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AN ABRIDGED HISTORY  
OF THE  
ARMY ATTACK HELICOPTER PROGRAM (u)

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## ARMY ATTACK HELICOPTER PROGRAM

### BACKGROUND

The suitability of the helicopter as a weapons platform was initially studied by the Army in 1955.<sup>1</sup> In the intervening years all Army armed helicopter programs, with one exception, have been modifications or derivatives of aircraft designed for other than weapons carrying purposes. This paper will focus on that exception, the AH-56, replaced by the AAH, in an attempt to provide insight into the actions which lead the Army to its current Attack Helicopter posture.

#### Establishing the Requirement

- Primary role of advanced attack helicopters translated from escort to anti-armor.
- Performance requirements based initially on what was available.
- Secretary of the Army directed a more advanced system.

The role of attack helicopters has evolved into two mission categories-- escort or soft target suppression and anti-armor. Early aircraft weaponization concentrated on the former role due in part to lack of an airborne weapon capable of defeating armor. However, emphasis has shifted toward the anti-armor role, particularly with the compatibility of TOW to airborne systems and its subsequent success in Vietnam.<sup>2</sup>

As early as 1957, DCSOPS recommended arming the H-13, H-21, and H-34 with single 7.62mm machineguns.<sup>3</sup> However, it took the impetus of Vietnam and the Howze Board to result in the jury rigging of guns, rockets, and missiles on UH-1's in 1962. The Army air fleet was authorized 102 aircraft for each infantry division in 1962, when the Army's Howze Board was convened to study the possibility of increasing troop mobility by substituting still more helicopters for ground vehicles. The Board's recommendations supported the air mobility concept and also called for a large number of attack helicopters to provide close-in support with guns, rockets, and missiles.<sup>4</sup> A DOD directive which forbade the Army from engaging in close air support and which limited helicopter empty weight to 20,000 pounds, was waived.<sup>5</sup>

On December 1962, the CGs of AMC, CRD, CDC, and Director of Army Aviation met and decided on an interim, off-the-shelf procurement for fulfilling the escort role until experience could be gained on what was really needed for a weapons helicopter.<sup>6</sup> Options were armed Mohawk, UH-1B, other systems, or a new interim helicopter. CDC then drafted a QMR which reflected requirements (1500# payload, 140 kt cruise speed) coinciding with the potential of the Bell "Warrior."<sup>7</sup> This aircraft a derivative of the H-13 was proposed by Bell. SA, however, disapproved this "interim" approach and directed the Army "to lift its sights" to a more advanced system.<sup>8</sup> In accordance

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with the SA's guidance, CDC's new QMDO prescribed a rotary wing aircraft with 195 kts cruise speed, 220 kts dash, and hover OGE 6,000', 95°.9 Basis for the speed requirement appeared to have been a combination of what was then judged to be technically feasible and a rule of thumb ( $\pi/2$  \* escorted vehicle cruise speed) for the escort dash speed requirement.

In April 1963 the DDRE concurred in Army's reorientation but would not release funds until he could: 1) review the program in detail, and 2) receive an analysis of improvements that could be made on UH-1 as an interim system.<sup>10</sup> After feasibility studies, AMC recommended narrowing competition to a compound helicopter.<sup>11</sup> CG, AMC received CSA approval to designate a PM, with full line authority of CG, AMC, in order to effect SA's goal of a quantum jump in support of Army aircraft. COL Leeney was appointed PM and on 21 June 1963 AMC established a PM office, at AMC headquarters, for the Fire Support Aerial System (FAS).<sup>12</sup> In March 1964, after comparative test and analysis, SA advised DDRE that neither the Kaman UH-2 nor Bell UH-1 came close enough to FAS requirements to justify a modification program. Army would therefore continue to use existing systems until an optimum system became available.<sup>13</sup> At about this point, the Army Attack Helicopter Program became clearly divided between interim aircraft and a much advanced system.

#### Armament Subsystem Development

- SEA provided the impetus and battle testing for diverse aircraft armament.

Meanwhile, armament subsystem development picked up. A French developed SS-11B antitank guided missile was adapted for use on the UH-1B helicopter. This weapon was considered to be satisfactory for known requirements until its replacement, the TOW system, would become available. In September 1965, twelve SS-11B subsystems were deployed to SEA with the 1st Cavalry Division and the initial distribution of 36 systems to Europe began in July 1966. No additional procurement of the SS-11B was planned.<sup>14</sup>

A July 1958 QMR had stated that "TOW must be capable of being carried on, and fired from, a lightly armored tracked vehicle, an unarmored vehicle, or a helicopter (if found feasible)...."<sup>15</sup> In October 1961, the CRD authorized feasibility studies of the TOW system after it was concluded that adequate passive homing guidance could be developed within a reasonable time.<sup>16</sup> The XM 26 armament subsystem consisted of the TOW missile, two launchers holding three rounds each, a stabilized sight and tracker, and an aircraft mounted guidance and control system. Development of the heliborne launcher with associated guidance and control equipment was initiated in October 1965, and the first prototypes were expected to be available in August 1967. The sighting and guidance components of this subsystem were, at that time, to be used in the Aerial Fire Support System (AAFSS).<sup>17</sup>

Reports from Vietnam during this period indicated that the 40mm grenade launcher and the 2.75 inch rocket system were most effective and reliable

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for aircraft application. With the advent of the Huey Cobra, a derivative of the UH-1, the Aircraft Weaponization Project Office made provisions to meet the armament requirements for the aircraft. Under development for the Cobra was the XM 128 armament subsystem consisting of two 40mm grenade launchers, or two 7.62mm high-rate machine guns, or a combination of one of each type of weapon mounted in a flexible nose turret. This choice of weapons was intended to provide combat commanders with a desired flexibility in battle.<sup>18</sup>

#### Selection of an Interim Aircraft

- Operating prototypes permitted a flight evaluation.
- Sixteen months elapsed between Cobra contract award and deployment in SEA.

