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# THE DECISION TO DEVELOP THE UTTAS

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13 March 1972

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CASE STUDY

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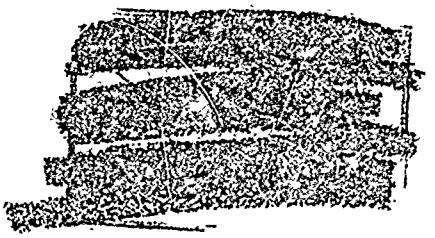
# THE DECISION TO DEVELOP THE UTTAS

BY

LIEUTENANT COLONEL CLARENCE A. PATNODE, JR.
INFANTRY



US ARMY WAR COLLEGE, CARLISLE BARRACKS, PENNSYLVANIA

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USAWC RESEARCH PAPER

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A Case Study
by
Lieutenant Colonel Clarence A. Patnode, Jr.
Infantry

US ARMY WAR COLLEGE
Carlisle Barracks, Pennsylvania
13 March 1972

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The UTTAS Concept Formulation efforts produced a decision to initiate development the first time it was considered at the OSD level. This case study attempts to supplement the recorded history with the illumination of the many and varied aspects that impinged on and influenced the UTTAS program. With a potential for more than $2 billion worth of business for a depressed industry, the US aerospace industry, the interests in UTTAS were from a very broad base of industry and government. The multi-service utilization of this class of helicopter added the complexities of possible joint development. The Concept Formulation was done very openly with participation from OSD level to Combat Developments Agency. Although delays were experienced, actions were expedited at decision time.

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# CHAPTER I

## INTRODUCTION

Since the appearance of Robert S. McNamara as Secretary of Defense, the military services have received a great deal of publicity on weapon systems' conception, development, and acquisition. Many of the highly publicized systems of this era wallowed in the concept formulation stage for years prior to dying for lack of defining the requirement. Some systems experienced severe setbacks in engineering development which led to an early death in the "life cycle." Nearly all weapon systems experienced great difficulty in providing accurate and acceptable cost estimates covering many years into the future. This long range forecasting was needed to support the development of the total life cycle costs.

In most cases the proponent service worked diligently, within the service womb, to develop the concept of the new system. The lack of hard driving, fully exposed coordination among the services and with the Office of the Secretary of Defense (OSD), evolved requirements and the recommendations to initiate development in a guarded situation. As the recommendation to start development was forwarded to OSD for decision, coordination with the other services and/or OSD agencies started to expose the detailed rationale and its backup. A review of the analysis that supported the recommendation generally centered on the assumptions, inputs (particularly costs) and methodology. A major disagreement on any one of these items generally involved some rework and the attendant delays.

During the early 1960's the US Army was faced with identifying the replacement for the UH-1 "Huey" series helicopter. Having watched the problems within and outside the Army, the initial group of action officers and a few supervisors decided to try the "open approach." They recognized there would be new problems but the possibility for a more timely and better understood rationale encouraged the new approach. Briefly, this approach involved "action-types" from OSD on down to the proponent agency of the US Army Combat Developments Command (USACDC) conducting periodic informal reviews where the participants came to agreement on the issues. This was followed by whatever formal or informal actions were required to keep the participant's agencies informed and in general agreement. Having participated in numerous of these reviews, I suggest this summary of the chosen approach:

> When the gestation of a new weapons system takes place in a fishbowl in full view of the proponent service itself and the interested agencies of the Department of Defense, many problems are solved and many new problems arise. These problems are different from those of the concept conceived and grown initially in the womb of the proponent service without being bleached of its parochialism.

## THE DECISION

On 22 June 1971, Deputy Secretary of Defense (DEPSECDEF) Packard announced a decision to approve the US Army recommendation to develop a new helicopter. The Utility Tactical Transport Aircraft System (UTTAS) was to replace the UH-1 helicopters in the air cavalry, lift, and medical evacuation units. This was the culmination of the Army's Concept Formulation and action on the UTTAS by the Defense

Systems Acquisition Review Council (DSARC). The DSARC recommended to the Secretary of Defense "approve the UTTAS development as requested by the Army according to the cost, schedule, and performance listed in Sec. XIV of the Development Concept Paper, DCP." Mr. Packard approved the recommendation and added his personal note: "With understanding there will be informal coordination with Navy because it is very doubtful that a Navy development in this class can be justified."[1]

The UTTAS effort had produced a decision to initiate development the first time up at the DSARC level. This case study attempts to supplement the recorded history with the illumination of the many and varied aspects that impinged on the UTTAS program and played major roles in influencing the program.

## SIGNIFICANCE OF THE DECISION

The projected program cost for a 1,000 helicopter buy was estimated to exceed $2 billion in constant 1971 dollars.[2] The program could involve--depending on final Army, USN, USMC, USAF, and foreign applications--up to $8 billion. At its lower value it represented the second largest helicopter program ever. The UH-1 series, with the impetus of the Vietnam conflict, has been the largest helicopter program in history.[3] Even more important than the magnitude was the fact that it represents only the second new helicopter development in the United States in the last 10 years. The other development, the Cheyenne AH-56, had yet to receive a production go-ahead in mid-1972. To the ailing aerospace industry

and in particular the "very sick" helicopter industry, the importance of such a decision is obvious.

The Systems Development Plan (SDP) called for an engine development to be followed at an appropriate interval by an airframe development. The airframe program called for a "fly off" between the prototypes developed by the two winners of the airframe design competition. This "fly off" was in consonance with the Packard approach to fly-before-buy.[4]

In 1967, the Army Aviation Materiel Laboratory initiated an Advanced Technology Demonstrator Engine program to determine if large gas turbine technology could be scaled down to much smaller engines than those used in present Army aircraft. This program called for building optimum designed engine components to demonstrate the performances that were theoretically achievable. Following this, these components were to be integrated into an engine. This was not designed to produce prototype engines but to demonstrate the performance and manufacturability of the new concepts. General Electric and Pratt and Whitney were selected to participate in the program as a result of the initial competition in the 1500 shaft horsepower (SHP) class. Both companies demonstrated engines which met the broad objective of the program, such as: 40% reduction in engine weight; 20% to 25% reduction in maximum power specific fuel consumption; 25% to 30% reduction in cruise power specific fuel consumption; and the manufacturability of the engines.[5]

During this period AVCO's Lycoming division, the UH-1 engine producer, was gaining much experience with their T-53 engine as it

was growing from 800 SHP to 1,400 SHP. Lycoming had developed the AGT 1,500 for a tank application and was to use much of this technology to compete for the UTTAS engine in late 1971.

