Report of the Defense Science Board Task Force

on

OPTIONS FOR ACQUISITION OF THE ADVANCED TARGETING POD AND ADVANCED TARGETING FLIR POD (ATP/ATFLIR)

February 2001

Office of the Under Secretary of Defense
For Acquisition, Technology & Logistics
Washington, D.C. 20301-3140

This report is a product of the Defense Science Board (DSB). The DSB is a Federal Advisory Committee established to provide independent advice to the Secretary of Defense. Statements, opinions, conclusions, and recommendations in this report do not necessarily represent to official position of the Department of Defense.

This report is unclassified

MEMORANDUM FOR PRINCIPAL UNDER SECRETARY OF DEFENSE (ACQUISITION, TECHNOLOGY & LOGISTICS)

SUBJECT: Final Report of the Defense Science Board (DSB) Task Force on Options for Acquisition of the Advanced Targeting Pod and Advanced Targeting FLIR Pod (ATP/ATFLIR)

I am pleased to forward the final report of the DSB Task Force on Options for Acquisition of the Advanced Targeting Pod and Advanced Targeting FLIR Pod. This study, chaired by Mr. Walter Morrow, was established to assess the options for acquisition of third generation Forward Looking Infrared (FLIR) targeting pods for the Air Force and the Navy.

In their report, the Task Force recommends that the Department continues with both the Navy's ATFLIR program and the Air Force ATP program as currently planned since it offers the most expeditious and cost-effective option to fielding a much needed capability.

I endorse all of the Task Force's recommendations and propose you review the Task Force

Craig I. Fields
Chairman

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EXECUTIVE SUMMARY

BACKGROUND

The Under Secretary of Defense (AT&L) requested that the DSB form a brief study of ongoing Navy and Air Force programs aimed at developing advanced laser guided weapon targeting pods for their tactical aircraft. This request for a DSB Task Force was occasioned by Congressional interest in the possibilities of a Joint development and production program for these pods.

Current targeting pods are inadequate because improved enemy low altitude air defenses have forced tactical aircraft to operate at significantly higher altitudes. As a result, both the Chief of Naval Operations and the Chief of Staff of the Air Force have declared that obtaining an advanced targeting pod for the current Navy, Marine, and Air Force tactical air fleets is an extremely urgent matter.

FINDINGS

A. The Navy Advanced Targeting FLIR (ATFLIR) Program, which was initiated in 1997, is progressing well and should successfully meet Navy requirements for a high altitude targeting system for laser guided weapons. The recent extension of the development schedule back to the original schedule should permit the reduction of the angular jitter by the factor of two thus meeting the requirement. All other requirements are anticipated to being met.

B. The recently initiated Air Force Advanced Targeting Pod (ATP) Program plans competitively to contract for advanced targeting pods as non-development items (NDI). The Task Force believes that there is some risk that this approach may not meet Air Force needs. Modifying these NDI designs to meet Air Force needs may require development efforts requiring additional time and expense.

C. The option of a Joint Program employing the Navy ATFLIR design may result in a protest by the competitors for the Air Force ATP Program. In addition, a redesign of the Navy version to accommodate Air Force needs for an in-pod cooling system may result in a pod that is too large for F18 carrier operations. Thus, two physically different designs may be needed

D. adding to the costs of a joint program compared with separate programs. Such a joint program will very likely delay either service obtaining this badly needed capability by up to two years, since joint requirements will have to be negotiated and a new contract let. Finally, such a joint program could result in a lack of future competition for such pods with resulting higher costs.

E. The option of a Joint Program employing the Air Force ATP Program will require termination of the Navy ATFLIR Program with resulting costs and perhaps a protest by the contractor. This approach will also result in significant delays while a joint requirement is negotiated, and a new contract negotiated. As discussed above, two pod configurations will likely have to be developed resulting in additional costs that would likely offset the cost savings of a larger production run.

F. The option of continuing the current ATFLIR and ATP programs will result in the least delay in obtaining this badly need capability for the Services tactical air forces; will probably be least costly; and will maintain industrial competition thus minimizing long term costs as well as maintain a strong technology base.

RECOMMENDATION

The Task Force recommends that the Department should continue with the current ATFLIR and ATP targeting pod programs for the following reasons:

A. Because the pods for the F16 and F18 will be substantially different configurations, the cost of separate designs will very likely more than offset any savings due to a doubling of the total quantity of pods procured.

B. The current pod programs are the fastest way to obtain high altitude targeting of laser guided weapons, an urgently needed capability because of improved enemy air defenses. Either of the Joint options will require substantial delays to negotiate joint requirements, renegotiate contracts.

