

SIX AMAZING YEARS

RAGs, NATOPS, and More

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In the early 1950s the U.S. Navy and Marine Corps were suffering near-catastrophic accident rates. In 1954 alone the Navy/Marine Corps accident rate was almost fifty-five major mishaps per hundred thousand flight hours, meaning that 776 aircraft and 535 aviators were lost. This was unsustainable. Two British inventions, the angled flight deck and the optical landing system, ameliorated the problems of flying jet aircraft at sea, but widespread safety problems persisted, not only in carrier operations but in shore-based operations as well. It was apparent that beyond carrier modifications and other technological fixes, there were institutional changes that needed to be made. This article chronicles several of these changes at a critical period in the service's history.

Between the start of 1958 and the end of 1963 the Navy and Marines logged a remarkable achievement in aviation safety. In a period of only six years that included intensive operations with some of the most difficult aircraft in the fleet—Crusaders, Demons, Skyrays, Tigers, Phantoms, Vigilantes, and Skywarriors—the Navy-wide major mishap rate was reduced by more than half and was launched on a downward trajectory that continues to this day.¹ In those

six years were established replacement air group (RAG) training, a system of “level readiness,” a Naval Aviation Training and Operations Procedures Standardization (NATOPS) program, an improved system for selection and assignment of personnel, a more responsive system for maintenance and supply support, and more. Several of these programs go hand in glove and need to be discussed together.

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REPLACEMENT AIR GROUP TRAINING

Replacement training was the first of the concepts developed in that six-year period, but once adopted it led into others, especially level readiness and NATOPS.

Formerly, before replacement training was institutionalized, newly designated aviators or those being reassigned from other duty had reported directly to fleet squadrons, usually while the squadrons were between deployment re-group and “workup” status. It was up to the squadron to check out the “nugget,” or “newbie,” in whatever aircraft the squadron happened to be flying. For aviators who had flown similar aircraft in the training command or at previous duty stations, there was no great difficulty; however, those going to jet squadrons who had never before flown a jet had a real problem. In some ways it was even harder for the more senior pilots, likely to be coming from shipboard or shore duty where they had flown little but twin-engine Beech SNB-5s four hours each month, to maintain general proficiency and qualifications; they were now expected not only to master a new kind of airplane but to lead as well.

A related issue particularly pertinent to carrier squadrons manifested itself when, later in the training cycle, it was time to work at the scale of an air group—that is, the aviation units that would be assigned, under an overall commander, to an aircraft carrier. Normally, there were no more than casual exchanges among the squadrons within an air group. This was a special problem with the “air task groups”² left over from the Korean War and with the various detachments needed to flesh out an air group’s capabilities.³ Leaders did not know one another, and junior pilots did not know the senior officers of other squadrons or on the air group staff. No one knew much about working with other types of aircraft in the air, as they would have to once air-group operations began—usually during workups at the naval air stations at, say, Guantanamo Bay (Cuba) or Fallon (Nevada), or upon embarkation on board the assigned carrier.⁴

A third group of issues for carrier air groups had to do with specialty training, maintenance, and supply. Except for air task groups an attempt was made to base all squadrons of an air group at the same naval air station in order to facilitate air group command and control, but the resulting need to distribute such facilities among several air stations exacerbated problems of training, maintenance, and supply generally. For example, if each air group had a squadron of F9F-6 Cougars, a squadron of F9F-5 Panthers, another of FJ-4 Furies, and one of AD Skyraiders, each host naval air station had to maintain the aircraft simulators and a fleet air support squadron (FASRON).⁵ The same applied to the aviation supply office at each naval air station. For instrument training, pilots often had to be sent away to other stations on temporary duty, at great expense in money and time. Thus, for carrier squadrons on the West Coast, services had to be duplicated at NAS (Naval Air Station) Alameda, Miramar, Moffett Field, and North

Island, California, and on the East Coast at NAS Oceana and Norfolk (in Virginia), and Cecil Field, Jacksonville, and Key West (in Florida).⁶ Not only did such a system place unneeded demands on test equipment and highly trained maintainers and stretch the spare-parts inventories in the supply system, but it was also expensive and terribly wasteful of manpower and did little to enhance either readiness or safety.

