For use with Module 1 – Introduction to Enhanced Crew Resource Management

Names of perished CG Aviators grouped by accident (most recent first):

- LT Jeffrey F. Crane (CG Aviator #3188)
- LTJG Charles W. Thigpen IV (CG Aviator #3310)
- AD3 Richard L. Hughes
- ASM3 James G. Caines
- CGNR 6549 perished in poor weather conditions and high seas while responding to a sailing vessel taking on water at night. It is believed the aircraft impacted the water while attempting to make an approach to the vessel. The entire crew was lost.
- LT Laurence B. Williams (CG Aviator #2887)
- LT Mark E. Koteek (CG Aviator #3113)
- ASMCS Peter A. Leeman
- AM1 Michael R. Gill
- CGNR 6541 was responding to a grounded sailing vessel at night and in poor weather. As the crew attempted to descend through the fog to assist the vessel in distress, the helicopter impacted the side of a cliff. The entire crew was lost.
- LT Marc C. Perkins (CG Aviator #2803)
- LTJG Mark S. Fisher (CG Aviator #3042)
- CGNR 6594 was delivering aids to navigation personnel and equipment to the Ambrose light tower. The helicopter landed short of the elevated helipad. The left main gear struck the edge of the pad, resulting in a dynamic rollover. The aircraft fell to the sea 100 feet below. Both pilots perished in the accident.

For use with Module 3- Normalizing Excellence

Lt Commander Bates Mini Case Study

From the NY Times

Jet Aviator Killed in Nashville Had Earlier Crash, Navy Says

By ERIC SCHMITT

Published: January 31, 1996

The flier whose Navy F-14A fighter plunged into a Nashville suburb on Monday, killing himself and four other people, crashed another jet into the sea last April. But Navy investigators and senior admirals forgave him, saying he made a mistake in pursuit of the combative flying that the Navy wants and encourages in its pilots.

The flier, Lieut. Comdr. John Stacy Bates, flew aggressively, a Navy official said today, but he added: "We want them to fly aggressively. Bates was highly motivated and that accident was a one-time glitch on his record. He was a great aviator."

The Navy invests years and more than $1 million to train each of its fighter pilots, and is reluctant to dismiss them if senior officers believe an erring pilot can learn from mistakes.

But as military investigators sifted through the wreckage today for clues to what caused the crash that killed the fighter's two-man crew and three people on the ground, Navy officials said they did not know what caused Commander Bates's second crash, or why his squadron had lost so many F-14 Tomcats.

The crash was the fourth in 16 months for Fighter Squadron 213, a 14-plane unit known as the Fighting Blacklions and one of six F-14 squadrons assigned to Miramar Naval Air Station near San Diego. The unit's safety record is by far the worst among the Navy's 13 F-14 squadrons.

Commander Bates was blamed for losing control of his F-14 last April while conducting training maneuvers off Hawaii. Last September, an F-14A from the squadron exploded in flight off the Philippines, but both crew members ejected safely. The cause of that accident is still under investigation.

In October 1994, one the Navy's first female fighter pilots, Lieut. Kara S. Hultgreen, died in a training accident off Southern California, rekindling tensions within the military over the decision to expand some combat roles for women. The Navy concluded that that accident resulted from a combination of pilot error and mechanical failure.

"You go back 10 or 15 years and they are snake bit," said a retired admiral who once commanded the squadron. "We've tried to put top-notch pilots and maintenance people there. You can't believe in luck or superstition, but they're behind the eight ball and have stayed there."

The Navy ordered the squadron to suspend its operations for three days for safety reasons after the second of the squadron's four crashes. Vice Adm. Brent Bennitt, the

commander of naval air forces in the Pacific, immediately ordered the squadron to stand down again after the crash on Monday to review its safety record and procedures.

The crash underscores the fact that even in peacetime, operating complex weapons of war is a hazardous business. Twelve F-14 fliers have died in training accidents since 1992.

But the accident also raises questions about the F-14's safety record. Since 1991, the fighter has a major crash rate of 5.93 per 100,000 flight hours, compared with 4.82 major crashes per 100,000 hours for all Navy tactical aircraft. Navy officials note that since 1981, the F-14's major accident rate is slightly lower than the overall tactical aircraft rate.

Many naval aviators have complained that the engines on the older A-model F-14's are not powerful enough to perform the demanding aerial maneuvers they fly. The Navy is replacing them with a more powerful engine that is now on about 30 percent of the fleet's F-14's. Fighter Squadron 213 flies all A-model F-14's.

In the latest accident, the twin-engine, two-seat Tomcat crashed shortly after takeoff from Berry Field, an Air National Guard airfield adjacent to Nashville International Airport. The jet left Miramar Air Station in San Diego for Nashville on Friday on a routine training mission. Admiral Bennitt said today that Navy officials approved Commander Bates's request to use a maximum-performance takeoff, in which a pilot turns on the jet's after-burner and soars straight up moments after the aircraft leaves the ground. After screaming up through the clouds, the F-14 then came straight down, exploding into a huge fireball. The Tomcat was carrying 16,000 pounds of fuel on takeoff.

"We may never know why the crew didn't eject," Rear Adm. Skip Dirren told reporters this morning. Newer fighter planes do have recorders, Admiral Dirren said, but they were not included when the F-14A's were built in the 1970's. The Grumman Corporation, now the Northrop-Grumman Corporation, manufactured the F-14's, which cost $32 million each.

Killed besides Commander Bates, 33, of Chattanooga, Tenn., was the jet's radar operator, Lieut. Graham Alden Higgins, 28, of Dover-Foxcroft, Me. Three civilians were also killed when the plane hit a house. They were Elmer Newsom, 66; his wife, Ada, 63, and a friend, Ewing T. Wair, 53.

"One guy was just sitting on his couch," James Dean, a firefighter, told The Associated Press. "He never had a chance. They were all just sitting where they were."

From the NY Times:

Navy Blames Showing Off For Jet Crash

By TIM WEINER

Published: April 13, 1996

The Navy said today that a pilot was probably showing off for his parents when he crashed an F-14A jet fighter in Nashville in January, killing himself, a fellow officer and three people on the ground.

The pilot, Lieut. Comdr. John Stacy Bates, had been grounded for a month in April 1995 after he lost control of another F-14A after taking off from the aircraft carrier U.S.S. Lincoln. The plane crashed after the pilot and his crew ejected. The crew members were rescued.

Rear Adm. Bernard Smith, who investigated the Nashville crash, said Commander Bates's judgment "was influenced by his parents' presence at the field" and his desire to show them risky takeoff and flight maneuvers.

The admiral said that in taking off from the Nashville airport on Jan. 29, Commander Bates ascended at an angle steeper than 50 degrees, violating Navy rules.

After the near-perpendicular takeoff, in the clouds, Admiral Smith said, the pilot became disoriented, and in all likelihood did not realize that he was heading earthward until his jet pierced the clouds at 2,300 feet. By then, the admiral said, it was too late to prevent the plane from smashing into the house of Elmer and Ada Newsom.

