

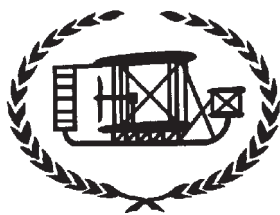
AIR POWER

History

FALL 2005 - Volume 52, Number 3

The Red Baron Reports: What They Really Said <i>William Sayers</i>	4
Italian Aircraft in Russia <i>Viktor P. Kulikov</i>	14
Airlifts in Time <i>Justin Giovannettone</i>	26
Committing to the Shuttle Without Ever Having a National Policy <i>L. Parker Temple III</i>	36
<hr/>	
Book Reviews	52
<i>Splendid Vision, Unswerving Purpose: Developing Air Power for the United States Air Force during the First Century of Powered Flight</i> By ASD Staff.	52
Reviewed by Squire Brown.	
<i>Stauffenberg: A Family History, 1905-1944.</i> By Peter Hoffman.	52
Reviewed by I.B. Holley, Jr.	
<i>Masters of Chaos: The Secret History of the Special Forces.</i> By Linda Robinson.	53
Reviewed by I.B. Holley, Jr.	
<i>Martin P6M SeaMaster: The Most Advanced Seaplane Ever Built.</i> By Stan Piet and Al Raithel.	54
Reviewed by James C. Kellogg	
<i>Lone Star Stalag: German Prisoners of War at Camp Hearne.</i> By Michael R. Waters, et al.	54
Reviewed by Scott D. Murdock.	
<i>Rattler One-Seven: A Viet Nam Helicopter Pilot's War Story.</i> By Chuck Gross.	54
Reviewed by William A. Nardo.	
<i>Commandants of the Marine Corps.</i> By Allan R. Millett and Jack Shulimson, eds.	56
Reviewed by Curtis H. O'Sullivan	
<i>Hit to Kill: The New Battle over Shielding America from Missile Attack.</i> By Bradley Graham.	57
Reviewed by Joseph Romito.	
<i>Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914-1945.</i> By Tami Davis Biddle.	57
Reviewed by Nicholas Evan Sarantakes.	
<i>Royal Air Force Historical Society Journal 32: Air Power: Anglo-American Perspectives.</i> By C.G. Jefford, ed.	58
Reviewed by Nicholas Evan Sarantakes.	
<i>Billy Mitchell "Stormy Petrel of the Air."</i> By Roger G. Miller.	59
Reviewed by Jim Schier	
<i>Chasing the Silver Bullet: U.S. Air Force Weapons Development from Vietnam to Desert Storm</i> By Kenneth P. Werrell.	59
Reviewed by George M. Watson, Jr.	
<i>Woodbine Red Leader: A P-51 Mustang Ace in the Mediterranean Theater.</i> By George Loving	60
Reviewed by Scott A. Willey	
<i>Franklin Delano Roosevelt: Champion of Freedom</i> By Conrad Black	61
Reviewed by John R. Braddon	
Books Received	62
Coming Up	64
Letters, News, Notices, Reunions	66
In Memoriam: General Bernard A. Schriever	67
History Mystery	68

The Air Force Historical Foundation



Air Force Historical Foundation
1535 Command Drive – Suite A122
Andrews AFB, MD 20762-7002
(301) 981-2139
(301) 981-3574 Fax
E-Mail: afhf@earthlink.net
http://afhistoricalfoundation.com

Officers

President

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

Vice-President

Gen. John A. Shaud, USAF (Ret)

Secretary-Treasurer

Maj. Gen. John S. Patton, USAF (Ret)

Executive Director

Col. George K. Williams, USAF (Ret)

Advisors

Gen. John P. Jumper, USAF

Lt. Gen. John R. Dallager, USAF

Lt. Gen. Donald A. Lamontagne, USAF

Brig. Gen. Frederick F. Roggero, USAF

CMSAF Gerald R. Murray, USAF

Mr. C. R. "Dick" Anderegg

Board of Trustees

Col. Kenneth J. Alnwick, USAF (Ret)

Mr. F. Clifton Berry, Jr.

Maj. Gen. Ralph S. Clem, USAF (Ret)

Lt. Gen. John B. Conaway, USAF (Ret)

Lt. Gen. Russell C. Davis, USAF (Ret)

Gen. Michael J. Dugan, USAF (Ret)

Gen. Ronald R. Fogleman, USAF (Ret)

Maj. Gen. John P. Henebry, USAF (Ret)

Col. George A. Henry, Jr., USAF (Ret)

Lt. Gen. Bradley C. Hosmer, USAF (Ret)

Brig. Gen. Alfred F. Hurley, USAF (Ret)

Brig. Gen. James A. Jaeger, USAF (Ret)

Mr. John Kreis, USAF (Ret)

Gen. Walter Kross, USAF (Ret)

Maj. Gen. Charles D. Link, USAF (Ret)

Hon. Hans Mark

CMSgt Norman A. Marous, USAF

Gen. Thomas S. Moorman, Jr., USAF (Ret)

CMSgtAF Sam E. Parish, USAF (Ret)

Col. Robert E. Vickers, Jr., USAF (Ret)

Col. George Weinbrenner, USAF (Ret)

Trustees Emeriti

Lt. Col. Maynard Y. Binge, USAF (Ret)

Lt. Gen. Devol Brett, USAF (Ret)

Lt. Gen. William E. Brown, USAF (Ret)

Lt. Gen. Charles G. Cleveland, USAF (Ret)

Gen. Bennie L. Davis, USAF (Ret)

Gen. Howell M. Estes, Jr., USAF (Ret)

Mr. John E. Greenwood

Gen. Robert T. Herres, USAF (Ret)

Dr. I. B. Holley, Jr.

Maj. Gen. Jeanne M. Holm, USAF (Ret)

Gen. David C. Jones, USAF (Ret)

Lt. Col. Donald S. Lopez, USAF (Ret)

Col. Kenneth Moll, USAF (Ret)

Col. Helen E. O'Day, USAF (Ret)

Hon. Verne Orr

Maj. Gen. John S. Patton, USAF (Ret)

Maj. Gen. Ramsay D. Potts, USAF (Ret)

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

MSGT. Charles J. Warth, USAF (Ret)

Col. Sherman W. Wilkins, USAF (Ret)

Maj. Gen. Richard A. Yudkin, USAF (Ret)

Contributing Members

The individuals and companies listed are contributing members of the Air Force Historical Foundation. The Foundation Trustees and members are grateful for their support and contributions to preserving, perpetuating, and publishing the history and traditions of American aviation.

Donors

Lt. Gen. John B. Conaway, USAF (Ret)

Col. Kenneth Moll, USAF (Ret)

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

Maj. Gen. John S. Patton, USAF (Ret)

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

Supporters

ATV Capital Management, Inc.

Mrs. Irene W. McPherson

Maj. Gen. Richard A. Yudkin

Friends

Mr. F. Clifton Berry, Jr.

Lt. Col. Maynard Y. Binge, USAF (Ret)

Brig. Gen. Alfred F. Hurley, USAF (Ret)

The Honorable Hans Mark

Col. Helen E. O'Day, USAF (Ret)

The Honorable Verne Orr

AIR POWER *History*

The Journal of the
Air Force Historical Foundation
Fall 2005 Volume 52 Number 3

Publisher

Editor

Jacob Neufeld

Technical Editor

Robert F. Dorr

Book Review Editor

Scott A. Willey

Layout and Typesetting

Richard I. Wolf

Advertising

George K. Williams

Circulation

Richard I. Wolf

Air Power History (ISSN 1044-016X)
is produced in March, June, September,
and December by the Air Force Historical
Foundation.

Prospective contributors should consult the
GUIDELINES FOR CONTRIBUTORS at
the back of this journal. Unsolicited manu-
scripts will be returned only on specific
request. The Editor cannot accept responsi-
bility for any damage to or loss of the man-
uscript. The Editor reserves the right to
edit manuscripts and letters.

Address **Letters to the Editor** to:

Air Power History
P.O. Box 10328
Rockville, MD 20849-0328
e-mail: jneufeld@comcast.net

Correspondence regarding missed issues
or changes of address should be addressed
to the **Circulation Office**:

Air Power History
P.O. Box 151150
Alexandria, Virginia 22315
Telephone: (301) 981-2139
Fax: (301) 981-3574
e-mail: airpowerhistory@yahoo.com

Advertising

George K. Williams
1535 Command Dr--Suite A-122
Andrews AFB, MD 20762-7002
(301) 981-2139; fax (301) 981-3574
e-mail: afhf@earthlink.net

Copyright © 2005 by the Air Force
Historical Foundation. All rights reserved.
Periodicals postage paid at Lexington, VA
24450 and additional mailing offices.

Postmaster: Please send change of
address to the Circulation Office.

By now most readers of *Air Power History* have learned the sad news of the passing of General Bernard A. “Bennie” Schriever, on June 20, 2005. [See page 67.] He was in frail health for many months before, but his death still came as a shock to those of us who were privileged to know him. The “father” of Air Force missiles and space systems, General Schriever was one of the makers of the United States Air Force and its preeminent visionary. He leaves a tremendous void in the ranks, but his legacy will endure in both his great works and the generation of Airmen/scientists whom he inspired. General Schriever’s desire to be buried near his mentor, General Henry H. “Hap” Arnold, at Arlington National Cemetery was honored

* * *

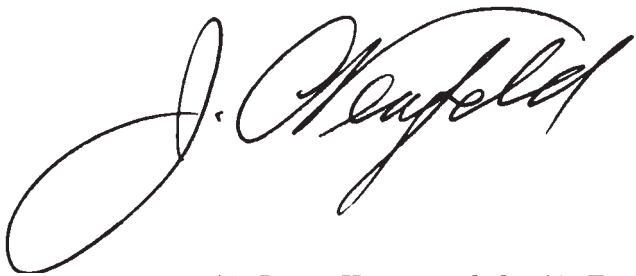
The lead article in this issue is William Sayers’s “The Red Baron Studies: What They Really Said.” Sayers painstakingly reviews the air combat statistics of the U.S. Air Force and Navy during the Vietnam War. His expert analysis challenges the popularly accepted conclusions and should stir up the adherents of the “conventional wisdom.”

In “Airlifts in Time,” Jason Giovannettone applies the methodology of historians Richard Neustadt and Ernest May that was demonstrated in their fascinating 1986 book, *Thinking in Time: The Uses of History for Decision Makers*. Giovannettone uses the Neustadt–May thesis to draw lessons from two historic events: the Berlin Airlift and the resupply of Israel during the 1973 Yom Kippur War.

In the third article, Viktor Kulikov, our correspondent in Moscow, continues his series on the origins of Russian aviation. In this article, Kulikov presents the history of Russia’s acquisition of Italian planes beginning in World War I and running to the 1930s. Not only is this an eye-opening story, but the photographs offer a great deal of information and rich detail.

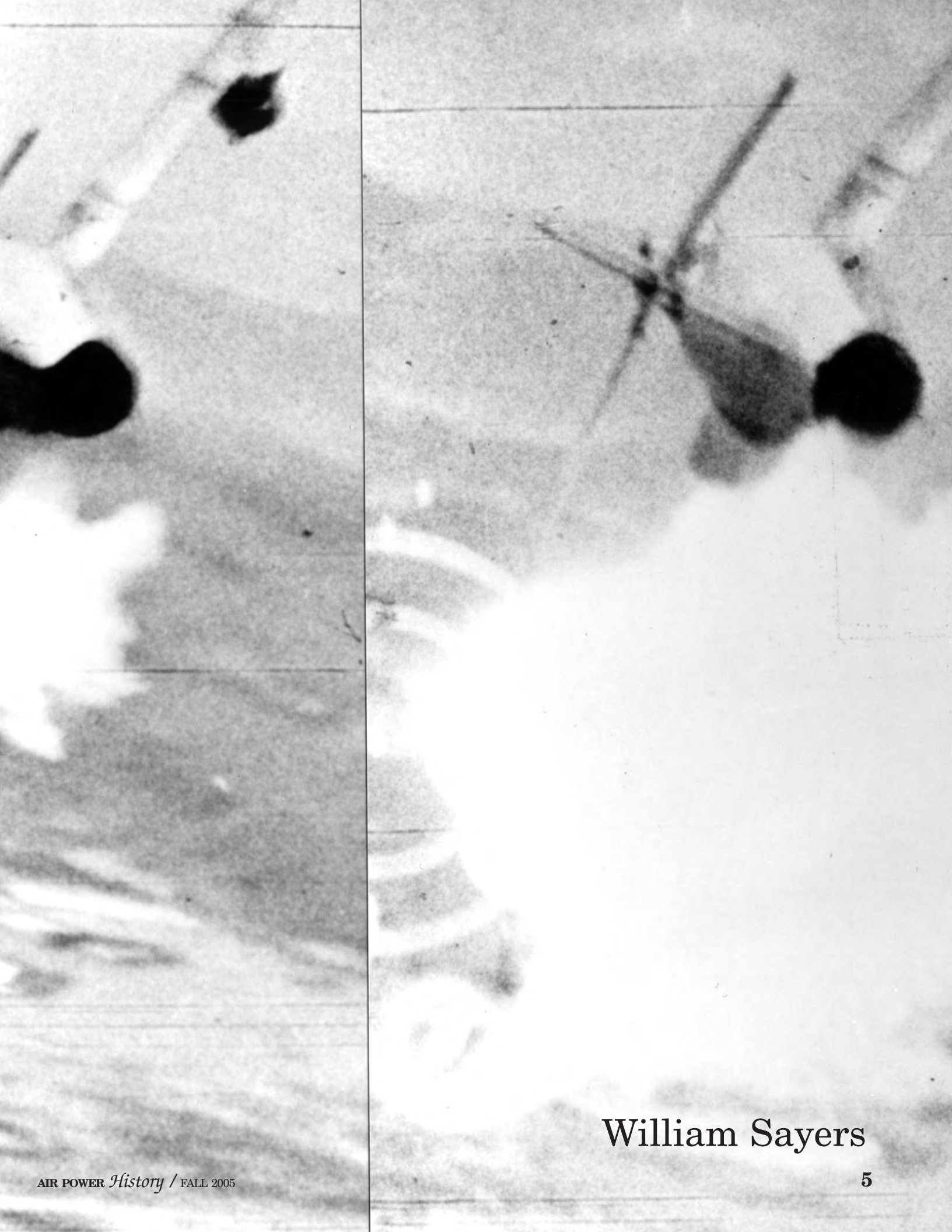
As we go to press, at the end of July, the Space Shuttle *Discovery* is on orbit, docked with the Space Station. NASA officials are pondering the consequences of a chunk of foam insulation that fell off on launch. This event dramatizes our fourth article, Parker Temple’s recounting of NASA’s total commitment to the Space Shuttle. He asks such provocative questions as: Who made the commitment to rely on the Shuttle and why? Was this commitment justified? and What were the consequences of this decision?

More than a dozen new books are reviewed in this issue of *Air Power History*. The reviewers are scholars, Airmen, and air enthusiasts; they all share a love for reading and an appreciation for air power literature. If you are interested in reviewing books, check the books received list [p. 62], then contact Scott Willey. If the review is accepted, you’ll be “published,” impress your friends, and earn a free copy of the book.



Air Power History and the Air Force Historical Foundation disclaim responsibility for statements, either of fact or of opinion, made by contributors. The submission of an article, book review, or other communication with the intention that it be published in this journal shall be construed as prima facie evidence that the contributor willingly transfers the copyright to *Air Power History* and the Air Force Historical Foundation, which will, however, freely grant authors the right to reprint their own works, if published in the authors’ own works. In the case of articles, upon acceptance, the author will be sent an agreement and an assignment of copyright.

THE RED BARON REPORTS WHAT THEY REALLY SAID



William Sayers

(Overleaf) A three-photo sequence of an F-105 shooting down a MiG-17 over North Vietnam, June 1967.

FOR MANY YEARS, THE US AIR FORCE HAS SUFFERED GREATLY FROM COMPARISONS WITH ITS US NAVY COUNTERPARTS

THE GENESIS OF THIS DEBATE STARTED WITH THE EXPERIENCE OF THE KOREAN WAR

Aoute Pack II vicinity of Vinh, Democratic Republic of Vietnam, May 7, 1968. The two U. S. Navy F-4B Phantom IIs of Silver Kite section were providing MiGCAP in very hazy weather for a strike on Vinh when they encountered interceptors from the Vietnamese People's Air Force (VPAF). In the confusion that followed, the Navy Phantoms lost sight of each other, finding themselves suddenly very alone in the hostile skies of North Vietnam. As Lt. Cmdr. E. S. Christensen turned Silver Kite 210 toward the sea and home, he rolled out wings level at 8,000 feet and searched for his wingman, hoping to join up and regain the vital mutual support they had lost. Indeed, at that very moment, Christensen was being tracked—but not by his wingman. Nguyen Van Coc, the first—and to that point, only—ace of the Vietnam War was moving into attack position astern of Christensen's Phantom. Nguyen succinctly described his sixth and final kill of the war: "I went after him and launched two missiles from 1,500 meters. The Phantom crashed in flames into the sea." Fortunately, Commander Christensen and his Radar Intercept Officer successfully ejected from their stricken fighter five miles out into the Gulf of Tonkin, and were quickly recovered by Navy rescue units.¹

Route Pack VIA vicinity of Hanoi, DRV, May 10, 1972. Four U. S. Air Force F-4Ds of Oyster flight were tracking four VPAF MiG-21s, preparing for a head-on engagement.² The MiGs had no weapons able to engage the Americans from a frontal aspect, but the Phantoms were carrying AIM-7 Sparrow radar-guided missiles that could be fired in a nose-to-nose engagement, and the USAF fighter pilots pressed their advantage to the maximum. As the two flights passed, two of the MiGs exploded, leaving the F-4s with a 2 to 1 advantage in the fight. Oyster Lead (Maj. Robert Lodge, pilot; Capt. Roger Locher, Weapons System Officer), a crew with two previous MiG kills to their credit, immediately turned with Oyster 02 on their wing to pursue one of the survivors, while Oyster 03 and 04 ran down and destroyed the last MiG. As Oyster 01 took aim on his target, a flight of VPAF MiG-19s swept through the furball, initially overshooting the Phantoms. The new arrivals were not particularly well flown, but Oyster 01 was apparently so intent on bagging his prey that he failed to heed the desperate warnings from his wingman that one of the MiG-19s was about to fire on them. Seconds later, Oyster 01 was hit by 30mm cannon shells and began to come apart. Captain Locher successfully ejected, but Major Lodge was killed in the crash. In his debrief of the fight, Oyster 03's pilot referred to

the crew of Oyster 01 as the best and most experienced in the theater.³

These two vignettes are emblematic of the air war over North Vietnam because both victims went down the way over 80 percent of their comrades in arms did—unaware that they were under attack.⁴ All six of Nguyen Van Coc's victories were made from dead astern of victims who were unaware that he was there, and fully 62 of the VPAF's 78 confirmed kills were made in fights where the winner initiated the combat from a position of nearly unbeatable advantage.

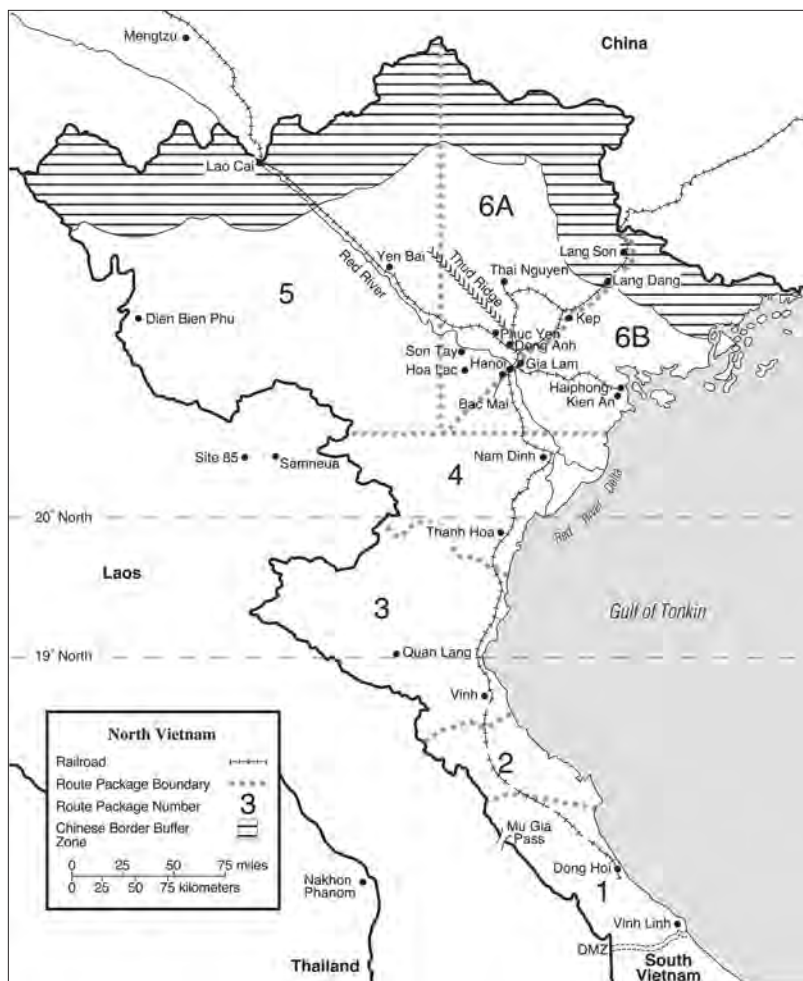
For many years, the U.S. Air Force has suffered greatly from comparisons with its U.S. Navy counterparts who at the end of the war ran up an impressive kill ratio. Much credence was lent to this view by the publicly disclosed conclusions of the Air Force's own "Red Baron" reports—one of the most thorough after-action studies of air combat ever done. However, much of the hyperbole resulting from the debate has come from a fundamental misunderstanding of the air war over North Vietnam.

The genesis of this debate started with the experience of the Korean War where USAF F-86 pilots ran up a 10:1 kill ratio over their North Korean and Chinese opponents. In contrast, American fighter pilots over North Vietnam "only" managed a 2.5:1 kill ratio up to the final bombing halt of 1968. Frustration over this embarrassing performance was intense. Popular mythology has it that while the Air Force continued to bungle along with a grossly inadequate training program, the Navy established their famed "Top Gun" program which, when the air war heated up again three and a half years later, proved itself an ace-making machine, its graduates sweeping the skies over North Vietnam. Meanwhile, Air Force fighter pilots failed to keep up—even losing ground to the Vietnamese defenders.

After the war ended, the U.S. Air Force began to dissect the data it had collected on the fight for air superiority in the skies over North Vietnam. With painstaking attention to detail, the authors of what became the Red Baron reports outlined the circumstances surrounding every decisive air-to-air engagement of the war, sifting for the critical elements that led to victory or defeat. The reports themselves were classified for more than twenty years after their completion, but as the myths of the conflict were being written, the Air Force seemingly conceded that the worst was true when the study's conclusions were used to justify a radical overhaul of the USAF fighter community's training program.

The Red Baron reports were finally declassified in the late 1990s, and while the conclusions do,

William A. Sayers holds a Bachelor's degree in history (Texas Tech University, 1981), and a Master of Military Studies (Marine Corps University, 1999). A Distinguished Graduate of Marine Corps Command and Staff College, Sayers remained at Quantico for the Advanced Course and became the only civilian graduate in the history of the U.S. Marine Corps School of Advanced Warfighting in 2000. After a brief tour of duty as a U.S. Air Force officer, Sayers became a military aviation analyst for the Department of Defense and has worked in that capacity for the last nineteen years at various government agencies.



North Vietnam and the route packages assigned.

**THE DATA...
DIRECTLY
CONTRA-
DICTS THE
CONVEN-
TIONAL
WISDOM
THAT HAS
BEEN SO
DISMISSIVE
OF THE USAF
FIGHTER
PILOTS**

indeed, emphasize the need for better training, a careful study of the data gives a very different impression of the air war over North Vietnam—one that directly contradicts the conventional wisdom that has been so dismissive of the USAF fighter pilots who fought for control of the skies over Southeast Asia.⁵

First, it must be acknowledged that while the North Vietnamese Air Force produced a few excellent pilots who would have been at home in the best squadrons the USAF and USN had to offer, on average their pilots were considerably less capable than our own.⁶ They certainly could not have stood against American fighter pilots in a straight-up fight, as evidenced by the fact that whenever this happened, they lost badly. Even with every possible advantage on their side, they lost two and a half for every one they shot down. The real key to the VPAF's "success" (if running a 4:1 kill ratio can be deemed as such) lay in the fact that they were truly outstanding *tacticians*.

When the U.S. began bombing North Vietnam in 1964, it was clear to the VPAF's leadership that to go up en masse day after day to challenge U.S. pilots for supremacy in the skies over their country would be suicide. They were well aware of the fact that the North Koreans and Chinese had done exactly that in the Korean War, and were shot out of the sky in great numbers. Worse still, their sacrifice achieved nothing. In their long war against

the West, the North Vietnamese richly deserve credit for two things: fanatical determination and an outstanding ability to adapt their strategy and tactics to the current realities of their battlefield. While they certainly possessed the courage and stamina to present a head-on challenge to U.S. tactical air forces, they had the intelligence to realize that there had to be a better way.

On the ground, the North Vietnamese followed the three-phased plan for people's revolutionary warfare laid out by Mao Zedong. According to Mao, phase 1 was used to set the stage for the battles to come by using political cadres to infiltrate, educate, and propagandize the target population. In phase 2, guerrilla warfare was used to destabilize the government and demoralize the army and population. Phase 3 consisted of decisive war in which more conventional battles would be fought to win the war once the stage was set. The genius of Mao, and his students to the south, was in the recognition that the three phases were not mutually exclusive, but rather would blend together, ebbing and flowing as circumstances dictated. Most importantly, they recognized that if their attempts at phase 3 operations were rebuffed, they could retreat to phase 2 to buy time and maintain pressure, all the while rebuilding in anticipation of another go at phase 3.

This is important to the air war because the VPAF was apparently greatly influenced by this model. They were no more inclined to challenge U.S. fighters directly than their People's Army of Vietnam counterparts were to openly fight the U.S. Army and Marine Corps on the ground. They would seek a decisive fight only when they believed the conditions were so absolutely aligned in their favor that victory was almost inevitable. In effect, the VPAF ceded air superiority to the U.S. in order to wage a guerrilla war of the air. While this allowed U.S. air forces free rein to go where they wished, it was not terribly painful during the Rolling Thunder campaign of 1965-1968 because the White House virtually gave air superiority back to them over their most important facilities by placing severe restrictions on targeting.

In return, this strategy allowed the VPAF the flexibility to engage only on its own terms. Many U.S. pilots flew hundreds of missions without ever encountering a MiG, while others never saw the one they did encounter—on their final mission. The North Vietnamese built an excellent early warning and Ground Controlled Intercept radar net to build an integrated air picture over their country in support of the air and air defense forces. Using this air defense command and control system, they were able to monitor the progress of U.S. missions and take advantage of any openings that appeared. With rare exception, the North Vietnamese never committed their aircraft to battle unless they believed that they had a high probability of shooting down a U.S. aircraft, and a high probability of safely escaping the American fighters.⁷

While these guerrilla tactics would not seize air superiority from the American air forces, they



**THE VPAF
CAME OUT IN
FORCE ONLY
WHEN THEY
BELIEVED
THAT THEY
HAD THE
OPPORTU-
NITY TO DO
DECISIVE
DAMAGE**

could exact a cost, particularly when combined with an increasingly dense and sophisticated Surface-to-Air Missile (SAM) network and a prodigious number of ever present Anti-Aircraft Artillery (AAA) guns. Just as importantly, such tactics would create enormous frustration within American ranks, and hopefully have a demoralizing effect. At the same time, the VPAF would be constantly on the lookout for opportunities to use their forces in a more decisive role, working towards the day when they would have the strength and experience to openly challenge American air forces for air superiority over their own country. Until that day, however, it would be up to the SAMs and AAA to stand toe-to-toe with the enemy, while the interceptor force specialized in ambushes and hit-and-run attacks.

Just as with the ground war in the south, the VPAF came out in force only when they believed that they had the opportunity to damage significantly American forces. Unlike the ground war, which became increasingly conventional as the years dragged on, the VPAF never really met with the decisive success necessary to transition to air superiority operations. The one-sided defeats they inevitably suffered when they came up in force served to ensure that major air battles were a fairly rare occurrence over the course of the war.

During the Rolling Thunder campaign of 1965-1968, the VPAF openly challenged U.S. fighters in only three major actions, all in 1967: January 2 (Operation Bolo), April 19, and a series of battles fought from May 13 to June 5.

By late 1966, the VPAF was operating a substantial number of the very capable MiG-21s, and was becoming more confident and aggressive as a result. Having been frustrated by nearly two years of small skirmishes and ambushes, the USAF leadership believed that the time was right to execute an operation designed to engage the VPAF in a major battle. Operation Bolo was planned and led by the USAF's most outstanding fighter commander of the time, Col. Robin Olds, as a special MiG sweep that would lure the VPAF into the air by masquerading as an unescorted bomber strike. The ploy worked, and Olds' 8th Tactical Fighter Wing

decimated the North's MiG-21 fleet, shooting down seven, without a loss to themselves. Four days later, the 8th followed up with two additional MiG-21 kills in another ambush, again without a loss.⁸

The VPAF licked its wounds for some time, but by mid-April apparently was ready to challenge the Americans again. On the 19th, the MiGs came out in force to challenge a large strike by F-105s. The results must have been disheartening, for the F-105s bagged four MiG-17s and two more probables, in exchange for the loss of only one of the fighter-bombers.⁹

This loss may have set back the VPAF a bit, but it is obvious that they had not given up on the idea of mounting an open challenge for air superiority. Finally, in mid-May they came up in a series of battles spread over three weeks. By June 5, it was obvious that they had failed, having lost twenty MiG-17s and five of the deadly MiG-21s, while shooting down just two F-4s—a kill ratio of over 12:1 in favor of the USAF.¹⁰ This not only surpassed the much lauded kill ratio the USAF achieved in Korea, the figures included eight kills by F-105 *fighter-bombers* in the mix. In Korea, the high kill ratio included only F-86 air superiority fighters vs. MiGs—including the F-84 and F-80 fighter-bombers would have lowered the exchange rate somewhat. At the end of the battle, the USAF's overall kill ratio stood at 4.1:1, with F-4C MiGCAP aircraft—the closest equivalent to the Korean War F-86s—at an astounding 10.8:1.¹¹ The USAF could hardly be blamed for believing the MiG problem was well under control. On the other hand, the North Vietnamese Air Force was beaten so soundly that it was five years before they attempted a large-scale battle again.

Once again, the VPAF dropped back into their guerrilla war tactics, decreasing their loss rate by a factor of seven. Over the course of the next sixteen months until the end of Rolling Thunder, they traded the USAF evenly, with the loss of twenty-one aircraft on each side.¹² In every case, without exception, the MiGs' victories were initiated from directly astern of an unaware target.¹³ Obviously, these tactics greatly impacted the USAF kill ratio—driving it down from 4.1:1 to 2.3:1—but it

**BY LATE
1966,... WAS
BECOMING
MORE CONFIDENT
AND
AGGRESSIVE
AS A RESULT**

**ONCE AGAIN,
THE VPAF
DROPPED
BACK INTO
THEIR GUER-
RILLA WAR
TACTICS**

**AFTER 3 1/2
YEARS OF
ROLLING
THUNDER,
AMERICAN
PILOTS WERE
FRUSTRATED
...CON-
CERNED
ABOUT THEIR
RELATIVE
LACK OF
SUCCESS**



virtually eliminated the VPAF interceptor force as a major factor in the air war.

After more than three years of Rolling Thunder, American pilots were frustrated over North Vietnamese tactics and concerned about their relative lack of success, but in reality, there was little reason to be hard on themselves. The MiGs were dangerous and had taken their toll, but U.S. forces had air superiority over their opponent's country and there was little doubt that, with only temporary exceptions, they could go just about anywhere the White House let them. As long as the Americans were willing to pay the price of admission, there was nothing the North Vietnamese air defenders could do to stop them. Of course, the actual impact of the bombing was dubious. But the "bottom-line" for the MiGCAP forces was to see to it that the bombers could get to their targets, and in that job they had succeeded. If they hadn't run up the score like their fathers and older brothers in Korea, it was more because they were up against a wily and capable opponent who saw no profit in being blown out of the sky for any good purpose.

By "halftime," USAF pilots had accounted for 87 MiGs while losing 38, for a kill ratio of 2.3:1. However, USAF losses included a propeller-driven A-1, an unarmed RF-101, an EB-66 and even an RC-47 (a military variant of the venerable DC-3). These figures also included the primary USAF bomber of Rolling Thunder, the F-105. As noted before, the high Korean War scores that haunted U.S. fighter pilots didn't include non-air superiority types in their tallies, and certainly wouldn't have counted B-29s or B-26s. A better comparison would be to examine the statistics for aircraft on MiGCAP missions: USAF F-4s achieved 57 kills vs. 10 losses = 5.7:1. Amazingly, even the F-105s ran a positive kill ratio against the MiGs, despite the fact that they were nearly always heavily laden and on the defensive when the engagement began (27.5 kills vs. 20 losses = 1.4:1 overall, and an astonishing 5.5:1 against the MiG-17.)¹⁴

Comparable numbers for the Navy would be, 30 MiG kills vs. 9 losses = 3.3:1 overall; MiGCAP F-4s and F-8s—25 kills vs. 7 losses = 3.6:1¹⁵.

Overall, the USAF's 87 victories accounted for three-quarters of U.S. MiG kills, showing that while the talent between the fighter communities may have been fairly even, the USAF was confronted more directly by the MiG threat.¹⁶

As mentioned earlier, the USN reaction to Rolling Thunder was an emphasis on training by creation of the Naval Fighter Weapons School, otherwise known as "Top Gun." Ironically, it borrowed both its name and concept ("graduate-level" training for fighter pilots, who could then pass on the techniques to their squadron mates) from the Air Force's program at Nellis AFB, Nevada.¹⁷ In contrast, while Air Force training may have had room for improvement, it was not considered a driving factor in the USAF's performance. When it came down to a simple duel between pilots, the USAF always came out on top. In fact, in the very first USAF kills of the war, the Phantom pilots used the very same vertical maneuvering tactics taught later at Top Gun to defeat the MiGs.¹⁸ The USAF felt that its greatest problem had to do with effective enemy tactics, and called for a technical solution.

