The Space Race: Spacecraft Recovery

By Nancy S. Lichtman

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Marine Aviation Played a Critical Role At the Dawn of the Space Age

First Lieutenant Wayne Koons, a HUS-1 pilot with Marine Helicopter Transport Squadron (Light) 262, carefully set his history-making cargo, the Freedom 7 spacecraft, on the deck of USS *Lake Champlain*(CVS-39), and then landed his helicopter. As he shut down the engine of the Sikorsky HUS-1 Seahorse, his passenger, Commander Alan Shepard, USN, who had just returned to Earth following the United States' first manned space flight, stuck his head up through the copilot's hatch, slapped Koons on the leg, and said, "Good boy!"

It's a memory that stands out for Koons, now 81 and a retired Marine Corps Reserve lieutenant colonel, and for his copilot, George Cox, a 79-year-old retired Marine Corps major. Even after 55 years, both men can recount the details of the flight with remarkable precision.

The two aviators were a part of an amazing event in history. They transported Shepard on the last leg of a journey that had taken him to space and back again. With the whole world watching, the mission demanded perfection. And perfection was something that Koons and Cox were striving for on all their flights.

The date was May 5, 1961, and the United States was about to send a man into space for the first time. At 9:34 a.m., NASA launched Shepard's Freedom 7 spacecraft atop a Redstone rocket for a suborbital flight. Freedom 7 returned to Earth about 15 minutes later, splashing down in the Atlantic Ocean near the Bahamas. It was time for Marine Corps aviators to do their job.

Command pilot 1stLt Koons and his copilot, 1stLt Cox, took off from *Lake Champlain* and flew to the splashdown location. While Koons maneuvered the HUS-1 into a hover over Freedom 7, communicating with Shepard via radio, Cox entered the cargo hold and leaned out of the helicopter to remove the spacecraft's high-frequency antenna. He then snared the spacecraft's recovery loop with a special hook the Marines had designed for the job. At that point, Koons raised the spacecraft slightly, so that the Freedom 7's hatch was clear of the water. Shepard opened the hatch and crawled through to catch a sling that had been lowered from the helicopter. Cox brought Shepard into the aircraft, and Koons flew the spacecraft to the deck of the carrier.

The recovery of Shepard and Freedom 7 worked exactly as it was rehearsed. The recovery process, however, was new. A small but dedicated group of leathernecks from Marine Aircraft

Group 26 at Marine Corps Air Station New River, N.C., had spent countless hours of training and several unmanned test missions developing the new process.

The Cold War prompted a “Space Race” between the U.S. and the Soviet Union, and the two nations were locked in a struggle to be the first to successfully land a man on the moon and return him to Earth safely. Less than a month before Shepard’s mission, cosmonaut Yuri Gagarin had orbited the Earth, so the pressure was on for the Freedom 7 mission to be a success.

Initiated in 1958, Project Mercury was the first step for the U.S. in manned space flight. The goals of the program were to send manned spacecraft into orbit, investigate an astronaut’s ability to function in space and safely recover the spacecraft and their crews.

It was a complex engineering feat involving an entirely new type of vehicle, and while a team of engineers was designing the complicated spacecraft that took Shepard into space, it fell to Marine Corps aviators to figure out how to retrieve it from the water upon re-entry.

NASA’s plan was to have helicopters lift the capsule out of the water and carry it to a waiting ship nearby. According to Koons in his 2004 oral history interview for NASA, the Army initially was approached to do the job but declined due to a lack of familiarity with carrier operations and flights over open water. The Navy also declined, Koons said, because their helicopters didn’t have the external cargo capability or the lift capability needed due to their antisubmarine warfare equipment.

NASA’s next stop was the Marine Corps. The Corps’ HUS-1 (later called UH-34 when the Department of Defense standardized aircraft designations) was a heavy-lift aircraft capable of the mission. However, there were no recovery procedures in place and the spacecraft design hadn’t been finalized. Yet the Marines of MAG-26 had to figure out how to accomplish the mission.

An Engineering Challenge

Koons completed flight training in early 1959 and was still relatively new to HMR(L)-262 when he was told: “The skipper wants to see you on the double. We’ve got to see the group commander.”

“I thought my day was going south,” Koons said. When he arrived in the air group commander’s office, he was shown a couple of classified messages. “I saw words like astronaut and launch, and I wondered ‘What in the Sam Hill am I doing here?’ ” said Koons.

He soon found out that MAG-26 was being tasked with figuring out how to retrieve an astronaut and his spacecraft from the ocean following the spacecraft’s return to Earth.

