NAVAL AVIATION NEWS

MARCH 1976

COVERS — *Front, PH3 Harold Brown filmed the launch activity aboard USS Enterprise in March 1975. A VA-196 Corsair is on the catapult, an A-7 from VA-97 is next and a VF-1 Tomcat waits its turn. PHCS(AC) R. L. Lawson was close aboard to film a VA-165 Intruder passing USS Constellation during exercises off Karachi, Pakistan, in November 1974, on the back cover. Above, the Phantoms of VF-51 lined up neatly for the camera of Harry Gann.*

NAVAL AVIATION NEWS

FIFTY-EIGHTH YEAR OF PUBLICATION

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editor's corner

The hard way. Although unintended, the first subsurface launching of a torpedo from a plane was accomplished at NAS Pensacola on April 26, 1924. Ltjg. (later rear admiral) George Van Deurs was a student Naval Aviator flying an R6L on a training hop. The waters of Pensacola Bay were glassy smooth. This caused him to misjudge his altitude and the distance from the torpedo launching point, and he dove into the briny deep. For an instant, the aircraft was entirely submerged. It popped back to the surface, minus its torpedo. Another pilot in an HS seaplane witnessed the splash, saw the torpedo skirt away and followed it until it had run its course. He attached a line to it and towed the torpedo back to the beach. The plane was a total wreck but Van Deurs suffered only a ducking.

Epistle by missile. Art Schoeni, writing in LTV's *Profile*, recalled the first attempt to send mail by missile. In September 1958, the supersonic *Regulus II* was fired for the first time at sea, from the submarine, USS *Grayback*, off Point Mugu. Fifty-five official letters were cached in a compartment aboard *Regulus*. Although it crash-landed near Edwards AFB when control pilots could not get its landing gear down, the letters were salvaged. They were mailed to President Eisenhower and other officials. Because of the crash there was no public mention of the mail portion of the event. The launching itself was lauded. Several other mail-missile flights have occurred and one, in the summer of 1959, was described as the "first official missile mail." In fact, Postmaster General Arthur Summerfield was on hand to remove some 3,000 specially designed letters after the *Regulus I* landed at Mayport, Fla. The "first" controversy has never been resolved but a few philatelic buffs own some rather rare covers, thanks to *Regulus*. In the photo, a *I* version booms skyward from USS *Randolph*'s flight deck in 1956.

Bible and bologna bunch. Protestant Chaplain Curt Brannan doesn't necessarily believe that the way to a person's religious commitment is through his stomach. But bologna sandwiches do help. About 50 men and women at Point Mugu's Pacific Missile Test Center gather once a week during lunch to study the Bible while consuming free sandwiches. LCdr. Brannan's enrollment has grown abundantly from the seven people who started the sessions a year and a half ago. He explains that the meetings are "primarily involved in the Scriptures and how they relate to the everyday life of Christians on this base." All hands are invited regardless of denomination or belief. Chaplain Brannan has had similar groups at previous duty stations. Mugu's is his largest and consists of civilian as well as military personnel. A former communications technician who believes the Navy is ". . . the best ministry in the world," he originally supplied the food himself. During one meeting, however, a member put an empty cup on a counter which was filled with money by the session's end. Although never requested, a cup full of money is now found on the counter after each get-together.

Shotgun solo. That's what they called it at Pensacola's VT-4. It was a syllabus hop for a "blue chip" class of 28 flight surgeons who graduated from jet flight training last December. The good doctors deviated from the normal syllabus route and trained in jets vice T-34s. On the shotgun solo an

instructor was aboard the T-2 *Buckeye* but took over only when the physicians needed help. The class consisted of 24 Navy doctors, an Army major and representatives from Argentina, Germany and Iran.

Speaking of wives. *Sealift* magazine recalls that "In the days when the Navy was the "new" Navy, wives were permitted to sail with their husbands. Many cruises were more extended than they are today and when a pregnant wife was overdue, the skipper fired a cannon which would activate that last "heave" to prompt the delivery. Hence the phrase, son of a gun. Perhaps, had there been carriers then, the offspring might have been called "son of a cat shot."

Naval Aviation NEWS did you know?

No Bomb Bombing

A research team at the Naval Postgraduate School (NPS), Monterey, Calif., is experimenting with a practice bomb scoring system that could eliminate the use of expensive dummy bombs. The system consists of a tracking radar, various electronic components and an inexpensive microcomputer.

Besides a potential saving of millions of dollars annually in dummy-bomb costs, the new development would have many other advantages, says Dr. Uno Kodres, director of the project. No-drop bombing practice is safer, it saves pilot and aircraft time, it requires no bombing range, it can use realistic targets. A form of no-drop bombing practice existed in the past utilizing radar bomb scoring (RBS) for heavy attack planes. The new method would involve smaller tactical aircraft.

The process is simple. First, the aircraft is tracked by radar. The information is transmitted to a microcomputer, which stores it as a position history of the aircraft. Next, the pilot "releases the bomb" by pushing a button that activates a radio signal. The computer coordinates the signal with the position history. Wind direction and velocity at the drop point are also recorded. With this information the computer calculates the "bomb's" trajectory and determines the point of impact.

The necessary equipment for the new system can be contained in a van and moved to the test point. Aboard ship it could be installed in a permanent location. "The basic package could cost as little as $1,600," says Dr. Kodres, "given the existence of a tracking radar with digital output." Such radars are usually available aboard aircraft carriers. The NPS project modified and used a surplus *Nike-Hercules* tracking radar.

Dr. Kodres and his team compare the results of actual bombing runs with the computer's predictions. The first such test was made in 1974 at China Lake. One television camera followed the airplane and another the actual drop of the practice bomb. Ground observers spotted the "real" point of impact. The results were favorable.

The team feels that the system could be valuable for training. The pilot knows his release conditions precisely and can immediately spot the point of impact. The system could also give the pilot a release tone to warn him to pull out of a dive run. Since the use of live ordnance would be eliminated, realistic targets such as bridges or buildings could be used. Under some circumstances practice bombs are still needed — where a pilot has to practice rolling in at very high gross weights and a high angle of attack. One disadvantage of the no-drop bomb is that pilots can't actually see where their practice bombs are hitting. They miss the puff of smoke they get from a dummy bomb.

A bigger sample of actual bomb runs is needed to make sure the system predicts accurately where the bombs are going to land. Dr. Kodres also plans to gather data on different kinds of bombs.

The basic no-drop bomb system is the brainchild of Navy brothers, Lieutenants Alfred and Andrew Pease. Alfred Pease is an NPS graduate and a nuclear physicist. Andrew Pease, a former computer science student at NPS, is now in flight training at Pensacola.

Microwave Imaging System

The Naval Research Laboratory has developed a new passive microwave imaging system that makes possible airborne observation of ground and sea areas under weather conditions unsuitable for more conventional reconnaissance.

The NRL system combines flexibility of configuration (selection of different antenna-radiometer combinations) and operation at frequencies as high as 90 GHz. The older passive microwave imaging method operates at relatively low frequencies of about 10 to 37 GHz. The new system is particularly useful for remote sensing, offering the advantages of versa-

tility and resolution of approximately 50 feet at an altitude of 1,500 feet.
Scientists at NRL say that the device could be used for ship detection and classification as well as all-weather reconnaissance to supplement or replace forward-looking infrared radiometers. It could also provide all-weather monitoring of oil spill distribution and thickness, and ice cover reconnaissance. Installation of the system is feasible not only on airborne platforms such as aircraft, balloons and remotely piloted vehicles but also on surface ships.

Space Shuttle A one-third scale model of the space shuttle orbiter is being tested in the NASA Ames Research Center 40 by 80-foot test section wind tunnel. The tests are producing low-speed flight data to support approach and landing tests of first full-scale shuttle orbiter scheduled for next year at NASA's Flight Research Center.

Retreads Tire tests at the Naval Air Test Center, Patuxent River on the F-4 main landing gear have shown that retreads are safe, practical and cost effective. The Navy is expected to save 50 to 75 percent of its current F-4 *Phantom* tire expenditure.

Retreads for the A-4 *Skyhawk* were evaluated at NATC in 1973. They failed miserably in the first tests. Project engineer Ray Detwiler explained that the manufacturer and his engineers had never seen a carrier launch or arrest, "so we brought them here to watch a few. After the very first takeoff and recovery, they realized the design needed improvement. They went back to the drawing board and we now have excellent retreads, showing a two-to-one lifespan in many cases over the original new tires."

Only one company has been certified to manufacture retreads for the Navy although several others are trying to qualify.

Because of today's energy shortages, greater emphasis is being placed on recycling usable tire carcasses. It takes only one gallon of oil to provide the chemicals and energy to rebuild an average aircraft tire, compared with six gallons of oil to manufacture a new tire.

Blanchard Award

On January 9, Vice Admiral Charles E. Rosendahl, USN(Ret.) received the first Jean Pierre Blanchard Award for pioneering achievement in American aviation. The award was made by Deptford Township, N.J., as part of its bicentennial celebration, to commemorate the first flight from American soil. The flight was made on January 9, 1793, by the celebrated French aeronaut Jean Pierre Blanchard in a gas balloon. He made the ascent from the old Philadelphia prison yard with George Washington, John Adams and James Monroe among those present. The sortie ended in a Deptford field 46 minutes later.

Adm. Rosendahl was a key figure in the development of the U.S. airship program. During his career, he was commander of the airships *Akron* and *Los Angeles*. He was navigation officer on *Shenandoah* in 1925 when the airship broke up in flight during a storm. For more than an hour, Rosendahl and six others free-ballooned the still floating, separated forward section and landed it safely.

On receiving the award, Adm. Rosendahl spoke briefly of his belief in a revival of the airship and its exciting future.

The Reel Machine

A new target tow reel system, the RMK19, is being evaluated by the Naval Air Test Center, Patuxent River as a replacement for the automatic system now in use throughout the fleet. Dave Carroll, project engineer for tow targets at NADC Warminster, says that the RMK19, or "reel machine," is expected to be a noticeable improvement over the RMK8A by providing greater flexibility for the operator.

Externally the RMK19 is not very different, but internal changes will allow the operator to control speed, distance and braking during all reeling and unreeling of the cable and target. Also, larger turbine blades on the air-driven unit will enable the RMK19 to handle a 30-foot-long, 500-pound fiberglass aerial tow target.

Project engineers Pat O'Brien and Charlie Noell are supervising the carrier suitability tests and the flight limitation clearance tests. At present, tests are being run only on the F-4, but NATC expects to evaluate the ADU422 adapter which will fit the new tow reel system to the A-4.

The RMK19 is a ram-air, turbine-driven power unit with reversible pitch blades, capstans, a towline storage spool, level-wind mechanism, target launcher boom and saddle, emergency cable cutter and a control system. The tow reel normally carries 40,000 feet of cable which can be reeled out or in at 5,000 feet per minute. The reel operator controls towline rate of change in speed through manual operation of the blade pitch angles.

grampaw pettibone

Non-Natops — Wheels Up

Two young aviators were scheduled for a day proficiency flight in the T-28 *Trojan*. The pilot-in-command (PIC) had approximately 800 hours, with 120 in the T-28. The copilot had less than 300 hours with just over 100 in the T-28. The PIC occupied the rear seat. Good flying weather was forecast. No discrepancies were noted. Preflight, engine start, taxi and takeoff were uneventful.

The flyers proceeded to a nearby airfield and entered the landing pattern for touch and go's. The PIC made three, raising the landing gear after each. Following these landings, control was passed to the copilot in front while on the downwind leg for the fourth touch and go.

Approaching the 180-degree position, the copilot read the checklist. Abeam, he called for landing clearance and reported the gear down. The T-28 was cleared to continue, following an E-2 which was on final.

While turning, the copilot called again for landing clearance and re-

ported gear down. Both pilots later stated that they saw the gear indicating down and locked. The tower cleared the *Trojan* for landing. It landed wheels up, sliding 1,000 feet on its fuselage. The surprised pilots secured the aircraft and exited without difficulty. At this time, both pilots noted the gear handles in the up position and all gear doors in the closed position.

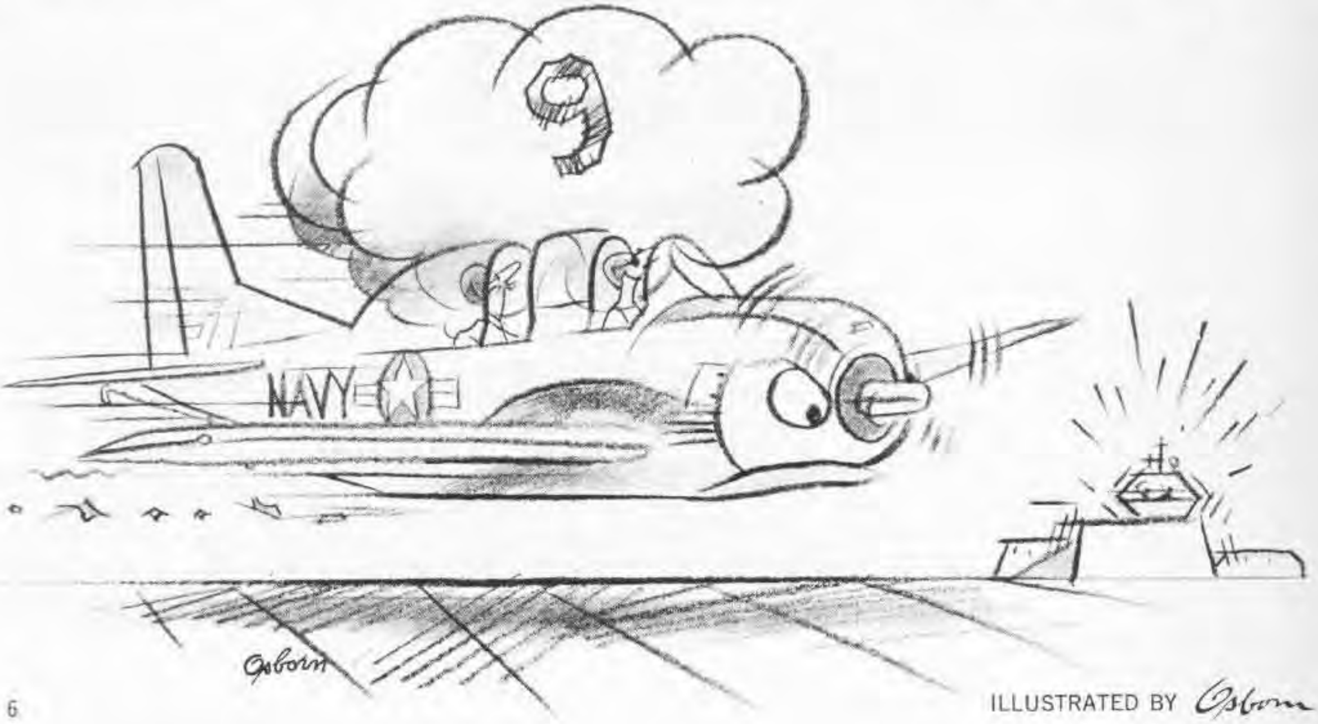
Grampaw Pettibone says:

Jumpin' Juniper! I don't believe it!?! And with *two* pilots yet! Believe it or not, in the recent past the majority of "wheels-up" landings were made in multi-piloted machines. I believe I can do the "write-up" right now on the next wheels-up landing 'cause they are all the same.

The thing that really gets to me here is that Natops says, "Leave the rollers down when in the landing pattern." That's simple enough. Then why the heck didn't the pilot-in-command comply. You know, I can have a small amount of sympathy for a gent who makes a mistake, but I have no sympathy for a driver who gets in trouble when he is willfully disregarding Natops. Need I say more?