For the most part, USAF aircraft assigned duties under Rolling Thunder flew out of bases in Thailand. These bases were far enough away from the inland "Route Packs" assigned to the Air Force, that multiple aerial refuelings were required for virtually every mission. Consequently, USAF fighters had to approach North Vietnam at high altitude, where fuel efficiency could be maximized, and this resulted in the VPAF being able to pick them up early on radar and track them for some time on ingress to the target area. With a large stretch of Laotian countryside to cross before reaching the broadest area of North Vietnam, there was plenty of room for VPAF controllers to work their interceptors in behind the USAF strike packages. Thus, the typical engagement between the USAF and the VPAF began as a "bounce" by the North Vietnamese interceptor, coming in at high speed, already set up for the kill. In stark contrast, there was no effective USAF radar coverage over its assigned Route Packs.¹⁹ When USAF aircraft flew over North Vietnam, they were generally reduced to



THE NAVY HAD EFFECTIVE RADAR COVERAGE OVER THEIR TARGET AREAS PROVIDED BY CRUISERS PATROLLING OFFSHORE

using the same sensor the original “Red Baron” had used when hunting Allied aircraft over the Western Front: the Mk-1 eyeball.²⁰

Furthermore, the USAF pilots had the high-altitude SAM threat to contend with, and the VPAF were able to tactically exploit this double-edged threat by shooting at MiG-dodging fighters with SAMs, and bouncing SAM-wary fighters with MiGs.²¹ Except for those battles covered above when the VPAF openly challenged the U.S. for air superiority, the MiG GCI controllers would only commit their interceptors to combat when they believed they had a significant tactical advantage—virtually a guaranteed kill with low risk of loss.²² After the disastrous summer of 1967, the VPAF maximized this tactical advantage by directing their MiG-21s to supersonic missile passes from behind the USAF strike packages. The result was that while MiG-17s were still killed at an exchange rate quite favorable to the USAF, the MiG-21s actually ran a positive kill ratio. These one-pass “blow-throughs” were effective on a limited basis, but did not allow for reattack or multiple shots. As long as the VPAF was willing to cull a single aircraft out of a package and call it a day, they could be successful. However, these tactics were not effective in stopping the strikers. Interestingly, they undoubtedly had more effect in causing entire flights of aircraft to jettison their bombs in order to evade, than in actually shooting down bombers.²³

The USN Story

The Navy’s areas of responsibility were close to shore where carrier-based aircraft could be used to maximum advantage. As a result of the proximity of USN Route Packs to the sea, Navy fighters had enough fuel to allow them to ingress North Vietnam at lower, less fuel efficient altitudes, coming in under enemy radar coverage. This afforded the VPAF less warning time to react, and far less opportunity to come in behind Navy fighters who had their backs to the “wall” of the USN-controlled Gulf of Tonkin. Any VPAF pilot daring to fly “feet wet” over the Gulf would have had trouble getting life insurance—as evidenced by the MiG-21 bagged by a Navy guided-missile cruiser in 1968.²⁴ More

importantly, in contrast to the situation the Air Force had inland, the Navy had effective radar coverage over their target areas provided by cruisers patrolling offshore. In fact, whenever possible, the USAF took advantage of “Red Crown,” and greatly praised its efficiency.²⁵ This all served to put the Navy at a tremendous theoretical advantage compared to the Air Force.²⁶ At any event, however, the Navy faced MiGs less often, faced the less dangerous MiG-17 a higher proportion of the time, and actually paid the price in more aircraft lost to AAA than the Air Force.²⁷

As illustrated by the vignettes at the beginning of this article, it is extremely difficult to counter an enemy of whom one is unaware. An analysis of Rolling Thunder air-to-air losses showed that in the 47 engagements resulting in the shoot-down of an American aircraft, the MiG began the fight from a position of advantage 89 percent of the time, while the U.S. fighter was lost after starting from a neutral position only twice. In other words, if the fight began with the U.S. pilot in a position of at least neutrality, he almost *never* lost the fight. On the other hand, in engagements where MiGs were shot down, U.S. pilots began from a position of advantage only 66 percent of the time. In 13 percent of those engagements, the U.S. pilot actually *reversed* the advantage and gained the kill. Therefore, the USAF’s primary answer to this problem was, quite reasonably, to find some way of warning their pilots that MiGs were attempting to gain firing position on them. It was assumed that if the USAF pilot knew the MiG was there, his survival would be almost assured, and if that information allowed him to enter the engagement from at least a neutral position, he would have a good chance of getting the kill.²⁸

In the spring of 1972, North Vietnam mounted an all-out conventional invasion of South Vietnam. In response, President Nixon ordered U.S. air forces to bomb North Vietnam in an attempt to punish and debilitate the aggressors. The Linebacker strikes, which lasted to the end of the year, and the subsequent MiG engagements have been touted as the proof of the Navy’s superior response to the problems of the air war. However, this is a misreading of events.

THE USAF’S PRIMARY ANSWER TO THIS PROBLEM WAS, QUITE REASONABLY, TO FIND SOME WAY OF WARNING THEIR PILOTS THAT MIGS WERE ATTEMPTING TO GAIN FIRING POSITION

Some of the MiG killers of the 8th Tactical Fighter Wing in 1967. (Left to right) Capt. Francis M. Gullick, 1st Lt. William D. Lefever, Capt. Richard M. Pascoe, Col. Robin Olds, Maj. Thomas M. Hirsch, Capt. Norman Wells, and Maj. Everett J. Raspberry.



THE AIR FORCE WAS FAR MORE HEAVILY ENGAGED BY VPAF INTERCEPTORS

First, it must be said that the Navy aviators did admirably well, and nothing presented here should be construed as taking away from their performance. However, it will be shown that the USAF fighter community has been unjustly maligned by unfair comparisons between them and their USN counterparts.

The first Linebacker mission took place on the May 10, and on that day the VPAF inexplicably rose to challenge American air power head-on. It was their misfortune to take off directly into a Navy “alpha-strike,” and this time, it was the Navy’s turn to benefit from the VPAF’s mistake. Naval aviators bagged 7 MiG-17s and a MiG-21, while USAF fighters traded 3 MiG-21s for 2 F-4s. The VPAF quickly righted itself, and for the remainder of the campaign, the MiGs reverted, for the most part, to their more successful “guerrilla” tactics as evidenced by the fact that the Navy gained only 11 more kills for the rest of the war. Over the course of 1972, Navy crews shot down 25 MiGs while losing 3 fighters and a reconnaissance aircraft for a kill ratio of 6.3:1. In contrast, USAF crews downed 52 MiGs vs. 25 losses for a 2.1:1 kill ratio.²⁹

Clearly, the Air Force was far more heavily engaged by VPAF interceptors. What is not clear from the raw numbers, however is that of the Navy’s kills, only 8 were against MiG-21s, while the Air Force shot down 40 of the deadly interceptors.³⁰ Moreover, nearly all of the USAF losses were from supersonic stern attacks on aircraft caught unawares. As with Rolling Thunder, no USAF air-

craft were shot down after entering an engagement from a position of advantage, although this happened to one Navy F-4J.³¹ According to Red Baron data, the single most significant factor in the loss of aircraft was the element of surprise, with 81 percent of all U.S. losses occurring when the crew was either completely unaware they were under attack, or found out too late to effectively defend.³² Under these circumstances, it is difficult to understand how better training would have significantly altered the results.

In June, the MiGs actually gained temporary ascendancy over the USAF—a development troubling enough to cause a reevaluation of tactics.³³ However it must be stressed that while the USAF fighter community was greatly *frustrated* over this turn of fortune, it involved so few losses that it had little real impact on the campaign. In August, the Air Force finally got its technical answer to the warning problem, a control center called “Teaball.” Teaball was, in essence, an all-source fusion center that issued MiG warnings in real-time to U.S. aircrew over a complicated set of radio nets.³⁴ Because of the complexity and unreliability of the communications involved, Teaball did not always work. But when it did, the results were excellent:

The Teaball facility came into operation in early August when we had a loss-ratio of .47-to-one—we were losing almost twice as many as the MiGs to us. Then, with the first week’s operation of Teaball, we jumped to a four-to-one ratio for the month of

THE MIGS ACTUALLY GAINED TEMPORARY ASCENDANCY OVER THE USAF

**FOLLOWING
THE COM-
MENCEMENT
OF TEABALL,
AMERICAN
PILOTS
ENJOYED
DEFINITE AIR
SUPERIORITY
OVER NORTH
VIETNAM**

**THE USE OF
RATIOS
DRAWN OVER
SMALL NUM-
BERS OF
KILLS SEEMS
PRONE TO
GREAT
ABUSE**

August, and four-to-one in September.... This proved one thing—if you can show the American fighter pilot where [the enemy] is in sufficient time, he'll shoot him down. Overall, and especially following the commencement of Teaball, American pilots enjoyed definite air superiority over North Vietnam.³⁵

When Teaball didn't work, the results were just as dramatic. The USAF lost only 6 aircraft to MiGs after Teaball went on the air, and virtually all of them were shot down during a communications interruption.³⁶ "...when Teaball would break down on any given day...we lost airplanes. One very dramatic illustration: we had a Marine aircraft up there being used on Ingress CAP (Combat Air Patrol). That Marine was shot down at precisely the five minute period when Teaball was off the air!"³⁷

From the time Teaball was activated, the USAF shot down 27 MiGs vs. 6 losses for a kill ratio of 4.5:1. More to the point, USAF aircraft on MiGCAP missions shot down 18 MiG-21s and 5 MiG-19s for 4 losses—a 5.8:1 kill ratio. During that same period, the Navy shot down 4 MiGs while losing 2 aircraft.³⁸ Essentially, when the Air Force was afforded conditions similar to those the Navy enjoyed, the results were very similar between the services. One interesting illustration comes to mind: From May of 1972 through mid-August, naval aviators shot down 20 MiGs while losing 2 F-4Js, for a kill ratio of 10:1. From May through mid-August of 1967, the USAF accounted for 26 confirmed and three probable MiG kills for the loss of 2 fighters, a kill ratio of 14.5:1—one of the greatest winning streaks since World War II. Yet this run went largely without comment—in great contrast to the events of the summer of 1972. Two other excursions are worth mentioning. If the six "probable" kills (instances where the claims are credible, but impossible to confirm) by the VPAF vs. the USN were added in, the Navy's 1972 kill ratio would drop to 2.5:1, and its overall kill ratio would have remained virtually unchanged from the Rolling Thunder period at 2.9:1. Alternatively, if bad weather had cancelled operations on May 10, 1972, and that day's kills were wiped from the books, the Navy's 1972 kill ratio would have dropped to 4.3:1, with the overall ratio falling to 3.7:1. In contrast, discounting that "one day in a long war," would not have impacted the Air Force's record at all.

After the war was over, the USAF embarked on a major overhaul of its tactical fighter force. The F-15 made its first flight in 1972, and the AIM-7F and AIM-9L missiles came on line around the time of the Eagle's entry into service—thus taking care of most of the USAF's perceived hardware problems. Training was overhauled—with justification provided by the Red Baron reports—in an equally decisive manner. The Air Force created four "Aggressor" squadrons equipped with F-5s (stand-ins for MiG-21s) and trained to execute Soviet tactics.³⁹ The Aggressors flew against each fighter squadron on a rotating basis, giving USAF pilots an "up close and personal" view of their enemy's way of war.

Perhaps the most radical change was the insti-

tution of the "Red Flag" program at Nellis. Designed to give U.S. aircrew a chance to fly complex missions in a simulated war against a challenging "enemy" (often, though not always, the Aggressors), Red Flag was a direct result of the Red Baron findings that fighter crews that survived their first ten missions had a greatly improved chance of survival and success. The idea was to give them those first ten "combat" missions in an environment somewhat less lethal than actual war.

More and better training is always a good thing, and these programs are almost universally recognized as a major factor in the phenomenal success U.S. airman have garnered since their implementation three decades ago. But did they really address the problems encountered by the USAF fighter force in Southeast Asia? More to our point, did the data collected in the Red Baron reports justify their conclusions? It is difficult to see how. Air Force aircrew, when aware of the presence of the enemy, made extremely difficult prey for VPAF fighters. When equipped for air superiority missions and provided with a stand-up enemy, they ran up impressive kill ratios. Their only difficulty came when the enemy had the opportunity to bounce them from behind with no warning. And all the training in the world is unlikely to save an airman who is unaware he is under attack.⁴⁰ In contrast, the excellent E-3 Airborne Early Warning and Control System (AWACS) aircraft were conceived contemporaneously with these weapons and programs and spoke directly to the problem as the Air Force leadership saw it in July 1972. Yet, AWACS is rarely mentioned in discussions of the hard lessons learned over North Vietnam. Nevertheless, the USAF fighter community had an expansive agenda when the Red Baron study was finished in 1974, and it was a good agenda—even if not entirely justified by the data.

The performance of U.S. aircrews over North Vietnam can be analyzed in any number of ways, however the use of ratios drawn over small numbers of kills seems prone to great abuse. While the Navy may have run a slightly better kill ratio over any particular time period, another of similar length or numbers of kills can probably be found showing the Air Force in a better light. For the entire war, the Air Force shot down 137 MiGs while losing 65 aircraft of all types, including bombers. The Navy accounted for 56 MiGs and 13 losses. However, the bottom line was that it was excellent North Vietnamese tactics—not pilot skill—that kept the kill ratios from reaching Korean War levels. Whenever the VPAF rose to confront U.S. airmen directly, the U.S. kill ratios rose dramatically, as well. The upshot was that if the VPAF wanted to "live to fight another day," they had only one choice: cede air superiority to the Americans, and be content fighting a guerrilla war of the air. This is most profoundly illustrated by a final statistic: During the course of the Linebacker campaigns, as hard fought as they were, only *four* USAF strike aircraft were shot down by MiGs.⁴¹ Whatever else our fighter forces accomplished, they decisively won the only fight that really mattered. ■

Editor's Note: The spreadsheet of data from which the statistics are derived is electronically available by e-mail request to airpowerhistory@yahoo.com. (2.4 Mbytes)

1. Chris Hobson, *Vietnam Air Losses: United States Air Force, Navy and Marine Corps Fixed-Wing Aircraft Losses in Southeast Asia 1961-1973* (Hinckley, UK: Midland Publishing, 2001) p. 148; Marshall L. Michel III, *Clashes: Air Combat over North Vietnam 1965-1972* (Annapolis: Naval Institute Press, 1997) p. 147; Nguyen Van Coc quoted by Istvan Toperczer, *MiG-21 Units of the Vietnam War* (Oxford: Osprey Publishing Limited, 2001) p. 21; Red Baron II, vol I, pt II pg. 4.
2. *Clashes*, pp. 212-213.
3. Red Baron III, vol II, pt 1, p. 104.
4. Red Baron III, vol III, pt 1, p. 61.
5. The 25-year review for the immediate post-war analyses came up in 1998, with the declassification of the Air Force's definitive postwar analysis of the fight for air superiority, the famous "Red Baron" reports, providing a virtual gold mine of information. Marshall Michel's *Clashes* was largely based on the Red Baron reports, and provides an excellent narrative context. Istvan Toperczer, a Hungarian Air Force flight surgeon, has published a series of short volumes on the VPAF using Vietnamese interviews and sources, opening up the Vietnamese perspective for the first time, while Chris Hobson's *Vietnam Air Losses* details the loss of every US fixed-wing aircraft by tail-number, finally allowing VPAF claims to be validated.
6. See Red Baron II, vol II, pt 1, p. II-18, and Red Baron III, vol III, pt 1, p. 62, in which the conclusion of a detailed analysis is that despite the advantages the enemy had, they were unable to achieve better than a 4:1 kill ratio because, "US aircraft and their pilots were more capable than their VPAF counterparts."
7. Red Baron III, vol III, pt 1, p. 62.
8. *Clashes*, pp. 73-74.
9. Red Baron II, vol. II, pt.1, p. II-7. A second pulse at the end of the month saw the VPAF trade 4 MiG-17s and two MiG-21s for four F-105s; however, the USAF losses were all in carefully orchestrated MiG-21 "bounces" of Iron Hand (SAM-hunter), flak-suppression or RESCAP (rescue of downed aircrew) aircraft.
10. Red Baron II, vol. II, pt.1, pp. II-3, II-8 & 9; *Clashes* pp. 99-107. Navy fighters shot down 4 MiG-17s without loss during the same period.
11. Through 5 June 1967, USAF fighters on air superiority missions shot down 22 MiG-17s and 21 MiG-21s for the loss of 4 F-4s. The overall USN kill ratio at this point was 3.2:1.
12. Red Baron II, vol. II, pt.1, pp. II-3 & 4, II-9-11. Included in the USAF losses are an unarmed RF-101 and an F-102 interceptor in the only air-to-air combat action of the type's entire career. The VPAF also brought down an EB-66, an obsolete bomber converted into a platform for jamming North Vietnamese radars. Over the same period, the Navy shot down 14 MiGs while losing 4 F-4s.
13. *Ibid.*
14. Red Baron II, vol. II, pt.1, pp. II-2-II-11 and Red Baron II, vol. II, pt.2, p. II-7.
15. The F-8s accounted for 18 MiGs while losing 3 for a 6:1 kill ratio. However, the numbers involved are so small as to question the almost mythic reputation that has grown up around this aircraft. Oft billed as "The Last of the Gunfighters," Crusaders actually gained only two guns kills – compared to 25 for the F-105; 16 for USAF F-4s (9 by F-4Ds with gun pods, and 7 by F-4Es with internal guns); and, of course, 2 by B-52 gunners.
16. *Ibid.*
17. Disappointment with missile reliability was a major

concern for both services. Both communities believed that they would have had considerably greater success if they had been equipped with missiles that could be depended upon to function as advertised—or even a fraction of what was promised—when launched. Their efforts to fix this vexing problem would not see fruition for another decade—long after the end of the conflict in Southeast Asia.

18. *Clashes*, pp. 21-24.
19. Red Baron III, vol III, pt 1, pp. 67, 69-70, and 120. EC-121 Early Warning radar aircraft were tried, but their obsolescent equipment proved wholly inadequate for detecting fighters over land.
20. The radar on the F-4 was wholly inadequate for air search work, especially over land. It was designed to take the intercept hand-off from a GCI or other search agency.
21. Of course, naval aviators had to contend with the SAM threat, as well. However, they generally had more tactical options available to them, given the aircraft carriers' proximity to their targets.
22. Red Baron II, vol II, pt 1, p. II-18, and Red Baron III, vol III, pt 1, p. 62.
23. Red Baron II, vol. II, pt 1, pp. III-54-III-57. The MiG-21s shot down 17 USAF aircraft using these tactics while losing 4 from August 23, 1967 to the end of Rolling Thunder.
24. *Clashes*, p. 147.
25. *Clashes*, p. 226. According to Michel's account, a USAF fighter pilot commented that if they had more Red Crown coverage, "...we would have doubled our MiG kills."
26. Red Baron III, vol III, pt 1, p. 67.
27. For example, during the Linebacker operations, the USAF and USN lost comparable numbers of aircraft, but while the Air Force lost more to MiGs, the Navy nearly made up the difference in aircraft shot down by AAA. Red Baron III, vol. III, pt.1, p. 122.
28. Red Baron II, vol. II, pt.1, pp. II-2-II-11 and Red Baron II, vol. II, pt 1, p. II-16.
29. Red Baron III, vol. III, pt.1, pp. 121, A-2, A-10-14, A-16-17.
30. Red Baron III, vol. III, pt.1, p. 121.
31. Red Baron III, vol. III, pt.1, pp. 50-54.
32. Red Baron III, vol. III, pt.1, p. 61.
33. *Clashes*, p. 253. The MiGs shot down 7 USAF fighters for only 2 losses. All seven USAF losses were taken by MiG-21s attacking from behind on unaware targets, while one of the USAF victories was made in a reversal over an attacking MiG.
34. *Clashes*, p. 251.
35. HQ PACAF Project CHECO Report, "Linebacker: Overview of the First 120 Days" quote of 7th AF Commander, Gen John Vogt, pp. 47-48. In August, the USAF shot down 4 MiGs for no losses. In September, they traded 8 for 2, and in October, they shot down 9 MiGs while losing 2 aircraft.
36. HQ PACAF Project CHECO Report, "Linebacker Operations: September - December 1972" p. 52.
37. "Linebacker: Overview of the First 120 Days" p. 68. Again, a quote from Gen. Vogt.
38. Red Baron III, vol. III, pt.1, pp. 100 & 121.
39. Interestingly, the Navy's aggressors were equipped with A-4s—a MiG-17 simulator.
40. To be fair, the experience provided by the Red Flag program may improve a pilot's situational awareness to the point that he might be able to avoid be caught unawares—but that is speculation, and Red Flag certainly didn't play in the perceived success of the Top Gun graduates in 1972.
41. Red Baron III, vol. III, pt.1, p. 64.

Italian Aircraft in Russia





Viktor P. Kulikov

(Overleaf) Crash of red military pilot Polozenko, July 30, 1924.

(Right) Ansaldo A.1 Balilla fighter first arrived in Russia during the Russian Civil War years from 1918 to 1920. Soviet ace Alexey Shirinkin flew this airplane. More than 30 airplanes of that type were in the Red Army armament in 1920-1928.

AT THE END OF 1916, ITALY AND RUSSIA SIGNED A MUTUAL AID AGREEMENT

Contemporary Russia remains an acknowledged world leader in aviation, notwithstanding the country's present complicated position. Powerful military and civil aircraft have been built in Russia during the past several years and dozens of well-known design bureaus are working on new aviation technology. Their products, including "MiG" and "Su" fighters, "Tu" bombers, and "An" gigantic transports, are known world-wide.

At the dawn of its aviation development, Russia used many types of foreign planes. During the 1920s and 1930s, for example, Russia purchased Italian aircraft and engines. This article deals with the exploitation of Italian planes beginning in World War I. At the end of 1916, Italy and Russia signed a mutual aid agreement whereby Italy would deliver a variety of military equipment in return for Russian wood, metal, oil, wheat, potash, and sodium carbonate. The Italian government extended a credit line of 400 millions lire to Russia to purchase military technology and equipment.

At that time, Russia experienced great difficulty in supplying its air force with aircraft and aircraft engines. By the beginning of 1917, the Russian military air fleet numbered 1,670 aircraft, considerably fewer planes than the 9,640 planned by the Military Department. In the field there was a chronic lack of planes and engines; the actual number of serviceable aircraft at the front was fewer than 400. The Russian aircraft industry had low capacity, having turned out in the best of times about 1,500 aircraft per year.

This catastrophic state of affairs induced the Military Department to adopt a number of late but important measures concerning orders for aircraft engines and airplanes to Russia and her Allies in World War I. Russian embassies in Paris, London, and Rome were asked to seek out promising aircraft technology. The purchased machines would be shipped through the Northern ports of Archangel and Murmansk. Shipments from Italy first were shipped to England or France and then to Russia as a part of convoys. The situation was aggravated by the activity of German submarines that sank many English and French ships with aviation loads.

The "Konjok-Gorbunok" was designed by Khioni. Fifteen were built in 1923 in the Soviet Union and were equipped with Italian Fiat A.10 100-HP engines. Throughout World War I about 400 engines were delivered to Russia from Italy.



Moreover, because the Italian aircraft industry had limited capacity and was oriented primarily to support the Italian front, most of the Russian orders were for aircraft engines. The engines were technologically advanced and could be mounted on many aircraft of Russian and French design. Price Golitsin, Russia's military attaché to Italy, ordered 1,642 aircraft engines, for 54,749, 414 lire, to be delivered by January 1918.

The extensive engine order included:

- 100 Fiat A.10 100-hp
- 250 Hispano Suiza 200-hp
- 490 Fiat A.12 200-hp
- 100 Le Rhone 80-hp
- 200 SPA 6-A 150-hp
- 300 Le Rhone 110-hp
- 200 Isotta Fraschini 150-hp
- 2 Isotta Fraschini V-5 200-hp

To fill this order within the time specified by the contract, Italian factories asked the Russian government to provide them with aluminum and other metals. But filling the order advanced very slowly and was frustrated frequently by unexpected circumstances. Thus, on June 8, 1917, the Russian military attaché in Italy reported that 20 engines, produced by Isotta Fraschini and 20 engines by Fiat were intercepted suddenly by Italian officials and sent to the Italian front. The Italian government representatives explained their action was driven by the relative calm on "the Russian front and the fear of [an anticipated] separate peace with Germany; and besides that considerable losses, connected with the offensive at the Italian front."

Later on the deliveries to Russia proved even more difficult. Military Pilot Junior Captain Bystritsky, having visited the aircraft factories in Italy, reported on September 21, 1917, that orders in Italy were in a desperate state. Fiat refused to fill any new contracts because of the lack of credit and untimely payments, which shook the Italians' faith in Russian orders. Still, by September 30th, 100 Fiat A.10 100-hp engines, 100 Le Rhone 110-hp, and two Isoatta Fraschini V-5 200-hp produced at Italian factories were sent to Russia. Some parts of the orders were distributed and partly fulfilled

A Muscovite, Viktor P. Kulikov graduated from Urals University. For the past twenty years, he has been researching and writing the history of Russian aviation of the World War I period. Mr. Kulikov's articles, Sikorsky's Fighters, Aeroplanes of Lebedev's Factory, Soviet Ship-Based Reconnaissance, 1920s-1950, and British Aircraft in Russia appeared in the Winter 2000, Winter 2001, Spring 2003 and Spring 2004 issues of this journal, respectively.



A group of staff leaders of the Trans-Caucasus Military District near Ansaldo SVA-10 airplane, Tbilisi, 1923. Second from the left - M. Budennyi, the third from the left - G.K. Orzhonikidze.

by the same date. The Fiat firm that had an order for 490 Fiat A.12 200-hp engines had produced only 180 by July 1917. But their transfer to Russia was stopped by the Italian government which urgently needed 1,000 engines for the Italian front.

The fulfillment of the order for 200 SPA 6-A 200-hp engines was postponed until October 1917, as there was a shortage of those engines for equipping Italy's Ansaldo SVA 5 fighters. The Bianki factory had a contract for 200 Isotta Fraschini V4B 160-hp engines. Fifty engines that had been produced for Russia were requisitioned by the Italian government and the implementation of the order was postponed until October 1917. In accordance with the order, the Skat factory was to make 250 Hispano Suiza N35 250-hp engines. But Russia had not received any of them—part of the engines that had been produced remained at the disposal of the Italian government. So the order for 1,642 aircraft engines was filled only in part during World War I. Russia had received only 400 engines from

Italy. Those engines were used at the end of the war during the construction of such airplanes as Voisin, Lebed XII bis, Anadis, flying boat M-15, Hydroplane GASN and others. In 1920, the Soviet Union used the Italian engines on KOMTA, Konjok-Gorbunok, DH-4, and other airplanes.

Besides airplanes and engines, Russia purchased aircraft guns, aircraft cameras, head lamps for the planes, built by Sacinia, the Fiat 7V machinegun.

Voisin

The popular French Voisin aircraft, produced in Italy under license, was a two-seat biplane with a tail boom and pusher propeller. The Voisin was equipped with an Italian Isotta Fraschini V-4 150hp engine. By July 30, 1917, six Voisin airplanes were sent to Russia with V-4 engine, another modification of that airplane was equipped with an Isotta Fraschini V-5 250-hp engine and Fiat aerial cannon. More than a dozen of the aircraft were sent to Russia and were flown at the front by Russian pilots.

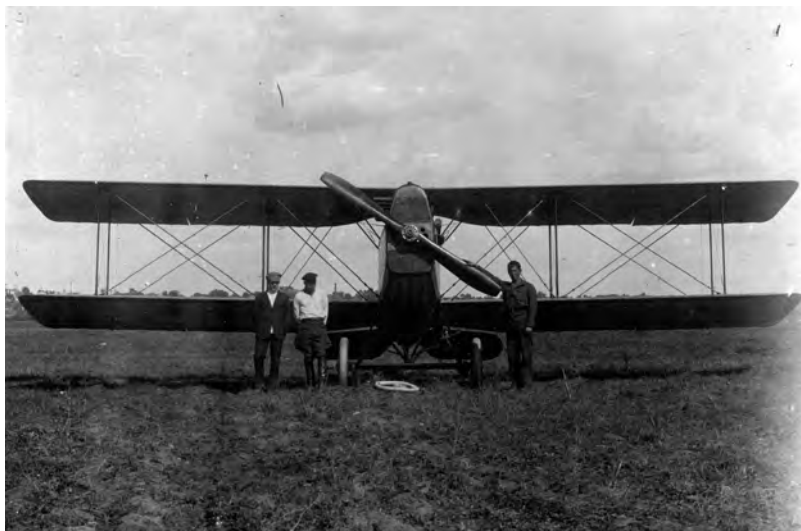
On September 12, 1916, the crew of the XIth Army Aviation Detachment, comprised of military pilot Kornet (Cornet) Mikulin, observer Shtabs-Kapitan, and Captain Kazumbekov attacked Austrian planes. The Russian pilots flew the Italian-made Voisin, equipped with a Fiat cannon. During a frontal attack, Kazumbekov opened the fire with shrapnel shells from the cannon. Five or six cannon shots at the enemy plane downed it and it began a steep descent, falling not far from the Russian trenches.

Caproni

Heavy bombing aircraft were well developed in Russia, notably such planes as the gigantic four-engine bombers designed by Igor Sikorsky had already entered the arsenal in 1914. However, the

Airplane Ansaldo A.300/3 was used on ski undercarriage at winter at the air detachments of the Red Army.





Ansaldo A.300/3 at the Kiev airfield.

CAPRONI AIRPLANES BRING ME INTO UTTER DELIGHT

Russians lacked a medium bomber necessary for carrying out tactical tasks at the front. Therefore, they turned their attention to the three-engined Caproni biplane. A Russian commission that was formed to buy aircraft equipment abroad, liked the Caproni bomber because of its good flight characteristics. Colonel Nemchenko examined the Caproni airplane and reported to the Department of the Military Air Fleet on July 11, 1917:

Caproni airplanes bring me into utter delight, they are exactly the apparatus that are desirable to Russia and should be built [for] it, they have very little metal, [constructed entirely] from wood. The structure is simple and strong. Safety factor is "6," loading—a number divisible by 3. Mr. Caproni himself is ready to help. Russian Baltic factory could be occupied with the production of that airplane, but license should be bought.

During the official registration of the order, the cost of the airplane (without engine) was determined to be 56,250 lire; tools and armament—3,000 lire; and spare parts — 24,780 lire, for a

total 84,030 lire. Someone suggested taking engines from the 200 Isotta Fraschini V-4 150hp that had been ordered earlier. The problem, however, was in transporting the airplane. Once disassembled, it occupied 14 boxes, each measuring 13 meters long. The decision was made to deliver the airplane to Russia by flying it from Saloniki to Odessa. Two officer-pilots and one gunner were needed to organize the flight that was entrusted to Italian pilots.

At the end of July 1917, the Russian military attaché was informed that the order for the Caproni biplane may be fulfilled within one week, as many finished airplanes without engines had been accumulated at the factory. The delay was caused by problems associated with organizing and mounting additional fuel tanks for the long-range flight. The credit to buy the Caproni airplane was confirmed by the Russian Military Department on August 10th. The takeoff was planned on October 24, 1917. But the next day the Bolsheviks launched their revolution and came to power. There is no information about the flight of Caproni bomber in the archives, but most likely it did not occur because of the changed circumstances.

Ansaldo

In March 1917, the prototype of S.V.A. fighter made its first test flight. The airplane created by Italian engineers V. Savoia and R. Verduzio, demonstrated excellent qualities. Powered by the SPA 6A 200hp engine, it attained a top speed of 228 km/h. Launched into serial production that year, the new fighter drew the attention of Russian pilots from the purchase aircraft commission who decided to buy two of the planes for flight testing. The total order amounted to 200,000 lire, of which 104,000 lire was the price of the aircraft with engines, 66,000 lire for spare parts, and 30,000 lire for four machineguns and ammunition. On August 10, 1917, the Russian Military Department affirmed the credit to buy two S.V.A. airplanes. In a perspec-

Ansaldo A.300/3 airplanes from the complement of the 1st reconnaissance squadron.



This S-16bis airplane was the "little old man" - it stayed at the armory until 1931.



THE REVOLUTION AND THE CIVIL WAR THAT FOLLOWED RUINED ALL THE PLANNING

tive, after the tests, Russia planned to order 500 airplanes of that type in 1918. Deliveries of 50-100 aircraft per month in 1918 would be followed by the Russians obtaining a production license. While negotiations were ongoing with the representatives of Ansaldo firm, the Russian revolution broke out.

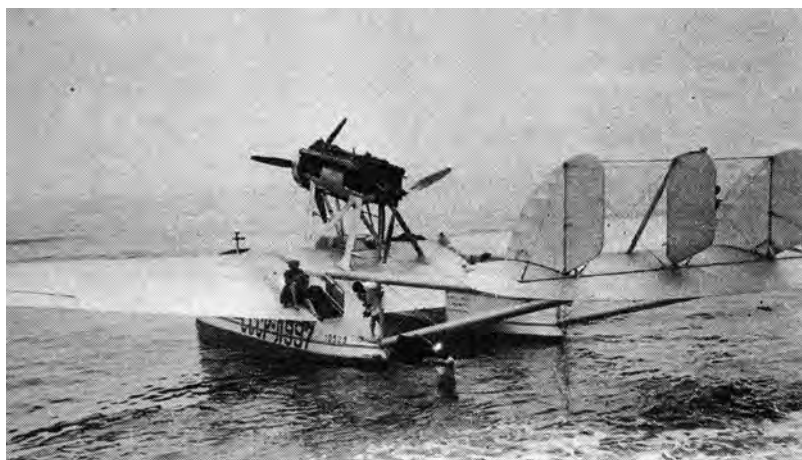
The revolution and the Civil War that followed ruined all the planning. The new Russian government—represented by the Council of Peoples Commissars—carried through with the order. The 20th Military Air Fleet of Soviet Russia was equipped mainly with the foreign aircraft, including some produced by the Italian firm Ansaldo. In 1918, the Soviets flew the single-seat fighter Ansaldo A. Balilla with SPA 6A 220hp engine. The aircraft was distinguished by its good maneuverability. The plane had one unique feature: in case of emergency, its main fuel tank could be dropped down through an opening in the bottom of the fuselage. Built towards the end of World War I, only 108 machines were built. Aircraft maintenance proved difficult because of the lack of spare parts.

After the end of the war, military orders decreased sharply as Ansaldo was unable to fill production orders. That was an order for 30 aircraft

in 1920, which for Soviet Russia appeared to be very timely. At the beginning of 1922 the planes were accepted at the armory at the West Military District (the 2d Fighter Squadron of the 2d Regiment, the temporary air base of the Kharkov fortified region), Air Forces of the Black Sea Fleet (2d Navy Fighter Air Detachment) and at Air Forces of the Baltic Sea Fleet (1st and 2d Fighter Air Detachments). The Ansaldo A.1 Barilla aircraft was popular among Russian pilots because of its maneuverability and easy handling. Some difficulties appeared in the course of operating the plane. The Russians, anxious to save money, planned to install, by themselves, the plane's synchronous machinegun. Unfortunately, they had neglected to order synchronizers, and production in Russia proved impossible. In this connection the Commander of the Navy Fleet reported on August 30, 1923, that "...new "Balilla" aircraft were unsuited for combat because they still lacked devices for shooting through the propeller."