In August and September of 1965 a group met at Headquarters, AMC to evaluate proposals for an improved armed helicopter. Bell's Huey Cobra, Sikorsky's S-61, Kaman's UH-2, Vertol's CH-47, and Piasecki's H-16 were evaluated. The objective of this group was to select an aircraft which offered the most significant increase in capability over the armed UH-1B Iroquois helicopter. The three highest ranking aircraft, the Cobra, the S-61, and the UH-2 were selected to undergo a flight evaluation by the Aviation Test Activity. As a result of this evaluation, the Cobra (AH-1G) was recommended as the best candidate for the interim armed helicopter role.<sup>19</sup>

On 13 April 1966, the Army awarded its first Cobra production contract to Bell Helicopter Company for 110 Cobras, data, and initial long-leadtime provisioning items, at a cost of \$21 million. Subsequently, the contract was amended to include training devices and additional spare parts, which increased the total funding to \$25 million. The first Cobra was produced in May 1967.<sup>20</sup> Five months later the first six AH-1G Cobras were deployed in SEA. At the end of FY 70 there were 711 AH-1G's delivered, of which 440 were in RVN.<sup>21</sup> While the Cobra served well in SEA and confirmed the value of attack helicopters, performance limitations highlighted the need for an improved aircraft and emphasized the existing concern of vulnerability in a mid-intensity environment.

#### AAFSS (AH-56) HISTORY

On 26 March 1964 CSA redesignated the FAS Program as the "Advanced Aerial Fire Support System (AAFSS)." The first PM TDA (11 people) took eight months to achieve 90% fill.<sup>22</sup> This was the start of continuing PM problems regarding spaces and qualified personnel for the program office.

#### Initiation of Project Definition Phase

- Project Definition Phase contracts awarded without approved QMR.
- Early cost goals were unrealistically low.

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- Selected contractor had no previous helicopter production experience.
- Requirements modified to insure funding.
- Quantitative requirements not resolved.

The first half of 1964 was spent attempting to prepare and receive authorization to release an RFP. A QMDO was not approved until April 1964. A month later, DEPSECDEF provided qualified approval to the PCP which authorized issuance of the RFP. On 1 August 1964 TRECOM released the RFP to 148 prospective contractors. A Source Selection Board was convened and on 19 February 1965 Lockheed and Sikorsky were announced as winners of Project Definition Phase Contracts based primarily on contractor claims of low development cost, technical design and in the case of Lockheed, the rigid rotor.<sup>23</sup>

The two contractors were issued revised RFP's incorporating QMDO and draft QMR updates. Each responded with proposals for three versions of AAFSS: 1) development effort for the optimum weapons system, 2) application of the modular concept option for removing or adding equipments to tailor for specific missions, and 3) a proposed AAFSS for early RVN support. An average flyaway cost of \$900K was stated as a goal.<sup>24</sup>

During September 1965, investigation by the PM's office revealed that there was no Lockheed or Sikorsky data system that would apply to the AAFSS, and that contractual support would be necessary to help the PM identify technical data interface requirements and perform technical data review, storage, and retrieval functions during the course of the project. The DCG AMC subsequently approved a TRW contract "to design a technical data management system for use by the PM in controlling and managing the total AAFSS project."<sup>25</sup>

On 6 October 1965 the SSEB presented its evaluation to Source Selection Authority (SSA). Lockheed's proposal offered a program of lower costs, earlier availability, and less technical risk. However, they had no previous helicopter production experience. The SSA council also found the proposals for an early RVN production model to be marginal in value and suggested an acceleration of the basic program in order to meet early RVN deployment. The modular program was dismissed as offering no significant cost reduction without a proportionate degradation in mission effectiveness.<sup>26</sup>

Lockheed was announced as winner on 3 November 1965. At this time an approved QMR had still not been completed, but was necessary to complete any statement of work and final contract negotiation. Major delay was incurred in QMR approval by the CSA office, who returned it for change and refinement to show a clear need for the aircraft in a sophisticated environment to insure funding. This prompted the requirement for a cost effectiveness analysis. AMC and BRL were assigned to conduct the cost effectiveness analysis. The PM's office was not included as a member of the analysis team. This caused further delay when the PMO discovered that BRL was finding AAFSS the most expensive (least cost effective) system.<sup>27</sup> Negotiations with Lockheed

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were further delayed due to Army's request for production option prices on quantities of 375, 500, 1000, and 1500 systems. Therefore, to permit initiation of effort, a formal agreement was signed allowing Lockheed to expend, at their own risk, up to \$2.5 million.<sup>28</sup>

On 17 December 1965 the QMR was finally published. However, it included numerous significant changes (e.g., addition of an aerial rocket subsystem) which necessitated further rewriting of the development descriptions. A time Zero IPR was held in January 1966 to approve each development requirement. Fourteen discrete requirements, not included in original Lockheed proposals, were added.<sup>29</sup>

Engineering Development

- Total Package Procurement type contract limited Government flexibility and promoted development and production concurrency.
- Quantitative requirements still not resolved.