By the late 1950s the situation cried out for some sort of consolidation, and the Navy found models in its own backyard. In World War II, a pilot ordered to an air group would first go through an Advanced Carrier Training Group, where he mastered the plane he would fly before he reached the carrier. In other words, he was combat ready when he reported to his squadron.⁷ That process was dropped soon after the war ended, but the idea remained in institutional memory.

As early as May 1952, the commander of the Naval Air Force, Pacific Fleet had established the Fleet Air Gunnery Unit (FAGU) at NAS El Centro, California.⁸ Atlantic Fleet squadrons took advantage of FAGU's training some years later, establishing in effect a Navy-wide system of gunnery, bombing, and ordnance-system maintenance.

In the Naval Air Training Command too, instructors were already receiving standardized preparation, in special instructors' schools, before ever taking on a student; one was the Instructors' Basic Training Unit in Pensacola, Florida. In April 1955 the Jet Transitional Training Unit (JTTU) had been established at Olathe, Kansas, to orient erstwhile deskbound pilots to jets.⁹

Even earlier, with the arrival of even more demanding jet aircraft into the fleet, Vice Admiral William Martin, then Commander, Naval Air Force, Pacific Fleet, directed that Commander James D. "Jig Dog" Ramage, commanding officer of Composite Squadron 3 (VC-3) at Moffett Field, establish a transitional training unit there to train both pilots and maintenance personnel in standardized procedures for operating and maintaining the high-performance aircraft then entering the fleet. Project CHECKOUT (then colloquially "Cougar College") was organized to train for the swept-wing F9F-6 and later the FJ-4; it was combined later with Project CUTLASS to set up training for the F7U.¹⁰ Training for the Douglas A-4D Skyhawk, the Demon, and the Skyraider followed.¹¹

With these examples before them, it was easy for planners to visualize the establishment of replacement training squadrons, starting with replacement training air groups—or "RAGs," as they have long been called—and leading ultimately to the graduate training program we know today as the RAG system.

A catalyst for a replacement training program may have been an 18 December 1957 letter from Vice Admiral Robert Goldthwaite, then Chief of Naval Air Training (CNATRA), to Vice Admiral William V. Davis, Jr., the Deputy Chief of Naval Operations (Air Warfare)—that is, "Op-05." The letter compared the

introduction by the U.S. Air Force of its “Century Series” fighters, with its program of carefully organized training, and the Navy’s much worse experience with relatively unsupervised checkout in its own new jets. He went on to suggest that the CNATRA-supervised training at the JTTU, in Olathe, might be a model for the Navy. Further, he suggested that the issue be put on the agenda for a General Aviation Training Conference to be held the following February.

Whether Admiral Goldthwaite’s suggested discussion made the agenda or not is unknown, but on 10 March 1958 the Chief of Naval Operations approved

a reorganization of carrier aviation that would create uniform air groups, provide a more permanent group assignment to ships, and permit a reduction of assigned units and aircraft without also reducing combat readiness. The new organization also provided for a permanent replacement Air Group to be established on each coast and made responsible for the indoctrination of key maintenance personnel, the tactical training of aviators, and conducting special programs required for the introduction of new models of combat aircraft.¹²

Hand in hand with the RAG approach, the Navy instituted what was then known as the “base loading” system. Basically, all aircraft of a given type were now consolidated at one station on each coast, colocated with the RAG for that type, thereby facilitating instrument, simulator, and maintenance training, as well as intermediate maintenance and supply. It also did wonders for tactics, as pilots met, passed the word, and discussed the best way to carry out missions—sometimes in semiformal classrooms, sometimes at “Happy Hours” at officers’ clubs.

