HOW MANY TIMES in USAF HISTORY has this happened?

JUST ONCE

but once was good enough!

In October 1974, a Dover Air Force Base C-5A Galaxy became the only aircraft ever to launch a live Minuteman ICBM from its cargo deck. That C-5A soon will become part of the Air Mobility Command Museum’s collection of historic aircraft.
Air Mobility Command Museum
Mission Statement

The mission of the Air Mobility Command Museum is twofold:

- To present the history and development of military airlift and tanker operations.
- In a goal closely aligned with the first, to portray the rich history of Dover Air Force Base and its predecessor, Dover Army Airfield.

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What is the Air Mobility Command Museum?

Located in Building 1301 on Dover Air Force Base, Kent County, Delaware, the AMC Museum is part of the National Museum of the United States Air Force’s field museum system.

Building 1301 was built in 1944 and used in World War II by the 4146 Base Unit as a secret rocket development site at what was known as the Dover Army Airfield. During the 1950s through 1970s, the area was home to various fighter squadrons serving the base. Following several years of inactivity, the facility was renovated to house the AMC Museum. The Museum consists of the former hangar, administrative offices, shop and heating plant, and now counts more than 30 planes as part of its inventory.

Building 1301 was placed on the National Register of Historic Places in 1994.

Although located on Dover AFB proper, entrance to the Museum may be made from Delaware Route 9, south of the base. Admission to and parking at the Museum is free and military identification is not required. The Air Mobility Command Museum is open from 9 a.m. to 4 p.m., Tuesday through Sunday. It is closed on Mondays, Thanksgiving and Christmas.

For more information, call 302-677-5939.

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From the Director

2012 was a great year; 2013 will be even better

Every time I sit down to write this column I re-read the last one to make sure I don’t repeat myself. I should not worry because things keep happening at such a breakneck pace that some stuff is old news by now.

One very visible new improvement is the addition of the last major piece of the B-17 that we were missing. I’m referring to the left cheek window that mounts a .50-caliber machine gun. Up to now we had a plain Plexiglas window panel installed, but thanks to the B-17 network we were able to purchase a beautifully made replica window frame from Bruce Orriss in California. Another volunteer, Dave Godek, of Oregon but soon to be moving to Delaware, donated the proceeds from the sale of one of his original oil paintings to fund improvements for the B-17. Kevin Wysopal, the longtime crew chief of our Flying Fortress and two new active duty sheet metal volunteers, Albert and Nick, are in the process of installing the window frame. They also are building us a replica .50-caliber gun so we don’t have to use a real one. In the past we have used some replicas and some real weapons that have been demilitarized by welding. Accountability is much easier with the replicas, so that is the way we are proceeding from now on. From five feet away even an armorer can’t tell the difference.

One very significant behind-the-scenes event that’s been virtually invisible to our visitors has kept us busy for several months. As part of a program to ensure safety and compliance with accountability, we have been doing a series of in-depth inspections of all our aircraft.

One of those inspections required us to open all the fuel tanks on every aircraft to ensure they don’t have any residual fuel in them. Now in the case of some of our planes, they last had fuel in them 50 years ago, some a lot more recently. When I drilled the rivets out of the long-sealed fuel tank access covers on our C-47, I was pretty comfortable the tanks would be dry. Not only were they dry but there was a three-inch pile of sand blasting media that had seeped in during its restoration 25 years ago.

We did, however, find some residual fuel in several tanks of the KC-135E Stratotanker. With the help of the base Fuel Systems Shop we drained and cleared those tanks. Even though it took a lot of time and effort, we have done the ecologically right thing.

Another inspection aimed to identify all the instruments and switches that had radi- um dials or glow points. These are not high levels of radioactivity but they do require a certain level of safety management. We had literally thousands of instruments, switches and circuit breakers to inspect, mark and record. Those kinds of projects don’t create any new exhibits but they do take time and effort and they do need to be done.

After three years of hard work in between all their everyday “urgent priorities,” Debbie and Hal Sellars have completed a major exhibit on the history of airlift. We can tell visitors like it because they spend a lot of time reading and examining all the different eras of the exhibit. Stop by and have a look for yourself and say thanks to Debbie, Hal and all the others who have helped out on this project.

I’d also like to thank the folks from the Shoreline Garden Railroad Club for their third annual garden-scale train layout. It was bigger and better than ever this year and our visitors loved it. (Full disclosure: I play with trains, too.)

We’re looking forward to 2013. We are planning the arrival ceremony for our C-5 and several other exhibits are getting a facelift. Don’t forget to come see for yourself, things are looking better than ever.

— Mike

From the Editor

C-5A tail no. 69-0014: a big plane with an even bigger story

“BIG!”

It’s a superlative that can be applied to just about anything having to do with the C-5 aircraft.

More than 40 years after it came into the inventory, the C-5, with new engines and updated avionics, is still flying and will continue to do so for years into the future.

Each C-5 has its story, but few can match that of tail number 69-0014, which was used as part of the Air Mobile Feasibility Demon- stration, to see if the United States could launch a missile from a cargo plane.

The AMC Museum soon will receive 69-0014 into its collection, the first C-5 to be retired and turned over to a museum. This issue of the Hangar Digest tells just a little bit about the AMFD and about the men who flew the test demonstrations. Like the C-5 itself, the story of the AMFD is big and varied and we cannot possibly include every detail in these pages. The background materi- al used in this issue will be archived at the Museum for use by future generations.

