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Landing Signal Officers wave aboard an F/A-18 during aircraft carrier testing of the Hornet.

McDonnell Douglas Photo

naval aviation news

Sixty-Third Year of Publication

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Wraparound cover photo by NANews' JOC Kirby Harrison shows Ltjg. George Rose of VT-6 highlighted by night visual landing aid during two-week LSO School at Cecil Field.

Features

Departments

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From the

EDITOR'S NOTEBOOK

When Eugene Ely made his celebrated landing on USS *Pennsylvania* in 1911, there was no Landing Signal Officer (LSO), to help guide him aboard. No one had yet thought of the idea. More than a decade later, Lieutenant Commander Godfrey deC. Chevalier made the first landing aboard the first U.S. aircraft carrier on October 26, 1922, in an Aeromarine 39-B. "Chevy" Chevalier, like Ely, did it all on his own. The only signal provided by the ship was a flag posted on the port side aft. A red flag meant that the carrier was not ready to receive aircraft while a white one told the pilot he was cleared to land. The rest was up to him.

But the day of the LSO was not far off. In the April 1972 issue of *Naval Aviation News*, Rear Admiral J. R. Tate, USN (Ret.), provided his account of the birth of this concept aboard USS *Langley* in those early days of Naval Aviation. It is reprinted in part below:

" During landings, Commander Kenneth Whiting, the exec and the senior aviator, always watched the landings from the stern of the flight deck, on the port side. He developed a type of back-seat driving and would talk out loud and make appropriate motions. 'He's too low, now he's too high, now he's O.K.' Lieutenant A. M. (Mel) Pride, who was just about the hottest pilot on board and whose piloting was precision plus, had developed a dragging nose-high approach with power, which was eventually to become the standard type approach. He came in for a landing in a TS-2 fighter. On deck afterward, while discussing the landing with Whiting and Squash Griffin, Pride remarked to Whiting, 'You were wrong on my being too low on the approach. I was over the stern by 10 feet and caught the #2 wire." Whiting looked at him in surprise and asked, 'Did you see me?' Pride laughed, ' We all watched you waving too high, too low and O.K.'

Whiting called a meeting of all pilots and set up a plan to station an experienced pilot on the port-side stern of the flight deck who would use a pair of semaphore flags to monitor each approach. At first, Whiting supplied the comments and the flag waving was done by one of the junior aviators. We used only three signals: O.K., too high and too low. Later, we added the cut.

When *Lex* and *Sara* came into the picture, additional signals were added and the cut became a mandatory order."

DID YOU KNOW?

Noel Davis Trophy The Noel Davis Trophy for the period October 1978-December 1980, has been awarded to the following squadrons as the best of their type in the Naval Reserve: VP-60 and VR-51, Glenview; HC-9, North Island; VA-205, Atlanta; VF-202, Dallas; and VAW-88, Miramar. The trophy is named for the pioneer Naval Aviator who was killed in 1927 when his plane crashed at Langley Field, Va., where it was being tested prior to attempting a nonstop New York to Paris flight. The award recognizes excellence in combat readiness, aircraft maintenance, personnel retention and professional proficiency. The miniature trophies presented to the winning squadrons are copies of the original trophy which is retained by the Chief of Naval Reserve.

Arleigh Burke Fleet Trophy The 1980 winners of the Arleigh Burke Fleet Trophy are *Saratoga* (CV-60) on the East Coast and *Ranger* (CV-61) on the West Coast. The trophy is in the form of a plaque, awarded annually to one ship or aircraft squadron in both the U.S. Atlantic and Pacific Fleets. The recipient is selected by its commander in chief for having achieved the greatest improvement in battle efficiency in the competitive year.

CNO Safety Awards The following are the winners of the 1980 CNO Aviation Safety Awards:

NavAirLant: VF-32, VA-46, VP-10, VS-31, VRC-40, HSL-36, HM-14 and, for the second consecutive time, VA-65, VAW-121, HS-15 and VF-43.

NavAirPac: VF-24, VAs 52 and 146, VAW-117, VP-4, VAQ-132, VS-38, VC-5, HC-3, HS-10, Navy Fighter Weapons School, VA-128 for the second consecutive time, and HSL-35 for the third consecutive time.

CNATra: VTs 6, 19, 22, 24 and 86.

NavAirResFor: VA-204, VF-302, VC-12, VP-66, VR-56 and HAL-5.

FMFLant: VMFA-451, VMA(AW)-533, VMAQ-2 and HMH-461.

FMFPac: HMH-361, HMA-169, VMA-214 and, for the second consecutive time, VMFA-212 and VMGR-152.

4th MAW: VMA-124 and HMH-772.

The CNO 1980 Readiness Through Safety Awards went to Commander, Naval Air Reserve Force and Chief of Naval Air Training. Seven major air commands compete for this annual award. The recipient is given temporary custody of the trophy for one year and permanent custody of a replica of the trophy.

Clifton Award The *Swordsmen* of VF-32 are the FY 1980 winners of the Admiral Joseph Clifton Award. Named in honor of Admiral Clifton, who distinguished himself as a fighter pilot during WW II, the award goes to the Navy's outstanding fighter squadron, based on fleetwide competitive evaluation. Selection criteria include achievement in weapon systems readiness/development, combat readiness and exercises, contributions to tactics development, and general contributions to fighter aviation. The Clifton Award marks the second time in five years that the

Swordsmen have been accorded this honor.

VF-32 also received the 1980 CNO Aviation Safety Award and the 1980 Fox One Award for excellence in radar missile employment, utilizing the F-14 weapons system to its utmost.

Led by Commander Bill Hayden, the squadron, a component of CVW-1, recently returned from an eight-month Med deployment aboard *Kennedy*.

Climatic Tests on F/A-18

The Air Force is doing its best to drown, freeze and fry the Navy's F/A-18 *Hornet* strike fighter. The scene of the weather "assault" is the McKinley Climatic Laboratory, operated by the Air Force's 3246th Test Wing at Eglin Air Force Base, Fla. The tests were requested by the Navy and the aircraft's prime

contractor, McDonnell Douglas Corporation.

In a hangar large enough to house a jumbo jet, the weather changes from 125-degree Fahrenheit desert heat to Arctic cold at 65 degrees below zero. Precipitation ranges from a tropical monsoon to blizzards, while winds vary up to 100 miles per hour. In photo, the *Hornet* is deluged with rain at 20 inches per hour.

Blue Angels Recruiting

In September 1981, the *Blue Angels* will select a flight leader, one demonstration pilot and one KC-130 Marine Corps pilot for their 1982 team. Interested officers are encouraged to submit their applications as soon as possible, including their experience and qualifications.

A flight leader applicant must be a commander or lieutenant commander with 3,500 hours of flight time and must have screened for aviation command. Submit letters directly to the Chief of Naval Air Training with information copies to the Commanding Officer, Navy Flight Demonstration Squadron and to Commander, Navy Military Personnel Command, Code 433-3.

An applicant for demonstration pilot should be a tactical jet pilot with 1,500 flight hours, a regular naval officer, rolling to or on shore duty. Letters of application should be endorsed by the commanding officer and forwarded to the *Blue Angels* with a copy to CNATra and NMPC-433-3 or Commandant, Marine Corps, Code AA, for Marines.

KC-130 pilot applicants must be regular officers, captain or 1st lieutenant, aircraft commander or senior T2P.

Any further questions can be answered by contacting the *Blue Angels*, NAS Pensacola, FL 32508, autovon 922-2583/2585 or commercial (904) 452-2583/2584.

Grampaw Pettibone

Confusion

Two senior officers were scheduled to fly a TF-1 (C-1A) *Trader* to a monthly safety officers' conference at a West Coast base. Six other aviators were scheduled as passengers on the trip, and all eight alert birdmen were aboard as the aircraft lined up for takeoff after a very thorough runup and briefing of the passengers on bailout and ditching.

Just before liftoff speed was reached on the takeoff, the plane started to yaw to the left. After takeoff, the yawing increased, and the pilot was forced to use an increasing amount of rudder and rudder trim. By this time, with only about 400 feet of altitude, the plane had swung left to a heading paralleling high tension lines and a populated area along the shoreline.

One of the aviator passengers suddenly reported that the port engine was on fire and flames could be seen pouring out of the oil cooler doors. Reception on the intercom was so poor that all further conversations were conducted by shouting – and all pilots were shouting and giving conflicting advice.

As the pilot hit the feathering button to the port engine, the copilot lowered the landing gear on the advice of one of the passengers and immediately raised the wheels again as the pilot shouted "Gear up."

He had lost 200 feet and airspeed had dropped to 120 knots. Full right rudder and aileron were applied in an attempt to control the plane's heading, which was still falling off to port. Airspeed dropped alarmingly as the port engine feathering button was punched and fire extinguisher actuated.

The starboard throttle had crept back due to a loose friction knob while the pilot was fighting to maintain control and the copilot was busy fastening his shoulder harness! Precious altitude was lost and airspeed dropped to 90-95 knots.

Ditching was inevitable. As the pilot attempted to flare and level the wings, the left wing, port engine still windmilling, hit the water and the plane cartwheeled, coming to rest in three to five feet of water, inverted.

All eight aviators aboard were injured but survived. No one had worn a parachute harness, only one had on a Mae West, neither pilot had used a hard hat, and three out of five passengers did not have shoulder harness fastened. One passenger who was strapped in, released his safety belt on the first impact and caught the full force of the second one. The TF was a strike.

Grampaw Pettibone says:

Gosh, dang it, this whole deal really hurts my soarin' blood pressure! Dropping the landing gear on the pilot while he had his hands full with a burning engine at low altitude purty near cost us eight birdmen. It's just too doggone bad there weren't more seats up front to take care of everyone trying to get into the act.

After hearing a thorough bailout and ditching briefing, how all hands aboard could ignore Mae Wests, parachutes and shoulder harnesses beats me. The average military aviator riding with someone else at the controls most generally almost makes a quadruple amputee of himself cinching things up tightly. Until BuMed revises the physical qualifications for NavCads to include feathers and webbed feet, we better use the gear BuAer provides us to make up for the lack of 'em.

Reprint from *NANews*, December 1958.

Rollout Roulette

Following a night dive-bombing mission, a section of A-7E *Corsairs* split up for individual approaches to home plate. After several minutes of radio difficulties, communications were finally established with the approach controller at nine miles from the runway. Two landing gear checks were given and the pilot acknowledged both with "Three down and locked."

The glide slope was intercepted at one-half nautical mile from touch-

ILLUSTRATED BY Osborn

down. Touchdown with a centered ball occurred approximately 1,000 feet down the 13,500-foot runway. Aerodynamic braking was used until the aircraft nose fell through. At this point, the pilot noted the airspeed was 115 kias, about 25 kias faster than it should have been. He quickly applied moderate braking, but then released the brakes and contemplated going around for another pass.

Seeing the 8,000-foot-remaining marker, it occurred to him that a go-around might be a bit of a hassle to explain to the tower, so he decided to stay on deck. He reapplied brakes at about 92-95 kias, with 8,200 feet of runway remaining, and then experienced an unfamiliar sensation and noise which he analyzed as a frozen port tire. He deselected wheel antiskid and then reapplied brake pressure. Noticing no appreciable difference, he cycled the antiskid switch, with brakes off, and was able to maintain directional control with rudder as the aircraft slowed. Approaching the long-field arresting gear with moderate speed, he decided to execute an arrestment and lowered the tailhook. The aircraft then commenced a hard swerve to the right. He applied full left rudder and nose gear steering but was unable to control the clockwise skid toward the right edge of the runway.

The aircraft departed the runway pointing 90 degrees to the runway heading, but sliding with a forward velocity vector. The port landing gear dug into the dirt and was torn from the aircraft. The port wing tip contacted the ground and shed pieces of wing panels as it plowed its way to a final resting place 180 feet from the runway.

Meanwhile, the flight leader was taxiing on the parallel taxiway. He observed sparks shooting from his wingman's aircraft and advised ground control that he thought his wingman had blown a tire. He looked back down the runway, saw no lights and taxied back down the parallel to check. He observed the A-7 off the runway, radioed for crash assistance, and then observed the uninjured pilot standing well clear of the wreckage.

Grampaw Pettibone says:

Great grinding Goodyears! A ride like that will remodel your whole blimp – tires notwithstanding.

There are several lessons to be learned from this insidious sequence of events. Individually, they were minor; collectively, they were disaster.

Of serious concern was the pilot's failure to note his airspeed until he commenced braking. He remembered putting the gear down but did not remember lowering the flaps. Four things should have alerted him to his flaps-up condition during the approach. He neither cross-checked airspeed with the AOA, nor saw the flashing wheels/flaps warning light or flap gauge. His transition to optimum angle of attack was quicker than normal and he recalled that he ballooned less, but did not question why.

The pilot's decision to stay on deck would have been okay had the antiskid or nose gear steering functioned as expected. After the tires blew, full rudder throw and more directional control would have been available by lowering the flaps. Finally, his luck was all but exhausted when the tailhook lowered and caused the apparent malfunctioning nose gear centering device to swerve the aircraft off the runway.

The fact that the tower personnel were unaware of a crash is also of concern. Their attention was diverted to other landing traffic as the mishap aircraft began its rollout. Fortunately, the pilot was uninjured and was able to exit his own aircraft.

This pilot allowed himself to become too involved with his radio difficulties and set himself up for a mishap. He was distracted from flying the aircraft and violated the age-old aviation axiom: "Aviate, navigate, communicate."

Quote of the Month

(From Flight Surgeon's comments in a Medical Officer's Report, recounting the adventures of a young pilot who set his FJ-4B down a bit short of the runway.)

"I have known Ensign P— for three months and regard him as a conscientious aviator. I'm sure his accident has been a maturing experience."

The LSO and a companion run for safety aboard the escort carrier Altamaha as an F4U Corsair careens off the deck edge in a missed landing attempt. Right, Ensign R. J. Grant, braced against the wind, waves in a Hellcat during the days when "Paddles" actually used paddles as visual aids.

LSO

"When the moon isn't out, when the weather is turning bad, when two recoveries are piling up on each other, when there's no Bingo Field, when there's a ship casualty, when the deck is badly fouled, when the pattern is full of low state bolters, the LSO is going to sweat blood to try to turn each approach into an arrestment."

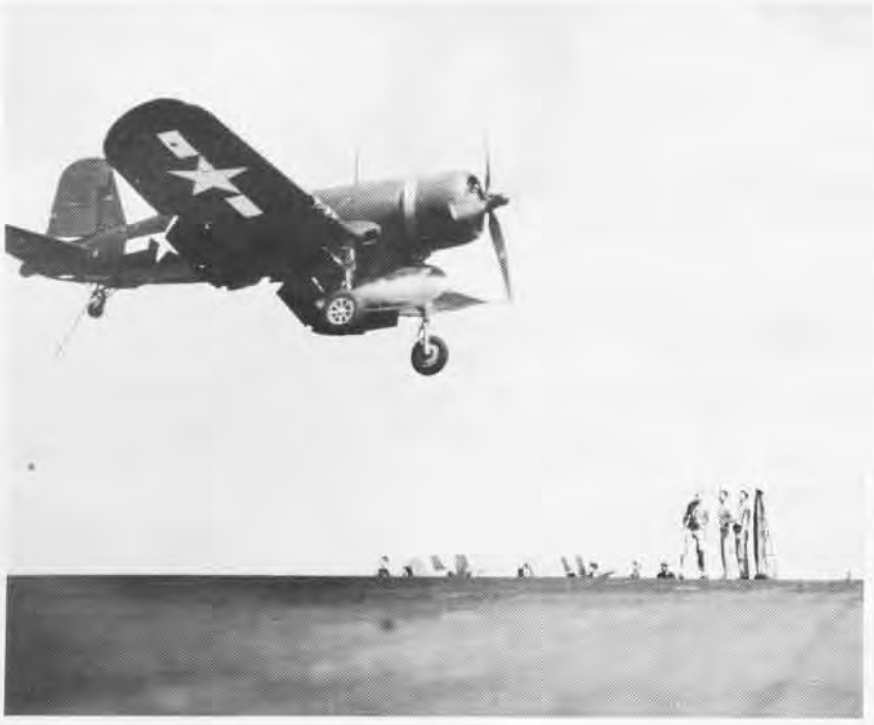
Commander R. M. Neatherland
U.S. Naval Institute Proceedings

By JOC Kirby Harrison

The man on the spot is the Landing Signal Officer. And the spot aboard the aircraft carrier is a small platform off the port wing of a 26-ton plane, flying just the good side of a stall and headed for what an Air Force observer once described as little more than "a controlled crash."

