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MEMORANDUM

From: P. V. NEFFENGER, VADM
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To: Distribution

Subj: FINAL ACTION ON THE ADMINISTRATIVE INVESTIGATION INTO THE CRASH OF CG-6581 THAT OCCURRED ON 29 APRIL 2010

1. **Overview:**

On the morning of 29 April 2010, Coast Guard Group/Air Station Humboldt Bay helicopter CG-6581 was conducting a routine training flight. When CG-6581 entered the Arcata Airport in McKinleyville, California, the Pilot in Command (PIC) began simulated tail rotor malfunction training. At approximately 1054 hours Pacific Daylight Time (PDT), the PIC simulated a stuck right tail rotor pedal scenario and the pilots lost positive control of the aircraft as it yawed to the left while making a landing approach. Yaw is the rotational movement of the helicopter around a vertical axis through the aircraft. Just prior to landing, the left yaw accelerated, and the helicopter assumed a nose low, right wing down attitude. The aircraft contacted the runway resulting in collapsed right landing gear and destruction of the main rotor blades. No aircrew members were injured. Airport runway damage was negligible. But damage to the aircraft was significant.

This document sets forth the facts that led to and evolved into this mishap, states my conclusions and orders certain actions designed to prevent similar mishaps in the future.

2. **Findings of Fact and Opinions:**

On the morning of 29 April 2010, CG-6581 was scheduled to conduct authorized offshore rescue swimmer training with another Coast Guard helicopter. The other helicopter was diverted to conduct a search and rescue mission. After delaying takeoff to await the other aircraft's return, CG-6581 departed to conduct practice instrument approaches to the water and airport pattern flying. This flight mission change was approved by the Group/Air Station's Operations Officer.

The aircrew of CG-6581 consisted of a PIC occupying the pilot's left seat; a copilot (CP) occupying the right seat; and a flight mechanic (FM). CG-6581 took off from Arcata Airport at 0925 PDT. The aircrew completed several approaches to the water for training, and then proceeded back to the Arcata Airport to conduct pattern flying.

Weather conditions, with winds out of the northwest at approximately 7 knots, visibility at 10 nautical miles, and a cloud ceiling of 6000 feet, were within limits for this flight training.

The aircrew conducted a 200-foot landing checklist and confirmed that the aircraft's gear was down prior to 200 feet. All radio calls and briefs were conducted in a professional manner.

As CG-6581 entered the Arcata Airport environment, the aircrew set up for a right traffic pattern to runway 32, and the PIC, acting as safety pilot, took control of the aircraft's tail rotor control pedals. He placed the left pedal forward of the neutral position to simulate a loss of tail rotor thrust for the CP, who was at the flight controls. The CP removed his feet from the pedals and placed them flat on the cockpit deck. The CP correctly diagnosed this initial simulated tail rotor malfunction as that of a loss of tail rotor thrust with the left pedal forward. At this stage of the simulation, the PIC and CP agreed that a stuck right tail rotor pedal would be a more suitable practice maneuver given the actual left crosswind. The PIC pushed the right tail rotor pedal forward of the neutral position to simulate a stuck right tail rotor pedal. The H-65 Flight Manual, CGTO 1H-65C-1, states that left crosswind for stuck pedal positions above that required for stable hover power can be used to assist with runway alignment and to minimize groundspeed. The pilots believed that the left crosswind on runway 32 would assist in their training scenario. The shift in pedal position occurred somewhere between a point in the downwind portion of the pattern and the turn for right base. A right traffic pattern for runway 32 includes a downwind heading of approximately 140 degrees, a ninety degree turn to the right through the base position with the right turn continuing for an additional ninety degrees to align the aircraft on a 320-degree final heading.

As the helicopter crossed the runway threshold, its nose was either lined up with the runway heading or was slightly yawed to the left. Yaw is the movement of an aircraft about the vertical axis of the aircraft and describes the pivot of the aircraft's nose to the left or right in relation to centerline of the horizontal movement of the aircraft. The H-65 Flight Manual calls for a right yaw approach angle. As the aircraft decelerated over the runway, its nose continued to yaw further to the left. Just prior to the mishap, left yaw accelerated very rapidly, surprising the aircrew. The CP stated that he planned to follow the aircraft around to the left and fly out, down runway 32. The PIC expected that the CP would arrest the left yaw and fly forward to bring the nose back to the right while continuing down runway 32, but did not verbalize this to the CP. As CG-6581 yawed left much faster than expected, both pilots simultaneously attempted to regain control of the aircraft. A positive transfer of controls from the CP to the PIC did not occur.

CG-6581 spun counterclockwise, with its nose yawing to the left, and touched down on runway 32 at 1054. The aircraft's attitude at point of touchdown was nose low and right wing down. Upon impact, the right landing gear collapsed. CG-6581's rotor blades and airframe came into contact with the ground. The aircraft came to rest on its right side on runway 32. The landing created markings and indentations in the runway.

The pilots shut the aircraft down, secured the emergency fuel shutoff levers, and activated the rotor brake and emergency electrical cutoff switch. Both pilots egressed the aircraft through the right pilot door and the FM egressed the aircraft through the left cabin door. The aircrew was uninjured.

Arcata Airport Rescue and Fire Fighting (ARFF) responded and were on scene as CG-6581's crew was assembling upwind of the aircraft. A yellow flame came out of the #1 engine and the ARFF extinguished it. CG-6581 sustained considerable damage, including collapse of the right landing gear, damage to the airframe, and destruction of the main rotor blades.