General Electric, Lycoming, and Pratt and Whitney had been expending sizable efforts in preparing for the UTTAS engine competition and were actively pursuing the award of the engine development contract. General Electric was doing their research and planned to do the production if they won--at Lynn, Massachusetts. Lycoming's efforts were being accomplished at their main facility at Stratford, Connecticut, with possible production at Charleston where they had opened a manufacturing facility during the Vietnam buildup. Pratt and Whitney were doing their research at West Palm Beach with either their Connecticut or West Virginia facilities planned for production.

Bell Helicopter Company; Boeing Company's Vertol Division; Hughes Tool Company's Aircraft Division; United Aircraft Corporation; Sikorsky Aircraft; and Vought Helicopter, Incorporated were actively preparing for the airframe development competition. Bell had a five facility complex around Fort Worth and a sizable facility in Amarillo. Boeing-Vertol had a very large development/production facility in Philadelphia, backed up by numerous Boeing Company facilities countrywide. The Hughes facilities were in the Los Angeles area. Sikorsky's facilities were in the Stratford, Connecticut area.

Vought Helicopters was formed to be the sole licensee in the United States for L'Industrie Aero Nautique et Spatiale Francaise. Their UTTAS candidate, the SA 330, had been jointly developed by the French and British. Vought would manufacture the SA 330 in Dallas,

should it prove to be one of the two airframe finalists. In order to increase the attractiveness of the SA 330, the French government had suggested the possibility of France purchasing A-7 fighter aircraft that were manufactured by the Ling-Temco-Vought corporation of which Vought Helicopters was a subsidiary. Conversations between Dr. John S. Foster, Jr., Director of Defense Research and Engineering, and his British and French counterparts had been the genesis of this approach.

With the potential for more than $2 billion worth of business and so many areas interested in becoming part of the winning team, the interests in UTTAS were from a very broad base of industry and government.

## CHAPTER I

## FOOTNOTES

1. US Department of Defense, Office of the Director of Defense Research and Engineering, Development Concept Paper (DCP), DCP No. 13 Utility Tactical Transport Aircraft System (UTTAS) (U) (Washington, 22 June 1971), p. 20. (Hereafter referred to as UTTAS DCP.) CONFIDENTIAL.

2. Ibid., p. 16.

3. Interview with Warren T. Rockwell, Director of Washington Operations, Bell Helicopter Company, Washington, 29 June 1971.

4. US Army Aviation Materiel Systems Command, Systems Development Plan (SDP), Utility Tactical Transport Aircraft System (UTTAS) SDP (St. Louis, 15 May 1971), p. A-3. CONFIDENTIAL.

5. US Army Air Mobility Research and Development Laboratory, Eustis Directorate, Briefing for Assistant Secretary of the Army (Research and Development), 1500 SHP DEMC Engine Briefing (Washington, March 1970). CONFIDENTIAL.

## CHAPTER II

## NATURE OF THE PROGRAM

The UTTAS was proposed by the Army to perform tactical troop assault and some utility missions now performed by the UH-1 series helicopters. The UH-1 is the backbone of the Army's current helicopter fleet and is also used by the USMC, USN, and USAF. The current inventory is approximately 5,000 UH-1s in all Services, of which approximately 4,000 are in the Army. About 2,700 are the preferred UH-1H and UH-1N models.[1]

The UH-1 series started out in the late 1950's as a compact turbine-powered aerial ambulance, UH-1A. Due to the rapid acceptance of the concept of air mobility and the demands of the Vietnam conflict, the UH-1A rapidly grew to the UH-1D and UH-1H troop carriers by 1966. A twin engine version, UH-1N, was developed in the late 1960's.

The UH-1 series helicopters possessed serious operational shortcomings, especially in troop assault operations. To overcome these shortcomings, the Army proposed the development of the UTTAS with increased payload and substantially improved maintainability, reliability, survivability, and performance.[2]

Since the Army was clearly the largest user of this type of helicopter, performance requirements for the UTTAS had been optimized for Army use. Therefore, the UTTAS Concept Formulation was conducted by the Army. The other Services all operated Uh-1 and other utility helicopters within the general performance parameters of the proposed UTTAS. It was probable that the basic UTTAS or variants of it would

experience multi-Service applications. Since the USMC troop lift requirements were similar to the Army's requirements, close liaison was maintained with the USMC during concept formulation. Because the USAF and USN required new utility/tactical helicopters during the projected production life of the UTTAS, the OSD decisionmakers had to examine the potential relationship of those requirements to the UTTAS.[3]

## DEFENSE DEPARTMENT MANAGEMENT ISSUE

The Defense Department management issue was whether:

> (1) the Army proposal to develop a new helicopter for the troop assault missions and some of the utility missions should be approved essentially as proposed, or
>
> (2) the Army proposed program should be expanded to a joint program to include other Service requirements with specific emphasis on the Marine Corps.[4]

## EVOLUTION OF THE CONCEPT

In 1965 the Army initiated the first steps to identify the system to replace the UH-1 helicopter. Recognizing the lead time normally required to clearly identify the requirement and perform an orderly development, the DA staff tasked the United States Army Combat Developments Command (USACDC) to prepare a Qualitative Materiel Development Objective (QMDO) for the UTTAS. The QMDO was approved by the Department of the Army (DA) in October 1965. After this approval, USACDC was tasked to prepare a Qualitative Materiel Requirement (QMR) for the UTTAS.

Due to the growing requirements for near timeframe mobility assets, a decision was made in January 1966 to extend production of the UH-1. With the resulting forecast asset position, the introduction of the UTTAS could be delayed beyond the 1973 Initial Operating Capability (IOC) that had been envisaged when the QMDO was approved. USACDC was requested to review the requirement for a UTTAS and to recommend to DA a revised milestone schedule.[5] In October 1966, USACDC made these recommendations to the Department of the Army:

1. A mid-1970 timeframe for IOC of UTTAS.

2. Initiate a major study effort to review the requirement for a UTTAS.

3. The study effort should satisfy the six prerequisites for entering contract definition as outlined in AR 705-5.[6]

These recommendations had been delayed and influenced by the Brown Board and Committee of Four Studies. Both of these studies considered the methodology used in the new requirements determination process then under study as a result of policies instituted by Mr. McNamara. The Army Life Cycle Management Model for satisfying the six prerequisites to contract definition (the initial stages of Engineering Development) was an outgrowth of the studies.

## INITIATION OF CONCEPT FORMULATION

USACDC initiated certain aspects of the study effort in late October 1966[7] and was officially tasked by DA in January 1967. The formal study directive to USACDC was made on 29 August 1967.

