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The Minuteman Air Drop

By Gene Andreosky

On Friday, August 24, 1974, I was told by the Autonetics Minuteman program manager to attend a meeting that afternoon at the Space and Missile Systems Organization (SAMSO) located at Norton Air Force Base in San Bernardino, California. Autonetics was the guidance and control contractor for the Minuteman missile. The program manager did not know the subject of the meeting but the company was told to send a representative, preferably someone with a control systems background. When I got to the meeting I noticed the room was filled with an assortment of people, both military and civilian. Some of them I knew from past programs but a large number were faces I had never seen before. One unusual thing was that Brigadier General John Hepfer, Commander of SAMSO, was in attendance.

The attendees were told that we were going to do something that had never been done before called the Air Mobile Feasibility Demonstration. We were going to drop a Minuteman-I missile from a Lockheed C-5 airplane and ignite it in the air. The missile was to be placed on a pallet in the airplane, dropped out of the airplane with the pallet tethered to the airplane. The missile would then slide off the pallet and parachutes would open for a controlled descent. As it approached the water, the missile would be released from the parachutes and a modified stage one motor that had ten seconds of active propellant (the rest being inert) would ignite. Thiokol would make the modification. Stages two and three were to be inert propellant motors that had been around for years.

And, oh yes, the whole thing was to be completed by November 1st, slightly more than sixty days away. If not completed by that day the project would be terminated.

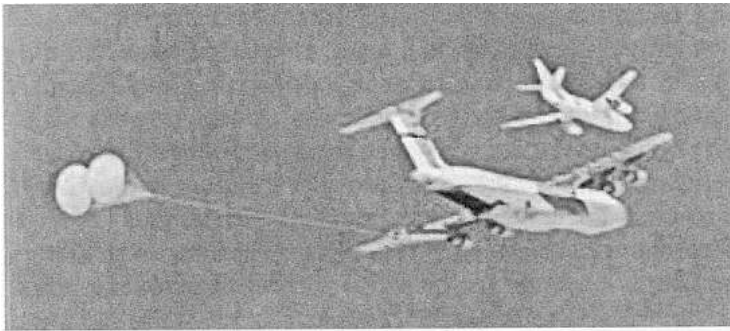
The first thing that came to my mind was that it could not be done because the Minuteman-I guidance platform did not have sufficient gimbals freedom to perform the task. SAMSO had a solution to this problem.

A little sidebar will help here. When Minuteman-I was upgraded to Minuteman-II and, subsequently, to Minuteman-III, the stage two and stage three rocket motors were replaced and the old motors dispositioned as surplus. An enterprising company in Chatsworth, California—Space Vector Corporation—purchased these surplus motors, placed an attitude control guidance system on top, and sold the system called Aries with various atmospheric sensors as payload. They were reasonably successful with this and sold them around the world as sounding rockets. It was this guidance system that we were going to use in place of the Minuteman system.

I was given the task of integrating the Space Vector system with the Stage One P89 Nozzle Control Unit (NCU) and making sure that the system was stable. I arranged for a meeting to be held the following Monday at Space Vector in Chatsworth. I wasn't particularly looking forward to the meeting because at that time I lived in Laguna Hills, which is in the southern end of Orange County and Chatsworth is in the western end of the San Fernando Valley. It was only about 80 miles but Los Angeles was in between.

The next day, Saturday, I was at home doing my normal Saturday tasks. While mowing my lawn, I received a telephone call from the Autonetics patrolman who was in the company control center asking if he could give my home phone number to Newell Saunders who was our logistics department representative at Hill Air Force Base in Utah. I told him he could and, shortly later, Newell called. He said if I needed any hardware at all to give him a call. I told him that all I would probably need

was a P89 NCU and to assure that all the rocket motors, both live and inert, had working raceway cables so we could communicate between the guidance set and the NCU. I resumed my lawn mowing when I received another call from the patrolman asking if he could give my number to a civil servant from Hill Air Force Base. This person was the top civil servant for Minuteman maintenance at the base. He also assured me that if I needed anything to give him a call and he would see that I would get it. Later in the morning, I received a third call. At this point, the patrolman said something important must be going on. This time it was the bird colonel in charge of Minuteman maintenance assuring me that if I needed anything I was to just give him a call. He gave me his office phone number and said his secretary was to interrupt any meeting to take the call.