In addition to those quoted in interviews, I’d like to acknowledge several people’s assistance in helping me find reference material, much of which has never been pub- lished: Silas Stephan, Samantha A. Morrison, Ray Snedegar, and Jack Langenstein.
This missile-firing C-5A wasn’t a video gamer’s fantasy

The C-5 Galaxy has been the workhorse of the U.S. Air Force’s cargo-carrying mission for more than four decades. Of the more than 120 planes built under contract with Lockheed Martin, most remain in service, thanks to continual improvements and upgrades to engines, wings and avionics.

But many of the early C-5s are being retired, and although that’s a loss to the Air Force, it is a boon to the Air Mobility Command Museum.

Early in 2013, one of those C-5s, tail number 69-0014, will return to Dover Air Force Base, where it will take its rightful place among the Museum’s collection of storied aircraft. When it arrives, it will bring a distinction carried by no other Galaxy: this C-5 is the only aircraft ever to have launched a Minuteman missile from its cargo deck.

SALT and the C-5

Envisioned as early as 1961 because the U.S. Army needed an aerial transport for its large equipment, the C-5 contract was awarded to Lockheed in 1965. Despite design troubles and a billion-dollar cost overrun, the first C-5 took to the air in July 1968. The fleet became operational in June 1970; the first C-5s were delivered to Dover AFB in April 1971.

C-5A 69-0014 was the 45th Galaxy aircraft built, and the first sent to Dover AFB directly from the factory. When it arrived on Aug. 3, 1971, it had only 27 hours on its airframe.

Only five months after arrival at Dover, 69-0014 was transferred temporarily to Charleston AFB, S.C. before returning on Aug. 21, 1973. It flew various missions from Dover until selected to take part in a test that ultimately figured into diplomatic talks between the United States and the Soviet Union.

The second round of these Strategic Arms Limitation Talks (SALT) began in 1972. The talks were aimed at equalizing the number of missiles on each side, dismantling weapons that exceeded the agreed-upon number and restraining developments that could threaten the treaty.

Both countries had widely differing positions on how to achieve these goals. One point of contention was figuring out how many American Minuteman missiles would be permitted, since these were long-range missiles capable of hitting almost any target in the Soviet Union.

The Minuteman was a three-stage, solid fueled rocket that had been deployed in widely-scattered locations throughout the western United States. Stored in underground silos, the Minuteman was one of America’s primary defenses and the best means for retaliating against any first-launch attack by the Soviets.

But some strategists felt the Minuteman had a major flaw: it was a static weapon, locked into fixed locations that were impossible to keep secret.

However, if it were possible to move the missiles around and launch them using cargo aircraft, planners reasoned the United States could maintain secrecy about where the weapons were in case they might be needed.

With that in mind, in August 1974, Department of Defense officers proposed the Air Mobile Feasibility Demonstration (AMFD), to see if air-launching the 56-foot tall missile actually could be done. The Air Force’s Space and Missile Systems Office (SAMSO) was given the job of planning and demonstrating the idea’s practicality.

Planning for the AMFD

From the outset, planners realized only the C-5 Galaxy was large enough to accommodate the missile and its support equipment. Although the plane was designed to carry up to four loads weighing 50,000 pounds each and had the ability to drop those loads sequentially, no one ever had made a single air drop of a load weighing in at 86,000 pounds, which was the weight of the missile and its launch cradle.

However, since earlier tests showed the C-5 was capable of air dropping four loads totaling 164,000 pounds, SAMSO officials felt the plane could carry and launch the Minuteman.

Two C-5s were chosen for the AMFD: 69-0014, which would serve as the primary demonstration aircraft, and 69-0027, which would provide support and backup services.

With less than 90 days to complete the demonstration, SAMSO officials used mostly off-the-shelf equipment instead of designing and building new hardware. The C-5’s onboard cargo subsystem and airdrop hardware, although not considered optimal for a Minuteman launch, still met the test’s basic needs while staying within safety limits.

Additionally, since the C-5’s basic airframe integrity was considered more than adequate, the plane required no structural reinforcements or changes in its control systems.

Preliminary work envisioned dropping the missile in a support cradle mounted atop a standard airdrop platform, which also allowed easier handling by ground crews charged with loading the Minuteman onto the aircraft. After opening the rear cargo doors, parachutes attached to the cradle would catch in the slipstream and pull the cradle and missile from the cargo deck and rear ramp. Restraint straps holding the missile to the cradle then would be cut, allowing the missile to fall free.

Additional parachutes mounted on the missile itself would slow its fall and make sure it was upright. Once the missile was stable, the descent parachutes would be jettisoned and the missile’s engines ignited using a timer.

Deployed from a height of 20,000 feet, the missile would drop to about 8,000 feet before its solid-fuel engine would ignite for a full-thrust burn of 10 seconds, followed by a decreased thrust burn of 20 seconds. Only
the first stage of the three-stage missile would carry any fuel; the second and third stages would be inert and there was no warhead.

Carrying out the test would be a major challenge. Before the AMFD, the C-5 had airdropped loads weighing up to 20 tons and 28 feet in length. The complete demonstration package, including the missile, support cradle and airdrop platform, weighed in at more than 87,000 pounds. Mounted on its cradle, the Minuteman missile took up 56 feet of the C-5’s 121-foot-long cargo deck.

Both 69-0014 and 69-0027 were fitted with identical instrumentation packages to monitor the tests and a master control panel on the flight deck. Two five-ton ballast blocks were fitted to the deck as well as a winch to help with cargo loading and eight camera mounts. In addition, a special framework was installed on the cargo deck to stop the missile from moving forward if the C-5 experienced a sudden deceleration.

The tests

The AMFD was to include seven test drops of weighted platforms, starting at 45,000 pounds and working up to more than 86,000 pounds. If these were successful, they would be followed by two drop tests of dummy missiles and then the final test with the live missile. The first eight flights were planned over the National Parachute Test Range near El Centro, Calif., with the final two near Vandenberg AFB, Calif.

