USAF PLANS AND POLICIES

R&D FOR SOUTHEAST ASIA

1968

by

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Office of Air Force History

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FOREWORD

USAF Plans and Policies: R&D for Southeast Asia, 1968 is the eleventh of a series of historical monographs prepared by the Office of Air Force History on various aspects of the war in Vietnam. It is a continuation of a previous study on the same subject written by the author. In this narrative, Mr. Wolk reviews several critical investigations of Air Force research and development procedures and programs, examines the functioning of the Southeast Asia Operational Requirement system, and discusses USAF efforts to modify or develop new systems and equipment to counter the enemy's growing air defenses in North Vietnam. He also reviews steps taken by the Air Force to improve bombing accuracies and briefly discusses the major systems which were developed and deployed to the theater under Project Shed Light.

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CONTENTS

I. DEBATE OVER AIR FORCE R&D

(U) During an appearance before a Congressional committee on 28 February 1968, Gen. John P. McConnell, USAF Chief of Staff, stated that the "first mission" of the Air Force in South Vietnam was to support Allied ground forces "through close air support and interdiction," its secondary mission being the interdiction and destruction of Communist traffic "coming from North Vietnam into South Vietnam." The Chief of Staff added that the Air Force had improved its interdiction operations but could not hope "to stop entirely the flow of supplies into South Vietnam." The primary reason was the area's terrain and jungle, which made the Southeast Asia (SEA) war "a very difficult type of war to fight." In such an environment, accuracy had to be "very high in the delivery of weapons. We do not have enough good all-weather and night capability. We are gradually improving that. We should have had it before now."[1]

[redacted] General McConnell's comments on USAF operational deficiencies at the beginning of the year could have been echoed at its end. By December 1968 the Air Force still lacked an adequate night/all-weather attack capability and the accuracy of its weapon delivery systems remained poor. Although some research and development (R&D) projects had produced equipment of only marginal value (such as the Tropic Moon I and II systems* and laser scan cameras), certain other equipment and munitions, newly modified or produced, had demonstrated outstanding capabilities in close support of friendly ground forces. Among these were the gunship, the B-52 used as a conventional bomber, and several types of ordnance.

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*See Chapter V.

Examining R&D Effectiveness

(S) As noted in an earlier historical study,* the Air Force in early 1965 had been ill-prepared to conduct a tactical air campaign against the infiltration of enemy troops and supplies from North to South Vietnam. Despite the change in emphasis from nuclear to conventional "options" initiated by the Kennedy administration in 1961, the Air Force during the 1961-1965 period had done little to improve its tactical capabilities. Even after the start of the air campaign against North Vietnam in February 1965, the Air Force took almost two years to deploy substantial quantities of new and modified equipment which significantly improved these operations. But major weaknesses remained. Thus, on 22 November 1967, the Air Staff's Tactical Panel noted that:

> The Air Force night attack capability was not good in World War II; little progress was made in Korea. Again, in SEA, there is the problem of stopping the enemy at night. Decisions have not been made on what aircraft and systems should be used. The Air Force must be careful not to lose the mission and opportunity to establish a permanent capability in the force structure.[2]

(S) Not only was the Air Force severely limited in its capability to locate and strike small, fleeting targets at night, but it also could not determine the success or failure of its interdiction efforts. Consequently, in late 1967 Secretary of the Air Force Harold Brown requested representatives from the Office of the Chief of Operations and Analysis and the RAND Corporation+ to analyze the effectiveness of the interdiction campaign. The group's interim report, submitted in February 1968, stated that while

*Herman S. Wolk, USAF Plans and Policies, R&D for Southeast Asia, 1965-1967 (AFCHO, June 1969).

+The group of about 25 was formally known as the AFGOA/RAND Southeast Asia Study group.

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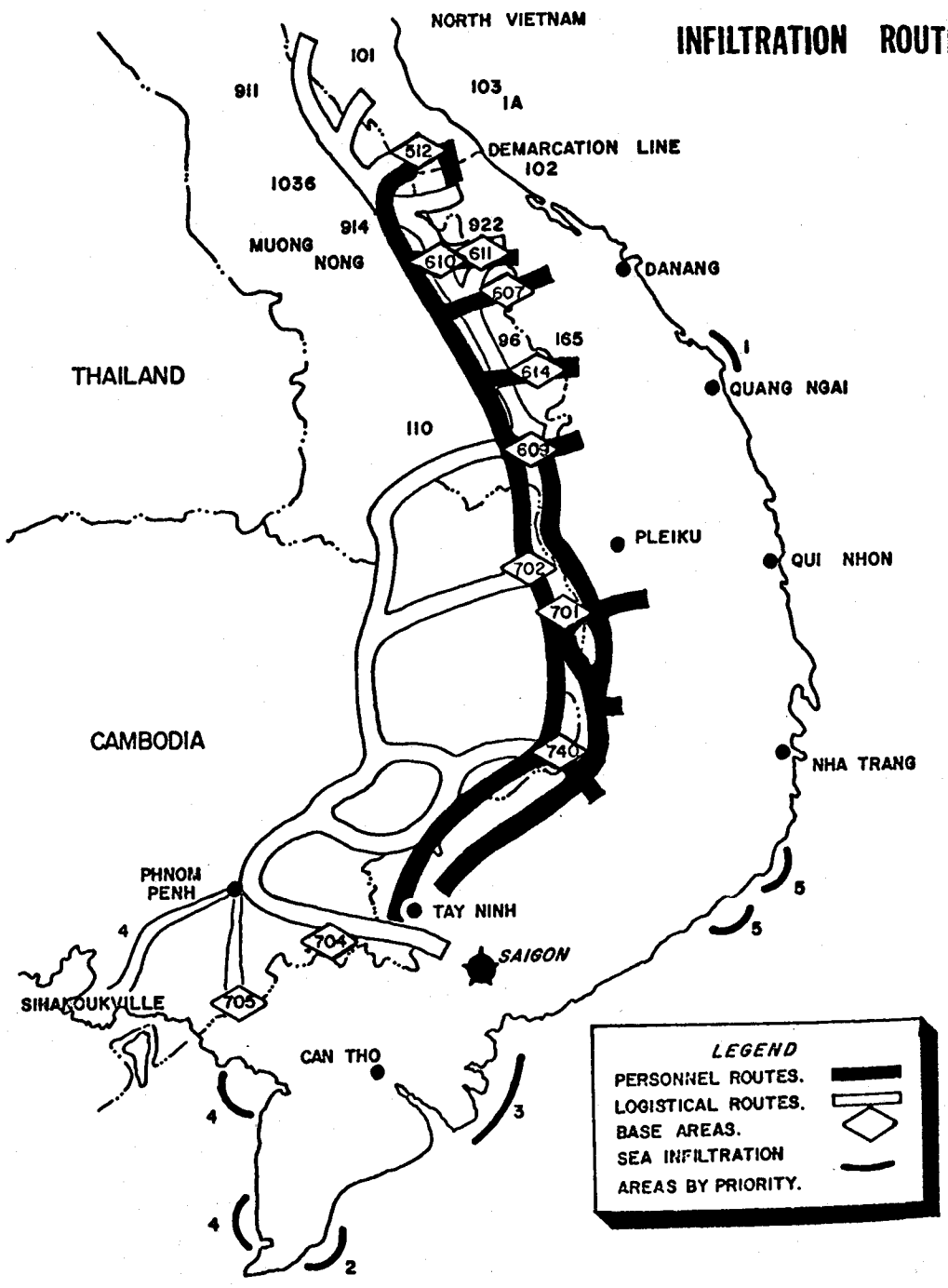

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the flow of materiel and personnel from North to South Vietnam had been impeded, the enemy continued to infiltrate sufficient supplies to sustain his war effort. This remained true despite the fact that the Air Force had improved its ability to interdict truck traffic on the Ho Chi Minh trail through Laos. Moreover, there was little evidence to indicate that "dramatic improvements" could be expected "unless the capabilities of our weapon systems are materially improved."[3]

(S-Gp-4) According to the study group, improvements to electronic countermeasures (ECM) equipment and ordnance had led to better accuracy, but this still could not be considered an "accurate night and bad weather capability." Only a small part of the force was equipped to operate at night and the F-4C did not possess a computing sight for visual weapon delivery. The group thought that certain attitudes and administrative procedures had prevented speedy development of USAF weapons and suggested that measures could be taken to reduce the time from development to operational deployment.[4]

(TS-Gp-4) In its final report on the U.S. interdiction effort, on 1 July 1968, the study group concluded that air operations over North Vietnam and Laos "can only be assessed as inadequate. Ordnance delivery accuracy during day, night and 'weather' is inadequate; target acquisition at night is limited (whatever the state of the weather); and there are deficiencies in available ordnance...." The group again noted that a major reason for these shortcomings could be found in the USAF "decision-development-procurement" process, which had not adequately exploited technology nor satisfactorily responded to theater interdiction requirements.[5]

(S-Gp-4) On 14 July 1968, in a separate report dealing with engineering development, the group reaffirmed that interdiction strikes were "no more

than marginally effective; the inflicted damage was low, both absolutely and in terms of relative effectiveness." In terms of development effort, the group found "that for one reason or another some of the more effective steps that might have been taken have not and that the central cause is ambivalence in the decision process adversely affecting the introduction of innovations." No single office within the Air Force was responsible for equipping tactical aircraft to meet unique delivery conditions and attack difficult targets; neither was there "a sense of urgency regarding improvement in weapon delivery accuracies...." Concluded the group: "We believe that the development-procurement process for bombing effectiveness in SEA requires urgent review and some necessary modification."[6]

(S-[redacted]) The group suggested that the technology for ameliorating near-term problems in SEA interdiction already existed, but was not always tapped. The many and complex difficulties involved organization, funding, and decision-making, with the last termed by the study members especially critical since it involved both the decision-making channels for requirements as well as the acquisition process. The decisions necessary for prompt and effective responses seemed almost impossible to obtain and to enforce.

