

AIR POWER

WINTER 2003 - Volume 50, Number 4

History



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History

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As we near the end of the centennial of flight year—also the fiftieth anniversary of the birth of the Air Force Historical Foundation—we observe yet another “changing of the guard.” Thus, we bid a fond farewell to Gen. W. Y. Smith, president since 1996, and a warm welcome to his successor, Lt. Gen. Michael A. Nelson. (See pages 70-71).

This issue includes a broad mixture of articles. The first, “Whiz Kid,” is an interview with Robert S. McNamara, by Air Force historians Herman Wolk and George Watson. However, the interview with the former secretary of defense is not about the Vietnam War. Rather, it is about his service as a captain in the Army Air Forces during World War II.

“Kennedy’s Space Policy Reconsidered,” takes a fresh look at the President’s May 25, 1961 commitment “before this [1960s] decade is out, of landing a man on the moon and returning him safely to earth.” Roger Launius, the former chief historian of NASA, examines the decision’s contemporary historical context, an alternative approach advocated by President Eisenhower, as well as the consequences of Project Apollo.

Who says the Air Force doesn’t have its Mahan? That is, Second Lt. John H. Mahan. He has refined an Air Force Academy student paper into an article on the limited, but invaluable role of the RF-86A Sabre in tactical reconnaissance during the Korean War.

Fourth, Phil Haun’s “Misty FACs of the Vietnam War,” recounts the story of intrepid men who volunteered to fly forward air control “for 120 days or 60 missions, whichever came first.” Among those volunteers were “Tony” McPeak, “Ron” Fogleman, “Bud” Day, and “Dick” Rutan.

During summer 2002, Professor Rodney Rogers and his spouse, of Embry-Riddle Aeronautical University, were on summer vacation in Russia. Their requirements were for inexpensive accommodations and an English speaking host. Their host in Moscow, a man named Georgi, turned out to be much more illustrious than an innkeeper.

More than a dozen new books are reviewed in this issue. Our reviewers provide expert evaluations of the recent air power history literature. Their guidance may turn readers on or off a certain volume or author. They may even interest you enough to buy a particular book, to judge it for yourself. It has happened.

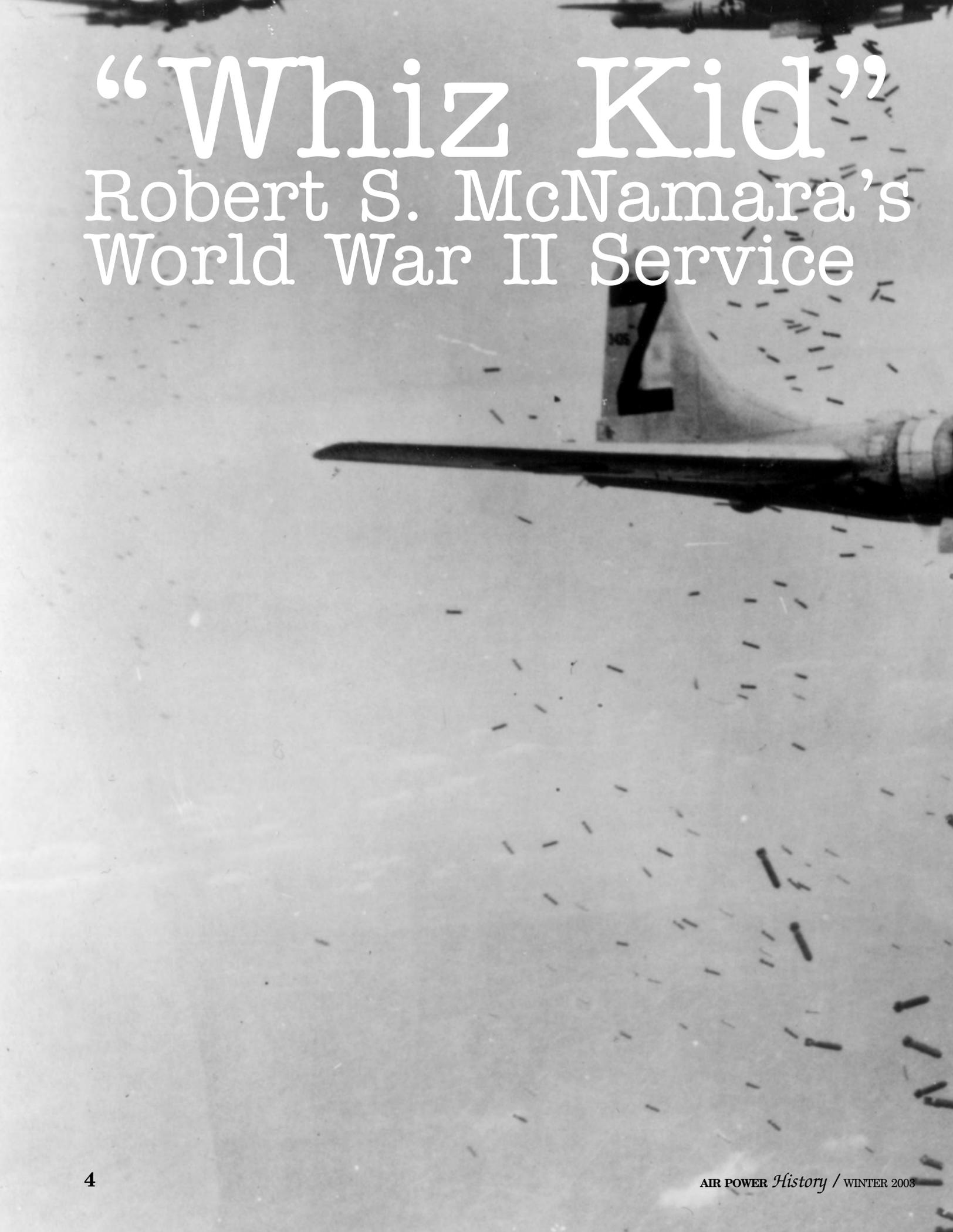
The departments section offers its traditional menu of Bob Dorr’s “History Mystery,” “Letters to the Editor,” “News,” “Notices,” “Reunions,” and, sadly, “In Memoriam.”

We welcome contributions of material for our “Readers Forum,” in which we provide a soap box for readers to “air their views” on significant issues in air power history. Are you still burned up over the “Enola Gay Controversy?” If so, write about it. Do you regret that the Air Force replaced “Aerospace” with “air and space?” Tell us why. Are we neglecting your pet topic? Write something persuasive. I challenge you.

Finally, we welcome Col. C. R. “Dick” Anderegg, USAF (Ret.), who was selected as the new Director of Air Force History. He will be profiled in the spring 2004 issue.



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A black and white photograph of a propeller with a knife resting on it. The propeller is the central focus, with its blades extending outwards. A knife is placed horizontally across the propeller's hub. The background is a light, textured surface, possibly a wall or a large piece of paper, with some faint markings and shadows. The overall tone is historical and evocative.

“Whiz Kid”

Robert S. McNamara’s World War II Service



George M. Watson, Jr. and Herman S. Wolk

(Overleaf) B-29s of the 500th Bomb Group drop fire bombs on Yokohama, Japan in 1945.

IN JANUARY 1943 I WAS COMMISSIONED IN THE UK AS A CAPTAIN

I WAS ASSIGNED TO THE TWENTIETH AIR FORCE IN JANUARY 1945

At the suggestion of Col. William B. Taylor III, USAF (Ret.), Herman S. Wolk and George M. Watson, Jr., of the Air Force History and Museums Program, interviewed former Secretary of Defense Robert S. McNamara, emphasizing his service with the Army Air Forces during World War II, in Europe and the Pacific.

Interviewer: Please describe your World War II experience in the United Kingdom.

McNamara: I went to the United Kingdom [UK] as a civilian war consultant in January 1943. I was commissioned in the UK as a captain at the end of January or early February. Then, I was sent back to Salina, Kansas, which was the Headquarters of the 58th Bombardment Wing in roughly October 1943. We were scheduled to go to the Pacific in accordance with an agreement and promise that President [Franklin D.] Roosevelt had made with Chiang Kai Shek. We were scheduled to bomb Japan in March 1944, but we didn't receive the air-planes until the end of February.

I was assigned to the Twentieth Air Force in January 1945, and would stay with them until June that year. I want to show you some documents. Here is a memo to [Lauris] Norstad that will help explain what we did. We gathered data on operations, analyzed it, and presented our findings.

Interviewer: You were an operations analyst?

McNamara: I was a Statistical Control Officer. The purpose of the statistics we gathered was to lay a foundation for operational planning. In these memos you will see some evidence of that. There must have been millions of memos written by majors and lieutenant colonels. So, why anybody

would select these or why a particular researcher found them, I will never know.

Interviewers: [Perusing the documents] Maybe it came from one of the record groups at the National Archives; one of the record groups dealing with Twentieth Air Force documents.

McNamara: I will get you the document that deals with [Curtis E.] LeMay, but maybe we ought to start back to your initial questions.

After I had been out of the Harvard Graduate School of Business for nearly a year, the dean of that school contacted me and asked me to come back as a research assistant. He called me in early July of 1940, and I said I was trying to woo a young lady whom I hadn't even proposed to, and he wanted me back in early September. I told the dean that if I could persuade her to marry me and bring her back, then I would take the job. To make a long story short, I succeeded and Marge [Margaret Craig] and I arrived in Cambridge to work at the Harvard Graduate School of Business in early September that year.

I was a lowly research assistant, making \$1,800 a year, when I was promoted to become the youngest assistant professor at Harvard University School of Business, and was paid a whopping \$4,000 per year. This promotion happened at the end of 1942. The dean at Harvard was far-seeing, since he recognized that the market for Harvard Business School students was drying up because of the war, the draft, and the desire of individuals of that age to volunteer. Therefore, there would be fewer individuals applying to the Harvard Graduate School of Business. He sent two professors to Washington in an attempt to gain some government contracts for Harvard. These two professors were Edward Learned and Cecil Frazer, and they

Dr. George M. Watson, Jr. is chief of special projects in the Washington, D.C. office of the Air Force Historical Research Agency. He earned a B.A. degree from the University of Maine, an M.A. from Niagara University, and a Ph.D., in Modern European History, from The Catholic University of America. During the Vietnam War, from 1969 to 1970, he served with the 101st Airborne Division. He was a staff historian at the former Air Force Systems Command, chief historian of the Office of the Air Force Surgeon General, and headed the Air Staff Division history office in the Pentagon. Dr. Watson has contributed research and writing to many history volumes and journals. He has interviewed numerous key Air Force leaders, both military and civilian. He is the author of The Office of the Secretary of the Air Force, 1947-1965 and co-author of With Courage: The Army Air Forces in World War II. In 2001, he published a personal memoir of his Vietnam experience, entitled Voices from the Rear: Vietnam, 1969-1970. His latest book, Biographical Sketches: Chiefs of Staff and the Secretaries of the Air Force, was published in 2002.

Herman S. Wolk is Senior Historian in the Washington, D.C. office of the Air Force Historical Research Agency. He received B.A. and M.A. degrees from the American International College and studied at the Far Eastern and Russian Institute, University of Washington. He served as historian at Headquarters Strategic Air Command, 1959-1966. A fellow of the Inter-University Seminar on Armed Forces and Society, he is the author of The Struggle for Air Force Independence, 1943-1947 [1997]; and Strategic Bombing: The American Experience [1981]. He is co-author of Evolution of the American Military Establishment since World War II [1978]; and contributing author to Winged Shield, Winged Sword: A History of the USAF [1997]. His book, Fulcrum of Power: Essays on the U.S. Air Force and National Security, was recently published by the Air Force History and Museums Program. He has also published a number of articles and essays on General George C. Kenney and the command of air forces in the Southwest Pacific during World War II.

**ROBERT A.
LOVETT
APPOINTED
TEX
THORNTON
TO
ESTABLISH A
STATISTICAL
CONTROL
OFFICE IN
THE ARMY
AIR FORCES**



**LEARNED
AND FRAZER
PROPOSED
THAT AN
OFFICER
CANDIDATE
SCHOOL BE
SET UP AT
HARVARD**

met a young lieutenant named “Tex” Thornton, who had just been appointed by Robert A. Lovett, the Assistant Secretary of War for Air. Lovett was a Wall Street businessman who appointed Tex Thornton to establish a Statistical Control Office in the Army Air Forces (AAF)¹. When he [Lovett] arrived in Washington he was absolutely dismayed with the manner in which the AAF was attempting to expand from a few thousand airplanes and several hundred officers to thousands of aircraft and tens of thousands of officers. The AAF had absolutely no foundation from which to manage this huge expansion, in ways that Lovett would have been accustomed to manage on Wall Street. He asked Tex to set this up. Tex had been a young reserve officer in Texas, and had come up to work on Capitol Hill.

Cecil Frazer had learned about this tasking and got in touch with Tex Thornton. Tex knew he had to build a huge organization, with thousands of people, but he had no one trained for such a mission. Learned and Frazer proposed that an Officer Candidate School be set up at Harvard, where they would train officers for the Army Air Corps. Harvard—quite rationally—said that it was not going to take just anyone the Army sent up there. They were going to select the people and do the selection, based on several factors. The Harvard authorities said that they understood that the Army had a punch card for every human being in their service, and that these cards were in Miami, where they had an IBM sorting system. Harvard told the AAF that they would send representatives of the Harvard faculty to Miami to run every punch card—of which there were tens of thousands through that machine. Harvard told them that they would select the individuals whose characteristics were required for the kind of officer they were supposed to train.

Obviously they would base their choices on intellectual and educational ability, where they had gone to school, and whether they had graduated. There was a whole group of other criteria, based upon their abilities, such as were they able to advance in life, and administer to a need, and so on. That was what we did. We ran names through that machine. Then we sorted and selected names and offered entrance to the individuals we thought were best qualified.

We had a highly select group of individuals from the start. Then, we put them through a short course of six to eight weeks and graded them. In accordance with Tex Thornton’s direction, we sent the best-qualified candidates to Washington to assist him in setting up his office there.

(To jump ahead a bit, at the end of the war Tex, who was one of the greatest promoters whom I have ever met, had an idea to take the best ten of this group and go out to save a major U.S. corporation. Tex wanted me to join him as his second in command. I said, “Heck, no. I am on leave as an assistant professor from Harvard.” I told him to forget it. Now this may sound odd but Marge and I had come down with polio or what was called infantile paralysis in July 1945. My case was light and I got out of the hospital in two months, but she was in for nine months in a hospital in Baltimore. She was told that she would never lift an arm or leg off the bed again. Tex asked me how I would ever pay the hospital bills. He wanted me to join him, but I said, “Forget it I will find some way!” Well, after a month or so it became clear that I didn’t know how I was going to pay my hospital bills. I finally agreed to go with him. We went out to the Ford Motor Company. That was how I got started with Ford.)

Now let’s go back to the Army. The statistical control units were being established in commands across the entire Air Corps. At that point the only air force unit really in combat was the Eighth Air Force, which had four bomb groups under it—three B-17 groups and one B-24 group. It was just at the time when the Eighth Air Force got to the United Kingdom. They were having trouble getting started, General [Ira C.] Eaker was in command. They wanted to set up a statistical control group. Tex asked me and Miles Mace, another professor at Harvard, if we would be willing to go over to England and be civilian consultants to the War Department, to help organize this thing and get it going. We were asked that if we did go and help them establish a statistical control group and retain us there, would we be willing to accept direct commissions into the Air Corps as captains.

We talked to our wives and said that a), we would be willing to go and b), without commitment, we would be willing to think about a commission. We went over to England in early January 1943. I remember that we flew over on Pan American Airways, on one of their flying boats. I had just gotten promoted to the assistant professorship at the time but I didn’t have much money. It cost \$100 for a \$10,000 life insurance policy to

AS WE BROUGHT THE AIRPLANE DOWN FROM HIGH ALTITUDE TO LOW ALTITUDE [WE EXPECTED] THE LOSSES WOULD INCREASE, BUT THE LOSSES ARE STILL VERY, VERY LOW

fly one way on Pan Am and I had to borrow the money from the Dean of the Harvard Business School to pay for the insurance.

When we got over there, one of the bomb groups was commanded by then Col. Curtis E. LeMay.² When we got there, we were trying to figure out what type of organization they required for statistical control. It became apparent that they had a hell of a problem, because the abort rate was then about 20 percent. They wanted to know why the abort rate was so high. Winston Churchill had set up an operations research organization, which became quite famous in Britain because it helped integrate and study the value of radar to the Royal Air Force's Fighter Command, among other things.

Interviewer: Did Solly Zuckerman get involved in that area?

McNamara: I didn't know Solly personally then, but he was associated with that organization. Later, I did get to know Solly well and became very close to him. Somebody suggested that we bring in the operations research group to help examine this problem of why the abort rate was so high. They had two Harvard professors, so the Army Air Forces suggested that we join in the project. My recollection is that the British Operations Research Group was comprised largely of scientists and very bright people who didn't know a lot about war or air operations. We were assigned to work with them. My recollection was that the Army Air Forces had to produce an operations report on each mission. I am not sure of the form number—it may have been called a 401A—but I do believe that the form had to be filled out following every mission. The operations mission report told what they did on the mission, what targets they hit, the number of bombs dropped, as well as the type of enemy fire they endured. If they aborted the flight, the report told why they aborted. We got a hold of those reports, which listed different reasons they aborted, such as that the electric flying suits didn't work. Of course they were bombing from 15,000 to 17,000 feet and with open gun turrets. There was no heat in the plane and the only way to keep warm was to use the electric flying suit. That was a reason for aborting and another reason was that the guns were jammed, which would expose the gunners and the aircraft to enemy fire. In any case we analyzed all this information and concluded that the abort rate didn't have anything to do with mechanical failure. It had to do with fear. The crews were aborting because they knew that the combat tour was twenty-five missions and that the loss rate was 4 percent per mission. That didn't mean that 100 percent would be killed, but it meant that a hell of a lot of them would be killed. Some of the crews learned that and they decided not to go to the target.

We presented this report to General LeMay and he issued an order saying that any crew that takes off and doesn't go to the target would receive a court-martial. Moreover, he would be flying the

lead aircraft. After he issued this order, the abort rate dropped. That was typical of LeMay.

Incidentally, during my three years in the service I felt that General LeMay was the greatest combat commander in all of the services that I had ever seen. I served, in a sense, alongside him in Europe as a civilian. Then, I stayed there as a commissioned officer for another eight to ten months. I was brought back to the B-29s going to the China-Burma-India (CBI) Theater that was an absolute debacle—you can quote me on that!

K. [Kenneth] B. Wolfe had been made the commander of [the XX Bomber Command on November 27, 1943.] the B-29s, because he had brought the plane through from Materiel Command. He was a wonderful man, but we accomplished nothing out there in the Pacific. Although it was not his fault, they removed him and replaced him with "Blondie" [Brig Gen. LaVern G.] Saunders, who was the hero in the Pacific. Blondie had been a football hero at West Point and he was a hero in the Pacific. [He took over on July 6.] The combat crews just loved him. He was made commander and we accomplished nothing under him. He was removed and then they brought out [Major General] LeMay [on August 29, 1944]. All of this was within a period of months. We got to the CBI in March 1944, and the whole operation was moved to the Marianas in October-November 1944. LeMay had come over and he recommended that it be moved. I was with him in the CBI just before it was moved. I had served alongside of LeMay in the Eighth Air Force and under him in the CBI, and then was over him when I was Secretary of Defense. Without any question, he was the most outstanding combat commander in any service.

I had mentioned the case of the abort issues, now let me provide you with another example of LeMay's performance. While I was on temporary duty in the Pacific, sometime in March 1945, when the first firebomb raid was carried out, I sat next to General LeMay when the crews were being interrogated upon their return to base following their mission. By this time I knew LeMay fairly well and I had never heard him speak more than three words at any one time. It was always "yep, no, maybe or nothing." Then one young captain stood up and asked, "I would like to know which son-of-a-bitch ordered taking this wonderful airplane (the B-29) down from the 20,000-foot level to the 7,000-foot level." He added that he had lost his wingman because of the low-level flights. Well nobody had ever talked to LeMay like that, or at least I had never heard that they had. LeMay knew exactly what the young captain was talking about. LeMay stood up. This is why I believe LeMay to be the best combat commander.

Most commanders of groups or wings could tell you how many airplanes they possessed or how many bombs they had dropped or what and what targets that they had destroyed.

But LeMay told the captain, "I understand what you are saying and, of course, you are right in

Maj. Gen. Curtis E. LeMay presides at a meeting of commanding officers of the 3d Bomb Division, Eighth Air Force, June 5, 1944.



HE WAS THE MOST OUTSTANDING COMBAT OFFICER I HAD EVER WORKED WITH

one sense. As we brought the airplane down from high altitude to low altitude [we expected] the losses would increase, but the losses are still very, very low. (I think it was on the order of 1.5 percent as compared to the 4 percent at the lower altitudes.) But captain, for the per unit of target destruction, the losses are minimal.” And that was the way to think of losses. That was LeMay’s understanding of why we had an Air Corps whose purpose was target destruction. The objective was to achieve high target destruction, with minimal cost or losses. That is why he moved the Air Force out of the CBI to the Marianas in the Pacific. And that is why he changed the altitude from 20,000 feet to 7,000 feet. That was typical of LeMay.

Interviewer: So, you knew LeMay fairly well?

McNamara: I got to know him fairly well. He was the most outstanding combat officer I had ever worked with. He was, by far, the worst geopolitical officer that I knew.

Interviewer: Would you please speak about your issue with LeMay about dropping the flight ceiling from 20,000 to 7,000 feet.

McNamara: Yes a movie is being make about me by a producer in Cambridge. He has a very young researcher from Harvard. I happened to mention for the movie that I had been on temporary duty on the island of Guam in mid-march 1945, when

the command I was associated with burned to death 80,000 to 100,000 Japanese civilians. The producer asked the researcher to dig into that more deeply. The researcher found out additional information. I guess I didn’t tell him at the time that that night was the first raid of about sixty low altitude attacks over Japan. Obviously, we didn’t burn to death 80,000 to 100,000 civilians on every raid—that was more of a total. It was the first of a whole series of raids. That led me to speculate that either President [Harry S] Truman, Secretary of War [Henry L.] Stimson or Chief of Staff General George C. Marshall were not aware of what the XXIst Bomber Command had been doing. Before they dropped the atomic bomb, LeMay had burned down some sixty Japanese cities. The researcher told me, while this movie was being made, that LeMay had said that if the leadership wanted to burn the rest of Japan that he could do that in several weeks. I suspect that Stimson, Truman, and Marshall were not really aware of how much destruction of Japanese cities had been carried out by the XXIst Bomber Command³ and that more was possible. Conceivably, if they had possessed that information it might have made them wonder whether they had to drop the atomic bomb. I don’t fault them for their decision at all, but it is an interesting point.

Interviewer: You may be interested to know that in June 1945, Gen. [Henry H. “Hap”] Arnold went to the Pacific and met with LeMay for a status

Maj. Gen. Curtis E. LeMay (center) is flanked by the pilot and co-pilot who flew him to the Marianas. Maj. Renato Simoni (left) was the co-pilot, and Capt. Robert Berman (right) was the pilot.



I DON'T
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report on how the B-29 campaign was going. LeMay talked with his group commanders and mentioned to General Arnold that at the rate this campaign was proceeding, the Japanese would certainly be on the ropes by October 1945.

McNamara: This was in a sense what I began to understand as this researcher dug further into it.

Interviewer: During one of my several interviews with General LeMay, I asked about a quote from the seven-volume Craven and Cate official history of the Army Air Forces in World War II. There was one sentence stating that after Arnold came out to talk to you [LeMay] in the Pacific you immediately, at Arnold's direction, went back to Washington to brief the Joint Chiefs of Staff. Well, Truman had met with the Joint Chiefs on June 18, 1945, and on that date Truman had given his approval of the two-step plan for the invasion of Japan in November 1945 and March 1946, if necessary. LeMay arrived in Washington on June 19, a day later, and I said to Gen. LeMay, quoting from the Pacific volume of Craven and Cate about his briefing to the Joint Chiefs of June 19th on the B-29 campaign. I asked him what was the reaction of the Joint Chiefs of Staff to his report. LeMay said, "Yes, I did brief the Joint Chiefs and I will tell you that General Marshall dozed throughout the briefing and [LeMay] further added that the Joint Chiefs were not at all interested in what a two-star general had to say."

McNamara: I don't blame President Truman at all for dropping the bomb. I had friends killed in the island hopping in the Pacific. The thought of going on the beaches and into Tokyo and Japan was horrifying. I understood why Truman dropped the bomb. But I believe now that I have learned more about this event that Secretary Stimson, and Truman, and perhaps Marshall were never confronted with the possibility that they could have avoided dropping the bomb and still win the war, without incurring huge loss of life among the American invasion forces by asking LeMay about his situation with the XXIst Bomber Command.

Interviewer: General [Haywood "Possum"] Hansell, who was LeMay's predecessor and who was fired by Arnold, stated conceivably that—if Truman, Marshall, and Stimson had more knowledge of the results of the XXIst Bomber Command, under LeMay, then Truman might have made a different decision.

McNamara: Did he? I didn't know that. I think it is very important that this point be made, not to criticize but to show just how difficult it is to make decisions about military operations. I don't care if you're talking about friendly fire or whatever, military operations are so much more complex than civilian operations. The variables are greater; the causal relationships between action and the effect on a variable are less clear. The result is that human beings are fallible, misjudgments, miscal-

(Left to right) Maj. Gen. Curtis E. LeMay, Brig. Gen. Haywood S. Hansell, and Brig. Gen. Roger M. Ramey.



THE “FOG OF WAR” IS A WONDERFUL PHRASE, YOU JUST DON’T KNOW AND CAN’T KNOW ALL THAT YOU NEED TO KNOW TO MAKE WISE DECISIONS

culations, and mistakes are made far more often in military operations than is generally recognized.

We see it obviously when we bomb a wedding party in Afghanistan or friendly fire a few days ago in Iraq. But what we don’t see are these multitudes of other decisions. The “Fog of War” is a wonderful phrase, you just don’t know and can’t know all that you need to know to make wise decisions. I would suspect that LeMay’s firebombing versus the decision to drop the bomb is an example of this. The non-use or recognition of another means to an end because of the paucity or lack of information represents an opportunity foregone.

The memo that you will receive that I wrote to LeMay in January 1945, stating that you are not accomplishing anything from high level so you ought to go low. I don’t want to suggest that I put the thought in LeMay’s mind but it was so damn obvious then. I lived through the B-29s from wherever I went from October 1943 to when I came back from China. I saw these screw-ups; you just can’t imagine how bad it was. One colonel wanted me court-martialed. When K. B. Wolfe was commander I was analyzing these things that are similar to that memo I am referring you to and I found that we were the only command in the (CBI) theater that was not directly under [Lord Louis] Mountbatten, the British General in Charge. We reported directly to the Joint Chiefs. We weren’t part of theater and we had to carry our own fuel and supplies over the “hump,” [Himalayas]. We were based in India and we were resupplied out of

I WROTE TO LEMAY IN JANUARY 1945, ... YOU ARE NOT ACCOMPLISHING ANYTHING FROM HIGH LEVEL SO YOU OUGHT TO GO LOW

Chengtu. Then we went to Japan to bomb the steel mills and other targets there. Because we didn’t get the B-29s before we flew to India, among other things, I was keeping track of the time between engine overhauls there. I cannot remember the exact figure, but I believe it was less than 100 hours. It was just unbelievably low. My recollection is that when we sent the B-29s we had them carry a spare engine in the bomb bay when they flew from Kansas to India. We had the B-29 engines scattered all over. When we got over to India, we were confronted with problems. One problem concerned the handling of engines. They were particularly sensitive to fuel consumption. At two different speeds you could get different fuel consumption. You needed to minimize or optimize the fuel consumption. Some of the pilots didn’t have enough experience to do that. We would send a plane up from India to China to drop fuel and some of them actually had to take on extra fuel to make the return trip. As we watched this and I noticed that the forward area commander was an old commander who was brought up in the Air Corps with General Arnold. He had ordered them to ship and unload lubricating oil up there instead of the fuel for the engines. I told K. B. Wolfe about this and he said, “Do something about it!” I said, “Hell, you have an A-4 and it is not my business and maybe I am wrong.” He said “Look, your are right I am sure you are. “Now go to it.”

I took a message down to the message center and of course I signed K. B. Wolfe on the message.

Gen. Curtis E. LeMay is sworn in as USAF Chief of Staff by Secretary of the Air Force Eugene Zuckert while President John F. Kennedy looks on, June 30, 1961.



THE WHOLE THING WAS SCREWED UP, BUT IT WASN'T ANY ONE PERSON'S FAULT. LEMAY WAS ASTUTE ENOUGH TO UNDERSTAND THAT THERE WAS NOTHING HE COULD DO

However, the message center put my statistical control system number on the message. And when the forward area commander got this report he noticed that it wasn't Wolfe who signed it, rather it was McNamara that signed it. Well, the area commander stated what McNamara had done and he fired a message back to K. B. Wolfe stating that "son of a bitch" is getting into our business, court-martial him. Obviously, we weren't court-martialed.

The whole thing was screwed up, but it wasn't any one person's fault. LeMay was astute enough to understand that there was nothing he could do. He could improve the India-China situation, but there was no way he could really accomplish a combat wartime objective being based in India. He had to get closer to the target. He had to move from India to the Pacific. This was typical of LeMay. Other commanders had been there and they didn't see that. The Joint Chiefs had been reviewing it for a year and they didn't see it. It was LeMay who saw the necessity for moving the Bomber Command to the Pacific.

Interviewer: Did you know Barton Leach?

McNamara: Yes. I was thinking of the Socialist who ran against Roosevelt in 1944? This man had debated Bart Leach and I went to the debate. Oh, it was Norman Thomas. Bart Leach debated him and he beat the hell out of him. Bart Leach was just so articulate; he was a wonderful guy. I was stationed in Kharagpur, India which was the

headquarters of the 58th Bomb Wing and then we became the XXth Bomber Command, which later was attached to the Twentieth Air Force. The reason why I was out there in India was because of a colonel named Stan Embrick. I think he was with A-3 and I think he was part of the 58th Bomb Wing. I think I worked with him in Kansas and I know I worked with him in India. He and I would occasionally fly out to Calcutta, India, together. He went to the Marianas with LeMay. He asked me to come out to help him with some operational planning so that is why I was out in the Marianas.

I don't remember Hansell? He didn't have anything to do with the XXth Bomber Command when I was over there. Was Hansell in command of the 73rd Bomb Wing?

Interviewer: Brig. Gen. Haywood S. Hansell Jr., came over from England and took command over the XXIst Bomber Command on August 28, 1944. The Headquarters of the XXIst was stationed on Harmon Field, Guam, from December 4, 1944 to July 16, 1945. The XXIst Bomber Command was assigned to the Twentieth Air Force that was engaged in very-long range bombardment operations until mid July 1945. Both the 58th and the 73rd Bomb Wings were part of and were assigned to the XXIst Bomber Command. Hansell came in with the first B-29s in October-November 1944.

McNamara: That was the 73rd Bomb Wing.

IT WAS LEMAY WHO SAW THE NECESSITY FOR MOVING THE BOMBER COMMAND TO THE PACIFIC

I LEARNED THE IMPORTANCE OF PLANNING, AND MONITORING AND READJUSTING PLANS, AT THE HARVARD BUSINESS SCHOOL.

LEMAY IS OFTEN CRITICIZED FOR BEING DR. STRANGE-LOVE

HE DIDN'T WANT NUCLEAR WAR, BUT HE BELIEVED THAT WE WOULD HAVE TO FIGHT A NUCLEAR WAR

Interviewer: General Arnold was growing very impatient. They were bombing from high-level and because of the weather and clouds they had only a few really good bombing days per month. Arnold sent LeMay over to replace Hansell in January 1945 and until that March raid, that you mentioned, LeMay hadn't had much luck or results as well.

McNamara: Wait until you read my memo and I am sorry that I don't have it at present. My memo shows that you can't do it from high altitude. I don't want to suggest that it was only my idea. My memo⁴ was to Norstad and I haven't any idea as to whether Norstad communicated anything to LeMay that said that McNamara says or anybody says that you are never going to accomplish anything from high altitude. It was crystal clear in January 1945 that he needed to do what he did do in March 1945. And it is far clearer in this other memo that I will send you.

Interviewer: All of your experience with the Army Air Forces in the Pacific and prior to that in the United Kingdom must have stood you in good stead in your later activities and your career.