Both C-5s would be used in alternating roles for the demonstration, with 69-0014 tapped for the final, live-fire test.

After some preliminary equipment tests, both planes flew to Edwards AFB, Calif., on Aug. 30, 1974, where ground testing took place and procedures were written to ensure test platforms and missiles could be safely loaded. 69-0027 also used the time to perform several parachute tow tests.

69-0014 made the first drop of a 45,000 test platform on Sept. 6, with 69-0027 making the second drop four days later. The 54,650-pound load was pulled from the plane using a 32-foot extraction parachute and stabilized with 10 recovery chutes, each 100 feet in diameter. Data was collected on how well the plane’s extraction system worked and what kind of loads were placed on the cargo rollers and rear ramps; the pilot reported he had no trouble controlling the C-5 and all other aircraft systems functioned normally.

That flight also set a new record, albeit a temporary one, for a single-load air drop.

The two planes alternated making test drops throughout September, with 69-0014 handling the odd-numbered tests.

A 66,000-pound load was successfully pulled from 69-0014 on Sept. 13, 1974, but the mission suffered overall when the test platform bent back and forth while in the air, shredding the recovery parachutes.

The flexing problem was corrected by the time 69-0014 flew again a week later. Engineers had replaced the 10 recovery parachutes with three 32-foot stabilization chutes, designed so the platform would hang vertically, thus simulating the missile’s launch position. This test was considered a success.

The next-to-last test platform trial, carrying an 87,320-pound load – more than the weight of the Minuteman and its cradle combined – did not go well. The extraction chute failed just as the platform started to roll off the cargo deck, requiring the crew to take emergency measures to jettison the load. The platform tipped off the loading ramp, missing the cargo deck’s pressure door by less than 18 inches. The pilot had to maneuver to keep the plane from excessive pitching as the test platform slowly exited the cargo deck. The platform broke apart in mid-air before smashing into the ground.

Tests showed the parachute’s suspension lines failed when they slipped out of their normal position on links connecting them together. The entire extraction system was replaced with a pair of 32-foot parachutes and a double-braided extraction rope. The change resulted in flawless extractions during the remaining tests.

The first missile test took place Sept. 28. An inert and obsolete Minuteman I – the series had been replaced in 1969 – was loaded aboard 69-0014 at Hill AFB, Utah. Crews used a ballistic missile trailer instead of a standard K-loader to place the load aboard the Galaxy, which had been jacked up to align the cargo deck with the trailer. A number of electromagnetic and vibration tests were conducted to make sure there was no electrical interference between the airplane and explosive bolts mounted on the cradle. The missile also carried a guidance and telemetry package to relay information to engineers on the ground.

The test was nearly perfect in every respect, except for a rotation of the missile as it was suspended from the stabilization parachutes. This was corrected before the second, inert missile demonstration two weeks later.

The final test took place Oct. 24, 1974, when the Minuteman I was loaded aboard 69-0014 at Hill AFB Timers for this (See C-SA on page 12)
Dover C-5 crew members tell some of their stories

AMC Museum Foundation Board President Don Sloan, himself a retired C-5 pilot, thought it would be appropriate to give Galaxy crew members a chance to talk about their time aboard 69-0014 and other C-5s.

Don’s “Foundation Notes” will return in the next edition of the Hangar Digest.

Lt. Col. John Reardon, navigator

“With the acquisition of the C-5, the Museum will now have all of the four planes I was assigned to: the C-97, C-130, C-141 and C-5A. I’m very happy for the Museum, but do you have any idea how old that makes me feel?”

Reardon was on flight status for 20 years and had accumulated almost 5,000 hours flight time when his position as navigator was eliminated in favor of a computer.

“Satellite technology made navigation ‘easy enough that even a pilot could do it,’” he said, “so we were phased out. I like to say I was the last navigator in our unit, and as the last man out, I turned out the light. You see, I missed the announcement that we didn’t have to show up on the last scheduled day, and when I did show up, I was the only one who did. So I ceremoniously turned out the light!”

Reardon continued his career as a member of the Air Force Reserve, working as Delaware’s contact for the Air Force Academy as a combination recruiter and admissions representative. Throughout his flying career, Reardon also worked for the state of Delaware.

“So here I am, looking back and realizing I never knew what a weekend was until I retired,” Reardon said. “I’d had some kind of a job since I was 12, usually two or three at a time. Now, every day is like a Saturday, and I’m enjoying retirement immensely.”

Col. Leland “Lee” Hoffer, pilot

A U.S. Air Force Reserve officer who was stationed at Dover AFB for 18 years, Hoffer served as both a pilot instructor and flight examiner. He also served as commander of the 326th Military Airlift Squadron.

“During those years, I flew at one time or another almost every C-5 assigned to Dover,” including 69-0014, he said. Those missions included the September 1975 flight of a Dover C-5 that was used at the Berlin Tempelhof Airport air show.

Hoffer says he didn’t take a lot of photographs during his many years aboard the C-5, but now wishes he had. But he did have interesting times aboard Dover’s Galaxies.

“The most historical mission was bringing back the Presidential Communications Team to Andrews Air Force Base after the Reagan-Gorbachev conference in Geneva, Switzerland, on Nov. 19-21, 1985.

“The conference table was also part of the cargo and it was going to the National Archives. I could write a narrative on that mission but I don’t have a copy of the flight order and feel credit should be given to others on the crew.”

Lt. Col. Paul Gillis, pilot

“I flew C-5s for 24 years, so having one at the Museum to tell the story of the biggest airplane of its time will be an asset to educating all that see it,” Gillis said.

Gillis also spoke of how the Museum’s newly acquired C-5 in particular played a major role in world history.