In March 1966 the Army and Lockheed signed an ED contract but delayed inclusion of production options.<sup>30</sup> DEP ASA(R&D) informed SA that he considered it the best development contract he had ever seen.<sup>31</sup> The contract was essentially a Total Package Procurement with the exception that it contained specific options for production rather than the terms of production. Negotiations on production options were finally completed in early FY 67, and incorporated into the ED contract. The ED contract did not include provisions for production base support; data and publications, ECP's, GSE, or repair parts, which were to be negotiated separately.<sup>32</sup>

The terms of the production options were such that the Government would have been required to issue a written preliminary contractual instrument and obligate funds for pre-production items and services by 31 March 1967 to take full advantage of the negotiated prices. Failure on the part of the Government to exercise its option by that date would result in schedule slippages and price increases to reflect the impact of delay. Failure to exercise the option by 31 December 1967 could, at Lockheed's discretion, void the agreement in its entirety.<sup>33</sup>

OSD was concerned that the high degree of concurrence between the development and production programs and the scheduled first flight of September 1967 could result in costly engineering changes if the production effort began too early. There also remained the question of an AH-56A Basis of Issue and determination of total quantitative requirements.<sup>34</sup>

Production Contract

- Cost estimates increased substantially.
- Force trade-off conducted without resolution of quantitative requirements.

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- High level management added to program.
- Production contract negotiated without adequate hardware testing.

The SECDEF approved \$31.4 million in January 1967 for the first production buy of 375 aircraft and directed that the production contract would include further production buy options contingent upon validation of the requirement through trade-off and operational doctrine studies.<sup>35</sup>

Between May 1967 and June 1968 all ten prototype vehicles were provisionally accepted by the Army.<sup>36</sup> The tenth prototype was to have been equipped with what was called auto-modes which was envisioned as the basis for an AH-56B program. Included was stationkeeping and terrain avoidance avionics. This program was abandoned due to high costs and the need to utilize all prototypes for flight testing on the basic program.<sup>37</sup> The development program during the period experienced a variety of system and subsystem failures and one aircraft was damaged as a result of a forced landing. Army testing was minimal during this period due to the nature of the development contract.<sup>38</sup>

The Army and OSD agreed to an equal cost trade-off between AAFSS and existing forces. An implicit assumption for the trade was that AAFSS would offer an improved ability to combat the threat. Ground rules for the trade-off included: a force of 375 AAFSS, a 10 year time period for evaluating costs, and costs were to be discounted at a 10% annual rate.<sup>39</sup> The significance of costs to this trade-off resulted in expanded DA involvement in cost analysis. Early estimates of production costs were performed by the FM and based on the assumption of 1000 production aircraft. In November 1966 the FM estimate was approximately \$1.5 million average unit cost. The cost analysis conducted by COA and utilized for the trade-off approximately one year later resulted in an estimate of \$2.7 million average unit cost based on a production buy of 375 aircraft.<sup>40</sup> Reasons for the substantial difference between the two estimates included 1) additional equipment, i.e., night vision, 2) lower production quantity, and 3) a more exhaustive, less optimistic analysis.

The LAC production contract proposal for 375 CHEYENNE aircraft was received by the Army 15 October 1968. The delay in award of the Production Contract from March 1967 to January 1968 necessitated adjustments to the target price for 375 aircraft on order. In addition to negotiation of the adjustment it was necessary to negotiate target prices for data, training, training aids, ground support equipment, and publications. In recognition of the complex nature of this task, a team representing all major commands, Defense Contract Audit Agency, and composed of cost analysts, cost auditors, and technical personnel, was assembled to evaluate the Contractor's proposal; establish negotiating objectives; and assist the contracting officer in fact finding and negotiations. To conclude negotiations with Lockheed, AMC organized a negotiating team with the DCG, AMC as the Team Chief.<sup>41</sup>

The Procurement Method and Plan being used in this procurement consisted of a contract financed on an incremental (or installment) basis, with the Government retaining an option to renew the work in succeeding years by making funds available out of current appropriations. Multi-year

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concepts and techniques were to be utilized to establish a cancellation ceiling to be used in the event the Government failed to order or make funds available for a succeeding year.<sup>42</sup>

Production Contract Cancellation

- Technical and management boards, groups, panels, and contractors appointed to resolve problems.
- Attempts to reduce aircraft speed requirements unsuccessful.
- AAFSS PM moved to AVSCOM and given Cobra responsibility.

