RESUME OF SERVICE CAREER

of

STORY CRANDALL STEVENS, Major General

DATE AND PLACE OF BIRTH: 24 February 1927, Dayton, Kentucky

YEARS OF ACTIVE SERVICE: Over 34 years

DATE OF RETIREMENT: 31 July 1983

MILITARY SCHOOLS ATTENDED

The Engineer School, Basic Course
The Transportation School, Advanced Course
The Command and General Staff College
The National War College

EDUCATIONAL DEGREES

Purdue University-- BS Degree - Chemical Engineering

Georgia Tech - BS & MS Degree - Aeronautical Engineering

CHRONOLOGICAL RECORD OF DUTY ASSIGNMENTS (Last 10 years)

FROM	TO	ASSIGNMENT
Aug 69	Feb 70	CO, 58 Trans Bn (AM&S), USARV
Feb 70	Sep 70	A/CO, 34th GS Grp, USARV
Sep 70	Aug 71	Air Systems Div Chief, AMC
Aug 71	Jun 72	Student, National War College
Jun 72	Jul 73	Comptroller, MTMS
Jul 73	Jul 74	CO, 1st Spt Bde, USAREUR
Jul 74	Jul 75	CO, Kaiserslautern Army Depot, USAREUR
Jul 75	Jun 77	A/CG AVSCOM

Jul 77	Jul 83	CO, ACRADCOM

PROMOTION	**DATES OF APPOINTMENT**
2LT	10 May 46
1LT	11 Sep 50
CPT	20 Jul 54
MAJ	1 Dec 61
LTC	12 Jan 66
COL	30 Nov 70
BG	20 Jun 75
MG	1 Jul 77

MEDALS AND AWARDS

Distinguished Service Medal
Legion of Merit w/2 Oak Leaf Clusters
Distinguished Flying Cross
Meritorious Service Medal
Air Medal w/13 Awards
Army Commendation Medal
Master Aviation Badge
Parachutist Badge
General Staff Identification Badge

SOURCE OF COMMISSION OCS

INTERVIEW ABSTRACT

Interview with **MG (Ret) Story C. Stevens**

CPT David M. Dobson interviewed **MG (Ret) Story C. Stevens** on 7 June 1985 at Hilton Head Island, South Carolina. **MG STEVENS**, an OCS graduate, spent 1953 in the Reserves finishing his bachelor's degree, then entered active service in 1954. He remained on active duty until his retirement.

This interview with **MG STEVENS** deals primarily with his involvement in the development of the Army's Light Helicopter Experimental (LHX) Program. He begins by tracing the steps in his career that led to a direct leadership role in the program. He recalls the initial lack of unity within the organizational structure in developing and fielding the Army's future helicopter and explains how the organizations were changed to strengthen and solidify the research and development so such a program would be effective. The General also discusses the manner in which research and development for the LHX has been funded. Additionally, he explains which aircraft the LHX and the advantages the new helicopters will have over the present fleet will replace.

MG STEVENS gives his opinions of the LHX program and the Army's use of young officers. He expressed his deep concern about the inadequate attention given to the Army helicopter air-to-air combat capability. Another area of concern was the airspeed criteria for the LHX, which he feels, is inferior to our adversary's helicopters. He also talks about how he feels the Army would benefit more by better channeling the careers of young officers.

He explains the many facets of LHX research and development. These include Advanced Rotorcraft Technology Integration (ARTI), Very High Speed Integrated

Circuits (VHSIC), Advanced Composite Airframe program (ACAP), Single Pilot Concept and Tilt Rotor Experimentation. He feels that much of the research that has gone into the development of the LHX will have a significant impact on the civilian helicopter industry.

Other areas covered include early Army helicopter development, explanation of different types of research money and maintenance of the LHX system. He closes with a summation of his career in the Army.

This is the Army Transportation Oral History Program interview conducted with **MG Story C. Stevens** on 7 June 1985 by **CPT David Michael Dobson** at **MG STEVENS**' home in Hilton Head Island, South Carolina.

CPT DOBSON: Would you consider your personal involvement in the Light Helicopter Experimental Program (LHX) to be one of the most significant and most interesting parts of your career?

MG STEVENS: If I might digress a bit, I was fortunate enough to have the Army send me to Georgia Tech to get my advanced degree in Aeronautical Engineering some time back. Afterwards, I decided I would join the Regular Army, having been Reserve up to that point in time. I went into the Transportation Corps because it looked as though all the aviation was going to be in the Transportation Corps. It was just prior to the Vietnam conflict.

After I received my degree in Aeronautical Engineering, I went for a utilization tour to the Department of Mechanics at West Point. We touched on aeronautical engineering in that particular course and I guess I got a little more interested in the research and development (R&D) aspect of Army aviation. Upon my return from Vietnam, I was fortunate enough to have an assignment at the Pentagon, where I became involved with the research and development and the material acquisition taking place in the Army. In fact, I was right in the middle of the Cheyenne (AH-56) program, which was very interesting, and I was at the upper level where I was seeing the efforts that the Army was making just getting into helicopter development.

If you go back in history, the first helicopter that the Army developed was the Utility Tactical Transport Aircraft system, which is now the Black Hawk. The Black Hawk (UH-60) and the Apache (AH-64) were really the first two helicopters that the Army developed. Prior to that time, the helicopters were essentially off-the-shelf, FAA (Federal Aviation Administration) approved aircraft. We didn't have our own flight test activity or anything else where we were doing the work. We were essentially buying off-the-shelf machines. Even the Cobra (AH-1) was something that Bell built, not to Army specifications.

CPT DOBSON: Could this have been caused by the Vietnam Era, though? We had to have aircraft at that time to do the missions.

MG STEVENS: Not so much the conflict there. It was just the evolution in that we had very little aviation within the Army for some time once the Air Force pulled out. Helicopter use was expanded in the Korean War, but not a whole lot; you've seen the TV series M*A*S*H. Most of the aircraft we had at that time were the L-19s (0-1 Bird Dog) that we were flying for artillery observation. It was after Korea that we started to get more and more aircraft and started to get more into the business of looking at the development and the engineering problems.

For a long time, the only thing we really had down at Fort Eustis was Transportation Research Command (TRECOM) which did the aviation research at the time. TRECOM since has evolved into the Applied Technology Laboratory, which is now a part of Aviation Systems Command (AVSCOM).

I got involved with aviation at the Pentagon level for several years, in the office of the Assistant Vice Chief of Staff. There in the Weapon Systems Analysis Directorate I had the Aviation Division. After another trip to Vietnam, I was assigned to the Army Materiel Command (AMC) where I headed up the Aviation Division under then MG John R. Guthrie. That was my first chance to really look at the total aviation development acquisition business, including its funding.

At that time, in my opinion it was still a rather disjointed effort. It was disjointed at the AMC level and AVSCOM level. You had one side of the house dealing with the engineering development effort, also called 6.4 money (see appendix). The other side of the house was the laboratory side that looked at research and development. About that time they set up the laboratories, co-located with National Aeronautical Space Administration (NASA) facilities in Ames, California; Langley, Virginia; and Lewis Labs, Cleveland, Ohio. At Lewis Labs we did the research in small engines, years, and seals; at Langley we did wind tunnel work; and at Ames we did our helicopter aerodynamic work. Our larger laboratory was at Ames. Still, the laboratory side of the house, at that particular point in 1971, was "stove-piped up." The lab was separate and managed within AMC that resulted in the lab's effort being disjointed without any particular focus. The lab would focus on technologies of different parts of the vehicle, but not on a particular vehicle. They did do a lot of good work, however, and contributed a great deal to the Black Hawk and to the Apache Helicopter.

