



## aerospace manufacturing

### A riveting concept



Ergonomic, customizable, impact-absorbing bucking bars improve the riveting process while reducing vibration up to 50 percent.

## Improved Bucking Bars Speed Production, Increase Safety

To speed production and increase worker safety in the aerospace industry, major manufacturers are willing to pay a higher price for quality equipment. Nowhere is that more applicable than with aircraft riveting, a high-impact assembly process to join aluminum sheets/materials that typically involves two people and exposure to repetitive, hammering force.

The process, which can be hard on workers' bodies, normally entails one person using a riveting gun and another on the other side of the joined material holding a bucking bar (which serves as a hand-held anvil to form the end of the rivet, or bucktail).

Due to the repetitive impact and vibration conveyed to

bucking bars during riveting, aerospace workers who continually install rivets often have health or ergonomic complaints.

On average, 46 percent of workers who use vibrating power tools contract Hand Arm Vibration Syndrome (HAVS), a painful, potentially disabling condition of the fingers, hands and arms, due to vibration.

"People don't understand that the person on the receiving end [of rivet bucking] is taking highly damaging vibration to the hand," said Richard Borcicky, a retired tool engineer and manager of ergonomics, who oversaw safety at the Department of Defense's (DoD) Fleet Readiness Center East base in Cherry Point, NC.

According to Borcicky, the DoD is continually seeking

Photo courtesy Honsa Isovib® Bucking Bar



Customization of the modular bucking bar with interchangeable end effectors allows operators to reach a wide variety of difficult rivets.

to improve safety and ergonomics in its facilities. Through implementing industry best practices, Borcicky said that the Fleet Readiness Center East base was able to reduce carpal tunnel syndrome cases from 50 to 0 annually.

However, Borcicky said one of the things that happens to people bucking the rivets is that their hands swell up during the week, and over time this can develop into an incurable, crippling disease of the fingers and hands. “We couldn’t get rid of the bucking bar issues because there was no fix,” he said.

“Without an ergonomically friendly bucking bar that absorbs impact and vibration, you have to continually switch workers out because they cannot rivet all day long, but that in itself can cause some quality issues.” said Brian Lewis, lead engineer at the Tulsa, OK, facility of Spirit AeroSystems, the world’s largest tier-one manufacturer and supplier of aero-structures, a \$7 billion global company with more than 18,000 employees worldwide.

However, the rivets still must be reliably and evenly driven with no marring of the airplane skin, or else they must be drilled out, deburred, and redone—and any such rework only

adds to production costs.

This can be a particular challenge with less than fully trained staff or new hires, who are often assigned tasks like riveting.

“Due to the force and impact of riveting, rivets and bucktails can be misaligned—but these need to be just right each time,” Lewis said. “So, having the right ergonomic equipment to facilitate fast, reliable production is critical.”

While some bucking bars do incorporate tungsten to absorb and dissipate vibration, this alone is seldom sufficient to fully address impact/vibration related repetitive injury or ergonomic issues.

If dropped, tungsten bucking bars can crack and break, rendering them unusable.

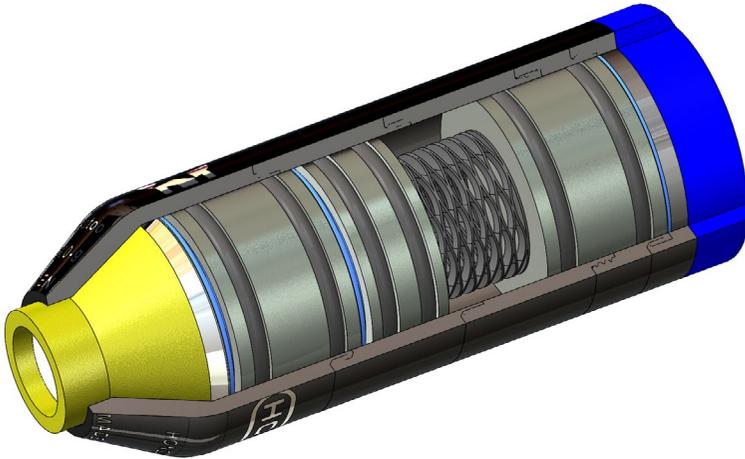
Fortunately, to speed reliable aerospace riveting while minimizing injuries due to repetitive impact and vibration, the industry has developed safe, ergonomic, impact absorbing bucking bars that improve the process while reducing vibration up to 50 percent. Because these are customizable, the bucking bars can also be tailored for ease of use in aerospace specific riveting processes.

