U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 2nd St. S.W. Stop 7000
Washington, DC 20593-7000
Phone: (202) 372-2000
Fax: (202) 372-2908

5830

JUN 7 2013

MEMORANDUM

From: P. V. Neffenger, VADM
DCO

To: Distribution

Subj: FINAL ACTION: ADMINISTRATIVE INVESTIGATION INTO NOSE LANDING GEAR COLLAPSE & DAMAGE TO CG-2139 ON 17 NOV 09

1. Overview:

On November 17, 2009, CG-2139, an HU-25 Guardian from Sector/Air Station Corpus Christi, while conducting a scheduled training flight, suffered a nose landing gear collapse during an attempted touch and go landing at Eagle County Regional Airport in Gypsum, Colorado. The aircraft never attained a stable approach profile and began the landing phase with excessive airspeed and sink rate. Following touchdown, the aircraft experienced nose wheel impacts on the runway that preceded a collapse of the nose wheel landing gear. The aircrew executed abort procedures and conducted a ground evacuation with the aircraft remaining on the runway. No personnel were injured, and the runway suffered only minor damage. The aircraft incurred significant damage. The Coast Guard placed the aircraft in storage while awaiting decommissioning due to structural damage and prohibitive repair costs.

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 17 November 2009, CG-2139, a Coast Guard HU-25 Guardian aircraft was scheduled to fly from Sector/Air Station Corpus Christi, refuel at the intermediate destination and return to base the same day. The flight was a Routine Trainer, meaning the Pilot-in-Command (PIC) had the flexibility to determine the flight's destination. The PIC chose Eagle County Regional Airport in Gypsum, Colorado as the destination, briefed his intentions for the flight, and received approval from the Assistant Operations Officer. Gypsum is located 15 miles west of Vail, Colorado. The flight's purpose was for the aircrew to practice takeoffs and landings at a high altitude airfield.

The HU-25 is a medium-range, fixed-wing surveillance aircraft used by the Coast Guard to perform search and rescue, law enforcement, drug interdiction, marine environmental protection, and other missions. Five personnel were aboard, consisting of the PIC, a copilot (CP), a drop master (DM), a sensor systems operator (SSO), and an airman with no assigned duties. The PIC

had been designated an HU-25 PIC on 18 December 2008. The CP had been designated an HU-25 CP on 7 August 2009.

Prior to the flight, the PIC and CP conducted preflight duties. However, arrival planning was insufficient in terms of reviewing available instrument approaches, missed approach, and climb requirements at the destination airport.

After taking off at approximately 0930 (all times are local), the aircraft reached an altitude of 28,000 feet and remained at that altitude for most of the three hour flight. All enroute checklists were completed. During the flight, the PIC and CP decided they would practice two or three touch and go landings prior to having the aircraft come to a full stop at the airport to refuel.

Air traffic control instructed CG-2139 to begin a descent at an appropriate distance from the airfield. The CP was at the controls during the descent phase and maintained the controls until the aircraft came to rest. At approximately 30 miles from the airport, the aircrew received a "direct" clearance, meaning the aircraft followed a westbound heading over the mountains directly to the airfield. CG-2139 was then cleared for a visual approach by air traffic control, which authorized the pilot to deviate from any assigned routes or altitudes and proceed visually, clear of clouds to the landing runway. Descent, approach and landing checks were rushed, but completed just prior to landing.

The PIC and CP calculated a reference approach and landing speed (Vref) of 117 knots, which is the speed at which the aircraft should have completed its approach and touchdown on the runway. Both the PIC and CP estimated they landed 15 to 20 knots in excess of their calculated final approach speed. Post-mishap flight data recorder analysis confirmed that CG-2139 landed at an airspeed between 139 and 140 knots, 22 or 23 knots faster than the final approach and landing speed calculated by the PIC and CP.

Recorded data indicated that the aircraft's vertical speed was possibly in excess of the vertical speed limit of 600 feet per minute (fpm) for touchdown prescribed in the HU-25 Flight Manual. The aircraft was descending at a rate of 1500 to 900 fpm between 45 and 16 seconds before touchdown. Four seconds prior to touchdown, the aircraft was descending at 850 fpm. While flight data analysis could not determine precisely when the aircraft first contacted the runway, it could be narrowed down to a 3-second window that indicated a vertical speed between 760 and 580 fpm.

