



## Getting the Torque Just Right with Skylight Could Save Millions

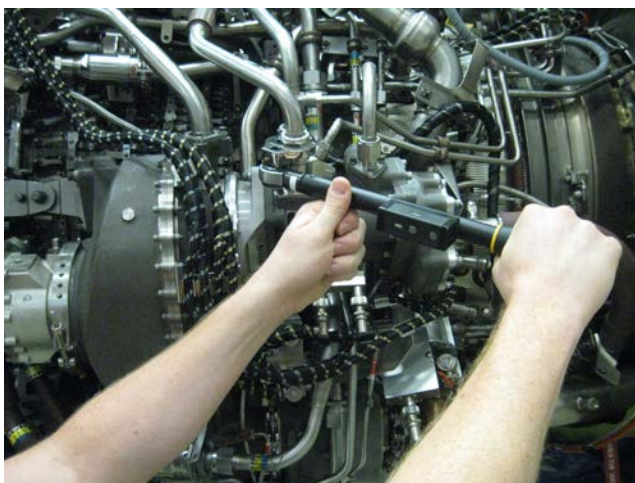
Maintenance errors are an expensive problem in the aerospace and aviation industry. GE Aviation is finding a new way to make sure every bolt is tightened perfectly—thanks to breakthroughs in wearable technology and the Skylight industrial augmented reality (AR) software platform from Upskill.

### Situation

Like most aerospace companies, GE Aviation loses millions of dollars each year to errors made at key points during the assembly and overhaul of its engines. The costs show up in lost productivity, delays in testing, delays in customer deliveries, and the man-hours required to troubleshoot and correct faults. Worse, if errors aren't detected until after the engines are sent to customers, the repair costs exponentially increase.

B-nuts are one such key manufacturing point. They play a critical role in aircraft engine fluid lines and hoses, providing a sturdy, reliable seal—but only if tightened and torqued properly. Too loose or too tight and you've got a maintenance do-over, cancelled flight, or even an in-flight shut down.

GE sought to find a solution that could improve how mechanics perform engine maintenance tasks, and believed AR technology might be the answer.



*Mechanic uses torque wrench to tighten B-nut.*



### Company

GE Aviation  
[www.geaviation.com](http://www.geaviation.com)

### Industry

Aerospace and Aviation

### Function

Manufacturing

### Wearable Solution

- Skylight
- Glass™
- Wi-Fi-enabled torque wrench

### Use Case

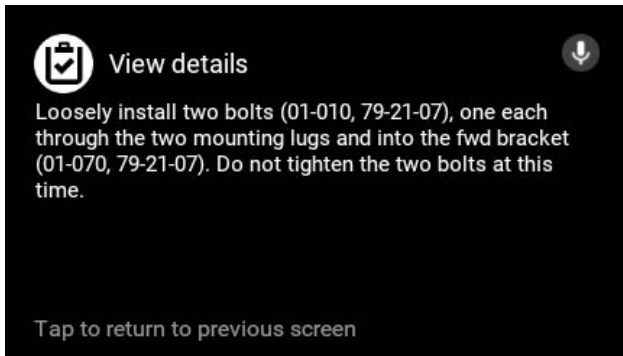
- Assembly, maintenance, and repair

### Benefits

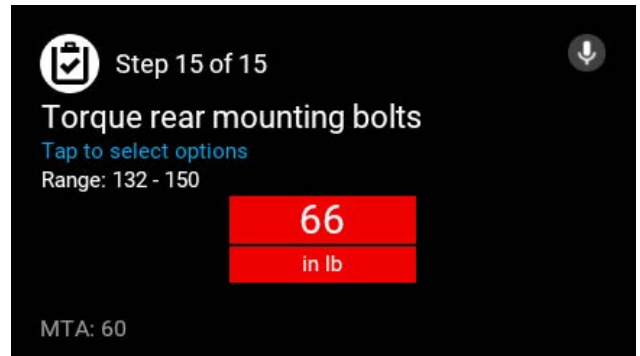
- Significant error reduction, saving millions
- Improved product quality
- 8 - 12% increase in mechanic efficiency
- Increased worker compliance
- Higher job satisfaction

Starting first with its facility in Cincinnati, Ohio, GE Aviation initiated a deployment of AR that combined three technologies: Skylight from Upskill, Glass Enterprise Edition smart glasses, and a Wi-Fi-enabled Atlas-Copco Saltus MWR-85TA torque wrench.