U.S. Air Force Photo

A Minuteman-I Missile is extracted from a Lockheed C-5A during the Air Mobile Feasibility Demonstration.

things. I called time out and asked Capt. Bowen to meet me outside the room. I told him if we were to meet our schedule, I could not possibly answer all those questions. To his credit, he told TRW to name one representative and the rest were to leave the room. We then continued the meeting.

Space Vector was a small company but it had an enthusiastic work force. The person who was the driver for the company was a consultant named Joe Jerger. He was as obnoxious as could be but he was brilliant. He later became president of the company. Joe and I got along great. We set up our working arrangement. The president of Space Vector, to his credit, gave me complete authority to commit his company to anything I deemed necessary.

I had a very good Autonetics control engineer, Leo Hayes, working with me. He set up a simulation in the Autonetics analog simulation laboratory that proved very valuable. We simulated the missile as it dropped on the parachutes and after ignition. After ignition, the plan was to position the missile to fly straight up, maintain constant attitude for the ten seconds and, when it reached its apogee, drop into the ocean.

Another little sidebar will help here. All missiles have bending modes. Normally, one does not see them in flight on telemetry because they are washed out when the motors are pressurized. The only people who worry about them are the controls types because if not taken into account they can destroy the missile. On Minuteman, the first bending mode is at around six Hertz. The second is at around thirteen Hertz. The first mode was very prevalent in the simulation. This will become very important as one will see later on.

In order to have freedom of movement, the program was unclassified but we were told to treat it as secret as far as discussing it with others outside the working group. About three weeks into the program we received word that there was a leak. "Somehow," the New York Times and the Washington Post found out that something related to Minuteman and the C-5 was taking place. Sure enough, it was in their papers.

While we on the missile side were working our problems, the airplane people were working theirs. Their major problem was the total weight of the missile and pallet. Combined they were three times

When I arrived at the meeting Monday morning, the Space Vector conference room was completely filled. I was the lone Autonetics representative, the SAMSO guidance office assigned a representative, I believe his name was Capt. Bowen, Space Vector had some people, but the vast majority were from TRW. As I started to review the assignment we had, I was immediately bombarded with all sorts of questions from the TRW people, "How are we going to assure this?... etc., etc." all sorts of

heavier than anything that had been dropped from an airplane before. They were continuously breaking tethers with all sorts of multiple combinations as they dropped simulated loads.

On the last Saturday in September, SAMSO decided to conduct a sample drop using an old "iron bird" missile at the Department of Defense National Parachute Facility in El Centro, California. If you were not aware that there is a DoD National Parachute Facility that's okay because neither was I. Lockheed, the C-5 contractor, was panicking. They were the first under the gun. Several days before the test they were still breaking tethers. Desperately, they decided to go with a single tether of approximately six inches in diameter. With few days to spare, they put in a hurried call to, I believe, Goodyear. I was told that Goodyear designed, fabricated and shipped the new tether in ONE DAY.

El Centro in September is not exactly the most desirable place to visit. It was hot and smelly! All participants went down on Friday. TRW personnel and senior SAMSO personnel, having a head start, booked their rooms at the El Centro Country Club, taking up all the rooms. Capt. Bowen asked if I could book him a room through our travel department hoping to get a reduced rate. The motel owner of the place we stayed at did not give him a reduced rate but gave him the best room in the motel. The cost of each of the rooms for both Capt. Bowen and myself was eight dollars.

SAMSO was not too subtle about the test. The C-5 was flown into the El Centro Naval Air Station a day ahead of time. It was by far the largest aircraft ever flown into that facility. Also, the test was to be held on a Saturday. It was the first Saturday that facility worked since World War II. The Soviets couldn't use trawlers to observe the test but several campers were observed parked in spots where campers normally did not park.

The test went without a hitch. The pallet went out of the plane, the tether held and the parachutes deployed. The dummy missile landed in the desert. Everyone went home after the test except Joe Jerger and me. We stayed behind to look at the telemetry data. It is a good thing we did. The first bending mode was very prevalent. Also, the missile as it was coming down on the parachutes was oscillating like a pendulum about the roll axis. The scheme we had planned earlier would not work. We decided the first thing we should do upon ignition was bring the missile rates to zero and then the attitudes. I called Leo Hayes and asked him to meet me at the simulation lab the next morning. We inserted the proposed fix and tested it out. It worked fine. I called Space Vector and told them what changes to implement.