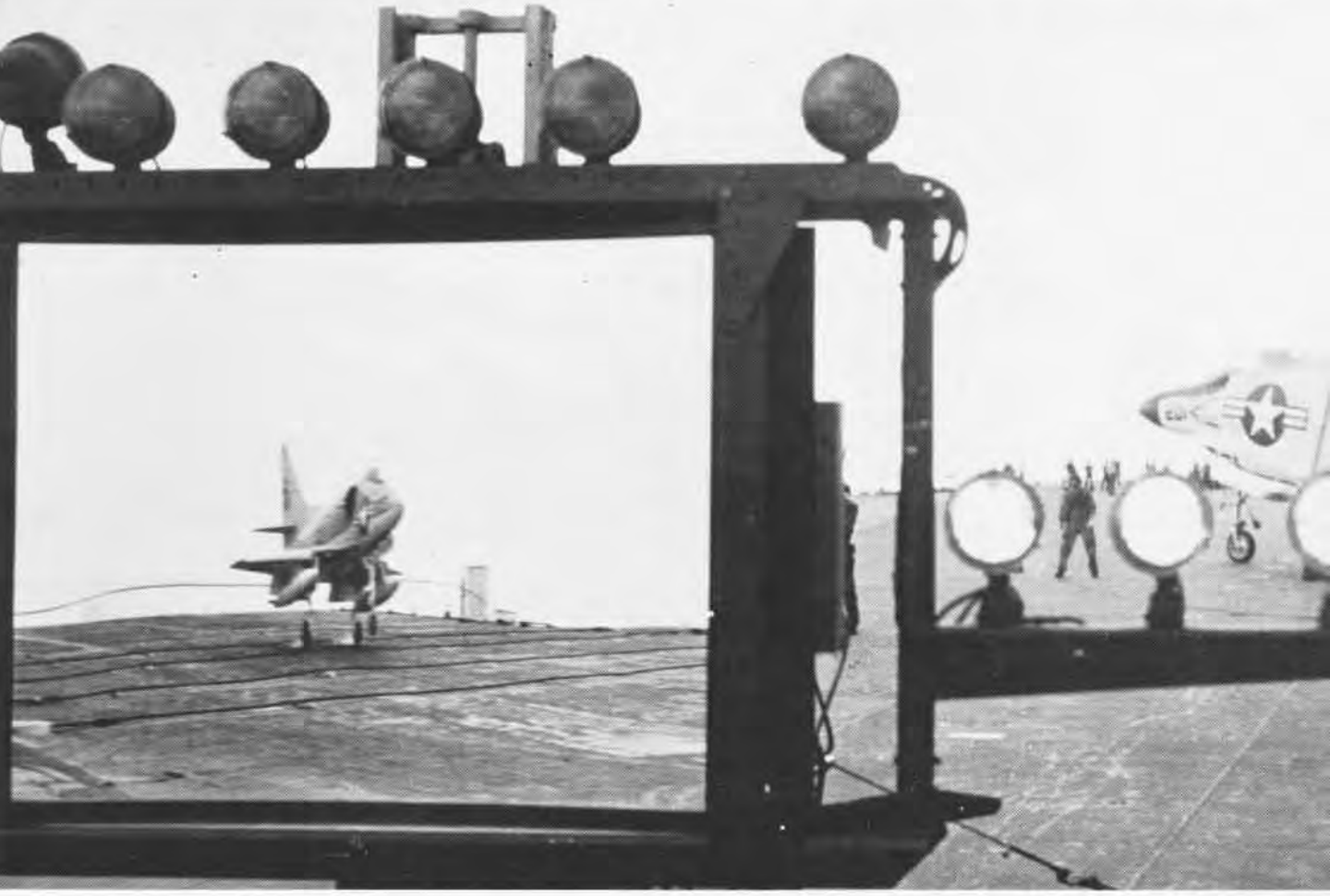
The pilot is the other man on the spot. And he will be until he catches his wire and the rush of adrenalin gives way to a flow of satisfaction. The LSO is still on the spot. He'll be on the spot every time he hears the pilot call the ball letting him know another plane is in the groove and has the visual landing aid in the proper place.

(Continued)



They call the LSO "Paddles," a name dating back to the earliest days of aircraft carriers when the executive officer of *Langley* used a lot of arm motion to "wave" pilots aboard. It worked so well that the next obvious step was to permanently assign someone the job of waving aircraft aboard, using large paddles. Prior to Commander Kenneth Whiting's arms-extended advisory to *Langley* pilots, the only communication between ship and plane was a red flag at the aft end of the carrier that meant "do not land" or a white flag to "come aboard."

As aircraft carrier operations expanded, the role of the LSO followed. By WW II he had his own perch on the port side aft. Standing there, braced against the wind, he would extend a



large pair of paddles to indicate to the pilot his position relative to the carrier deck and speed during approach and landing. For night operations, the LSO would bring out lighted wands and looking like an early *Star Wars* character he would sweat and, along with the pilots, curse the darkness.

The mirror visual landing aid system was an improvement, especially in night landings. Horizontal blue lights were intersected by a vertical row of amber lights, with a bright "meatball" that the pilot could see at the intersect point if he properly flew his approach.

It was an improvement but it also put an additional strain on the LSO. By this time, he was holding the "pickle" in one hand to control the lights, in the other a phone to communicate with the pilot, and was faced with converting his right-brain spatial perceptions into logical, left-brain verbiage. It was a problem of motor coordination that had to be learned and practiced, and one that rarely failed to embarrass every student LSO at least once in the training phase.

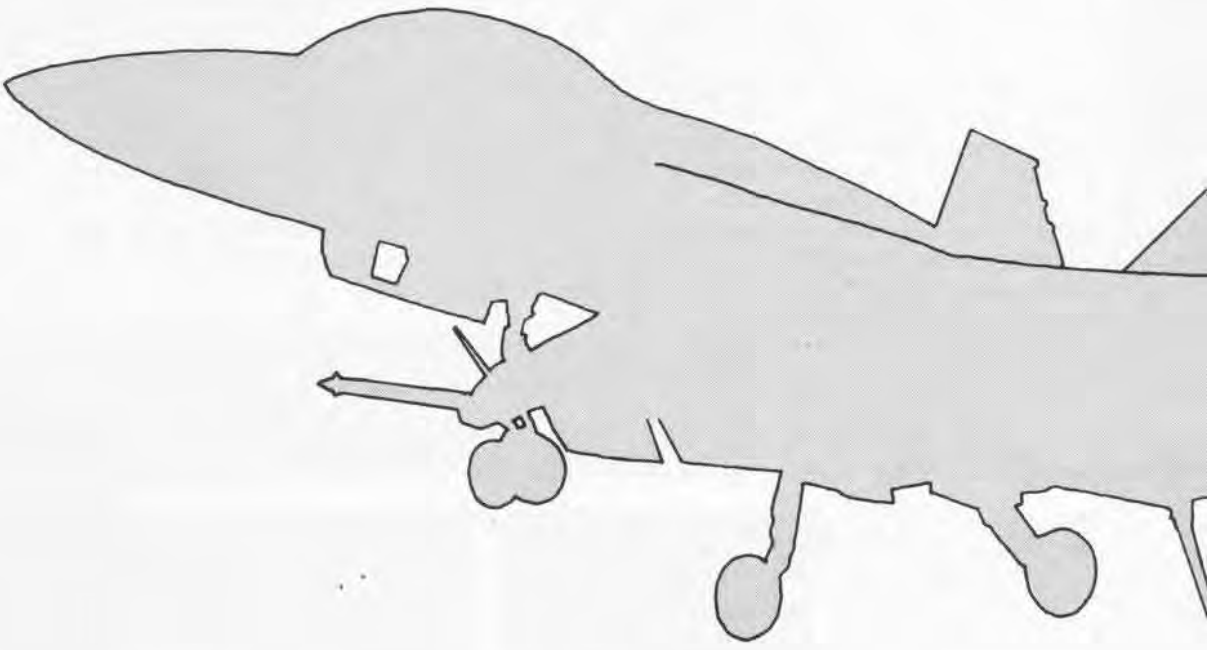
Then came the Fresnel lens, giving the pilot an amber "meatball" at the center of a vertical stack of the lens, between a horizontal row of green datum lights, if the aircraft was on the proper glide slope. Another improvement.

But through the years, with all the innovations — angled flight decks, better visual aids, etc. — the LSO's job has been essentially the same. He is responsible for the safe recovery of aircraft. He learns, along with the pilot and just as quickly as did his early counterparts, that no carrier landing is ever routine.

The aircraft on approach is flying onto the deck at something like 130 knots, and the difference between a ramp strike and a successful trap is just a little more than 10 feet. There are only four arresting wires to catch the hook and in a total of 120 feet, the pilot has only 30 of those in which to grab the ideal number 3 wire. The pilot is on the spot each time he begins the approach, until he is headed below for coffee and debriefing.

The LSO is on the spot every time a pilot begins his approach. And it doesn't end until every pilot is safely back aboard.

An F4U Corsair floats past Paddles, top left, after receiving the signal to cut power and land. At left, a successful trap by an A-4 Skyhawk is reflected in the mirror visual landing aid system set up on the starboard side of the carrier Saratoga. In more modern times, top, an F-4 Phantom makes an approach during field carrier landing practice at Point Mugu, Calif.



Back in "the good ol' days," a student Landing Signal Officer learned his craft aboard the carrier by watching someone who already had qualified as an LSO. The method generally worked out well, what with student LSOs being quick studies, the planes relatively slow, and the pilots skilled. But advancing technology is like a steamroller, threatening to either run us over or leave us behind. The technology involved in landing a 26-ton jet aboard a moving ship at sea is no exception.

The LSO is still called "Paddles," and making a proper approach to the carrier is still referred to as "flying the ball." But technology has eliminated "waving" planes aboard with fluorescent paddles and a lot of body English, although the term is still in use.

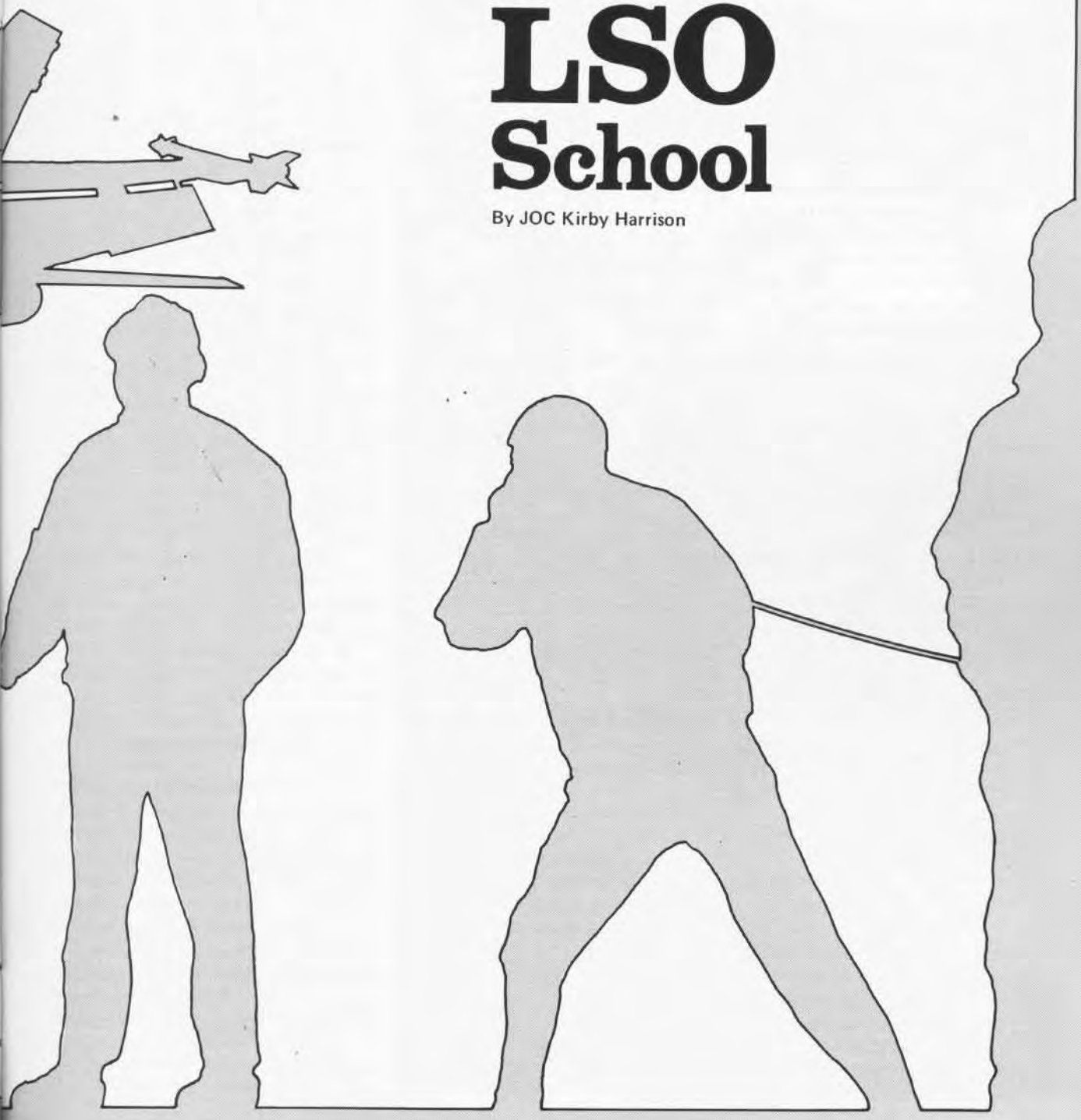
It is more complicated today, but Paddles is still the man responsible for seeing that the aircraft return safely aboard the carrier, according to Lieutenant Commander Jerry Singleton, officer in charge of the Navy's Landing Signal Officer School at NAS Cecil Field, Fla. Increasingly complex technology and more responsibilities assigned to LSOs are major factors in the need for a formal school phase of Landing Signal Officer training.

"The advent of the high-performance jet and the necessity for all-weather operations have increased the demand for skilled, experienced and well-trained LSOs," emphasizes Singleton.

(Continued)

LSO School

By JOC Kirby Harrison



The LSO must regularly juggle such factors as weather, ship configuration, aircraft capability, pilot experience and more. And he is also charged with training pilots in carrier landing technique, monitoring pilot performance, certifying pilot carrier readiness and qualification, scheduling and conducting ground training, and counseling and debriefing pilots.

Prior to 1980, the Landing Signal Officer School had been based at NAS Pensacola and its mission was to provide standardized, fleet-wide basic training in the area of LSO equipment, procedures and safety. The move to Cecil Field was prompted by a desire to take advantage of the LSO simulator there which was tied to the A-7E Night Carrier Landing Trainer. Prior evaluation of the LSO simulator at Cecil Field and another at NAS Lemoore, Calif., by the Naval Training and Equipment Center had noted the usefulness of the device in aircraft control procedure training, teaching aircraft control procedure under realistic conditions.

The school is under the operational control of the Chief of Naval Operations and administratively responsible to Commander Naval Air Force, Atlantic. The staff is comprised of LCdr. Singleton, Marine Major Ted Lyons, Lieutenant Earle Rudolph and ABEC Bert Pack. LCdr. Singleton is a staff qualified LSO and served aboard the carrier *Nimitz* with Carrier Air Wing Eight. Both Maj. Lyons and Lt. Rudolph are air wing qualified LSOs, and Chief Pack is the school's expert on catapults and arresting gear.

Class size at the LSO School is normally about 10 students, and may include personnel from East and West Coast commands, Commander Naval Air Training, and even allied military pilots. In addition to the normal two-week school, the staff also offers more advanced training and review courses aboard underway carriers.

The route to LSO qualification includes the LSO Phase One School for formal classroom training, Field Qualification and Shipboard Qualification. To accommodate deployment scheduling and changes in individual duty assignment, the phases may be completed in any order, but all three must be satisfactorily completed prior to designation as a squadron qualified LSO.

The squadron LSO may wave one type of aircraft, day and night and in all weather conditions. The wing qualified LSO may wave most aircraft types, day and night and in all weather conditions. The training LSO is entrusted with the initial carrier qualification of student pilots. The highest qualification level is that of staff Landing Signal Officer. He is qualified to wave all aircraft, day and night, and is also charged with training other LSOs.

"There will always be a need for highly motivated, well trained Landing Signal Officers as long as we fly high-performance jets off the decks of ships at sea."

LSO School students range from the "nugget" fresh out of the training command to prospective carrier air wing LSOs who are returning for a refresher. The mix leads instructors to deal primarily with key concepts of the LSO's job.

"And to some degree, we try to ensure that all the LSOs are receiving the same training at every level, so that we're all speaking the same language," explains LCdr. Singleton.

Various visual landing aids, normal and abnormal operations, LSO platform equipment, catapults and arresting gear, LSO and carrier Natops, radar, and a seminar to encourage discussions are part of the curriculum. And, there is also a familiarization study of the characteristics of individual ships and aircraft.

According to the school staff, the courses are especially valuable to the more experienced LSO in helping him understand the "why" of various procedures, an essential ingredient in teaching the next generation of LSOs during actual flight operations.

Perhaps the most impressive item in the school's equipment inventory is the LSO Reverse Display. The visual simulator's main component is an isolated LSO platform attached through computer link to the A-7E trainer. A central console allows an LSO instructor to monitor both the trainee and the person "flying" the approach in the trainer. Computer-generated imagery provides the trainee with a realistic impression of being "on the platform," complete with wing and approach lights and a shadow outline of an incoming A-7, horizon, stars, flight deck and even aircraft engine noises. To add even more to the impression of realism, there is also an illusion of variable visibility and ceiling, radio communication, a Visual Landing Aid Fresnel lens, and a pitching deck. All these elements may be controlled from the instructor's console.

"The simulator helps eliminate the *cone of confusion* that occurs when you take a man who has been standing next to the qualified LSO during landings and hand him the reins, and he suddenly draws a mental blank trying to coordinate everything," explains Singleton.

"As an observer, he may have been able to tell you after the fact that a pilot was too low in the early approach, or too fast. But when he holds the 'pickle' in one hand and has to talk to the pilot while operating the lens, there's a short period of confusion before the proper coordination between eye, mind and hand becomes natural."