([redacted]) The current structure was geared to long-term system development and could not deal effectively with short-term problems. To remove this major fault, the members suggested establishment of a small office at the highest level that would bypass the larger and more traditional R&D processes--and concentrate specifically on bombing and all other aspects of interdiction. This would also insure that priorities were assigned to promising short-term projects.[7]

([redacted]) The group also recommended "crash" measures outside of regular channels to complete development and procurement of an advanced laser system for the F-4D to improve its visual bombing accuracy; develop and test a new bombing system using a forward-looking infrared radar (FLIR) sensor to improve night operations; increase and accelerate production of AC-130 and AC-119 gunships; and expedite tests of the Ka-band radar for the F-111 bombing system. It urged the Air Force to accelerate development of route-denial and "Paveway" ordnance, speed work on a 2,000- to 3,000-pound general purpose demolition warhead for the Walleye guided missile, and support the Navy's "Condor" program (since the Air Force lacked an accurate standoff weapon to use against heavily defended targets).[8]

([redacted]) There was little immediate response to these recommendations. The first official comment came from Secretary Brown on 29 August when he suggested to Dr. Alexander H. Flax, Assistant Secretary for R&D, and General McConnell that the 14 July report appeared to be "very useful" and that the Air Force should find a way to speed the completion of critical projects.[9] Although the Chief of Staff felt that some portions of the reports could be helpful, he disagreed sharply with their views and conclusions, believing they were far too critical of the Air Force R&D effort. On 16 September, he stated bluntly to his Staff Directors that neither the summary report nor the supporting studies "should be construed to have the concurrence or endorsement of the Air Staff, the Chief of Staff, or the Secretary of the Air Force."[10]

The Air Staff Responds

([redacted]) The Air Staff nevertheless was disturbed by the thrust of the reports, although it was not convinced that the answer to the interdictions

problem was to establish a single office of responsibility. Thus on 9 October 1968, Lt. Gen. Seth J. McKee, Assistant Vice Chief of Staff, asked Lt. Gen. Joseph R. Holzapple, Deputy Chief of Staff/R&D, to create an ad hoc committee* to examine the proposals made in the 14 July report.[11]

(S-Gp-4) Even as he took this step, General McKee noted that the Air Force had previously investigated the validity of several projects listed in the report. It had found that a new laser bombing system would not improve the F-4D's delivery accuracy, that development of route-denial and "Paveway" munitions had been stepped up, and that development of an angle-rate bombing system with a FLIR sensor had begun. Efforts were under way to develop a 3,000-pound laser guided bomb and an advanced air-to-surface missile. In addition, the Air Force had accelerated production of gunships and continued to explore the feasibility of a Ka-band radar for the F-111 bombing system.[12]

(S-Gp-4) The ad hoc committee worked from October through December 1968 and, in January 1969, published two reports. The first, on 15 January, noted that "time, money, and testing compromises during the development program may also be major contributors to delay and unreliability." This report stated that projects which required urgent treatment definitely justified "higher risk management procedures." But special procedures to speed decisions could not be used for the majority of projects considered by the Air Staff. According to the committee, the Air Force lacked the experimental, design, and testing capacity to respond to many

*The group's steering committee consisted of General Holzapple, DCS/R&D, chairman; Lt. Gen. Glen W. Martin, DCS/Plans and Operations; and Lt. Gen. Robert G. Ruegg, DCS/Systems and Logistics.

potentially productive ideas. It recommended that the Air Force improve its design and testing facilities and that the Air Staff Board panels--during their regular deliberations--identify any cases in which projects might merit special consideration.[13]

(S) On 29 January 1969 the committee published its second report, a "White Paper" titled "Air Force Development/Procurement Actions in Response to SEA Problems." Considering development and procurement since 1965, the members insisted that the response had been effective. Although there had been some "temporary lapses in responsiveness," in general the innovation of Southeast Asia Operational Requirement (SEAOR) procedures had adequately served in pushing through the required short-term developments.[14]

(S) The committee listed many of the significant accomplishments. In reconnaissance and electronic warfare, it cited the continued development of the RF-4C since 1962. This aircraft had been procured as a follow-on to the RF-101 and had also replaced the photo reconnaissance version of the RB-66. It noted the acquisition of forward and side-looking radar and pointed to work done on radar homing and warning (RHAW) equipment, which found expression in "Wild Weasel." The USAF schedule for equipping the F-105F Wild Weasel III with an improved air-to-surface anti-radiation missile, the AGM-78B, was to be completed in March 1969. Electronic countermeasure pods had been developed and deployed to Southeast Asia to counter the enemy's surface-to-air missile (SAM) and anti-aircraft artillery (AAA) radars. In the area of night operations, the White Paper mentioned such improvements as the Tropic Moon and Black Spot aircraft and the Gunship II AC-130A's.[15]

(S) To improve visual bombing accuracy for the F-4C, a laser range finder had been developed and tested in the summer of 1968. Combat

evaluation of the unit was scheduled for mid-1969. Laser technology also figured in the evolution of the laser guided bomb (early development had been particularly encouraging), laser target designator, and target seeker, all of which were being evaluated in the theater during 1968.

(S-Gp-4) As far as advancing adverse weather capabilities was concerned, the committee noted the contribution of the MSQ-77 "Combat Sky Spot"; the development (with F-105 retrofit in 1969) of the T-Stick II advanced conventional weapons delivery system with long range navigation (LORAN); modifications to the F-111A delivery system prior to deployment to the theater in March 1968; development of the advanced Mark II conventional bombing system for the F-111D (delivery scheduled for early 1970); and the initiation of an over-the-horizon ground radar system ("Steer")* and a F-111A radar correlation bombing system, to be placed under development in early 1969 with an initial operational capability (IOC) scheduled in mid-1971.[16]

(S-Gp-4) According to the White Paper, all operational problem areas cited by the Operations Analysis/RAND reports had received attention. Delays in supplying equipment were traceable to lengthy development time required by certain items, but interim fixes had been provided in such cases. Concerning the suggestion that the Air Force set up a top level management group, the committee argued there were few projects that required special attention and that such a unit would put a strain on the USAF reserve of technically qualified officers. In summary, the White Paper concluded there

*A refinement of the radar bomb-directing technique which used two relay aircraft to control strike planes in low-altitude deliveries to ranges of 400 nautical miles from the ground terminal.

was no evidence showing the lack of support for any SEA problem. It said:

> There are, of course, differences of opinion concerning the management emphasis appropriate to any program. Opportunities for speeding the development of particular equipment always exist. The required commitment of resources must, however, be balanced against the total demand for development/procurement support.[17]

Dr. Flax Comments

([redacted]) In January 1969, just after the Nixon administration took office, the outgoing Assistant Secretary of the Air Force (R&D) unburdened himself on the problem to Secretary Brown, who also was leaving the government.* In retrospect, Dr. Flax said, between the mid-1950's and about 1963 the Air Force had concentrated its resources on nuclear weapons and the aircraft and equipment to deliver them. During the beginning of this period, he noted, "Air Force planning corresponded too literally and too narrowly to stated national policy." Even when the national policy changed in 1961--with its stress on R&D for limited war--for several years little change evolved in training, tactics, and equipment.[18]

([redacted]) According to Dr. Flax, the USAF Director of Requirements and many in the Air Staff were unalterably opposed to improving the F-4 aircraft. It had required pressure from his office, and from the President's Scientific Advisory Committee (PSAC), the Scientific Advisory Board (SAB), the Director of Defense Research and Engineering (DDR&E), and the Bureau of the Budget (BOB), before the Air Staff accepted a "weak compromise" with respect to F-4 conventional delivery modifications (the F-4D system).

*Dr. Flax joined the Institute of Defense Analyses; Dr. Brown became President of the California Institute of Technology.

Because of this, development of a continuous-solution bombing computer and advanced bombing system along with improved sensors fell short of what could have been realized for the F-4D. The Air Force still did not accept the view, stated the Assistant Secretary of the Air Force, "that a substantial part of the tactical aircraft force should be equipped with accurate weapon delivery systems for conventional weapons. There are many in the Air Force who are still unreconstructed."[19]

([redacted]) In the Air Staff, there were those who felt that present delivery accuracies were good enough for close support. However, others held that, even if accuracy could be somewhat improved, the results would not justify the cost because there were no sensors available to detect small, fleeting targets in all kinds of weather. Too, there existed the view that available accuracies were not good enough to make all-weather delivery a cost-effective tactic to be widely employed and that improved guided bombs and missiles along with ground (MSQ-77) and air bombing control systems could provide sufficient improvement in delivery accuracy.

([redacted]) However, Dr. Flax said there was an Air Force consensus that the F-111 should possess an accurate all-weather bombing system but disagreement over the various ways of developing this capability. He also supported developing the "Paveway" series of electro-optical and infrared radar (IR) guided bombs.

([redacted]) Exploitation of technology, admitted Dr. Flax, was "not as good as it should be," but he was opposed to establishing new organizations to expedite such activity. The "quick reaction" programs would have to be treated as normal tasks by Air Staff and Air Force Systems Command (AFSC) management rather than by newly created special offices. As far

as development of interdiction systems was concerned, there was no central office in either the Air Staff or AFSC "for doing a good job in this area."[20]

(S-[redacted]) There was another problem area Dr. Flax commented on. He said that, with regards to research and development for Southeast Asia, "we can lead the horse to water but we can't make him drink." No matter what new things the Air Force might develop or even produce, unless it could "promote approval of development" through the operational chain from the Joint Chiefs of Staff (JCS) down through the Military Assistance Command, Vietnam (MACV) and Seventh Air Force, it could do no good for the forces in the field. "Examples abound," he said, "in which long delays in development or even failure to deploy potentially useful technological innovations must be attributed to resistance somewhere along this line of operational command...."[21]

II. EXAMINING THE SEAOR SYSTEM

([redacted] Established in mid-1965, the Southeast Asia Operational Requirement system was designed to speed the identification of USAF equipment needs and to procure and introduce items more rapidly into the theater. By mid-1967, however, it became apparent that this system was not working as originally planned. Undoubtedly, part of the difficulty could be traced to U.S. defense planning, which had anticipated an early end to the war, perhaps within one or two years at most. Accordingly, the Air Force had continued to follow its peacetime R&D procedures with only slight modifications.[1]

([redacted] USAF responsiveness appeared to be hampered by the requirement system itself, which a member of DDR&E's staff described as "awkward."[2] The theater commanders flooded the requirements channel and the number of approved SEAOR's--identified as either required operational capabilities (ROC's) or Class V modifications--clearly surpassed the Air Force ability to determine priorities and satisfactory funding sources.