The milestone schedule established by USACDC, and subsequently approved by DA, required a Preliminary Qualitative Materiel Requirement (PQMR) be submitted by 30 June 1969.[8] The UTTAS study became the first USACDC study effort to approach the requirements process utilizing the Army Life Cycle Management Model.[9]

Implementation of the concept formulation step of the management model was conceived by USACDC as being accomplished by mutual interaction between it and the United States Army Materiel Command (USAMC) in three phases.

Phase I - develop a UTTAS mission and performance envelope.

Phase II - identify technical approaches and conduct trade-off evaluations.

Phase III - completion of the cost effectiveness evaluation would culminate in the submission of a PQMR to DA.

The documentation of concept formulation is published in three multi-volume reports corresponding to these phases. There was considerable overlap between phases.[10]

## THE OPEN APPROACH TEAM

As mentioned in the introduction, the UTTAS "open approach" was a major step toward evolving a new system in a "fishbowl." Although the representation varied over the years, the following agencies were almost always invited to the In-Process Reviews: Office of the Secretary of Defense (Systems Analysis) (OSD-SA); Director of Defense Research and Engineering (DDR&E); Deputy Under Secretary of the Army (Operations Research) (DUSA-OR); Assistant

Vice Chief of Staff (Weapon Systems Analysis) (AVCS-WSA); Office Chief of Research and Development (OCRD); Comptroller of the Army (COA); Assistant Chief of Staff for Force Development (ACSFOR); numerous US Army Materiel Command and US Army Combat Developments Command agencies; Continental Army Command; and any supporting contractors.

Whenever a particular expertise was required, invitations were extended to those who had the expertise.

Depending on the subjects to be covered and demands on key personnel, representation varied from the commanding general down to the action officers.

## PHASE I

Phase I began in October 1966 with USACDC reviewing the operational concept consideration concerning airmobility expected to dominate the 1975-1985 time period. A list of selected aircraft capabilities, derived from the operational considerations, was compiled and furnished to USAMC. These capabilities included generalized required characteristics such as ranges for speed, endurance, and pay load. From these generalized characteristics, USAMC developed a list of refined aircraft candidates. These parametric aircraft represented the full spectrum of technology from the present conventional helicopter to the technology forecasted for the 1975 timeframe. A total of 59 parametrized aircraft were provided USACDC for evaluation A gross screening process was conducted which evaluated the parameterized aircraft utilizing a

variety of missions under all intensities of conflict. The results of this screening process provided the input for Phase II.[11]

In addressing the generalized characteristics of the UTTAS, it became increasingly clear that an analysis of just the UTTAS per se would be theoretically correct and within current guidelines but of little help to the decisionmaker. The Army had then and was to have for the foreseeable future a family of lift aircraft from the smallest, the Light Observation Helicopter (LOH), through the UTTAS and the Light Tactical Transport Aircraft System (LTTAS) to the Heavy Lift Helicopter (HLH). Therefore, in considering a replacement for one of the family, the analysis had to consider the members of the family that bounded the UTTAS, namely the LOH and the LTTAS. The analysis should shed some light on at what level of capabilities the systems should interface. Also, within the context of the mix of lift aircraft, what would be the least cost mix to support the Army as envisioned in the 1975-1985 timeframe. Having determined the proper mix for the future, the optimum way to transition from the inherited fleet to the required future fleet became desired information. And a never-to-be-overlooked option, what would be the results of doing nothing, had to be addressed.

Because the lift capabilities of the LTTAS had not been determined, the question of developing a parameterized LTTAS or using the current system characteristics of the CH-47A had to be addressed. In deciding on the former, it was necessary to extend the study effort 7½ months and a new PQMR submission date of 15 February 1970 was established.[12]

The UTTAS Phase I study was completed in June 1968. A baseline UTTAS aircraft and nine possible variants had been identified for use in Phase II.

## PHASE II

Although Phase II of the UTTAS concept formulation began on a low key as early as July 1966, the majority of the effort occurred from July 1968 through October 1969. This phase provided the basis for determining the required and desired characteristics of the UTTAS. During the initial part of Phase II, USAMC awarded four contracts to industry to perform trade-off analysis using their breadth of expertise. The mission and performance inputs were products of Phase I. Bell, Boeing-Vertol, Lockheed, and Sikorsky submitted their replies based on their own company's best technical approach to achieve the required characteristics. USAMC also conducted trade-offs in terms of increments of performance, vulnerability and cost for the characteristics that described the baseline aircraft and the nine possible variants. The candidate aircraft and the incremental differences were compiled by USAMC and submitted to USACDC as a basis for the trade-off evaluation.[13]

The methodology utilized by USACDC for ranking of the aircraft candidates and evaluating trade-off options was complex and intricate. In general, all candidates submitted to USACDC by USAMC were programmed through three stages. The first stage processed candidates through all three computer models and acted as a filter to narrow the range of feasible solutions. Some new "best estimate candidates"

were derived by applying value judgment to subsystem options. These were processed exactly as the original candidates. The second stage was a verification process. The third stage provided a ranking based on cost and effectiveness. Phase II was completed on 15 June 1969 and resulted in a Draft Proposed Qualitative Materiel Requirement (DPQMR).[14]

## MAJOR EXTERNAL FACTORS

As in any dynamic situation such as air mobility, a myriad of factors with constantly varying magnitude and direction were bearing on the UTTAS program.

All of the major ones had some impact prior to the decision. The most significant ones will be mentioned here.

Starting in 1967, the transportation section of ASD-SA made an annual effort to force the Army to a platoon carrier rather than squad carrier concept of air mobility. The basic thrust of their rationale was that larger helicopters were more cost-effective on most measures of productivity. To further substantiate their position, they cited the significantly lower combat attrition rate of the Army's CH-47 rather than the squad carrier UH-1. In essence, the Army was being challenged on their current and future concept for employing airmobile forces. A significant level of effort by the DA staff, supported by USACDC and USAMC, was required annually to defend the Army's position.[15] The UTTAS study effort appeared to be a tailor-made opportunity to compile data for this exercise and possibly to deal it a death blow. This factor had wide ranging impact on the structuring of the study effort.