In addition to Commander Bates, 33, and his radar intercept officer, Lieut. Graham Alden Higgins, 28, those killed were the Newsoms and Ewing Wair, who was visiting them.

The crash would never have happened had the pilot made a normal take-off or taken the cloudy weather into account, Admiral Smith said after an 11-week review of the incident.

For use with Module 5 – Nutrition-Hydration

Slide 20

What do I need to know about 'Lytes'?
First, what are electrolytes? At the most basic level, electrolytes are salts, such as table salt, that dissociate into separate ions when they are dissolved in water. Electrolytes are integral to nerve and muscle function, as well as to almost every other physiological function in the body. The most important electrolytes include sodium (Na+), chloride (Cl), potassium (K+), calcium (Ca2+) and magnesium (Mg2+). These electrolytes are distributed throughout the body in a highly ordered way: any disruption of this order can result in severe bodily dysfunction. For example, when the body's electrolyte levels are disturbed, you may have heart problems, the gastrointestinal system may not work properly, muscles may develop cramps, and you may not even be able to think straight, because the brain may not function normally.
Electrolytes are important because they are what your cells (especially nerve, heart, muscle) use to maintain voltages across their cell membranes and to carry electrical impulses (nerve impulses, muscle contractions) across themselves and to other cells. Your kidneys work to keep the electrolyte concentrations in your blood constant despite changes in your body. For example, when you exercise heavily, you lose electrolytes in your sweat, particularly sodium and potassium. These electrolytes must be replaced to keep the electrolyte concentrations of your body fluids constant. So, many sports drinks have sodium chloride or potassium chloride added to them. They also have sugar and flavorings to provide your body with extra energy and to make the drink taste better.
Another example where electrolyte drinks are important is when infants/children have chronic vomiting or diarrhea, perhaps due to intestinal flu viruses. When children vomit or have diarrhea, they lose electrolytes. Again, these electrolytes and the fluids must be replaced to prevent dehydration and seizures. Therefore, drinks such as Pedialyte have sodium and potassium in them like the sports drinks do. However, pediatricians do not recommend giving sports drinks to a sick child! Sports drinks have much higher sugar concentrations than Pedialyte and the high sugar is not a proper treatment.

For use with Module 7 – Hazardous Attitudes

Slide 4 (Case Study)

NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of March 4, 1997
Abstract of Final Report
In-Flight Loss of Control and Subsequent Collision with Terrain
Cessna 177B, N35207
Cheyenne, Wyoming, April 11, 1996

EXECUTIVE SUMMARY

On April 11, 1996, about 8:24 a.m. mountain daylight time, a privately owned Cessna 177B, registration N35207, collided with terrain after a loss of control following takeoff from runway 30 at the Cheyenne Airport, Cheyenne, Wyoming. The pilot in command, pilot trainee Jessica Dubroff, and rear seat passenger (the pilot trainee's father) were fatally injured. Instrument meteorological conditions existed at the time, and a visual flight rules flight plan had been filed. The flight was a continuation of a transcontinental flight and was operated under the provisions of 14 Code of Federal Regulations Part 91. The safety issues discussed in the report include fatigue, the effects of media attention and itinerary pressure, and aeronautical decision making.

CONCLUSIONS:

The pilot in command was properly certificated and qualified for the intended cross-country trip.
The pilot in command was wearing corrective lenses at the time of takeoff as required by the limitation on his current medical certificate.
There was no evidence that airplane maintenance was a factor in the accident.
The airplane's engine was developing power at the time of the accident, and the flaps had been set at the preferred takeoff setting.
There was no evidence of airframe or control malfunction during the takeoff and subsequent crash.
Airframe icing was not likely a factor in this accident.
There were no air traffic control factors that contributed to the cause of the accident.
The pilot in command was provided with a satisfactory weather briefing prior to departing Cheyenne.
The pilot in command was at least assisting the pilot trainee (if he was not the sole manipulator of the controls) during the takeoff and climb-out sequence, and, at the time of impact, the pilot in command was the sole manipulator of the airplane's controls.
The accident sequence took place near the edge of a thunderstorm.
The pilot in command decided to turn right immediately after takeoff to avoid the nearby thunderstorm and heavy precipitation that would have been encountered on a straight-out departure.
The airplane was 96 pounds over maximum gross takeoff weight at takeoff, and 84 pounds over the maximum gross takeoff weight at the time of the impact.

Although horizontal in-flight visibility at the time of the stall was most likely substantially degraded due to precipitation, eliminating a visible horizon, the pilot in command could have maintained visual ground reference by looking out the side window. However, this could have been disorienting to the pilot.
The airplane experienced strong crosswinds, moderate turbulence and gusty winds during its takeoff and attempted climb, and the pilot in command was aware of these adverse wind conditions prior to executing the takeoff.
The right turn into a tailwind may have caused the pilot in command to misjudge the margin of safety above the airplane's stall speed. In addition, the pilot may have increased the airplane's pitch angle to compensate for the perceived decreased climb rate, especially if the pilot misperceived the apparent ground speed for airspeed, or if the pilot became disoriented.
The high density altitude and possibly the pilot in command's limited experience with this type of takeoff contributed to the loss of airspeed that led to the stall.
The pilot in command failed to ensure that the airplane maintained sufficient airspeed during the initial climb and subsequent downwind turn to ensure an adequate margin above the airplane's stall speed, resulting in a stall and collision with the terrain.
The pilot in command inappropriately decided to take off under conditions that were too challenging for the pilot trainee and, apparently, even for him to handle safely.
The pilot in command suffered from fatigue during the day before the accident. Information on fatigue and its effects, and methods to counteract it, might have assisted the pilot in command to recognize his own fatigue on the first day of the flight, and possibly enhanced the safety of the trip.
The airplane occupants' participation in media events the night before and the morning of the accident flight resulted in a later-than-planned takeoff from Cheyenne under deteriorating weather conditions.
The presence of media at the Cheyenne Airport and media interviews scheduled for the next two overnight stops probably also added pressure to attempt the takeoff and maintain the itinerary.
The itinerary was overly ambitious, and a desire to adhere to it may have contributed to the pilot in command's decision to take off under the questionable conditions at Cheyenne.

PROBABLE CAUSE:
The National Transportation Safety Board determines that the probable cause of this accident was the pilot in command's improper decision to takeoff into deteriorating weather conditions (including turbulence, gusty winds, and an advancing thunderstorm and associated precipitation) when the airplane was overweight and when the density altitude was higher than he was accustomed to, resulting in an a stall caused by failure to maintain airspeed.
Contributing to the pilot in command's decision to takeoff was a desire to adhere to an overly ambitious itinerary, in part, because of media commitments.