([redacted] Besides the lack of rigorous selectivity, some requirements--which should have been completed in about 12-18 months--evolved into long-term development efforts. To compound the problem, the tremendous increase in requirements caused excessive specialization within the Air Staff which, in turn, led to duplication of effort. Also, the SEAOR system continued to be plagued by obsolete funding practices.[3]

([redacted] In an effort to ameliorate the unsatisfactory funding process, improve the priority system, and reduce the time of equipment acquisition, a General Officers' SEAOR Review was held on 15-16 November 1967 at the

Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio.* Following this review, the Seventh Air Force and Headquarters, Pacific Air Forces (PACAF) were directed to devise--"to the extent practicable"--a priority list of unfunded SEAOR's. Although no precise machinery for solving these difficulties was established, several procedures were agreed upon to improve coordination and increase the flow of pertinent information.[4]

Establishment of the Review Board

(S [redacted]) With funding remaining one of the most serious problems, on 4 December Gen. James Ferguson, Commander, AFSC, informed General McConnell that the lack of SEAOR resources had reached the critical stage and would become even worse as more requirements were received. The amount of money needed to complete already identified SEAOR's had already passed a half billion dollars in R&D and production funds, as follows:[5]

	R&D	Production
FY 1968	$44,600,000	$98,039,000
FY 1969	18,330,000	391,181,000
	$62,930,000	$489,220,000

(S [redacted]) According to the AFSC Commander, since budgetary pressures could only become worse, the end result would be wasted effort in searching for technical solutions to SEAOR's for which there were no funds. Given the lack of funds, it would be much more productive to concentrate on those

*Attending were senior representatives from Headquarters USAF, AFSC, PACAF, Tactical Air Command (TAC), Air Force Logistics Command (AFLC), and Seventh Air Force.

SEAOR's which could be seen through to completion. The Air Force, he said, must establish a priority system to satisfy the most critical requirements and also find more money for present and future SEAOR's.[6]

(S [redacted]) General Ferguson therefore suggested to the Chief of Staff that Headquarters USAF--in conjunction with the Seventh Air Force and PACAF--establish a ROC priority system similar to the Class V modification list. Under this procedure, unfunded and new SEAOR's would be deferred until money became available, at which time Headquarters USAF would direct Systems Command to prepare (according to the priority list) an updated best preliminary estimate (BPE) for the next requirement. Also a review group should be established in the Air Staff to find money for new SEAOR's and for those critical requirements presently in need of funding.[7]

(S [redacted]) Acting on a directive from General McConnell, on 12 December 1967 General Holzapple established a SEAOR Review Board to analyze, approve, and fund Southeast Asia operational requirements. After receiving a best preliminary estimate from AFSC or AFLC, one of his aides* would recommend the requirement to the review board. A proposal would be presented only after an analysis of technical feasibility, determination whether the SEAOR could be completed within a reasonable time, and identification of a funding source. The review board would then decide whether the requirement should be pursued or canceled.[8]

(S [redacted]) Should it be canceled, the board would forward its rationale to General Holzapple. If he or his staff determined that the requirement could be satisfied (either in the near or long term), the board would then

*The Director of Operational Requirements and Development Plans.

propose a funding source and an appropriate office to manage the SEAOR. Further, the board would decide which requirements could be consolidated and when a SEAOR would be considered completed. The board would also establish a priority list of all active SEAOR's, periodically review funding, and present recommendations to the Deputy Chief of Staff/R&D.[9]

(S-Gp-4) The SEAOR Review Board --manned by Air Staff officials*-- convened in early January 1968 to consider the entire range of critical problems that plagued the USAF requirements system for Southeast Asia. When this comprehensive review was completed, each SEAOR had been examined and almost two months had elapsed. Short and long-term requirements were identified; criteria for the required operational capabilities were developed; some SEAOR's were canceled or combined; and funding priorities were established. The SEAOR, newly-defined, was described as: "A Seventh Air Force requirement that can normally be satisfied by providing an initial operational capability (IOC) within 24 months after receipt of the BPE and Headquarters USAF approval."[10]

(S-Gp-4) This marked an improvement over previous definitions but since more than 24 months was usually required to achieve an IOC, it still could not be considered either precise or binding.

The SEAOR Review Conference

(S-Gp-4) The Air Staff Review Board agreed to consider approval of SEAOR's, set priorities, and look at the overall program. However, as it turned out, a semiannual General Officers' SEAOR Review Conference--

*Members consisted of the Director of Operational Requirements and Development Plans; Director of Development; Assistant for Reconnaissance; Assistant for R&D Programming; Director of Operations; and the Director of Maintenance Engineering.

similar to the General Officers' Review of November 1967--took over many of the tasks of the board. It had been found that a periodic (every two months) and exhaustive review was impractical and, it was hoped, unnecessary. Held on 6-8 August at Headquarters USAF, the conference included representatives from the Air Staff,* Seventh Air Force, PACAF, TAC, AFSC, and AFLC. Requirements that needed funds or that had been plagued by technical problems were examined and views on current problems were exchanged.[11]

(S-Gp-4) Despite the establishment of the semiannual general officers' conference,+ PACAF continued to develop its own quarterly list of funding priorities (for unfunded SEAOR's only) so that when money became available participating organizations could weigh the relative importance of SEA requirements. The Seventh Air Force also promulgated a list (not always in agreement with PACAF's), but the PACAF summary was the one sent to Headquarters USAF. SEAOR's were still approved by the Air Staff after it had received a best preliminary estimate, appropriate comments from the commands, and PACAF's validation. Nevertheless, it continued to review the requirements received and to study the SEAOR system.[12]

*Representing offices that had previously sat on the SEAOR Review Board.

+A second conference was held in February 1969. General officers representing the Air Staff and the commands usually convened for one day of the three-day meeting.

([redacted]) Subsequently, a task force* that had studied Defense Department R&D procedures during the latter months of 1968 reported to the DDR&E[13] that:

> ...the present course of development of effective materials and techniques is particularly lengthy and its transfer to the field tortuous beyond necessity... this raises the question whether our Service R&D procedures are yet appropriate to the kind of real time responsiveness of which the community is capable.

([redacted]) Thus, it appeared at year's end that the SEAOR's system apparently was not working the way USAF planners had hoped when they established it in 1965 to meet critical combat needs. By 1968, this "crisis approach" had affected the overall ability of the Air Force to establish more orderly and cohesive R&D procedures.[14]

*Members of the task force included Dr. Gordon J. F. MacDonald, University of California (Santa Barbara), chairman; Dr. Chester Cooper, Institute of Defense Analysis; Dr. Richard L. Garwin, IBM; Dr. Murray Gell-Mann, California Institute of Technology; Dr. Marvin L. Goldberger, Princeton University; Dr. Harold Lewis, University of California (Santa Barbara); Dr. John L. McLucas, MITRE Corp; Dr. William A. Nierenberg, Scripps Institution of Oceanography; Dr. Guy J. Pauker, RAND Corp; Dr. Milton G. Wiener, RAND Corp; and Dr. Frederick Zachariasen, California Institute of Technology.

III. COUNTERING THE ENEMY DEFENSIVE THREAT

(S-Gp-4) For several years the Air Force had studied ways to counter the growing North Vietnamese defensive threat, which comprised ground-based guns (including small arms, automatic weapons, and AAA), surface-to-air missiles (SAM's), and fighter aircraft.* Although much attention focused on the SAM threat, about 75 percent of the USAF losses were caused by other types of ground fire.[1]

(S-Gp-4 NOFORN) Between 1965-1967 USAF pilots maintained clear superiority over the Communist MIG's, but in late 1967 enemy tactics improved substantially.+ U.S. aircraft encountered SAM and AAA fire as soon as they flew over the coast line from the east or crossed the Red River from the west, evidence of coordination between the enemy's radar surveillance and his command element. His MIG aircraft, which had been used very selectively, sought to interdict USAF planes in cloudy as well as clear weather employing tactics that indicated a radar-initiated intercept. The enemy's increased competence could be traced to a more effective use of ground control intercept (GCI) radars. As of August 1967, more than 200 early warning (EW) ground-controlled radars were deployed in North Vietnam along with AAA fire control and Fansong B missile control radars.[2]

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*See for example, Wolk, USAF Plans and Policies, R&D for Southeast Asia, 1965-1967 (AFCHO, June 1969), Chap III, "Countering the NVN Air Defense System."

+During September-December 1967, the United States lost 12 aircraft in air-to-air combat while downing 15 enemy planes. In contrast, over the first eight months of the year, 77 Communist planes were shot down with a loss of 24 U.S. craft.

([redacted]) The North Vietnamese deployed Bar Lock radars near Haiphong (with early warning coverage over the Gulf of Tonkin) and in the western part of Route Package 5 (see map, next page), providing EW/GCI coverage for about 90 miles into Laos. Because they were mobile and camouflaged, it was difficult for USAF aircraft to locate and destroy these radars. Also, Air Force EB-66 electronic countermeasures (ECM) aircraft lacked adequate jamming power and maneuverability and consequently proved vulnerable in the so-called "high-threat" areas over North Vietnam. Even when the Bar Lock GCI radar was jammed, the enemy could track incoming planes successfully by employing other radars not affected by penetrator jamming.[3]

Have Dart Task Force

([redacted]) Disturbed by the overall improvement in the North's defense system, Gen. William W. Momyer, Seventh Air Force Commander, in January 1968 reported to Gen. John D. Ryan, Commander of the Pacific Air Forces, on the growing dangers to his strike aircraft. "We have made repeated attempts," said General Momyer, "to eliminate their GCI capability, with virtually no success." Not only were the radars mobile and well hidden, but in some cases they were located near population centers, thereby precluding attack. The MIG threat, he observed, was increasing more rapidly than the Air Force's ability to counter it. He recommended a crash program to deal with the situation.[4]

([redacted]) On 31 January General McConnell directed AFSC to determine how best to resolve the problem. All aspects were to be considered, said the Chief of Staff, including how to attack and destroy radars situated adjacent to population centers.[5] Acting on this directive, General Ferguson