Integration of the LSO Reverse Display in the school's program has led to recognition of the need for a more advanced system of similar design. That system has been defined and tagged as the Carrier Aircraft Recovery Simulator, or CARS for short. It would require fewer personnel to operate, it would simulate additional aircraft types, and would be capable of a more complete range of recovery situations. The present reverse display requires a pilot and LSO instructor for each trainee.

Studies are now going on to evaluate the cost effectiveness of a systems approach to the CARS, emphasizing state-of-the-art technology. The goal is a training system that can keep pace with aircraft and equipment advances. Active participation of the LSO School in this project has resulted in expansion of the responsibilities for the officer in charge. LCdr. Singleton has been designated the LSO Training Model Manager, responsible for equipment, research and development, and as such is the advocate for new programs to increase the effectiveness of LSO training.

The importance of effective training and the use of CARS in the program was stressed in a 1976 letter from a squadron commanding officer, who pointed out, "The most critical evolution in carrier operations is the recovery of high-performance jet aircraft aboard ship. An essential role in this evolution is played by the LSO who is charged by the carrier's commanding officer with the responsibility for the safe and expeditious recovery of aircraft aboard ship. Unfortunately, the decrease in flight operations (due to fuel requirements and other factors) is also detrimental to the training and proficiency of the LSOs at a point in time when their particular skills are required most."

According to LCdr. Singleton, the ideal LSO trainee is a highly motivated junior officer who has volunteered for the job, since he will have to assume a major responsibility for gaining his own expertise and qualifications.

"This means long hours spent at the end of the runway in all types of weather, observing field and carrier approaches of different types of aircraft," he points out. "One can only learn these skills by doing. The demands on the man in terms of time and energy, during training and while working as an LSO, are enormous.

"There will always be a need for highly motivated, well trained Landing Signal Officers as long as we fly high-performance jets off the decks of ships at sea. We at the LSO School will continue doing all we can do to see that the Navy has the best."

At the LSO School, left to right, Lt. Willis Rief, Ltjg. Steve Howell, Ltjg. Jerry Staab and Ltjg. Andy Caputi discuss the simulated glidepath with guest speaker John Williams of the Naval Air Engineering Center, Mayport, Fla.

HAPI

By LCdr. Ronald P. Moseley
Mr. Mack S. Mutchler

Night environment aboard a ship at sea poses one of the most hazardous and taxing flight regimes possible, and visual cues and references are drastically reduced at the most critical phase of the evolution – approach and landing. The *Harrier* Approach Path Indicator, known as HAPI, and Hover Position Indicator (HPI) are substantial steps toward enhancing current LHA and LPH amphibious assault ship visual landing aids. Continuing evaluations indicate both systems will contribute considerably to the safety margin during night operations for both the vertical/short takeoff and landing (V/STOL) *Harrier* aircraft and any helicopter.

The present visual landing aids (VLA) for night operations aboard the assault ships are described as providing minimal cues for depth perception, closure rate, lineup and rates of glide slope deviation.

In February 1980, the Naval Air Systems Command was invited to send personnel aboard the British through-deck cruiser HMS *Hermes* to evaluate two devices designed to provide additional and more adequate cues. The Naval Air Test Center was tasked with conducting the investigation. The first system, HAPI, is similar in optical concept to the visual approach slope indicator installed at most airports. Evaluation of HAPI indicated an excellent potential for use during day/night and instrument and visual meteorological conditions (IMC/VMC). After further shore-based testing at NATC, a British system was procured and installed aboard *Tarawa* for further evaluation.

The HAPI system consists of three high-intensity light sources with equally divided lenses, white on top and red on the bottom. Each unit is stabilized to compensate for ship pitch and roll. Two of the units are located in the port catwalk area, 300 feet apart, and the third is above the flight deck, on the aft of the island.

The island-mounted unit is termed the close-in approach indicator (CAI), and in addition to the solid red/white lights has flashing white and red capability at the upper and lower boundaries of its elevation angular coverage. The units are oriented to provide a variety of distinct glide path corridors (GPC) instead of a single glide slope as currently provided by most visual landing aids. This allows optimum use for the slightly different techniques used by helicopter and *Harrier* pilots.

For helicopter use as an up-the-stern visual landing aid, a red close-in approach indicator over two white port-side HAPI lights is flown to provide an approximate glide path corridor of 2.8 degrees.

For AV-8 use, an initial sight picture of a red CAI and forward HAPI light over a white aft HAPI unit provides an approximate glide path corridor of 2.1 degrees. This representation is flown to approximately one mile astern, at which point the pilot's scan is changed slightly, with GPC information provided by the close-in approach indicator and the forward HAPI unit. This results in a slightly steeper final glide slope of 2.8 degrees. The flexibility of glide slope presentation enhances *Harrier* transition to the "hover stop" engine nozzle position at one nautical mile, reducing pilot workload by allowing the natural ballooning effect of the aircraft at hover stop to place the *Harrier* on the steeper glide slope.

The second subject of the evaluation was the hover position indicator. This system consisted of eight lights, four of which were mounted in a vertical arrangement with two white lights above two amber lights, spaced 18.5 inches apart. Three green lights were arranged in a horizontal plane, 30 inches apart, bisecting the vertical arrangement at the midpoint. A red reference light was mounted on an extended foreground arm, set at 230 degrees relative to the ship centerline. Once again, helicopter and *Harrier* techniques were different and therefore evaluated individually.

Helicopter use of HPI was evaluated in terms of providing a visual landing aid for glide slope/azimuth information during transition from standard night VMC racetrack pattern to a landing aboard ship. Non-stabilization of this system and a lack of appropriate sensitivity precluded the use of hover position indicator as a visual landing aid for helicopters.

Harrier evaluation of the HPI was conducted to assess the feasibility of system use for its original design objective as a pure hover position indicator, i.e., a visual landing aid providing altitude and drift information following culmination of a HAPI approach and visual acquisition of the deck. The sensitivity and stabilization deficiencies experienced by the helicopter did not affect the *Harrier* pilot's ability to maintain a stable hover and landing, due to the close proximity of the AV-8 to the HPI following the HAPI approach. The HPI system is currently used by AV-8 aircraft for night hover/landing cues following a HAPI approach.

During the initial evaluation periods aboard *Tarawa*, the amphibious assault ship night lighting system was found to be unsuitable for night AV-8 operations. The integral ship lighting package did not provide sufficient definition of ship features to allow pilots to safely hover and land. In addition, the overall night lighting system aboard *Tarawa*, was found unsuitable for *Harrier* operations.

In order to rectify this, Naval Air Test Center personnel, working with a Naval Air Engineering Center project team, recommended a modification to the ship lighting package that includes the following:

- Ten low pressure sodium lights as indicated: One 90w and 135w on

Landings

forward flight deck; three 55w on port side of island; one 90w on aft flight deck area; one 35w on aft island area; one 35w below SPN-35 radar dome; two 35w on stern.

- Deck edge lights modified to include a white section with approximately 100 degrees of aft coverage.

Although not the ultimate solution, the modified ship lighting package provides acceptable cues to allow both rotary wing and AV-8 pilots to perform the tasks of approach, hover and landing with significantly increased safety.

The end result of the overall developmental program was the Western Pacific deployment of *Tarawa* with day/night VMC and limited IMC certification for both fixed and rotary wing aircraft. This certification cleared the ship for IMC helicopter approaches to minimums currently contained in NWP-42 Shipboard Operating Procedures of December 1977. At the same time, *Harrier* approach minimums were recommended at 700-foot ceilings and two nautical miles visibility due to limitations of the approach control radar. During the Indian Ocean deployment, the AV-8 was actually operated with 1,000-foot ceilings and four nautical miles visibility weather minimums due to the radar limitations.

The visual landing aid and night landing package were evaluated by embarked fleet units during the just completed *Tarawa* deployment in the Indian Ocean. The evaluation, monitored on site by a NavAirSysCom special project officer, served as a significant data source in the VLA optimization program under the Navy vertical takeoff and landing capability development (NAVTOLAND) project under the Naval Air Systems Command. Current NAVTOLAND shipboard trials aboard *Tarawa* will confirm the final visual landing aid configuration for LHA/LPH-class ship operations of the AV-8 and helicopters.

Gripe

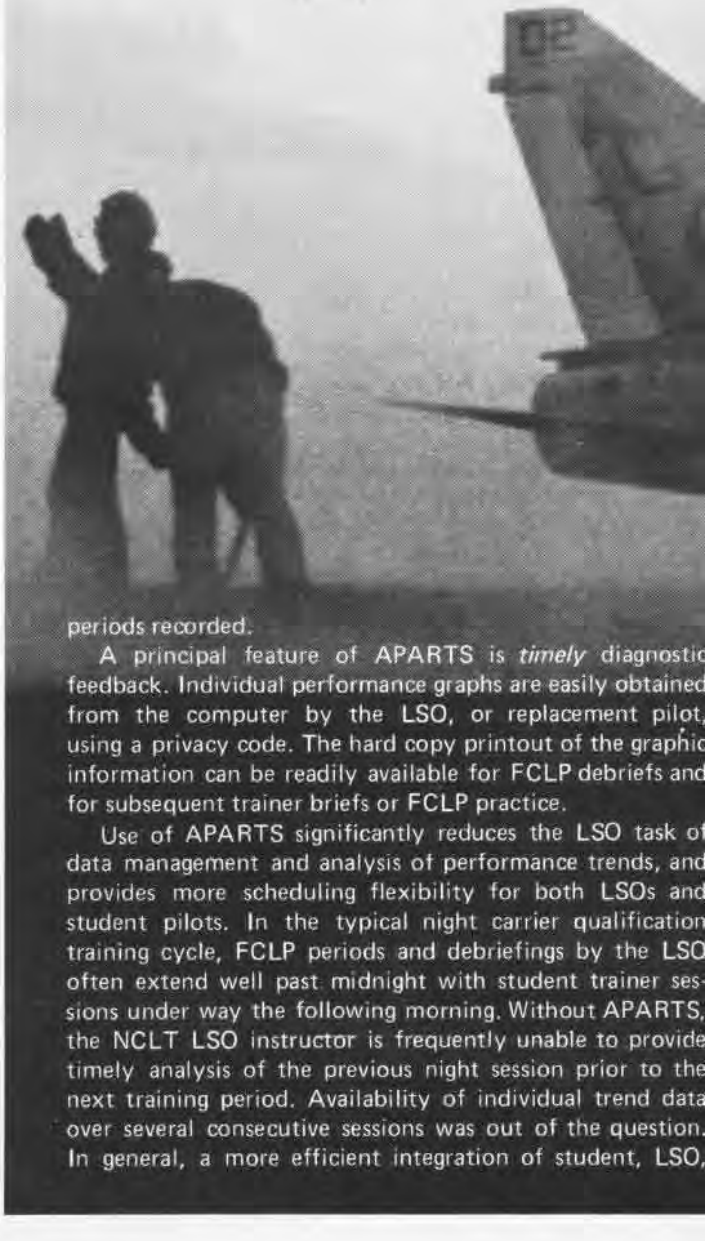
Analyzing night carrie

"I am not trying to impress anyone this first time, I just hope to survive." This statement, made recently by a young pilot just before night carrier landing qualifications, reveals the tremendous stress pilots experience during their first night carrier landings. Much of this stress is passed on to the Landing Signal Officer (LSO) who has the responsibility to train replacement pilots to safely and expeditiously perform night carrier operations.

The two primary training devices available for carrier landing training are the aircraft used during field carrier landing practice (FCLP), and night carrier landing trainers (NCLTs) such as those in use by the A-7, A-6 and F-14 communities. In a typical FCLP "bounce" period, the LSO grades and records several comments on each of the 10 to 12 landings/passes made by each of the 10 to 12 replacement pilots. This data accumulates over 10 to 12 night FCLP periods. In the past, management of landing performance data was entirely manual – very time consuming. As a result, it was not feasible to provide detailed diagnoses of landing problems or trends for any individual pilot.

Today, however, an innovative performance measurement system has been developed to assist the LSO in automated performance data management and analysis. This system, called automated performance assessment and remedial training system (APARTS), is a research and development project sponsored by ComNavAirSysCom and ComNavAirPac and managed by the Human Factors Laboratory, Naval Training Equipment Center, Orlando, Fla.

The APARTS application transfers the LSO's shorthand grades and comments for each student into a small, portable desk-top microcomputer. Grade transfer is easily accomplished as the computer is programmed to be "user friendly" and accepts comments in virtually the same format as recorded on traditional FCLP student grade sheets. Data for an entire night FCLP class can be transferred in approximately 20 minutes. Several data feedback display options are then available through a video monitor or paper copy presentation. These include general and specific landing problem analysis, data trend analysis for a specific FCLP period, and summarized performance over all FCLP periods recorded.



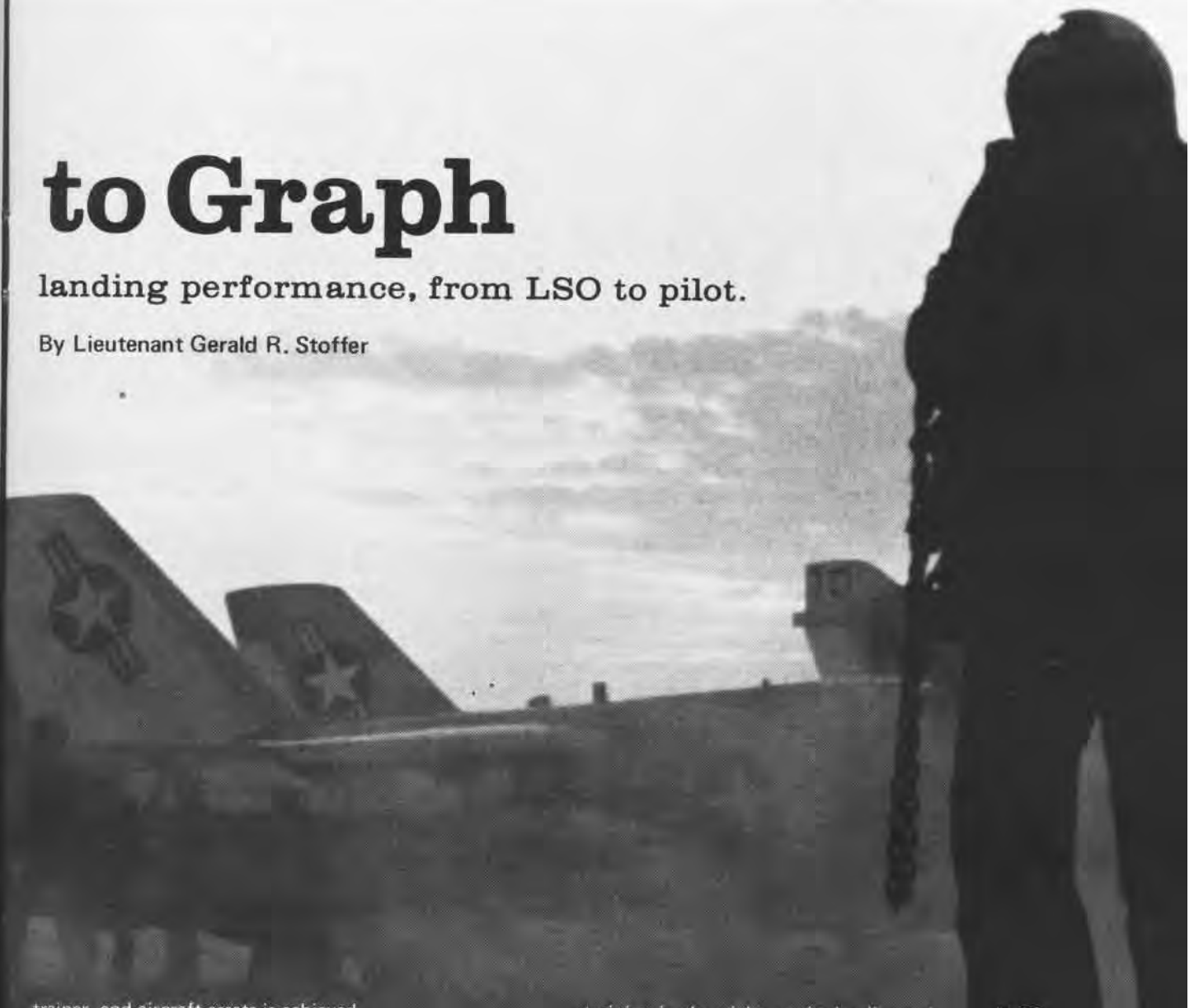
A principal feature of APARTS is *timely* diagnostic feedback. Individual performance graphs are easily obtained from the computer by the LSO, or replacement pilot, using a privacy code. The hard copy printout of the graphic information can be readily available for FCLP debriefs and for subsequent trainer briefs or FCLP practice.

Use of APARTS significantly reduces the LSO task of data management and analysis of performance trends, and provides more scheduling flexibility for both LSOs and student pilots. In the typical night carrier qualification training cycle, FCLP periods and debriefings by the LSO often extend well past midnight with student trainer sessions under way the following morning. Without APARTS, the NCLT LSO instructor is frequently unable to provide timely analysis of the previous night session prior to the next training period. Availability of individual trend data over several consecutive sessions was out of the question. In general, a more efficient integration of student, LSO,

to Graph

landing performance, from LSO to pilot.

By Lieutenant Gerald R. Stoffer



trainer, and aircraft assets is achieved.