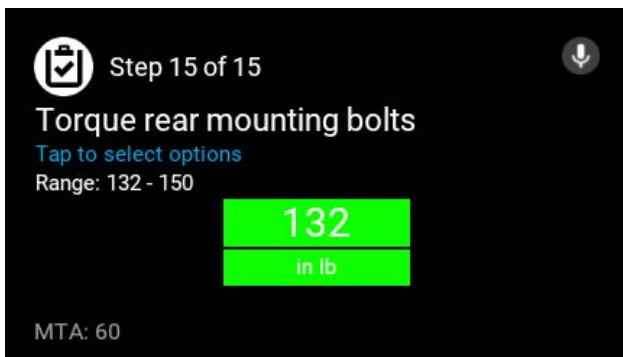
Using Skylight on Glass, mechanics receive step-by-step guided instructions and images directly within their line of sight while performing different maintenance tasks. As the mechanics move through standard procedures and come to a step where they need to apply the torque wrench, Skylight alerts them through the smart glasses and then verifies the correct value in real-time before the mechanic can move on.



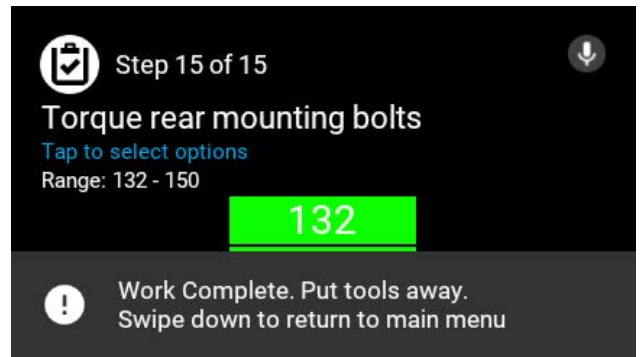
*Skylight bolt assembly workflow.*



*Red numbers indicate too much or not enough torque.*



*Green numbers indicate torque is within range.*



*Torque value recorded and task marked complete.*

*Actual views of Skylight workflow. Note the red background when torque applied has not yet reached approved standards. As the final range of 132-150 pounds of torque is reached, the background turns green. Workers use voice commands or swipe the side of Glass to change views and move ahead or backwards through their next task.*

For the initial deployment, 15 different mechanics from GE Aviation each spent a day testing the new technology against their existing procedures as they performed typical maintenance tasks. These workers normally follow instructions in paper binders or on a computer. In step with FAA-approved maintenance procedures, they regularly have to leave the engine, walk to a table or monitor, and review instructions to check their work.

With Skylight, instructions are now provided via the smart glasses. So are guided videos, animations, and images—all configured and accessible at any time for the worker. No stopping, no walking up and down ladders, less risk of injury. Workers can even turn on their camera and call engineers or other support team members for "see what I see" assistance with difficult steps.

Doing the work right is one part of the equation; tracking results is another. As each nut is finished, Skylight automatically records the final correct torque value. For further documentation, Skylight prompts the mechanic to take a photo of each installed B-nut for historical quality purposes before



proceeding to the next step in the procedure. Workers upload those records immediately to a laptop or, for long-term storage, to the manufacturing systems of record in the plant and an engine's maintenance files for chain of custody.

## Benefits

When GE reviewed and analyzed data from its initial deployment, the results were clear: its team could dramatically reduce development and production assembly errors, and consequently, also reduce downstream customer in-flight shut downs and unscheduled engine removals.

“ We believe that Skylight with Glass has the potential to be a real game changer in terms of its ability to minimize errors, improve product quality, and increase mechanic efficiency.

– Ted Robertson, Manager, GE Aviation



*The Torque In-Sight team during project kick off.*

Furthermore, the mechanics saw a notable productivity increase while using Skylight, an unanticipated benefit. One senior and more seasoned mechanic, for example, showed a task time of 35 minutes without the glasses and 32 minutes with the glasses—an 8% improvement. Later that day, while performing another maintenance task, the same mechanic showed a task time of 51 minutes using standard procedure, and 38 minutes with the glasses—a 25% improvement. On average, across all mechanics studied, the efficiency improvements were between 8 - 11% and the Torque In-Sight team believes its mechanics could see even greater efficiencies once the learning curve for use of the devices was mastered by its team members.



*Engine assembly manual versus Skylight on Google Glass.*

Following the pilot, the 15 mechanics included in the study were surveyed on their impressions of the technology: 60% of the participants indicated that they preferred using the wearable technology to the traditional methods, and 85% of the mechanics agreed to the statements, “I believe that using this system will reduce manufacturing errors,” and, “I thought the system was easy to use.”

An analysis by GE Aviation shows that Skylight with Glass could save millions of dollars. Excited by these results, GE is exploring where else AR could be applicable across their business.