After some other tours I came out on the General Officers' list and was assigned to AVSCOM in St. Louis as its deputy. At that time, the Commanding General at AVSCOM was MG John H. Hinrichs, not a rated aviator. He certainly was a most knowledgeable individual, a fine commander with a good background in logistics, but he really did not know too much about the air-vehicle or about R&D. In light of this, he gave me the job of looking after the R&D side of the house. When we had our first program reviews and put the budget together for the following year, I discovered there was really no staff element pulling the four laboratories together or managing the program side of the house where

the 6.4 money for engineering and development was located. That posed a problem in trying to make a decision on how best to distribute the funds and on what to focus. You had the labs with their proponents and the Program Managers (PMs) all going after the money, but no one below my level really orchestrating anything. It all came together at my desk with everyone having his or her own axe to grind. That was rather difficult for me, not having been around too long, to make those kinds of decisions. The first thing I saw I needed was some sort of an organization that would, indeed, pull everything together. At the same time, we had to be aware of the Training and Doctrine Command's (TRADOC) priorities because the program had to be approved not only at AMC, but also at TRADOC, and then it had to go and stand on its own through the budget cycle drill at Department of Army (DA).

The other thing that was going on about the same time was the reorganization within AMC as a result of a Blue Ribbon Committee, known officially as the Army Materiel Acquisition Review Committee (AMARC), that was looking at the total acquisition process within the Army. Probably the trigger was the Armaments Command. There were some fundamental problems with the way they were doing business and with the geography of the command's location and how it was divided. This committee recommended that the Army should divide that command into a research and development command, and another command that would essentially go out and procure, or really support the field. It was named the Readiness Command. As a result, one command would support the field, procure the spare parts, and take care of the maintenance policy, etc., and the other command would do the R&D. That would free up the commander from the day-to-day problems that were going on in the field. For instance, when I was a deputy there, the commanding general of AVSCOM was constantly getting tied-up with little problems concerning the field. Let me give you an example: One time we had an engine for a U-21 (VIP aircraft) that, by mistake, left a depot and went to Turkey. It should have been overhauled but was not. That gets elevated to general officer level, and now you have a two star general running around chasing parts. Most of the time, these kinds of problems were because someone didn't submit his requisition properly. But you have a two-star general that spends a lot of his time reacting to these kinds of things. This takes time away from a more important part of his job, which is looking at the total business. And when I say material acquisition, I'm talking about the basic research that goes through the advanced development, the engineering development, then procurement, and finally fielding. It wasn't until the system was fielded that it really became a problem for readiness.

As a result of this AMARC recommendation, which really was oriented towards one or two commands, the Army, in its infinite wisdom, decided to split all the commands within AVSCOM. There was opposition to this because, in some cases, we didn't think it made a whole lot of sense. For instance, Missile Command (MICOM) really wasn't having any problems. It meant splitting a command and making two in the same location; and, somehow or other by splitting the commands, we were supposed to save spaces. I never could quite figure out how they expected to do that, but that was an on-the-spot driven decision, I guess. In St. Louis, we had the Troop Support Command (TROSCOM) and AVSCOM. TROSCOM was basically readiness anyway; they weren't

doing any R&D. In St. Louis, the Army decided to take the readiness element within AVSCOM and combine it with TROSCOM. The new commands became the Troop Support and Aviation Materiel Readiness Command (TSARCOM) and the Aviation Research and Development Command (AVRADCOM), which included the laboratories, the PMs, and the AVIONICS Lab at Fort Monmouth, New Jersey. After the decision was made to implement this change, I was in a position to work the Table of Organization and Equipment (TO&E) for AVRADCOM. In addition to the splitting of AVSCOM, all the other commands within AMC were split.

CPT DOBSON: What time frame was this now?

MG STEVENS: That was in 1976. It was underway about the time I arrived there, which was July 1975, but I guess we started working on the TO&E around late 1975 or early 1976. As a result, I had an opportunity to pick some key people, and we worked up the organization for the AVRADCOM. Having been there about a year and recognizing where the shortcoming was, as far as managing the programs, we were able to organize a command we felt could get the job done a little bit better than the previous organization, now that we had something to pull the programs together. They didn't get pulled together at the AMC level or at the DA level. The avionics were on one side of the house, one division up there, and the air-vehicle part, so to speak, was on another side of the house. So, it was sort of a hodgepodge. But we were able to come up with an organization, and we ran the flag up on 1 July 1977.

I was fortunate enough to get the command. The first thing we decided was to set up a new directorate. It was called the Directorate of Advanced Systems, and this was the organization that would essentially pull the programs together over the year, establish the priorities which would interface with TRADOC, and work with the combat developers down there. In fact, we got the whole community pulled together pretty well. I think by about the second year, we were getting our priorities worked up together with TRADOC, and even with DA. So, when we went in from the aviation side of the house, we knew exactly what the priority was in our program; and this gave us an advantage over the other guys, the tankers and everybody else, because they had not done this yet. It worked well for us in regard to getting the funding for our programs.

The other thing we did was to sit down and draw up an R&D plan. We spent some time the first year really looking to see what we needed to do. At that time, money was getting short. For a long time, before this, you could have the little pet projects; the laboratories could do their things and pursue them. And perhaps if a real breakthrough came, that would be great, but if it didn't, that was okay too. They were doing their own thing. There were some things they'd been doing for years in the laboratories that they just kept on getting funding for, and they weren't getting anywhere with them. So, we decided to look at this whole thing and just do the things that were important to the program. The program we were looking at was the development of a new family of air vehicles.

Now, at that time, we didn't have the LHX as a name, but we did lay out an R&D program. You can go back and dig up the files from some years back, and we've had an R&D plan for several years; basically, we were looking at all the different technologies. For instance, on the propulsion side of the house, we started the 800-horsepower engine development. It was similar to the work that had been done on the T-700 for the Black Hawk and the Apache, but we wanted to get this into an 800-horsepower class because we figured that's about the size engine we were going to need for the next generation. As it turned out, that was probably a little small, although the technology was developed and pursued. Now we did have an engineering development program for the LHX engine that evolved from this advanced development work. We knew the propulsion had to be there, so we set up a program for air-vehicles. The other thing we were trying to get into in advanced development was the work on our composite technology, and the building of an all-composite helicopter. We had something in propulsion, we had something in structures, and there we were focusing primarily on composites. We now had the AVIONICS (Aviation Electronics) under AVRADCOM, so we were looking at the type of advanced cockpit you needed in the future battlefield. I still remember the meeting that took place about a year after we ran up the flag and, if I do say so, I challenged the guys. I said, "Hey, you know, when I first learned to fly, I was flying an L-19. Granted, it's a much simpler system, but I could fly the system, and I could adjust artillery fire only needing one pilot. It would be nice to have an observer, but you could do that with one pilot. Doesn't it make sense if we could come up with a one-man helicopter that could do a lot of these missions, whether it be scout or what have you?" Then some of these pilots came up and said, "Why not have the family of vehicles?" That just evolved over a period of time, and so did our focus.

It seems to me during the period that I've been involved in aviation development, a lot of the ideas are coming from the development side of the house. We're trying to get the user on-board, so to speak. I believe that's caused by the way we cycle our younger officers. To me, the logical thing is that the officer goes out, he does his initial operational stint, his tour with troops, flight school or whatever is appropriate; and then he should come into the materiel acquisition side of the house. After he's been there for two or three years, then he can go down to TRADOC and get into the Combat Development Program. He has a better understanding of how things work on the materiel acquisition. He's got his operational experience, he knows what's going on in the R&D, so when he goes down there and he's in a little better position to deal with the people that come in from industry and pitch their pie-in-the-sky programs. He has a little more objectivity, a little more knowledge of the questions to ask, and I just think it would be a better way to train the officers, rather than to have them just go from an operational unit to TRADOC, then to AMC. Another reason for this is that, I think, they tend to focus on the near-term when that occurs. They're not really looking out in the future, projecting ahead.