C. Pursuing both Programs is also the only option that will maintain competition; thus preserving a strong technology and production base as well as achieving minimum costs in the long term.

I. INTRODUCTION

A. Origin

The Under Secretary of Defense requested that the Defense Science Board form a brief study of developments by both the Navy and the Air Force of third generation forward looking infrared (FLIR) aircraft sensor systems.

This study was in response to Congressional concerns about a possible duplication of efforts including the issue of potential cost savings through a Joint development.

B. Tasking

The Task Force was asked to make recommendations for the preferred procurement option given consideration of technical feasibility, schedule, and life cycle costs. At a minimum the Task Force was asked to consider the following options:

1. The existing Advanced Targeting Forward Looking Infrared (ATFLIR) Navy program would continue and would be the Joint program for both services.
2. The Advanced Targeting Pod (ATP) Air Force program would be competed and the winner would be the basis for a Joint program.
3. Both programs would proceed as planned (status quo).

A complete text of the Terms of Reference for the Task Force is contained in Appendix A. Relevant Congressional language from the Report of the FY2001 Defense Appropriations Bill is contained in Appendix B.

The Study was sponsored by the Principal Deputy Under Secretary of Defense (Acquisition, Technology and Logistics).

C. Membership

The Task Force membership consisted of three individuals as follows:

(1) Walter E. Morrow - Director Emeritus, MIT Lincoln Laboratory, Chair

(2) Lawrence A. Skantze, General USAF (Ret)

(3) Richard D. Friichtenicht, Rear Admiral USN (Ret)

Biographies of the Task Force Members are contained in Appendix C. The Executive Secretary of the Task Force was Navy Captain Richard O. McHarg of the OSD Air Warfare Office. Support from the Defense Science Board was provided by Air Force LtCol Tony Yang.

D. Briefings

Briefings were heard by the Task Force from:

(1) The OSD Air Warfare Office

(2) The Navy ATFLIR Program Office

(3) The Air Force ATP Office

(4) The OSD Cost Estimating Office

II. BACKGROUND

Laser guided precision air to surface weapons have been used since the South East Asia conflict in the early 1970's. These weapons provided a quantum step in the kill probabilities of strike warfare against military targets compared with the earlier unguided gravity dropped weapons.

In order to provide day and night targeting for laser guided weapons, forward looking infrared (FLIR) targeting systems such as the LANTIRN have been used for more than two decades against ground military targets. The initial targeting systems were designed for operation from low altitudes and ranges because of limitations in the resolution of the sensors and in the intensity of the lasers used for guidance of the weapons. These systems produced a revolution in strike air warfare, in that they allowed for the first time, precision day and night air strikes against small military targets; subject, of course, to the presence of clear weather.

In addition, over the past few decades enormous improvements in the technology of infrared sensors and the power of miniature lasers have occurred as the result of investments by the DoD for other purposes. These developments will be further discussed below.

III. FINDINGS

A. Air Strike Operations

1. Precision Strike Is Vital To U.S. Military Tactical Air Forces

The ability to deliver precision weapons has become vital to U.S. Navy and Air Force tactical air forces for two reasons:

- It is U.S. and allied policy to minimize collateral damage to civilian facilities and personnel located near military targets.
- The military services do not have enough tactical air resources to achieve success against strike objectives using conventional gravity bombing.

2. Strike Air Operations Have Been Forced to Significantly Higher Altitudes

As a result of tactical air strike experiences in the Persian Gulf War of 1990, the continuing Northern and Southern Watches, the Bosnian Theater, and in Kosovo, U.S. tactical air forces have been forced to operate at two to four times higher altitudes and ranges in order to avoid vulnerability due to an enemy mobile surface-to-air missile (SAM) systems which have proved difficult to destroy due to their mobility and intermittent operation.

3. Older Precision Weapon Targeting Systems Have Become Inadequate

Due to the forced increases in altitude and range of strike air attack, the sensitivity and resolution of the older infrared imagers as well as the power of the targeting lasers have become inadequate, leading to much lower kill probabilities. The advent of Global Positioning System guided weapons does not solve this problem because of the difficulty of obtaining timely precision targeting information for mobile military targets.

4. Upgrading Current Tactical Air Fleets Has Become Vital

The current Navy, Marine and Air Force tactical air fleets can be expected to remain operational for as much as two decades longer, even if the Joint Strike Fighter (JSF), which incorporates an advanced precision targeting system, stays on its present schedule. In addition, future funding constraints on the JSF may result in current aircraft remaining in the active inventory even longer. This possibility reinforces the concern of both the Chief of Naval Operations and the Chief of Staff of the Air Force that obtaining an advanced targeting pod for the current Navy, Marine, and Air Force tactical air fleets is an extremely urgent matter.