RECOMMENDATIONS:
As a result of the investigation of this accident, the National Transportation Safety Board makes the following recommendations:

--to the Aircraft Owners and Pilots Association, the Experimental Aircraft Association, and the National Association of Flight Instructors:
Disseminate information about the circumstances of this accident and continue to emphasize to your memberships the importance of aeronautical decision making. *--to the Federal Aviation Administration:*
Expand the development and increase the dissemination of educational materials on the hazards of fatigue to the general aviation piloting community.

Incorporate the lessons learned from this accident into educational materials on aeronautical decision making.

For use with Module 8 – Error Producing Conditions

Slide 29 (Case Studies)

From the AP wire story, Wed., Sept. 5, 2007
WASHINGTON - A B-52 bomber was mistakenly armed with six nuclear warheads and flown for more than three hours across several states last week, prompting an Air Force investigation and the firing of one commander, Pentagon officials said Wednesday. Rep. Ike Skelton, chairman of the House Armed Services Committee, called the mishandling of the weapons "deeply disturbing" and said the committee would press the military for details. Rep. Edward J. Markey, a senior member of the Homeland Security committee, said it was "absolutely inexcusable." "Nothing like this has ever been reported before and we have been assured for decades that it was impossible," said Markey, D-Mass., co-chair of the House task force on nonproliferation. The plane was carrying Advanced Cruise Missiles from Minot Air Force Base, ND, to Barksdale Air Force Base, LA, on Aug. 30, said the officials, who spoke on condition of anonymity because of a Defense Department policy not to confirm information on nuclear weapons. The missiles, which are being decommissioned, were mounted onto pylons on the bomber's wings and it is unclear why the warheads had not been removed beforehand. Earlier, the Associated Press erroneously reported the bomber was armed with only five warheads.

Investigation to take weeks

The Air Combat Command has ordered a command-wide stand down on Sept. 14 to review procedures, officials said. They said there was minimal risk to crews and the public because of safety features designed into the munitions. In addition to the munitions squadron commander who was relieved of his duties, crews involved with the mistaken load, including ground crew workers, have been temporarily decertified for handling munitions, one official said. The investigation is expected to take several weeks. The incident was first reported by Military Times newspaper group. "There is no more serious issue than the security and proper handling of nuclear weapons," Skelton said in a statement Wednesday. "The American people, our friends, and our potential adversaries must be confident that the highest standards are in place when it comes to our nuclear arsenal." Skelton, D-Mo., said his committee will pursue answers on the classified matter "to ensure that the Air Force and the Department of Defense address this particular incident and strengthen controls more generally."

From the Navy Times:

New details on submarine cover-up

By Gidget Fuentes and Andrew Scutro - Staff writers
Posted : Friday Oct 26, 2007 5:20:20 EDTNuclear personnel aboard the submarine Hampton have been punished for lax safety procedures and for forging log books to cover their tracks, according to sources familiar with the ongoing investigation.
The accusations are already sending shockwaves through the tight-knit Navy nuclear community, which prides itself on its devotion to nuclear safety rules and regulations. So far, one officer and five enlisted sailors have received non-judicial punishment following a preliminary investigation, but a broader Judge Advocate General's Manual

investigation is underway, said Lt. Alli Myrick, spokeswoman for Submarine Squadron 11, which oversees the Hampton. The nature of the punishments has not been disclosed, but the six have all been reassigned to the squadron, she said. Hampton completed an overseas deployment Sept. 17. The transgressions were discovered during the boat's transit to Naval Base Point Loma, Calif., its new home port. It hasn't moved since docking. "Right now, it's not leaving the pier, it's not getting underway," Myrick said. Hampton's skipper, Cmdr. Mike Portland, was still in command as of Oct. 19, Myrick said. Executive officer Lt. Cmdr. Chad Hennings and chief of the boat Master Chief Yeoman (SS) Tim Baisley were also still assigned to the sub, she said. Navy officials declined to discuss the investigation because it is not complete. It was ordered by squadron commander Capt. Chip Jaenichen after "issues" surfaced while the submarine and squadron were preparing for a normal end-of-deployment examination, Myrick said. "During a routine review ... [the crew's] conduct of procedures, although found to be safe, fell short of high Navy standards," Submarine Squadron 11 officials said in a release Myrick provided to Navy Times. Those standards relate broadly to operations, record keeping, training and qualifications, she said.

Once the investigation is complete, it is possible additional crew members could be implicated and further discipline may follow. Myrick declined to speculate. Cmdr. Jeff Davis, a Navy spokesman at the Pentagon, said the sailors involved "clearly fell short of the rigorous standards that we set. But never in any way did that conduct result in an unsafe situation." According to one source with knowledge of the investigation, the central problem involves how often sailors analyzed the chemical and radiological properties of the submarine's reactor, which is typically checked daily. During preparations for the boat's Operational Reactor Safeguard Examination, which is typically conducted as a nuclear submarine ends its deployment, officials discovered that the sailors hadn't checked the water in at least a month, and their division officer, the chemistry/radiological controls assistant, knew it, the source said. They also learned that the logs had been forged, or radioed in submarine parlance, later to cover up the lapse and make it look as though the sailors had been keeping up with required checks all along. Failure to maintain proper chemistry controls could lead to long-term corrosion in the system, the source said. "The reason you maintain water chemistry within certain parameters is to prevent corrosion. But we measure also for general radioactivity levels in the water to make sure the reactor [fuel elements are] intact." A retired submarine commander described the rigorous process this way. "As the sampling is done and analyzed, it's checked by the watch standers in the propulsion plant so they can take any actions the samples indicate. That's the first echelon. Second, they are exhaustively reviewed by the ship's chain of command; the lead [engineering lab technician], the CRA and the engineer. All review these on a frequent basis; daily, weekly, monthly. And then the captain and the XO periodically review them as well." "That is the ship's chain of command. The third echelon is outside monitors and inspection teams, the squadron and [Naval Reactors] who sends monitors to the boat at any and all hours. Those guys don't give you notice; they just wake you up at 2 a.m. to tell you they're already on the boat. Having your [chemical] levels out of whack is a good way to get into trouble." That this process was apparently completely ignored shocked the former commander. "I'm outraged," he said. "It's incredible in the full sense of the word, as in, this isn't to be believed. I'm having a hard time getting my mind around it. The system, by design and

practice, is very closely woven and densely packed with people to make sure that it's done right the first time." Referring to the chemical levels, another former submarine commander added: "It's not that it's dangerous at the instant. Blowing off the [chemical] sample that day isn't what's dangerous, but the operational philosophy adopted by people who would do that, if applied to the other aspects of operating the nuclear propulsion plant watch stations or other aspects of the submarine, could be dangerous. That's what's scary. Besides, why the hell wouldn't you check the [chemical] levels? First, that's the ELT and the CRA's job. Second, it takes about an hour and a half each day to do it. Third, you're on a submarine, so it's not like you're going to get away with doing nothing on your free time." Although there is no evidence at this stage that the problem goes beyond the Hampton, the source familiar with the investigation said it will prompt further examination throughout the community. "Because once you see the problem once, you have to assume it exists in other places." Davis said that, although the investigation is still ongoing, "we have absolutely no reason to believe that this is a fleetwide problem." When asked about the sailors' motivation, the source replied that it was probably laziness. Concern has reached all the way to Adm. Kirkland Donald, director of Naval Nuclear Propulsion, the source said. "They know what happened and who was complicit," he said. Discussion has already begun on submarine-related blogs. "We all heard what happened and it is quite bad. This is going to be a ripple effect hitting everyone. Standby if you know what I'm saying. I've gotten all my stuff dug through twice already this month," wrote an anonymous poster on the blog at http://bubbleheads.blogspot.com. Portland took command of the submarine Aug. 3, 2005. Most recently, the submarine spent seven months at sea on deployment, which included two major exercises and an "emergent" deployment to the 7th Fleet region. "Emergent" usually means unplanned. At the end of the deployment, the boat marked its official homeport change, from Norfolk, Va., to Point Loma. This year, 10 commanding officers spanning different communities have been fired for a variety of reasons, some for accidents, others for command climate or lapses in judgment. Vago Muradian contributed to this report.

