



## AIR FORCE TECHNICAL APPLICATIONS CENTER

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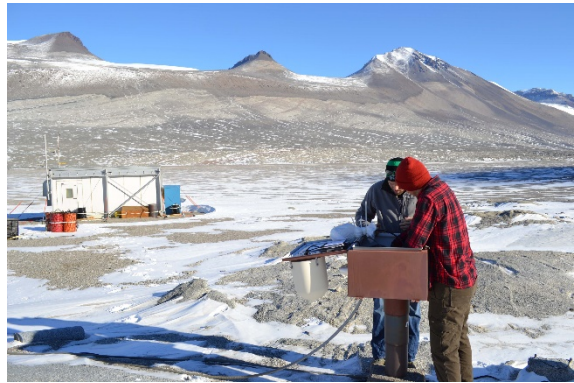
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### Downrange 'MacGyvers' creatively get the job done

*By Susan A. Romano, AFTAC Public Affairs*

**PATRICK AIR FORCE BASE, Fla.** – For six successive years starting in 1986, faithful viewers tuned in every evening before Monday Night Football to see what kind of clever solutions Secret Agent Angus MacGyver would concoct to solve cases for the fictional Department of External Services.

The rise of MacGyver's popularity largely stemmed from his innovative and resourceful use of common items to repair things in an improvised way. His ability to use everyday objects to solve seemingly impossible crimes quickly morphed into a verb (to MacGyver something) to describe when someone uses items on hand to make a quick repair.



Today, members of the Air Force Technical Applications Center sometimes find themselves applying a few MacGyver tactics as a last resort when they travel to one of the center's many overseas detachments to conduct periodic maintenance on vital seismic equipment.

AFTAC, the sole organization in the Department of Defense tasked with detecting worldwide nuclear events, has more than 3,600 sensors across the globe to monitor seismic activity. While some of the sites are located in relatively accessible places geographically, many of them are unmanned and positioned at austere locations in extremely rugged territory.

Despite the austerity, Airmen assigned to the 709th Technical Maintenance Squadron at AFTAC must perform periodic maintenance at these sites to ensure uninterrupted access to critical seismic data. From the frozen mountain peaks above the Arctic Circle to the windswept deserts of the Australian Outback to the sub-zero temperatures in the Antarctic, the maintainers trek to some of the most remote corners of the world. And while they travel with a large amount of supplies to repair and maintain their precision equipment, they sometimes find themselves in situations that require MacGyver-like problem-solving skills.

Take for example a recent trip to one of their unmanned sites in an isolated area of the north arctic. The frigid winter temperatures and ten months of precipitation led to build-up on the exterior of the seismic boreholes. The maintainers had to fabricate an ice-catching bucket and ice removal tool due to significant ice incursion. Technicians weren't able to pull the instrument out for repair until the ice was chipped away. But chipping away at the ice posed another problem – the ice chips would tumble down the borehole and damage the seismometer. So the team concocted the bucket-and-pick system they now use at sub-zero locations to catch the ice before it can fall into the hole.

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## 2-2-2 MacGYVER

Another unusual situation for the team occurred in eastern Asia. When the Airmen arrived to conduct routine maintenance, they discovered a red-footed falcon had made a nest five feet in diameter on one of the site's solar panels.

"We had to fashion a way to carefully remove the nest in one piece and relocate it to a nearby rock outcropping, all while the falcon was keeping a sharp eye on us as we moved her home," said Master Sgt. Chevis P. Stanley, subsurface maintenance flight chief. "The good thing was there were no eggs in the nest; otherwise, I'm not so sure she would have kept her distance as we moved it from point A to point B."



The maintainers travel with a large kit containing items that are included for obvious reasons -- and some, not so obvious.

"You'll always find standard supplies like electrical tape, all-in-one multi-tools, nuts and bolts, welding materials, etc., in our travel kits," said Stanley. "But from experience, we also travel with other more obscure things we may need at our sites, items like super glue, zip ties, toilet paper, electrical plug adapters, wet wipes, pick-axes, even a few tennis balls."

AFTAC's seismic mission touches every continent on earth through the U.S. Atomic Energy Detection System -- the largest sensor network in the U.S. Air Force. Once a disturbance is detected underground, the data is transmitted to AFTAC's 24/7 operations center at Patrick AFB, then analyzed to determine if the disturbance is nuclear in nature.

It's a critical mission that has national command authority interest, and the Airmen who maintain the precision equipment take their role in global nuclear event detection very seriously.

"We go to great lengths to ensure we've made the necessary repairs and calibrated all the sensors before we ship them to our operating locations," said Master Sgt. Joseph King, 709th Support Squadron's central repair facility superintendent. "We've also built an entire continuity program on 'unacceptable calibrations.' For the most part, AFTAC's seismic arrays are located in unpopulated, aseismic areas of the world, which is what we strive for in order to analyze and report clean and accurate seismic data. However, when we conduct the calibrations here at Patrick, which by our standards is an industrial area with lots of foot and vehicular traffic, that kind of 'noise' tends to give our calibrators headaches because the seismometers are so incredibly sensitive, making calibration very difficult."

So King and his co-workers in the CRF came up with an ingenious way to perform precision calibrations right here at their home base prior to shipping the equipment downrange.

"To further isolate the seismometer from environmental noise, we used an isolation table and a noise-cancelling sound booth," he said. "Then we concocted a system for the table to ride on tennis balls placed in a bed of sand on a thick rubber mat. I'm very proud of the 'out-of-the-box-thinking' that went down with this particular project. It works like a charm."

The equipment undergoes meticulous calibration in Florida prior to being shipped to an overseas detachment, but a small chord of fear is still struck in the hearts of the Airmen who perform the work.

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### 3-3-3 MacGYVER

“While we ensure the seismometers are sufficiently calibrated in the CRF, they still need to endure the frightening task of being shipped halfway around the globe,” said King. “I think we all know what the word ‘fragile’ means to a cargo company. More often than not the seismic equipment will need some level of additional repair when it arrives at its final destination.”



Of course, the CRF's MacGyver-like techniques are used as a last resort when an unusual situation arises at a maintenance site.

“The Airmen who conduct the repairs at our overseas detachments are governed by some pretty stringent Air Force instructions, policies, standards and contractual obligations,” said Dave Merker, AFTAC's Director of Systems Development. “They know the need to follow established technical orders to make any necessary adjustments on the equipment. But at some locations, such as our seismic site in Antarctica, we have an exceedingly small window of opportunity to perform annual maintenance. And sometimes, a bit of old-school ingenuity is required to ensure we have uninterrupted access to that vital seismic data. The ‘MacGyver’ technique is employed only as a last resort when all other avenues have been exhausted.”

When the team returns the following maintenance cycle, they'll adjust the MacGyver'ed equipment to its proper state with the necessary accessories and parts, Merker said.

“We have to make the most of the short period of time we're on the ground to work on the equipment, troubleshoot anything that needs troubleshooting, and leave it better than we found it so the data flows as required,” said Stanley. “One of the biggest lessons I've learned in this job is that you never truly know what issues you may encounter, and all you can do is prepare as much as possible for every contingency. Once you've done that, you just have to do the best you can with what you've got and be as flexible as possible. It's definitely a challenge.”

Chief Master Sgt. Michael Joseph, AFTAC's command chief, has been continuously impressed by the creativity and ingenuity of his maintainers.

“Our Airmen are well trained and prepared to do the mission, but sometimes they are faced with unique challenges,” said Joseph. “They just find a way to ensure the mission can continue uninterrupted.”