Results obtained during the evaluation of APARTS in the A-7 and A-6 fleet readiness squadrons show that use of the system contributed to improved glide slope control and night carrier landing boarding rates. Additionally, potential disqual students were identified by their performance trend analysis as early as their fifth FCLP training period. APARTS diagnostics were helpful in determining the remedial training required for the successful completion of the carrier qualification evolution, thereby reducing the number of recycled CQ students.

Lieutenant Commander Jerry Singleton, officer in charge of the LSO Phase One School and LSO training model manager, states that the APARTS performance analysis can also be effectively used in student LSO training since LSOs develop individual trends much the same as pilots. LSO trends, such as slow in detecting lineup error and slow to determine critical wave-off points, can be documented through performance data analysis during training in the night carrier landing trainer and LSO reverse display simulator. Use of APARTS should result in the grooming of an LSO who is more capable, much earlier — at a point where he is needed most.

In addition to LSO/pilot training, APARTS has potential application to other training scenarios, such as weapons delivery training and others which involve voluminous amounts of performance data and analysis.

Further evaluation of APARTS is planned in other aircraft communities. Lessons learned will be incorporated into a final configuration production model for delivery of APARTS to fleet training units by early calendar year 1983. The improved skill and confidence imparted by APARTS should produce higher quality, more cost-effective training in the pilot/LSO community, and enhanced carrier aviation safety.

Lieutenant Gerald Stoffer, Ph.D., is a designated Navy aerospace psychologist. He is a member of the Human Factors Laboratory at the Naval Training Equipment Center, Orlando, Fla.

AVCARS Will Land

By Linda Williamson
Naval Air Engineering Center, Lakehurst, N.J.

"It's not so much that you can't see where you are, it's that you can't tell where you're going," thought Lieutenant Chuck Kaul as he walked away from the experience of his first night carrier landings. "There's got to be a better way!"

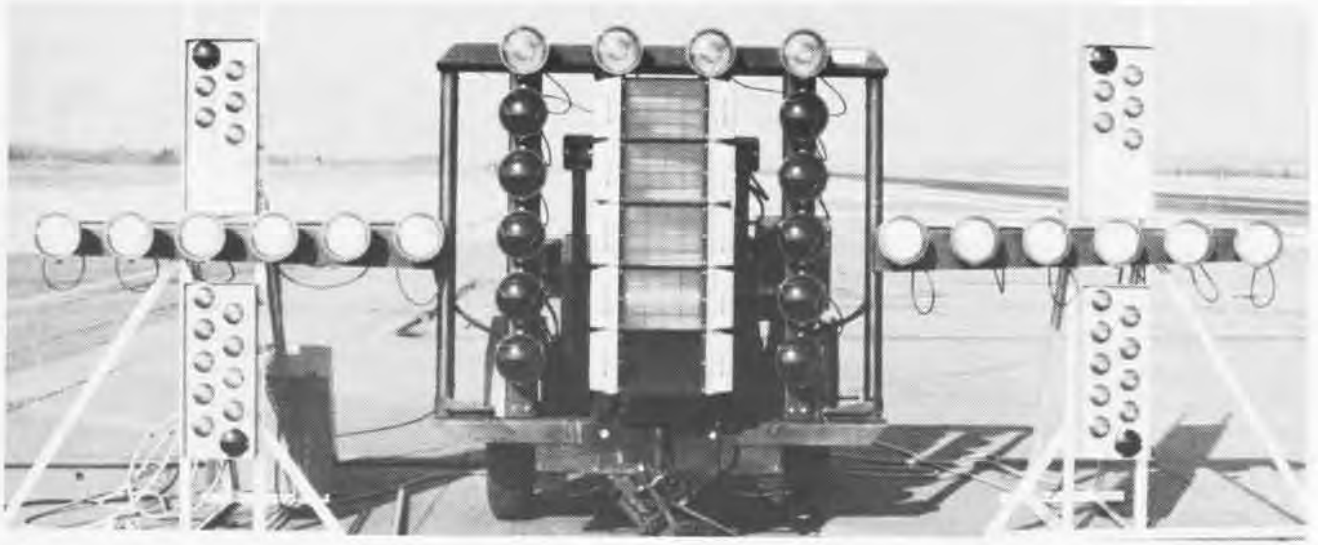
Several night landings later, the idea for an improved carrier landing system began to form in the mind of this aeronautical engineer pilot. He studied the circuitry and software programs of the Fresnel lens optical landing system (FLOLS) and formulated a design which would, in fact, tell carrier pilots where they are going, in addition to where they are.

Lt. Kaul's proposed design modified the FLOLS to additionally display vertical velocity (sink rate) cues to the pilot via a pair of vertical light bars mounted on both sides of the FLOLS apparatus. The concept, now labeled augmented visual carrier aircraft recovery system (AVCARS), involves state-of-the-art technology and off-the-shelf equipment which is either in use or could be acquired at a relatively low cost. Its tremendous potential for enhancing the safety and efficiency of carrier and field landings has been demonstrated in the visual technology research simulator (VTRS) at the Naval Training Equipment Center in Orlando, Fla.

The rate cueing system was evaluated against the conventional FLOLS by several experienced fleet carrier pilots and LSOs during night case III conditions in the VTRS. Reductions in average glide slope error of 50 percent "in the middle" and 40 percent "at the ramp" were demonstrated. Improvement in lineup control was also noted, suggesting that AVCARS reduces glide slope workload, allowing added attention to lineup.

The error cues, called arrows, are vertically displaced thermometer-type lights which extend below the datum lights to show excessive sink rate and above the datum lights to indicate insufficient sink rate. The length of the arrow indicates the amount of sink rate. No arrow indicates "on glide slope." Glide slope errors are thus more easily controlled by using cues to determine both the amount of initial correction required, and the timing of subsequent readjustments prior to the detection of meatball movement. The effect of the rate cue display is analogous to that

Information courtesy of
Air Scoop
Naval Air Engineering Center



provided by the flight path marker in the A-7E heads-up display.

Field landing tests conducted at Patuxent River with F-4, F-14, A-7 and H-1 aircraft, using a modified FLOLS with AN/SPN-42 inputs, confirmed the potential results observed in the VTRS. Pilot response to the system was very favorable and resulted in funding of further testing. Shipboard tests were conducted with Patuxent River F-14 and A-7 aircraft in May 1981 aboard *Eisenhower* with highly favorable results. Flight test data is being analyzed for design of a preproduction model of the system with AVCARS incorporated. With luck, shipboard tests could take place by late 1981. Installation of an operational fleet carrier system is planned during FY 1982.

Final AVCARS configuration will incorporate the integrated launch and recovery television surveillance (ILARTS) plat camera with a passive video contrast tracking device in lieu of the AN/SPN-42. The ILARTS camera is currently operational on *Lexington, America* and *Eisenhower*. Lt. Kaul conceived the augmented visual carrier aircraft recovery system concept during his first tour as a fleet VS squadron pilot/LSO. His assignment to NAEC Lakehurst, N.J., in May 1979 provided a unique opportunity for firsthand involvement in the three-man Naval Air Engineering Center AVCARS team which includes the vital expertise of Mr. John Tomkavich, AVCARS project director, and Mr. George Bray, optical landing aids engineer.

Basic technology in visual landing aids for fixed wing carrier operations has not changed significantly in 20 years. Results achieved thus far with AVCARS indicates that this concept will result in significantly improved boarding rates and safer carrier operations. Lt. Chuck Kaul has been awarded the Navy Commendation Medal for his innovation and perseverance in the development of the AVCARS concept.

Photos by A. Lamphier

Using AVCARS, an F-4 Phantom touches down at the Naval Air Engineering Center, Lakehurst, N.J. Above, the new AVCARS system features 10 lights, attached above and below, on each side of the basic Fresnel lens optical landing system.

Testing!

By Commander J. H. Rockwell

NPE time at Test Pilot School! It conjures up different images for different people, depending on whether one is a student, a recent graduate, or an instructor.

NPE stands for Navy Preliminary Evaluation, an exhaustive first-look test required by the Department of Defense of most new aircraft and equipment which the Navy is considering buying. At Test Pilot School, NPEs are simulated, performed by students on aircraft already operational, as the final exercise prior to graduation. A student test pilot's NPE gives him a chance to put the difficult lessons learned over the previous 11 months into practice and to thoroughly evaluate, for a specific mission, an airplane which he has never flown.

The student who is about to embark on an NPE sees it as a combination of work, adventure, *work*, opportunity, and WORK. He is seldom disappointed.

The recent graduate recalls the rigors of the exercise, but he also remembers it as a unique experience. How many Navy or Marine fighter/attack pilots have had a chance to bag four flights in an F-100, B-57 or RF-8G? From a practical standpoint, he will use his NPE experience again and again as a reference and constant companion during his "real world" flight testing and reporting.

The TPS instructor has yet another perspective, a combination of work and adventure, at the thought of flying a new airplane. (Yes, there are a few good deals for those who become TPS instructors. Ask those who recently had an opportunity to fly the SNJ, or who were participants in a European field trip.)

To understand what the NPE means, one should have an idea how the school works. Students are subjected to 11 months of intensive instruction in academic theory, flight test techniques, project management, and reporting writing. The first half of the course is devoted primarily to aircraft performance, the second to flying qualities. Each exercise consists of a classroom briefing by a flight instructor; a demonstration flight with a flight instructor; one or two solo data flights, in which the student uses techniques he has learned to generate data in the school's stable of aircraft; and a report, which is graded and debriefed. Concurrent academic classes provide the necessary theory for a full understanding of the lessons to be learned in each exercise.

At the end of the performance phase, the longitudinal flying qualities phase, and the lateral-directional flying qualities phase, the student flies a check flight with an instructor to assess his overall comprehension of the lessons included in that phase (and, equally important, to assess the quality of instruction). By NPE time he has been exposed to, and tried his hand at, virtually all significant phases of aircraft test and evaluation – from the human factors of cockpit design, through ground handling and takeoff performance, to stalls, spins, systems evaluations, autorotations, turning performance, and even a warm-up one-flight qualitative evaluation of a plane he has not flown before (with a vastly reduced scope and less formal report than the NPE, of course). He is now ready to plan, fly and report on the total aircraft and its potential to perform the mission – putting it all together.

The NPE exercise is briefed six weeks prior to graduation. At this brief, students are assigned to specific aircraft and are given a week to turn in a comprehensive test plan for approval by the grading instructor. The next week there are no academic classes scheduled so that students will be able to travel to the home base of their NPE airplanes, if necessary. (Edwards AFB; Dallas; Houston; NAS Miramar; Madison, Wisc.; Atlantic City; and Eglin AFB are a few examples of the sites where student NPEs have recently been conducted.) Each student is permitted four flights or six hours of flight time, whichever comes first, in his NPE aircraft. He then has two weeks in which to write his report. The reports are graded, reviewed, returned to the students, and debriefed just a few days prior to the class graduation. The best reports are submitted to a committee of flight instructors who select the top report for that particular class. The author, whose identity is kept secret from everyone except the committee, is honored with the "Best NPE" award at the graduation ceremony.

What sort of planes are used for NPE? Many different types are available, from the old B-57, F-8J and H-52 to the new F-15, S-76, LAMPS MK III system and F-16; from the small F-5 and B0-105 to the large C-130 and H-54. The underlying spirit of the Naval Test Pilot School is to train better evaluators and better test pilots by exposing them to as many different types of aircraft, systems and flying qualities/performance combinations as possible during their course of instruction. This not only makes them aware of what is out there in the world of aviation (Sometimes the old planes seem better than the new ones!) but also sharpens their powers of observation and gives them experience in communicating their findings to the decision makers in the Naval Air Systems Command and Office of Chief of Naval Operations. The whole purpose of a test pilot's existence is to function as a "sensor." He must evaluate a system and communicate his findings. The NPE, in addition to being an adventurous hell-week of work, is the final step in making him the most accurate sensor possible.

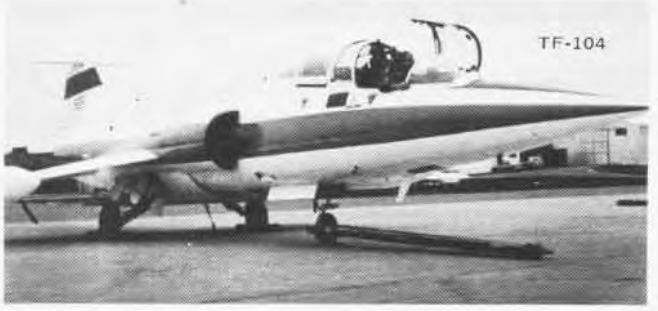
Testing!

F-105

Note: Deadline for applications to TPS Class #82, which convenes in January 1982, is July 20, 1981. Late applications will be considered until August 20 on a case by case basis. NAVMILPERSCOM INST. 1331.1 applies.

BO-105

F-5F



TF-104

CH-47C

F-16

naval aircraft

Over the years Marine squadrons for the most part have flown the same type aircraft as their Navy counterparts. Occasionally, though, their mission has called for special types, the V/STOL *Harrier* being a current example. Back in the late twenties, urgent needs for aircraft in shore-based operations in Nicaragua and China led to the adoption of a P&W Wasp-powered derivative of the Army's standard Curtiss *Falcon* as a land-based general purpose tactical aircraft. Changing foreign situations resulted in most of these Marine *Falcons* serving in the U.S. being utilized by observation and utility squadrons well into the thirties.

The Curtiss *Falcon* was originally designed as an observation plane for a 1924 U.S. Army competition. While not initially successful, it was the winner a year later and production began in 1925. With the Curtiss D-12 engine, its performance was quite impressive for a two-place observation plane; and 45 O-1Bs, a large number for that time, were ordered in 1927. Additional Liberty-powered O-11 *Falcons* were also ordered for the National Guard. In mid-1927, the Navy's Bureau of Aeronautics initiated a contract with Curtiss for three experimental derivatives of the O-1Bs as convertible (land plane or seaplane) two-place fighter, scout or bomber aircraft. Two F8C-1s would have P&W R-1300 400-horsepower Wasp engines, and one F8C-2 would have a 525-horsepower P&W Hornet. In that the F8C-1s were similar to Wasp-powered versions being developed simultaneously for the Army, their design and construction moved along in the early fall, while the details of the F8C-2 and the float landing gear were being worked out.

In October, the Marine's urgent needs for two-place aircraft of this general type in China and Nicaragua brought a complete change to the F8C program. Twenty-five additional *Falcons* were ordered. Four were Wasp-powered land planes directly derived from the O-1B, while 21 F8C-3s were to be similarly derived from the Army's A-3 attack version of the O-1B, having a .30-cal. machine gun, outboard of the propeller arc in each lower wing. The remaining F8C-2 on the original contract was to become a completely new design two-place fighter, suitable for carrier operations.

Recognizing the urgent need, the first F8C-1s of the production order were to be delivered by January 1, 1928, with the contract signed on November 21, 1927! To meet this delivery date, the two F8C-1s under the earlier experimental contract were appropriately reconfigured and switched to become the first two on the production order, the fifth and sixth taking their place in the production F8C-1 configuration when delivered in February. By the time these were delivered, some additional confusion was created. It was recognized that the *Falcons* were not really fighters, but more clearly observation or light bomber types. Thus, in December, they were redesignated OC-1 (F8C-1) and OC-2 (F8C-3). In January, after Curtiss had redone and repainted things to suit the new policy, the Bureau reversed itself and switched back to F8C-1 and F8C-3 as official designations "to avoid confusion." However, in view of the cost of revising and repainting, OC markings were allowed to remain. By the summer of 1928, with the contracts completed for all but the XF8C-2, the OC designations were made final.

OC-1 and OC-2

The first F8C-1 went to Anacostia for trials in early January while three others were completed and prepared for shipment to Nicaragua. Subsequent airplanes followed from February on, some going to the Third Brigade in China, and then to service in the United States. Trials and early service led to changes. The starter system, was modified (the hand crank couldn't be turned from the ground) and the wing bomb racks were moved outboard (so that the bombs would drop clear of the wheels when dive bombing) along with correction of other minor problems. Generally, however, the

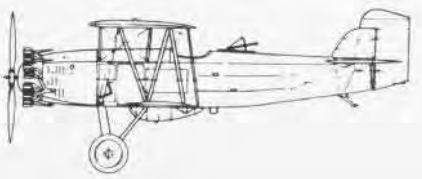
O-1B

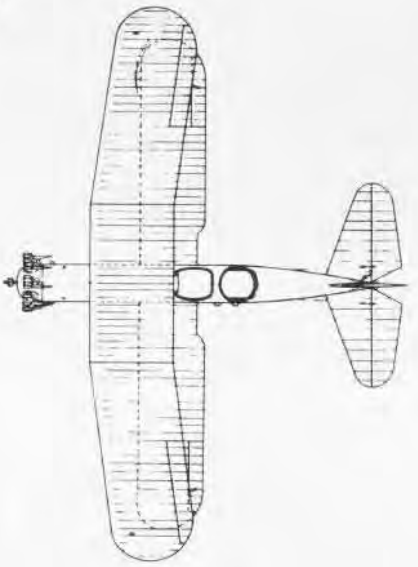
FALCON

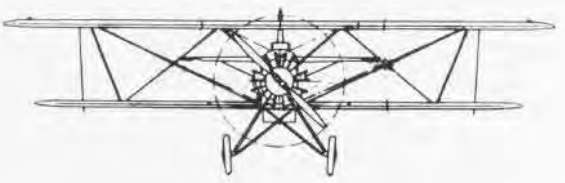
F8C-1

F8C/OC

	OC-1	OC-2	XOC-3
Span	38'	38'	38'
Length	27'11"	27'11"	28'
Height	10'3"	10'3"	10'10"
Engine	P&W R-1340 410 hp	P&W R-1340 410 hp	Curtiss H-1640-1 600 hp
Maximum speed	137.5 mph	137.5 mph	146 mph
Service ceiling	17,300'	16,850'	18,850'
Range	675 miles	675 miles	–
Armament	1.30 or .50 fixed 2.30 flexible 4 100-lb. bombs	1.30 or .50 fixed 2.30 fixed 2.30 flexible 4 100-lb. bombs	none installed







Falcons were found to be quite satisfactory for the Marine Corps mission. In 1929, one of the OC-1s was modified with a Curtiss *Chieftain* 12-cylinder, twin-row engine (H-1640) for service tests of this unusual configuration engine. This aircraft was redesignated XOC-3.