Koons, who later worked as a NASA project manager, learned that he had been assigned to the mission because of his education and background. He had majored in math and physics at Ottawa University in Ottawa, Kan., and had worked briefly for Westinghouse as an engineer. Koons and his fellow pilots, including Cox, were told by NASA that the spacecraft was projected to weigh 1,900 pounds. “That was a tight fit for our lift capabilities,” said Koons during a recent interview from his home in Kansas.

As Project Mercury progressed, the spacecraft got heavier because more systems were added to it. “We ended up with a spacecraft that was 3,000 pounds,” Koons said. That required a bit of ingenuity on the part of the Marines. In order to be able to lift the spacecraft, as much weight as possible had to be removed from the helicopter while ensuring it was still within center of gravity limits.

“Part of our effort was to decide how much equipment we could strip out of our helicopter,” said Koons. The Marines removed the life raft, seats and an auxiliary power unit. Much of the equipment that was removed had been added after the initial factory delivery of the aircraft, “so taking it out,” said Koons, “was a matter of going to a previous configuration.”

Typically, the HUS-1 had a three-man crew: the pilot, copilot and crew chief. For spacecraft recovery missions, however, to further reduce the weight of the aircraft, the crew consisted of only a pilot and copilot. The copilot also served as the loadmaster and crew chief and had to guide the pilot during the final stage of the retrieval process, giving voice commands over the intercom because “the pilot at that point couldn’t tell very well how he was moving relative to the water surface,” said Koons.

The helicopter didn’t have any navigation equipment, except a compass and a clock, so the pilot and copilot used dead reckoning. “That’s not all that unusual,” said Koons. “In World War II there was an awful lot of flying that was done on dead reckoning, and we were not that far removed from WW II at that time.”

Another factor that had to be considered was fuel. The Marines couldn’t pick up the spacecraft if the helicopter had a full load of fuel because the fuel added too much weight.

Koons recalled on one occasion the commanding officer of the ship they were on board said he didn’t want any helicopters to leave his ship without a full load of fuel. Koons, a first lieutenant at the time, said it fell to him to tell the captain, “Well, if that’s the case, we may not be able to do the mission.” Looking back, Koons said at the time he was “green enough that he wasn’t overly intimidated by guys with eagles on their collars.”

Adapting to Design Changes

When the Marines became involved with the project in 1959, the design of the spacecraft was still a work in progress and specifics of the recovery were still undecided. Initially, NASA

wanted to transport the spacecraft from the water to a U.S. Navy ship with the astronaut still inside of the spacecraft. When that plan changed, the Marines had to adapt and formulate a new set of procedures.

Another early problem was how to deal with the HF antenna that was attached to the top of the spacecraft so that it didn't get caught in the rotors of the helicopter. One early antenna design had a 40-foot piece of copper wire with a helium balloon attached to it, and the Marines had to figure out a way to remove the balloon without having it get wrapped around the tail rotor.

According to Koons, it was decided to give shotguns to the copilots and let them "have at it." About the time Marines got good at shooting the balloons, NASA engineers changed the antenna design and balloons were no longer being used. In true Marine fashion, the squadron adapted and overcame all the design modifications and engineering challenges that came their way.

"Probably my most satisfying experience was the whole two-year trail of working through changes and developing procedures and writing the operations manual and … just managing the whole thing and have it come to fruition and a good retrieval," said Koons.

Training for an Unusual Mission

Most of the training took place at MCAS New River, but some also occurred at Langley Air Force Base, Va., and Wallops Island, Va. Cox, who later flew CH-53s and CH-46s, said the recovery tasks were done in addition to regular squadron duties. "We were a Marine helicopter squadron, and most of that time that's what we were doing … but we also flew these hops," said Cox, adding that they always were working to improve their flying skills.

Not everyone in HMR(L)-262 wanted to be involved. Koons said the Mercury recovery flights were strictly voluntary. "The critical part of doing it was to approach the spacecraft while it was on the water and chase it up and down the waves and swells and everything until the copilot, who was down below, could lean out with an aluminum pole and hook the lift cable into the lifting loop on top of the spacecraft. And when you were doing that, you had your head sort of out the window, looking down into the water which was [disorienting]," said Koons.

The Marine pilots who volunteered for the retrieval missions knew that their safety came second to that of the spacecraft and the astronaut.