McNamara: Yes, well in a sense it did with the Ford Motor Company. My memo to Norstad is based upon my Harvard Business School education and planning. I remember we studied the planning of the General Motors Corporation as Donaldson Brown and the long time head of General Motors Albert Sloan introduced it. In any event, they came from Dupont in about 1919 or 1920. One of the things that always surprised me was how Charlie Wilson could have run General Motors since it was so screwed up. The reason was that Albert Sloan and Donaldson Brown laid out a system of planing that was followed into the 1960s after I had left Ford. A moderately intelligent executive could survive; he didn't have to be smart. All he had to do was do what they had established as a *modus operandi*. I learned the importance of planning and planning soundly and well, and monitoring and readjusting plans, and so on, at the Harvard Business School. That's what I did with the Air Force and that's what I did at Ford, and later in the Defense Department.

One other thing that I would like to say about General LeMay is that he is often criticized for being Dr. Strangelove or something similar. While we were making this movie about my life I was told that LeMay had said that if we had lost the war we would be tried as war criminals. What that meant to me was that LeMay was sensitive to what was going on. He had a theory of war that you needed to win at as little cost to your country as possible. For example, it has been said that he wanted nuclear war. He didn't want nuclear war, but he believed—and I think he was totally wrong—that we would have to fight a nuclear war with the Soviet Union and, by God, we had best do it as early as possible, when we had as great an

advantage as we possibly could. My belief was that we might be able to avoid a war with the Soviet Union and, therefore, let's not fight one if we can avoid it.

Interviewer: And we did avoid a nuclear war with the Soviet Union.

McNamara: That's right. There was never any way, during my seven years as Secretary of Defense from January 20, 1961 until I left in the end of February of 1968, at any moment of time for the U.S. to initiate a nuclear war with the Soviet Union and have a basis of belief that we could come out of the war without unacceptable casualties. Those were the kinds of things that I worked on when I was with the Army Air Forces in World War II and it was that type of experiences and thoughts that I took with me to Ford and to the Defense Department.

Interviewer: How long did you stay in the Air Force Reserves after you got out from active duty in 1946.

McNamara: I don't know. I think I was a colonel in the Reserves. I never did anything in the Reserves.

Interviewer: You showed up at the Air Staff a couple of times in the late 1940s.

McNamara: I don't know. I don't remember my Reserve service. I just believe in citizens helping if they could. I got out of active service I was willing to stay in the Reserves, which I did. I never received any pay nor do I think that I did anything. As far as I know I wasn't active at all.

Interviewer: I arrived at Strategic Air Command (SAC) headquarters as a historian in 1959. Gen. Thomas S. Power was CINCSAC at the time. Of course, he had worked with LeMay. When President John F. Kennedy was elected and you became Secretary of Defense there was a time, very early on, when you and the President came out to SAC headquarters in Omaha, Nebraska.

McNamara: I went out to SAC in March 1961, with President Kennedy and I was absolutely shocked at what I saw. I couldn't believe it.

Interviewer: That's my question.

McNamara: They then had Operational Plans one, two, three and four and roman numeral I. Plans one to four were retaliatory plans and plan Roman Numeral I was a first strike plan. I couldn't believe one to four because, quite understandably, we would have to blast our way in and the damage to Poland and the other places we would fly over would be just horrendous. Then there was the issue with fallout. Ops Plan IA (I think it was called) was absurd. There was absolutely no way

GENERAL
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I CUT THE
[MINUTEMAN
MISSILE]
FIGURE
FROM 3,000
TO 1,000

that we could avoid unacceptable losses. But that was LeMay's plan and General Power, his successor, was still thinking along those lines. I don't really recall us meeting with Power. I do remember that the University of Michigan gave the President an honorary degree. Of course, I had lived in Ann Arbor when I was with Ford. I flew out to Ann Arbor with the President and made a speech there. Then the President suggested that we go out to the West Coast and visit Vandenberg Air Force Base to look at a missile and see what their plans were. We flew out there and General Power, who was Commander of SAC at the time, met us on the airstrip and I remember we had an open car waiting for us. General Power, President Kennedy, and I sat in the back. The President was in the middle, Power was on the right and I on the left.

Power started talking something to the effect, "Now Mr. President when we get those 10,000 Minuteman missiles." Kennedy interrupted and said, "What did you say." Power added, "Well you didn't let me finish; when we get those 10,000 Minuteman missiles." Kennedy turned to me and said, "Bob, we are not getting those 10,000 Minutemen are we?" I said "No." What had happened was that General Power wanted to develop a first strike capability. He had recommended to the Air Force that the budget that we were trying to put together at the time include acquisition funding for 10,000 Minuteman missiles. The Air Force had also sent to me a recommendation of a stated objective for developing a first strike capability, but had cut the 10,000 to 3,000 Minuteman missiles. I had eliminated the first strike objective because I didn't think that there was any way to do it, even if we were not concerned about moral or political ends. It was impossible militarily. I eliminated and cut the figure from 3,000 to 1,000. That was what President Kennedy had in mind. It was really amazing. My analysis, when I became Secretary of Defense, was since Kennedy had campaigned on the "missile gap" issue, I felt that it was one of my first responsibilities to figure out how much of a gap there was and how to close or eliminate it. I was simply applying the thoughts and knowledge that I had learned when I was with the Army Air Corps and the Army Air Forces.

Interviewer: I think the press in Omaha reacted to your visit and when mentioning your reaction to the war plan was that it amounted to a "spasm."

McNamara: Yes. I concluded that we had to have alternatives. It was politically impossible quickly to give up the NATO strategy of responding to a Soviet conventional attack with the immediate use of nuclear weapons. I thought the thing to do was to introduce option capabilities or options which the President could exercise, even when it became necessary to initiate the use of nuclear weapons. And then the more I thought about the use of nuclear weapons it could never be justified. It goes back to my point of substituting an uncertain nuclear war for a certain nuclear war. If you

are going to initiate nuclear war, no matter how many you use, the enemy will respond with nuclear weapons of their own. This will force unacceptable damage on this country and, therefore, no matter what the NATO plan was, there was never any potential justification for the President to initiate the use of nuclear weapons. Very secretly, I presented that proposition first to President Kennedy and then to President [Lyndon B.] Johnson and it was my belief that they accepted it and I have never changed my mind from that day to this day. Now I have expanded it since to say it would never be militarily acceptable to initiate the use of nuclear weapons against a nuclear equipped opponent. It was never politically or morally defensible to initiate nuclear weapons against a non-nuclear opponent and that is our policy today. As you know, and it isn't just President [George W.] Bush today, but for nearly forty years we have never had a policy of first use. I just believe that is wrong.

Interviewer: I think at the time SAC was proposing a plan of counterforce.

McNamara: That is correct. This was the IA plan. That was what I was doing in 1961, when I went out there and through the rest of my tenure as Secretary of Defense. I was applying the thoughts and mental processes that I had developed during the three years that I was in the Army Air Forces. It is the same issue as the low altitude, high altitude bombing. You ask what is the objective? The objective is to achieve a military objective. You could not do that in my opinion no matter what NATO says by initiating use of nuclear weapons against the Soviet Union. It is just impossible. I am not arguing against the deterrent theories. Even though you couldn't bomb, the Soviet Union didn't know you couldn't or wouldn't use nuclear weapons as a first strike. Therefore, [McGeorge] Bundy coined the term "existential deterrence." There was some possibility of existential deterrence, even though there was less likelihood that we would ever follow NATO policy. Even to this day these ideas have not been adequately discussed.

Interviewer: Certainly, the deterrent policy was a good backup to the conventional warfare at the time.

McNamara: Go through the statements of the senior political and military leaders from the NATO side during those years. I read the statements of seven of the retired British chiefs of the Royal Air Force and five of them stated that they would have never ever advocated initiating the use of nuclear weapons. Lord Mountbatten stated that publicly before he was assassinated. Helmut Schmidt said it after he retired. And the German *Luftwaffe* commander, who was so severely burned during World War II, said in later life that he would support the use of nuclear weapons but

never launched from German soil. Today our nuclear policy of “the emperor has no clothes” is not sensible and I do not believe it should be followed.

Interviewer: That is very interesting. If we could get back for just a moment to 1945, to General Arnold at Potsdam. Truman went around the table with a sort of poll as to whether we ought to drop the atomic bomb at that point in the war. Margaret Truman writes about this in her book on her father. She was quite angry with Arnold because she claims, in her book, that Arnold had changed his mind, when actually he had not. At Potsdam he said it was not necessary militarily, to drop the bomb. I had several talks with Gen. Ira C. Eaker about this topic. Eaker said that Arnold at that point did not believe that it was necessary militarily to drop the bomb because the B-29 conventional bombing campaign had the enemy on the ropes. This was not because of the concern about morality but because he was fearful of what the dropping of an atomic weapon would detract from what the B-29 offensive had already accomplished, since March 1945. Arnold was always conscious of the decades-long effort to gain independence for the Air Force, an event that would take place in July 1947 with the passage of the National Security Act.

McNamara: The fact that he didn't think it was militarily necessary was very important. I didn't know that. That was exactly the point in my mind in this movie. One of the answers I thought that Truman and Marshall and Stimson didn't have the knowledge of the B-29 campaign in the Pacific. In any event if they did, they hadn't really thought the thing through.

Interviewer: What about Eugene M. Zuckert?

McNamara: I worked with Eugene Zuckert at Harvard. He graduated from Yale law School and Harvard Business School. He had some government experience [at the Securities and Exchange Commission]. When I came to Washington, I had a deal with Kennedy that I could appoint all the senior defense civilian officials without any input from the White House. I said I wasn't qualified to do it, and he said the kindest thing. “You know there isn't any school for Presidents either.” I said I would only do it if you agree that I can get the ablest people in the country. I said that if he wanted to recommend someone I would consider it, but the decision would be mine even though formally he had to submit the names for congressional approval. On that basis, I got a card file and listed all the names I could think of. Eugene Zuckert was one man whom I thought of favorably. ■

NOTES

The interview with Robert S. McNamara took place on March 26, 2003, at Mr. McNamara's office at 1350 I St. N.W., Washington D.C. His interviewers were Herman S. Wolk and George M. Watson, Jr.

1. For the purposes of this interview McNamara used the term Army Air Corps and Air Corps as well as Army Air Forces (AAF) interchangeably. For historical purposes the Army Air Corps was established by the Air Corps Act in July 1926. The Air Corps came under the AAF, which was created on June 20, 1941. The Air Corps was disestablished on March 9, 1942.

2. Col. Curtis E. LeMay commanded the 305th Bombardment Group from June 2, 1942 to May 1943. The 305th was a B-17 Group that moved to England, in August-October 1942, and was assigned to the Eighth Air Force, initially the VIII Bomber Command. It began combat on November 17, 1942, and operated chiefly as a strategic bombardment organization until April 1945. Until mid-1943 the unit attacked such targets as submarine pens, docks, harbors, shipyards, motor works, and marshalling yards in France, Germany, and the Low Countries. It bombed the navy yards at Wilhelmshaven on January 27, 1943, when heavy bombers of the Eighth Air Force made their first penetration into Germany. See Maurer Maurer, ed., *Air Force Combat Units in World War II*, Washington, D.C.: Office of Air Force History, 1983, pp. 177-79.

3. The XXIst Bomber Command was constituted on March 1, 1944, and activated the same day. After an assignment to the Second Air Force, it moved to the Marianas late in 1944 and was assigned to the Twentieth Air Force, where it engaged in very-long range bombardment operations until mid-July 1945. The history of the XXIst Bomber Command terminated on

July 16, 1945. On that date Headquarters and Headquarters Squadron, XXIst Bomber Command was redesignated Headquarters Squadron, Twentieth Air Force. This redesignation, which brought an end to the XXIst Bomber Command as an establishment, had no effect on the lineage of the Twentieth Air Force.

4. Reading from his one January 1, 1945 memo to Norstad, McNamara focused on a section that dealt with altitude:

By reason of purely physical principles, aiming errors are magnified as bombing altitude and speed increase. However, the decrease in accuracy due to increase in altitude alone is relatively small compared to the effect of weather which accompanies increase in altitude. The first eighteen missions of the XXth Bomber Command have proved that a cirrostratus [cloud] persistently exists at altitudes varying from 21,000 ft. to 28,000 ft. over Asiatic Sea coasts. For aircraft bombing through this stratum of cirrus cloud formation the undercast is increased by amounts varying from 2/10 to 7/10. Thus, a considerable portion of bombing is transferred from visual to radar bombing if B-29 formations bomb from above this cloud condition, and even though visual bombing is still possible, accuracy is difficult to obtain.

Although winds encountered over the Japanese home islands average about 50 knots at 25,000 ft., B-29 missions from Saipan indicate that extremely high winds are not uncommon at altitudes of 30,000 ft. and more. Visual bombing with the synchronous Norden bombsight does not take account of differential winds and it is to be noted that extremely high winds at very high altitudes can produce ballistic wind differentials which will affect the accuracy of a 500-pound G.P. bomb by 500 ft. or more and will affect an I. B. or fragmentation type to an even greater degree.

Kennedy's Space P A Post-Cold War P



Policy Reconsidered: Perspective



Roger D. Launius

(Overleaf) Astronaut Neil A. Armstrong, Apollo 11 mission commander, at the modular equipment storage assembly of the Lunar Module "Eagle" on the historic first extravehicular activity on the lunar surface. Astronaut Edwin E. Aldrin Jr. took the photograph with a Hasselblad 70mm camera. (All photos courtesy of NASA at <http://grin.hq.nasa.gov>.)

(Right) The Apollo 16 Saturn V space vehicle carrying astronauts Young, Mattingly, and Duke.



Is it time to reconsider Kennedy's space policy? The answer to this question is a resounding yes. From the perspective of nearly forty years, the Apollo program had enormous consequences. In this paper I shall discuss a few of them:

1. The Apollo decision has been used as a model for public policy formulation. This is an important legacy of the program, but one that requires reconsideration.
2. Apollo reshaped a very orderly, economical space exploration effort underway at NASA put in place by the Eisenhower administration that would have led to lunar and planetary exploration in the decades of the 1970s and 1980s.
3. Apollo expanded enormously the size and shape of NASA as a government organization and set the agency at odds with other parts of the federal government, a conflict that has not abated even in the twenty-first century.
4. Apollo established an unusual and difficult to meet set of expectations from the public when it came to NASA and space exploration.
5. Apollo left a questionable technological legacy, as most of its hardware was scrapped at the conclusion of the program in favor of an entirely different technological direction for later efforts.

While there are other aspects of Apollo that might be appropriately discussed, this essay represents an attempt to stimulate discussion for future research. It does not represent a final historical judgment, but seeks only to be provocative of possibilities for future consideration.

The Apollo Decision as a Model of Public Policy Formulation

In the more than forty years since President John F. Kennedy stood before the American people and declared that we should send astronauts to the Moon, scholars have offered four basic approaches to interpreting the Apollo decision-making process.¹ By far the most influential of these interpretations is the conception that Kennedy made a single, rational, pragmatic choice to undertake the U.S. sprint to the Moon as a means of competing with the Soviet Union and raising international prestige during the height of the Cold War. The President and his advisors, therefore, undertook an exceptionally deliberate, reasonable, judicious, and logical process to define the problem, analyze the situation, develop a response, and achieve a consensus for action.² The timeline progressed from point to point with few detours from problem

THE MOST INFLUENTIAL INTERPRETATION IS THAT KENNEDY MADE A CHOICE TO UNDERTAKE THE U.S. SPRINT TO THE MOON AS A MEANS OF COMPETING WITH THE SOVIET UNION AND RAISING INTERNATIONAL PRESTIGE DURING THE HEIGHT OF THE COLD WAR

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President John F. Kennedy in his historic message to a joint session of the Congress, on May 25, 1961. Shown in the background are, (left) Vice President Lyndon Johnson, and (right) Speaker of the House Sam Rayburn.

SINCE VIRTUALLY NOTHING IS DONE SOLELY ON A RATIONAL BASIS THIS IS A DIFFICULT CONCLUSION TO ACCEPT

definition to sensible decision. Neat and tidy, it has served as a model for public policy formulation.

This rational choice argument begins with the assertion that JFK's space policy was a relic of the Cold War struggle between the United States and the Soviet Union, and that it revolved around the question of international prestige. In this view, Apollo was a clear result of competition between the world's two superpowers to win over the "minds of men" to a specific economic and political system. In essence, the Apollo program was nothing less than the "moral equivalent of war." It sought to weaken the Soviet Union, while enhancing the United States.³

There is much to recommend this interpretation; and its study as a model of outstanding policy formulation is appropriate. Its main strength is its insistence that the American effort to land on the Moon served as an enormously effective response to a Cold War crisis with the Soviet Union. At the same time, the most significant problem with this interpretation is its unwavering belief that individuals—and especially groups of individuals, even competing ones—logically assess situations and respond with totally reasonable consensus actions. Since virtually nothing is done solely on a rational basis this is a difficult conclusion to accept. Charles E. Lindblom wrote, a generation ago, that the "science of 'muddling through'" is perhaps as useful an alternative approach to the study of decision-making as any, recognizing that "policy is not made once and for all; it is made and re-made endlessly."⁴ There may have been more "muddling through" in the Apollo decision of 1961 than most people believe.

A second interpretation of the Apollo decision suggests that Kennedy's tortured background and aggressive tendencies affected his decision-making, causing him to take a more combative approach toward the Soviet Union than required and necessitating his "winning" at whatever challenge came his way. At some level, Kennedy may

have even created crisis situations wherein he reaffirmed his quintessential masculinity and enhanced his own dominance over everyone and everything. Most of these analyses depict JFK in an unfavorable light and focus on his tendencies toward competitiveness, recklessness, and ambition. These character studies view Kennedy as an individual who had to dominate all and therefore, created situations calculated to demonstrate his mastery. His harsh treatment of women, demonstrated this fact, as did his competitiveness in sports, business, and politics.⁵ This competition may have prompted Kennedy's tendency as President to evoke "the image of unparalleled crisis to justify his policies," believing that "crisis combined with presidential charisma becomes a way for the chief executive to *connect* with the public, and create support for presidential policies."⁶

President Kennedy's assertive self-confidence may have provided an important element of the "Camelot mystique" but carried to a logical conclusion, it also led to tense Cold War situations in which on more than one occasion nuclear holocaust became a probable outcome. At the same time, that assertiveness hid a Kennedy weakness for indecisiveness and procrastination until pressed to take a stand. That, coupled with the lack of any essential ideology beyond a basic anti-communism and a faith in active government, ensured that there was more to the Apollo decision than rational action.⁷

Instead of taking a long view, Kennedy engaged in fear-mongering about supposed Soviet strength in space juxtaposed against American weakness, and responded with a lunar landing decision both spectacular in its achievement and outrageous in its cost.

A third explanatory approach toward understanding the Apollo decision suggests that Kennedy may have been more oriented toward cooperation with the Soviet Union in space than most people realized. In his inaugural address in January 1961, Kennedy spoke directly to Soviet Premier Nikita Khrushchev and asked him to cooperate in exploring "the stars."⁸ In his State of the Union address ten days later, Kennedy asked the Soviet Union "to join us in developing a weather prediction program, in a new communications satellite program, and in preparation for probing the distant planets of Mars and Venus, probes which may someday unlock the deepest secrets of the Universe."⁹

Even after Yuri Gagarin and the Bay of Pigs, during the month preceding the May 25, 1961, speech announcing Apollo, Kennedy had his brother, Robert F. Kennedy, quietly assess the Soviet leadership's inclinations toward taking a cooperative approach to human space exploration.¹⁰ In addition, NASA Deputy Administrator Hugh L. Dryden undertook a series of talks with Soviet academician Anatoly A. Blagonravov. Kennedy also instructed Jerome Wiesner to convene a panel with representatives from NASA and the President's Science Advisory Committee to

James E. Webb served as the second Administrator for NASA from February 14, 1961, to October 7, 1968. He died in 1992.



KENNEDY WAS UNSURE THAT A U.S.-ONLY APOLLO PROGRAM WAS THE BEST COURSE

WHEN ASKED TO MORE AGGRESSIVELY SUPPORT A BROAD RANGE OF SPACE-FLIGHT ACTIVITIES, KENNEDY RESPONDED, "I AM NOT THAT INTERESTED IN SPACE."

come up with ideas to do something with the Soviets, including setting up an international lunar base. In a memo, ironically written the same day as JFK's Apollo speech, Eugene Skolnikoff, who was on Wiesner's staff, proposed that "We should offer the Soviets a range of choice[s] as to the degree and scope of cooperation."¹¹ As Ted Sorenson remarked, "It is no secret that Kennedy would have preferred to cooperate with the Soviets on space exploration."¹²

Within two weeks of giving his bold May 25th speech, Kennedy met Khrushchev at the Vienna summit and proposed making Apollo a joint mission with the Soviets. The Soviet leader reportedly first said no, then replied, "Why not?" and then changed his mind again, saying that disarmament was a prerequisite for U.S.-USSR cooperation in space.¹³ On September 20, 1963, Kennedy made a well-known speech before the United Nations, in which he again proposed a joint human mission to the Moon. He closed by urging, "Let us do the big things together." In public the Soviet Union was noncommittal. *Pravda*, for example, dismissed the 1963 proposal as premature. Some have suggested that Khrushchev viewed the American offer as a ploy to open up Soviet society and compromise Soviet technology.¹⁴ Although these efforts did not produce a cooperative venture—Kennedy was assassinated in November 1963 and Khrushchev deposed the next year—the fact that Kennedy pursued various forms of space cooperation until his death suggests that he was unsure that a U.S.-only Apollo program was the best course.

Finally, one interpretation of the Apollo decision emphasizes Kennedy as visionary leader committed to expanding the human presence throughout the Solar System. In this scenario, the Apollo decision was merely the first step in an expansive effort to explore and colonize the heavens.

Kennedy, therefore, approved Apollo because he was a visionary who saw space exploration as a noble, worthy goal in its own right. Even without Cold War competition, even without Soviet successes in space, Kennedy would have made his decision to go to the Moon and stuck with it because he thought it a good thing to explore.

Lawrence Suid wrote, "Kennedy nurtured within himself an innate sense of adventure and curiosity about the unknown." Similarly, Kennedy supposedly "had a genuine fascination with space." Suid cites Robert Kennedy, Sorenson, and Kennedy's press secretary Pierre Salinger in observing that Kennedy had a "romantic" view of space and saw himself as a latter-day Columbus or Lewis and Clark.¹⁵

Alas, there is not a shred of evidence to support this interpretation other than the wishful thinking of space enthusiasts who would like to believe that one of their own occupied the White House and set the nation on a bold spaceflight adventure. Instead, Kennedy maintained a studiously ambivalent record on space exploration prior to the Gagarin flight of April 12, 1961, neither pro nor con. For instance, journalist Hugh Sidey noted that on assuming the presidency, Kennedy "seemed to know less" and to be "less interested in" space than in virtually any other major policy area.¹⁶ And if Kennedy had really been such a strong supporter of space exploration all along, why had he not approved NASA's request for an increased budget for Apollo in March 1961?¹⁷

Finally, a recently released tape of a White House meeting taking place on November 21, 1962, between President Kennedy and NASA Administrator James E. Webb, demonstrates the error of this approach beyond all dispute. When asked to more aggressively support a broad range of spaceflight activities, Kennedy responded, "I am not that interested in space." The major reason he was expending so much money on Apollo, he said, was because of its importance in the Cold War rivalry with the Soviet Union.¹⁸

All of this suggests that JFK's Apollo decision was much more complex and involved than most have generally believed. It is, at best, an ambivalent representation of the "rational actor" approach to decision-making in recent American history. In part because of this, the Apollo program left a divided legacy for NASA and the aerospace community. The Apollo decision created for the space agency an expectation that the direction of any major space goal from the President would always bring NASA a broad consensus of support and provide it with the resources and license to dispense them as it saw fit. NASA officials have been slow to understand that Apollo was not conducted under normal political circumstances and would not be repeated.¹⁹

The Apollo decision was, therefore, an anomaly in the national decision-making process. The dilemma of the "golden age" of Apollo has been difficult to overcome, but moving beyond the Apollo

Apollo 11 mission officials relax in the Launch Control Center following the successful Apollo 11 liftoff on July 16, 1969. In the foreground, facing the camera, from left to right are: Charles W. Mathews, Deputy Associate Administrator for Manned Space Flight; Dr. Wernher von Braun, Director of the Marshall Space Flight Center; George Mueller, Associate Administrator for the Office of Manned Space Flight; Lt. Gen. Samuel C. Phillips, Director of the Apollo Program



IN 1959, NASA PREPARED A LONG-RANGE PLAN THAT ANNOUNCED THAT ITS GOAL IN THE 1960S "SHOULD MAKE FEASIBLE THE MANNED EXPLORATION OF THE MOON"

IN ESSENCE, KENNEDY THREW OUT THE LONG-RANGE PLAN BY MAKING THE APOLLO COMMITMENT IN 1961

program to embrace future opportunities has been difficult.

Transformation of the Space Program

Everything changed when John F. Kennedy went before Congress and the American public on May 25, 1961, and announced:

*I believe this Nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish.*²⁰

This announcement set in train a set of events that changed the structure and priorities of space exploration ever after.

Previously, the American civil space program had been operating at a measured pace with appropriate long-term goals. In 1959, just over a year after NASA began operation, it prepared a formal long-range plan that announced that its goal in the 1960s "should make feasible the manned exploration of the moon and nearby planets, and this exploration may thus be taken as a long-term goal of NASA activities." The plan called for the "first launching in a program leading to manned circumlunar flight and to a permanent near-earth space station" in the 1965-1967 period. It also called for the first human flight to the Moon

at an unspecified time "beyond 1970."²¹

In essence, Kennedy threw out the long-range plan by making the Apollo commitment in 1961. In so doing he also overturned the orderly approach to space exploration established during the Eisenhower administration, one that led to the long-range plan and an incremental growth in the budget to about one percent of all monies expended by the federal government. Eisenhower had refused to fall prey to public hysteria after the Sputnik launches in 1957, and set in place only with some reluctance NASA as an independent executive branch agency in 1958. Eisenhower took small steps because he possessed a long-term vision for defeating the Soviet Union in the Cold War, without head-to-head competition across a broad spectrum. Indeed, he was committed to achieving, without undue cost, the development of scientific and technical capability both to gain access to space and to operate therein, but this had to be balanced against a wide range of other concerns.²²

In the crisis over Sputnik, Ike had felt intense pressure from an alliance of diverse interests to establish a cabinet-level federal entity, something he always thought unnecessarily expensive, and once created, almost impossible to dismantle, to carry out a visible program of space exploration. With NASA's creation in 1958, an organization with less power and stature than others wanted, Eisenhower was able to deflect the coalition of interests that advocated an exceptionally aggressive space program. In so doing, he thwarted the goal of establishing a large, independent bureau-



The Transporter nears the top of the five percent incline at Launch Complex 39A with the Apollo 11 Saturn V.

cracy with expensive crash programs to race the Soviet Union into space and to accomplish spectacular feats that would impress the world.²³

Kennedy, however, had a much less refined strategy for how to win the Cold War and, accordingly, greater capacity to view each problem as if he was in a death match. Each confrontation with the Soviet Union took on spectacular proportions and desperate characteristics for Kennedy. For example, had Eisenhower been in office in 1961 it is doubtful that he would have responded to international setbacks with a similar lunar landing decision. Instead, he probably would have sought to reassure those stampeded by Soviet successes and explain carefully the long-term approach being taken by NASA to explore space. A hint of the Eisenhower approach came in 1962, when he remarked in an article:

*Why the great hurry to get to the moon and the planets? We have already demonstrated that in everything except the power of our booster rockets we are leading the world in scientific space exploration. From here on, I think we should proceed in an orderly, scientific way, building one accomplishment on another.*²⁴

He later cautioned that the Moon race “has diverted a disproportionate share of our brainpower and research facilities from equally significant problems, including education and automation.”²⁵

Kennedy’s decision to race the Soviets to the Moon fundamentally altered the space program then underway by NASA, and whether or not one agrees that this alteration was good is very much a matter of perspective. For instance, it placed on hold an integrated space exploration scenario centered on human movement beyond this planet and involving these basic ingredients accomplished in essentially this order:

1. Earth orbital satellites to learn about the

requirements for space technology that must operate in a hostile environment.

2. Earth orbital flights by humans to determine whether or not it was really possible for humanity to explore and settle other places.

3. Develop a reusable spacecraft for travel to and from Earth orbit, thereby extending the principles of atmospheric flight into space and making routine space operations.

4. Build a permanently inhabited space station as a place both to observe the Earth and from which to launch future expeditions to the Moon and planets.

5. Undertake human exploration of the Moon with the intention of creating Moon bases and eventually permanent colonies.

6. Undertake human expeditions to Mars and eventually colonize the planet.²⁶

Specifically because of Apollo, NASA lost the rationale for a space station, objective 4, viewed by everyone, both then and now, as critical for the long-term exploration and development of space.

Instead of building the infrastructure necessary for sustained space exploration, as a space station would have done, JFK committed the nation to an expensive sprint to the Moon as a demonstration of American technological virtuosity, but ultimately it was a demonstration that had little application beyond its propaganda value. Of course, even though the project was not undertaken to advance scientific understanding so much as to resolve Cold War rivalries, one could argue that the scientific return of Apollo was significant.²⁷ In reality, however, had we found something of interest on the Moon, instead of an aborted space exploration program, Apollo would have been the vanguard of an armada of spacecraft from Earth. As it was, the belief of most Americans became “been there—done that,” and they pushed for decreased funding for NASA and emphases on other projects. The dreams of sustained human exploration in the solar system was trashed in the perceptions of Apollo as being something only mildly worthwhile for narrow scientific purposes.

Expansion of the NASA Organization

NASA changed remarkably during the 1960s, as it transformed itself from a relatively small research and development agency into a huge program management one. To realize the goal of Apollo under the strict time constraints mandated by the President, personnel had to be mobilized. This took two forms. First, NASA moved quickly, during the early 1960s, to expand its physical capacity. In 1960 the space agency consisted of a small headquarters in Washington and its three inherited NACA research centers: the Jet Propulsion Laboratory, the Goddard Space Flight Center, and the Marshall Space Flight Center. With the advent of Apollo, these installations grew rapidly. In addition, NASA added three new facilities specifically to meet the

[EISENHOWER] LATER CAUTIONED THAT THE MOON RACE “HAS DIVERTED A DISPROPORTIONATE SHARE OF OUR BRAINPOWER AND RESEARCH FACILITIES”

Dr. Hugh L. Dryden served as NASA Deputy Administrator from August 19, 1958, to December 2, 1965. Dr. Dryden died in December 1965.



THE NASA WORKFORCE EXPLODED TO MEET THE NEEDS OF APOLLO

THE NASA FUNDING LEVEL, MUCH OF IT GOING TO APOLLO, REPRESENTED 5.3 PERCENT OF THE FEDERAL BUDGET IN 1965

demands of the lunar landing program. In 1962 it created the Manned Spacecraft Center—renamed the Lyndon B. Johnson Space Center in 1973—near Houston, Texas, to design the Apollo spacecraft and the launch platform for the lunar lander. This center also became the home of NASA's astronauts and the site of mission control.²⁸

NASA also greatly expanded for Apollo the Launch Operations Center at Cape Canaveral on Florida's eastern seacoast. Renamed the John F. Kennedy Space Center on November 29, 1963, this installation's massive and expensive Launch Complex 39 was the site of all Apollo Moon launches. Additionally, the spaceport's Vertical Assembly Building (VAB) was a huge and expensive 36-story structure where the Apollo/Saturn rockets were stacked. NASA also created the Electronic Research Center (ERC) at Boston, Massachusetts, in 1962, an installation dedicated to the development of the multitudinous systems required to reach the Moon. It also opened the Michoud Assembly Facility in suburban New Orleans as an assembly and staging site for the Saturn launch vehicle. Finally, to support the development of the Saturn launch vehicle, in October 1961, NASA created on a Deep South bayou the Mississippi Test Facility, renamed the John C. Stennis Space Center in 1988. The cost of this expansion was great, more than \$12.2 billion over the decade, with 90 percent of it expended before 1966.²⁹

In addition to the creation of this massive infrastructure, the NASA workforce exploded to meet the needs of Apollo. By 1966 the agency's civil service rolls had grown to 36,000 people from the 10,000 employed at NASA in 1960. Additionally, NASA's leaders made an early decision that they would have to rely upon outside researchers and technicians to complete Apollo, and contractor em-

ployees working on the program increased tenfold, from 36,500 in 1960 to 376,700 in 1965. Private industry, research institutions, and universities provided the majority of personnel working on Apollo.³⁰

The budget for NASA also grew exponentially throughout the first part of the 1960s to support the Apollo effort. As Kennedy had suspected, the cost of winning a race to the Moon was "astronomical."³¹ Initial NASA estimates of the costs of Project Apollo were about \$40 billion through the end of the decade, a figure approaching \$160 billion in 2003 dollars when accounting for inflation. In the end it was not quite that expensive, costing \$25.4 billion (about \$103 billion in 2003 dollars).