Monday morning TRW and SAMSO personnel got to see the telemetry data and they panicked. The phone started ringing off the hook. I told them to calm down. The six-cycle oscillation they were seeing was the first bending mode and it was nothing to worry about. Regarding the pendulum oscillation about the roll axis, I told them we already had the fix implemented.

At the onset of the program some ground rules were established. There would be no formal design reviews, rather there would be a series of continual technical interchange meetings. I was continually on the road. Most times I was representing both Autonetics and Space Vector. One night while I was at home, I received a call from Capt. Bowen. He was at Hill Air Force Base where the missile that was to be dropped was being assembled. He wasn't sure if the guidance commands were moving the nozzles in the proper direction. I tried to explain it over the phone but he asked if I would come up to make sure everything was done right. I went to the Orange County airport and was able to get on the last plane to Salt Lake City. I got into Salt Lake City, rented a car and got to Hill Air Force Base about midnight. I had been to the base many times but never in the maintenance area where the missile was being assembled. Capt. Bowen had given me the building number but I had no idea where to start looking. Fortunately, they had put a person outside the correct building with a flashlight so I found my way in. We conducted the tests and I assured them that things were working properly. I didn't bother to get a hotel room. I caught the first flight out to Orange County in the morning and went to work.

Finally the time came to think about the real drop. SAMSO decided to make a test run. The plane took off from Edwards Air Force Base and made the run to Vandenberg Air Force Base. We tested

the telemetry to make sure every thing worked. The day was beautiful, hardly a cloud in the sky. The plane then returned to Edwards.

October 24th was picked as the date of the real drop. Again, in subtlety, the Coast Guard closed the whole channel between the mainland and the Channel Islands to shipping. This is rarely done. However, there were some trawlers off the coast. Unfortunately, the day was uncommon for an October day. It was more like June. A thick overcast settled in. A decision was made to go ahead anyway. I was in the control center as the plane approached. I had to give the go that the guidance and control was working properly. Everything worked beautifully. Unfortunately, no one could see it.



U. S Air Force Photo

The airdropped Minuteman test missile begins to align into a vertical attitude before igniting its stage one motor.

Again, most people took off when the test was completed. I decided to stick around to see what the films showed. The films showed the plane coming over and dropping the pallet with the missile and the parachutes deploying. The films also showed the missile coming up through the cloud cover after ignition. Most of us were in our work clothes. In the back of the room was a gentleman whom we had never seen before. He was dressed in a suit. We later found out he was from the State Department and he was there to get a copy of the films. He had a plane waiting and took off immediately for Moscow where Henry Kissinger was meeting with the Soviets.

We met our deadline with a week to spare. The cost to the government for all parties, both missile and aircraft, was \$7 million. The Autonetics cost was about \$33,000. The only people working it from our company were myself, Leo Hayes, and Chris Myers from the program office.

When it was over, a little party was held at SAMSO. General Hepfer said we would probably never see another program like it again. He was right. After a while citations were issued. General Hepfer presented Mort Margolis a citation for the Autonetics contribution to the task. The citation specifically noted the rapid turnaround in the fix of the control scheme after the first inert missile drop. He also presented me with an Air Force Systems Command Certificate of Merit. The commendation states that the Air Mobile Feasibility Demonstration was one of the most remarkable peacetime achievements in this Nation's military technology. Some years later, I attended a function commemorating SAMSO's twenty-fifth year of existence. I was shocked when the Secretary of the Air Force said that of all of SAMSO's accomplishments, the one he thought was the single most important was the Air Mobile Feasibility Demonstration. He said it worried the Soviets so much to think that the United States could develop an air mobile Minuteman force that they (the Soviets) became much more cooperative in negotiations.

About the Author: Gene joined the newly formed Autonetics Division of NAA in July 1957. His first assignment was the flight control system for the A3J. He was one of the first to move to Fullerton and then to Anaheim. After Autonetics won the competition as contractor for the Minuteman Guidance and Control System, Gene was instrumental in the design and development of the system. He held several management positions and was the program manager for the Autonetics

portion of a large corporate covert program when he retired in 1990. He currently resides in Santa Ana, California with his charming wife, Judy.