For use with Module 9, Comm/Assertiveness, Slide 11: HH60J Case Study

R 281752Z NOV 07 ZUI ASN-A01332000063
FM COGARD AIRSTA CAPE COD MA
TO COMDT COGARD WASHINGTON DC//CG-1131/CG-41//
AIG 8907
BT
UNCLAS FOUO //N03750//
//
WHAT FOLLOWS MAY CONTAIN PRIVILEGED SAFETY INFORMATION.
USE FOR MISHAP PREVENTION PURPOSES ONLY.
//
SUBJ: MISHAP, AVIATION, CLASS D, HH60J, FLIGHT
A. SAFETY AND ENVIRONMENTAL HEALTH MANUAL (COMDTINST M5100.47).
1. AIR STATION OR UNIT: CG AIRSTA CAPE COD, MISHAP REPORT NUMBER: 2011507018.
2. AIRCRAFT TYPE: HH60J, COAST GUARD IDENTIFICATION NUMBER CGNR: 6028.
3. MISHAP DESCRIPTION: INADVERTENT IMC SPATIAL DISORIENTATION AND NEAR FLIGHT INTO WATER (FINAL REPORT).
4. OPMODE: FLIGHT, CLASS: D.
5. DATE: 06-10-07, LOCAL TIME: 0200, PERIOD OF DAY: NIGHT.
6. LOCATION OF MISHAP: APPROXIMATELY 10 NM NE OF AIR STATION CAPE COD, LAT/LONG/41-50N/70-28W.
7. WEATHER AT TIME/PLACE OF MISHAP: 600 FT OVERCAST, 6 NM VIS, METEOROLOGICAL CONDITIONS: IMC, OBSTRUCTIONS TO VISIBILITY: FOG/HAZE.
8. FLIGHT INFORMATION.
A. MISSION: SAR, FLT TIME: 0.4, FLT PLAN/CLEARANCE: VFR, DESTINATION: PROVINCETOWN, MA.
B. PHASE OR EVOLUTION AT TIME OF MISHAP: DESCENDING, AIRSPEED: 40, ALTITUDE: 185 AWL, NVD: 0.4 HRS.
9. AIRCREW INFORMATION.
A. PILOT AT CONTROLS: PIC, SEAT POSITION: RT, DESIGNATION: AC, TOTAL FLIGHT TIME: 2393.1, FLIGHT TIME IN TYPE: 582.3, FLIGHT TIME LAST 30 DAYS: 39, MONTHS AT UNIT: 18, NVD: 320 HRS.
B. PILOT NOT AT CONTROLS: NPIC, SEAT POSITION: LT, DESIGNATION: CP, TOTAL FLIGHT TIME: 667, FLIGHT TIME IN TYPE: 467.2, FLIGHT TIME LAST 30 DAYS: 21, MONTHS AT UNIT: 15, NVD: 64.9 HRS.
C. AIRCREW POSITION/DESIGNATION: FM, RATING: AMT, TOTAL FLIGHT TIME: 204, FLIGHT TIME IN TYPE: 204, FLIGHT TIME LAST 30 DAYS: 15, MONTHS AT UNIT: 0.
D. AIRCREW POSITION/DESIGNATION: RS, RATING: AST, TOTAL FLIGHT TIME: 2447, FLIGHT TIME IN TYPE: 2201, FLIGHT TIME LAST 30 DAYS:

4.6, MONTHS AT UNIT: 36.
10. NARRATIVE: AIRCREW DEPARTED FROM AIR STATION CAPE COD TO SEARCH FOR A POSSIBLE PIW IVO PROVINCETOWN, MA. WEATHER AT KFMH WAS REPORTED AS FEW AT 6000 WITH 6 MILES VISIBILITY. THE REPORTED WEATHER AT PROVINCETOWN WAS 100 FT OVERCAST AND 1/4 MILE VISIBILITY. SHORTLY AFTER TAKEOFF, THE AIRCREW ENCOUNTERED CEILINGS AS LOW AS 600 FEET. THE PIC/PAC FOLLOWED THE WELL ESTABLISHED AIR STATION CAPE COD LOW VISIBILITY ROUTE TO THE NORTH AT 400 FT AGL. UPON CROSSING THE SHORELINE, THE VISIBILITY DECREASED AS DID THE CEILING. THE PIC STATED THAT THE CEILINGS WERE COMING DOWN AND ALTHOUGH STILL VISUAL, BEGAN A DESCENDING RIGHT HAND TURN TO 200 FT. THE PIC CONTINUED THE DESCENT PAST 200 FEET AND THE AIRCRAFT ENTERED INADVERTENT IMC AT APPROXIMATELY 185 FT. PIC ATTEMPTED TO LEVEL THE AIRCRAFT AND MAINTAIN ALTITUDE BUT EXCESSIVELY SLOWED THE
AIRCRAFT AND ENTERED A LEFT YAW WITH A NOSE HIGH ATTITUDE. THE AIRCRAFT CONTINUED TO DESCEND WITH LEFT YAW, PITCH OSCILLATIONS, AND NR DROOP. PIC REPORTED THAT THE HELICOPTER EXITED IMC AT 100 FT AWL AND THAT FINAL RECOVERY OCCURRED AT 35 FEET AWL. PIC BRIEFED AIRCREW THAT THEY WERE TERMINATING THE MISSION AND RETURNED TO AIR STATION CAPE COD WITHOUT INCIDENT.
11. MISHAP DAMAGE AND COST.
A. N/A.
B. N/A.
C. N/A.
D. NUMBER OF INJURIES: 0, FATALITIES: 0, DAYS LOST: 0.
E. TOTAL COST: $0.00.
F. ENGINE: .
12. ADDITIONAL FINDINGS AND CORRECTIVE ACTIONS TAKEN:
A. THE MISHAP AIRCRAFT VOICE AND FLIGHT DATA RECORDER (VFDR) WAS REMOVED AFTER THE INCIDENT ON 10 JUNE 2007 AND SENT TO ARSC FOR ANALYSIS ON 12 JUNE 2007.
B. PIC ESTIMATED THAT THE HELICOPTER ROTATED THROUGH 270 DEGREES OF LEFT HEADING CHANGE DURING THE RECOVERY WITH NR BETWEEN 91%- 95% AND TORQUE AT A MAXIMUM OF 124%. NPIC/PNAC STATED THAT PITCH ATTITUDE VARIED FROM 10 DEGREES NOSE HIGH TO 20 DEGREES NOSE LOW AND THAT NR REACHED A LOW OF 90% AND TORQUE A MAXIMUM OF 118%
C. BOTH PILOTS WERE ON NVG'S WITH THE PIC USING THE HUD MONOCLE THROUGHOUT THE FLIGHT. PIC/PAC HAD AI, MINIATURE AIRCRAFT, COMPASS, TURN AND SLIP, TORQUES, DISTANCE TO FTP, BANK ANGLE, AND RADALT SELECTED AS HUD PARAMETERS. VSI WAS NOT SELECTED AS A HUD PARAMETER. DURING THE RECOVERY FROM THE UNUSUAL ATTITUDE/SPATIAL DISORIENTATION, PIC DID NOT SWITCH SCAN TO PRIMARY FLIGHT INSTRUMENTS. THE PIC HAD APPROX 50 HOURS OF PRIOR SERVICE EXPERIENCE WITH THE HUD AND FELT COMFORTABLE WITH ITS USE. THE PIC HAD PREVIOUSLY USED THE HUD AS SAFETY PILOT DURING SIMULATED