About a year later, in May 1959, FASRONs were disestablished. Maintenance devolved to units having custody of aircraft, although new aircraft intermediate maintenance departments on carriers and at naval air stations assumed the FASRONs’ former role.¹³

The first two replacement air groups were regular carrier air groups, one from each coast, redesignated in 1958 as RAGs and given new missions.¹⁴ One, CVG-4, sometimes called “CAG-4,” was renamed RCVG-4 and based at NAS Cecil Field for East Coast carrier squadrons.¹⁵ The other, CVG-12 (or “CAG-12”), at NAS Miramar, became the West Coast training group.¹⁶ Later, in April 1962, to bring their generic titles in line with their functions, RAGs were categorized as “combat readiness air groups” (CRAGs)—though they were still referred to individually as RCVGs (e.g., RCVG-4).¹⁷ Many of the squadrons assigned to them retained their original names and numbers, but the RCVGs eventually absorbed a mixture of squadrons and aircraft types, with new training missions. RAG squadrons dedicated to instrument training were also established to train and refresh pilots in instrument work, using two-place aircraft,

and to administer the required written examinations. Early on, FAGU was absorbed into the RAGs. At the outset, though the RCVG commanders and their staffs were in Cecil Field and Miramar, their squadrons were distributed among Oceana, Jacksonville, Cecil Field, and Key West on the East Coast and Alameda, Moffett Field, and Miramar on the west. On the Marine Corps side, Marine Training Squadron 1 (VMT-1) was established at Marine Corps Air Station (MCAS) Cherry Point, North Carolina, in July 1958, with a three-element curriculum: a Swept-Wing Jet Transitional and Refresher Course and two instrument courses. There was a similar organization at MCAS El Toro, California, for West Coast Marines. Later, replacement patrol air wings were established, especially important as the maritime patrol (VP) community began its transition to the P-3 Orion aircraft. Sometime later, RAGs were established on both coasts for heavy attack, reconnaissance attack, airborne early warning (the E-1 Tracer and E-2 Hawkeye), and helicopters. Today we have RAGs for each major type of aircraft and mission in the inventory. Still later, the two RCVG commanders and staffs were seen as redundant and replaced by other supervisory organizations.

RAGs not only familiarized and trained newly reported pilots, and soon naval flight officers (or NFOs, specializing in weapon and sensor systems), in the systems and flight characteristics of their new aircraft but also trained enlisted maintenance personnel in the particulars of their aircraft. The latter took the place of the former on-the-job training provided recent graduates of specialized technical training activities (known as “A” and “B” schools) by fleet squadrons and FASRONs, thus simultaneously improving maintenance readiness and reducing costs.

Most importantly, the RAGs had a tremendously positive influence on accident prevention.

July 1959 marked the end of the first year of Replacement Carrier Air Group operation. RCVG-trained pilots represented 28 percent of the average number of fleet pilots flying A4D, F4D, F11F, F3H, FJ-4 and F8U aircraft during fiscal year 1959.

A study of their safety record as opposed to squadron trained pilots showed only 1 in 24 RCVG trained pilots were involved in a pilot factor accident as contrasted to 1 in 9 for squadron trained pilots.

The RCVG program was estimated to have saved the Navy approximately 40 million dollars to date [1959].¹⁸

LEVEL READINESS

RAGs also facilitated readiness. Previously, as noted, squadrons would reconstitute between deployments. The more experienced pilots would depart for other duty soon after a cruise, to be replaced by a combination of pilots from shore

duty and “nuggets” directly from the training command. It was up to the squadron leadership to mold this new group into a cohesive and talented fighting unit. As expected, results were mixed, depending almost solely on the leadership (or lack of it) of the commanding officer, executive officer, and operations officer. “Level readiness” was a response to this unevenness: the RAG would train the replacement pilots, and later NFOs, making them ready to blend in with any squadron flying similar aircraft without any further indoctrination. Squadrons would not be totally reconstituted between cruises but have individuals rotate in and out in accordance with optimum career planning and the needs of the service. The theory was that every two months, each fleet squadron, regardless of where it might be in a deployment cycle, would lose one full-tour pilot and gain a replacement pilot of equivalent rank. In this way the squadron would maintain continually its level of combat readiness.¹⁹