It was an enormous undertaking, with only the building of the Panama Canal rivaling the Apollo program's size as the largest non-military technological endeavor ever undertaken by the United States, and only the Manhattan Project, to build the atomic bomb in World War II, being comparable in a wartime setting.³²

As soon as Apollo's success seemed assured, political leaders moved to cut the NASA budget. President Lyndon B. Johnson's budget director, Charles Schultze, informed Johnson, in the fall of 1965, that cost overruns in the space program were eating up the funds that Johnson needed for his "War on Poverty" and other domestic programs as well as to expedite resolution of the conflict in Vietnam. Schultze urged Johnson to cut the NASA budget by \$600 million, a decision that would delay Kennedy's goal until after 1970. With great care, Johnson allowed cuts to the NASA budget but ensured that the timing for the lunar landing was not compromised.³³

The NASA funding level, much of it going to Apollo, represented 5.3 percent of the federal budget in 1965. A comparable percentage of the \$1.9 trillion Federal budget in 2003 would have equaled more than \$75 billion for NASA, whereas the agency's actual budget then stood at less than \$15 billion. NASA's budget began to decline beginning in 1966 and continued a downward trend until 1975. NASA's fiscal year 1971 budget took a battering, forcing the cancellation of Apollo missions 18 through 20. With the exception of a few years during the Apollo era, the NASA budget has hovered at about one percent of all money expended by the U.S. treasury. Stability has been the norm as the annual NASA budget has incrementally gone up or down in relation to that one-percent benchmark.³⁴

The irony is that NASA built an enormous infrastructure to support Apollo for which future uses were limited. Even so, the agency has fought to keep this infrastructure in place despite thirty years of limited usefulness. As support for the civil space program grew softer, the budget and personnel assigned to NASA declined to about half of what they had been during the heyday of Apollo. Faced with deteriorating resources, NASA Administrator James C. Fletcher tried to protect, as best he could, the technical and scientific core of per-



Astronaut Buzz Aldrin, lunar module pilot, walks on the surface of the Moon near the leg of the Lunar Module "Eagle" during the Apollo 11 extravehicular activity. Neil Armstrong, took this photograph with a 70mm lunar surface camera.

THEY KILLED THE "GOOSE THAT LAID THE GOLD EGG."

sonnel located at the NASA field centers, the truly essential resources needed carry out the agency's mission. He designated "roles and missions" for each center, thereby avoiding duplication of effort. This created a particularly difficult environment inside NASA, given the interlocking interests present between installations, contractors, and geographic regions on the one hand and their representatives in Washington on the other. Political infighting became more common as each NASA center struggled for survival. In the end, the NASA centers have limped along as best they could since the 1970s, losing their best personnel to industry, the military, and universities, and working both to sustain their infrastructure and conduct space-flight activities on a shoestring.³⁵

Too many decisions have been made to feed the infrastructure rather than support space operations. This has sparked periodic attempts to reduce its size, complexity, and direction—with only moderate success. Just as Apollo was being completed, a White House memo commented that "NASA is—or should be—making a transition

from rapid razzle-dazzle growth and glamor to organizational maturity and more stable operations for the long term," adding that

*we need a new Administrator who will turn down NASA's empire-building fervor and turn his attention to (1) sensible straightening away of internal management and (2) working with OMB and White House to show us what broad but concrete alternatives the President has that meet all his various objectives.*³⁶

The White House failed to accomplish this in 1971, and later. The result has been a constant push and pull between the desire for measured, incremental progress in space exploration and aggressive funding increases that would both feed the NASA infrastructure and allow for aggressive Apollo-like programs.³⁷

Nothing shows this more effectively than the debate over the Space Exploration Initiative (SEI) between 1989 and 1991. In July 1989 President George Bush proposed this ambitious program to return Americans to the Moon, establish a lunar base, and, then, using a NASA-built space station, send human expeditions to the planet Mars.³⁸ Within two years the program was dead, largely because of the incredible cost NASA estimated for it, more than \$700 billion. Most of that was for the sustenance of NASA as an institution, critics asserted. Normally a strong supporter of NASA efforts, Maryland Senator Barbara Mikulski bluntly declared, "We're essentially not doing Moon-Mars."³⁹

Would this have turned out differently had NASA been less institutional and more entrepreneurial? Perhaps, but with the billions required to support NASA infrastructure, most of it created to support Kennedy's Apollo program, the space agency's leaders viewed this as an opportunity to fix lots of problems that years of starvation budgets had created. In the process, they killed the "goose that laid the gold egg." Perhaps the United States would have been better off to not have built the infrastructure in the first place.

NASA as a "Can Do" Agency

NASA's rise as a "can do" agency can be traced directly to the experience of Apollo and its legacy of success. We have heard this quote, or another variation, a great many times: "If we can send a man to the moon, why can't we clean up the Chesapeake Bay?"⁴⁰

The space race thus provided a national self-examination, a trial of the ability of Americans and their government to overcome great obstacles, just as the mobilization for World War II had tested the American system two decades earlier. As the decade progressed, and the Apollo flights began, a government whose space program had begun with exploding rockets put its reputation on the line and carried out one successful mission after another, each a more complex or daring task.

The Earth "rises" over the surface of the Moon.



NASA DID NOT OPERATE A FAILURE-FREE SPACE PROGRAM DURING THAT TIME

NASA CAN NEVER MEET THE HEIGHTENED EXPECTATIONS CONJURED UP BY RECOLLECTIONS OF PUTTING AN AMERICAN ON THE MOON IN 1969

In the process Americans forgot that failures had always been a part of the effort. They were reminded of that in January 1967, when the Apollo 1 crew was lost during a ground test, but NASA weathered that tragedy and moved forward. Even it was viewed in retrospect as a triumph of sorts, as observers pointed to the recovery from the fire as necessary in successfully completing the landings. Finally, even such a public failure as Apollo 13 has been interpreted as a success story. Flight Director Eugene Kranz has been erroneously credited with saying during the desperate hours in Houston as NASA engineers worked to bring the crew home alive, that "failure is not an option." While one must give Kranz high marks for never giving up on the possibility of successfully recovering the crew, it is ironic that neither Kranz nor too many others had realized that the mission had already failed, and failed catastrophically.⁴¹

Ever increasing through the early 1960s, a culture of confidence grew up around NASA because of the presumed success of Apollo. The expectation was that every project should succeed. No exceptions.

This, in reality, is so much nostalgia. As the whole record of human and instrumented space-flight reveals, NASA did not operate a failure-free space program during that time. But its image was carefully crafted so as to avoid pejorative aspects of governmental activity. Politicians and pundits also presented the Apollo program as something that was difficult to accomplish. Part of its worthiness was contained in the difficulty that it possessed. Human flights to the Moon seemed incredibly perplexing to a public barely accustomed to rocketry. They even appeared difficult to NASA engineers.⁴²

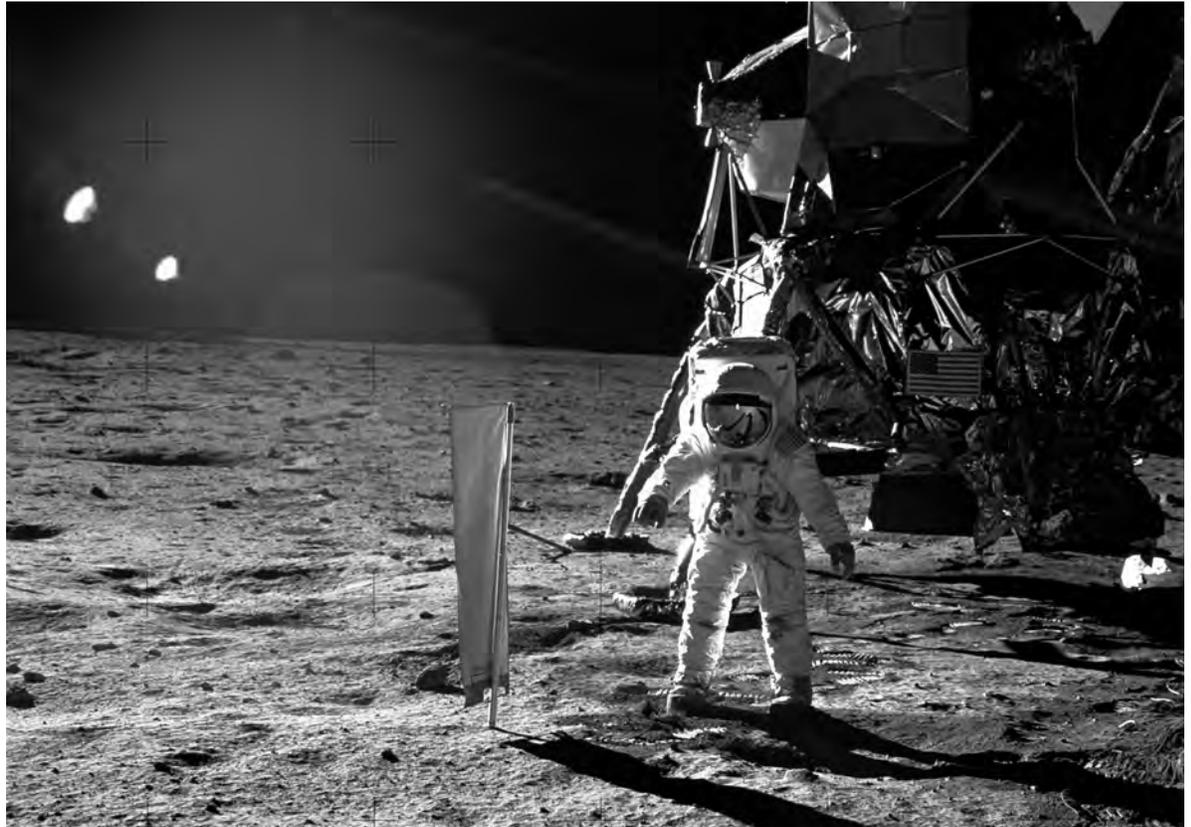
Indeed, if there is one hallmark of the American people, it is their enthusiasm for tech-

nology and what it can help them to accomplish. Historian Perry Miller wrote of the Puritans of New England that they "flung themselves in the technological torrent, how they shouted with glee in the midst of the cataract, and cried to each other as they went headlong down the chute that here was their destiny" as they used technology to transform a wilderness into their "City upon a hill."⁴³ Since that time the U.S. has been known as a nation of technological system builders who could use this ability to create great machines, and the components of their operation, of wonder.

Perceptive foreigners might be enamored with American political and social developments, with democracy and pluralism, but they are more taken with U.S. technology. The United States is not just the nation of George Washington, Thomas Jefferson, Abraham Lincoln, Frederick Douglas, and Elizabeth Cady Stanton, but also of Thomas Edison, Henry Ford, the Tennessee Valley Authority, and the Manhattan Project. These reinforced the belief throughout the world that America was *the* technological giant of the world. Until the loss of *Challenger* and a few other embarrassing missteps, NASA and its accomplishments symbolized more than any other institution America's technological creativity.

That symbolism, misplaced as it might have been all along, accounts more than any other for the difficulties the agency has felt in the recent past. It ensures that NASA can never meet the heightened expectations conjured up by recollections of putting an American on the Moon in 1969, a feat of admittedly astounding technological virtuosity. Every NASA failure raises the question of American technological virtuosity in the world, and questioning of much American capability in so many other areas is already underway that setbacks in this one are all the more damaging to the

Astronaut Edwin E. "Buzz" Aldrin, Jr., lunar module pilot of the first lunar landing mission, is photographed during the Apollo 11 extravehicular activity. On Aldrin's right is the Solar Wind Composition experiment already deployed.



PRESIDENT RICHARD NIXON TOLD AN ASSEMBLED AUDIENCE THAT THE FLIGHT OF APOLLO 11 REPRESENTED THE MOST SIGNIFICANT WEEK IN THE HISTORY OF EARTH SINCE THE CREATION

THE APOLLO PROGRAM HAD NO LOGICAL LEGACY

American persona. American doubts increased with every perceived failure in the space program.⁴⁴

Apollo's Questionable Technological Legacy

Not long after the first lunar landing in July 1969, President Richard Nixon told an assembled audience that the flight of Apollo 11 represented the most significant week in the history of Earth since the creation.⁴⁵ Clearly, at least at that time, the President viewed the endeavor as both path-breaking and permanent, a legacy of accomplishment on which future generations would reflect as they plied intergalactic space and colonized planets throughout the galaxy. Dr. Hans Mark, director of NASA's Ames Research Center during the 1960s, recently voiced a less positive result for Apollo. "President Kennedy's objective was duly accomplished, but we paid a price," he wrote in 1987, "the Apollo program had no logical legacy." Mark suggested that the result of Apollo was essentially a technological dead end for the space program. It did not, in his view, foster an orderly development of spaceflight capabilities beyond the lunar missions.⁴⁶

Nixon's statement was political hyperbole made at the time of the dramatic lunar landing. Both he and the nation as a whole soon largely forgot about Apollo and the space program. Mark's later and more reflective statement revealed the skepticism of a leader in the techno-scientific establishment who was disappointed by the direction of later efforts in space. Somewhere between

these two extremes probably lays a responsible set of conclusions about the Apollo program and its achievements, failures, and effects on later activities.

More to the point, prior to the Mercury, Gemini, and Apollo programs of the 1960s, everyone involved in space advocacy envisioned a future in which humans would venture into space aboard winged, reusable vehicles. That was the vision from Hermann Oberth in the 1920s, through Wernher von Braun in the 1950s, to the U.S. Air Force's X-20 Dyna-Soar program in the early 1960s.⁴⁷

Because of the pressure of the Cold War, NASA chose to abandon that approach to space access in favor of ballistic capsules that could be placed atop launchers developed originally to deliver nuclear warheads to the Soviet Union. NASA developed its ballistic launch and recovery technology at enormous expense and used it with a 100 percent success rate between 1961 and 1975. As soon as Apollo was completed, NASA chose to retire that ballistic technology, despite its genuine serviceability, in favor of a return to that earlier winged, reusable vehicle. The Space Shuttle was the result.⁴⁸

This begs the question, had there not been the crisis of the Cold War and the Apollo commitment that flowed from it, might NASA have pursued reusable space plane concepts as the launcher of choice earlier? Some certainly thought that with the investment made in Apollo technology that it should not have been abandoned. They believed that it was a waste of both money and a fully reli-



Man leaves his mark on the Moon.

ROBERT C. TRUAX, SUGGESTED THAT ABANDONING APOLLO TECHNOLOGY WAS ILL-ADVISED

ONE MIGHT THINK THAT ADAPTATION OF EXISTING TECHNOLOGY WOULD HAVE BEEN ATTRACTIVE

able technology, and that the costs of moving in an entirely different technological direction at the conclusion of Apollo far outweighed the benefits that might accrue. This “minority position” on the Space Shuttle created a scandal in the 1969-1971 period as the debate over Apollo as a technological dead end surfaced for the first time. Iconoclastic aerospace engineer Robert C. Truax, for one, suggested that abandoning Apollo technology was ill-advised. He thought there was no necessity of building a new winged or lifting body vehicle. Instead, the approach taken in Apollo would do just as well and be recoverable in the ocean and reusable. That would cut down development costs drastically, but since splash-downs were “inelegant,” he thought, NASA was committed to a winged spacecraft that “could be an unparalleled money sponge.”⁴⁹

So why did NASA turn away from effective launch vehicle technology in favor of creating a new launch system from scratch? While the timetable of the Apollo project, tied as they were to Cold War public policy concerns, certainly drove NASA to exploit ballistic missile technology, the budget pressures in the post-Apollo era replaced it. Given that the era of virtually unlimited budgets that Congress gave NASA in the 1960s had ended, again one might think that adaptation of existing technology would have been attractive. As things turned out, it took almost a decade between the political announcement to build the shuttle and its first flight, so it ended up costing much more than anticipated for development alone.⁵⁰ In reality, NASA probably would have been better to stay with Saturn launch technology, perhaps emphasizing the Saturn 1B and incrementally improving it.

Conclusion

This discussion represents a beginning in the process of reassessing the Apollo program. Much

remains to be done. A post-modern discussion might well lead to an entirely different perspective on Apollo than the one earlier held. Scholars have been wrestling for some time now with an epistemological questioning of whether or not anything is truly knowable, in other words whether or not there are “facts” in any absolute sense. The fundamental philosophical thrust of recent historical inquiry has led to a blurring of the line between fact and fiction, between history and poetry, between the unrecoverable past and our memory of it. According to Robert F. Berkhofer, the philosophy of history presently in vogue essentially denies factuality. He claims, that the “transmutation of so much—some would say all—of the referential side of history into the presentational and narrative side destroys the effect of overall factual authority claimed for historical productions.”⁵¹

Hayden White, a leader in the linguistic turn in historical analysis, argues that historical writing is not simply noting “facts” in a chronological sequence, since that does not offer any understanding whatsoever. It involves the historian consciously fashioning a story, an “emplotment” in White’s jargon, that achieves coherence only through the decryptions and glossing of the historian.⁵²

All of this activity has raised the specter of the inexact character of historical “truth,” and of its relationship to myth and memory and the reality of an unrecoverable past. “Truths” have differed from time to time and place to place with reckless abandon and enormous variety. Religious, social, ethnic, national, language, and other types of groups over time have held a remarkably diverse set of truths, all internally consistent and rational. Choice between them is present everywhere both in the past and the present; my idea of fact dissolves into your idea of opinion almost as soon as it is articulated. We see this reinforced everywhere about us today, and mostly we shake our heads and misunderstand the versions of truth espoused by various groups about themselves and about those excluded from their fellowship.

Because of this inexact nature of truth—indeed I’m not sure that truth really exists or if it does that it is knowable. Historians play a critical role in this search for truth, and abdication of our responsibility for pursuing the quest by invoking allegiance to some other person or hierarchy is an unacceptable position. It is important for historians to mediate the unrecoverable past with myth and memory to assist the broader community that they serve in ascertaining their place among all the other groups with their own truths. Such activity has always been a part of the historical enterprise, and has helped fundamentally to define the identity of the group in ambiguous situations. Consciousness of a common past, as I stated earlier, is a necessary ingredient in defining an “us” and a “them.” Without this definition process, the group lacks identity. Historians are uniquely skilled in helping with this process, pro-

viding context and coherence that is useful to the group in shaping its identity. They are also properly trained to rectify memory, myth, and the

unrecoverable past into a useful whole. Without them the group would have to invent them. Only time will tell. ■

NOTES

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4. Charles E. Lindblom, "The Science of 'Muddling Through,'" *Public Administration Review* 19 (1959): 79-88.
5. Seymour Hersh, *The Dark Side of Camelot* (Boston: Little, Brown, and Company, 1997), pp. 17, 250-51, 254; Richard Reeves, *President Kennedy: Profile of Power* (New York: Simon and Schuster, 1993), pp. 14-17.
6. Michael Meagher, "In an Atmosphere of National Peril: The Development of John F. Kennedy's Worldview," *Presidential Studies Quarterly*, summer 1997, pp. 475-76. Meagher points out that in his first State of the Union address, Kennedy told Congress that "I speak today in an atmosphere of national peril" (p. 471).
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9. "Annual Message to the Congress on the State of the Union, January 30, 1961," in *ibid.*, pp. 19-28, quote from p. 26.
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12. 1995 interview with Sorenson cited in Fursenko and Naftali, *One Hell of a Gamble*, p. 121.
13. Harvey and Ciccoritti, *U.S.-Soviet Cooperation in Space*, pp. 78-79. A State Department memo covering the two leaders' discussion in Vienna does not mention Khrushchev's fleeting acquiescence, instead focusing on Khrushchev's desire to have progress in disarmament before consenting to a joint lunar landing program. See, 6/4/61 Memcon between JFK and Khrushchev, 6/4/61, Luncheon, Soviet Embassy, Vienna in the Kennedy Presidential Library, Box 126 and the NASA Historical Reference Collection.
14. Public Papers of the Presidents of the United States, John F. Kennedy, 1963, p. 695, cited in Harvey and Ciccoritti, *U.S.-Soviet Cooperation in Space*, p. 123; "Text of President Kennedy's Address on Peace Issues a U.N. General Assembly," *New York Times*, September 21, 1963, p. C6; see Yuri Karash, "The Price of Rivalry in Space," *Baltimore Sun*, July 19, 1994, p. 11A; Dodd Harvey and Linda Ciccoritti, *U.S.-Soviet Cooperation in Space* (Miami, Fla: Center of Advanced International Studies, University of Miami, 1974), pp. 78-79; McDougall, . . . *the Heavens and the Earth*, p. 395.
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"EVERY MAN A TIGER"

The RF-86A Sabre in Tactical Role during the Korean War, 1952-1953



Reconnaissance Operations



John H. Mahan

(Overleaf) The RF-86A at rest.

The work of a reconnaissance pilot lacks much of the personal glamour that is attached to the fighter pilot. His enthusiasm must be maintained by the knowledge that the information he obtains is not only of great value but is also being put to full use.

—CONAC Aircrew Training Handbook

The surprise North Korean invasion of South Korea, on June 25, 1950, caught the United States Air Force off guard and woefully unprepared to fight a conventional air war. Although World War II clearly illustrated the value of aerial reconnaissance in successfully executing an air campaign, the inevitable draw down and financial cuts after that war severely hindered the development of aerial reconnaissance weapons systems in the new jet age. However, tactical reconnaissance, the oldest and most basic mission of military aviation, would prove to be even more vital to the United Nations Command (UNC) forces in the Korean War than in any previous conflict.

In an attempt to improve the photographic results of daylight tactical reconnaissance combat operations and increase the survivability of its aircraft, the 15th Tactical Reconnaissance Squadron (15th TRS) in Korea devised a series of field modifications to the legendary North American F-86 Sabrejet fighter to create a tactical reconnaissance version of the aircraft—the RF-86. This article will evaluate the effectiveness of the RF-86A Sabre in tactical reconnaissance combat operations during the Korean War, 1952-1953. Although conversions to RF-86A configuration in the Korean War never numbered more than seven aircraft, the incredible survivability of the aircraft allowed the 15th TRS to operate it with disproportionately greater success than any other type of USAF reconnaissance aircraft in Korea. The RF-86A provided the UN forces valuable photographic and visual intelligence at extremely low cost to the 15th TRS.

The tactical reconnaissance mission originated early in World War I, when unarmed aircraft of both sides ranged over the battlefields of Europe performing a variety of seemingly simple tasks, including visual observation of the front lines and artillery and naval gunfire adjustment. Throughout World War I, the interwar years, and World War II, more sophisticated forms of tactical aerial reconnaissance, such as photographic, weather, electronic, and contact reconnaissance, evolved from, but did not replace, these basic missions.¹ During the Korean War, photographic reconnaissance “provide[d] the bulk of the intelligence on which day to day operations [were] planned,”² it is as a collector of intelligence, “in a potentially high threat environment,”³ that tactical reconnaissance,

especially photographic, becomes useful to a theater commander. The scarcity of highly skilled Air Force photo interpreters in Korea constituted the largest single post-flight hindrance to providing “near or real time”⁴ and relevant intelligence to requesting agencies, usually units of the U.S. Eighth Army. However, the tactical intelligence gleaned by photo interpreters could provide great insight into enemy intentions, enemy status and activity at designated targets, threats (such as, targets of opportunity, topography, movements of troops and supplies, and construction efforts), and targeting and bomb damage assessment (BDA).⁵ Such intelligence permitted the Eighth Army and the Fifth Air Force to remain at least one step ahead of the Communist ground and air forces in Korea, which greatly outnumbered the UN forces. In the interim, however, obtaining good photographic results and returning home with valuable photographic cargo remained a problem for the understrength and underequipped USAF tactical reconnaissance units in Korea.

In the summer of 1950, the Far East Air Forces (FEAF)—of which the Fifth Air Force was the largest subordinate unit—possessed only one daylight tactical reconnaissance squadron, the 8th TRS, based at Yokota Air Base, Japan, and flying Lockheed RF-80As, the unarmed camera-equipped version of the Shooting Star fighter. By July 9, 1950, the 8th TRS had relocated to Itazuke Air Base, in southern Japan, where its RF-80As had the range to fly photographic reconnaissance missions for Fifth Air Force and the Eighth Army. However, the photographic negatives of the 8th TRS had to be ferried back to Yakota and the photo interpreters of the 548th Reconnaissance Technical Squadron, a process that in bad weather might take a week to accomplish.⁶ For the requesting UN units facing the relentless North Korean advance, this was unacceptable. Fifth Air Force required a dedicated tactical reconnaissance wing for photographic reconnaissance to be effective organizationally, comprising day and night visual and photographic reconnaissance squadrons and its own local reconnaissance technical squadron for timely photo interpretation and reproduction.

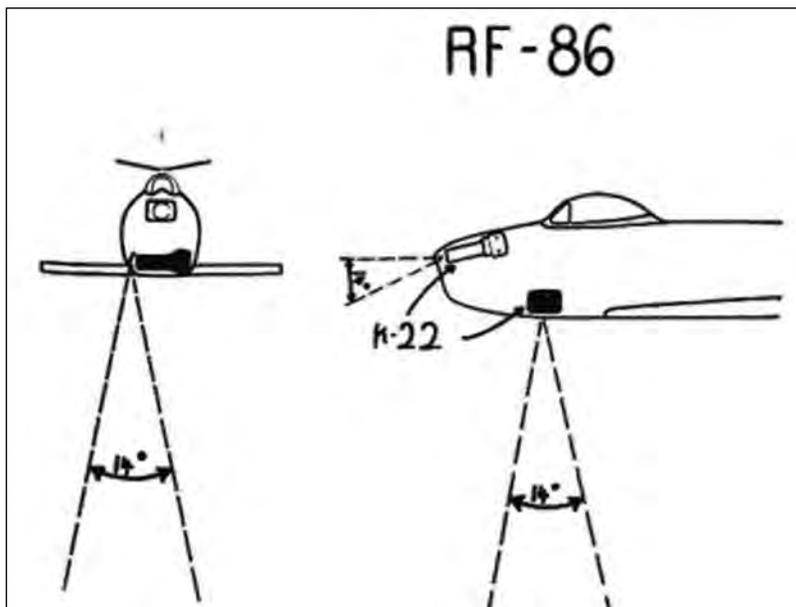
On February 25, 1951, Lt. Gen. George E. Stratemyer, commander of FEAF, activated the 67th Tactical Reconnaissance Wing (67th TRW), under the command of Colonel Karl F. “Pop” Polifka. During World War II, Colonel Polifka had pioneered new aerial reconnaissance tactics, such as dicing—low level photography with forward-facing oblique cameras—which would become even more vital in the Korean War when reconnaissance aircraft of the 67th TRW needed to photograph Chinese airfields across the Yalu River in

THE 15TH TRS IN KOREA DEVISED MODIFICATIONS TO THE LEGENDARY NORTH AMERICAN F-86 SABREJET FIGHTER TO CREATE THE RF-86

IN THE SUMMER OF 1950, FEAF POSSESSED ONLY ONE DAYLIGHT TACTICAL RECONNAISSANCE SQUADRON

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RF-86



(Above) Drawing of the camera arrangement of the RF-86A.

(Above right) An RF-86A. Note the bulged fairing just forward of the wing root and the mirror attached to the K-22 camera.

THE RF-80As, MANUFACTURED IN 1945, INITIALLY PROVED MORE THAN ADEQUATE

Manchuria without entering Chinese airspace. In the 67th TRW, the 8th TRS was renamed the 15th TRS, PJ (Photo Jet), nicknamed the "Cottonpickers." The squadron's strength at this time was twenty-seven RF-80As. In mid-1951, the wing moved to Kimpo Air Base, South Korea, bringing together FEAF's tactical reconnaissance and reconnaissance technical squadrons for the first time.

Since FEAF had easily gained and maintained air superiority over Korea early in the war, the RF-80As, manufactured in 1945, initially proved more than adequate in the photographic reconnaissance role. To convert the Shooting Star from an interceptor to a reconnaissance aircraft, technicians removed all six .50 caliber machine guns from the nose and enlarged the nose so that cameras and film magazines could be fitted. The RF-80A enjoyed great versatility, since its nose camera bay could accommodate thirty-nine different camera installations, but the standard installation was one K-38, 24" or 36" focal length, vertical camera, and one K-22, 12" focal length camera, employed either for vertical, side oblique, or dicing photography.⁷ It could outperform every type of Communist piston-engine fighter with ease during the first six months of the war, and set a high standard for aerial photographic quality.

THE SWEEP-WING MIG-15 HAD A 200-MILE PER HOUR SPEED ADVANTAGE OVER THE STRAIGHT-WING RF-80A

However, the advent of the Soviet Union's MiG-15 jet fighter into the Communist air forces and the rapid Communist buildup of anti-aircraft artillery (AAA) in the spring of 1951 painfully illustrated the shortcomings of the aging RF-80A. According to volume 1 of FEAF's *Report on the Korean War*:

*The Korean War indicated the reconnaissance aircraft and its associated equipment has lagged in development behind the bomber and fighter... The development of reconnaissance aircraft and high quality recording equipment must keep pace with other weapons systems if we are to employ airpower effectively.*⁸



The swept-wing MiG-15 had a 200-mile per hour speed advantage over the straight-wing RF-80A. To overcome the limitations of camera equipment designed for the speeds of conventional piston-engine aircraft, RF-80A pilots had to maintain a constant and relatively slow airspeed, heading, and altitude on the photography run to the target. Although survival depended upon possessing greater speed, maneuverability, and altitude than enemy interceptors, the RF-80A did not possess altitude and speed advantages over the MiG,⁹ and so "photography was accomplished in upper MiG country [the area of North Korean north and west of Sinanju to the Yalu River, known as "MiG Alley"] only under heavy F-86 escort."¹⁰ When a MiG-15 attacked a single reconnaissance aircraft, the American pilots could generally use their higher skill and proficiency and the superior maneuverability of the RF-80A to break into the attack, turn inside the MiG to avoid its field of fire, and return to Kimpo on the deck over the sea where the MiG's fuel consumption was too high and where there was no flak.¹¹

Throughout the second half of 1951 and early 1952, MiGs appeared in increasing numbers over North Korea and generally showed great aggressiveness in attacking FEAF tactical reconnaissance aircraft. The Communists suffered heavy losses to the Sabre escorts, but unescorted RF-80A losses mounted as well. Although the MiGs shot down only one RF-80A under escort, escorted reconnaissance missions diverted large numbers of F-86s (twelve to eighteen to escort one RF-80A¹²) from fighter sweeps or bomber escort missions.

What the 15th TRS urgently needed in mid-1951 was a tactical reconnaissance aircraft able to meet or exceed the performance of the MiG-15 and fly combat missions without escort. The USAF intended to reequip the squadron as soon as possible with the Republic RF-84F Thunderstreak, a new swept-wing version of the F-84 Thunderjet fighter and designed from the ground up as a tactical reconnaissance platform. The RF-84F possessed the speed and altitude capability to hold its own against the MiG-15, but for various reasons, including production delays, and despite repeated promises to the 67th TRW, the USAF was unable to deliver any RF-84Fs to the 15th TRS during the Korean War.¹³

(Near right) Forward oblique camera installation, looking forward and down from above cockpit.

(Far right) The installation of the K-22, 36-inch focal length vertical camera.



