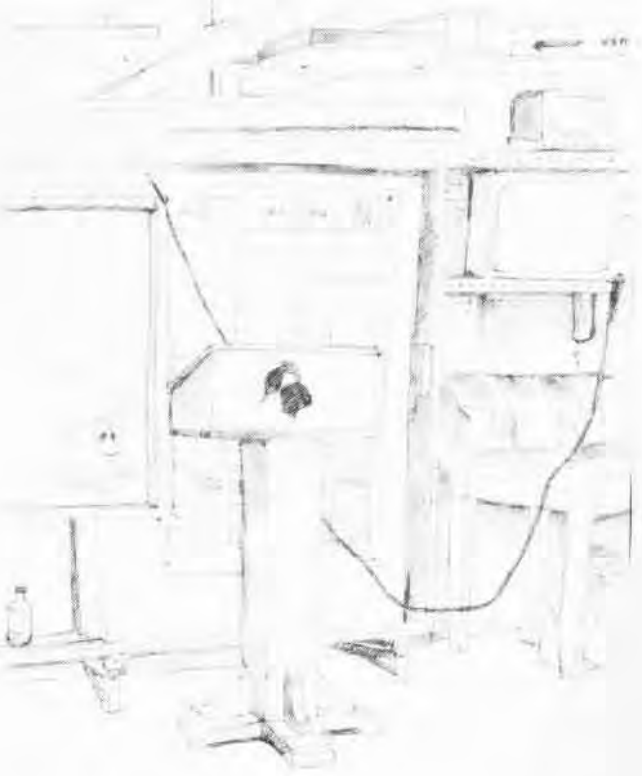
NAVAL AVIATION NEWS

June 1978

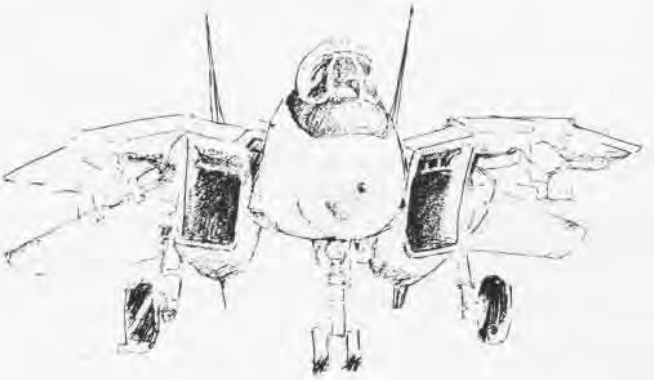
NAVY

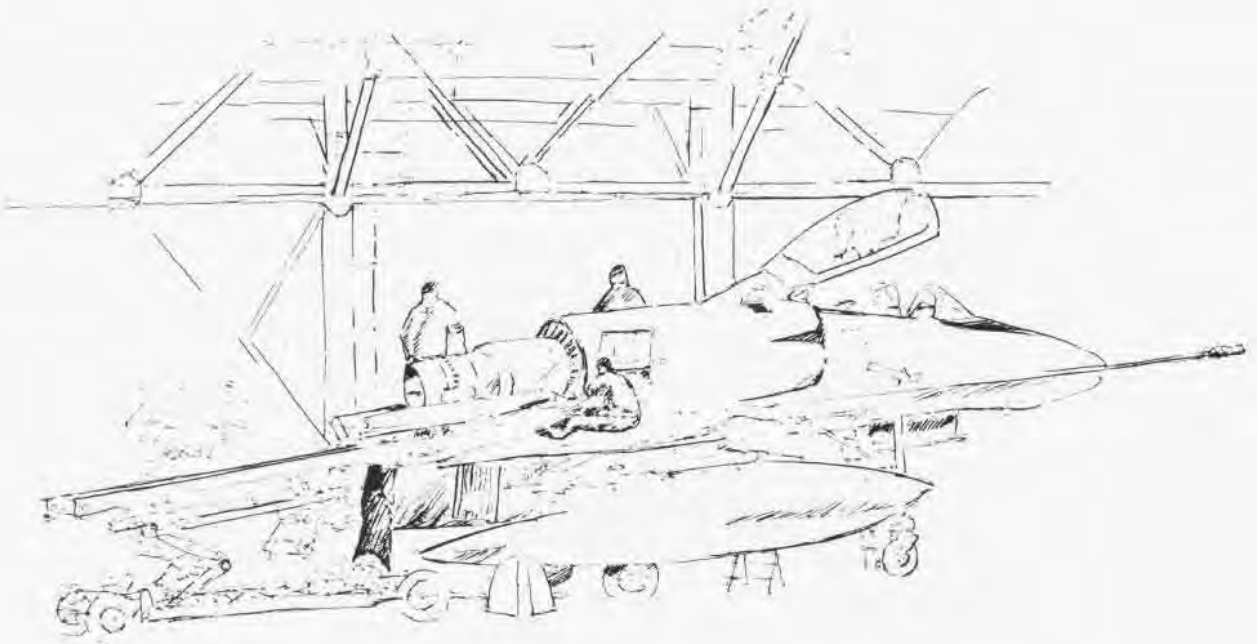
Spare-time artist LCdr. Mike O'Connor, Naval Air Technical Services Facility, Philadelphia, provided these scenes from the life of a Naval Aviator.



ARTISTS

Lt. John Martin, who was with Training Air Wing One at NAS Meridian and is now out of the Navy, offered these sketches from his portfolio.





editor's corner

The surroundings evoked elegance and tranquility. Long and green ran the fairways, populated by a modest number of players and an abundant array of towering shade trees. The ocean was a few miles away, shielded from view by the rambling California countryside. The club itself, a handsome structure with decorous lines, rose from a gentle knoll in the midst of the course. Inside, there were deep carpets and furniture of thick wood, solid and smooth to the touch.

The host arrived precisely at 11:30, shook hands briskly and ushered us into the dining room. He seemed slight in stature, wore a brown suit of conservative cut, a dark tie and well-shined shoes. His hair was snow white, befitting a man of his years. Behind the thick glasses, however, the eyes held the vibrancy of youth.

We were inclined to order modestly, a bowl of soup perhaps. But the gentleman would have none of that.

"Clam chowder, the sole – it's excellent here – some white wine and Kahlua parfaits," he said to the waitress. "All right with you, commander?"

Thus began a conversation with John Knudsen Northrop, a living legend at the age of 83. He hailed from New Jersey but it was in 1911, as a teenager in Santa Barbara, Calif., that he was ignited by the wonders of flight. He saw a traveling Frenchman pilot his pusher biplane from a nearby grass strip. From that moment he was hooked on aviation.

In the decades which followed, the name Northrop loomed alongside, if not above, stalwarts in the industry. There were Douglas, Vultee, Boeing, Lockheed and others with and for whom he worked before founding, in 1939, the company which bears his name. These men were the innovators, the pioneers, the sponsors of the golden age of flight. Jack Northrop is remembered as one of the best among the best.

His achievements fill volumes. There was the S-1, a sprightly looking biplane of "new" monocoque construction, capable of 52 miles per hour horizontally. Designed as a sport plane for returning WW I aviators, it was a doomed venture. A surplus of inexpensive war machines saw to that. But the S-1 served as a preview of greatness.

The *Vega* arrived in 1927, broke records and earned an international reputation.

Some consider Northrop's most significant contribution his stressed skin multicellular airframe construction technique. It became the standard for airplanes the world over. In a somewhat theatrical demonstration, not uncommon for that day, a tractor with wide steel wheels was driven over a wing featuring Northrop's technique, demonstrating its inherent strength.

The first of Northrop's long line of flying wings went aloft in 1929. There was the all-metal *Alpha*, followed by the *Beta*, the *Gamma*, the *Delta*, the A-17, a Navy fighter (XFT-1) and the BT series which led to the SBD *Dauntless*. And so many more.

"We knew we were pioneers," remembers Northrop, "and I suppose we were over-daring at times. But we were living in an era during which we could improve, in quantum jumps, aircraft structure, power plants, aerodynamics. There were many challenges. It was fun.

"We got our hands dirty, too. I helped build the ribs on the Douglas Round-the-World-Cruisers, as a matter of fact. We gained confidence as we went along. We strived constantly to make the planes fly faster, better and higher. At the same time, we kept the maintenance personnel in mind and made every effort to keep designs simple."

What were his favorite planes?

"The flying wings," Northrop responds without hesitation. "I was very proud of them. Did you know that the later versions could carry 150 percent of their own weight?"

Flying wing, circa 1929.

Ed Heinemann, who designed the A-1, A-3, A-4 and many other Navy planes, had asked to be remembered to Northrop. Both men were colleagues on a number of projects in those illustrious beginning years. Jack Northrop beamed at the memory. In the spirit which must have prevailed then, he said, "You tell Ed that if he's thinking of starting up a company, I'll sign on!"

Northrop retired in 1952 but visits the company's Hawthorne plant on occasion.

Northrop is as proud of his employer-employee record as he is of the aeronautical designs which made a permanent imprint on aviation. To this day, the company is known as a "very good place to work."

After lunch we lingered in the sun for awhile. John Knudsen Northrop viewed the golfers. "I still play," he said, "but it's really more like nudging the ball along."

Finally, after another vigorous handshake, we parted. He walked away with a lively step, climbed into his compact car, started up and drove off. He was indeed small in size. But somehow visiting him was like being in the shadow of a giant.

An airliner soared high overhead, leaving a contrail in the sky, a painter's stroke of white against the blue. It served as a reminder of just how far we have come in one man's lifetime.

NAVAL AVIATION NEWS did you know?

Winglet Airfoils

An Air Force jet cargo/tanker aircraft has been delivered to NASA's Dryden Flight Research Center, Edwards, Calif., to be modified for a study which could provide significant fuel savings.

Winglets, nine-foot-long airfoil sections, will be attached to the wingtips of a KC-135. The winglets are expected to improve the performance of the aircraft in cruise flight by approximately eight percent. This, according to the Air Force Flight Dynamics Laboratory, could result in an annual fuel saving of 45 million gallons for the KC-135 series.

The winglets will be constructed of aluminum and installed on outer wing panels by the Boeing Company. The panels will then be placed on the KC-135 at the Dryden Center.

Liquid Methane Fuel System

Lockheed-California Company has received a NASA contract to study liquid methane fuel systems for aircraft capable of carrying 400 passengers 6,300 miles at about 640 miles per hour. The study will include a comparison of the economics and performance characteristics of liquid methane, liquid hydrogen and synthetic Jet A fuel. All three can be produced from coal and are considered alternate fuel candidates for subsonic aircraft in the 1990s.

According to Daniel Brewer, manager of hydrogen studies at Lockheed, the design of the tanks and insulation system presents a major technical challenge. Liquid methane boils at minus 258 degrees F. and freezes at minus 290 degrees F. To contain it in liquid form until it is delivered to the engines requires specially insulated tanks.

Awards

In recognition of their overall contributions to Naval Aviation safety in 1977, Admiral Flatley Memorial Awards were presented to USS *Saratoga* and embarked CVW-3, USS *Coral Sea* and CVW-15, and USS *Okinawa* and HMM-165. A special Admiral Flatley Award was presented to the training carrier *Lexington* for superior performance in aviation safety during 1977.
memory of the VA-305 executive officer who lost his life during a reserve tactical air test onboard *Ranger* in November 1976. The new award is presented to the top air wing in the annual reserve air wing bombing derby which pits attack squadrons of East Coast-based CVWR-20 against those of the West Coast's CVWR-30.

The CNO Readiness through Safety Award co-winners for 1977 are Commander Naval Air Force, U.S. Atlantic Fleet and Commanding General, 4th Marine Aircraft Wing, Marine Air Reserve Training Command.

VF-24 is the recipient of the Admiral Joseph Clifton Award for 1977, naming it Navy's No. 1 fighter squadron. The award is given in memory of Adm. Clifton who distinguished himself as a fighter pilot in WW II. Squadron aircrewmen have also won 88 individual Battle Es. Commander Joel R. Graffman is C.O.

Fleet Satellite System

The first message over the Navy's new fleet satellite communications system was sent by CNO Admiral James L. Holloway III on March 16 to the nuclear carrier *Enterprise*, "I take great personal pleasure in inaugurating with this message a new era in Navy tactical command, control and communications. . . ." The Navy now leases a commercial maritime satellite system to satisfy a portion of its needs.

NAVAL AVIATION NEWS did you know?

Pensacola Radar Facility With its newly modernized radar room, NAS Pensacola's air traffic control facility is one of the most modern in the Navy. The new equipment provides for two additional functions besides ground controlled approach: fleet area control and surveillance (FACS) and radar intercept officer training.

GCA controllers can now consistently place aircraft, on low visibility approaches, within 100 feet of the runway center line with FPN-47 surveillance radar, and within 20 feet with FPN-52 precision radar. FACS provides advisory information to aircraft operating offshore south of Pensacola. Radar intercept training which previously used outdated radar equipment now reaps the benefit of the latest radar facilities.