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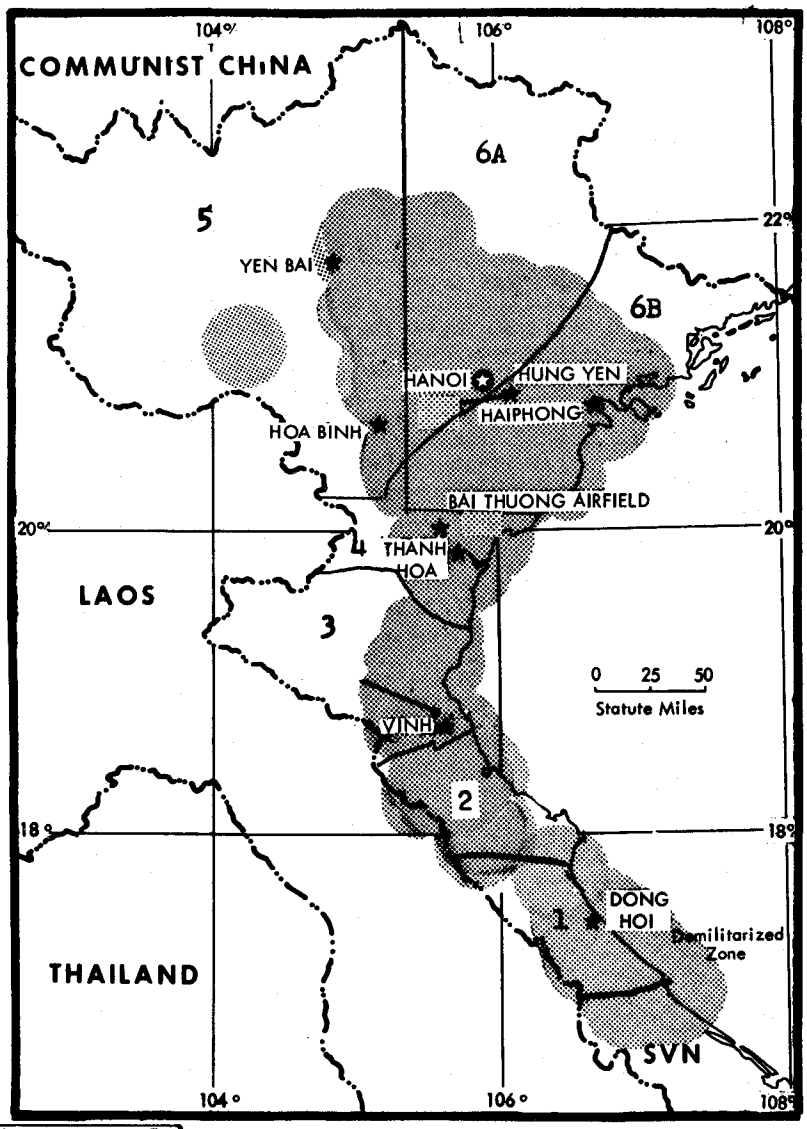

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established a special task force (designated Have Dart) on 5 February 1968 to undertake an investigation and propose solutions. The AFSC commander recognized that not only had the enemy's GCI and overall defensive effectiveness caused an "unfavorable loss ratio of our aircraft," but they also affected the accuracy of their strikes. Many aircraft unloaded their ordnance prematurely in order to avoid Communist defensive fire.*[6]

([redacted]) In a summary report completed on 13 March, the task force concluded that complete destruction of the GCI radars "appears unlikely" and that the enemy's Bar Lock radar appeared to be the most vulnerable to attack. However, to achieve a 500-foot CEP the F-4/F-105 had to drop 170 M-177 (750-pound) bombs to provide a 90 percent destruction probability against each GCI site. Since most of these sites were located within or near restricted areas, it was clear that the Air Force needed to acquire an accurate guided bomb.[7]

([redacted]) USAF officials further realized that Air Force electronic equipment was not adequate enough to counter enemy radars. To improve command and control in a hostile environment, the task force recommended improvements to EC-121 (College Eye), EB-66, and F-4D aircraft, deployment of a TPS-43 radar, and development of radar for helicopters. The information gathered by College Eye aircraft together with the Navy's positive identification and radar advisory zone (PIRAZ) ships could be used to produce controlled intercepts and positive identification for air-to-air missile launches without visual identification by the pilot.[8]

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*One of the continuing problems faced by the Air Force was unsatisfactory circular error probables (CEP's). Frequently, heavy ground fire compelled USAF pilots to release their weapons from inordinately high altitudes. For example, on dive-bombing missions weapons were released at about 8,000 feet in order to keep from going below 4,500 feet on pullout where heavy fire would be encountered.

([redacted] Also, the task force proposed that the Air Force employ the Talos missile against MIG's, develop day-visual radar acquisition and strike equipment along with a day/night/adverse weather integrated system of radar acquisition, give more attention to ECM jamming against EW/GCI radars, procure 1,000 Redeye missiles for use in air-to-air combat, and assign a high priority to guided bomb development.[9]

Credible Comet Report

([redacted] On 1 March, just prior to publication of the Have Dart report, the so-called Credible Comet study group--which included representatives from the Air Staff, TAC, ADC, AFLC and AFSC--reported that deficiencies in tactical electronic warfare (TEW) were adversely affecting air operations. This subject--which formed part of the Have Dart analysis--had long been of concern to operational commands and the Air Staff, since TEW constituted an integral part of air operations in any hostile environment. Without an effective electronic warfare capability, any plan for countering the North Vietnamese defensive threat would prove ineffective.

([redacted]) The Credible Comet group recommended that advanced TEW equipment be developed and installed on "all tactical aircraft exposed to a hostile electronic warfare environment." It suggested this include electronic attack devices to destroy the enemy's systems, ECM equipment, and electronic operational support (EOS) systems. To improve electronic warfare management, the group proposed a number of functional realignments within the Air Staff and a reorganization of operational and support commands. For research, development, and acquisition, a more cohesive and responsive cycle could be attained by clarifying R&D policies and procedures followed by the various commands during development of electronic systems.[10]

([redacted]) Reflecting concern with the entire research and development process, the report observed that the deficiencies uncovered during the Vietnamese war (which led to tactical shortcomings) necessitated a "broad reassessment" of organization and command responsibilities. For example, in Tactical Air Command some electronic warfare groups were assigned to reconnaissance, some to fighter wings, and others--such as Wild Weasel--to strike forces. Within the Air Force, noted the Credible Comet group, focal points "to accomplish the EW mission are dispersed, vague or nonexistent. The management picture also shows a lack of a total integrated systems approach with few clear-cut nodes of single authority or decision-making recognizable in the management network."[11]

([redacted]) The group emphasized the importance of changing or even eliminating obsolete and time-consuming funding and procurement practices. Existing procedures for initiating AFLC's Class V electronic warfare modifications constituted, it said, a "less than efficient use of funds, manpower and facilities." Overall, a much more responsive RDT&E and acquisition cycle appeared necessary so that badly needed equipment could be produced more rapidly and in greater quantity.[12]

JCS Review of Night Song Report

([redacted]) On 25 April 1968, shortly after the Have Dart and Credible Comet reports had been issued, the Joint Chiefs of Staff completed a review of the Night Song study. This study, initiated in January 1967 by Deputy Secretary of Defense Cyrus Vance in response to a marked improvement in Communist air defenses, was originally published in March 1967 with the proviso that it would be updated a year later. It recommended equipping

USAF strike aircraft with an advanced radar homing and warning system and self-protection devices.*

([redacted] In its reappraisal of Night Song, the Joint Chiefs noted that the Communists' air defense system still depended on materiel shipped from the Soviet Union, China, and the eastern European bloc countries. As long as the North Vietnamese received equipment, they were capable of making their defense even more effective. Although the Air Force had improved its tactical strike craft since early 1967, the experience of the intervening period indicated that elimination of the MIG threat was not feasible. As long as the enemy continued to use Chinese air bases near the North Vietnamese border, it would be impossible to remove the threat since it was U.S. policy not to strike within Chinese territory.[13]

([redacted] Also, the JCS observed that the Air Force still did not have sufficient numbers of heavy bombs and needed more effective proximity and long-delay fuzes. The Joint Chiefs hoped that eventual procurement of advanced fuzes, electronic and infrared sensors, and laser equipment would enable pilots precisely to locate the enemy's radar, guns, and vehicles.[14]

([redacted] The Night Song report reiterated that a "broad air campaign" was necessary to reduce the flow of materiel into North Vietnam, and it recommended strikes against additional military targets and war-supporting industry in the north.[15]

*See Wolk, USAF Plans and Policies, R&D for Southeast Asia, 1965-1967 (AFCHO, June 1969), Chap III, "Countering the NVN Air Defense System."

[redacted] In late 1968, acting on these reports, the Air Force took steps to modify equipment and to develop new devices to deal with the defensive threat. USAF officials were optimistic that they could make inroads against the enemy's defensive system, although an early, complete solution was out of the question. However, with the cessation of the U. S. bombing campaign over the North, a final test of the additional offensive capabilities of the Air Force became a moot point.

IV. BOMBING, INTERDICTION, AND SURVEILLANCE OPERATIONS

([redacted]) From the time it began full-scale operations in Southeast Asia in early 1965, the Air Force had sought to improve its bombing accuracy. Three years later, on 5 March 1968, General Holzapple admitted to a Congressional subcommittee that "we still have room to grow in terms of accurate delivery of ordnance." It was a very difficult problem, he said, "a problem inherent in any strike airplane." He advised the subcommittee that the Air Force planned to deploy the F-111 to Southeast Asia and predicted this new aircraft would lead to "a big step forward in the accurate delivery of ordnance."[1]

Combat Lancer

(TS-Gp-4-NOFORN) In October 1967 the USAF Combat Target Task Force--established by General McConnell to examine the problem of all-weather bombing--had recommended that six F-111A's be deployed to Southeast Asia.* For the long term, the task force suggested that a combat CEP of 200 feet or less be set as a criterion for such conventional all-weather bombing systems. Subsequently, in March 1968, the Air Force sent a small F-111A unit--designated Combat Lancer--to the war zone. Six aircraft, along with support personnel, arrived at Takhli AB, Thailand, on 18 March 1968.+

*See Wolk, USAF Plans and Policies, Southeast Asia R&D, 1965-1967 (AFCHO, June 1969), Chapt IV, "Night and All-Weather Operations and Reconnaissance."