The Atlantic Fleet adopted the practice of level readiness, but the Pacific Fleet did not, and even in the Atlantic Fleet not everyone was happy with the arrangement. Among other things, there was suspicion that it was simply a scheme concocted by the Bureau of Naval Personnel to stretch limited personnel resources. Squadron commanding officers objected to losing experienced pilots in the middle of a deployment, to be replaced by unknown quantities.²⁰ Some years later the level-readiness concept was somewhat modified to enable squadrons about to deploy to work up as units with all personnel on board. Yet level readiness paid off any number of times, even in the Pacific Fleet, when an individual lost to accident or in combat had to be replaced on short notice and the RAG system was able to do that.

NATOPS

As the RAGs got started, familiar questions about what the best way was to do certain things emerged with new urgency. At first, as had been the case in squadrons before RAGs, operations officers or commanding officers of RAG squadrons dictated as they thought best. Soon, however, after a few exchanges between coasts, it became obvious that there had to be one best way. Thus came the first glimmers of standardization. Eventually they led to what is known today as NATOPS, Naval Aviation Training and Operations Procedures Standardization. How that happened and why is quite a story.

In 2010 a retired Marine aviator recalled how it had been before NATOPS—in his case, in 1956.

What the flying did not include in those days was a fully-fledged standardization program and a mature Naval Aviation Safety program. The result, predictably obvious by today’s standards, was a horrific accident rate.²¹ You see, the folks who led us back then were all wily, steely-eyed veterans of World War II and Korea and knew no fear.

They trained us the same way they had been trained—by launching us into the hostile sky largely unsupervised with the hope that the more promising among us would return alive. Surprisingly, some of us did. It was a training system Charles Darwin would have been proud of.²²

While the remark about merely hoping that “nuggets” would stay alive might be an exaggeration, it is true that there was little supervision. Orientation to fleet aircraft often consisted of a reading of the handbook, a blindfold cockpit check, a brief on how to start the engine, and a “good luck.” More than one novice was told something like, “Meet me over the San Mateo Bridge at 5,000 feet,” only to find that the rendezvous was for an air-to-air test of his skill and mettle.

Not all was chaos before NATOPS, however. Standardization was the rule in many aspects of Naval Aviation. In the training command, students preflighted, started, taxied, and flew their training aircraft in standard ways. Takeoff procedures, landing approach patterns, and flight procedures—including a variety of maneuvers, both acrobatic and nonacrobatic—were performed according to strict standards. Flight grades were predicated on those standards. Instructors, as we have seen, were prepared in standardized ways.

Then there was instrument flight training, but before 1950, not all Naval Aviators were qualified to fly on instruments, only those with special training. Everyone else flew according to visual flight rules. With increased emphasis on flying at night and growing need for flying near high-traffic metropolitan areas and in airways, the Chief of Naval Operations directed that instrument flight boards be established at each squadron, air group, and station and that by the middle of 1952 all Naval Aviators have and maintain valid instrument ratings.²³ That, of course, required increased training in instrument flying and airways procedures, which was in itself a kind of standardization. Much of that learning and subsequent practice was codified in the *All-Weather Flight Manual*, a sort of precursor to NATOPS for flying at night and in bad weather on instruments.

Meanwhile, in the training command and in the fleet, takeoff and landing patterns had long been standardized. Air Force, Navy, and Marine pilots flew identical patterns at airfields, and all aircraft carriers had the same launch and landing pattern. In fact, there was a United States Fleet directive, and later a Naval Warfare Publication (NWP), that stipulated the patterns. Also, in the fleet, each organization had a standard operating procedure (SOP), important if for no other reason than it was on the checklist for every administrative inspection.