Faulty Attention

On a bright California morning, two proficiency pilots in a trusty C-45 received taxi clearance to the warm-up spot for the north runway at a West Coast air station. During warm-up, the pilots were informed by ground con-



ILLUSTRATED BY Osborn

trol that wind conditions were such that they could use the west runway if they so desired. Due to the sun, the decision was made to use the alternate runway. After being cleared, they taxied toward the takeoff end of the other runway. To expedite their departure, the copilot switched to tower frequency and requested takeoff clearance en route to the warm-up spot.

The tower cleared the aircraft for takeoff and both pilots hurriedly completed the remaining few items on the checkoff list. Another C-45 was holding to the left side of the throat, to the runway perpendicular to the taxiway centerline. Both pilots of the taxiing aircraft were busy with last minute takeoff items and did not see the parked C-45 until their starboard engine contacted the starboard wing of the other aircraft. Both aircraft were substantially damaged but, fortunately, there were no injuries.

Grampaw Pettibone says:

Well, now, if that doesn't tear the rag off the bush! Drivin' a bug smasher or any other aircraft around with a pair of eyes in the cockpit copying a clearance or doing anything else is absolutely ridiculous. The visibility in a C-45 is poor at best and even more reason to use extra caution during ground operations, but the same attention and caution is required regardless of the type of aircraft you're in. Maneuvers like this are gettin' to us at the rate of several hundred clams each year. There is just no defense for a guy who pulls such a trick.

This lad really didn't have a clearance problem as a United Airlines plane had just taxied around the parked aircraft. He just *failed to ensure* that the area ahead was *clear*. It's just that simple and to put it any other way would be a waste of words. Uncage the eyeballs, boy! (June 1964)

Night Ride

An instructor and his student were scheduled for a night instrument sortie in the TA-4J *Skyhawk*. The instructor had over 1,000 pilot hours with almost 200 in the *Skyhawk*. Since this was an instrument flight, he occupied the front seat.

After the briefing, the pilots proceeded to the aircraft. The instructor told the student to strap in while he did the preflight. Preflight and start were without incident. The instructor taxied out and the plane was scrutinized by the final checker.

Leaving the final checker, the pilot did not engage nose-wheel steering or increase power. As the pilot taxied forward, the *Skyhawk* slowly drifted right. The pilot then engaged nose-wheel steering to correct the aircraft direction. The plane tracked properly with nose gear steering engaged. The pilot continued to the duty runway and held short, waiting for takeoff clearance. He completed the takeoff checklist.

The flight was cleared for takeoff and was shifted to departure control frequency. The pilot taxied into position, using the center-line lights for runway alignment. He stopped the aircraft approximately 500 feet down the runway. He then conducted the manual fuel control check IAW Natops and received a ready-to-go from his student (now under the instrument hood). He added power and released his brakes, passing 90 percent rpm.

The aircraft began to roll, heading slightly to the right. The pilot tried to correct with left rudder but the A-4 still drifted right. In a right skid, the pilot added more rudder. The *Skyhawk* came back to the left of center line. During this correction, the pilot retarded to idle and thought, "If I can't get it to stay on the runway, I will probably eject."

The aircraft then went hard right with a left skid. The pilot ejected himself and the student prior to leaving the runway 2,150 feet from the takeoff end.

The *Skyhawk* then traveled 500 feet off the right side of the runway, breaking off its nose-wheel inner barrel. It came to rest on its nose and main mounts. The pilots were not injured; however, the aircraft sustained substantial damage.

Grampaw Pettibone says:

Thunderin' thunderin's! This is a weird one. Even though there was some degree of driver error here, there were other factors which did not give our pilots an even shake!

This aircraft had many previous discrepancies with the nose-wheel steering and right brake. Granted, maintenance made numerous attempts at correcting the discrepancy. However, with this gripe constantly recurring, maybe it was time to call in expertise beyond the local level. All in all, there were a lot of people besides the pilot who could have helped prevent this.


EFFICIENCY
ECONOMY
EFFECTIVENESS
NAVAL AIR REWORK FACILITY
NARF
NORFOLK, VIRGINIA

NARF NORFOLK

By Cdr. Rosario Rausa

Photos by PH1 Harold Phillips

It began as one element of Naval Air Station, Norfolk in 1917. It grew from a diminutive unit of 30 men to an immense complex and independent command employing 4,500 people. It's the Naval Air Rework Facility, Norfolk and it conducts major overhaul and repair of aircraft, aircraft components, engines and missiles.

Through the years the activity has had several titles — Construction and Repair, Assembly and Repair, Overhaul and Repair. Regardless of the nomenclature, NARF has pursued the same goal since its inception during the infant years of flight. That goal has been to support fleet needs and provide the forces afloat and ashore with refurbished weapons systems fully capable of performing missions throughout a designated service tour.

NARF's is a laborious and technically demanding business. Instilling new and long life into aircraft and associated elements of aerial warfare is a super-complicated endeavor wherein errors must be kept to an absolute minimum. What comes in to NARF is usually a product wearied by heavy duty in the skies, aboard carriers and at land bases. What goes out must be a quality product, fully rejuvenated, primed and ready for extensive use.

Captain A. D. Williams commands NARF Norfolk and its 4,500 men and women, only 25 of whom are military. "Most significantly," explains Capt. Williams, "we conduct depot-level rework on airplanes and related systems and ever-increasing engineering support of the fleet and headquarters. We provide field team support on a scheduled basis and are also capable of responding almost instantly when needed.

"For example," he went on, "late last year *Kennedy* and the destroyer *Belknap* collided in the Mediterranean. Within hours of the accident, NARF personnel were on the way to assist in repairing the damage to the carrier.

"We also have an analysis center," relates the C.O. "It consists of a carefully selected group of professionals who spend their full time looking into material and maintenance problem areas in the fleet. These specialists are charged with evaluating and solving those problems. This is their central and only goal and they are not diverted from it."

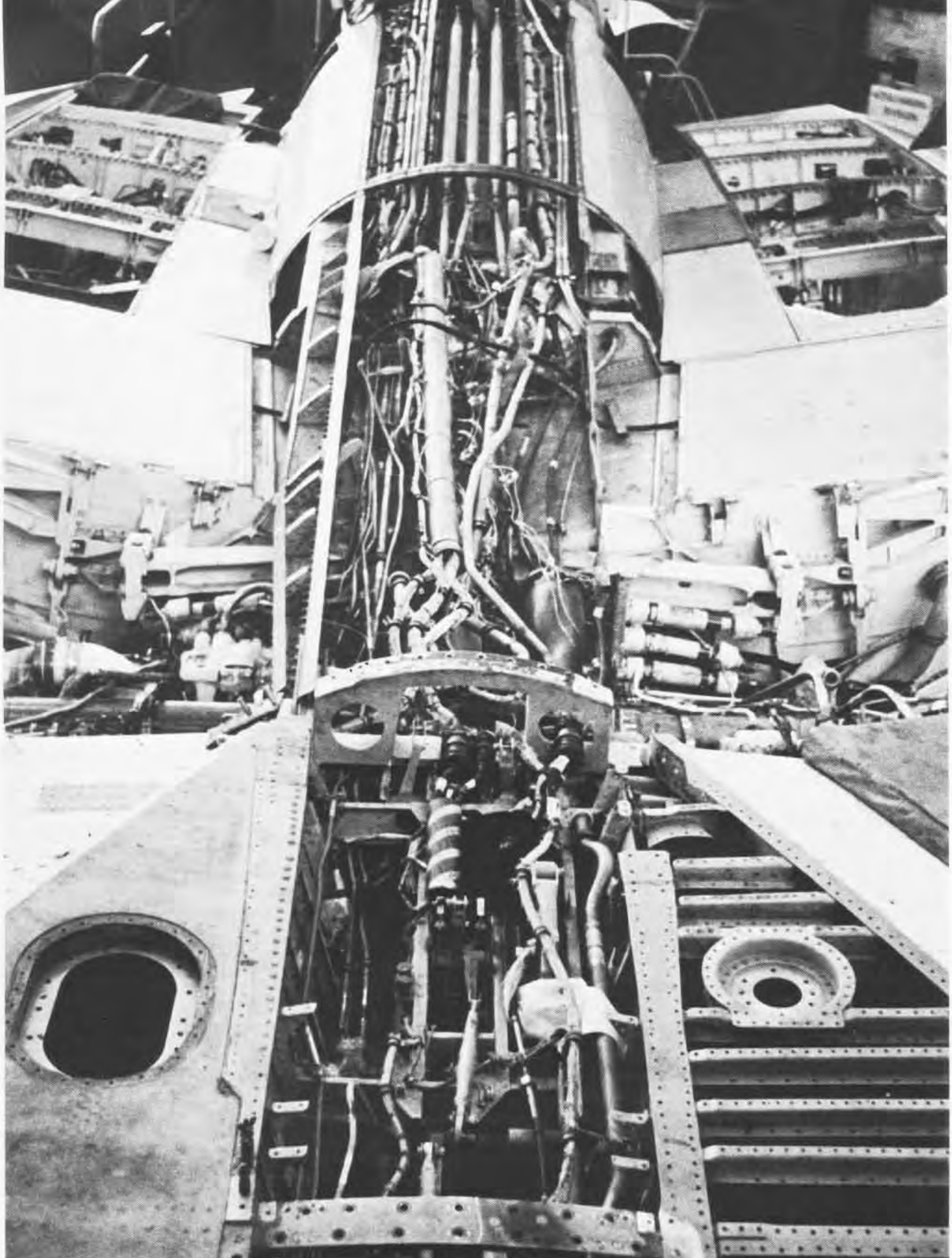
NARF's facilities include 115 buildings of varying sizes which sprawl over 174 acres at the air station. The interior spaces proliferate with equipment as basic as a chain hoist or as sophisticated as a fuel system test unit which resembles a control station from *Star Trek*. NARF has numerically controlled machining centers. On command from a computer, these machines can manufacture specially designed parts. Cavernous engine test cells absorb untold decibels of sound. And there's a unit called DITMCO (dit ma co) which consists of an octopus-like cascade of electric test cables. In the final stages of rework these cables are draped over an aircraft and plugged into myriad receptacles for testing electrical characteristics of the aircraft wiring systems.

Capt. Williams relates that "Our NARF's most important asset, however, is its people." Their wide-ranging skills are applied to hardware and software enterprises and range from processing administrative records to removing, repairing and installing the entire wing of an aircraft. There are the engineers who work at drafting tables, and skilled craftsmen who labor on the production line. So varied are the training and expertise of NARF's human element, it would be difficult to list their qualifications and capabilities here. It can be said that their work efforts measure up to the demanding tasks of maintaining today's ultra-sophisticated, intricately-configured aerial weapons systems.

Capt. Williams states, "The eagerness of both military and civilians to get at the root of the problem and to take action has been very encouraging to me.

"Take the F-14," adds the C.O. "We're in our first go-around with the *Tomcat* and there has been some corrosion noted in the wing and wheel strut areas. We determined that it was necessary to remove the landing gear mounts and the wing to properly treat these areas. Normally, this scope of work isn't required this early in the aircraft life cycle. The additional work presented a real challenge to keep the aircraft on schedule and cost."

NARF also reworks A-6 and EA-6A/B *Intruders* and F-8 *Crusaders*. It also has major overhaul responsibility for the TF-30 and J-57 power plants.



During F-14 rework, 200 panels are removed permitting access to interior.

***"Our NARF's most important asset . . . is its people."* Capt. A. D. Williams, C.O.**

as well as complete repair capability for the J-52 and T-56 engines. It reworks a broad line of electronic components — black boxes — and completely overhauls guidance and control sections of the *Sparrow* and *Sidewinder* missiles. These are just a few of NARF's responsibilities.

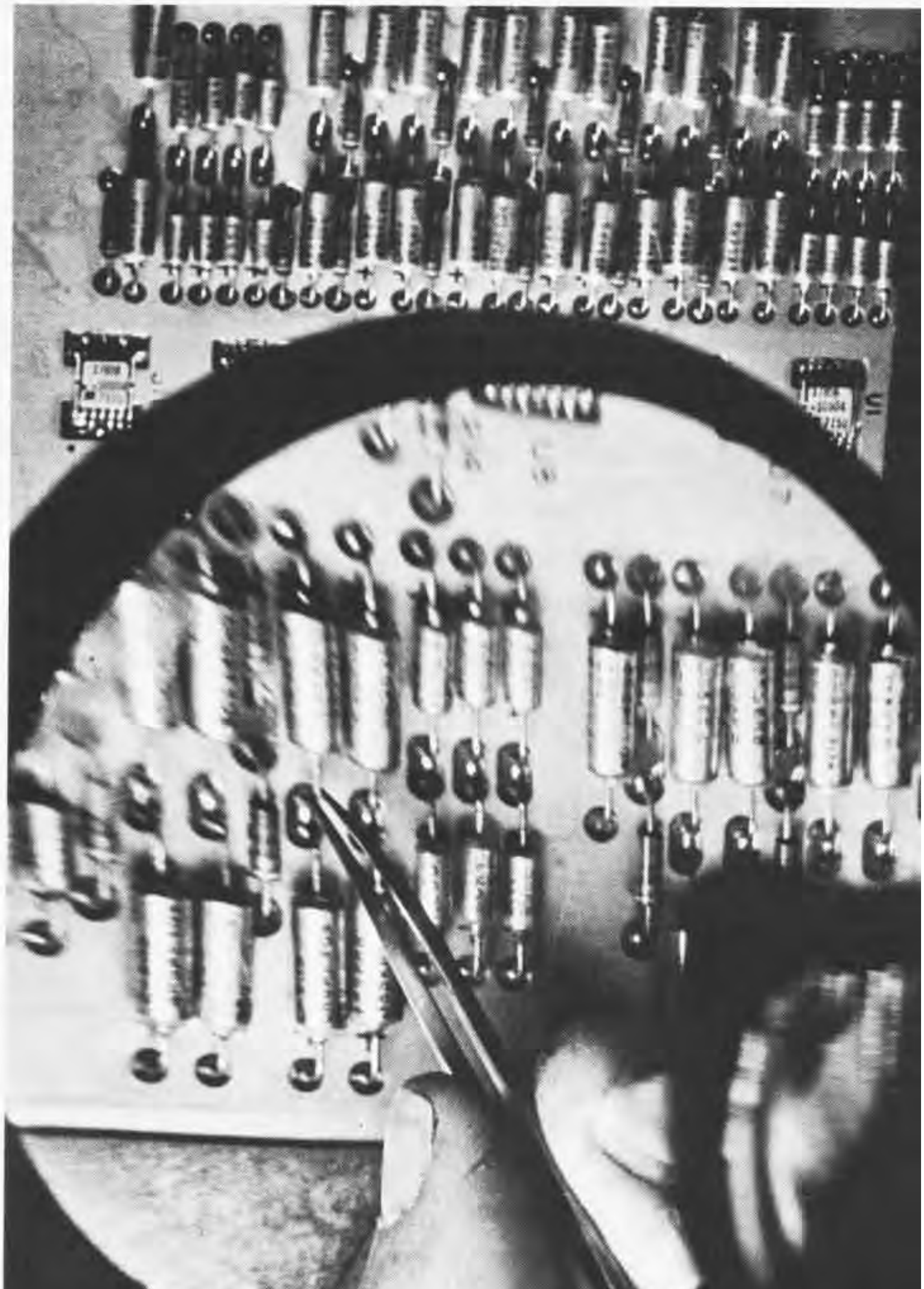
"The workload is immense," explains Commander Wendell Powell, X.O. "In an average quarter of the calendar year, we will complete SDLM (standard depot level maintenance) on 35 aircraft and repair or modify an additional 65. We'll overhaul 45 engines, repair another 80. We'll service 800 missiles and process some 10,000 components and spare parts."