SH-60B The Navy has awarded Sikorsky Aircraft a contract for full-scale development of the SH-60B LAMPS MK III helicopter, on which initial design work began last September. Five prototypes will be built and flight tested.

When operational in the early 1980s, SH-60Bs will operate from frigates, destroyers and cruisers. They will carry out ASW and anti-ship surveillance and targeting missions, as well as fleet support, medical evacuation, and search and rescue.

Sikorsky is the helicopter airframe contractor in the LAMPS program. IBM Corporation of Owego, N.Y., is the prime contractor for the system.

First Student Aviator May 21 marked the 100th anniversary of the birth of Glenn Hammond Curtiss, the man who first demonstrated to the world that aviation could go to sea, who built the Navy's first aeroplane and taught the Navy's first aviator how to fly. By way of remembering Mr. Curtiss we present this letter. It was written by that first student aviator, Lt. Thedore "Spuds" Ellyson, to the officer in charge of Naval Aviation, Captain W. I. Chambers, while Ellyson was being tutored by Curtiss. The letter was written from San Diego, Calif., on January 18, 1911.

My Dear Captain Chambers,

Your letter received today and it was very much appreciated. If I do not misunderstand your letter, you are looking out for all matters concerning aviation in the Navy, and from the tone of your letter I feel that I can write to you personally, and bring out many small points as well as receiving advice, which would be impossible to do officially. Having been in the submarine service for some little time, when there was no one in the Department really interested in submarines, I can appreciate what your interest and help will mean.

In the first place I am absolutely uninformed concerning aeroplanes excepting what I have picked up from newspapers and magazines, and what I have learned from aviation meets at Richmond, Va., Los Angeles, and San Francisco. In this connection I would like your advice as to the quickest means of obtaining all standard works on aviation, either from the Department or at personal expense. Furthermore, I would appreciate it very much, if copies of all confidential reports, and of all other reports which in any way concern aviation, be forwarded to me. I keep a file as well as a diary and all such information will be available for my successor, in case anything should happen to me. Please remember that I am poorly informed on the subject of aviation, and probably everything you have on file will be of interest and will contain points which I should know. This may be a "large" request, but as I am starting on the practical side of the question, it will benefit me greatly if I can obtain all the information at hand.

I received a letter from Lt. Wright stating that you knew of all Curtiss aeroplanes and their construction up to November 1, 1910. In this case I will write only concerning machines manufactured after that date.

I arrived in Los Angeles January 2nd and attended the last day of the Aviation meet there. Came here that night with Mr. Curtiss, and returned to Los Angeles on the 4th. Went to San Francisco on 5th, inspected platform on *Pennsylvania* in company with Mr. Ely. Attended Meet at San Francisco on 7th, 8th, 10th, 15th, and 16th, rain preventing any flying on the intervening days. I spent most of my time in 'Frisco at the aviation field, studying both the standard and crank machines, made it a point to meet and know all of the aviators and talk with them concerning their particular types of machine. My experience is too limited to submit any views, and unless you advise otherwise, my monthly report will simply cover my movements, as my observations would be of no value.

I left San Francisco after only five days of the meet were completed, because the flights there were of no practical value, no matter what the newspapers may say to the contrary, and I realized that Mr. Curtiss might do work here which would be of interest. I came down with Mr. Curtiss, arriving here in machine with him about noon today. We immediately went to North Island, where his two planes are, and spent the afternoon there. While here I will work at all times with his mechanics, my idea being to know everything possible about this type of aeroplane from the "ground up," and I expect to help them in all overhaul because I can gain more by doing a thing myself than by watching others do it. Today we commenced putting the hydroplanes and floats on the machine, and inside of four days Mr. Curtiss will carry out his experiments of rising from and lighting on the water, which he hopes to accomplish before his meet here which has been postponed until the 28th and 29th of this month.

Our present stay here will be for at least two weeks. How much longer I do not know, but will advise you later. Mr. Curtiss had intended to make this his permanent station but the San Diego Aero Club has established a station on North Island, and he fears that this may interfere with his work.

As yet I have done no practical work, but hope to start in shortly, though it is possible that I may not receive any instruction until after the meet here, as there are only two machines at present, one for water experiments and one for the exhibition flights here. I doubt very much if my work will start before the completion of the San Francisco Meet, when more aeroplanes will be available.

Two Army Officers are ordered here for instruction, why not two Naval officers? Whiting has volunteered, and is a most excellent man, why not get him out here, if Mr. Curtiss is agreeable, and I am sure that I can get his consent. I have been with Whiting practically since we entered the Naval Academy, and I think his record will show what sort of a man he is.

In an official letter I requested a typewriter, which is essential if I wish to put in any confidential reports. This may seem "far fetched," but there are lots of points coming from Mr. Curtiss in personal conversation, which I could put in reports if I were writing myself, which I would not transmit through a stenographer.

It is likely that I will be moving from place to place. Would you advise me to ask for an expense account? It is to my advantage, and I think to the Navy's advantage, that I stay at the same place with Curtiss, for he is a very frank sort of a person, and when I am at the same place, I spend most of my time with him, we talk shop most of the time, and something is always gained thereby, but it is expensive for me.

In this relation, I have a good opportunity of writing for the *New York Herald*, without my name being used. Would you advise for or against this. While in 'Frisco, the *Examiner* gave me a good opportunity, but I wired Lt. Comdr. L. C. Palmer, unofficially, and upon his advice did not request permission, as my name would have appeared.

I would like to obtain a supply of official paper and official envelopes, that I may use wherever I may be. Can I get this from the Department?

I am afraid that my letter will bore you, as there is little about aviation. I want to start right and want to make good, so I am trying to make you see everything as it appears to me. Will you please return this letter or a copy.

Yours sincerely

T. S. Ellyson

grampaw pettibone

Emergency Landing Demo

A T-34B was flown from home base to a local university airport to provide orientation and indoctrination flights for aviation candidates. Three such hops were conducted without incident.

Late in the afternoon, a fourth was required. The pilot preflighted the aircraft, briefed the passenger, conducted normal taxi, run-up, takeoff and transit to the op area.

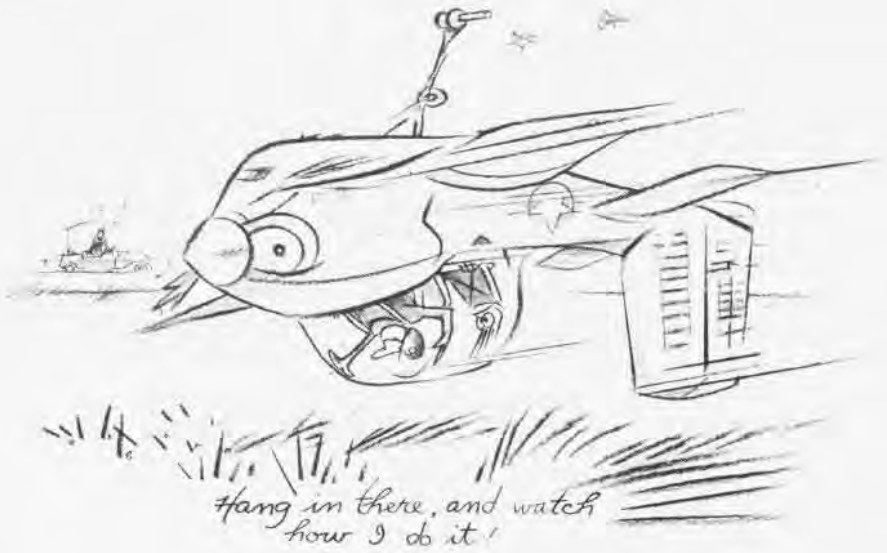
Standard aerobatics for this type flight were performed. At the completion of the aerobatics demo, the pilot started the return flight to the university airport. As he descended to landing-pattern altitude two miles from the airport, the engine began to sputter and unwind.

The pilot initiated emergency restart procedures but was not successful. An emergency voice report was broadcast. The pilot proceeded south across an interstate highway, generally oriented east to west, and turned eastbound to set up for an emergency landing.

Leveling the wings, the pilot flew through a gap in a tree line about 45 degrees toward the interstate highway, and attempted a 70-degree right turn to land on the roadway, eastbound. On the final turn, the right wing tip struck the treetops and the aircraft rolled right and impacted the ground approximately 120 degrees, right wing down. The plane came to rest inverted after about a 50-foot skid. Local civilians at the scene lifted the port wing and assisted the crew from the wreckage. Both escaped with minor injuries.

Grampaw Pettibone says:

Great Scott! Completely out of fuel and ideas, this aerial jockey just plain doped off. Five flights on the same day and no one took time to "gas" the flyin' machine? Short cuts like this suggest dazzlin' footwork – but a severe lack of headwork. Excuses wear thin. This one could easily have been a last performance.



All Yours

After a complete preflight of their T-34, the instructor and his student took off at 1200 for a pre-solo check flight. The weather was clear and both pilots were in proper mental and physical condition to fly.

Upon completion of some initial high altitude maneuvers, the *Mentor* entered the landing pattern at the auxiliary landing field and commenced practicing touch-and-go landings. After the final touch-and-go and upon reaching an altitude of 550 feet indicating

ILLUSTRATED BY Osborn

110 knots, the instructor chopped the throttle, simulating a low altitude emergency. The student executed the initial procedures properly and headed for a farmer's field to the north of the auxiliary landing field.

On final approach to the field, with gear and flaps down, the student noted his line-up was a bit right of his intended point of landing and added left aileron to correct it. (Up to this point the student had correctly executed the maneuver with the exception of trimming the *Mentor* for balanced flight.) Just after adding left aileron, he noted the instructor was also on the controls although there was no verbal or other acknowledgment by either of them that control had shifted. As soon as he perceived the instructor on the controls, the student released the stick and throttle quadrant. He demonstrated that he no longer had control by holding his hands over his head. The instructor, then in control, returned the aileron to a neutral position, added full power, and attempted simultaneously to apply left rudder.

He was unable on the first few tries to depress the left rudder as the student had failed to remove his feet from the rudder pedals. This, in effect, prevented coordination of rudder and aileron movement and resulted in a cross-control situation. By the time the instructor was able to neutralize the rudder, too much altitude had been lost to allow for recovery.

The T-34 hit a fence post, bounced twice and came to rest. The engine burst into fire on impact and the aircraft was destroyed. Both occupants experienced some degree of difficulty exiting the wreck, but finally made it with only minor burns. They retreated to a safe distance and were picked up shortly by the SAR helo and returned to base.

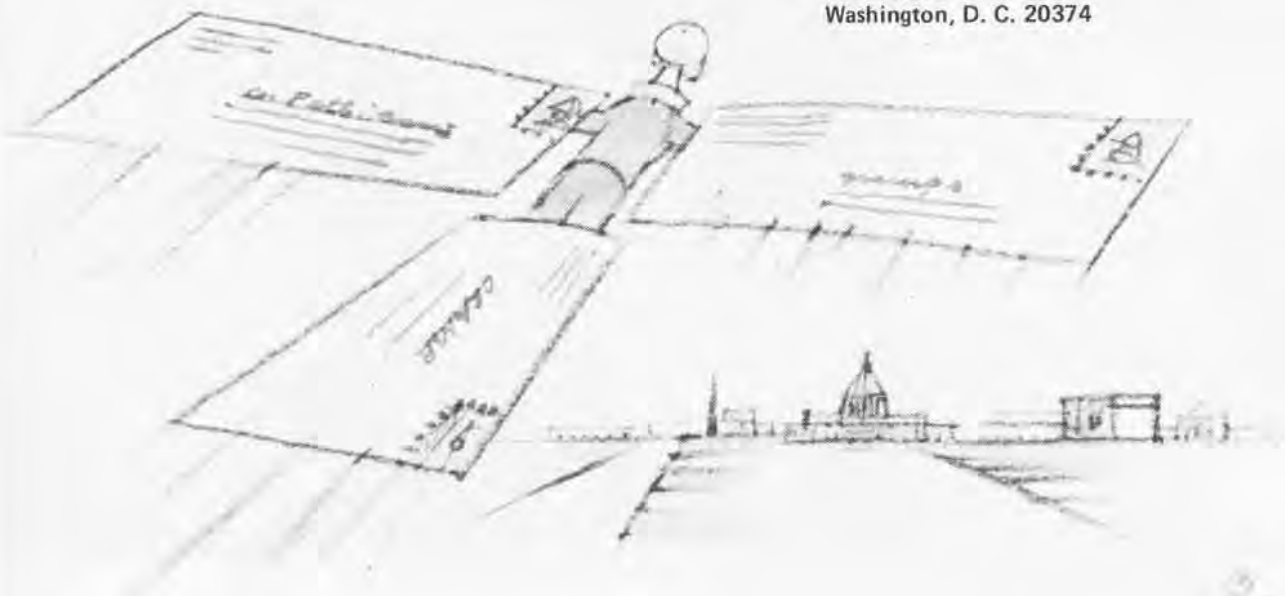
Grampaw Pettibone says:

Heavenly days! This sorta foolishness went outa style with button shoes. If Gramps could only get all throttle jockeys to read OpNav Instruction 3710.7C and live by it, how serene life would be. Para 411 on page 4-2 of this book covers the change in control procedure extremely well. It was written just to prevent this sort of thing because it has happened before. A wise man learns by his mistakes; a wiser man learns by the mistakes of others. (April 1967)

Gramps' Mailbag

Gramps receives numerous articles each month which range from accounts of near accidents to letters of commendation for acts of real professionalism. If you would like to share an experience, send your letter to:

Grampaw Pettibone
Building 146
Washington Navy Yard
Washington, D. C. 20374



Drs. Ross McFarland and Ashton Graybiel, from left, above, wearing hats, were part of the original research staff in 1940. Author gives a general physical, right, to Max Replogle, one of 128 subjects who returned to Pensacola at their own expense in 1977. Dr. Robert Mitchell, far right, uses ophthalmoscopic camera in 1963 retinal test of Dr. Albert Oberman who is now Chief of Preventive Medicine at the University of Alabama School of Medicine.