The restricted engine life and the lack of spare parts were two more problems. According to reports from the combatant units a number of defects were revealed in most SPA 6A engines after a period of exploitation, including leakage of water jackets, breaking of valve springs, wearability of balance beam rollers and so on. That prompted the Command to order additional engines and spare parts for them. The greater part of exploitation of aircraft in Russia occurred in the winter and that was why skis were mounted on the plane's undercarriage. The Ansaldo Company sent their aircraft mechanics to Russia to perform the repairs there. In the winter of 1924 Air Forces of the Baltic Sea used skis from Nieuport aircraft for that purposes, later on a ski-undercarriage was designed specially for Ansaldo airplanes. By the end of 1926, only 12 Ansaldo A.1 Balilla airplanes remained in the Red Army Air Force's inventory. By mid-1928 these planes were hopelessly out of date and were used for pilot training.

S-55 (w/n 10529, Soviet civil aircraft register: CCCP-JI997/ SSSR-L997). S-55 planes were used in 1934-1935 for air communications along the Pacific Ocean coast.



Flying boat Savoia S-55 was purchased by the Soviet Union in Italy in 1932.



THE TWO-SEAT ANSALDO SVA-10 FIRST APPEARED IN RUSSIA AS A TROPHY OF WAR

The two-seat Ansaldo SVA-10 first appeared in Russia as a trophy of war. In 1920, twenty-five of the aircraft were bought by the independent government of Georgia after the end of the Civil War and the annexation of Georgia to the USSR in 1922. The Ansaldo SVA-10 became part of Red Army Air Forces and dozens more were purchased. These planes were sent to the West Military District armament (17th Separate Air Detachment), at Air Forces of the Black Sea (1st and 2d Reconnaissance Air Detachments) and Air Forces of the Trans Caucasus Military District. SVA-10 airplanes stayed in the Red Army arsenal until the mid-1920s.

The three-seat reconnaissance, two-strutter biplane Ansaldo A.300/3 with Fiat 12Abis 300-hp engine was produced in 1920. In 1922 50 airplanes of that type were bought for Air Forces of the Red Army. They were at the 1st, 2d, and 3d Reconnaissance Air Detachment's armament, as well as

at the 17th and 37th Separate Air Detachment of the Ukrainian Military District and at the 1st Reconnaissance Air Detachment of the 2d Regiment of Minsky Military District. After several years of exploitation in combatant units, Air Forces Command encountered the same problems as with Ansaldo A.1 Balilla aircraft—a lack of spare parts for the engines whose lifespan was exhausted. New engines demanded greater expenses, which posed problems for the USSR in hard economic times. Soviet engineers were asked to replace the worn out Fiat 300-hp engines with German BMW-IV 250/300-hp engines that had been purchased earlier in great quantities from Germany. In January 1926, the Ansaldo A.300/3 airplane was re-engined at the aircraft factory RVZ N6 "Promvozdukh" in Kiev. The aircraft appeared to be 120 kg lighter, as its crew was reduced from three to two. Additionally, the German engine was 105 kg lighter than the Italian one, reducing its service load from

The overwing fuelling S-55 'SSSR-L997'. Far East, summer 1935.





FIELD TESTING DID NOT INSPIRE CONFIDENCE ... THE TESTS HAD TO BE STOPPED AND THE BMW-IV REJECTED

150 to 70 kgs. The radiator from the "Fokker D.VII" aircraft was used for engine cooling. However, field testing did not inspire confidence among Soviet airmen. Test pilot Kosinsky completed only several flights, after which the tests had to be stopped and the BMW-IV rejected. During flights the modified Ansaldo A.300 pitched-up and showed a tendency to dive. The cause of the failure was tracked to incorrect centering of the airplane. That is why Fiat 12Abis 300-hp engines later were bought in Italy. The last Ansaldo A.300/3 airplanes were preserved at the Red Army armament till the end of 1928.

Savoia

In the middle of 20th century, seaplanes were also purchased abroad for the Soviet Navy. They included German aircraft seaplanes of German manufacture "Junkers," "Dornier," and "Heinkel"

and among them flying boats of the Italian Savoia firm. Some aircraft parts were reverse engineered, modified, and turned out at Soviet factories.

The three-seat flying boat Savoia S-16bis with Fiat A-12bis 300-hp engine was bought in accordance with the agreement dating to December 1922 and entered the Red Army inventory at the beginning of 1923. The first batch of thirty-two seaplanes was destined for the Baltic and Black Sea Air Forces. Some machines had dual controls and were transferred to the Navy aircraft school named after Leon Trotsky. Later, fifty more planes were purchased, they were the mainstay of the Navy aircraft of the Red Army until 1931. S-16bis airplanes were flown by the 1st and 2d Reconnaissance Hydro Air Detachment of the Baltic Sea Fleet; at the 3d Navy Air Detachment, 4th Reconnaissance Hydro Air Detachment, 53d, 55th, 63d, and 64th Separate Air Detachments, Navy Training Air

Flying boat Savoia S-62bis drew the attention of Soviet Air Forces Command by its good flying characteristics.



Savoia S-62bis was equipped with Isotta Fraschini 750 HP engine and could take up to 500 kg of bombs.

BY JANUARY 1928, S-16BIS AIRCRAFT WERE DESIGNATED "B" CATEGORY, AND LIMITED IN AEROBATICS



Detachment of the Black Sea Fleet; and separate air detachment of the Pacific Ocean Fleet.

But not long after, the S-16bis airplane was considered outdated and was designated for use in air schools and by rear units. In 1926-1927 the Navy Experimental Aircraft Section attempted to modernize the S-16bis. A Lorraine-Dietrich 450-hp engine was installed and the plane redesignated the S-16ter. Although the modification slightly increased the plane's speed, its range remained the same. Moreover, the S-16ter proved difficult to maintain. The boat's bulkhead was not watertight, so that the slightest puncture caused it to fill with water and begin to sink. Aviation workshops and repair bases tried to reinforce the bottom of the boat by adding another frame, and mounting special air boxes in the hull to improve floatation. Additionally, the attached fuel tanks were rein-

forced, a new silencer was installed, and other improvements made. The expenses to repair and modernize the S-16bis grew to 15 percent above its price. Still, the repairs didn't produce sufficient improvements nor make the aircraft effective in combat. By January 1928, S-16bis aircraft were designated "B" category, and limited in aerobatics. After various modifications, using different materials, the aircraft became 323 kg heavier and its service loading was reduced from 750 to 320 kg. During five years of exploitation each machine required at average two major and four minor repairs. On average the planes flew for only 250 hours before needing service.

The flying boat Savoia S-55, with two-hulls and two tail booms, was bought in 1932. It was the passenger version of the airplane with a three-person crew and carried 12 passengers. The Soviet Union

MBR-4 (from the left) and Sh-2 flying boats. Taganrog, 1932



MBR-4 with Asso 750 engine of the 31st aircraft factory. Taganrog, 1932.

BUILT IN 1927, THE FLYING BOAT SAVOIA S-62BIS ... WAS CONSIDERED TO BE THE MOST ADVANCED PLANE AT THE TIME



purchased five S-55s (works numbers 10527-10531), powered by “Asso” 750 engines. The S-55s were used for air communications along the Pacific Ocean coast in the 1930s.

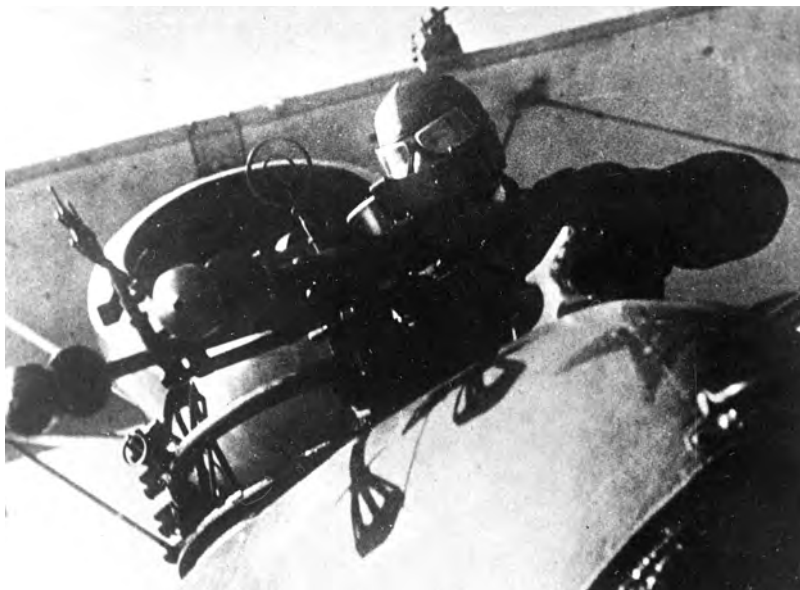
Built in 1927, the flying boat Savoia S-62bis, with the Isotta Fraschini “Asso” 750-hp engine was considered to be the most advanced plane at the time. That airplane with works number 6206 and side index “I-AAQA” was purchased for the Soviet Air Forces and underwent testing from March 15 to April 10, 1930, in Sevastopol, at the Black Sea Fleet base. With 1,435 kg full loading (including 500 kg of bombs) the airplane developed maximum speed near the water surface at 220 km/h and 194 km/h at an altitude of 3,000 m. In mock combat with the I-4 fighter, the S-62bis — owing to its maneuverability — escaped fighter attacks and could beat them off from different directions. During demon-

stration flights, the Italian pilot showed the stability of the airplane in a spin that was the cause of many air crashes at that time. From the Soviet side aviation engineer Robert Bartini took part in the tests (he was an Italian, political emigrant, and had worked in Russia since 1924). In his report, Bartini noted that the S-62bis would satisfy the demands of the Red Army Air Forces for reconnaissance and bombing at the Black Sea theatre of war. The good flight range (the radius of action of the aircraft was 945 km or 510 miles) permitted it to reach Rumania, Bulgaria, and Turkey.

A comparison between the S-62bis and the German flying boat “Dornier Wal” showed the S-62bis having equal armament and equipment, but greater flight range (for 40 miles), and able to fulfill the same combat tasks within a shorter period of time. Thus, S-62bis was transferred for tests at

Official tests of MBR-4 at the Azov Sea in April 1932.





Coaxial gun of Degtjarev system at the nose gunner MBR-4 flying boat.

ITALIAN SPECIALISTS WERE SENT TO RUSSIA TO SPEED REPAIRS AND PUT THE S-62BIS MACHINE INTO OPERATION

the Black Sea Air Forces and in June 1930 after the end of the tests the Commander of that Air forces reported: "...I consider that S-62bis is the most interesting and correspondent to our demands machine from the existing ones at this time in Europe." General Trudoljubov – the Soviet military attaché in Italy headed the talks with S.I.A.I. firm (Societa Idrovolanti Alta Italia) and on January 20, 1931, signed an agreement for fifty S-62bis airplanes and 125 "Asso" 750-hp engines. The first ten machines were ready and sent by ship from Genoa on May 27, 1931.

The cost to deliver one airplane by sea was 7,350 lire, while the price of the aircraft didn't exceed 237,500 lire. At first consideration was made to fly completed aircraft by air, but the cost of the flight of ten airplanes, including ten Italian pilots and mechanics comprised 693,365 lire and seemed too high to Soviet military officials and they decided to save money and send the airplanes by ship. But when on September 20, 1931, the first ship arrived in-Sevastopol it soon became clear that such economy came to naught. After unloading it appeared that airplanes arrived damaged because of the carelessness in shipment; water penetrated into the boxes with engines because their tightness was disturbed and they got rusty. All that was the result of the bad work of the transport section of Trade Delegation of the USSR: the airplanes stayed more than a month in the port and were loaded on the ship with numerous violations.

A reception commission headed by pilot Mitrofan Korovkin worked at the aircraft factory of Italian SIAI firm and had to accept and test the S-62bis planes. The commission worked rather successfully, until on June 3, 1931 at 7:00 o'clock in the evening during a flight test one of the flying boats crashed and the pilot perished. That day Korovkin decided to test the airplane for performance in a spin. From a height of 1,800 meters, he threw the machine into a right spin and after six turns tried to pull out, but failed. Having completed six or seven turns the airplane was crushed having not

pulled out from the spin. For unknown reasons the pilot didn't use his parachute. Immediately after the crash, the Soviets side declared the airplane too dangerous and demanded additional tests. A commission of inquest found that the spin test was done by Korovkin without a preliminary agreement at his own initiative. A height of not less than 4,000 meters was necessary to conduct such tests to have reserve in case of emergency. The mistake was made by the Russian pilot. As a compromise the acceptance commission agreed to abstain from testing the plane in a spin. The Italians gave written guarantees of the full S-62bis safety while in a spin at any flying regime and assumed all the expenses connected with the crash. In August 1931, twenty more machines passed the tests and were sent to Russia.

No serious conflict arose in connection with the demand of the Soviet side to install a ski undercarriage on S-62bis airplane in the course of its production, as without them airplanes had to stay out of action during winter. But that demand was declined by Italian firm on legal grounds as it was not foreseen by the contract. That could be done, but the Italians asked for an additional payment to install the ski undercarriage.

Italian specialists were sent to Russia to speed repairs and put the S-62bis machine into operation. They helped their Soviet colleagues, but the stay of some of them in Russia caused problems for military officials, who trained their subordinates to Spartan life conditions at Stalin's totalitarian regime. Thus, on September 10, 1931 aviation mechanics Peskatfe and Kasollo arrived at Sevastopol. Some time after their return the head of the Black Sea Air Forces supply office noticed that the mechanics had behaved improperly. It seems that the Italian specialists, who were paid ten rubles a day, wanted to get their money immediately—even at night. Besides that, every day they wanted to eat expensive a la carte dishes—beef-steak or shashlik, butter and wine not only for them selves but also for "ladies" whom they invited.

In March 1931, the Commander of the Red Army Air Forces decided to construct S-62bis airplane after available Italian model at aircraft factory N 31 in Taganrog (Azov Sea). In December of the same year the airplane with designations MBR-4 (Morskoj Blizhny Razvedchik=Naval short-range reconnaissance) was launched into serial production. The copy of flying boat S-62bis was constructed with the use of Russian materials. In the course of its production import materials were replaced by local ones (for example, spruce was replaced by pine wood); some structural alternations were introduced—for instance ski undercarriages were mounted to enable using the airplane during winter time, a radiator of Russian design was installed and so on. The turn out of the airplane was delayed in connection with a number of technical difficulties. It was necessary to make the draft from the Italian model and gain an understanding of assembly diagrams received from Italy. First serial airplane MBR-4 was admitted to offi-

The Italian bomber SM-82 with German Luftwaffe identification marks was captured at one of the airfields in 1944.



cial test on April 9, 1932. In August 1932, ten airplanes with works numbers OE68-OE77 passed the tests that were carried out at the air detachment of the Navy test station of the Black Sea Fleet Air Forces. During the tests as many as sixty manufacturing defects were revealed, that sharply reduced the flying qualities of the airplane.

Airplanes were returned frequently to the factory for repairs. The use of pine wood, native bombardment, rifle and electrical equipment produced excessive weight. The plane had grown 274 kg heavier in comparison with the Italian model. The delivery tests of MBR-4 lasted till autumn 1932. On the whole, twenty-nine MBR-4 machines were turned out.

The S-62bis (MBR-4) seaplane was the mainstay of the Black Sea Fleet Air Forces, Baltic Sea Fleet Air Forces, Pacific Ocean Fleet, the Danube and the Amur Rivers military flotilla till 1936 and later on was replaced by the flying boat MBR-2 designed by Georgy Beriev.

Fiat

In spring 1928, the Fiat C.R.20 airplane drew the attention of Soviet military specialists, who decided to buy two of the planes for testing. Airplanes with works numbers 662 and 671 were sent to Moscow on May 25. During the reception of the airplanes in Milan they showed good results, much better than expected: maximum speed 272 km/h, ceiling more than 7,000 m, and flight duration 3 hours (15 minutes more than provided in the agreement). Soviet Russia had to pay \$10,000 for each airplane, without armament and spare parts. Fiat sent a pilot named Battalla and a mechanic named Ramela to assist. The Italians arrived for the tests, but in July when they finished their work, the two returned to Italy. It had seemed that the successful demonstrations in Italy would provide confidence. But later tests of the Fiat C.R.20 airplane in Russia, by the Scientific Research Institute of Air Forces (NII VVS= Nauchno-Issledovatel'sky Institut Voenno-Vozdushnykh Sil) showed that "...airplane can by no means be regarded as a modern fighter because of its obvious drawbacks." These included a low rate of climb, sharp transition into vertical diving during steep descent. It is difficult to understand what had caused such disparity between the tests on the plane in Italy compared to tests in Russia, but the Red Army Air Forces refused to accept it.

The trophy copy of Fiat C.R.32bis fighter underwent tests at the Scientific Research Institute of the Air Forces in 1936. The most numerous fighter used by the Frankists, it was brought to Russia

during the Spanish Civil War. The mock combats between the Russian I-15 fighter, designed by Nikolai Polikarpov, and the Italian fighter Fiat C.R.32 demonstrated the obvious advantages of the Russian plane. The Fiat C.R.32 lagged behind considerably in time-to climb and maneuverability. Also, the plane's takeoff was difficult as it was unsteady and gained speed slowly. Only skilled pilots were able to perform such aerobatics as the "turn" and "split S." The Italian fighter was superior in its more powerful armament—two large caliber (12.7 mm) synchronous Breda machineguns and two wing machineguns of 7.7 mm caliber. They permitted the C.R.32bis to fire from long distance, out of the reach of the I-15 machineguns fire. But it was impossible to exploit this advantage during combat because of the plane's deficiencies in speed and time to climb.

Savoia-Marchetti (SM)

In June 1941, the Rumanian Air Forces, as a part of German troops in Southern Russia, participated in combat in the South of Russia. Rumanian bombers were shot down by Russian fighters during air combat near Odessa. That were S.M.-79 "Sprier aircrafts of Italian Savoia-Machete firm, from 1940 they were turned out at the Rumanian aircraft factories by license. One of the planes shot down SM-79 was repaired and transferred to the 69th Fighter Air Regiment, where it was used as a constituent part of the composite squadron together with Russian reconnaissance and attack airplanes. The "life" of the aircraft SM-79 in Russia was not long. On August 4th the Rumanian army began the siege of Odessa. During the hasty retreat on September 30, 1941 the trophy airplane SM-79 was used to evacuate pilots and mechanics of the 69th fighter regiment. With great difficulties 18 men managed to board the plane. But when the overloaded machine took off from the airfield, projectiles began to explode. The apparatus safely reached the location of Soviet troops but during landing was damaged because of the overloading.

Another Italian airplane built by Savoia-Marchetti was captured during the offensive of the Soviet army in 1944 and in the postwar period was used as a transport aircraft.

Dornier

Because the Versailles treaty forbade Germany from producing airplanes on its territory, its Dornier "Wal" flying boats were mainly built in Italy. The USSR bought sixty copies of that plane for their naval aviation in 1926-1928. The boats were turned out at the "Konstruktsionni mekhaniki Aeronautic C.A." factory, located in Marino-de-Pizo. Each airframe (without an engine) cost \$40,500. From 1920-1930, besides aircraft, the Soviets purchased from Italy balloons made by the "Aporio" company, parachutes by "Aerosalva," and aircraft engines from "Fiat" and "Isotta Fraschini." ■

WHAT HAD CAUSED SUCH DISPARITY BETWEEN THE TESTS ON THE PLANE IN ITALY COMPARED TO TESTS IN RUSSIA

Airlifts in Time





Justin Giovannettone

(Overleaf) These "K-loader" ramps assisted the unloading of C-5 aircraft at Israel's Lod airport.

**CODENAMED
OPERATION
VITTLES, THE
AIRLIFT
EMERGED AS
AN ENOR-
MOUS OPER-
ATIONAL AND
STRATEGIC
SUCCESS**

**THE METHOD
OF ANALYSIS
USED HERE
WAS
ADAPTED
FROM
NEUSTADT
AND MAY'S
THINKING IN
TIME**

"History repeats itself," is a common refrain among many casual and even some more formal observers of history. For the policymaker however, such thinking is surely a trap. No two crises are exactly the same—whether in terms of circumstance, appropriate response or corresponding outcomes. On the other hand, a policy- or decision-maker who does not examine the past in order to gain insight into the present is surely handicapped. This article examines two historically unique strategic airlifts and the crises and decisions that led to them in the context of these assertions.

The first operation considered below is the Berlin Airlift—the successful United States-led effort to supply the western sectors of Berlin after ground access to the city was cut off by the Soviet Union in June 1948. Codenamed Operation Vittles, the airlift emerged as an enormous operational and strategic success for the U.S. and its western Allies—demonstrating the impressive capacity of the newly created U.S. Air Force, saving West Berlin from envelopment by the Soviet Union, and demonstrating America's resolve against Soviet aggression; all the while avoiding an outbreak of war in Europe. The second operation, Nickel Grass, involved the unilateral U.S. resupply of Israel during the 1973 Yom Kippur War. That airlift, though a significant success operationally, was at best only a partial success strategically. The resupply very likely saved Israel from defeat and by doing so prevented a Soviet proxy victory in the Middle East. However, Operation Nickel Grass also helped prompt the devastating Arab oil embargo from October 1973 to March 1974, the effects of which burdened the economies of the U.S. and its allies for years to come.

Operations Vittles and Nickel Grass are distinct in U.S. history in that they were both strategic airlifts used exclusively to support an ally or allied population in peril, without the presence of or intent to introduce combat forces. Each operation was also executed under complex domestic and international political conditions and had enormous global strategic significance. There are important differences as well in the structure of the crises themselves, the responses by the administrations under whose watch they occurred, and in the content of the supplies airlifted.

The intent of this article is to answer the question: Why was one operation a strategic success, while the other was only a partial strategic success? Emerging from the answer to that question is a set of "lessons learned" that can assist American strategic policymakers to first identify where similar potentially dangerous crises may occur in the



future; and second, to better position the country and themselves to deal with such crises when and if they do emerge.

The method of analysis used here was adapted from Richard E. Neustadt and Ernest R. May's 1986 book, *Thinking in Time: The Uses of History for Decision Makers*. In conjunction with analysis of how decision makers—primarily American Presidents—have used history since the end of the World War II, *Thinking in Time* prescribes a set of "mini-methods" that decision makers can apply to make more effective decisions and make better use of history when making such decisions. The book is helpful here in two ways: First, Neustadt and May's methodology, when applied to historic case studies, conveniently offers a means to analyze the decision making process and helps pinpoint where policymakers in the past might have done better. For example, they recommend leaders faced with an erupting crisis list (on paper, not just orally) what is *Known*, *Unclear*, and *Presumed* about a situation in order to isolate the key issues at hand.¹ Thus, for the purposes of this article, comparing the *Knowns*, *Unclears*, and *Presumed* of Presidents Harry S. Truman and Richard M. Nixon leading up to and during Operations Vittles and Nickel Grass help us to better understand the events from their perspectives. Secondly, Neustadt and May also recommend decision makers list the *likenesses* and *dif-*

1st Lt. Justin Giovannettone, USAF, is currently serving with Seventh Air Force, in South Korea. He received his master's degree in International Commerce and Policy at George Mason University in May 2004. This article was adapted from a paper Lt Giovannettone wrote for the Military Operations Other than War class at GMU. The views expressed in this article are his alone, written in an academic context, and do not represent the views of the Air Force, the Department of Defense, or the U.S. government.

(Left) President Harry S. Truman.

(Near right) Lt. Gen. Lucius Clay.

(Far right) Maj. Gen. William H. Tunner.

“WE STAY IN BERLIN, PERIOD,” WAS TRUMAN’S CHARACTERISTICALLY BLUNT ANSWER

NEUSTADT AND MAY, EMPHASIZE THE IMPORTANCE OF CONSIDERING BOTH WHAT TO DO AND HOW TO DO IT



ferences between a present crisis and apparently analogous crises from the past. Doing so should help avoid simplistic and dangerous conclusions about cause and effect and sharpen one’s own objectives. For our purposes, the likeness and differences method helps to flesh out Operations Vittles and Nickel Grass from the perspective of an American President facing a similar crisis today and thus is key to deriving our lessons learned.

“We stay in Berlin, period.”

On June, 28 1948, ten days after the Soviet Union announced the blockade of all western ground traffic to Berlin, President Truman chaired an oval office meeting with Secretary of Defense James Forrestal, Secretary of the Army Kenneth Royal and Under Secretary of State Robert Lovett. The question of how to respond to the blockade was the primary topic. “We stay in Berlin, period,” was Truman’s characteristically blunt answer. Royal asked Truman whether the consequences had been fully thought through. To this Truman replied, “We will have to deal with the situation as it develops.”²

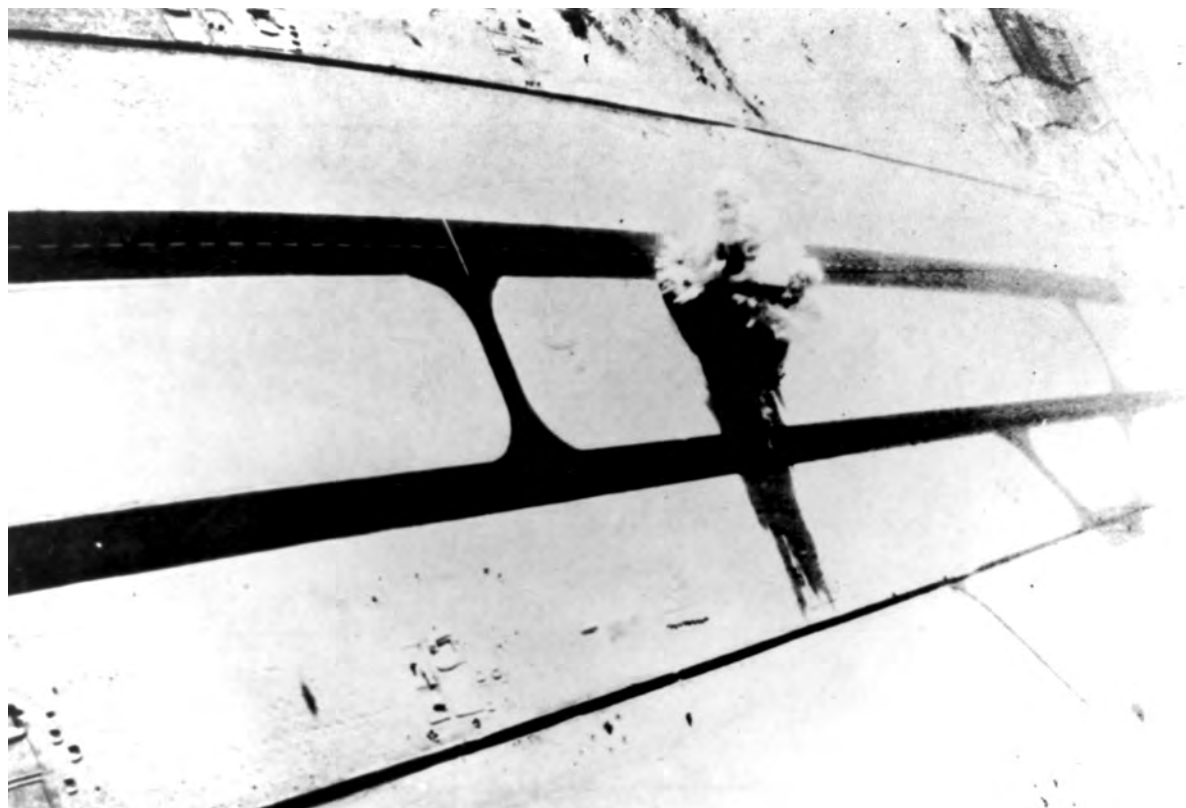
Such apparently hasty decision-making would probably not be endorsed by Neustadt and May, who emphasize the importance of considering both *what to do* and *how to do it* as two “inextricably interlaced” questions in the decision making process. The idea being that the right decision about what to do cannot be arrived at without understanding how, and therefore if, said decision might be achieved. Thus *what to do*—staying in Berlin—did not address the *how to do it*; which could have meant an attempt at busting the blockade with a ground convoy and therein risking war with the Soviets, or could have meant an airlift of

undetermined duration.

Of course, by the time Truman held the meeting on June 28, the airlift had already begun. On June 22, Gen. Lucius D. Clay, U.S. Commander in Chief European Command, had directed Lt. Gen. Curtis E. LeMay, Commander of U.S. Air Forces in Europe (USAFE) to begin the airlift. USAFE aircraft delivered 156 tons in 64 sorties that day.³ Truman seemed to have settled on the airlift as the *how to do it*; however, he and others understood the airlift as only a temporary operation while a diplomatic solution to the crisis was worked out: “In this way we hoped that we might be able to feed Berlin until the diplomatic deadlock could be broken.”¹⁴

Clay meanwhile advocated sending an armed convoy through the blockade to Berlin to call what he presumed was a Soviet bluff. On June 25, he sent a message to Army Undersecretary William Draper stating, “I am still convinced that a determined movement of convoys with troop protection would reach Berlin and that such a showing might well prevent rather than build up Soviet pressures which could lead to war.”⁵ Truman vetoed the proposal. He likely had more faith in a diplomatic solution than did Clay, but additionally, Truman’s *what to do*—stay in Berlin—had an important footnote.

Troop demobilization in Europe, during 1945 and 1946, left only about 60,000 American troops on the continent in 1948; just over 10,000 were combat troops. The Soviets, in contrast, still had some 300,000-400,000 troops in Europe.⁶ If Clay’s convoy sparked a war, Truman might have been forced to respond to overwhelming Soviet force by employing atomic weapons, of which America had about 50 at the time to the Soviet’s none. It is no secret that Truman dreaded having to resort again to the A-bomb after ordering its use against Japan



THAT TRUMAN REJECTED THE CONVOY OPTION IN FAVOR OF AN AIRLIFT IS THE CRUCIAL DECISION

at the end of World War II.⁷ So in addition to staying in Berlin, the footnote to Truman's *what to do* was to *avoid a war with the Soviets*.

That Truman rejected the convoy option in favor of an airlift is the crucial decision of the crisis. It is almost universally accepted that it was the right decision. An important question for us is how did Truman—considering the pressure on him to respond with force and the uncertainty of indefinitely supplying a city from the air—arrive at the decision to reject Clay's convoy option in favor of the airlift? The answer can be found by examining the period prior to the imposition of the blockade, which may have allowed the Truman Administration to inadvertently accomplish something resembling Neustadt and May's *known, unclear*, and *presumed* methodology.

Truman's Knowns, Unclears, and Presumed

Following the joint occupation of Berlin by Allied forces in May 1945, written agreements between the Western Allies and the Soviet Union provided three twenty-mile-wide air corridors connecting West Berlin with Hamburg, Frankfurt/Main, and Hannover-Bueckeburg guaranteeing U.S., British and French aircraft the right to travel to and from the city. On the other hand, the Western Allies received only verbal assurances of rail, road and barge access to the city. Beginning in early 1948, the validity of those verbal assurances was put to the test. Relations between the Soviet Union and the U.S. sunk to new lows as negotiations over the reunification of defeated Germany broke down. Anticipating the Allies' intention to create a West German state, the Soviets began

harassing British and American trains to Berlin. Then in March (the same month Congress passed the Marshall Plan), the Soviets imposed rules requiring all military trains to and from Berlin to obtain permits and be searched.

The U.S. responded by canceling all military trains to Berlin and implementing what became known as the "Little Lift"—a ten-day airlift to resupply the military garrison in Berlin—using C-47 Skytrains to deliver 300 tons of goods. After the "Little Lift" USAFE began work on contingency plans for limited airlifts into Berlin that might be necessary in the future. The plans were not intended to fulfill the massive requirements of what became the Berlin Airlift after the June blockade, though they were undoubtedly a primer. More importantly, the experience of those first six months of 1948 filled in much of the *knowns*, *unclears*, and *presumed* for Truman and his staff, and may have been the key to their successful handling of the crisis.

By June, Truman and his advisors knew of the Soviets' tendency to resort to harassment of ground traffic to Berlin when they were frustrated by events elsewhere. Furthermore, they knew that the Soviets could not, without breaking written agreements, block air traffic to and from the city. Though the ability of the U.S. and British air forces to supply the city indefinitely had not yet been demonstrated, an *unclear*, at least they could conduct a temporary resupply, a *known*, while diplomats would iron out the crisis, a *presumed*. The presumption that the crisis would be resolved relatively quickly by negotiations turned out to be wrong. This failure was remedied nonetheless by the U.S. and British air forces' ability to implement

BEFORE THE
OCTOBER
1973 WAR
BEGAN,
ISRAEL CAL-
CULATED
THAT IT HAD
EQUIPMENT
AND SUP-
PLIES FOR
ABOUT
THREE
WEEKS OF
WAR

the airlift indefinitely—something that was at first not only considered unlikely by Truman, but was deemed impossible by many of his domestic critics. There were other relevant *knowns, unclears, and presumed*: the troop balance on the continent—again, a *known*—and the *presumption* that a retreat from Berlin would be similar to the appeasement of Adolf Hitler before World War II and thus would only serve to encourage Soviet aggression. But it was the experience with the mini-blockades and subsequent “Little Lift” that not only helped prepare the newly created U.S. Air Force for the possible need for an airlift, but also educated Truman about the possibilities of airlifting supplies to Berlin. Thus, he had a clear understanding of the dynamics of the situation and an option short of war when the real blockade came. In other words, he had already applied one of Neustadt and May’s key methods before the crisis broke (though unintentionally, and not on paper as recommended).

Without this background, Truman might have been more agreeable to Clay’s more aggressive proposals. On July 10, when it was becoming clear that the Soviets did not intend to back down, Clay proposed that the U.S. threaten the Soviets with the armed convoy maneuver if the blockade was not lifted by a specific date. Truman again rejected the idea, as he also did the suggestion at a July 22 meeting that he turn over control of America’s atomic weapons to the Joint Chiefs of Staff.⁸

That meeting was also the one at which Truman decided to fully commit the U.S. to the airlift for the long haul. During the meeting, Clay reported that Operation Vittles, as the airlift had been named, was exceeding all expectations in terms of tonnage delivered—2,500 tons a day—but was still about 2,000 tons short of what was thought to be the minimum level needed to sustain Berlin without extreme hardship, particularly during the winter. He asked for and was granted seventy-five additional C-47s that he estimated would allow him to reach the minimum requirements.⁹

The airlift proceeded through the summer and fall—increasing monthly the tonnage delivered—from 69,000 tons in July to 119,002 tons in August; 139,623 in September; and 147,581 in October. There was widespread speculation that the airlift could not deliver sufficient supplies through the winter months when weather in Germany would deteriorate significantly. Critics, including renowned *New York Herald Tribune* columnist Walter Lippmann, were nonetheless proven wrong after a series of logistical adjustments and the authorization of additional transports by Truman helped the airlift adjust to the winter difficulties.¹⁰ While total tonnage delivered dropped in November to 113,588 tons, it began to rise again in December to 141,468, and reached 171,959 in January. Consistently, the airlift began to exceed the requirements for maintaining minimum levels of comfort in the city and stockpiling of supplies began. It was becoming clear that the airlift could sustain Berlin indefinitely and the counter block-

ade, which was initiated by the Western Allies and eventually cut off the flow of steel, chemicals, and manufactured goods from Western Europe to the Soviet control areas, was taking its toll.¹¹ The Soviets began lifting the blockade in April and on May 12, 1949, both blockades were lifted. Operation Vittles is remembered as a shining example of American determination, ingenuity and goodwill. It was a decisive U.S. victory in the Cold War and Truman called it one of his proudest decisions—the success of which likely contributed to his slim reelection in November 1948.¹²

“Get them in the air, now.”