The impressive conglomeration of material and human assets at NARF prompted a visitor to ask, "Could you build an aircraft from the ground up?"

Don King, F-14 project planner, fielded the question, "No, but we could come pretty close." He was quick to add that manufacturing airplanes is best left to others. "At NARF," he says, "Our job is to give back to the fleet an aircraft or a system which it can use effectively throughout a programmed service tour of that aircraft or system."

Schedules, and meeting them, are important, of course. Explains Don King, "We are optimistic in making deadlines. We don't always return an aircraft on time but we sure try."

The timetable, or turnaround time, for reworking an F-14 is set at 127



Artisans at NARF Norfolk have a broad range of skills, including those required to master the miniaturized and seemingly delicate components of electronic circuitry.

"The workload is immense."
Cdr. Wendell Powell, X.O.

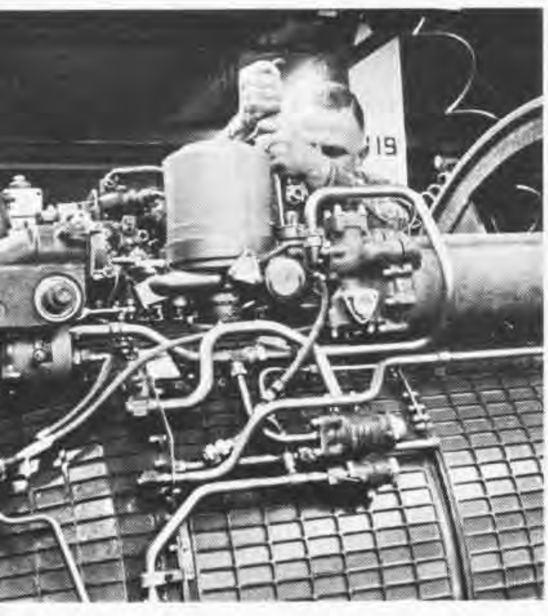
Worker is viewed through jet tail cone on NARF's production line. Below, mechanic makes adjustment on TF-30 engine.

days, or about four and a half months. Induction planning begins well before the aircraft is delivered.

NARF coordinates its schedule with Naval Air Systems Command Representative Atlantic who reports to the Naval Air Systems Command. At quarterly meetings a schedule is proposed. When agreement is reached, the type commander sends a message to the controlling custodian (the squadron), specifying when the aircraft should be prepared for induction.

When feasible, NARF will send representatives to the unit for preliminary evaluation of an aircraft's condition. The ferry squadron is notified, picks up the plane and delivers it to the NARF line, normally by 1200 the day prior to induction. Lt. Ray Grinnell, F-14 project officer, adds, "The squadron can retain some elements of the plane. With the F-14, they might keep the weapons release system and use it as a spare. This helps the squadron as well as us. We don't rework that particular system and would just have to remove and store it for the duration of the SDLM sequence."

On arrival, a thorough check is conducted. Avionics components are removed and transferred to stowage

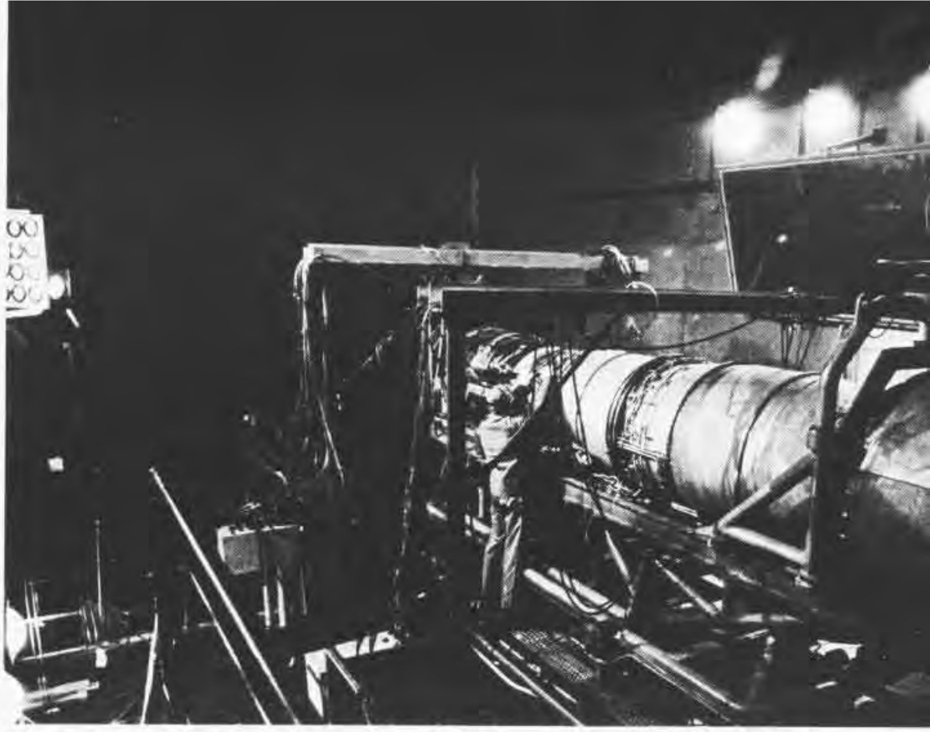


A key element in the production sequence at NARF is the production certification program. It has been in effect for several years and although it is a radical departure from early practices involving product quality, it has been most effective.

NARF's approach is to motivate naval industrial workers to maintain their pride of workmanship. Certification is not only product oriented but focuses on the motivation principle of individual responsibility and recognition for job accomplishment.

The radical departure from the old to the new is the way in which the quality of a product is determined. In former times an artisan would present his completed product for approval to the supervisor or an individual designated as inspector. The product was either approved or disapproved. Under the new production certification program, the artisan can approve or disapprove his own work before presenting it. He owns a stamp that identifies him and, when he affixes that stamp to the product document, he is saying, "Here is my work, I have done my best." The artisan's work may then be inspected or not inspected at the discretion of a quality assurance specialist who now takes the place of the inspector. He selectively verifies the quality of the product through a quality assurance program based on

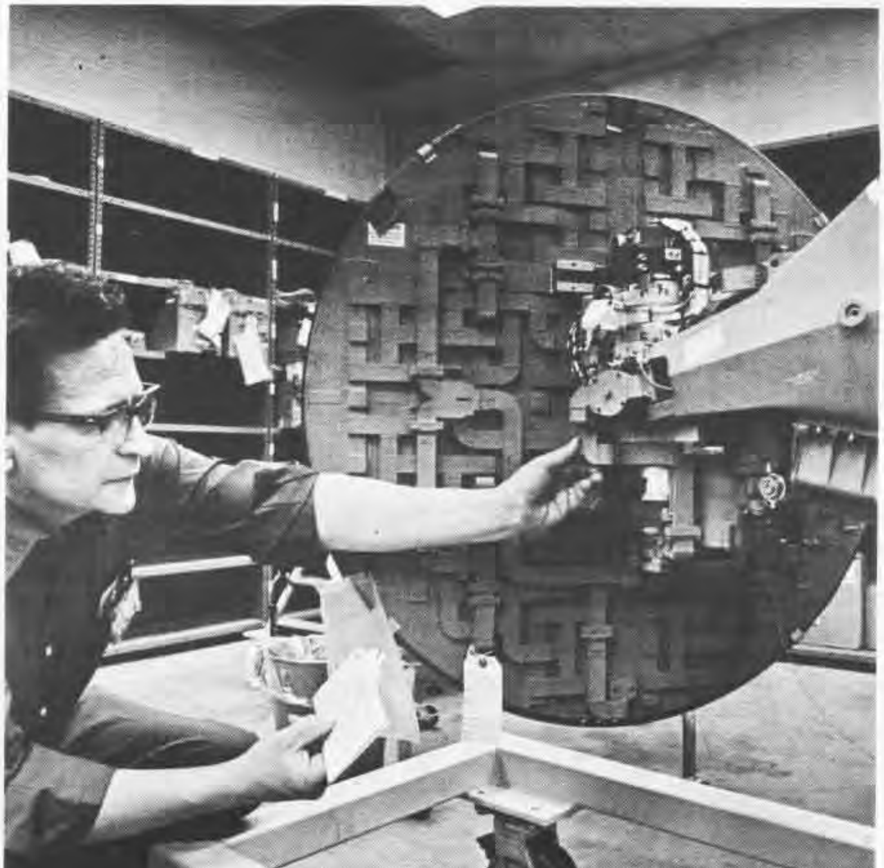
Aircraft engine mechanic Harvey Fentress monitors gauges during a test cell run.



Adjustments are made on F-14 power plant prior to turn-up in the cell, above. Checking an F-14 AWG-9 antenna is Eugene N. Harte, Jr., electronics mechanic.

or rework areas as necessary. The ejection seat is safed and various pyrotechnic devices removed. In the F-14 alone there are some 150 "firecracker" lines which have to be checked.

A "workbook" covering all areas of the aircraft is compiled. It becomes a sort of historical log and contains inspections, changes or modifications, which must be made, squadron requests and related data.



analysis, tests and statistically valid sampling procedures.

The production certification program at NARF Norfolk is led by Mr. Ed Castagna, the quality assurance department head. It involves people from nearly all NARF departments who contribute to the quality of the product. They also own stamps and certify that their work contributes to a quality product. Success of this program can be attributed to a total team effort, starting at the top and filtering through the ranks, finally resting with the artisan. And it is the artisan who is recognized by all as the foundation upon which the program depends and from which it derives its ultimate success.

These and the next several stages in the sequence normally require about two to four days each.

The *Tomcat* is then towed to the cleaning shop where its paint condition is scrutinized. On newer planes, like the F-14, over-spraying is usually done at the end of the cycle. Some may be just touched up. Older birds, like the F-8, are usually stripped and completely repainted before they are returned to the parent squadron.

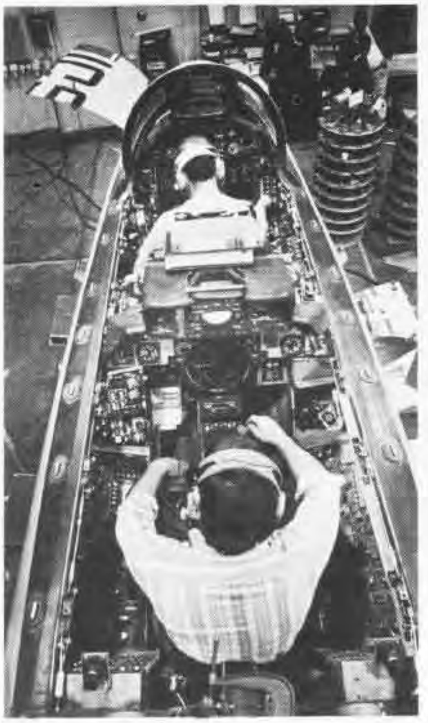
A detergent wash follows, after which corrosion control coating is applied to the airframe. Engines and fuel cells are purged and preserved.

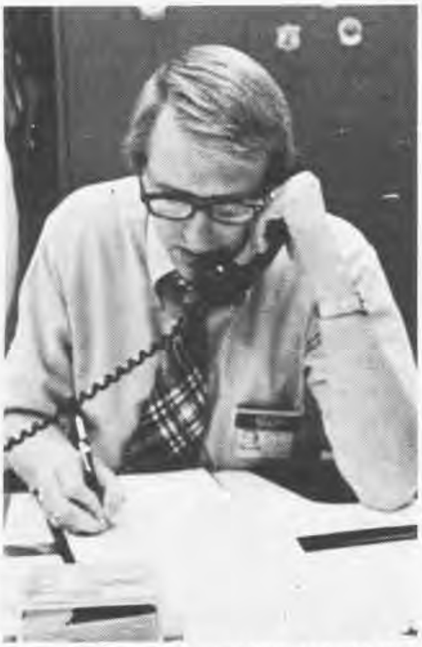
The *Tomcat* is then towed to the rework line where disassembly begins. Some 200 access panels are removed, additional components are dismantled and routed to other shops as necessary. A team of examination and evaluation (E&E) experts plunge in for a detailed look at the countless nooks and crannies inherent in modern flying machines. The team verifies part numbers, and reviews changes and modifications which have been installed. The workbook is referred to continually.

Squadron requests are reviewed for appropriate action. For example, a unit might want the canopy glass changed due to distortion which has developed in the F-14's initial service tour. This is a NARF capability and responsibility.

Expectedly, this disassembly/rework stage is usually the longest, taking a month or more. Since the F-14s now at NARF are early production models, they are receiving some 275 aircraft changes. Man-hours required to effect these range from a few minutes to 2,000 hours. A major modification to the longeron system, for example, requires the latter amount of time.

The F-14 at this point, especially with the engines removed, has become a sort of skeleton. One has to live with that skeleton, day in day out, as it becomes whole again, to fully appre-





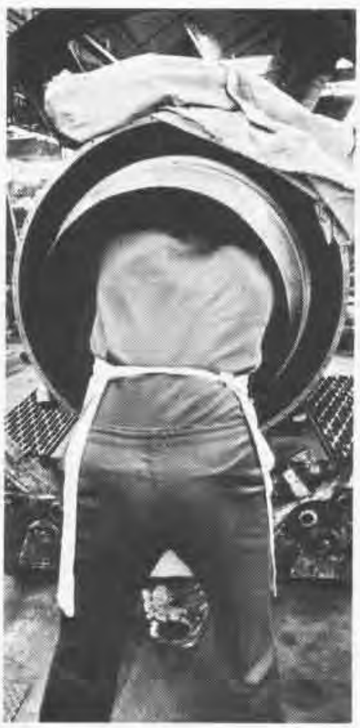
NARF Norfolk's busy people include Don King, F-14 project planner, and Mary Rice, clerk typist, log book section.

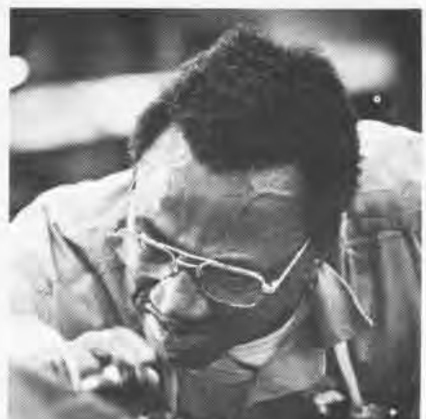
Left, NARF technicians in F-14 test electronic components. Above, Intruder gets full DITMCO treatment — an evaluation of the aircraft's electrical characteristics.

ciate the complexity and detail germane to depot level maintenance. Components reworked elsewhere are returned to the plane for installation. Orchestrating this endeavor demands ongoing coordination with a broad spectrum of personnel from the white-collar force topside to the craftsmen on the work floor.

Nearly all together again, the F-14 gets the DITMCO treatment. DITMCO is named after its manufacturer. The acronym stands for Drive-In Theater Movie Company. The system is also used in an elaborate electrical continuity test of theater speaker systems. In fact, DITMCO consists of a multitude of snake-like electrical cables which are plugged into the voluminous receptacles in a plane to test wiring and electrical integrity.

Once draped by this umbrella of lines, an aircraft looks as if it were undergoing a far-out electrocardiogram. Nearly a day is needed just to connect the cables. After DITMCO,





Left to right, mechanic takes a deep look in jet tail section; Edward A. McCarthy, sheet metal mechanic (aircraft), works on front fan of TF-30; Calvin P. Lambert, aircraft mechanic, makes intense examination of landing gear.

four days are required to build up the fuel system components so that fuel transfer and indicating systems can be tested.