B. Advanced Technology Developments Make Possible Improved Targeting Systems

The principal technologies that determine the effectiveness of precision targeting

systems are the sensitivity and resolution of the infrared imaging sensor, the power of the laser designator, and the minimization of the angular jitter of the sensor / laser line of sight.

1. Infrared Imagers

Because of technology limitations, the early infrared imagers used a one dimension linear array, of infrared individual sensors, which was scanned over the focal plane of the sensor. This technology limited the sensitivity of the sensor because of the low duty cycle (0.01) of the individual sensors on any single point in the focal plane. In recent years, as the result of DoD and industry investments, the technology of infrared focal planes has advanced to where two dimensional arrays of up to approximately 500 by 500 pixels of individual high sensitivity detectors can be fabricated. This enhances the sensitivity of the sensors by one to two orders of magnitude thus providing the needed additional range capability.

2. Laser Designators

Early laser designators employed high voltage flash lamps to pump YAG lasers. These devices had relatively low power and also suffered from high voltage breakdown at high altitudes. As the result of development in the 1980's, low voltage laser diode pumping was developed resulting in the ability to develop much higher powers in miniature lasers as well as eliminating the high voltage breakdown problem.

3. Angular Jitter

At the longer ranges that are now needed, the angular jitter of the sensor and laser aiming must be reduced by a factor of two to four. Improved vibration isolation systems have been developed in recent years to make this possible.

4. Automatic Target Acquisition and Boresighting

Advances in automatic target acquisition and boresighting techniques have improved acquisition and identification of targets as well as improving the precision of weapon targeting.

C. Current Service Programs for Advanced Targeting Systems

1. Navy Advanced Targeting FLIR Program (F18 C, D, E, F)

Because of an urgent need, the U.S. Navy in 1997 held a competition and awarded a

contract for the development of a next generation targeting FLIR and laser designator system. This upgraded targeting pod is designed to replace the Loral Nite Hawk pod on both U.S. Navy and Marine Corps aircraft. The then CNO instructed the Program Office to shorten the schedule by one year. Because of technical development difficulties, the schedule has had to be pushed back one year to the original dates. The current schedule is shown below.

- Schedule
  - Development Contract Awarded: 1997
  - First Development Pod Delivery: 1999
  - First Production Pod Scheduled: 2002
  - OT&E (TechEval/OpEval): June 2002
  - F18 ATFLIR First Deployment: June 2002
  - Full Rate Production: May 2003

- Performance

The numerical performance values for the ATFLIR vs. earlier targeting pods are classified. However, performance values relative to early targeting systems are unclassified. The most significant difference is its ability to detect and discriminate targets at altitudes and ranges that are approximately double that of the AF LANTIRN and four times that of the Navy and Marine Nite Hawk. In addition, ATFLIR laser designation range for the GBU-24 is substantially greater than that of either the LANTIRN or the Nite Hawk. The Task Force was shown side by side video comparisons of military target imagery from the ATFLIR and LANTIRN pods. Target recognition improvement due to a 10:1 increase in the number of pixels in the image was immediately evident.

The following unclassified chart indicates the ATFLIR performance as compared with the current LANTIRN and Nite Hawk systems in relative terms.

ATFLIR ORD Key Performance Parameters	ATFLIR ORD Threshold	NITE HAWK (AAS-38B)	LANTIRN	Predicted ATFLIR
Geo-Point Accuracy for GPS weapons	XX meters CEP	5%	10%	100% Compliant
Recognition Range (Discrimination tank vs. truck)	X Nautical Miles	25%	60%	>100% Compliant
Laser Designation Range (Continuous lasing for GBU-24)	Y nm Release Z nm Egress	77%	90%	100% Compliant
Reliability (MFHBOMF)	40 hours	18 hours	19 hours	41 hours
Maintainability (MCMTOMF)	1.5 hours	1.5 hours	1.0 hours	1.2 hours
Availability	90%	82%	N/A	91%

- Current Cost Estimates

Projected RDT&E Costs:	$247 M
Estimated Production Costs:	$1790 M
No. Pods:	574
Estimated Initial Cost per Pod:	$3.1 M

The Task Force finds that the current ATFLIR Program is now proceeding with minimum risk and high confidence thus providing the Navy tactical air forces with a very satisfactory targeting system for use at higher altitudes.

2. Air Force Advanced Targeting Pod Program (F16 Block 30, Block 50)

More recently, as the result of experiences in the 1990 Kosovo air war, the Air Force formed a new Program Office tasked with the development of a new FLIR and laser designator called the Advanced Targeting Pod (ATP). The Air Force plans to let a competitive fixed price contract initially for approximately 12 pods with options for fixed price subsequent awards at one year intervals.