The problem was that even if the squadron followed it, the SOP changed every time the commanding officer or the operations officer changed. At the same time, lurking in the background and impeding progress toward standardization generally, was the question, “Why standardize and shut down initiative?” It

seemed to one observer at the time, “Some people view the idea of everyone in Naval Aviation doing everything, ‘the one best way’ with some misgivings. They fear that general use of standardized procedures, while it may reduce the accident rate, will result in a reduction of a pilot’s ability ‘to think on his feet’ and deal flexibly with emergencies and combat situations.”²⁴

That is, standardization was not necessarily looked upon as a safety factor. After all, all the Navy’s propeller-driven aircraft were so similar in cockpit configuration that an experienced pilot could easily step from one type to another without any special training, and many did. Even going from single-engine to multiengine was not especially hard. Every cockpit had a stick (or a yoke), a throttle (or two or four), propeller and mixture control(s), magneto switches, perhaps a supercharger lever, flaps, and landing-gear controls. All these were in similar positions in every aircraft; the only thing an experienced pilot needed to learn to fly a new airplane was how to start it and what airspeeds were recommended for maneuvers and landing. Tactics varied from fighters to bombers to patrol and transport, but that did not matter to people who cared only about the flying. Then came the jets.

The first jets were not much different from reciprocating-engine, propeller-driven aircraft. Of course, the takeoff roll was longer, engine response to throttle movement was quite a bit more sluggish, fuel was used up a lot quicker, and there was less time to correct a bad landing approach, but then, that messy throttle quadrant—with mixture, prop, and supercharger levers—was gone, and there were no magnetos. Problems began to develop only when older pilots tried flying jets with habits they had picked up in “props,” jets began flying from ships, and even-higher-performance jets, with new capabilities, came along. It was then, with fleet accident rates at a new high, that perceptive leaders recognized that something had to be done.

It was natural to look to examples already established—JTTU, “Cougar College,” FAGU, and others. Thus even before NATOPS there was a framework for establishing a methodology to ensure that newly indoctrinated pilots were exposed to the best possible training and procedures, training and procedures that would improve the mishap performance, and therefore readiness, of all fleet aircraft.

Still, the Pacific Fleet, the Atlantic Fleet, and the Naval Air Training Command all had different ideas as to what the best system might be. One example, perhaps apocryphal, was that A-4 pilots from one fleet made approaches with speed brakes out, in the other with speed brakes in. There was a difference of opinion as to the best way to recover from a poststall gyration in an F7U Cutlass. Still other differences abounded as well. At that point Vice Admiral Robert Pirie, USN, Deputy Chief of Naval Operations (Air Warfare)—that is, DCNO (Air),

Op-05—stepped in. Sources vary as to what caused him to act, but act he did, setting the tone for what NATOPS is today: a manual for the users.²⁵

First, he made the basic decision that there must be one best way to, say, make an approach in an A-4, recover from a Cutlass poststall gyration, or whatever the case might be. He put a team together to find, for each situation, that best way. Second, he had to choose between letting his staff, all experienced aviators, decide the best way and asking the fleet—that is, the current users of the aircraft. He came down on the side of the current users: they would be the subject-matter experts, they would write what became NATOPS, and they continue to write and modify it to this day. Naval Aviators who were actually flying the aircraft in the fleet, lieutenants and lieutenant commanders, wrote the books, using as a guide a June 1961 Naval Training Device Center publication, *Improvement of Flight Handbooks*. Agreement had to be reached from squadron to squadron and fleet to fleet and up the chain of command before any NATOPS manual was approved. Approval came via wing commanders and type commanders (to DCNO [Air]);²⁶ only after that entire command chain approved did Admiral Pirie and his successors put their signatures to each volume. The end result was a manual that stipulated the best method of performing every function in a given aircraft, thus contributing to safe and efficient flight operations.