After the fuel check, the hydraulic systems, which have been disassembled and rebuilt, are installed. Leak checks are made, cabin pressurization is carefully tested and various access doors are reinstalled. In this one-week stage, two TF-30 engines — which have been reworked but may not necessarily be the same power plants which came with the aircraft — are added.

Systems operational checks follow and flight controls are rigged. In the F-14 with its inflight swing-wing feature, this is a particularly demanding chore. The air data computer, Tacan and other navigation systems are tested on hangar power. The remaining black boxes are then inserted.

Not all of the electronic components are reworked at the NARF but the navigation gear, considered safety-of-flight items, must be operable. In the *Tomcat* these electronic systems are so well integrated that, generally, when the nav equipment checks out, virtually half of the fire control system is properly operating.

By now the *Tomcat* is back outdoors. The engines are run and trimmed. And the avionics units are tested on aircraft or engine power alone.

Flight testing is next. NARF hits the jackpot when a single flight is all that's needed. On occasion this happens. Usually several airborne tests are flown to work out various kinks. Buddy Franklin, production superintendent on the F-14, relates that, "When we have problems at this stage, one particular system is usually the cause. It could be the brakes, for example. Several repair actions may be necessary. It's seldom that more than one or two chronic ailments work together against us."

Finally, weight and balance data are recorded and the F-14 is sealed and painted.

The ferry and parent squadrons are notified and within a short time the *Tomcat* is back to work flying operational missions.

The sequence is not really over until the squadron issues its aircraft discrepancy report (ADR). Traditionally, the squadron's Group IX work force descends on its "long-lost" bird and gives it a detailed going over. Discrepancies it finds, usually minor in nature, are recorded in the ADR which is sent to NARF for review and cognizance. Admits Buddy Franklin, "Those ADRs can be pretty critical, but that's part of the business. We use them to help prevent those discrepancies in subsequent aircraft on our production line."

The extent of NARF's activities cannot be completely described here. In addition to supporting fleet commands, it assists the Chief of Naval Air Training, the Office of Naval Research, the Commander in Chief, Atlantic Fleet and the Mutual Defense Assistance Program. It also does calibration work for the Coast Guard as well as some maintenance support of Coast Guard radar sites. It services various missiles for the Air Force and a number of components for the Army. NARF also processes F-8 *Crusaders* for the Marine Corps.

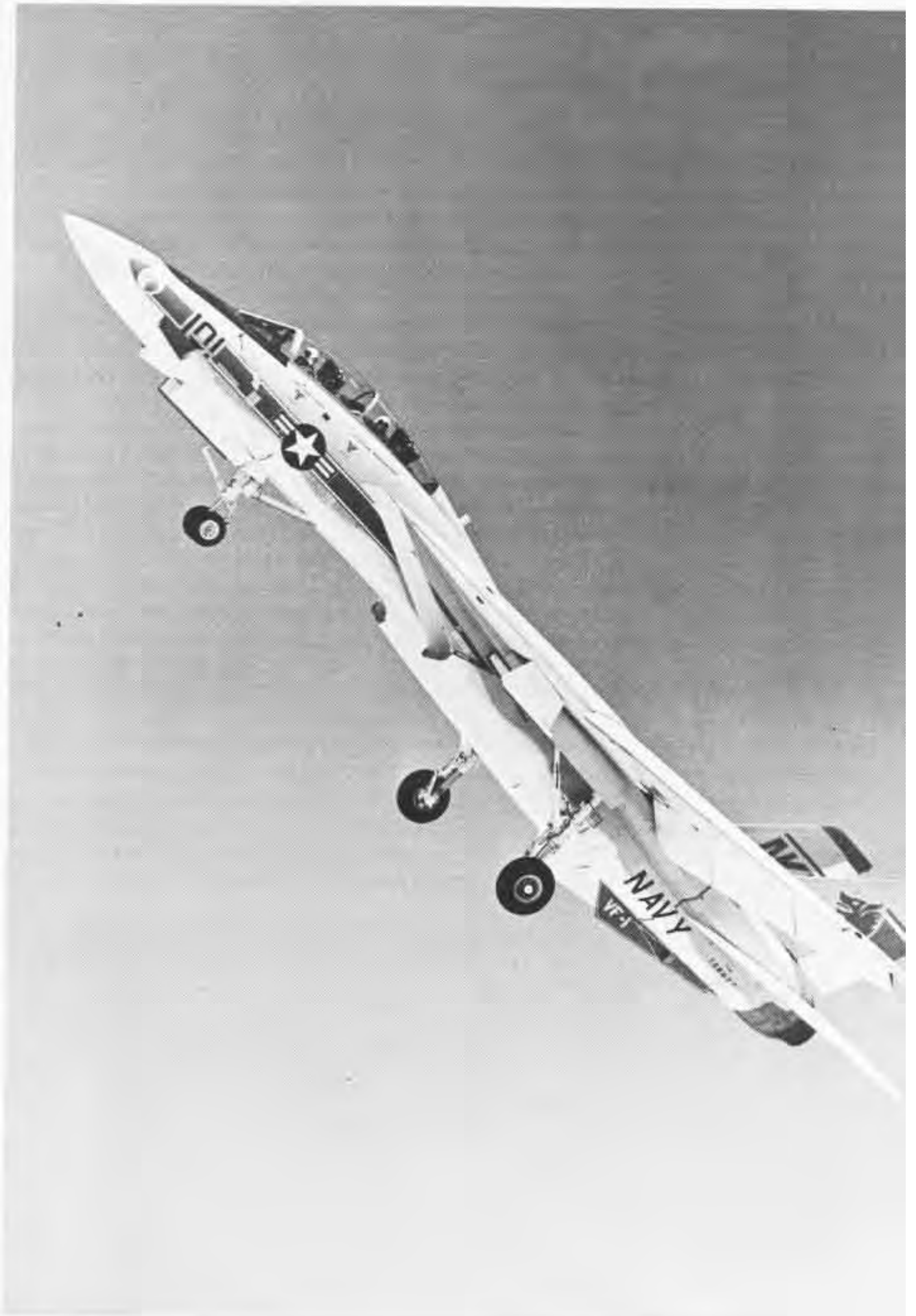
NARF's field teams travel across the U.S. and overseas. They have been located on aircraft carriers in every ocean and at sites in North Africa,

Malta, Spain, Italy, Iceland, Newfoundland, Japan, Puerto Rico and the Philippines.

NARF Norfolk's organization includes nine major departments. The commanding officer and executive officer are aeronautical engineering duty officers (1510s). Three 1510 commanders serve as directorate officers and are ably assisted by five project officers. Three test pilots and one NFO are assigned to flight test. The balance of the 25 military billets are assigned to various departments and include ten enlisted personnel.

Although Norfolk's is the largest NARF on the East Coast, it is only one of six similar activities. These include the NARFs at Cherry Point, N.C.; Jacksonville and Pensacola, Fla.; and Alameda and North Island, Calif.

NARF team which performed repair work on this Tomcat poses with the finished product, left. VF-1 plane nears completion at rework, below. It will soon be back at parent squadron sharing the sky with #101, filmed at Miramar, right.



PHCS(AC) Robert Lawson

NAVAL AVIATION 65 in '76

March 27, 1918

In 228

It was Wednesday, March 27, 1918. The flying boat rocked gently in the chill waters of the Delaware River but a bright sun warmed the onlookers ashore. The small crowd grew as the H-16 crew started the twin Liberty engines. Minutes later, the huge machine was turned into the brisk 15-knot wind. As the engines growled steadily, the aircraft gathered speed. An expanding V-shaped wave pattern marked its path across the surface. As it rose from the water and climbed confidently into the cloudless sky, the onlookers heaved a collective sigh of achievement.

They were workers at the Naval Aircraft Factory and this test flight culminated their strenuous and accelerated efforts throughout the past few months. They had built the H-16 from the ground up. And it was now safely airborne on what was to be a successful test flight. The event served as an exclamation point and underlined what people in a hurry can do in the name of national defense.

The Naval Aircraft Factory was fathered by the demands of war. Naval Aviation was still in its infancy in 1917. America had just entered the conflict in Europe. Existing aircraft plants were deluged with large orders for airplanes by the Army and Navy. But it appeared unlikely that these civilian companies could totally satisfy the Navy's requirements.

It was therefore decided to build an aircraft factory under Navy ownership. An original goal was to construct a plant capable of producing 1,000 training seaplanes a year — or the equivalent. Commander F. G. Coburn, USN, Construction Corps, was tasked with making a survey of the situation. His report and recommendations were approved by Secretary of the Navy Josephus Daniels in the summer of 1917.

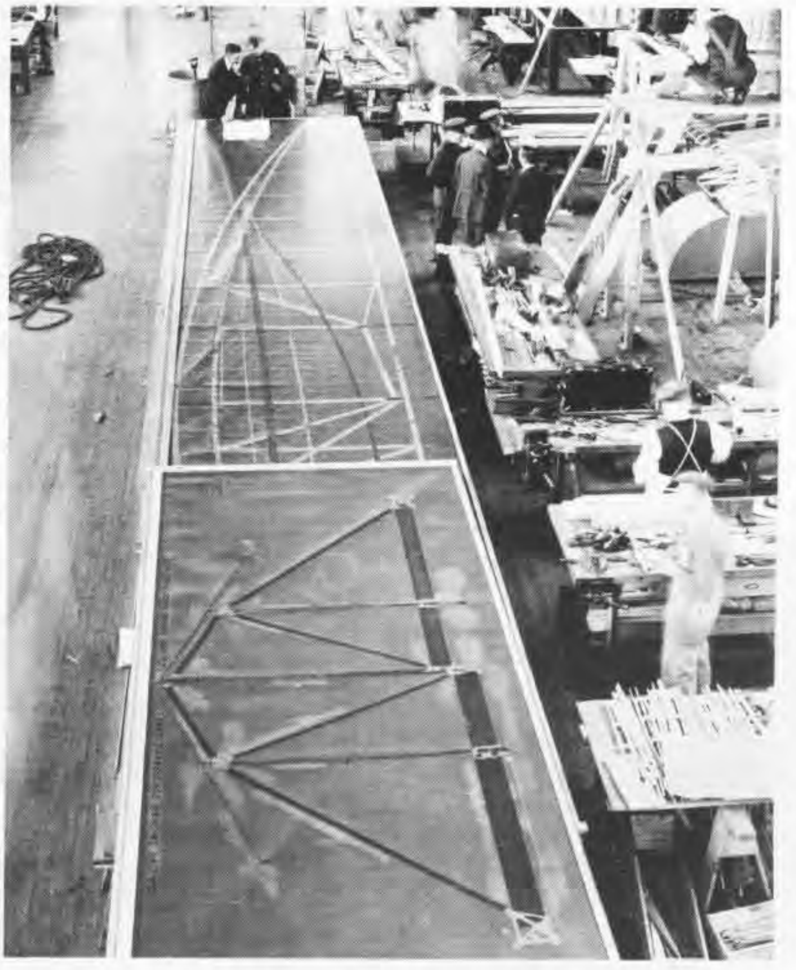
The Philadelphia Navy Yard was chosen for the factory site. Ample land was available, transportation networks were suitable, a labor source was nearby and the adjacent Delaware River offered a natural facility for testing aircraft.

At the outset, the NAF had three objectives, all of which it eventually achieved. First, it was to manufacture aircraft under Navy Department direction and control. Second, the plant was to permit design and development under close scrutiny by the Navy and its bureaus. Finally, NAF was to collect data which the Navy could use as guidelines in dealing with cost questions arising from contract negotiations with private aircraft companies.

By November, a mere 110 days after ground breaking, the plant was completed. It included a main and three auxiliary buildings — a dry kiln, a dry lumber storehouse and a boiler house. Cdr. Coburn was ordered in as the Factory's first manager.

Less than ten of the 400 engineers and technicians initially hired had previous airplane experience. Extensive training programs were instituted. Interestingly, by the end of that first year, women employees began work at the plant. At war's end, they comprised 25 percent of the work force.

Instead of building training planes, though, the NAF's mission was modified. Aircraft were urgently needed for patrol and convoy duty in the North Sea and particularly over the waters contiguous to the coasts of Ireland and France. So the NAF built Curtiss H-16s. Due to the inexperience of personnel as compared to the skilled craftsmen at Curtiss, as well as differences in production methods, a complete redrawing of the aircraft plans was required. This task took two months under the able direction of Chief Engineer George R. Wadsworth, a major in the Army Signal Corps. The H-16 was no little challenge, either. It had an upper wing span of 96 feet with a hull 46 feet long. It was large enough to accommodate a four, and sometimes, five-man crew and four machine guns.



Days

Despite the inexperience problem and all its ramifications, the NAF energetically proceeded. It took just 228 days from the start of plant construction until the initial test flight. Several days after the test, the first H-16 and one other were shipped to England for war service. The Naval Aircraft Factory had become a marvel in its own time.

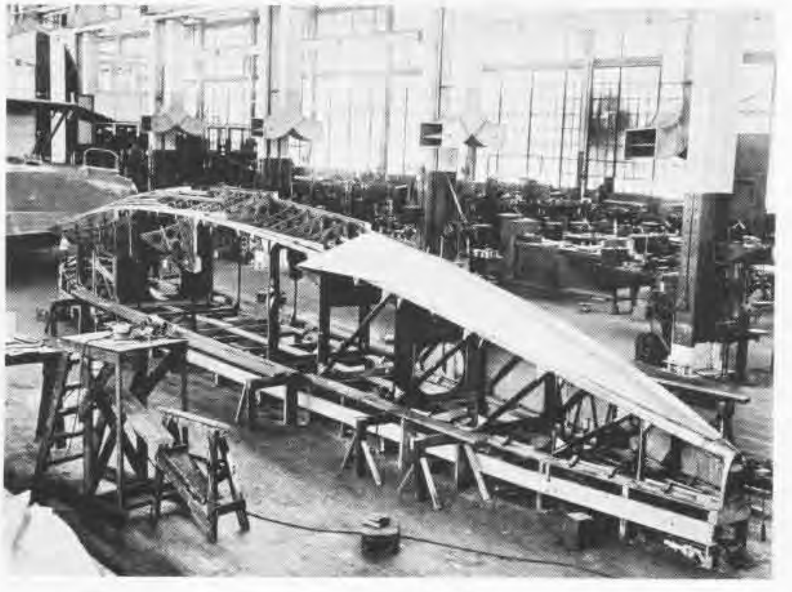
By the end of 1918, the NAF had produced 150 H-16s and 33 F5L flying boats. Its responsibilities were expanded along with its labor force. In the next four decades, it was involved in virtually all facets of aircraft and aircraft system production, maintenance and experimentation. In WW II the labor team swelled to 10,000 people. The NAF eventually produced more than 30 different types of aircraft and worked on countless systems and components.

The Factory was redesignated in the mid-1950s. But it has served as a sort of springboard or founding father for the development of other commands and units tasked with the technical development, production and maintenance of aircraft and related systems.

The Naval Aircraft Factory has been a redoubtable cornerstone in the heritage of Naval Aviation.

By Cdr. R. Rausa

H-16 plows ahead for takeoff on the Delaware River. Naval Aircraft Factory had produced 150 of the Curtiss flying boats by the end of 1918. Aerial view of factory was taken that year. Note tent rows, presumably part of shipyard rather than the NAF. Above, F-5L diagram is readily accessible to technicians. Below, PN-10 hull is under construction, 1926.



VIND

Notable as the first monoplane to equip a carrier combat squadron, the SB2U was one of the transition types between the biplane era and the aircraft that bore the brunt of early WW II U.S. combat operations. Given the name *Vindicator* shortly before Pearl Harbor, SB2U-3s played their only U.S. combat role with Marine squadron VSMB-241 during the Battle of Midway.

