



DEPARTMENT OF THE AIR FORCE
TECHNOLOGY TRANSFER AND TRANSITION



LATEST AFRL PATENT HELPS THE WARFIGHTER TAKE A LOAD OFF SAFELY

Wright-Patterson AFB, DAYTON – A team of innovators from the Air Force Research Laboratory (AFRL) have patented their design of a device that could save millions yearly while reducing pain to the warfighter.

It's the job of a loadmaster to make sure cargo is loaded and unloaded from an aircraft quickly and safely. One of the tools used to do this is called a cargo ramp support strut, known colloquially as the milk stool. They are typically strapped down in the cargo hold and placed under the ramp during loading and unloading. In the past, milk stools have been made of pressure treated lumber and weighed anywhere from 70 to 120 pounds and have been physically demanding of loadmasters. Combining that with having to do all this quickly under potential enemy threat, it could lead to acute and long-term injuries.

“(The Air Force) was looking for a solution to have a lighter weight, but just as strong, version of the milk stool/strut support to install in an aircraft,” said Chris Falkowski, an electrical engineer with the AFRL Materials and Manufacturing (RX) Directorate.

Falkowski and his teammates – mechanical engineer J.D. Bales and chemist Maj. Jason Goins – started looking at the milk stool and how it could be improved, particularly while being used on C-130 planes. They did this through an AFRL/RX program called Junior Force Warfighter Operations in RX (JFWORX) where scientists and engineers can volunteer their time to help solve immediate challenges the warfighter faces. This collaboration led to patent #US D976192 S: Support For A Cargo Ramp.

“When the C-130 was built, the original design was to have a wooden strut that goes under the rear door. When you palletize anything heavier than 2,000 pounds, that strut has to be under there. If it isn't, the aircraft can do a wheelie,” Falkowski explained. During their research, the team discovered the United States Air Force Academy (USAFA) conducted a similar research project by four cadets. The study found that aluminum could possibly be used to produce a lighter replacement to the wooden version. While the USAFA prototype was only tested to 20,000

TECH SNAPSHOT

PATENT NUMBERS:

US D976192

TECHNOLOGY NAME:

Support For A Cargo Ramp

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J.D. Bales

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TECHNICAL PROJECT OFFICE:

AFRL 711 Human Performance Wing

SOURCE:

US Patent and Trademark Office

www.uspto.gov

pounds, Falkowski and his teammates saw room for improvements in their design and testing.

“The base on their model wasn't as wide as the original wooden version, which it needs to be, so it doesn't punch a hole in the tarmac,” he said. “So, we had to modify it. Also, because the aircraft lands on uneven surfaces occasionally, it could rock back and forth with the aircraft. We needed to add gussets next to the pipes so that it would hold the welds.”

The aluminum milk stool design the team produced in-house ran through a battery of testing – including two ergonomic studies focusing on the effects to loadmasters' backs -- before it was given the green light. The height can be modified, and crews can still add wood or rubber to the top or bottom depending on the circumstances while loading. What C-130 loadmasters will most likely enjoy best about the design is it weighs just 35 pounds.



“We made 12 versions of the milk stool using the iterative design method to find the optimal balance of wood and aluminum during our testing. Our lab test plan included endurance tests and withstanding pressure up to at least two and a half times more than the aircraft’s maximum loading. The operational test plan demonstrated resiliency through impacts, especially if someone threw it off the aircraft, and still functioned the way it needed to,” Falkowski said.

While this new milk stool should help loadmasters have longer careers, and hopefully less pain after retirement, the taxpayer will see less pain in the pocketbook. The team has calculated the new design will translate into \$2.5 million in fuel savings across the Department of Defense (DoD) and \$4.4 million worldwide if adopted internationally as well.

Although this is the fourth of five patents for Bales, this is the first for Goins and Falkowski. It’s extra special for Falkowski who lost his father – who earned a patent while with General Motors -- at an early age. However, Falkowski says getting a patent wasn’t the primary objective of the team.

“When we started this project in 2017, our goal wasn’t to invent something. J.D., Jason, and I wanted to make something that helped these C-130 loadmasters save their backs by providing a lightweight and reliable solution. Looking back now, I count it as a blessing that I was able to be a part of a team that will positively change loadmaster’s lives in the DoD,” he said.

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Mr. Chris Falkowski
AFRL/RX Directorate