As the Vietnam conflict forces peaked out and the Army started to look to the future modernization of its forces, the Chief of Staff directed that each major system be considered for product improvement as well as a new development. The replacement for the UH-1 was no exception. For those avid supporters of product improvement, there were a number of strong arguments to support their views. Although the UH-1 series had grown from a 6,600 pound to a 9,500 pound gross weight helicopter, the product improvement supporters saw this as an indication that the series could be economically grown another 3,000 pounds. Bell had developed the "Huey Tug" with company money. It was a product improvement of the UH-1B. The "Huey Tug" had a more powerful engine and upgraded dynamic components. It was advertised as a prime mover for the 105mm howitzer. The contractor suggested this as a logical method of disposing of the UH-1Bs which were no longer used as troop carrier or gunships due to their lack of performance. Bell had made design studies of a variety of UH-1 product improvements to upgrade the UH-1 to as close to the UTTAS performance requirements as possible.[16] Although the most promising product improvements of the UH-1 were incorporated in the Phase III Cost Effectiveness Effort,[17] eventually a supplementary cost-effectiveness study was required to address two additional hypothetical-improved UH-1s and a foreign aircraft, the SA-330, PUMA, helicopter.[18]

As the helicopter industry became more assured that the Army was going to look at something other than a product-improved UH-1 for the UTTAS role, many helicopter manufacturers expanded their

UTTAS efforts. The requirement for the Department of Defense to consider equipment developed by our Allies added credence to giving the PUMA candidate system status. Vought Helicopters employed the services of Mr. Al Bayer to aid in their marketing. Mr. Bayer is one of the most widely known aerospace lobbyists. He was a key witness in the Review of Army Procurement of Light Observation Helicopters, Hearings Before the Subcommittee for Special Investigation of the Committee on Armed Services, House of Representatives.

These were some of the major factors that had significant influence on the UTTAS program in that timeframe.

## CHAPTER II

## FOOTNOTES

1. UTTAS DCP, p. 1.

2. Ibid.

3. Ibid.

4. Ibid.

5. US Department of the Army, Office of the Chief of Research and Development, Letter, CRD-L, Utility Tactical Transport System (UTTAS) (U) (Washington, 20 September 1966), pp. 1-2. CONFIDENTIAL.

6. US Army Combat Developments Command, Letter, CDCCD-J, Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Belvoir, 24 October 1966), pp. 1-2. CONFIDENTIAL.

7. US Department of the Army, Office of the Chief of Research and Development, Letter, CRD-L, Utility Tactical Transport System (U) (Washington, 12 January 1967). CONFIDENTIAL.

8. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Letter, FOR AV AS, Utility Tactical Transport Aircraft System (UTTAS) Study (U) (Washington, 29 August 1967). CONFIDENTIAL.

9. US Army Combat Developments Command, Summary Report, UTTAS Study Progress Review (Fort Rucker, 22 December 1967), p. 5. CONFIDENTIAL.

10. US Army Combat Developments Command, Final Draft Report, Part III Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Rucker, 25 May 1971), v. 1., pp. 1-10. SECRET NOFORN.

11. US Army Combat Developments Command, Final Report, Part I Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Rucker, June 1968), p. ix. SECRET NOFORN.

12. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Letter, FOR AV AS, Revised Time Frame for Utility Tactical Transport Aircraft System (UTTAS) Study (U) (Washington, 21 December 1967). CONFIDENTIAL.

13. US Army Combat Developments Command, Final Report, Part II Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Rucker, June 1970), p. vi. CONFIDENTIAL.

14. Ibid.

15. US Department of the Army, Office of the Deputy Under Secretary of the Army, Memorandum for Acting Assistant Secretary of Defense (Systems Analysis), Platoon Lift vs. Squad Lift Helicopters (U) (Washington, 30 October 1969). SECRET.

16. Bell Helicopter Company, Engineering Change Proposal, UH-1D/H-510 Increased Payload and Improved Hot Day Hover Performance (Advanced UH-1H+) (Fort Worth, 10 March 1970).

17. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Letter, FOR AV AS, Recommended Systems to be Evaluated During Utility Tactical Transport Aircraft System (UTTAS) Phase III, Cost/Effectiveness Study (Washington, 29 August 1969). CONFIDENTIAL.

18. US Army Combat Developments Command, Final Draft Report, Part III Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Rucker, 25 May 1973), v. II, p. 11. SECRET NOFORN.

## CHAPTER III

## COMPLETION OF CONCEPT FORMULATION

By mid-1969, Phase I (the development of the mission and performance envelopes) and Phase II (the identification of technical approaches and the conduct of trade-off evaluations) were practically completed. A big input to the decision on development would be the Phase III Cost Effectiveness Study and the submission of the PQMR, the requirements document. As mentioned earlier, the assumptions, inputs, and methodology had been well exposed to review. Although the UTTAS had been well received outside the Army, there was a group of UH-1 product improvement supporters within the Army who were making a case to delay the development of the UTTAS. In addition, the strong proponents of the Heavy Lift Helicopter (HLH) were concerned that the Army would not receive sufficient resources to develop both systems. It seemed wise for them to maintain the HLH as a higher aircraft development priority than the UTTAS. The priority had been established on 22 December 1969.[1] This chapter will address the completion of Concept Formulation and concurrent significant related events between 1 July 1969 and 31 December 1970.

### PRODUCT IMPROVEMENT EVALUATIONS

When Bell was unable to sell the "Huey Tug," a product improvement of the UH-1B of which they had built one prototype, they increased their marketing effort of a number of conceptual product improvements of the UH-1D/H. They found enough interest in these

concepts to prepare a formal Engineering Change Proposal which Bell submitted to the Army on 10 March 1970.[2] In accordance with normal procedures, the Army was required to evaluate the proposal and inform the contractor of the results of the evaluation.

With the existing strong and diverging opinions on this subject, USAMC elected to perform two separate technical evaluations of the proposal. This would provide a better opportunity for conflicting opinions to be aired and for removing organizational bias. One analysis was performed by the Flight Standards Division, USAASC. This division is widely recognized as the most technically proficient agency within the Aviation Systems Command headquarters. The results of this evaluation was published in April 1970.[3] A second evaluation was performed by the US Army Aviation Materiel Laboratories which published their results in May 1970.[4]

The strong product improvement supporters found a high level spokesman in the Director of Weapons Systems Analysis (WSA) of the Office of the Assistant Vice Chief of Staff. Enough of the cost effectiveness effort had been accomplished to show that the existing DOD systems were not competing with the UTTAS for the UTTAS missions. The product-improved UH-1s, given optimistic performance and cost characteristics, could compete in the less demanding missions. A great deal of interest existed in the exact inputs to be used in the cost effectiveness analysis.