+Nine F-111A's were modified for Southeast Asia and six were originally deployed, of which three were lost in the first four weeks of operations. The cause of these crashes has been attributed to weld failure of the Bendix horizontal stabilizer link. Two additional aircraft deployed as replacements and one remained in the United States for testing.

Beginning on 25 March, they flew a total of 55 combat missions--averaging 2.46 hours--in Route Package #1 (North Vietnam from the demilitarized zone north to the 18th parallel). Low-level missions consisted of single-aircraft night flights. After eight months in the theater, the unit returned to the United States on 23 November 1968.*[2]

([redacted]A RAND Corporation analysis of Combat Lancer radar bombing completed prior to the termination of the F-111A operations found that the "verdict certainly must be 'not well enough' in terms of destruction of targets attacked." The F-111A attained an overall CEP (in which bomb-miss distance was known) of 1,050 feet. By comparison the report observed that an F-105/F-4D radar bombing program (Commando Nail) showed an overall CEP of 2,000 to 3,000 feet with a 400 to 500 feet circular error for daylight dive-bombing over North Vietnam. However, because of a relatively high loss rate for the F-105's and F-4's, these aircraft did "not appear to provide any overwhelming advantage over the F-111A."[3]

([redacted] Therefore, the RAND report concluded that all major USAF aircraft left something to be desired as far as CEP was concerned--a conclusion previously reached by the Combat Target Task Force. The RAND analysis also indicated, however, that the F-111A showed promise for improved radar bombing. Substantially better results could be attained, it suggested, since Combat Lancer operations had been limited (crews could have been expected to improve with experience) and since Route Package #1

*On several occasions between March and November 1968, Combat Lancer operations were suspended due to crashes, hydraulic system failure and metal fatigue of the wing carry-through structural box discovered at General Dynamics, San Diego. In late June, the F-111A's were restricted to flying without using the terrain following radar (TFR).

was a poor area for radar bombing.* Considering the short operational period and the unfavorable conditions, the result according to RAND, could be construed as "fairly respectable."[4]

([redacted] A Combat Lancer final report subsequently issued by the USAF Tactical Fighter Weapons Center--noting that the F-111A's had dropped their bombs "with varying degrees of accuracy"--estimated the planes had achieved a 400-foot overall CEP for radar bomb releases at 1,500 feet or less. Because of the brief duration of operations, the Center, like RAND, could not come to hard and fast conclusions. The concept of low-level F-111A penetration and attack during night and adverse weather "appeared valid."+ As for radar bombing results, the report stated that

> the most critical factor affecting bombing accuracy was radar acquisition of the aimpoint... Results of combat showed that aimpoints with good radar return characteristics had a CEP of 233 feet while the CEP for ill-defined aimpoints was 2,304 feet.[5]

T-Stick II

([redacted] As mentioned, the Air Force gave high priority to the evolution of systems which would enable its combat aircraft to stay out of range of small arms and automatic weapons fire during daytime, and still operate under low overcast (2,000 to 3,000 feet) during the northeast monsoon season. To acquire such a capability, the Air Force proposed

*The basic Combat Lancer tactic included a low-altitude approach (200 to 1,000 feet) at night employing terrain masking, random headings, random release times and passive electronic countermeasures.

+A conclusion reported to Secretary of Defense Clark M. Clifford on 9 January 1969 by Secretary Brown, who emphasized that this finding was based on limited combat data [Memo (S), SAF to SECDEF, subj: COMBAT LANCER Preliminary Rprt, 9 Jan 69].

several modifications to the F-105D/F, one of which was the T-Stick II/LORAN (long range navigation) weapon delivery system,* for which funds had been deferred by OSD.[6]

(S) In August 1968, Adm. John S. McCain, Jr., Commander in Chief, Pacific Command (CINCPAC) observed that U.S. aircraft still found it difficult to conduct air strikes at low altitudes and he requested a review of military R&D programs. He noted that a high percentage of planes had been lost to the enemy's automatic weapons fire at altitudes of 3,000 feet and under. What was needed, he said, were systems to keep planes out of the range of Communist guns and still enable pilots to accomplish their mission using improved navigation equipment and guided bombs.[7]

(S) On 28 September 1968, the funds previously held by OSD were released by Deputy Secretary of Defense Paul H. Nitze who directed they be applied to the T-Stick II modifications. However, he required the Air Force to limit the work to one 18-unit equipment (UE) squadron (30 aircraft including training, support, and attrition aircraft) instead of the originally planned 65 airplanes. It was necessary, noted Nitze, "that we obtain good data on the accuracies obtained with the LORAN bombing system to assess the desirability of providing other aircraft with this capability." As far as their oversea deployment was concerned, such a decision would depend on an evaluation of the modified aircraft. Extensive testing of early T-Stick II production models in the United States would be necessary.[8]

Commando Hunt Interdiction Campaign

(S) Ever since the administration committed substantial forces to the war, it had given high priority to interdiction of the enemy's supply

*With an original initial operational capability of mid-summer 1969.

and communications lines. And, on 4 March 1968, Admiral McCain reiterated that development and deployment of advanced interdiction systems and munitions were mandatory if the United States was to increase the pressure on the Communists. The Shed Light and Muscle Shoals* programs, said Admiral McCain, should receive "full support."[9]

([redacted]) At the same time, Secretary Brown--concerned that the coverage of the enemy truck traffic in Laos was not intensive enough--suggested to Mr. Nitze that a combination of more sorties and more effective night operations would increase substantially the number of trucks destroyed.[10]

([redacted]) After the President on 31 March 1968 suspended U.S. bombing north of the 20th parallel (revised three days later to the 19th parallel), the major Air Force objective became the interdiction of the truck traffic in Laos, almost three-fourths of which operated in the area between Mu Gia pass and the demilitarized zone (DMZ). The infiltration through Laos remained substantial and as the dry season approached was expected to increase. On 2 July, the President's Scientific Advisory Committee (PSAC)--concerned with the incessant movement of supplies into South Vietnam--recommended another special effort against the enemy's logistics, this time an intensified interdiction operation in Laos during the 1968-1969 northeast monsoon season (the dry season in Laos). Dr. Donald F. Hornig, the President's science adviser and chairman of the PSAC, met on 12 July with Defense Secretary Clifford, Deputy Secretary Nitze, and Dr. John S. Foster, DDR&E, to discuss the Advisory Committee's proposal. The group estimated that 60 percent of the materiel infiltrating into South Vietnam passed through Laos, most of it during the northeast monsoon.[11]

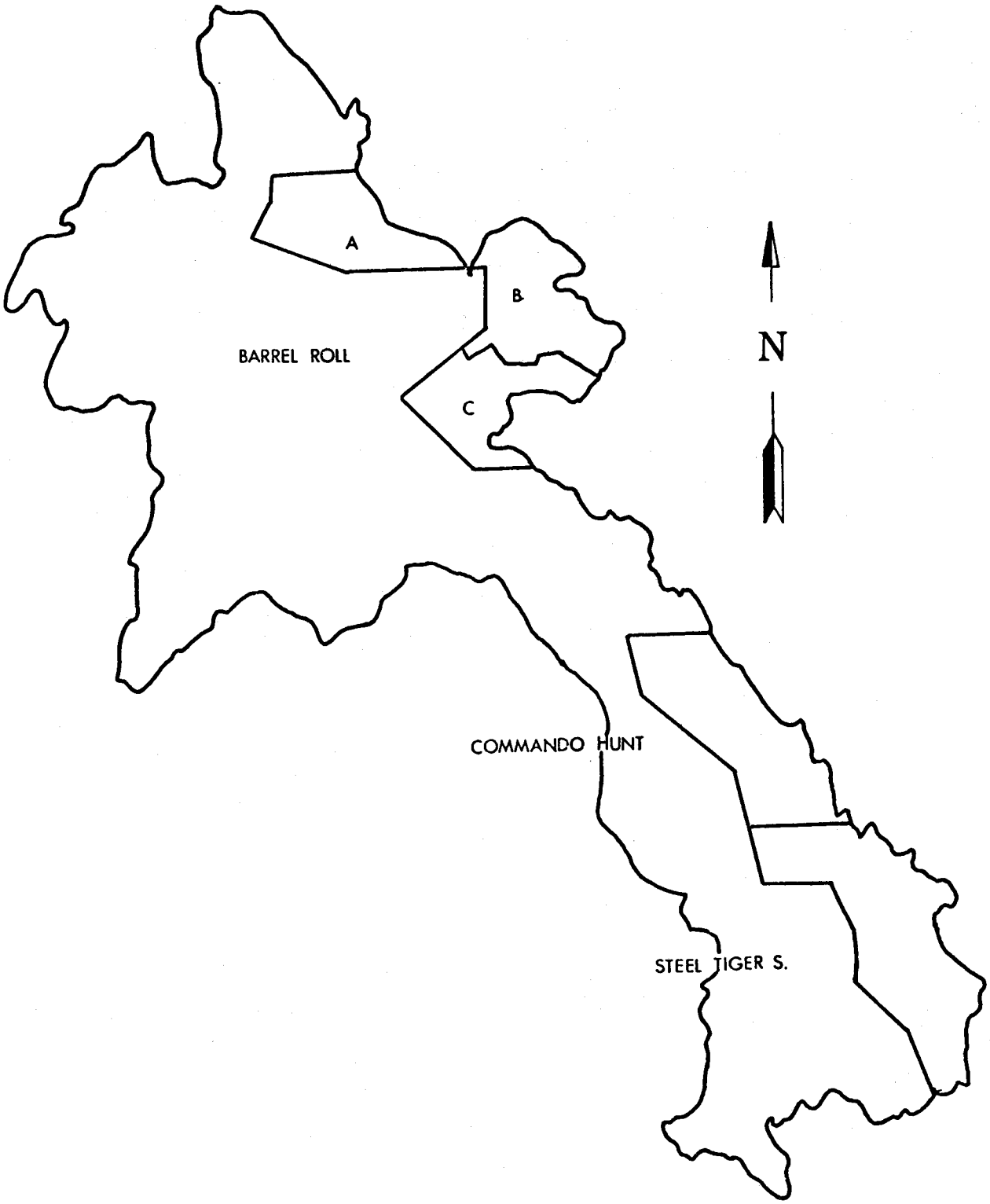
*Renamed Igloo White on 1 June 1968.