37 YEARS LATER...

1000 AVIATORS

By LCdr. Neil R. MacIntyre, MC, USNR

The rapid growth of military aviation in the years after World War I was accompanied by a high student-pilot attrition rate. By 1940, as the second world war was approaching, it was apparent that the existing pre-flight entry standards were inadequate to select the proper physical and psychological characteristics in the number of men necessary for the increasing needs of military aviation. To address this problem, the National Research Council, the Harvard University Fatigue Laboratory and the U.S. Navy began the Pensacola Study of Naval Aviators. Originally the project was designed to administer a variety of psychological, psychomotor and physiological tests to over a thousand student aviators in a search for successful flight training predictors. After the war, however, it was realized that the remarkable data base accumulated on such a large homogenous group of healthy young men could serve as the foundation for a unique prospective study of the aging process. Thus, although not designed originally as a longitudinal study, subsequent evaluations in 1951, 1957, 1963, 1969 and 1977 gave the project, which became commonly known as the "1000 Aviator" program, this orientation.

The study has been characterized over the years by a phenomenally high follow-up rate, a strong commitment by a small group of dedicated investigators, and a high level of enthusiasm in all persons involved with the program. The subjects themselves have been typical of the aviators of their era in their eventual career patterns. About one-third of the original group remained in military aviation for 20 or more years. Even among those who returned to civilian life after the war, more than 50 percent remained in some contact with aviation. As intelligent, well motivated individuals, their lives were, as one would suspect, generally successful. There were even a few full-scale heroes in the group. Perhaps the most famous of these is Joe Foss, Marine Ace, former governor of South Dakota and first commissioner of the American Football League. The overall intelligence and scientific orientation of the group no doubt contributed significantly to their continued interest in the program over the years. Special mention should also be made here of Doctors Ashton

Graybiel, Ross McFarland, John Packard, William Harlan, Albert Oberman and Robert Mitchell as some of the key scientists involved with the program.

Pensacola was selected as the site of the 1940 study because of the large number of flight students there. The program began in July of that year and continued through May 1941. During that time, Classes 147 through 165 as well as 83 additional instructor pilots were subjected to a full day of testing.

The average age of the 1,056 subjects was 23.6 years. They were all considered physically fit and well motivated. Physiologic tests included the Schneider Index (pulse rate response to position and exercise), tilt table and cold water arm immersion blood pressure measurements, lung volumes, basal metabolism, anthropometric measurements, skin galvanic resistance, electroencephalograms and electrocardiograms. In addition, the heart rate and electrocardiographic response to a startle (surprise pistol shot) was recorded. Psychomotor and psychological testing included administration of intelligence tests, mechanical aptitude tests and a variety of coordination and reaction time tests. Eye-movement characteristics and dark adaptation were also measured. From this body of data several detailed reports emerged. It was learned that many of the psychomotor and psychological tests were indeed highly predictive of aviation adaptability. The present-day flight aptitude rating (FAR) is a direct outgrowth of these results. The physiological data, on the other hand, showed little correlation with success in aviation. It was in these physiologic data, however, that Dr. Ashton Graybiel and others saw the unique opportunity for a long-term follow-up of the normal aging, particularly the cardiopulmonary aging, characteristics of an initially healthy group of young men.

A full-scale re-evaluation was planned and successfully carried out in 1951-1952. By that time, 220 members of the group had died (213 of those deaths were directly related to WW II). The problems of identification and location of the group were enormous, but 818 of the 836 survivors

Captain Donald Gay, now rear admiral (retired) and brother of Ens. Gay of Battle of Midway fame, sits in tilt chair apparatus used during 1963 test. Vestibular function was tested by requiring subject to bring chair to a vertical position.

were contacted. Of these, 703 were examined in a mobile laboratory in which the investigator toured the country. The remaining 115 subjects completed only a questionnaire. Testing consisted of a medical history and physical exam, plus an electrocardiogram and a chest x-ray. As computers were now available, all data from this and subsequent evaluations were stored in automated files.

Reports from the first re-evaluation were concerned primarily with the large number of military deaths that occurred during WW II, the excellent general health of the remainder of the group and some interesting follow-up on the electrocardiogram. With regard to the latter, it should be noted that the electrocardiogram was not used routinely for aviators until 1960, and official standards were not set until 1964. The 1000 Aviator Program was thus instrumental in defining the role of the electrocardiogram in aviation and, as early as this first follow-up, the prognoses of a variety of so-called borderline abnormalities were becoming understood.

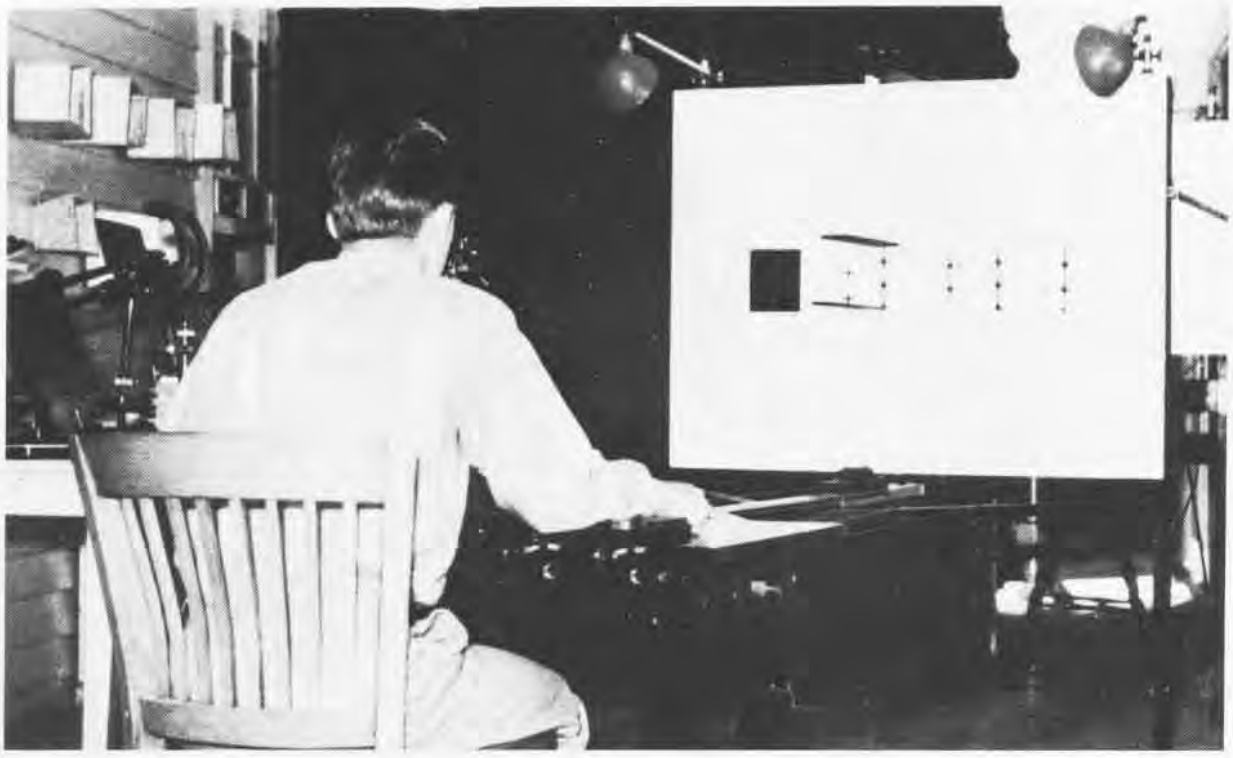
A second re-evaluation was carried out in 1957 when the average age of the group was 40. Again, the mobile laboratory was used to tour the country. Twenty more subjects had died since 1952; 804 of the remaining 816 subjects were located. Of these, 785 were seen while 19 only answered the questionnaire. A medical history, physical exam, electrocardiogram and chest x-ray were again performed. In addition, an exercise electrocardiogram and a cholesterol level determination were done on 455 of the subjects in an attempt to better identify coronary artery disease risk factors which could be validated in future follow-ups. The overall good health of the group was striking. Furthermore, more relaxed blood pressure standards for military aviation seemed appropriate as borderline values detected in 1940 had not predicted fixed hypertension or coronary disease.

In 1963, with the group age 45, the Public Health Service joined with the Navy in an attempt to conduct an extensive evaluation of the group at the Naval Aerospace Medical Institute, Pensacola. It was felt that only through an elaborate in-depth study of the group could subtle abnormalities be elicited and then correlated with previous data.

From 1963 to early 1965, 675 of the subjects were seen. An additional 89 answered a questionnaire while 17 more were found to have died. Only 35 of the original members were not located.

Each subject underwent two days of testing at the laboratory where, in addition to the routine history, physi-

In 1940, blood pressure response to various positions was recorded on tilt table. To take chest x-rays during 1951 and 1958 follow-up evaluations, subject and film had to be six feet from camera which was mounted in rear of this specially designed mobile laboratory.



Depth perception was tested during the 1940 evaluations by using frontal plane apparatus consisting of a hinged board which the subject manipulated with pulleys to line up the images. Aspiratory air flow was measured for the first time in the 1963 lung function test.

cal exam, electrocardiogram and chest x-ray, a large battery of other tests were given. These included exercise electrocardiograms, ballistocardiograms, vectorcardiograms, audiograms, electroencephalograms, pulmonary function studies, blood levels of sugar, lipids, and uric acid, and blood cell count. A personality profile was established by using the Guilford Zimmerman Temperament Survey.

Although the number of cardiovascular disease states was still too low to validate the role of earlier predictors, elevation of the blood pressure, a well-known cardiovascular disease precursor, was now apparent in a relatively large number of subjects. Weight gain and family history appeared to have a much stronger relationship to this development than any prior blood pressure measurements. Increased blood lipids, an additional cardiovascular risk, were also found in those with excess weight gain and in those with a strong history of cardiac disease in the family. Overall mortality rates still continued well below comparable civilian statistics.

A re-evaluation almost identical to the 1963 study was carried out in Pensacola in 1969-1971. At that time 675 individuals were seen in person while an additional 83 answered questionnaires. Twenty-three more subjects had died by this time, and only 60 were lost to follow-up. The only major changes in the test protocol were the use of the treadmill for exercise testing and the addition of several more blood chemistry measurements. Although all of these data were placed in computer files, funding restraints limited analysis.

By 1976 a renewed interest in the program allowed for a full-scale questionnaire mailout to the subjects to ascertain their current health and activities. In addition, a free physical exam along the lines of the 1969 protocol was offered to those members who could fund their own travel. By the end of 1977, 128 of the subjects did return for testing in Pensacola while another 554 returned the questionnaire. Forty-six new deaths were recorded. Only 51 of the original 1,056 subjects could not be located. Thus the program has maintained a phenomenal 96.7 percent follow-up over 37 years.

The data from this latest follow-up is being correlated with data from those of previous studies, and several

reports are in preparation. Among the more significant findings:

• The overall nonmilitary mortality, now through age 60, continues to remain much lower than census bureau or insurance company statistics would have predicted. Presumably, the preselection of the student aviator coupled with other factors listed below contributed to this.

• The prevalence of cardiovascular disease is markedly lower than in the civilian populace. This appears to be

Original 1940 tilt chair, above left. Treadmill electrocardiogram in 1969 evaluation proved a good predictor of future coronary disease. In 1963, caliper was used to measure skin–fold fat; ballistocardiogram detected pulsation of blood flow by means of an air-cushioned floating bed.