The flight data recorder analysis showed that 10 seconds prior to touchdown, the throttles were pulled to flight idle and remained in that position. During the entire descent and up to 8 seconds prior to touching down, the aircraft's pitch angle was nose down. At the 8-second mark, the aircraft experienced the first slight nose-up attitude since descent profile began. A normal pitch attitude for the HU-25 during landing transition is 6 to 8 degrees nose-up at the 40 degree flap configuration. With excessive airspeed, the aircraft will be placed in a nose-low attitude to overcome the excess energy and thus the nose gear could impact the runway prior to the main wheels or bounce and induce a porpoising effect. Porpoising is defined by the Federal Aviation Administration as a series of nose-first bounces that increase in intensity until a pilot either elects

to reject the landing and execute a go-around or bring the aircraft to a stop. In this type of landing, there is a high probability that the aircraft will strike the runway with enough force to collapse the nose gear.

Although it is unclear if the nose wheel touched down before the main wheels, once the nose wheel touched the runway, it began to bounce with increased intensity. The CP continued the touch and go procedure and called for the PIC to reset the flaps and trim to the normal take off setting. The nose bouncing continued with increased intensity until approximately 14 seconds after the initial landing, when the bouncing stopped and the aircraft nose dropped well below a level pitch attitude. The PIC immediately called to abort the flight and pulled the drag chute to slow the aircraft. The CP executed the abort procedures in accordance with CGTO 1U-25A-1, and stopped the aircraft approximately 300 feet from the end of the runway. Emergency teams were dispatched by the tower controller and arrived on scene just after the crew evacuated the aircraft.

Flight data recorder analysis completed after the mishap indicated that, at approximately 7 seconds after initial touchdown, the aircraft accelerometer recorded a 3g-vertical force and 3 seconds later, 3.5g-vertical force. Vertical axis accelerations are measured near the left observer seat and captured in "g" units, where 1g corresponds to the vertical acceleration force due to gravity at the earth's surface. This indicated the amount of vertical acceleration that occurred near the center of the cabin was over 3 times the force of gravity. For comparison purposes, the maximum sink rate at touchdown of 600 feet per minute would equate to a 1.3g-vertical force. The main landing gear remained intact, but the nose gear collapsed approximately 14 seconds after initial touchdown, and the aircraft's forward fuselage contacted the runway and slid approximately 1,000 feet with the nose gear collapsed before coming to a stop.

An engineering assessment completed after the mishap concluded that existing deficiencies in material performance properties or stress-corrosion cracking was very unlikely. Failure analysis of the nose landing gear indicated the most likely cause of the nose landing gear failure was attributable to dynamic shock loading in excess of the design yield load of the landing gear structure. Analysis of the nose landing gear indicated it sustained a force in excess of two times the design component strength.

The aircraft's approach to landing exceeded stable approach criteria for which the CP attempted to compensate before touching down by pushing the aircraft's nose down and extending the airbrake. Despite the CP's attempt to compensate for the excessive airspeed, the aircraft was in an undesirable nose down trim attitude while exceeding landing reference speed and sink rate limits. Post-mishap interviews indicated neither the PIC nor the CP considered executing a go-around maneuver.

While this mishap did not occur because of the airfield's high altitude, it is notable to document that the field elevation was 6,547 feet with a calculated density altitude of 7,120 feet. This has an effect on aircraft performance, specifically the aircraft speed over the ground, which in this case would have been 19% higher than the indicated airspeed, and landing distance roll-out.

CG-2139 was built in 1982, was acquired for $5,204,465, and recorded 15,092 flight hours over its service life. Because of prohibitive repair costs, it was transported for storage at Davis-Monthan Air Force Base until its planned decommissioning in 2013.

3. Findings and Directed Action:

A. I find that no misconduct was associated with the nose landing gear collapse and damage to CG-2139. I base this finding on the following facts:

1. The aircrew members were properly qualified in their roles for this flight.

2. There was no indication that any member of the aircrew intentionally violated any procedures required by regulations, official policy, or directives governing the operation of a Coast Guard HU-25 from Sector/Air Station Corpus Christi.

3. There was no indication that any maintenance action or procedure factored in the mishap.

4. The hard landing and damage to CG-2139 is attributable to errors in judgment and loss of situational awareness by the PIC and CP.

B. I find that the pilots failed to control the flight path of the aircraft within the design landing parameters. I base this finding upon the following facts:

1. There is no evidence to indicate pre-existing structural deficiencies to CG-2139.

2. Poor airspeed control and improper pitch control were demonstrated throughout the approach and landing phase.

3. An unstable approach was continued to an attempted landing against recommended guidance specified in CGTO 1U-25A-1, the HU-25 Flight Manual, for a go-around under the circumstances.