“Like the C-47 taking part in D-Day, this airplane did an amazing feat by launching an ICBM. It also was part of the rest of the C-5 legacy by taking part in every world event from Vietnam to Iraq and worldwide relief. Doing air shows the C-5 was always the biggest crowd gatherer. People were amazed something that big could fly.

“When I first started flying the C-5, a friend who was a U.S. Navy pilot in World War II, found out the takeoff weight for training flights was half-million pounds, he couldn’t believe it. On a relief mission just before Christmas, I flew behind the Iron Curtain bringing tents and heaters to earthquake survivors. We went to lunch with the foreign minister and he was telling Gorbachov jokes. I knew Communism was falling.”

Gillis circumnavigated the world on one mission, going to places such as Bangkok, the Indian Ocean and Japan. His Navy friend was astounded to know the C-5 could fly from Tokyo to San Francisco in 12 hours.

“When I came back I gave a talk to a fourth-grade class about the flight and one boy asked, ‘Why did you do that?’ I told him we were moving cargo, but I still think he wondered.

“I also toured the Pyramids in Egypt, the Acropolis in Athens, and other things most people wish they could see. Over the years I went to 26 countries. The most challenging and rewarding flights were those teaching others how to do an in-flight refueling, flying at 300 miles an hour, 15 feet away from another airplane.”

Senior Master Sgt. Larry Koewing, flight engineer

Koewing flew aboard 69-0014 during the Persian Gulf War and was on the first C-5 flown into Bucharest, Romania.

“Flying as a crewmember on an airplane was my boyhood dream,” Koewing said. “Flying the C-5 realized that dream many times over, a sense of challenge and satisfaction surpassing all other of my professional accomplishments.

“Having a C5 -- and one with such an illustrious history -- at the AMC Museum is a fitting, proper, and stellar addition to the museum’s aircraft roster. Visitors will look upon this vast machine, gaze across the sky, and consider the manner of people who took these great airplanes to all the places they went.”

Then-Capt. John Reardon of the 328th Military Airlift Squadron at Dover AFB.

Lt. Col. Paul Gillis, after landing in Kuwait in September 2005. Crew members were required to wear civilian clothes while on the ground in that country.


SMSgt. Larry Koewing in May 1991.
More memories from Dover C-5 crew members

Lt. Col. Barry Rutledge, pilot

“A C-5 at the AMC Museum! Finally!

“As a former C-5 pilot I can think of no better place to put a C-5 on display -- after all, Dover AFB has served as the center of the universe with respect to C-5 operations since 1971,” Rutledge said.

“Additionally, it was a C-5 Galaxy that brought the B-17 ‘Shoo Shoo Baby’ to Dover for restoration, a key project that was in many ways the foundation of the AMC Museum.

“Finally, the many civilians that visit the Museum have a chance to actually see, touch and tour the C-5 instead of viewing it from more than a mile away as it sits on Dover’s flight line. This is an exciting ‘gain’ for the AMC Museum and for the public -- it will certainly better enable the Museum to continue to tell the story of the Air Mobility Command, Dover AFB and the mighty C-5!”

Lt. Col. Charlie Corbett, pilot

Corbett started on the C-5 at Dover AFB in 1982 after years flying the C-123 out of the now-closed Lockbourne AFB, Ohio. The size of the Galaxy compared to the Provider left him almost slackjawed.

“The Galaxy was huge 23 years ago and when I retired in September 2005 and flew my ‘fini’ flight, the Galaxy still was huge to me.

“What a fine aircraft she is. I have been asked to speak to several organizations about my experiences piloting the C-5 and after my little speech everyone comes up to me and is completely amazed about my experience flying such a big machine all over the world to include air refueling. I know they were excited about the machine and what she can do … not my briefing skills,” he said.

He also had some pretty interesting experiences, such as one with Maj. Matt Gioia to Helsinki, Finland.

“Somewhere over the Baltic Sea, a couple hundred miles from our destination of Helsinki, we were flying just outside the Russian border when a new voice from air traffic control came over our headsets telling us to make a 90-degree turn to the right.

“Matt and I looked at each other and it was obvious that a right turn would put us into Russian airspace, uninvited so to speak. Well, we didn’t turn and kept going to our destination. We filed an incident report.

“We also were so excited about what had just happened that we got behind in monitoring our destination weather forecast,” Corbett said. “It turned out the weather had deteriorated down to Category II minimums. This was the first of many Cat II approaches that I flew in the C-5.”

“It’s terrific that aircraft 69-0014 will fly into Dover to be retired in the AMC Museum,” Corbett added. “She was a workhorse along with her sister 69-0013, who was at Dover and so many of us also got to fly. They were test beds for many modifications and they flew some very unique missions including air dropping that ICBM missile. The AMC Museum is a first-class museum and it is only fitting that 69-0014, an old classy lady Galaxy, retire on the ramp there.”

Master Sgt. Rodney Moore, air reserve technician

“During my active duty time at Dover, I spent virtually every day of duty on the flight line doing my small part to keep our aircraft in top flying condition.

“As the C-5 is a strategic airlift aircraft, most of its flying time is ‘on the road’ and they are touched by a cast of thousands. If everyone who has had any involvement with the C-5 were to tell just one interesting, tragic or amusing anecdote, they could fill a library.

“Interestingly, the time I was assigned as crew chief for 69-0014 accounts for less than five percent of its operational career, however I was very fortunate to be the crew chief during that very brief time when it performed the Air Mobile Feasibility Demonstration. I wish I could recall the names of the other crew members assigned to the aircraft to give them their due recognition but it’s been more than 38 years and I can’t find a single piece of paper or document naming them. I do feel confident in saying on their behalf that all of us were and continue to be extremely proud that ‘014’ was chosen.

