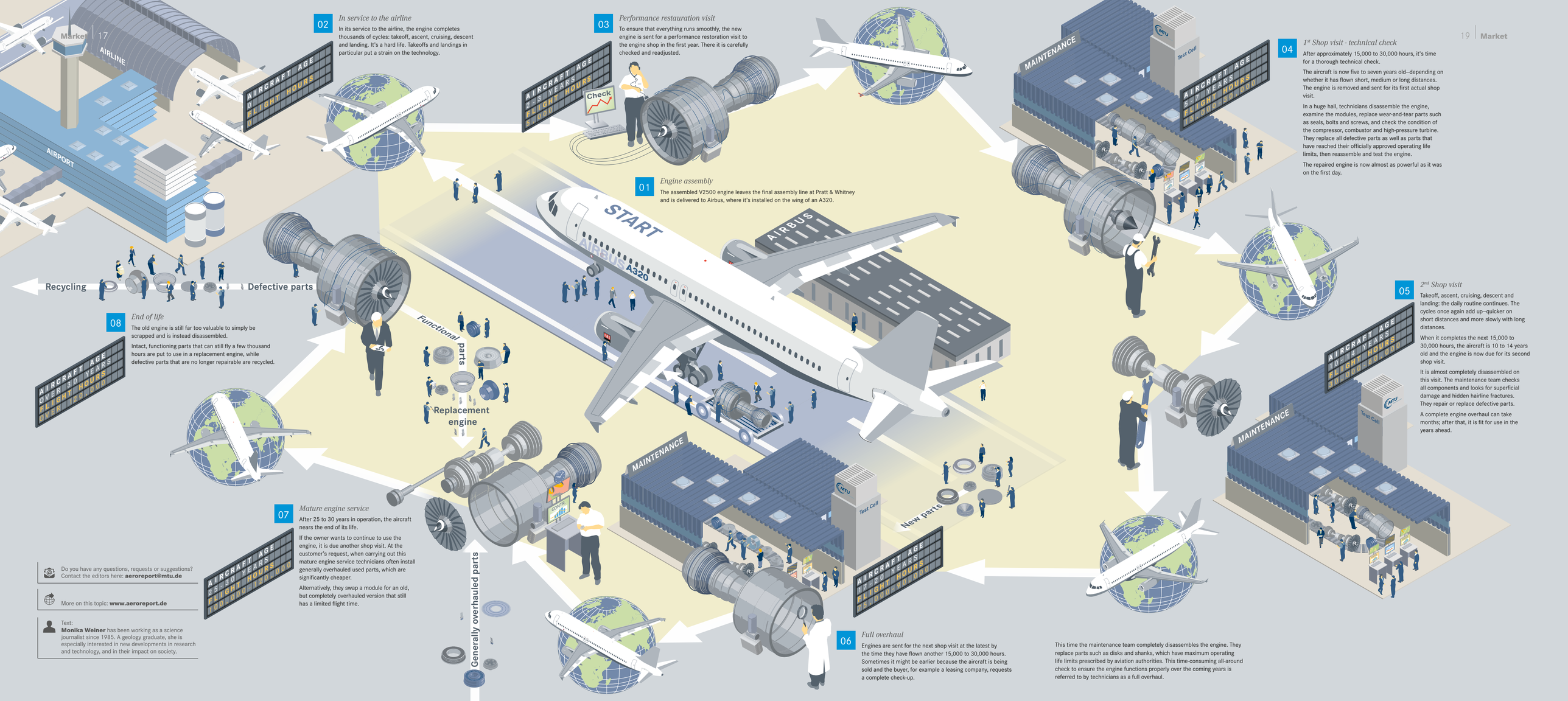

01 *Engine assembly*

The assembled V2500 engine leaves the final assembly line at Pratt & Whitney and is delivered to Airbus, where it's installed on the wing of an A320.

02 *In service to the airline*

In its service to the airline, the engine completes thousands of cycles: takeoff, ascent, cruising, descent and landing. It's a hard life. Takeoffs and landings in particular put a strain on the technology.

03 *Performance restauration visit*

To ensure that everything runs smoothly, the new engine is sent for a performance restoration visit to the engine shop in the first year. There it is carefully checked and readjusted.

04 *1st Shop visit - technical check*

After approximately 15,000 to 30,000 hours, it's time for a thorough technical check.

The aircraft is now five to seven years old–depending on whether it has flown short, medium or long distances. The engine is removed and sent for its first actual shop visit.

In a huge hall, technicians disassemble the engine, examine the modules, replace wear-and-tear parts such as seals, bolts and screws, and check the condition of the compressor, combustor and high-pressure turbine. They replace all defective parts as well as parts that have reached their officially approved operating life limits, then reassemble and test the engine.

The repaired engine is now almost as powerful as it was on the first day.

05 *2nd Shop visit*

Takeoff, ascent, cruising, descent and landing: the daily routine continues. The cycles once again add up–quicker on short distances and more slowly with long distances.

When it completes the next 15,000 to 30,000 hours, the aircraft is 10 to 14 years old and the engine is now due for its second shop visit.

It is almost completely disassembled on this visit. The maintenance team checks all components and looks for superficial damage and hidden hairline fractures. They repair or replace defective parts.

A complete engine overhaul can take months; after that, it is fit for use in the years ahead.

06 *Full overhaul*

Engines are sent for the next shop visit at the latest by the time they have flown another 15,000 to 30,000 hours. Sometimes it might be earlier because the aircraft is being sold and the buyer, for example a leasing company, requests a complete check-up.

This time the maintenance team completely disassembles the engine. They replace parts such as disks and shanks, which have maximum operating life limits prescribed by aviation authorities. This time-consuming all-around check to ensure the engine functions properly over the coming years is referred to by technicians as a full overhaul.

07 *Mature engine service*

After 25 to 30 years in operation, the aircraft nears the end of its life.

If the owner wants to continue to use the engine, it is due another shop visit. At the customer's request, when carrying out this mature engine service technicians often install generally overhauled used parts, which are significantly cheaper.

Alternatively, they swap a module for an old, but completely overhauled version that still has a limited flight time.

08 *End of life*

The old engine is still far too valuable to simply be scrapped and is instead disassembled.

Intact, functioning parts that can still fly a few thousand hours are put to use in a replacement engine, while defective parts that are no longer repairable are recycled.

Do you have any questions, requests or suggestions? Contact the editors here: **aeroreport@mtu.de**

More on this topic: **www.aeroreport.de**

Text:
Monika Weiner has been working as a science journalist since 1985. A geology graduate, she is especially interested in new developments in research and technology, and in their impact on society.