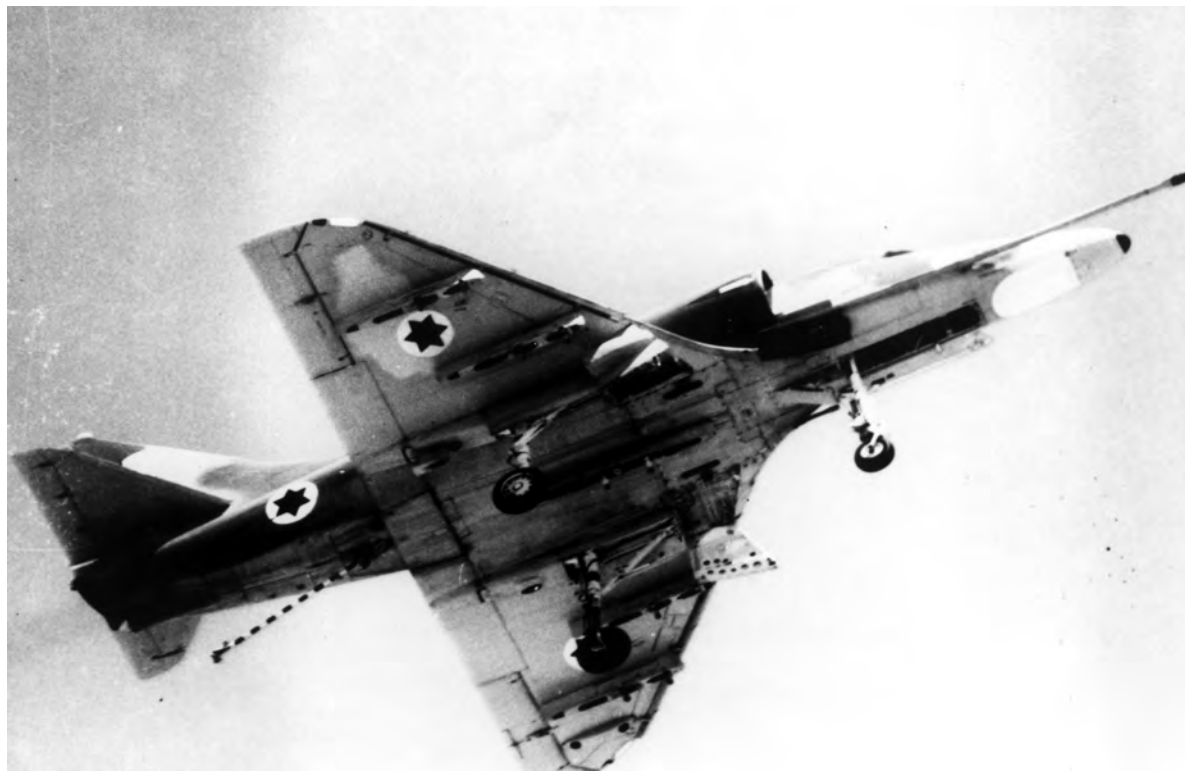
On October 12, 1973, President Richard M. Nixon faced a situation at least as serious as that faced by President Truman in June 1948. Six days earlier, Egypt and Syria (with assistance from Iraq, Jordan, and Libya) launched surprise attacks on two fronts against Israel. The attacks, launched on the Jewish holy day Yom Kippur, achieved almost complete strategic surprise, forcing Israeli forces to fall back from positions established after the 1967 Arab-Israeli War. Before the October 1973 war began, Israel calculated that it had equipment and supplies for about three weeks of war. This estimate however was based on the country’s triumphant experience during the 1967 war, when preemptive strikes allowed Israel to quickly and decisively defeat Egypt, Syria and Jordan. Six years later, caught off guard by Arab armies recently reequipped with new Soviet armaments, the Israelis were expending ammunition and losing tanks and planes at a far greater rate than in 1967.

President Nixon was already aware that Israeli supplies were getting perilously low when on October 12 he received a confidential letter from Israeli Prime Minister Golda Meir stating that Israel’s survival was at risk. Nixon had already authorized a resupply of Israel on October 9 and tasked his Secretary of State/National Security Advisor Henry Kissinger with managing the logistics (and politics) of the resupply.¹³ After being appointed Secretary of State on September 22, Kissinger maintained his position as National Security Advisor, thus becoming the only official in U.S. history to hold both titles simultaneously. Due in part to the dual distractions of Vice President Spiro Agnew’s resignation on October 11 and an escalating Watergate investigation, Kissinger had been basically running the show since the beginning of the crisis. However, while Nixon’s other concerns ensured Kissinger was the central figure in the crisis, the President remained involved throughout—making crucial decisions, including the final order to the military to initiate the resupply.

Since the war began, Kissinger struggled desperately to balance a confounding mix of U.S. interests. Early in the crisis, he arranged for the Israelis to pick up supplies in the U.S. via unmarked El Al planes. However, Israel’s national airline could not handle the required tonnage. An effort was then made to enlist the U.S. civilian airline industry in

ISRAEL’S
NATIONAL
AIRLINE
COULD NOT
HANDLE THE
REQUIRED
TONNAGE

At the outbreak of the October War, about 1/3 of Israel's 488 combat aircraft were McDonnell Douglas A-4s, shown here with Israeli markings.



ON OCTOBER 10, THE SOVIETS BEGAN TO RESUPPLY EGYPT AND SYRIA

the resupply effort. That effort also failed, in part because no insurance company would cover the planes flying into a war zone.¹⁴ The President could have compelled the civilian airlines to cooperate under the Civil Reserve Air Fleet program if he had declared a national emergency, but that would have defeated the point. Kissinger's attempt to coordinate a resupply without obvious U.S. government involvement was aimed at not offending Israel's Middle Eastern enemies, particularly Saudi Arabia and Iran, whose influence in global petroleum markets had recently become stronger than ever.

However, on October 10, the Soviets began to resupply Egypt and Syria. That move proved critical. The possibility of the Soviets achieving a proxy victory over U.S.-allied Israel (emphasized by Meir's letter and a desperate phone call to Kissinger by Israel's ambassador to the U.S. at 1:45 a.m. the day before)¹⁵ prompted Nixon to step in on October 12 and order the U.S. Air Force to initiate the resupply immediately. Nixon made it clear that he was aware of the potential consequences of offending Arab nations and was willing to risk them. In his memoirs, Nixon recalls a conversation with Secretary of Defense James R. Schlesinger, the administration official most concerned about the effects of an oil embargo.

I called Schlesinger and told him that I understood his concern and appreciated his caution. I assured him that I was fully aware of the gravity of my decision and that I would accept complete personal responsibility if, as a result, we alienated the Arabs and had our oil supplies cut off. I said if we could not get the private planes, we should use our own military transports. "Whichever way we have to do it, get them in the air, now."¹⁶

The decision was made and Operation Nickel Grass began. The U.S. Air Force Military Airlift Command had been preparing for the airlift by positioning materiel at several locations in the eastern United States. When President Nixon's order came, the supplies were loaded onto C-141 Starlifters and C-5 Galaxies. Within nine hours of Nixon's decisions the aircraft were ready to depart. Last minute complications included bad weather at Dover AFB, Delaware, where the first C-5s would depart, and some high level diplomacy to convince Portugal to allow the aircraft to make stopovers at Lajes Airfield in the Azores (no other European country would allow stopovers or overflights). The first C-5 landed at Lod/Ben-Gurion air complex in Tel Aviv on October 13. It unloaded 97 tons of 105 mm howitzer shells, which were quickly delivered to the Israeli army. Within the next twenty-four hours U.S. military aircraft would deliver another 829 tons.¹⁷ That same day, Israeli counterattacks, which actually commenced before the first U.S. aircraft landed, began to make significant gains on both fronts.

The Oil Weapon

On October 15, the decision to initiate the resupply became public. The next day, oil ministers of the Organization of Petroleum Exporting Countries (OPEC) meeting in Kuwait City announced that they would raise the price of oil by 70 percent. The day after that, October 17, the oil ministers agreed to cut production by five percent from September levels and continue cutting by five percent each month until the U.S. reduced its support for Israel, thus pushing the price of oil even higher. On October 18, Arab nations, led by Saudi Arabia, threatened to cut off all oil shipments to

OPEC ... ANNOUNCED THAT THEY WOULD RAISE THE PRICE OF OIL BY 70 PERCENT

countries supporting Israel if the U.S. resupply was not halted immediately. On October 20, that is exactly what the Saudis did.¹⁸

That same day Kissinger landed in the Soviet Union to begin talks that would eventually lead to a ceasefire. Though an American-Soviet cease-fire proposal was approved by the United Nations on October 22, fighting continued until October 24, with the Israelis the obvious victors on the battlefield.¹⁹ Interestingly, in his 2003 book, Kissinger states that following the ceasefire declaration, the “United States had achieved its strategic objectives: (1) it had fulfilled its obligations to Israel; (2) it had reduced the Soviet role in the Middle East... and (3) it had maintained friendly relations with the Arab world.”²⁰

But had *all* of America’s strategic goals really been met? During the following months, as the effects of the embargo set in, gasoline prices in the U.S. rose 40 percent and lines at gas stations grew to previously unimagined lengths, as drivers feared there might be none available the next day. The embargo quickly pushed the country into a recession. If the U.S. had indeed “maintained friendly relations with the Arab world,” Americans waiting in lines at gas stations hardly noticed.

Nixon’s Known, Unclear, and Presumed

To better understand the calculations that resulted in the initiation of Operation Nickel Grass we turn again to Neustadt and May. Though there is no indication that Nixon or Kissinger had listed the *known*, *unclear*, and *presumed*, a review of the crisis history does indicate that they had a solid grasp of most of them nonetheless. Clearly, by October 12, Nixon and Kissinger were well aware of the possibility that the Arab oil producing nations might unleash the oil weapon, a *known*. Nixon’s statement to Schlesinger demonstrates as much. On that same day, he also received a letter from the chairmen of the American oil companies operating in Saudi Arabia warning him that continued support for Israel would evoke retaliation from the Arab oil producing nations “that would produce a major petroleum supply crisis.”²¹ The exploration of other options for supplying Israel was a somewhat haphazard attempt to avoid such a crisis.

Two big *unclears* on that fateful day were: 1) Would the Arab nations actually make good on their threat to initiate an embargo, and 2) would Israel survive without immediate U.S. assistance? As indicated above, Nixon and Kissinger likely believed the answer to the first question was yes and the second one no. There is a subtle distinction here between the *known*—the threat of an oil embargo—and the *unclear*—whether or not the Arab countries would actually go through with the embargo. This left room for hope that they would not, but as the old saying goes, “Hope, is not a plan.” When deciding *what to do* and *how to do it*, Nixon and Kissinger therefore chose to subordinate the goal of preventing an oil embargo in favor of the

mutually supporting goals of saving Israel and stemming Soviet influence in the Middle East. Kissinger states as much in his book: “... all American policy makers were agreed that we should do our utmost to prevent a confrontation with the Arab world...though not to the point of impairing American strategic interests.”²²

Why prevention of the oil embargo was subordinated to their other objectives can be explained by a closer examination of Nixon and Kissinger’s *presumptions*. Before the surprise attack against Israel, the administration had been struggling to maintain support for détente with the Soviet Union. Their most difficult task in doing so was to demonstrate that it was in America’s interest to improve relations with a country, the Soviet Union, which “treats its people in a way distasteful to most Americans.”²³ Specifically, they were attempting to secure so-called Most Favored Nation (MFN) status for the Soviet Union as a sign of goodwill. There was no shortage of opponents to détente in Congress and throughout the country. So Nixon and Kissinger *presumed* that a Soviet proxy victory against U.S.-allied Israel would not only kill the MFN initiative, but the entire policy of détente. Furthermore, strong support for Israel in Congress made President Nixon more inclined to support Israel for domestic political reasons. Though Nixon never had much support from the American Jewish community, he knew with the Watergate investigation heating up that he might need all the support that he could get, particularly in Congress,

These presumptions were matters of domestic and international politics—two areas in which Nixon and Kissinger, respectively, were experienced authorities. However, another important set of presumptions, related to the effects of a potential oil embargo, entered the realm of international economics—a subject with which both had considerably less experience. Significantly, the official who was most apprehensive about the airlift was Schlesinger—a former economics professor at Harvard. In contrast, Kissinger—himself, a former history professor at Harvard—is said to have told his aides a few months after the embargo began, “Don’t talk to me about barrels of oil. They might as well be bottles of Coca Cola. I don’t understand!”²⁴ Economics was not Kissinger’s game.

Kissinger did, however, know his history. He knew, for example, that the U.S. had secretly supplied Israelis during the Six Day War.²⁵ And he surely knew that Arab nations also imposed an oil embargo during that war. That embargo almost immediately removed six million barrels of oil per day (bbl/d) from the world market; the 1973 embargo removed only five. Yet in 1967 the price of oil did not quadruple, gas lines did not emerge and western economies were not thrown into recession. One significant difference between 1967 and 1973 was that the conditions in the international petroleum market had changed dramatically in terms of both supply and demand. On the demand side, worldwide oil consumption increased from 36 million bbl/d to 56 million bbl/d. Consumption in the



**PRESIDENT
NIXON STILL
WOULD HAVE
CHOSEN TO
SUFFER THE
EMBARGO IN
ORDER TO
SAVE ISRAEL
AND DEFEAT
THE SOVIETS**

U.S. alone rose from 12.5 million bbl/d to 17.3 million bbl/d over the same period.²⁶ On the supply side, changes were even more significant. From 1957 to 1962 the U.S. maintained a surplus capacity in domestic production of about four million bbl/d; by 1970 it was down to one million bbl/d.²⁷ Furthermore, U.S. production capacity reached its peak in 1970 at about 11.2 million bbl/d—and began decreasing steadily after that. Meanwhile, production in the Middle East rose from 26 percent of total global production in 1967 to 36 percent in 1973.²⁸ The combination of increased production in the Middle East, increased consumption throughout the developed world, and a corresponding decrease in U.S. production gave the oil weapon its newfound potency in 1973.

Lessons Learned

Whether Nixon and Kissinger grasped the changing dynamic in the international petroleum market *during* the crisis is not as relevant as it may seem. Even if they had comprehended America's vulnerability to the embargo, it would not have done them much good after October 6, 1973. It is likely President Nixon still would have chosen to suffer the embargo in order to save Israel and defeat the Soviets. A real solution could only have been set in motion well before the war began. One of the key differences between Operations Vittles and Nickel Grass is that events occurring between January and June 1948 allowed the Truman Administration to become familiar with the crucial issues related to a blockade. The 1973 crisis emerged unexpectedly, prompting Kissinger's frantic search for acceptable options to resupply Israel. Additionally the 1973 crisis arose at the worst possible time: there was the controversy

involving Vice President Spiro Agnew, Watergate, and the growing Middle East oil dependency. Based on these differences we come to our first strategic lesson learned:

*Crises become more difficult to deal with once they occur; therefore, if possible, identify potential crises in advance and start to deal with what you will do and how you will do it **before** a crisis arises.*

Other than having better timing though, what could have warned Nixon and Kissinger of the country's vulnerability and the perilous situation America faced in the Middle East? Certainly part of the answer relates to a greater appreciation for economics. Nixon was certainly not unaware of America's growing energy dilemma in the early 1970s. He had imposed price controls on oil in 1971 and delivered a major Presidential address on energy in April 1973, during which he announced the elimination of petroleum import quotas.²⁹ The real shortfall though was a failure to link the new energy environment to national security. Economics is a means of national power—along with political (diplomatic) and military power—for the U.S. as well as other countries. Used aggressively, economic weapons can have effects almost as devastating as military weapons: the disruption of industries, unemployment, starvation, social upheaval and capital flight. This is probably truer today, amid the most highly integrated global economy in history, than it was thirty years ago. So our second lesson is:

Consider economics as a strategic factor that can be used as a weapon; not only by the United States, but against it as well.

Certainly, economic concerns need to be balanced with other strategic considerations. American interests in the Middle East have been conflicted, ironically, ever since President Truman recognized the State of Israel just before the Berlin Blockade in May 1948. What should have raised red flags in 1973, as opposed to 1967, were the emerging dynamics of the international oil market. While solving the Middle East dilemma itself seems to be a little too much to expect, certainly something more could have been done. If Kissinger had only approached Saudi Arabia's King Faisal before the crisis to address the king's concerns, a deal to prevent the embargo could likely have been reached.³⁰ Faisal had tried desperately throughout 1973 to warn Nixon that if America failed to deconflict its Middle East interests, it would be "extremely difficult for [Saudi Arabia] to continue to supply the United States with oil." Instead, Egypt's President Anwar Sadat convinced the reluctant king to cooperate with the surprise attack by using the oil weapon against Israel's allies.³¹ Here we see another difference between the two crises: though all of America's strategic concerns relating Berlin in 1948 were consistent,

in 1973 the country's strategic interests in the Middle East were tragically conflicted. Our third lesson emerges from this difference while also building upon the first two:

U.S. policymakers should identify potential conflicts where America has contradictory interests; pay close attention to those potential conflicts where one player might wield economic leverage against America and deal with those conflicts before true crises arise.

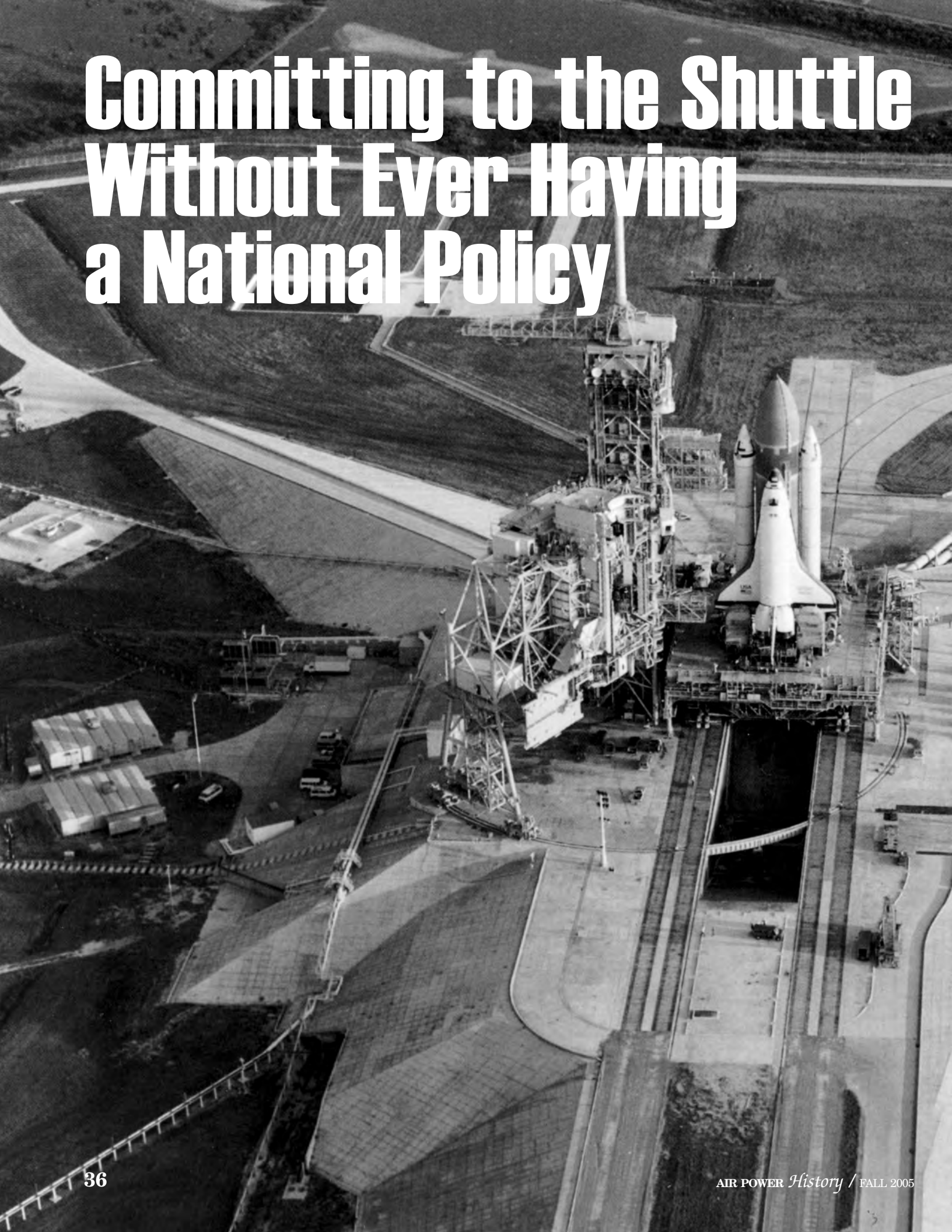
While it is true America's interest in the Middle East may still be conflicted, it is also important to note there are several other areas where this lesson may apply. Ongoing tensions between Taiwan and China, Pakistan and India, Georgia and Russia are the most apparent. In each case the U.S. has strong strategic ties with the first country, while its economic ties with the second country are significant and growing. While it would be inappropriate here to delve into the economic and related political dynamics of each of these situations, it certainly would be appropriate—in light of the lessons learned above—for the current U.S. administration to do so in Washington. ■

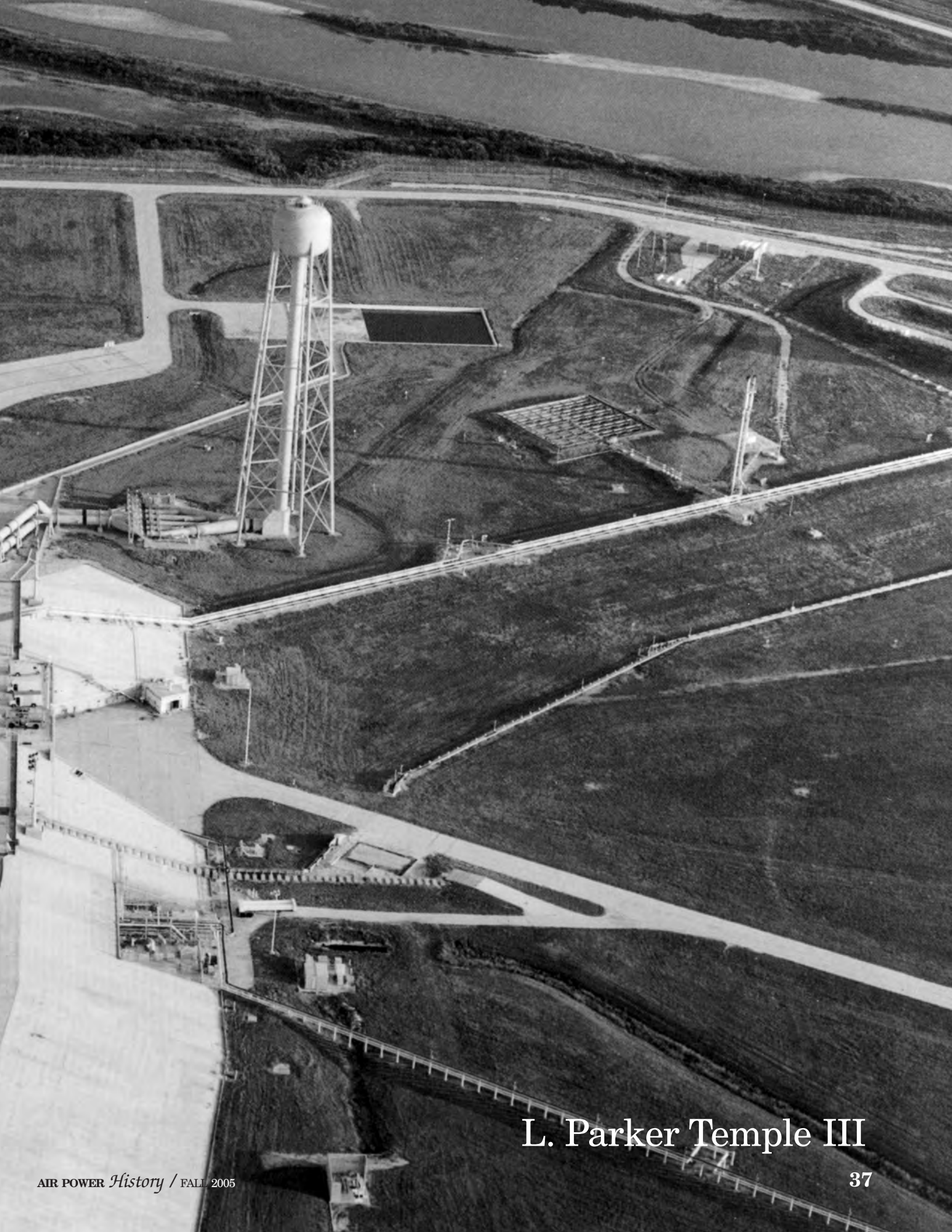
NOTES

1. Neustadt and May refer to the *Known, Unknown, and Presumed* "mini-method" throughout their book, but the concept is introduced on pages 37-38. Richard E. Neustadt and Ernest R. May, *Thinking in Time: The Uses of History for Decision Makers*, (New York: The Free Press, 1986).
2. David McCullough, *Truman*, (New York: Touchstone, 1992), p. 630.
3. USAFE Berlin Airlift Website. Retrieved on Nov 9, 2003, <http://www.usafe.af.mil/berlin/quickfax.htm>.
4. Truman, Harry S., *Memoirs*, Volume II (Garden City, N.Y.: Doubleday & Company, 1956), pp. 121-22.
5. Smith, Jean Edward, editor, *The Papers of General Lucius D. Clay: Germany, 1945-1949* (Bloomington: Indiana University Press, 1974), pp. 699-704.
6. D.M. Giangreco and Robert E. Griffin *Airbridge to Berlin: The Berlin Crisis of 1948, Its Origins and Aftermath* (Ballentine Books, 1988), p. 91.
7. For Truman's views on possible use of the atomic bomb again, see McCullough, pp. 649-50.
8. *Ibid.*
9. Giangreco and Griffin, p. 97.
10. Truman doubled the number of C-54 Skymasters, which carried about ten tons compared to the C-47's 2.5 tons, available for the airlift.
11. Giangreco and Griffin, p. 175.
12. McCullough, p. 631.
13. Richard Milhouse Nixon, *RN: The Memoirs of Richard Nixon* (New York: Simon & Schuster, 1990), p. 923.
14. Robertson, Kenneth K. Jr, *Operation Nickel Grass: The Airlift to Israel and Coronation of the C-5 Galaxy, October-November 1973*. 2d ed., (Dover, Del.: AMC Museum Foundation, Inc, 2000), p. 22.
15. Kissinger provides the transcript of this and numerous other conversations in his book, *Crisis: The Anatomy*

- of *Two Major Foreign Policy Crises*, (New York: Simon & Schuster, 2003), p. 144.
16. Nixon, pp. 926-27.
17. Walter Boyne, "Operation Nickel Grass," *Air Force Magazine*, Dec 1998, Vol. 81, No. 12.
18. Daniel Yergin, *The Prize*, (New York: Simon & Schuster, 1992), pp. 607-608. Also see front page stories from the *New York Times* Oct 16-21, 1973.
19. Ian J. Bickerton and Carla L. Klausner, *A Concise History of the Arab-Israeli Conflict*, (New Jersey: Prentice Hall, 2002), p. 175.
20. Kissinger, p. 305.
21. Yergin, p. 604.
22. Kissinger, p. 159.
23. Bernard Gwertzman, "Détente and Mideast: High U.S. Aides Still Hopeful, but Critics of Stronger Soviet Ties Are Bolstered," *The New York Times*, October 18, 1973, p. 19.
24. Yergin, p. 613.
25. Kissinger mentioned this to Schlesinger on Oct 7, 1973. See Kissinger, p. 94.
26. BP Statistical Review of World Energy June 2002. Retrieved at www.bp.com.
27. Yergin, p. 567.
28. BP Statistical Review of World Energy June 2002. Retrieved at www.bp.com.
29. The quota, originally imposed by President Eisenhower, allowed only a set level of America's oil supply to be imported and thus kept the domestic price artificially higher than the market would naturally dictate. See Daniel Yergin and Joseph Stanislaw, *The Commanding Heights: The Battle for the World Economy*, (New York: Simon & Schuster, 1998), pp. 42-47.
30. After the airlift began, Kissinger tried to open channels to both Faisal and the Shah of Iran. But both efforts were in vain. See Kissinger, p. 249.

Committing to the Shuttle Without Ever Having a National Policy





L. Parker Temple III

PRESIDENT RICHARD M. NIXON SAID IT WOULD REPLACE ALL LAUNCH VEHICLES EXCEPT "THE VERY LARGEST AND VERY SMALLEST"

Announcing his approval of the Space Shuttle, President Richard M. Nixon said it would replace all launch vehicles except "the very largest and very smallest." U.S. space policy never explicitly committed all launches to the Shuttle without equivocation. How, then, did the U.S. commit all of its launches to the Space Shuttle and nearly extinguish its national ability to produce expendable launch vehicles?

The answer lies in an intricate web of varied organizational and individual objectives leading to *de facto* commitment. The United States committed all of its national security, military and civil satellites to the Space Shuttle program without ever having a national space policy of total commitment. Such a national commitment would either have required an explicit national space policy—which never occurred, or the nation's space programs needed to be maneuvered in such a way that the end result was elimination of alternatives to the Space Shuttle coincident with elimination of political jeopardy of cancellation. The *de facto* commitment was achieved through a finesse of the policy process.

Getting the Idea

Studies of reusable space planes began very early in the United States' space programs' history, but this story starts with the Space Task Group (STG) study of the post-Apollo space program. Chartered by President Nixon, the STG began February 13, 1969, chaired by Vice President Spiro T. Agnew.¹ By March 22, the National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD) agreed to form a joint study of the future of space launching.² From the outset, NASA insisted that the Space Shuttle would be a reusable space plane as one part of the "operational" Space Transportation System (STS). The immediate questions became what requirements would drive such a system's design, and what were the roles and responsibilities of the participating agencies?

Over that summer, while the STG focused on the civil space program, Secretary of the Air Force Robert C. Seamans conducted a parallel effort on the future military and national security space programs. The military space program covered those capabilities developed for military operations, principally led by the Air Force. The national security space program was the covert effort run by the National Reconnaissance Office (NRO), developing and operating reconnaissance satellites. The STG and Seamans' studies would shape the future U.S. space launch program.

Seamans' report went to Agnew on August 4, 1969. Seamans expressed the then contemporary wisdom that expending hardware made Expendable Launch Vehicles (ELVs) more expensive than reusable systems. Seamans recommended avoiding a large development and opting for an experimental program to prove reusable technology. After reducing technology risks, later decisions would be made with confidence in schedules and costs.³

The September 1969 STG report concluded that eventual human spaceflight missions to Mars needed a sustainable support infrastructure, based on a permanent space station. The nation had to provide routine access to the space station using an Earth-to-orbit (and return) shuttle. The participants agreed the purpose of the shuttle was to provide a cost-effective space transportation system for all.

Agnew forwarded both the STG and the separate DoD reports to Nixon in September.⁴ But Presidential approval was not forthcoming, as Nixon considered the implications of a major expansion of the civil space program, whose costs were only then beginning to come under control as the Apollo program waned. Defense Secretary Melvin R. Laird had recently cancelled the DoD's Manned Orbiting Laboratory (MOL) under pressures from the continuing war in Southeast Asia. At the time, the national security space program was undertaking a major new effort, and the additional budgetary burden of the space station, space shuttle, and flights to Mars were difficult effort to endorse all at once.

Bureau of the Budget Director Robert P. Mayo was leery of the STG's recommendations. On September 25, Mayo told Nixon that it was possible to move forward without significant near-term budget expansion. He suggested sequential development of a Space Shuttle followed by the Space Station. This clever inversion of the STG recommendations allowed the prospect of a cost-effective launch system and temporary or even permanent deferral of the Space Station. Mayo wanted to delay any official response for six months to allow further consideration of the report.⁵

Defining the Idea

During the noticeable delay, NASA Administrator Thomas Paine asked George M. Low, of the Houston Manned Spacecraft Center, to become the NASA Deputy Administrator. Low's mission was to "sell" the Space Shuttle. He understood enough of the politics to recognize that it was impossible, without DoD's people and budget.⁶

Dr. Temple has a long involvement with the national security and national defense space programs, starting with his early work on the Space Shuttle program while in the Air Force in 1976. Subsequently, he held positions in Air Force Systems Command, the Office of the Secretary of the Air Force, and the National Reconnaissance Office prior to retiring. He currently works as a systems engineer on space programs. He holds degrees in astronautical engineering, management, operations research, and science and technology policy. He is the author of the recent American Institute of Aeronautics and Astronautics book, Shades of Gray, National Security and the Evolution of Space Reconnaissance.



Secretary of the Air Force
Robert C. Seamans, Jr.

MILITARY REQUIRE- MENTS FOR THE STS PROVED DECISIVE FOR ITS DESIGN

At their initial meeting on the subject, Seamans told Low of his qualified support for the Shuttle as a prudently paced technology development. Though encouraged, Low got no commitment from Seamans.⁷

Low expected resistance as he made the DoD rounds, since, after all, he was asking for money. Instead, he found the DoD civilians positive, professing interest in the technology without committing funding. Defense Secretary Laird insisted that Low could count on the DoD to encourage NASA's program, but that NASA would have to "pay its own way."⁸

In their first joint document on the Shuttle, in February 1970, the Air Force and NASA agreed that the STS had to be of maximum utility to both. What "maximum utility" meant remained unexplained. Their goal was reducing launch costs by an order of magnitude, that is, to one tenth of their prevailing costs.⁹

The Air Force Space and Missile Systems Organization (SAMSO) supported NASA's Space Shuttle definition studies, opening a program office to ensure DoD uses for the Shuttle were considered and included in the NASA program. Failing that, the Air Force would have little interest. This new group occupied the same offices that, about a year before, housed the cancelled MOL. MOL's engineers

were in danger of being lost, so active participation in the Shuttle program provided a suitably large opportunity to keep an experienced cadre of people qualified to work on space systems.¹⁰

Nixon responded to the Space Task Group report on March 7, 1970 with what seemed like wonderful news. He endorsed substantially reducing the cost of space launch and other far-reaching goals. Those goals could cover the STG's long-range goal of exploring Mars and everything in between. The only thing missing was funding.¹¹

Military requirements for the STS proved decisive for its design. The military and national security space programs projected the growth of their operational payloads into the Shuttle timeframe of 1978-1990. These projections required performance equivalent to delivering 65,000 pounds to low-inclination orbit for transfer to higher altitude (an East Coast mission). The West Coast equivalent mission's near-polar orbit actually made the lower total weight requirement of 32,000 pounds tougher to achieve. Furthermore, this near-polar mission also required the ability to return to a continental U.S. landing site after one orbit. Aerodynamically altering the flight path by 1,100 miles during re-entry forced the Shuttle's double-delta wing shape versus smaller stub-wings.¹²

Projections for expected military and national security payload sizes and upper stages required a maximum payload bay of 60 by 15 feet. The minimum Shuttle size accommodating that bay defined the physical size of the Space Shuttle main engines, which had to fit roughly within the diameter of the Shuttle fuselage. Altogether, the military and national security requirements for the size of the payload bay and re-entry capabilities drove the Shuttle's structural size and shape, giving a maximum size for the engines, while the weight of these payloads, structure and fuel on top of all that to achieve a near-polar orbit determined the amount of thrust needed from each engine.¹³

The requirements were far larger and heavier with fewer launches than NASA expected, surprising NASA Associate Administrator for Manned Space Flight Dale D. Myers. Myers requested DoD validation of the payload sizes and weights.¹⁴

The initial DoD response was that if NASA did not accept the sizes and weights, DoD would have to build an ELV to meet its needs. Actually, the Air Force had no additional major launch vehicle development under consideration beyond the various versions of the Titan III, which had been in use for some time. The intent was to push NASA to provide as much capability as possible. Whatever was left over would be accommodated by large ELVs such as the Titan III.