It just blew my mind, and still does that we aren't further along on our air-to-air combat requirement. Anybody that's studied history at all has got to understand that helicopters are going to be fighting helicopters. But, because it wasn't shown as an official threat, no one would put it as a requirement. We couldn't get a requirement out of TRADOC

even though, at an aviation review I attended, the four-star generals were telling the guys, "Hey, you've got to look at this." Nothing really came out of the TRADOC. It was very, very slow in coming. We did everything we could to pull for it but without money, and without program approval, you couldn't spend much money in those areas. We did the best we could on the side with some 6.2 money and basic research work, but we're way behind in that arena, as far as the air-to-air combat. It was very difficult and, in general, it seems like we're all the time trying to take our stuff down and sell the user in TRADOC, rather than their coming up with the thoughts and pushing us on the development side.

Really, the LHX program started on the development side of the house and then it became pretty much a joint effort. I'm not taking this away from Rucker; I'm just saying they weren't worried about that at that particular point in time because they had so many near-term, tomorrow kinds of things they were getting involved in and worrying about. The commander down there was sort of in the same situation as the commander of AVSCOM was when he had all the readiness to worry about. The commander down at Rucker at that time had all the school to worry about and all these other problems, getting people trained through pilot school, and I just don't think that he had the time to look at the combat development effort. So, it was a little slow at first in getting them on board; but, once they got aboard, it was great because then it was a real combined effort to go with this program.

The thing we had to do, of course, was to support these technologies in the advanced development area so that we could get the funds and could get the stuff developed that could be incorporated into the next family of helicopters. We had to get the engine developed, or at least into advance development, so we were able to go into engineering development. We wanted to do the all-composite aircraft, We felt that we wanted to go to a fly-by-light, rather than a fly-by-wire, because the fly-by-wire is vulnerable to electromagnetic effects which is a problem in modern warfare. We're discovering many things like that, so the fly-by-light looked like a very highly survivable system, taking a lot of weight out of helicopters and getting away from all the mechanical controls. You've got strictly redundant kinds of systems in there. So, we wanted to get that technology moving along, for example, probably changing the controls in the cockpit to go into maybe a single side-arm controller where you didn't have to use your feet, just one hand. And I think that's probably where the LHX will go. Sikorsky did some work with a Canadian firm that equipped a Huey with just a single side-arm controller. It was just a little stick that stuck up on the right that you held in your hand; if you pulled up on it, you increased the collective and you went up. If you pushed down, you went down. You put pressure to the right, you turned to the right, left, whatever, and you twisted it for your anti-torque. So, you did everything by hand, and it didn't take very long; in about twenty minutes you could do a halfway decent job of flying. It was very interesting. It frees up your other hand, frees up your feet. I think we'll probably go to some sort of a side-arm controller in the LHX.

But all these kinds of technologies had to be funded. Every aviation research program could be incorporated in a new helicopter or else it could go into an engineering change

proposal to be incorporated into an existing helicopter, such as the Black Hawk or the Apache. We began doing work in composite blades. In fact, we developed composite blades for the Cobra, and now there's a program ongoing to make composite blades for the Huey. All the kinds of research were applicable to both old and new helicopters, and we tried to get away from things that had no near-term or reasonably far-term application. No hobbies anymore in the labs. The focus was to pull the total effort together and concentrate on getting the mission accomplished. We had not been able to do that sort of thing in AVSCOM. The command didn't have the organization. You could have reorganized and set up another directorate that would pull together these programs and prioritize, and so forth, and that's true; but at that particular point in time, I think it still would have been difficult to get the full attention of the commander when he had to worry about the day-to-day readiness problems of the field.

A year or so before the command was formed, we actually started the engineering development work on the Chinook (CH-47D). But, during the six years of AVRADCOM's existence, we developed and fielded the CH-47D with 100 percent spare parts; the first unit equipped was down at Fort Campbell, Kentucky. It was there we brought the whole system through. We fielded the Black Hawk and transitioned Black Hawk and, of course, we got through the engineering development on the Apache and awarded the first two production contracts. It wasn't fielded during the six years. I say six years because AVRADCOM stayed AVRADCOM for about six years.

In the meantime, the rest of AMC was going back to the old command structure. Part of that was due to GEN Guthrie. He came back to take command of AMC, and things were not the same as when he left. When he left there were commodity commands; you had the MICOMS, the AVSCOMS, the ECOMs (Electronics Command), whatever. He really didn't like the commands being split, and, of course, the people down at MICOM wanted to get back together. Finally, after a couple of years, he gave the green light to let MICOM recombine. The Missile Research and Development Command, Missile Readiness Command, went back to become MICOM again, and then TAACOM (Theater Army Area Command) went next, and then one by one they went. We were the last to go in St. Louis because things were going well, and I guess they didn't want to mess us up at that time. A couple of times they came out and did a study, but all our curves were going up; and so they never could quite rationalize a change. Finally, GEN Donald R. Keith, the AMC Commander, came in and in order to get them all back together again, he made the decision to go ahead back to AVSCOM and TROSCOM.

But, looking at history and looking at the blue-ribbon AMARC committee, I personally think that we would not have an LHX program today if we had not reorganized back in '77. I do not think that we would have pulled together the programs that focused the technology, gotten the team together across the Army, to where our research program was cited as a model program for the rest of the Army. In other words, the way they were structured, you had everything laid out so that you knew exactly what this was going to buy down-stream. As a result of that, we got funded. It's a simple game of priorities and funding.

CPT DOBSON: So this is something that has affected all the branches, in other words, the ways they get the money for their technology.

MG STEVENS: Once a year a team would come around which was chaired by one of the directors from AMC, but it had people from DA, from TRADOC, and from the general acquisition community. There'd be maybe 15 or 16 people that would go around to each of the subordinate commands within AMC and review their R&D program. And this is to prioritize primarily the 6.2, the 6.3, and the 6.4 effort. Most of the 6.4 programs were pretty well locked in. Those were the ongoing engineering development programs so there wasn't too much flexibility there. They had other monies too, but they were doing other kinds of things in some of the PM shops, so they had to defend their programs every year. We would essentially lay out and defend our programs, our plans for the next year, and also review what we told them we were going to do, what we did do the previous year, and what we intended to do that next year. By that point in time, we had the TRADOC people on board, so we weren't doing any fighting on priority. Initially, back in '75, '76, and even in '77 AMC had one priority list, TRADOC had come in with another priority list, and then the Deputy Chief of Staff for Operations & Plans (DCSOPS) would come in with a priority list that might be different from either one. We saw them going in and pulling money out of higher priority programs that sometimes had a rather significant effect on what we were trying to do. Quite often that was just from lack of knowledge of what the program was. And so, we would have to go back and talk to them, and quite often we'd get it worked out. We recognized then that this was a communications problem; we were not all speaking the same language. I laid it on the Directorate of Advanced Systems to get together with all our counterparts in the other commands and up at DA, to go over our priority and our programs so they understood. Usually, once you sat down and talked about what you were doing, then everybody was for it. It was more lack of understanding and communication than anything was that gave us problems. We had an unofficial 0-6 Mafia that met, CUL Clark Burnette, who was Director of Combat Development (DCD) from Fort Rucker, and somebody from TRADOC headquarters, and somebody from DCSOPS, and the guys in my Directorate of Advanced Systems, to periodically review how we were doing on our programs. The community was together and our strength was in that because, as I say, nobody else in the Army at that point in time was working it the way we were working it on the aviation side of the house. As a result, we were getting our 6.3 programs funded, and that's why we were able to stay on schedule.