In the early Thirties, Vought's engineers, like those in other companies and in BuAer, began exploring the adaptation of monoplane designs to carrier aircraft missions. Finally, in October 1934, Vought's design for a monoplane dive bomber to follow the SBU-1s (see *NANews*, April 1974) won an order for the XSB2U-1 prototype. Significantly, a modified SBU-1 with retractable landing gear, the XSB3U-1, was also ordered as a backup.

Retractable landing gear, enclosed canopies for the pilot and radioman/gunner and folding wings were all featured in the prototype, which first flew January 4, 1936. Only its construction, still largely a fabric covered all-metal structure, was not in keeping with latest advances in other new designs of the period.

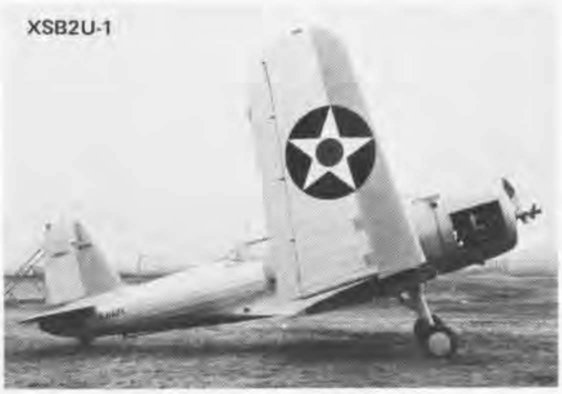
Successful trials of the developed prototype led to production of 53 SB2U-1s, used mostly by VBs 2 and 3 beginning with first deliveries in December 1937. While the intended dive-retarding propeller was never perfected, modified dive-bombing tactics evolved and 58 SB2U-2s followed the -1s off the production line from November 1937 to July 1938. These differed mainly in having a greatly improved landing gear retraction system.

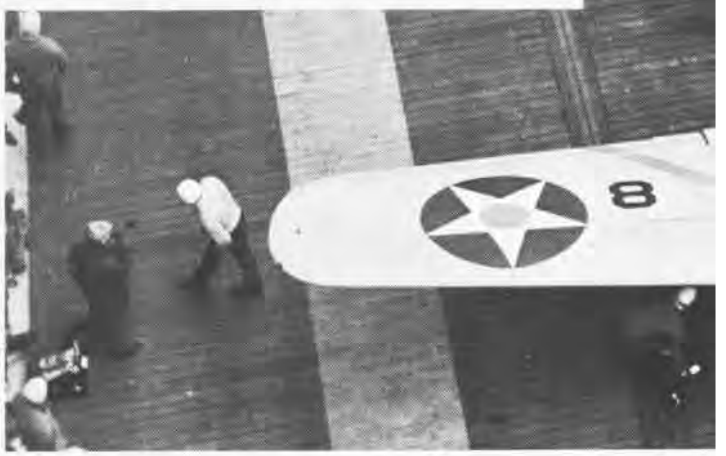
The need for a longer range version, suitable for operations with wheel or float landing gear for use by the Marines, led to the XSB2U-3 prototype, converted from the last SB2U-1, which underwent trials in 1939. During this time period, production aircraft went to the French and British, though they saw only limited combat in Europe.

Production of 57 Marine SB2U-3s wound up the line in 1941, these having provision for two additional wing guns (four total) and increased armor, along with the convertible wheel/float landing gear and greatly increased internal fuel capacity. The float landing gear provision was deleted after the first aircraft were delivered.

Following service with many Navy and Marine squadrons, including brief combat duty, the SB2Us gradually passed into operational training in mid-1942. A year later their phase-out to ground training and the bone-yard began. All were retired by October 1943.

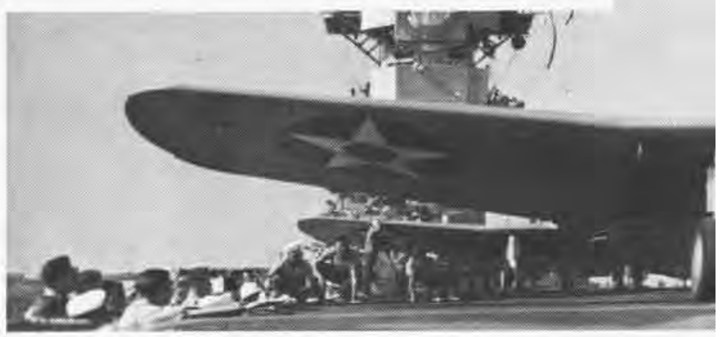
XSB2U-1





SB2U-3

SB2U-



ICATOR

SB2U-1

SB2U-1

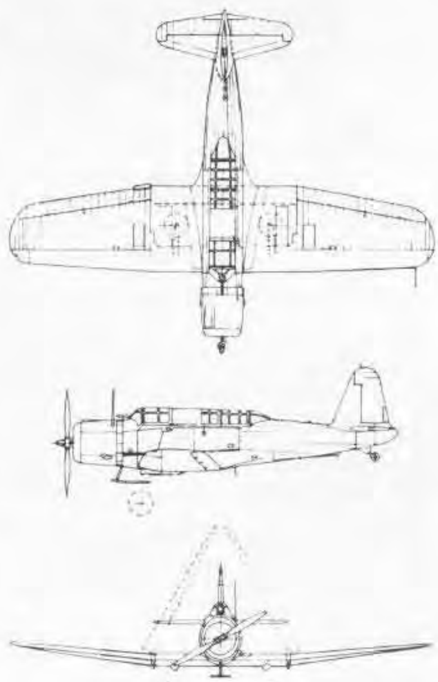
XSB2U-3

SB2U

Span		**42'0"**
Length		**34'0"**
Height		
-1, -2		14'2"
-3		14'7"
Engine		
-1, -2	R-1535-96	825 hp
-3	R-1535-2	825 hp
Maximum speed		
-1, -2		250 mph
-3		240 mph
Service ceiling		
-1, -2		27,500'
-3		22,000'
Maximum range		
-1		1,186 miles
-2		1,120 miles
-3		2,640 miles

Armament

-1, -2	One or two fixed .30 or .50 machine guns in wing
-3	plus two fixed .30 machine guns in wing
All	One flexible .30 machine gun in rear cockpit
All	One 1,000-lb., one 500-lb. or two 100-lb. bombs



NAVAL AVIATION 65 in '76

THE LOG . . .

1898 Theodore Roosevelt, AsstSecNav, recommended to the Secretary that he appoint two officers "of scientific attainments and practical ability" who, with representatives from the War Department, would examine Professor Samuel P. Langley's flying machine and report on its practicability and potentiality for use in war.

1911 First funds for Naval Aviation, $25,000, were appropriated for the Bureau of Navigation for experimental work in the development of aviation for naval purposes.

Lt. John Rodgers, destined to become Naval Aviator #2, reported to the Wright Company, Dayton, Ohio, for flying instruction.

1912 An early, although limited, interest in the helicopter was shown when SecNav authorized expenditure of not more than $50 for developing models of a helicopter design proposed by CMM F. E. Nelson, USS *West Virginia*.

1913 The Navy Appropriations Act for FY 1914 provided an increase of 35 percent in pay and allowances for officers detailed to duty as flyers of heavier-than-air craft, limited to 30 the number of officers that could be so assigned, and further provided that no naval officer above the rank of lieutenant commander, or major in the Marine Corps, could be detailed to duty involving flying.

Aircraft instruments and equipment for installation in a new flying boat, the D-1, were listed as: compass, altimeter, inclinometer, speed indicator, chart board, radio and generator. Although the radio and generator were not installed, the remaining equipment was representative of instrumentation on naval aircraft of the period.

1915 The 1916 Naval Appropriations Act added enlisted men and student aviators to those eligible for increased pay and allowances while on duty involving flying. Among other things, it also raised the limits on personnel assigned to aviation to a yearly average of not more than 48 officers and 96 men of the Navy and 12 officers and 24 men of the Marine Corps.

The title Naval Aviator replaced Navy Air Pilot as the designation for naval officers qualified as aviators.

1917 The First Yale Unit enlisted in the Naval Reserve Flying Force and reported to West Palm Beach to begin war training.

1918 The dirigible station at Paimboeuf, France, was taken over by American forces and commissioned a naval air station, LCdr. L. H. Maxfield in command.

An unmanned flying-bomb type plane was successfully launched and flown for 1,000 yards at the Sperry Flying Field, Copiague, Long Island. Launching device was a falling weight type catapult.

The Office of the Director of Naval Aviation was established in CNO.

A formation of flying boats, on a long-range reconnaissance of the German coast, was attacked by German seaplanes. Ens. Stephan Potter shot down one of the attackers and was officially credited as being the first American Naval Aviator to shoot down an enemy seaplane.

Ens. John F. McNamara, flying out of RNAS Portland, England, made the first attack on an enemy submarine by a Naval Aviator.

1919 The feasibility of using voice radio and telephone relay for air-to-ground communication was demonstrated as Lt. Harry Sadenwater, in an airborne flying boat, carried on a conversation with the Secretary of the Navy, 65 miles away at his desk in the Navy Department.

A gyrocompass developed by Sperry Gyroscope Company for the Navy was tested in an aircraft. Although this particular instrument was not acceptable, it marked the first recorded instance of tests of a device which later proved an invaluable navigation instrument.

1922 USS *Langley*, converted from the collier *Jupiter* as the

MARCH

first carrier of the U.S. Navy, was placed in commission at Norfolk, Va.

An Experimental Research Laboratory was established at Bellevue, D. C. The new activity included the Aircraft Radio Laboratory from NAS Anacostia, the Naval Research Lab from the Bureau of Standards and the Sound Research Section of the Engineering Experiment Station. Consolidation was completed and the activity was commissioned in July 1923. Its name was officially changed to the Naval Research Laboratory by the Naval Appropriations Act of 1926.

1923 The training of nucleus crews for the rigid airships *Shenandoah* and *Los Angeles*, under way since July 1922 at Hampton Roads, opened at a new location when ground school work started at NAS Lakehurst.

1925 Fleet Problem V, the first to incorporate aircraft carrier operations, was conducted off the coast of Lower California.

NAS Anacostia reported arrangements were being made for daily weather flights to an altitude of 10,000 feet to obtain weather data and to test upper-air sounding equipment.

1927 First passenger transport, a JR-1 Tri-Motor, was purchased from the Ford Motor Company.

1939 Following the successful experimental refueling of patrol planes by the submarine *Nautilus*, the Commander in Chief, U.S. Fleet directed that Submarine Division Four and Patrol Wing Two conduct refueling tests at frequent intervals.

1941 Support Force, Atlantic Fleet was established for operations on the convoy routes across the North Atlantic. Its component patrol squadrons were placed under a Patrol Wing established at the same time.

1942 USS *Enterprise*, as part of Task Force 16 (VAdm. W. F. Halsey), moved to within 1,000 miles of Japan to launch air attacks constituting the first raid on Marcus Island.

1950 Operation *Portrex*, the largest peacetime maneuvers in history and the first to employ airborne troops in an amphibious operation, was completed.

SecDef announced that BuAer, under a research program begun in 1946, had developed a new lightweight titanium alloy for use in jet aircraft engines.

1951 Carrier Air Group 101, composed of Reserve squadrons called to active duty from Dallas, Glenview, Memphis and Olathe, flew its first combat mission from USS *Boxer* — the first carrier strikes by Reserve units against North Korean forces.

1965 Four enlisted men completed 24 days in a rotating-room test at the Naval School of Aviation Medicine at NAS Pensacola. They were determining the spinning rate man can endure without discomfort and checking out procedures for conditioning men for space flight.

1973 Last American troops left Vietnam.

Acid Trip

By Harold "Kiddy" Karr

I believe it was in the mid-Twenties, when I was attached to Scouting Two, that I had the most dangerous peacetime flight of my life. I was at the naval air station in San Diego, Calif. I was copilot with Lt. Cy Simard (later admiral) of a 1918 F5L flying boat that had two Liberty engines and a crew of three. I had known Cy a long time. We were ensigns together at Pensacola in 1920 and he frequently drove me from our apartment house to the air station in his little red Ford "bug."

That particular morning we were to make an experimental flight using a thick fluid, titanium tetrachloride. This very peculiar fluid made dense white smoke when sprayed near moisture of any sort. We were to lay a smoke screen at 4,000 feet. Then, maintaining our altitude, we were to find out how fast the heavy white vapor would sink. Thus, we would determine how high our smoke-screening planes should fly around an enemy fleet in order to obscure their vision clear up above the masthead, and how long it would take.

Our crew had ACCM Bobby Roberts as chief mech. ACOM Frenchy Le Page would control the fluid flow. I have long since forgotten the name of the radioman, but he was surely a hero. When the fluid we were to use was mixed with water it formed acid and required very high pressure (800 psi) for operations. Therefore, dual tubing went to each engine behind the exhaust stacks on one side of the engines. The fluid spray mixed with the moisture of the exhausts and created two streams of heavy smoke behind us.

A gas bottle, about four feet high, was lashed against the forward bulkhead of an open hatch back of the wings. Le Page would handle the

valve on this bottle. Roberts would be at another open cockpit inside the wing gap. The radioman's station was right behind Lt. Simard and me in the hull, forward of the gasoline tanks. Lt. Simard and I were in the open pilots' cockpit.

We were well down the Mexican Coast when we reached 4,000 feet. We prepared for our first simulated screening run which was to last about 90 seconds. Then we were to head away from the smoke and time the rate of drop of the screen.

Lt. Simard signaled Le Page that we were ready. Nothing happened and so we assumed he was having trouble with the valve. I was watching the rear in an automobile rear view mirror which I had installed to view the crew in back without turning around every time. I saw Roberts in position, half out of the middle cockpit. Le Page was moving back and forth behind the gas bottle — but no smoke appeared behind the engines.

Lt. Simard looked questioningly at me and I wrote on a message pad, "Evidently trouble with the valve." He nodded. We had plenty of time and gas, so we kept on course — no worry! Then I turned around to watch Le Page. I saw him throw his arms up around his face. A burst of white smoke enveloped him. I could see a fine spray of fluid escaping from the bottle which instantly turned to white smoke, and I knew the valve was leaking. I quickly wrote to Lt. Simard, "Valve leaking — Le Page face covered with fluid." At that moment the acrid smoke was drawn into the hull and sucked forward. We were enveloped in smoke and blinded.

We had no blind flying instruments in those old planes except a turn and bank indicator, an altimeter, a compass and an airspeed indicator. Lt. Simard made a perfect ball-in-the-center turn back towards the base. In a few minutes, he motioned for me to take the controls while he got his handkerchief out to wipe his streaming eyes. Then he took the wheel again. I saw Le Page crawling up on the stub wing by Roberts who was in the mid cockpit. He evidently was crazed by the pain of the fluid and gas leaking into his goggles. He was getting ready to jump overboard to get away from it when Roberts came up out of the cockpit. He threw his arm around Le Page and got a firm grip on the inter-wing wires.

My eyes were running water. I had my goggles off and was wiping them

frequently when Lt. Simard motioned for me to take the wheel again. After wiping his eyes, he kept them closed for a few minutes to keep out the dense smoke. Since we could see through the smoke only at intervals, we were practically flying blind. With the 5" by 12" windshield keeping the airstream away from me, I left my goggles off so I could wipe my eyes. Then Simard took the wheel again. As I looked back, I could now and then see Le Page beating Bobby Roberts over the head to make him let go. Since Le Page's arms and hands were heavily coated with this thick yellow fluid, Roberts was also immediately enveloped in thick white smoke.