THREE RECONNAISSANCE PILOTS SOUGHT TO OBTAIN FROM FEAF A CAMERA-EQUIPPED VERSION OF THE F-86

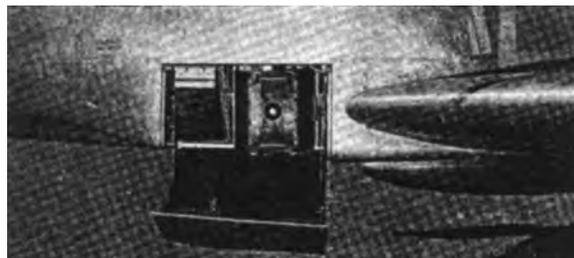
USAF PILOTS HAD PROVED THAT THE MODERN F-86 COULD OUTFIGHT THE MIG-15 IN VIRTUALLY ALL SCENARIOS

KNOWN AS PROJECT HONEYBUCKET, THE TWO NEWLY-DESIGNATED RF-86AS IMMEDIATELY BEGAN OPERATIONS

At Kimpo, three reconnaissance pilots of the 15th TRS, Maj. Bruce B. Fish, Maj. Ruffin W. Gray, and Capt. Joe Daley sought to obtain from FEAF a camera-equipped version of the F-86. In hundreds of air combats, USAF pilots had proved that the modern F-86 could outfight the MiG-15 in virtually all scenarios. Fish, Gray, and Daley thus conceived the RF-86 as a higher-performance daylight tactical reconnaissance fighter to serve as a stopgap in the Korean War until the dedicated reconnaissance aircraft—the RF-84F—could reach the 15th TRS. The airmen's primary consideration for pursuing such a project was the superior penetration ability of the F-86 over the RF-80A into MiG Alley. FEAF, however, did not initially grant the three officers their wish.

To demonstrate an improvised camera installation on the F-86 to FEAF, Fish, Gray, and Daley visited the 4th Fighter-Interceptor Wing (4th FIW), equipped with F-86Es, based on the other side of the airfield at Kimpo. They obtained the nose section of an abandoned F-86A, in which they mounted a small focal length, high-speed K-25 camera, mounted horizontally and shooting through a forty-five degree angled mirror down through an optical glass camera port. There was considerably less space in the RF-86 nose bay than in that of the RF-80A, so this installation necessitated the removal of the two lower 0.50 caliber machine guns on the right side of the fuselage.¹⁴

In October 1951, Col. Edwin S. "Chick" Chickering, the new commander of the 67th TRW, persuaded Far East Materiel Command (FEAMCOM) to modify two war-weary F-86As at Tachikawa Air Base, Japan, to the specifications of Fish, Gray, and Daley. Known as Project Honeybucket, the two newly-designated RF-86As immediately began operations with the 15th TRS. Captain Daley flew the first RF-86A combat photographic mission on December 8, 1951 against Namsi and Taechon air-



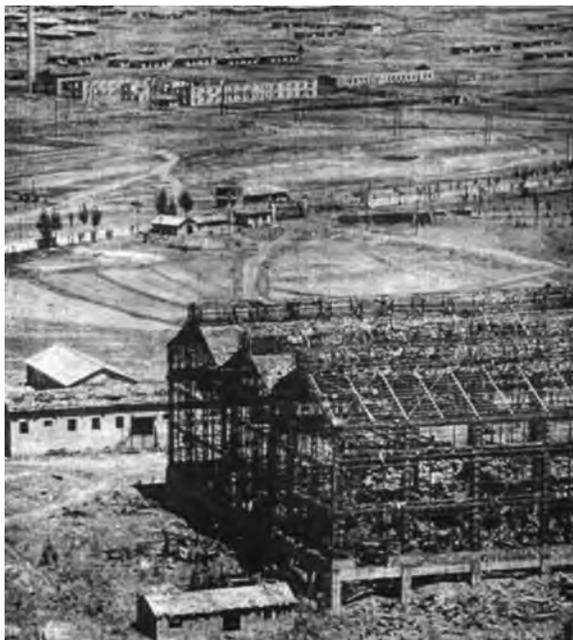
fields at 6,000 feet AGL, the altitude for the proper photography scale of the K-25 camera. Although aircraft vibration blurred the photographic results of the K-25, the RF-86A pilots soon established the precedent of flying combat missions in formation with regular 4th FIW Sabres on fighter sweeps and parking their aircraft—which were painted in the colors of the 4th FIW—across the airfield with the fighter squadron, to conceal their true nature from the Communists.¹⁵ A Honeybucket aircraft would serve as one of the flight leads, drop out of the formation to make its photography run, and "hightail it" back to Kimpo, while the 4th FIW's fighters hunted MiGs.¹⁶

When Gen. Hoyt S. Vandenberg, USAF Chief of Staff, took personal interest in Project Honeybucket, FEAMCOM, Air Materiel Command (AMC), and North American Aviation Co. collaborated to take the RF-86A field modification to a new level. Project Ashtray numbered six aircraft, each fitted with an enlarged and constant temperature air-conditioned camera compartment enclosing a forward-facing oblique twenty-four-inch K-22 camera for dicing photography and two twenty-inch K-24 split vertical cameras. Each Ashtray aircraft differed as to armament. Some retained either two or four .50 caliber machine guns (sans gunsight, making them fairly useless in aerial combat), while the others had all six guns removed and the gun ports sealed over.¹⁷ The Cottonpickers, however, painted false gun ports on their aircraft to further the deception that these were ordinary Sabres. AMC and North American also upgraded the two Honeybucket aircraft to Ashtray configurations, which could be distinguished from 4th FIW Sabres by a bulged fairing on the underside of the fuselage, accommodating the enlarged camera installation.

Obtaining photographic quality comparable to that of the RF-80A with the RF-86A was a tall order. The 15th TRS had no choice but to rely on its operational experience with the Sabre to determine its effectiveness as a tactical reconnaissance platform. The dicing camera on the Ashtray RF-86As yielded excellent results during high-speed low-altitude photographic passes, due to the K-22's high shutter and film recycling speeds, and especially when the 15th TRS later fitted the K-22 with a thirty-six-inch lens cone. The vertical installation proved unsatisfactory because the limited space in the RF-86A's nose bay necessitated horizontal mounting of the cameras, and so all photographs were taken through mirrors. Since mirror image photography is worthless to photo-

(Near right) Photograph taken with the K-22 camera, forward oblique, at an altitude of 300 feet, and 500 knots indicated air speed.

(Far right) An airborne RF-86 (F-model).



THE VIBRATION OF THE AIRCRAFT IN FLIGHT CAUSED THE IMAGE TO BLUR BETWEEN THE MIRROR AND THE CAMERA

interpreters, the film had to be turned over during development and printing, resulting in a loss of quality which, coupled with the Communists' mastery of camouflage, could potentially cripple the intelligence effort.¹⁸ Additionally, the vibration of the aircraft in flight caused the image to blur between the mirror and the camera, "since each [was] mounted on different members of the aircraft...[and] vibrating to a different degree."¹⁹ Based on the input of the RF-86A pilots and the 67th TRW's photo interpreters, AMC and North American sent personnel to Kimpo who subsequently modified five of the six Ashtray aircraft by replacing the split vertical K-24s with one thirty-six-inch K-22 and mounting the mirror directly to the camera.

THE RF-86A ILLUSTRATES NOT ONLY THE AIRCRAFT'S ABILITY TO PENETRATE THE DEFENSES IN MIG ALLEY BUT ALSO THE OVERARCHING LIMITATIONS AND DANGERS OF THE AIR WAR IN KOREA

The operational record of the RF-86A illustrates not only the aircraft's ability to penetrate the defenses in MiG Alley (its paramount function), take photographs, and avoid MiG-15s at will, but also the overarching limitations and dangers of the air war in Korea. While anxiously awaiting delivery of the RF-84F, the 15th TRS ruefully reported that the "entire [Ashtray] project is a matter of expediency. It is felt that the final result can be considered only a temporary and partial solution of the problem."²⁰ The vertical camera installation never achieved photographic results up to RF-80A standards, even after the direct mounting of the mirror to the camera, because the shutter speed was too slow to compensate for the RF-86A's ground speed. It was not until the arrival of the RF-86F (known as Project Haymaker), which was factory-equipped with a pair of vertically mounted K-22s, in the spring of 1953 (very near the end of the war), that satisfactory vertical photographic results could be achieved.

For pilots used to flying the relatively slow RF-80A, flying the unfamiliar and much faster RF-86A into combat for the first time was a clash between survival and obtaining good photographic



results. On his first mission in the RF-86A, on June 27, 1952, Lt. Co. Jack P. Williams, commander of the 15th TRS, was shot down and killed by North Korean small arms fire during a dicing run on the Chosen hydroelectric plant. According to Colonel Williams' wingman, Capt. Clyde K. Voss, Williams had not taken advantage of the RF-86A's speed:

Entering the mission area I repeatedly had to tell him to increase his speed over the target area. He then took the lead in a single low level pass [approximately 500 feet AGL] over the dam. But he was still too slow and accurate North Korean ground fire set his aircraft afire.²¹

The RF-86A did allow for the relatively easy penetration of MiG Alley, and beyond, to 15th TRS pilots whose only previous experience in that area of Korea, with the RF-80A, was extreme frustration at being outclassed by the MiG-15—although at low altitudes, flak remained a serious threat.

For some reason, USAF determined that, for dicing photography, "there is only a small requirement...only amount[ing] to approximately three percent of our assigned missions."²² However, the USAF underestimated the high speed and range of the RF-86A and its ability to project another long arm of FEAF air power. Dicing missions were the primary way to pinpoint Communist targets on both sides of the Yalu, such as Namei, Taechon, Antung, and Uiju. Dicing provided UN intelligence with

a wealth of information about the number and movement of aircraft, revetted areas, runway lengths, etc. One set of dicing photographs showed a flight of MiGs from the beginning of take off roll to its completion, and provided positive answers to the long debated question of the amount of runway required for take off.²³

RF-86As did not always remain on the Korean side of the Yalu to take dicing photographs. Sometimes it became necessary for the Cottonpickers to cross the river into Chinese airspace. One day in the summer of 1952 at Kimpo, a returning 4th FIW pilot reported Soviet IL-28 bombers on the airfield at Antung, which could mean "only one thing—an offensive strike at the airfields in South Korea, possibly followed by a ground offensive. The whole wing, and probably the rest of South Korea, was immediately put on alert and contingency plans made." According to Captain Bill Coffey:

(Right) Two photographs taken with the K-22 camera, from an altitude of 19,000 feet. The photo at near right is of poorer quality.



THE LEGACY OF THE RF-86A SABRE IS ONE OF INNOVATION, TRIAL AND ERROR, AND GREAT TACTICAL POTENTIAL

THE GREATEST LEGACY OF THE COTTONPICKERS' EXPERIENCE IN KOREA WAS THEIR CONTRIBUTION TO THE EVENTUAL SUCCESS OF EVERY SUBSEQUENT TACTICAL RECONNAISSANCE AIRCRAFT

In the meantime Captain [Richard E.] Chandler launched in one of the RF-86s for a looksee at Antung. As I recall we sat on that hot runway for a long time waiting to hear from him. Anyway, Chandler crossed the Yalu on the deck, flew to Antung, and went straight down the runway shooting dicing pictures all the way. The pictures were great! MiG-15s lined up tip-to-tip, with very surprised communist ground crews in, on, and around the MiGs—all looking at this lone American Sabre coming straight down the main runway!

The 4th FIW pilot had mistaken the MiG-15s for IL-28s, and after determining that the Communists were not planning another offensive, the uproar gradually died down.²⁴

Although Colonel Williams was the only combat loss among the Cottonpickers, several other RF-86A aircraft suffered moderate to heavy battle damage from ground fire, usually on dicing missions. As a result, the 15th TRS could only claim to have one or two operational RF-86As at any given time, since most Sabre units sent their damaged aircraft to FEAMCOM in Japan for repairs. Three other RF-86As, piloted by 1st Lts. Mirt D. Humphreys, William C. Aney, and Sidney W. Jones, crashed at Kimpo, due to fuel exhaustion, engine failure, and hydraulic pump failure, respectively. None of these accidents, which all occurred in

1952, were fatal to the pilot (although one crash in 1953 of an RF-86F killed its pilot and several bystanders at Kimpo), and none of the circumstances that resulted in RF-86A accidents were unique to that particular type of aircraft.²⁵

The legacy of the RF-86A Sabre is one of innovation, trial and error, and the eventual realization of great tactical potential. When the RF-84F finally entered service in 1954, the three RF-86As still in USAF service went to Air National Guard units. One later crashed, and the other two were scrapped at Davis-Monthan Air Force Base, Arizona, in 1958. However, “the few RF-86As available in mid-1952 in effect weathered the Korean conflict without the help of the production-delayed RF-84,”²⁶ and provided a serious morale boost to the overworked and underappreciated Cottonpickers. RF-86Fs of the 15th TRS went on to conduct “several dozen” photographic reconnaissance missions over the Soviet Union and China from 1954 to 1957 on the direct orders of President Dwight D. Eisenhower.²⁷ Perhaps the greatest legacy of the Cottonpickers’ experience in Korea was their contribution to the eventual success of the RF-84F and every subsequent tactical reconnaissance aircraft, by revealing that this force “must, because of the nature of the mission, be technologically superior to perhaps any other mission performed in a fighter-type aircraft.”²⁸ ■

(Right) A pair of RF-86As.



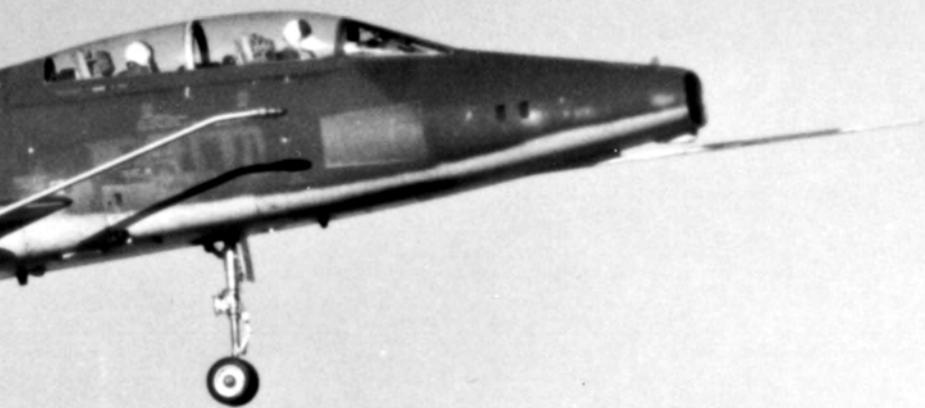


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Misty FACs of the Vietnam War





Phil Haun



ne of the most successful tactical innovations of the Vietnam War was the introduction of the F-100 Super Sabre to perform the new mission of “Fast FAC” (Forward Air Control). Under the call sign of “Misty,” F-100F pilots interdicted equipment and supplies flowing into South Vietnam. Their story is important because it provides key insights into how the Air Force flies, fights, and adapts during combat.

This article reviews the early years of the Vietnam War and how the need for Fast FACs evolved. Prior to the spring of 1967, the USAF tasked O-1 and O-2 FACs to conduct visual reconnaissance missions over the southern area of North Vietnam. In response, the North Vietnamese deployed additional air defenses, driving the slow and vulnerable propeller-driven aircraft back across the border. Operation Commando Sabre was the first test of the Fast FAC concept. Jet aircraft would perform FAC duties, adapting the two-seat version of the F-100 Super Sabre to the visual reconnaissance and strike control mission. This article also highlights the build-up and operations over the Misty FACs three-year history until the unit’s dissolution in May 1970. Commando Sabre operations never consisted of more than twenty-two pilots at any given time and rarely involved more than six single-ship missions per day. Yet, they succeeded in finding and destroying targets where other methods had failed. This success came at a price, though, as the low altitude Misty FAC missions proved to be among the most dangerous missions flown in the Vietnam War. Nonetheless, the tactics developed by the Misty FACs—including visual reconnaissance, strike control, and search and rescue operations—formed the foundation for FAC and Killer Scout operations employed during Operations Desert Storm and Allied Force, and remain valid today.

Vietnam: The Interdiction Campaign

Prior to August 1964, the U.S. military presence in South Vietnam was limited to an advisory role. However, instability within the South Vietnamese government led President Lyndon Johnson to question Saigon’s ability to withstand the increasing threat from North Vietnam.¹ In the

wake of the Gulf of Tonkin incident of August 2, 1964, Johnson’s position shifted towards more aggressive and offensive measures, leading ultimately to the commencement of the Rolling Thunder air campaign in March 1965.

Johnson’s primary goal for Rolling Thunder was to demonstrate the resolve of the United States, believing that a series of graduated air strikes on North Vietnam would compel Hanoi to withdraw support from the Viet Cong in South Vietnam.² A secondary goal was to improve morale and help stabilize the South Vietnamese government. Additionally, the air strikes were to limit the flow of reinforcements, weapons, and supplies to the Viet Cong.³

While Rolling Thunder was an offensive campaign, target selection was limited by the President to those approved during his Tuesday Rose Garden luncheons. This fell well short of the strategic air campaign proposed by the Air Staff, consisting of over ninety-four strategic targets. These limited air strikes alone, however, did not achieve Johnson’s objectives and, by July 1965, he concluded that victory in Vietnam required a protracted campaign with more emphasis on military action in South Vietnam.⁴

As the Johnson administration shifted its emphasis toward ground operations and increased U.S. troop strength, the importance of close air support and the interdiction of supplies from North Vietnam to the Viet Cong in the south was likewise elevated.⁵ Under the direction of Military Assistance Command, Vietnam (MACV) Commander, Gen. William C. Westmoreland, the U.S. Army concentrated on direct military action in South Vietnam against Viet Cong and North Vietnamese regular forces. Restricted to South Vietnam, these ground operations relied heavily on close air support.⁶ While the Air Force provided CAS within South Vietnam, it was also responsible for conducting the Rolling Thunder strikes in the North, including interdiction missions.

The North Vietnamese logistics and transportation system was centered in Hanoi. Chinese supplies flowed into Hanoi along roads and the rail system leading north, while Soviet supplies reached Hanoi via ships through Haiphong Harbor. These were then moved along rail and major

F-100F
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An F-100F rests in a shelter.



THE HO CHI MINH TRAIL, [A] NETWORK OF THOUSANDS OF MILES OF REDUNDANT ROADS, CONCEALED NORTH VIETNAMESE TRUCKS UNDER A DENSE TRIPLE CANOPY FOREST

THE AERIAL INTERDICTION CAMPAIGN FOCUSED ON FOUR AREAS

road routes toward the South and transferred to smaller convoys, that maneuvered along a series of redundant roads and trails. The supplies were further dispersed as they approached the demilitarized zone (DMZ) and carried by truck, bicycle, or packed on foot along trails at night. The North Vietnamese also moved supplies through the Laos panhandle and into Cambodia to more easily access Viet Cong positions in central and southern South Vietnam. Known as the Ho Chi Minh Trail, this network of thousands of miles of redundant roads concealed North Vietnamese trucks under a dense triple canopy forest.⁷

The aerial interdiction campaign focused on four areas: on the Rolling Thunder air campaign in North Vietnam in Route Packages IV, V and VI; on the area in southern North Vietnam near the DMZ in route Package I; on the Ho Chi Minh Trail in southern Laos; and on trails within South Vietnam.⁸

The most lucrative targets were those found at the head of the transportation system around Hanoi.⁹ These included railheads, major bridges, and repair and support facilities for the entire logistics systems. However, many of these targets were within the restricted and prohibited zones imposed by the Johnson administration around Hanoi and Haiphong Harbor and were thus off limits to attack for much of the war.¹⁰

Interdiction near the DMZ and along the Ho Chi Minh Trail proved more difficult.¹¹ Bombing the roads was ineffective due to the redundancy of road systems and the relative ease with which the roads were repaired.¹² For interdiction to be effective, convoys had to be attacked directly. Target identification was further complicated as the North Vietnamese adapted to traveling at night and in poor weather, while camouflaging their positions during the day.

The interdiction campaign in South Vietnam, Laos, and near the DMZ in North Vietnam instead relied heavily on airborne FACs for target identification and strike control. Three types of aircraft

were used for these missions: slow moving, propeller-driven aircraft; armed transport aircraft; and jet fighters.

The 19th Tactical Air Support Squadron (TASS) began deploying 22 Cessna O-1 Bird Dogs and 44 FAC pilots in June 1963, in support of the South Vietnamese Air Force.¹³ By January 1965, the number of FAC pilots in Southeast Asia had grown to 144. An additional three TASSs were activated in March; by December, 224 FACs were in country.¹⁴ With continued high demand for these airborne FACs their number swelled to 668 by October 1968, operating more than 324 O-1 and O-2A Super Skymaster aircraft in 5 TASSs.¹⁴ In 1968 alone, these aircraft flew more than one-third of the total U.S. combat time in Vietnam, averaging over 29,000 flying hours a month.¹⁵

The single-engine O-1's slow speed proved both an advantage and a disadvantage. The advantage lay in its slow speed and extended loiter capability, that allowed controllers ample time to observe enemy positions and control strikes. By June 1965, General Westmoreland divided South Vietnam into sectors that could be patrolled by the O-1 on a daily basis and all major ground units had assigned FACs.¹⁶ Although always in high demand for CAS and visual reconnaissance missions, the O-1 had its limitations. Its slow speed delayed its response time, once alerted, it had limited target marking and night flying capability, and it was susceptible to enemy ground fire. The introduction of the two-engine O-2 in 1966 somewhat improved speed, target marking and night capability, but did little to enhance survivability.¹⁷ The introduction of the OV-10 Bronco in 1968 brought in more firepower but, while the OV-10 was less susceptible to small arms fire, it was still vulnerable to larger antiaircraft artillery (AAA) and surface-to-air missiles (SAMs).¹⁸

To increase tactical air's ability to support the U.S. Army at night, the Air Force introduced the first gunships to South Vietnam in 1965. The AC-47 Spooky was a C-47 fitted with either three

A Cessna O-1A Birdog used by Forward Air Controllers.



GEN. MOMYER, APPROVED A TEST PROGRAM TO PLACE FACs INTO THE REAR SEAT OF FIGHTER AIRCRAFT

six-barrel, 7.62 mm Gatling Guns or ten side-firing 30-caliber machine guns. The AC-47 had a long loiter time, could accurately fire from above 3,000 feet, and had flare dispensers. Spooky's potential was soon realized during CAS missions and its role expanded to include strike and flare missions along the Ho Chi Minh trail.¹⁹ The success of the AC-47 led to the introduction of the AC-119K and to the development of the AC-130 by 1967. With an improved fire control system, increased firepower, and sensors for better night capability, the AC-130 proved to be the best platform for destroying trucks of the war.²⁰

LENGTHY OPERATIONS AT LOW ALTITUDE AND OVER HEAVILY DEFENDED TERRITORY MADE THE MISTY FAC MISSION EXTREMELY DANGEROUS.

By spring 1967, the success of U.S. military activity in South Vietnam, Laos, and North Vietnam convinced Communist states that the North Vietnamese needed additional support. The Soviets stepped up shipments of SAMs, AAA, and small arms, making the O-1 and O-2 FAC and AC-130 operations along the Ho Chi Minh Trail and DMZ considerably more dangerous.²¹

Operation Commando Sabre and Misty FAC Operations in 1967

The influx of antiaircraft weapons into Route Package I and the Laos panhandle significantly increased the risk to U.S. FACs by May 1967. In response to the loss of two O-1s to SA-2 surface-to-air missiles, Seventh Air Force Commander, Lt. Gen. William W. Momyer, approved a test program to place FACs into the rear seat of fighter aircraft.²² Their higher speed allowed fighters to operate in the high threat areas deemed too dangerous for the slow O-1s and O-2s. Codenamed Operation Commando Sabre, the initial test selected the F-100F, the two-seat version of the North American F-100 Super Sabre, to fly single-ship missions in the Route I and Tally Ho areas of the southern panhandle of North Vietnam.²³

Under the call sign "Misty," the FACs mission

was to "impede the enemy logistic flow within and through Route Package One/Tally Ho to the maximum extent possible."²⁴ They were also to "suppress enemy defenses as practicable to maintain a permissive environment for strike reconnaissance and FAC operations."²⁵

On June 28, the Commando Sabre mission was assigned to Detachment 1 of the 416th Tactical Fighter Squadron (TFS), 37th Tactical Fighter Wing (TFW), stationed at Phu Cat AB, South Vietnam.²⁶ The 37th TFW consisted of two squadrons of F-100s.²⁷ Commando Sabre came with neither aircraft nor maintenance, relying instead on the 37th TFW to supply both.

Commando Sabre operations initially consisted of 16 to 18 pilots and a dedicated intelligence officer.²⁸ The pilots, including a commander and operations officer, were drawn primarily from the 37th TFW, with other F-100 units in Vietnam providing extra pilots on a temporary duty basis.²⁹ Initially, four FACs from the 504th Tactical Air Support Group were also included to instruct the F-100 pilots in FAC techniques.³⁰ The checkout program consisted of on-the-job training in the rear cockpit with an experienced Misty FAC in the front. The FAC would also demonstrate visual reconnaissance, strike control and battle damage assessment techniques.³¹

The lengthy operations at low altitude and over heavily defended territory made the Misty FAC mission extremely dangerous. Pilots were, therefore, solicited on a volunteer basis to perform the duty for 120 days or 60 missions, whichever came first.³² All F-100 pilots selected for Misty had combat experience in Close Air Support missions in South Vietnam. Some also had prior FAC experience.

By the beginning of July, Commando Sabre Operations were scheduling two sorties a day, with a single air refueling per sortie.³³ Initially unopposed, Misty FACs began encountering small arms

The O-2A Super Skymaster helped meet the demand for FACs.



MISTY FAC MISSIONS HAD A LOSS RATE MORE THAN THREE TIMES HIGHER THAN THE WING'S OTHER F-100s

and AAA fire on July 5, after which enemy ground fire became common.³⁴ Through July and August, the Misty FACs continued to refine their tactics and sharpened their skills at visual reconnaissance and air strike control. They located truck parks, bridges, and air defense sites. In July alone, Misty FACs flew 82 missions and directed 126 strikes.³⁵ Although Misty FACs could locate and mark the targets, the inability of fighters to drop unguided bombs for direct hits on such hardened targets as AAA pieces reduced the overall extent of battle damage.

The first setback for the Misty FACs occurred on August 26, when Misty commander Major George "Bud" Day and Captain Corwin M. Kippenhan were conducting visual reconnaissance of an active SAM site twenty miles north of the DMZ. They were forced to eject when their F-100F was hit by 37mm flak.³⁶ While Kippenhan was rescued, Day was eventually captured.³⁷ From July 1967 to October 1968, Misty FACs flew 1,498 sorties over Tally Ho and Route Package I, losing 9 aircraft for a loss rate of 6.01 per thousand sorties.³⁸ Of the 18 pilots who ejected, 12 were rescued, 3 were captured, and 3 were listed as Missing in Action.³⁹ From November 1968 to May 1970, interdiction operations shifted to Laos, for which Misty FACs flew a total of 3,072 sorties, losing 11 aircraft for a loss rate of 3.58.⁴⁰ Of the 22 pilots who ejected, 18 were rescued and 4 were listed as Missing in Action.⁴¹ Misty FAC missions had a loss rate more than three times higher than the wing's other F-100s, which conducted CAS and strike missions.⁴²

The Tet Offensive and Misty FAC Operations in 1968

On January 30, 1968, the North Vietnamese commenced a conventional ground offensive into Vietnam during the traditional Vietnamese holiday

of Tet.⁴³ U.S. air efforts focused throughout January and February on close air support in South Vietnam.⁴⁴ The elevated consumption rate of supplies incurred by the offensive forced the North Vietnamese to increase the number and size of their truck convoys. Though the northeast monsoon season severely hampered Misty interdiction efforts in January and February, March ushered in clearer skies and a higher interdiction success rate. On the single most successful Misty FAC mission, "The Great Truck Massacre" of March 20, Misty FACs located and controlled strikes on a large truck convoy, damaging or destroying some 79 trucks.⁴⁵

Misty FACs' detailed knowledge of the terrain and North Vietnamese defenses in Route Package I and Tally Ho proved invaluable, not only for FAC operations, but for rescue efforts as well. Misty FACs assisted in many successful Search and Rescue (SAR) operations, locating the position of downed aircrew and suppressing enemy ground fire for rescue helicopters.⁴⁶ The versatility of the Misty FACs was further demonstrated in May and July when they began spotting for naval gun fire on fixed positions in Route Package I.⁴⁷

The capability of the Misty FAC to locate and strike trucks did not go unnoticed by the North Vietnamese. By June 1968, Tally Ho and Route Package I were free of daylight enemy truck traffic.⁴⁸ On June 12-13, Misty FACs conducted two night sorties to test the F-100F for night visual reconnaissance. The results were positive and Seventh Air Force gave immediate approval for night operations in Route Package I. While Misty FACs flew 46 night sorties in July and August, regularly scheduled night missions were discontinued on August 21.⁴⁹ Continual difficulties in marking targets and conducting attacks, coupled with the risk of mid-air collision, plagued night strike control. Night sorties were then irregularly scheduled until completely halted in October.⁵⁰

MISTY FACs
CONTINUED
FLYING
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UNTIL
PRESIDENT
JOHNSON ...
PROHIBIT[ED]
BOMBING IN
NORTH
VIETNAM

THE FAST
FAC MISSION
WAS INTRO-
DUCED INTO
THE VIETNAM
WAR TO FILL
A VOID FOR
VISUAL
RECONNAIS-
SANCE

The success of Misty FAC operations was somewhat offset by the limited number of F-100F airframes available and the plans to remove the jets from Vietnam by 1970. In response, Seventh Air Force turned to another multi-role fighter to augment and eventually replace the F-100F. The first F-4s to join the Fast FAC mission were those of the 366th TFW at DaNang Air Base. Misty FACs flew F-4 pilots in the back seat of F-100Fs on upgrade and area orientation sorties. Select Misty FAC pilots also went to DaNang to fly with the F-4 "Stormy" FACs to complete their checkout.⁵¹

Another initiative, introduced in August 1968, was the Sun Valley Test, a hunter-killer concept capitalizing on the F-100 strikers already collocated with Operation Commando Sabre at Phu Cat.⁵² The F-100 strikers carried a full load of bombs and flew at medium altitude, trailing several miles behind a faster and more maneuverable Misty FAC on visual reconnaissance at low altitude. Once targets were located, the F-100 strikers were already in position for a quick attack. While the concept showed great potential, the loss of two Misty aircraft compelled the Seventh Air Force to direct a review of operations. It was concluded that the North Vietnamese restriction on daylight movement had been forcing Misty FACs to increase their exposure time in locating targets. Seventh Air Force, therefore, imposed restrictions to reduce exposure time, which temporarily halted hunter-killer operations and reduced the overall effectiveness of Misty FACs in locating valid targets.⁵³

November 1968 Bombing Halt and Misty FAC Operations in Laos in 1969

Misty FACs continued flying missions into Tally Ho and Route Package I until President Johnson issued the Executive Order of November 1, 1968, prohibiting bombing in North Vietnam.⁵⁴ Attacks were then shifted into Laos, redirecting the Misty FAC mission to visual reconnaissance of the southern areas of Steel Tiger in the Laotian panhandle. The decreased AAA threat in Laos further allowed Misty FACs to perform visual reconnaissance at lower altitude and to reintroduce hunter-killer tactics.⁵⁵

February 1969 brought the additional task of photo reconnaissance to the mission. While Misty FACs had been using 35mm high-speed cameras in the rear cockpit to photograph potential target areas for some time, Operation Search formalized a working arrangement between Misty and the 460th Tactical Reconnaissance Wing.⁵⁶ This was a four-month long effort to familiarize RF-4C crews with Misty FAC tactics.⁵⁷

During this period the 37th TFW at Phu Cat converted from the F-100 to the F-4. In May, Misty FAC operations deployed with the 416th TFS to Tuy Hoa Air Base where F-100 operations continued with the 31st TFW.⁵⁸ Misty's area of responsibility expanded in August from the southern areas of the Laotian panhandle to include the entire Steel Tiger region.⁵⁹ However, the number of daily mis-

sions scheduled was reduced from seven to five at the behest of the 31st TFW, which was in need of additional F-100F airframes to train incoming F-100 pilots.⁶⁰ In response to the overall lower experience level of the 31st TFW F-100 pilots, the Misty FACs were forced to reevaluate their own manning and training program. Roughly half of the pilots they began receiving were inexperienced. The inexperienced pilots flew with Misty FAC instructors and completed a FAC upgrade program prior even to becoming flight leads.⁶¹

In October 1969, the number of daily missions scheduled was further reduced from five to four and a theater-wide shortage of tanker support cut back the length of each mission.⁶² Misty FAC time on station was reduced from ten hours a day, based on a six sortie schedule, to just under three and one-half hours with the four sortie schedule. A combination of good weather, increased ground activity, and the arrival of three replacement F-100Fs in early 1970 returned the daily schedule to six missions, but the lack of tanker support continued to limit on-station times.⁶³

The loss of two aircraft on January 18 and 19, along with 8 hits on aircraft in just 19 days, brought about a change of tactics for Misty operations. Whereas visual reconnaissance had been conducted at altitudes as low as treetop level, Seventh Air Force raised the altitude to 4,500 feet Above Ground Level (AGL) and confined strafing to the support of rescue missions only.⁶⁴ This greatly reduced the ability to visually acquire targets and forced Misty FACs to rely more heavily on photographs shot by the back seater.