Our programs were updated every year, so if we didn't get funding for something then we would adjust and lay it out, and stretch it out so that we were still working toward the final objective. It wasn't something that was written in concrete one year. You had to keep it flexible because it was a plan, and the plan was only good if it was funded; then if it was funded, you had to accomplish what you set out to accomplish. If you ran into a technical problem and maybe had to put more money in a program, then the plan would be adjusted. It had to show time-wise when it would be available to go either into an existing system, on our retrofit, or into a new system.

We focused on the new family of helicopters, trying to lay the development programs out so that we'd be ready to go into engineering development. I guess originally we were really looking at 1986. We thought maybe that would be a little optimistic. Things moved along pretty well; as I say, we got an awful lot of support on this program. We really got the four-star support when we pointed out to them the fact that the Huey (UH-1) helicopters, the Cobra (AH-1) helicopters, the Kiowa (OH-58s), the Loach (OH-6s), were going to be pretty old, based upon our schedule, by the time we'd have this aircraft fielded sometime around 1993 or 1994. We didn't know what the Hueys were going to be doing when they got about 30 or 40 years on them. Nobody knows. You can overhaul aircraft, there's no question about that; but that basic airframe, sooner or later, has seen a lot of shaking, rattling, and rolling. It's just old technology, 1950, 1960 stuff; and there's just much better available, and the cost of maintaining them is another thing. It starts to become prohibitive. The parts aren't being made anymore. An example is the UH-LB helicopter door that the Army ordered, which fell into the almost gold-plated hammer category because those doors were originally bought in quantity, I think, from Cessna. An order came from the Navy for some 17 left-hand doors for the UH-LB; and I think the cost to produce those was several thousand dollars as opposed to four hundred dollars, since they were essentially hand-made. That's what you run into on these old helicopters when things start to fail. You find out that they've become very expensive to maintain. Plus with the new, engine technology, we can build engines with much better fuel economy than before. Not only do you save an awful lot of fuel but also the maintenance man-hours are much less on the new helicopters. Besides the probability they might fall out of the sky when they get about 30 or 40 years old, they also become very expensive to maintain.

You know the Hueys aren't really conducive to a program like the CH-47 when we've rebuilt the CH-47A, B, and C to the CH-47D. You've got new engines in there; you've got all kinds of new plumbing, etc. You've almost got a new aircraft, although they still had a pretty good portion of fuselage that saved us money. But when you start going to the small helicopters and you say, "What if I do the same kind of program that I did with the CH-47D? What if I take a Huey and put a new engine in, and put in new dynamic components?" What you find out is that the fuselage is such an insignificant part of the cost of the vehicle that it doesn't make sense. The government would be ahead by building a new machine and selling the old one, rather than taking the old one and putting new guts in it.

The OH-58D Advanced Helicopter Improvement Program (AHIP) program is essentially a new helicopter with the fuselage of the OH-58. We could buy the same helicopter for maybe 10 percent more than what it's costing us to get the other one overhauled. But, that's the kind of congressional directive where they said, "Take your old scouts and rework them." Again', to me, it would be more cost effective to buy a whole new helicopter and sell the old one. You'd come out ahead financially. But politically, I guess it wasn't feasible at the time. Nobody seemed to want to buy that idea.

CPT DOBSON: You mentioned that you got the four-star level of interest when they realized that our aircraft fleet was becoming obsolete. Once you got that support did things start moving along?

MG STEVENS: Yes. We really got the four-star level behind the program. You've got to remember, up until this time, we'd been doing advanced development work on all the bits and pieces that go into a new machine. And it didn't really have to go to the four-star level to get those kinds of things approved. It really never gets to the four-star level other than the final budget approval and the blessing of the AMC commander that you're going in the right direction. But early on we didn't have to have the decision, go or no-go, on LHX. Their blessing our approach is good; "Yes, we're going to have to some day buy a new helicopter." Well, as we got a little closer and further along to approaching the engineering development timing, we then had to get the Chief of Staff of the Army behind the program, as well as the commander of AMC. Once he saw the time-lines laid out for the obsolescence of the other helicopters and saw where we were on the program, we got tremendous support. In fact, we almost got too much support because, at the time, the current Chief of Staff was then the Vice Chief of Staff; when we briefed GEN Wickham and Secretary Ambrose on the program, they were all for it and wanted to accelerate it. They didn't want to wait until '86 or '87 to go into engineering development. They wanted to go into engineering development in 1985. I think that Secretary Ambrose felt that if we could get the Scout/Attack helicopter into the fleet, we wouldn't have to buy more AH-64s. And he had a political problem with Congress at that point in time because he didn't want more AH-64 helicopters other than what was in the program, even though the Army wanted to buy more. Since then, we've gotten more into the program; but there was a problem at that time, so he was anxious to have the LHX come along.

We had to sort of dampen their enthusiasm because we did not want to start in '85. That would have been too early to get the various new technologies to a point where we felt confident enough that they could be incorporated into the aircraft with a relatively low risk. There are still pieces of them that are going to be high-risk. We still don't know, for instance, whether or not we can go with a one-man helicopter. That will hopefully come out of the results of what we're calling the Advanced Rotorcraft Technology Integration (ARTI) program that is looking at the integration in the cockpit and how one pilot can do all the things he is supposed to do. You know, he must find the target and kill the target, or designate the target, identify it, fly in all weather, and see at night with a Forward Looking Infrared (FLIR), and maybe with radar. So, there are still some things that have to be worked before we go into engineering development. Now the engineering development has been set up for early 1987. The funding, as a result of our budget problems, has been cut. So now the acquisition strategy is at stake. The Army planned to have a full-scale engineering development program with two contractor teams. By teams, I'm talking about the idea that once you had a winning team, then the third year in production you would have further competition between those two guys. For instance, let's say maybe Bell helicopter would team with Sikorsky, and Boeing would team with Hughes, and they would compete. Each would build prototype helicopters; and then there'd be a fly-off, and we'd pick a winner. Suppose we'd pick the Hughes team with

Boeing. They would build the same identical helicopter for about the first two years. Then they would compete for the third year buy, and they'd each be given some portion to build, enough to keep them in business. But every year you'd have the competition in order to keep the costs down. That's the strategy. Now, as a result of the budget being cut, they don't think they'll be able to have a fly-off. If they can't get the money back in the budget, then the next best thing would be to carry two teams through what they call a critical designs review where they really design the helicopter in great detail. They would have done some wind tunnel work; they would have other supporting experiments that would support their design. You really have a paper competition. You have a Source Selection Board that will review both the proposals and then pick one team that would then go ahead and build the aircraft. Instead of having a fly-off, you just have a paper fly-off and pick a team. That saves you a lot of money because that saves you two guys building helicopters and flying them all the way through the whole thing. It saves a lot of money. Considering the importance of the program, I'm sorry to see it go that way. It may not, but right now it looks as though the funding that's been approved for the start of '87 will probably preclude a full-scale fly-off. So, it will probably be some sort of paper fly-off.

CPT DOBSON: This would be a good time to ask you while you're alluding to the companies, what companies and organizations have assisted the Army in this development of the LHX, specifically civilian?