I suppose it was then that I realized what the acid was doing to Le Page and Roberts — and, incidentally, all of us. I grabbed the pad and wrote a message to base sick bay, "Crew of 2S4 covered with acid, get wash tubs of baking soda water to VS-2 ramp! Now! Now! Soonest!" Because of the smoke, I couldn't see the radioman behind us. So, I reached over and got a spare message pad. I threw it where he should be and waved the paper I had just written at him. He got it and turned back to his set. From then on we were in direct communication with the base.

I was afraid to look back at Roberts and Le Page for fear they both had gone overboard (none of us had parachutes on). But through a rift in the smoke I saw they were still on the stub wing and still battling. Finally Roberts got Le Page down on the wing, with part of him in the mid cockpit. He was still wildly throwing punches and struggling to get away. Roberts was having a rough time of it. I would have dropped my seat and gone back to give him a hand but I had to be ready to relieve Lt. Simard when the pain in his eyes got so bad he couldn't stand it any longer. Dropping his lids to keep out the smoke seemed to be the only relief. My eyes watered so bad, my handkerchief was almost dripping wet. I knew Simard was in a similar condition. I hated to think about the poor radioman down there in the hull, still at his post with no relief. Now and then he handed up a message from the base.

Sick bay radioed they were leaving for the beach with the soda water, and the tower said the air had been cleared around North Island. We were to come straight in and up to the sand beach. I sent another message to the squadron advising them to keep the beach crew away from us until the props had stopped windmilling. I knew that the moment we stopped the entire plane would be in the center of a cloud of dense smoke and a crewman could easily be killed by a prop.

We were letting down gradually, increasing our speed and reducing the time needed for an approach when we came in to land. Every once in a while I could see the horizon and kept us on the original course Lt. Simard had set. At last, in the dim distance, I could see Point Loma.

By now we were all feeling the action of the acid on our skin. At first I thought it was just the smoke causing it, but then it began to smart. I could think of nothing so grand as putting my head into one of those tubs of soda water, getting my clothes off and sponging off with more of the water. I hated to think of the pain Roberts and Le Page were suffering with the concentrated fluid on their skin and eyes. I could see, now and then, that Le Page did not seem to be struggling so violently. He was still half in the cockpit with Roberts' arm and one leg around him. I was confident they could hold out until we hit the beach. The radioman had put his arm up on the back of our seat so I could signal him if I had another message to send, and he could signal me if a message came in. But after the arrangements were made the air was silent.

We came in over the lower end of the bay and bore slightly north, directly towards the squadron. The tension now, when we were so close to the end, seemed even greater. It seemed at least half an hour before we made the last turn and dropped for the landing. The second Lt. Simard felt the hull hit the water, he opened the throttles and kept the plane on the step across the bay. Evidently the denser air near the water improved visibility and we had an almost uninterrupted view ahead.

Of course, the plane was smoking fiercely astern. I suppose anyone who saw us thought we were on fire. When we slid high on the sand beach in front of the hangar, the beach crew forgot all about what they had been told. Thinking the plane was on fire, they started scooping up water with their hands and hats, throwing it all over the plane. This immediately intensified the dense cloud of smoke around us. Lt. Simard and I were yelling at the top of our voices, "keep away from the props." The thick smoke we drew into our lungs started us coughing so hard we couldn't talk.

Quickly, other plane crews waded in from the rear and got Roberts and Le Page off. I dropped the catch on my seat so the radioman could come out forward. We jumped down on the sand and ran away from the smoke cloud. I got up on the ramp just in time to see someone pick up Le Page, flip him over and dunk him in the tub of soda water. When they pulled him up, he was "boiling" all over as the soda neutralized the acid. Then, one by one, the rest of us got the same treatment. What a blessed relief when the stinging pain suddenly stopped. Then and there we all undressed and sponged our bodies with the soda water. We washed our eyes with some liquid from sick bay. However, the stuff remained in our eyes until the next day. Fortunately there was no permanent damage or injury.

Had it not been for the radioman remaining on station, many complications could have resulted. Bobby Roberts surely deserved a medal. Although he was recommended for one he never got it. Aside from the engines, the plane was a total survey job. The acid ate into the plywood hull until you could skive it off with your thumbnail. The control wires looked like squirrel tails with stranded wires sticking out in every direction. The oddest effect was seen in the kapok life preservers that had been in the plane. You could tear the cover away and the interior resembled a mush-like substance. It could be squeezed through the fingers, just like toothpaste.

The engines were removed and the plane was taken to the dump and burned. We could not get reimbursed for the clothing we had on which was absolutely ruined. I went home that night in GI coveralls. By the time I got there my shoes had started coming apart where the acid had eaten into the cotton thread with which they were sewed together!

The author was the Navy's first enlisted pilot, designated in 1920. He retired as an ensign. In addition to the F5L, Karr flew numerous aircraft in his career, including the British S.E.5, the Donnet-Denhaut flying boat, *Nieuports* and *Camels*.

Simulators

By G. Dean Carico

For 30 years, Naval Air Test Center pilots and engineers have flight-tested helicopters to determine their mission suitability. Now they are being tasked to judge how well those flight characteristics have been reproduced in flight simulators.

While the helicopter simulator inventory is small in comparison to that of the attack and fighter communities, it now possesses one of the latest state-of-the-art simulators. The SH-2F WST (weapons system trainer), which features a motion base and computer generated image (CGI) visual system, is now undergoing on-site testing at NAS Norfolk.

The correlation between simulator time and aircraft time in terms of training value has been debated for years. Data from flight training studies shows that the "substitution ratio" has varied from .8 to 4.0 hours of flight simulator time to one hour of flight training, depending on the syllabus.

Of primary concern to Navy planners is how much simulator time may be used for initial training programs, for instrument checks and for maintaining flight hour minimums. Currently, each military service permits a portion of its minimum annual instrument flight-hour requirements to be accomplished with simulator time. Six hours of the 12-hour annual Navy and Marine Corps instrument requirement may be obtained in approved simulators. In the future, instrument ratings and Natops aircraft qualifications may be obtained in designated simulators with OpNav approval.

The Coast Guard has been using the HH-3F simulator since 1973. As a result, they spend one-tenth the money in hourly costs over a period of one year using the simulator instead of actual flight time. In November 1974, *Army Aviation Digest* reported a rotary wing instrument course saving of $377,758 by using its UH-1H simulator. The eight-week course formerly consisted of 28 hours in a trainer and 42 flight hours. The course was reduced to six weeks with 34 hours of simulator time and seven flight hours.

Substantial cost savings have also been reported by the Air Force in the operational evaluation of its simulators. This savings trend is expected to continue with future Navy and Marine Corps simulators.

Maximum simulator cost effectiveness can only be attained when the ratio of simulator operating expenses to aircraft operating expenses is low. At the same time, the equality of training must be maintained at a high level.

This last requirement implies that the flight characteristics of the simulator should be very close to those of the aircraft. Indeed, it should have a flight fidelity approaching 100 percent in the syllabus flight regime. The test techniques used to define the flying qualities and performance of the helicopter should also be used to verify the flight fidelity of the simulator.

New model helicopters tested at NATC are instrumented for flying qualities, performance and structural parameters. Simulator programs often occurred after the initial aircraft tests were completed and the instrumentation packages had been removed. If additional data was required to verify the simulator flight fidelity, it had to be acquired from uninstrumented helicopters. Concurrent helicopter and simulator test program planning is under way to ensure adequate airframe data for simulator flight fidelity evaluations. NATC is working toward the integration of simulator data requirements into the planning of future helicopter test programs.

Acquisition of new Navy and Marine Corps helicopter motion base simulators with visual systems should upgrade the pilot training programs and reduce aircraft operating cost. New test techniques will be developed by NATC to ensure that the state-of-the-art of simulator testing parallels the advances in simulator development. Increased emphasis on the acquisition and flight fidelity testing of helicopter simulators should help meet the Department of Defense goal of an overall 25 percent reduction in flight hours by the end of FY 1981.

DO SHARKS LIKE HELICOPTERS?

By Bernard J. Zahuranec, ONR

The book and movie *Jaws* have made it fashionable to talk about sharks. Or, to put it another way, sharks are attracting more notice. Sharks have long been recognized as a definite hazard to men in the ocean, whether the men are swimmers, divers, downed aviators or seamen awaiting rescue.

To try to overcome the shark hazard during WW II, a research program was set up involving personnel from the Naval Research Laboratory and other scientists. Out of that program came the Navy's standard shark repellent, commonly called "shark chaser." It is a cake of water-soluble wax containing copper acetate and nigrosine dye. The dye forms a dark cloud in the water which at least some sharks avoid. The copper acetate provides acetate ions which have been found distasteful to many sharks. Shark chaser provides men in the water, especially downed aviators, with something to repel the creatures.

There are more than 200 species of sharks in the world, but only about 20 of the species are really dangerous to man. Even though some are closely related, they have different kinds of behavior and capabilities. The original testing with shark chaser was necessarily limited to a few species. It was not possible to investigate all known dangerous or potentially dangerous sharks. In fact, at that time, it was not really known which of the species were dangerous or how dangerous they were. For those sharks tested, the mixture of acetate ions and nigrosine dye worked reasonably well as a repellent. However, the search for a better repellent goes on.

Just how different the various species of sharks are only started to become clear as a result of research supported largely by the Office of Naval Research from the 1950s until now. Although sharks have many similarities, they are also quite different in how they respond and react to a sensory stimulus. These stimuli include:

Visual cues — most dangerous sharks apparently can see colors well, though exactly which colors is not known.

Chemicals — certain organic chemicals such as amines are not only very attractive to sharks but can also be detected by them in extremely low concentrations, perhaps in parts per billion.

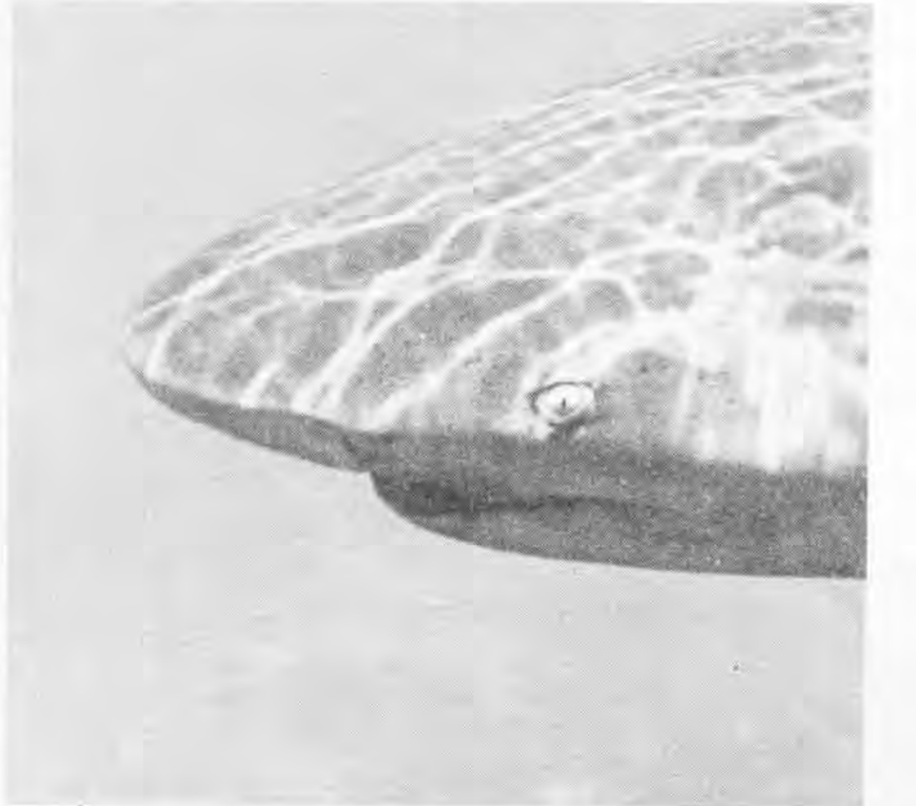
Weak electric fields — at least some species of sharks are sensitive to extremely weak electric fields in the sea, the types of electric fields generated by living organisms such as fish with a sensitivity ranging below one-tenth of a microvolt per centimeter.

Sounds — many species of sharks, especially open-water free-swimming species, are attracted to low-frequency sounds. Those sounds with irregular pulses of short duration seem alluring to sharks.

In ONR-supported research at the University of Miami, Dr. Arthur Myrberg found that sharks are attracted to low-frequency sounds, that is, sounds below 1,000 hertz. Those around 20-40 Hz seemed the most attractive. But constant humming sounds or a regular pulsed beat, even at these low frequencies, did not attract sharks nearly as well as irregular pulses. These resemble the kind of low-frequency sounds made by a fish struggling in the water. Dr. Myrberg and his associates found that wherever they tried putting the low-frequency irregularly-pulsed tones into the water, whether in the Atlantic or Pacific, they were successful in calling sharks toward the transducer.

It is the sharks' attraction to sound that prompted the title of this article. At least some helicopters put low-frequency noise into the water. For some time, ONR personnel have heard rumors or stories that sharks were lured to the area below a hovering helicopter. However, there were no direct reports by personnel who had observed this phenomenon. Then, last December, during a telephone conversation with us, Commander Gene Williams mentioned having made such observations while piloting a helo around Key West. He sent the following information:

"During the years 1957 to 1960, I was a helicopter pilot in HS-1 at Key West. We flew the SH-34 (HSS-1) which is powered by a reciprocating engine. The majority of our training



occurred in the Gulf Stream south of Key West, beyond the 100 fathom curve. The mission involved utilization of dipping sonar. This requires establishing a 20 to 40-foot hover and lowering a sonar transducer via a cable to 50 or 100 feet below the surface. A relatively stationary hover would be maintained from two to five minutes and, occasionally, as long as 30 to 45 minutes. Engine rpm would be about 2,500 rpms (with a range of 2,400 to 2,800). The corresponding rotor speed would be about 210 rpm (a guess). The sonar transducer was usually operative, but this was not always the case. If the mission was designed simply for pilot training to practice hovering over the ball or to practice tactics, the sonar operator might elect not to listen or ping. I honestly don't recall the output frequency of the sonar we had. On several occasions, I saw one or more sharks in the water below the helo in the area of water disturbed by the rotor wash. I don't recall ever seeing sharks in undisturbed water while in a hover unless we purposely flew over to get a closer look at one we had spotted. The sighting of the sharks was by no means a frequent thing, but it should be noted that usually the rotor wash of the helicopter was behind the aircraft as we hovered facing into the wind. [Consequently, the sharks might not be easily noticed.] Only when the wind was relatively light or calm was this area of disturbed water easily visible. I am pretty sure that I have made such shark sightings both with and without the sonar being active.

"As to species of shark, I never saw a sand shark. Usually they were what we called blue sharks. Infrequently, single hammerhead sharks were seen. They would suddenly appear in the rotor wash, swim around for a short time and then disappear. Normally if several fish were seen, we would move the hover site 1,000 to 2,000 yards. I never felt that at those distances we were followed. However, the submariners we operated with told me we could be heard up to several miles underwater."

We would like to know more about the possible attraction of sharks to helicopter noise because of the relationship to SAR missions. Ultimately it may be necessary to conduct controlled experiments but there may be a great deal of information available from helo pilots and observers — like that reported above. Such data could provide clues as to how experiments could best be conducted.

We would appreciate hearing from any pilots or observers about shark sightings. As much information as possible about the circumstances would be helpful including weather and flying conditions, height above the water, locality, estimated depth of the water (if possible), type of helicopters or other aircraft, time of day, dates or season, number and size of sharks, etc.

Information should be sent to LCdr. James Welch, Department of Environmental Sciences, U.S. Naval Academy, Annapolis, Md. 21402. LCdr. Welch teaches biological oceanography and the midshipmen in his class will compile a report for ONR from the information received. Results of the study will be published later.