The *Falcons* soldiered on for several years, principally with the Marine Corps West Coast Expeditionary Force squadrons at San Diego. They acquired ring cowls and other new equipment, while generally shedding their armament as they shifted over to utility service. The last OC-2 was retired in 1935.

XOC-3

Giving Tomcat a Brake

by Scott Chasen

With the recent boom in new composite materials influencing everything from the space program to the sports field, a new use for carbon composite materials is being tested at the Naval Air Test Center – carbon brakes for high-performance aircraft. Modern-day tactical aircraft place severe demands on brakes, while the requirement for weight savings and improved reliability and maintainability is increasingly important. Carbon composite materials offer high strength and low weight in addition to good thermal stability, making them ideally suited to brake components.

Before the brakes can be introduced into the fleet, extensive evaluation and qualification testing must be conducted at the Test Center to verify the safety and performance of the carbon brakes in the most severe land and carrier-based environments. In addition, the new brakes must be evaluated to determine their compatibility with other related aircraft systems. The prototype carbon brakes will be installed in an instrumented F-14A at the Center where the thermal and dynamic properties of the brakes and other relevant flight data can be telemetered to the real-time telemetry processing system. Here, the project engineer will monitor the data and assist the pilot during high-workload testing. Laser tracking will be utilized to measure velocities, decelerations and stopping distances. This data will be correlated with aircraft data and analyzed by the project engineer to examine the aircraft/system interaction and the effectiveness of the carbon brakes.

The evaluation will begin with the examination of carbon brake maintenance, servicing and operating procedures for possible fleet maintainability problems. Gear swings will be conducted with the aircraft on jacks to measure retraction clearances. After the functional tests and other static tests are completed, full taxi stops from slow speed up to full operational landing speed will be conducted in a gradual buildup sequence as confidence is gained with the carbon brakes. During this critical phase, the project engineer will monitor the aircraft handling characteristics and the brake system performance to spot potential problems. After confidence in the brakes is built up during normal taxi tests, the aircraft will be released for flight and the test program will be directed toward more demanding environmental and energy-related test conditions.

A rigorous series of antiskid tests will be performed to demonstrate the compatibility of the carbon brakes with the existing antiskid system and to assure that the mechanical response of the new braking system, coupled with electrical and electromechanical responses of the production antiskid system, does not produce any undesirable aircraft handling characteristics. Use of the antiskid system during a maximum braking effort puts the most demands on the brakes as they absorb more energy in a shorter time than would be present in a normal stop, where aerodynamic drag would assist the brake system during a long landing rollout. Antiskid compatibility tests will be approached in logical buildup steps until the worst cases of high-speed conditions are reached. Various combinations of wet and dry brakes will be combined with dry, wet and alternating wet/dry runway conditions to duplicate most conceivable scenarios.

Although all steps have been taken to ensure the safety of the aircrew and aircraft – including an on-site landing signal officer, rigged long-field arresting gear and ready crash crew – the pilot must be thoroughly acquainted with and continuously guard against any possible emergencies. A blown tire, brake fire, or wheel explosion, at high ground speeds, must be countered immediately, and the decision to fly or abort must be made without hesitation.

Throughout the program, test hardware will be carefully inspected and aircraft instrumentation data analyzed to detect adverse trends. Hardware and performance deficiencies, if they exist, will be reported so that the contractor can correct them before the brakes are introduced into the fleet. Fleet introduction of the carbon brakes is planned for late 1981 if the qualification tests are successful. The carbon brake evaluation is one of many projects being pursued at the Naval Air Test Center to eliminate fleet problems and to incorporate new technologies into the F-14 community.

NAVAL AVIATION HALL OF HONOR

This is the seventh in a series of articles on each of the first twelve men to be enshrined in the Naval Aviation Hall of Honor.

Patrick N. L. Bellinger

By Jeanne Gray

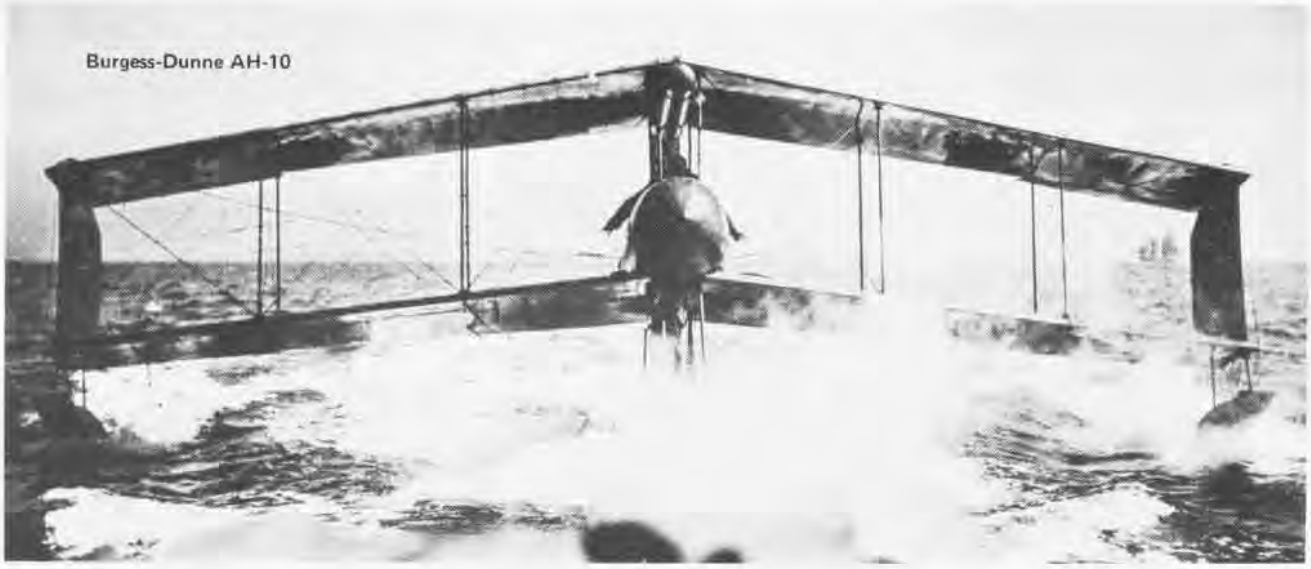
Patrick Nelson Lynch Bellinger's retirement from the Navy in 1947, as a Vice Admiral, closed a distinguished career that was marked by many contributions he made to the early development of Naval Aviation. As one of the foremost pioneers, his tireless efforts to define the role of aircraft in naval warfare were instrumental in gaining the acceptance of Naval Aviation in the fleet. He helped establish the role of aviation in war by demonstrating the capabilities of aircraft in aerial bombardment and in locating the enemy at sea.

In April 1915, flying the Burgess-Dunne AH-10 seaplane, Bellinger was the first to attain an altitude of 10,000 feet. He participated in night flying experiments with seaplanes in 1917, using flood lights. As commander of the NC-1 flying boat, he took part in the first transatlantic flight. Although his aircraft landed in the sea short of the Azores, it was a courageous effort to bring to fruition one of man's fondest dreams. It was the conviction and determination of men like Bellinger that led to the establishment of Naval Aviation as we know it today.

Bellinger graduated from the Naval Academy in 1907 and began his career in Naval Aviation only after his request for flight training had been inadvertently sidetracked. This came about when his detailer told a clerk to make out a set of orders for Bellinger to flight duty, and the clerk misunderstood the name to be "Billingsley." When Ensign Billingsley accepted, Bellinger's application was dropped. In the meantime, Bellinger served at sea in *Vermont* and *Wisconsin* on an around-the-world cruise with the Great White Fleet from 1907 to 1909. He became commanding officer of the submarine C-4 in September 1912, and was sent to Annapolis to participate in exercises to evaluate the effectiveness of aircraft in detecting submarines. It was there, at Lieutenant John H. Tower's suggestion, that he checked the status of his flight training request and straightened out the previous error.

Receiving his orders at this time, he reported to the Aviation Camp at Annapolis on November 26, 1912. Bellinger was given his choice of aircraft for flight training – either of the Curtiss or Wright hydroaeroplanes. After looking over the two types, Bellinger asked Towers which type he should select and Towers replied, "I fly the Curtiss." As a result, Bellinger selected the Curtiss aircraft for training because of his confidence in Towers' judgment.

Before he was able to make his first solo flight, he was transferred to Guantanamo Bay, Cuba, in January 1913 to participate in fleet exercises. There, he continued his flight training but had difficulty with landings. Towers asked where he looked when he was trying to land the plane and Bellinger said "straight down." Towers suggested that he look straight ahead and, using this technique, he made his first solo flight on February 1, 1913. While in Guantanamo, he participated in the Navy's first advance base exercise using aircraft to demonstrate their capability to scout as well as to locate submarines and mine fields. Much of the work at Guantanamo involved observers from the fleet. Flying was usually accomplished before 10:00 in the morning because the trade winds started picking up at that time. One day Bellinger returned from a flight and landed on the water as the wind began to blow. It lifted a wing and the plane slowly capsized. A boat was sent out to tow it ashore. As ground handling personnel tried to extricate the airplane from the water, the wings crumbled and only two parts of the plane, the engine and propeller, were salvaged. There were no aircraft to spare in those days, so they rebuilt the plane from spare parts and it retained its old designation of AH-3. Despite such mishaps, the aviation


Burgess-Dunne AH-10

concept was gradually introduced to the fleet. But there was considerable resistance along the way and there were many skeptics who had to be convinced of the effectiveness of the new idea.

There was good reason for skepticism. In addition to the problem of adapting aircraft to shipboard operations, the speed, distance and endurance of these machines were not very impressive. Primitive engines greatly limited their performance. Nevertheless, Towers thought their aircraft might be coaxed up to altitudes in excess of 2,000 feet, and he encouraged Bellinger to attempt such a record flight. As a result of Towers' urging, Bellinger made several tries and on June 13, 1913, attained an altitude of 6,200 feet. To accomplish this feat, he climbed until the airplane would fly no higher, stalled and fell off on one wing. Pushing the nose over, he was able to recover from the stall and landed safely. Stall/spin maneuvers, which are basic to any flight training program today, were still new and dangerous to aviators in 1913. Everything was accomplished by a sense of feel as instrumentation was nonexistent.

On January 14, 1914, Bellinger reported to USS *Orion* and proceeded to Pensacola, Fla., where the first Naval Aviation training station was being established. Soon afterward, he joined USS *Mississippi* which sailed for Veracruz, Mexico, during the occupation of that city from April 24 until June 12, 1914. Bellinger was in charge of the ship's aviation detachment, which consisted of a hydroaeroplane and a flying boat. Henry C. Mustin and Bellinger were the only two aviators on board and, since Mustin was captain of the ship, Bellinger was the only pilot available for reconnaissance missions. He bought an Eastman A-3 camera with bellows, which he used to take aerial photographs of enemy positions, thus demonstrating the use of the aeroplane for photographic reconnaissance. He experienced some difficulty in using the camera when the wind caught the bellows and while the idea had great potential it also required some development.

While *Mississippi* was en route to Veracruz, the hydroaeroplane was provided with wheeled landing gear which were fashioned aboard ship. The only protection for the aircraft was a pistol carried by the observer. During the Veracruz mission, Bellinger conducted the Navy's first bomb-dropping tests. He flew more than 43 consecutive days on missions to locate the enemy and to experiment with bombing techniques.

Inspecting his aircraft after one of his missions, Bellinger was surprised to find bullet holes in the wings. He was completely unaware that he had been shot at by ground forces. This was the first occasion on which a U.S. airplane had been fired upon in combat.

There were other notable firsts for Bellinger. Back in the U.S., he flew mail from *Mississippi* about 30 miles to the post office at Old Point Comfort, Va., on July 3, 1914. This was possibly the first air mail to be flown ship to shore.

Bellinger set the American altitude record of 10,000 feet for a seaplane on April 23, 1915. The flight was made in a Burgess-Dunne AH-10 swept-wing aircraft and lasted one hour and 19 minutes.

When the aviation section of the Signal Corps was unable to comply with the Secretary of War's request for a plane to spot for artillery fire, the Secretary of the Navy offered assistance. As a result, Bellinger received orders to Fortress Monroe on July 25, 1915. The major problem he encountered on this assignment was in communicating with the artillery crew. He had Very pistols and prepared cartridges of various colors for signaling. On the morning of the test, however, there was no wind and the plane could not take off with an observer aboard. Consequently, he elected to fly the mission by himself. Whenever he tried to load the pistol he had to let the plane fly itself toward the target. Although he experienced some difficulty, he completed the job

satisfactorily. As Bellinger put it, "The Army was pleased and the Secretary of the Navy gave me a Letter of Commendation."

In March 1916, Bellinger commanded a special aviation detail at sea off Guantanamo Bay and was provided with a new opportunity to prove the usefulness of Naval Aviation. Spotting for a battleship gunnery exercise, he conducted the first demonstration of aircraft-directed mortar fire – the first instance of spotting of this nature in the Navy. The flights averaged approximately one hour and 50 minutes in length.

In 1917, Bellinger returned to duty at Pensacola where he conducted the first night seaplane flight in which flood lights were employed to illuminate the landing area. This marked the first phase of regular night flying instruction in the Navy.

Bellinger won the Navy Cross for his service as commander of the NC-1 flying boat, which participated in the first transatlantic flight in May of 1919. His aircraft failed to complete the flight but a sister ship, the NC-4, made it all the way. Many years later Bellinger was instrumental in ensuring that the NC-4 was preserved for posterity.

Thirty years after he had become a Naval Aviator, Bellinger was promoted to Rear Admiral and shared air defense responsibilities at Pearl Harbor on December 7, 1941. He and his counterpart, Army Brigadier General F. L. Martin, had prepared a report earlier that year which emphasized the danger of a surprise attack by carrier-based airplanes. They prescribed a search plan to prevent such an attack but, unfortunately, neither aircraft nor trained personnel were available at that time to implement such a plan.

Bellinger held a succession of command posts in both the Pacific and Atlantic Fleets until his retirement in 1947. He died of a heart attack on May 29, 1962.

Vice Admiral Patrick Nelson Lynch Bellinger, USN(Ret.), was one of the nation's most illustrious Naval Aviators and played a key role in the evolution of Naval Aviation.

Lt. P. N. L. Bellinger and Curtiss AH-8 hydroaeroplane at Pensacola.

Naval Air War in Vietnam

Special Operations

This article is adapted from The Naval Air War in Vietnam, *a new book by Peter B. Mersky and Norman Polmar. It is previewed here with the permission of the Nautical & Aviation Publishing Company of America.*

Some idea of the unusual methods employed during the campaign along the Ho Chi Minh Trail can be obtained by looking at the activities of VO-67. Observation Squadron 67, with its highly modified Lockheed *Neptunes*, was such an unusual unit that it merits special attention. Enemy infiltration along the various roads and paths of the larger Ho Chi Minh Trail was so intense that Secretary of Defense Robert S. McNamara in the fall of 1966 requested that the Army propose additional methods of dealing with the flow of men and material from North Vietnam. The Army submitted a plan calling for the emplacement of seismic and acoustical sensors along the trails to detect traffic. Although the Army's plan was accepted, it would be another year until the system could be developed for planting with the proposed Air Force F-4 *Phantoms*. The Navy was tasked with the creation of a squadron to fill the gap.

As McNamara wanted the Navy unit operational by November 15, 1967, events moved rapidly – so rapidly, in fact, that at the squadron's commissioning ceremony on February 15, 1967, only 23 officers and enlisted men were on hand. Most of the additional complement was still in transit and training. Initial training, carried out under the auspices of VP-31, included survival and escape courses, counterinsurgency indoctrination and aircraft familiarization.

The aircraft which VO-67 was to operate was the veteran Lockheed P-2 *Neptune*, long the backbone of the maritime patrol squadrons of the Navy, as well as several allied countries. The model chosen for the squadron was the SP-2E, but with the large amount of internal and external modifications needed to outfit the plane for the squadron's

mission, the aircraft was redesignated OP-2E. These major external modifications, which were conducted by Martin Aircraft in Baltimore, Md., included the distinctive magnetic anomaly detection (MAD) tailboom to allow the introduction of chaff dispensers; the removal of the wingtip tanks; the addition of two SUU-11 7.62-mm minigun pods under each wing; the provision of internally mounted cameras; and fiberglass propellers. These propellers caused maintenance problems during subsequent operations, with 80 percent of the propellers changed during deployment due to damage from runway debris.

