

CLEAN LANDINGS

A MOBILE CLEANING, RECOVERY, AND RECYCLING SYSTEM

GETS NAVAL AIRCRAFT CARRIERS AND MUNICIPAL PARKING LOTS INTO SHIPSHAPE

A Navy aircraft carrier idles in the middle of the ocean, readiness compromised by foreign object debris (FOD) across its flight deck. Debris and hard particles have built up from aircraft and ground-support activity. Even something as routine as moving planes from the hangar deck to the flight deck can spread debris or spill grease and jet fuel. Given that jet engines have powerful intakes that can suck up the debris, the risk of damage to aircraft engines becomes too significant to allow takeoffs and landings. Even a bit of spilled grease or fuel can be dangerous if aircraft slip into each other on the rolling deck of a carrier in high seas.



In order to get the carrier fully operational, the Navy calls on Triverus, a Palmer, Alaska-based small business that has produced advanced cleaning technology since 2001. Triverus ships their five-ton Mobile Cleaning Reclaim Recycle System (MCRRS, pronounced “McChris”) to the vessel overnight. MCRRS starts immediately cleaning the deck using water-jet technology, integrated air recovery, and waste-water recycling. Within a short time, the flight deck is spotless, and the ship certified as mission ready.

Prior to MCRRS, ships and carriers used aging, inadequate, costly, and unreliable cleaning systems that did not meet the Navy’s safety or efficiency needs. Oftentimes, sailors were even required to scrub the decks by hand, an expensive and time-consuming option.

The MCRRS was developed with the support of the U.S. Office of Naval Research (ONR) and Naval Sea Systems Command (NAVSEA), Carderock Division. It was specifically designed to quickly clean flight deck surfaces on aircraft carriers using only fresh water while producing minimum waste. “In 2001, Triverus received a Small Business Innovation Research (SBIR) contract,” said Hans Vogel, CEO. “We wanted to meet the Navy’s need. Although 14 companies submitted a proposal, we were one of the two final awardees. And, in the end, they liked our product better.”

Referring to other ships out of commission due to FOD, Vogel added, “Aircraft cannot take off or land. If the Navy can’t certify that they recovered the FOD, they put pilots and airplanes at risk. Our machine ended up staying in the fleet, working on their ships for several years. And, it has drastically



changed the way decks are cleaned.”

Aircraft carriers are especially challenging environments because of the volume of activity taking place on deck. There are three main reasons that ship and aircraft-carrier flight decks need cleaning. First is FOD. FOD removal involves micro-solid and liquid debris that can cause major damage to aircraft and potentially injure personnel. Second is the

coefficient of friction (COF). COF is a measure of the force of friction between two objects. Flight decks cannot be slippery; their COF must be maintained by effective surface cleaning. This involves the complete removal of oils and grease caused by flight deck activities. Finally, there’s environmental pollution prevention. Petroleum oil lubricants, jet fuel hydraulic oil, and grease need to be managed without polluting the waters around the ship.

“We have an environmentally relevant technology that both the military and municipalities need, saving taxpayers a lot of money.”

Triverus’ MCRRS outcompetes other products by addressing all three technology drivers. Vogel described the complex path to today’s technology.

“We received Phase 1, 2, and 3 SBIR awards and approached the challenge iteratively. Phase 1 was for a technical white paper detailing the concept and how we would achieve it. We also did some lab testing to demonstrate technical direction. In Phase 2, we built the prototype. We had numerous Phase 3s. In 2003 and 2004, we deployed a couple of prototype units aboard different ships. When we got onboard, we learned a myriad of things that we could not have learned otherwise. These were high pressure trips with us being out at sea for a month at a time. They were launching and recovering aircraft every



Hans Vogel



Triverus equipment aboard the USS America, F-35s in the background.

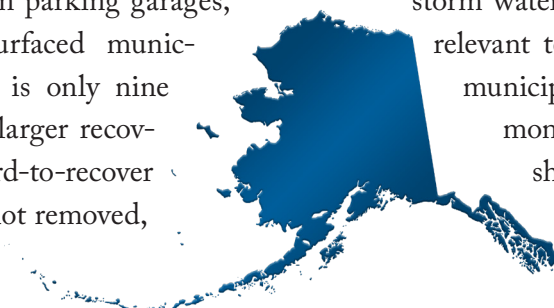
day. The potentiality of our solution was what got us on the ships and let us stay there. In early 2019, we won a contract for 43 machines.”

The initial machines in this procurement include systems that will be delivered to “L” class amphibious carriers used for carrying personnel, helicopters, and F35/harrier jump jets, and CVN, nuclear class carriers. Both carrier types need protection from FOD damage, including non-skid debris.

“During the past several years, we leveraged what we learned from the Navy and developed two other machines. We now have a Municipal Cleaning Vehicle (MCV) which has been sold to airports and cities. MCVs are being used to clean parking garages, aircraft ramps, and hard-surfaced municipal spaces. This technology is only nine years old. It not only cleans larger recoverable particles but also hard-to-recover sub-micron particles that, if not removed,

contribute to stormwater pollution. We also have an Airfield Cleaning Vehicle (ACV) in production,” said Vogel.

Over the years, new pervious surfaces have been developed. These are flat, paved surfaces made of permeable concrete, pervious asphalt, and constructed to manage storm water runoff. “Until we came along, there had not been a good way to clean those surfaces,” Vogel said. “Our technology can clean and restore pervious surfaces. We are picking up materials where conventional cleaners are leaving material behind. If there is a discharge permitting issue, we can clean materials and remove them before they get into the regulated storm water system. We have an environmentally relevant technology that both the military and municipalities need, saving taxpayers a lot of money. And, as a result, there are no more ships stranded at sea due to flight decks that need cleaning.” 🌸



Triverus

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