Even after it had been decided that the astronaut would exit the spacecraft and enter the helicopter before being taken to the ship, Koons said the squadron prepared for alternate scenarios. For example, if the astronaut became disabled in the course of the mission, or if the

hatch didn't work, the Marines planned to take the spacecraft to the ship with the astronaut still inside. If the Seahorse helicopter experienced an engine failure in that scenario, the crews had to "fully accept the idea that the helicopter and its crew came second to the spacecraft … particularly a spacecraft with a man on board."

"So I made that judgment, and I wrote it into the operations manual, and the squadron commander signed it and that was the end of the discussion," Koons said. He also said that astronaut John H. Glenn, a fellow Marine, was vocal in his disagreement with that philosophy. Koons told Lieutenant Colonel Glenn, "I can get killed any day of the week and I won't get written up anywhere but the hometown newspaper. If I kill you, we're not going to hear the end of it for a year. So it's not reasonable to say that I would give myself the priority over you. That's just not the way it works."

Importance of Backup Crews

There were plenty of crews trained and ready. Seven pilots, 10 enlisted Marines and three helicopters were typically used for spacecraft recovery. "There was always a backup ready to go if there was any problem," said Cox, who was the copilot in the backup helicopter in July 1961 for the recovery of Liberty Bell 7, the spacecraft used for the nation's second manned suborbital flight. After the primary recovery helicopter experienced difficulties, Cox rescued astronaut Captain Virgil I. "Gus" Grissom, USAF.

After splashdown, as the two Marine helicopters arrived on station and pulled into a hover waiting for Grissom to indicate that he was ready, the hatch blew off the spacecraft. Liberty Bell 7 quickly began to fill with water, and Grissom egressed the spacecraft into the ocean. According to Koons, who by that time was a full-time NASA employee, 1stLt James Lewis, the command pilot for the lead helicopter, realized that the spacecraft was starting to sink, so he and his copilot, 1stLt John Reinhard, immediately got into position to engage the spacecraft. As they were working to lift it and drain some of the water, a warning light illuminated in the cockpit of the HUS-1, indicating a possible engine malfunction. The Marines were forced to abort the mission and "pickle" (drop) the spacecraft into the ocean.

According to Cox, it was later determined there wasn't a malfunction in the primary recovery helicopter, but "you don't question those lights at the time."

While all of that was going on, Grissom was in the ocean. To make matters worse, a leak in the neck dam of his spacesuit was causing him to take on water. The backup helicopter, with Cox and command pilot Captain Phillip Upschulte aboard, recovered Grissom.

During NASA's later debrief with Grissom, the astronaut said he was glad to see it was Cox in the helicopter because they had trained together so many times.

A Change in Procedure

The third manned Mercury mission marked a change in the recovery process. Beginning with John Glenn's 1962 orbital flight, procedures were changed and Marine helicopters were no longer the primary means of recovery. The lessons learned during the early Mercury flights laid the foundation for the future successful recoveries conducted throughout the remainder of the project and Project Gemini and Project Apollo.

The success of the space program was a great triumph for America, and people throughout the world followed its progress closely. The astronauts became celebrities and even the Marines who supported their missions gained a measure of fame. Koons was unprepared for the media attention and said, "For the most part, I had my head down working on what was needed to be done." Both Koons and Cox appeared on an episode of the CBS show "I've Got a Secret" and were VIP guests of Igor Sikorsky at his company headquarters, where both men were presented with models of the HUS-1 and taken for a flight in the company's newest helicopters.

Koons and Cox also received a letter from Alan Shepard who thanked the Marines "for prompt and efficient service."

Cox went on to a variety of flying assignments in squadrons throughout the Marine Corps including multiple tours in Vietnam and the Far East. He retired from the Marine Corps in 1978 and taught eighth-grade math for the next 21 years. Cox has fond memories of those early days of his flying career and supporting some of America's first astronauts. "Those men were exceptionally brave in what they did. It was a privilege to know them and work with them," said Cox recently, from his home in North Carolina.

After leaving active duty, Koons went to work full time for NASA in 1961, and for the next 22 years, he was assigned to various aspects of the Mercury, Gemini and Apollo programs and the space shuttle program.

Fittingly, Koons was in mission control watching along with his NASA colleagues when Neil Armstrong took his first steps on the moon on July 20, 1969. Koons said he was "just awestruck, even though I knew the guys who were flying the mission [and] I knew the flight controllers. … You were still just awestruck that it all came together, and for the first time in the history of mankind … people actually walked on the moon."

The journey to space has been one of America's greatest conquests. One of the crucial first steps in that journey—the recovery of the nation's first astronauts—was made possible by Marine Corps aviation.

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