MG STEVENS: Within the Army, the way we do our development work, we have what's called 6.1 money, which is really basic research. In AVRADCOM, and I think it's still going on in the AVSCOM, we get some 6.1 basic research money that's really very fundamental. A lot of that money goes to the Army Research Office, but we do get some 6.1 basic research money. We get a fair amount of what we call 6.2 money, which is also research, but it's not quite as basic as 6.1. It's more of the "brass-board" kind of work, you might say, where you go in and you explore the mechanics involved with, say, the flow around the helicopter blade area. You're changing the shape of the blade to try and improve the performance. Then, you go into 6.3A, 6.3B money. 6.3A is advanced development work where you go out now and you take that brass-board thing, and let me cite an example: Remotely Piloted Vehicle (RPV). There we did advanced development work and actually developed a system that would fly. We could take it out and see how it worked, and give it to the troops and see how they liked it. It wasn't ready for engineering development, and it didn't meet all the military requirements, but it was a system that did fly. It had an airborne TV, and this system was used to determine if this was the way we wanted to go. We did advanced development work on composite blades. 6.3 money is usually contracted out. A lot of 6.2 is also done on contract, but there is 6.2 done in-house in the laboratories. It's about 50-50. Companies come in with various proposals in the areas we're interested in, whether it is developing a new tail rotor, or what have you. We'll give them some money to pursue that, or we'll cost-share, in those kinds of efforts. We put money into the industry for aeronautics, structures, propulsion, and weaponization. We had money for aircraft weaponization that we usually gave to other commands, and they let the contracts; but we do control some of that aircraft weaponization money. Also, industry does their own R&D effort, what we

call the Industrial Research and Development (IR&D). We review and approve those programs because it's really government money. There's a certain slice of their production money that goes into their internal research and development. In order to get IR&D approved, it has to be something that could eventually benefit the Department of Defense. Now, they have their own R&D money that they can put across-the-board any way they want to, but the government money that goes into their R&D does get approved by the government, by AMC. So, all the companies are involved in R&D, $100 million or so a year.

CPT DOBSON: So, all the major companies.

MG STEVENS: Yes, Boeing, Bell, Hughes, Sikorsky, and then a lot of the other subs. You've got your system houses that are doing some work. You've got the guys involved with sights and things. You've got Martin Marietta involved with the target acquisition data system. They're all doing work. We've got contracts with the companies that are working on the interfaces for the fly-by-light system. You've got to convert that light system into some sort of electrical mechanical system. You've got transducers and things in there that have to talk to the light so to speak. That was a shaky part of the technology that really had to be brought along before we could go fly-by-light.

CPT DOBSON: You've already mentioned some of the aircraft that will be replaced by the LHX. Are we basically looking at dropping all the aircraft except for the Black Hawk, the Apache, and then the Chinook--of course, the Chinook's in another whole class--but keeping those three major aircraft that we've got today and then replacing everything else?

MG STEVENS: At this time, the AHIP is planned to be in the system for quite some time. It would be relatively new compared to OH-58As, Bs, and Cs, and to the Loaches, the Hueys, and the Cobras. So, the Cobras will eventually be replaced with the Scout/Attack (SCAT), the OH-58s, again, with the Scout/ Attack, and the Hueys with the LHX Utility Helicopter.

We originally had roughly an 8,500-pound weight target with a one-man helicopter. To pick up two-man, that really adds about another 500-pounds or more to the machine. Cost-wise, of course, we've been talking 5 million dollars in '84 money; the SCAT will cost a little more than that, and probably the Utility will cost a little less, but somewhere around there we're going to try to hold. I think we must, in order to sell it to Congress. Unfortunately, weight and cost go together so you've got to keep it light or your cost is going to be up. That's a fact of life. The heavier it is, the more it costs.

CPT DOBSON: Our current tactical employment of the aircraft uses one aircraft for observation and one for attack. Is that going to be modified or changed at all with this LHX program?

MG STEVENS: Well, the idea of the SCAT, of course, is that it will have the flexibility of taking on any kind of armament you might want. You can take it out and fly it light with

just maybe air-to-air missiles, or you can load it down and go out and shoot tanks if worse comes to worse. So, it's really going to be a vehicle that will be about the right size to do the Scout mission, and to do the Cobra mission, or the so-called light-attack mission. It won't be able to carry as much ordnance as the AH-64. It's not supposed to replace the AH-64. It won't be as hardened as the AH-64; survivability will be more from its size and its agility. It will not have as much heavy armor on it, but rather just stay out of the way and have the electronics, avionics, and the aircraft survivability equipment that will warn you if the enemy is sighting you. You can take evasive action and get the heck out of there.

CPT DOBSON: So, we're looking at two aircraft really for LHX, one being the SCAT, which is the Scout and Attack, and the other being the Utility Track.

MG STEVENS: Right. And as I say, if it's a one-seater, okay, fine; if it's two-seater, no doubt it'd be tandem on the SCAT version, and then the Utility would probably be side-by-side.

CPT DOBSON: With the light aircraft, utility-wise, what type of capacity are we looking at, as far as troop capacity?

MG STEVENS: I think we're looking at carrying probably six or eight passengers. You may be able to cram ten in. I'm not sure the requirement is defined on that; as I say, you're in the 8,500-pound size, and that's like getting back to the UH-IAs, smaller than the Huey.

CPT DOBSON: A mission of the Scout/Attack helicopter is to attack the second echelon and perform long-leg tactical operations. If we were to use our current aircraft to do this mission, because of their inherent fuel inefficiency, this would be a very tough mission to do. Will the LHX be able to do this?

MG STEVENS: Well, yes. Let me give you my personal opinion on one of the problems because it's been rather frustrating to me. The decision has been made that this aircraft is going to be a helicopter and that the desired speed is about 170 knots. I feel that's wrong and I think we're taking a step backwards. I think it came as a real surprise to everyone that the decision that it be a helicopter was made up-front. I had envisioned all along that the Army was recognizing the air-to-air threat, and that we were going to need a vehicle that flew a lot faster than a helicopter. We didn't do much air-to-air combat; the Marine's did some air-to-air stuff and certainly found out that the best thing against a helicopter is another helicopter. It's very hard for a fixed-wing to shoot down a helicopter, particularly if he is armed with missiles. He gets about one pass on you; and if he doesn't get you on the first one, he's in trouble. You can turn inside him, and there are ways to avoid high-performance fixed-wing aircraft. In fact, I used to dogfight with F-80s and F-86s in an L-19 when I was stationed in Japan. Those guys could never get a bead on you, if you knew they were coming, because you could always turn inside of them. We had a lot of fun in the bar, talking about it afterwards. You can do the same thing in a helicopter. You run a lot slower than a fixed-wing; you can turn inside, and

you've got the maneuverability to get down low on the ground. You can make them very nervous if you launch a missile at them. Probably the best thing to take on another helicopter is a helicopter. Intuitively, from all you've ever read and associated with air-to-air combat, it's usually the guy that has the speed and maneuverability that has got the advantage. Nobody's arguing maneuverability; we need the maneuverability. But the experiments they've done show we really don't need that speed because once you engage, it's more of a cat-fight and a lot of maneuvering, and you don't have high speed. Well, I hear the scientists, but I still question it from what operational experience I've had. I think for one thing, with speed, you have an opportunity of picking the point of engagement, which might be important. You might be able to set up an ambush more readily. If you have to run, then you can get away from him and maybe live to fight another day. To go out there from the very beginning and know that I'm going to be flying slower than the Soviet helicopters, to me, is criminal. I really think this is a very, very serious mistake on the part of the leaders in the Army. I'm not so sure whether Secretary Ambrose made this decision or just exactly who made the decision. I don't think anyone that really understood aviation made this decision. In the past, we've gone out in our aerospace industry and have said this is what our requirement is. If the requirement is to fly 200 miles an hour, or 200 knots, or whatever it is, anything you can design to give me 200 knots is fine. If you can make a helicopter that flies that fast, okay. If you've got to compound it, then compound it. But, to back-off and say we only need 170 knots and it'll be a pure vanilla helicopter is really a step backward, because in our whole material acquisition process up to this point in time we've said, "Hey, this is our requirement; now, what are the things that will permit us to reach this requirement?" And usually, it's a long time before we reach the final kind of vehicle. We had a terrible fight on our RPV and Scout helicopter. Can RPVs do that job, or vice-versa? We had to go through a whole lot of drills to prove that, no, we can't do it with that kind of vehicle. To suddenly say, way up front, before you've even got your ROC (Required Operational Capability) out, "This is going to be a helicopter," just blew everybody's mind. Maybe they can build some other widget, other than a helicopter, a lot cheaper that will do the job. I personally think it would have been better to go ahead and lay out the requirements and not tell industry specifically what was needed. Even if we said, "Well, 170 knots is okay; we'd like to have more, but we'll settle for 170 knots," it's possible that Bell Helicopter would've gone ahead and submitted a tilt rotor as their proposal. If we could've gone through the fly-off, then we would have had an opportunity to compare our helicopter with the tilt rotor for this particular mission. A tilt rotor gives you the additional speed that you need in your air-to-air work. There will be times I think we're going to need it. Now, maybe it isn't that important, but a tilt rotor can, at least in theory, pull more Gs in the regime that you're normally fighting another helicopter, the 70 to 130-knot regime.