A fatal test flight accident occurred on 12 March 1969, followed by presentation of a "Cure Notice" to Lockheed on 10 April 1969. The "Cure Notice" followed in-house reviews and a series of reviews by prominent rotary wing consultants convened to assist Lockheed in solutions to CHEYENNE flying qualities problems; plus Army assembled advisory teams of representatives from AVLABS, NASA, BRL, and leading experts in rotor dynamics and transmission problems. The Cure Notice listed ten performance areas where Lockheed was not meeting the requirements of the contract's top specifications. Eleven major technical problems were listed; one or more of which was preventing the contractor's compliance with contractual requirements. The contractor's reply, which addressed each problem identified in the Cure Notice, was reviewed by an AMC Review Board. Following review of the contractor's proposed solutions with attendant program slippages and increased costs, the CHEYENNE (AH-56A) Production Contract with the LAC was terminated for default on 19 May 1969.<sup>43</sup>

In 1968, the PM had requested the formation of a Blue Ribbon Panel to evaluate technical flight performance problems which became apparent during flight testing. The panel confirmed the seriousness of the problem (associated primarily with the main rotor and control system) and with the PM, recommended that LAC not perform the high speed testing which resulted in a fatal crash in March 1969. Following the crash, ACSFOR queried CDC as to the impact of reducing the maximum speed of the AAFSS to 180 knots, in view of the consideration that aerial escort and the 212 knot speed requirement were not as critical as previously considered. CDC responded that the 180 knots would be acceptable, and that the CHEYENNE speed could fall short of the QMR and still be a useful weapon system. However, this amendment was not made to the QMR. The QMR was updated at the initiation of CDC in December 1968 but changes dealt primarily with maintainability and reliability, and system accuracies. The QMR, as such, remained basically unchanged since the original approval in 1965.<sup>44</sup>

In the Fall of 1968, the Director of Army Aviation recommended establishment of a DA level System Manager to coordinate all DA Staff functions.<sup>45</sup> A MG was appointed to the position October 18, 1968, reporting to CSA. At that time the PM asked to be relieved but was refused by SA and DCG, AMC.<sup>46</sup>

As a result there was a LTC PM at AMC, reporting to a LTG DCG, AMC with a System Manager at the Pentagon reporting to CSA. As a further complication, the SA had a tendency to deal directly with the PM.<sup>47</sup> The System Manager formed the Augmented AAFSS Review Group co-chaired by the General Counsel and the CRD with Secretariat and DA Staff level membership.<sup>48</sup> The Review Group dealt primarily with determining ways to ensure contractor compliance and restructuring the development contract.

On 10 June 1969 the SA requested DOD authority to procure 135 UH-1J's and to continue armed helicopter R&D (CHEYENNE and COBRA). Subsequent deliberations resulted in a 27 June 1969 decision by DEPSECDEF to approve \$106 million for procurement of substitute armed helicopters.<sup>49</sup> In the meantime, AMC was tasked to negotiate with Lockheed on the restructuring of the R&D contract. LAC was then given the opportunity to propose a revised development program, without the restraints of a production schedule. An AMC Review Board met to evaluate the LAC proposal. The Board concluded that the plan was not in sufficient detail for a decision on program continuation, but did provide an acceptable basis for negotiating a restructured program to permit testing the weapons system concept and continued development of subsystems. LAC was notified that the restructured contract would be cost reimbursable.<sup>50</sup> Throughout the year, unsatisfactory handling qualities on the aircraft were apparent. Attempts by the contractor to eliminate one problem often exacerbated another. Significant transmission problems and failures, during testing, continued throughout FY 70. During mid-1969 a new PM was assigned to AAFSS. AMC directed the AAFSS PM to pick up COBRA project management responsibility, and the PM office was moved to St. Louis, Missouri.<sup>51</sup> In February 1970 the AAFSS System Manager's Office was disestablished.<sup>52</sup>

Attempts to Salvage CHEYENNE

- Contractor financial problems overshadow program deficiencies.
- System procurement cost growth forces attempts at austerity.
- Unsolicited industry proposals prompt comparative analysis and eventually a serious new look at the requirement.

In March 1970 Lockheed Aircraft Corporation requested financial assistance from DOD in the amount of \$641 million. Lockheed maintained that pending disputes on the C-5A, SRAM, CHEYENNE, and Navy ships would, if not promptly settled, make it financially impossible for them to complete performance on these programs. The contractor claimed that the total package procurement procedure was the major cause of its contractual problems. Advanced progress payments were made on several existing contracts in an attempt to alleviate LAC's financial problems.<sup>53</sup> DA approved extending Integrated Technical Data System through 30 August 1970 to provide support to the Litigation Task Force, which was established to resolve the production contract termination claims.<sup>54</sup>

In the first months of FY 71, Congressional committees showed an intense interest in CAS aircraft. They were faced with DOD requests to fund three separate CAS aircraft: AH-56A CHEYENNE, AV-8A Harrier, and A-X. The A-X was envisioned by the Air Force as a means of reestablishing that service's responsibility as the primary provider of CAS to ground troops. After considerable study of the merits of each service's system, the committee directed the SECDEF to reevaluate the roles and missions and aircraft options available for CAS. Findings, including a decision as to the aircraft best suited to fill the needs of CAS were to be delivered to the Appropriations Committee in time for the FY 72 budget hearings. In accordance with Congressional instructions, a DOD CAS study group was formed. The Group found that A-X, CHEYENNE, and Harrier were sufficiently divergent in capability so as to justify all three programs.<sup>55</sup>

During the Spring and Summer of 1971 LAC and the Army initiated a producibility/cost reduction (P/CR) study in an attempt to significantly reduce AAFSS costs. The then estimated procurement unit cost of \$3.8 million was reduced by about \$0.5 million through a variety of means. P/CR efforts continued up to cancellation of CHEYENNE.<sup>56</sup>

