



History of Coast Guard Rotary-Wing Aviation: From Inception to the Modern Day

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Abstract

Several innovative Coast Guard officers saw the helicopter's value as a rescue tool. However, World War II diverted resources away from rescue and funneled them toward anti-submarine warfare. The helicopter adapted and found itself uniquely suited to fill the submarine hunting role. After safely reducing the Atlantic merchant shipping losses, the Coast Guard helicopter was able to pursue its true search-and-rescue mission. Through the decades, the helicopter has saved thousands from treacherous waters. Today, armed helicopters help the Coast Guard fight drug trafficking. With the future of post-Fidel Cuba uncertain, the drug war in high tempo, and many open-water pleasure cruisers venturing out further to sea, the Coast Guard has a secure future.

History of Coast Guard Rotary-Wing Aviation: From Inception to the Modern Day

The United States Coast Guard traces its history back to August 7, 1789 when the First Congress federalized the lighthouse program (Historian's Office, 1). Since then, the service has been instrumental to the defense of this nation in both peace and wartime. It was in the very beginning of aviation when the Wright brothers flew their heavier-than-air craft from the Outer Banks of North Carolina. Three surfsmen from the Kill Devil Hill Lifeboat Station helped carry the biplane to its launch rail on December 17, 1903 (Scheina, 1999, 1). From that moment, the Coast Guard and aviation have been inseparable. The Curtiss aircraft company provided the early fixed-wing aircraft that the service embraced and made such an efficient lifesaving machine. The helicopter had a more difficult history.

Early on, the history of the United States Coast Guard (USCG) helicopter was fraught with resistance. These rotary-winged machines were not as popular at the time as blimps, autogiros, or airplanes. Eventually placed under the Navy for World War II, the Guard found itself fighting for attention for what it believed to be a worthy project. However, the Navy was not interested in the helicopter, as it was preoccupied with fighting the war. An icon of USCG aviation Commander Frank A. Erickson risked his career to promote the helicopter which he knew to be a critical addition to the airborne fleet. Erickson and other innovative Coast Guard aviators saw the great potential of the helicopter as a search-and-rescue and anti-submarine warfare tool and put their careers in harms way to prove to the world the helicopter's worth.

Early Helicopter Development

During the 1930s, engineers in both Germany and America were designing and testing the helicopter. Heinrich Focke designed the Fa 223 Drache which achieved a record altitude of

23,400 feet in 1940 (Day). Meanwhile, in the U.S. Dr. Igor Sikorsky was developing his own helicopters. Another American company Platt-LePage developed the PL-1.

It was at the end of the 1930s that the U.S. government became interested in the helicopter. On June 30, 1938, the Dorsey Bill (H.R. 8143) authorized two-million dollars for rotary-wing and other aircraft development. Every possible government user of the helicopter came together to form an inter-agency board to execute the project. Commander William J. Kossler, headquarters aviation engineering officer, represented the Coast Guard on the board. Spearheaded by the Army, the board chose the Platt-LePage PL-1 which Platt redesigned to become the PL-3 (Hendrickson). Modifying the design slightly to meet military needs, the XR-1 was born. Figure 1 depicts the XR-1. The Coast Guard was not as enamored with the XR-1. The Coast Guard kept searching for a design.



Figure 1. XR-1. Note. From Hendrickson, Jay. *Platt-LePage Aircraft Co.* Retrieved March 22, 2008, from http://www.helis.com/pioneers/f_plp.php.



Figure 2. VS-300. Note. From Aerospaceweb.org Staff. *Historic Milestones in Aerospace.* Retrieved April 2, 2008, from <http://www.aerospaceweb.org/question/history/q1054.shtml>

Despite losing the competition, Sikorsky's bureau United Aircraft Company continued work on its designs. Setbacks in the PL-1 project kept it from testing until May 22, 1941.

Sikorsky had already demonstrated his design. On December 17, 1940, the board decided to

pursue the Sikorsky VS-300 as well as the Platt-LePage XR-1 (U.S. Coast Guard Aviation Association, 2004). Figure 2 shows the VS-300 flown by Igor Sikorsky.