CPT DOBSON: It almost turns into a fixed-wing aircraft.

MG STEVENS: Well, it does; but see by tilting the pylons some, you can pull a tighter turn. You can pull more Gs than you can with a regular helicopter. I don't know if you've ever pulled up that tight in a helicopter where it started to stall out or not, but it is possible to do that and that's a very uncomfortable feeling. So, you can out-maneuver

the enemy helicopter with that vehicle. Now, the problem with the tilt rotor is I have a hard time seeing that flying nap of the earth. The reason is that you're going to be taking about as much space now, with a smaller vehicle, as you take with the AH-64, in the Scout mode, and to me, that's a minus. If I can build a Scout with a relatively small rotor diameter, I can get into a lot tighter spaces. I can hide better than I could in a tilt rotor because the tilt rotor means I'm going to have those rotors out a lot further and I'm going to take up about as much space as I would in the AH-64. Now some people are going to say, "Well, that's not all that much; and with all the other advantages I get, it's worth it." I'm not saying one way or another. I'm just saying the Army could not come to grips with this. The only way that I could see them coming to grips with this was to build the aircraft, and go out and fly and test it. Then let the user decide, "Do I want the additional speed? It's going to cost me more, ten percent more probably, a little bigger, ten percent in weight, ten percent in cost. Is what I get from that worth it? Or, am I better off for this particular mission, Scout/Attack, or Utility, whatever, with just a regular helicopter?" I think if we had not said it's got to be a helicopter that, maybe, in the competition, Bell would've come through with a tilt rotor, and we might have been able to answer that question. Now, we aren't going to know.

The Chief of Staff, then GEN Edward C. Meyer, and certainly the current Chairman of the Joint Chiefs of Staff, GEN John W. Vessey, have got to be concerned with the Russian helicopter threat. They've got more helicopters now than we have, they're adopting the tactics that we envisioned, and they're talking air-to-air helicopter in all their literature and in their development. What they're developing is going to fly a lot faster than anything we have, and we aren't going to have anything to counter that. I guess I'm still kind of hoping that, somehow ' this is going to get turned around before we go into development, that we will go back and revisit this issue. Again, we're a little behind the power curve. Maybe we should be considering a more important part of this mission, the air-to-air, and maybe we should give up the configuration that's best for the ground and go ahead and accept that as a penalty in order to have something that we can go out and shoot helicopters with. If the Russians have thousands of helicopters out there, and if they have an airmobile operation going, and we want to try to shoot them down, what are we going to shoot them down with? I don't know. How are we going to get out there fast enough to intercept them before they put the troops on the ground and they're gone? And once they're on the ground, they aren't vulnerable anymore. You can say, "What's 220 knots versus 170?" At a short distance, 50 knots doesn't give you that much differential. You can do your operational studies, and you can convince yourself that most of the time you won't need that additional speed. But, the war, or at least the battle, may be lost. Again, it's the old situation where I'm not so sure our guys are looking ahead as far as they should. We're working right now on our helicopters. We're going to put the stinger on it. We've been messing around with that for years. The 30-millimeter on the Apache does not even have the fire control to shoot down other helicopters. We didn't have the money in the program to make that part of the Attack Helicopter program, strange as it may seem. You have limited dollars; you're under criticism from Congress because the program is costing so much. To have incorporated just the additional software in the machine to shoot down helicopters would have cost more money, and the money wasn't in the program so you could do that. I guess we will

some day have to use Kentucky windage. We may be great pilots, but it's going to be a risky business until we get an air-to-air capability. Well, so much for that. I still think we made a mistake. The way it was going, we would've gone out and said, "Hey, this is a requirement; come in with your proposals." It would've been competition from then on.

CPT DOBSON: I understand that ARTI will play a big role in the LHX cockpit. Would you explain what this is and why the Army's putting such an emphasis on it?

MG STEVENS: This particular effort really evolved from the development community's initial proposal to consider a one-man helicopter. We asked the user, "If we can give you a machine that one man can fly and perform the mission, would you be interested in that?" Essentially, the user community said, "We would, but you've got to prove to us that one man can do all of this." Now, that was not unanimous in the user community because the guys down at Fort Knox felt that they still needed another pilot in the aircraft. They needed a battle captain in addition to the guy flying. But, at least the majority of the users had an open mind and they were willing to take a look at this. A lot of the advantage is weight and availability of pilots. You have the manning factor to consider. You cut it in half, and that means you can fly 24 hours with two or three pilots where before it was going to be a little difficult. We said, "All right, in order to prove this, we've got to build up some cockpits and demonstrate that one pilot can do I it." We didn't get the level of funding for this, initially, that we would've liked to. It was a little tougher to get the money for it, and it started a little late, so we don't have the answer yet. We had hoped to have it by now; we hoped to have that answer by '85. I guess we'll have it now in about April of '86. We're running probably one year behind now. We could take all these new technologies, new flight control system, the navigation systems, and design them for one pilot to manage. We have been working on a digital map display, and I guess I'm not sure whether we're going to be able to incorporate that into the aircraft or not. On the screen, you'll actually see a map, and you'll see yourself flying along the ground; that map should be correlated with the terrain outside. You can adjust the view so that either you're looking down from where you are, or else you can turn it so that you actually see the terrain in front of you, and you get a dimensional effect. We've demonstrated this on simulators, and so now hopefully we'll be able to incorporate this in the helicopter. It's a little easier than reading the map on your knee, needless to say. That'll have to be, of course, updated with your navigation system. But that digital map display will give the pilot information on elevations of all the little points on the map so that this can be read out digitally. I've flown the thing, and it's pretty neat. You can really fly it, no problem, on the simulator; I've never flown that in the actual aircraft.

The other work we were doing in weaponization was a system that would pick up and identify targets that were very difficult to see by eye. You can have a computer program that has enough information to recognize what a certain target is, whether it's a tank or what. You can give it the logic to prioritize the targets for you. Now, again, I'm not sure if we're far enough along on that, whether it's one of those things that's desired to have, or whether it's required. I haven't seen the ROC yet, but that technology is available. We're getting readings up to 80, 90 percent accuracy on identification of the actual target.

CPT DOBSON: I'm sure on the modern battlefield all the targets will just be in a short amount of space and it's going to put a lot of work on the pilot.

MG STEVENS: So, you might have a TV screen or a FLIR display that, by eye, you might not be too sure about or even see that target; but your automatic target recognition system will see it for you, pick it up, and identify it with a blip or whatever on the screen. Then you can make up your mind whether you're going to shoot it or give the location of it to another system, maybe an Attack Helicopter or some other weapon system.

CPT DOBSON: Dealing with adverse weather operations, will they have something that we're going to be able to work in terrain that has fog sitting in it?

MG STEVENS: We may use microwave radar. We have radar that is able to look through that stuff. You have a problem here because you don't want to light yourself up too much to where the other person sees you due to your own radar shooting out there. You'll probably have the FLIR, and you'll have the TV, and maybe some sort of microwave radar; and you'll be able to see through that garbage, hopefully. It'll be more all weather than the AH-64. But, all of those systems have to be integrated within the real estate that you have in the cockpit so that you can use it effectively.