“At the time, there were 78 operational C-5s in the fleet, and discounting the ones dedicated for training or in maintenance, the Department of Defense had a fleet of around 50 or so airframes to choose from. While no C-5 ever has been tagged as “the best,” their performance is closely monitored for their in commission rate, home station and worldwide departure reliability. To select that particular aircraft for such a time-sensitive and noteworthy test is true testimony to its flying performance.

“I flew several missions on ‘014’ as a flying crew chief, or Range Rider as we were known then. They were pretty routine because that plane truly was a bird that loved to fly. It would’ve been great to go along to support the missile drop test but that wasn’t approved.

“What a fitting way to end the flying career of an ordinary but very special C-5A by seeing it preserved at the Air Mobility Command Museum.”
Air Mobile Feasibility Demonstration

Crewmembers, engineer recall historic C-5A missile launch

The time was mid-1974, and U.S. Secretary of State Dr. Henry A. Kissinger soon was to sit face-to-face with Leonid I. Brezhnev, General Secretary of the Communist Party of the Soviet Union. Their negotiations, the Strategic Arms Limitation Talks, were aimed at permanently curbing the number of nuclear weapons in both nations’ arsenals.

Although the American nuclear arsenal was technologically superior to that of the Soviets, the destructive power on both sides was roughly equal. Top military and political figures wanted an extra bargaining chip, one the Soviets could not easily answer.

The solution was inspired. The Soviets, who could easily target underground silos housing America’s intercontinental ballistic missiles, would have a much harder time countering a missile force if those missiles were loaded aboard airplanes.

But could it be done? Could a 56-foot-long, three-stage Minuteman missile, topped with a nuclear warhead be carried aboard a C-5 Galaxy transport aircraft? And could that aircraft then successfully launch the missile?

Pentagon officials came up with a plan that, if successful, would work.

By the time Kissinger concluded his talks with Brezhnev, both he and the Soviets had the answer.

An audacious undertaking

Planned and executed by the Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio, the Air Mobile Feasibility Demonstration brought together dozens of military and civilian experts, including a number from Lockheed-Martin, prime contractor for the C-5.

One of those specialists was now-retired Chief Master Sgt. James Sims, a loadmaster assigned to the 436th Military Airlift Wing at Dover AFB, Del.

Then a senior master sergeant, Sims already had dropped hundreds of tons of cargo from the C-5 during the plane’s testing and development trials.

“I was at the 436th when my name came down from [the Military Airlift Command],” Sims said. “I had a great rapport with the Lockheed crews. They knew me, so there was no problem. And, of course, Dover was happy to have me help.”

Another loadmaster, now-retired Chief Master Sgt. Elmer W. Hardin of Travis AFB, Calif., was brought on board, also at the request of Lockheed.

“Jim and I had done a lot of work with Lockheed on different programs,” said Hardin, a technical sergeant at the time. “When those folks get to know you and a project comes up, they ask for you.”

Carrying the roughly 87,000-pound missile and its launch cradle was not the problem, as the C-5 easily could haul three times that much. However, the loads had to be divided up and dropped separately because the Galaxy’s cargo delivery system – an arrangement of railings built into the cargo deck and rear loading ramp – was not designed to handle that much weight all at once.

Pat O’Brien, then a young engineer at Wright-Patterson, worked as the junior airdrop project engineer with the teams modifying a series of standard airdrop platforms that would be dropped from the C-5. Each would be heavier than the last, while one actually would weigh more than the Minuteman missile and the cradle designed to hold it for the demonstration.

“There was a lot of pressure to get it done, but it was good pressure,” O’Brien recalled. “We didn’t realize at the time it was for the SALT talks, but we knew they wanted it done in a certain number of days.”

As designed, the test platforms weighed between 45,000 pounds and the missile’s weight of more than 87,000 pounds.

“A couple of our engineers got called to the Pentagon on a Saturday and were asked if it could be done,” O’Brien said. “The assessment was that there was a risk, a moderate technical risk, but that we could do it.”

With a deadline looming and possessing a high-priority ticket from the Pentagon, things quickly got under way. Even a four-star change of command held Aug. 30 at Wright-Patterson, which closed the base to flying, didn’t stop O’Brien and his teammates from bringing in a C-5 to test the system.

“We were in a rush,” O’Brien said simply.

Two C-5As were assigned to the demonstration, 69-0014, which would be the prime aircraft and was earmarked for the final, live drop, and 69-0027, which would serve as a backup and a testbed for parachute and load tests.

The test platforms were assembled at Wright-Patterson, then shipped to Naval Air Facility El Centro, Calif. Except for the final two missions, including the live-fire missile demonstration, the drop tests and parachute
As the flights progressed, with test teams alternating between 69-0014 to 69-0027, the test platforms grew increasingly heavy. For the first missions, the platforms were loaded aboard the C-5 using a standard cargo loader but later, as the loads went above 55,000 pounds, the teams used a ballistic missile transporter. This also meant lifting the C-5 up to match the transporter.

"Because of the tension placed on that ramp, the airplane had to be jacked up," Hardin said. "We didn't want to take any chances with the ramp, so when the missile was loaded, it was supported by jacks."

As with any project, there were problems the crews and engineers had to overcome.

The recovery parachutes failed during the third test, destroying the test platform, but the procedures for pulling the platform out of the aircraft were considered a success.

"We were working with all different types of equipment to get those loads out of the airplane. That's the reason we went step-by-step," Hardin said.

Another malfunction, this on Sept. 23, 1974, occurred when the extraction chute collapsed as the load was being pulled from the C-5.