The additional loss of an aircraft in late March and heavy battle damage of aircraft in late April and early May compelled Seventh Air Force to review the entire Commando Sabre program. Given the limited number of available F-100F airframes and experienced pilots, Misty FAC operations were discontinued. The Commando Sabre Operation was officially terminated on May 14, 1970.⁶⁵ Although the F-100F was no longer used, the F-4 continued flying Fast FAC missions through the end of the Vietnam War.

Legacy of the Misty FACs

The Fast FAC mission was introduced into the Vietnam War to fill a void for visual reconnaissance and strike control over areas of North Vietnam and Laos too heavily defended for the O-1 and O-2 FACs. The fact that the Misty FACs conducted these missions for three years and that the Fast FAC mission expanded to the F-4 indicates that Air Force leaders in Southeast Asia considered the mission as successful. Twenty years later over the Persian Gulf, A-10 FACs and F-16 "Killer Scouts" continued the Misty tradition locating and destroying mobile targets. Likewise, over Kosovo A-10 and F-16 FACs used Misty tactics to attack the Serbian 3d Army.

The Misty FACs were a brave and courageous group of men who developed effective tactics to

directly attack mobile targets over heavily defended territory. As important as their contributions were to tactical aviation has been the lasting influence on aviation and the U.S. Air Force. The 155 men who flew as Misty FACs produced several

general officers including two Air Force Chiefs of Staff, Gens. Merrill A. "Tony" McPeak and Ronald "Ron" Fogleman. They also include a medal of honor winner Colonel "Bud" Day, and the first man to fly non-stop around the world, Dick Rutan. ■

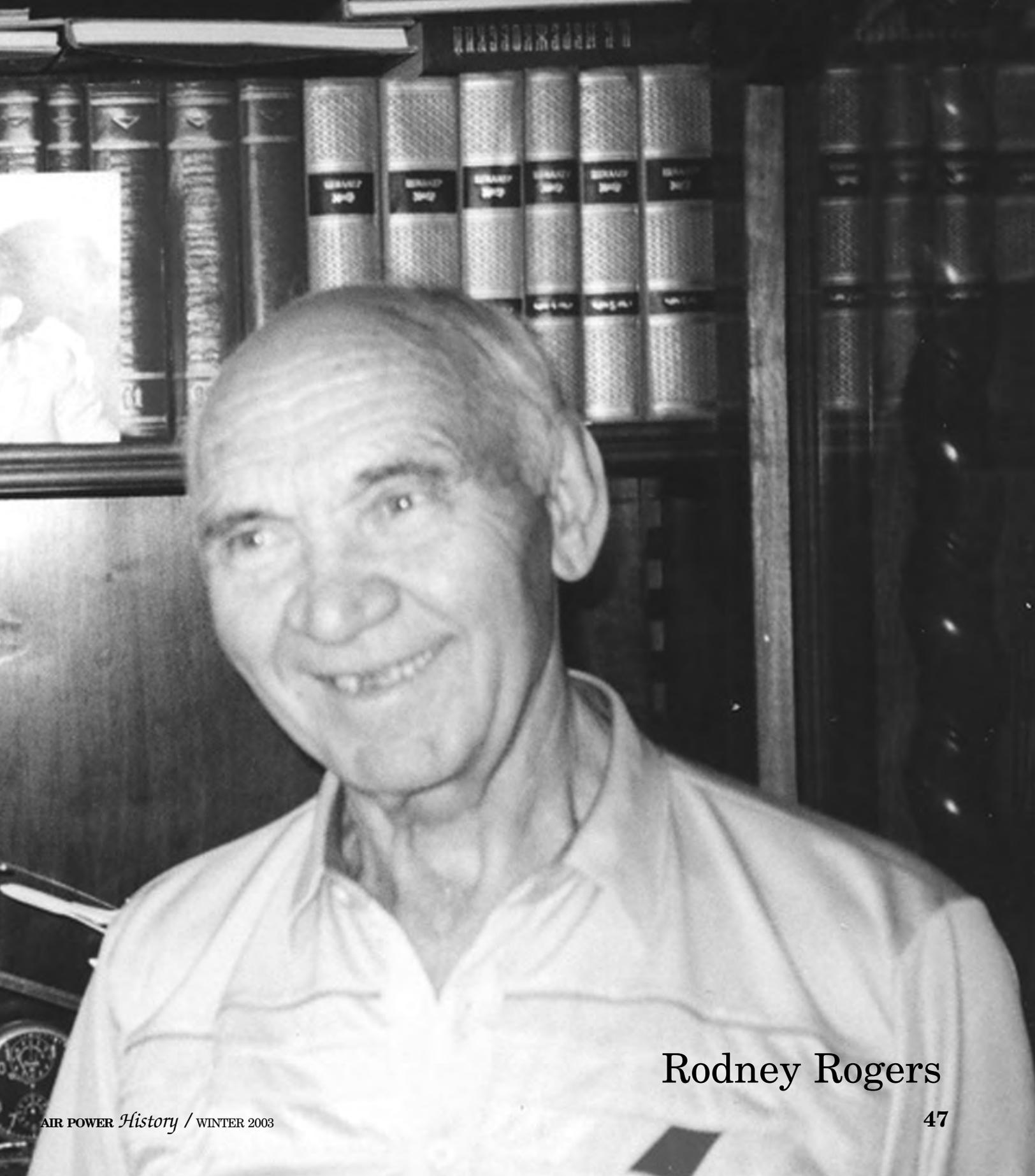
NOTES

1. Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: The Free Press, 1989), p. 60.
2. *Ibid.*
3. *Ibid.*
4. *Ibid.*, p. 71. Johnson accepted Secretary of Defense Robert McNamara's proposals, following a McNamara fact finding trip in July 1965.
5. *Ibid.*, p. 70. Johnson increased U.S. troop strength to 82,000 in late April 1965 and in July further approved an increase to 175,000. John Schlight, *The War in South Vietnam: The Years of the Offensive, 1965-1968* (Washington, D.C.: Office of Air Force History, 1988), p. 33.
6. Schlight, p. 42.
7. Eduard M. Mark, *Aerial Interdiction: Air Power and the Land Battle in Three American Wars-A Historical Analysis* (Washington, D.C.: Office of Air Force History, 1994), p. 331.
8. William W. Momyer, *Air Power in Three Wars: WW II, Korea, Vietnam* (Washington, D.C.: Office of Air Force History, reprint, 1985), p. 174.
9. *Ibid.*
10. *Ibid.*, p. 184.
11. Gary Lester, *Mosquitoes to Wolves: The Evolution of the Airborne Forward Air Controller* (Maxwell AFB, Ala.: Air University Press, 1997), pp. 151-57. Interdiction in southern Laos included operations Steel Tiger, Tiger Hound, Cricket, and Commando Hunt I-VII. Momyer, p. 217. Interdiction in Route Package I was known as Tally Ho.
12. Mark, p. 335.
13. Lester, p. 110.
14. *Ibid.*, p. 114.
15. *Ibid.*, p. 117.
16. *Ibid.*, p. 121.
17. *Ibid.*, p. 111.
18. *Ibid.*, p. 133.
19. Schlight, p. 91.
20. *Ibid.*, p. 237; Mark, p. 336; and Momyer, p. 211.
21. Lester, p. 129; Momyer, p. 217.
22. Ralph Rowley, *The Air Force in Southeast Asia. FAC Operations 1965-1970*, (Washington, D.C.: Office of Air Force History, 1973), p. 173.
23. The F-100F was the two-seat variation of the single seat F-100C multi-role fighter-bomber. It was originally designed for use in initial F-100 training and for upgrade and orientation sorties. Operation Commando Sabre continually competed for the use of F-100Fs against the required upgrade sorties for newly arrived F-100C pilots.
24. Lester, p.170.
25. Extract, 7th AF OPOD (Draft) 504-67, June 28, 1967. Contained in History of Commando Sabre Operation July-September 1968, AFHRA K-WG-37 HI, document 1.
26. Rowley, p. 173.
27. 37th TFW History Jan-Mar 1968, vol. I, 17. In February, 1968 the wing expanded to three squadrons with the arrival of the 355th TFS.
28. The total number of pilots fluctuated over the three-year period, sometimes rising to as many as 22 or dropping to as low as 14, depending on the daily flying schedule. The schedule, in turn, was dependent on the number of F-100Fs available.
29. History of 37th TFW, Jul-Sep 67, 416th Detachment
- 1 Operation Commando Sabre Roster.
30. Rowley, p. 173.
31. Dick Durant, "Dick Durant's Observations," in *Misty: First Person Stories of the F-100 Misty Fast FACs in the Vietnam War*, (Austin, Tex.: The Misty FAC Foundation, 2002), Don Shepperd (ed.), p. 246. The Misty upgrade program consisted of five missions in the back seat, followed by additional missions in the front seat with a Misty instructor pilot in back. Checkout varied but, following the initial five backseat missions, pilots alternated between front and back seats for an additional 5-15 missions in training status until fully checked out.
32. Interview, author with Maj. Gen. Donald Shepperd, USAF (Ret.); History of 37th TFW Jul-September 1967, memo from Lt. Col. Donald Jones to Col. Edwin Schneider. These limits would later be extended, as evidenced by Capt. Dick Rutan being hit on his 104th mission after flying as a Misty from January 30-August 17, 1968. History of Commando Sabre Operation July-September 1968, History of 37th TFW, Jul-Sep 68, vol. II, p. 93.
33. History of 37th TFW, Jul-Sep 67, p. 20.
34. Rowley, p. 179.
35. *Ibid.*
36. History of 37th TFW, Jul-Sep 67, p. 23.
37. Major Day would eventually receive the Medal of Honor for his evasion efforts and conduct as a POW.
38. *Summary of F-100 & F-4 Losses in the FAC/VR Role July 1967-July 1970*, p. 7.
39. *Ibid.*, table D2.
40. *Ibid.*, p. 7.
41. *Ibid.*, table D2.
42. History of 37th TFW, Jan-Mar 69, volume II, p. 21.
43. Schlight, p. 282.
44. Momyer, p. 319.
45. History of 37th TFW, Jan-Mar 68, p. 21.
46. History of 37th TFW, Jan-Mar 68, pp. 24-5.
47. History of 37th TFW, Jul-Sep 68, p. 25.
48. History of 37th TFW, Apr-Jun 68, p. 21.
49. Rowley, p. 181.
50. *Ibid.*, p. 182.
51. History of Commando Sabre Operations, Jul-Sep 68, p. 40.
52. *Ibid.*, p. 41.
53. *Ibid.*, p. 17.
54. *Ibid.*, p. viii.
55. History of Commando Sabre Operations Oct-Dec 1968, p. 11.
56. History of Commando Sabre Operations, Jan-Mar 69, p. 10.
57. History of Commando Sabre Operations, Apr-Jun 69, p. 16.
58. History of 37th TFW, Apr-Jun 69, p. 15.
59. History of Commando Sabre Operations, Jul-Sep 69, vii.
60. *Ibid.*, p. 9.
61. *Ibid.*, p. 5.
62. History of Commando Sabre Operations, Oct-Dec 69, p. 9.
63. History of Commando Sabre Operations, Jan-Mar 70, p. 8.
64. *Ibid.*, p. 12.
65. History of Commando Sabre Operations, Apr-Jun 70, p. 13.

A HERO OF THE



SOVIET UNION



Rodney Rogers

(Overleaf) Georgi K. Mosolov in the study of his Moscow apartment. Background pictures (right to left) show Mosolov with his young son; Charles M. Duke on earth's moon; and Mosolov with Yuri Gagarin.

**ABOUT 5' 9"
TALL WITH
GRAY HAIR
AND A
RECEDING
HAIRLINE, HE
IS DRESSED
IN A NON-
DESCRIPT
SHORT-
SLEEVED
SHIRT**

**HE WAS
ONCE A PRO-
FESSIONAL
PILOT ... NOT
AN AIRLINE
PILOT, BUT A
TEST PILOT**

It is mid-June 2002, and my wife Shirley Waterhouse and I are about to complete a six-hour Russian train journey from Saint Petersburg to Moscow. When the train comes to a stop in Leningrad Station, we allow our six-person compartment to empty, then lift our seat tops and retrieve the stored single suitcases we allow ourselves during extended leisure travel. Soon we are walking down the concrete walkway toward the station. Shirley is pulling her backpack on rollers; mine is on my back. It is after ten o'clock in the evening, but Moscow is far north, and the sun has not yet set. The long express train was sold out. The walkway overflows with passengers crowded shoulder to shoulder.

Shirley and I are seasoned independent travelers. As academics, we have large blocks of unstructured time in the summer, and often travel in Europe for period varying from three to six weeks. By avoiding travel in high season, we almost never have to book accommodations before arriving at a destination. This trip, however, has been different. We speak no Russian, and are only gradually becoming familiar with the Cyrillic alphabet. Very few Russians understand English; fewer still have any interest in speaking it with Americans. Thus we were frustrated in Saint Petersburg by normally routine transactions. Bargaining for inexpensive accommodations; buying groceries or tickets; reading street signs during our daily hours-long walks; determining which direction train to take in a metro station: these and similar activities have been troublesome and time-consuming to complete. Consequently, before leaving Saint Petersburg we booked a five-day home stay in Moscow with an English-speaking host.

We know nothing about our host Georgi beyond his name, his Moscow address and telephone number, and the fact that presumably he will meet us at the head of the train with a sign displaying my last name. We hope he will be there, because our backup plan takes us by taxi to a relatively inexpensive hotel near the Kremlin, and our Lonely Planet travel guide has cautioned us about taxi travel from Russian train stations and airports. As we approach the engine, I see an elderly man holding a folded cardboard sign. About 5' 9" tall with gray hair and a receding hairline, he is dressed in a non-descript short-sleeved shirt and drab trousers. He looks very fit for his age, which we later learn is seventy-six, and it is easy to see that he was handsome when young. I walk over to him, gently unfold the sign, and recognize my

name. After brief introductions, we make our way to the car park. On the way, we note that our host walks with a limp, and that his bent and scarred left forearm implies a one-time serious fracture.

On the way to Georgi's apartment in his twelve-year-old automobile, Shirley and I become acquainted with our host. He is very friendly and seems to have a genuine love of life. Outgoing, modest, courteous, gentle—almost courtier-like—he makes one feel comfortable immediately. His English, halting but adequate for everyday conversation, is self-taught; his German, he assures us without vanity, is much better. Georgi's wife Galina currently is residing at their country cottage, so only the three of us will be staying at the Moscow apartment. We are not the first Americans to stay in their home. Georgi tells us he hosts English-speaking tourists because he enjoys the cultural interchange, because it affords him an opportunity to practice his English, and because it enables him to supplement his income. His behavior during our stay will confirm the sincerity of the first two sentiments, but ultimately we will understand that money is not an unimportant issue in his decision to allow tourists into his home.

We arrive at Georgi's apartment, a third-floor five-room flat in a high rise building on the Moscow River Embankment. Directly across from Gorky Park, it turns out to be a pleasant twenty-five minute river walk from Red Square and the Kremlin. We have learned that Georgi is retired. Asked about his profession, he hesitantly reveals that he was once a professional pilot. Shirley and I find this information intriguing, since we are both faculty members at Embry-Riddle Aeronautical University in Daytona Beach, Florida. Shirley is currently Director of Educational Technology for the university. I teach subjects such as aerodynamics, aircraft performance, and upset recovery to students who for the most part anticipate careers as airline pilots. Moreover, as a young man I flew U. S. Navy jets off aircraft carriers. I ask Georgi if he was an airline pilot, and after some urging, he says no, not an airline pilot, but a test pilot. I tell him I too was once a pilot, then—because his answers are reluctant—let the matter drop. Later I will discover that his reluctance simply masks modesty.

Inside Georgi's apartment, we settle our belongings into a drab combination living room/den with a sofa bed, then share with our host—who provides tea—a small meal of bread and cheese we carried onto the train but did not eat.

Rodney O. Rogers holds the Ph.D. degree in Computer Science from the University of Central Florida, and in English and American Literature from the University of Virginia. In a long and varied academic career, he has published book reviews, poems, and both technical and literary articles. As a young man, he flew single place jet airplanes for the United States Navy on active duty and in the reserves, accumulating 247 carrier landings and 2,500 total flight hours, including 1,500 in the F8 Crusader and 500 in the A4 Skyhawk. He also qualified as plane commander in the S2 Tracker multi-engine propeller-driven aircraft. Currently Dr. Rogers is a faculty member at Embry-Riddle Aeronautical University in Daytona Beach, Florida, where he teaches academic courses for pilots in Aerodynamics, Aircraft Performance, and Upset Recovery.

Georgi K. Mosolov in his pressure suit.



I AM IN THE APARTMENT OF GEORGI MOSOLOV, CHIEF TEST PILOT FOR THE MIG

ALTHOUGH A RETIRED SOVIET AIR FORCE OFFICER, GEORGI WAS A CIVILIAN PILOT WHEN HE FLEW FOR MIG

Leaving the kitchen, I glance into Georgi's disarrayed study and glimpse a myriad of aviation memorabilia: models of jet fighter and transport aircraft; aviation pictures and citations; what appear to be military medals; and similar paraphernalia. The next day, I cannot resist asking him to give me a tour of the room. Once inside, what I see overwhelms me. Here is a picture of Georgi in 1960 sitting on the immediate right of Leonid Breshnev, then head of the Soviet Communist party, and shortly to displace Nikita Khrushchev as the most powerful man in Russia. Of the ten men in the picture, Georgi is one of only two to whom Breshnev has just presented the Soviet Gold Star, a medal which designates its recipient a *Hero of the Soviet Union*. The Gold Star is the highest Soviet award, comparable apparently to the U.S. Medal of Honor. There is also a picture of Georgi with Yuri Gagarin, the first cosmonaut, about ten years Georgi's junior; Gagarin's left arm is wrapped around the shoulders of his mentor and close friend. Beside the Gagarin picture is a shot of Apollo 16 on the moon, autographed by Charles M. Duke, Jr.: "To Georgi Mosolov: A salute to a famous pilot from Apollo 16. God bless you. Charlie Duke 7/15/92." Nearby on the wall are three citations the Fédération Aéronautique Internationale presented to Georgi between October 1959 and July 1962. Working my way haltingly through their French language inscriptions, I realize two are for airplane world speed records, and one for an airplane world altitude record. I examine a six-inch high stack of aviation magazines containing articles about Georgi written in German, Russian, Polish, and other eastern-bloc languages. Several feature his picture on their covers.

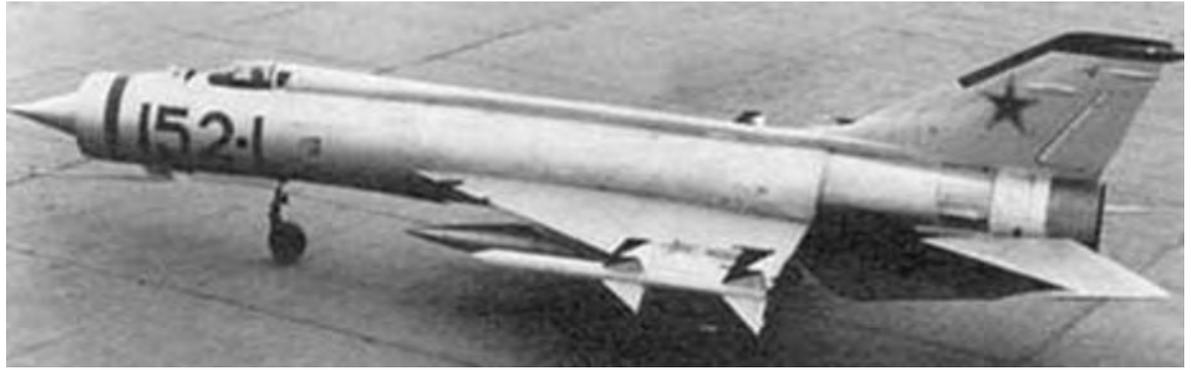
Gradually the meaning of what I am seeing becomes clear to me. I am in the apartment of Georgi Mosolov, chief test pilot for the Mikoyan and Gurevich (MiG) Aircraft Manufacturing Com-

pany before he stopped flying in 1964. Although a retired Soviet Air Force officer, Georgi was a civilian pilot when he flew for MiG. Military test pilots fly an airplane only after its prototypes have been thoroughly evaluated by the manufacturer's test pilots and certified for production. Georgi, by contrast, flew the earliest versions of Soviet aircraft such as the MiG-19 and MiG-21, aircraft which—when they appeared—embodied the finest fighter technology in the world. As a U.S. Navy pilot flying the Chance-Vought F8 Crusader, between 1962 and 1964 I sat in squadron ready rooms aboard aircraft carriers operating in the Mediterranean Sea and listened to Air Intelligence Officers explain what little was known about the operating capabilities of such top-line secret Soviet MiG fighters. Now, almost an old man myself, I am standing next to a somewhat older man who was the first person in the world ever to fly these airplanes. The Mediterranean was where I first fell in love with Europe. Flying fast airplanes was an integral part of that heady romance. I feel as if a line has stretched back to a mooring in my youth, connecting me once again with experiences from which, all these long years, I have been slowly and silently drifting away.

Jet fighter pilots in general are cocky bastards who are almost as good at what they do as they think they are, or who die finding out otherwise. Assertive in the extreme if not actually aggressive, they hate being wrong and hate admitting it even more. And they do not display emotion easily, particularly not vulnerability. As an academic, perhaps I am not entirely typical, but I am not standard deviations away from the norm either. Shirley will tell you—sometimes you need not even ask—that my ego is not underdeveloped. At the moment, however, I feel entirely humbled in Georgi's presence. Here is a man who has accomplished what most pilots can scarcely allow themselves to dream of doing. In the course of the next five days, I will ransack Georgi's brain about his aviation career. Once he accepts that we are somehow brothers in what we both consider an exclusive fraternity of jet fighter pilots, his innate modesty abates and he allows himself to talk rather freely about his flying experiences. Every story he tells enralls me.

Beginnings

Georgi K. Mosolov, born in the Ukraine, turned eighteen in 1944 and enlisted in the Soviet army. World War II in Europe ended in Spring 1945, and Georgi did not see combat as a Soviet soldier. His father did, however, and died in brutal fighting on the German front. The family never learned the date, location, or exact circumstances of his death. Americans tend not to be aware of the monumental loss of Russian lives during World War II. Historians currently place the number variously at between 25 and 40 million, not all of them combat losses, of course. Georgi insists politely that more than 50 million Russians met their fates dur-



HE WAS CHOSEN IN 1955 TO MAKE THE INITIAL FLIGHT OF THE COMPANY'S TOP SECRET PROTOTYPE JET FIGHTER ... KNOWN ALMOST UNIVERSALLY AS THE MiG-21

ing that period. Together with the estimated 20 million killed during the Stalin purges and forced famines, the total number of dead between the mid-1930s and 1953, when Stalin himself died, amounts to about half of the current population of Russia, and significantly more than half of every-one living today in European Russia.

Georgi had already started learning to fly as a civilian before he joined the army. After the war, still in uniform, he matriculated as an army student aviator. Upon receiving his wings, he became a Soviet Army flight instructor. Ultimately the Soviet Air Force separated from the army, even as the Army Air Corps in the United States became the United States Air Force in 1947. Georgi rose to the rank of Soviet Air Force colonel. In the early fifties he married Galina; they celebrated their fiftieth wedding anniversary on November 7, 2002. Back in the states, we will learn from an American couple who met Galina in Russia that at one time she was a close friend of Nikita Khrushchev's wife. Georgi and Galina's son and only child was born in October 1955. A diplomat in Japan in the Soviet years, he is now a consultant to American business interests in Russia. By this time, Georgi was already working for MiG and had become the company's top test pilot, as evidenced by the fact that he was chosen in 1955 to make the initial flight of the company's top secret prototype jet fighter E-66—known almost universally as the MiG-21, one of the most famous airplanes ever built. In 1959, after five and one-half years of evening study at Moscow University of Aviation, Georgi received his engineering degree.

When Sputnik went up in 1957, the race to the space age between the USSR and the United States flooded the American public's consciousness. As has been well documented, Russia outstripped the United States in aerospace technology in the late fifties and early sixties. Airplane top speed and maximum altitude became two of a number of focal points of competition between the two superpowers. In his time, Georgi Mosolov held world records in both categories.

High Speed Flight

The Mach number of an airplane tells its relationship to the speed of sound in air. For example, at Mach 1.5, the airspeed is one and one-half times

the speed of sound. An airplane's G force is defined as the lift in pounds produced by the wings divided by the weight of the aircraft. Informally, it is a measure of the force a pilot feels against his seat due to his own body mass. In straight and level flight, an aircraft is subject to +1.0 G and the pilot feels his normal weight exerted against the seat. In turning flight however, especially at high bank angles, or in vertical maneuvers such as loops, significant additional lift is required, and the pilot is pressed down in his seat with a force equal to his own weight multiplied by the G force being developed. At +6.0 Gs, for example, a 25,000 pound airplane is developing lift equal to six times its weight, or 150,000 pounds of lift; its 200 pound pilot will be pushed down into his seat with a force of 1200 pounds. High positive Gs tend to drain blood from the brain into the lower body, ultimately precipitating unconsciousness, called "black-out." At less than +1.0, a pilot exerts less than his own weight on the seat. A G force of less than 0.0 indicates that the wings are developing negative or "downward" lift, and that the pilot's weight is acting away from his seat toward his head. When negative G forces become strong enough, pooling of blood in the brain occurs, causing a visual impairment known as "red-out," and possibly permanent ocular damage.

Achieving a supersonic fighter's top speed is a straightforward maneuver. Climb the aircraft to somewhere around 50,000 feet, and at a speed just below Mach 1 initiate a one-half G pushover maneuver at maximum thrust. This maneuver feels like a rapid fall in an elevator; its purpose is to decrease the lift and associated drag developed by the airplane, allowing it quickly to transit the transonic flight region between Mach 1.0 and Mach 1.3, where shock waves developing on the airframe severely impede acceleration. A shallow dive angle of about twenty-five degrees is required. Gently round out the descent around 36,000 feet, because this altitude—where the air temperature stops decreasing—is most propitious for achieving an airplane's maximum Mach number. It remains simply to wait patiently until the airspeed no longer increases, a time typically around five minutes. During this period of supersonic flight, aircraft sounds are left behind and the pilot is encapsulated in a cocoon of near-silence. Unless clouds or other aircraft are nearby, there is little physical

sense of motion, though instruments may indicate a ground speed of twenty miles per minute or more.

On October 31, 1959, in the month I began flying Navy airplanes in Pensacola, Florida, Georgi Mosolov piloted the MiG-21 to a world speed record of 2,388 kilometers per hour (1,484 miles per hour). Then on July 7, 1962, he set a second world speed record in an E-166 MiG prototype fighter, averaging 2,681 kilometers per hour (1,666 miles per hour) over a two-way course. The plane reached a ground speed in excess of 3,000 kilometers per hour (1,864 miles per hour) during one of the transits. To better appreciate the significance of these numbers, consider that 1,666 miles per hour airspeed—assuming standard atmospheric temperature and pressure—is equivalent to Mach 2.52 at the tropopause, or more than two and one-half times the speed of sound. By contrast, the top speed in 1962 of the Navy's fastest operational fighter, the F8 Crusader, was Mach 1.9, or about 1,255 miles per hour. The E-166 Soviet fighter thus was one-third faster than its best U.S. Navy competitor. Today the E-166 Georgi flew resides in a Soviet aviation museum outside Moscow, displayed together with his picture.

High Altitude Flight

Flying jet fighters is not an occupation for individuals averse to risk taking. United States military aviators receive incentive pay, usually called *flight pay*; its official name is *hazardous duty pay*. When I was flying from aircraft carriers, a six-month peacetime cruise in the Mediterranean would typically result in two or three deaths in a group of about 125 aviators. Five to ten deaths were not unheard of. Naturally, in combat the risks increase monumentally, as is well documented by U.S. pilot losses during the Vietnam War. However, assuming no malfunction occurs, achieving high supersonic speeds in a jet fighter is not a hazardous maneuver. The same cannot be said for the maneuver a pilot uses to reach an airplane's maximum altitude, in part because humans cannot live in a very high altitude environment without sophisticated artificial life support systems. To provide a context for discussing Georgi Mosolov's world-record altitude flight, permit me to recount my own limited experiences with high altitude aviation.

Standard air pressure at 40,000 feet is 20% of sea level pressure; at 50,000 feet, the figure drops to 11%; at 70,000 feet, it is only 4%. As a consequence, military jet aviators wear oxygen masks from the ground up, because fighter cockpit pressurization systems—unlike the systems in airliners, which rarely venture above 40,000 feet—provide insufficient oxygen at high altitude to sustain human life. At 35,000 feet altitude, without supplemental oxygen unconsciousness occurs in about a minute, and brain death in about five. Up to about 50,000 feet, breathing 100% oxygen alone suffices to protect a pilot against harm in the event

of cabin pressurization failure. Above that altitude, the human body is increasingly incapable of tolerating the extremely low air pressures encountered in the atmosphere even when adequate oxygen is provided for breathing. For this reason, pilots likely to encounter very high altitudes wear full-body pressure suits to protect them in case cabin pressure is lost. Playfully termed *Cadillac suits* by the Cold War naval aviators who wore them—each cost, we were assured, the same as a new Cadillac automobile—these olive-drab suits are essentially a camouflaged version of the familiar silver-white space suits worn by Apollo and Space Shuttle astronauts. Such a suit supplies breathing oxygen to a pilot at very high altitudes when cabin pressurization is operating normally. In addition, should the cabin pressure drop, the Cadillac suit inflates rigidly with 100% pressurized oxygen to provide the pilot a closely contained life-support environment. The ensuing lack of cockpit mobility is a fair tradeoff for a service without which a pilot would quickly die.

I have in my hand—part of cherished memorabilia from my days as a Navy pilot—a card dated February 21, 1962, when I received physiology training in preparation for a high altitude flight in the F8 Crusader. Signed by P. W. Scrimshaw, the senior flight surgeon at Naval Air Station Cecil Field in Jacksonville, Florida, the card attests that on that day *Lt. Rodney O. Rogers became a member of U.S. Navy SPACE (Society of Pioneering Astronauts & Celestial Explorers)*. I was presented this card after ascending to a simulated altitude of 70,000 feet in a low-pressure chamber, an experience I vividly remember. My pressure suit is fully inflated, affording me the approximate mobility of someone in a body cast. On a table in front of me stands a small beaker of water, bubbling violently. So low is the air pressure at 70,000 feet that water boils even at the very low temperature created when air is evacuated from the chamber. Earlier that morning, the training instructor had reminded me that the human body by weight is more than half water.

To reach a jet airplane's maximum altitude, accelerate to maximum speed at the tropopause in straight and level flight, as in a speed run. Now gently raise the nose about forty-five degrees above the horizon and, converting airspeed into altitude, wait until the aircraft runs out of kinetic energy and stops ascending. As speed decreases, the nose of the aircraft should gradually fall through to the horizon, at which point a descent from the achieved maximum altitude will begin. As you have been briefed, there are hazards to be anticipated. First, at very high altitudes the air is so thin that your airplane will not respond to control surface movements. You will be able to move the control stick full deflection in any direction without experiencing the expected changes in pitch or bank angle. In particular, you lack the ability to lower the nose of your aircraft and terminate your climbing attitude. Rather, you must simply hope that the tail of the aircraft will follow

MILITARY AVIATORS RECEIVE INCENTIVE PAY, USUALLY CALLED FLIGHT PAY; ITS OFFICIAL NAME IS HAZARDOUS DUTY PAY

AS SPEED DECREASES, THE NOSE OF THE AIRCRAFT SHOULD GRADUALLY FALL THROUGH TO THE HORIZON

ON APRIL 18, 1961, GEORGI MOSOLOV REACHED A WORLD-RECORD ALTITUDE OF 34,714 METERS (113,901 FEET) ABOVE THE EARTH'S SURFACE IN A MIG E-66A

THE COCKPIT OF THE E-66A IS SO WELL SEALED THAT THE AIRCRAFT MAINTAINED A SAFE CABIN PRESSURE EVEN AFTER LOSS OF ENGINE POWER

its nose over the apex of your climb, and that the subsequent nose down attitude will result in a controlled decent. Should this fail to happen, the aircraft may progress through a series of strange attitudes and then enter a spin, an out-of-control maneuver where the airplane descends rotating like a falling leaf. Spins in swept-wing aircraft are difficult to recover from, and are in fact prohibited maneuvers in planes like the Navy F8 Crusader. Everyone who flies such an airplane knows of someone who has ejected from or crashed fatally in an unrecovered spin.