Low agreed with the thinking that a reusable Shuttle was needed and ELVs would provide supplementary capabilities. In October 1970, Low met with Caspar W. Weinberger, Deputy Director of the Office of Management and Budget (OMB). Low proclaimed the Shuttle as the single, economical system for all future space launches.¹⁵ Privately, though, he considered NASA needed six Titan IIIs

per year through the first generation of the Shuttle program. He expected similar DoD needs.¹⁶

A Shuttle and ELV fleet troubled Myers and other NASA officials because a “mixed” fleet was incompatible with Shuttle economics. To pay its own way, Shuttles had to launch 60 times per year—40 from Kennedy Space Center and 20 from Vandenberg AFB.¹⁷

Responding to Myers’ validation request, the DoD forecast 149 military payloads for launch between 1981 and 1990. That meant the military and national security space programs, the major sources of U.S. space launches, needed only about 15 launches per year, falling far short of the 60 necessary for Shuttle economics. A smaller Shuttle with less performance supported only eight military payloads per year, forcing extensive Titan III reliance. Retaining any ELVs severely diminished the Shuttle’s economic attractiveness.¹⁸

NASA’s strategy needed all the military and national security traffic, but even after incorporating the larger payload bay within its own program costs, NASA faced a significant shortfall of civil and commercial launches thereby threatening Shuttle economics.¹⁹

Selling the Idea

NASA projected the large number of Apollo era space launches would not only continue but actually increase. Having gone to the Moon and returned, the U.S. was a truly space-faring nation, and that meant launching things into space more often and more routinely. That was the dream. Reality was about to change radically. Some key assumptions about future needs based on past accomplishments were being undermined.

The solid-state electronics revolution was about to make satellites more reliable and longer-lived. Solid-state devices were replacing high-voltage vacuum-tube systems at an accelerating rate. Solid-state devices not only drew less power; their smaller size enabled more backup systems in satellites. Pound for pound, solid-state systems packed vastly more capability than their vacuum-tube predecessors. Lower power and greater redundancy led to increased satellite reliability, and reliability translated directly into longer lifetimes. Longer lifetimes meant fewer satellites needed to be built and launched. Had the revolution occurred five years earlier or later, the decisions and subsequent history of the U.S. space launch capability would have been radically different.

Shuttle launch projections assumed the average, short lifetimes of satellites prior to solid-state electronics. Some programs, anticipating eight to ten launches per year based on their experience through the mid 1960s. By the early 1970s, these same programs demonstrated they only needed to launch 1 to 2 times per year. By the late 1970s, the launch demand changed to once every several years. The future launch needs underlying the initial Shuttle studies exceeded actual needs by more than an order of magnitude.

SAMSO had contracted for enough ELVs to cover its early projections of a high launch demand. The Titan IIIs to support the expected high launch rates of the 1960s were delivered for \$9 million per unit in the early 1970s. However, the longer lifetime of satellites made such production rates too high, and soon an excess of Titans existed. By 1974, Titan production had to be severely reduced to near minimum economic production rate under six vehicles per year to accommodate earlier over-production. The Titans’ declining number drove their unit cost up, reinforcing the Shuttle advocates’ claims about high ELV costs. Such claims were, however, artificial.²⁰

As the cost for each launch began to go up, the DoD’s cost to participate in the STS began to climb as well. The Air Force’s responsibility beyond the Shuttle’s western launch site evolved to include orbit-to-orbit reusable space tugs to take payloads from the Shuttle to higher altitudes. Shuttle missions were planned for orbits at 100 nautical miles, and the maximum altitude was expected to be about 300 nautical miles (depending on payload), so the infrastructure of reusable vehicles laid out by the STG included a reusable upper stage to take things such as communications satellites up to 22,000 nautical mile altitude. As budget pressures reduced NASA program content, the Air Force assumed the responsibility to develop an interim upper stage until funding became available for the reusable space tug.

In late 1971, Director of Defense Research and Engineering (DDR&E) John S. Foster, discussing the Shuttle with Low, explained he thought the technology worth pursuing. NASA could not implement Foster’s strong views on how to proceed because Foster insisted that the Shuttle had to be built along with a place to go: a space station. That ran counter to OMB’s insistence on building the Shuttle first, and presupposed the importance of human presence.²¹

OMB remained unconvinced about the cost-effectiveness of human spaceflight and whether any scientific grounds justified it. On December 29, 1971, NASA Administrator James C. Fletcher and Low took a briefing and a letter to OMB Deputy Director Weinberger. The letter included a comprehensive overview of the Shuttle’s background and concept definition work and recommended developing a small, 40-foot payload bay excluding many DoD and some NASA payloads. The letter was at odds with the briefing charts describing the purpose of the Space Shuttle program as a replacement for *all* launch vehicles. The letter was not used, and it is not clear if the letter was even discussed. Low appears to have been hedging his bets, anticipating Weinberger’s push for the less costly Shuttle with the smaller payload bay.

Instead, the OMB staff insisted on exclusive use of the Shuttle for launch, which required accommodating all DoD payloads. Meeting with OMB Director George Shultz on January 3, 1972, Fletcher and Low were surprised at the strength of OMB’s insistence on the 60-foot payload bay.



Secretary of Defense
James R. Schlesinger.

THE
SUPPOSED
BENEFITS OF
DoD
SUPPORT TO
THE SHUTTLE
WERE
DUBIOUS.

Replacing all existing launch vehicles was still about budget, based on false assertions of the economics of reusability, and had little to do with space policy.²²

Two days later, Fletcher and Low discussed the Space Shuttle with Nixon for about 40 minutes. Nixon supported the program enthusiastically. He announced the U.S. would proceed with STS development to achieve routine access to space, taking the place of all launch vehicles except "the very largest and very smallest."²³

Immediate Administration and Congressional concerns arose over the cost of maintaining both expendable and reusable launch vehicles. DoD officials insisted the Shuttle had to demonstrate its performance, cost-effectiveness, reliability and operational status before any commitment could be considered.²⁴

So concerned were OMB and the Air Force over the validity of NASA's cost projections that Fletcher emphasized to Low the need to reduce Shuttle costs to about \$5 million per flight to regain Air Force interest in the program.²⁵ Low needed large amounts of development funding. The funding needed would only be possible with a phase out of all existing expendable boosters.²⁶ The booster phase-out would only happen if the Shuttle could launch everything, including the largest and smallest, contrary to Nixon's announcement. Although Fletcher expected continued DoD interest, the military remained officially committed only to consider the Shuttle for most of its launch needs.²⁷ Harsh reality demanded the DoD had to continue to launch its satellites to meet military and

national security commitments and operational needs, regardless of what happened to the Shuttle.

The Shuttle would always be in jeopardy without firm DoD commitment. To counter the weak support in a draft policy prepared by the DDR&E staff, he asked Foster to orchestrate a firm policy statement coupling supporting the program with a plan for the phase-out of ELVs. Foster agreed to provide a letter.²⁸

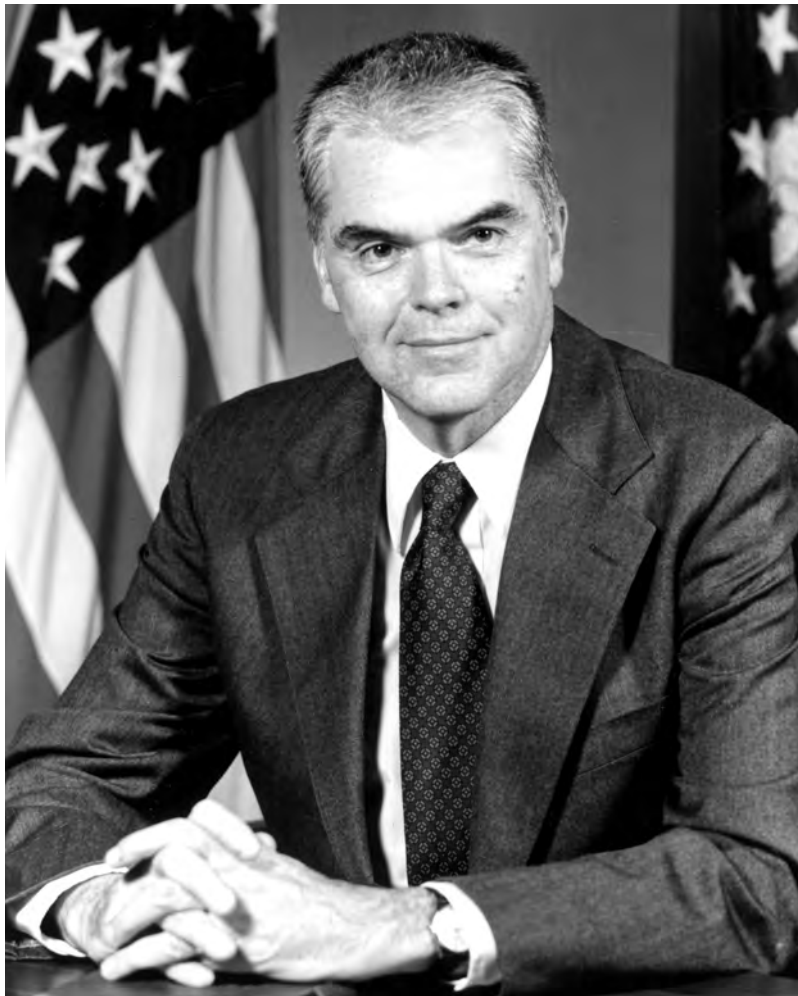
The November 1972 result was Deputy Secretary of Defense Kenneth Rush's Shuttle Planning Guidance. This established a DoD Shuttle User Committee chaired by the Air Force (i.e., Seamans). A *quid pro quo* arrangement offered the Air Force lower costs per flight due to their development of the western Shuttle launch and landing site at Vandenberg Air Force Base in California. The Air Force committed to developing a Shuttle upper stage booster and other capabilities. Rush's planning guidance was the last conceptual step short of committing large-scale funding to the Shuttle.²⁹

When Dr. Malcolm Currie replaced Foster as the DDR&E, Low worked to gain his trust on the Shuttle program.³⁰ Currie avoided an excessively risky policy of committing exclusively to the Shuttle. He established December 1982 as the initial date for Vandenberg Shuttle operations. He also allowed as long as five years for a *possible* transition of *some* programs, but not all, to the Shuttle [my italics]. Although the Shuttle's cost savings appeared attractive, military and national security reliance on space capabilities demanded a hedge against uncertainty. Consequently, Currie directed retaining "a prudent back-up launch capability using existing boosters."³¹ The Shuttle program was, at last, in DoD and Air Force policy. Low had gotten active participation, though less than he had wanted. And even that was too much for some.

In the spring of 1974, Leonard Sullivan and members of the Office of the Secretary of Defense (Program Analysis & Evaluation) staff threatened to reduce Shuttle funding. This would affect support to NASA, Vandenberg development, and the space tug. They objected to the Shuttle program, saying it had neither cost savings nor any benefit to DoD. Without DoD benefit, funding should stop. Sullivan's objections gained support and reinforcement by Dr. Albert Hall and his staff of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence).³² They forced a major rethinking of DoD's participation the Shuttle program.

Sullivan had already convinced Secretary of Defense James R. Schlesinger that the supposed benefits of DoD support to the Shuttle were dubious.³³ Schlesinger barely supported the space tug, and felt no inclination to move forward on any aspect of the Shuttle or Vandenberg. He questioned the defense benefit derived from increasingly costly participation in the NASA Shuttle program.³⁴

Substantive differences existed in the methods used by NASA and Sullivan's staff in calculating the Shuttle's costs and savings to payloads.



Secretary of the Air Force
Dr. Hans Mark.

**UNTIL THE
EARLY 1970S
SATELLITES
WERE OPTI-
MIZED FOR A
SPECIFIC ELV**

Schlesinger never believed in early program cost estimates, and looked even more askance at claimed cost savings. The result was the 1974 amendment to the 1970 Memorandum of Agreement on the Space Transportation System. The rhetoric of decreasing costs by an order of magnitude had already become too unrealistic, so the goal became "reducing operating costs significantly below those of present systems."³⁵

Fletcher, worried about DoD backing away from participation levels used for planning the overall STS, appealed to Schlesinger on June 21, 1974. Fletcher claimed "a decision which implies that the DoD will not rely on the shuttle for its space activities in the 1980s, could be used by Congressional opponents of the program to attack and perhaps even cut back the shuttle development program."³⁶

Schlesinger did not want to be the member of the Administration who killed the Shuttle program. Yet neither could he commit to a program in whose claims he had so little faith. Schlesinger told Fletcher the Shuttle was too risky for full commitment.³⁷ Fletcher abandoned the cost-benefit argument, claiming that the Shuttle's real benefits derived from its imaginative uses. Unimpressed, Schlesinger agreed only to continued studies and activities of little cost to the DoD.

DoD staff disagreements on the status of the

Shuttle program and the degree of military and national security involvement led to an internal DoD review of the Shuttle. The review forced opponents of the program and advocates of the technology developments to strike a compromise. Sullivan forced the DoD position that NASA would fund all the Shuttle orbiters, and that the Air Force would use these orbiters interchangeably with NASA. The exact terms for use of the Shuttles were details to be defined later, but the orbiters were to be a common national asset. In return, the Interim Upper Stage (IUS) would be developed by the Air Force, adding to the Air Force commitment to build Shuttle facilities on the West Coast for access to polar orbits. With his staff in agreement on the compromise, Schlesinger agreed to minimal partnership in the Shuttle program, but refused to go along with full support. Deputy Secretary of Defense William P. Clements formalized DoD's position on the key issues in an August 1974 letter to Fletcher. The Air Force would develop the low-cost upper stage (the IUS) for use "concurrently with the Shuttle in 1980."³⁸ Vandenberg remained part of the agreement, and would be available for Shuttle operations in December 1982. Having said that, Clements still expected "to launch essentially all of our military space payloads on this new vehicle and phase out of inventory our current expendable launch vehicles."³⁹ "Essentially all" was not NASA's hoped-for "all." The strongest statement of support for the Shuttle to that date had important consequences inside the DoD.

First, the statement called for some satellites to be "dual-compatible" or capable of launch by either ELVs or the Shuttle until the Shuttle proved itself. Until the early 1970s, when the Shuttle program began, satellites were optimized for a specific ELV, squeezing out every possible ounce of performance. The missile heritage of ELVs caused satellites to be long and thin, suited only for their specific ELV. The long period to redesign and build satellites meant that DoD needed to start redesigning immediately (in 1974).

Second, the number of Titan III launch vehicles was nearly adequate to cover launch needs until after the six developmental Shuttle flights in 1981. The combination of incipient payload redesign, an adequate number of Titan IIIs, slowing production rates of Titans, and underlying technological factors, forced a further reduction in the launch rates of the Titans. Lower launch rates meant fewer launches over which the fixed production costs could be amortized, so ELV launch costs had to go up yet again.

Third, the announcement committed the DoD to large-scale funding in the STS program and legitimized the Shuttle so that "everyone assumed it would replace ELVs, and that was the policy." Yet formal policy only recognized a commitment of "essentially all."⁴⁰ An assumed DoD policy of transition did not have the same character as dedicated use of the Shuttle, which had yet to occur.

The Air Force schedule for the western Shuttle launch and landing site's 1982 availability solved a

few of NASA's transition problems.⁴¹ Starting in 1982, NASA could convert immediately from ELVs to the Shuttle.

Making the Shuttle "Cancellation-Proof"

The inauguration of the Carter Administration meant a different set of policymakers to guide the Shuttle within DoD. Dr. Harold Brown became the new Secretary of Defense. Former NASA official Dr. Hans Mark assumed control of the military and national security space programs as he was the new Air Force Under Secretary and Director of the National Reconnaissance Office. Mark strongly supported the Shuttle, and with Brown's support, pushed constantly for a more rapid transition of payloads to the Shuttle. The team in place in DoD by 1977 could insure the consummation of DoD's support.

Mark suspected that the Shuttle would run into cost problems, simply because NASA had committed itself to the success of too many technology and design choices for them all to work correctly. Eventually, some problem would require significant additional funding. Mark believed the Shuttle was important for the nation because of its technology, its promise of lower cost and routine space operations, and for national prestige. The Shuttle had to be made safe from cancellation.⁴²

The planned date for exhausting the existing inventory of Titan IIIs overlapped the initial operations phase of the Shuttle, but the overlap duration was unknown. The Shuttle was clearly going to be late and its performance too low. Mark moved quickly in 1977, appearing to implement the "dual-compatibility" policy. The key was a temporary ELV that could handle some early Shuttle-class payloads for the DoD. His options ranged from extending production of technologically newer Titans to pushing for an early commitment to the Shuttle and then riding out the rough spot of the transition. He chose a middle course that resulted in an eventual national commitment without a national policy of commitment.⁴³

The seminal idea sprang from the fact that Titan IIIs did not get their payloads all the way to orbit. Instead, Titan IIIs relied on an upper stage to get payloads to their final low earth orbit or for boost to higher orbits. The Titan III's standard orbital insertion stage was the Transtage, which was incompatible with the Shuttle. To Mark, "dual-compatibility" required a new Titan, the Titan 34D, to use the Interim Upper Stage (IUS), which was the Air Force's Shuttle upper stage program. This appeared to allow any satellite using the IUS to launch on either the Shuttle or the Titan. Mark ended Titan III production in favor of the new Titan 34D, thus forcing the transition to the IUS, causing significant payload redesigns, and increasing space program costs for all large payloads.⁴⁴

This Titan 34D was "an austere backup," in essence a hedge against delays in Shuttle initial operations.⁴⁵ Mark did not want a continuing Titan 34D production line, tempting satellite program

managers to delay or forego transition to the Shuttle. There were to be no more than the initial order for 16. The austere program ensured that there would be no gap in launching Titans (between the Titan III and the Titan 34D), and helped reduce the risk of a gap between ELVs and the Shuttle, but it set an end to production of large ELVs.⁴⁶

With the Titan 34D decision, Mark also accomplished a sleight of hand in policy. He incorrectly referred to the Clements-promulgated policy of dual-compatibility as "Shuttle-compatibility." This was no simple word change. Compatibility with the Shuttle no longer implied the ability to launch on ELVs. Aside from their inability to fit on a Transtage in the case of Titan, satellites had to be built and tested to the very different acceleration, vibration and acoustic environment of the Shuttle. Compatibility with the Shuttle's launch environment meant that the same satellite could not simply be plucked off a Shuttle and put on a Titan. Shuttle-compatible satellites could not change to the Titan without going through extensive re-qualification for the Titan's launch environment. This would entail further costly and lengthy delays.

The final part of this finesse was another, seemingly small word change. From "Shuttle-compatible," it was tiny step to ensure that new satellites would be designed to take advantage of the Shuttle's unique capabilities. A new term appeared: "Shuttle-optimized." In 1977, the House Committee on Appropriations examining the Space Shuttle heard that "'Shuttle-optimized' payloads have a greater potential for cost savings than 'Shuttle compatible' payloads."⁴⁷ The reason was:

*The term 'Shuttle compatible' implies a payload design compatible with Shuttle launch: it may or may not be compatible with ELV launch. The term 'Shuttle optimized' implies a payload designed to exploit the unique capabilities of the Shuttle- i.e., retrieval, on-orbit service, large weight and volume, etc. The 'Shuttle optimized' payload is not likely to be compatible with existing ELV launch capability.*⁴⁸

Whereas "Shuttle-compatible" might be accomplished with some structural changes and re-qualification, Shuttle-optimization entailed a complete redesign of most satellites. Shuttle-optimized payloads might have been retrievable or serviceable in space, as Mark indicated. More to the point, Shuttle-optimization's redesign certainly meant wider and sometimes shorter repackaging. DoD Shuttle flight charges were based on linear feet of the payload bay occupied, not weight or width. Wider repackaging became attractive, since less linear space could reduce an individual satellite program's flight charges, and allow cost sharing through ride sharing.⁴⁹

Shorter and wider redesign with the same weight did not fit the payload designers' mentality. Instead, many satellites actually just grew wider and heavier (hence more capable) than their ELV-

ONLY THE
SHUTTLE
COULD
LAUNCH
SHUTTLE-
OPTIMIZED
PAYLOADS

THE AIR
FORCE WAS
NOT PERMIT-
TED TO
DEVELOP A
NEW ELV
THAT COULD
ACT AS THE
BACKUP,
PRUDENT OR
OTHERWISE

optimized counterparts. Mark began insisting that any satellite-related matter briefed to him had to discuss the applicability of spacecraft servicing, maintenance, repair in orbit, and retrieval. Satellites designed for repair and servicing by astronauts incurred yet more weight increases.

On ELVs, payload weights tended to approach the maximum launch capacity demanding every bit of performance. However, that approach in the Shuttle meant problems. The Shuttle's performance was falling short, so the engines needed to work at 104-percent thrust. Eventually, even this power became insufficient for some of the larger satellites, necessitating lighter filament-wound casings for solid rocket boosters to launch the specified payload weights. Consequently, payloads planned for the thrust and acceleration promised by the Shuttle designers then had to start all over in their structural, vibrational and acoustic analyses because the lighter and more powerful Shuttle solids and higher thrust main engines changed all of these. And that led to more payload cost increases.

Although never officially acknowledging the Shuttle as the only launch vehicle for its payloads, "Shuttle-optimization" had the same effect, since only the Shuttle could launch Shuttle-optimized payloads. DoD continued to hedge against any national space policy that hinted at total commitment, insisting on words about "prudent backups" for assured access to space. While "prudent backups" might appear to preclude complete commitment to the Shuttle, the Air Force was not permitted to develop a new ELV that could act as the backup, prudent or otherwise.⁵⁰ This shift in policy was crucial to sustaining the Shuttle program, since the greater the progress toward Shuttle-optimized payloads when the inevitable Shuttle problem occurred, the more likely the solution would be to fix rather than cancel the Shuttle.⁵¹ Congress would either pay to fix the Shuttle or redesign all payloads to go back to expendables. Satellite redesigns were very expensive, as evidenced by the costs to move from expendables to the Shuttle. The faster and less costly option would be to fix the Shuttle.⁵²

Thus it is unsurprising that President Carter's 11 May 1978 Presidential Directive/NSC-37, "National Space Policy," laid out the nation's intent to use the "unique capabilities" of the Shuttle. NSC-37, the principal space policy document of the early Carter Administration, contained the policy language committing the nation to exclusive STS use, without ever explicitly admitting to a policy of commitment. The language about replacing "all but the very largest and the very smallest boosters" was gone (in just six years). Rather, the STS was "to service all authorized space users—domestic and foreign, commercial and governmental."⁵³ Although perilously close, this was not an explicit national policy of commitment to the Shuttle, as seen in the subsequent national policy and in Carter's related actions. In October 1978, the next major policy statement, NSC-42, "Civil and Further National

Space Policy," described how best to utilize the Shuttle. The idea that improving or fixing the Shuttle was preferable to canceling it resulted in policy direction for "incremental improvements in the Shuttle [to] be made as they become necessary." NSC-42 again called for backup ELVs, though without a program to supply these the result was national commitment.⁵⁴

Shuttle-optimization finessed the commitment of all payloads to the Shuttle. That finesse, however, was probably not clearly understood by Carter, despite his having signed the policies. Carter did not interpret the national policies as a national commitment, as seen in his attitude towards large and expensive programs. A year after NSC-42, Carter wanted to cancel the Shuttle. He entered office having promised to cancel a large program, and considered either the North American B-1 Lancer bomber or the Shuttle. In 1977, Defense Secretary Brown rescued the Shuttle program with Mark's help when OMB was hoping to save funds by reducing the number of orbiters. Using an argument based on the technical parameters of the Shuttle's performance and the number of orbiters available in case of an accidental loss of one of these, Brown was able to deflect OMB's arguments. Brown and Mark convinced Carter not to cancel the Shuttle because of its potential for future economy in space and its technology development. Carter cancelled the B-1.

Then in November 1979, having been put off once, Carter again considered canceling the ever more costly Shuttle. All of Mark's policy finesses would be for naught if Carter cancelled it.⁵⁵ Mark put together the case and presented it to Carter on November 14. The President relented. Carter's two cancellation attempts were doubly significant.⁵⁶

First, Carter clearly did not believe his policies had committed the nation to the exclusive use of the Shuttle; no explicit language in any policy document did that. The commitment sprang from the Shuttle-optimization language finesse coupled with Mark's termination of ELVs, and disapproval of any "prudent backup" development program.

Additionally, the second rescue stands as the key turning point in the commitment of all U.S. payloads to the Shuttle. The commitment depended on the space policies then in place, but nothing guaranteed the continued commitment of money and Administration support to the Shuttle. After removing the jeopardy of loss of political support, the national commitment no longer needed an explicit policy statement.

The Shuttle had still not flown, and therefore had not been proved. The crucial point of *de facto* commitment had passed, but that was not the end of the ELV backup.

Not an End—a Beginning

Americans returned to space after the Apollo program on April 12, 1981, when astronauts John W. Young and Robert L. Crippen flew the first Space Shuttle mission. President Ronald Reagan

The Space Shuttle fastened to its Boeing 747 carrier.



REAGAN
EXPANDED
THE CARTER
SPACE POLI-
CIES,
DIRECTING
EXPEDITIOUS
TRANSITION
TO THE
SHUTTLE

NASA HAD
AGREED TO
A FLAT PRICE
OVER THE
FIRST THREE
YEARS OF
OPERATIONS
DESPITE
THEIR
INCREASING
COSTS

said they had “made us all feel like giants again.”

In November 1981, Reagan expanded the Carter space policies, directing expeditious transition to the Shuttle. National Security Decision Directive 8, “Space Transportation System,” mandated the first priority of the STS was becoming fully operational and cost effective. The “prudent ELV back-up” policy became approval to operate ELVs “until the capabilities of the STS are sufficient to meet its needs and obligations.”⁵⁷ The policy added that unique military considerations might dictate special launch capabilities, partly addressing the DoD concern over Shuttle performance requirements. This new escape clause obviously hedged against the Shuttle’s shortfalls. The policy put the burden on the military to prove the Shuttle was incapable of meeting some unique requirement. That would have been a public policy donnybrook, as the Air Force would have to publicly disclose what in all likelihood would be a highly classified program, and then it would be the Air Force’s claim against NASA’s about how well the Shuttle would perform. Implementing the unique military capabilities escape clause proved extremely difficult. With NASA’s strong support in Congress, any indication that the Air Force was considering the use of the escape clause would bring a swift reaction.

PD-37’s Shuttle-optimization was repeated by Reagan’s next major space policy, National Security Decision Directive 42, “National Space Policy,” on July 4, 1982. As he stood in the foreground of an actual Shuttle, he directed “spacecraft should be designed to take advantage of the unique capabilities of the STS.”⁵⁸

In reality, robust, survivable, operational space systems cost a lot of money. The initial DoD-NASA Shuttle pricing agreement, based on high launch

rate assumptions, allowed a flat price for the Air Force over the first three years of Shuttle operations. That price took into account a very favorable *quid pro quo* for the DoD because of the Air Force’s investments in the STS. The actual cost, however, had risen well beyond anyone’s expectations. As the real launch rate of the Shuttle plummeted, the workforce did not decrease accordingly. Furthermore, the earlier economic trades between reusable and expendable systems had hinged on the size of the launch, recovery and refurbishment workforce of the reusable system. If that remained comparable to the size of the manufacturing and launch workforce of the expendables, then the cost differences between the two systems would be negligible. By the time of the first launch of the Shuttle, however, its necessary workforce grew to about 6,000 people, versus about 600 required to manufacture and launch a Titan. Rather than saving an order of magnitude in cost, the Shuttle represented an actual increase of more than an order of magnitude. Something had to be done to offload some of the cost.

NASA had agreed to a flat price over the first three years of operations despite their increasing costs. In February 1982, the General Accounting Office (GAO) found that NASA had locked “into a pricing policy that encourages Space Transportation System use at NASA’s expense and at the expense of the space science, applications and aeronautics programs.” GAO stated that it “believes DoD and other Government agencies should bear a greater share of the Shuttle’s early years’ operations costs.”⁵⁹

The first serious run at the “unique capabilities” escape clause came on March 4, 1983, when Lt. Gen. Richard C. Henry, Air Force Space Division Commander, voiced prescient concern over the wis-



Secretary of the Air Force
Edward C. "Pete" Aldridge,
Jr.

dom of commitment to the Shuttle. The lengthy ground processing delays of the Shuttle *Challenger* on its first mission in April 1983, if applied to the fleet of four Shuttles, "would develop a backlog of launches that would take months to years to work off. This represents a considerable threat to the continued vitality of the national space program and in particular, could impact national security through inadequate launch support of priority DoD spacecraft."⁶⁰ Henry put numbers to the "National Space Policy's" "prudent backup." He made the case for a mixed Space Shuttle-ELV fleet, introducing the idea of using each type where it was best qualified. His idea would continue producing ELVs at a low rate, serving as the basis for an alternative if the Shuttle fleet were ever grounded. The letter proved controversial, because the idea of a mixed fleet seemed to indicate the DoD was preparing to abandon the Shuttle. The additional cost of a mixed fleet also had little Congressional support.

Later that month, with encouragement from

Air Force Under Secretary and NRO Director Edward C. "Pete" Aldridge, Martin Marietta Corporation proposed the unthinkable: a commercial launch vehicle. The idea was not entirely new, but this was the first serious proposal by a major supplier. Martin Marietta executives believed a market existed for commercial Titan IIIs. They called for a government guarantee of a certain number of commercial launches paid for launch by launch (there being no budget to do otherwise). Before the Air Force finalized an agreement, however, OMB determined such an action would constitute an illegal subsidy. Jumping on the bandwagon, Congressional leaders expressed concern that DoD's encouragement of continued ELV production signaled a lack of support, and accused DoD of attempting to abandon the Shuttle. NASA officials complained that launching commercial satellites on the Titan would undermine the financial basis for commercial use of the Shuttle.⁶¹

Commercial launch had merit, particularly in light of the Administration's thrust to create a commercial space sector. Commercial space launches would maintain a small industrial base without direct government subsidy. The Administration formalized the ground rules for such a commercial enterprise in its May 1983 policy statement, "Commercialization of Expendable Launch Vehicles." But the rules were strict, and consensus policymaking required mention of the role of the STS in commercial space launches. It set goals for optimizing STS management and operations to achieve routine, cost-effective access to space exploiting the unique attributes of the STS, and private sector commercial launch operations.⁶²

The government was precluded from subsidizing commercial launch vehicles. The new policy called for NASA to continue to offer the Shuttle to all users, but directed that NASA pricing beyond 1988 had to recoup "full costs" for commercial and foreign flight operations. That created a predicament for the Shuttle's commercial use. The Shuttle and the commercial ELV providers faced competition from the European ARIANE booster. To remain a viable commercial launch supplier, NASA had to liberally interpret the meaning of "full cost recovery." The one thing it could not mean, somewhat obviously, was charging a commercial satellite the entire cost of a Shuttle launch. Most communications satellites cost considerably less than the several hundred million dollars the U.S. invested in each Shuttle flight. NASA could only interpret "full cost recovery" as the incremental cost of consumables in each flight.⁶³

With commercial satellite programs paying only for consumables, the government's cost per launch had to go up again. The mandate to achieve full cost recovery forced NASA to attempt to get a larger share of the actual STS operating and fixed costs from DoD. The result was that the Air Force would have to pay far more for a flight than a commercial satellite, despite the *quid pro quo* arrangement for exchange of mutual services. The Air Force had yet to launch a payload, and its costs con-

WHILE ALDRIDGE CONTINUED TO PUBLICLY SUPPORT THE SHUTTLE AND THE AIR FORCE'S COMMITMENT TO IT, HE AND HIS STAFF BECAME INCREASINGLY CONCERNED THAT THE SHUTTLE WAS A HOUSE OF CARDS WAITING FOR A STIFF WIND

tinued escalating due to causes beyond its control.

Official DoD public support for the Space Shuttle continued. DoD concerns about performance and reliability were addressed directly with NASA. Either officially or actually unaware of the problems with the Shuttle, Congressional supporters of the Shuttle continued to foil Air Force requests for an ELV backup. The Air Force's issues related only to an expendable backup and keeping the ELV industrial base intact until the Shuttle demonstrated its performance and reliability.

The original schedule for the Shuttle had called for many more flights by the end of 1983 than had actually occurred. The DoD satellites built to conform to "Shuttle-compatibility" and "Shuttle-optimization" formed a launch backlog. As the backlog increased, satellite programs had to pay more money to store their satellites, further increasing the costs of transition to Shuttle.

The DoD satellites in orbit were reaching the ends of their predicted lifetimes. Replacements were urgently needed for some of the highest priority satellites. Urgency accentuated the DoD's already high priority for launch. When the Shuttle launch rate proved to be far lower than originally advertised, there were only a small number of possible launches available each year. That meant many lower-priority NASA scientific payloads were being forced to slip their schedules. The net effect was an increasing bow wave of military-related launches that would dominate the NASA schedule for several years to come, just as Henry had predicted. That led to grumbling in the press about the "militarization" of the Shuttle, and even led to ludicrous charges that the Air Force wanted to take over the Shuttle program. The only way NASA could reduce the backlog was to increase its launch rate, which was proving very difficult to do.