In the Fall of 1971 the Army conducted a comparative analysis of the LAC CHEYENNE, Sikorsky BLACKHAWK, and Bell KING COBRA as candidates to fulfill the AAFSS mission. The BLACKHAWK and KING COBRA had been provided as unsolicited candidates by the contractors. Results of the analysis showed that neither new candidate could meet the requirements of the QMR but at least the KING COBRA would cost substantially less than CHEYENNE.<sup>57</sup>

On 17 August 1971, a settlement agreement was reached with Lockheed that provided for completion of CHEYENNE development, and resolved all issues of the production termination litigation. In this settlement, the development contract was restructured to a cost reimbursement (no fee) type, retroactive to 29 December 1969. Lockheed expenditures prior to that date resulted in a minimum contractor loss of \$72.3 million. The production settlement allowed Lockheed to retain previously paid progress payments (\$54 million) and provided \$33 million for Lockheed settlement of their sub-contractor claims. The termination inventory was reserved for the beneficial use of the Government in any future CHEYENNE or successor helicopter production contract with Lockheed.<sup>58</sup>

On 14 January 1972, the Army established a special task force to conduct a reevaluation of its attack helicopter requirements and to prepare an updated and defensible Materiel Need (MN) document. In the generation of this MN, the Task Force considered field tests, combat experience and computer simulations that have been conducted over the past several years as well as actual flight evaluations of the CHEYENNE and two company-funded prototypes (Bell KING COBRA and Sikorsky BLACKHAWK). The requirements identified for an Advanced Attack Helicopter which could be available in the late 1970's described an aircraft that would be more agile, smaller, slower and less sophisticated than the CHEYENNE. This requirement also defined a less costly system than that of the original AAFSS requirement. Based on these results, the Secretary of the Army announced on 9 August 1972 the decision to terminate CHEYENNE.<sup>59</sup>

AAH HISTORY

Establishing the Requirement

- Task Force conducts comprehensive cost and effectiveness analysis to establish AAH requirement.
- New Materiel Acquisition Policy and Design to Cost provide substantial program controls.

An MN was developed by the AAH Task Force (January-August 1972) which evaluated the Army's changed requirements (vis-a-vis AAFSS) for an advanced attack helicopter, and tested three basic candidate aircraft against the defined requirement. The CHEYENNE (AH-56), BLACKHAWK (S-67), and KING COBRA all failed to adequately meet the new requirement, and a "new start" AAH was authorized by ASARC I on 17 August 1972.<sup>60</sup> The AAH was to be smaller, less complex and cost less to procure, operate, and maintain than the AH-56A CHEYENNE. These attributes were achieved by reducing the requirements for airspeed, payload, navigation accuracies, and weapons sophistication. It was to be complementary to the AH-1 Cobra series as well as to fixed wing, close support aircraft, and would be capable of hovering OGE under adverse weather conditions, day or night, and of achieving the high degree of agility which the Cobra lacked.<sup>61</sup> Cost analysis of the Task Force derived MN indicated a program unit cost of \$3.8 million. Under the assumption that this cost was too high, the MN was "scrubbed" to yield an aircraft costing approximately \$3.2 million.

DSARC I was held on 28 September 1972, however, the DCP was not immediately approved except in concept. On 10 November 1972, DEPSECDEF authorized release of the RFP, and directed that the DCP be modified to incorporate Design-to-Cost, and trade-off (performance vs. cost) as indicated. These trade-off floors were to be fully supported by the proposal to be cost effective or necessary to remain within the Design-to-Cost goal of \$1.4 - \$1.6 million recurring flyaway costs.<sup>62</sup> In November 1972, the Army approved a further scrubbed Materiel Need for an AAH in an attempt to gain OSD agreement on projected costs.

DEPSECDEF authorized release of the AAH RFP on 10 November 1972, specifying a \$1.4 million to \$1.6 million (FY 72 constant dollars) constraint on the recurring fly-away design-to-unit production cost. On 15 November 1972, a Request for Proposal (RFP) was issued to industry for Engineering Development, including Government Competitive Testing. The RFP stated the Government intended to award contracts to two contractors for Phase I Engineering Development for the purpose of achieving maximum benefits from competition (technical and cost). Further, contractors were authorized to make design trade-offs to keep costs within the Design-to-Cost goal. Each offeror was required to design, develop, fabricate and test two AAH prototypes and one Ground Test Vehicle (GTV). The RFP reserved the right of the Government to award only a single engineering development contract for five AAH prototypes and one GTV. Bell Helicopter Company, Boeing-Vertol Company, Hughes Helicopters, Lockheed California Company, and Sikorsky Aircraft responded to the RFP

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on 15 February 1973. An Army Source Selection Evaluation Board (SSEB) evaluated the submitted proposals and negotiated viable contracts with each offeror. Findings were submitted through the Source Selection Advisory Council to the Secretary of the Army for the selection decision.<sup>63</sup>

In March 1973, the AAH DCP was submitted to the Department of Defense for approval after months of coordination. DCP thresholds were established relative to performance characteristics, milestone schedules and cost.<sup>64</sup>

Engineering Development

- Increased OSD involvement in Source Selection.
- Emphasis on procurement cost equals or exceeds performance and schedule.