Second, since jet engines require air to burn fuel and are cooled by air, and since air is essentially lacking at the altitudes you are traversing, you may experience engine overheating or erratic thrust. In either case, you will probably have to shut down your engine or risk destroying it, then try to restart it later when you have descended to a lower altitude. If you shut down the engine, cabin pressure will begin to decrease. It may fall below a safe level, in which case only inflation of your pressure suit stands between you and a niche in Arlington Cemetery. If your suit inflates as it should, however, cockpit mobility and your ability to control the airplane will be impeded. To sum up, high altitude flight involves something like riding an out-of-control machine. From the time you pitch up at 36,000 feet until you descend below 60,000 feet and the plane will once again respond to control inputs, you are as passive as you would be riding the Space Shuttle into orbit. What a pilot lacks in such flights is his normal sense that the aircraft is completely under control. The resultant feeling can be disquieting.

My ride to high altitude in the F8 Crusader unfolded routinely. As the plane reached an altitude not much above 70,000 feet, indicated air-speed was near zero and the aircraft's nose was falling through the horizon. Southbound paralleling the east coast of Florida, about 15 miles offshore east of Cape Canaveral, I looked right out of the cockpit. I could clearly see both coasts of Florida; off its west coast the Gulf of Mexico's blue expanse stretched beyond the horizon. At the top of my climb, out of sheer curiosity I did in fact slowly "wipe out the cockpit" with the control stick to confirm that the aircraft wouldn't respond to control movements. It didn't. Once past its apex, the aircraft fell to a steep nose low attitude and the air-speed started increasing. Descending through about 55,000 feet, I gently began rounding out the dive and recovered to level flight by 30,000 feet. The engine had functioned normally throughout. My pressure suit had not inflated, but my heart rate and blood pressure must have been up more than a little.

On April 18, 1961, using essentially the flight strategy described above, Georgi Mosolov reached a world-record altitude of 34,714 meters (113,901 feet) above the earth's surface in a MiG E-66A. Essentially a modified version of the MiG-21 Georgi had piloted to the world speed record in 1959, the E-66A, in addition to its turbojet engine,

was fitted with a liquid-fueled rocket engine located inside the aft fuselage of the aircraft. Unlike jet engines, which lose thrust drastically as the air thins at high altitudes, rocket engines contain their own oxygen source and can develop undiminished thrust even in the vacuum of outer space. The drawback to rocket engines is that they require massive amounts of fuel for relatively short burn times. The rocket on Georgi's E-66A burned far less than a minute, but while ignited it almost doubled the total sea-level thrust of his airplane. Georgi told me about air show flights in the E-66A where he used the rocket engine at very high speed and low altitude to achieve a maximum performance climb. Still wide-eyed about the aircraft's performance so many years later, he said he could climb using rocket assisted thrust from sea level to 40,000 feet "in an instance." He was unwilling to state a precise time in seconds, perhaps because he did not remember exactly, or perhaps because he still considered the information to be a Soviet secret. My guess would be about 30-40 seconds, which would mean a sustained supersonic climb speed. If this is the case, then the air show must have been conducted in a remote area, since the sonic boom produced by the airplane would break glass windows in any nearby buildings.

Georgi Mosolov's record setting high altitude flight was not as uneventful as my relatively meager foray into space. One reason for this is that his rocket-assisted MiG ascended to a much higher altitude than the Crusader is capable of attaining. After accelerating the E-66A to a speed above Mach 2.0, Georgi raised the nose high above the horizon and lighted the airplane's rocket engine. Past the top of what must have been an exhilarating climb to almost 114,000 feet, and long after the rocket engine had burned out, Georgi was forced to shut down the E-66A's turbine engine due to overheating. The plane now became a high-altitude glider, if one can call falling ballistic through almost airless space gliding. For some reason Georgi's pressure suit did not inflate, or at least he did not perceive that it inflated. This seems anomalous, because cabin pressure is maintained by high-pressure air taken from the jet engine's compressor section, and at high altitude there is insufficient outside air density to keep the engine windmilling at high speed after a pilot closes the throttle and interrupts its fuel supply. Thus engine RPM should have decreased, cabin pressure should have been lost, and the suit should have inflated. Perhaps the cockpit of the E-66A is so well sealed that the aircraft maintained a safe cabin pressure even after loss of engine power. Or perhaps before Georgi secured his engine, he had already descended to an altitude where air pressure is high enough to support human life. It is impossible to know, since aneroid altimeters do not register accurately at very high altitudes; maximum height achieved during the flight was determined using ground instrumentation. In any event, Georgi successfully restarted his engine after descending to a normal operating altitude,

Georgi Mosolov wearing the Soviet Gold Star medal designating him a Hero of the Soviet Union



FLYING IS SAID TO CONSIST OF HOURS OF BOREDOM PUNCTUATED BY MOMENTS OF STARK TERROR

THE EXTREMELY SENSITIVE MANNER IN WHICH A JET FIGHTER RESPONDS TO FLYING TAIL MOVEMENT [OFTEN] PRESENTS THE POSSIBILITY OF INDUCING AN INADVERTENT MANEUVER KNOWN AS PILOT INDUCED OSCILLATION

and ultimately landed the E-66A successfully.

A Close Call

Flying is said to consist of hours of boredom punctuated by moments of stark terror. Flying transport planes or airliners may involve tedium, but very few fighter pilots believe that piloting high-performance jets is boring. However virtually all fighter pilots know from personal experience that moments involving some degree of terror do occur from time to time. Such moments are naturally more frequent for test pilots than for any other breed of aviator. The difficulties Georgi encountered on his record high altitude flight was relatively routine compared to two other episodes he described to me. The first of these episodes occurred in 1955 and involved a terrifying and prolonged out-of-control descent from high altitude that barely missed ending in a ground collision.

The wing-like structure on an airplane's tail is called the horizontal stabilizer, a component that facilitates both pitch stabilization and pitch control. On conventional airplanes, the aft portion of the horizontal stabilizer consists of a moveable surface called the elevator. A pilot moves the elevator by manipulating the control stick in the cockpit forward and aft. As the elevator moves down or up, it changes the shape of the horizontal stabilizer and increases or decreases the lift it develops. These changes result in a corresponding upward or downward movement of the nose of the airplane relative to the orientation of the pilot in the cockpit.

Even today, airliners and similar subsonic airplanes use elevators for pitch control, in the manner of the Wright Brothers a hundred years ago. But the advent of supersonic flight brought a significant change to fighter aircraft pitch control strategy. In the 1950s, jet fighter pilots discovered that the stick forces necessary to move the elevator at high indicated airspeeds were so excessive that pitch control was seriously compromised. Engineers devised two compensatory designs. First, hydraulic pressure was used to move aircraft control surfaces. Second, the elevator was elimi-

nated; fore and aft movement of the control stick now resulted in repositioning the entire horizontal stabilizer. The new horizontal stabilizer concept was called a *unit horizontal tail* or *stablator*. Among my generation of jet pilots, it was informally referred to as a *flying tail*.

The flying tail restored the sensitive pitch control so important to a fighter aircraft's maneuverability, but at a price. At high airspeeds, especially at high altitudes, small control stick movements can cause large changes in pitch attitude. These changes, in turn, affect the lift developed by the airplane's wings, creating large G forces that can overstress the airplane and actually cause the wing spars to fail structurally. The problem is complicated by the fact that hydraulic pressure lines provide pilots no feedback about the magnitude of the force exerted on the airplane by the flying tail. Most jet fighter pilots have known or heard stories about a comrade who accidentally pulled back too hard on the control stick in high-speed flight and ripped the wings off his airplane.

A related difficulty is the extremely sensitive manner in which a jet fighter responds to flying tail movement. This sensitivity presents the possibility of inducing an inadvertent maneuver known as *pilot induced oscillation*, or *PIO* for short. PIO occurs when a pilot's control stick pitch inputs get out of phase with high frequency up-down movements of the airplane's nose. Correcting for an unanticipated nose up displacement in level flight, the pilot pushes forward too hard on the control stick, moving the nose down past the horizon. In response to the excessive nose down movement, he now pulls back the stick to command nose up movement. This time the nose moves farther above the horizon than its initial displacement, and the pilot pushes forward even harder on the stick. Because pitch command is so sensitive and nose movement so rapid, each control input amounts to an *overcorrection*. A series of such overcorrections will cause the nose oscillations to increase in amplitude instead of damping out. In some flight regimes, two or three such oscillations suffice to overstress the aircraft and destroy it. The result is almost always fatal for the pilot. When I was flying Crusaders—an airplane especially prone to pilot induced oscillations—PIO was referred to as the *Jesus Christ maneuver*, an allusion to the imprecation that instinctively formed on a pilot's lips when he experienced the phenomenon. Recovery from a pilot induced oscillation is simple: let go of the control stick. The inherent pitch stability of the aircraft will restore controlled flight once the pilot's out-of-phase control inputs have been eliminated.

Pilot induced oscillation is a well-understood phenomenon today, and fighter pilots are routinely taught how to avoid it. Such was not the case when Georgi Mosolov narrowly escaped crashing uncontrolled into the ground in 1955. He was testing a prototype of the new MiG-19, predecessor of the MiG-21, and the first MiG to incorporate a flying tail into its design. In level flight at something like



Mosolov (right) with Yuri Gagarin.

THE MiG-19 HAS EXPERIENCED SEVENTEEN PITCH OSCILLATIONS IN TWENTY-ONE SECONDS, OR ONE OSCILLATION EVERY SECOND AND A QUARTER

Georgi's PARACHUTE HAS OPENED NORMALLY, BUT HIS RIGHT LEG IS TANGLED IN THE PARACHUTE RISERS

thirty thousand feet and an airspeed of Mach 1.0, Georgi experienced a sharp nose-up pitch after reducing engine power. His attempts to restore the nose level with the horizon resulted in a series of severe pitch oscillations that he finally brought under control at an altitude of less than a thousand feet. Aircraft instrumentation ultimately revealed that the MiG-19 has experienced seventeen pitch oscillations in twenty-one seconds, or one oscillation every second and a quarter on average. Any jet pilot will tell you that this must have been an exhilarating ride, a veritable descent into the realm of the daemon death. What is more astonishing than the rapidity of the oscillations is their magnitude: the G forces Georgi experienced in his descent varied between +12.0 and -4.5. It is nothing short of a miracle—and an overwhelming testimonial to the design prowess of the Mikoyan and Gurevich engineers—that the MiG-19 didn't come apart. An American fighter of that era would almost surely have ended up as scattered little pieces on the ground. What is impossible to convey here is the constrained terror that lay behind Georgi's steely fighter-pilot eyes when he told me the story of this flight. It was one of the few times he mentioned the dangers inherent in a test pilot's job. As a result of what Soviet engineers learned from this flight, they redesigned the MiG-19 control system to progressively decrease the flying tail movement corresponding to a fixed control stick input as airspeed and altitude increase.

A Close Encounter with Death

The second encounter with stark terror Georgi related to me is at once easier to describe and much more serious than the near crash of his MiG-19. It is September 11, 1962—exactly forty years to the day before the Twin Towers catastrophe in New York City. Georgi is piloting the MiG E-8/1, a high performance experimental fighter. Completed the previous January, the E-8 had made its maiden flight on June 13 with Georgi at the controls. Now the airplane is performing its twenty-fifth and—as events will unfold—its last

flight. During a speed run at 35,000 feet and approximately Mach 2.5, the E-8 experiences a catastrophic engine failure. Razor sharp blades from the engine's compressor section penetrate the plane's fuselage, severing hydraulic flight control system lines and rupturing fuel tanks. High-speed air peels back the fuselage's broken skin. Parts are flying off the aircraft. A large fire has broken out.

Unresponsive to control stick input, the E-8 begins to yaw violently. Georgi's head repeatedly strikes the canopy with heavy blows, shattering his crash helmet and stunning him. Unable to control the airplane, Georgi observes helplessly as it rolls inverted and enters a steep dive. A space of perhaps seven to ten seconds is enough to convince him that remaining with the aircraft means a swift and certain death. The E-8 had begun to decelerate when its engine failed; but the current nearly vertical nose down attitude is maintaining a speed well above Mach 1.0. Quickly transmitting a Mayday call that—it turns out—is never received, Georgi fires the emergency egress system and embarks on an adventure every jet fighter pilot dreads: a supersonic ejection.

It would be difficult to overstate the abuse inflicted on the human body by air flowing past it at supersonic speed. Certainly evolution has in no way equipped us to endure such an eventuality. The air stream outside the cockpit contorts Georgi's body horribly. Injury assessment in the hospital will reveal that his left arm is broken in three places. He also has a compound fracture of the left femur with serious bleeding, trauma to the fingers of his right hand, and grave head injuries. One could nevertheless argue that Georgi is lucky: he is still alive, one of only a few pilots to survive a supersonic ejection. Georgi's parachute has opened normally, but his right leg is tangled in the parachute risers, causing him to descend headfirst. As he nears the ground, he somehow summons energy to free himself using only his right arm. However, a hard ground impact fractures his right leg. Moreover, since his mayday transmission was not heard, knowledge of his plight is delayed in reaching rescue teams, his exact location unknown to them. More dead than alive, he now begins a five-hour ordeal waiting for rescue.

About three hours into his ground ordeal, Georgi is alert enough to begin contemplating his situation. He is bleeding badly and feels very weak. If he dies before help arrives—an eventuality he now sees as likely—the knowledge of what happened in the experimental E-8 dies with him. Fearing the worst, he told me, he begins trying to raise an alarm, calling out "people, people, people." I will always wonder what a more accurate English translation of his actual words would be, but in any event it seems to me a cry lacking any shred of self-pity. A farmer residing nearby detected the crash and has been conducting a solitary search for the pilot and wreckage. He hears Georgi's cries and comes to his assistance. A professional even to the point of death, Georgi's first concern is to rehearse the farmer in what to tell

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officials if they should arrive to find him dead. After he is convinced that the farmer knows how to report essential details of the E-8's engine malfunction and ensuing loss of control, Georgi has him spread out his parachute in an open area as a signal to rescue searchers. The farmer also starts a fire, and helps Georgi recline, something he had been unable to do on his own since his broken legs were trapped under his body. Ultimately official help arrives.

Georgi of course survived, but what happened that day essentially ended his flying career. He spent the next year in a hospital bed, much of it in traction. Essentially comatose for the first three weeks, his survival seemed doubtful to his doctors. Five holes were opened in his cranium to drain fluid and relieve pressure on his brain. When he related this story to me, Georgi encouraged me to feel his skull to experience firsthand the extent of the physical insult he endured. The marble-size holes are deep enough to receive half the length of one's fingernail. Georgi started flying again for MiG in 1964, but quickly realized that he was physically unequal to the rigorous tasks required of a test pilot. A permanent result of his injuries was impeded blood flow out of his brain, apparently slowing his reaction time and limiting his ability to respond quickly to critical in-flight situations. While nothing in Georgi's behavior today betrays this perceived limitation, apparently he felt the accident had dulled his fighter pilot reflexes. Until 1969 Georgi remained with MiG as part of its engineering team. Subsequently he served as an Aeroflot representative in Helsinki until 1975, and later taught high school for nine years. Ultimately the E-8 prototype was developed into the MiG-23. A. V. Fedotov, the man who replaced Georgi as chief pilot for Mikoyan and Gurevich, flew the E-8/2, the only other E-8 MiG ever built. Fedotov was fifty-one years old when he died in April 1984 testing the MiG-31 fighter.

An interesting footnote to Georgi's lengthy recuperation involves his extended stay in 1963 at a sanatorium. It must have been a prestigious establishment, because Indira Gandhi was one of the guests present during Georgi's residence. Another internationally known figure he met there is Manolis Glezos, the Greek liberal politician and freedom fighter famous among other things for pulling down a Nazi flag from the Acropolis during the German occupation of Athens in World War II. Apparently, injured Soviet aviation heroes were treated very well in the heady Cold War days of the sixties.

After Perestroika

Before we left Russia, Shirley and I engaged Georgi to take us on a three-day automobile tour of the Golden Ring cities, medieval settlements of great historic interest lying northeast of Moscow. Georgi took great pride in showing us these monuments of his country's rich and varied past. We were also able to observe typical Russian res-

ponses to a Hero of the Soviet Union. Upon sighting the Soviet Gold Star medal on Georgi's inexpensive gray poplin jacket, people of all ages—individuals whom he had never seen before—approached him with hugs and kisses, the Russian way of showing respect that in the west might be reserved for royalty, heads of state, or the Pope. Police or civil guards gave Georgi special parking privileges in his aged automobile. Because of the Gold Star, we were invited to visit areas of a church or monastery not open to more ordinary citizens, or given preferential treatment at a restaurant or in our lodgings. We were impressed by such treatment, and even more by the modesty and warmth that Georgi exhibited in receiving his countrymen's tributes. We observed no trace of vanity in his interactions with them.

At the same time, Georgi obviously enjoyed his encounters with the people who approached him. Shirley and I concluded that the Star represents to him a better time in his life now past and gone. In private, we discussed the obvious irony that we were able to make friends with a Hero of the Soviet Union precisely because he had accustomed himself to taking English-speaking tourists into his home to supplement his retirement income. In the five days we spent with Georgi, we paid him perhaps \$400 for the use of his home and the services he rendered us. This amount—a modest sum to middle-class Americans—is close to twice Georgi's monthly retirement stipend. He appeared to feel no rancor or envy because we hail from a country where the average person's financial circumstances are so much more favorable than they are in contemporary Russia. However, Shirley and I were deeply moved that a man so prominent under the Soviet system—a highly respected man who was once well compensated by his government—is today unable to sustain a middle-class existence on his retirement income.

Georgi is far from alone in this predicament. Many Russians—educators, retirees, and blue-collar workers notable among them—are unable to make ends meet under Perestroika. Russia today is a fallen empire, an unsettled country where the infrastructure is crumbling and the economy in great difficulty. The average Russian has yet to accept capitalist notions of striving to make the best product or to render the best service. Bureaucratic workers seem to have little sense of the value of time. For instance, it took us almost an hour to purchase train tickets to Moscow at the St. Petersburg station, although we were assisted by an English-speaking Russian university teacher, and only four people were in line ahead of us. Although he loves his country dearly, Georgi made very clear his discontent with the current economic and political situation in Russia. Nevertheless, he endures financially, and he is clearly a happy man who loves his life and always has. Like the pilot of his youth, the aged Georgi Mosolov is a survivor. One imagines him sticking around for a long time to come, but he has already lived a life far richer and fuller than most. ■

**LIKE THE
PILOT OF HIS
YOUTH, THE
AGED
GEORGI
MOSOLOV IS
A SURVIVOR**

Punk's War. By Ward Carroll. New York, New York: Signet Books, 2002. Pp. 323. \$6.95 ISBN: 0-451-20578-2.

You probably should not start *Punk's War* late in the evening because most likely you will still be reading and turning pages way past your usual bedtime. However, if you are securely strapped into a window seat of a Boeing or Airbus bound from Atlanta to San Francisco or leaving Union Station on Amtrak's *Acela* for New York or Boston, then settle in, order another drink and some peanuts, and get ready for an enjoyable and distracted trip.

This is a fast-moving, page-turning novel of near contemporary, post-Gulf War I American naval aviation (but prior to 9/11, Ending Freedom, and Iraqi Freedom). While *Punk's War* is not *The Red Badge of Courage* or *The Bridges at Toko-Ri*, it is a huge step above a vast number of similar works by less talented and authoritative authors that strain your willingness to suspend disbelief and offend your sense of propriety regarding a proper command of the written English word.

The book's authenticity, detail, and flashes of excellent humor—in particular, several short anecdotes about how pilots and their “guys in back” receive their personal call signs—comes from the author's experience. Carroll flew in the back seat of F-14 Tomcats for fifteen years, serving with five different fighter squadrons before leaving the Navy as a commander. He now teaches English and ethics at the Naval Academy, has written for U.S. Naval Institute *Proceedings*, and was a technical consultant on *The Flight of the Intruder* and *The Hunt for Red October*.

Punk is Lt. Richard J. Reichert, an F-14 pilot with VF-104, The Arrowslingers, a fighter squadron nearing the end of a long, hot, and rather monotonous six-month Persian Gulf tour on an unnamed carrier simply referred to as “the boat.” While Punk and the other characters are by necessity rather broadly drawn, they are very real and very human, unlike a more widely known F-14 pilot, the heroically talented, lucky, bright, handsome, suave, well tailored, studly, and cheery Commander Rabe of TV's *JAG*. The book's characters have faults, egos, strengths, ambitions, and some unpleasant habits and personality traits, and most likely will remind readers of friends, associates, rivals, allies, superiors and subordinates they've known.

While *Punk's War* is about a pilot's first combat missions, it is also about squadron and wardroom relationships and politics and the characters' different and shifting goals, aspirations, and ambitions. Carroll introduces real issues: aircraft and equipment that break down; the various stresses of deployment, from night carrier landings to boredom and concern about personal relationships; the complexity of joint operations;

and carrier deck activities. The squadron's CO provides the primary dramatic tension—a seasoned pilot (Top Gun graduate and former Blue Angel) with character flaws magnified by his quest for a combat “kill,” a captain's four stripes, and higher flag rank.

There is a surprising amount of “good stuff” in the book: insightful looks at the benefits and drawbacks of modern command-and-control systems and a discussion of the benefits of carrier-based (read Navy) aviation assets versus land-based (read Air Force) aircraft. The latter includes an exchange between Punk and an Air Force officer who, after hearing about Punk's fuel-starved punch-out while diverting from the boat to a civilian airfield (the Navy couldn't get the Air Force to open a military field), observes, “Well, I never heard of an Air Force plane diverting to a carrier.”

This is a well-written, insightful, and often funny work which will please anyone looking for “a good read” about naval aviation.

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Air Power History: Turning Points from Kitty Hawk to Kosovo. Edited by Sebastian Cox and Peter Gray. London and Portland Ore.: Frank Cass, 2002. Maps. Tables. Diagrams. Notes. Index. Pp. xix, 362. \$26.50/\$18.50 paperback. ISBN: 0-7146-5291-1 (cloth), 0-7146-8257-8 (paper)

Anyone who reads this review should enjoy reading this collection of papers from a conference at the Royal Air Force Museum Hendon in 2001. This gathering of scholars and practitioners from many countries must have been worth the price of admission. The book's individual chapters are generally well written, well documented, very informative, and more uniform and homogenous than in most such compilations. The editors, Sebastian Cox, head of the Air Historical Branch of the British Ministry of Defence, and Peter Gray, the RAF's Director of Defence Studies, offer readers a scholarly consideration of many of the key developments in the history of air power. They may not all be accepted as the “turning points” promised in the subtitle. However; they are all extremely significant and worthy of study.

The editors arranged the subjects in chronological order: “The First World War and the Inter-war Years,” “The Second World War,” “The Gulf War 1991,” and “Air Power in Regional Conflict.” Following Richard Overy's useful introductory overview on the history of air power and its turning points, Tami Biddle and John Ferris provide insightful looks at the development and application of air power in the First World War and at British strategic air defense

from its earliest days through 1940. Like other authors in this volume, each of these historians does more than summarize current scholarship on their chosen subjects. Biddle shows that if we wish to understand air warfare, we have to study the First World War and see the extent to which—even for airmen—it served as a precursor to the Second. Ferris probably ruffles some feathers when he questions the tendency to give radar the primary credit for saving Britain in the fateful summer of 1940. Furthermore, he takes issue with historians who claim that the RAF ignored air defense during the interwar period.

Christina Goulter's chapter explains the extent to which the Royal Naval Air Service led the way during World War I not only in maritime aviation but also in strategic bombing. The first part of the book is then rounded out with a chapter often passed over—that of air forces in the Spanish Civil War. We tend to give this cataclysmic upheaval only a few words, crediting the Germans with using the affair as a kind of laboratory. Here, James Corum supplies detailed chapter and verse about the *Luftwaffe* and the lessons it learned in Spain.

By this point, readers should appreciate the state of air power on the outbreak of war in September 1939. Richard Hallion, considering World War II as a turning point for air power, covers most of the key uses of aircraft during the war and clearly shows their impact on its outcome. He accomplishes this in a lively style with pithy quotes from a cross-section of the literature over several decades. In his contribution, John Buckley sees World War II as “the defining conflict in the development of maritime air power.” He also makes a strong case that dominance in this field demonstrates Allied superiority over the Axis powers in waging total war and was crucial to Allied victory.

The fall of France in 1940 takes on a new importance—and contemporary relevance for expeditionary air forces—in a fascinating chapter by Stuart Peach who labels it a “neglected turning point.” A similar observation can be made about Peter Dye's look at the RAF's logistics experience during World War II. The other offerings on the war also provide much food for thought: James Sterret on Soviet air doctrine, Brad Gladman on tactical air doctrine in North Africa, and Ian MacFarling on Australia and the Pacific air war will supply most readers with a wealth of new information and ideas.

The final two sections of the book seem particularly relevant today. Their subjects alone promise (and generally deliver) much: the Washington perspective on planning the air campaign by Diane Putney, the 1991 bombing of Baghdad by John Andreas Olsen, the Gulf War and British air power doctrine by Sebastian Cox and Sebastian Ritchie, along with the latter's take on air power and the Kosovo campaign from the perspective of Britain and NATO. The last-

mentioned chapter comes in the fourth and final part of the book, led off by Mark Clodfelter on the impact of Vietnam on USAF doctrine and concluded by Peter Gray's thoughtful look at the use of air power in the Balkans going back to 1941.

This collection of papers has been carefully chosen and arranged to give readers a remarkably coherent look at the ways in which air forces have learned to apply the immense power at their disposal. Casual readers could profitably use this book as an alternative to a general history of air warfare; specialists, practitioners, and educators could safely employ it as a supplement to their other reading. Mining the detailed end-notes accompanying many of the chapters could alone justify the purchase price.

Even if you eschew published conference proceedings, read this one.

Dr. Carl A. Christie, Senior Research Fellow, Centre for Defence and Security Studies, University of Manitoba, Winnipeg, Manitoba.



Science and Technology; The Making of the Air Force Research Laboratory. By Robert W. Duffner. Maxwell AFB Ala.: Air University Press, 2000. Tables. Illustrations. Photographs. Notes. Appendices. Glossary. Index. Pp. xix, 307. ISBN: 1-58566-085-X

Air Force labs were under a lot of pressure in 1996. The Cold War's end de-empha-

sized new acquisitions. Plans were in place for reducing lab personnel—35 percent between 1994 and 2001. A 1995 report called for reductions of management and redundancy throughout the lab system and consolidation of all labs into one for the entire Department of Defense (DoD). The combined annual research and development (R&D) budget for labs within DoD, the Department of Energy, and NASA was \$15 billion—out of the total government R&D budget of \$70 billion. Seven years of reductions still had not eliminated stovepipes and duplication of even R&D efforts, not to mention staff. "Vision 21," DoD's long range plan for making labs more effective by 2005, identified 86 military labs, including 19 in the Air Force (only four formally separate USAF labs existed) that should be studied under the consolidation mandate. Implementation was to begin by 2000, with completion by 2005.

For more than a decade, under three administrations, the Air Force and DoD consistently tried to consolidate, rationalize, and shrink the numbers of labs, people and associated expenses. It was a period of consistent downsizing of dollars and defense, especially so in the aftermath of Desert Storm and the Cold War. Study after study said the system was wasteful and duplicative, and every report said that money was going to be tighter. But in 1996, the Air Force still had four (or 19) labs instead of one, even as military and civilian workforces shrank. So the decision crept up channel and down channel, and on schedule the labs became

one—but one with satellite locations, enough of them in fact that, "Indeed, most employees retained their positions and locations, and no organizations physically moved."

So, what was the bottom line? Did this consolidation save any money? Were jobs done away with, or did outsourcing hide them? What was the payroll in 2000? Was the workforce smaller? How many layers of management disappeared? How much grade creep was there? How many new senior executives replaced GM-15s? Unfortunately, the story ends in 1997 with the beginning of the single lab, so the book contains nothing on how well consolidation is working and what savings may have taken place.

This is unquestionably the work of an Air Force historian. It lacks only the volumes of photocopied documents, but otherwise it's ready for storage in the great Air Force archive. It has the disclaimer that opinions are the author's own; and it has the chronology, list of acronyms, and obligatory appendices with germane documents. Also, illustrations are from government documents. Sources are primarily official documents, oral history interviews with the principals, and an occasional semi-official source such as the local base newspaper. The author also uses the web for additional government sources and publications of various government elements such as the Air Force History office. The tale is a house history of a non-controversial series of events. There is no bibliography or any notes on sources. However, what this well-written history

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demonstrates (intentionally or not) is what a ponderous, almost tedious, process of change the military has developed in the half century since the Pentagon Building itself was built under budget in only eight months.

John H. Barnhill, Ph.D., Tinker AFB Oklahoma.



Peacekeeping Fiascos of the 1990s: Causes, Solutions, and U. S. Interests.

By Frederick H. Fleitz, Jr. Westport, Ct.: Praeger, 2002. Maps. Tables. Diagrams. Illustrations. Photographs. Notes. Appendix. Bibliography. Index. Pp. xx, 224. \$39.95 ISBN: 0-275-97367-0

In this book Fleitz argues that the evolution of peacekeeping operations from “traditional peacekeeping” to “expanded peacekeeping” has been a disaster. He describes traditional peacekeeping operations as those that require acceptance by the disputants, impartiality, and minimum use of force. A classic example is the Multinational Force and Observers (MFO) in the Sinai.

Such a limited role gave way in the 1990s to expanded peacekeeping—a term coined by former UN Secretary-General Boutros-Ghali. Peacekeeping missions require the use of military force against local parties, do not require consent, and often include much broader functions such as nation building. Haiti and Somalia are examples.

As his title unequivocally states, Fleitz considers expanded peacekeeping to be an abject failure. This is not a particularly fresh observation. It is easy to spot shortcomings and difficulties. What makes Fleitz’s book useful is his analysis of why expanded peacekeeping—a concept that began with such promise and enthusiasm in the post-Cold War world—collapsed.

Fleitz finds plenty of fault with the UN, an organization he argues is plagued by corruption and ill-suited to command and control expanded peacekeeping forces. Of course, he is not alone in criticizing the UN. What should be of more interest to the military reader is his assertion that “Expanded peacekeeping collapsed because its promoters put their idealistic and political aspirations ahead of operational realities.”

The U.S. military in the 1990s fell in line with this dynamic. The end of the Cold War left the U.S. without the obvious Soviet enemy it once had. The military (especially the Army) tried to adapt to the new situation—and remain relevant in the face of drastic downsizing—by expanding its roles and missions to include “operations other than war” (OOTW). As the Army was quick to point out, it had been doing such missions for centuries. The difference now was the scope, domination, and intensity such missions would assume in the 1990s.

Army officers are “can do” people, trained to be subordinate to civilian authority, and

conditioned to say “yes” rather than “no.” Thus, the Army leadership signed up for OOTW lock, stock, and barrel; going as far as to argue that OOTW required no additional training and certainly was not unique enough to warrant specific listing on a unit’s Mission Essential Task List (the logic being if it was on your METL you would, by definition, train to it).

The 1993 edition of FM 100-5, *Operations*, touted “versatility” as a veritable panacea for the Army’s expanded role. “Versatility,” it claimed, “ensures that units can conduct many different kinds of operations, either sequentially or simultaneously, with the same degree of success.” Details on how to obtain this versatility were scarce, but the clear implication was that OOTW-type versatility was not to be gained by special training. Indeed, tactical units were charged to be able “to adapt to different missions and tasks, some of which may not be on unit METLs.” It was a lone voice who failed to accept this logic, even though it marked a radical departure from the Army’s previously ironclad training doctrine to “train as you fight.”