The step exercise electrocardiograms of 1958 and 1963 were useful in assessing cardiac function but lacked predictive value for future disease of later treadmill test. Subject at right receives two-hand coordination test in 1940. Ballistocardiograms of 1969 and 1977, above right, added special devices that measured timing of various heart sounds and also contour of pulse wave in carotid artery. Pulminary testing of 1969 and 1977, far right, included sensitive measurements of airway function and gas diffusion properties of the lung.

due to a lower overall blood pressure, lower cholesterol, lower prevalence of cigarette smoking and continued fitness. Nevertheless, subjects who did develop any of the known risk factors had the increased chance of developing coronary disease that would also be predicted from civilian data. The long-term follow-up of the exercise electrocardiogram has also been shown to be useful in predicting coronary disease.

• An aviation career is not associated with an increase in chronic lung disease despite the theoretical risk of lung damage from fumes and G forces. Smoking, however, is just as significant a risk for emphysema and bronchitis as it is in the civilian world. The cessation of cigarette smoking that occurred in a large percentage of the group before age 45 was associated with a much lower risk for cardiopulmonary problems.

• Cancer death rates are also down as compared to civilian statistics. The lower industrial carcinogen exposure, better socio-economic status, lower cigarette consumption, and close medical surveillance probably all contributed to this.

The future of the program is now being planned. The study has confirmed the efficacy of aviators' pre-

selection and has justified the maintenance of fitness and medical surveillance to keep natural mortality and morbidity low. Furthermore, it has demonstrated that a career in aviation does not adversely affect cardiopulmonary aging. Exercise electrocardiography has proven to be an important aviation medicine tool to predict potentially catastrophic coronary disease. Additional analysis into the role of other cardiopulmonary disease predictors is envisioned, and improved standards for maintaining and extending the service life of the aviator should emerge from studies based on these data.

The project itself however, is now passing out of the realm of aviation medicine and into the purview of the National Institute on Aging. That group is eager to coordinate continued follow-up — and well they should. In this era of longer life-spans and increasing health costs for the aging population, information on the retardation of age-related disorders is vital. The remarkably high follow-up rate, the early use of so many diagnostic tools and the "ideal aging" characteristics of this initially large, homogenous group of healthy young men make this program a priceless natural resource.

AEGIS

By Cyril J. O'Brien, APL

Chief Jacob Barber, missile system supervisor, squeezes firing key.

Pioneer teams of officers and enlisted men are already working hand in hand with scientists, engineers and advanced fleet defense planners in testing, operating and preparing the *Aegis* system for deployment in the fleet. *Aegis* is an area AAW defense system geared to protect the fleet for the coming decades against threats not yet designed.

On the Pacific Missile Test Center range, the system has been undergoing live firing tests aboard the research and experimental ship USS *Norton Sound*. Already the *Aegis* ship has grasped supersonic missiles from their threatening paths overhead, accounted for hundreds of air attackers in a five-nation naval exercise and destroyed or intercepted simultaneous targets flown from the Pacific Missile Test Center.

A meld of electronics, computers, uncanny radar, missiles, launchers representing the imagination and dedication of thousands of people, *Aegis* is a product worthy of the concentrated efforts of the Navy team which combines American industry, military, government and its science advisors.

The *Aegis* radar, AN/SPY-1, provides the equivalent of hundreds of singular radar sensors which scan the sky from ocean wave to stratosphere. Unlike the conventional radar the sailor first knew in WW II with its whirling wire mesh, the electronically-steered array antennas of the AN/SPY-1 stand like four great shields amidship. Nothing seems to move, yet the AN/SPY-1 can detect, identify and simultaneously track hundreds of targets at one time and provide the means of simultaneous guidance of many weapons against those targets deemed hostile by the computers.

Actually, it is the rapid and automatic response of the radar, computers and weapons in one system that gives *Aegis* the promise of the instant and decisive protection the Navy needs to survive.

One deck above the bridge of *Norton Sound*, within its electronics-loaded combat center, the *Aegis* firing team picks up and monitors the action commenced when the radar detects the target. A coded radio signal interrogator confirms that the incoming is friendly, hostile or unknown. The Navy operators intently monitor the multiple display screens and only their deliberate monotone repetition of the firing commands — "Engage track number 2 — Target at Mach 1.2" — clue an observer that a target confrontation is anywhere near.

While a radar controller monitors the AN/SPY-1, a tactical action officer (TAO) directs the total operation while the missile system supervisor manages the final actions in the firing sequence.

The TAO isolates the incoming threat for observation by pushing a button on his console to mark the blip on his screen with a luminous circle. That act brings to his view all of the information from the computer which the radar has obtained about the target: range, speed, direction, identification and target priority.

When the TAO is certain the target is hostile, he marks it for engagement. He determines the weapon and authorizes further action to the missile supervisor. When all parameters are go, the missile supervisor squeezes the firing key. This launches the missile to its target.

Even with launch of these modern missiles, the AN/SPY-1 radar system still has much to do. The radar guides the missile (made by General Dynamics, Pomona) to the vicinity of the target. In the last few seconds before intercept, AN/SPY-1 then activates an illuminator which transmits the homing signal to the target for the final seconds of the missile's flight.

Should the attackers be more numerous, the *Aegis* system will automatically schedule targets and control multiple missiles against multiple targets. All of these operations on the

test range are observed and checked out by the ship's commanding officer and combat system officer to ensure the safety and readiness of all involved.

The whole sequence from detection to destruction takes minutes in test runs. In a combat situation the sequence could well be in seconds. Tomorrow's threat may give no more time than that.

"We know we cannot expect to be the first to fire in a sea confrontation," said Rear Admiral Wayne E. Meyer, *Aegis* shipbuilding project manager, NavSea. "So we have only time from launch of enemy's missile to somewhere before it could impact to detect, identify and destroy it."

In all engagements, men and men's decisions are very much part of the operation. However, *Aegis* is prepared to react in seconds, bypassing most human decisions – because they have been made beforehand.

"The system will react automatically from target detection to engagement, right up to pulling the trigger – once the threat has met certain definitions and is in a critical threat zone," said LCdr. Gilbert F. Monell, the combat system officer on several recent tests on *Norton Sound*. (RCA Corporation, Government Systems Divisions, Missile and Surface Radar, is the *Aegis* ship combat system developer.) "We don't even have to reserve the missile firing for a human hand. It can all be done automatically if we choose – faster than a person could think about it."

Perhaps the most significant test to date of the *Aegis* system came last spring when *Norton Sound* out of Port Hueneme encountered two simultaneous targets in a critical landmark test. Lt. Glen Rice, TAO, and Chief Jacob Barber, missile systems supervisor, were at their stations when the test operations conductor at PMTC released two BQM-34A radio-controlled drones. The ship's AN/SPY-1 radar picked up the two 12-foot-wing-span targets as they entered the radar coverage area. Upon engagement, one drone was destroyed by a direct hit and the other was well within the lethal impact zone.

This simultaneous multiple target engagement and subsequent intercepts ensured a capability which was a prime requirement of the far-sighted advanced missile system Navy planning group. The panel (headed by retired Rear Admiral Frederic S. Withington) was charged with looking at the Navy's threat of the 1980s and beyond. The group first met at The Johns Hopkins University Applied Physics Laboratory and included several members of the Lab's staff. APL had developed the first guided missiles for the Navy, and its *Terrier* and *Tartar* were the forerunners of the *Standard* missile. The APL-developed AMFAR radar provided the technology upon which AN/SPY-1 was based. George W. Luke is the *Aegis* program manager at APL.

RAdm. Meyer said the firepower demonstration from *Norton Sound* ". . .was nothing short of phenomenal. Never have two missiles been flown before in the configuration and under the simultaneous electronic control used in this operation. The successful preparation and conduct of these tests are direct results of the magnificent dedication of thousands of men and women across the country in military, government and industry."

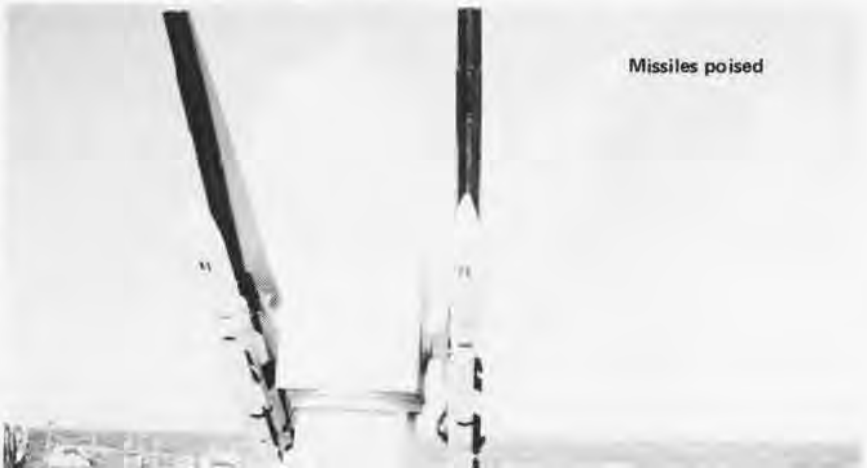
LCdr. H. Wyman Howard, project officer SM-2/*Norton Sound* operations, said, "It means we can talk to two missiles at a time and guide them to impact on targets anywhere above the horizon. It also reaffirms that we have in a ship's magazine unmanned interceptors ready to deploy instantly, 24 hours a day."

Aegis is being developed primarily with the Navy officers and men in mind, one member of the industry team explained. "They participated in the development of a system which will continue to operate in the defense of the fleet and the nation when the rest of us, scientists and engineers, have gone on to something else."


AN/SPY-1 radar system

With the current development test phase completed on *Norton Sound*, the emphasis on *Aegis* shifts to a combat systems engineering development (CSED) site in Moorestown, N.J. This site now houses the complete *Aegis* combat system (until the final and operational model is placed on an *Aegis* ship). Within this dry land test site, the system is being engineered for immediate and automatic response to counter even threats from under the sea.

When *Aegis* first goes to sea operationally, it will be on the new DDG-47-class destroyer. Later it will go on cruisers. A contract for construction of the lead destroyer is expected to be awarded this summer, with the first *Aegis* ship completed in 1982.


Missiles poised

USS Norton Sound, circa 1945

Mother ship of a brood of PBYs in WW II and the target of Japanese suicide planes which dropped in the sea around her, *Norton Sound* (then AV-11) emerged from that war unscathed to help pilot the Navy into the future of research and weaponry.

Launched in 1943, and to this day protected by heavy armor plate of the big war, *Norton Sound* brought American science across the threshold of space research. A few years after the war, Dr. James A. Van Allen, discoverer of the earth's radiation belts, was firing *Aerobee* rockets from her stern to conduct research on cosmic rays, charged particles and the upper atmosphere while with APL. In 1950, her wide beam accommodated the 50-foot five-ton *Viking* rocket in a pioneer space venture. Even today such a launch would be substantial from shipboard.

In the early and mid-fifties, the former seaplane tender was the bed for sea tests of *Terrier* and *Tartar* which, with *Talos*, were the world's first supersonic guided missiles to defend a fleet. She saw the launch of a first *Sea Sparrow* and the beginning of the *Sparrow*/basic point defense surface missile system (1965). The old sea veteran also mothered programs which developed a digital controlled launcher, *Phoenix* infrared radar, infrared countermeasures and other undertakings.

In 1974 she eased out of her berth at the Long Beach Naval Shipyard equipped with the infant *Aegis* ship defense system.

Ironically, in her constant trips to sea from Port Hueneme, *Norton Sound* (now AVM-1) makes her way past once cocky destroyers which also knew the sound of Japanese guns and engines. Now muted and moored, they wait as target ships under a severe and ancient code of the sea that makes room only for those able to keep up.

Aegis is the name of the shield of the sky god and the war goddess of Greek and Roman mythology. Symbolizing authority and protection, it had the power to frighten and dazzle enemies who were then conquered in battle.

In Greek mythology, the sky god is Zeus. The Roman counterpart is Jupiter. The war goddess is known as Athena in Greek religion and as Minerva in Roman mythology.

Zeus often loaned his aegis to Athena. Once, she loaned it to Perseus. He used the aegis and Hermes' winged shoes (Hermes is the Greek counterpart of the Roman god Mercury) to fight the Gorgon Medusa, with snakes for hair, a monster so frightening that those who viewed her were turned to stone.

Perseus defeated Medusa, cut off her head and presented it to Athena. On his return voyage, he used the Gorgon's head to turn others to stone, including Atlas, who was frozen forever with the world on his shoulders.

After Perseus returned her shield and gave her the Medusa's head, Athena bore the head on her aegis forever, thus increasing the powers of the shield still further.

The roots of the word "aegis" may have been aegis, which means goatskin, or, possibly, kataigis, meaning hurricane. The aegis in its earliest form, was a goatskin shield. (Animal hides were the earliest known form of body protection.) Later civilizations replaced the skins with solid shields covered with metal or other materials. Aegis was also closely associated with storms, thunder, and thunderclouds.

By the time of the Roman empire, aegis had come to mean breastplate.