As a risk reduction effort prior to release of the Request for Proposals (RFP), the Air Force and the prospective competitors have conducted extensive joint flight test demonstrations using existing Non-Development Item (NDI) pods and components. No development funds are involved in the ATP program since each of the three competitors claims to have the technology and development in hand and are therefore offering NDI equipment.

- Schedule

No contract is in place. This is the Air Force planned schedule.

Contract Award: July 2001
First Pod Delivery: October 2001
OT&E: October 2001
Lot 2 Award: June 2002
First Deployment: October 2002

- Performance

The details of the ATP performance cannot be determined at this time because they will depend on the contractor chosen. However, where the requirement is similar to that of the ATFLIR, we anticipate that similar performance will be achieved. Based on that assumption, the ATP pod should have a geopointing capability 10 times more accurate than the LANTIRN with triple the recognition range and twice the resolution. Substantial advances in the reliability and maintainability should also occur.

The following chart indicates the expected initial performance as derived from current contractor pods. As with the ATFLIR performance chart, classification limits presentation of performance parameters to relative values.

ATP Performance Parameters	ATP ORD Threshold	LANTIRN	Predicted ATP Performance
Geo-Point Accuracy for GPS weapons	XX meters CEP	10%	100% Compliant
FLIR Recognition Range (50% Probability)	X+ Nautical Miles	35%	100% Compliant
Laser Ranging	Y+ Nautical Miles	45%	100% Compliant
Reliability (MTBF)	400 hours	79 hours	» 400 hours
Maintainability (MTTR)	30 Minutes	8 - 12 hours	< 30 Minutes
Availability	92%	89%	92%

- Estimated Costs

Because no ATP contract has yet been let, only Air Force estimated costs are available. They are based on fixed price consecutive contracts at one year intervals with a variable number of pods delivered each year depending on costs of performance improvements as well as learning experience.

RDT&E (Non-Developmental Item):	$0 M
Estimated Production Costs Within FYDP:	$260 M
Estimated Number Pods Within FYDP:	168
Estimated Average Cost per Pod:	$1.5 M
Note that each pod in the first lot is estimated to cost about:	$2.9 M

The Task Force believes that the state of technology supports the ATP Program, but that significant adaptation and development funds may be required to convert the contractor's Non Development Item (NDI) targeting pods to the needs of Air Force. As a result, the Task Force is concerned about potential schedule delays and development costs inherent in such an approach.

The Task Force notes that, while not part of the Task Force's charter, the Air Force should look at the possibility of upgrading its LANTIRN pods, numbering more than 300, with advanced infrared imagers, higher power lasers, and new data processors.

D. Independent Cost Estimates of the Three Procurement Options

In addition to the cost estimates of the ATFLIR and ATP Program Offices, independent cost estimates were made by OSD cost experts. The results of their efforts are shown in the table below. The accuracy of these estimates, compared with actual costs, is generally agreed to be ±10% at best.

The independent estimates indicate that the two Joint program options are more costly than the total costs of the separate programs as estimated by the Program Offices and are, at most, 6% less than the costs for the separate programs as estimated by the independent analysts.

Furthermore, these Joint program costs do not take into account the potential costs of protest should a Joint program be initiated at this point in the schedule of the ongoing ATFLIR and ATP Programs.

	ATFLIR Program Office Estimate	ATP Program Office Estimate	ATFLIR Cost Estimating Team[1]	ATP Cost Estimating Team[2]	Joint ATFLIR[3]	Joint ATP[4]	Joint ATP[5]
R&D	75	0	75	0	75	90	176
Proc	1518	998	1518	1101	2481	2498	2498
O & S	1547	702	1547	1067	2442	2564	2564
T for C[6]	0	0	0	0	0	61	61
Total	**4841**		**5308**		**4998**	**5213**	**5298**
Savings	**9%**		**Baseline**		**6%**	**2%**	**0%**

Notes:

1. The ATFLIR estimate does not account for concurrency of ATP pod production. The ATFLIR estimate includes 70 more pods than the ATP estimate.
2. The ATP AVDLR cost element (O&S) is based on ATFLIR estimating methodology.
3. No schedule delay or R&D costs associated with Joint ATFLIR based on USAF position that Terminator has already been developed. Cost savings result from concurrent production of pods.

4. Joint ORD will lead to two-year schedule delay for both services. USN incurs contractor integration costs that are already sunk in ATFLIR. Contractor will receive existing R&D funds in a Termination for Convenience scenario.
5. Same as Note 4. Also, contractor's design warrants additional costs associated with redesigning pod to fit on F/A-18 cheek station.
6. Costs of termination for convenience (T for C).