The Air Force, as DoD's launch agent, had to work through this increasingly difficult transition. Somehow, satellites awaiting launch had to be provided for. At the Air Force's request, Secretary of Defense Caspar Weinberger issued his 1984 Defense Space Launch Strategy to add DoD support for commercial launch vehicles. The letter was issued to reiterate DoD's continuing support for the Shuttle, but also to document the unique military requirement for assured access to space, allowing the commercial launch vehicle backup solution.⁶⁴

In the near term, however, something had to be done within the allowable framework of national space policy. The Air Force prepared to study how to modify existing ELVs to launch Shuttle-optimized payloads. Senator Garn and Congressman Boland, in a joint letter from the perspective of overseeing the NASA programs, expressed concern that the Air Force was preparing to abandon the Shuttle. On January 25, 1984, they wrote to NASA Administrator James Beggs asking him to charter an independent study of alternative backups to the Shuttle. The result was a study performed by the National Academy of Sciences and the National Academy of Engineering through the National Research Council.⁶⁵ In the interim, Representative

Don Fuqua, Chairman of the House Committee on Science and Technology, wrote to Defense Secretary Weinberger that, in effect, he did not believe the Air Force's proposal to limit the backup ELVs to two per year, writing "many observers believe the actual use of expendable launch vehicles may be much greater."⁶⁶ Laying out all the arguments marshaled by NASA against the backup ELVs, he called the DoD request to fund these backup ELVs a "rush to judgment...counter-productive [to] research and development." In a coincident letter to Representative Joseph P. Addabbo, Chairman of the House Committee on Appropriations' Subcommittee on Defense, Fuqua wrote "I urge you not to support or sustain a DoD decision to develop and use expendable launch vehicles."⁶⁷

When the National Research Council (NRC) study began to show signs of supporting the Air Force's intent to use alternative technologies to backup the Shuttle, Boland and Garn, using the weight of their two appropriations committees, issued a June 1984 letter to express their concerns that the commercial effort "has not been well conceived." In particular, the Air Force emphasis to use some technology base other than the Shuttle drew their pointed criticism, because for "all practical purposes, the RFP [Request for Proposal] is structured in such a way as to exclude the realistic consideration of a 'shuttle derived' expendable launch vehicle." No amount of testimony to the contrary seemed to convince them.⁶⁸

While Aldridge continued to publicly support the Shuttle and the Air Force's commitment to it, he and his staff became increasingly concerned that the Shuttle was a house of cards waiting for a stiff wind.⁶⁹ Too many things could happen to the Shuttle that would cause the whole STS to be grounded, and with it, all U.S. space launches. Although he wanted the Shuttle to work through its problems, he had the dual responsibilities to steer and protect the military and national security space programs. In a sense, he was as constrained by prior policy as was NASA. Without overturning the commitment to the Shuttle, then, he had to orchestrate a policy alteration that would provide a feasible alternative when the Shuttle inevitably failed in some way. Such an alternative, he knew, would also make possible a recovery from the loss of a Shuttle, were that to happen.

The 1982 National Space Policy provided part of the justification Aldridge needed. If the DoD demonstrated a unique need not met by the Shuttle, then it could procure some ELVs. Reagan's August 15, 1984 "National Space Strategy" included a crucial new mandate to assure access to space under conditions of peace, crisis, and conflict. Assured access was a unique national security requirement the Shuttle could not meet. If Shuttles were ever grounded, access to space was not assured, and this DoD unique requirement was unmet. Thus, assured access to space permitted acquiring a limited number of complementary ELVs. The concept that the ELVs were a complement to the Shuttle rather than competition was



(Above and right) The Space Shuttle in action.

**ALDRIDGE
FELT SO
STRONGLY
ABOUT THE
NEED FOR
THE EXPEND-
ABLE
BACKUP
THAT HE
REFUSED TO
GIVE UP.**

important. A complement recognizes the continued existence of another system, such as the Shuttle. The Air Force was neither abandoning nor undermining the Shuttle. National security and defense dictated the need to provide the prudent backup. Eventually, NASA and the DoD would have to come to grips with the numbers to be procured.⁷⁰

The 1984 "Strategy" expanded the mandate for full cost recovery after October 1988. Under the Strategy, NASA had to achieve routine and cost effective access to space, making the STS operational and cost effective by 1 Oct 1988, at which time it was to start full cost recovery. Once again, a policy statement used "operational" without definition. This time, however, the policy provided the means to understand the intent of the term. Recognizing that the earlier publicity about the Shuttle's being an "operational" space launch vehicle had created mistaken impressions, the President directed DoD and NASA to define what constituted a fully operational and cost effective STS. Their report was due to the President by 31 December 1984.⁷¹

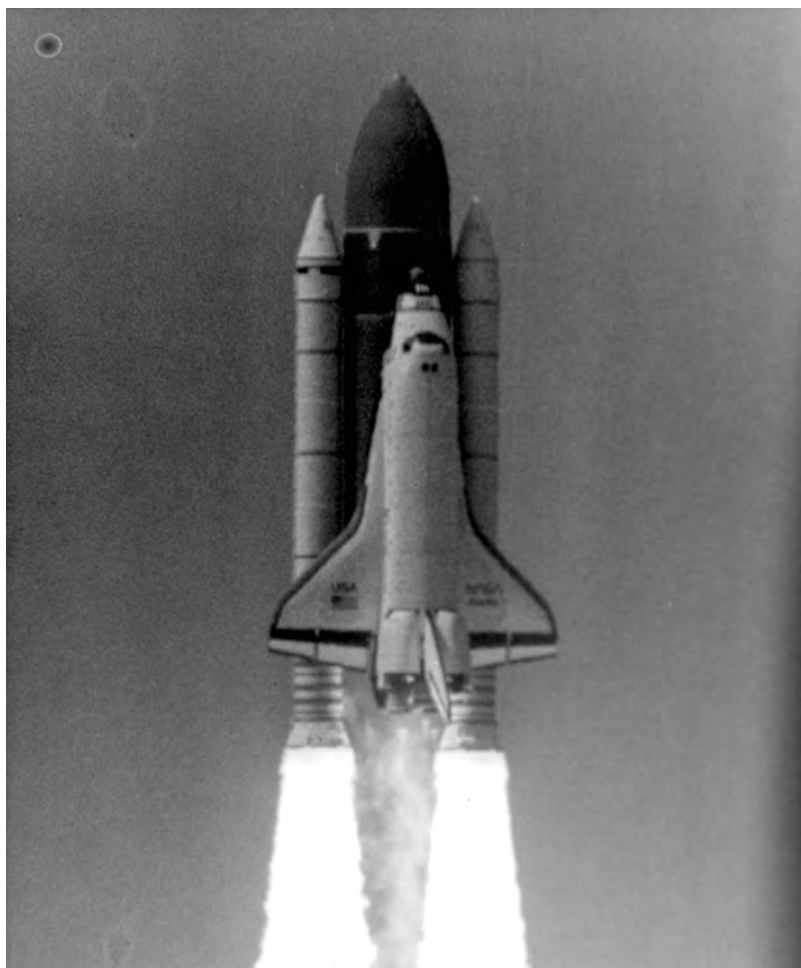
When the NRC study results showed strong support for the Air Force's effort, Weinberger was able to respond to Addabbo that "This strategy to acquire and employ complementary ELVs (CELVs) has the strongest support from all the users of space launch vehicles and the National Research Council." By the time of his September 1984 letter,

Weinberger also had the support of the President, expressed in the "National Space Strategy."⁷²

The need for some ELV backup to the Shuttle was endorsed by both independent and joint NASA/DoD studies. Finally, the Administration and Congress accepted the need. However, acceptance was not forthcoming from NASA Administrator James M. Beggs. Beggs continued insisting that the complementary ELV would undercut the Shuttle's economics and was the first step in the Air Force's abandonment of the Shuttle. Beggs claimed even two ELVs per year jeopardized Shuttle flight rates.

Based on the "National Space Strategy's" rules, the Air Force had proceeded with a solicitation for a Complementary Expendable Launch Vehicle (CELV). In an unprecedented move, NASA submitted various government designs based on Shuttle components to compete with industry proposals. The proposal evaluation looked unfavorably on the risk of using Shuttle-derived hardware to complement the Shuttle. Should a defect in the Solid Rocket Boosters ground the Shuttle fleet, for instance, this would also preclude a Shuttle-derived CELV's access to space. When the results of the evaluation became clear and the choice would not support the NASA-proposed solution, relations got very strained between the agencies.⁷³

Aldridge felt so strongly about the need for the expendable backup that he refused to give up.



GONE WAS THE WISDOM OF COMMITTING ALL LAUNCHES TO A SINGLE NATIONAL LAUNCH VEHICLE

Finally, he appealed directly to Beggs for NASA acceptance of the CELV program. Heading to a late afternoon flight out of town in mid-February 1985, he negotiated with Beggs over the phone, conceding whatever it took to gain Beggs' agreement. Their mutual agreement was documented as National Security Decision Directive 164, the "National Security Launch Strategy." The price was high, requiring the DoD commitment to rely on the STS as its primary launch vehicle and to fly one third of all STS flights available during the subsequent ten years. Furthermore, Shuttle prices would be changed so that the DoD would pay an annual fixed fee and, in addition, charges per flight at the marginal or incremental cost per flight (a variable rate depending on the total launches for the year in question). In return for these and other concessions, the Air Force was allowed to acquire 10 CELVs to be launched at a rate of two per year from 1988 to 1992. By 1992, the Shuttle would either have proven itself or the need for additional backups would have been justified.⁷⁴

Uncommitting to the Shuttle

On January 28, 1986, eleven months later after the Aldridge-Beggs telephone agreement, the Space Shuttle *Challenger* destroyed itself and its crew of seven just 73 seconds after liftoff. Discussing the ramifications later that day, one Pentagon space policy analyst pointed out that it would be easier to figure out what had not changed in the wake of the disaster than trying to list everything that just changed. The leaders of the U.S. space programs had to rethink their approach to space to a time before the 1969 Space Task Group.

Certainly gone was the wisdom of committing all launches to a single national launch vehicle. Limitations on the CELV backup sought by DoD were no longer valid. ELVs once again became a key element of the national launch capability. The timing of the CELV acquisition was an exquisitely close call. A few more months' delay, and the ELV industry would have lost the ability to start back up without a delay of several years. As it was, re-establishing the production lines led to a lengthy gap in U.S. space launches.

Aldridge led the reestablishment of the national space launch capability. With his unique dual responsibilities for both the national security and national defense space organizations, Aldridge was able to rapidly affect the necessary changes, obtain the necessary funding and coordinate the activities that were the fastest route to recovery. He instituted a version of the mixed fleet emphasizing ELVs as the primary access to space. Through statesmanship and the support of his Air Force and NRO staffs, he created a sensible fleet of medium and heavy ELVs providing the capacity to work off the backlog of nationally critical satellites.

On January 16, 1987, Reagan's next National Security Decision Directive, "United States Space Launch Strategy," made the necessary modifications to national policy, superseding the Beggs-Aldridge agreement, and extensively modifying the launch provisions of all other policies. It promoted a balanced mix of Shuttles and ELVs. NASA was directed to use the Shuttle by emphasizing its unique capability for human access to space, but not for commercial and foreign payloads (except for those payloads already under contract that could only ride on STS).⁷⁵

The commitment to the Shuttle that was never officially explicit policy had nearly become a disaster for the nation's access to space, were it not for the persistent vision of a few people, most especially Edward C. Aldridge, who could differentiate the rhetoric of policy from the good of the nation. ■

NOTES

1. President Richard M. Nixon to Vice President Spiro T. Agnew et al, Subj.: Space Task Group Charter, Feb 13, 1969; President's Science Advisor Dr. Lee A. DuBridge to President's Science Advisory Committee, Subj.: Post-

APOLLO Space Program Study, Jul 3, 1969.

2. NASA Letter to the Secretary of the Air Force, "Terms of Reference for Joint DoD/NASA Study of Space Transportation Systems," Apr 4, 1969. There was nothing

exceptionally new here, as there had been many joint studies of launch programs in the past. Any comprehensive review of the future of a national space program must consider the launch infrastructure, and this was different only because both NASA and DoD had become very interested in the idea of reusable launch systems.

3. Secretary of the Air Force Seamans to Vice President Spiro T. Agnew, Subj.: Post Apollo Space Program Concerns, Aug 4, 1969.

4. The Seamans report was forwarded separately due to classification issues.

5. Bureau of the Budget Director Robert P. Mayo to President Richard M. Nixon, "Space Task Group Report," Sept 25, 1969.

6. NASA Deputy Administrator George M. Low, Personal Notes No. 1, Jan 1, 1970, p. 9, from personal papers held at Rensselaer Polytechnic Institute.

7. Low notes #1, p. 10; Low Memorandum for Record, Jan 28, 1970.

8. Low Memo, Jan 28, 1970.

9. NASA Administrator Thomas O. Paine to Secretary of the Air Force Robert C. Seamans, Subj.: Invitation for Joint Study, Apr 4, 1969; Deputy Administrator George M. Low, "Space Shuttle Discussions with Secretary Seamans," Jan 28, 1970; Department of the Air Force and National Aeronautics and Space Administration, "Memorandum of Agreement Between the Department of the Air Force and the National Aeronautics and Space Administration Concerning the Space Transportation System," Feb 17, 1970; NASA Administrator Thomas O. Paine to President Richard M. Nixon, Subj.: Future NASA Directions, Jun 23, 1970.

10. NASA Deputy Administrator George M. Low, Memorandum to Administrator Thomas Paine, "Telephone Conversation with General Phillips," Mar 16, 1970.

11. White House press release, Office of the Press Secretary, Statement by the President, Space Task Group Report, Mar 7, 1970.

12. The technical jargon of the program dubbed the ability to alter the flight path on re-entry the "cross-range" requirement.

13. NASA Associate Administrator for Manned Space Flight Mr. Dale D. Myers and Assistant Secretary of the Air Force for Research and Engineering Mr. Grant L. Hansen, Cochairmen. "Space Transportation System Committee Summary of Activities for 1970," Jun 1971.

¹⁴Department of Defense and National Aeronautics and Space Administration, "Meeting Minutes, 54th Meeting of the Aeronautics and Astronautics Coordinating Board," July 10, 1970.

15. NASA Deputy Administrator George M. Low to Office of Management & Budget Deputy Director Caspar W. Weinberger, Oct 28, 1970.

16. NASA Associate Administrator for Manned Space Flight Dale D. Myers to Assistant Secretary of the Air Force (Research & Development) Grant L. Hansen, May 25, 1971; Assistant Secretary of the Air Force (Research & Development) Grant L. Hansen Response to NASA Associate Administrator for Manned Space Flight Dale D. Myers Jun 21, 1971; and NASA Deputy Administrator George M. Low Memorandum, "Space Shuttle Program," Oct 12, 1971.

17. Secretary of the Air Force Robert C. Seamans to NASA Administrator James C. Fletcher, July 7, 1971.

18. Air Force Assistant Secretary (Research and Development) Grant L. Hansen to NASA Associate Administrator for Manned Space Flight Dale D. Myers, Subj.: Impact of Shuttle Small Payload Bay, Jun 21, 1971; and Seamans to Fletcher, July 7, 1971.

19. Seamans to Fletcher, July 7, 1971.

20. Author interview with Deputy Under Secretary of the Air Force, Jimmy D. Hill, July 1992; The price is confirmed and explained in detail in Plattner, C.M. "Air Force

Stressing Operational Economy," *Aviation Week & Space Technology*, Sept 9, 1963, pp. 54-55. The specific number of Titans that represented minimum economic production rate is not a confirmable number and represents an estimate based on subsequent experience and the re-starting of the production lines after the CHALLENGER explosion.

21. NASA Deputy Administrator George M. Low to Administrator James C. Fletcher, "Discussions with Johnny Foster," Dec 2, 1971; NASA Administrator James C. Fletcher to Office of Management & Budget Deputy Director Caspar W. Weinberger, Subj.: Space Shuttle Course of Action, Dec 29, 1971; NASA Deputy Administrator George M. Low, Personal Notes No. 61, Jan 2, 1972, pp. 3-4; NASA Administrator James C. Fletcher to Office of Management & Budget Deputy Director Caspar W. Weinberger, Jan 4, 1972; NASA Administrator James C. Fletcher to Office of Management & Budget Deputy Director Caspar W. Weinberger, Subj.: Meeting with OMB Director, Mar 6, 1972.

22. Office of Management and Budget Assistant Director Donald B. Rice to Office of Management and Budget Director George P. Shultz, Subj.: "NASA Letter on Scientific Results of Apollo 15," Sept 20, 1970; Fletcher to Weinberger, Dec 29, 1971; and Briefing Charts for NASA Administrator Fletcher Meeting with OMB Deputy Director, Dec 29, 1971; NASA Administrator James C. Fletcher to OMB Deputy Director Caspar W. Weinberger, Subj.: Space Shuttle Decisions, Jan 4, 1972; Fletcher to Weinberger, Meeting with OMB Director, Mar 6, 1972; National Aeronautics and Space Council Meeting Minutes, White House, Washington, DC, Apr 3, 1972.

23. David N. Parker, "White House Schedule Proposal," Dec 31, 1971; NASA Associate Administrator George M. Low, "Meeting with the President on Jan 19, 1972," Jan 12, 1972; White House press release, Office of the Press Secretary, Presidential Announcement on Space Shuttle, Jan 5, 1972.

24. Paine to Seamans, Apr 4, 1969; Hansen to Myers, Jun 21, 1971; Seamans to Fletcher, July 7, 1971; NASA/USAF "Summary of Activities for 1970;" Under Secretary of the Air Force Dr. Hans Mark to Secretary of Defense James Schlesinger, "Maintaining TITAN III Production Capability During Shuttle Transition," Nov 9, 1979; Air Force Space Division Commander Lt. Gen. Richard C. Henry to Air Force Systems Command Commander Robert T. Marsh, Subj.: Space Shuttle and Space Station Concerns, Mar 4, 1983; and Deputy Secretary of Defense William P. Clements to NASA Administrator Dr. James C. Fletcher, Subj.: Shuttle Commitment, Aug 7, 1974.

25. Low Personal Notes, No. 65, Feb 27, 1972, p. 2.

26. Low was mistaken on the degree of influence that was held at the time by the DDR&E. The DoD Directive, "Development of Space Systems," # 5160.32, had been changed by Deputy Secretary of Defense David Packard in 1970. Until that date, the DDR&E held greater responsibility for preliminary research in new ways of using space technology, and would have been able to direct Service programs such as the Shuttle development. After that date, the DDR&E was responsible only for monitoring space technology activity, and control resided in the Air Force.

27. National Aeronautics and Space Council Meeting Minutes; Clements to Fletcher, Shuttle Commitment, Aug 7, 1974.

28. NASA Deputy Administrator George M. Low, Personal Notes No. 80, Nov 4, 1972, pp. 1-2.

29. Deputy Secretary of Defense Kenneth Rush Memorandum for All Departments, "DoD Planning for the Space Shuttle," Nov 13, 1972.

30. Low routinely shared internal NASA memoranda with Currie, as several copies in both Low's papers and the NASA History Office show. An example is Deputy

Administrator Low to Associate Administrator for Manned Space Flight, "Space Shuttle Upper Stage Decision," Oct 10, 1973, which also carries the annotation that Currie agreed to the statements contained therein. Other memoranda that went to Fletcher also were shared with Currie.

31. Director of Defense Research & Engineering Malcolm Currie to Secretary of the Air Force Dr. William C. Seamans, "DoD Space Shuttle Planning," Aug 7, 1973.

32. NASA Deputy Administrator George M. Low, Memorandum for the Record, "Telephone Conversation with Mal Currie on July 23, 1975," July 24, 1975.

33. NASA Deputy Administrator George M. Low to Administrator James C. Fletcher, "Space Shuttle Discussions with Mal Currie," May 20, 1974.

34. Low to Fletcher, "Space Shuttle Discussions."

35. NASA Deputy Administrator George M. Low, Personal Notes No. 122, Jun 8, 1974, pp. 1-2; NASA Deputy Administrator George M. Low, Memorandum For Record, "Meeting with Mal Currie," Jun 17, 1974.

36. NASA Administrator James C. Fletcher to Secretary of Defense James R. Schlesinger, Jun 21, 1974.

37. Fletcher to Schlesinger, 21 Jun 1974; NASA Deputy Administrator George M. Low, Memorandum For Record, "Meeting with Secretary Schlesinger," July 17, 1974.

38. Clements to Fletcher, Shuttle Commitment, Aug 7, 1974.

39. *Ibid.*

40. Hill interview.

41. Chairman, Space Shuttle Payload Planning Steering Group John E. Naugle to NASA Associate Administrator, Office of Applications Mathews, "Transition Plan from Expendable Launch Vehicles to the Shuttle/Interim Upper Stage," Jan 28, 1975; and Low "Telephone Conversation with Mal Currie on July 23, 1975."

42. Hill interview; Author interview with former Secretary of the Air Force Dr. Hans M. Mark, Oct 19, 1991.

43. Author interview with Lt. Colonel Russell C. Cykoski, TITAN project manager, Oct 29, 1991.

44. Mark interview; Reed Testimony; Cykoski interview. Mark's 1991 reconstruction of events did not correspond with what actually happened. He claimed not have terminated TITAN production, when he actually did terminate TITAN III, and then capped the production of the TITAN 34D through a final block buy.

45. Testimony of Air Force Systems Command Commander General Alton D. Slay, Hearings Before the Committee on Armed Services, DoD Authorization for Appropriations for Fiscal Year 1979, Senate, 95th Congress, 2nd session, S.2571, pp. 3859, 3939.

46. Cykoski interview.

47. "Space Shuttle Appropriations for Fiscal Year 1979," Hearings before Subcommittees of the Committee on Appropriations, House of Representatives, 95th Congress, 2nd Session, p. 364.

48. "Space Shuttle Appropriations for 1979," p. 363.

49. The wider and shorter payloads allowed a concept called "manifesting," or combining several satellites on one Shuttle launch, as long as they were going to roughly similar orbits. By the time satellites were being redesigned to favor manifesting, the intent of having the Shuttle pay for itself had been overruled by Congress. Manifesting allowed NASA to receive more revenue per launch, helping to defray the rising costs of a Shuttle launch.

50. The TITAN 34D was not a candidate for the long-term backup, since its production quantity had been limited and in any event, Shuttle payloads were going to grow in weight beyond the 34D's capability. The latter was an inevitable result based on historical satellite design approaches to use every bit of available performance. The Shuttle had more capability than the TITAN 34D.

51. Author interview with Colonel John C. Bailey, a former satellite program manager; Hill interview.

52. Hill interview.

53. National Space Policy, Presidential Decision/NSC-37, May 11, 1978.

54. Civil and Further National Space Policy, Presidential Decision/NSC-42, Oct 10, 1978; Mark Interview.

55. Mark Interview; Secretary of the Air Force Hans Mark "Meeting with the President on Space Shuttle Issues," Briefing and Issue papers, Nov 14, 1979.

56. Mark, "Meeting with the President on Space Shuttle Issues," Nov 14, 1979.

57. Space Transportation System, National Security Decision Directive 8, Nov 13, 1981; National Space Policy, National Security Decision Directive 42, July 4, 1982.

58. "National Space Policy."

59. General Accounting Office Final Report, "NASA Must Reconsider Operations Pricing Policy to Compensate for Cost Growth on the Space Transportation System," MASAD 82-3, Feb 23, 1982.

60. Lieutenant General Richard C. Henry, Commander, Air Force Space Division, to General Robert T. Marsh, Commander, Air Force Systems Command, Mar 4, 1983.

61. During this period, the author was involved with the discussions involving the U.S. Trade Representative, NASA and DoD officials to establish a "level playing field" for U.S. companies to compete with the European ARIANE launch vehicles. These discussions, and the irregularly recurring "pricing" negotiations between the Air Force and NASA on Shuttle reimbursement, also supported by the author, made abundantly clear the extent to which NASA officials viewed any U.S. commercial launch vehicles as threats to Shuttle economics. These same concerns also motivated NASA to compete against private launch vehicle development in the Complementary Expendable Launch Vehicle source selection.

62. "Commercialization of Expendable Launch Vehicles," National Security Decision Directive 94, May 16, 1983.

63. "Commercialization of Expendable Launch Vehicles." Costs over and above the consumables were paid by the Government. This was the basis for the claim by the Europeans that Shuttle was subsidized, after the U.S. complained about European subsidies to ARIANE.

64. Department of Defense, "Defense Space Launch Strategy," Jan 24, 1984.

65. Senator Garn/Representative Boland to NASA Administrator, Jan 25, 1984.

66. Representative Don Fuqua, Chairman House Committee on Science and Technology, to Honorable Caspar Weinberger, Apr 12, 1984.

67. Representative Don Fuqua, Chairman House Committee on Science and Technology, to Honorable Joseph P. Addabbo, Apr 13, 1984.

68. House of Representatives Committee on Appropriations, Joint Letter to Honorable Caspar Weinberger, Jun 6, 1984.

69. From the author's personal experience.

70. "National Space Strategy," National Security Decision Directive 144, Aug 15, 1984, unclassified Fact Sheet.

71. "National Space Strategy."

72. Secretary of Defense Caspar Weinberger to Honorable Joseph P. Addabbo, Sept 24, 1984.

73. Such a claim is hard to document specifically, and derives from the author's experience as part of the continuing discussions between NASA and the Air Force as part of the Air Force Secretariat Office of Space Plans and Policy, and can be found throughout the time period in media articles in the *New York Times*, *Aviation Week and Space Technology*, and as evidenced by the exchange of letters from Congress, cited above, concerning the different views of the "real intent" behind the Air Force's CELV effort.

74. "National Launch Strategy," 25.

Splendid Vision, Unswerving Purpose: Developing Air Power for the United States Air Force during the First Century of Powered Flight. Wright-Patterson AFB, Ohio: Aeronautical Systems Center History Office, 2002. Maps. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xvii, 508 ISBN 0-16-067599-5

The dominance of the USAF in aerial warfare is the consequence of vision, leadership, skill, and knowledge. These qualities are evident in the contributions of Wright Field, and its predecessor, McCook Field, to the development of air power in the twentieth-century. With the publication of *Splendid Vision, Unswerving Purpose*, readers of diverse backgrounds will learn how the military and civilian work force of these institutions first led the way to an effective military airplane and ultimately to modern, high-tech aerospace weapon systems. Along the way, individuals as diverse as Jimmy Doolittle, Gen. Frank Carroll, Ann Bumgartner Carl, Gen. Harry Armstrong, M.D., Ezra Kotcher, Gen. James Stewart, and Bill Lamar, Director of Engineering for the X-20 Dyna Soar, added personality and inspiration, as described in many sidebars.

The advocates of air power, who emerged from World War I, men such as Gen. Billy Mitchell, had a vision of military aviation being decisive in a future conflict. But to realize this vision, the Army Air Service would need an effective instrument of air warfare, an airplane with capabilities greatly exceeding the primitive wood-and-fabric flying machines of the early 1920s. In a bold move, contrary to the previous *laissez faire* acquisition policy, the Army leadership directed the workforce of McCook Field to initiate projects to transform the military airplane, and thus began a journey that continued through World War II, the Cold War, and into the twenty-first century.

McCook Field was always a temporary facility, and in 1927 it was replaced by Wright Field, today one of the principal units of Wright-Patterson AFB. At Wright Field the mission can be characterized as three primary functions: technology development, systems engineering, and acquisition management. Wright Field was the crossroads of military aviation, where operational needs, requirements, technologies, industry, and flight testing all came together to create modern aeronautical weapon systems. *Splendid Vision, Unswerving Purpose* describes many examples of the Wright Field laboratories initiating high-risk projects, of the planning offices creating future concepts, and of the program offices managing new systems acquisition.

This very hefty book is the product of a team of professionals in the Aeronautical Systems Center History Office. They have created an authoritative, as well as entertaining, account of the history of an impor-

tant institution. *Splendid Vision, Unswerving Purpose* will be attractive to a diverse audience, from students of Air Force history to aviation enthusiasts to historians of technology and industry. It is an excellent companion volume to accounts of aircraft development from the viewpoint of defense contractors. Scholars of the history of air warfare will find the descriptions of the development of famous combat aircraft helpful in appreciating their role in operational service.

Readers will find the book's appearance attractive. It was designed by talented graphic illustrators and layout specialists, and it is printed on high-quality paper. The photographs are reproduced in high resolution, providing opportunities for detailed examination. *Splendid Vision, Unswerving Purpose* is published by the Government Printing Office, which does not promote its products as a commercial firm would, nor will it be found at a local bookstore; however, the book can be ordered through the GPO web site (Amazon offers it as a special order).

Squire Brown, Dayton, Ohio.



Stauffenberg: A Family History, 1905-1944. By Peter Hoffman. Montreal: McGill-Queens University Press, 2003. [2d English ed., translated by the author from the original German edition.] Illustrations. Photographs. Appendices. Glossary. Index. Bibliography. Pp. xix, 424. \$24.95 Paperback ISBN 0-7735-2595-5

Why should the study of a German Army officer be reviewed in *Air Power History*? Because this book is concerned with character and courage, a requisite for all officers in every service. The three Stauffenberg brothers—Berthold, Alexander, and Claus—were sons of an aristocratic family of the lesser nobility. They were classically educated and, as Christians, were horrified by Nazi persecution of the Jews. But there was another powerful factor motivating them. They fell under the spell of the poet Stefan Gorge whose post-Versailles vision of a restored and greater Germany powerfully influenced all three. Although this is a family history, it deals primarily with Claus, for it was he who played a key role in the anti-Nazi resistance movement and ultimately dared to attempt an assassination of the Führer.

As a descendant of Field Marshal Gneissau, Claus had little difficulty in gaining admission to the *Reichswehr* and rapid promotion. With Greek, Latin, and English already in hand, he took up Russian in the army. He stood at the head of his class at the War Academy, where his intellectual brilliance and attractive personality won the

respect and admiration of his fellow officers. Although he was slow to appreciate the menace of the Nazi party, once the persecution of Jews became evident, his opposition grew. His views were aristocratic, not democratic. He looked to the officer corps as the vehicle to save the state from Nazi abuses.

When Hitler invaded Poland, Stauffenberg enthusiastically participated with his division. Invited by fellow officers to join a plot to unseat Hitler, Claus declined, pointing out that the time was inappropriate given Hitler's political popularity following the rapid conquest of Poland. In view of his performance there, he was assigned to the General Staff. The defeat of the French further enhanced his reputation as a brilliant staff officer. Later, with the attack on Russia, the tension between his enthusiasm for the successes of German arms and his disgust over crimes committed by the SS against civilians finally tipped the balance, inducing him to declare early in 1942, "There is only one solution. It is to kill him."

With increasing difficulty in replacing losses at the front, Hitler decreed that replacements must be found by transfers from staffs. Claus was delighted to join the 10th Panzer Division in North Africa. There his luck ran out when he was badly wounded by enemy aircraft, losing an eye, two fingers on his left hand, and his right hand at the wrist. Hospitalized in Munich, he suffered a long and painful recovery, all the while plotting with sympathetic officer friends on how best to overthrow the Führer.

Although many top army generals wanted to be rid of Hitler, it became clear they would not act. Stauffenberg decided it was up to the colonels. Once discharged from the hospital, he was assigned as Chief of Staff of the General Army Office, a post which afforded opportunities to involve increasing numbers of officers in the conspiracy to "save Germany." Although it was clear that Germany would be defeated by the Allied armies, it seemed essential to kill Hitler if only to demonstrate that not all Germans were as morally depraved as the Nazis. Plans were laid to have army units occupy key headquarters and communication centers once the Führer was declared dead.

It is a mark of Stauffenberg's prestige that he was selected to brief Hitler at the Führer's field headquarters. He placed his briefcase equipped with plastic explosives and thirty-minute fuzes on the floor under the staff table as near the Führer as possible and then excused himself to make a phone call. There was an enormous explosion, and moments later Stauffenberg saw someone being carried out under Hitler's overcoat. He assumed that Hitler was dead and flew back to Berlin to activate the preplanned takeover of the government. But Hitler was *not* dead. On learning this, some conspirators tried to distance themselves from the plot, but others tried to carry out the troop movements according to the planned government

takeover. With Hitler alive, the plot quickly unraveled. Loyalists countermanded the insurgents' orders, disarmed the five key plotters at Headquarters, and had them shot. The plot to terminate the Nazi regime failed, but Stauffenberg's courage and example live on.

Peter Hoffman, a professor at McGill University, while presenting a sympathetic view of his protagonist has managed to remain remarkably objective in portraying Stauffenberg's highly nationalistic and scarcely democratic conception of the German Army as a political institution.

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

Masters of Chaos: The Secret History of the Special Forces. By Linda Robinson. New York: Public Affairs, 2004. Photographs. Maps. Index. Pp xxii, 388. \$26.95 ISBN: 1-58648-249-1

This excellent volume is written by a well qualified journalist, a senior writer for *U.S. News and World Report*. The title is poor; there's nothing secret about the U.S. Army's Special Forces: long under-publicized, perhaps, but not secret. If you wonder why an air power journal bothers to review a ground force operation, hang on. The author wisely begins with an account of the Green Beret's organization, currently about 9,500 men in

five active duty regional groups: Asia, Africa, Southwest and Central Asia, Latin America, and Europe, plus two National Guard groups. Unlike other U.S. Army units, these learn the languages of the regions in which they specialize. Formed in 1952, the Green Berets have had more than half a century of frequent deployments to perfect their doctrine and individual skills.

To tell the story, Robinson interviewed a number of men who have deployed in Panama, Somalia, Bosnia, Afghanistan, and Iraq. The cutting edge of Special Forces is found in the twelve-man teams, six of them to a company. Each team member is a specialist: in communications, medical, intelligence, etc. And each team studies its assigned area with the diligence of a Ph.D. candidate: demographics, tribal and clan ties, their schisms and histories. They study the local economy, terrain, water sources, and road networks, but above all, they study languages.

In a brief review one cannot cover all the deployments reported in this volume, but one will suffice to illustrate the operating techniques employed by the Green Berets. In Desert Storm, the first Iraq war, Special Forces played a minor role reflecting the Army command's skepticism regarding unconventional soldiers. But in the current Iraqi war they were given far more crucial roles as the high command had come to appreciate their potential. While the media concentrated their attention on the conventional heavy armor thrust up the Tigris and Euphrates watersheds from Kuwait to

Baghdad, far to the West, some 900 Green Berets slipped across the border and drove across the desert 300 kilometers towards an area where Scud missiles were located. Desert Storm had taught the fallacy of relying entirely upon aerial surveillance to locate Scud missiles. Spotting a radio direction-finding complex, they called in the grid coordinates to an AWACS (Airborne Warning and Control System) plane loitering overhead which in turn summoned waiting F-16s. In minutes the direction finder was destroyed. This was the payoff for months of practice perfecting teamwork with the Air Force. Minutes later, when several hundred Iraqi soldiers drove out from the frontier town of Ar Rutba and came close to overrunning a Special Forces observation post, alerted aircraft once again wiped out the Iraqi attackers. Miles away in Saudi Arabia, an Air Force general monitored this action with mounting satisfaction, while on the ground an intelligence sergeant from the 12-man team on the site busily collected papers from the wreckage of the attacking Iraqi column for useful information.