All NATOPS manuals were similar in format. Each had eight chapters: “Introduction,” “Shore-Based Procedures,” “Carrier-Based Procedures,” “Flight Procedures,” “Emergency Procedures,” “Communications,” “Special Mission,” and “Miscellaneous.” Over the long term, the introductions were probably most important, because they invited every reader and every user to recommend changes and modifications. All such inputs were reviewed, and all were considered, and they still are. Thus, through an iterative process, the best procedures and practices were distilled, combat readiness and operational effectiveness were significantly raised, and aircraft accident rates were significantly reduced. One very experienced Naval Aviator would write, “[NATOPS] is designed as a means of providing the best and safest aircraft training and operating procedures in an easy to use manual for each type of plane we fly, to enable such a manual to be attentive to the needs of the operating forces, and to provide a training tool for Squadron Commanders’ use in determining areas of weakness in his training program or in an individual.”²⁷

In May 1961 the NATOPS program was adopted and made authoritative by the Chief of Naval Operations, through the promulgation of OpNav Instruction 3510.9, a series still effective today. Of course, manuals for every aircraft type did not spring up the day the instruction was signed; it took a great deal of work and coordination to bring out each one. The helicopter community, with its Sikorsky HSS-1N Seabat (later the SH-34) NATOPS, was first “out of the chocks,” that

very same May 1961. Other aircraft types soon followed, and within the year manuals for forty-seven aircraft had been issued. It was as if everyone had thought, "It's about time!" Gone were arguments with newly arrived operations officers about the "right way." Down went the mishap rate. Almost everyone pronounced NATOPS to be "good," though diehards continued to grumble about lost opportunities for initiative.

NATOPS continued to develop, of course. In the beginning, NATOPS was just one of a trilogy of books to be used by Naval Aviators. There were still the *Flight Manual*, which had long been around and covered the mechanics of the airplane—the "systems," in today's vernacular; the NWP series, which addressed tactics; and now NATOPS, covering techniques. In December 1963 an F9F-8T (two-seat Cougar trainer) manual appeared, consolidating all three; handbook information with flight and operating procedures was promulgated. Although its covers were not blue at first, the "Blue Sleeping Pill" had been born.²⁸ More—many more—editions were to follow. (There were also, of course, manuals and technical orders, to which, though they were kept in maintenance spaces, pilots seeking answers to special problems often referred.) Frequent and regular NATOPS conferences under the auspices of the air type commanders helped to keep the manuals current and useful. One of the best summaries of NATOPS available was published in the August 1961 issue of *Approach*, the Naval Safety Center's universally read aviation safety magazine: "The new NATOPS program was developed by the users for the users. It will be modified as we go along by these same individuals. New tricks of the trade will be passed around quickly for expert evaluation and, if sound, for use by all hands. The end result will be increased operational readiness through increased safety brought about by improved pilot techniques."

An interesting and important milestone on the road to adoption of NATOPS was cooperation among all the many Navy aviation communities, among fleets, and with the Air Force. The latter cooperation in particular was remarkable, in that most Navy people are reluctant to learn anything from their brethren in light blue. Nevertheless, the Air Force had operated a standardization and evaluation ("Stan/Eval") program for many years, and the first Navy standardization evaluators actually took the Air Force course, learned that service's philosophy and methodology, and brought them back to the Navy, albeit somewhat modified. Along with the NATOPS manual came the aforementioned standardization instructors and evaluators, who visited squadrons to make sure that their normal flight and emergency procedures were in conformance, systems knowledge was adequate, and more. The NATOPS framework was implemented quickly, but its scope broadened gradually, until, type by aircraft type and unit by unit, it was incorporated in every Navy and Marine squadron and wing, afloat and

ashore. Later, the system was expanded to landing signal officers and aircraft carriers and other aviation ships. NATOPS is used as a teaching guide in ground school and as a guide for both standard and emergency procedures in simulators, in trainers, and in the air. It is also the common denominator for readiness across fleets, type commanders, ships, and stations.