E. Pros and Cons of the Three Acquisition Options

In this section of the Findings, the Task Force evaluated the merits of the three proposed acquisition options outlined in the Terms of Reference. Listed below are summaries of the Task Forces Pros and Cons for each option.

Option 1: ATFLIR -led Joint Program

Pros	Cons
- A more mature program - Results in a larger production run - May result in cost savings because of the larger production run	- Does not meet current Air Force design requirements for internal cooling - Likely to result in protest from ATP competing contractors - Will lead to substantial program delay while joint requirements are determined - Will result in a lack of competition which will result in a narrowing of the industrial base and have a negative impact of future technology development - Total cost of both programs will likely increase thus off-setting the potential savings of larger production runs

- Long term cost growth because of a lack of competition

Pros

- Fastest way to get vital equipment to the Navy and Air Force tactical air forces
- Maintains industrial competition and technology base
- Avoids protests and legal disputes
- Confidence in Navy Program meeting its technical and schedule goals

Cons

- Uncertainty that Air Force dependence on Non-Development Items will satisfy their needs without additional development

IV. RECOMMENDATION

The Task Force recommends that the Department should continue with the current ATFLIR and ATP targeting pod programs for the following reasons:

A. Because the pods for the F16 and F18 will have to be substantially different configurations, the cost of separate designs will very likely more than offset any savings due to a doubling of the total quantity of pods procured .

B. The current pod programs are the fastest way to obtain high altitude targeting of laser guided weapons, an urgently needed capability because of improved enemy air defenses. Either of the Joint options will require substantial delays to negotiate joint requirements, renegotiate contracts.

C. Pursuing both Programs is also the only option that will maintain competition, preserve a strong technology and production base, as well as achieve minimum costs in the long term

Appendix A

Terms of Reference

THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION AND
TECHNOLOGY

22 DEC 2000

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference for the Defense Science Board Task Force on Options for Acquisition of the Advanced Targeting Pod and Advanced Technology FLIR Pod (ATP/ATFLIR).

You are requested to form a Defense Science Board (DSB) Task Force to assess the options for acquisition of third generation Forward Looking Infrared (FLIR) targeting pods for the Air Force and the Navy.

In 1997, the U.S. Navy held a competition for development of their next generation targeting FLIR for tactical aircraft. This upgraded FLIR pod was being designed to replace the Loral Nitehawk pod on U.S. Navy and Marine Corps aircraft. The Air Force recently articulated a new requirement for an Advanced Targeting Pod (ATP) that will support their Destruction of Enemy Defenses (DEAD) mission, a result of the Air War in Kosovo in 1999.

The task force will make recommendations for the preferred procurement option for the Department, and this recommendation will be considered in preparing the report. The parallel requirements and calendars make the Joint program one option, but you should examine a minimum of three options for technical feasibility, schedule, and life cycle costs. They are listed below:

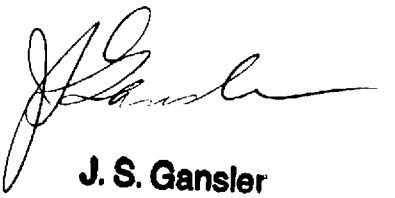
(1) ATFLIR (Navy) program continues and is the Joint program for both services.
(2) ATP (Air Force) is competed, and the winner becomes the Joint program. (Of note here is that a version of ATFLIR is to be offered by Raytheon for ATP.)
(3) Both Programs proceed as planned (status quo).

You should consider the state of technical maturity of all the concepts and pods available, as well as the realism of the schedules and costs in view of other service flight program software, aircraft integration, and service specific requirements. Cost estimates for the listed options will be provided by an independent cost estimating team composed of both Navy and Air Force cost estimators, led by an analyst from the Office of the Secretary of Defense Cost Analysis Improvement Group.

Congressional interest in both programs has been high. The House Appropriations Committee report language restricts the Air Force from committing funding until submission of a Department of Defense report to congress by February 15, 2001. Therefore, request that the group's findings and conclusions be provided to me in the form of an interim letter report by February 1, 2001.

The Study will be co-sponsored by the Principal Deputy Under Secretary of Defense (Acquisition Technology and Logistics) and the Director, Strategic and Tactical Systems. Mr. Walter Morrow will serve as the Task Force Chairman. CAPT Richard O. McHarg, USN, of the Air Warfare office will serve as the Executive Secretary and LtCol Tony Yang, USAF, will serve as the DSB Secretariat Representative.