Not all Special Forces actions involve killing the enemy. With their language skills, Green Berets contacted anti-Saddam Iraqis and recruited their cooperation, often making it possible to control a town without causing casualties. Clearly, by the second Iraq war, the Army high command had come to recognize the impressive potential of Special Forces; and the Special Forces perfected their cooperation with the Air Force

THE BATTLE OF BRITAIN

Air Defence of Great Britain, Vol. II

T C G James

Edited and with an Introduction by Sebastian Cox, *Head of the Air Historical Branch of the Ministry of Defence*

Foreword by Air Chief Marshal Sir Peter Squire

'there can be nothing but praise for such a majestic, seminal history as this one.' *Air Pictorial*

This volume offers the reader access to the RAF's detailed contemporary day-by-day account of the Battle.

456 pages illus 2000

0 7146 5123 0 cloth \$62.50/£45.00 0 7146 8149 0 paper \$26.50/£18.50

Royal Air Force Official Histories

COURAGE AND AIR WARFARE

The Allied Aircrew Experience in the Second World War

Mark K Wells, *Deputy Head of the United States Airforce Academy's Department of History*

Winner-Society for Military History Distinguished Book of the Year 1997

'Courage and Air Warfare is well written and well researched. It is relevant especially to those who would aspire to the command of flying units. Give it a very high place on your reading list.'

Dr David Mets, Maxwell AFB, Alabama, Airpower Journal

256 pages illus 1995 repr. 1997, 2000

0 7146 4618 0 cloth \$59.50/£42.50 0 7146 4148 0 paper \$24.50/£17.50

Frank Cass Publishers

North American Orders: ISBS, 5824 NE Hassalo Street, Portland, OR 97213 3644, USA Tel: 800 944 6190 Fax: 503 280 8832

UK/RoW Orders: Crown House, 47 Chase Side, Southgate, London N14 5BP Tel +44 (0)20 8920 2100 Fax: +44 (0)20 8447 8548

Website: www.frankcass.com

AIR POWER HISTORY

Turning Points from Kitty Hawk to Kosovo

Peter Gray, *Director of Defence Studies for the Royal Air Force* and Sebastian Cox, *Head of the Air Historical Branch of the Ministry of Defence* (Eds)

Contributors from academia and the services examine the theory and practice of air power from its earliest inception.

288 pages 2002

0 7146 5291 1 cloth \$64.50/£45.00 0 7146 8257 8 paper \$26.50/£18.50

STRATEGIC AIR POWER AND THE GULF WAR

John Andreas Olsen, *Royal Norwegian Air Force Academy*

Olsen provides a comprehensive examination of the origins, evolution and implementation of 'Operation Desert Storm' using official military and political documentation, interviews with US Air Force officers and Iraqis with experience of the inner workings of the Iraqi regime.

256 pages 2003

0 7146 5193 1 cloth \$62.50/£45.00 0 7146 8195 4 paper \$26.50/£18.50

as an instrument of close air support.

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



Martin P6M SeaMaster: The Most Advanced Seaplane Ever Built. By Stan Piet and Al Raithel. Bel Air, Md.: Martineer Press, 2001. Diagrams. Illustrations. Photographs. Appendices. Glossary. Bibliography. Pp. 224. \$35.00. Paperback. ISBN: 0-9700662-0-1

When a technology is established long enough to become a tradition, there is a reluctance to let it to pass into obsolescence. As with the sailing ship's replacement by the steam ship and the horse by the mechanized vehicle, the flying boat did not easily disappear from naval aviation. In this book, Stan Piet, Executive Director of the Glen L. Martin Aviation Museum; and Capt. Albert L. Raithel, Jr., USN (Ret.), an aviator with vast experience in flying boats, tell the story of the Navy's last seaplane project.

The coverage of the developmental history and technical details of the SeaMaster is exhaustive. The authors have taken full advantage of the Martin archives to give a thorough description of the aircraft in all its variations, and provided more than 370 photographs and drawings. Major challenges in engineering the P6M included rough water handling, turbojet engine installation, flight control system dynamics, and the development of a weapons system capable of high-speed, low-altitude mine laying as well as nuclear weapons delivery. Each of these is covered in detail, giving the reader a picture of how interdependent the components of an airplane are and where a change in one system often has unexpected effects on other systems. The glossary is particularly useful in explaining flying boat hull design terminology that might be unfamiliar to even an experienced student of aviation.

The authors also cover the tremendous challenge of designing a flying boat hull capable of flight near Mach one while still maintaining acceptable water handling abilities. However, the discussion lacks some needed aerodynamic and hydrodynamic background information. For example, much is made of the technique of "dynamic modeling" used by the SeaMaster's designers, but what this technique is and how it differs from previous wind tunnel and tow tank research is not explained. In fact, dynamic modeling is the science of scaling fluid dynamics measurements obtained with small-scale models to accurately predict behavior at full-size.

In addition to the technical details of the P6M, the book also takes a wider view, putting the SeaMaster in context as a weapons system under development during the political, military, and technological changes of the 1950s. The 1951 Navy requirement for a Seaplane Striking Force

(SSF) envisioned open-ocean based P6Ms supported by seaplane tenders and refueled by tanker submarines. At the time, the Strategic Air Command was the political favorite, and the Navy wanted the SSF to avoid being eclipsed in the nuclear deterrence role. By 1959, however, when the P6M-2 was finally ready for fleet service, the SSF concept was outmoded. Advances such as the angled flight deck and steam catapult had made the aircraft carrier a better platform for fast, long range strike aircraft, and the first nuclear-powered ballistic missile submarine was put in commission.

The authors relate the disappointment felt by the Martin employees at the SeaMaster's cancellation. Their best efforts had failed to make the flying boat relevant to the jet-age Navy. The seaplane, with which naval aviation had started in 1911, would be taken out of service less than ten years later.

James C. Kellogg, Naval Research Laboratory



Lone Star Stalag: German Prisoners of War at Camp Hearne. By Michael R. Waters, et al. College Station: Texas A&M University Press, 2004. Tables. Illustrations. Photographs. Bibliography. Index. Pp. xv, 268. \$22.50 Paperback ISBN: 1-58544-318-2.

Michael Waters is a Texas A&M professor of anthropology and geography. He combined his professional energies with a personal interest in the former German POW camp a mere twenty miles from his home. From a first attempted visit to the former camp, one thing led to another, and this excellent book is the result. Waters used a three-pronged approach to tell the story. Using the historian's method, he scoured archives and libraries to find official facts and figures as well as contemporary news accounts. His anthropological leanings led him to interview a broad mix of participants, including former prisoners and guards, and local citizens. An archaeological survey rounds out the research, uncovering some fascinating artifacts that had been hiding in the scrub brush near Hearne for six decades.

Lone Star Stalag flows nicely. Chapter 1 covers camp planning and construction, some background on the American staff that ran the camp, and the prisoners' backgrounds and arrival. I was pleased to find a plan of the camp early in the book that helped my understanding of the lay of the land as I read on. The plan, with accompanying area map, was detailed enough that I could easily find the former camp on recent aerial photographs. Chapter 2 details the sometimes boring, occasionally funny, and ever fascinating life in the camp. The wide variety of educational and artistic programs available for prisoners, as well as the relative freedom that prisoners sometimes had,

while working outside the camp, was amazing. Chapter 3 delves into problems that arose ranging from illicit production of alcohol, to elaborate inter-camp prisoner communication schemes, to deaths. The end of Chapter 3 is devoted to the in-camp murder of a prisoner. In these pages it seemed that the pace stumbled a bit. Suddenly the writing was more like a technical transcript than the smooth narrative it had been up to this point. Chapter 4 explores the activities and moods in the camp at the end of the war and briefly discusses the few Japanese prisoners who stayed briefly at Camp Hearne.

Chapter 5 is where the book switches gears from an archival and interview project to an archaeological survey, describing artifacts—mostly uniform items and personal effects—found on the former site. Chapter 6 focuses on landscape features built by prisoners, a fascinating variety of fountains and statues. This chapter also describes the camp's buildings—both the standard "government issue" buildings and prisoner modifications—such as a theater complete with stage and orchestra pit. Chapter 7 includes an interesting editorial from the final issue of the camp newspaper and briefly tells what some of the prisoners did with their postwar lives.

This book offers good insights into the specifics of the Hearne POW camp as well as an understanding of the network of POW camps across our country in World War II. Students of Texas history will learn how the camp affected a small town and how the prisoner labor helped local farmers. I highly recommend this easy-to-read, yet very informative volume.

Scott D. Murdock, Historian, Arlington, Texas.



Rattler One-Seven: A Viet Nam Helicopter Pilot's War Story. By Chuck Gross. Denton: University of North Texas Press, 2004. Maps. Photographs. Notes. Glossary. Bibliography. Index. Pp. xiii, 229 \$27.95 ISBN: 1-57441-178-0

From May 1970 to May 1971, Chuck Gross piloted a helicopter in Vietnam, logging more than 1,200 hours of flight time and becoming a Senior Aircraft Commander (SAC). After the war he became a pilot for American Airlines and recently retired as a 767/757 Captain. This is his first book.

Gross starts off by talking about how he became an Army helicopter pilot and describing the transition from civilian life to the Army and the training he received in flight school. He then writes about what it was like to be a "newbie," or the newest guy in the company, and all the harassment he was expected to take from more senior company members. For the first several weeks, Gross flew missions and was never fired upon by the enemy. Suddenly, he got his "cherry"—the first mission in which his air-



INTO THE WILD BLUE YONDER

My Life in the Air Force

ALLAN T. STEIN

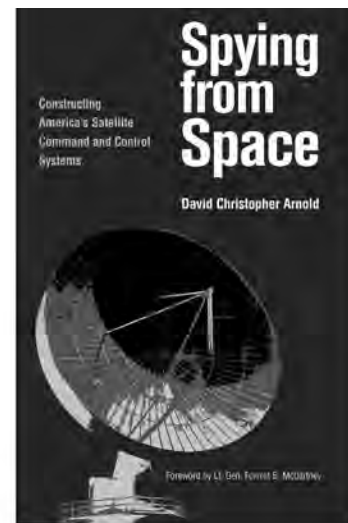
By the time he retired as a lieutenant colonel in 1969, Allan T. Stein had flown everything from BT-13s and B-24s to B-52s and C-47s. He flew missions over China and the Sea of Japan during World War II, spent a year in Vietnam helping to monitor and locate Vietcong units, and ended his career as inspector general of the Civil Air Patrol. Here he offers an account of his career as an air force officer. \$29.95



FROM THE PILOT FACTORY, 1942

WILLIAM P. MITCHELL

As a result of the need for manpower in the skies during World War II, the U.S. Army Air Force trained over 193,000 men as pilots between 1939 and 1945—making it a veritable “factory.” William Mitchell’s wartime letters share his experiences first at the pilot factory and then as an enlisted pilot and give glimpses into an era that now seems innocent and naïve. \$32.95



SPYING FROM SPACE

Constructing America's Satellite Command and Control Systems

DAVID CHRISTOPHER ARNOLD

Arnold tells the story of how military officers and civilian contractors built the Air Force Satellite Control Facility (AFSCF) to support the National Reconnaissance Program. These organizations made possible the development of the command and control systems that made rockets and satellites useful. This book offers a revealing look into a little-known aspect of space history. \$48.00



New in Paper:

AMERICAN MILITARY AVIATION

The Indispensable Arm

CHARLES J. GROSS

Gross traces the development of American military air power from the Wright brothers' triumph to the air war for Kosovo. He explains the roles of politics, economics, and technology in shaping U.S. air power. The evolution of the air arms of each of the different services and analyses of military budgets are also provided in this book that has been adopted as a standard text in Air Force ROTC programs.

\$19.95 paper

TEXAS A&M
University Press

www.tamu.edu/upress

800-826-8911

Fax: 888-617-2421

craft took enemy fire—and it was non-stop action from then on.

The book covers thoroughly the differences between flying regular missions and flying special operations and also how Gross felt meeting the new newbies and saying goodbye to those who died or left to go back to the States. An interesting part of the story is his description of what it was like taking orders from commanding officers who were simply “irrational” and how he dealt with their idiosyncrasies. He was elated when he was selected as a SAC and describes his concept of aircraft command. For example, some SACs would let their gunners shoot at anything they wanted to, even if they knew that the enemy was miles away from their position. Gross’s door gunner, Callahan, was a good man who would never fire on a ground target unless it was confirmed as hostile. He and Gross worked together very well. One idea that comes out well is how some missions went smoothly, while others were complete disasters. Gross describes, for example, how the orders of incompetent commanders contributed to the shooting down of several of his company’s helicopters and the subsequent waste of American lives. Also included in the book are stories of R & R and what it was like to go home.

Unlike the typical “John Wayne character,” Gross was very humanistic and sensitive. This 19-year-old warrant officer wrote about his feelings as well as the facts as to what happened to him during his tour of duty. This is a very personal book; Gross waited 33 years before he could write it. The final passage in his chapter called “Homeward Bound” demonstrates this and is well worth quoting. Gross had come home the night before and was just beginning to read—just to the civilian world and family life again. It was his first full day home in well over a year and everyone else had gone out. “It was late afternoon, and the new turntable was spinning Gordon Lightfoot’s ‘If You Could Read My Mind.’ As I sat there alone in the darkening light, listening to the music, I suddenly realized that I would never be able to go home, for home was what I had held in my mind for the last three years, but life stops for no one. I looked around the small, empty room, and cried.” This is an excellent book and well worth reading.

William A. Nardo, NASM Docent



Commandants of the Marine Corps. By Allan R. Millett and Jack Shulimson, eds. Annapolis, Md.: Naval Institute Press, 2004. Notes. Bibliography. Index. Photographs. Pp. xx, 380 \$55.00 ISBN: 0-87021-012-2

Colonel Millett is a well known and respected writer of military history, with several books on the U.S. Marine Corps to his credit. Shulimson is not as well-known but also has a background that is particularly pertinent to this work. The other eighteen contributors have impressive credentials as well, and some will be widely recognized.

The essays of 27 commandants range in length from 10-30 pages, with a mean of about 17. This makes the case studies here much longer and comprehensive than those found in somewhat similar compilations such as *Commanding Generals and Chiefs of Staff*, *Four Stars*, and *Dictionary of Admirals of the U.S. Navy*. Those are limited to a page or two, are factual, and may give a line or two to “career highlights” or major accomplishments during key assignments.

In this book, however, each chapter is intended to cover the background and personality that led to the individual’s selection as Commandant, how he performed there, and what the historical significance was of

Lancaster Index to Defence & International Security Literature

Air Power History (along with its predecessor *Aerospace Historian*) is one of nearly 350 publications indexed and abstracted in the bibliographic database *Lancaster Index to Defence & International Security Literature*. This information is produced by Military Policy Research Ltd., of Oxford, England, and can be found at www.mpr.co.uk. It contained over 90,000 citations and abstracts as of the end of May 2002, and is increasing at the rate of around 10,000 per year.

The *Lancaster Index* database is primarily designed for information professionals in the defense and security sector, and can appear somewhat daunting to the casual visitor. A look at the User Guide, downloadable from the site, is recommended. Free access, using the global index, scans the whole database, but returns literature citations that exclude the volume, issue, and page references. Researchers who need these references for serious research purposes will need to take out a paid subscription. Individual rates range from \$9.95 for a 24-hour pass to \$99.95 for a 365-day pass.

Military Policy Research Ltd.

his service. It is common boilerplate, in commenting on collections from different authors, to state that not all items can be of equal quality. In this instance, variations add a refreshing change of pace. The differences relate mostly to the characteristics of the subject and the era in which he served.

The reports end with General Barrow, June 30, 1983. The editors determined that it was too soon to give a dispassionate evaluation of more recent incumbents since some papers are not available or even written and certain things remain classified. It would have made the book more useful if a compromise could have been reached. A red flag could have been raised or a warning label attached that the final entries would be of a different character. They could have been limited to factual biographical data, without judgmental evaluation.

I made no effort to cross check the information in the essays. However, I did turn to Venson's *The United States in the First World War: An Encyclopedia* to find a date for George Barnett and found some statements that might have been pertinent to the summary about him.

There are many books and articles about the Marine Corps, and I have read a fair share. I'm a life member of the Marine Corps Association and, thus, a reader of the *Gazette*, possibly going back to when I attended the Amphibious Warfare School at Camp Pendleton while Chesty Puller headed it. I have limited shelf space for more books, but I plan to keep this one. History is well told by the lives of leaders, and this book serves that purpose.

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



Hit to Kill: The New Battle over Shielding America from Missile Attack. By Bradley Graham. New York: Public Affairs, 2003. Photographs. Notes. Glossary. Index. Pp. 445. \$18.00 Paperback. ISBN 1-58648-209-2

Hit to Kill recounts the evolution of America's national missile defense, from the systems tentatively fielded in the 1960s to the programs established by President George W. Bush early in his administration. Bradley Graham, a writer and editor for the *Washington Post* for more than twenty years, has focused on national security and international affairs since the early 1990s. He has combined his extensive reporting background, in-depth research, and exceptional access to key military and civilian leaders to produce a detailed story of how technology, policy, and politics have shaped U.S. missile defense from its inception.

In other fora, Graham has expressed his personal views and opinions on missile defense, but *Hit to Kill* is an unbiased, factual history. By treating all the partici-

pants—whether they are proponents or opponents of missile defense and without regard to political affiliation—in an even-handed fashion, he has succeeded in producing a clear account of a complex story.

Graham depicts the history of American missile defense as the result of interaction among several parallel threads: the real or perceived ballistic missile threat posed by current and potential enemies; the judgments of political and military leaders regarding how to deal with the threats; the constraints imposed by existing international treaties; and the ability of industry to develop and build effective, affordable defense systems.

At first glance, the question of whether a missile defense system is needed seems clear. Surely the U.S., faced with the USSR's significant ICBM capability in the 1960s, should deploy a system to defend itself against such attack. But Cold War logic did not support this seemingly straightforward view. To the contrary, the U.S. and USSR concluded that the best defense is a good offense, and determined that mutually assured destruction (MAD)—where each side had sufficient offensive capability to eradicate the other—was the best way to deter use of ICBMs. By allowing a national leader to believe, rightly or wrongly, that his nation could survive a counterattack, the fielding of missile defense systems might actually increase the likelihood that offensive nuclear missiles would be used. This led to the 1972 Anti-Ballistic Missile (ABM) treaty which limited the number of missile defense sites to two each in the U.S. and USSR (subsequently reduced to one per nation).

The treaty limitation, coupled with MAD, might have been sufficient to maintain the status quo between the two superpowers, but the emergence of potential new threats from other nations (most notably China, North Korea, and Iran) caused the U.S. to reenergize its missile defense efforts. Throughout much of the 1980s and 1990s, attention was focused on technological challenges and treaty issues.

After debating the relative merits of space- and ground-based systems, decision makers determined that a ground-based system offered the greatest likelihood of early deployment. The technical challenge was considerable. Simply stated, the task was to detect a speeding bullet in the atmosphere, discriminate between the incoming warhead and dozens of decoys, and then kill the warhead with another speeding bullet. Developers made reasonable progress, but found it difficult to keep pace with an overly optimistic schedule that reflected political and treaty concerns. After some near misses and some well-publicized and expensive failures, the "hit-to-kill" capability was successfully demonstrated in 1999.

On the treaty front, policy makers in the Pentagon, State Department, and White House devoted considerable time and energy

to determining how far they could go in building and deploying system components without violating the ABM treaty. This was a major issue, because an effective nationwide defense system, even one designed to counter limited threats, required at least two sites. The question of treaty compliance was resolved three months after the September 11 terrorist attacks when President Bush informed Russia that the U.S. would withdraw from the ABM treaty. As the book closed in late 2002, the ground-based system had been successful on five of eight intercept tests, ground had been broken on a site in Alaska, and the President had announced plans for a second site in California.

Although *Hit to Kill* is essentially a history book, it is far more readable than one might expect of that genre. Much of the book focuses on the Pentagon (arguably the world leader in producing a unique vocabulary and acronyms), but the text is remarkably free of jargon and "Pentagonese." A glossary defines the essential terminology, and the book is further enhanced by sections that identify the key players and provide a chronology of the major political and technological milestones in the evolving history of America's missile defense.

Graham does an excellent job of weaving the threads that constitute the story. For anyone who wants both a clear understanding of how the nation's missile defense program has evolved over time and a solid foundation for understanding future developments in missile defense, *Hit to Kill* is a great place to start.

Lt. Col. Joseph Romito, USA (Ret.)



Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914-1945. By Tami Davis Biddle. Princeton and Oxford: Princeton University Press, 2004 [original edition, 2002]. Notes. Bibliography. Index. Pp. viii, 406. \$19.95 Paperback ISBN: 0-691-12010-2

In this much anticipated study, Biddle examines the ideas that shaped the strategic bombing campaigns of the U.S. and UK in World War II. She argues, "The history of strategic bombing in the twentieth century is a history of the tension between imagined possibilities and technical realities." The strength of this study comes not from this obvious thesis but from its comprehensive sweep.

On a number of sub-issues, though, Biddle offers revisionist accounts. She dismisses the usual suspects in the story of air power theory. "Billy" Mitchell is just an "energetic publicist," noting that he "never articulated a coherent body of doctrine that devolved from consistent theories or logical postulates." She also gives the Italian theo-

rists, Giulio Douhet and Count Gianni Caproni, short shrift. Douhet's writings were dramatic, which is why English-speaking theorists cited him. But they were doing so to bolster ideas that they had already reached.

Biddle instead argues that a number of lesser recognized individuals in the realm of aviation developed the ideas that turned into strategic bombing doctrine. The most significant of these figures include Gen. Jan Christian Smuts (future Prime Minister of South Africa), Sir Hugh Trenchard, and Viscount Tiverton/the Earl of Halsbury (two different titles for the same individual). These three individuals, and several others, developed most of the core ideas that became the strategic bombing doctrine for the RAF and Army Air Forces. The coverage in this study leans more towards the British in both number of pages and importance; no American reaches the level of significance of the British theorists.

The airmen in both of the English-speaking countries were convinced that enemy societies were vulnerable to sustained military pressure. The major difference between the British and American the-

ories was the nature of the vulnerability. The strategists in the two countries did a good deal of mirror imaging. The Americans in a reflection of the boom of the 1920s and the bust of the 1930s focused on what might now be called the industrial web, looking for economic vulnerabilities that they could incapacitate with precision strikes. Since the United Kingdom is a more class-conscious society, British strategists were looking to put pressure on the social divisions of their foes.

Biddle also shows that neither air force really made any effort to test these theories. Professional military education in both services was disappointing. Athletics was particularly important at the RAF Staff College at Bracknell, while horseback riding was important both there and at the Air Corps Tactical School at Maxwell Field. With little analytical rigor both services became dogmatic in their commitment to strategic bombing. There was, though, more classroom thoroughness at Maxwell than at Bracknell. This makes one wonder why Biddle devotes so much coverage to the British side of the story.

In the end, strategic bombing ideas held


up poorly in the test of combat. The combined bomber offensive was more of a contest between the two English-speaking air forces than a coordinated attack. The Germans came quite close to defeating both before attrition took its toll on the *Luftwaffe*. Biddle, instead of summarizing her argument in a long conclusion, wanders from her topic and shows that USAF leaders tried and failed to employ strategic bombing in the wars that followed.

Biddle provides her readers with a solid summary of how theories of air power changed during the first forty years of aviation history. This book should be considered the first stop for serious readers interested in a comprehensive survey.

Nicholas Evan Sarantakes, Ph.D., Air War College, Maxwell AFB, Alabama.



Royal Air Force Historical Society Journal 32: Air Power: Anglo-American Perspectives, 21st October 2003. By C.G. Jefford, ed. Northmoor, UK: Advance Book Printing, 2004. Tables. Diagrams. Illus-



AIR★POWER

New books from Texas A&M

100 YEARS OF AIR POWER AND AVIATION

ROBIN HIGHAM
Higham presents a critical history of British, American, Soviet, German, Italian, French, Japanese, and Israeli air power and aviation. In the process, he uncovers the social, economic, and political components; the lessons learned during wartime; the composition of air forces; and the creation of aviation industries. "Students of all levels—begin or continue your exploration here."—Stephen L. McFarland. 8 1/2x11. 480 pp. 398 b&w photos. \$50.00

THE BIRD IS ON THE WING

Aerodynamics and the Progress of the American Airplane
JAMES R. HANSEN
Hansen presents an easily understandable overview of the research and design processes that gave rise to historic American aircraft such as the DC-3, X-1, and 747. 54 b&w photos. 240 pp. \$50.00 cloth; \$24.95 paper

TEXAS A&M UNIVERSITY PRESS

College Station, Texas
Orders: 800-826-8911
Fax: 888-617-2421
www.tamu.edu/upress

Illustration courtesy NASA

trations. Photographs. Notes. Appendices. Glossary. Bibliography. Pp. 169. Paperback ISBN: 1361-4231

The Royal Air Force Historical Society is the British counterpart to the Air Force Historical Foundation. In 2003 these two organizations sponsored a conference at the RAF Museum in Hendon. This book presents the proceedings of this conference.

The thirteen articles that make up this volume appear in chronological order from World War I to the Gulf War I. The authors are both American and British. Although a number of these individuals hold advanced degrees, almost all of them are officers (both retired and active) in the two services under investigation. There is nothing wrong with this employment, but it speaks volumes about the limited number of people studying aviation and air power history in both countries.

The quality and focus of these articles vary significantly. Only two of them are the product of extensive research in primary source material. Several of them are speeches from serving and retired RAF officers rather than informed studies. The topics include such diverse topics as mechanic training programs, air support cooperation in the North African campaign, U.S. missile deployment in England, RAF-USAF rivalry in occupied Germany, and issues of command and control during the Gulf War.

A major theme that emerges from all but one of the accounts is that cooperation has been the rule rather than the exception in the military-to-military relations of these two services. From World War I until the middle of World War II, the RAF was the dominant service, sharing its knowledge and experiences with its American cousins. The only dissenter from this view of the "special relationship" is Air Vice-Marshal Stuart Peach. He sees a good deal of rivalry in issues of doctrine, tactics, and targeting between the two air forces in Cold War Germany. This near consensus on the trans-Atlantic partnership runs counter to a dominant theme in the field of diplomatic history—that differences developed between two services representing two nations is hardly surprising, but that they never became major disputes—is interesting.

Another theme that emerges from these articles that explains the absence of a major confrontation like those that took place between the British, French, and U.S. armies in World War I is that there has always been a more powerful air force in the relationship, and it was the dominant partner that established the parameters of how they would work together. Despite America's great industrial resources, the nation either refused or was unable to produce a strong air force even as late as the first half of World War II. It was only in the middle stage of that conflict that the two air forces were roughly equal. Otherwise the senior partner made all the major decisions.

A final theme that emerges from these studies is the diversity of subject matter within the field of air power history. This field includes accounts ranging from logistics to air transport or officer exchange programs to command and control issues. There is clearly plenty of room for people interested in writing air power history that focuses on either of these two air services.

Nicholas Evan Sarantakes, Ph.D., Air War College, Maxwell AFB, Ala.



Billy Mitchell "Stormy Petrel of the Air." By Roger G. Miller. Washington D.C.: Air Force History and Museums Program, 2004. Photographs. Appendices. Pp. 58. [Pamphlet]

This is a 6 x 9 inch paperback monograph written for the 100th Anniversary of Flight. It is a compromise between a highlights article and an in-depth biography that is convenient and easy to read and will satisfy the interest of people wanting to gain a reasonable degree of insight into Mitchell and his accomplishments.

Miller's style is straightforward as he moves chronologically through Mitchell's life, briefly covering supporting information, while focusing on critical events and people. Although Mitchell entered the Signal Corps in 1898, the bulk of the book centers on the period from 1916, when Major Mitchell was appointed deputy head of the Aviation Section (his first aviation duty), to his court martial in 1925. Miller highlights incidents early in Mitchell's career that prepared him for aviation and shaped him as an officer, provides a detailed account of his relationships with peers and superiors, and provides specifics of his accomplishments in establishing the U.S. Air Service for the Allied Expeditionary Force.

Serving as the head of Air Service Operations and Training under Maj. Gen. Charles Menoher after the Great War gave Mitchell the opportunity to refine his vision of an independent air force. As in all of his assignments, Mitchell's brilliance in operations and doctrine was compromised by his flaws of alienating key superiors and bypassing the chain of command. Throughout the post-war period when Mitchell fought for recognition, funding, and independence of air power, he achieved equal measures of stunning successes and colossal failures equally publicized. Menoher was relieved of duty over a controversy caused by Mitchell; but his next boss, Maj. Gen. Mason Patrick, managed to keep a lid on Mitchell until he angered both Secretary of War Weeks and President Coolidge, which led to his court martial.

The last two pages briefly summarize the impact Mitchell had on military aviation. His contributions to shaping the culture of military aviation as it evolved from

Aviation Section to Air Service to Air Corps are treated superficially. Events that earned Mitchell publicity and notoriety are well covered such as the bombing trials that sank the battleship *Ostfriesland* and led to both Army strategic bombardment and Navy aircraft carrier capabilities. While not a scientist or engineer, Mitchell had a keen awareness of the value of R&D, and he enlisted the cooperation of scientific and industrial leaders, establishing a pattern of investment and experimentation that persists today. Although Miller pays attention to the smaller scale, such as development of bombs and bomb dropping tactics, the larger dimension is not discussed.

While a good assortment of photos is included, the captions repeat the main text adding no value. A map of the key area of France during the action in September-October 1918 from St. Mihiel to the Meuse-Argonne would have helped the reader understand force dispositions and major movements during the period when Mitchell commanded 1,481 allied aircraft in one of the first major joint air-ground operations. While sustaining losses of up to 100 aircraft per day, Colonel Mitchell demonstrated the command abilities that led to his field promotion to brigadier general and also demonstrated courage and leadership while personally flying daily reconnaissance missions that earned him a Distinguished Service Cross.

Despite its relatively minor flaws, Miller's text is well worth reading for an intermediate depth understanding of this key figure in aviation history.

Jim Schier, Docent, NASM's Udvar-Hazy Center, Dulles, Virginia.



Chasing the Silver Bullet: U.S. Air Force Weapons Development from Vietnam to Desert Storm. By Kenneth P. Werrell. Washington, D.C.: Smithsonian Books, 2003. Photographs. Index. Pp. Vi, 346. \$37.95. ISBN 1-58834-116-X

The author states up front (p. 7) that his study attempts to answer two key questions. First, how did the USAF develop and exploit technology during the period 1960 to 1991? And second, how did technology affect USAF performance during that same period? Werrell notes that since its beginnings the Air Force remained riveted to its mission of strategic bombardment at the expense of all else. So the major theme of the study is how the USAF, designed for one kind of warfare, found its technology flawed in the Vietnam War, and how it got back on the right track to field superior technology and a world-beating force in the Gulf War. Dr. Werrell lists the types of air force weaponry to include fighters, bombers, missiles, munitions as well as space activities and traces their historical evolution func-

tional and actual uses. He mentions (p.15) how the F-105 could not overcome the limitations of its basic design, the peculiar conditions of the war, the role in which the F-105 served, or American tactics, which underscore the point that technology must be appropriate for conditions. In other words, the Thud was an excellent aircraft for its designed mission, but a poor one for the mission it actually flew in Vietnam.

He notes that the C-47 gunship proved a much more practical weapon as did the C-130 for its service in Vietnam. And he speaks plainly about the F-4 (p. 42), the most important American air superiority fighter during the war. Operated by the Air Force, Navy, and Marines, the F-4 flew 26 percent of all U.S. combat and combat-support sorties and scored most of the air-to-air victories, 107.5 of the 137 Air Force claims and 44 of 67 Navy-Marine claims. McDonnell, the plane's manufacturer built more than 5,000 F-4s. It became the dominant American fighter until the F-14 and F-15 appeared in the mid-1970s.

Werrell observes that air superiority in the Vietnam War was difficult to claim and maintain, especially when the envisioned combat was not dominated by long-range missiles, but rather close-in, highly maneuvering dogfights in which missiles were difficult to use for fear of hitting friendly aircraft. So air battles were mostly air-to-air combat as they had been in previous wars. Thus, in keeping to his theme the author simply states that American aircraft proved inadequate in a conflict for which they were not designed.

As with the aircraft and aircrews, the missiles were in a war for which they were not designed (p. 45). The USAF was woefully unprepared for the SAM (surface-to-air missile) missile during the Vietnam War. Air Force technology proved inadequate in a conflict for which it had not prepared. Air Force fighter pilots barely achieved a positive air-to-air, kill-to-loss ratio, even by their own count. The Communists effectively used the small and nimble MiGs, directed by ground radar, to harass and harry American strike packages and make air operations more difficult and expensive (p 54). While acknowledging that the Air Force performed reasonably well in the difficult situation in Vietnam, Werrell states that USAF technology proved inadequate in both unexpected roles (guerrilla warfare in South Vietnam and interdiction in Cambodia and Laos) and the traditional one (air superiority over North Vietnam). He acknowledges that the Air Force technology may have been good for battle, but not for the battle that was fought (P. 54).

Werrell gives much credit to a group of reformers led by a lone Air Force officer, Col. John R. Boyd, who observed (p. 58) that high technology promised more than it delivered. Boyd believed that the more complicated and costly the weapon, the poorer it performed in combat. The reformers' criticisms

led to a new air superiority fighter (F-15), as well as to an experimental lightweight fighter that grew into the F-16.

The author takes the reader through the development of the FX (F-15) and the AX (A-10), from conception to end product or first flight, and from the disastrous cost overruns of the C-5A and the F-111 through the fly-before-buy philosophy of Defense Secretary Melvin Laird and his Deputy Secretary of Defense David Packard, who sponsored prototyping.

A major theme expressed in this book is that the Air Force's focus on bombers between 1945 and 1989 resulted from the national priority assigned to the Cold War and nuclear weapons. The AAF became America's sole deliverer of nuclear weapons when it dropped two atomic bombs on Japan in 1945, and the USAF maintained that role for about a decade and a half. Since then, nuclear-armed, manned, penetrating bombers have declined in importance as other delivery systems have gained prominence (p. 270).

One area of Air Force neglect was in air munitions. The USAF has consistently focused more on flying than fighting, more on airframes than air munitions. But the Air Force would definitely improve. Indeed, by the time of the Gulf War the USAF had incorporated space-based guidance, the global positioning system (GPS) into its conventional air-launched cruise missile, thus giving it a fair-and foul-weather, day-and-night, very accurate, conventional weapon. PGMs were more expensive than the munitions they supplemented, but they were cost-effective (p. 272).

There were many restraints on the development of technology aside from the technical issues. Within the Air Force there were issues concerning doctrine, training, intraservice rivalry, and responses to outside funding limitations. From the outside, civilian control sometimes overrode military advice because of issues such as bureaucratic maneuvering, economics, partisan politics, or maintenance of the industrial base (p. 276).

The Gulf War demonstrated that American technology not only worked, it made significant contributions to victory. Airlift and aerial refueling gave the USAF the ability to reach even remote and underdeveloped theaters of operations. Satellites provided weather and intelligence information that, coupled with precision-guided weapons, greatly increased air power's effectiveness by enabling it to hit important targets, while sparing civilians and their housing (p. 279).

