

# Improving Maintenance Inspections of Critical Aircraft Components

**Collaborating with engineers at an Air Force base to design and install a large overhead gantry structure and high-energy digital radiography system to examine strategic bomber control surfaces and structural components during rework of high-tech jets**

## The Challenge

The Customer is a U.S. Air Force maintenance and engineering team tasked with rework and servicing a fleet of strategic bomber aircraft. The team performs rework on structural elements of the aircraft, including critical flight control surfaces: the moving flaps and parts of the wing and tail that allow a pilot to adjust and control the aircraft's flight attitude (orientation in the air). These aircraft are a primary weapons delivery system for the U.S. military, so fail-safe performance is imperative. Flight control surfaces and other critical systems must be inspected and maintained with the utmost precision and attention to quality.

Aircraft parts are inspected after a designated number of hours in service to identify any damage and determine if they can be repaired effectively and placed back into service. The engineering team repairs and refurbishes these existing aircraft parts and receives new replacement component parts as needed. The replacement parts are manufactured elsewhere and delivered to the maintenance plant. Newly received parts have to be inspected to ensure there are no defects in materials or workmanship before being installed onto the bombers.

The Air Force maintenance oversight organization tracks closely when these new parts are delivered to the plant, and the engineering team has a specified time frame in which to complete installation of new parts and deliver mission-ready aircraft to the flight crews. If these time windows are not met, there are heavy performance penalties.

To perform parts inspections, the maintenance engineering unit had been using an old high-energy X-ray system that was installed inside



Strategic bomber aircraft in flight

**Industry:** Aerospace / Defense & Military

**Technology:** Digital Radiography

**Products & Services:** Overhead gantry / Digital X-ray imaging

**Customer Profile:** A U.S. Air Force maintenance engineering team performing rework of high-tech military bomber jets

**Business Challenge:** Bomber jet flight control components have to be inspected regularly to determine if they need to be repaired or replaced. When new parts arrive from the supplier, the engineering team has a limited time window to inspect and install them. The team needed a fast, accurate and reliable system to inspect both used and new aircraft components

**Solution:** A high-energy digital radiography imaging system and custom-built overhead gantry that allows the component parts to be manipulated for quick scanning, installed inside of an existing radiation enclosure

### Benefits:

- Component parts can be inspected rapidly and accurately, identifying defects or any areas for repair
- The reliability of the scanning and gantry systems ensures there will not be a malfunction or costly unplanned downtime during critical inspection time windows
- Quality standards for critical aircraft structures are maintained using the system's precision digital X-ray imaging and automated data capture and analysis, helping to keep bomber crews safe in the air

of a radiation-safe enclosure. But this system could not keep up with the speed nor provide the accuracy needed for bomber parts inspection, and it was unreliable. If the system wasn't functioning during critical time windows and the team missed their required delivery deadline, the costly performance penalties would kick in. The team needed to upgrade to a better system and sought Adaptive Energy's expertise to design a more effective solution.

## The Adaptive Energy Solution

Adaptive Energy upgraded the inspection system by installing a high-energy digital radiography system that could capture and process X-ray images for structural inspection of the components, in digital format. This system has the capability to provide improved accuracy and speed for parts inspections. However, there was still an additional challenge: many of the parts that need to be inspected are quite large, the size of entire aircraft wing flaps.

Adaptive Energy is experienced at designing and fabricating overhead gantry systems that allow large parts to be moved and manipulated easily so they can be thoroughly scanned on all sides. For example, one gantry system built for X-ray tube inspection accommodates a large scanning area greater than 35 feet by 24 feet and a scanning height up to 12 feet, while maintaining tight position repeatability, within a radiation-safe enclosure. Adaptive Energy used this expertise to create a customized overhead gantry solution on the Air Force base.

## Results

The digital radiography imaging system and overhead gantry assembly solution was installed inside the Air Force's existing radiation testing enclosure, providing improved speed and accuracy. Parts can be placed in the gantry system and moved in both the X and Y directions, passing under an overhead X-ray source. Images are captured in digital format for immediate, automated processing and analysis. Engineers can quickly ascertain the condition of used parts and make a determination if rework is appropriate, and they can inspect new parts prior to installation to ensure there are no defects.

The new system provides improved efficiency, enabling the maintenance engineering team to meet demanding service deadlines. The imaging system and gantry assembly is easy to use and requires minimal maintenance or downtime, with the reliability the engineering team needs when they are under time pressure to complete rework on an aircraft.

The system also offers greater accuracy, with automated digital capture, analysis and storage of X-ray images. The improved quality of parts inspections provided by the new system ensures that critical bomber missions are not compromised by mechanical failure.

## About Adaptive Energy

Adaptive Energy creates customized, non-destructive material evaluation solutions to address mission-critical, time-sensitive testing needs. By combining the latest digital radiography, computed tomography, and ultrasonic imaging technologies with innovative mechanical and robotic assemblies, Adaptive Energy's integrated systems offer rapid deployment, are easy to learn and maintain, and perform reliably under pressure.

Working collaboratively with organizations in the aerospace, automotive, energy, petro-chemical, defense, infrastructure, and materials industries, our experts develop optimized solutions for flaw and crack detection, composite delamination, weld inspection, hardness testing, custom radiation enclosures and overhead gantry systems, and more.

Adaptive Energy is also the exclusive distributor in the U.S. and Canada of FORCE Technology's P-Scan ultrasonic scanners, including the P-Scan Stack with Phased Array, a next generation automated inspection system.



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