"The sixth airdrop, a package weighing 87,320 pounds, the heaviest single package ever airdropped, was the last test to use the single 32-foot extraction chute," said Lockheed test engineer Bill Harris. Writing in "The C-5 Galaxy History: Crushing Setbacks, Decisive Achievements," an exposé by Roger Launius and B.J. Dvorscak, Harris described what could have been a major setback.

"Extraction chute failure on this event allowed the load to exit the airplane more slowly than normal, [and] tip off the ramp, which in turn caused the stabilization chute to deploy too slowly."

Harris wrote.

Because the load already had started moving out of the plane, O'Brien said the crew could not abort the test. The platform "dribbled" slowly off the ramp instead of being hauled out quickly, he added.

Although the test platform was destroyed, the failure gave the crews an unscheduled opportunity to test and verify emergency procedures.

"We always planned for probable failure modes such as an extraction system failure," O'Brien said. There were three factors in anticipating this problem, he added: 1) keeping control of the aircraft, 2) reducing stress on the loading ramp, thus decreasing the chance the ramp would fail and, 3) ensuring the load didn’t tip off the ramp in such a way it became wedged in the aircraft structure.

If that happened, "then you’d lose the center of gravity and you’d lose the aircraft," O'Brien said.

For the seventh and succeeding tests a new system using two 32-foot parachutes was used. There were no further troubles with the extraction system.

Finally, a month after the nearly disastrous sixth test, it was time to prove the air launch concept was more than just an idea.

On Oct. 24, 1974, as Kissinger planned more meetings with Brezhnev, C-5 69-0014 took off from Hill AFB. Jim Sims was riding on the left side of the cargo compartment with Bill Hardin on the right. The live Minuteman sat in its cradle between the two men. There were 11 others on the mission: two Lockheed test pilots, a flight engineer and two flight test engineers, a test pilot for the Air Force Flight Test Center, two personnel from the 6511th Parachute Test Group, an engineer in charge of the missile’s guidance system and one from the Boeing Corporation, manufacturer of the Minuteman.

Fire in the hole

With all of their experience gained from the prior tests, the final, deciding demonstration was almost a milk run.

Everything was, "pretty straight and narrow," Hardin recalled.

The test engineers monitored the Minuteman’s vital signs at a control panel behind the plane’s cockpit during the flight between Hill AFB and the test range over the Pacific Ocean. Meantime, wearing portable oxygen tanks and communicating over the plane’s intercom on the unpressurized cargo deck, Hardin and Sims had a number of tasks of their own.

"We were checking the rails to make sure the locks were out, and we had a 10-minute warning to make sure the extraction chute was hooked up properly and that the safety line ran through the extraction cable mechanism," he said. Sims also pulled the red safety plug from the missile and swapped it for a green plug that indicated the Minuteman was armed. The giant rear cargo doors were opened about eight minutes before the drop, and just before the countdown reached zero, Sims armed the locks that would automatically release the missile and its cradle as soon as the extraction chutes were dropped.

"We just did a checklist, opened the doors in flight and away she went," Sims recalled. "It was picture perfect."

With winds whipping past at more than...
C-5 cockpit trainer added to Museum’s collection

The Air Force doesn’t simply hand over the keys to a multimillion-dollar aircraft to just anyone.

Long before they’re assigned missions in the C-5 Galaxy, C-17 Globemaster III or any other airplane, Air Force flight crews undergo months of rigorous, highly technical training. Some of it is in the classroom, some of it is hands-on experience in a real aircraft, supervised by experienced crews.

But much of a crew’s initial instruction is spent “flying” intricately detailed computerized trainers, devices that give them the feel of working in a real aircraft without ever having to leave the ground.

One of those machines, a C-5 cockpit systems trainer, recently was transferred to the Air Mobility Command Museum after being decommissioned at the Dover Air Force Base aircrew training facility.

“It’s a really unique acquisition, and we’re very happy to have it,” said Museum Director Mike Leister shortly after the trainer was set up on the Museum’s main exhibit floor.

Having the C-5 trainer on display will give Museum visitors another chance to see how the Air Force helps both fliers and aircraft maintenance technicians learn to do their jobs, Leister added. Guided by experienced instructors and sophisticated computer programs, for more than 30 years the procedures trainer allowed airmen to learn C-5 aircraft systems and how they interacted without risking an actual plane or taking away resources that could be better used on real-world missions, he said.

Officially known as an A/F-37A-T65 C-5 Cockpit Procedures Trainer, the new exhibit joins the Museum’s C-17 and C-141 simulators, as well as the AMCM’s computerized flight simulator, which allows Museum visitors to “fly” around Dover’s airspace in one of several types of aircraft.

Lessons in ‘switchology’

The CPT was built by Gould Hydrosystems of Melville, N.Y., said Ron Collins, C-5 training project officer for C-5 aircrew training at Dover AFB, and installed on July 5, 1979. A retired Air Force aircraft maintenance superintendent, Collins said the trainer came to Dover after first being used at Altus Air Force Base, Okla.

Engineers completed an installation and acceptability test in August 1979 and the unit underwent its first quality test and evaluation procedure during a 10-day period in February 1980, according to the official 436 Airlift Wing history.

Aircrews made immediate use of the procedures trainer: records show it and Dover’s existing flight simulator were used for more than 2,880 hours between April and September 1980. Over more than three decades, thousands of flight crew members and aircraft maintenance technicians used the trainer, which was regularly upgraded to reflect changes made to the real aircraft, Collins said.

But it’s a mistake to call the CPT a “flight simulator,” since it wasn’t designed to imitate the motions of an aircraft in flight. Unlike a true flight simulator, which relies on a...
series of gimbals and hydraulics to mimic flight, the CPT stayed firmly rooted to the ground.