PEOPLE PLANES AND PLACES

It was a clear Mediterranean night and USS *Kennedy's* flight deck crew was awaiting final recovery of aircraft. It was 2200, November 22, 1975.

The first plane, an EA-6B, was in the groove. Behind the *Intruder*, comfortably spaced in the approach sequence and tiered in holding patterns, were the remaining Air Wing One aircraft.

Suddenly, a fireball erupted from the ship. The LSO quickly waved off the *Intruder*. The carrier and USS *Belknap*, a destroyer in company, had collided. All planes were given a four-minute, then a ten-minute delay. It was soon determined that the planes would have to be diverted.

An E-2C *Hawkeye*, #722, was holding at 20,000 feet.

At the combat information center station was LCdr. Jay Sprague. Another NFO, Ltjg. Jim Beamer, was the air control officer. They were instantly ready to assist the score of *Kennedy* planes. The pilot, LCdr. Ray Bunton, and his copilot, Ltjg. Brett McVay, along with flight technician AT3 Carlos Diaz, complemented the efforts of the NFOs.

The E-2C has always had a solid reputation as an airborne communications platform. This VAW-125 *Hawkeye* was equipped with a VHF radio in addition to a UHF set. (The squadron had been experimenting with the dual arrangement.) On this night, the VHF proved especially useful to Sprague and Beamer. It gave them a clear, uncluttered channel of communications.

The best divert field was NAF Sigonella, 100 miles away. Seven-two-two set up position at the midway point between *Kennedy* and the Sicilian airfield. Sprague and Beamer issued vectors at the outset. Thereafter the *Hawkeye* and its crew monitored the en masse movement of the aircraft and reported the traffic flow to *Kennedy* and Sigonella.

On occasion, a divert can be a confusing event described as a "flail." On this tragic November night, the *Hawkeye* and crew responded without hesitation or dramatics. It became a routine evolution.

"It went smoothly," LCdr. Sprague said later. "Good weather helped, of course. The planes were already well spaced in the Case III recovery pattern. It was sort of like one big shift as they changed heading for Sigonella."

Fittingly, 722 was the last plane to land at Sigonella—after all the others.

When funds are limited and equipment is needed but not affordable, a bit of resourcefulness and some surveyed material can sometimes be the answer. This vehicle, an NC-5 mobile electrical power plant, was taken from the scrap pile, redesigned and overhauled by Marines and Navy men of the ground support equipment unit at MCAS Yuma. The men con-

verted the NC-5 into a much needed ground support towing and troubleshooting vehicle. It cost about $2,000 and took a total of two and one-half months of uncommitted time to design and build. The new unit has already cut GSE's down time by 75 percent. The men say they have other ideas for future vehicles that could be fabricated from surveyed units and odds and ends of used materials.

To a Naval Aviator, the recent achievement of Capt. James Flatley III could be compared to Hank Aaron overtaking Babe Ruth as the home run king. Flatley surpassed a significant record when his F-4 *Phantom* set down on *Independence* to log his 1,419th carrier arrested landing, December 12, 1975. The previous mark was set by Capt. George Watkins, USN (Ret.).

Flatley is Commander, Attack Carrier Air Wing Seven, and the son of the carrier aviator and WW II fighter ace, VAdm. James Flatley. In 1958, the admiral published a document, the *Flatley Report*, presenting recommendations on how to lower the Navy's disastrous and ongoing accident rate of the mid and late 1950s. The ultimate outcome of the study was the institution of the RAG concept and assurance of more tours in the cockpit for carrier pilots.

Flatley, who won his wings in October 1957, has been following his father's advice. Now in his tenth deployment in the cockpit, he has accumulated 4,260 flight hours in over 20 different tailhook aircraft and operated from 13 U.S. carriers and one British. He has a total of over 7,200 landings of all types. These achievements were recorded without a single ground or airborne incident, accident or significant aircraft equipment failure.

Twenty USS *Midway* crewmen were honored recently with medals and letters of commendation for their performances during the evacuation of South Vietnam last April. Those honored were cited for their individual contributions in accomplishing the ship's mission during the evacuation. The 3,073 evacuees received food, lodging and medical care while transiting in *Midway*.

Midway hosted a group of foreign visitors recently when 44 Japanese news media representatives came aboard for a two-hour tour of the ship and Air Wing Five. The tour marked the first such visit by Japanese media in over two years.

On December 15, 1954, Ens. Robert Horton flew a VS-30 *Tracker* from Norfolk, Va. Twenty-one years later, on the same date, the same Horton, now a commander, flew the same S-2 at NAS Lakehurst, N.J. Horton attributes the extended career of this aircraft to the maintenance it received from skilled Navy mechanics and the tender, loving care bestowed on it by the pilots who flew it. The aircraft has logged 7,846 flight hours.

The *Saints* of VC-13 came rolling into NAS Miramar January 8, in A-4L *Skyhawks* to join NARDet Miramar. The relocation to San Diego came after a three-year stay in New Orleans. The squadron will be manned by three officers and 42 enlisted men full-time with 14 officers and 85 enlisted Selected Air Reservists.

The *Fighting Redtails* of VS-21 have returned to NAS North Island from a seven-month deployment with Navy's newest aircraft, the S-3A *Viking*. During the deployment aboard *John F. Kennedy*, the *Redtails* amassed over 5,000 flight hours and made over 1,300 carrier arrested landings.

Cdr. A. W. Stoeckel, VS-21 C.O., became the first S-3A centurion.

During the course of its work-up period in support of NATO forces in Europe, VS-21 participated in six major fleet and two NATO exercises.

Weekenders

As most reserve squadrons, Patrol Squadron 65 is comprised of insurance men, policemen, pilots, mechanics, technicians . . . civilians from all walks of life.

Two days each month these men leave their businesses and jobs, their families and friends and don their Navy uniforms to help supplement the Navy's active force of airborne submarine hunters. To remain proficient and on a par with their regular Navy counterparts, VP-65's airmen dedicate many hours to weekend flying.

The men fly the P-3A *Orion*, from their home base at NAS Point Mugu, Calif., on antisubmarine warfare duty along the West Coast and points beyond.

On a recent transoceanic training flight, reservist TD2 Larry Hincker, a photography student at Brooks Institute in Santa Barbara, Calif., accompanied the Weekend Warriors of VP-65 and filmed them at work.

Flight engineer Ed Lester, an L.A. policeman, reviews the gripe sheet for malfunctions and discusses them with a member of power plants division. Aviation Machinist's Mate Lester monitors the fuel system and computes the weight and balance of the aircraft. He reports his findings to the pilot, Lt. John Rasmussen, a civilian flyer for Flying Tiger Airlines.

Wearing mickey mouse ears to abate engine noise, AO2 Dave Mehrens, a maintenance man with San Diego Power and Electric, loads cargo webbing used to tie down loose gear. On a tactical flight, Mehrens is responsible for loading sonobuoys and ordnance.

Inflight, Lt. Jeff Hereford, navigator, Comptroller for Naval Construction Battalion Center, Port Hueneme, interprets a signal from the Loran navigational device as AE3 Jim Oxander, a technician for the Air Force, adjusts the high-frequency land radio. It enables him to give position reports to nearby monitors tracking the flight.

The dead reckoning computer, compass and protractor are simple but invaluable tools of the trade. The crew is required to make a position report every five degrees of longitudinal travel. Thus, the navigator makes a position check about once an hour and passes the information to the radio operator.

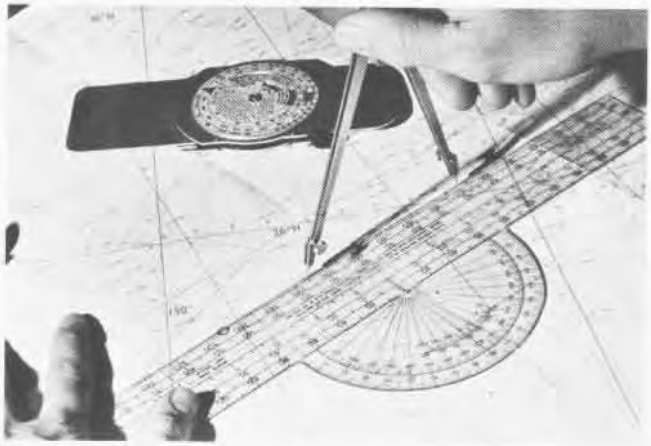
A seven-hour flight at 27,000 feet overwater calls for an occasional break. ATC Ron Scaggs, an electronics technician with Hughes Aircraft, relaxes with a smoke as copilot Lt. Dave Richardson, a civil service employee in San Diego, positions his sunglasses on his head for a better view of cockpit instrumentation.

Silhouetted on the wing, flight engineer Lester makes final checks on the aircraft before tying down for the night.







MLS

By Don Braun, FAA

Landing has always been the trickiest part of flying. For more than 25 years, ground controlled approach has been the military's mainstay for precision landing approaches. On the civil side of aviation, the instrument landing system has performed yeomen duty for about the same period. But now a better system is coming: the Microwave Landing System (MLS).

The day will come when MLS is installed at every major U.S. civil and military airport, offering more reliable and versatile landing assistance. When that day arrives — before the year 2,000, according to present plans — all types of military aircraft from every service will be able to land at airfields of any other service because all the planes and airfields will utilize the same kind of landing aid. Military planes will be able to use MSL-equipped civil airports with equal ease. Everybody, literally, will be on the same wavelength, using the same type of electronic landing signals. Interservice and civil/military "interoperability" is a major benefit of MLS in addition to its purely technical advantages.

U.S. efforts to create MLS got going in a big way in 1971 with publication of the National MLS Development Plan, formulated jointly by the Department of Transportation (DOT), DOD and the National Aeronautics and Space Administration. DOT's Federal Aviation Administration was made manager of the plan.

In 1972 the International Civil Aviation Organization (ICAO) began coordinating efforts for development of a new international standard MLS, a project which the U.S. joined, along with Britain, France, Germany and Australia. In September 1976 an ICAO panel will recommend to the full ICAO membership one of the MLS designs developed by these nations as a new international standard landing aid. Final ICAO selection is scheduled for the first half of 1977. The first MLS systems are expected to go into operation in 1978.

MLS will solve the problems which afflict today's landing aids: poorer performance in bad weather, signal interference from nearby buildings and local terrain, limitation to a single approach path and radio frequency congestion.

Because they require a controller to look at a radar picture, ground controlled approach systems can be hard to use when they are needed most — in bad weather. The controller wants to see the reflection from the plane, not clutter from clouds or heavy precipitation. Furthermore, most precision approach radar systems are filled with vacuum tubes, and it's becoming difficult to replace burnt out tubes. In general, it is an arduous task to maintain these aging systems. Also, GCA provides only a single, narrow final approach path.

Similarly, aircraft flying instrument landing system (ILS) approaches must line up with the runway several miles out and fly the single straight ILS path down to the concrete. In effect, all the planes are channeled into the same groove. The glide slope on any given ILS is fixed.

ILS's lower radio frequencies make its signal subject to interference.

Sometimes it is not possible to install an ILS without first moving mountains (or at least large hills) and, in many places, it isn't possible to install ILS at all.

Finally, ILS uses 20 radio frequencies — with a total of 40 available — making it difficult to install more systems in confined geographic areas.

Enter MLS with multiple approach paths, almost no problem from terrain interference and bad weather, far more radio frequencies and suitability for quick-assembly, tactical systems in rough conditions. Who could ask for more? The experts say that MLS will meet aviation needs right into the next century.

MLS's much higher radio frequencies are less affected by local terrain or buildings. This means MLS can be installed in many places where ILS can't go. Two hundred radio frequencies are available for MLSs. And, most impressive, is the fact that MLS generates an electronic funnel into which an aircraft can enter and make almost any curved or segmented approach to the runway, limited only by the performance of the plane.

These instrument MLS approaches can begin up to 40 degrees to the side of the extended runway centerline or on up to a 20-degree initial glide slope. The ability of aircraft to make curved approaches with MLS will give air traffic controllers much more flexibility in managing incoming aircraft, aid in noise abatement flight paths and help increase airport capacity.

By at least one measurement, the military services will be the biggest MLS customer. At present there are 20,000 aircraft in the military fleet, and the majority of them, or their replacements in the years ahead, probably will be equipped with MLS receivers when MLS comes into use. This is a much bigger group than the commercial airliners which number about 2,500.

On the ground, there are plenty of military air bases where MLS is likely to be installed. Navy's MLS plan calls for replacement of all GCAs. Currently, 54 Navy and Marine Corps stations are using GCA. The Air Force anticipates a need for some 200 MLSs at over 100 Air Force bases — a number of which have more than one GCA. The Army foresees a need for 106 MLSs, the majority for tactical use and the remainder for civil and military use at Army airfields. The Army now has 44 GCAs at airfields and a larger number of tactical systems.

Although the U.S. MLS program calls for development of a so-called "milspec" version of MLS, plans are still uncertain as to who will develop it and when. These systems will be designed as rugged, portable, easy-to-set-up units for tactical use in the field by the Air Force and Army.

Another version of MLS will be designed for use on aircraft carriers. They eventually will get MLSs. MLS might even replace the SPN-42 automatic carrier landing system. An aircraft would use the precise MLS signals emanating from the carrier to do its own computations for a hands-off final approach and touchdown.

In today's system, shipboard electronics do the calculations and send commands to the aircraft. A completely airborne flight command package probably would act more quickly than a shipboard system in adjusting the plane's motion and speed as it roars down the groove.

FAA developed MLS in three phases. In Phase I, basic engineering problems were attacked and solved. In Phase II, four contractors built pre-prototype MLSs. Two companies worked separately on scanning beam systems, while the other two worked separately on Doppler systems.

In the autumn of 1974, FAA assembled some 120 experts from government, the military, industry and other nations to help it decide which system to pursue, based on cost, performance and practicality. Ultimately, an FAA MLS Steering Committee of 17 members, including two each from the Army, Navy and Air Force, voted to recommend a time-reference scanning beam system. Bendix Corporation and Texas Instruments, Inc., had developed this method. The recommendation was not easy to reach, because both the Doppler and scanning beam systems worked well. Early this year an interagency MLS Executive Committee of DOD, DOT, and NASA representatives ratified the recommendation. By this action, the U.S. committed itself to submitting a scanning beam design to ICAO.

MLS, as its name implies, will use the microwave portion of the radio frequency spectrum: the C-Band, which is 5 GHz. The term "scanning beam" refers to the method of sending out two fan radio beams from the runway, one scanning side to side, the other up and down. Equipment on board the aircraft will measure the time between successive "to" and "fro" sweeps of the beams to figure out the plane's position relative to the runway centerline and to a pre-selected glide path. "Time reference" means that the signals for azimuth and elevation, and additional functions like back-course azimuth and elevation and auxiliary data, are all transmitted on the same frequency in a certain timed sequence which can be changed if desired.

In December 1975, FAA submitted detailed technical data on the U.S. MLS design to ICAO. The complicated MLS scenario continues next month with scheduled delivery to FAA of Phase III ground and air prototype equipment built by Bendix and Texas Instruments. FAA expects to get additional hardware in order to provide two MLS airborne receivers each to the Navy, Air Force, Army and Marines. In the ensuing months, both FAA and the military services will spend as much time as possible in the air, collecting more data on MLS performance. The Navy will fly its tests in an F-4 *Phantom*. This supplementary data will be given to ICAO before it selects one of the competing MLSs next September.

FAA officials say they are "thinking positive." If the U.S. design is selected by ICAO, the MLS prototypes will be crucial to development of production-line systems. If not, the prototypes will become sophisticated electronic curios.

The coming of MLS will not immediately wipe out existing landing systems. Installation of the first MLSs in 1978 will usher in a period of 20 years or so in which MLS will gradually replace ILS and GCA. When decisions are made to replace non-precision, Tacan-DME landing aids at specific locations, MLS will of course be the choice.