INSTRUMENT APPROACHES TO THE WATER BUT NOT WHILE MANIPULATING FLIGHT CONTROLS.
D. NPIC BEGAN TO ENTER SAR DATA INTO THE TACNAV COMPUTER SHORTLY AFTER CROSSING THE SHORELINE. AFTER THE PIC STATED THAT THE WEATHER WAS COMING DOWN AND THAT THEY WERE DESCENDING, THE NPIC NOTED THAT
THE AIRCRAFT WAS STILL VMC AND THEN RETURNED TO ENTERING DATA INTO THE TACNAV COMPUTERS.
E. THE FM AND RS STATED THAT THEY HEARD THE NPIC STATE "WE'RE GOING DOWN" AND THE PIC REPLY "I'VE GOT IT." THE RS ASKED THE PIC IF THEY SHOULD INITIATE A MAYDAY CALL TO WHICH THE PIC REPLIED NO. BOTH THE FM AND RS BRACED FOR IMPACT, LOCATED THEIR EGRESS ROUTES, AND PREPARED TO USE THEIR HEEDS BOTTLES. THE FM AND RS STATED THAT DURING RECOVERY HEAVY ROTOR WASH ENTERED THE CABIN DOOR. THE RS HEARD THE PILOTS CALL PITCH OSCILLATIONS FROM 5 DEGREES NOSE UP TO 20 DEGREES NOSE DOWN AND FELT THAT THE AIRCRAFT DID ONE COMPLETE CLOCKWISE REVOLUTION FOLLOWED BY A NOSE HIGH COUNTERCLOCKWISE YAW
AND FINALLY, A NOSE LOW CLOCKWISE TURN.
F. BOTH PILOTS PARTICIPATED IN AN ALL H-60 PILOTS DISCUSSION REGARDING THE EVENT WHICH INCLUDED USE/LIMITATIONS OF THE HUD, NIGHT OVER WATER FLIGHT, CRM, AND ORM.
G. WEATHER AT PROVINCETOWN AIRPORT WAS REPORTED AS 100FT OVC AND 1/4 VIS.
H. ANALYSIS PROVIDED THE FOLLOWING DATA REGARDING THE EVENT: AT 175FT AWL, A DESCENDING, DECELERATING RIGHT TURN WAS INITIATED AT APPROX 40 KIAS AND WITHIN 6 SECONDS THE AIRCRAFT WAS IN A 40 DEGREES NOSE UP AND 24 DEGREES RIGHT WING DOWN ATTITUDE. 5 SECONDS LATER, THE RADALT TONE GOES OFF PASSING 100 FT WITH NO VERBAL ACKNOWLEDGMENT FROM THE PILOTS. THREE SECONDS AFTER DESCENDING THROUGH 100FT, RECOVERY BEGINS AND NR DROOPS DOWN TO 90.5% WITH A LOWEST ALTITUDE ACHIEVED OF 14FT AWL. THE AIRCRAFT DESCENDED FROM 94FT TO 14 FT IN 4 SECONDS WITH AN APPROX RATE OF DESCENT OF 20FT/SEC OR 1200FT/MIN. DURING RECOVERY, THE AVERAGE RATE OF TURN WAS 38 DEGREES PER SECOND. NR DID NOT RETURN TO 98.5% UNTIL 15 SECONDS AFTER THE LOWEST NR AND ALTITUDE VALUES RECORDED.
I. THERE WERE SEVERAL NOTEWORTHY CRM TAKE-AWAYS FROM THIS INCIDENT.
THROUGHOUT THE EVENT THERE WAS VERY LITTLE COMMUNICATION REGARDING
WHAT WAS OCCURRING. THE PAC/PIC DID NOT VOICE HIS OBSERVATION THAT HE WAS NOW IMC, STILL ON THE HUD, AND EXECUTING A DESCENDING RIGHT TURN TO TRY AND REACQUIRE VISUAL CUES. AS A RESULT, THE NPAC WAS UNAWARE OF THE NEED TO BACK UP THE PAC. THE ONLY VERBAL COMMUNICATIONS DURING THE DESCENT AND RECOVERY WAS THREE SECONDS

AFTER THE 100 FT RADALT TONE GOES OFF WHEN THE AIRCRAFT IS AT ITS LOWEST ALTITUDE AND THE PAC AND ONE OTHER PERSON IN THE CREW SAYS "WHOA". SIX SECONDS AFTER THE PAC INITIATED RECOVERY THE PNAC ASKS "WANT THEM OFF" WHICH THE PAC/PIC QUICKLY STATES "NO" FOLLOWED BY "I GOT IT" THREE TIMES IN RAPID SUCCESSION WITH THE PNAC CALLING "LOW ROTOR" FOUR TIMES. REFERENCES TO ATTITUDE OR ALTITUDE WERE NOT VOICED UNTIL 19-33 SECONDS AFTER RECOVERY BY WHICH TIME THE AIRRCRAFT WAS AT 235 FT, LESS THAN 30 KIAS AND 10 KTS OF GROUND SPEED.