“We used it primarily for visuals and to get airmen familiar with the layout of the cockpit,” Collins said. Trainers and instructors informally referred to the training scenarios as lessons in “switchology.”

“Think of having to learn where all the controls are on a new car,” Collins said. “It’s like learning the instruction manual, but on a much grander scale.”

Training devices like the C-5 CPT are nothing new, but are particularly important when it comes to familiarizing military personnel with expensive, highly technical equipment. One of the earliest such trainers was the Antoinette Barrel Trainer, developed in 1909 to familiarize pilots with the plane, a revolutionary French-built single wing aircraft. Additional trainers were developed during World War I, and as early as 1919, a Popular Science Monthly article detailed how aircraft gunners used mechanical trainers to hone their shooting skills.

But there still were problems for the fledgling aviation industry. Faced with the almost disastrous loss of pilots killed while carrying the U.S. mail in poor weather, the U.S. Army Air Corps turned to inventor Edwin A. Link to provide the means to train pilots while still on the ground. In 1934, Link had developed what became known as the Link Trainer, a generic simulator that duplicated a number of the hazards found in cross country flights. Many World War II pilots learned their instrument procedures while in the Link Trainer.

The boom in air travel following World War II and during the Cold War led to advancements in flight training, including more advanced simulator development which today encompass digital technology that mimics nearly every motion an aircraft makes.

But fixed-place trainers continued to make their mark, particularly with the development of larger and more complex aircraft such as the C-5. Their use as familiarization trainers continues today, particularly for aircraft engine maintenance personnel, who use them to practice engine testing procedures.

**Simple economics**

Advances in technology eventually brought a fully-computerized, full-motion flight simulator to Dover AFB, followed by a second simulator in 2008. By that time Dover’s simulator was in use 16 hours a day, 360 days a year, and since has been upgraded to run the new all-digital avionics present on the modernized C-5M.

With the continued use of these more modern simulators, demand for the fixed-base cockpit procedures trainer began to drop, Collins said.

“That’s when it started to become obsolete,” he said.

Eventually, it came down to a matter of simple economics: the CPT only was being used for about 52 hours a month instead of the almost 500 hours called for in the contract with the Air Force.

“We were investing a lot of dollars into a simulator that only was being used about 10 percent of the contracted time,” Collins said. The system required a lot of energy to maintain – air temperature in the computer room had to be kept at 64 degrees – and also required considerable manpower.

“There was just no way to justify the cost,” Collins added.

Efforts began in early 2012 to dispose of the trainer, and that’s when C-5 aircrew Training Manager Robert Schroeder got in touch with the AMC Museum.

“Bob contacted us and asked if we needed it,” Leister said. “Well, we certainly did!”

The first step in the process was deciding what parts of the trainer the Museum would need. It wasn’t possible to set up and maintain all of the programming and computer hardware necessary to make the trainer fully functional, so much of that, to include more than two miles of wiring, was left behind.

“We made a decision early on that a large part could be removed because it held only the instructor’s desks and consoles,” Leister said.

Civil engineering crews, bolstered by volunteers from the AMC Museum, split the trainer into three sections, and then removed a wall in the aircrew training systems building. The two sections destined for the Museum were moved through the opening, placed on a flatbed and taken on the three-mile trip to the Museum. Once there, the big hangar doors on the Museum’s east side were opened – a rare occasion in itself – and the trainer was moved inside.

An operation that was expected to take a week was completed in only one day, and Museum volunteers had the trainer reassembled and open to the public in just under two weeks, Leister said. They had planned on it taking at least three months, he added.

Even though the trainer isn’t set up to give visitors the full experience of flying a C-5, Museum volunteers, many of whom are former Galaxy crew members, will provide an experience Museum guests won’t soon forget.

“Several of our volunteer staff even used that same trainer when they were on active duty,” Leister said. “People will be able to sit in the cockpit and learn from former aircrew members who will talk them through cockpit procedures.

“They’ll be able to get a really good understanding of what a flight crew does.”

So far, the cockpit procedures trainer has proven a favorite with Museum visitors, Leister said.

“We’re very happy and our visitors are very happy,” he said. “We had a perfect place to put it and it fits our mission beautifully. It’s just a real win-win for us.”
C-5A
(Continued from Page 5)

live test were to separate the stabilization chutes 48 seconds after the missile left the C-5. It would free-fall for two seconds before the engine fired for its 10-second burn. The timing of these events ensured the missile was stabilized before ignition and allowed the C-5 to be well away from the missile when its engines were lit.

The C-5 took off from Hill at 8 a.m., and headed for the Pacific Ocean Western Missile Test Range, west of Vandenberg AFB. Everything went perfectly, from extraction of the missile from the cargo deck through ignition and final shutdown.

69-0014 landed at Vandenberg at 10:55 a.m., marking a successful end to the AMFD.

Both aircraft went on to varied careers with the Air Force. 69-0027, which was delivered to the Air Force on April 6, 1972, was last assigned to the West Virginia Air National Guard. Sent to the Warner-Robins Air Logistics Center in 2009, it was retired on March 22, 2011, and sent to the 309th Aerospace Maintenance and Regeneration Group, i.e., “The Boneyard,” at Davis-Monthan AFB, Ariz.

After its history-making work on the AFMD, 69-0014 returned to Dover AFB, until being reassigned to Travis AFB, Calif., in July 1977 and then to Altus AFB, Okla., in December 1981. Following major upgrades to its wings and related structures, it was reassigned between Travis and Altus until January 2004, when it was sent to Lackland AFB. Finally, it was assigned to the 164th Airlift Wing of the Tennessee Air National Guard in December 2011, from where it is being retired to the AMC Museum.