Internally, the *Neptunes* were also substantially altered. All ASW equipment was deleted and self-sealing fuel tanks were installed. A chaff system and various radios were introduced, as well as a Norden bombsight to direct sensor emplacements, and provision for M-60 handheld 7.62-mm guns in waist positions. Painted in a dark jungle-green camouflage, the "chopped and blocked" P-2s took on a sinister appearance in keeping with their highly secretive missions.

With the arrival of additional squadron personnel, bringing the total roster to 300, VO-67 left its base at Alameda, Calif., and arrived at Nakhon Phanom Royal Thai Air Force Base on the target date of November 15, 1967. The disproportionate amount of senior members made the squadron's rank structure top-heavy. The commanding officer was a captain, with 11 commanders and 5 lieutenant commanders. There were also 23 chief petty officers in the enlisted ranks. The heavy seniority was necessary, it was felt, to offset the lack of time for training and familiarization for the squadron. The senior pilots would be able to mold their crews into working units more quickly.

Nakhon Phanom was the home for several Air Force units, including HH-3 SAR helicopters, the colorful "Sandy" A-1E, A-1H *Skyraiders* which provided protection for SAR operations, WW II-vintage B-26 trail-interdiction aircraft, and Cessna O-2 FAC aircraft. Space on the base was so cramped that the new arrivals of VO-67 were forced to conduct maintenance on the ramps in the open, without benefit of hangars. However, at that time the Nakhon Phanom base did have the following facilities: officers open mess, NCO club, airmen's dining hall, base exchange, chapel, swimming pool, base theater, hobby shops, base library, and University of Maryland extension courses, plus a six-lane bowling alley under construction, in addition to barracks for the several thousand U.S. troops.

Modifications continued through January 1968, with the OP-2Es being equipped with terrain avoidance radar and a specialized LORAN navigational system. By February 2, 1968, all 12 *Neptunes* had been through the rotational mod program at Sangley Point in the Philippines, and squadron assets were at peak levels.

The squadron flew its first operational mission on November 25, 1967, and within a month had suffered its first battle damage. The first aircraft losses came in fairly rapid succession. On January 11, 1968, the *Neptune* carrying the squadron's executive officer, Commander D. A. Olsen, and his crew of eight failed to return from a mission. The wreckage of Olsen's plane was located at the base of a cliff two weeks later. It was determined that the plane had flown into the cliff in bad weather, while climbing out after dropping its sensors.

The next loss, directly attributed to combat action, occurred on February 17, when another plane was hit by AAA while dropping sensors from an altitude of only 500 feet. Escorting *Phantoms* called the VO-67 pilot to tell him his starboard engine was on fire. Climbing back into the cloud layer above him, the pilot acknowledged, saying he was returning to Nakhon Phanom and that he was "pretty beat up," which indicated further battle damage. However, three minutes later, the orbiting FAC in an O-2 reported sighting burning wreckage in the jungle along the *Neptune's* flight path. All nine crewmen had perished.

By this time, it was apparent that the lumbering P-2s, like their prop-driven contemporaries, the A-1s, could not survive in areas of antiaircraft concentration. On Feburary

RA-3B Skywarrior

18, a conference was convened to discuss the means of decreasing the OP-2E's vulnerability to ground fire.

As if to underscore the problem, the squadron's third combat loss occurred on February 27, when a *Neptune* was shot down during an emplacement mission over Laos. The plane had flown into a hornet's nest of 37-mm antiaircraft fire and one projectile had smashed through the fuselage, killing an enlisted crewman instantly and starting a fire which filled the aircraft with flames and smoke. The aircraft commander, flying from the right seat at the time, immediately ordered his men to bail out. The eight surviving crewmen jumped; seven were rescued by helicopter, but the aircraft commander, one of the last to leave the plane, was never found. Several other aircraft sustained hits from ground fire and, in one case, only the provision of self-sealing gas tanks prevented another loss.

The conference on the OP-2E's vulnerability made several recommendations, including a limitation to one pass over the target areas, alternative target areas, minimum weather requirements, and the suggestion that the use of smoke markers from accompanying FAC aircraft be reduced, especially if the target was plainly visible.

By June 1968, the decision was made to disestablish VO-67, but the date was pushed back in deference to the Air Force's request that the *Neptunes* remain for an extended period until the 25th Tactical Fighter Squadron could assume the mission. After an additional month, VO-67 was notified that it would be disestablished on July 1. The phaseout of operations and transfer of personnel began immediately, with all aircraft and men returning to the States by July 9. VO-67 was a unique, and uniquely short-lived, squadron. It was not followed by another similar unit and its activities have remained largely unchronicled. The men of the squadron overcame many unusual administrative and operational problems, including lack of formalized training and clerical help, weather and enemy defenses, to accomplish their assigned mission.

Other special Navy aircraft fought their own antitruck war, including the EKA-3B, yet another development of the venerable *Skywarrior*; the new A-6C TRIM; and the backbone F-4 and A-4/A-7 combinations. Thousands of trucks were destroyed by Air Force and Navy aircraft, but the influx of supplies and men into the south hardly slowed. By not cutting the stream of supplies off at the

OP-2E Neptune of VO-67

source, in Hanoi, Haiphong, Cam Pha and other North Vietnamese population centers, the campaign against the convoys that traveled the Ho Chi Minh Trail was doomed to failure.

Another of the many unsung units of the Vietnam War was Heavy Photographic Squadron 61, operating twin-jet RA-3B *Skywarriors* in various detachments from Guam to Da Nang and Don Muang Airfield in Thailand. VAP-61's mission was primarily cartographic photography, the large A-3 providing a near-ideal platform for the exacting work of mapping photography, as well as in-flight access to the several cameras. Active from the beginning of hostilities, VAP-61 provided new cartographic imagery to update old French maps, dating back some 20 years.

However, after the November 1, 1968 bombing halt, the RA-3Bs were given an intelligence-gathering mission along the Ho Chi Minh Trail – first during the day, and then, after the loss of two aircraft to small-arms fire, at night. Outfitted with infrared sensors, as well as a video real-time display, the A-3s roamed up and down the trails looking for night truck traffic. Usually flying no higher than 500 feet, the RA-3B's crew would train their sensors, looking for "hot spots," indicating traffic on a road. Keeping track of the trucks on his video console, the crewman could call down orbiting A-4s from the offshore carriers to "pounce" on the traffic. Although the VAP-61 aircraft flew sometimes three missions a night, the best time seemed to be near dawn, when the Viet Cong drivers pulled their trucks off the trail to hide them during the day. These concentrations of vehicles created larger hot spots which showed up accordingly on the video console, indicating a larger target for the A-4s. Forty-man dets were established at Da Nang in January 1968, which permitted the aircraft to operate with more than one carrier group each night, increasing the aircraft's effectiveness.

Another facet of VAP-61 (and its sister unit VAP-62, which operated under 61's authority at Da Nang) was its camouflage-detection activity, using a special infrared film. This CDIR film could detect whether or not vegetation was alive. The Communists were adept at camouflaging their truck parts with cut trees. The special film could show when dead trees covered over a suspected area. After five and one-half years of combat operation, VAP-61 was decommissioned in 1970.

Forged by Fire

A Former Prisoner of War in Vietnam Remembers

by J02 Steve Bellow

When the first group of American prisoners of war returned home from Vietnam in February 1973, Americans everywhere waited anxiously to hear the hour-by-hour accounts of how they survived. Mixed with the good news of the POW release came the shocking details about life and death inside North Vietnamese prisoner of war camps.

One account is provided by Navy Captain Gerald L. Coffee, whose POW experience began in early 1966, while he was flying a reconnaissance mission from the aircraft carrier USS *Kitty Hawk* (CV-63) in the Tonkin Gulf. When enemy ground fire crippled his RA-5C *Vigilante*, the pilot and his navigator were forced to eject.

"Because we had been accelerating in an attempt to reach the open sea, our airspeed at ejection was about 680 knots, and I was knocked unconscious immediately," as he begins to relate the drama of his seven-year ordeal. "For all practical purposes, had I never regained consciousness, I would have died then and there.

"When I regained consciousness some minutes later, I found myself and my crewman floating in the water about a quarter mile offshore. He had stayed with me, giving up even what small chance he had to escape out to sea. Already, we had been spotted by Vietnamese soldiers, who now were coming toward us in several small boats, shooting all around us and over our heads."

Looking back to that day, Coffee recalls how he fell into enemy hands and was carted away. Speaking with eloquence and compassion, he also talks about the loss of his crewman. "I'm just not sure how my friend died," Coffee says. "But I'm sure he was killed sometime during the struggle when we were captured, for after that day I never saw him again."

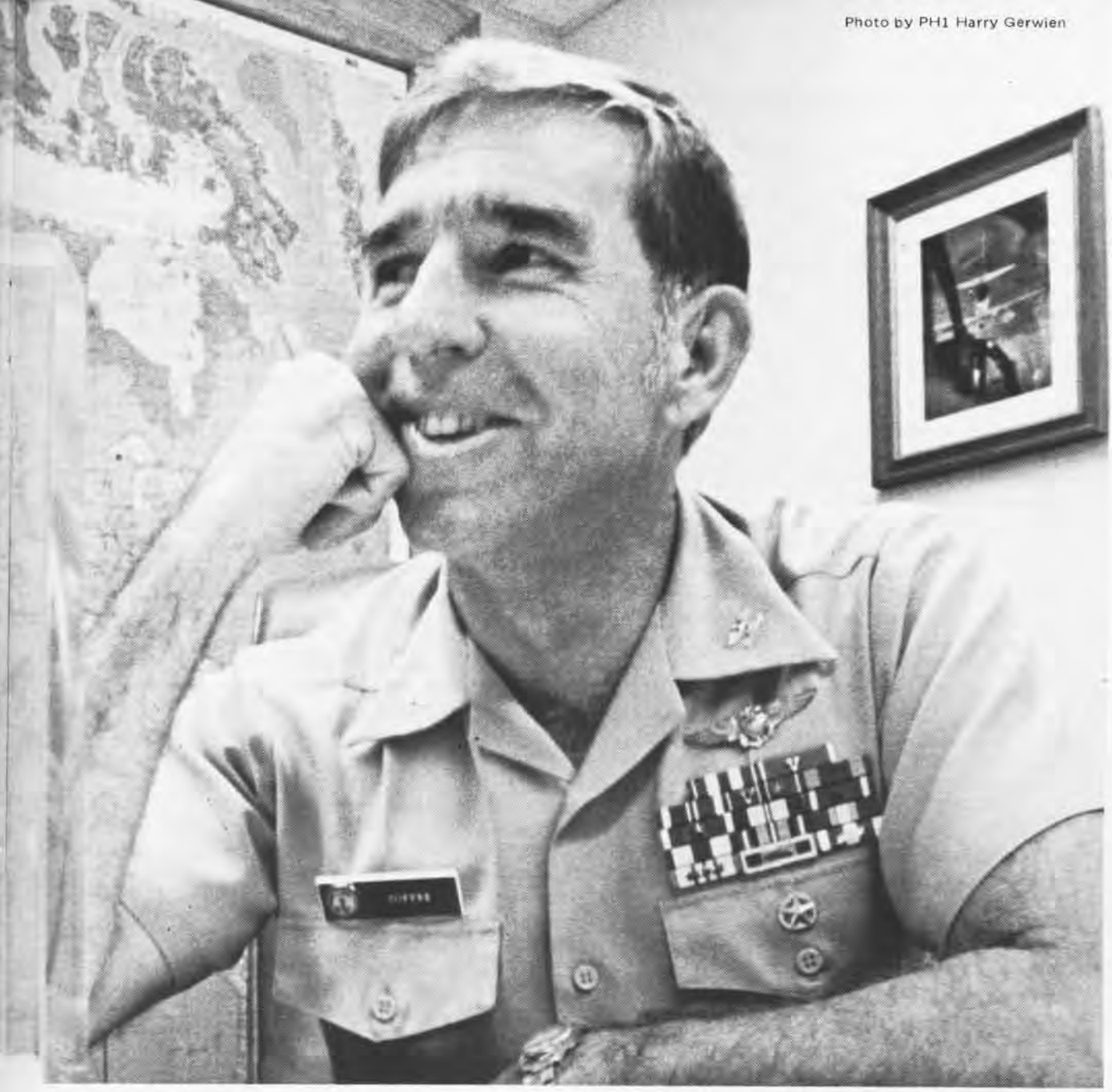


Photo by PH1 Harry Gerwien

Taken prisoner and loaded aboard a jeep-like vehicle, Coffee began the long trip from the coastline to Hanoi, not knowing what would be his destination or his fate. For days he went without rest or medical attention, even though he had suffered a broken forearm, dislocated elbow and shoulder, and cuts, burns and bruises as a result of the parachute jump from his burning aircraft. The pain made his trek into North Vietnam an almost endless ordeal.

"We traveled over rough, rutted, bombed-out roads until we finally reached the capital city of Hanoi," Coffee remembers. "We passed through the suburbs and kept going to the center of town before pulling up in front of that huge, formidable, fortress-like prison called Hoa Lo, which in Vietnamese means fiery forge."

With vivid recall, Coffee relives the moment of his imprisonment, telling how he came to the end of the long journey from the coast only to begin another long journey.

"The vehicle bumped through the gate of Hoa Lo prison and stopped in the courtyard. I was then taken through those big iron gates and led through the dark passageways to my first cell and shoved roughly inside. I heard the huge, wooden door slam shut behind me, and the heavy iron bolt slam home with a clank of finality. I looked around me and just couldn't believe where I found myself."

Jailed in a small, rodent-infested cell, Coffee's first months of solitude began. Describing that first cell, he recalls candidly: "There was a narrow cement slab along one wall, and this was my bed. At the foot was a set of ankle stocks, wooden on the bottom and with a heavy iron bar that came down across the top and locked with a crude, rusty padlock. One small can in the corner of the cell was to take care of all my physical needs. The cell just reeked of

the human misery, decades of human misery, that had been there before me."

Unable to forget the loneliness and torture he suffered during his captivity, Coffee still tells his story without prejudice or malice. He does not dwell on the cruelty of the interrogations or the inhumane and polluted environment he was forced to endure. Nevertheless, his narrative provides a vivid description of his anguish and anxiety, especially during the initial weeks and months when interrogations were usually the most intense.

"You always expected those keys to rattle outside your door at the wrong time of the night. And when they did, you knew it was your turn to go again," he tells his listeners.

"As I recall, my early prayers, though many, were rather futile. I'd pray, 'Please God, get me home soon. Let it be a military victory, POW exchange or whatever. I don't know how long I can last like this.' "

As time went on, Coffee's prayers became more pragmatic. "God, help me make this time count for something positive. Help me to use this time productively, to emerge a better and stronger man in every way. After that time, which was a turning point for me, my life there took on new meaning. Every day had a purpose."

As the days turned into months, and the months into years, Coffee and most of the other POWs at Hoa Lo found that life could go on, and that they could survive. Confined in their solitary cells, they prepared for the freedom they hoped would eventually come.

To stay physically fit, they paced their cells and exercised each day with sit-ups and push-ups, as many as their meager diet would allow their bodies to perform.

"We'd walk several miles a day there in our cells," Coffee explains with some humor. "Three steps and turn, three steps and turn — that was as far as you could go in any one direction. We called it the Hanoi Shuffle."

The POWs learned to communicate through the stone walls separating their cells by using a simple tap code. "Talking" through the walls, they shared their personal feelings, experiences and accomplishments.

"We spent several hours each day tapping on the walls to our neighbors," he remembers. "We refined the tap code with our own shorthand, abbreviations and slang. We became so proficient that even though the guards discovered the basis of the code and tried on numerous occasions to intercept our conversations, they were not able to."

To avoid periods of deep depression, the POWs worked to keep their minds active, studying and learning anything they could from each other. Coffee says that when he returned home, he received two years' college credit by examination for the French he had learned through the walls of Hoa Lo.

"We discovered our memory capacity was amazing," Coffee says. "At one time, I memorized in alphabetical order the names of over 450 prisoners there. Almost every man did this. If by some strange quirk of fate one could escape, be exchanged or released, he could carry that information to our government and to the families of those men who were being held prisoner.

"We memorized the books of the Bible and, alphabetically, the capital of every state. We also learned poetry."

When he was released, he had about forty poems committed to memory, some of them virtual epics with dozens of verses. Coffee often recites passages he still remembers from such poems as Kipling's "Ballad of East and West" and "If."

Despite their wretched plight and for reasons that made little sense, Coffee remembers he and the other POWs sometimes found themselves laughing. "It was just the sense of humor which has always been found in American fighting men, whatever their situation," he says.

But the laughter and humor never lasted. For on every single day of those seven years he spent in his solitary cell, Coffee was reminded of the enemy outside his door and of his distant home.

He recounts the intent and scope of the enemy's propaganda barrage at Hoa Lo. He tells how the enemy attempted to disillusion the POWs about their own country and society. "In the reading material provided from Hanoi press and through the prison loudspeakers, we read and heard everything that was bad about the United States of America, everything negative that we had the least to be proud of," he says.

"We heard about the crime, the disunity, the demonstrations and riots, the Manson murders, the Kennedy and King assassinations, all the things that would make us feel sad about our country. And frequently, amidst that overwhelming deluge of negative propaganda, we had to fight the cumulative effect as it began to take its toll."

Again and again, Coffee emphasizes how faith carried him through. His unrelenting belief in himself, his fellow prisoners, his family at home, his countrymen and his God brought him back alive, Coffee says.