Operation Shamrock

The combined weapons training exercise conducted for the Commander in Chief on March 17, 1978, was an unqualified success and a great credit to the United States Navy. In my 35 years of naval service I have not witnessed a better operation of this nature. Every element of President Carter's visit and the associated evolution was imaginatively conceived, competently planned and perfectly executed. There is adequate credit for all to share: CinCLantFlt and the TyComs for the full readiness of the ships and aircraft, Com2ndFlt for meticuious organization and thorough planning, the ships and squadrons for professional execution. It was a great occasion for the Commander in Chief and a magnificent performance on the part of our Navy. I am proud to be in uniform.

J. L. Holloway III, Admiral, U.S. Navy, Chief of Naval Operations

Photos taken aboard Eisenhower by JOCS Archie Galloway

PEOPLE PLANES AND PLACES

His first flight as patrol plane commander proved to be more exciting and rewarding than expected for Lt. Gerry Feltz of Moffett Field's VP-9, when he and his crew transformed a routine training flight into a medevac.

En route back to Moffett Field with passengers who boarded in San Diego, the *Orion* was diverted to MCAS Yuma to pick up a Marine who was suffering from chest injuries. A special flight plan was expedited for the trip to nearby Luke AFB where an ambulance met the plane and hurried the Marine to a hospital for surgery.

Its mission completed, the VP-9 crew returned to Yuma with the medical team who accompanied them to Luke AFB. The *Orion* then proceeded to Moffett Field with its passengers who, by this time, were wondering if they would ever reach their destination.

Assisting in the medevac were Ltjgs. Scott Linn and Pat Conway, Ens. Chip McDermott, AE1 Mike Kelleigh, AW2 Rod Pitts and AT2 William Rhodes.

Members of HS-74, South Weymouth, and North Island's HS-84 participated in a joint exercise using the Canadian operational support ship HMCS *Provider* (AOR-508) as their base.

"The reservists deployed aboard *Provider* to perform various tactical evolutions including surface force screening, antisubmarine warfare, search and rescue, and personnel and cargo transfers with the Canadians," said Cdr. Melvin E. Taunt, ComHelWingRes.

Ground has officially been broken on a $1.6 million naval reserve training and administrative facility for NARDet Miramar. The 17,726-square-foot facility will house administrative headquarters and training spaces for the four reserve squadrons and eight non-tactical support units based at the naval air station.

"The new facility," according to Cdr. H. F. McCloskey, OinC of the NARDet, "will be a major step in the consolidation of the reserve forces at Miramar."

Moffett Field's VP-31 hosted members of the air element of the Canadian Armed Forces recently. Commanded by LCol. Ian Patrick, the flight crew was part of the 404 Squadron home-based at Greenwood, Nova Scotia.

"The 404 Squadron is very interested in how and what we teach here, since within a couple of years they will be doing almost the same thing with their new airplanes," said LCdr. Steve Wilson, VP-31 training officer. "The air element plans to replace their almost 20-year-old *Argus*, a four-engine piston-driven aircraft, with the Lockheed *Aurora*, a turboprop similar to the *Orion*."

Records:

HML-267, now at Camp Pendleton, was awarded the Meritorious Unit Commendation for the period December 1, 1975, to November 30, 1976, for "contributing significantly to readiness standards in the eastern Pacific."

The squadron, support unit of the 1st Marine Division, is tasked with nearly all the VIP missions in southern California and provides medevac service for the Camp Pendleton area on a 24-hour basis.

HML-267 has also achieved 46,500 accident-free flight hours.

The Golden Hook Award for shipboard landing excellence was won by VA-81, home-based at Cecil Field, while the *Sunliners* were deployed aboard *Forrestal* in the Caribbean. Cdr. "Funky" Yarborough, C.O., cited maintenance efforts and commented, "It's nice to have some top performers win awards in individual competition, but winning the big one takes solid performance throughout the squadron and that means your nuggets must learn very quickly and very well. Ltjgs. Hogan, Hofheimer, Babin and Rabideau did just that and the *Sunliners* came out on top."

Competing in six types of weapons delivery, the squadron also won the ComLAt-Wing-2 bombing derby recently. In their A-7Es, *Sunliner* pilots achieved the highest cumulative score in day and night dive bombing, rocket delivery, laydown and night radar bombing.

VAdm. P. N. Charbonnet, CNavRes, re-

cently lauded the Naval Air Reserve Force for its outstanding accident rate during FY 1977/77T. He recognized NavAirResFor units for having "... the best safety record among Naval Air units."

These units amassed a total of 237,600 flight hours, for a major and minor accident rate of 0.21 in each category. Adm. Charbonnet said the operations pace of the past year was one of action. "In fact," he added, "it has been one of our most rigorous in years; night carrier work and total carrier landings have been second to only one other year."

For many LAMPS detachments, participation in five fleet exercises and flying more than 600 accident-free hours is considered a very successful cruise. HSL-35 Det 6 accomplished this record in only five months aboard *Kirk* (FF-1087), flying the SH-2F. Individual honors were noted when Lts. Steve Beal and George Howard and Ltjg. Morgan Merritt each made 100 small deck landings during the WestPac deployment.

Capt. Wyatt St. B. Eustis III, Cherry Point's VMA-223 maintenance officer, completed his 2,500th accident-free flight hour in the A-4 *Skyhawk*. "He said, I have been at the controls of every version of the A-4 we've had. This includes the A-4C, E, F and M. I feel the *Skyhawk* is an extremely reliable, safe and dependable plane."

Two squadrons celebrated accident-free milestones – in years. The *Grey Knights* of VP-46 at Moffett Field completed 14 safe years. VP-8's *Tigers,* NAS Brunswick, achieved their 15-year mark. Respective C.O.s are Cdr. William E. Frederick and Cdr. Earl R. Riffle.

Cdr. R. E. Tucker, Jr., C.O. of VF-74, logged his 3,000th flight hour in the F-4 *Phantom II* aboard *Forrestal*. Cdr. Tucker has also made over 1,000 traps.

VA-303 achieved 11,000 safe A-7 hours in three years. A part of CVWR-30, the *Golden Hawks* are home-based at Alameda and commanded by Cdr. A. F. Talley.

Two VAW-124 flight technicians became double centurions aboard *America*. Flying as combat information center officer during the same flight, Ltjg. Ron Harrell completed 1,000 hours in the E-2C *Hawkeye*. AT1 Ed Perrin and AT2 Chris Powers were the record makers.

The *Mad Foxes* of VP-5 logged 16 years of accident-free flying, surpassing 130,000 safe hours. The squadron currently holds the ComSixthFlt ASW excellence award for superior performance during a recent Med deployment. C.O. is Cdr. W. R. Spearman.

The HC-3 *Packrats* of NAS North Island celebrated 30,000 accident-free hours flying the CH-46D *Sea Knight*.

Cdr. Dave Edwards, skipper of VA-12, made his 900th arrested landing, aboard *Eisenhower*.

Capt. J. B. Urbanczyk, USMC, piloted an HMH-362 CH-53 to *Raleigh's* 1,000th safe landing during its current Med deployment. Since commissioning, LPD-1 has logged its 14,000th accident-free landing achieved by Capt. V. W. Natoka, USMC, in a CH-46. *Raleigh* is commanded by Capt. G. L. Riendeau.

The *Ghostriders* of VF-142 are the first East Coast F-14 squadron to fly a single *Tomcat* 1,000 hours. BuNo 159437 flew its record-setting hour shortly after midnight on February 8, 1978, when the pilot, LCdr. Pete Cruser, and RIO, Lt. Chuck Bueker, launched on a practice combat air patrol from *America* in the Med.

A VF-32 *Tomcat* trapped aboard *JFK* recently carrying two new *Kennedy* quadruple centurions. Cdr. C. Flack Logan, squadron X.O., piloted the F-14 with Lt. John Scull as RIO.

Flying an A-7E to a #2 wire aboard *Forrestal*, Cdr. Phil Jacobs, VA-81 X.O., logged his 400th arrested landing. His wingman, Lt. Lee Willis, followed a few seconds later, earning an OK grade as he snagged a #3 wire for his 100th *Forrestal* landing.

A milestone was reached in the history of the Atlantic Fleet Weapons Training Facility when the 3,000th remotely controlled drone aerial target was launched. The BQM-34S

was fired in support of an air-to-air missile training exercise conducted by CVW-7. The target, capable of speeds up to 0.9 Mach, can remain airborne over 100 minutes and then be parachuted into the ocean at a predetermined position for recovery by helicopter.

Crewed by Ltjgs. Tom Cavanaugh and Ted Harwood, an F-14A from VF-14 flew the squadron's 10,000th accident-free hour while deployed aboard *JFK*. The aircraft was the same airplane that flew VF-14's 1,000th *Tomcat* flight hour.

Whiting Field's VT-6 recently flew its 100,000th consecutive flight hour without an accident, a total accumulated over three years in the T-28 *Trojan*. The 100,000 hours are equal to about 11 1/2 years, day and night, or, if you commute one hour round trip to work each day, it would take 400 years to achieve such a record. VT-6's C.O., Cdr. Richard D. Stout, observed that constant, dedicated effort by both aviators and mechanics is needed to avoid accidents. Honoring each pilot's estimate of his own limits and constantly stressing safety awareness contribute to a long record of flight safety.

LCdr. Bill "Bûgsy" Miller, VA-97, achieved a milestone that few in the A-7E community have reached. Recently he logged his 2,000th hour in the *Corsair II* during normal flight operations at Lemoore. Miller has flown over 3,500 hours and made 466 *Enterprise* traps during his Naval Aviation career.

The rest of the *Warhawks* are busy preparing for a WestPac deployment. C.O. Cdr. Rex Arnett, leads the pack with his 100th *Big E* trap during *Readiex 2-78*. He is followed by Lts. John Hansson, Pat Virtue, Todd Greeno and Earl Brownlee, who also qualified as *Enterprise* centurions during pre-cruise workups.

VX-4, Point Mugu, recently completed over four years (20,000 hours) of accident-free flying in five different aircraft: F-14s, F-4s, TA-4s, US-2Bs and C-1As. The squadron's safety record helped ensure that weapons systems were thoroughly tested and evaluated in a timely manner. VX-4 is commanded by Capt. R. W. Burnett.

Oceana's VF-43 celebrated its 33rd birthday on April 1. The squadron was originally commissioned in 1945 as VF-74A, based at NAS Otis Field, Mass., and assigned to Battle Carrier Air Group 74 aboard *Midway* (CVB-41). On September 1, 1948, it was redesignated VF-21 and began transitioning from F4Us to F9Fs, until the *Cougars* were replaced by FJ-3s, then F11Fs. Redesignated VA-43 on July 1, 1959, and subsequently VF-43 on June 1, 1973, the squadron now flies A-4Es, A-4Fs, T-38As and F-5s in adversary roles against Atlantic Fleet fighter and attack squadrons and Marine Corps and Air Force units. The *Challengers* also provide all-weather instrument ground and flight

VF-43 F5Fs and Skyhawks over Kitty Hawk monument.

training to Atlantic Fleet pilots and replacement pilots.

At Point Mugu, six women have filled positions traditionally held by men – they now serve as the color guard for the NARU.

Members of the group are: PN2s Brenda Walker and Carol Collins, YN3s Vickie Baker and Sandy White, PN3 Debbie Sweat and ACAN Mara Kruzzette.

The women – who are attached to NARU, VP-65 and PMTC – do not receive time off for the extra hours required for color guard performances. "Being part of the color guard is an excellent opportunity to represent women in the Navy," Collins says, "but primarily we do it because it's fun and we love it."

The group practices before each performance, which may require walking a few miles while carrying lightweight guns and flags. "The equipment is bulky but not heavy," Collins comments. "Although the flags sometimes wrap around our heads, we have never received any injuries – only blisters."

During ceremonies onboard *Midway*, VF-161 skipper, Cdr. John M. Nash, presented the Charger of the Year Award for 1977 to AO1 Jerry Richardson. His selection from among 150 candidates was for his personal achievements, high standards of professionalism and safety, and his demonstrated leadership ability. Richardson is responsible for maintenance of weapons and guided missile systems of the F-4.

The award identifies and honors the individual whose professional productivity and growth far exceed the norm. Richardson (right) received a squadron plaque, letter of commendation, 96 hours of liberty, one duty-free quarter and a wooden scale model of a *Phantom* with squadron markings.

The title of a popular song, *Making the Best of a Bad Situation*, may have been going through LCdr. Norm Justesen's mind recently when he flew with VC-12 during a training mission to Dallas from Norfolk. His A-4 experienced landing gear trouble . . . it wouldn't come down. Justesen could either punch out, which would save him but not the plane, or try to land without landing gear. He chose the latter, using his large but empty center line fuel tank as his ace in the hole.

Justesen brought the *Skyhawk* in with its nose up high, holding it there as long as possible while the plane settled onto the fuel tank. The plane skidded to a halt with a minimum of damage. It didn't take long to make repairs to the slightly bent left wing tip and get the plane back in the air. . .along with LCdr. Norm Justesen – who required no repair work at all.