13. RECOMMENDATIONS: A. RECOMMEND CG-711 DETERMINE THE INTENT FOR THE HUD MONOCLE, THEN ATC H60 BRANCH AND ATC AVIATION SPECIAL MISSIONS BRANCH PROMULGATE POLICY AND GUIDANCE ON HUD USAGE. WHILE
UNDETERMINED, IT APPEARS THE HUD MONOCLE IS NOT INTENDED FOR USE IN MARGINAL OR IMC CONDITIONS AS IN THIS CASE. AN INSTRUMENT SCAN COULD NOT BE ADEQUATELY ACCOMPLISHED USING THE HUD MONOCLE AND IT
SEEMS IS INTENDED TO AID THE PILOTS IN VISUAL CONDITIONS PERFORMING OPERATIONAL CLOSE-IN TACTICAL OPS.
B.RECOMMEND ALL UNITS UTILIZING THE HUD MONOCLE THOROUGHLY DISCUSS
THIS EVENT.
C.RECOMMEND ALL UNITS REVIEW THE HAZARDS ASSOCIATED WITH INADVERTENT IMC ENTRY AND CONDUCT TRAINING ON THE NEW UNUSUAL ATTITUDE RECOVERY PROCEEDURE TO BE CONTAINED IN CHANGE 5 OF THE MH-60J FLIGHT MANUAL WHEN PUBLISHED.
D. RECOMMEND THE FOLLOWING CAUTION BE ADDED TO THE BEGINNING CHAPTER 25 "AIRBORNE USE OF FORCE" OF THE MH-60J FLIGHT MANUAL:
CAUTION
THE HUD MONOCLE DOES NOT PROVIDE INFORMATION SUFFICIENT TO CONDUCT
AN EFFECTIVE INSTRUMENT SCAN IN IMC CONDITIONS. PILOTS UTILIZING THE HUD MONOCLE IN MARGINAL WEATHER CONDITIONS SHALL BRIEF INADVERTENT IMC PROCEDURES PRIOR TO OPERATIONS IN SUCH CONDITIONS.
E. THE VFDR ANALYSIS FACILITATED BY CG-1131 AND PERFORMED BY ARSC PROVED VITAL IN DETERMINING THE EVENTS AND THEIR SEQUENCE DURING THIS COMPRESSED PERIOD OF LOST SITUATIONAL AWARENESS. HOWEVER, THE PARAMETERS CAPTURED BY THE H60 VFDR DO NOT INCLUDE ANY ENGINE OR MAIN GEARBOX DATA. IF CONDITIONS HAD YIELDED A NO SURVIVOR/NO WITNESS MISHAP TO INVESTIGATE, THE MISHAP ANALYSIS BOARD WOULD HAVE
BEEN CHALLENGED BY WOEFULLY INADEQUATE VFDR DATA. CAPTURED DATA FALLS WELL BELOW PARAMETERS OF OTHER CG AIRCRAFT AND THE INDUSTRY NORM. RECOMMEND CG-1131 CHAMPION MORE ROBUST DATA COLLECTION ON THE
H60 VFDR. THE TRANSITION TO THE H60T MAY PROVIDE MORE ROBUST DATA

WHICH IS EASIER TO CAPTURE.
14. NAME, RANK, PHONE NUMBER OF PERSON TO CONTACT REGARDING MISHAP: LCDR ERIK J. JENSEN, (508) 968-6357.
15. COMMANDING OFFICER'S ENDORSEMENT/COMMENTS: THIS UNIT CAME WITHIN 14 FEET OF A CLASS A MISHAP WITH THE POTENTIAL FOR LOSS OF CREW AND/OR AIRFRAME. WHILE TECHNICALLY "COST FREE" THANKS TO GENEROUS H60 LIMITS, THIS EVENT PROVES PRICELESS WITH LESSONS LEARNED IN SEVERAL AREAS:
A. ORM: THE CREW OBTAINED A VERY ACCURATE WEATHER BRIEF THAT REPORTED ON SCENE CONDITIONS NEAR CERTAINLY AT 100 AND ¼ IN THE HARBOR WHERE THE BOAT REPORTEDLY CAPSIZED. IN PREFLIGHT PLANNING THE CREW SHOULD HAVE ANTICIPATED GOING IMC AND WHAT ACTIONS WOULD
BE TAKEN. WORDS LIKE, "WHEN I GO IMC I WILL..." SHOULD HAVE BEEN UTTERED BY THE PIC/PAC. AT A MINIMUM, A PRE-BRIEFED HEADING AWAY FROM LAND AND A LEVEL CLIMB TO VMC SHOULD HAVE BEEN UNDERSTOOD BY
THE ENTIRE CREW. ADDITIONALLY, THE LOCAL CG STATION HAD A BOAT RESPONDING, MOST LIKELY THE BEST (WHILE HARDLY EFFECTIVE) ON SCENE PRESENCE GIVEN THE SEVERELY RESTRICTED VISIBILITY. A WEATHER REPORT FROM THE CG BOAT COULD HAVE INDICATED SAFE FLIGHT ON SCENE WAS UNLIKELY AND GREATLY ENHANCED RISK MANAGEMENT. WHILE THE CREW DID
NOT HAVE THE LUXURY OF HINDSIGHT, THEY INCURRED SIGNIFICANT RISK BASED ON A REPORTING SOURCE WHICH LATER SHOWED UP AT THE STATION, WAS DEEMED TO BE INTOXICATED/NON-CREDIBLE AND THE CASE WAS SUSPENDED. AGAIN, I FULLY UNDERSTAND THIS "REST OF THE STORY" IS SELDOM KNOWN IN THE EARLY STAGES OF A CASE. BUT, IT UNDERSCORES HOW HIGHLY UNCERTAIN THE "GAIN" STACKED UP AGAINST NEAR CERTAIN ELEVATED "RISK".
B. LOSS OF SITUATIONAL AWARENESS/CRM: NOTHING ABSOLVES THE PIC FROM THE SAFE CONDUCT OF THE FLIGHT. IN THIS CASE, THE PIC/PAC LOST SA
IN AN ENVIRONMENT THAT DEMANDED SOLID RELIANCE ON THE FUNDAMENTAL
BASICS OF AN EFFECTIVE INSTRUMENT SCAN. IF YOU HAVE NOT EXPERIENCED INADVERTENT IMC AND HAD TO FORCE AN INSTANT INSTRUMENT SCAN YET IN YOUR CG AVIATION CAREER, STAND BY...YOU WILL. HAVING GONE IMC, THE PIC/PAC SHOULD HAVE TRANSITIONED TO A "TRADITIONAL" INSTRUMENT SCAN WITH HEAVY DOSES OF THE ATTITUDE GYRO, AIRSPEED INDICATOR AND ALTIMETER. IN ADDITION, HE SHOULD HAVE LEVERAGED THE OTHER PILOT FOR CALLOUTS OF ASSISTANCE. AGAIN, PRE-BRIEFING AND PLANNING FOR THE NEAR INEVITABLE FLIGHT INTO IMC WOULD HAVE PAID HUGE DIVIDENDS. I AM ENCOURAGED THAT THE ATC H60 BRANCH IS CONSIDERING AN IMPROVED UNUSUAL ATTITUDE RECOVERY PROCEDURE AND WOULD RECOMMEND SIMULATOR
PRACTICE OF THIS NEW PROCEDURE AS PART OF AN INADVERTENT IMC