### Faster, Safer Aerospace Riveting

According to Lewis, Spirit AeroSystems’ Tulsa, Okla., facility builds primarily new parts for wing structures, such as slats and flaps, which require the use of large quantities of rivets.

In the past, when the Tulsa facility used regular, off the shelf bucking bars of tungsten or tube steel, Lewis said the result was not satisfactory in terms of production or ergonomics.

“With the traditional bucking bars, riveters can develop elbow or shoulder issues so it is not prudent to leave people



On the end of the Isovib bucking bars, a precision non-mar height gauge helps eliminate over-bucking and surface damage, and ensures the same height bucktail on every rivet.

in that role for very long,” he said. “Also, the rivet bucktails sometimes are not the same height; and the bucking bars can leave marks on sheet metal surfaces, which is not acceptable in our industry.”

In search of a solution, Lewis was receptive to the recommendation of an airline maintenance employee at a nearby facility who had successfully used an advanced bucking bar called the ISOVIB Guardian “Torpedo,” from Honsa, a Milan, Illinois-based manufacturer of ergonomic bucking bars and anti-vibration power tools that improve productivity and reduce injuries for aerospace/industrial use.

The advanced bucking bar, which was developed in collaboration with Richard Borcicky’s expertise in safety, ergonomics and injury reduction, provides three levels of vibration protection including a wave spring, tungsten inserts, and a cushioned palm pad.

Compared with traditional bucking bars, this reduces vibration up to 50 percent.

According to Lewis, after the bucking bar manufacturer came to the Tulsa facility, demonstrated the bucking bars and let the mechanics test them, a test batch was ordered.

“One of our mechanics had shoulder surgery after an unrelated injury, and so was unable to rivet using typical bucking bars,” he said. “When we let her try the Honsa bucking bar, she was able to rivet without the impact and vibration hurting her shoulder. She spoke to our leadership team to get the first order pushed through, and later several more orders

were placed for different areas in the plant.”

In the advanced bucking bars, a precision non-mar height gauge also helps to eliminate over-bucking and damage to metal and/or painted surfaces when this is required. In regard to quality control, this helps to ensure that even less experienced riveters produce the same height bucktail on every rivet.

According to Lewis, over time, experienced riveters get a “feel” for properly set rivets. The more advanced bucking bars allow “someone that may not be experienced at doing that particular job to install rivets faster, with better feel,” he said.

Because bucking bars can be required in potentially thousands of different shapes and sizes to suit specific aerospace applications, customization of the modular bar with interchangeable end effectors can also allow operators to reach a wide variety of difficult rivets.

“Honsa was able to custom make a solution for pretty much every area we had—it was not one product for the whole plant,” said Lewis, who notes that the manufacturer was able to turn rough drawings from workers on the plant floor into fully engineered drawings. “We went back and forth with their design team to get a truly custom solution and they were very easy to work with.”

According to Lewis, utilizing the advanced bucking bars has significantly improved production as well as safety in Spirit AeroSystems’ Tulsa facility.

“The ergonomic bucking bars have definitely helped our production flow and reduced riveting redos by about 10% to 20 percent,” he said. “Anytime we can move the needle in terms of quality, it is a good thing for us and the customer.”

Using the impact and vibration reducing tools has also been a real morale booster for the work crew, Lewis added. As a result, he has already recommended their use to other Spirit AeroSystems facilities.

“Our work crew tends to do the same riveting tasks over and over,” he said. “So, anytime we can help them do their job better and prolong their career, it is a win-win. For anyone doing aerospace riveting, switching over to advanced bucking bars is really a no-brainer.”

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*Edited by SME Media, using information provided by manufacturers.*