(TS-Gp-4) Following this meeting, Secretary Clifford directed the preparation of an interdiction plan to attack enemy supply lines and evaluate Igloo White equipment. General McConnell assigned to Gen. Joseph J. Nazzaro, Commander in Chief, Pacific Air Forces (CINCPACAF), the task of establishing a group at Seventh Air Force headquarters to plan the interdiction campaign. Completed in late August and designated Commando Hunt, the plan envisioned the destruction of a greater number of trucks and supplies on the major infiltration routes in the Laotian panhandle. The proposed operations would hopefully tie down substantial enemy forces supporting the movement along the Ho Chi Minh trail while checking out the Igloo White sensors. The administration was especially anxious to strike key roads that the Communists had rebuilt over the past year. Intelligence indicated that the enemy's 559th Transportation Group--with about 50,000 personnel and well over 1,000 trucks--was located in the eastern part of the Laotian panhandle.[12]

(S-Gp-4) Gen. Creighton Abrams, Commander, U.S. Military Assistance Command, Vietnam (COMUSMACV) approved the plan on 26 September 1968 and assigned it a high priority. Commando Hunt operations began on 15 November, with USAF Brig. Gen. William P. McBride, Commander of Task Force Alpha at the Infiltration Surveillance Center (ISC), Nakhon Phanom AB, Thailand, being responsible for integrated planning and control of Air Force, Navy, and Marine aircraft. General McBride's task force also directed the Igloo White air surveillance system (see discussion below) and was in a position to allocate Igloo White resources to the Commando Hunt project. The area of operations in the eastern segment of Steel Tiger extended from the Mu Gia pass to approximately six miles south of Tchepone, Laos, and

~~SECRET~~

INTERDICTION AREAS IN LAOS



covered about 1,700 square miles including 450 miles of primary roads. Information derived from Igloo White sensors was used as the primary intelligence base for locating truck concentrations. Also B-52 Arc Light aircraft were used against truck parks and supply storage areas as the Air Force increased the number of sorties allocated to strike in Laos.[13]

(S [redacted]) Between November 1968 and January 1969, the Air Force committed 40 percent of its SEA strike aircraft (including fighter-bombers, B-52's, and AC-130 gunships) against about 1,350 enemy trucks in Laos.* Commando Hunt emphasized attacks against roads and points which the Communists found difficult to bypass. When they completed their repairs, these same areas were hit again. During the Commando Hunt operation, the Air Force estimated that only 18 percent of the materiel entering Laos from North Vietnam actually arrived in South Vietnam, with 47 percent of it probably destroyed, 29 percent consumed, and six percent stored.[14]

([redacted]) The Air Force attributed the apparent success of Commando Hunt to several factors. First, the strikes were not arbitrarily limited in time and were expected to continue into June 1969, when the weather would make movement very difficult for the Communists. Second, Igloo White sensors had helped to locate interdiction points and areas.+ Also, the use of area denial munitions plus the effectiveness of the integrated command and control network under Task Force Alpha seemed to have made a

*Of the total, the North Vietnamese operated approximately 400 trucks per day although upon occasion the total was substantially higher.

+The Air Force made a distinction between interdiction points and areas, using different tactics and munitions for each.

difference. In the Air Force's view, Commando Hunt was perhaps the most effective American interdiction effort of the war.*[15]

Igloo White Surveillance System

(S-Gp-4) In 1967, when Secretary McNamara directed that a barrier system be constructed just below the DMZ and west to the mountain trails of Laos, the Air Force simultaneously began to deploy a complementary air surveillance system called Muscle Shoals.+ Redesignated Igloo White, the system became operational in December 1967. Its purpose was to gather intelligence on the enemy's personnel and vehicular movements through the use of a variety of sensors dropped over infiltration routes to provide 24-hour all-weather coverage.[16] Despite some technical problems, when initial operations began, it became clear that the Igloo White equipment was helpful in detecting enemy movements. The system proved sufficiently successful for General Abrams' staff to promulgate a plan (called Duck Blind and later, Duffel Bag) designed to use sensors solely in South Vietnam to locate Communist base areas, truck parks, and possible ambushes as well as landing zone surveillance.[17]

(S-Gp-4) On the basis of an Air Staff study, General McConnell recommended to Secretary Brown on 6 February 1968 that management of the Igloo White network be transferred from the Defense Communications Planning Group (DCPG), which had been responsible for setting it up, to the Air Force.

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*Excluding Khe Sanh, in which elements of interdiction, neutralization and even saturation bombing (especially by B-52's) combined to decimate the enemy and frustrate his objectives.

+See Wolk, USAF Plans and Policies Logistics and Base Construction in Southeast Asia 1967 (AFCHO, Oct 1968), Chap IV, "The Anti-Infiltration System."

He delineated two plans, the first calling for a phased transfer of responsibility from the DCPG to the Air Force, a process which would consume about five months after which time the DCPG would be disestablished. Subsequently, the Secretary of the Air Force would declare Igloo White a designated system and establish a system program office (SPO) to take over development responsibility. His second proposal envisioned Igloo White's immediate transfer as a so-called "designated system" with the SPO director being a member of the designated systems management group (DSMG) for the surveillance network. Secretary Brown agreed to support the latter option "at the right time."[18]

(S-Gp-1) In the meantime, an evaluation committee headed by Adm. James S. Russell (Ret.) concluded that, although Igloo White had not stopped infiltration,* it showed "great promise for new and exciting military capabilities." Perhaps the major impetus for going ahead with Duffel Bag in-country development was the outstanding success achieved at Khe Sanh with battlefield sensor surveillance. Overall, the Russell committee felt that former Secretary of Defense McNamara had made a mistake when he placed "an untried infiltration-interdiction system in first national priority." It recommended the formation of a high-level committee reporting directly to the defense chief to study possible weaknesses in the military structure that led to the establishment of the DCPG. The highest national priority, declared the group, should be placed on development, production, and procurement of air munitions for interdiction.+ Also, development and production

*The Air Force emphasized that Igloo White was not an anti-infiltration system, but rather a surveillance system.

+In general, the Russell committee concluded that the development of air munitions and delivery systems had been "inadequate."

of an all-weather, day-night aircraft should be accelerated. Finally, the committee proposed that the military coordinate plans to develop and deploy sensors so that the services might eventually take over DCPG responsibilities.[19]

(S [redacted]) On 7 November 1968 the Joint Chiefs endorsed the recommendation that the services make plans for a coordinated development of sensors and they agreed that greater stress should be placed on producing interdiction munitions and developing an effective tactical all-weather aircraft. The JCS also backed the Air Force's Commando Hunt interdiction plan.[20]

([redacted]) Acting on the Russell report and the recommendations of the JCS, Dr. Foster directed the Defense Communications Planning Group to transfer all procurement, systems engineering, and "operational interfaces" of the Igloo White system to the Air Force no later than July 1970. Although the Igloo White technology was "still in its infancy," said Dr. Foster, "I believe it is of national importance to continue these developments with the same sense of urgency and dedication exercised by the DCPG over the last two years."[21]

V. PROJECT SHED LIGHT

(S [redacted]) Another project designed to provide the Air Force with the capability to find and destroy the enemy and his supplies at night was Project Shed Light, established in March 1966. Although several Shed Light development projects were designed specifically to facilitate night operations and new or improved aircraft were required for the nighttime role, the fact remained that by 1968 the Air Force still had not developed a wholly satisfactory system. This was especially true for aircraft which could operate against the enemy over his own territory at night--and survive.*[1]

Major Systems

(S [redacted]) Four major USAF systems--designated Gunship II, Black Spot, and Tropic Moon I and II--were deployed to Southeast Asia following their development under Project Shed Light. The first system, an AC-130A, was a self-contained, all-weather, night attack aircraft equipped with special sensors, four 7.62 "mini-guns," and four 20-mm gatling guns. In September 1967 a prototype model was deployed to Southeast Asia for evaluation and spent more than 10 months in combat before returning to the United States in November 1968. Between February 1968 and its last combat mission on 12 November, this Gunship II AC-130A compiled the following record:[2]

Mission Data

Missions Flown	-	151
Sorties	-	246
Avg Flying Time Per Month	-	111 Hours

*For a status report on all Shed Light systems and equipment as of January 1969 see Appendix #2.

Bomb Damage Assessment

Trucks Sighted	-	1,000
Trucks Destroyed	-	228
Trucks Damaged	-	133
Boats Sighted	-	32
Boats Destroyed	-	9
Boats Damaged	-	8

([redacted]) Based on the prototype's success,* Secretary Brown approved the procurement of an additional eight AC-130's, 26 AC-119G's, and 26 AC-119K's. Four of the eight follow-on AC-130's were deployed to Ubon AB, Thailand, in December 1968 to fly interdiction missions over Laos.[3]

([redacted]) In August 1968 the Air Force deployed two night attack Black Spot C-123K's initially to Osan AB, Korea, where they began surveillance operations in support of the Republic of Korea Navy against North Korean efforts to infiltrate South Korea by sea. The C-123's were equipped with forward-looking infrared radar moving target indicator (MTI), low light level television (LLLTV), and a laser ranger. In 28 sorties, the crews discovered they could detect water traffic with Black Spot equipment but were unable to identify which of the hundreds of vessels spotted were North Korean. In mid-November the two aircraft were sent to Phan Rang AB, South Vietnam, and on 1 February 1969 were redeployed to Ubon AB, Thailand, from where they operated against enemy lines of communications (LOC), logistic strong points, and trucks in the IV Corps and southern Laos. The following depicts Black Spot operations in Vietnam and Thailand between 15 November 1968 and 13 March 1969:[4]

	Attacked	Damaged	Destroyed
Trucks	727	156	255
Boats	103	24	55
Miscellaneous (Docks, Buildings, Camps)	138	78	27

*Especially in support operations over areas where the enemy possessed only light antiaircraft weapons.