SCENARIO OF T AND P COURSES.
C. NEW TECHNOLOGY: OTHER THAN THE MINIMAL TRAINING PROVIDED IN THE AUF QUALIFICATION SYLLABUS, THERE IS CURRENTLY A NOTABLE LACK OF GUIDANCE ON HUD UTILIZATION AND TRAINING. THE MH-60J FLIGHT MANUAL, COAST GUARD AIR OPERATIONS MANUAL AND AIRBORNE SPECIAL MISSIONS MANUAL ALL FAIL TO PROVIDE ANY SUCH GUIDANCE. INITIAL AND RECURRENT TRAINING MINIMUMS ARE NON-EXISTENT. THE PIC/PAC WAS MAKING USE OF A HUD MONOCLE TO WHICH HE WAS EXPOSED DURING AUF TRAINING. WHILE THIS
PILOT DID HAVE PRIOR DOD HUD MONOCLE EXPERIENCE, IN THIS CASE THE MONOCLE PROVED INADEQUATE IN PROVIDING NEEDED SAFETY OF FLIGHT INFORMATION TO THE CREW AND FAILED TO PROVIDE THE BASIS FOR QUICK SA DECISIONS AND CONTROL INPUTS. SIMPLY PUT, IT IS AN INADEQUATE SURROGATE FOR A FULL INSTRUMENT PANEL AND ASSOCIATED SCAN. PILOTS UTILIZING THIS NEW TOOL MUST UNDERSTAND ITS LIMITATIONS IN IMC CONDITIONS AND MUST BE PROVIDED WITH CLEAR DOCTRINE AND ADEQUATE RECURRENT TRAINING IN ORDER TO UTILIZE IT SAFELY.
BT
NNNN

For use with Module 11- Mutual Support (Slides 3 &13)

Slide 3

- First stage (bottom section) S-C-1, Built by Boeing: 138 feet high, 33 feet in diameter and weighed 288,000 lbs without fuel, with five F-1 engines generating 7.7 million pounds of thrust pushing with the force of thirty diesel locomotives.
- Second stage, S-2 built by North American: 81.5 feet high, 33 feet in diameter, weighing 83,400 pounds empty, five J-2 engines fueled by oxygen and hydrogen, one million pounds of thrust.
- Third stage S-IV-B, built by McDonnell-Douglas: 21.7 feet in diameter, 59.3 feet high and weighed 25,100 pounds empty.
- All three stages had the combined fuel capacity to fill 96 railroad tank cars and a combined power of 543 jet fighters flying on full afterburners.
- The Lunar Module built by Northrop Grumman.
- The command module and Lunar Landing built by Rockwell International.
- **The Mutual Support point –** every stage was built by a different company but had to fit perfectly, work in stages perfectly timed, fall away from the next stage sequentially once the fuel tank was empty, and all support the mission to launch the command ship and lunar module, built by yet another company - Grumman, carrying three men.

Mutual Support is about understanding how big the team really is, what your job is within that team, how well you do that job, and then how you turn your focus toward the bigger picture and support others.

Slide 13

4. **Instruct** – If someone on the team isn't up to the level of knowledge and capability that is not only what you expect, but the standard for the job, provide training, assistance and motivation to get that team member where they need to be.

   (Reference chapter 24, page 253 – " Joe was a magnificent aviator, perhaps too good, for he would prefer a weekend spent hunting with Chuck Yeager to hanging around the simulators for some extra practice. His ability to fly was unquestioned, but he wasn't as up to speed as I would have liked on the lunar module's quirky systems. Since I was his commander, I felt responsible for his performance and after a long day of work, we would frequently get together at night in a motel room for some extra private tutoring."

For use with Module 12 – Putting it Together

Exercise:

These are the notes and exercise scenario that accompanies module 12. The instructor notes has the entire exercise spelled out to be utilized by each group.

Situation

- A new CO has taken command of a unit that operates out of an environmentally challenging location. He is cautious and usually errs on the side of safety.
- A vague mission has come down with orders for one crew to launch on a SAR.
- Not only is the location vague, but the mission is vague as well. There may have been a very important government official that was fishing on this vessel, but due to the poor and then lost communications, it can not be confirmed. No coordinates, just a general compass heading.
- The ready crew flew two other sorties earlier and they have been busy since coming on duty. They are still within duty limits; the aircraft commander is pressing to take the mission.
- The crew will be out of duty limits before this mission could possibly be concluded.
- The location of the vessel is still unknown, but seems to be at the limits of fuel range with an approximate compass heading.
- A fixed-wing asset has been launched with no success so far in locating the vessel.
- The aircraft commander of the ready crew is known to press the envelope, and has had a few “too close” calls under his belt.
- Leadership recognizes him for the success of his mission accomplishments, but crewmembers have complained about his undisciplined methods in accomplishing missions.
- The second up crew is very capable, but new to the location and has just been qualified in the environment with minimal time.
- The mission was to launch at midday, but has been delayed time and time again from headquarters - now it is dark.
- Visibility has now dropped to about ¼ mile, in an increasingly severe storm; search location is no clearer.
- The other first up crewmembers are now growing uncomfortable with the situation; the mission is too vague and it still isn’t confirmed if the individual is actually lost. The aircraft commander is still demanding to take the mission, whenever the call for launch comes down. If they accomplish the mission it will be a huge boost to his reputation and already large ego.
- Headquarters has finally sent the order to sector to launch – it may be an issue of national importance or even national security, but they can’t confirm any information.
- The most experienced crewmembers available just got off duty earlier that day, and also had a busy duty day. They have now been home for a few hours.

Instructor notes. Here is the exercise: Encourage use of intervention and conflict management from previous slides if there are areas where conflict may arise. Also, have each group look for error producing conditions, violation producing conditions, hazardous attitudes, blue threats and psychological pitfalls. What pressures is each group encountering?

1. Select two or three people to play the role of the new commander and advisors. Headquarters is providing intense pressure. Utilize the practical steps of Conflict Management and intervention.
    - Get the issue out in the open
        - What do I expect?
        - What is happening?
    - Do an honest evaluation.
    - Lay out evidence
        - Policies, guidelines, SOPs, controlling documents, etc.
2. Select four people to play the role of first up crew. They are a very capable day, night, NVG crew and all but the aircraft commander are feeling apprehensive about mission success and their chances of surviving the search without a mishap due to deteriorating weather, no coordinates for a search and their day keeps getting longer. They recognize the pressure on their commander from headquarters and sector; they recognize the cultural pressure of the organization and peers. The aircraft commander wants the mission no matter what and is pressing to launch. Utilize the practical steps of Conflict Management:
    - Get the issue out in the open
        - What do I expect?
        - What is happening?
    - Do an honest evaluation.
    - Lay out evidence
        - Policies, guidelines, SOPs, controlling documents, etc.