Noting the growing controversy over this, the Commanding General of the Aviation Systems Command initiated a third technical evaluation and in his guidance expanded the systems to be evaluated to

include UTTAS. The evaluation team was headed by Colonel Wally Buelow and the results are commonly referred to as the "Buelow Report" or the results of the "Buelow Committee."[5] The evaluation, including the UTTAS, was getting at the heart of this problem that was much more narrow than the Concept Formulation effort. In fact, the existing Department of Defense and Department of Army regulations required the proposed system be demonstrated as cost effective against existing DOD systems. The UTTAS effort had been expanded to include a "conceptual," or not-in-being system, as a competitor. In the atmosphere of this timeframe, the "open approach team" adopted the philosophy of giving every break to the product improvement whenever any interpretation had to be made. The other competing systems were evaluated on demonstrated performance data and existing cost data. If the UTTAS could not survive this type analysis, the "open approach team" felt it would be too weak a program to support a recommendation for development.

The allegation that the product improvement was not getting a fair shake reached a dramatic plateau on 23 July 1970. In an effort to staff the PQMR for tentative approval so the system described by the PQMR could be used in the final cost effectiveness analysis, a general officer review board was held. The AVCS made the point that the Army Staff had not thought in terms of a product improvement but in terms of a new development to satisfy the requirement for the Improved Lift Ship. The meeting closed in controversy without a decision or consensus. It displayed the criticalness of this point. This had a direct bearing on the decision to have the Buelow Committee.[6]

In addition to these technical evaluations, the ACSFOR requested USACDC perform an operational or users evaluation of the product-improved UH-1. USACDC was reluctant to submit an evaluation prior to the completion of the UTTAS cost effectiveness analysis. This analysis was to present more accurate cost effectiveness data and tentative basis of issue options. If the UTTAS IOC was to be delayed beyond 1980, the CGUSACDC recommended the Army product improve at least a portion of the lift fleet during the decade of the '70s as a hedge against programmed obsolescence.[7]

A number of Bell briefings were given at all levels to cover the subject in general and to elaborate on specifics when requested to do so.

## COST DATA

Of all the inputs to the Concept Formulation studies and analysis, the cost data required the most effort to develop.

In an effort to upgrade the Army's cost estimating abilities, an Improved Cost Estimating (ICE) project had been undertaken by the Department of the Army. This project involved total systems costs. In that UTTAS was in the conceptual stage, had a large potential fund impact, and was receiving so much high level attention, it was selected as the first aircraft system to be applied to the model. All major weapons systems were to be eventually applied to the model. The UTTAS Project ICE model was staffed and approved at Department of the Army. However, in order to reach consensus on the cost inputs for Phase III of Concept Formulation, much more effort and time were required.

The US Army Aviation Materiel Laboratories had developed an aircraft system costing model that was undergoing continual upgrading. It became the core of the UTTAS Project ICE. A version of this costing model was used in Phase III. A peculiar problem associated with Phase III was the mixing of current systems with actual cost data available and conceptual systems with only cost estimates available. Direct comparisons were required in the cost effectiveness analysis. Both existing and conceptual systems had to be costed on a common ground. Because the current systems were not competing well, their cost inputs were not challenged. The key issue again was the UTTAS and product improvement.

Again the open approach was used. This is the one area where this approach nearly led to a stalemate. The principal participants in this controversy that lasted nearly two years were: the cost analysis portion of COA under Mr. T. Arthur Smith, weapon systems analysis portion of AVCSA under Mr. Dick Trainor, and the cost analysis portion of the UTTAS Project Manager's Office. The final cost inputs were provided direct from COA to USACDC after nearly two years effort.[8]

## AIRCRAFT DEVELOPMENT PRIORITY

As mentioned earlier in this chapter, as of 22 December 1969 the HLH had a higher priority than did the UTTAS. At the time these priorities were approved, it was anticipated that future funding and technical feasibility would permit the development of an HLH with an IOC prior to that of UTTAS. The justification for giving the HLH a

higher priority than the UTTAS was that it provided a new capability urgently desired by the Army, whereas the UTTAS provided an improvement over the present quite satisfactory lift ship (the UH-1).

During the development of the various Army Program Objective Memorandums (POM) in response to OSD tentative fiscal guidance, it became evident that sufficient funds could not be forecasted as available to support the development and fielding of both the HLH and the UTTAS as previously planned. Initially, both programs were slipped.

On 21 July 1970, Army representatives appeared before the HLH DSARC and recommended the development of an HLH as outlined by a 19 May 1970 Memorandum for the DDR&E. Basically this was the "Advanced Components Development Program" to precede the development of the actual helicopter. This delayed the HLH IOC to a point where it was unwise to have the UTTAS remain behind HLH in priority. The UH-1/UTTAS type aircraft are the heart of the Army's air mobility concept. Therefore, the DA staff recommended and the Chief of Staff and Secretary of the Army approved a standing program in all POM submissions that included funding of the UTTAS as one of the "Big 8" and in priority over the HLH. Due to these factors, the ACSFOR recommended the UTTAS be put ahead of the HLH in priority of an aircraft development.

On 10 August 1970 the Vice Chief of Staff approved the recommended change in priorities except that the words "Improved Lift Ship" will be substituted for UTTAS.[9]

The Improved Lift Ship (TILS) was a result of the concern on the part of the AVCSA-WSA that the Army Staff was not giving product improvement as much consideration as a new development. They considered TILS more broad in scope. The point was to be reinforced again in September 1970 when the ACSFOR recommended to the Chief of Staff the designation of the UTTAS for separate Department of the Army System Staff Officer (DASO) monitorship. On 29 September 1970, the recommendation was approved except that the words "The Improved Lift Ship" was substituted for "UTTAS."[10]

## PQMR EFFORTS

In an effort to describe the UTTAS as accurately and precisely as possible, the PQMR was staffed in September 1970. This description was to be used to formulate performance and cost data for the final cost effectiveness efforts.

The UTTAS PQMR was staffed in accordance with existing directives. Subsequent to the initiation of the staffing on 9 September 1970, a conference among CGUSAMC, CGUSACDC, and the ACSFOR was held to verify the UTTAS PQMR. They agreed to changes in the PQMR that were submitted by a USACDC letter on 28 September 1970. These changes reduced the airframe procurement cost an estimated $153,000 per aircraft in a 1,000 aircraft buy. These changes, along with the DA staff comments received and recommended by the ACSFOR for inclusion, were incorporated in the revised PQMR which was submitted for approval. Once the PQMR was approved, a final conceptual design could be completed. The performance and cost of this final design

was to be used in the final cost effectiveness analysis with competing DOD systems and the establishment of the Basis of Issue Plan (BOIP). Having these two major actions completed, the entire Concept Formulation could then be completed. The results would be key inputs to the Materiel Requirements Review Committee (MRRC) which would meet to review the new QMR and make appropriate recommendations to the Chief of Staff.