Coast Guard Visionary Finds His Motivation

On December 7, 1941, then Lieutenant Erickson was stationed at Pearl Harbor, Hawaii. This morning he was the duty officer at the airfield on Ford Island. At 0753, he watched through the window of the control tower as the Marine color guard marched to the flag pole. At 0800, as the National Anthem began to play, he heard two grand explosions. What would follow would be one of the worst days in U.S. Naval history. Erickson watched helplessly “from his aerie in the tower at the epicenter of attack” (Beard, 1998, 2). The Japanese bombed Battleship Row and strafed the airfield. From his perch, “[h]e watched as nearby Hickam Field to the south erupted in billowing smoke and flames” (Beard, 2). During the devastating day, he was forced to stand by as men burned in oil-slicked water. All the while, he wanted nothing more than to save these men. As an officer of the Coast Guard, he dedicated his life to saving lives. He was frustrated that there was no effective way to save the “more than two thousand men killed within a radius of a mile-and-a-half plus many thousands more wounded” (Beard, 3). Early in August of that year, he read an article in *Aeronautical Digest* that profiled the helicopter, a relatively new machine to aviation. The article talked about a rotary-wing machine built by Dr. Igor Sikorsky. Erickson immediately recognized the helicopter’s potential for the Coast Guard. Through Erickson’s eventual success, “a legacy lives with the millions of saved lives accountable to [the]...dream born in carnage” (Beard, 4).

Coast Guard Helicopter in Its Infancy

Through the stroke of President Franklin D. Roosevelt’s pen on November 1, 1941, Executive Order 8929 integrated the Coast Guard under the jurisdiction of the Navy (National

Archives, 1941). Kossler attempted to convince the Navy of the helicopter's importance. However, the Navy was not interested. Despite the lack of interest, Kossler continued to pursue the helicopter for the Coast Guard. He could not give up on something he knew to be so important. Commander Kossler and Commander Watson A. Burton, Commanding Officer Coast Guard Air Station Brooklyn, attended the "first official American helicopter demonstration...on 20 April 1942" (U.S. Coast Guard Aviation Association). Both men immediately took an interest in Sikorsky's design. Also present at the demonstration was Royal Air Force Wing Commander Reggie Brie. He was in the United States examining the possibility of using helicopters aboard Royal Navy vessels for anti-submarine warfare. Brie and Kossler would remain close over the coming years, a relationship that would provide an avenue for the exchange of ideas during the war. Commander Kossler's interest in the VS-300 lead him to recommend that Coast Guard Commandant Vice Admiral Russell R. Waesche purchase three helicopters at a total of \$250,000. The service chose the HNS-1 Sikorsky design. Despite Kossler's enthusiasm, his superiors RADM Harvey Johnson Coast Guard Engineer-in-Chief and Assistant Commandant RADM Lloyd Chalker were not supportive of the purchase, citing the great cost combined with limited utility. These men believe \$250,000 was too expensive for only three machines. Chalker said, "Hey, Bill [Kossler], the Navy isn't interested in life saving; all they want to do is get on with the business of killing the enemy" (U.S. Coast Guard Aviation Association). The Assistant Commandant did not see the future of the helicopter in anti-submarine warfare. Kossler made it his career pursuit to show these men that the helicopter could kill the enemy. He found himself working against the strong anti-helicopter inertia of the Navy. During the inter-agency board of 1938, the Navy asserted the helicopter was but a minor application and not worth pursuing.

Seeing that he would need an ally, Kossler contacted Coast Guard Air Station Brooklyn's Executive Officer Lieutenant Commander Frank Erickson. Kossler sent his assistant Lieutenant Bill Healy to have lunch at the air station. Kossler's purpose was to get Erickson to attend a demonstration at Sikorsky's factory. During the meal, Healy asked if there was someone who could fly him to Bridgeport for a meeting with Sikorsky. Erickson volunteered to fly Healy in an amphibious fixed-wing for the meeting, and while in Bridgeport, Erickson witnessed the demonstration. His interest in helicopters had already been piqued in 1941 at Pearl Harbor. After seeing firsthand that a man could climb into the helicopter from a rope dropped to him, Erickson was forever dedicated to rotary-wing aviation. Now the Engineering Officer had both the Commanding (CO) and Executive (XO) Officers of Air Station Brooklyn on his side in the fight for a Coast Guard helicopter. Shortly after the demonstration, Erickson wrote a memorandum to Commandant Waesche asserting the value of the helicopter as a lifesaving and law-enforcement tool. In the letter, he also stressed the potential to use the helicopter for convoy protection against German U-boats. He pointed out that any ship with a thirty-foot platform could support helicopter operations. The helicopter would provide the convoy with an additional method of submarine detection, allowing a convoy to travel with fewer escorts. By freeing escort destroyers for other convoys, the helicopter would single-handedly increase the U.S. merchant shipping capacity of the Atlantic. This important point stuck with the Commandant.