Today it would be hard to conceive of aviation in the Navy without replacement air groups and Naval Aviation Training and Operations Procedures Standardization, but in the beginning it was equally hard to conceive that Naval Aviation could have standardized to such an extent without destroying the spirit of innovation that in fact persists until this day. Nor could it have been conceived that, thanks largely to farseeing souls who believed that dedicated training and standardization just might help, the Navy-wide mishap rate could be improved from 1,106 major accidents, 613 destroyed aircraft, and 358 people killed the year before RAGs were first begun and NATOPS was first considered to only eleven major mishaps in 2009. At the same time it is hard to detect any decrease in either individual or squadron initiative.

Very often, when old-timers are told that today's accident rate is only about one every hundred thousand flying hours, they are at first incredulous. Then they ask, "How? What made the difference?" The answer might be better leadership, better selection, better personnel management, improved integration of aviation medicine, better aircraft and systems, better maintenance and supply, angled decks and landing-approach mirrors on carriers, the replacement training concept, or NATOPS.²⁹ The answer is not singular, all these helped—but central among the reasons are most certainly the adoption of the RAG concept and the implementation and effective use of NATOPS.

These were indeed six amazing years.

NOTES

1. The Vought F8U Crusader, McDonnell F3H Demon, Douglas F4D Skyray, Grumman F11F Tiger, McDonnell F4H Phantom, North American A5A (later RA-5C) Vigilante, and the Douglas A3D Skywarrior.
2. In order to fill out the decks of aircraft carriers mobilized during the Korean War, "air task groups" were formed, taking one squadron from each of several already formed air groups. For example, Air Task Group 1 consisted of VF-111 from Air Group 11, VF-52 from Air Group 5, VF-151 from Air Group 15, and VF-194 from Air Group 19.
3. Customarily each air group took with it on deployment detachments of aircraft and personnel for photo reconnaissance, airborne early warning, and night and all-weather attack, as well as helicopters.
4. One perhaps extreme example of the difficulties attendant to such an arrangement comes from the author's first cruise. The ship had been to sea about six weeks when a strange