The aircrew's training requirements were current and they were qualified for the positions assigned on the flight. At the time of the mishap, the PIC had 3,128.0 hours and the CP had 635.9 hours of H-65 flight time. Both pilots completed annual Standardization Check Flights in March 2010 that included performing a simulated tail rotor malfunction to the "Standard" level.

For the relevant semi-annual period, Humboldt Bay aircraft commanders averaged 27 flight hours per month and CPs/ first pilots averaged 18 flight hours per month. Consistent with many other air stations, Humboldt Bay was over-billeted by three aviation-coded officers above the standard 13 duty-stander billet structure at the time of the mishap.

For the relevant semi-annual period, the PIC was averaging approximately 12 flight hours per month and the CP was averaging approximately 14 flight hours per month. Prior to the mishap during the month of April 2010, the PIC had 8.4 flight hours and the CP had 8.2 flight hours.

Following the mishap, the PIC and CP completed remedial training including a Standardization Check Flight with an Air Station Humboldt Bay Instructor Pilot with a strong focus on tail rotor malfunction maneuvers.

3. **Findings and Directed Action:**

On approach, CG-6581's PIC and CP did not properly align the aircraft for a Practice Tail Rotor Malfunction Powered Landing Procedure. Believing that the pedal position would require a relatively slow touchdown speed, the nose was not adequately aligned with right yaw on final approach. Slowing the aircraft caused the nose to further yaw from centerline to the left and to increase yaw rate. The combination of rapid yaw rate and close proximity to the ground left little margin for error and little time to recover. During the recovery attempt, the aircraft made contact with the ground, causing the right landing gear to collapse and the rotor blades to break apart.

A. I find that no misconduct occurred in the flight mishap involving the CG-6581 on 29 April 2010.

I base these findings upon the following facts:

1. The aircrew was properly qualified in their positions, medically cleared for flight, and post-flight testing revealed no evidence of substance abuse.

2. There is no indication that any member of the aircrew's actions prior to, during, or after the mishap constituted gross negligence, recklessness, or willful misconduct.

3. There is no indication that any maintenance actions or procedures factored in the mishap.

4. The aircrew was professional, focused on the training mission, and wearing all required personal protective gear.

B. I find that pilot error caused this mishap.

I base this finding upon the following facts and opinions:

1. There is no evidence to indicate any mechanical failure.

2. On final approach, CG-6581 was not aligned with right yaw/left sideslip as required by the H-65 Flight Manual in chapters 2 and 3.

3. Voice and Data Recorder data indicate that runway alignment was attained at a 50 knot ground speed. The CP at the controls slowed the aircraft to below a 30 knot ground speed, causing the aircraft's nose to yaw further to the left.

4. The CP attempted to complete a non-standard maneuver by following the aircraft around to the left and flying out after a full 360 degree rotation. The CP verbalized this intent to the PIC. However, the PIC failed to acknowledge the risks of such a maneuver and failed to properly communicate another course of action to the CP.

5. The PIC did not take assertive action and call a wave-off or take the controls.

6. Following the uncontrolled left yaw, both the PIC and CP simultaneously attempted to regain control of the aircraft without one person positively taking the controls.

Action: As a result of this finding, I understand that:

Administrative entries were made in the flight logbooks of the PIC and CP in the Pilot's Accident and Violation Record section.

C. I find that inadequate H-65 Flight Manual guidance contributed to this mishap.

No information, warnings, or restrictions are provided in Chapter 2 (Practice Tail Rotor Malfunctions) or Chapter 3 (Loss of Tail Rotor Thrust in Forward Flight or Fixed Tail Rotor Pitch) of the H-65 Flight Manual to inform pilots of flight hazards associated with excess yaw angles or allowing the aircraft's tail to rotate through the wind line during Tail Rotor Malfunction landing procedures (real or simulated).

Action: As a result of this finding, I direct:

FORCECOM, through Aviation Training Center Mobile, to review and update the H-65 Flight Manual to provide appropriate warnings, cautions or advisories related to excessive yaw angles and to evaluate and address the technique of allowing the aircraft to pass its tail through the wind line during Tail Rotor Malfunction corrective procedures.

D. Additional Observation. Although not considered causal or contributory to this mishap, an additional matter was raised during the course of this investigation that warrants attention.

Humboldt Bay aircraft commanders averaged 27 flight hours per month and CPs/First Pilots averaged 18 flight hours per month. The mishap CP averaged 14 flight hours and had flown only 8.2 hours in the month of April prior to the mishap. Operational Commanders should strive to provide all pilots 20 to 25 flight hours per month with 40 percent of rotary wing hours dedicated to training as delineated in the Coast Guard Air Operations Manual, Commandant Instruction M3710.1F.

4. **Summary**:

Simulated Tail Rotor Malfunction Landings are among the most demanding of the recurring maneuvers H-65 aviators are required to perform in order to maintain proficiency. This maneuver requires the development of complex psychomotor skills to make the necessary control inputs to achieve landing alignment and position under very dynamic conditions. Varying environmental conditions and aircraft weights require a wide array of touchdown speed, yaw rate, and descent profiles to safely perform this maneuver. It is essential that H-65 aircrews practice this maneuver to ensure proficiency, and that pilot knowledge base includes a solid mastery of the aerodynamic forces involved in these evolutions. This foundation will provide mastery of the necessary control inputs required to land the aircraft safely.

This mishap more importantly reiterates that solid communications, assertiveness and leadership are absolutely essential elements during the conduct of high demand operations, training or otherwise.

We are extremely fortunate that no one was injured. The structural damage to CG-6581 was within the Coast Guard's means and ability to repair. CG-6581 has been returned to fleet service.

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