In June of 1942, Germany U-boats sank 707,000 gross tons or four percent of the U.S. merchant fleet. One in twenty ships that began the voyage across the Atlantic would fall to the German wolf pack (Browning, 1999, 1). Following losses of this magnitude, on February 19, 1943, Navy Admiral Ernest King Commander in Chief, U.S. Fleet and Chief of Naval Operations, assigned development of the helicopter for anti-submarine warfare (ASW) to the

Coast Guard (Browning, 6). King decreed that a useful helicopter would have a minimum crew of one man, have a life raft, a 100-mile range radio, and at least four hours endurance. These specifications described the HNS-1 perfectly. Soon confusion developed as to who was taking the lead in the helicopter ASW mission. King ordered a Combined Board for the Evaluation of the Helicopter in Anti-Submarine Warfare. The board included members of the Coast Guard, the Navy Bureau of Aeronautics, the British Air Commission, the War Shipping Board, and the National Advisory Commission for Aeronautics (Browning, 7). The Coast Guard was on its way to becoming the premiere early operator of helicopters.

Buying Airframes, Building Fields, and Training Pilots

With the approval of higher headquarters, Erickson suggests the Sikorsky HNS-1 currently in development for the Navy as a suitable airframe for the Coast Guard. The HNS-1 had a crew of two, could carry a 325-pound depth charge, cruise at twenty-five to sixty miles per hour, reach a top speed of 100 miles per hour, and had an endurance of hour hours. More important than its specifications, the HNS-1 could be in production by early 1943, ahead of many others. Waesche “requested one HNS-1 and three HOS observation craft from the Army” (Browning, 4). Figure 3 shows the HNS-1 in testing at Langley, Virginia.



Figure 3. HNS-1. *Note.* From Dick, Stephen. *SP-4305 Engineer in charge*. Retrieved April 2, 2008, from <http://history.nasa.gov/SP-4305/app-e.htm>

In addition to the orders placed by the U.S., Sikorsky won orders from the Royal Air Force (RAF) for 200 helicopters with a more powerful 450 horsepower engine. The RAF secured an option to purchase 800 more HOS airframes. The U.S. Coast Guard had only two HOS machines on order. The long-standing relationship between Waesche and his RAF friend Wing Commander Reggie Brie helped bring this order to fruition.

Kossler handpicked Erickson to be the first Coast Guard helicopter pilot because they were professional friends and Erickson was already so involved in the rotary-wing program. Since training facilities were not yet available at Brooklyn, Sikorsky conducted Erickson's training at his facility in Bridgeport. Graduating from training in spring 1943, Erickson became Coast Guard Helicopter Pilot Number One (Browning, 6). That summer, he went on to train Commander Stewart Ross Graham in the HNS-1 at Bridgeport (Historian's Office, 2003, 2). Graduating on October 20, 1943, Graham became Coast Guard Helicopter Pilot Number Two. Two weeks after completing training, Graham and Erickson "ferried the first Coast Guard helicopter, a Sikorsky YR-4B (Serial No. 46445) from Bridgeport, Connecticut" to Brooklyn (Historian's Office, 2). The YR-4B is another designation for the HNS-1. Now that the Coast Guard had helicopters to call their own, it needed a training facility for both pilots and maintenance men. With both the CO and XO integrated into rotary-wing flight, the service chose Air Station Brooklyn as its helicopter training center on November 19, 1943. The Coast Guard trained all Allied helicopter pilots during World War II at Air Station Brooklyn (Scheina, 6). By June 1944, the field was a fully operational training base. In two years, the Coast Guard trained 125 men as helicopter pilots. This number includes, ninety-six Coast Guard, twelve Navy, eleven RAF, two Army, and four civilians (Browning, 11). The Coast Guard had successfully convinced

the Navy of the value of the helicopter, acquired a rotary-wing fleet, established a base for their airframes, and trained its pilots. Kossler and Erickson had brought the helicopter program a long way from the inter-agency board of 1938.