On 22 June 1973, Phase I Engineering Development system contracts were awarded to Bell Helicopter Company and Hughes Helicopters with the stipulation, by DEPSECDEF, that contractors were not to proceed with the development effort for a period of thirty days pending 1) Army/OSD CAIG intensive review of projected unit costs, 2) OSD/CAIG clarification of Design-to-Cost consistent with other cost reporting procedures, and 3) revalidation of cost data and design trade-off determinations to identify cost reduction possibilities to assure maintenance of the Design-to-Cost goal.<sup>65</sup>

After accomplishment of the above efforts, the Army was authorized to proceed with the AAH program. A modification to each system's contract to implement the "go-ahead" was consummated on 20 July 1973. A modification to the UTTAS General Electric Engine Contract, which provides T-700 engines and necessary supplies and support for the AAH contractors' prototype aircraft during Phase I of the Engineering Development Program, was signed on 23 July 1973. A bilateral contract modification with each system's contractor was processed on 3 August 1973. These amendments incorporated the appropriate trade-offs which were necessary to remain within the design-to-production unit cost constraint.<sup>66</sup>

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FOOTNOTES

1. US Army AMC Attack Helicopter History (Draft) \*
2. FM Historical Summary, FY 1971 (Draft) \*
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4. US Army AMC Historical Summary, FY 1964
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36. Annual Historical Summary, CHEYENNE (AH-56A) Project, 1 Jul 67 to 30 Jun 68
37. Interview with PMO Representatives
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39. R.J. Trainor "NATO" Speech, Rome, Oct 1968
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41. Annual Historical Summary, CHEYENNE (AH-56A) Project, 1 Jul 68 to 30 Jun 69
42. Ibid.
43. PM Annual Historical Summary, 1 Jul 68 - 30 Jun 69, and interviews with PMO representatives
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48. Interview with System Manager representative
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50. Interview with PMO representative
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52. US Army AMC Draft Historical Notes
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58. 31 March 1973 CHEYENNE Selected Acquisition Report (SAR)
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60. AAH DCP, 17 May 1973
61. 5 October 1973 AAH Selected Acquisition Report (SAR)
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63. OP CIT AAH Selected Acquisition Report (SAR)
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ADVANCED AERIAL FIRE SUPPORT SYSTEM (AAFS)

Salient Characteristics	1964	1965	1970	1971	1971
	(OMDO APPROVAL) (1)	(OMR APPROVAL) (2)	(CI TO DA APPROVED OMR) (3)	(RESTRUCTURED CONTRACT) (4)	(PRODUCTIBILITY/COST REDUCTION STUDY) (5)
Speed: Cruise	195 Knots			196 Knots	
Dash	220 Knots			212+4 Knots	
Payload (armament & munitions)	1,500 lbs				
Endurance	3.0 hrs (incl 10 min hover OGE)				
Ferry range	1,000 n.m. (2)	2,500 n.m. or air transportable in C-130 & C-141 acft and range of 1,500 n.m.		1,500 n.m. (5)	Internal fuel only. Ferry capability deleted.
Crew	Pilot & co-pilot/gunner				
Hover OGE at design gross weight	6,000' at 95°F. (2)	5,000' at 90°F.		3,500' at 90°F. (4)	
Point target weapon	As high a first round kill probability as practicable out to 3,000 meters. (2)	Daylight visual single shot kill probability of 0.75 against NATO type III heavy tank targets moving 30 mph out to 2,000 meters and 70° L&R of acft heading. (3)		Range increased to 300-3,000 meters & "kill probability" amended to "hit probability." Added: Probability of hit during darkness of 0.58 at ranges from 300-1,200 meters. (4)	

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Salient Characteristics

1964

(QMDO APPROVAL) (1)

1965

(QMR APPROVAL) (2)

1970

(CI to DA  
(APPROVED QMR) (3)

1971

(RESTRUCTURED  
CONTRACT) (4)

1971

(PRODUCIBILITY/  
COST REDUCTION  
STUDY)

**Suppressive fire**

Rn to 2,500 meters & 100° to either flank of acft hovering or in flight.

**Instrument flight capability**

Equal to UH-1 & CH-47 acft

In combat area at minimum altitude (200 ft) under most weather conditions except severe icing & turbulence.

**Night vision (NV)**

Space & weight provisions for NV light intensification system.

Means to enhance NV to enhance visual reconnaissance, terrain following & target acquisition at night.

**Navigation system**

Complete provisions for the system projected for use during the projected time frame

All-weather day & night terminal & area navigation. Errors not to exceed 0.5% of distance travelled.

**Fuel tanks**

Self-sealing against 7.62mm

Separate tank w/20 minutes of fuel protected against 12.7mm fire.