Changes of command:

ComNavAirLant: VAdm. G. E. R. Kinnear II relieved VAdm. Howard E. Greer.

CVWR-20: Cdr. Melvin L. Seidel relieved Capt. Charles L. Tinker.

Det MAG-16: LCol. Early E. Spiars relieved Col. Oliver G. McDonald.

HSL-34: Cdr. Richard C. Strand relieved Cdr. Stanley L. Stevens.

NAS Dallas: Capt. T. F. Rinard relieved Capt. James R. Foster.

National Parachute Test Range: Capt. Elbert D. Lighter relieved Capt. Robert S. Chew, Jr.

VA-72: Cdr. Hugh A. Merrill relieved Cdr. Patrick M. Commons.

VA-127: Cdr. Gary L. Beck relieved Cdr. Ronald L. Waters.

VA-192: Cdr. John L. McWhinney relieved Cdr. J. D. Cole.

VAQ-33: Cdr. R. W. Barrett relieved Cdr. B. J. Penn.

VF-74: Cdr. D. C. Anderson relieved Cdr. R. E. Tucker, Jr.

VF-103: Cdr. S. L. Vernallis relieved Cdr. W. T. Inderlied III.

VP-9: Cdr. Byron L. Powers relieved Cdr. Delbert A. Ritchhart.

VP-22: Cdr. Michael B. Hughes relieved Cdr. David K. Moore.

VP-47: Cdr. Daniel J. DeNike relieved Cdr. Gary A. Wells.

VP-0919: Cdr. Robert Zimmerman relieved Cdr. Donn Johnson.

touch and go

LSO

The Navy's Phase One Landing Signal Officer (LSO) School is located at NAS Pensacola, Fla. Established as a formal school on July 1, 1974, it is designed to train the entire LSO community. More than 500 LSOs have completed phase one of the school.

Phase two, field training, and three, aboard a carrier, are performed in replacement training squadrons.

Tradition has it that the first LSO was Captain Kenneth Whiting, Naval Aviator #16, *Langley* X.O., who saw a pilot having trouble landing. He grabbed the white hats from two sailors and helped signal the plane in.

During WW II LSOs became prominent. They were pilots, usually serving in a non-flying billet, and were called Paddles. Later came the angled deck, the lens-system meat ball, the mirror, the fresnel lens, – and the jets. It was apparent that LSOs needed training.

In the early 1960s, phase one training was given as ground-school-type instruction – usually half a day of lectures in the BOQ – given by any available LSO. Watching aircraft from the back of a ship was phase two.

LSO training is now formalized. The staff consists of an ex-air wing staff LSO as OinC, a first tour training-qualified LSO as the assistant, a Marine LSO and an ABEC. School syllabus exposes students to technical and practical facets of LSO training. Subjects range from the inner workings of the fresnel lens to techniques of debriefing a pass. Students also learn applicable publications and get field trips ashore and afloat to observe actual equipment and operations.

PAMS

Marv Stumpf, an engineering technician in the technical support directorate at NATC Patuxent River, operates a strange-looking piece of gear called a photographic position and attitude measuring system (PAMS). From a camera mounted on an aircraft, a five-minute movie is produced to show what happens around the bomb rack when a pilot releases the weapons. Under Mary's guidance, PAMS translates the movie film, one frame at a time, into mathematical data indicating the position of the weapon before, during and after separation from the aircraft.

NATC uses the data to recommend the most effective separation envelope for that weapon. Weapon designers and developers also use the information to make improvements at the drawing-board stage.

A scale model of the weapon under evaluation is positioned on a movable rack and a television camera focused on it. Using remote controls on the PAMS console, Mary twists and turns the model until its TV screen image is exactly the same as the real weapon's image on the first frame of film. Once the two images are superimposed, she punches a button and PAMS produces an IBM card reflecting the position and attitude of the weapon in relation to the aircraft's camera. This process is repeated for every frame. There are 128 frames for each second of film.

Each weapon is tested individually, but not in concert with others, before it gets to NATC. By the time NATC has checked out the weapon for fleet use, pilots can attack their targets confident everything will separate as advertised.

FLYER ON THE HILL

Congressman Jim Lloyd is a retired Naval Aviator who keeps in touch with Naval Aviation by flying in fleet and training aircraft. He received his wings at NAS Pensacola in 1944 and, in WW II, flew SBDs, SB2Cs and F-6s in the Pacific. In his naval career, he operated from the decks of 14 different aircraft carriers.

The congressman was an instructor at NAS Kingsville, Texas, from 1958 through 1960, where he flew F9F-8Ts and Bs as well as the F-11 *Tiger*. He retired in 1963.

Lloyd serves on the House Armed Services and Science and Technology Committees and is an active aviator with a commercial license. In line with his duties, he flies military aircraft to evaluate the performance and utility of the weapons systems authorized by the Armed Services Committee. During his three years in Congress, he has flown in the F-14, F-5E, F-15, AV-8A, A-37, T-34C, AAH attack helicopter, T-44 and, most recently, the TA-4J and TA-7 *Corsair*.

In addition, Lloyd has checked out in the Boeing 747 and Douglas DC-10. On a trip to Israel with the Armed Services Committee, he flew the French *Mirage* with the Israeli Air Force and, at the Paris Air Show, the A-300 *Airbus*. During landing simulations for the space shuttle at Edwards AFB, Calif., he checked out in the F-104. He has flown more than 50 different types of military and general aviation aircraft over the years.

According to his legislative assistant, Don Waunch, a former Marine Aviator, "If the *Tomahawk* cruise missile had a seat in it, he'd be airborne in that, too."

In the photograph, Lloyd mans a T-34C during a visit to Training Air Wing Five at NAS Whiting earlier this year.

JASMMM

Rapid technological advances in aviation weapons systems during the late Sixties and early Seventies created a "support gap" which could only be filled by improved management techniques. JASMMM was developed to fill that gap.

Its goal is to create cooperation and empathy between maintenance and supply organizations. It is also designed to develop aviation support supervisory, technical and management skills. Each class consists of approximately 60 percent maintenance, 30 percent supply and 10 percent operations and engineering.

JASMMM is staffed by an aircraft maintenance officer and two Supply Corps officers. It focuses on areas common to supply and maintenance, including terminology, weapons systems designation, material identification (with emphasis on aviation technical publications) and an in-depth study of the Naval Aviation maintenance program.

Continuing emphasis is placed on the course as an integral part of the training program for all supply and maintenance officers en route to air stations, wings, groups and aviation ships. A two-week course is being considered for reserves on active duty training.

About 12 times a year, a three-week course in joint aviation supply and maintenance material management (JASMMM) convenes at the Navy Supply Corps School in Athens, Ga. Attendees include active duty and reserve Navy and Marine Corps personnel, civilians, officers and senior enlisted men from supply, maintenance and engineering communities, and prospective C.O.s and X.O.s of aircraft squadrons.

FIRST RESERVE FIGHTER MEET

In the Naval Air Reserve's first fighter meet, held in January, VF-302, was declared the top reserve fighter squadron.

Originated by Commander Riley Mixson, Commander, CVWR-30, the derby demonstrated the readiness and proficiency of the two reserve air wings and their squadrons from NAS Miramar and NAS Dallas.

The four units which participated in the week-long meet were VF-201's *Renegades* and the *Superheats* of VF-202, both from CVWR-20 at Dallas, and the Miramar-based VF-301 *Infernos* and VF-302 *Stallions*, representing CVWR-30. Aircrews from each squadron flew their F-4N *Phantoms* in eight two-versus-one and eight two-versus-two air combat maneuvering sorties. VF-126's TA-4s played the adversary role. A maintenance abort counted the same as a loss on the range. VF-302 led the scoring with five "kills" and no loss of aircraft.

The derby took place over the MCAS Yuma air combat maneuvering range (ACMR). Several ground receiving stations gathered data sent by the aircraft and transmitted it to the ACMR terminal at Miramar. There, ground instructors watched the aerial battles live and judged each event. Video tapes were played back to the flight crews during the debriefs.

The two Dallas squadrons, under the command of Captain C. L. Tinker, Commander, CVWR-20, finished in second and third places. Commander Max Gore, C.O. of VF-202, said that the fighter meet was an excellent opportunity for the reserve F-4 community to get together and try proven tactics that have been gospel for a long time. "The four squadrons," he added, "have done more combat maneuvering getting ready for this meet than we have done since the inception of the reserve force concept."

In presenting the McDonnell Douglas award to the top fighter squadron and wing, Vice Admiral Pierre N. Charbonnet, Chief of Naval Reserve, stated that "Their [the four reserve squadrons] performance was proof of the high state of readiness of the members of the Naval Air Reserve."

Commander Jon G. James, VF-302's C.O., lauded the efforts of the squadron's maintenance personnel in providing outstanding availability of aircraft and weapons systems to the *Stallion* pilots and radar intercept officers.

Long before the flight crews began briefs for their morning hops, the ground crews were at work. Many put in demanding 10 or 12-hour shifts.

To the uninitiated, the fighter meet begins when the jets take off down the runway. Not so, really. Flight crews depend on the maintenance force. The two men in the cockpit are well aware that the technicians who repair and prepare their planes are vital to achieving a successful mission.

Master Chief Tom Coomes, head of the VF-202 maintenance crews, observed, "For the aircrews to be successful, we must give them the best aircraft we can. In a fighter meet like the one the reserves just held, a good weapons system and a ready radar unit are key factors in winning." He also noted that "Support jobs are taken seriously by both selected air reservists and active-duty personnel. If a pilot is marked as a 'kill' on the combat maneuvering range, he can come back to fight another day. If we make a mistake, we endanger the lives of the flight crew."

Cdr. James remarked, "In competition as fierce as this, it's obvious that the *Stallion* maintenance crew owns as much of this trophy as the aircrew."

VF-302 won special Phantom trophy.

Reserve fighters over San Diego Padre Stadium represent, in sequence, VFs 301, 302, 201 and 202.

LCdr. Jerry Weber

Six aircrews from VMAQ-2 were aboard Lexington recently receiving carrier qualifications in preparation for deployment with the Seventh Fleet aboard Midway. The EA-6B squadron will provide electronic warfare support for Fleet Marine Force, Pacific. Capt. John N. Summerlin, right, was the landing signal officer for the carrier qualifications.

Training

Photos by SSgt. Steve Manuel

Traps

MARK OF

YC-129

This article was written by Harry Gann, McDonnell Douglas. It is another of the seemingly endless stories about the C-47.

On November 4, 1942, in Long Beach, an Army ferry pilot signed the acceptance papers on a new olive-drab C-47. He then delivered C-47 serial number 41-18656 to its assigned base and the aircraft became one of the 10,000 plus military DC-3s that played such a major part in the fight against Hitler and the Axis powers. With the end of the war, that twin-engine transport received its honorable discharge and became a civilian. That airplane is still flying.

So are many other C-47s, you say. In fact, about 3,000 *Gooney Birds* are still wearing the beast-of-burden mantle with the military air forces, large, small and middle-sized airlines, or private companies. But this C-47's mark of distinction is that it has carried eight different letter designations, which must be a record for a single airframe.

After conversion to civilian status, this C-47 became a DC-3A when it was altered to conform to requirements of the Civil Aeronautics Authority (now the FAA). Western Airlines operated this DC-3A on its routes until the late 1940s when Douglas Aircraft Company re-acquired the airplane for a new project.

Douglas had made many studies trying to come up with a suitable DC-3 replacement. However, with all of the surplus DC-3s flying around the world, it was decided that a market existed for an improved, remanufactured DC-3. 41-18656 was selected to become the pilot ship for the conversion to a Super DC-3. With its return to the factory at Santa Monica, little time was lost in modification. The outer wing panels were removed and a new set with greater sweepback was installed. The fuselage was lengthened by the addition of a 39-inch plug. Higher-rated Wright engines replaced the 1,200-hp Pratt & Whitney R-1830s and a larger tail was added to improve the stability and to account for the increased power.

Test pilot Johnny Martin made the first flight on the new DC-3S and soon Capital Airlines and the Navy ordered 103 improved DC-3s. (Douglas modified two aircraft as prototypes which

DC-3S prototype

R4D-8

DISTINCTION

accounts for the 105 Super DC-3s.)

Soon after this, the airplane again went through a change. The Air Force requested an aircraft that could perform an escape and evacuation mission. The airplane was modified by the installation of reversible propellers, JATO bottle, dual wheel landing gear, a 60-foot-diameter drogue landing parachute and 1,600-gallon fuselage fuel tanks. The DC-3S was redesignated YC-129. Despite an impressive flight test program, the Air Force cancelled the mission requirement and production of the aircraft did not begin. However, the YC-129 prototype was delivered to the USAF where it was again redesignated, this time YC-47F. (The reason for the change has been lost in the records.)