So, this is a history of the plusses and minuses of Air Force weaponry. Here are the reasons why certain weapon systems were chosen over others and how requirements changed and quick fixes were instituted. *Chasing the Silver Bullet* is an excellent history of the weaponry with less reliance on the strategic theory. In a sense, this book is a

testimonial to the official Air Force history program since its pages are laden with references to many oral history interviews, monographs, and technical studies from all aspects of Air Force history to include major commands and field units. Without these works Werrell's book would not have been possible. Indeed, it is a greater tribute to the Air Force for supporting its history function. My only issues concern some of the footnotes. The author should have credited the interviewers of the oral histories and all authors of studies cited.

Dr. George M. Watson, Jr., Air Force Historical Studies Office, Bolling AFB, Washington, D.C.



Woodbine Red Leader: A P-51 Mustang Ace in the Mediterranean Theater. By Lt. Gen. (Ret) George Loving. New York: Ballantine/Presidio Press, 2003. Map. Diagram. Illustrations. Photographs. Appendices. Glossary. Pp. viii, 292. \$6.99 paperback. ISBN: 0-89141-813-X

Gen. Loving has put together a great story in this book. Here, in the words of a combat pilot with 151 missions under his belt, is a story seldom written about—the air war in the Mediterranean Theater of Operations. With the notable exception of the heavy bomber attacks against Ploesti, this theater just did not get the coverage that the Eighth Air Force's war over western Europe received (but then, no area received the coverage the Eighth did). And Loving has a unique perspective. While the subtitle states he flew Mustangs, it does not indicate that the general's first 101 combat missions were flown in Spitfire Mk V and IX aircraft.

In one way, the book is typical of the I-was-there books written by many pilots in World War II. But a far higher percentage of this one is devoted to flying and combat service than most. Loving covers his early life in eight pages, and the book ends with his leaving the combat theater for the U.S. It is not a life history. Rather, it is a rich chronological narrative of sixteen months of flying training and ten months of combat.

One of the great features of the book is the excellent overview of pilot training from indoctrination as Aviation Cadets in Class 43-C through primary, basic, and advanced flight training, introductory fighter training, and type training in the Spitfire in North Africa. Loving then flew all of his combat with the 31st Fighter Group, joining this distinguished unit as a 20-year-old in October 1943 at Pomigliano Airdrome in Naples. For the first five months, his combat experience was primarily one-and-a-half to two-hour patrols and fighter sweeps over the slowly moving combat line, particularly over the Anzio area. He was gaining experience that would be invaluable for his next combat phase.

The 31st was reequipped with P-51Bs in the early spring of 1944 and moved to San Severo northwest of Foggia. This was to be a new ballgame involving bomber escort missions deep into Germany, Hungary, Romania, Austria, and France—missions that lasted up to six hours each. During this time, he flew as an element, flight, squadron, and even group leader (he celebrated his twenty-first birthday on mission 145, leading the entire group) and racked up five kills along with several enemy planes damaged. By far, one of his most interesting experiences was the third time USAAF used bases in the Soviet Union. In July 1944, the group escorted P-38s on ground attack missions and then continued on to a base in the Ukraine. For three days, this force helped soften up enemy forces for the advancing Soviet army in Poland. Everything about the mission—navigation, living with the Soviets, the primitive conditions, and the combat—is fascinating.

Loving uses one other feature I liked. At the beginning of many of the chapters, he gives a short synopsis of what's going on in the war around the world, putting his part of the action into perspective. For a good, easy read on an interesting piece of World War II aerial combat, this is an excellent book on which to spend several evenings.

Col. Scott A. Willey, USAF (Ret.), NASM Docent and Volunteer



Franklin Delano Roosevelt, Champion of Freedom. By Conrad Black. New York: Public Affairs, 2003. Photographs. Notes. Bibliography. Index. Pp. vii, 1280. \$39.95 ISBN: 1-58648-184-3

The culmination of decades of research, this work is a major achievement. A huge volume, it is also an arduous but enjoyable and rewarding read. Unfortunately Black was the subject of a major scandal involving his British publishing empire just at the time the book was published. However, that should not distract the reader, since Black weaves a remarkable story of a remarkable man who dominated American and world politics for so many years and whose influence is still felt and debated around the world. While Black very much admires Roosevelt, he is also keenly aware of his many shortcomings and describes them in considerable detail. He contends that Franklin Roosevelt was the most important person of the 20th century, one of America's greatest presidents, and its most accomplished leader since Abraham Lincoln. His greatness rests on seven achievements:

He, along with Winston Churchill, saved Western civilization. Because of his leadership, the U.S. was able to support the British so they could withstand the German onslaught until we could apply our might to the defeat of Germany and Japan. He anchored the U.S. in the world and permanently defeated the isolationism that had so long plagued America's international relationships.

He reinvented the American state. Before he could bring the U.S. into the international arena where it could defend its interests and assume its responsibilities, Roosevelt had to bring the nation out of the Great Depression. In doing so he involved the government in many areas where its presence had been limited or non-existent: industrial recovery, Social Security, reform of financial institutions, rural electrification, flood and drought control, stabilization of farm prices, conservation, refinancing of home mortgages and farm loans, reform of

working conditions, public sector development and distribution of hydroelectric power, generous treatment of veterans, as well as the repeal of Prohibition.

He was a uniformly successful war leader, far more so than Washington, Madison, Lincoln, or Wilson. After their initial defeats, American forces were never defeated. Even in the early days, engagements such as Midway were great victories even though American forces were outnumbered. His great strategic vision set the overall American strategy; and his superb selection of wartime leaders such as Marshall, Eisenhower, Nimitz, and King provided American forces with the leadership to prevail in the greatest war that our nation has ever fought.

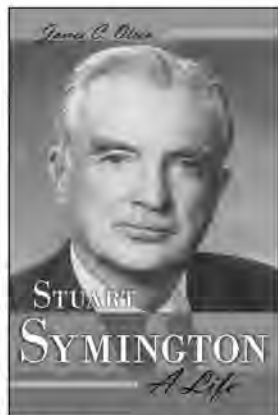
He created the institutions and circumstances that allowed the U.S. to complete the Allied victory, to rebuild a shattered world, and to make the world safe for democracy.

He was a master of the American political system. Churchill never led his party to victorious election. Roosevelt faced the voters four times, never lost touch with the American people, and was able to legitimize his goals and policies.

Perhaps his greatest achievement was his ability to overcome adversity. To have been stricken with polio and permanently crippled, and then to overcome such adversity to become the greatest leader of his generation, is almost beyond belief.

Black's prose, meticulous scholarship, and thoroughness in weaving his tale are amazing. I highly recommend this volume to anyone whose interests include American civilization, World War II, and the current debates of American social policy.

Col. John R. Braddon, USMC (Ret.)



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

www.system.missouri.edu/upress

UNIVERSITY OF MISSOURI PRESS

Phone: 1-800-828-1894

Books Received

Aleshire, Peter. *Eyes of the Viper: The Making of an F-16 Pilot*. Guilford, Ct.: The Lyons Press [An Imprint of the Globe Pequot Press], 2004. Photographs. Bibliography. Pp. xxiii, 272. \$22.95 ISBN: 1-59228-260-1

Alexander, Thomas E. *Rattlesnake Bomber Base: Pyote Army Airfield in World War II*. Abilene, Tex.: State House Press, 2005. Maps. Photographs. Notes. Bibliography. Index. Pp. 216, \$ 18.95 Paperback ISBN: 1-880510-90-1

Bednarek, Janet R., Ed. *Generations of Chevrons: An Enlisted History through the Experiences of the Chief Master Sergeants of the Air Force*. Washington, D.C.: Air Force History and Museums Program, 2004. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xii, 241. \$32.00 ISBN: 0-16-072421-X

Buck, Bob. *North Star over My Shoulder: A Flying Life*. New York: Simon & Schuster, 2002. Photographs. Index. Pp. 446 \$15.00 Paperback ISBN: 0-7432-6230-1

Elder, Donald C. and George S. James, Eds. *History of Rocketry and Astronautics: Proceedings of the Thirty-First History Symposium of the International Academy of Astronautics, Turin, Italy, 1997*. [AAS History Series, Volume 26.] San Diego, Calif.: Univelt, 2005. Tables. Diagrams. Illustrations. Photographs. Notes. Index. Pp. xviii, 412. \$70.00 Paperback ISBN: 0-87703-519-9

Gilster, Herman L. *Vietnam Diary: From Inside Air Force Headquarters*. Pittsburgh, Pa.: Rose Dog Books, 2005. Maps. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. viii, 361. \$30.00 Paperback ISBN: 0-8059-9440-8

Hasegawa, Tsuyoshi. *Racing the Enemy: Stalin, Truman, and the Surrender of Japan*. London and Cambridge, Mass.: Belknap Press of Harvard University Press, 2005. Maps. Photographs. Notes. Index. Pp. ix, 382. \$29.95 ISBN: 0-674-01693-9

Hearn, Chester. *Sorties into Hell: The Hidden War on Chichi Jima*. Guilford, Ct.: The Lyons Press, 2005 [c 2003 by Chester G. Hearn] Maps. Tables. Diagrams. Illustrations. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xvi, 226. \$14.95 Paperback ISBN: 1-59228-687-9

March, Peter R. and Howard J. Curtis. *Military Aircraft Markings, 2005*. Hersham, Surrey, UK: Ian Allan, 2005. Tables. Photographs. Notes. Glossary. Bibliography. Pp. 224. \$14.95 Paperback ISBN: 0-71103052-9

Peebles, Curtis. *Twilight Warriors: Covert Air Operations against the USSR*. Annapolis, Md.: Naval Institute Press, 2005. Notes. Glossary. Bibliography. Index. Pp. xv, 330. \$29.95. ISBN: 1-59114-660-7

Rolfe, Mel. *Flying into Hell: The Bomber Command Offensive in World War Two as Witnessed by the Crews Themselves*. London: Grub Street, 2004. Photographs. Glossary. Bibliography. Index. Pp. vi, 186. \$19.95 Paperback ISBN: 1-904010-89-X

Rickman, Sarah Byrn. *Flight from Fear*. [A Novel] Santa Fe, N. Mex.: Disc-Us Books, 1996, Pp. 241. \$16.50 Paperback ISBN: 1-58444-273-5

Rickman, Sarah Byrn. *The Originals: The Women's Auxiliary Ferrying Squadron in World War II*. Santa Fe, N. Mex.: Disc-Us Books, 2001. Glossary. Bibliography. Index. Pp. 413. \$24.95 Paperback ISBN: 1-58444-264-6

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: scott-linda-willey@peoplepc.com

* Already under review.

Schrijvers, Peter. *The Unknown Dead: Civilians in the Battle of the Bulge*. Lexington: The University Press of Kentucky, 2005. Maps. Photographs. Notes. Bibliography. Index. Pp. xviii, 430. \$35.00 ISBN: 0-8131-2352-6

Smart, Jacob E., Compiler *Lowcountry Families in World War II: A Memorial*. Lexington, S.C.: Jasper County Historical Society, 2004. Maps. Appendices. Glossary. Bibliography. Index. Pp. xiii, 1169. \$46.00 ISBN: 1-887301-24-0

Walker, Chuck, with Joel Powell. *Atlas: The Ultimate Weapon*. Ontario, Canada: Apogee Books [Collector's Guide Publishing, Inc.], 2005. Maps. Tables. Diagrams. Illustrations. Photographs. Notes. Appendices. Glossary. Index. Pp. 308. \$29.95 ISBN: 1-894959-18-3

Ward, Bob. *Dr. Space: The Life of Wernher von Braun*. Annapolis, Md.: Naval Institute Press, 2005. Photographs. Notes. Appendices. Bibliography. Index. Pp. xiii, 282. \$29.95 ISBN: 1-59114-926-6

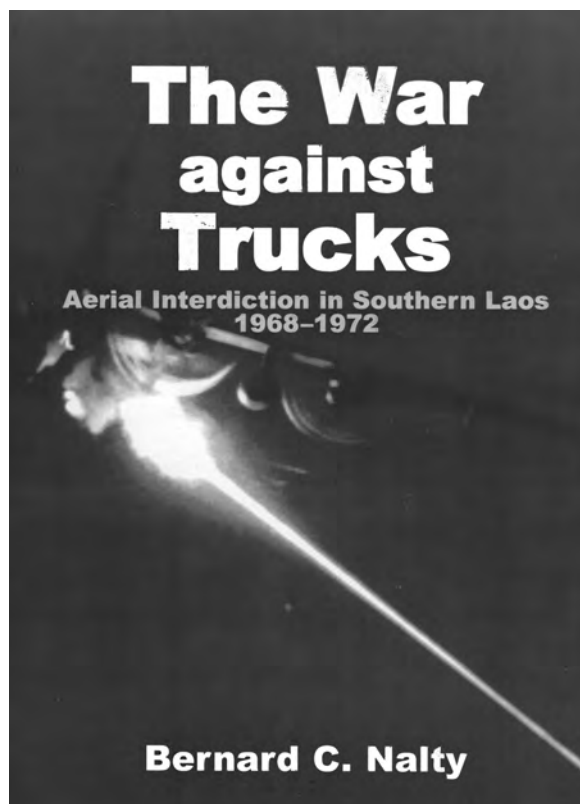
THEN THERE WERE SIX
by Karnig Thomasian
WWII veteran - gunner on
B-29 Superfortress
and a POW of the Japanese

The true story of the 1944 Rangoon Disaster...When only 1 of the 11 B-29s returned to its base...when 18 men died, and 29 airmen were captured by the Japanese. All this was the result of a very bad decision by our commanding officer which had a dramatic impact on the lives of 47 men.

Soft cover ____\$20 pus \$2.50 S/H. ea.
Hard cover ____\$26 pus \$2.50 S/H. ea.

Both books are 6" x 9" with 170 pages of my last mission and my POW experience including 26 photos and drawings.

Mail your order form with check to:
Karnig Thomasian
300 Continental Ave
River Edge, N.J. 07661
Phone: 201-262-2984



Available at
WWW.GPO.GOV

AIR
FORCE
History
and
Museums
PROGRAM

Coming Up



Compiled by George Cully

Sep 23-25

The **Great War Society** will hold its 16th Annual National Meeting at the Virginia War Museum in Newport News, Virginia. This year's theme commemorates the Society's 25th anniversary. Contact:

Dr Steve Gehrich
608 Grasson Lane
Fruitland MD 21826
e-mail: segehnrich@salisbury.edu
website: www.wfa-usa.org

Sep 24-25

Daniel Webster College will host its annual Aviation Heritage Festival at the Nashua Municipal Airport (adjacent to the college campus) in Nashua, New Hampshire. The program will include presenters on aspects of New Hampshire aviation history, displays, and an unusually large gathering of WWII-era military aircraft. Contact:

Daniel Webster College
20 University Dr.
Nashua NH 03063-1300
(603) 577-6000, fax -6001
e-mail: info@dwc.edu
website: www.dwc.edu/news

Sep 28-Oct 1

The **Society for Military History** will sponsor a slate of presentations at The Northern Great Plains History Conference to be held at the Plaza Hotel in Eau Claire, Wisconsin. Contact:

Joe Fitzharris
Department of History - Mail #4018
University of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105 USA
651-962-5734 fax: 651-962-6360
e-mail: jcfitzharris@stthomas.edu
website: personal2.stthomas.edu/jcfitzharris/NGPHC/

Sep 28-Oct 1

The **Society of Experimental Pilots** will host its 49th annual symposium and reunion in Anaheim, California. Contact:

SETP
P. O. Box 986
Lancaster CA 93584-0986
(661) 942-9574, Fax 940-0398
e-mail: setp@setp.org
website: www.setp.org

Sep 29-Oct 1

The **Canadian Science and Technology Historical Association** will hold its 14th biennial conference at the Canadian Museum of Science and Technology in Ottawa, Canada. Contact:

Edward Jones-Imhotep
Department of History
University of Guelph

Guelph (Ontario) N1G 2W1
Canada
e-mail: imhotep@uoguelph.ca
website: www.er.uqam.ca/nobel/r20430/ahstc-cstha/english/home.html

Oct 3-6

In honor of the 100th anniversary of its involvement with, and support of aviation in the U.S., the **Society of American Engineers** will sponsor 2005 SAE Aerotech Congress and Exhibition. Its theme is "Where Technology Takes Off," and it will be held at the Gaylord Texan Resort and Convention Center in Grapevine (Dallas/Ft. Worth region), Texas. Contact:

SAE International
400 Commonwealth Dr.
Warrendale PA 15096-0001
website: www.sae.org/aerotech

Oct 4-6

The **Space Foundation** and **Space News** will co-host Strategic Space 2005 in support of the U.S. Strategic Command; the event will be held at the Qwest Convention Center and Arena in Omaha, Nebraska. Contact:

The Space Foundation
310 S. 14th Street
Colorado Springs, CO 80904
(719) 576-8000, fax x8801
website: www.spacesymposim.org

Oct 5-6

The **U.S. Naval Institute** will host its 10th Annual Naval Warfare Symposium and Exhibition in Virginia Beach, Virginia. Contact:

U.S. Naval Institute
Beach Hall
291 Woods Road
Annapolis MD 21402
(410) 295-1067, Fax x1048
e-mail: frairbow@usni.org
website: www.usni.org/

Oct 5-9

The **National D-Day Museum** will host an International Conference on World War II with a theme entitled "The War That Changed The World." The conference also includes a World War II Film Festival; it will be held at the New Orleans Hilton Riverside and the Ernest N. Morial Convention Center in New Orleans, Louisiana. Contact:

The National D-Day Museum
945 Magazine Street
New Orleans LA 70130
(877) 813-DDAY, Ext. 226
e-mail: info@ww2conference.org
website: www.ww2conference.org

Oct 8-10

The **George C. Marshall Foundation**, working in conjunction with the **McCormick Tribune Foundation** and the History Department of the **Virginia Military Institute**, will host "From Quagmire to Détente: The Cold War from 1963 to 1975." The conference will be held at the Marshall Center in Lexington, Virginia. Contact:

Prof. Malcolm Muir, Jr.
Department of History
Virginia Military Institute
Lexington VA 24450
(540) 464-1224
e-mail: muirm@vmi.edu

Oct 14-15

The 2006 topic for the annual conference of the **Centre for Conflict Studies** will be "Terrorism in History: The Strategic Impact of Terrorism From Sarajevo 1914 to

9/11." This gathering will be held at the University of New Brunswick, Fredericton, NB, Canada. Contact:

Dr. David Charters
Centre for Conflict Studies
University of New Brunswick
(506) 453- 4587, Fax (506) 447-3175
e-mail: charters@unb.ca
website: www.h-net.org/announce/show.cgi?ID=144293

Oct 21-23

The **Conference of Historic Aviation Writers** will hold its twelfth biennial meeting in the Washington, DC metropolitan area (near Dulles Int'l Airport). Contact:

Dr Erik D. Carlson
History of Aviation Collection
University of Texas at Dallas
Richardson TX 75080
(972) 883-2570
e-mail: carlson@utdallas.edu

Oct 27-28

The **Center for Cryptologic History** will host its 2005 Symposium on Cryptologic History near Baltimore, Maryland. Contact:

National Security Agency
Center for Cryptologic History
Suite 6886
Fort Meade, MD 20755
301-688-2336
e-mail: history@nsa.gov <<mailto:history@nsa.gov>>
website: www.nsa.gov/cch/

Nov 3-6

The **Society for the History of Technology** will co-locate its annual meeting in conjunction with the **History of Science Society**; the meeting will be held in Minneapolis, Minnesota. Contact:

Dan Holbrook
Marshall University
Dept. of History
One John Marshall Blvd.
Huntington, WV 25705
e-mail: holbrook@shotprogram.org
website: www.shotprogram.org

Nov 10-12

The Rothmere American Institute at **Oxford University** will host a conference on The United States in the 1980s: The Reagan Years, including panel presentations on "Reagan and the American Military." Contact:

Ruth Parr, Assistant Director, Academic Programme
Rothermere American Institute,
Oxford, OX1 3TG United Kingdom
e-mail: academic.programme@rai.ox.ac.uk

Nov 11-12

The **Farmingdale State University** of New York will host an inter-disciplinary conference entitled "War and Nation Building in the Twentieth Century." Contact:

Dr. Jeffrey Gaab
Hale Hall, rm 219
Farmingdale State University of New York
2350 Broadhollow Rd
Farmingdale, NY 11735
e-mail: jeffrey.gaab@farmingdale.edu
www.h-net.org/announce/show.cgi?ID=145430

Nov 17-19

The **In Flanders Fields Museum** in Ypres, Belgium will host 1915: Innocence Slaughtered?, an international conference on the initiation, use, and impact of chemical warfare during World War I. Contact:

Dominiek Dendooven
In Flanders Fields Museum

Janseniusstraat 9
B-8900 Ypres Belgium
e-mail: stedelijke.musea@ieper.be
website: www.inflandersfields.be

2006

Jan 5-8

The annual meeting of the **American Historical Association** will include "Social Shaping of Weaponry: The History of Military Technology in Context," a session co-sponsored by the U.S. Commission on Military History and the Society for the History of Technology. Contact:

Barton C Hacker
Smithsonian Institution
NMAH-4013 / MRC 620 POB 37012
Washington, DC 20013-7012
e-mail: hackerb@si.edu
www.h-net.org/announce/show.cgi?ID=145793

Mar 2-4

The **University of Nebraska at Omaha** will host the 49th Missouri Valley History Conference at the Embassy Suites Hotel in downtown Omaha, Nebraska. Contact:

Moshe Gershovich, Program Chair
Missouri Valley History Conference
Department of History (ASH 287E)
University of Nebraska at Omaha
Omaha, NE 68182
(402) 554-3175, Fax -2794
e-mail: mgershovich@mail.unomaha.edu
website: www.unomaha.edu/mvhc/index.html

Mar 22-25

The **Intelligence Studies Section of the International Studies Association (ISA)** invites paper and panel proposals for the next ISA annual convention, to be held at the Town & Country Resort and Conference Center in San Diego, California. Contact:

Stephen Marrin
Woodrow Wilson Department of Politics
University of Virginia
e-mail: spm8p@virginia.edu or spm8p@yahoo.com
website: www.people.virginia.edu/~spm8p/
or <http://iss.loyola.edu/call2006.html>

Apr 3-6

The **Space Foundation** will host its 22nd National Space Symposium at the Broadmoor Hotel in Colorado Springs, Colorado. Contact:

The Space Foundation
310 S. 14th Street
Colorado Springs, CO 80904
(719) 576-8000, Fax x8801
www.spacesymposium.org

Apr 19-22

The annual meeting of the **Organization of American Historians** will be held in Washington, D.C. This year's theme is "Our America."Contact:

Organization of American Historians
P.O. Box 5457
Bloomington Indiana USA 47408-5457
(812) 855-9851, Fax x9872
website: www.oah.org

If you wish to have your event listed, contact:

George W. Cully
10505 Mercado Way
Montgomery Village, MD 20886-3910
e-mail: warty@comcast.net

Letters

Reference the letter exchange between James Corum and Bill Getz, [Vol. 52, No. 1, *Air Power History*, Spring 2005], please put me in the latter's camp. At the same time, I want to convey my appreciation for Dr. Corum's excellent piece in the Summer 2004 issue of *Air Power History*. The work is thoroughly researched and replete with new insights for me into the structure, strength, and wartime deployment of the air forces of Germany's allies, especially during the early years of World War II.

Corum's conclusion—that Germany's failure to build industrial coalitions with Finland, Hungary, Romania, and Italy were central to Germany's demise in World War II—may be a bit overstated. Germany's historical relationship with its neighbors suggests to me that the alliance was fragile from the start. Moreover, one could conclude that serendipity played a more dominant role in the fall of the Third Reich than did Hitler's failure to build an armament producing coalition. What if Hitler had not switched target emphasis to the City of London in the Battle of Britain? What if he had turned loose the panzers on D-Day? Rommel might have crushed the Allies on the Normandy beachhead. What if we never had the Enigma and Ultra?

Midway may be the war's best example of serendipity's role in the outcome of a war-turning battle. The "what ifs" abound, and they make good scenarios for study, but the factual outcome makes it all irrelevant.

Dr. Corum notes Hitler's "alliance" with Italy that best illustrates the point made in Getz's response—it's the hand that wields the weapon that counts. The Italian forces may not have had the best armaments, but they were poorly led and at the troop level had little stomach for an unpopular war. I doubt that better weaponry would have changed the Italian army's performances in Ethiopia, Albania, Greece, and later in North Africa. Contrast that with the way airmen, seamen and soldiers of Italian descent performed in the U.S. armed forces. Another historical example worth noting is how Russian forces were held at bay by the fanatical resistance of the Finns in 1939, until that small nation was simply overwhelmed by sheer numbers.

Lt. Col. Bernard T. Nolan, USAF (Ret)

News

Gen. Westmoreland, MACV, dies

Gen. William C. Westmoreland, USA (Ret.) died on July 18, 2005, at Charleston, S.C. He

was ninety-one. General Westmoreland was best known as the head of Military Assistance Command, Vietnam (MACV) during the Vietnam War, from 1964 to 1968. After the Tet Offensive in 1968, President Lyndon B. Johnson appointed his chief of staff of the Army. A West Point graduate (class of 1936) General Westmoreland saw combat in World War II and Korea. He retired from the military in 1972.

Reunions

The **Sampson AFB Veterans Association** will hold its reunion on September 8-11 at Sampson State Park, on Seneca Lake, Romulus, N.Y. Contact:

Chip Phillips
PO BOX 331
Williamsville, NY 14231-0331
(716) 633-1119
e-mail: chip34@aol.com

The **58th Bomb Wing (B-29s-WW II-India, China & West Field, Tinian)** reunion will be held September 20-25, 2005 in St. Louis, Mo. Contact:

Roger L. Sandstedt
147 Ameren Way
Ballwin, MO 63021-3302
(636) 825-2353
e-mail: r.l.sandstedt@att.net

The **27th Fighter Wing Association** (Kearney/Bergstrom era) will hold its reunion on September 22-24, 2005, in San Antonio, Texas. Contact:

John McConnell
(210) 824-1329
e-mail: johnmc@stic.net

The **459th Bomb Group Association** (World War II, Fifteenth Air Force), will hold its reunion on September 29-October 2, 2005, in Shreveport, Louisiana. Contact:

Charles "Skip" Johnson #1388
PO Box 6419
Bossier, LA 71171
(318) 549-0522

or

John Devney #002
90 Kimbark Rd
Rochester, NY 14610-2738
(585) 381-6174

The **27th Air Transport Group** (310, 311, 312, 325th Ferrying Sq; 86, 87, 320, 321st Transport Sq.), will hold its reunion on September 29-October 2, 2005, in San Antonio, Texas. Contact:

Fred Garcia
6533 West Altadena Ave.
Glendale, AZ 85304
(623) 878-7007

The **Fina-Commemorative AIRSHO 2005** will take place October 1-2, 2005, at the Midland (Texas) International Airport. Contact:

Tina Corbett
CAF Headquarters
PO BOX 62000
Midland, TX 79711-2000
(432) 563-1000 ext.2231
www.commemorativeairforce.org

The **306th Bomb Group Association** reunion will be held on October 19-22, 2005, in San Antonio, Texas. Contact:

Royce Hopkins
35427 Pontiac Dr.
Brookshire, TX 77423-9541

or

Albert McMahon
273 N. Peachtree St.
Norcross, GA 30071
(770) 448-8513

The **20th Fighter Wing and 20th Fighter Group Associations** will hold their reunion on October 26-30, 2005, in Tucson, Arizona. Contact:

Ray L. Rider
5031 South Auckland Court
Aurora, CO 80015-3911

or

Dennis L. Schaan
5645 Nicole Court
Las Vegas, NV 89120-2226

The **TAC Missileers** will hold their reunion in 2005 in Nashville, Tennessee. Contact:

Joe Perkins
(904) 282-9064
e-mail: perkster@fcol.com

USAF Pilot Training Class 56-D will hold its reunion November 3-6, 2005, at Colorado Springs, Colorado. Contact:

Troy Hanson
6547 No. Academy Blvd. #451
Colorado Springs, CO 80918
(719) 632-1179
e-mail: troyhanson@juno.com

Troop Carrier Homecoming for all troop carrier veterans from World War II through Vietnam, Galveston, Texas, November 9-13, 2005. Contact:

Sam McGowan
3727 Hill Family Lane
Missouri City, TX 77459
e-mail: SEMcGowanJr@aol.com.
TAC Troop Carrier Reunion

The **Association of Air Force Missileers** will hold its seventh national meeting September 27 to October 1, 2006, in Cheyenne, Wyoming. Contact:

AAFM
PO BOX 5693
Breckenridge, CO 80424

General Bernard Adolph Schriever USAF (Ret.) 1910-2005



Gen. Bernard Adolph Schriever, USAF (Ret.) died on June 20, 2005, at his home in Washington, D.C. He was ninety-four years old.

Regarded universally as the “father” of the Air Force’s ballistic missile and space programs, Schriever was born in Bremen, Germany, on September 14, 1910. He and his family immigrated to the United States in 1917 and became naturalized citizens in 1923. “Bennie” Schriever grew up in San Antonio and graduated from Texas A&M in 1931 with a BS degree in engineering.

Commissioned in the Field Artillery, he began flight training at Randolph Field and earned his wings and commission in the Air Corps in June 1933. First Lieutenant Schriever was assigned to March and Hamilton Fields, California, as a bomber pilot. In winter 1934, Schriever participated in the Air Corps’ ill-fated flying of the airmail. He commanded a Civilian Conservation Corps camp in New Mexico in 1935. Next, he was assigned to Panama for duty at Albrook Field. Schriever left the Air Corps in September 1937 to fly as a pilot for Northwest Airlines. He returned to military duty in October 1938 with the 7th Bomb Group at Hamilton and the following year became a test pilot at Wright Field, Ohio. There, he also attended the Air Corps Engineering School, graduating in 1941. He then entered Stanford University, was promoted to captain in April 1942, and earned a master’s degree in aeronautical engineering in June.

Promoted to major, Schriever went to the Pacific in July to fly combat with the 19th Bomb Group, participating in the Bismarck Archipelago, Leyte, Luzon, Papua, North Solomon, South Philippine, and Ryukyu campaigns. In January 1943, he moved to the Fifth Air

Force Service Command in maintenance and engineering assignments and as chief of staff, eventually rising to command the advanced headquarters of the Far East Air Service Command, which supported operations from bases in Hollandia, New Guinea, Leyte, Manila, and Okinawa. In August 1943, he was promoted to lieutenant colonel and to colonel that December.

After World War II, Schriever was assigned to Headquarters, Army Air Forces, in the Pentagon, as chief of the scientific liaison branch. In June 1950 he graduated from the National War College and returned to Air Force headquarters as the assistant for evaluation. In January 1951, he performed similar work, with the title of assistant for developmental planning and was promoted to brigadier general in June 1953.

Schriever continued his long association with Air Research and Development Command (ARDC) in June 1954 as assistant to the commander. The next month he was named to lead the Western Development Division in Los Angeles, organizing and forming the Air Force’s ballistic missiles and space divisions, which produced such long range ballistic missiles as the Atlas, Titan, Thor, and Minuteman, and the aerospace systems that were subsequently launched into orbit, including support for the NASA’s manned and unmanned space programs.

He was promoted to two-star rank in December 1955. In April 1959, he moved from Los Angeles to Andrews AFB, Maryland, to become a lieutenant general commanding ARDC. Two years later, when Air Force Systems Command was created, Schriever was named its commander and promoted to four-star rank. In 1963, he headed Project Forecast, the Air Force’s landmark assessment of futuristic R&D. General Schriever retired in September 1966, having devoted thirty-three years to military service.

After retirement, General Schriever continued to serve the Nation with his involvement in the aerospace industry and government, including membership on the President’s Foreign Intelligence Advisory Board, Defense Science Board, Ballistic Missile Defense Organization Advisory Committee, and many others. He was a trustee and supporter of the Air Force Historical Foundation and its president from 1967 to 1970.

Among his numerous military awards and decorations are two Distinguished Service Medals, the Legion of Merit, Purple Heart, Asiatic-Pacific Campaign Medal, and Philippine Liberation Medal. He was inducted into the National Aviation Hall of Fame, received the NASM Lifetime Achievement Award, has an endowed chair in space systems engineering at the Air Force Academy, and is the only airman to have an air force base named in his honor during his lifetime.

General Schriever is survived by his wife, Joni James Schriever; his brother, Gerhard Schriever; three children from a previous marriage: Brett Arnold Schriever, Dodie Moeller, and Barbara Allen; two stepchildren: Michelangelo Acquaviva, and Angela Mia Acquaviva Kwoka; eleven grandchildren and seven great-grandchildren.



The "What is it?" aircraft in our last issue was the Bell HSL anti-submarine warfare (ASW) helicopter operated by the U.S. Navy in the 1950s.

It was the only tandem-rotor helicopter ever built by Bell. A four-seater with two pilots and two Sonar operators, it was packed with ASW gear and was intended to carry several kinds of ordnance.

The Navy initially ordered three HSL-1s. The first made its initial flight on March 4, 1953, but progress with testing was delayed by technical glitches. Still, after considering even larger numbers, the Navy ordered 50 production HSL-1s.

The Navy's leadership, along with much of the general public, was deeply worried about the growing threat from Soviet submarines. A *Collier's* magazine in 1954 credited the U.S.S.R. with 450 subs—a number now known to be an exaggeration—and several approaches were taken to guarding the fleet and the nation from the perceived threat. The HSL was not a good answer, however. The helicopter was so

loud that its Sonar operators had difficulty performing their duties.

The HSL was not around long enough to receive a popular name, either. Still, it did make a contribution.

According to *Bell Aircraft Since 1935*, by A. J. Pelletier (London: Putnam, 1992), deliveries to squadron HU-1 began in January 1957. Soon afterward the aircraft was demonstrated in the minesweeping role. Six HSL-1s were modified to do this and were operated by the Navy Mine Defense Laboratory in Panama City, Florida. In later years, helicopters routinely performed mine countermeasures duties for the Navy.

It appears that no HSL-1 ever flew a genuine, operational mission. A proposed civil version and a proposed Royal Navy variant were considered by Bell, but never built.

Only nine *Air Power History* readers entered our "What is it?" contest this time—perhaps because it was summer, perhaps because it was a helicopter. That suggests that it may be time to ask readers if this 17-year-old feature should continue. If you have an opinion, please weigh in with it.

Our "History Mystery" winner is Thomas F. Hitchcock, of Washington, Utah, who pointed out that the HSL-1 was also known as the Bell Model 61. Thomas will receive a copy of my newly published book, *Chopper*.

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. But remember, please: postcards only. The rules, once again:

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 one, please include your e-mail address.

3. A winner will be chosen at random from the postcards with the correct answer. Again, the prize is a mint copy of *Chopper: A History of American Military Helicopter Operations From World War II to the War on Terror*, by Robert F. Dorr (New York: Berkley Caliber, 2005).

If we continue the "History Mystery," we'll need your help. In your attic or basement, you may 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" puzzles. We'll return them to you.