Crashworthy Fuel System

ADVANCED AERIAL FIRE SUPPORT SYSTEM (AAFSS) - BACKUP INFORMATION

- 1/ Requirements as stated in DA approved QMDO for an Advanced Aerial Fire Support System, dated 6 April 1964. This QMDO was originally submitted by CDC to DA on 3 September 1963, subsequently approved by DA on 6 November 1963, and retitled and published by CDC on 6 April 1964.
- 2/ The first QMR for the AAFSS was submitted by CDC to DA on 29 October 1965 and was, subsequently, approved by the DA Staff and published by CDC on 17 December 1965. This QMR described the AAFSS as the primary attack helicopter in the 1970's to replace the UH-1B gunship. Changes in requirements reflect an update to the state-of-the-art.
- 3/ Change 1 to the 1965 QMR provided an update to the point target weapon capability by specifying "hit probability" in lieu of "kill probability" for single shot firings of the weapon. The night kill probability for the point target weapon was added. The QMR, with this change, remains as the Army's latest published requirement for the AAFSS.
- 4/ As the Army prepared to exercise its production option with Lockheed Aircraft Corporation in late 1968 and early 1969, it became apparent that Lockheed would not meet all contract specifications for the CHEYENNE. At that time LTG Bunker, the Army's chief negotiator for the CHEYENNE production contract, went to the DA Staff with a list of characteristics achievable for the production aircraft. This list was reviewed by the Army Staff and CDC, and was approved, in part, for further contract negotiations. The production contract was terminated in April 1969 for default by Lockheed, but the deviations approved for General Bunker were carried into the restructured contract. The restructured contract negotiations were conducted by COL Delbert Bristol, AVSCOM, and the contract was signed on 17 August 1971.
- 5/ Changes proposed by the CHEYENNE Producibility/Cost Reduction Program to reduce costs without reducing overall aircraft effectiveness. This program grew out of a memorandum from Mr. Woodall of WSA to General Klingenhagen, then Director of Army Aviation, questioning the effectiveness of the CHEYENNE as opposed to its cost. A subsequent cost study directed by Mr. Trainor, briefings to the SA and ASA(R&D), and staff actions by ACSFOR and AMC resulted in establishing the Producibility/Cost Reduction Study in 1971.
- 6/ Crashworthy fuel tanks included in the P/CR version of the CHEYENNE per BG Maddox, Director of Army Aviation and Chairman, P/CR Executive Council, on 19 July 1971.

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AAFSS SIGNIFICANT TURNING POINTS

CONCEPT FORMULATION

March 1964

Army determines that redesign of existing helicopter systems will not meet requirements and turns from seeking an interim helicopter to the development of an advanced system.

ADVANCED DEVELOPMENT

November 1965

Army chooses Lockheed, an inexperienced helicopter designer, to develop a technically advanced helicopter

ENGINEERING DEVELOPMENT

March 1966

Army signs Total Package Procurement-type development contract, with specific production options tied to calendar dates, and containing significant concurrency.

January 1968

SECDEF approves first production buy, in order to avoid schedule slippages and cost increases resulting from the type of contract and its specified option dates.

CONCURRENT ENGINEERING DEVELOPMENT AND PRODUCTION

March 1969

Prototype aircraft fails, resulting in fatal crash, surfacing a continued history of rotor system technical problems.

May 1969

Production contract terminated for default.

March 1970

Lockheed request for financial assistance from DOD.

October 1971

Comparative analysis of CHEYENNE, BLACKHAWK and KING COBRA conducted.

January 1972

Advanced Attack Helicopter Task Force established to reevaluate attack helicopter requirements. Result is new MN which none of the then current competitors can meet. CHEYENNE is cancelled.

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## AAFSS DEFICIENCIES

### COST ESTIMATING/COST GROWTH

- Inadequate consideration of affordability vs unit cost and quantity
- Optimistic assessment of unit cost
- Substantial cost growth due to optimistic early estimates, add-ons to the system during development, technical problems and constrained production rates.

### REQUIREMENTS GENERATION/OPERATIONAL DEFICIENCY

- Early indecision on modest performance or high performance advanced aircraft
- Requirement based on escort mission, not modified when primary mission became anti-armor
- Performance requirements based on optimistic assessment of industry capability
- RFP started before approved QMDO and released without a QMR
- Single contractor selected prior to approved QMR
- QMR modified to "insure funding"
- Insufficient early assessment of subsystem requirements
- No firm quantitative requirement or basis of issue
- Rigid rotor, in retrospect, was high risk

### MANAGEMENT/LAYERING/DECISION POINTS

- Project office located at AMC, not moved to AVSCOM until 1969
- PMO manpower quantity and grade level insufficient in early stages of program
- Heavy reliance of PM on supporting commodity commands with minimal authority
- System Manager (MG level) added with result that the relationship between the PM (COL), his boss DEP CG, AMC (LTG), System Manager (MG) and Sec Army (who communicated directly with PM on occasion) appears in retrospect to have created, rather than solved problems.

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CONTRACTING/INDUSTRY INTERFACE

- Selected contractor did not have applicable helicopter experience
- Production options in development contract tied to calendar dates rather than accomplished milestones.
- Contractor selection based on RFP response
- Antagonism existed between contractor and PM

TESTING/OPERATIONAL/DECISION POINTS

- Design problems not surfaced due to concurrency of testing and production decision

CONCURRENCY/DECISION THRESHOLDS

- High development and production concurrency and locked in by TPP type contract
- Schedule delays caused primarily by early contractor and Army optimism but compounded by delay and changes in GFM subsystems, sub-contractors, and technical problems

PERSONNEL CAREER MANAGEMENT

- PM's management training and orientation questionable
- PM of major system at LTC/COL level

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AAH REQUIREMENTS EVOLUTION

In January 1972, the Army established a special task force to conduct a reevaluation of its attack helicopter requirements and to prepare an updated and defensible Materiel Need (MN) document. In the generation of this MN, the Task Force considered field tests, combat experience and computer simulations that have been conducted over the past several years, as well as actual flight evaluations of the CHEYENNE and two company-funded prototypes (Bell KING COBRA and Sikorsky BLACKHAWK). The requirements identified an aircraft that would be more agile, smaller, slower and less sophisticated than the CHEYENNE. This requirement also defined a less costly system than that of the original AAFSS requirement.