While the Navy required the helicopter for ASW duties, Erickson still believed in its use as a search-and-rescue (SAR) tool. He continued through the war to experiment with SAR techniques. Soon, he would demonstrate what he learned in several dramatic rescues. In the meantime, he would pursue the Navy's ASW mission.

Anti-Submarine Warfare

The focus of the World War II Coast Guard helicopter was ASW. After the losses of May 1942, the Navy wanted the helicopter to operate from the deck of ships. The Combined Board began evaluating the HNS-1's ability to kill submarines. The plan was to have the helicopter loiter over the convoy until it spotted a submarine then attack the U-boat with its depth charge. If the submarine went below the surface, the HNS-1 would dip sonar equipment in the water to find the sub and then continue the attack. With a payload of only one charge, the helicopter would have to return to the destroyer to rearm before continuing the attack (Browning, 7). The plan seemed to be a good one. However, with a payload of only one depth charge, the helicopter would be rather innocuous to the submarine. Less than half of one percent of depth charges dropped during the war caused significant damage to the target (Browning, 9). These statistics made the helicopter marginal at best as a submarine killer. It quickly became evident that the helicopter was better suited as an observation platform. It would be uniquely able to spot the submarine from high above the convoy and be difficult to see through the periscope because of its small size.

So far, the Coast Guard had done its part by establishing viable rotary-wing operations. The next step was to learn to operate from a ship at sea. The Combined Board for the Evaluation of the Helicopter in Anti-Submarine Warfare decided on a three tier training program to get pilots ready for convoy operations. The program began with flat-water trials then moved to the open seas. The final stage of testing would place the helicopter in an operational role aboard ships crossing the Atlantic in convoy (Browning, 10). On May 7, 1943, Army Colonel Frank Gregory conducted twenty flights from the deck of the *Bunker Hill* while it was anchored off the coast of Connecticut. Following this successful demonstration, the program began open sea trials aboard the cutter *Governor Cobb*. The *Cobb*, a converted coastal passenger ship, was the first turbine-driven ship built in the U.S. and the first helicopter carrier. In June 1944 Erickson conducted the first shipboard helicopter landing on a ship underway. The *Cobb*, operating in Long Island Sound, had made its place in history (Scheina, 6). It was decommissioned shortly after the war, sighting exorbitant maintenance costs on the old vessel. Figure 4 shows the HOS operating from the *Cobb*. After proving a helicopter could operate from the deck of a moving ship, the Combined Board moved the program to the final trial tier.



Figure 4. HOS. Note. From Unknown. *Sikorsky HOS-1 (R-6) "Hoverfly II."* Retrieved April 2, 2008, from http://www.uscg.mil/hq/g-cp/history/WEBAIRCRAFT/AC_Sikorsky_HOS1.html.

The very next month, Commander Graham and the HNS-1 departed New York for Liverpool, England, aboard the *SS Daghestan*. The sixteen-day passage was fraught with foul weather, severely limiting the sea trials. By the tenth day, the weather subsided and Graham took to the sky. In a demonstration that would garner the Air Medal, he flew thirty minutes around the convoy before landing on the *Daghestan* in twenty-knot winds on a deck rolling ten to twenty degrees. At the conclusion of the passage, the American pilots completed 166 takeoffs and landings, and the British completed 162 (Browning, 11). The trials also revealed that the HNS-1 was too underpowered to handle the pitching, rolling decks of a ship at sea. In September, Waesche downgraded its use to that of training (Browning, 11).

Beginning in April 1944, the Coast Guard began experimenting with dipping sonar. This is the sonar transmitter/receiver that could be lowered from a helicopter hovering about the surface of the sea. The sonar would aid in the detection of a submarine (U.S. Coast Guard Aviation Association). The technology of the dipping sonar is still used today.

Following the 707,000 gross tons lost in June 1942, the Coast Guard made a valiant effort to curtail the German U-boat. In January 1945 the Germans claimed only 15,746 monthly tons. “With the threat of the submarine all but gone,” the Navy downsized the helicopter program (U.S. Coast Guard Aviation Association). Instead of the original order for 210 airframes, the Coast Guard cut the authorization to only thirty-six helicopters (Browning, 12). Now that the submarine threat was gone, the service could turn its attention to saving lives through rescue.