Fleitz argues that if expanded peacekeeping is ever to be successful and U.S. troops are to participate in it, they “must be given specialized training by a nation with significant peacekeeping experience to learn the intricacies of peacekeeping doctrine and practice.” I would argue that the U.S. military has a sufficient capability to conduct such training itself, but the point is that expanded peacekeeping requires special and specific training. After the difficulties of the 1990s, the Army has in fact come to this conclusion—certainly in practice if not in doctrine.

The 2001 edition of FM 3-0, *Operations*, recognizes that “stability operations [the successor to OOTW in the Army lexicon] often require commanders to apply METT-TC [considerations regarding mission, enemy, terrain, troops, time, and civilians] differently than they would when conducting offensive and defensive operations.” It says terrain analysis may be different. A different skill set including such interpersonal skills as cultural awareness, negotiating techniques, and critical language phrases will be required.” Commanders must “develop tailored concepts and schemes for stability operations.” These may seem like minor concessions and largely obvious observations, but they do mark a departure from the previous conventional wisdom. More significantly, the Army has gone full-force in specifically training for expanded peacekeeping, especially at its Combat Training Centers such as the CMTC in Germany. A Center for Army Lessons Learned 1998 newsletter began, “Since Peace Support Operations present a series of unique and unfamiliar roles for soldiers, full-mission rehearsals are essential for a successful deployment to Bosnia. Both collective and individual training and rehearsals conducted at the CMTC focus on the peace support mission. They are designed to prepare soldiers and units

specifically for operations in Bosnia.” This represents a major and, Fleitz would argue, healthy change in philosophy.

This is an excellent book for anyone interested in peace support operations. Fleitz presents detailed, factual, and analytical arguments that explain a phenomenon, not just historically, but also offer recommendations to hopefully prevent a *Peacekeeping Fiascos of the 2000s* from being written someday.

Lt. Col. Kevin Dougherty, USA, Professor of Military Science, University of Southern Mississippi.



The Road to Rainbow: Army Planning for Global War 1934-1940.

By Henry G. Gole. Annapolis Md.: Naval Institute Press, 2003. Maps. Photographs. Notes. Appendices. Bibliography. Pp. xxi, 224. \$34.95. ISBN: 1-55750-409-1

Colonel Gole has a good background for this effort. He is a graduate of the Army War College, was on the faculty, and was also a research analyst. He had a Dissertation Fellowship from the U.S. Army Center of Military History, and his study is based largely on War College material.

For a country that has prided itself as being peace-loving (at least that’s the national myth), our history is replete with incidents of aggression and planning for offensive operations. Though not formally planned, the subjugation of Native Americans is a glaring example. The capture of Louisbourg by Colonial forces in 1745 set a pattern to be emulated in later conflicts. Our revolution started with a concentration of Patriot forces against the center of British power in Boston, forcing the Redcoats to evacuate. This operation was not based on any high-level, long-range, strategic planning, but just happened! In contrast, the capture of Fort Ticonderoga started Congress (functioning as a General Staff War Plans Division) thinking in terms of grand strategy to invade adjacent territory with the political hope of making Canada the fourteenth state and the strategic goal of protecting the northern flank. The first failed, but the second led to victories at Calcutta Island and Saratoga.

Given the geographical facts of life, it is not surprising that Madison’s Grand Plan for the War of 1812 was another invasion of Canada. Again in 1846 it was President James Polk—with some help from the Commanding General of the U.S. Army Scott—who determined the direction of a war of conquest. Later, the Civil War’s offensive (and winning) strategy of the Anaconda Plan is generally credited to Scott.

Up to the Spanish American War, military planning was on an ad hoc, spur-of-the-moment basis. However, this time, there had been some prior expectation that a conflict

might occur over Cuba and some thought given about how to handle it. Three institutions came into existence during this period that contributed to the prior-planning process: the Office of Naval Intelligence, the Naval War College, and the Army's Military Intelligence Division. It is uncertain how McKinley used his cabinet and senior military officers in deciding on the global strategy of three corps-sized expeditions in Cuba, Puerto Rico, and the Philippines.

Following that war, four more institutions were created that strengthened the planning system: the Navy General Board (1900), Army War College (1901), Army General Staff (1903), and Joint Army and Navy Board (1903). But the U.S. had little chance to influence the grand strategy of World War I. Our Army fit into what the Allies were doing. Previously, the Navy had started significant work on Plan Orange (especially after Japan's rise in 1904-1905), but our sailors were generally relegated to the unplanned and unsought missions of convoy escort, anti-submarine warfare, mine laying, Grand Fleet reinforcement, and several operations ashore. After the Armistice, the Navy gladly returned to massaging and updating Orange, while the Army centered its training on preparing for a rerun of the

World War I American Expeditionary Force Plan Black (though I remember in 1932 an Army-wide rehearsal of Plan Crimson—another invasion of Canada!).

In 1920, the Army General Staff added a fifth (though unnumbered) division to G-1 through G-4—the War Plans Division. The War College became an auxiliary think tank for that division. Gole describes well the development of this role. He also covers two other innovations: coalition, rather than unilateral, war and war on more than one front. Until World War I, our only experience with Allies was during the Revolution. We had fought on scattered parts of the map several times (notably during the Mexican and Spanish-American War), but only against a single foe. During World War I we did have three small forces on other than the Western Front.

I have only a few minor complaints about the book. It has a somewhat narrow focus—not uncommon in doctoral dissertations. The two maps at the back aren't too legible and are not really essential. Two of the appendices would have been more interesting if the later grades and assignments of individuals were shown. And several of the War College commandants of the period could have received more coverage. However, within the limits Gole imposed upon himself, this

is a readable, well-documented effort. As a War College graduate, I have a special interest in the subjects covered, but I wonder how broad the overall appeal may be.

*Brig. Gen. Curtis H. O'Sullivan, USA (Ret.),
Salida, California.*



Expanding the Envelope: Flight Research at NACA and NASA. By Michael H. Gorn. Lexington: The University Press of Kentucky, 2001. Photographs. Notes. Appendices. Glossary. Index. Pp. xii, 472. \$35.00 ISBN: 0-8181-2205-8

The subject of flight research has been only partially covered by books about the exotic X-series aircraft. Pilots with the "right stuff" risked their lives to take those aircraft to their limits to "expand the envelope" of aeronautical knowledge. This book distinguishes *flight research* from *flight test*—terms often incorrectly used interchangeably. *Flight test* determines whether prototype or modified aircraft satisfy design requirements, whereas *flight research* uses aircraft to acquire reliable in-flight data (including pilot experience) to apply to a spe-

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cific research problem and to identify performance limits.

As NASA's Dryden Flight Research Center historian, Gorn has access to information covering much of the history of flight research. He begins his history with Sir George Cayley, who discovered the basic processes of flight; the contributions of Lillenthal and Chanute; and the work of the Wright brothers who concentrated on the problems of control and conducted flight tests to arrive at successful flight solutions.

Congress established the Advisory Committee for Aeronautics in 1915 (quickly changed to the *National* Advisory Committee for Aeronautics, or NACA) and, in 1916, approved funds for establishment of a national aeronautical research center. The Army and Navy were the most interested parties in aeronautical research but, after they failed to locate such a center, the NACA Langley Research Center became a reality in 1920. Its earliest research focused on effects of air pressure on flying machines and attempts to improve propeller design. Gradually, aerodynamicists discovered that data from carefully instrumented aircraft corroborated wind tunnel findings. Flights often provided data not even conceived under laboratory conditions.

Aircraft manufacturers and established

engineering institutions began to contact NACA for testing of new concepts and design ideas. MIT student Lt. Jimmy Doolittle investigated the strange failures experienced by Air Service planes for his master's thesis. His daring flight program resulted in much more rigorous testing of Army airplanes and acquisition of NACA's first airplane, a specially built and equipped Boeing PW-9. It also raised questions such as whether future design loads would be governed by machine limitations or the physical makeup of the pilot. Research conducted to find answers to these questions established NACA and its agenda. The military services, universities, and aircraft industries looked to NACA for research leadership and innovation.

During World War II, American aircraft designers reaped huge benefits from NACA's handling-qualities research. Wartime research needs pushed the creation of the Lewis (now Glenn) and Ames Research Centers. After the war, the search for higher speeds and altitudes led to programs that sought supersonic flight and ever-higher altitudes. Gorn does an excellent job of telling the story of problems encountered: wrangling over contracts, clashing egos and turf claims, and personnel and management problems. He

explains problem solutions and aircraft involved but also covers the test pilots, engineers, designers, manufacturers, and ground crews involved, making it evident that flight research is a team effort. Gorn smoothly segues through the gamut of exotic craft from the X-1 and other X-series research vehicles (including the Navy's D-558 airplanes) to the ultimate speed and altitude champion, the X-15, showing how flight research led the way through the thickets of problems encountered in reaching hypersonic speeds and the edge-of-space.

However, space flight became the nation's focus after the Russians launched *Sputnik*, and Congress passed the National Aeronautics and Space Act of 1958, creating NASA from the old NACA. The Flight Research Centers (FRC) took a back seat as NASA concentrated on launch vehicles and spacecraft. However, some Dryden researchers had been experimenting on their own with lifting body technology. These wingless vehicles finally became viable and controllable through almost endless testing and re-design, providing a basis for design of the space shuttle. Further, the FRCs have continued flight research work in tilt-rotor aircraft, fly-by-wire control systems, integration of computers into flight control systems,

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winglets, high angle-of-attack vehicles, high-maneuverability aircraft, supercritical wings, and space shuttle aerodynamics.

In a sea of “pros,” the only “cons” of this book are nit-picks—the author’s reference to the deHavilland DH-4 as an “unfamiliar French aircraft” and a photograph of a Martin MB-2 bomber with a caption calling it a much-later Martin B-10B. The remaining research in the book is flawless.

The late Dr. Hugh Dryden, final director of NACA and first deputy administrator of NASA, stated the FRCs’ purpose was “to separate the real from the imagined problems...” While “NASA” means space flight to the general public, this book well illustrates the sterling aeronautical work of the FRCs.

Lt. Col. Steve Horn, USAF (Ret.), aviation history researcher and writer.



Thirty Seconds over Tokyo. By Ted W. Lawson. Washington, D.C.: Brassey’s, 2002 [Brassey’s Aviation Classics; originally published in 1943]. Photographs. Pp. 221. \$24.95 ISBN: 1-57488-508-1

War was a part of our every thought. I felt that the world had shrunk like a prune. A group of Russian aviators barged into McChord one night, and I followed them around like a kid, thinking to myself that here we all were, just about in the same fight together, yet as distantly removed in almost everything as men of Earth and men of Mars. I was in the war. There were times during those months of maneuvers when I asked myself what the hell I was doing there, risking my neck.

While the words written above may seem applicable to today’s wars in Southwest Asia, they were written in 1941 and are taken from Ted Lawson’s book about his experiences as one of the famed Doolittle Tokyo Raiders. Trained to fly B-25 medium bombers off the flight deck of a Navy carrier, their special mission was considered by many a one-way trip. To those who supported, planned, and flew the mission, it was a once-in-a-lifetime opportunity to strike back against Imperial Japan.

Lawson was a youth who wanted to know everything about airplanes. He began studying engineering courses, took up flying

lessons, and joined the Army’s Aviation Cadet program to see whether he preferred designing or flying. After earning his aviators wings, he became one of the first pilots of the new B-25 bomber. In those days, every flight could be considered a test flight as new aircraft were paired up with new pilots and crews, and flying safety meant returning to the parking area in one piece.

Several months after the attack on Pearl Harbor, Lawson and a few others were called into a meeting and asked to volunteer for a dangerous mission. Some would hazard guesses, but when Jimmy Doolittle appeared, the majority of flyers knew it was something special. For those who were selected, time passed quickly as they were told to go out and “fly,” which some took literally to mean hedge hop, buzz, and generally wreak havoc trying new techniques and procedures that would guarantee bombs on target.

Doolittle understood both the politics and realities of war. His leadership ensured that on the cold and bitter morning of April 18, 1942, sixteen B-25s successfully took off from the USS *Hornet* and flew into the history books. Lawson goes into details from



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the pilot's point of view as a husband, warrior, and survivor of a violent crash landing at sea after the raid. From the heartfelt support of Navy personnel, remembrances of love from family, cost to the Chinese people who paid with their lives for rescuing and hiding the survivors, and finally return to the U.S. with honor, Lawson's words paint a picture that is as meaningful today as when the words were written in the 1940s.

Thirty Seconds over Tokyo deserves to be read by today's generation of aviators who may find themselves asking the same questions Lawson did then.

TSgt. Jim McClain, USAF, (Ret.), SOF/ USAF Auxiliary



The Hostile Sky: A Hellcat Flyer in World War II.

By James W. Vernon. Annapolis, Md.: Naval Institute Press, 2003. Photographs. Index. Pp.202. \$28.95. ISBN: 1-55750-865-8.

When told of the successful strike on Pearl Harbor, Admiral Yamamoto supposedly said he feared the Japanese had awakened a sleeping giant and "filled him with a terrible resolve." Yamamoto's fear was well grounded. While a peacetime United States built only about 2000 aircraft in 1940, the war-aroused nation produced a staggering 96,000 airplanes in 1944. In *The Hostile Sky*, Vernon provides a highly readable description of the system that produced thousands of well-trained pilots to man the flood of airplanes pouring from America's factories. Having flown Hellcats in combat, Vernon is uniquely qualified to recount both the long training process preceding a carrier pilot's deployment and what naval air combat was like in the waning days of World War II.

Unlike the many books by World War II fighter pilots providing detailed accounts of air-to-air battles, *The Hostile Sky* primarily concerns the training that preceded Vernon's combat deployment—a long process. The author enlisted in the Naval Aviation Cadet program in the summer of 1942. Seventeen months would pass before he was commissioned as a naval aviator, and he did not actually head for combat until May 1945.

What makes this book particularly interesting is how the author puts a personal and very human face on his wartime experiences. He is remarkably open in relating his thoughts on a variety of topics, including his own somewhat unhappy family life and his reasons for choosing to serve as a naval aviator. In 1942, Vernon's decision to become a pilot "was mainly cerebral, colored by escapism, a sense of adventure, and yes, patriotism." After the war, however, the excitement of combat gone, the author decided to leave the Navy. As he found himself making his last flight in a naval aircraft, Vernon writes: "I headed west sadly, toward the end of flying, which had lost its meaning,

to begin the rest of my life." The author's hope for a more meaningful life was fulfilled by a civilian career that returned him to the sea as a marine geologist.

Vernon's knack for capturing an individual in a few well chosen lines is displayed in the many candid sketches of the people from all walks of life he encountered during his service. In so doing, the author opens a revealing window into how America looked and felt in the 1940's. He also has a talent for concise description. Some of his more memorable images include grubby young aviation cadets impulsively dashing off a temporarily halted cross-country train to "shower" in a cloudburst, delicate waterfalls cascading two thousand feet to the sea along the coast of Molokai, and how the fleet anchorage at Ulithi appeared to be an immense cluster of ships anchored in mid-ocean.

The book offers a clear-eyed and unsentimental view of the author's wartime experiences. Vernon saw neither glamor nor glory in what he did. He calls the facilities that trained him aviation factories; he questions the efficacy of ground attack tactics that exposed him to great danger without visible results; and he found pep talks before combat missions distasteful. But Vernon is equally matter-of-fact when telling how he found, in contrast to his training days, that in combat he formed strong bonds with his flying comrades. He also relates the respect he felt for fellow flyers who fought beside him without ever revealing their own distinguished combat achievements earlier in the war.

Other books provide more technical details about how the Hellcat flew and fought. This book's strength lies in its wealth of detail about the human side of World War II naval aviation. It is well worth reading.

Larry Richmond, attorney for the federal government and volunteer docent at the National Air & Space Museum



El Dorado Canyon: Reagan's Undeclared War with Qaddafi. By Joseph T. Stanik. Annapolis, Md.: Naval Institute Press, 2003. Maps. Photographs. Notes. Abbreviations. Bibliography. Index. Pp. xvi, 319. \$34.95 ISBN: 1-55750-983-2

El Dorado Canyon is a very topical book. While its subject is primarily state-sponsored terrorism, as compared with the current problem of non-national groups, there are many important parallels. Joseph Stanik, a Naval Academy graduate who retiring for three years at Annapolis before rejoining the Navy, does an impressive job of putting the subject into context and detailing both the problem and American reaction. Although his focus is the 1986 air

strike against Libya—codenamed El Dorado Canyon—he goes much further.

The author shows how Libya, not the only country waging acts of terrorism against western targets, became America's primary target. Qaddafi, the most outspoken advocate of terrorism, had little support in the world community, and was the weakest militarily. Stanik narrates the long list of terrorist acts—assassinations, bombings, shootings, and hijackings—linked to the Libyan dictator and the timid European response. He also notes the divided and ineffective Libyan opposition groups and the failures of international economic and diplomatic measures.

Along the way he weaves in Qaddafi's attempt to incorporate the Gulf of Sidra under Libyan control. This led to U.S. Navy "Freedom of Navigation" exercises in that area and the destruction of two Libyan fighters in 1981. Two more fighters were shot down, an SA-5 site was attacked, and two Libyan surface vessels were sunk in early 1986. Qaddafi reacted with more terrorist assaults culminating in the bombing of a discotheque in West Berlin that killed two American servicemen and a Turkish civilian. Clear evidence (radio intercepts) of Libyan involvement gave the Reagan administration a "smoking gun."

Stanik details the formulation of the retaliatory mission from the specific targets to the involvement of both Navy and Air Force units. He denies that the USAF was included in order to give the airmen a piece of the action and describes the European Command's micromanagement of the number of Air Force aircraft and their target assignments that was hotly contested by the unit tasked to carry out the mission. They saw this as a "high-risk, low payoff gamble." Stanik approvingly quotes another author who called this "a gross tactical error." He relates how American allies, France and Spain, denied overflight rights, thus forcing F-111s based in Britain to fly around the European continent and through the Straits of Gibraltar to and from their targets in a mission lasting fourteen hours. The author devotes much more space to the Air Force operation that was marred by aborts (six of the eighteen aircraft launched), the downing of one, a number of instances of collateral damage, and relatively light damage inflicted (only four of the F-111s delivered their bombs near or on the intended targets), than to the much more successful strike by Navy A-6s.

The author asserts that the operation was a success, as it sent a clear message to Qaddafi. While the Libyans continued to sponsor terrorism, these incidents declined markedly and the connections were much less direct. Nevertheless, Libyans were involved in the December 1988 downing of Pan American Flight 103 and of an airliner in Niger in September 1989 that cost some 440 lives. He concludes with a brief discussion of the September 11, 2001 terrorist

acts; it appears to have been tacked on at the last moment.

Stanik is to be commended for this thoroughly researched and even-handed account. He not only does an excellent job with the focus of his study but also touches on other interesting and important topics such as the conflicts within the Reagan administration as to the proper course of action, the Libyan adventure in Chad, and now press leaks undercut some American actions. *El Dorado Canyon* reads well, but after such a detailed and thoughtful study, the author offers limited conclusions that will disappoint readers who seek “lessons or guidelines” for future American action. Nevertheless this is a good book on a significant and relevant subject that undoubtedly will become more important as events unfold.

Dr. Kenneth Werrell, Christiansburg, Virginia.



History of the 504th Bomb Group (H) in World War II. By Fiske Hanley II. Enfield Ct.: Olympia Sales, 1992. Maps. Tables. Diagrams. Illustrations. Photographs. Notes. Bibliography. Pp. xii, 307. **Accused American War Criminal.** By Fiske Hanley II, Austin Tex.: Eakin Press, 1997. Maps. Diagrams. Illustrations. Photographs. Footnotes. Bibliography. Index. Pp. xi, 280. \$27.95. ISBN: 1-57168-193-0

Fiske Hanley is uniquely qualified to write these two fine books. He was a flight engineer on B-29s in the 504th Bomb Group out of Tinian before being shot down on his eighth mission and incarcerated by the Japanese. Well after the war, the 504th Bomb Group Association appointed him as their historian.

The *History of the 504th* is in a fairly typical unit history format: large book, locally published (by a company owned by a fellow group member and POW survivor), average quality picture reproductions. However, of all of these I have read, this one goes a step beyond in the quality of its content. There isn't much that Hanley left out: rosters, nose art, markings, people photos, combat photos, maps, reproduced documents, mission summaries, crew lists, etc. It's all here. But what makes this volume stand out is the final chapter—nearly eighty pages, containing 101 anecdotes written by a cross section of the group's survivors. Each story provides an interesting aspect of combat and life on Tinian in the words of the men who experienced these situations. This book—like many other unit histories—is primarily designed for the surviving members of the group and their families. As these aging warriors pass into history themselves, this fine book will have documented for all time what this one very heavy bomb group did in the greatest war in history.

However, Hanley's real contribution to the mound of historical information on World War II is his book on his experiences as a prisoner of the Japanese. *Accused American War Criminal* is a chilling account of what men can do to other men during war. He begins with a relatively short narrative on his training to become both an officer and a flight engineer, early B-29 training, and then the flight overseas to the 504th's new home on Tinian in the Marianas Islands. As one of the eleven members of 2d Lt. John Brown's crew, Hanley participated in a number of familiarization, practice, and test flights before his first combat mission to Nagoya on February 16, 1945.

The 504th was selected as the lead group for the new mission of minelaying by B-29s. On the night of March 27, Fiske Hanley's life changed forever over the Shimonoseki Straits. When his aircraft was hit by flak, only he and the copilot survived by bailing out through the fire enveloping the aircraft. The harrowing escape is itself a breathtaking story. After coming down, he was nearly killed by a civilian mob before being rescued by a policeman. Soon, however, the severely wounded airman was in the hands of the Kempei Tai, the Japanese equivalent of the Gestapo. Feared by the Japanese people as well, these brutal men made Hanley's next six months a living Hell.

I have read many of the books written by POWs in North Vietnam. Horrendous as those experiences were, the Vietnamese had nothing on the Kempei Tai. All of the B-29 prisoners (and others who the Japanese declared guilty of indiscriminate warfare) were considered “Special Prisoners” and, therefore, not subject to Geneva Convention rules. Hanley had no change of clothes for his entire incarceration, was given no medical aid (his wounds were, in fact, deliberately infected by Japanese doctors), was fed starvation rations, lived in absolute filth and among all sorts of vermin, was beaten and constantly prodded with bayonets, and was repeatedly told he was going to die. In fact, only about 200 B-29 prisoners were repatriated after V-J Day. At another prison (Hanley avoided shipment there only because of an administrative error), 62 prisoners were kept in their cells when a B-29 raid set the prison on fire. All burned to death, except for 17 who got out and were murdered by guards. Fifty other prisoners were beheaded at another location. The Kempei Tai commander gave orders on August 14 that all Special Prisoners were to be executed immediately. The deputy commander got them all out to a military camp where the survivors were rescued by a party led by Commander Harold Stassen from Admiral Halsey's staff.

This is not an enjoyable book to read, but like the detailed accounts of the “Rape of Nanking” and the many stories of the “Bataan Death March” and other Japanese atrocities, it is a part of the history of the war that cannot be ignored. We can only hope

that such treatment will never again be inflicted on anyone, but current events do not seem to bode well for that.

Col. Scott Willey, USAF (Ret.), Docent and Volunteer, National Air and Space Museum.



Airmen and Air Theory: A Review of Sources. By Phillip S. Meilinger. Maxwell AFB, Ala.: Air University Press, 2001. Glossary. Index. Photographs. Pp. ix, 164. ISBN 1-58566-101-5

Although this book is a reprint of two earlier publications, it would be a mistake to dismiss this highly useful updated bibliography as merely a warmed over remake.

Part 1 consists of thirty-nine biographical sketches of air-arm generals by the author along with his appraisals of whatever published biographies and autobiographies are available. Many of the biographies are excellent, as Meilinger points out; but few of the autobiographies are. Most of these, written late in life, offer anecdotal recollections with little analytical content. The author's evaluations might have been enhanced had they been supplemented with citations to reviews published in professional journals when the books first appeared. One is led to speculate on what was lacking in the education of these flag officers and why British airmen have turned out so much better autobiographies. Supplementing the freestanding biographies and autobiographies, Meilinger also discusses the anthologies with collective accounts of general officers along with the two major oral history collections available to scholars. Most disturbing is the absence of biographical studies for a long list of significant officers. As Meilinger puts it, “too many books on Claire Chennault and too few on Jimmy Doolittle.” He goes on to enumerate the many neglected individuals who made impressive contributions, especially those in the area of research and development—“another gap in the literature.” While numerous archives contain both official and personal papers of air-arm senior officers, as yet no one has undertaken to publish any of these; not even the immense collections of Arnold and Spaatz, in contrast to the multi-volume sets done for Army leaders such as Marshall, Eisenhower, and others. In sum, Part 1 offers an experienced scholar's critical guide to the available literature with useful suggestions on what remains to be done.

Part 2 deals with the historiography of air power theory and doctrine appearing in English. Successive chapters treat the early writers on air power including Douhet, Mitchell, and various officers at the Air Corps Tactical School during the interwar era. These are followed by chapters on RAF writers, European theorists, naval aviation, World War II and after, Vietnam, and NATO. In a grab-bag chapter titled “The Current

Debate,” Meilinger highlights the excellent work being done by the Australians, RAF Air Vice Marshal Tony Mason, Colonels John Boyd and John Warden of the USAF, and others such as Benjamin Lambeth of RAND. Each of these chapters has the benefit of the author’s perceptive evaluations based on his long experience. In a concluding chapter Meilinger offers further suggestions on tasks yet to be done: areas inadequately studied and waiting for scholarly treatment.

Dr. I. B. Holley, Jr., Emeritus Professor of History, Duke University



The Technological Arsenal: Emerging Defense Capabilities. Edited by William C. Martel. Washington, D.C. and London: Smithsonian Institution Press, 200 1. Glossary. Notes. Photographs. Index. Pp. xix, 284. \$29.95 ISBN 1-56098-961-0

Editor Martel, formerly Director of the Center for Strategy and Technology at the Air War College and currently Professor of National Security Affairs at the Naval War College, has drawn upon a dozen specialists to contribute chapters on several emerging technologies. These he sees as propelling revolutionary changes in U.S. defense strategy which, within a decade, he optimistically suggests, could destroy ballistic missiles, disrupt communications, and wage war from the relative safety of the homeland. A great deal hangs on that word "could," the past tense of "can," implying, as the dictionary says, a shade of doubt. He might better have used "may" or "might," for much of the technology described has yet to prove itself in action, no matter how promising the potential.

The book limits itself to the technological arsenal in three highly promising areas: directed energy (lasers, high-power micro-waves), military targeting (cruise missiles, non-lethal weapons, space operations, unmanned vehicles) , and command and control (directing war from home, computer control of warfare, information warfare). The several authors write not as advocates for one or another of the technologies described, but only to introduce these technologies to readers. In a concluding chapter, the editor wisely points out that the crucial challenge that lies ahead will be for Congress to decide which of the promising technologies merit further funding and support and which to let lapse.

All the contributing authors have taken great pains to insure that the complex technologies they describe can be readily understood by the lay reader and non-specialist. This is one of the strengths of the book, though occasionally the dumbing down has been carried too far in an effort to strike the right balance between technical jargon comprehensible only to the in-group experts on the one hand, and superficial journalistic description, on the other. The several authors have endeavored well to spell out negative aspects—the limitations and inefficiencies—of the weapons described.

All in all this is an excellent introduction to some of the more hopeful technologies which may have a transforming impact on U.S. strategy. If at times the authors are a bit too sanguine as to the ultimate success of some of the weapons mentioned, it is admittedly difficult not to be excited by the impressive potential presented here.

Dr. I. B. Holley, Jr., Duke University

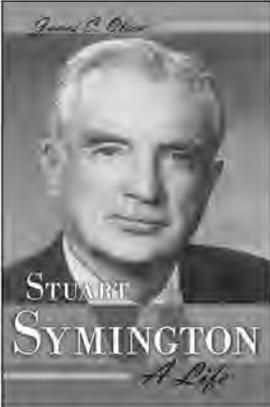


“The Wrights at Kitty Hawk”

Steady winds . . . Velvet Sands
Determined Brothers . . . Willing hands
Gifted men . . . Self-taught minds.
By years of toil and eager thirst,
That from your dunes that they be first
To launch a plane by man's own might
And ride your winds in motored flight.

From Kitty Hawk the Wrights did rise
To throttle time . . . Explore the skies.
Bring nations from a distant berth,
That by their flight this Hallowed Date
May ground forever War and Hate
And man will strive as they once stood
To bring the World to Brotherhood.

Howerton Gowen, 1964



Stuart Symington

A Life

James C. Olson

Stuart Symington is the first full-length biography of one of Missouri’s most influential and effective twentieth-century political leaders. Known as “Harry Truman’s Trouble Shooter,” Stuart Symington was unanimously confirmed by the Senate for six major presidential appointments—a record. As assistant secretary of war for air, he represented the War Department in negotiations leading to the National Security Act of 1947, which unified the armed services into a single national military establishment under the secretary of

defense. During his tenure as secretary of the air force, he steered that organization through a series of crises, including racial integration, as it developed into an independent entity within the Defense Department. **560 pages, 40 illustrations, \$39.95**

“Stuart Symington’s story is as fascinating as it is complicated, and James C. Olson tackles the Herculean task of sorting it all out. This well-crafted book provides the first comprehensive portrait of Symington and his multifaceted career. The writing is clear and to the point. The research is impressive. Olson’s access to personal papers still in the hands of the family afforded him valuable insights about Symington and his actions. *Stuart Symington: A Life* is a fascinating read.”—William E. Foley

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Books Received

Burgess, Colin and Kate Doolan, with Bert Vis. *Fallen Astronauts: Heroes Who Died Reaching for the Moon*. Lincoln and London: University of Nebraska Press, 2003. Photographs. Index. Pp. xxiii, 272. \$25.00 Paperback ISBN: 0-8032-6212-4

Campbell, Douglas N. *The Warthog and the Close Air Support Debate*. Annapolis, Md.: Naval Institute Press, 2003. Photographs. Notes. Glossary. Bibliography. Index. Pp. xiv, 302. \$34.95 ISBN: 1-55750-232-3

Charnov, Bruce H. *From Autogiro to Gyroplane: The Amazing Survival of an Aviation Technology*. Westport, Ct. and London: Praeger, 2003. Photographs. Notes. Bibliography. Index. Pp. xxiv, 389. \$49.95 ISBN: 1-56720-503-8

Clark, Wesley K. *Winning Modern Wars: Iraq, Terrorism, and the American Empire*. New York: Public Affairs, 2003. Maps. Notes. Index. Pp. xvi, 218. \$25.00. ISBN: 1-58648-218-1

Crouch, Tom. *First Flight: The Wright Brothers and the Invention of the Airplane*. Washington, D.C.: National Park Service, 2002. Maps. Tables. Diagrams. Illustrations. Photographs. Index. Pp. 117. Paperback ISBN: 0-912627-71-9

Cutler, Robert S. *It Happened at Bakers Creek - Australia: A History of the Fifth Air Force's Worst Air Crash in World War II*. Hickam AFB, Hawaii: PACAF/HO, 2003. Maps. Notes. Bibliography. Appendices. Pp. xii, 84. Paperback

Dixon, J. E. G. *The Battle of Britain: Victory & Defeat-The Achievements of Air Chief Marshal Dowding and the Scandal of His Dismissal from Office*. Bonor Regis, W. Sussex, UK: Woodfield Publishing, 2003. Tables. Illustrations. Photographs. Appendices. Bibliography. Index. Pp. 285 £15.00 Paperback ISBN: 1-903953-40-5

Defense's Nuclear Agency, 1947-1997. Washington, D.C.: Defense Threat Reduction Agency, 2002. Diagrams. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. vi, 458.