The Acting Vice Chief of Staff returned the action for continuation of analytical and Concept Formulation actions. It was found sufficiently descriptive of the requirements for a follow-on lift ship to warrant its use as the basis for completing the Concept Formulation phase of the UTTAS life cycle.[11]

## SUPPLEMENTAL EVALUATION

In October 1970 the decision was made to evaluate the UTTAS with some additional product-improved UH-1s and the SA-330 without delaying the completion of Concept Formulation. Since it was too late to include these aircraft in the basic analysis, they were evaluated separately. USAMC provided cost and performance input for the SA-330, UH-1H+(702), UH-1H+(ATE), and cost only on the UH-1H and the UH-1H+(ECP). This cost data was in 1971 dollars and not compatible with the Phase III effort. The comparative analysis included only the PQMR as approved, the SA-330, the UH-1H+(702), and the UH-1H+(ATE). This effort was included in the final documentation of Phase III.[12]

## THE WRAP-UP

During the fall of 1970, the myriad of details in numerous analyses were brought together and Concept Formulation efforts neared completion.

The Mix Analysis done by Research Analysis Corporation under contract to USACDC was briefed to the interested agencies. The results of their analysis was incorporated in the final step of the USACDC effort, the judgmental evaluation.

With the precise performance characteristics, USACDC finished the organizational analysis for the Army force structure. The results of this effort led to the TBOI.

Final preparations were being made to present the recommendation to the Chief of Staff and with his approval to the Secretary of Defense. One of the major problems faced at this time was the management of all the details contained in the twenty-one volumes of the Phase I and II reports. Most "what ifs" had been addressed, the continuing problem was to know where it was documented. In addition, the 12 volumes of the Phase III report were in the preliminary draft stages.

During this stage the UTTAS had strong support in most of the interested agencies. The questionable areas of support were AVCS-WSA, and DUSA-OR. DUSA-OR had Mr. House as a very active participant until he left for a position outside of government. Mr. McDavitt was now in DUSA-OR. He had for the previous three years been in OSD-SA and was an active UTTAS supporter. Dr. Wilbur Payne was the unknown quantity.

Mr. A. Golub, Scientific Adviser to the ACSFOR, had closely monitored the UTTAS efforts over the latter part of 1970. He had formally worked for Dr. Payne. When Mr. Golub felt the recommendation to develop the UTTAS should be made, he discussed the matter with Dr. Payne. Dr. Payne agreed with the ACSFOR position.

At this point the ACSFOR was ready to ask for a decision. Due to the very high interest, the ACSFOR recommended to the AVCS the Select Committee (SELCOM) be convened on 27 January 1971 to address the alternatives available for improving the lift ships of our utility helicopter fleet. The AVCS responded,

> SELCOM is too broad. ACSFOR, USACDC, CRD, USAMC, DCSLOG, DCSOPS, and AVCS is good enough. 27 Jan is OK. I will convene meeting. We seek 'consensus'--a tough issue. If we can't agree we will send difficulties to VC/S/CS - We may not agree.

The stage was set for the decision.[13]

## CHAPTER III

## FOOTNOTES

1. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Message, ACSFOR AV, Army Aviation R&D Priorities (U) (Washington, 22 December 1969). CONFIDENTIAL.

2. Bell Helicopter Company, Engineering Change Proposal, UH-1D/H-510 Increased Payload and Improved Hot Day Hover Performance (Advanced UH-1H+) (Fort Worth, 10 March 1970).

3. US Army Aviation Systems Command, Research Engineering and Data Activity, Flight Standards Division, Report, Technical Evaluation of the Bell Helicopter Company Model 214 (UH-1H+) Proposal (St. Louis, April 1970), p. I. CONFIDENTIAL.

4. US Army Aviation Materiel Laboratories, Report, Design and Performance Analysis and Risk Assessment of the Proposed Advanced UH-1H+ (Fort Eustis, May 1970), p. i. CONFIDENTIAL.

5. US Army Aviation Systems Command, Report, Comparative Evaluation of UTTAS, UH-1H+ and UH-1H Aircraft (St. Louis, November 1970), pp. 1-14. CONFIDENTIAL.

6. Interview with John L. Klingenhagen, MG, US Army Aviation Systems Command, St. Louis, 26 February 1971.

7. US Army Combat Developments Command, Letter, CDCMR-V, USAMC Proposal to Product Improve the UH-1H Aircraft (U) (Fort Belvoir, 5 February 1970). CONFIDENTIAL.

8. US Department of the Army, Office of the Comptroller of the Army, Letter, COMPT-CA(M), Cost Estimate for Utility Tactical Transport Aircraft System (UTTAS) (Washington, 23 December 1970).

9. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Summary Sheet, FOR AV AS, Aircraft Development Priority (U) (Washington, 27 July 1970). CONFIDENTIAL.

10. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Summary Sheet, FOR AV AS, Department of the Army Systems Staff Officer (DASSO) System (U) (Washington, 29 September 1970). CONFIDENTIAL.

11. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Summary Sheet, FOR AV AS, Proposed Qualitative Materiel Requirement (PQMR) for Utility Tactical Transport Aircraft System (UTTAS) (U) (Washington, 9 October 1970). CONFIDENTIAL.

12. US Army Combat Developments Command, Final Draft Report, Part III Utility Tactical Transport Aircraft System (UTTAS) (U) (Fort Rucker, 25 May 1971), v. XII. SECRET NOFORN.

13. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Memorandum for Assistant Vice Chief of Staff, US Army and personal reply, SELCOM for the Improved Lift Ship (Washington, 21 December 1970).

## CHAPTER IV

## THE DECISION PROCESS

Although the Summary Sheet was the established means for presenting recommendations for decisions to the Chief of Staff, it had lost much of its utility for major decisions. Recognizing that a major decision such as developing the UTTAS could easily become mired in the various levels of each staff agency, the ACSFOR directed a modification to normal procedures.

Normal procedures would have involved the staffing of the PQMR as received from USACDC. The results of this staffing, along with an overall review of the Concept Formulation, would be performed by the Materiel Requirements Review Committee (MRRC). The MRRC would then make appropriate recommendations to the Chief of Staff.

A major problem associated with this Concept Formulation was the management of the enormous amount of information contained in the documentation. The need was for an accurate but brief input to those various staff members involved in the coordination along with a rapid correct recall ability to answer their questions.