Search and Rescue

On January 4, 1944, Erickson had the chance to demonstrate the helicopter’s value in saving lives. That night, the destroyer *USS Turner* suffered an explosion of several ammunition

magazines. The Coast Guard rescued 150 survivors and transported them to a hospital at Sandy Hook, New Jersey. The mass influx of men quickly overwhelmed the hospital which exhausted its supply of blood plasma. Braving twenty to twenty-five knot wind and sleet, Erickson lashed two cases of plasma to the floats of his helicopter and flew them from the Battery in New York to the hospital at Sandy Hook. This operation was the first helicopter landing near a hospital (Intrepid Sea, Air & Space Museum, 2006).

The Coast Guard won a large victory when Waesche officially shifted helicopter development from ASW to SAR. Immediately, the service began demonstrating the fantastic capabilities of the helicopter. Erickson, together with Sikorsky, had invented the hydraulic hoist which had a capacity of 170 pounds. In August 1944, a helicopter used the hydraulic hoist to pick up a man floating in Jamaica Bay, New York and another from a life raft. Figure 5 shows an HNS-1 lifting Sikorsky with its hoist.



Figure 5. HNS-1 with hoist. *Note.* From Rotary Action. *Notes on history of helicopters.* Retrieved April 2, 2008, from <http://rotaryaction.com/history.html>.

In October, a helicopter operating from the *USS Cobb* picked up four men in only ten minutes (U.S. Coast Guard Aviation Association). It also picked up an unconscious man in thirty seconds. All these demonstrations went to show the world the great capacity of the helicopter to save lives at sea.

In July 1946, Erickson headed the newly established Rotary Wing Development Unit at Elizabeth City. Graham was his Executive Officer and chief test pilot (Historian's Office, 3). This unit developed much of the rescue equipment still used today to include the rescue basket. The timing of these advancements could not have been better timed. In post-war America, the Baby Boomers had money to spend on pleasure craft. The Coast Guard found itself busy conducting rescues of private boaters.

Then on September 18, 1946, a Belgian airliner flown by Sabena Airlines crashed on a remote island twenty-four miles southwest of Gander, Newfoundland. Erickson and Graham transported an HNS helicopter to Gander and began rescue operations on September 22. In the end, they rescued eighteen survivors in the face of hazardous terrain and difficult landing conditions. The President of the United States awarded the Gold Star to Graham for this operation (Historian's Office, 8).

Roughly one year later on November 5, 1947, Graham conducted the first night aeromedical evacuation by flying from Cape Hatteras to Elizabeth City. With an absence of navigational aids, he used the phosphorescence of the shore to guide himself back to the lights of New Jersey (Historian's Office, 5). Elizabeth City happens to be the home of the Rotary Wing Development Unit that created so many of these rescue techniques.

Later, in 1955, Graham conducted the first night hoist operation while picking up three survivors from the “fishing vessel KIMTOO, which had grounded southwest of Anna Maria

Key, Florida” (Historian's Office, 7). He won the Distinguished Flying Cross for this operation. This rescue was not the last time a Coast Guard aviator showed courage and ingenuity.

The helicopter soon played a role in national security. During the Korean War, Erickson’s “dream of a rescue helicopter and lifesaving machine came to pass” (U.S. Coast Guard Aviation Association). The Coast Guard played a vital role in SAR during the war. There was an increase in sea and air traffic between the United States and Asia in support of the war. Naturally, more traffic led to more rescues. The service set up rescue stations in the Philippines, Midway, Wake, and Guam islands. In 1951, President Truman presented the Guard with the nation’s top aviation award, the Collier Trophy for the “development of the helicopter” (U.S. Coast Guard Aviation Association). On March 4, 1952, the Coast Guard stationed three helicopters at Air Station Brooklyn to aid in port security operations (Historian's Office, 2002, 5).

The Modern Coast Guard

The Coast Guard would go on to acquire newer and better helicopters, all the while conducting amazing rescues. In 1965, it rescued 3000 flood victims from the Mississippi river. Vietnam found 7000 Coast Guardsmen stationed in Asia. The 37th Aerospace Rescue and Recovery Squadron operated out of Da Nang until November 1972 (Scheina, 8). In 1980, 100,000 Cuban refugees fled across the Straits of Florida. On May 17, the *Olo Yumi* sank when fifty-two people “on board panicked because of rough seas, ran to the stern, and caused water to come over the transom” (Scheina, 9). In the end, the helicopter rescued eleven men while a ship recovered thirty-eight more and ten bodies. Later that year, the cruise ship *Prinsedam* caught fire in the Gulf of Alaska. Along with the US Air Force and Canadian military, the US Coast Guard’s HH-3F operated at the extreme limit of its range to rescue the largely senior citizen passengers as

they bobbed in the life rafts. This was one of the most successful maritime rescues in history (Scheina, 9).