"Keeping faith in our country and her cause there in Hanoi was not always easy," he remembers. "But we did. For those seven years, our Vietnamese captors tried to break our spirit and our faith, but they couldn't do it."

And he remembers each Sunday morning when the tapping of "church call" would pass through the walls. Every man would then stand in his own cell and, in some semblance of togetherness, we would recite the pledge of allegiance to our flag," he says. "We would recite the Lord's Prayer and, often as not, the 23rd Psalm.

"We realized as we watched and listened to the schemes of the Vietnamese officers and guards around us each day that despite the fact that we were prisoners our minds remained free. We pitied them, knowing they were destined to live under that system of theirs for the rest of their lives."

For all of seven years and nine days, Coffee and his compatriots remained determined to resist the enemy outside their doors. United, they continued each day to resist the pressure and the exploitation.

"I never gave up hope of returning home," he recalls. "While a POW, I vowed that, given the opportunity, I would one day share my experiences and the lessons I learned, and how faith helped me to survive."

When he did return home in February 1973, he kept his promise. After his return, Coffee began to share his story with military and civilian audiences whenever he was invited. At first, such occasions were few and infrequent. But more recently, as word has spread about his inspiring presentations, invitations have come from many regions of the country. In fact, he is finding it necessary to turn down some because of the priorities demanded by his Navy career. Yet, he still finds time to accept more than a hundred requests every year, using leave days and traveling mostly on weekends.

In the past year alone, he has addressed dozens of church groups, civic clubs and professional organizations, both in Hawaii and on the mainland. In recent months, he has found time to speak in Detroit, Boston, New Orleans, Anchorage, San Francisco and New York City. Locally, in Hawaii, he has spoken to Navy wives clubs, several large gatherings of Army soldiers at Schofield Barracks, and to students and youngsters at numerous area boys' clubs and scouting units.

Always speaking in uniform, he is especially committed to telling his story to America's youth who, he says, are usually his most attentive listeners. "I try never turn down an invitation to speak before a group of young people."

Over the past eight years, Coffee has accumulated several volumes filled with letters from people who found his story unforgettable. It is this response from his listeners, more than anything else, that encourages him to keep telling his story. "I am aware, even wary, of the potential obsolescense of the POW experience," Coffee says. "But as long as the response to my message continues to be so overwhelmingly positive, I will keep making the effort."

After one recent engagement, Coffee received a letter of appreciation from a teacher who noted: "I've never seen the students sit so still and attentive for so long for anyone before." Another person wrote, "Your talk changed my life. I found that the lessons you learned as a POW are applicable to me every day here at home. Thank you so very much."

For his contribution to Americanism, through his many voluntary public speaking engagements, Capt. Coffee recently was awarded the George Washington Honor Medal by the Freedoms Foundation at Valley Forge. Inscribed on the medal are the words, "For outstanding achievement in bringing about a better understanding of the American way of life."

The account of the capture of Lieutenant Gerald Coffee and loss of Lieutenant Junior Grade Robert Hanson that appears in the official history of Reconnaissance Attack Squadron 13 in 1966 is short. It begins with the report, "At 1306 (local time), on 3 February, *Flint River* 605 (RA-5C), with Lt. Coffee, pilot, and Ltjg. Hanson, navigator, launched from USS *Kitty Hawk* in the Gulf of Tonkin."

The mission was to photograph battle damage of a supply depot in North Vietnam. The first indication that something had gone wrong came with the report from Coffee that he was hit, had hydraulic failure and was climbing out. *Flint River* was apparently following the first general rule for Naval Aviators during the Vietnam War. It had quickly been established that, if damaged, the best chance of rescue by far was to make it to the Gulf of Tonkin before ejecting.

Less than a half an hour later, both men were in the water and the plane had exploded. Rescue personnel knew at the time that at least one of the two men had survived, since the manually activated "beeper" signal from the PRC-40 beacon was operating. In addition, a life raft was sighted by the search and rescue destroyer USS *Waddell* and a dye marker was observed in the water by both the rescue cover aircraft and the Crown Bravo *Albatross*. The account of Lieutenant Commander R. J. Simonic, flight leader of the rescue cover aircraft, was only a little more illuminating.

Working to suppress ground fire directed at the *Albatross*, Simonic and Lieutenant Junior Grade Kalember as wingman attempted to fire across Vietnamese boats, trying to pick up what Simonic assumed were the downed fliers. "We were receiving fire from the boats and the beach . . . . I then made a low pass near the boats in an attempt to spot survivors among the boats' occupants. . . . Negative results . . . . We continued to make runs to turn the boats without success. . . . We saw where the fire on the beach was coming from and we attacked. . . . This seemed to reduce some of the fire but we couldn't shoot the boats for fear of hitting friendlies."

Despite efforts to turn the boats back to sea, the craft made shore and Simonic made one more low pass to see who was getting out of the boats and running for safety. "I didn't notice anyone resembling an aviator or anyone being forced to the shelter of the ditches," he said.

The report by Coffee's squadron summed up the operation in the last two paragraphs.

"It is the opinion of this command that one or both crew members ejected from the aircraft and it is near certainty that at least one was subsequently captured.

"Pending receipt of further illuminating information, recommend continuing both Lt. Coffee and Ltjg. Hanson as Missing in Action."

The final paragraph was written in 1973 when after seven years as a prisoner of war in North Vietnam Lt. Coffee came home.

A native of Modesto, Calif., Capt. Coffee is a graduate of U.C.L.A. He joined the Navy in 1957 and is presently serving as Air Operations Officer at U.S. Pacific Fleet headquarters, Pearl Harbor, Hawaii.

TOUCH and GO

Forrestal Completes Type Training

The carrier *Forrestal* returned to her home port at Mayport, Fla., in late January after completion of a Type III training cruise aimed at preparing the ship and crew for deployment to the U.S. Sixth Fleet in the Mediterranean.

During the two-week cruise, off the coast of Florida, the ship and crew were tested in several areas, with special attention placed on combat readiness and damage control. General quarters drills were a daily occurrence, during which the crew trained to fight fires, flooding and other damage which would be expected during battle.

The cruise ended with a simulated two-day war in which a carrier task force battled an imaginary attacker. Aircraft from all of *Forrestal's* squadrons participated in the games, and simulated missile hits tested the crew's effectiveness at damage control.

Photo by PH2 Dave Dextradeur

Crewmen aboard Forrestal prepare for damage control training.

Work-up cruises, such as this one, are a major requirement for all ships prior to deployment, and training in the area of damage control is mandatory for all fleet sailors. **J03 John Gagne**

Helo Casting Catches On

Helo casting is not to be confused with fishing for tuna while holding a hover. Reconnaissance Marines will tell you very quickly that it is one of the more exciting ways to insert a force into an enemy-held coastal area.

Three companies from the Third Reconnaissance Battalion at Subic Bay recently had an opportunity to practice the technique in exercises near the Philippine base. Preliminary training was at the Subic golf course swimming pool, going off the 10-foot diving board. The real thing came later, when the Marines cast themselves from a helicopter moving over the water at 10 knots, about 10 feet from the surface.

Sgt. David P. Pshak was chief instructor and jump master for the exercise. He points out that the technique "can be dangerous if not performed properly."

"I once jumped at 40 feet from a bird that was moving at 40 knots," he recalls. "And I've got a few broken teeth to show for it."

The Marines were dropped in water 25 to 40 fathoms deep. "In a combat situation, the men would swim to shore and perform their mission," says Sgt. Pshak. "But for training purposes during the Third Recon's exercise, they were picked up by high-speed recovery, with each swimmer being yanked from the water by a large loop and deposited in a fast-moving patrol boat.

"The men enjoy 'hot dog' training like this," says Pshak. "It's only a small part of our mission, but we have a lot of fun doing it."

The "casting," with a variety of equipment and weapons, was followed by a return to the destroyer USS *Elliot*, dry clothing and a warm meal.

Pfc. D. P. Walker

Ranger Hosts Politicians

The carrier *Ranger* played host in February to Senator John Tower (R-Texas), chairman of the Senate Armed Services Committee, and Representative Bill Nelson (D-Fla.), a member of the House Budget Committee, during the ship's Indian Ocean deployment.

Tower and Nelson visited *Ranger* as part of an extensive trip through the Indian Ocean area to review national defense affairs and meet with representatives of foreign governments on matters of regional security and the U.S. role in the region.

Sen. Tower (left), Rep. Nelson and RAdm. Kirksey discuss carrier operations aboard Ranger.

Both men had strong praise for *Ranger's* crew and the approximately 20,000 personnel who make up the U.S. Indian Ocean battle group. In a closed-circuit television appearance, Tower told the ship's TV audience, *"Ranger's* presence in the Indian Ocean is a demonstration of the resolve of the American people to defend our interests."

Echoing Senator Tower's sentiments, Nelson added, "The crew of *Ranger* and all the Navy men in the Indian Ocean have the gratitude and respect of the American people."

Rear Admiral Robert E. Kirksey, Indian Ocean Battle Group Commander, embarked aboard *Ranger*, briefed the congressmen on Navy operations in the Indian Ocean, battle group logistic support, and the nature of Soviet naval activity in the region. Senator Tower and Representative Nelson also watched flight operations while aboard the carrier.

Ranger left her home port of San Diego September 10 last year and has been conducting operations in the Indian Ocean since October 1980.

Directing the Forward Traffic

You can't have traffic at a major intersection without a signal light. And air traffic control personnel can provide the same important service for an amphibious landing.

Marine Air Traffic Control Unit 73, a reserve unit of 57 persons, is trained to provide the aerial coordination necessary to an amphibious landing or to any front line area. At the heart of the detachment are three radar sets. The single, long-range search radar can spot a plane up to 200 miles away and determine if it is an enemy aircraft. Two smaller, more precise TPN-8 radars are used to track aircraft on final approach. According to the unit's commander, Major William D. Winters, the two TPN-8 radars are accurate to within a yard.

Home-based at NAS Willow Grove, Pa., MATCU-73 has 12 air controllers and 22 reservists working as technicians.

SSgt. Margaret Shipman operates the TPN-8 precision radar.

The monthly weekend training and the annual two-weeks active duty for training are aimed at keeping the unit ready to mobilize and deploy. Radar, radios, generators and supporting equipment are designed for easy assembly and disassembly. And to make sure that they, and units like them, are ready to deploy at any time, periodic mobilization, operational readiness and deployment tests are monitored by representatives of the Marine Reserve headquarters in New Orleans.

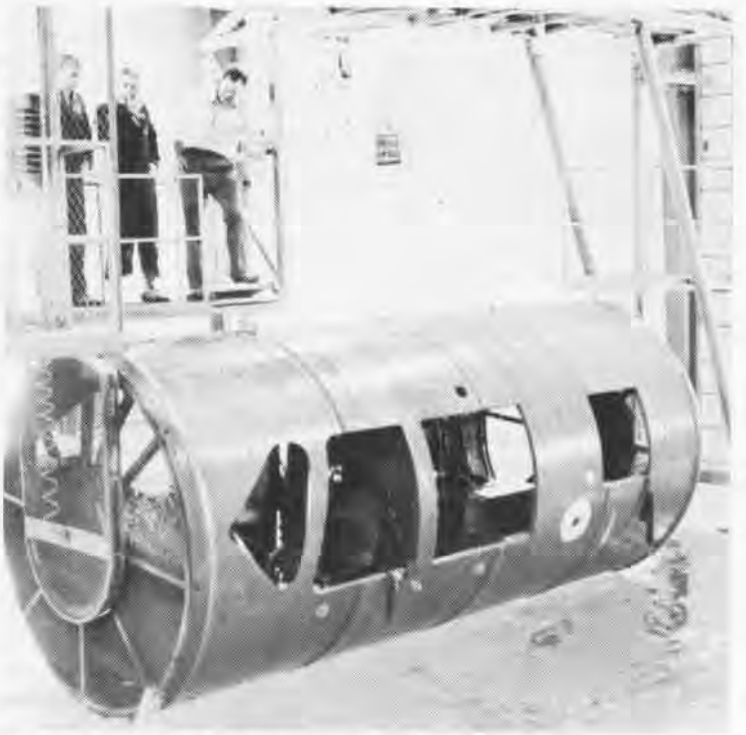
"On our last deployment test," says Maj. Winters, "we were set up and actually tracking aircraft less than two hours after our arrival.

"This is the best unit I've been involved with since I've been in the Corps. And that includes the time when I was on active duty."

Life Flight Extends Wings

Life Flight aircrews, providing emergency helicopter transportation to seriously injured persons in the Pensacola area, are extending their capabilities. Three members recently completed water survival training at the Swim Training Division of the Naval Aviation Schools Command.

According to Life Flight officials, knowledge of water survival techniques will significantly increase the probability of survival in case of a water ditching. Recognizing the need for adequate training, due to frequent over-water flights, the schools command has trained two groups of Life Flight aircrew personnel in the past 18 months. The training is similar to that received by student Naval Aviators, including basic swimming proficiency tests and instruction to eliminate deficiencies, instruction in water survival techniques, and rides in the multiplace "dunker."



Students prepare for a "dunker" survival test.

The "dunker" is considered an especially effective device to simulate, in a controlled environment, the problems of water ditching. The "dunker" can be configured to match a number of aircraft interiors. Trainees learn to exit the sinking or submerged simulator in a variety of situations, while Navy divers stand by to assist those who may have problems.

As one Life Flight trainee put it, "The multiplace "dunker" was excellent. Hopefully, I will never need the training, but my confidence in my ability to survive has been significantly improved." **Lt. J. H. Broadway**

Referral Works At Point Mugu

Prospect Referral Operation, known as PRO-Navy, is alive and well at the Point Mugu Pacific Missile Test Center, under the leadership of civilian Bob Scudder and Lieutenant Ron Wagner. The navywide program is designed to give those interested in the Navy's future an opportunity to refer prospective young people to recruiters.

"We have set up self-addressed, stamped postcards at the base post office," says Lt. Wagner. "Any person interested in joining the Navy may fill one out. On receipt of the postcard, the Navy Recruiting Command will have the local recruiter contact the individual named on the card."

Scudder, a Naval Reserve commander and chief engineer for airborne weapons, explains that PRO-Navy is not designed to replace local recruiters, but rather to augment their work by reaching more people. He adds that the major advantage of this program is that it provides an opportunity for contacting people who are reluctant to walk into a recruiter's office. And any background information on the card will allow the recruiter to address specific programs of possible interest to the candidate during the initial meeting.

Lt. Wagner is a Naval Academy graduate with an extensive background in aviation. He emphasizes the cooperation the program has received from the command. "That enables Bob and me to expand on PRO-Navy as it is designed by the recruiting command."

Both Wagner and Scudder feel the program has particular value in their area, since civil service or contractor personnel make up most of the Point Mugu population.

Scudder sums up the goal of the local PRO-Navy activity as an effort to "continue this fine tradition by making sure that anyone contemplating a Navy career is afforded the opportunity to get as much information as possible."

"The bottom line," adds Lt. Wagner, "is that there are a tremendous number of programs, specialties, subspecialties and educational opportunities to take advantage of in the Navy of the eighties. **Ltjg. S. D. Glutting**

Drop in Jumping

By SSgt. Jess Gonzales

Don't ever ask anyone in the Marine Corps Reserve's 3d Air-Naval Gun Liaison Company to drop in for a dip in your home pool. They do it the hard way, complete with parachutes and helicopters, but it all comes under the heading of specialized training. For example, when they were once teamed with aircraft from HMM-764, MCAS Tustin, Calif., they chose a high-altitude jump into Lake O'Neil at Camp Pendleton.

"It's an invigorating way to spend a weekend," according to Lieutenant Colonel Jacques C. Naviaux, company C.O. He, like most of his officers, is a jet pilot assigned to the unit, which directs air strikes and gunfire from ground positions. Sometimes, though, the problem is to get onto the ground, and a parachute is the fastest means. These Marines, training one weekend a month from their headquarters at Naval Station, Long Beach, and for two weeks each summer, learn to jump into tiny lakes, desert wastes and in mountain terrain. The training is important because parachutes are often used to get into otherwise inaccessible areas.

For the lake training, the jumpers were required to guide their chutes to the target – in this case, the lake – to disengage themselves from their harnesses while still in the air and to drop the last few yards, unencumbered, into the water.

Jumpers are taught not to release themselves from the parachute too soon. A free fall into water from a great distance has the same impact as onto concrete.

"But that's the easy part," says Captain Steven Vernon. "You must also tread water with full combat equipment, including boots and steel helmet."

A boat stands ready to fish out the jumpers, giving priority to any who appear to be in trouble. The parachutes are collected for drying and repacking.

"We're kind of a strange breed," Lt.Col. Naviaux explains. "Some people spend their weekends golfing, some surfing. Our people spend their weekends in rigorous training. What it comes down to is that we've developed the pride that goes with teamwork, and we enjoy working together."

The training is important because parachutes are often used to get into otherwise inaccessible areas. The drills teach the jumpers how to disengage themselves from their parachutes in a water landing.

PEOPLE·PLANES·PLACES

Awards

LCdr. Don Thune was recently awarded a Lockheed pin for 5,000 hours in the P-3. He has more than 5,700 hours in the aircraft, 4,200 hours of which are pilot time. With more than 8,200 total flight hours, LCdr. Thune is still racking them up in the *Orion* at VXN-8.