Therefore, the ACSFOR directed a briefing be prepared for these principal staff officers representing those staff agencies involved in coordination. The briefings and question answering would be handled by a very small group of knowledgeable people. This was not a decision briefing. The decisionmaker would not be present. It was, however, a consensus briefing since all the principals would be present. The plan called for a Summary Sheet recommending

development of the UTTAS be prepared so that formal coordination could start immediately following the consensus meeting. Since the principals would have agreed, the tendency to mire down within a staff agency was minimized.

## THE ARMY DECISION

The Improved Lift Ship (TILS) briefing was originally scheduled for 27 January 1971. It was changed to 29 January 1971 to better accommodate the principals. The ACSFOR assumed the responsibility for the briefing and all administrative support. The AVCS extended the invitations to the principals. Due to space limitations and the desire to keep it at a manageable size, attendance was restricted. The following is a breakout of the spaces:[1]

| AGENCY | PRINCIPALS | ASSISTANTS |
|---|---|---|
| AVCS | 1 | 2 |
| DCSOPS | 1 | 1 |
| DCSLOG | 1 | 2 |
| CRD | 1 | 2 |
| ACSFOR | 2 | 4 |
| USAMC | 1 | 2 |
| USACDC | 1 | 2 |

The agenda was developed by OACSFOR and OAVCS. Approximately two hours were scheduled for six short presentations covering:

a. Introduction: problem, issues, and courses of action.

b. Background: evolution and evaluations of UTTAS QMR and product improvements.

c. Force structure analysis of each course of action.

d. Cost and schedule for each course of action.

e. Budget interface for each course of action including restraints and trade-offs.

f. Advantages and disadvantages of each course of action.

Fact sheets were prepared and distributed with the same points of contact that had been used for all major UTTAS actions. These fact sheets were used to prepare the principals for the briefing.

Neither the fact sheets distributed prior to the briefing or the briefing itself contained any new information that had not been made available before. As each UTTAS contact prepared his principal for the briefing, considerable feedback on current opinions and questions was made to OACSFOR.

The briefing, although prepared in considerable detail by mid-January and then further refined, was given a major overhaul on the night of 28 January 1971. This was done to provide the most timely presentation for the particular people in attendance.

The presentations were made with a number of questions being handled in each area. The discussion period showed that most principals agreed with the recommendations. Mr. Trainor remained clearly favoring a product improvement. At this point, the ACSFOR called for the principals to retire to his office for coffee and discussion. During the discussion in the ACSFOR's office, the AVCS stated that he would not be the one principal who prevented consensus and thereby joined the other principals in recommending development of UTTAS.

Although COA and the Office of the Chief of Legislative Liaison (OCLL) were not invited to the briefing, their UTTAS action officers were kept informed. Final coordination of the recommendation required the concurrence of these two agencies.

The Summary Sheet was staffed the following week and forwarded to the Chief of Staff. It recommended that the Chief of Staff approve:

- The UTTAS QMR.
- Course of Action 3, to initiate a new development with an engine Request for Proposal (RFP) issued in 3d Qtr FY 71 and an airframe RFP in FY 72.

The Vice Chief of Staff approved the recommendation on 10 February 1971.[2] The Army decision was made. This would become the basic thread of the Army's position in the OSD Development Concept Paper (DCP) on UTTAS.

The Systems Development Plan (SDP) was finalized and the formal In-Process Review was held on 25-26 February 1971. The SDP was approved and provided major inputs to the DCP. A number of briefings addressing specific questions were given during the staffing of the DCP.

The GAO had initiated a review of the UTTAS program during FY 70. During February 1971 the Army staff was provided an opportunity to comment on the draft report and to provide a witness at the hearing. This was accomplished prior to the Defense Decision. There was no adverse publicity from the GAO review.

## THE DEFENSE DECISION

The DCP is the vehicle for presenting the recommendations to the Secretary of Defense. The existing UTTAS action officers played a major role in the preparation of the DCP. In accordance with the current directives, the OAVCS. WSA was the responsible staff agency and received the inputs from all other staff agencies.

The OACSFOR briefed UTTAS to the Defense Science Board on 22 April 1971. This group, although not in the decision line, did make inputs in their advisory role. The briefing was followed by a lively discussion period and overall was given a warm reception.

The DCP was staffed with the Joint Staff; the service secretaries; ASD-C, ASD-I&L, and ASD-SA. The DSARC was held on 13 May 1971. The Army was represented by General H. A. Miley, Jr., CGUSAMC and LTG Robert R. Williams, ACSFOR. At the conclusion of the briefing a number of questions were posed by the OSD members of the DSARC. Most of the questions were answered on the spot. The few additional inputs requested for the final DCP did not pose any major problems. The final version of the DCP appeared on 24 May 1971. The administration of securing all the final coordination signatures was completed by 18 June 1971.

The USAF posed no major objections. They did question the advisability of initiating the development of a new helicopter when, in their mind, the subject of helicopter vulnerability was so unclear.

As was mentioned earlier, the Army and the Marines had worked closely on the development of the UTTAS requirement. During the

spring of 1971 there were still some significant differences in the two services' requirements. Adding to the problem was the Army's concept formulation having been initiated years ahead of the Marine's investigation for a replacement for the CH-46. In the spring of 1971, the Army's effort was completed and the Marine effort was still in progress.

Where the Army's requirements favored a compact squad carrier, the Marine requirements favored a somewhat larger helicopter. This was due to the requirement to put a Marine Amphibious Force ashore in a specified time from a given standoff distance with a given number of ships.

There was another more subtle facet to the larger helicopter requirement. The Navy's long range plans called for replacing their current anti-submarine helicopters with a larger helicopter with greater performance and endurance. With the rapidly increasing costs of developing and producing new helicopters, approval of a new development to support this relatively small force structure of anti-submarine helicopters would be very unlikely. If, however, the development of a new helicopter with a model variation could be applied to both the anti-submarine requirement and the Marine troop lift requirement the development costs could be better justified. Although this consideration was never openly tabled by the Navy, many comments during the staffing of the DCP strongly suggested this consideration.

As the staffing progressed, the Navy gradually moved away from supporting a start of a joint development for a new utility tactical

helicopter with the Army as the lead service and the final size to be determined later. On 3 June 1971 the Secretary of the Navy signed the DCP recommending the Army proceed on its own as did all the other principals in the coordination.

Therefore, Mr. Packard received the DCP with a unanimous recommendation for the UTTAS development as requested by the Army according to the cost, schedule, and performance listed in Section XIV of the Development Concept Paper.

On 22 June 1971, DEPSECDEF, Mr. Packard, approved the recommendation and added his personal note cited earlier.