Since the mission requirements had been cancelled and the lone Super DC-3 in the inventory would create a spare parts problem, the airplane was declared surplus and transferred to the Navy inventory, joining the 100 Super DC-3s that they had previously received. The aircraft was sent to the overhaul and repair facility at Naval Station, Jacksonville, Fla., to have the special features, installed for the evacuation mission, removed. The aircraft was modified to conform to Navy requirements. While the modification was being accomplished, the aircraft was designated R4D-8X, the sixth different designation that had been assigned to this one airframe.

When the plane had been outfitted to meet the Navy's requirement, the designation became simply R4D-8. This airplane has seen service at Naval Air Stations China Lake and Patuxent River and at Marine Corps Air Stations El Toro and Yuma. The Marines now refer to it as a C-117D, as all the Super DC-3s in service are now called. This last change from R4D-8 to C-117D occurred in 1962 when the Department of Defense changed the system of designating military aircraft to conform to a single system for all branches of service.

If you happen to be near Davis-Monthan AFB, where U.S. military aircraft are stored, and see an airplane with BuNo 137820, you will know that you are looking at a C-47, DC-3A, DC-3S, YC-129, YC-47F, R4D-8X, R4D-8, C-117D, *Skytrain, Dakota, Gooney Bird.*

C-47

C-117D

DC-3A

By John M. Lindley

Navy's rigid airships of the 1930s represented a multimillion dollar weapons system which gradually passed out of service. But to explain their demise solely because of the competition for funding, the popularity of the airplane, or of their supposed vulnerability to attack is to overlook the presence of other alternatives in Naval Aviation at that time. Although several airship officers did grasp the idea that *Akron* or *Macon* could operate as a lighter-than-air carrier for scouting, this idea was never fully worked out prior to the crash of *Macon* and it certainly was not widely known to naval leaders outside of the lighter-than-air field. Lacking an appreciation for this potential doctrine for airship operation, critics of the rigids saw only the expense and publicity, not always favorable.

Even if this doctrine had gained widespread acceptance, it would probably have changed surface warfare tactics very little because it fitted in easily with the dominant tactics of the interwar period. The rigid airship as a scout was no threat to the battle line and the big gun. The rigids, with their heavier-than-air detachments, were basically scouts with no offensive combat roles; thus they required no substantial re-thinking of surface warfare organization or tactics.

The aircraft carrier, meanwhile, was still undergoing substantial technological development in the 1920s and 30s. Yet, because it was a new and an experimental ship type whose aircraft had a potential for both scouting and offensive air operations, it was bound to have a greater impact on surface warfare organization and tactics than the rigid airship had had. The degree of influence which the carrier would have on fleet organization and tactics depended principally on how success-

Capt. J. M. Reeves (left) and RAdm. W. A. Moffett aboard Langley, circa 1924-25.

ful officers in the British, Japanese and American navies were in working out the implications of carrier operations for naval warfare. In short, how able they were in formulating an operational doctrine which not only included this new ship type, but also employed it to its fullest capabilities.

During the early interwar period the British were making headway in carrier building and development. Many American admirals were reluctant to try to catch up with or overtake the British; consequently they resisted the initial efforts of other U.S. Navy leaders to begin experimental development of carriers. At first the U.S. Navy concentrated upon developing seaplanes and flying boats. Float-equipped planes assigned to battleships and cruisers could either be flown off a turret or catapulted. Their use in gunnery spotting was considered essential to battle-line tactics. Like flying boats, these aircraft did not in any way restrict the arc of fire of the big guns on these warships. Once the planes had done their work as spotters, they could be recovered by cranes or by seaplane tenders.

Seaplanes and flying boats were also useful for long-range patrol or reconnaissance missions. Thus the Navy emphasized the development of patrol planes. The F5L flying boat of WW I never got into action in that conflict, but the Navy eventually bought a total of 227. The last of these flying boats was withdrawn from service in 1931. Following the flight of the NCs in 1919, the Navy built six more of this type of patrol plane, but they proved too unwieldy for routine operations. Thus the majority of the flying boats which the Navy built or bought during the 1920s were essentially structural variations of the basic F5L type with improved engines or other design improvements. The PN-9 which Commander John Rodgers flew to Hawaii had, for example, a hull made entirely of duralumin rather than laminated strips of wood.

The first monoplane flying boats in the U.S. Navy were the PY types whose prototype was built by Consolidated Aircraft with production models built by the Glenn L. Martin Company as P3M-1s, first delivered to the Navy in 1931. These were followed by improved Consolidated P2Ys. Beginning in 1936 the Consolidated PBYs began to replace the P2Ys for patrol duties with the fleet. The PBY (named the *Catalina* early in WW II) subsequently saw extensive service with the British RAF in the Atlantic and Mediterranean during the war, and it was the principal patrol-bomber flying boat in the U.S. Navy when America entered the war. To aid in operations involving seaplanes and flying boats, the U.S. converted several older ships to seaplane tenders. The first of these was completed in 1921 as USS *Wright*

Langley in Panama Canal

(AV-1). Seaplane tenders could neither carry nor launch seaplanes or flying boats, but they had great utility as advanced bases that provided servicing facilities for these planes and quarters for their crews.

The naval emphasis upon the development of flying boats in the interwar period was largely a product of their reliability and their range for long over-ocean flights.

The development of flying boats and other aircraft in the 1920s and 30s was assisted materially and psychologically by the Schneider Trophy Races. The French aviation buff Jacques Schneider had sponsored in 1913 an international aviation competition open to seaplanes of all nations. A trophy and prize of $5,000 went to the winner of each competition. In 1923 Lt. David Rittenhouse, USN, won the trophy with a Curtiss CR-3 flying at over 177 miles per hour. Two years later Lt. James Doolittle, USA, upped that winning speed to 232.57 miles per hour with a Curtiss R3C-2, the last biplane to win the Cup. Maj. Mario de Bernardi of Italy won in 1926 with a Macchi M-39 which averaged nearly 245 miles per hour. Then the British dominated the Cup Races with *Supermarines* designed by R. J. Mitchell flying at speeds up to 343 miles per hour. The British finally retired the Schneider Cup in 1931 after having won three straight races.

The nations which competed in these races took them seriously for more than the prize money, which generally covered little more than the expense of entering the races. After 1923 all the aircraft entered in the races were designed exclusively for racing.

The aircraft designed for carrier operations in this period were not as fast or as impressive as the racers. Carrier airplanes had to be sturdy and able to withstand the shocks of arrested landings. Widely used U.S. Navy carrier biplanes of the interwar period were the Chance-Vought O2U *Corsair*, the Boeing F3B and F4B, and the Martin T4M-1. The *Corsair* was a versatile scout able to use wheels or floats and be catapulted from battleships and cruisers as well as operating carriers. The F3Bs and F4Bs were Navy fighter planes with a maximum speed of 157 miles per hour in the F3B and 176 miles per hour in the F4B. The T4M-1 carried a torpedo, up to 1,500 pounds of bombs, and had a top speed of 114 miles per hour. It carried a crew of three.

The U.S. took a hesitant step toward the fast carrier task forces of WW II in 1919 when Congress authorized the conversion of the collier *Jupiter* to an aircraft carrier. Renamed USS *Langley* (CV-1: C for carrier, V for heavier-than-air), this first carrier had a flight deck 534 feet long and 64 feet wide. When she joined the fleet on March 30, 1922, she carried 34 airplanes and was nicknamed *The Covered Wagon*. Originally *Langley* had a short funnel on either side of the flight deck for exhaust gasses. Later this arrangement was modified so that both funnels were on the port side and hinged so that they would swing outboard of the ship during flight operations. Her first takeoff and landing took place in October 1922.

Between the World Wars, other naval powers besides the United States experimented with aircraft carriers and the aircraft which could be used with this new ship type. The British responded to the limitations on capital ships by converting two cruisers to carriers – rather than scrapping them. These ships were *Courageous* and *Glorious*, each capable of carrying 36 aircraft. Thus *Courageous* and *Glorious*, together with *Hermes* (laid down before the end of the war), *Furious* (modified as a flush-deck carrier in 1925), and a new *Ark Royal* (60 aircraft, maximum speed 30 knots) which was completed in 1938, gave the British five big carriers by 1939. However, the Royal Navy was not able to capitalize on the construction of these ships and develop carrier tactics and aircraft procedures during the interwar period because the RAF dominated fleet aviation until 1937 when the Fleet Air Arm finally gained separate status from the RAF. The main concern of the RAF had been the development of land-based forces; consequently Naval Aviation had to take a secondary role.

Following the completion of the "world's first built-for-the-purpose" aircraft carrier, *Hosho*, in 1923, the Japanese also converted two battle cruisers to carrier use. These ships were *Akagi* and *Amagi* (later damaged in an earthquake and scrapped). *Akagi* was a strange carrier by present-day standards. She had three flight decks in tiers and a port-side island which proved to be a problem because it produced disturbing air currents over the flight deck during landing operations. In 1928 the Japanese converted another capital ship to a three-deck carrier, *Kaga*.

A third generation of Japanese carriers joined the fleet in the 1930s. *Ryujo*, completed in 1933, was a small vessel of only 8,000 tons. She carried 36 aircraft. *Soryu* (34 knots, 55 aircraft) and *Hiryu* (34 knots, 55 aircraft) came along in 1937 and 1939. Two more carriers, *Shokaku* (34 knots, 72 aircraft) and *Zuikaku* (34 knots, 72 aircraft), followed these earlier ships in joining the Japanese Fleet in 1941.

In contrast to Japan where Naval Aviation gained a strong position in planning and development, U.S. Naval Aviation lost influence immediately after the end of WW I. This loss was partly the result of substantial cutbacks in financial appropriations which were politically popular in the 1920s. Equally as important were military problems.

Internally, many senior naval officers, who had received their training on the decks of battleships, felt that aircraft should be subordinate to ships' guns. The Navy's Gun Club saw no special need to promote aviation at the expense of capital ships and surface auxiliaries.

The external influence on Naval Aviation in the 1920s was spearheaded by General "Billy" Mitchell. Mitchell wanted the U.S. to have an independent air force similar to the RAF in Great Britain. This air force would concentrate on long-range strategic bombing and thereby (or so Mitchell and his supporters claimed) make Naval Aviation unnecessary – or relegate it to the role of a minor adjunct. In an effort to achieve this, Mitchell deliberately stirred up public contro-

versy. Typical of this were the controversial bombing tests in July 1921 during which the Army Air Corps sank the anchored and unmanned ex-German battleship *Oftsfriesland* and then claimed to have demonstrated that this feat proved aircraft had made navies obsolete.

Such controversy helped make the entire Navy more aviation conscious. Following Adm. Moffett's leadership, Naval Aviators vigorously defended aviation's place within the fleet. Congress was persuaded to give Naval Aviation greater status and influence by establishing the Bureau of Aeronautics in 1921 and the office of the Assistant Secretary of the Navy for Air in 1926.

The growing consciousness of aviation within the Navy, in conjunction with the Washington Naval Disarmament Treaty of 1922, led to the construction of two more carriers. Under the terms of the treaty all carriers already built or under construction were classified as experimental vessels. The signatories also agreed that the U.S. and Great Britain could each build up to 135,000 tons of new carriers and Japan could build up to 81,000 tons of carriers. Capital ships such as cruisers and battleships were limited according to a ratio of 5:5:3 on the basis of existing tonnage for Great Britain, the United States and Japan, respectively. Since the U.S. knew it would have to scrap several battle cruisers then under construction in order to comply with the treaty ratios, the Navy decided to convert two of these cruiser hulls to aircraft carriers. Eventually the two hulls became the carriers *Lexington* (CV-2) and *Saratoga* (CV-3).

Each carrier displaced 36,000 tons, had a maximum speed in excess of 33 knots, and carried 72 aircraft. Thus they were roughly equal to the third-generation carriers of the Japanese Navy. In addition to their aircraft, both carriers retained some of their original cruiser armament – twin turrets with 8-inch guns forward and aft of the superstructure. These guns as well as the bridge, funnels and other control stations formed a massive island on the starboard side of each vessel. When *Saratoga* and *Lexington* joined the fleet, toward the end of 1927, the U.S. Navy had begun a modest but determined carrier building program. Other carriers soon followed in the 1930s. Construction of *Ranger* (CV-4) began in 1931; *Yorktown* (CV-5) and *Enterprise* (CV-6) followed in 1934 and *Wasp* (CV-7) and *Hornet* (CV-8) in 1936 and 1939, respectively.