- commander came into the ready room, looked around, and left. All looked at one another and asked, "Who was that?" It turned out to have been the air group commander.
5. The FASRON was the intermediate level of maintenance between overhaul and repair depots staffed mostly by long-term Navy civilians and the organizational level staffed by sailors in each squadron. The FASRON was manned by both permanent-duty station Navy personnel and specialists on temporary duty from parent squadrons. When the squadron deployed its FASRON-assigned personnel would rejoin the squadron. The FASRON owned difficult-to-transport test equipment and repair benches, expensive spares, and, often, spare aircraft.
 6. Marines apparently had fewer problems, being based primarily at Cherry Point, North Carolina, and El Toro, California.
 7. "A Revolution in Readiness," *Naval Aviation News*, January 1959, pp. 7–11.
 8. A six-week course at El Centro for Navy and Marine fighter and attack squadrons was meant to establish a cadre of excellence in ordnance and gunnery within each squadron. Established initially for West Coast squadrons, it expanded later to offer training to those on the East Coast as well.
 9. Roy A. Grossnick, *United States Naval Aviation, 1910–1995* (Washington, D.C.: Naval Historical Center, 1997), p. 206.
 10. "Supersonic Checkout," *Naval Aviation News*, April 1955, pp. 1–5.
 11. "Crusader College Carries On," *Naval Aviation News*, June 1958, pp. 22–23. VF(AW)-3, formerly VC-3, had actually operated as a transitional training unit since 1954. Initially it was a small unit at Moffett Field, California, operating under the aegis of the Naval Air Test Center as an adjunct to a fleet indoctrination program for new aircraft. At first, four pilots from each transitioning squadron completed a forty-hour flight syllabus at VF(AW)-3 in all phases of flight. Later a cadre of enlisted maintenance people was added, the idea being that, for each squadron, the four pilots and the small group of maintainers would form the core of a training effort. Ramage took command in 1955 just as the squadron began training with the Cutlass.
 12. Grossnick, *United States Naval Aviation, 1910–1995* (as republished in Roy A. Grossnick, *Dictionary of American Naval Aviation Squadrons* [Washington, D.C.: Naval Historical Center, 1997], vol. 2, CD-ROM).
 13. Grossnick, *Dictionary of American Naval Aviation Squadrons*.
 14. For the Atlantic Fleet, the mission of Carrier Air Group 4 was defined as the indoctrination, familiarization, and basic training of Naval Aviators and key maintenance personnel, as well as the establishment of fleet introduction programs for new models of carrier combat aircraft. For Pacific Fleet squadrons, the mission was to provide indoctrination and flight training to fleet replacement pilots, as well as indoctrination and on-the-job training for replacement enlisted personnel.
 15. The original RCVG-4 squadrons were VF-101, VF-174, VF-21, VA-44, and VF-22.
 16. The original RCVG-12 squadrons were VF-121, VF-124, VA-125, and VA-126.
 17. Grossnick, *Dictionary of American Naval Aviation Squadrons*.
 18. *Approach*, August 1959. Referring to the A4D (later A-4D) Skyhawk.
 19. Capt. R. G. Dosé, USN, "Professional Note: The Replacement Air Group Concept," U.S. Naval Institute *Proceedings* (April 1960), pp. 135–38.
 20. Donald D. Engen, *Wings and Warriors: My Life as a Naval Aviator* (Washington, D.C.: Smithsonian Institution, 1997), pp. 236–37.
 21. The fiscal year 1956 Navy-Marine accident rate was 33.5 major accidents for each hundred thousand hours flown, with 574 aircraft destroyed and 406 people killed.
 22. Col. William T. Hewes, USMC (Ret.), "The High Dive," *Naval Aviation Museum Foundation* 31, no. 1 (Spring 2010), p. 96. For another look at generally the same experience, see Robert C. Rubel, "The U.S. Navy's Transition to Jets," *Naval War College Review* 63, no. 2 (Spring 2010), pp. 49–59.
 23. Grossnick, *United States Naval Aviation, 1910–1995*, p. 188.

24. "The One Best Way: A New Standard for Navy Air," *Naval Aviation News*, August 1961, p. 6, available at www.history.navy.mil/.
25. In his *Aircraft Carriers at War* (Annapolis, Md.: Naval Institute Press, 2007), Adm. James L. Holloway III, who had been executive assistant to Vice Admiral Pirie, gives his version (pp. 149–51). Vice Adm. Donald Engen, an air wing commander at the time of NATOPS introduction, gives a different view in his *Wings and Warriors*, p. 245.
26. Air wing commanders oversee the training, manning, maintenance, and administration of groups of squadrons of mixed types that, at least ideally, embark together on aircraft carriers. Type commanders performed the same functions for all naval aircraft in the Atlantic or Pacific Fleet (today combined in one headquarters in San Diego, California).
27. *Approach*, October 1962; quoting Captain R. J. Selmer, Commander, Fleet Air, Alameda, California.
28. Today's manuals are thick volumes, some even produced in more than one volume for a single aircraft type, but all characterized by blue covers. There is so much material that anyone attempting to read the whole book from cover to cover in one sitting would be prone to falling asleep—thus, "Blue Sleeping Pill."
29. For the introduction of the angled flight deck and mirror landing aid, see Thomas C. Hone, Norman Friedman, and Mark C. Mandeles, "The Development of the Angled-Deck Aircraft Carrier: Innovation and Adaptation," *Naval War College Review* 64, no. 2 (Spring 2011), pp. 63–78, available at www.usnwc.edu/press/.