CPT DOBSON: To decrease the workload on the pilot ...

MG STEVENS: Yes, and we don't know for sure. It may be too much for one person.

CPT DOBSON: With ARTI decreasing the pilot's work load and, I believe it's the Very High-Speed Integrated Circuits (VHSIC), that goes along with ARTI...

MG STEVENS: Yes. That, of course, permits a very sophisticated software program to be incorporated into a relatively small amount of hardware. It'll work rapidly and do a lot for you, you know, identify targets rapidly. I'm no expert on the electronics side of the house, but we've gone from great big computers to smaller and smaller computers. Now we've got something that's small and fast and will permit you to do all these big tasks that have to be done in the time allotted. And still, it is small enough to package in the aircraft where you do not have to fly a 747 to carry the system.

CPT DOBSON: So, ARTI and VHSIC are reducing the pilot's workload, but it seems like it's very complicated. What about the maintenance side of this?

MG STEVENS: ARTI will put it all together to measure the best design now. Put the pilot in it, and can he fly it? We'll put it together this way, and maybe another company will put it together another way, and whatever comes out of that will tell us whether or not one pilot can handle it. The VHSIC is just the electronic hardware, and it'll support the software program to do all this.

The final system, then, we'll look at, and say, "Here, mister-user, Peter-pilot, get in here; can you fly this helicopter and do all these things?" If it turns out that one person can't handle it all, then we're back to two pilots. There's also another program we're going to do in-house out at Ames, California. You see, there's the other question. We may find that you've got more of a problem with two people in there trying to coordinate and get the job done; it may pose more of a problem than one pilot trying to work the system. So, they've got to look at two-man, too, doing the same thing. It may be that one person can handle it better than two can, even though he can't handle it as well as we'd like to have him handle it.

CPT DOBSON: Are they going to incorporate the black box idea, as far as maintenance?

MG STEVENS: Yes. Now, getting into maintenance, believe it or not, with the new technology and the way we've gone in the electronic arena, our systems now are more reliable than they've ever been before. Hopefully the VHSIC technology will even improve it; the reliability will be even greater than it is now. From a maintainability point of view, the whole design will be focused on that. With the Black Hawk certainly we did it, given the state of the art at that time. Now, we're talking about the kind of technology that went into the Black Hawk about ten years ago. The technology that's going into the avionics and electronics in the LHX will hopefully be such that they're very highly reliable systems that require very little maintenance. The black boxes, the boards, and thus, things will be overhauled back at the depot level. They won't mess with-them at the unit level.

CPT DOBSON: So we'll be able to get this aircraft on the battlefield...

MG STEVENS: Yes, with very, very little maintenance required in theory and I think it'll come out that way. We didn't say too much about it, but we do have this All-Composite Aircraft Program (ACAP). Right now, we have Sikorsky flying an all-composite helicopter, with Bell soon to follow suit. This means less weight on the aircraft and more reliability. Also, other components that are composite have a softer failure mode such as blades, rotor hubs, and things like that. There are fewer parts in the composite rotors and fewer bearings that point towards less maintenance, higher reliability, and longer life.

CPT DOBSON: This is a good example of what you mentioned before, that research and development in the LHX is actually helping our aircraft today, for example, the Black Hawk.

MG STEVENS: Yes, the all-composite tail boom for the Black Hawks will be cheaper to manufacture. With the ACAP we get about 20 to 23 percent savings in cost and in weight on the aircraft. Right now, there are a lot of aircraft flying that use composites but no main structure. Well, I can't say that, because the rotor blade is main structure; but the main structure of the airframe itself is all metal. There are composite skins and things like that, but the mainframe is metal. On the ACAP aircraft it is all composite, and

the ACAP is designed so that it is crashworthy. When you crash, it's designed so that it attenuates the crash, absorbs the energy gradually, collapsing, so to speak.

CPT DOBSON: Ballistically?

MG STEVENS: Ballistically, it is much more tolerant than the metal and easier to repair. It's a good program and it's gone well, too. It's one of those success programs that the helicopter industry has done well. In fact, Boeing's coming along. They're doing the same thing even though they don't have a contract with the government. They're doing their work in-house in order to stay up with it.

CPT DOBSON: You have mentioned before the single-pilot concept. Interavia, a helicopter magazine, stated that the Army would consider scrapping the LHX if the companies that were actually trying to design an LHX helicopter felt that the single-pilot helicopter was infeasible, or would not work. Why is the Army so concerned about the single-pilot?

MG STEVENS: I think the Army's going to go ahead whether it's single-pilot or not; we have to. Those other helicopters are just not going to last, and we aren't going to be able to afford to maintain them. The advantage to the single-pilot is basically cost. By cost, I mean in manpower, instead of two men to man the aircraft, one man can man the aircraft. Cost, as far as the aircraft itself goes, is less because the machine will be some 500 pounds lighter if one person can man it. So, if we can do it with one pilot and a smaller machine, then it's more cost-effective than with two pilots and a bigger machine.

CPT DOBSON: In your opinion, at this time, is the single-pilot helicopter feasible?

MG STEVENS: That's a tough question. I think it's feasible, yes. Now, as I say, the pilot has to do an awful lot; there's probably going to be a little bit of a trade-off there. He may not be able to do everything that two people could do, but it may be more than enough. So, then the users are going to have to decide if we want 100 percent or if we are willing to settle for 87 or 97 percent maybe. We can buy more if they're going to be cheaper, supposedly, and we'd have more availability as far as pilots go. Given the same number of pilots, I can fly more hours. So, we have some trade-offs we have to make. I don't know yet. I don't think anybody really knows yet whether one pilot will be able to do it, but I think it's feasible.

CPT DOBSON: You mentioned earlier that they're planning on being able to field this by 1992. Do you see that our current economic situation, the cutbacks in spending, will have an affect on the LHX and maybe push back this date some?

MG STEVENS: Well, it's definitely having an affect on the acquisition strategy. I think the original plan was to start full-scale engineering development in January 1987. With the cut-back, if it holds, the next best alternative would be to go with two teams and carry them through a critical design review, rather than just having a paper competition and picking one team. I think certainly the PM's position at this point in time is, "Hey, I'm

only going to get the money we have in the budget now for '87; then let me start the program about April and I'll take two teams through to the critical design review. Then I'll pick one team and go with them." So, right now it means that if no more money is put back in the program, the PM is proposing an April start in '87; we're slipping three months right away because of the '87 budget. I personally think maybe '93 instead of '92, realistically, although the commander at AMC says now we're going to get it in a hurry. That's fine if he gets the funding. But with the complexity in the machine, etc., I just envision that it may be '93 before we're in production. But, that's good. We were shooting for '92. If we only slip a year, that's great.

CPT DOBSON: There's not a doubt in my mind that the LHX technology alone has totally changed the concept of what we know as the helicopter today. This is good for the military, but will some of this stuff start going into the civilian side, too?

MG STEVENS: Oh yes. So many of the things that have been developed under government contract, advanced development work for the Army by these various companies, has then been incorporated into their commercial helicopters. One example is the AHIP program, the mast-mounted sight that Bell has for the OH-58D. They are now marketing that air vehicle, I think it's the Bell 400. It has a much better performance and much smoother flying than the current jet-ranger; it's a much better helicopter. I had the opportunity of flying it in Saudi Arabia for a month. I was involved in a fly-off over there, and it was essentially the AHIP without the mast-mounted sight, and it had conventional AVIONICS. It's a superb flying machine, absolutely superb. It certainly meets the Army specifications for high-altitude work, and it's extremely smooth going through translation and has no vibration at all. You can hover down-wind and don't get any shake at all. It's four-bladed and a beautiful machine.