After *Langley* joined the fleet in the mid-1920s, the Navy began using its carriers extensively in fleet exercises and training problems. These problems trained personnel and tested the characteristics and capabilities of the carriers. When Naval Constructor Holden C. Richardson invented a practical turntable catapult for launching aircraft in 1921, he provided warships with an efficient device for launching small seaplanes. Thus catapults were widely used on battleships and cruisers to launch float planes which spotted naval gunnery fire. The carriers of the interwar period also had catapults, but generally they were used only for launching seaplanes. The use of catapults for launching wheeled aircraft did not come into widespread use until WW II. Prior to that, wheeled aircraft were usually able to take off from carriers under their own power. The catapults varied. *Langley* had a compressed air catapult while *Lexington* and *Saratoga* initially had whirling fly-wheel devices that powered their catapults. Shortly before WW II these machines were replaced with flush-deck hydraulic catapults. The Navy found that the operational advantages of the catapult were substantial. Catapults, by providing initial assistance at the moment of takeoff, increased the load-carrying capacity of aircraft thereby either lengthening effective range or enlarging the armament load. For seaplanes, launched from battleships and cruisers, the turntable catapult was especially useful. It made launches possible when rough seas would have prevented a conventional surface takeoff. Equally important, since the turntable catapult could be pointed into the wind, it was possible to launch aircraft without interrupting cruise formations by hunting a favorable wind.

The thorniest technological problem encountered in the development of carrier aviation was the design of suitable equipment for restraining planes once they touched down on a carrier's deck. While *Langley* was being constructed, a dummy deck was installed on a huge turntable at Naval Air Station, Hampton Roads. The

XS-2 seaplane preparing for launch aboard S-1 submarine (1926).

turntable was used because it could be turned so that the planes could head directly into the wind. On the deck a British-type arresting gear was installed, consisting essentially of cables running longitudinally the length of the deck. The theory was that these fore-and-aft lines would catch hooks mounted on the plane's axle and, through friction, gradually bring it to a halt. They would also guide the plane down the flight deck and prevent it from careening over the side.

Before Lt. A. M. Pride began testing this rig, other lines were mounted crosswise of the deck and attached to weights suspended from a tower. A larger hook was also secured to the bottom of the plane so that it would engage these athwartship lines and thus help retard the plane. This hybrid system was perfected and installed aboard *Langley* when LCdr. R. G. de Chevalier made the first landing aboard, October 26, 1922. A similar configuration was installed on the Navy's next carriers, *Lexington* and *Saratoga*, when they were commissioned. The fore-and-aft wires however proved very cumbersome. In January 1931 Squadron Leader W. R. D. Acland, RAF, gave a talk to the Royal Aeronautical Society on carrier landings in which he said the wires "in about nine cases out of ten turned a moderately good landing into a bad one. . . .Fore and aft wires were therefore abandoned" and the British returned to making unretarded landings.

The U.S. Navy also concluded that the fore-and-aft wires were a hindrance and removed them in 1929. The athwartship wire, which had been appended to the longitudinal wire system became the major element of arresting gear, particularly when attached to a hydraulic energy-absorbing mechanism. Thus the modern arresting gear came into being.

Carrier training exercises and problems also provided an opportunity for tactical experimentation. Bombing operations in WW I had shown that a higher percentage of hits resulted from low-altitude attacks. Post-war experiments with captured German warships also showed that attacks at about a 60-degree angle were very accurate although subject to possible heavy anti-aircraft fire. Consequently Navy and Marine Corps pilots began to develop the technique of dive-bombing in the mid-1920s. Soon thereafter, the Navy began designing aircraft specifically for this method of attack.


T4M over Saratoga


Japanese carrier Hiryu burning in 1942


LCdr. Hunsaker

Although these operational tests and experiments in Naval Aviation technology and tactics were relatively crude in comparison with the sophisticated research and development carried out with present-day weapons systems, they did provide operational experiences which, in the words of one Navy aeronautical engineer, Cdr. J. C. Hunsaker, "reveal the past and present state of the art" and "show the trend of more successful designs." Thus Naval Aviators could determine the direction of the most promising future technological and tactical developments.

Fleet Problem IX of 1929 is a fine illustration of the experimental direction of Naval Aviation in the interwar period. This was the first fleet exercise for the new fast carriers *Lexington* and *Saratoga*. Black Forces operating in the Pacific, including *Saratoga* and *Langley*, were to attack the Panama Canal which was defended by the Blue Force of warships, *Lexington* and land-based Army airplanes. When *Langley* had a breakdown, the seaplane tender *Aroostook* was substituted – with one float plane representing *Langley's* 24-plane squadron.

While the Black Fleet was planning the attack, Rear Admiral Joseph M. Reeves persuaded Adm. William V. Pratt to let him divide his air power and attack from two directions. A task force consisting of *Saratoga* and the cruiser *Omaha* was to make a wide sweep to the south and then sail north along the South American Coast and attack the Pacific terminus of the canal. Simultaneously, *Aroostook* would launch its plane from extreme range, attack the Atlantic terminus and then land on the beach and surrender.

On the afternoon before the attack, *Saratoga* and *Omaha* encountered and disposed of an enemy destroyer. During the evening the cruiser *Detroit* encountered them, tracked them dur-

Curtiss CR-3 Racer (1923)

ing the night and provided the defending commander with position reports. At 4:58 a.m. on January 26, *Saratoga* launched her attack on the canal from a distance of 140 miles. Some 70 planes, including dive bombers, torpedo planes and fighters, arrived over the target, catching the enemy by complete surprise. The lone utility plane from *Aroostook*, aided perhaps by the fact that the Army had not been advised that one aircraft represented 24, was equally successful. Theoretically, the simultaneous bombings blew up the Miraflores and Pedro Miguel Locks and damaged the air fields at Forts Clayton and Albright.

Some writers have heralded this exercise as marking the birth of the fast carrier task force. More realistically, it was a dim portent of the future. There was much that had to be learned before the great carrier task forces of WW II could even be visualized. Fleet Problem IX, however, demonstrated clearly that aircraft carriers could successfully attack land-based aircraft and installations. Adm. Pratt called the air attack from *Saratoga* "an epic in the history of aviation." He said, "No single air operation ever conducted from a floating base speaks so eloquently for the advanced state of development of aviation as an integral part of the fleet." Admiral H. W. Wiley, Commander-in-Chief, U.S. Fleet, also commented that the use of stronger aircraft was the only method that either ships or coastal strong points could rely upon to beat off air attack. The admiral added that there was no "analysis of Fleet Problem IX fairly made which fails to point to the battleship as the final arbiter of naval destiny."

Adm. Wiley's statement was clearly a manifestation of what Adm. Chester Nimitz described as the enduring "controversy over the relative emphasis to be placed on carriers and heavy ships." Throughout the period between the World Wars and on into WW II, "Many officers regarded the carrier strictly as an auxiliary, of little use beyond reconnaissance and gunfire spotting. Others, including Adm. Moffett, saw the carrier as nothing less than the capital ship of the future."

Fleet exercises such as the one in 1929 gave some indication of the future uses of the carrier, but they were by no means conclusive in settling the problem of the role of this ship type in the fleet. The U.S. had the industrial capacity to produce the ships and planes necessary to provide for realistic tests of the carrier and its aircraft, but two practical factors hindered this type of experimentation. One factor, the extremely high rate of obsolescence of aircraft, slowed carrier development. The second factor, the reluctance of Congress to spend money on costly research and development, was equally important. Even after improved carrier aircraft such as the Chance Vought *Vindicator* bomber (SB2U), the Grumman *Wildcat* fighter (F4F), the Douglas *Devastator* torpedo plane (TBD) and *Dauntless* dive bomber (SBD) gradually became available for carrier operations between 1937 and 1941, realistic, full-scale maneuvers were not truly possible.

The uncertainty over the role of the aircraft carrier in the fleet was apparent in statements of fleet doctrine and in actual exercises. On the one hand, Admiral William S. Sims, as advocate of Naval Aviation, told a Congressional committee in 1925 that "A small, high-speed carrier alone can destroy or disable a battleship alone, ...a fleet whose carriers give it command of the air over the enemy fleet can defeat the latter, . . .the fast carrier is the capital ship of the future." Sims defined the fast carrier as "an airplane carrier of 35 knots and carrying 100 planes" which was "in reality a capital ship of much greater offensive power than any battleship." On the other hand, the official U.S. Navy War Instruction of 1934 stated that carriers were "simply mobile airplane bases and their use depends upon the employment of their aircraft." The War Instructions did not consider the carrier a capital ship. Her jobs were reconnaissance, shadowing the enemy, spotting gunnery fire in surface actions and shore bombardment, protecting herself and the fleet from submarine and air attacks and attacking a faster enemy to slow him down so that the battleships could do the fighting.

To be continued

Mitscher makes first landing on Saratoga.

NAVAL AVIATION NEWS letters

Liberty

I would like to hear from any aviation personnel who were embarked in *America* (CVA-66) or *Saratoga* (CVA-60) during the Arab-Israeli Six Day War in June 1967. I am especially interested in the USS *Liberty* (AGTR-5) incident of June 8, 1967. (An article on the *Liberty* incident is scheduled for publication in the June issue of Naval Institute *Proceedings*.)

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NAVAL AVIATION NEWS

SIXTIETH YEAR OF PUBLICATION

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COVERS — CNO and the President watch flyover from deck of USS Eisenhower during the Commander in Chief's visit to CVN-69 in March, front. JOCS Archie Galloway took this and other pictures of the event (pages 20 and 21). Back cover view of Corsair IIs preparing for carrier launch is from our files.

SOSs

For a naval aviation history project on U.S. Navy fighter squadrons and for our naval heritage displays, I would like to request reader assistance in borrowing photographs of the following:

VF-4, *Hellcat*, 1944-45, *Bunker Hill* and *Essex* (or NAS Hilo, Hawaii)

VF-11, *Wildcat*, 1943, NAS Maui, in combat at Guadalcanal, *Hornet* (CV-12), 1944

VF-111, *Panther* F9F-2, 1950, *Philippine Sea* (CV-47)

VF-14, F3D *Skyknight*, 1954, NAS Key West and possibly *Roosevelt* (CVA-42)

VF-162, F4D-1 *Skyray*, NAS Cecil Field and *Intrepid* (CVA-11), 1960

VF-51, FJ-1 *Fury*, 1948, *Boxer* (CV-21)

All material will be reproduced and returned in good order.

Thomas F. Gates
Curator/Editor
The Naval Museum of the Pacific
25 Sunset Drive
Berkeley, Calif. 94707

I am enrolled in the NJROTC at Sanger High School. Our instructor, Captain "Nick" Nicholson, always has your fine magazines on our classroom bookshelves. They are very interesting reading and give the students a good idea about Naval Aviation, past, present and future.

The main reason I am writing this letter is because you previously published a letter written by a 15-year-old boy who asked all the squadrons to send him squadron patches and pictures of their aircraft. I would like to ask the same favor. The pictures and patches would be appreciated and used as a display in our NJROTC classroom.

Marc Wate
Sanger NJROTC
Sanger High School
1705 Tenth Street
Sanger, Calif. 93657

Ed's Note: Unit PAOs please note.

In going through my squadron files, I came across an Attack Squadron 38 — commissioned March 1, 1967, decommissioned October 1, 1968. That's all I have. Can anyone fill me in as to its nickname, insignia, aircraft, etc?

Also, which squadron carried the circled tail letters aboard USS *Intrepid* (CVS-11) during 1970?

Steve Ginsberg
125 Beach 17th Street
Far Rockaway, N.Y. 11691

I try to read *Naval Aviation News* each month and do so with much interest. I have finally gotten up the nerve to write to you with the hope that you might be able to help me. I have been a collector of military patches, etc., for several years and have had the naval portion of my collection on display at the local Navy recruiting office several times.

I am presently trying to build my Navy portion up but am not doing so hot. I have many rating badges but would like to have more ship and air squadron patches as I have barely scratched the surface.

John C. Rogers
1250 Wetsell Avenue
Lancaster, Ohio 43130

Over?

On page 30 of the March issue of *NANews* there is a caption which reads "Navy blimps *over* Boca Chica Field . . ." It appears that all airships in the photo are actually *moored* to mobile mooring masts and all are swinging nose-into-the-wind.

Don Caldwell
Air 53631F
NavAirSysCom
Washington, D.C.

Ed's Note: OK, but aren't they still technically, and grammatically, over the field?

Reunion

USS *Hancock* (CV-19) air groups and crewmen will hold a reunion July 24-26 at Atlantic City, N.J. Contact Edmund Orchowski, 5427 Bossart St., Pittsburgh, Pa. 15206.

Editor's Note:

In the center column, page 19 of the May 1978 issue, we quoted NARF Pensacola C.O., Captain John S. Mallory. He has advised us his statement should read: "I feel that the 1520 captains are now well qualified to compete for high level management jobs such as NARF C.O."

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The Strike Aircraft Test Directorate at NATC Patuxent River conducts test and evaluation of experimental and production fighter, attack and other specifically designated aircraft, including V/STOL types.

Organized in 1975, the unit is led by Capt. L. Wayne Smith. SATD draws its theme and inspiration from NATC's long history of testing tactical systems. The insignia depicts a high performance aircraft in flight with a bolt of lightning representing the "strike" capability.

SQUADRON INSIGNIA

NAVAL AVIATION NEWS