In the years ahead, GCA may well "coexist" with MLS at some military airfields, as long as the GCA can still be maintained and military aircraft are still converting to airborne MLS receivers. On the civil side, FAA has a similar scheme in mind: co-locating MLSs with ILSs in many locations until the airlines convert fully to MLS.

No matter what nation wins the ICAO sweepstakes, MLS eventually will be everybody's precision landing aid. And purely on its technical merits, MLS will do a better job.

AIR

RACER

By John Tegler

Late in the afternoon of September 14, 1975, at the Stead Facility eight miles outside of Reno, Nev., a highly modified Grumman F8F-2 *Bearcat* turns tightly off the #8 course pylon. It streaks down the main straightaway before 30,000 screaming fans and takes the checkered flag to the unlimited championship at the Reno National Air Races. A new race record of 429.916 mph is recorded. The pilot is Lyle Shelton of Granada Hills, Calif.; a 727 driver for TWA and a naval reserve commander attached to Naval Air Systems Command Test and Evaluation Unit 719 at China Lake, Calif.

The team which helped bring the *Bearcat* to victory, from the pilot on down, is almost totally Navy oriented.

The racer itself is, of course, an ex-Navy aircraft. But it looks and performs a bit differently today than it did as a production carrier fighter. Lyle Shelton is an active naval reserve officer. His able team crew chief, Bill Hickle, is employed as a civilian engineer in the advanced aircraft systems office at China Lake. The crew is "Navy" in one sense or another and includes Bill's brother, Art Hickle, who is also a civilian employee at China Lake. Also on the roster are two retired ADRCs, Robbie Robinson and Austin Cranston; Lt., Norman Hansen; two Grumman employees from China Lake, Greg Davis and Ron O'Brien; and AMH1 George Williamson.

The back-up pilot, who does a great deal of the ferry work and some of the test flying along with Shelton, is LCdr. Jim Pate, an attack pilot stationed at China Lake.

This team carries on a tradition in the "fastest sport in the world," a sport which began back in the 1920s when the Navy participated in both the Schneider and Pulitzer Trophy Races.

In 1923 Navy aircraft and pilots placed first and second in the Schneider Trophy Races at Cowes, England. Lt. David Rittenhouse set a new record at 177 mph in a Curtiss CR-3; Lt. Rutledge Irvine, also in an CR-3, took second place at 173. The Navy also participated in the Schneider competition in 1925 at Baltimore, Md., and at Hampton Roads, Va., in 1926. The best effort in these two races was turned in by Lt. Tomlinson in a Curtiss F6C-1. He placed fourth in 1926.

During the 1920s, the Pulitzer Trophy Races seemed like a contest between Navy and Army aircraft and pilots. The first Pulitzer, in 1920, had four Navy participants with Ltjg. Arthur Laverents achieving the best finish. He was fifth, flying a Vought VE-7 at 125 mph. Civilian flyer Bert Acosta won in a Navy Curtiss CR-1 at 177 mph the next year. In 1922, Navy pilots placed third and fourth.

In 1923 Navy participants swept the first four places. Lt. Al Williams, in a Curtiss R2C-1, was the winner at 243 mph. Lt. Harold Brow placed second with Lt. Lawson Sanderson, USMC, third, and Lt. Steven Callaway, fourth. Lt. Williams placed second in 1925 and, in 1926, the Navy won again with Lt. George Cuddihy in a Boeing FB-3 at 180 mph.

At the National Air Races in 1927, the Navy's best finish was achieved by Lt. Thomas Jeter who finished third in a Boeing FB-5. Lt. Jeter led an all-Navy field of seven aircraft in the Boeing XF4B-1 at 172 mph in 1928. The last official military participation in these races was in 1929. Only one Army and one Navy plane entered. Navy's entry, a Curtiss F6C-6 *Hawk*, managed a fourth place finish with Commander J. J. Clark at the controls.

Probably the best known Navy air racing effort to come along in the years following 1929 was achieved by Cook Cleland in the post-World War II Cleveland National Air Races. Navy pilot Cleland placed sixth in the Thompson Trophy Race one year after WW II hostilities ended. He piloted a Goodyear FG-1D *Corsair* at 396 mph. A year later, in an F2G, he had to pull out on the fourth lap, after turning two of those four laps at 410 mph. He then came back to win the final Thompson Trophy Race in 1949 with the same *Corsair*. He scored a new record average speed of 397 mph.

The sport of closed-course pylon air racing was revived in 1964 and is once again becoming a major spectator sport. Lyle Shelton, in his purple and white #77 *Bearcat*, is sponsored by The Aircraft Cylinder and Turbine Company. He has picked up the mantle once worn by Navy racer pilots of the past.

A native of Texas, Shelton began his flying career with the Navy at Pensacola in 1956. During his active duty, he flew SNJs, T-28s, T-34s, ADs, FJs and others. He served as a flight instructor in the Navy and with the Air Force while on exchange duty, flying T-38s. He also flew as an attack pilot from USS *Roosevelt* and USS *Kearsarge*.

After leaving active duty, he did some agricultural flying and worked as a flying engineer for an oil company in Texas. He then joined TWA where he is rated in both the 707 and 727 aircraft. He has been active in the Naval Air Reserve since 1966, first flying A-4 *Skyhawks*.

Shelton first became interested in air racing in 1965 and raced a P-51 *Mustang* at Reno. He finished in the championship race in his first outing. He returned in 1966, this time in a Hawker *Sea Fury*, but was unable to make the championship race.

In 1968 he purchased the remains of a wrecked *Bearcat* in Indiana, trucked the pieces back to California, and began a major rebuilding effort. The rebuilt *Bearcat* has evolved into the fastest competition aircraft in the world.

It appeared for the first time in competition at Reno in 1969 bearing the name *Able Cat* and #79. It really was a hybrid since it contained parts of many other *Bearcats* and was powered by a Wright R-3350 rather than its normal P&W R-2800. The yellow and blue *Bearcat* suffered from a faulty water injection system that year but Shelton was still able to finish fifth in the championship race. In 1970 he won his heat race in *Able Cat* which now carried #77. Unfortunately, the engine threw a rod in the championship race and he had to pull out.

Finally, in 1971, after three years of hard work and constant modification, all of the patience and skill that had gone into his aircraft began to pay off for Shelton and his crew. He won the Schlitz Cup Unlimited Championship in #77, rechristened *Phoenix I*, at the New Jersey National Air Races. He was the top qualifier at the United States Cup Race at San Diego, and came in second at Reno in the championship race just .02 seconds behind winner, Darryl Greenamyer. He averaged over 413 mph. He was declared the national point champion in the unlimited class of air racing for 1971 and topped off the year by setting a new world time-to-climb record for propeller aircraft by flying the *Bearcat* to 3,111 meters in just 91.9 seconds.

Further modification work was performed on the racer during late 1971 and early 1972. This included a reshaping of the canopy, addition of a tail cone and the clipping of the outer wing panels. The aircraft also received a new white and lavender paint job

Left to right, Shelton banking #77, rebuilt Bearcat gets a bath, Shelton closing on Darryl Greenamyer's Bearcat #1 at 1975 California National Air Races, and Shelton in cockpit.

and was renamed *Phast Phoenix*.

At Reno in 1972 Shelton qualified third in a field of 16, again at over 400 mph, finished second in his heat race, and second in the championship race, with an average speed of 404 mph, this time behind Gunther Balz in a modified *Mustang*.

The year when everything came together for Lyle Shelton was 1973. He completely dominated the unlimited racing scene. The aircraft had a new sponsor and was now called "The U.S. Thrift 7¼% Special." Shelton began the year by winning the Roscoe Turner Speed Classic, the championship race for the unlimited class, at the Great Miami Air Races with a speed of 373 mph. At Reno, later in the year, he broke the existing qualifying record in the class at 426 mph. He won his heat race at 406 and the Gold (championship) Race at 428 mph after a hotly contested battle with Bob Love in a *Mustang*. This shattered the former record of 416 mph set by Gunther Balz in 1972. At the California National Air Races at Mojave in October, it was the same story all over again. Lyle won the championship race after another battle with Bob Love at 396 mph. In 1973 Shelton was declared the unlimited national point champion and was elected president of the Professional Race Pilots Association.

At Reno, 1974, Lyle started out by once again breaking the unlimited qualifying record. He posted a qualifying speed of 432 mph and won his heat race with a speed in excess of 420 mph. It looked like another unlimited championship victory was forthcoming for him, but it was not to be. He actually crossed the finish line in that race in the first position with what looked like another race record speed, but was, unfortunately, called for a rules infraction and was dropped to fifth place in the official standings. Later in the season, at the California National Air Races, Shelton again looked like a sure winner but was nipped at the finish line by Mac McClain in a *Mustang*, the *Red Baron*. He finished second.

At the California National Air Races in June 1975, Shelton experienced an almost exact replay of what had happened the year before, since he was again just beaten across the finish line, this time by Cliff Cummins in his *Mustang*, *Miss Candace*, after what had been one of the most exciting unlimited races ever.

Shelton and crew showed the mark of champions by coming back at the 1975 Reno National Championship Air Races to win in what was the fastest starting field in the history of Thompson or unlimited closed-course pylon air racing. Every aircraft in the field had qualified in excess of 400 mph. Not only did #77 win, but it set a new race record speed which broke the old record set by Shelton.

Even though it has been many years since the military has sanctioned or given their blessing to any participation in the sport of air racing, there are still many who carry on the competition between Air Force and Navy, primarily in *Mustangs* and *Bearcats*. Even though there is no rooting section waving blue and gold banners, there is still absolutely no doubt where the sentiments of Lyle Shelton and his championship air racing crew lie. If you will look closely at #77, you will see it clearly says "Fly Navy."

NAVAL AVIATION NEWS letters

At Atsugi

I was interested in your article by Russell A. Stone on NAS Atsugi. On September 3, 1945, a group of Navy officers (myself included) greeted members of the Russian legation who had been interned when Russia declared war and were liberated the day before Atsugi airfield was taken by the American forces. It is too bad that Mr. Stone did not know Naval Aviation was there that fateful day so that he could give it credit for liberating the Russians.

The events leading up to our presence in Atsugi were these: Although General Douglas MacArthur did not want advance publicity, Vice Admiral John McCain had permission to launch "reconnaissance" flights from his carrier task force as he saw fit. I commanded VT-85 aboard *Shangri La*, VAdm. McCain's flagship. As Air Group 85 was the senior air group in the Western Pacific, VAdm. McCain wanted us there for the Japanese surrender and kept us beyond our rotation date.

After VJ Day we were busy looking for POW camps all over Japan, and I proposed to the admiral that we land in Japan to see whether the Japanese really meant to surrender. He said that if we were foolish enough to do it, he was foolish enough to let us and would provide a fighter cover from VF-85.

We were on the schedule the next morning as a special "recon" flight. Things looked different in the cold light of dawn but we had to go through with it. We flew two TBMs, one piloted by me and the other by Ens. D. K. Herbert of Washington, D.C. We circled the field at Atsugi a few times to get up our nerve. No one shot at us and so we landed. When we did, all we could see were Japanese soldiers. We decided to get out and were heading for a takeoff spot when a black Buick came tearing across the field, the driver waving like mad. I stopped, he jumped up on my wing, stuck out his hand and said, "Am I glad to see you!" He was the head of the Japanese News Agency and was at Atsugi to cover the surrender. He assured me that the Japanese really meant to surrender. I radioed this to our cover, who in turn radioed the ship that the surrender was all in order. The covering fighters put on a show for the Japanese before returning to *Shangri La*. We stayed, rode around the base with the newsman and had some "tea" in the tent set up for the arrival of Gen. MacArthur a few days later.

We had to return for the next launch, but we did meet with Colonel Dunne as he laid out conditions for the surrender. Later we welcomed the Marines at Yokohama. The admiral allowed us to participate in these events before being relieved and returning to the States. Needless to say, we would have done anything for Admirals McCain and Halsey.

I just wanted you to know that Naval Aviation played a part in the early negotiations and in the circumstances leading up to our being there on August 28, 1945.

E. V. Wedell, Capt., USN(Ret.)
90 Townhouse Lane
Corpus Christi, Texas 78412

VPB-121

I have written a history of the operations of Patrol Bombing Squadron 121 in WW II which will be published in the Summer 1976 issue of the *American Aviation Historical Society Journal*. I would like to use this brief history as the basis for a book about this Consolidated PB4Y-2 *Privateer*-equipped squadron. All former members of VPB-121 are asked to share their memories and photographs with me. Photographs will be promptly copied and returned.

Joseph C. Woolf
1223 Oakdale Circle
Weaver, Ala. 36277

Reunion

The USS Wasp (CV-7) Stinger Club is trying to locate shipmates who served aboard *Wasp* from 1939 until she was sunk on September 14, 1942, in the Battle of Guadalcanal. The club is also trying to locate widows and families of shipmates who did not survive the sinking, to offer them membership in the club.

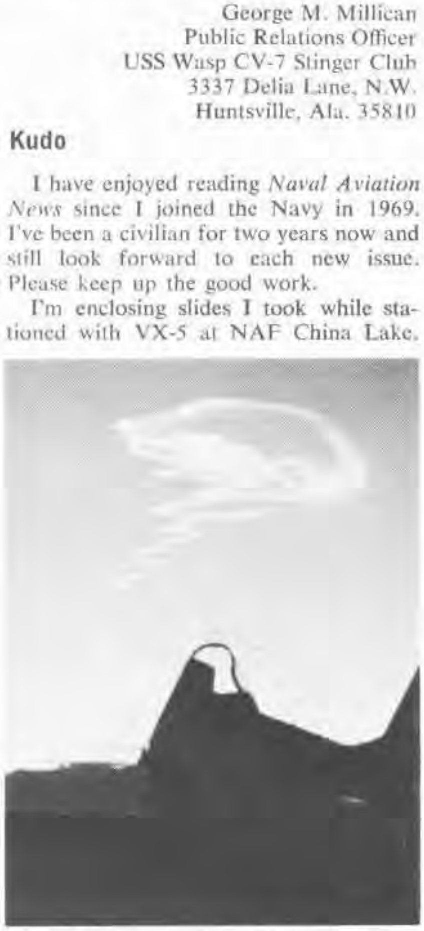
Our fourth reunion is being planned and we would like to hear from anyone wishing further information.

George M. Millican
Public Relations Officer
USS Wasp CV-7 Stinger Club
3337 Delia Lane, N.W.
Huntsville, Ala. 35810

Kudo

I have enjoyed reading *Naval Aviation News* since I joined the Navy in 1969. I've been a civilian for two years now and still look forward to each new issue. Please keep up the good work.

I'm enclosing slides I took while stationed with VX-5 at NAF China Lake.



One night Vandenberg AFB launched a missile and I happened to have my Pentax handy. I was working night check at the time. At first, the vapor trail was straight as an arrow but the winds soon made a beautiful changing pattern in the desert sky. As the vapor froze, the setting sun reflected off the vapor crystals. It was late in '72 or early '73. Anyway, I hope you can print one of my pictures in your fine magazine.

Dan Wheeler, ex-AME2
2503 S.W. 48th St.
Oklahoma City, Okla. 73119

Ed's Note: Done.

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Marine Fighter Attack Squadron 212, based at Kaneohe Bay,Hawaii,deploys aboard Kitty Hawk with its F-4B Phantoms. Tactical Electronic Warfare Squadron 136, Whidbey Island, operates the EA-6B Prowler. It also deploys aboard CV-63. Patrol Squadron 44, home based at Brunswick, Maine, carries out its mission in the P-3 Orion.


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NAVAL AVIATION
NEWS