The Task Force will be operated in accordance with the provision of P.L. 92-463, the "Federal Advisory Committee Act," and DoD Directive 5105,4, the "DoD Federal Advisory Committee Management Program." It is not anticipated that this task force will need to go into any "particular matters" within the meaning of section 208 of Title 18 U.S. Code, nor will it cause any member to be placed into the position of acting as a procurement official



J. S. Gansler

Appendix B

Congressional Language

Department of Defense Appropriations Bill, 2001 House of Representatives Report of the Committee on Appropriations -- Aircraft Procurement, Air Force, Pages 127-128.

Miscellaneous Production Charges

The Air Force requested $398,474,000 for *Miscellaneous* Production Charges. The Committee recommends $363,553,000, a reduction of $34,921,000. Two years ago, the Navy initiated a next generation infrared targeting pod program called ATFLIR and, according to the Air Force, invited the Air Force to participate as a joint partner. The Air Force declined at that time. Now, the Air Force plans to procure its own next generation targeting pod, a potential billion dollar program. Though the Air Force's requirements for a next generation pod are similar to the Navy's, the planned acquisition strategy could lead the service to procure a completely different pod. The Committee is disappointed that the Navy and Air Force cannot work more closely together to develop joint solutions to meet similar requirements. Joint programs reduce costs through higher production rates, greater commonality in software development, stand-up single vs. multiple depots, and more efficient spares procurements and management as well as numerous other efficiencies. To ensure joint commonality in DoD's next generation targeting pods, the Committee directs the Chairman of the Joint Chiefs of Staff, the Undersecretary of Defense for Acquisition and Technology, and the Commander In Chief of the Joint Forces Command to review the Department's plans to acquire next generation targeting pods (including pods that would be procured by Guard and Reserve components) to ensure the requirements and acquisition approach appropriately promote joint commonality. The Committee directs the Chairman of the Joint Chiefs of Staff, the Under Secretary of Defense for Acquisition and Technology, and the Commander in Chief of the Joint Forces Command to report its findings and the steps taken to promote joint commonality to the congressional defense committees no later than February 15, 2001. The Committee fully supports Air Force acquisition of a next generation targeting pod, but will not stand by and accept another lost opportunity for joint commonality. Accordingly, the Committee recommends no funds for an Air Force Advanced Targeting Pod until these issues are resolved and the report directed above is submitted.

FY0I Appropriations Conference Report, Page 200.

Advanced Targeting Pods

The Air Force requested $34,921,000 for the Advanced Targeting Pod program. The conferees agree to provide this amount to the reporting requirements directed by the House. The conferees direct that of the quantity of Advanced Targeting Pods procured with fiscal year 2001 appropriations, no less that 15 pods shall he assigned on a permanent basis to Air National Guard units deployed to Desert Storm which have otherwise not been upgraded to perform the SEAD mission. The conferees further direct the Air Force to implement its proposal to upgrade such units with F-16 Block 30 or better aircraft no later than fiscal year 2003.

Appendix C

Task Force Member Biographies

WALTER E. MORROW, JR.

Walter E. Morrow, Jr. was born in Springfield, Massachusetts on 24 July 1928. He received the Bachelor of Science and Master of Science degrees in Electrical Engineering from the Massachusetts Institute of Technology in 1949 and 1951, respectively. As a graduate student, from June 1949 to February 1951, he was a Research Assistant in the MIT Research Laboratory of Electronics.

In September 1951 Mr. Morrow joined the MIT Lincoln Laboratory as a staff member in the Long-Range Communications Group. From 1951 until 1958 he was active in the early research and development in ionospheric and tropospheric beyond-the-horizon communication techniques. From July 1955 to January 1964 he was the Leader of the Communications Systems Group. He was instrumental in creating the foundation of the WEST FORD Program and guiding it through a successful experimental test. In February 1964 Mr. Morrow was appointed Associate Head of the Communications Division and a member of the Lincoln Laboratory Steering Committee, and in September 1966 he was appointed Head of that Division. In September 1968 he was appointed Assistant Director of the Laboratory, and in January 1972 he became Associate Director. In April 1977 he was appointed Director of the Laboratory and in July 1977 he was appointed Professor of Electrical Engineering at MIT.

Mr. Morrow retired from the Directorship of MIT Lincoln Laboratory on 30 June 1998. He is currently the Director Emeritus of Lincoln Laboratory.