The UTTAS Concept Formulation had been long and difficult but did produce a decision the first time up, a favorable decision at that.

C. A. Patnode Jr.

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LTC Inf

## CHAPTER IV

## FOOTNOTES

1. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Letter and Disposition Form, FOR AV AS, The Improved Lift Ship (TILS) Briefing (Washington, 11 January 1971).

2. US Department of the Army, Office of the Assistant Chief of Staff for Force Development, Summary Sheet, FOR AV AS, The Improved Lift Ship (U) (Washington, 4 February 1971). CONFIDENTIAL.

# CHAPTER V

## CONCLUSIONS

The following conclusions are derived from an analysis of the information examined in this research:

1. The open approach is an excellent technique for Concept Formulation. It does foster delays early in the program but appears to expedite the actions required at decision time.

2. The participation of action officers from all key interested agencies throughout concept formulation is a useful technique in establishing an atmosphere conducive to decisionmaking.

3. Sensitivity to established personalities rather than established procedures produces the best results.

## SELECTED BIBLIOGRAPHY


1. Art, Robert J. The TFX Decision. Boston: Little, Brown, 1968. (UA 23 A94).

2. Bell Helicopter Company. Engineering Change Proposal. UH-1D/H-540 Increased Payload and Improved Hot Day Hover Performance (Advanced UH-1H+), Fort Worth, 10 March 1970.

3. Klingenhagen, John L., MG. US Army Aviation Systems Command, St. Louis: Personal Interview, 26 February 1971.

4. Rockwell, Warren T., Director. Washington Operations, Bell Helicopter Company, Washington: Personal Interview, 29 June 1971.

5. US Army Air Mobility Research and Development Laboratory, Eustis Directorate. Briefing for Assistant Secretary of the Army (Research and Development). 1500 SHP DEMO Engine Briefing. Washington, March 1970. CONFIDENTIAL.

6. US Army Aviation Materiel Laboratories, Report. Design and Performance Analysis and Risk Assessment of the Proposed Advanced UH-1H+. Fort Eustis, May 1970. CONFIDENTIAL.

7. US Army Aviation Systems Command, Report. Comparative Evaluation of UTTAS, UH-1H+ and UH-1H Aircraft. St. Louis, November 1970. CONFIDENTIAL.

8. _____. Research Engineering and Data Activity, Flight Standards Division. Report. Technical Evaluation of the Bell Helicopter Company Model 214 (UH-1H+) Proposal. St. Louis, April 1970. CONFIDENTIAL.

9. US Army Combat Developments Command. Final Draft Report. Part III Utility Tactical Transport Aircraft System (UTTAS) (U). Fort Rucker, 25 May 1971. SECRET NOFORN. (OO ARMY CDC AVNA UTTAS PH.3 v. 1 through v. 12).

10. _____. Final Report. Part I Utility Tactical Transport Aircraft System (UTTAS) (U). Fort Rucker, June 1968. SECRET NOFORN. (OO ARMY CDC AVNA UTTAS PH.1 v. 1 through v. 8).

11. _____. Final Report. Part II Utility Tactical Transport Aircraft System (UTTAS) (U). Fort Rucker, June 1970. CONFIDENTIAL. (O ARMY CDC AVNA UTTAS PH.2 v. 1 through v. 13).

12. _____. Letter. CDCCD-J. Utility Tactical Transport Aircraft System (UTTAS) (U). Fort Belvoir, 24 October 1966. CONFIDENTIAL.

13. _____. Letter. CDCMR-V. USAMC Proposal to Product Improve the UH-1H Aircraft (U). Fort Belvoir, 5 February 1970. CONFIDENTIAL.

14. _____. Summary Report. UTTAS Study Progress Review. Fort Rucker, 22 December 1967. CONFIDENTIAL.

15. US Department of the Army. Office of the Assistant Chief of Staff for Force Development. Letter and Disposition Form. FOR AV AS. The Improved Lift Ship (TILS) Briefing. Washington, 11 January 1971.

16. _____. Letter. FOR AV AS. Recommended Systems to be Evaluated During Utility Tactical Transport Aircraft System (UTTAS) Phase III, Cost/Effectiveness Study. Washington, 29 August 1969.

17. _____. Letter. FOR AV AS. Revised Time Frame for Utility Tactical Transport Aircraft System (UTTAS) Study (U). Washington, 21 December 1967. CONFIDENTIAL.

18. _____. Letter. FOR AV AS. Utility Tactical Transport Aircraft System (UTTAS) Study (U). Washington, 29 August 1967. CONFIDENTIAL.

19. _____. Memorandum for Assistant Vice Chief of Staff, US Army and personal reply. SELCOM for the Improved Lift Ship. Washington, 21 December 1970.

20. _____. Message. ACSFOR AV. Army Aviation R&D Priorities (U). Washington, 22 December 1969. CONFIDENTIAL.

21. _____. Summary Sheet. FOR AV AS. Aircraft Development Priority (U). Washington, 27 July 1970. CONFIDENTIAL.

22. _____. Summary Sheet. FOR AV AS. Department of the Army Systems Staff Officer (DASSO) System (U). Washington, 29 September 1970. CONFIDENTIAL.

23. _____. Summary Sheet. FOR AV AS. Proposed Qualitative Materiel Requirement (PQMR) for Utility Tactical Transport Aircraft System (UTTAS) (U). Washington, 9 October 1970. CONFIDENTIAL.

24. _____. Summary Sheet. FOR AV AS. The Improved Lift Ship (U). Washington, 4 February 1971. CONFIDENTIAL.

25. US Department of the Army. Office of the Chief of Research and Development. Letter. CRD-L. Utility Tactical Transport System (UTTAS) (U). Washington, 20 September 1966. CONFIDENTIAL.

26. _____. Letter. CRD-L. Utility Tactical Transport System (U). Washington, 12 January 1967. CONFIDENTIAL.

27. US Department of the Army Office of the Comptroller of the Army. Letter. COMPT-CA(M). Cost Estimate for Utility Tactical Transport Aircraft System (UTTAS). Washington, 23 December 1970.

28. US Department of the Army. Office of the Deputy Under Secretary of the Army. Memorandum for Acting Assistant Secretary of Defense (Systems Analysis). Platoon Lift vs. Squad Lift Helicopters (U). Washington, 30 October 1969. SECRET

29. US Department of Defense. Office of the Director of Defense Research and Engineering. Development Concept Paper (DCP). DCP No. 13 Utility Tactical Transport Aircraft System (UTTAS) (U). Washington, 22 June 1971. CONFIDENTIAL.