(S-Gp 4) The Air Force planned to return the C-123's to the United States in May 1969 for refurbishing and then redeploy them again to Southeast Asia as part of the permanent force.[5]

(S-Gp 4) The Tropic Moon I program featured the development, testing, and deployment, in December 1967, of pod-mounted LLLTV night attack equipment on four A-1E aircraft. Based at Nakhon Phanom AB, Thailand, they began operations in the Steel Tiger area of Laos on 8 February 1968. In May, with the start of the rainy season in Laos, the Tropic Moon I planes moved to Bien Hoa AB, South Vietnam, for operations in the III and IV Corps. On 1 December 1968, the program was terminated, the LLLTV systems were removed and returned to the United States, and the A-1E's reverted to normal configuration, remaining in South Vietnam.[6]

(S-Gp 4) Three Tropic Moon II B-57's deployed to Southeast Asia in December 1967. Based at Phan Rang AB, they started operations in the Steel Tiger area on 6 February 1968. During a 90-day combat evaluation that ended in May, these aircraft flew 116 sorties, detected 536 trucks, destroyed 31, and probably destroyed 43. They redeployed to the United States in July.

(S-Gp 4) Both Tropic Moon I and II programs proved disappointing, their effectiveness considered "marginal." The major reason given for the failure of Tropic Moon II was that "the speed of the B-57 allowed insufficient time to identify targets." Also, the navigation equipment in the B-57 proved inadequate for the Tropic Moon II mission.[7]

Tropic Moon III

(S-Gp 4) In September 1967--two months before the operational deployment of the Tropic Moon I and II aircraft--a Shed Light General Officers

conference had concluded that the B-57 was "the logical choice" for the Tropic Moon III mission of operating against small targets with a multi-sensor aircraft. On 28 November 1967, the Air Staff Board authorized the modification of 16 B-57's for the self-contained night attack role and OSD approved the program on 24 February 1968.[8]

(S-Gp-4) The Tropic Moon III B-57's were to be equipped with low light level TV, forward-looking infrared radar with moving target indicator, and an advanced system for target detection, tracking and weapons delivery. In addition to radar homing and warning equipment and ECM, these aircraft were to have special ceramic armor to protect the crew and explosion-proof internal self-sealing fuel cells.[9]

(S-Gp-4) Air Force officials visualized the modified B-57's as being able to perform the night attack role creditably after the war in Southeast Asia was over. Initial planning called for the development of two prototypes. Tropic Moon III contracts were let in late 1968 and training for crews and technicians began. The Air Force estimated that the 16 B-57's would be operational late in 1969.[10]

Conclusion

(U) During their appearance before a House committee in February 1968, Secretary Brown and General McConnell emphasized the positive aspects of the Air Force's R&D programs for Southeast Asia. The Chief of Staff pointed out, for example, that over an 18-month period the Air Force had introduced into the operational inventory about 15 new air-deliverable weapons or major improvements in existing weapons. In this

connection, Dr. Brown submitted to the committee a lengthy list of contributions of Air Force research to the Vietnam war. The items ranged from equipping USAF reconnaissance units with completely self-contained mobile photographic processing and interpretation facilities to ceramic armor kits for C-130 aircraft.

(U) When a somewhat skeptical Congressman asked whether he wasn't being "overly-optimistic in what we expect of the developments and devices which become available each year," Secretary Brown admitted that such items "never perform in the field as they do on the test range." But, he argued, they always "perform better than last year's system." Further, he noted that the enemy also was developing systems, both in conventional war and in strategic war, "so we have to keep working on these things in order to stay ahead of the game."[11]

APPENDIX 1

Equipment Introduced Into Southeast Asia 1968-1969

Calendar Year 1968

MUNITIONS

LAU-62/A Flare Launcher
SUU-42/A Dispenser
SUU-41 Dispenser
Chemical Weapon BLU-52
FMU-26A/B Fuze
Fuze, FMU-56/B
Long Duration Target Marker LUU-1/B
CBU-34A Dispenser and Mine
CBU-28A Dragontooth Mine
FMU-57B Proximity Fuze

RECONNAISSANCE

Printer-Enlarger (EN-99A)
Photographic Printing, Processing, and Interpretation Facility (ES-73A)
KA-79 Camera
KA-80 Panoramic Camera
M-731 Strike Film Viewer

ELECTRONIC COUNTERMEASURES

QRC-312-1/ALT-15 Mod Kit
QRC-128 Communications Jammer
AN/ALT-28 ECM Jammer
QRC-359/ALT-16 Mod Kit
QRC-335A Seed Sesame
ALQ-71 ECM Pod
QRC-337A/ALQ-71 Mod Kits
ALR-31 (SEE SAM)
QRC-353-A, Chaff
QRC-248A IFF Interrogator

NAVIGATION

ARN-92 Loran D

AIRCRAFT AND MISSILES

Tropic Moon I and II
AIM-4D Pilot Training Missile
AGM-78A-Standard ARM Missile

C-130 Gunship II
F-111A Aircraft
AIM-7E-2 Sparrow Missile
OV-10 Aircraft
AGM-45A Shrike Missile
AGM-12E Stand-off Cluster Missile
F-4E Aircraft
Black Spot Aircraft

IMPROVED ATTACK CAPABILITY

Laser Guided Bomb
Electro-Optical Guided Bomb
Pave Arrow - Laser Target Designator (LTD) and Seeker System
Infrared Guided Bomb

COMMUNICATIONS, COMMAND, AND CONTROL

TPS-50 Radars
Map Overlays for Mobile GCA Units
AN/GPA-129 Video Mapping Group
College Eye Modification C-121
AN/PRC-72 Radio

PERSONAL LIFE SUPPORT

URT-33 Personal Locator Beacon
Marker, Signal SRU-22/P
Improved Body Armor
Radio Set URC-64

OPERATIONAL SUPPORT

Truck, Fork-Lift A/S 32H-15
Low Altitude Parachute Extraction System and Platforms
Palletized Mail Systems
Cargo Buffer Stop
Fast Fix Cement
C-130 Ramp Kit
Aircraft Arresting Barrier (BAK-13)
Mobile Electronic Weighing System (A/M 37-U2)
Combat Trap
Cargo Airdrop Release Gate
Hydraulic Flow Comparator

Calendar Year 1969

MUNITIONS

Hard Structural Munition - BLU-31/B
Anti-Vehicle Land Mine (CBU-33)
Anti-Materiel Bomblet (CBU-54B)
Downward Ejection Bomb (CBU-38A)

RECONNAISSANCE

Photo Interpretation Equipment (AR-109A)
F-4D/APX-81 Interrogator
Step and Repeat Printer (FH-701A)
Infra-Data Link (Compass Sight)
Mobile Color Film Processing Facility (EN-75)
Compass Count (AN/AVD-2 Laser)

ELECTRONIC COUNTERMEASURES

QRC-354-Receiver
QRC-373 Miniaturized Noise Jammer

NAVIGATION

Rotating TACAN Antenna YN1-106
Tactical Instrument Landing System (AN/ARN-97 and AN/TRN-27)
Lightweight TACAN (AN/TRN-26)

AIRCRAFT AND MISSILES

AGM-45A with Tracking Flare
AGM-78B Standard Arm Missile
Hunter I System
AN/ASQ-96 System
Tropic Moon III

IMPROVED ATTACK CAPABILITY

F-4C Laser Bombing System AN/AVB-1
Lightweight Precision Bombing System

COMMUNICATIONS, COMMAND, AND CONTROL

MSQ-77 Modifications
K-300 A/1 Automatic "Satellite Picture" Recorder
Portable Cloud Height Measuring Device
Rapidly Deployable Antenna Mast

(This page is UNCLASSIFIED)

APPENDIX 2

SHED LIGHT STATUS REPORT, RDT&E FUNDS

DATE: 29 January 1969

(FUNDS IN THOUSANDS OF DOLLARS)

PROGRAM ELEMENT	PROJ	TASK	S/L NR.	SHED LIGHT TITLE	AFRDC OPR	SPEC ATTN	PRI	FY 66/67 FUNDED	FY 68 FUNDED	FY 69 FUNDED	FY 69 ADD'T REQ	FY 70 ADD'T REQ	FY 70 BUDGET
61102F	5635	5	93	RESONANT REGION RADAR	RDDG	S	1-7	430	500	128	0	0	0
64708F	1559	224	93	RESONANT REGION RADAR	RDDH	S	1-7	0	225	0	0	0	0
61102F	7235	--	15A	ISOCON IMAGE AMP DEV	RDDH	S	370	282	120	156	0	--	200
61102F	8601	6	94	AIR/B RECCE MAGNETOMETRY	RDDG	S	370	250	50	0	0	0	0
62101F	7621	7	95	ENVIRON FACTORS LLLTV	RDDH	S	1-7	518	533	0	0	150	--
62403F	5227	3	20	IR NIGHT SENSOR	RDDH	S	370	675	100	0	100	--	--
62403F	4056	6	103	FLIR FABRICATION TECH	RDDH	S	370	230	0	88	--		350
62403F	5042	19	101	POLY FREQ SIDE LOOK RADAR	RDDG	S	1-6	2690	750	250	0	0	325
62710F	2563	--	61	TARGET ILLUMINATION PYRO	RDDA	PS	370	452	175	150	0	0	500
63101F	7990	A	96	S/L EFFECTIVENESS MODEL	RDDH	S	1-7	0	0	0	0	0	0
63203F	666A	5B	82	DOPPLER INERTIAL LORAN	RDDG	S	1-7	1417	700	1900	0	0	1950
63208F	665A	C05	23	HIGH ALTITUDE IR SENSOR	RDDH	S	370	550	231	0	0	0	0
63208F	665A	7	35A	FOPEN 1A	RDRM	S	370	900	1897	300	0	0	0
63208F	665A	C01	100	TAC NEAR REAL TIME RECCE	RDRM	S	1-7	350	780	1000	0	0	1000
63208F	665A	C03	137	HIGH RES LOW ALT IR SENSOR	RDRM	S	1-7	0	0	550	0	0	100
63208F	665A	--	53	A/B IR RASTER DISP ABIGD	RDRM	S	370	97	0	0	0	0	0
63215F	698DF	A	15B	ISOCON IMAGE AMPLIFN TEST	RDDH	S	1-7	0	0	20	0	0	0
63215F	698DF	1A	13	ADVANCED LLLTV	RDDE	PS	1-6	1270	178	280	0	0	500
63215F	698DF	1B	18	ADVANCED FLIR	RDDE	PS	1-6	800	329	580	0	0	600
63215F	698DF	1C	31	LASER TARGET RECOGN SYS	RDDE	S	1-6	500	1160	526	0	0	300
63215F	698DF	2A	105	MULTI SENSOR WPN DLVY SYS	RDDE	S	370	0	50	100	0	0	600
63215F	698DF	2B	138	KINEMETIC BOMBING SYS	RDDE	S	370	0	0	625	0	--	0
63215F	698DR	2C	133	CLOSE AIR SUPPORT SYS	RDDE	S	1-7	0	0	600	0	0	200
63302F	679A	6	106	LASER OP GUID INTEG LOGIC	RDDA	PS	1-7	1227	1171	1000	0	0	904