The Army cost estimate for an aircraft as described by the MN was \$3.8 million program unit cost. Since this cost was roughly equal to that of CHEYENNE, it was assumed that some reduction was necessary. The ACSFOR therefore scrubbed the MN by deleting some subsystems, requiring only space weight and power for others, and removed contingency funds from the cost estimate. The result was a new estimate of \$3.2M. The CAIG reviewed the Army's new estimate prior to DSARC and concluded that the most likely cost was \$3.9M.

DSARC I was held in Sep 72. Discussions included the need to reduce costs and the possibility of approaching the AAH from the standpoint of designing to a cost. The DCP was approved in concept only.

On 10 Nov 72 DEPSECDEF authorized release of the RFP but specified a \$1.4 - 1.6 recurring flyaway design to unit production cost and contractor trade-off to achieve the design to cost goals. Trade-offs below MN requirements were permitted by specifying performance "floors" in the RFP. This constituted the second scrubbing of the original MN requirements to reduce cost both of which were accomplished without substantive analysis. The Army included the RFP language in the draft DCP and resubmitted it to OSD for approval in March 1973. The DCP which included the design-to-cost goal of \$1.6M with a zero threshold on PEMA recurring flyaway costs was approved in May 1973. Contractor responses to the RFP met or exceeded performance requirements and stayed under the design-to-cost goal. SSEB evaluation of contractors cost estimates, while higher, were also under the DTUC goal.

DEPSECDEF approved award of the contract but with the stipulation that an Army/OSD CAIG intensive review of projected unit cost be conducted before the contractors were allowed to proceed with development. Further, additional design trade-offs were to be identified to assure maintenance of the design-to-cost goal. The joint analysis resulted in a difference between Army and OSD CAIG estimates of the AAH recurring flyaway cost with the CAIG's estimate approximately \$0.3M higher than the Army's. The issue was resolved by

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DEPSECDEF instructing the Army to proceed with development, retain the \$1.6M design-to-cost recurring flyaway goal, promptly execute appropriate initial trade-offs and continue to consider trade-offs to maintain the design-to-cost goal.

Results to date of changes to original MN requirements (as reflected in the two contracts) are relatively minor. Vertical flight performance, handling characteristics, cruise speed and endurance have remained unchanged. Most changes result from simplified or deleted subsystem components and provisions for space, weight and power for pilot visionics. Cost estimates have been significantly reduced from the original estimate of \$3.8M program unit cost to the current estimate of \$3.1M. The cost reduction exceeds the cost savings due to the deletion or simplification of subsystems.

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## DOCTRINAL DEVELOPMENT

Doctrinal development appears to lag several acquisitions currently planned or in progress. An example of this exists in the development of the requirement for medium lift helicopters in the 1980's. It is realized that the present, aged fleet of CH-47 model A's and B's (representing approximately half of the CH-47 fleet) will require major overhaul and product improvement in order to effectively perform up to the capability of the C models in the 1980's. However, the possibility exists that some portion of the medium lift requirement will be absorbed by the appearance of the UTTAS, and perhaps by the Heavy Lift Helicopter now in development. A Cost and Operational Effectiveness Analysis is presently being conducted on the HLH, and this study will provide some additional visibility. At the same time "Helilog," an extensive study into the future logistical requirement for helicopters is also being initiated, and will add further information with which to develop a logistics doctrine for lift helicopters. However, the decision on whether to initiate a R&D program to improve the CH-47 A&B capability must be made in the very near future, before the availability of the subject study, and without any solid logistic helicopter doctrine. The absence of this doctrine weakens the justification for particular systems, system mixes and AAO's.

AAFSS REQUIREMENTS

AAFSS appears to provide a prime example of last minute changes to the requirement, without adequate analysis, which resulted in increased sophistication and cost.

The first draft of the AAFSS RFP was prepared two months prior to approval of the QMDO. The RFP was released, two contractors selected, revised proposals submitted and the winning contractor (Lockheed) selected all before the QMR was approved. After selection of the two contractors, the proposed QMR was returned "for change and refinement to show clear need for the aircraft in a sophisticated environment in order to assure funding." This prompted the requirement for a cost/effectiveness analysis but due to delays in its completion, it was decided to complete the QMR without the cost/effectiveness analysis. As a result, Lockheed was selected as AAFSS prime contractor on 3 Nov 65 and the QMR approved on 17 Dec 65. Since the approved QMR contained significant additions to the RFP, a zero time IPR was held on 14 Jan 66 to approve the additional development requirements. Items not contained in the contractor proposal included such things as: aerial rocket system, terrain avoidance radar, stationkeeping and associated flight control system, reduction of IR signature, voice warning system, oxygen system, etc.

It is interesting to note that terrain avoidance radar and stationkeeping were a part of the AAFSS auto-modes program (envisioned as the AH-56B) which was abandoned, at least in part, due to excessive cost.