On 29 October 1963 MIT President Julius A. Stratton presented Mr. Morrow with an Award for Outstanding Achievement. The award was given to Mr. Morrow *"for his imaginative contribution to a new concept of intercontinental microwave communication by means of orbiting metallic dipoles, and his skillful persevering guidance of the research and development that translated the concept into a successful experimental test."*

Mr. Morrow is a Fellow of the Institute of Electrical and Electronics Engineers. He was Vice Chairman of the IEEE Northeast Electronics Research and Engineering Meeting (NEREM) in 1968, Chairman of NEREM-69, and Chairman of the NEREM Board of Directors in 1970. From 1976 to 1979 he was a member of the IEEE Energy Committee. On 30 November 1976 the IEEE Communications Society presented Mr. Morrow with the Edwin Howard Armstrong Achievement Award *"in recognition of innovative contributions to space communications."* He was Chairman of the IEEE Technical Activities Board Technical Appraisal Committee from 1977 to 1979.

In October 1969 Mr. Morrow was appointed Lincoln Laboratory representative to the MIT Standing Committee on Special Laboratories. In January 1976 he was appointed to the MIT Department of Electrical Engineering Area I Subcommittee on Communications. In April 1976 he was made a member of the MIT Solar Energy Advisory committee. From 1964 to 1969 Mr. Morrow was a member of the DoD/NASA Technical Committee on Communications Satellites.

In May 1971 he was made a member of the CNO Industry Advisory Committee for Telecommunications (CIACT), later known as the CNO C^3 Advisory Committee and, in November 1972, a member of its Subcommittee on Research, Development, Test and Evaluation. In 1978 he became a member of the C^3 Sub-Panel, now known as the Force Enhancement Sub-Panel, of the CNO Executive Panel (CEP). He has served as a member of the CEP since 1982. He was the co-chair of the CEP Naval Warfare Innovations Task Force from 1994-2000.

In September 1972 Mr. Morrow was appointed a member of the Applications Committee of the NASA Space Systems and Technology Advisory Committee, NASA Advisory Council. During 1974-75 Mr. Morrow was a

member of the USAF Scientific Advisory Board (SAB) ad hoc Committee on Future Air Force Energy Needs - Fuels and Systems. In December 1975 he was appointed to membership on the National Research Council - Assembly of Engineering Space Applications Board, Committee on Satellite Communications; and in 1977 he became Chairman of its Air Force Studies Board Data Link Technology Panel. He was a member of the Defense Communications Agency Scientific Advisory Group from January 1976 to December 1986. Mr. Morrow was appointed a member of the USAF Scientific Advisory Board in 1978, and in 1980 became Chairman of its Electronics Panel and continued to serve on the USAF/SAB until June 1984. In November 1985 he was reappointed to membership on the USAF/SAB and served until 1989.

In 1983 Mr. Morrow was appointed a member of the Voice of America Radio Engineering Advisory Committee, and in 1984 was appointed Chairman and served in that capacity through 1987, and as a member through 1989. Also in 1984 he was appointed a member of the American Physical Society Study on Directed Energy Weapons.

He has served as a member of the Defense Science Board since 1987. In 1987-89 he served as a member of the Technology Assessment Committee to the U.S. Space Command of the Air Force Studies Board, Commission on Engineering and Tactical Systems. In 1988-89 he served as a member of the Editorial Board of the *Journal of Defense Research*.

In December 1991 he was appointed a member of the Vice President's Space Policy Advisory Board.

In 1978 Mr. Morrow was elected a Fellow of the National Academy of Engineering.

In June 1980 Mr. Morrow received the Armed Forces Communications and Electronics Association (AFCEA) Medal of Merit Award.

In March 1995 the American Association of Engineering Societies awarded Mr. Morrow the 1995 National Engineering Award *"in recognition of an engineer whose career and accomplishments have particularly benefitted humanity".*

In May 1998 Mr. Morrow was awarded the Department of Defense Medal for Distinguished Public Service.

LAWRENCE A. SKANTZE, GENERAL USAF (Ret)

INDUSTRIAL EXPERIENCE

Independent Consultant (1987-Present)

- Retained by several Commercial and Defense firms (Northrop Grumman; Raytheon: United Technologies; Lockheed Martin; ORINCON; APTI. Modern Technologies (MTC) as a management and strategic planning advisor, providing analysis and advice on program management and technology investment to the CEO and COO levels.
- Fiduciary Board Membership: Vice Chair. Aerospace Corp; UNC Inc; Elbit Fort Worth (EFW); ORINCON Corp: MTC, Logistic Management Institute (LMI); ADPA/NSIA, USO.
- Consultant to Office of Secretary of Defense, Defense Science Board; National Academy of Science, Ballistic Missile Defense Office (BMDO).
- Regular contributor of commentaries on National Defense issues to weekly publication DEFENSE NEWS.