Donaghy, Greg. *Tolerant Allies: Canada & the United States, 1963-1968*. Montreal, Canada: McGill-Queen's University Press, 2002. Notes. Bibliography. Index. Pp. x, 235. \$27.95 Paperback ISBN: 0-7735-2433-9

Lambeth, Benjamin S. *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space*. Santa Monica, Calif.: RAND, 2003. Notes. Appendix. Bibliography. Pp. xviii, 193. \$24.00 Paperback ISBN: 0-8330-3330-1

Leone, Richard C. and Greg Anrig, Jr., Eds. *The War on Our Freedoms: Civil Liberties in an Age of Terrorism*. New York: Public Affairs, 2003. Pp. ix, 317. \$15.00 Paperback ISBN: 1-58648-210-6

Moreley-Mower, Geoffrey with Ray Duke. *Messerschmitt Roulette: The Western Desert, 1941-42*. Shrewsbury, UK.: Airline Publishing, 2003. [Originally published in 1993 by Phalanx]. Maps. Photographs. Notes. Appendices. Pp. 204. \$16.95 Paperback ISBN: 1-84037-426-9

Riddle, Brian and Colin Sinnott, Eds. *Letters of the Wright Brothers: Letters of Wilbur, Orville and Katherine Wright in the Royal Aeronautical Society Library*. Stroud, Gloucestershire, UK: Tempus Publishing, Ltd., 2003. Photographs. Appendices. Glossary. Bibliography. Index. Pp. 287. \$37.50 Paperback ISBN: 0-7524-2584-6

Showalter, Dennis E., Ed. *Future Wars: Coalition Operations in Global Strategy*. Chicago: Imprint Publications, 2002. Notes. Index. Pp.184. \$22.95 ISBN: 1-879176-39-4

PROSPECTIVE REVIEWERS

Anyone who believes he or she is qualified to substantively assess one of the new books listed above is invited to apply for a gratis copy of the book. The prospective reviewer should contact:

Col. Scott A. Willey, USAF (Ret.)
3704 Brices Ford Ct.
Fairfax, VA 22033
Tel. (703) 620-4139
e-mail: scottwille@aol.com



Readers of *Air Power History* readily identified the North American P-64 fighter of World War II, known to its manufacturer as the NA-68. Fifteen readers sent in postcards correctly identifying last issue's mystery aircraft.

The P-64 evolved from a family of trainers that also produced the famous AT-6 Texan advanced trainer of World War II. The Army Air Forces' P-64 was a real fighter according to those who have flown it, not just a trainer with a single cockpit. A pilot who flew many fighters said the P-64 was the "snappiest" he ever flew.

North American built six NA-68 fighters for Thailand (usually called Siam at the time). The aircraft were also known in factory jargon as NA-50A models. Test pilot Louis Wait took the first NA-68 aloft for its initial flight on September 1, 1940 and it performed well, although it would have been no match for a Lockheed P-38 Lightning, Mitsubishi A6M Zero, or Messerschmitt Bf 109.

That year, President Roosevelt embargoed U.S. military exports to a number of countries deemed

in danger of being overrun by Axis forces. The U.S. government seized six NA-68s and turned them over to the Army Air Corps where they became known as P-64 pursuit ships.

Powered by an 840-hp. Wright R-1820-77 radial engine and weighing 6,850 pounds when fully loaded, the NA-68 was initially armed with four .30-cal. machine guns, two in the cowl and one in each wing, plus two 20-mm. cannons in fairings beneath the wings.

Lacking a clear combat mission for a unique population of six fighters, the air force removed the guns. The P-64s became "hacks," used by commanders for transportation. Several, if not all, of the P-64s were based at Luke Army Air Field near Glendale, Ariz.

Our "History Mystery" winner, chosen at random from correct entries, is Earl Lock of Tallmadge, Ohio. He will receive an aviation book. Try your own plane-spotting skills by identifying our new mystery aircraft, following the "History Mystery" rules, below.

This Issue's Mystery Plane

Once more, we present the challenge for our ever-astute readers. See if you can identify this month's "mystery" aircraft. Reminder, postcards only. But remember the rules, please:

1. Submit your entry on a postcard. Mail the postcard to Robert F. Dorr, 3411 Valewood Drive, Oakton VA 22124.

2. Correctly name the aircraft shown here. Also include your address and telephone number, including area code. If you have access to e-mail, include your electronic screen name. Remember that a telephone number is required.

3. A winner will be chosen at random from the postcards with the correct answer. The winner will receive an aviation book.

This feature needs your help. In that attic or basement, you have a photo of a rare or little-

known aircraft. Does anyone have color slides? Send your pictures or slides for possible use as "History Mystery" puzzlers. We will return them.

And, yes, Bob's latest book, *Air Force One*, is still available in bookstores or directly from Bob.

Contact Bob at robertdorr@aol.com



Coming Up



Compiled by George Cully

2003

December 15-18

The **American Institute of Aeronautics and Astronautics** will host its 12th International Symposium on Space Planes and Hypersonic Systems and Technologies in Norfolk, Virginia. Contact:

AIAA
1801 Alexander Bell Dr., Ste. 500
Reston VA 20191-4344
(703) 264-7551
<http://www.aiaa.org>

2004

January 8-11

The **American Historical Association** will hold its 118th annual meeting in Washington, D.C. This year's theme is "War and Peace: History and the Dynamics of Human Conflict and Cooperation." Contact:

The American Historical Association
<http://www.theaha.org>

January 8-11

The annual meeting of the **American Association for History and Computing** will be held at the Marriott Wardman Park and Omni Shoreham hotels in Washington, D.C. This year's theme is "Digital Scholarship: 'Doing History' with Technology." Contact:

Dennis Trinkle
Executive Director, AAHC
DePauw University
603 S. College
Julian Center, Room A106
Greencastle, Indiana 46135-1669
(765) 658-4592, Fax (877)828-2464
e-mail: dtrinkle@depauw.edu
<http://www.theaahc.org>

January 20

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is Alex Danchev & Daniel Todman (eds.), *Alanbrooke, Field Marshal Lord. War Diaries, 1939-1945 (2001)*. Speaker: Dr. Jeffrey G. Barlow, Naval Historical Center. Contact:

LCDR Wanda Pompey, USN
Naval Historical Center
805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

February 17

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is Bruce Catton, *This Hallowed Ground: The Story of the Union Side of the Civil War*, Doubleday, 1956. Speaker: Dr. Craig L. Symonds, U.S. Naval Academy. Contact:

LCDR Wanda Pompey, USN
Naval Historical Center
805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

March 16

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is Geoffrey Parker, *Military Revolution, Military Innovation, and the Rise of the West, 1500-1800*. Cambridge University Press, 1988/2000, and John Guilmartin. *Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the 16th Century*, Cambridge University Press, 1974/2003. Speaker: Dr. John A. Lynn, University of Illinois. Contact:

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805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

March 25-28

The **Organization of American Historians** will hold its annual meeting at the Boston Marriott Copley Place Hotel in Boston, Massachusetts. This year's theme is "American Revolutions—Transformations in American History." Contact:

OAH Annual Meeting
112 North Bryan Ave.
Bloomington IN 47408-4199
(812) 855-9853
e-mail: meetings@oah.org
<http://www.oah.org/meetings>

April 20

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is John G. Bourke, *On the Border with Crook*, University of Nebraska Press, 1971. Speaker: Dr. Perry D. Jamieson, U.S. Air Force Historical Office. Contact:

LCDR Wanda Pompey, USN
Naval Historical Center
805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

May 5-9

The **Council on America's Military Past** will hold its 38th Annual Conference at the Eastland Park Hotel in Portland, Maine. Contact:

Col. Herbert M. Hart, USMC (Ret.)
Executive Director
Council on America's Military Past
Post Office Box 1151
Fort Myer, VA 22211
(703) 912-6124. Fax (703) 912-5666
e-mail: camphart@aol.com

May 18

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is Douglas Leach, *Arms for Empire: A Military History of the British Colonies in North America, 1607-1763*, MacMillan, 1973. Speaker: Dr. Reginald C. Stuart, Mount Saint Vincent University.
Contact:

LCDR Wanda Pompey, USN
Naval Historical Center
805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

May 20-23

The **Journal of Policy History** will host a Conference on Policy History to be held in at the Sheraton Clayton Plaza in St. Louis, Missouri. Contact:

Journal of Policy History
Saint Louis University
3800 Lindell Blvd. P. O. Box 56907
St. Louis, MO 63156-0907
<http://www.slu.edu/departments/jphand>

June 3-6

The **Historical Society** will hold its National Conference in the Spruce Point Inn, near Boothbay Harbor, Maine. The theme of the conference is "Reflections on the Current State of Historical Inquiry." Contact:

2004 Conference
The Historical Society
656 Beacon Street, Mezzanine
Boston MA 02215-2010
e-mail: historic.bu.edu
<http://www.bu.edu/historic>

June 15

The **Military Classics Seminar** meets for dinner-discussion at the Ft. Myer, Virginia, Officers' Club. This month's selection is Tami Davis Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas About Strategic Bombing, 1914-1945*, Princeton University Press, 2002. Speaker: Dr. Thomas Julian (Colonel, USAF (Ret.)). Contact:

LCDR Wanda Pompey, USN
Naval Historical Center
805 Kidder Breese Street, SE
Washington Navy Yard, D.C. 20374-5060
(202) 433-2331
e-mail: wanda.pompey@navy.mil

If you wish to have your event listed, contact:

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(513) 748-4737
e-mail: 71022.1100@compuserve.com



The *Concorde* SST made its final landing at London Heathrow on October 24, 2003."

Air Power History

List of Referees,
Dec. 2002-Dec. 2003

David G. Allen
William H. Bartsch
Donald R. Baucom
Janet Daly Bednarek
August Blume
George Bradley
David R. Chenoweth
John Cloe
James Corum
Sebastian Cox
George W. Cully
Richard G. Davis
Ron Dick
Samuel Dickens
Stanley Falk
Alan Gropman
Brian S. Gunderson
Michael Haas
R. Cargill Hall
Grant T. Hammond
Paddy Harbison
Von Hardesty
William Head
I. B. Holley
Perry Jamieson
Priscilla D. Jones
John Kreis
William M. Leary
Donald S. Lopez
Mark Mandeles
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Edward Marolda
Clay McCutchen
Charles Melson
Roger G. Miller
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David N. Spires
Rick W. Sturdevant
Wayne W. Thompson
George M. Watson
Kenneth P. Werrell
Darrel Whitcomb
Herman S. Wolk
William T. Y'Blood
James Young

Changing of the Guard



General W. Y. Smith, USAF (Ret.)

General W. Y. Smith served for 35 years in the USAF, rising from jet fighter pilot to four-star rank. Upon his retirement in 1983 he was selected as a Fellow at the Woodrow Wilson Center for International Scholars at the Smithsonian Institution. Subsequently, he became President of the Institute for Defense Analyses, a federally funded research and development center. He retired from that position in 1991.

General Smith graduated from West Point and holds M.A. and Ph.D. degrees from Harvard University. He saw combat in the Korean conflict and was awarded the Silver Star, Distinguished Flying Cross, and the Purple Heart, among other decorations. He was assigned to the National Security Council staff at the White House under President Kennedy, and served as Military Assistant to two secretaries of the Air Force and as Assistant to three Chairmen of the Joint Chiefs of Staff.

General Smith became President of the Air Force Historical Foundation in 1996. During his tenure the Foundation's financial condition improved markedly. He took great pride in introducing "jointness" into the Foundation's biennial symposia, for example the May 2002 symposium, "Coalition Air Warfare in the Korean War, 1950-1953," and the recent joint symposium with the Royal Air Force Historical Society on "Anglo-American Cooperation in the Twentieth Century." General Smith guided publication of the illustrated history, *Air Force*.

General Smith plans to stay active through his participation on various boards and panels.



Lt. Gen. Michael A. Nelson, USAF (Ret.)

Lt Gen Michael A. Nelson served for 35 years in the USAF, retiring in 1994 as Commander, Ninth Air Force, and Commander, Central Command Air Forces. He served as president of The Retired Officers Association (now Military Officers Association of America) from 1995 to 2002. In addition to his new position as president of the Air Force Historical Foundation, he is president of the National War College Alumni Association.

Lt Gen Nelson earned his commission through AFROTC at Stanford University, later receiving a masters degree at the University of Arizona. He completed pilot training in Class 61B at Laredo AFB, entered F-100 training at Luke AFB and, for the rest of his career, interspersed flying fighters (F-100, F-105, A-7, F-4E, F-15, F-16) between staff, command, and professional education assignments, completing his last single seat sortie just before retirement. From July 1967 to July 1968, General Nelson worked on fighter electronic warfare and also flew F-105s with the 333rd Tactical Fighter Squadron of the 355th Tactical Fighter Wing, completing 100 combat missions over North Vietnam. His commands include the 357th Tactical Fighter Squadron, 21st Tactical Fighter Wing, 313th Air Division, 13th Air Force, Sheppard Technical Training Center, and Ninth Air Force. He is a graduate of Squadron Officer School, Air Command and Staff College, and the National War College.

The Nelsons have served overseas in England, Korea, Okinawa, the Philippines, Germany, and Belgium in USAF, joint, and international assignments. They now live in Fairfax Station, Virginia.



THE AIR FORCE HISTORICAL FOUNDATION

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Dear Members of the Air Force Historical Foundation:

It is my good fortune to have inherited the presidency of this fine organization from General "Bill" Smith, who led it skillfully and with selfless dedication for seven years. Under his stewardship, we have improved our financial health, enhanced our programs, and further secured the reputation of this magazine, our flagship, as the leader in interesting, useful, and accurate accounts of relevant air power history. I thank General Smith, both personally and on behalf of all the Foundation's members, for his outstanding leadership.

Early in my time as president, I will try to build on the legacy left by General Smith by organizing the development of a strategic plan for the Foundation. I don't anticipate any hard turns here, but I do think it will be useful for us to articulate where we hope to be in a few years and how we plan to get there. Whatever we put together must accommodate the need to recruit new members, especially those who are now making their own air power history in uniform, and it must describe the means of securing further financial support. The latter requirement is especially important if we are to broaden the services and programs we provide in order to appeal to more potential members.

I have asked the members of the Board of Trustees for assistance in the construction of the strategic plan. Their commitment to the Foundation and their many personal experiences and judgments will be vital to the creation of a useful document. I know they would be delighted to hear from any member with suggestions about this initiative. Simply send your comments, by paper or electronic mail (AFHF, 1535 Command Drive, Suite A-122, Andrews AFB, MD 20762-7002 or afhf@earthlink.net) to our Executive Director, Col Joe Marston, USAF (Ret), who will pass them along to those participating in the planning process.

Ours is an organization rich in its own history. It was established fifty years ago, in 1953 at a meeting attended by some of the most illustrious Air Force names: "Benny" Foulois, "Tooey" Spaatz, Ira Eaker, Hoyt Vandenberg, and Nate Twining, to name only several. Over the years the Foundation has worked diligently to live up to the charter established by these great leaders. It is now our responsibility to pick up the torch carried for so long and so well by our predecessors, doing our best to continue their legacy.

Sincerely,

Michael A. Nelson, Lt. Gen. USAF (Ret.)

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Navy Carriers in Korea

Michael Rowland betrays his Air Force antecedents in "Why the U.S. Air Force did not use the F-47 Thunderbolt in the Korean War." He writes: "Another Navy jet, the McDonnell F2H Banshee, did not even appear in Korea until August, 1951 when the U.S.S. *Essex* (CVA-9) arrived with its powerful new steam catapults." According to the Naval Historical Center the *Essex* received her SCB 125 refit in 1955-56, the principal change being the addition of an angled deck, but no steam catapults. The SCB 27C refit, of which the principal modification was the steam catapult, was done concurrently with SCB 125, but confined to *Shangri-La*, *Lexington*, *Bonne Homme Richard*, and *Oriskany*. So far as I know none of the carriers,

American or British, employed during the Korean War had angled decks or steam catapults.

Michael H. Coles, Shelter Island Heights, New York

Author's reply:

I'm happy to acknowledge my mistake. The *Essex's* new catapults were improved hydraulic, not steam catapults. USS *Hancock* (CVA-19) was the first U.S. carrier to receive steam catapults; this modification was completed in March 1954. Another error to correct is that *Essex* carried the designation CV-9 when she arrived off the Korean coast in August 1951. She was redesignated CVA-9 in October 1952.

I'm not sure how these errors betray my "Air Force antecedents." What they betray is a weakness in my research. I'm proud of my service in the Air Force, but I'm the son of a career Navy officer and I have a life-long interest in naval aviation. I carry a scar on the bridge of my nose from an encounter I had with an F-14 Tomcat during a Tiger Cruise aboard the USS Abraham Lincoln (CVN-72) in early 1990. One of my most memorable experiences in the Air Force was sitting in the cockpit of an FG-1D Corsair at Sheppard AFB. I have a model of an F2H-2 Banshee hanging from the ceiling in my room. I'm glad to know my article is being read carefully. I appreciate the information about the carrier modifications and I enjoyed learning more about this fascinating period in aviation history.

Michael Rowland

[In addition, two errors crept into the article during the final publication process. On p. 10, the photo caption should read 34.5 victories, not 38.5. On p. 13, top left column, the MiG-15 appeared over Korea in 1950, not 1951. Editor]

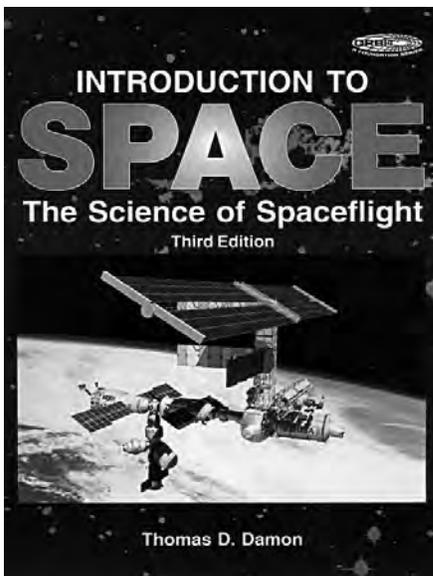
Enlisted "Aces"

I read Colonel Hinds' article on Staff Sergeant Benjamin F. Warmer, III and his status as an "Ace" with considerable interest.

As many readers know, the Air Force Association's *Air Force* magazine publishes an almanac each year, one of the features of which lists USAF aces of all wars. A couple of years ago I inquired as to the possible "Ace" status of enlisted air gunners and was told that such claims could not be adequately confirmed. The Air Force Historical Research Agency at Maxwell AFB states on its "Aerial Victory Credits" internet site that the Army Air Forces "abandoned the attempt to systematically award victory credits" to gunners. It does recognize air-to-air kills from Korea and Viet Nam by enlisted air gunners, due to greater documentation of these kills.

Now, I read that SSgt. Warmer's accomplishment was thoroughly researched and confirmed and that no less an authority than Lt. Gen. Spaatz designated him an "Ace." I would hope this is "official" enough for anyone.

MSgt. William T. Brockman, Georgia ANG, Robins AFB, GA



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Seven Down and Glory?

The Fall 2003 issue of *Air Power History* generated a request to us about gunner aerial victory credits. In answering the request, I noticed a photo caption on p. 18 in the article "Big Ben": Sergeant Benjamin F. Warmer III, Flying Ace," by John W. Hinds, that states: "Staff Sergeant Benjamin Franklin Warmer, III, towers over Lt. Gen. Carl A. "Tooney" Spaatz who is decorating the gunner with the Distinguished Service cross for accomplishing what no U.S. airman did in any war: shooting down seven German Bf 109s on a single mission." The statement is technically correct, because no other U.S. airman shot down seven German Bf 109s. Two fighter pilots, however, each shot down seven airplanes on a single mission. Major William L. Leverette of the 37th Fighter Squadron shot down seven enemy aircraft on October 9, 1943 (all Ju-87s), and Captain William A. Shomo of the 82d Reconnaissance Squadron shot down seven enemy airplanes on January 11, 1945—six fighters and one bomber, not otherwise identified.

Dr. Daniel Haulman, Air Force Historical Research Agency, Maxwell AFB, Alabama.

General Dixon and the RCAF

In the Fall 2003 issue of *Air Power History*. Vol. 50, No. 3, page 60, Col. R. J. Powers noted that Gen. Robert J. Dixon had transferred from the U.S. Air Corps to the Royal Canadian Air Force. "Did [he] wash out?" Powers wondered.

We're pleased to pass along eyewitness testimony from Brig. Gen. James H. McPartlin, USAF (Ret.), who attended primary flying with Dixon at Parks Air College, Illinois, in July 1941, Flying Cadet Class of 42B. "We graduated from Primary Flight Training, and moved on to Randolph Field....graduation was within our grasp....We now felt comfortable that we would not wash out...." McPartlin then talks about Dixon "having a rough go [hazing] with a TAC officer." There was "a blow up," and Dixon refused to comply with the restrictions and punishment. He subsequently joined the RCAF and then the RAF, where he flew Spitfires in a reconnaissance squadron and earned a British DFC.

Synthesis of letter from Brig. Gen. James H. McPartlin, USAF (Ret.),

Yamamoto and Bin Laden?

I think that your response to the letter from Lt. Col. Michael J. Yaguchi, USAF, in the Letters section of the Fall 2003 edition is outstanding. Your substantive points are excellent, and your tone is clear and heartfelt, not muddled by political-speak. Good for you.

Richard Boverie, USAF (Ret.), West Palm Beach, Florida

News

Dr. Ivan A. Getting

Dr. Ivan A. Getting, military scientist and technologist, died on October 11, 2003; he was ninety-one. He was born in 1912 in New York and raised in Pittsburgh. A child prodigy, he attended the Massachusetts Institute of Technology, graduating with a degree in physics. As a Rhodes Scholar at Oxford, he was then awarded a doctorate in astrophysics in 1935. Returning to the U.S. he won a fellowship at Harvard to work on cosmic radiation. There he designed one of the essential components of the first digital computers, when they were developed in the 1940s.

During World War II, Getting headed the MIT radiation laboratory's Army and Fire Control Radar Division, the group responsible for the development of almost all the ground-based radars used by the U.S. In 1950, Getting went to work at the Pentagon as assistant of development planning for the U.S. Air Force, but the following year he moved on to the Raytheon Company of Lexington, Massachusetts, as vice-president for research and engineering. Under his direction, Raytheon became the first company to produce transistors commercially. He was also responsible for the development of its AIM-7M Sparrow III and Hawk missiles. In 1960

Getting became the co-founder and president of the Aerospace Corporation, which he ran until he retired in 1977. While working at Aerospace Corporation he led the development of the satellite technology which, was to become the space-based Global Positioning System.

Dr. Getting served on the U.S. Navy Studies Board and the undersea warfare committee of the US National Academy of Science. He was much involved in the development, among other weapon sys-

tems, of the Polaris submarine-launched intermediate-range ballistic missile.

He is survived by his wife, Helen, and by two sons and a daughter.

Dr. George R. Abrahamson

Dr. George R. Abrahamson passed away Tuesday evening, July 15, 2003. Dr. Abrahamson was Air Force Chief Scientist from June 1991 thru June 1994. Funeral services were held on July 19, 2003, in Palo Alto, California.

David Shircliffe, Air Force Historian

David Shircliffe passed away in early September. Dave was a long time member of the Air Force History program, which he joined in 1963, after a twelve-year Air Force career. He began as an historian at Headquarters NORAD in Colorado Springs, Colorado, after earning his B.S. and M.A. from the University of Missouri. He quickly moved on to Twelfth Air Force at Bergstrom AFB, Texas, and then onward to Air Training Command in 1974. He retired from ATC in 1988 as the command historian. He is survived by his wife Lou Ann, four sons, and six grandchildren.

Reunions

The **306th Bomb Group Association** reunion will be held December 4-7, 2003, in Savannah, Georgia. Contact:

Savannah Marriott Riverfront
100 Gen. McIntosh Blvd.
Savannah, GA 31401
(912) 233-7722; FAX (912) 233-3765
e-mail: tbaker26@eesc.com

2004

The **Association of Air Force Missileers (AAFMM)** will meet May 19-23, 2004, in Omaha, Nebraska. Contact:

AAFMM
P.O. Box 5693
Breckenridge, CO 80424
(970) 453-0500
aafm@afmissileers.org

The **610th Air Control and Warning Squadron** (618th, 527th, and all Southern Japan Radar GCI sites). Proposed reunion at Branson, Missouri, in September 2004. Contact:

Marvin Jordahl
(904) 739-9337
e-mail: jordahlmarvin@attbi.com

General W. L. "Bill" Creech 1927–2003



General W. L. Creech died on August 26, 2003. He was seventy-six. Among his many accomplishments, the rebuilding of Tactical Air Command stands out.

General Creech was born in Argyle, Missouri, in 1927. He earned a BS degree from the University of Maryland, an MA in international relations from The George Washington University, and graduated from the National War College in 1966. He received his wings and commission in September 1949 as a distinguished graduate of flying training school.

His first operational assignment was with the 51st Fighter Wing at Naha, Okinawa. During the Korean War he flew with the 51st Wing from Kimpo Air Base and completed 103 combat missions over North Korea. He also served a combat tour as a forward air controller with the U.S. Army's 27th Infantry Regiment, 25th Infantry Division. In July 1951, General Creech was assigned as a flight commander at Luke AFB, Arizona, where, for the next two and one-half years, he taught advanced gunnery to students from fourteen nations. In November 1953 he joined the U.S. Air Force Aerial Demonstration Team, the Thunderbirds, and flew 125

official aerial demonstrations over the United States and Central America.

In January 1956, he became commander and leader of the U.S. Air Forces in Europe Aerial Demonstration Team, the Skyblazers, based at Bitburg, West Germany. By December 1959, he had flown 399 official aerial demonstrations with this team throughout Europe, North Africa, and the Middle East.

In June 1960, General Creech was named director of operations, U.S. Air Force Fighter Weapons School at Nellis AFB, Nevada, where he served until February 1962. He then was assigned as a special adviser to the commander of the Argentine air force in Buenos Aires.

From August 1962 to August 1965, he was executive and aide to the commander of Tactical Air Command, Langley AFB, Virginia. In August 1965, he entered the National War College at Fort Lesley J. McNair, Washington, D.C. Upon graduation, in June 1966, he was selected to be a staff assistant in the Office of the Secretary of Defense. General Creech transferred to the Republic of Vietnam in November 1968 as deputy commander for operations of the 37th Tactical Fighter Wing, Phu Cat AB. After six months with the wing, during which he flew 177 combat missions, he became assistant deputy chief of staff for operations, Headquarters Seventh Air Force, in Saigon.

In November 1969, General Creech was assigned to U.S. Air Forces in Europe and successively commanded two tactical fighter wings. After one year as commander of the 86th Tactical Fighter Wing at Zweibrücken, West Germany, he became the commander of the 401st Tactical Fighter Wing at Madrid, Spain. From August 1971 until August 1974, General Creech served as deputy chief of staff for operations and intelligence, Headquarters U.S. Air Forces in Europe at Wiesbaden and Ramstein, West Germany.

General Creech was assigned to Air Force Systems Command, in September 1974, as vice com-

mander of Aeronautical Systems Division at Wright-Patterson AFB, Ohio, and in October 1974 was appointed commander of the Electronic Systems Division, Hanscom Field, Massachusetts.

After two and one-half years as commander of Electronic Systems Division, General Creech was transferred to Washington, D.C., where he served concurrently as the assistant vice chief of staff, assistant to the Chief of Staff for readiness and North Atlantic Treaty Organization matters, and senior U.S. Air Force member, Military Staff Committee, United Nations.

On May 1, 1978, he was promoted to four-star general and named commander of Tactical Air Command, with headquarters at Langley AFB. As commander, he directed the activities of two numbered air forces, three centers, and seven air divisions. More than 111,300 military and civilian personnel were assigned to 32 TAC bases in the United States, Panama, Okinawa and Iceland. Additionally, TAC was the gaining organization for 58,300 Air National Guard and Air Force Reserve personnel in 149 major units throughout the United States.

After retiring from the Air Force, in December 1984, General Creech became a management consultant. He wrote, *The Five Pillars of TQM* [Total Quality Management], a book that pointed readers to success through attending to "product, process, organization, leadership, and commitment."

General Creech was a command pilot, experienced in forty different military fighter, cargo, and reconnaissance aircraft. His military decorations and awards included the Distinguished Service Medal with oak leaf cluster; Silver Star, Legion of Merit with two oak leaf clusters; Distinguished Flying Cross with three oak leaf clusters; Air Medal with 14 oak leaf clusters; Air Force Commendation Medal with two oak leaf clusters; Army Commendation Medal; Republic of Vietnam Air Service Medal (Honor Class); Spanish Grand Cross of Aeronautical Merit with white ribbon; and Republic of Korea Order of National Security Merit Tong II Medal.

General Creech is survived by his wife, Caroline, of Henderson, Nevada, and his sister, Maxine Body, of Bigelow Minnesota.

Guidelines for Contributors

We seek quality articles—based on sound scholarship, perceptive analysis, and/or firsthand experience—which are well-written and attractively illustrated. The primary criterion is that the manuscript contributes to knowledge. Articles submitted to *Air Power History* must be original contributions and not be under consideration by any other publication at the same time. If a manuscript is under consideration by another publication, the author should clearly indicate this at the time of submission. Each submission must include an abstract—a statement of the article's theme, its historical context, major subsidiary issues, and research sources. Abstracts should not be longer than one page.

Manuscripts should be submitted in triplicate, double-spaced throughout, and prepared according to the *Chicago Manual of Style* (University of Chicago Press). Use civilian dates and endnotes. Because submissions are evaluated anonymously, the author's name should appear only on the title page. Authors should provide on a separate page brief biographical details, to include institutional or professional affiliation and recent publications, for inclusion in the printed article. Pages, including those containing illustrations, diagrams or tables, should be numbered consecutively. Any figures and tables must be clearly produced ready for photographic reproduction. The source should be given below the table. Endnotes should be numbered consecutively through the article with a raised numeral corresponding to the list of notes placed at the end.

If an article is typed on a computer, the disk should be in IBM-PC compatible format and should accompany the manuscript. Preferred disk size is a 3 1/2-inch floppy, but any disk size can be utilized. Disks should be labelled with the name of the author, title of the article, and the software used. WordPerfect, in any version number, is preferred. Other word processors that can be accommodated are WordStar, Microsoft Word, Word for Windows, and AmiPro. As a last resort, an ASCII text file can be used.

There is no standard length for articles, but 4,500-5,500 words is a general guide.

Manuscripts and editorial correspondence should be sent to Jacob Neufeld, Editor, c/o *Air Power History*, P.O. Box 10328, Rockville, MD 20849-0328, e-mail: jneufeld@comcast.net.

General Charles A. Gabriel 1928–2003



General Charles A. Gabriel, USAF, (Ret.) died of natural causes on September 4, 2003 in McLean, Virginia.

General Gabriel was born in Lincolnton, North Carolina, in 1928. He attended Catawba College, Salisbury, North Carolina for two years before entering the United States Military Academy at West Point, New York. He graduated in June 1950 with a B.S. degree. He earned an M.S. degree in engineering management from the George Washington University, Washington D.C.; completed courses at the Naval War College (Command and Staff), Newport, Rhode Island; and the Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C.

After completing pilot training at Goodfellow AFB, Texas, and Craig AFB, Alabama, he was assigned to the 18th Fighter-Bomber Wing and the 51st Fighter-Interceptor Wing in South Korea. He flew 100 combat missions in F-51s and F-86s and was credited with shooting down two MiG-15s,

During his tenure of over thirty-five years of military service, he held numerous key positions culminating his career as the eleventh Chief of Staff of the United States Air Force. He served as a pilot and squadron air operations officer, 86th Fighter-Interceptor Wing, Landstuhl

AB, Germany; squadron air officer commanding, USAF Academy, Colorado; adjutant for the 3550th Pilot Training Group and Commander Headquarters Squadron Section, Moody AFB, Georgia; staff officer, Directorate of Plans, Headquarters USAF, Washington, D.C.; executive officer to the Chief of Staff, Supreme Headquarters Allied Powers Europe, Mons, Belgium; commander, 432nd Tactical Reconnaissance Wing, Udorn Royal Thai AFB, Thailand; deputy of operational forces and deputy director of operations, Headquarters USAF; Deputy Chief of Staff for Operations, Headquarters Tactical Air Command, Langley AFB, Virginia.; deputy commander in chief, U.S. Forces Korea and deputy commander in chief, United Nations Command, Seoul, Korea; deputy chief of staff for operations, plans and readiness, Headquarters USAF; Commander in Chief, USAFE and Commander of Allied Air Forces Central Europe, Ramstein AB. In July 1982 he was named Air Force Chief of Staff. General Gabriel retired on July 1, 1986.

His military decorations and awards include the Defense Distinguished Service Medal, Air Force Distinguished Service Medal, Legion of Merit with oak leaf cluster, Distinguished Flying Cross with four oak leaf clusters, Air Medal with 14 oak leaf clusters, Air Force Commendation Medal with oak leaf cluster, Presidential Unit Citation Emblem, Air Force Outstanding Unit Award Ribbon, Republic of Korea Order of National Security Merit (Gugseon Medal) and Republic of Korea Presidential Unit Citation.

General Gabriel is survived by his wife, Dottie, their two children, Jane and Chuck and their grandchildren of McLean, Virginia.