SHEDLIGHT STATUS REPORT, RDT&E FUNDS

DATE: 29 January 1969

(FUNDS IN THOUSANDS OF DOLLARS)

PROGRAM ELEMENT	PROJ	TASK	S/L NR	SHED LIGHT TITLE	AFRDC OPR	SPEC ATTN	PRI	FY 66/67 FUNDED	FY 68 FUNDED	FY 69 FUNDED	FY 69 ADD'T REQ	FY 70 ADD'T REQ	FY 70 BUDGET
63709F	681A	2	86	LORAN INERTIAL BOMB DEMO	RDD	S	1-7	0	0	0	450	0	0
63716F	670A	P3	114	TARGET MARKING MUNITIONS	RDDA	S	370	0	187	100	--	200	200
63716F	670A	P12	115	BATTLEFIELD ILLUMINATION	RDDA	S	370	0	225	300	0	200	200
64212F	1709		12	LASER RANG AIDED VIS F-4C	RDQRT	PS	1-7	6400	1200	181	0	0	0
64212F	1766		3A	O-2/OV-10 NIGHT AVIONICS SYS	RDDH	PS	1-7	73	0	2250	2250	--	3500
64212F	2701		126	PAVE GAT	RDDA/RDDH	S	1-6	0	1300	0	0	0	0
64212F	2702		127	NIGHT RECOVERY SYSTEM	RDDH	S	1-6	0	3525	1500	--	--	0
64212F	2707		139	GUNSHIP INERTIAL TGT SYS	RDDH	S	1-6	0	0	280	0	0	0
64212F[1]	4004		119	GUNSHIP DIG FIRE CONTROL	RDDH	S	1-6	0	296	130	0	0	0
64212F	4366		128	C-130 TESTBED AIRCRAFT	RDDH	S	1-6	596	63	250			180
64212F	5220		10	F-105 T-STICK II	RDQRT	PS	1-7	6699[2]	100	0	0	0	0
64212F	6033		140	RED FLAME II	RDDH	PS	1-6	15402[2]	3186	2670	0	12800	3320
64212F	6038		122	SEC VIDICON TUBE	RDDH	PS	1-6	0	148	352	0	0	0
64212F	6041		123	HAVE AUGER	RDDE	PS	1-6	0	750	450	0	0	300
64212F	6041		121	BLACK CROW	RDDH	PS	1-6	0	50[3]	0	0	550	0
64212F	6041		124	PAVE CROW	RDDD	PS	1-6	0	110[3]		0	0	750
64212F	XXXX		141	LASER TGT DES IN CLS AIR SUP	RDDH	PS	1-6	0	0	1500	750	2500	0
64212F	XXXX		113	QUIET AIRCRAFT	RDDH	S	1-7	0	0	0	--	--	0
64212F	XXXX		134	RESERVE RANGING	RDDH	S	1-7	0	0	450	0	0	550
64703F	--		80C	AN/TPQ-27	RDDD	S	370	600	0	700	0	0	1500
64708F	1559	198	130	PAVE SPOT	RDDH		1-6	--	45	339	0	0	0
64708F	1559	178	110B	MILLIMETER WAVE RADIOMETRY	RDDH	S	1-7	0	449	0	0	0	0
64708F	1559	222	125	PAVE BOX	RDDH	S	1-6	0	0	157	0	0	0
64708F	1559	224**	93	RESONANT REGION RADAR	RDDG	S	1-7	430	225	0	0	0	0
64708F	1559	209***	12	LASER RANG AIDED VIS F-4C	RDQRT	PS	1-7	6400	24	0	0	0	0
64708F	1619	01	73	LASER TGT DES PAVE ARROW	RDDH		1-6	5750	2509	367	1000*		1000
64708F	1619	04*	116	LASER TARGET DES PAVE LIGHT	RDDH		1-6	543	565	150	0	0	0
64708F	1619	05*	102	LASER TGT DES PAVE KNIFE	RDDH	S	1-6	--	1991	650	0	0	0

* FY 67/68 were funded from 1559 Tasks 146/157
** FY 66/67 funds under 61102F 5635 Task 5
*** FY 67 funding 64212F 1709

1 Previously 64708 1559 142 funds of 68 and prior are for original Gunship II
2 15.402M funded from other sources
3 60K of this was funded from 1559

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SHEDLIGHT STATUS REPORT, RDT&E FUNDS

DATE: 29 January 1969

(FUNDS IN THOUSANDS OF DOLLARS)

PROGRAM ELEMENT	PROJ	TASK	S/L NR.	SHED LIGHT TITLE	AFRDC OPR	SPEC ATTN	PRI	FY 66/67 FUNDED	FY 68 FUNDED	FY 69 FUNDED	FY 69 ADD'T REQ	FY 70 ADD'T REQ	FY 70 BUDGET
64708F	6517		69A	COIN RANGING & HOMING	RDDD	PS	370	2775	0	250	0	0	350
64708F	2077		1A	BIAS	RDDH	PS	1-6	3252	448	0	0	0	0
64708F	4053		6	BLACK SPOT	RDDH	PS	1-6	11841	630	0	0	0	0
64709F	--	--	80B	LT WT PRECISION BOMBING SYS	RDDD	S	1-6	300	0	460	0	0	0
64710F	1593		33	LASER RECCE ADVANCED DEV	RDRM	PS	1-7	1050	800	2600	600	0	0
64710F	4010		132	IR RECON SET	RDRM	PS	1-6	0	1600	0	0	0	1800
64712F	1254		99	FORWARD FIRING TGT MK	RDDA	S	1-7	0	0	260	610	0	0
64712F	7053		129	GUNS FOR GUNSHIP	RDDA	S	1-7	0	0	0	--	--	0
64712F	8751		135	HOMING OPTICAL GUIDANCE SYS	RDDA	S	1-7	0	0	600	0	0	800
XXXX	XXXX		136	COMBAT RAM	RDRE	S	1-7	--	QRC 402 PRODUCTION FUNDED				

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GLOSSARY

AAA	Anti-Aircraft Artillery
AB	Air Base
ADC	Aerospace Defense Command
AFB	Air Force Base
AFCCS	Air Force Command and Control System
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
AGM	Air-to-Ground Missile
AIM	Air Intercept Missile
AM	Amplitude Modulation
ARM	Anti-Radiation Missile
ARPA	Advanced Research Projects Agency
ASD	Aeronautical Systems Division
BIAS	Battlefield Illumination Airborne System
BOB	Bureau of the Budget
BPE	Best Preliminary Estimate
CBU	Cluster Bomb Unit
CEP	Circular Error Probable
CINCPAC	Commander in Chief, Pacific
CINCPACAF	Commander in Chief, Pacific Air Forces
CJCS	Chairman, Joint Chiefs of Staff
CofS	Chief of Staff
COMUSMACV	Commander, United States Military Assistance Command, Vietnam
CONUS	Continental United States
CSAF	Chief of Staff, United States Air Force
CTZ	Combat Tactical Zone
DCPG	Defense Communications Planning Group
DCS	Deputy Chief of Staff
DDR&E	Director, Defense Research and Engineering
DMZ	Demilitarized Zone
DSMG	Designated Systems Management Group
ECM	Electronic Countermeasures
EOS	Electronic Operational Support
EW	Early Warning Electronic Warfare
FLIR	Forward Looking Infrared Radar
FM	Frequency Modulation

GCI	Ground-Controlled Intercept
IFF	Identification, Friend or Foe
IOC	Initial Operational Capability
IR	Infrared
ISC	Infiltration Surveillance Center
JCS	Joint Chiefs of Staff
JCSM	Joint Chiefs of Staff Memorandum
JTF	Joint Task Force
LLLTV	Low Light Level Television
LOC	Line of Communications
LORAN	Long-Range Navigation
MACV	Military Assistance Command, Vietnam
MTI	Moving Target Indicator
NLF	National Liberation Front
NVN	North Vietnam
OSAF	Office of the Secretary of the Air Force
OSD	Office of the Secretary of Defense
OT&E	Operational Test and Evaluation
PACAF	Pacific Air Forces
PACOM	Pacific Command
PIRAZ	Positive Identification and Radar Advisory Zone
PROVOST	Priority Research and Development Objectives for Vietnam Operational Support
PSAC	President's Scientific Advisory Committee
QRC	Quick Reaction Capability
R&D	Research and Development
RDT&E	Research, Development, Test and Evaluation
RHAW	Radar Homing and Warning
ROC	Required Operational Capability

SAB	Scientific Advisory Board
SAC	Strategic Air Command
SAF	Secretary of the Air Force
SAM	Surface-to-Air Missile
SCNA	Self-Contained Night Attack
SEA	Southeast Asia
SEAOR	Southeast Asia Operational Requirement
SECDEF	Secretary of Defense
SPO	System Program Office
SUU	Suspension Unit
SVN	South Vietnam
TAC	Tactical Air Command
TDY	Temporary Duty
TEW	Tactical Electronic Warfare
TFR	Terrain Following Radar
UE	Unit Equipment
US	United States
USAF	United States Air Force
WSEG	Weapons Systems Evaluation Group

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23.	AFIN	52.	AFXOOW
24.	AFACDS	53.	AFXOX
25.	AFPRP	54.	AFXOXF
26.	AFPRPK	55.	AFXOXFS
27.	AFPRPB	56.	AFXOXFTA
28.	AFPRPT	57.	AFXOXX
29.	AFPRC	58.	AFXOXXEP

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