Rescues

Cdr. W. McDonald and the crew of HS-6 were awarded Navy Commendation Medals recently. They were flying a routine mission when an SH-3H helicopter ditched into the sea with four crew members and three passengers aboard. Cdr. McDonald and Lt. E. Chenoweth flew to the scene and deployed PO3 G. Beeson as rescue swimmer into 12-foot seas to assist the survivors. The crew hoisted aboard all 7 shipmates of the ditched helicopter and then proceeded to *Constellation*. Meanwhile, a motor whale boat had been lowered from *Constellation* to assist in the recovery. The boat was swamped in the heavy seas, hurling another five crew members into the water. With darkness fast approaching and only 50 minutes of fuel remaining, McDonald and Chenoweth launched once again from *Constellation*, with PO1 S. Hobart as the new rescue swimmer, and rescued the five crew members.

HSL-33, Det 7, deployed aboard USS *Downes* and operating an SH-2F helicopter crewed by LCdr. D. Swan, Lt. R. Caddell and PO3 W. Owens, with medical officer LCdr. R. Puckett from Diego Garcia aboard, recently evacuated a crewman from the bulk carrier *World Dulce*. The crewman had suffered a stroke. To fit the stretcher onto the helo, detachment maintenance personnel removed the aircraft's left cabin side panel and sensor operator's seat. The helo then transported the crewman to *Downes* (FF-1070) for medical attention.

A VP-45 P-3 piloted by LCdr. Wayne Howell received a distress signal on March 8 from the Israeli ship *Mezada*, located some 96 miles southwest of Bermuda. The ship was abandoned and sank shortly thereafter. High seas and strong gusts of wind had capsized her life boats, dumping the survivors into the water. The P-3 crew dropped emergency survival kits containing two seven-man life rafts, food, radios and flashlights to the ship's crew members. A Coast Guard C-130 and the P-3 *Orion* kept a close watch on survivors in the water. Four merchant ships were also directed to the scene to assist in rescue operations. Navy ships *Paul, Edson* and *Forrestal* also participated in the SAR mission. Eleven crew members of the ill-fated vessel survived. One of these was rescued by the Navy helicopter.

Honing the Edge

Captains Manuel Bezerra Barreto Reale and Luiz Oseas Fernandes of the Brazilian Air Force arrived at Cecil Field on March 23 for two weeks of training at LSO Phase I School. They were flown out the next day to *Coral Sea* to observe air traffic. Fernandes said he could tell he was on board an American aircraft carrier because there was a Coke machine in CIC.

The Brazilian pilots finished their U.S. training with VRC-30's LSO LCdr. Brian "Mad Dog" Burns who said, "They are excellent pilots." Each has flown approximately 1,100 hours on S-2s and logged over 100 arrested landings.

VF-161 recently completed its third Indian Ocean deployment in the last year and a half. The *Chargers,* in their F-4J *Phantom,* flew 1,180 hours in 653 sorties

during a five-month operational period. While deployed, the *Chargers* participated in a number of exercises. Especially noteworthy was the winning of their first air wing tailhook award in a two-month competitive cycle.

Record

Cdr. T. P. O'Connor of VR-51, Glenview, recently logged his 5,000th hour as a C-118 pilot. He also has 2,500 special crew hours

in the C-118 as a navigator.

Majs. T. D. Seder and David Van Esselstyn of VMFA-115 logged 3,000 and 2,000 flying hours, respectively, in the F-4 *Phantom.*

Sea Cadets

Capt. James G. Pirie, C.O., NAF Washington, is shown during a recent inspection of Dahlgren Division Sea Cadets and officers. A former POW in Vietnam, Capt. Pirie spoke to the cadets of his nearly six years in a North Vietnamese prison. Pictured, right to left, with backs to camera are: Cadets

Beverly Johnson, Joe T. Artis, David Allen, and Cadet Daniel Edwards at left. Behind Capt. Pirie is Dahlgren Division's headquarters building at the Washington Navy Yard.

PEOPLE·PLANES·PLACES

Et cetera

Tributes to an aircraft are usually given as the plane is wheeled into the musuem, but VP-8 would like to salute the P-3B *Orion* in a more glorified manner. VP-8 is the last squadron to operate the Bravo which will be replaced by the P-3 Charlie. The B version became a part of the Navy inventory in December 1965 and its longevity is evidenced by the fact that VP-8 possesses the second one to come off the assembly line. This faithful old work horse is not destined for retirement at the Davis-Monthan aircraft boneyard but will be busy training Naval Reservists.

The 12 F-4N *Phantoms* assigned to VF-201 are shown flying over Pyramid Lake, Nev., last summer during the squadron's AcDuTra deployment to Fallon. Led by Cdr. K. L. Fisher, the *Hunters* are one of two Naval Reserve fighter squadrons home-based at Dallas. Since most of the Navy's support facilities for fighter training are located on the East or West Coast, VF-201 deploys more frequently than most other tactical reserve squadrons. The *Hunters* boast of having some of the most experienced fighter aircrews in the Navy. Almost 30,000 hours of military flying experience are pictured in the photo.

Happy Mother's Day

Mother's Day in the Indian Ocean? That is where *Midway* was on Mother's Day, on Gonzo Station in the Arabian Sea. Crew members of *Midway*, commanded by Captain R. S. Owens, spelled out a personal message of love to their mothers, as seen in photo. *Midway* is currently on her fourth Indian Ocean deployment in two years and operates out of Yokosuka, Japan, as a unit of the U.S. Seventh Fleet.

Change of Command

Constellation: Capt. Dennis M. Brooks relieved Capt. L. A. "Bud" Edney.

CVW-14: Cdr. Richard A. Wilson relieved Capt. Vincent J. Huth.

HC-6: Cdr. Eric L. Peterson relieved Capt. Charles E. Plaugher.

HM-12: Capt. Charles E. Brooks relieved Capt. John M. Quarterman, Jr.

LAtWing-1: Capt. John Waples relieved Capt. L. W. Smith.

MAG-26: Col. Billy J. Kahler relieved Col. William T. Hewes.

NARU Norfolk: Cdr. Charles E. Patterson relieved Capt. John G. Colgan.

VA-82: Cdr. Dan Ryder relieved Cdr. Bruce Newell.

VA-1074: Cdr. D. W. Thornhill relieved Cdr. J. C. Harris.

VF-32: Cdr. William B. Hayden relieved Cdr. Donald L. McCrory.

VF-171: Cdr. C. Flack Logan relieved Capt. Lafayette F. Norton.

VP-47: Cdr. Dennis A. Pignotti relieved Cdr. Daniel T. Twomey.

VP-48: Cdr. Lawrence J. Le Doux relieved Cdr. Edward J. Crowely.

VP-0479: Cdr. Douglas Siebert relieved Cdr. Robert L. Wilson.

VS-22: Cdr. Richard C. Asbell II relieved Cdr. Danny J. Powers.

VS-41: Capt. Jerry E. Goodman relieved Capt. Henry L. Phillips, Jr.

VT-2: Cdr. Jerry M. Crumly relieved Cdr. Robert A. Montgomery.

VX-1: Cdr. John Meserve relieved Capt. Vince Onslow.

Professional Reading

Messimer, Dwight R. *No Margin for Error*. Annapolis: Naval Institute Press, 1981. 176 pp. $15.95.

This is the story of Commander John Rodgers' attempt to fly the seaplane PN-9 #1 from San Francisco to Hawaii in 1925. On its way across, the aircraft disappeared at sea and after an exhaustive search was presumed lost. Ironically, the plane went down at the same time the airship *Shenandoah* was lost with 14 lives, resulting in severe criticism of Naval Aviation. Rodgers and his crew turned defeat into victory when they stripped the fabric from the wings and sailed the aircraft tail first to Hawaii. Dwight Messimer has produced a well researched, true adventure story. It is a little known but important episode in the history of Naval Aviation. Illustrated.

Rausa, Rosario. *Gold Wings, Blue Sea*. Annapolis: Naval Institute Press, 1981. 216 pp. $15.95.

The significance of Navy wings to those who wear them is the underlying theme of this book. The narrative takes the reader from the author's first realization that he wanted to be a Naval Aviator through flight training to a fleet squadron and beyond. It is replete with colorful episodes that will bring instant recollections of one's own experiences in Naval Aviation. Refreshing, exciting and humorous, this book is a good insight into the special world of Naval Aviation. Illustrated.

Smith, Herschel. *Aircraft Piston Engines*. New York: McGraw-Hill Book Company, 1981. 238 pp. $18.95.

This book will be of interest to those with a particular fascination for the mechanical side of aircraft evolution as well as those with a more general interest in aviation progress. It is a comprehensive treatment beginning with the development of the earliest aircraft piston engines and covering all major types produced by major aircraft producing countries. Detailed but not overly technical, this is a history rather than an engineering treatise. Well illustrated.

Mersky, Peter B. and Polmar, Norman. *The Naval Air War in Vietnam*. Annapolis: The Nautical and Aviation Publishing Company of America, 1981. 224 pp. $17.95.

A pictorial history of Naval Air operations in Vietnam, including carrier and land-based and Marine Corps. The book covers the period from post-WW II French naval air involvement to the great American air campaign of the 1960s to the final North Vietnamese invasion in 1975.

Describes previously untold operations, including those of VO-67 and VAP-61, which employed the unusual OP-2E *Neptune* and the RA-3B *Skywarrior* along the Ho Chi Minh Trail. Air combat is well covered, including thefinal encounters of 1972 which gave the U.S. its first aces of the conflict. Aircraft development related to the war and its effect on the war's prosecution are also included, as are the politics of the various bombing campaigns and the 1973 peace initiative which finally brought about a cease-fire and the return of the POWs. Over 200 illustrations.

EMC — WHAT IS IT?

By Mr. P. J. O'Connor

The aviation community is generally familiar with numerous flying-related acronyms in use today. There is one term, however, that relatively few individuals are thoroughly familiar with and that is EMC, a general term that stands for electromagnetic compatibility. At the Naval Air Test Center in Patuxent River, Md., a small, dedicated group of engineers and technicians is heavily involved with EMC test and evaluation of Navy aircraft.

EMC by definition describes the successful operation of one or more pieces of equipment in an electromagnetic environment, internal to an aircraft or in a dense electromagnetic environment such as an aircraft carrier flight deck. The term EMC is closely associated with the term electromagnetic interference (EMI). Electromagnetic interference is defined as any emission, either radiated or conducted, which degrades the specified performance of avionics equipment. In other words, electromagnetic interference results from not having obtained electromagnetic compatibility between systems when integrated in the total weapon system.

Electrical or electronic equipment, operating in conjunction with or adjacent to other electrical or electronic equipment, is tested for EMC to ensure that each system does its job without causing EMI in any other system. Everything that carries an electrical current is radiating electromagnetic energy and every electronic device is, to some degree, susceptible to electromagnetic radiation. An interference source can range from the most complex to the simplest and smallest devices.

The potential safety-of-flight hazards associated with EMI are shown in the results obtained during past EMC tests on three specially instrumented aircraft at the Test Center. When the HF transmitter was keyed and modulated at several specific frequencies, the following was observed:

- The inlet turbine temperature, hook, lox, door open, probe out, wave-off, data link tilt, ten second, coupler available, and master caution warning lights illuminated.
- Emergency brake pressure fluctuated.
- TACAN No-Go light illuminated.
- Cancelled inertial navigation system lights were cancelled.
- Integrated radio control lights brightened.
- Horizontal situation indicator (To/From) pointer changed 180 degrees.
- All intercommunications lights illuminated and oscillated from green to amber to green.
- Parking brake lights and emergency brake lights cancelled.
- Angle of attack indicator changed six units.
- Low frequency automatic direction finder #1 needle oscillated approximately 30 degrees.
- Horizontal and vertical bars were driven off vertical direction indicator.
- Distance flag raised on the horizontal situation indicator.
- Left engine fuel flow indication decreased by 500 pounds.
- Radar altimeter needle oscillated between 0 and 5,000 feet.
- Loud thumping from the hydraulic actuators in the forward and aft section of aircraft was noted.
- Multi-purpose display was distorted.
- The automatic flight control system disengaged.
- Switching logic unit switched to Auto.
- Pitch/Roll/Yaw indicators oscillated.
- Prior to the transmission, the speed brakes were extended (open). The transmission caused the speed brakes to retract (close) and remain retracted.
- Left landing gear indicator unsafe (barber pole) was noted.
- Prior to the transmission, the leading edge flaps were fully extended. The transmission caused the leading edge flaps to retract to one-half their previous position and oscillate at that position.
- The barometric altimeter oscillated plus or minus 200 feet and the standby flag appeared.
- Severe oscillation of the control stick in the roll axis of the flight control was noted.

Many of these anomalies were traced to the susceptibility of the aircraft electronic proximity switches to high electromagnetic field strengths caused by the on-board HF transmitter. Similar anomalies were noted to be caused by the aircraft carrier HF transmitters during initial carrier trials of the test airplane.

Another instance of EMI or lack of EMC involved a helicopter engine which was inadvertently shut down because the instrumentation power supply wires were installed too close to the engine ignition actuator. Fortunately, this problem was identified during a ground EMC safety-of-flight test. The examples presented are but a few of the many interference cases that have occurred and illustrate the seriousness of interference with respect to flight safety.

Most of the Navy aircraft EMC testing is conducted in the EMC test laboratory at the Test Center. Designed and constructed 30 years ago as an electromagnetically shielded enclosure, the EMC test laboratory, or shielded hangar, is the world's largest structure of its type. Built in the "T" shape, the main section of the hangar is the size of a football field. The smaller part of the hangar is being modified for use as an anechoic chamber for tactical-sized aircraft testing such as the F-18, EA-6B or F-14. A lightning simulator and a computer-controlled electromagnetic environment generating system are located within the shielded hangar and are being updated to aid in the testing of new or modified aircraft.

EMC – what is it? Hopefully, it will be better understood in the future.

Letters

HS-15 Red Lions

I viewed with interest your chilling Aviantics photo of two of our helicopters, apparently passing close aboard, in your March 1981 issue.

You may be interested in the fact that the *Red Lions* were recently awarded the CNO Aviation Safety Award for the second consecutive year and the third time in the past five years. The squadron has surpassed 28,000 accident-free hours attained over the past seven and one-half years. HS-15 is the recipient of the following awards within the past year: CNO Aviation Safety Award; AirLant Battle E; ComSeaBasedASWWings-Lant HS Squadron of the Year; ComHSWing-1 Semiannual Maintenance Trophy (2); and the Captain Arnold Jay Isbell Trophy for ASW Excellence.

We are currently deployed aboard *Independence* with CVW-6 serving as an integral part of ComCarGru-8 in the Indian Ocean.

Bill Crossen, Cdr., USN
Commanding Officer, HS-15
FPO New York, NY 09501

Coast Guard

FANTASTIC . . . just a super article. We have dog-eared the first few advance copies of the April 1981 issue of *Naval Aviation News* that you sent to Jim Sutherland and have all agreed that your article was factual, will be most interesting to the uninitiated, and is just full of compassion for humanity; and, of course, that is just what saving lives is all about.

Just to keep you up to date on our SAR business:

FY 1981 – Cases	298
Lives saved	644
Lives assisted	785
Property value involved	$5,321,090

Again, your article "tells it like it is" and we appreciate your including us.

J. E. Foels, Capt., USCG
Commanding Officer
USCG Air Station, Miami, FL 33054

Reunions, Conferences, etc.

VPBs-103, 105, 110 and 114, Dunkeswell, England, 1943-45, FAW-7 Hedron reunion planned for the fall of 1981 in Minneapolis. Anyone interested, please contact: Donald Schierenbeck, 3710 North Abbott, Robbinsdale, MN 55422, (612) 588-6870.

Tenth Annual National Stearman Fly-In will be held September 9-13, 1981, at the Galesburg Municipal Airport, Galesburg, Ill. For further information, write to: Ted McCullough, 43 Indiana Avenue, Galesburg, IL 61401, (309) 342-2298.

New Space Shuttle Exhibit

A new exhibit devoted to the space shuttle opened April 6 at the Smithsonian's National Air and Space Museum.

Entitled "America's Space Truck — The Space Shuttle," the exhibit features a 16-foot model of *Columbia* on its launch pad, thermal protection tiles from the shuttle's exterior, and models of future payloads. *Columbia* is intended to be one of a fleet of shuttles, with four in operation by the mid-1980s as the space transportation system.

The Air and Space Museum has on display many examples of manned space flight. Among them are the *Apollo 11* command module; *Gemini 4*; *Friendship 7*; and a Skylab Orbital Workshop which visitors may enter.

The Museum also has galleries devoted to satellites, rocketry and space flight, exploring the planets and lunar exploration vehicles.

Aerial Refueling Squadron 208 traces its history back to July 1970, when it was commissioned as VAQ-208 at NAS Alameda, Calif., to provide aerial refueling, pathfinding and electronic countermeasure services for both active duty and reserve forces. Flying the KA-3AB Skywarrior, affectionately known as the Whale, the squadron has won the Battle E and the highly esteemed Noel Davis Award four consecutive times.

In 1979, the squadron's designation was changed to VAK-208, reflecting the primary emphasis placed on aerial refueling and pathfinding. Having served from as far west as the Indian Ocean to as far east as the eastern Mediterranean, and from the Arctic Circle to the Equator, the squadron, under the leadership of Commander Jack Dempsey, continues to provide these vital services to a new generation of naval aircraft.

squadron insignia

naval aviation news