3. Select four people to play the role of the second crew: They are a confident but green crew, and are chomping to take the mission. Utilize the practical steps of Conflict Management:
    - Get the issue out in the open
        - What do I expect?
        - What is happening?
    - Do an honest evaluation.
    - Lay out evidence
        - Policies, guidelines, SOPs, controlling documents, etc.

4. Select two or three people to play the role of headquarters. They are involved because of the potential this mission has to become a huge media event: Utilize the practical steps of Conflict Management.
    - Get the issue out in the open
        - What do I expect?

        - What is happening?
    - Do an honest evaluation.
    - Lay out evidence
        - Policies, guidelines, SOPs, controlling documents, etc.

6. Select four people to play the role of the most experienced crew. Remember they have just gotten off duty a few hours prior. Utilize the practical steps of Conflict Management:

    - Get the issue out in the open
        - What do I expect?
        - What is happening?
    - Do an honest evaluation.
    - Lay out evidence
        - Policies, guidelines, SOPs, controlling documents, etc.

8. See how the group eventually resolves the conflict. How is the initial crew treated?
9. Is it positive or negative?

10. Does the treatment of the crew reflect any of the intervention barriers that were discussed?

    - Mismatched Power and authority
    - Knowledge base
    - Experience differential
    - Confusing confidence with competence
    - Culture

For use with Module 14 – Introduction to Automation Airmanship (Slides 10, 19 & 41)

Slide 10

USS Stark 1987

At 8:00 PM on 17 March 1987, a Mirage F-1 fighter jet took off from Iraq's Shaibah military airport and headed south into the Persian Gulf, flying along the Saudi Arabian coast. An Airborne Warning and Control System (AWACS) plane, in the air over Saudi Arabia and manned by a joint American-Saudi crew, detected the aircraft. Aboard the USS *Stark*, a Perry-class frigate on duty in the gulf, radar operators picked up the Mirage when it was some 200 miles away; it was flying at 5,000 feet and traveling at 550 mph. Captain Glenn Brindel, 43, commander of the *Stark*, was not particularly alarmed. He knew it was fairly common for Iraqi and Iranian warplanes to fly over the gulf. Earlier in the day, Iraqi jets had fired missiles into a Cypriot tanker, disabling the vessel. But no American vessel had been attacked.

In keeping with standard procedure, Captain Brindel ordered a radio message flashed at 10:09 PM: "Unknown aircraft, this is U.S. Navy warship on your 078 for twelve miles. Request you identify yourself." There was no reply. A second request was sent. Still no answer. Brindel noted that the aircraft's pilot had not locked his targeting radar on the *Stark*, so he expected it to veer away.

At 10:10 PM, the AWACS crew noticed that the Mirage had banked suddenly and then turned northward, as though heading for home. What they failed to detect was the launching by the Iraqi pilot of two Exocet AM39 air-to-surface missiles. The Exocets had a range of 40 miles and each carried a 352 lb. warhead. For some reason, the sea-skimming missiles were not detected by the *Stark*'s sophisticated monitoring equipment. A lookout spotted the first Exocet just seconds before the missile struck, tearing a ten-by-fifteen-foot hole in the warship's steel hull on the port side before ripping through the crew's quarters. The resulting fire rushed upward into the vessel's combat information center, disabling the electrical systems. The second missile plowed into the frigate's superstructure.

A crewman sent a distress signal with a handheld radio that was picked up by the USS *Waddell*, a destroyer on patrol nearby. Meanwhile, the AWACS crew requested that two airborne Saudi F-15s pursue the Iraqi Mirage. But ground controllers at Dhahran airbase said they lacked the authority to embark on such a mission, and the Mirage was safely back in Iraqi airspace before approval could be obtained.

As fires raged aboard the *Stark*, Brindel ordered the starboard side blooded to keep the gaping hole on the port side above the waterline. All through the night the fate of the stricken frigate was in doubt. Once the inferno was finally under control, the *Stark* limped back to port. The Navy immediately launched an investigation into an incident that had cost 37 American seamen their lives. The *Stark* was endowed with an impressive array of defenses -- an MK92 fire control system that could intercept incoming aircraft at a range of 90 miles; an OTO gun that could fire three-inch anti-aircraft shells at a rate of 90 per minute; electronic defenses that could produce bogus radar images to deceive attackers; and the Phalanx, a six-barreled gun that could fire 3,000 uranium rounds a minute at incoming missiles. Brindel insisted that his ship's

combat system was fully operational, but Navy technicians in Bahrain said the *Stark*'s Phalanx system had not been working properly when the frigate put out to sea. (Brindel was relieved of duty and later forced to retire.)

Bhopal 1984
Union Carbide night shift crews misapply valve positioning systems and send tons of fuming methyl-isocyanate (a pesticide) into the air. As it cools, it settles to ground level killing over 3000 in their sleep

Chernobyl 1986
Intentional procedural violations circumvent automated safety systems resulting in the atmospheric release of radiation that subsequently spread around the globe.

Sioux City 1989
An “impossible” malfunction leaves a DC-10 without any hydraulic power.

USS Carl Vincennes 1988
The US mistakenly shoots down an Iranian Airbus, mistaking it for an attacking fighter. Automation and violations are blamed. A good case study can be found here: http://ocw.mit.edu/NR/rdonlyres/Aeronautics-and-Astronautics/16-422Spring2004/40763DF2-1797-48D5-9D5C-136DFE8D43C7/0/vincennes.pdf

Slide 19

4. Key decisions: if you are moving vip’s someplace on a strict timeline plan your approach and what kind of approach you are going to do and a backup plan to include the or unexpected headwind monitored precision auto land if fuel to alternate gets tight The Setup has points at which our input is required.
5. Let the crew know what you do not want to have happen. For instance “We’ve got vip’s on board today so we do not want to go around and we don’t want to divert. We’re planning to hand fly the approach, but we’re going to program the automation for a precision approach as a backup if the weather is questionable.
6. Address Constraints and limitations: if your flight is cutting it close on crew day, brief the most expeditious launch and recovery and maximize use of automated features accordingly including programming altitudes, airspeeds, and other parameters whenever possible. Brief directly from the automation after it is programmed, because what you see in there is EXACTLY what the aircraft is going to do.

Slide 41

Where do you think crews performed the best?

If you chose text book emergencies as those which crew members handled best, you'd be right. But at 24% not handled well, there's a lot of room for improvement. That number should be a real caution to crewmembers who care about their own readiness to handle an aircraft emergency or system malfunction. Of all the non-text book emergencies, to know that crews mishandled 93% of them is a number that should set off your personal "master warning" system and inspire you to look at those emergencies that you rarely practice and prepare for the possible occasion where you're going to be called on to deal with a major flight control malfunction, multiple bus failure, or a failure of the mission computer that would require you to revert to some low-level of automation.

If the experienced, proficient and knowledgeable crews in the aircraft incidents studied by NASA could end up performing poorly, that should serve as a wake-up call to the broader profession.

The way you respond to failures and deviation – automation airmanship Skill #7 – can put you up with the "7-percenters" – those who handled complex problems well.