MILITARY EXPERIENCE

Commander Air Force Systems Command (1984 - 1987)

- Managed an organization (325 major projects. 53,000 people, 167 facilities. 32 Billion annual budget) with direct responsibility for strategy, budgeting, advocacy, and program execution for research, development, test, and procurement of all new weapon systems and support equipment for the U.S. Air Force.

Vice Chief of Staff, U.S. Air Force (1983 - 1984)

- Acted as the principal deputy to the Chief of Staff, USAF in the management and guidance of all functions of HQ U.S. Air Force in executing the day-to-day mission and operations of the Air Force. Also acted as the primary interface with DoD, the Joint Chief of Staff, and Congress.

HIGHLIGHTS

Program Management

- Worked in planning and engineering positions on the Nuclear Powered Aircraft and Manned Orbiting Laboratory Programs.
- Managed the development, procurement and deployment of the Short Range Attack Missile (SRAM). Received the Air Force Association's Outstanding Management Award 1973.
- Managed the development. procurement. and deployment of the Airborne Warning and Control System (AWACS). Received the Air Force Association's Theodore Von Karman Award for greatest technical achievement.

Technology Investment

- Developed the technical investment strategy for the Air Force's Advanced Technology Fighter (ATF) Program.

- Created a new Air Force Science and Technology ($1.8 Billion) annual budgeting strategy that provided new stability to the annual funding process.
- Conceived, created, and directed PROJECT FORECAST 11 which synthesized the best Air Force and Aerospace Industry thinking on the best technology and weapon system concept pursuits for the 21st Century States Air Force.

Corporate Business Strategy

- Created. articulated, and negotiated the Department of Defense two bomber program (B-1 & B-2) and defended it before the Congress.
- Revised Air Force Acquisition strategy to place Product Assurance (Reliability, Maintainability, Producibility and Quality) at a higher priority than system performance in awarding contracts.
- Formulated on an annual basis Air Force Acquisition Financial Strategy and Budgets, advocating and defending the proposals through the Air Force and the Department of Defense.

ASSIGNMENT HISTORY

1984 - 1987	Commander, U.S. Air Force Systems Command
1983 - 1984	Vice Chief of Staff, U.S. Air Force
1979 - 1992	Commander, USAF Aeronautical Systems Product Division
1977 - 1979	Deputy chief or staff, Systems, HO, Air Force Systems Command
1973 - 1977	Program Manager, USAF Airborne Warning & Control System (AWACS)
1971 - 1973	Program Manager, USAF Short Range Attach Missile (SRAM)
1960 - 1971	Planning & Engineering assignments in a number of Air Force development programs
1953 - 1957	Flying assignments as a technical squadron pilot in South Korea and in the U.S.

EDUCATION

U.S. Air Force Institute of Technology, MS. (Nuclear Engineering) 1959

U.S. Naval Academy, B.S. (Electrical Engineering) 1952

RICHARD D. FRIICHTENICHT, RADM, USN (Ret)

Dick Friichtenicht is an Adjunct (Consultant) with the Operational Evaluation Division of the Institute of Defense Analyses. As a member of the Tactical Air Systems team, he performs evaluation and anaylsis in support of the office of the Director of Operational Test and Evaluation (DOT&E) in its role of providing oversight of operational testing of major weapon systems.

In addition. Dick is an Associate with Slay Enterprises, Incorporated (SEI) and Burdeshaw Associates Limited (BAL). As an Associate. he performs consulting services for major aerospace companies, including Boeing, Lockheed-Martin Northrup-Grumman, and others.

Dick retired from the U.S. Navy in 1991 at the rank of Rear Admiral (0-8). At the time of his retirement. he was Vice Commander of the Naval Air Systems Command (NAVAIR). From 1984 to 1989. Rear Admiral Friichtenicht was the Deputy Commander for Programs at NAVAIR. He also carried the titles of Acquisition Executive and Deputy for Operations. Dick also had previous tours in NAVAIR in program management, engineering and research and development.

Dick is a designated Naval Aviator, Aeronautical Engineering Duty Officer and Material Acquisition Professional. He has a Masters Degree in Electronics Engineering from the U.S. Naval Postgraduate School and an additional Masters in Systems Management from tile University of Southern California.

Prior to specializing in acquisition, Dick had operational flying tours in electronic intelligence collection (VP). photographic reconnaissance (VAP). and anti-submarine warfare (VP). He has over 5000 pilot hours flying A-7, A-3, P-2, and other fixed wing aircraft.

His military awards include the Legion of Merit, Air Medal, Meritorious Service Medal and Vietnam Service Medal.

Dick is a native Of Matherville, Illinois. He received his Bachelor of Science degree from Western Illinois University and entered the Navy through the Officer Candidate School. He and his wife Dixie now live in Alexandria Virginia.