In a paper submitted to the Aerodynamic Deceleration Systems Conference in November 1975, authors Daniel J. Kolega and James E. Leger of the Air Force’s Aeronautical Systems Division said the program had proven the idea of air launching a Minuteman missile from a C-5 could be accomplished.

Although successful, because the program was developed and completed so quickly, Kolega and Leger said improvements could be made to increase the missile’s range as well as reliability and safety. In addition, the demonstration confirmed the C-5, which had been in the Air Force inventory for less than five years, could be adapted for other uses.

“The tests also indicated that the C-5A has the capability of launching a missile that is significantly heavier that the Minuteman I and that multiple Minuteman I airdrops are also possible,” they wrote.

Minuteman
(Continued from Page 5)

160 knots, the platform rattled down the cargo deck and off the rear ramp.

“It sounded like a freight train,” Hardin said. “It made a lot of noise.”

With the sudden loss of almost 87,000 pounds of dead weight, the loadmasters noticed a change in the C-5’s flight characteristics.

“It was like dumping out a wheelbarrow full of water,” Sims said. “We gained some forward motion, but [the pilots] had control of that. It was very smooth.”

“It wasn’t all that bad,” Hardin recalled, “though you did come off the floor a bit.”

Standing at the edge of the loading ramp, both men watched in awe as the missile and its cradle fell. As it was pulled from the plane, the platform angled downward. Explosive bolts released restraining straps, which allowed the Minuteman to slide out of its cradle, which, according Sims, “drifted out into the sunset.”

Suddenly, the stabilization parachutes billowed above the missile, stopping its freefall and bringing it to a near vertical position above the ocean. For the longest time, Hardin said, nothing seemed to happen.

“I thought, after all our work, this damned thing isn’t going to go off,” he said.

Then, Sims said, there was a sudden flash in the clouds more than 12,000 feet below.

“I saw it fire,” Hardin added. “All at once there was this big ball of fire. That burn stopped the missile from falling and it came straight up. We were at 20,000 feet and it passed us. It was a very amazing thing to see.”

With the feasibility demonstration a success, both Sims and Hardin said they were briefed that Kissinger had gained the advantage he was looking for. Although the Secretary of State’s memoirs don’t mention the incident, transcripts of the talks showed Brezhnev was called away from the table at least once during negotiations held the following day. If they actually were told about the successful tests, Brezhnev and his team apparently never mentioned the fact to Kissinger.

Unlike most weapons testing programs, the United States made no effort at keeping the Air Mobile Feasibility Demonstration a secret. Local newspapers and national newscasts covered the event, which also was mentioned in the Air Force Times and in the Dover AFB newspaper, the Airlifter. A special AMFD decal adorned 69-0014 after the tests, and Air Force personnel taking part in the program were awarded the Meritorious Service Medal, while others, including O’Brien, received special citations.

But there is one more story to tell.

The idea of a mobile missile system did not sit well with the Strategic Air Command, which controlled the Minuteman program. In addition, the Military Airlift Command didn’t particularly want the responsibility of moving the missiles from place to place. But, intercommand rivalry being what it was – and still is – to Sims and Hardin, it seemed SAC’s representatives were trying to hog much of the publicity surrounding the demonstration.

Sims came up with a way to counter that, just before the final live-fire demonstration: “I put a big, damned MAC patch on the side of that SAC missile,” he said.

“If you see the film, you can see the MAC patch,” Hardin verified.

That expression of command pride did not go unnoticed once films of the test were shown. “It created a bit of a stir at MAC,” Sims admitted. “They were worried about it, but Gen. [Paul K.] Carlton, commander of MAC said it was great. It was the first thing he spotted.”

“They showed Carlton the film and he saw that MAC patch on the missile,” Hardin said. “He called up the commander at SAC and razzed him up a little bit.”

“A lot of people at MAC didn’t want anything to do with me until that four-star called me and said it was great,” Sims said.
Former Speaker of the House Newt Gingrich and wife Callista visited the AMC Museum April 21. Director Mike Leister, right, briefed the couple on the Museum’s exhibits.

Museum Archivist Harry Heist and Francis Urick share a laugh during Richard Bloch’s magic act during the Dec. 12 Christmas party. The AMCM Foundation threw the soiree to honor the Museum’s more than 100 volunteers.

Christmas came a little early for Hank Baker during the AMCM Foundation Volunteer’s Christmas Party. The Manhattan Dolls, from left, Heather Dispensa, Annemarie Rosano and Sarah Drake, provided part of the evening’s entertainment.

Museum Archivist Harry Heist and Francis Urick share a laugh during Richard Bloch’s magic act during the Dec. 12 Christmas party. The AMCM Foundation threw the soiree to honor the Museum’s more than 100 volunteers.

Retired U.S. Air Force Master Sgt. Ron Gough addresses a crowd of more than 135 people at the Museum’s Nov. 12 Veterans Day ceremonies.. Gough founded the AMCM’s Hallway of Heroes, dedicated to those who earned the Medal of Honor.

AMCM Foundation chaplain, retired USAF Reserve Lt. Col. John Groth, meets with veterans who attended the day’s ceremonies. From left are Groth, James Clark, Charlie Robinson, John E. Carson Jr., retired U.S. Army Sgt. 1st Class William Richardson, James Hooper and Alexx White.

Any Wedel and brother Luke Wedel of Newark, Del., helped decorate the AMC Museum’s Christmas tree on Nov. 18. The two siblings made the trip with their grandmother, Diane Wedel of Wilmington, Del.

Maddy Kibler, 9, and her grandmother, Rose Kibler, both of Milford, Del., look over the AMC Museum’s glider display on Nov. 12. “My nana, she brought my dad here when he was about my age,” Maddy said.
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