The modern era saw the Coast Guard fighting a dangerous breed of drug smugglers armed with powerful boats. These “go-fasts” were much faster than the Coast Guard fleet that could not chase them down. In order to stop these “go fasts,” the Coast Guard’s weapon of choice was a .50 caliber sniper rifle carried in an Agusta MH-68 Mako (Scheina, 10). Figure 6 shows the MH-68. Based out of Jacksonville, Florida, the Mako claimed its first kill in August 1999 (Historian's Office, 9). The MH-68 lease expired in January 2008, and the Coast Guard planned to replace it with the A109E Power (Historian's Office, 10).

In the search for a new long-range, fast airframe, the Coast Guard has been testing a BA-609 tilt-rotor. Designated the XV-15 and eventually to be called the HV-609, the tilt-rotor has flown from a cutter near Key West (Hirschberg, 1999). Figure 7 shows the tilt-rotor operating from the cutter’s deck. The BA-609 is better suited for ship-borne operations than the much larger CV-22 Osprey.



Figure 6. MH-68. *Note.* Browning 10.



Figure 7. HV-609. *Note.* From Hirschberg, Mike. *On the Vertical Horizon*. Retrieved April 2, 2008, from <http://www.vtol.org/vertiflite/BellTiltrotors.htm>.

Conclusion

Innovative aviators saw the helicopter as a brilliant tool, uniquely suited for the Coast Guard. It proved to be an excellent ASW and SAR resource. With the future of post-Fidel Cuba uncertain, the drug war in high tempo, and many open-water pleasure cruisers venturing out further to sea, the Coast Guard has a secure future.

References

- Beard, T. (1998). *Despair and visions: Birth of the rescue helicopter*. Retrieved March 21, 2008, from <http://www.uscg.mil/history/webaircraft/Beard.html>
- Browning, R. M. (1999, January 1999). *The eyes and ears of the convoy: Development of the helicopter as an anti-submarine weapon*. Retrieved March 21, 2008, from http://www.uscg.mil/history/h_antisb.html
- Day, D. A. (n.d.). *Heinrich Focke -- Fa 61*. Retrieved April 2, 2008, from <http://www.centennialofflight.gov/essay/Rotary/Focke/HE5.htm>
- Hendrickson, J. (n.d.). *Platt-LePage aircraft co.*. Retrieved April 1, 2008, from <http://tri.army.mil/lc/cs/csa/plattlpg.htm>
- Hirschberg, M. (1999, Winter 1999). Bell designs are accelerating at full tilt. *Vertiflite*. Retrieved April 3, 2008, from <http://www.vtol.org/vertiflite/BellTiltrotors.htm>
- Historian's Office (2002, January 2002). *U.S. Coast Guard: A historical overview*. Retrieved March 22, 2008, from http://www.uscg.mil/history/h_USCGhistory.html

Historian's Office (2002, May 2002). *Major events in Coast Guard aviation history*.

Retrieved March 21, 2008, from <http://www.uscg.mil/history/aviationchron.html>

Historian's Office (2003, September 2003). *Commander Stewart Ross Graham, USCG*

(ret.), Coast Guard aviator no. 114, Coast Guard helicopter pilot no. 2. Retrieved

March 21, 2008, from

http://www.uscg.mil/history/people/BIO_Stewart_Graham.html

Intrepid Sea, Air & Space Museum (2006, August 5, 2006). *Saving the day: Helicopters,*

helipads and aerial rescue. Retrieved April 2, 2008, from

<http://www.intrepidmuseum.org/intrepidmuseum/events/item.php?id=117>

National Archives (1941, November 1, 1941). *Executive Order 8929*. Retrieved April 2,

2008, from <http://www.archives.gov/federal-register/executive-orders/1941.html>

Scheina, R. (1999, January 1999). *A history of Coast Guard aviation*. Retrieved March

19, 2008, from http://www.uscg.mil/history/h_aviation.html

U.S. Coast Guard Aviation Association (2004). *A history of Coast Guard aviation: The*

growth years (1939-1956). Retrieved March 19, 2008, from

<http://uscgaviationhistory.aoptero.org/history02.html>