4. The nose landing gear sustained a force in excess of the design component strength.

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

CG-711 directed this incident be documented in each pilot's logbook in the Accident and Violation Record section.

C. I find that poor mission planning contributed to this mishap. I base this finding on the following facts:

1. There was no evidence that the command had prior awareness of the training location, along with the inherent challenges presented by the high altitude environment, above the Assistant Operations Officer.

2. Statements indicated the aircrew planned to conduct a visual approach at an unfamiliar field prior to takeoff. There were no indications that the aircrew researched published approach procedures or took into account the specific hazards associated with arrivals at an unfamiliar mountainous airfield. The aircrew limited the approach briefing to the runway in use and landing reference speed for a 40-degree flap landing.

3. The aircrew failed to plan a descent that would allow for proper airspeed upon arrival for approach and landing.

4. The aircrew failed to plan for a missed approach or rejected landing.

5. The aircrew failed to plan for the strict climb requirements necessary during the missed approach segment at the landing airfield.

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

CG-711 evaluated and developed policies regarding preflight mission planning and destination planning, including departure, approach and missed approach terrain clearance.

CG-711 implemented policy to ensure airports identified by the FAA as "Special Pilot in Command Qualification" airports require specific criteria for review.

Command oversight requirements for flights outside of a unit's AOR were bolstered by the Aviation Safety Assessment Action Plan directives in July 2010. This was further codified in the recent promulgation of the Air Operations Manual revision.

D. I find that loss of situational awareness and poor flight discipline contributed to this mishap. I base this finding upon the following facts:

1. Post-mishap statements from the PIC and CP indicated neither recognized an extremis situation existed that warranted termination of the landing attempt.

2. The aircrew allowed an approach that exceeded the stabilized approach criteria to continue and attempted a landing with excessive airspeed.

3. The aircrew had no operational need to attempt a landing with excessive speed, nor was a deviation from the standard pre-briefed. The pilot monitoring the execution of the approach is expected to query the flying pilot's deviation from the expected flight path or Flight Manual guidance, and take controls if necessary to regain or maintain a safe flight path.

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

CG-711 implemented fleet-wide policy change describing aircrew flight discipline during critical phases of flight to include the addition of mandatory and more stringent stabilized approach criteria outlined in the Air Operations manual and the HU-25 Flight Manual.

Additional Finding: As a result of the investigation, certain shortcomings in the HU-25 Flight Manual, CGTO 1U-25A-1, were brought to light.

1. The version of the HU-25 Flight Manual in use at the time contained guidance for a stabilized approach that was not aligned with other Coast Guard fixed-wing flight manuals, nor was it aligned with the industry standard. While the Manual stated that exceeding stabilized approach guidelines "may require an immediate go-around," it did not provide a mandatory go-around requirement for not meeting stabilized approach criteria.

2. The HU-25 Flight Manual did not contain specific rejected landing criteria.

3. Neither the previous nor current version of the HU-25 Flight Manual discusses high-altitude dynamics or considerations when flight planning to high-elevation destinations. There is no mention in the HU-25 Flight Manual that if landing at a high-elevation airfield, the descent checks may need to be initiated at a higher altitude than the current standard of 18,000 ft above sea level or earlier in the descent to allow the crew adequate time for completion.

4. The HU-25 Flight Manual does not contain bounced landing recovery procedures.

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

The HU-25 Flight Manual revision, dated January 23rd 2013, provides stabilized approach requirements and mandatory go-around criteria.

I direct that:

CG-711 work with FORCECOM to review and ensure critical guidance pertaining to go-arounds, rejected landings, bounced landing recoveries, high altitude operations, and initiating checklists is included in the HU-25 Flight Manual.

4. Summary:

This mishap reminds us that what some aircrew and aviation commanders consider to be a standard mission flight may actually be a challenging or even high-risk evolution, especially if complacency or over-confidence is present. The findings of fact demonstrated that the aircrew failed to recognize a non-standard approach profile and continued to attempt a landing. When an additional opportunity presented itself to execute a go-around following the initial bounced landing, the aircrew instead applied flight control inputs that exacerbated the porpoise landing, ultimately leading to the nose landing gear collapse. Our aircrews that train in challenging

environments, including operations at high altitude and in mountainous terrain, must have an appreciation for the attendant risks. Commands must provide the appropriate level of oversight.

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