CPT DOBSON: I had heard that our foreign civilian companies are pretty well equal with our American companies. However, because of the LHX project, we've pushed our technology so hard that it looks like, in the future, American companies will surpass the research and development of foreign countries and maybe takeover the whole market. Do you see this taking place?

MG STEVENS: No, I don't. I think it's certainly true we have led the industry, foreign and domestic, in rotary-wing research. So much of our research is made public, and certainly a lot of foreign companies have capitalized on a lot of the research that's been done in this country. Not to belittle them, they've done a lot of research, too. In fact, quite often, what happens is we'll do the research, we may develop something, but our companies are a little bit slower in incorporating them in their production aircraft. Aerospatiale, the French company, for instance, has led us up until now in the use of composites on the aircraft fuselage itself, not the mainframe. They had an all-composite rotor flying before we did. The Germans Messerschmitt-Boelkow-Blohm (MBB) had composite blades on their BO-105 helicopter before we had composite blades on ours. So, what they have done, they've gone ahead and incorporated a lot of things in production where we've been a little slower in doing that in this country. Now, I think that the technology that's coming with the LHX and the all-composite airframe is going to

give us a lead, and I'm sure that the companies will go ahead and build all-composite commercial aircraft which should cut cost and cut weight. I don't know of anything being done in Europe right now though there may well be, where they're building all-composite aircraft. I would expect they would have to do it pretty soon, if they were not already. I think we have the potential of having the jump on them. Now, whether or not our companies choose to invest the money in a commercial aircraft remains to be seen because right now the commercial business is not too good. But, it will help. There's no question that what we've been doing will help our own industry to a great extent; whether it will capitalize in the total market will be left up to competition. The other foreign companies get a lot of government subsidies that helps, of course. In Germany, there's really only one helicopter company and that's MBB. In France, it's Aerospatiale; in England it's Westland; in Italy it's Agusta. And with them there's a lot of government support. Here, in this country, we've got four biggies, probably more than we need, and not much government support. The foreign companies get government support and they don't play the game the way our industry plays it. We don't have money under the table; but over there there's a lot of under the table stuff.

CPT DOBSON: Sir, I appreciate the information on LHX; and if I may go back in time just a bit, the beginning of your military career interests me. I noticed that you switched from three different branches; that's hard to do.

MG STEVENS: I came in the Army at the tail end of World War II, and I had been in the Reserve Air Corps. I had joined the Reserve Air Corps when I was in high school. They had a program where you could join up when you were seventeen; you took a test, and, if you passed, they'd send you to flight school, supposedly. Well, when the war in Europe ended, they sent us all a letter that said, "Gee guys, we're sorry, but we don't need pilots anymore. So, you can either get out and register for the draft, or you can come in the Air Force and maybe be a gunner, or else you can go in the Army Reserves." So I said, "Well, if I can't be a pilot, to heck with your Air Force; I'm going into the Army, and I'll be a paratrooper."

So, I went into the Army, transferred into the Enlisted Air Corps, and they called me up I guess about July '45. We went up to Camp Atterberry, Indiana, and we said what we wanted to do there. Being kind of dumb, at eighteen, I turned down a chance to go to college. They were going to send me; you could get into Army specialized training programs. I said, "Well, what can I study?" They said, "Well, we've got an opening in Russian or whatever," and I said, "No, I don't want that; I want to be a paratrooper."

So, we're about to leave from Camp Atterberry and they had these big blocks marked off where they were putting all these new recruits. We went out to this one area and half the guys were saying, "Where are you guys going?" "Oh," we said, "We're going to Fort Benning, we're going Infantry. Where are you guys going?" "Oh, we're going Artillery," they answered. And I said, "What are we both doing in the same block?" So, I ended up at Fort Sill. I ended up in Artillery whether I wanted to go or not. So, that's kind of interesting because I went through Artillery Basic and we got to fire 105s and do instrument survey. I got through there, and while waiting to get a quota to jump school I

applied for OCS (Officer Candidate School), and was accepted. I wanted to go to Infantry OCS, but they only had an opening in Artillery. I wanted to go to OCS so much that I went Artillery. That's how I got into Artillery; then I pulled an Army of Occupation Tour in Korea.

Then, I decided to get out and go to school. I went to Purdue for three years, and was in a reserve battalion there. We got recalled to active duty after three years. It was a 155 self-propelled outfit that was sent down to Rucker, at that time Camp Rucker. All we did was move from one place to another, rehabilitating barracks, because we didn't have any guns. Then we moved, after about three months, to Camp Polk, Louisiana, and got our 155 self-propelled guns. But while there, I saw they were accepting applications for Army aviation, so I applied for flight school and was accepted. That's how I got into Army Aviation. After I applied, I was sent to the First Cavalry Division in Japan, and then TDY to Korea. I flew for awhile over there and then came back to Japan.

In '53, I decided I'd better get out and finish my final year of school. I went back to Purdue and finished my last year. By then, I wasn't too interested in Chemical Engineering. I really thought I'd like to fly. I thought I'd go back on active duty because I had five years in then. I thought I'd go back for 15 more years, and then I'd retire at 20 and do something else. Well, everything was one-way; people were just getting discharged at that time. When I heard that they needed some pilots in the Corps of Engineers, I went to Washington and talked to them there. They called me back to active duty in the Corps of Engineers. That's how I went Engineer. So, that was the only way I could get back to active duty. I just wanted to fly. They had a deal where they needed people for topographic survey work. I went back, and they sent me to the Engineer Basic Officer Course and then to helicopter school. Later, I joined the 130th Engineer Group and we went to Alaska one summer, which was quite exciting.

After I came back from Alaska, I saw a program they had going to get your advanced degree in Aeronautical Engineering. It was restricted at that time to combat arms, and I thought that since we're combat engineers, why couldn’t I go? So, I tried to get in that way and they said, "No, you can't; the Corps of Engineers doesn't have a quota, just Artillery, or Armor, or Infantry." So, I went to Washington again on leave and I said, "I'd like to go to school, what can I do?" They said, "Artillery has a quota; if you transfer back to Artillery, maybe you can go to school. Why don't you go talk to them?" So, I went down and talked with them and they said, "Yes, come on back to artillery." So, I put in my transfer, it came through, and I got orders to go to Georgia Tech to get my masters in Aeronautical Engineering. At the same time, I got the transfer orders back to Artillery. So, I really went from Artillery to Engineer, and back to Artillery, while I went to Georgia Tech.

While I was attending Georgia Tech, I decided I might as well go Regular Army. I applied for the Regular Army, and put TC as my first choice because, at that time, all the aviation was in the Transportation Corps. I figured, if I'm going to apply this Aeronautical Engineering and get on the flying side of the business, then I'd better go

TC. So, I put that as my first choice and it came through, and that's how I got in the Transportation Corps.

Except for the period of time I went to the Transportation Officer Advanced Course (TOAC), I have never really had a TC assignment. After TOAC I went to the Command and General Staff College (CGSC) at Fort Leavenworth because they wanted to send me up to West Point to teach in the Department of Mechanics. That was a great assignment. I actually ended up staying there for four years. So, that's how I got into Transportation. The closest thing I had to a transportation assignment was an aircraft maintenance battalion in Vietnam. From then on, it was all pretty much branch immaterial, Pentagon stuff, AMC, and command of the First Support Brigade in Europe. Then I commanded a depot in Europe and came out on the general officers' list.

CPT DOBSON: I don't think anybody would disagree with you that you've been very successful.

MG STEVENS: It was being in the right place at the right time. I had good assignments and that helped. You had to get your ticket punched to make colonel in those days. They said you needed an advanced degree, a battalion command, and a tour in the Pentagon; and I was fortunate enough to have those three. And then, to make general officer you just about had to have a command, and I was fortunate to get two commands. After I came out on the troop command list, I got the First Support Brigade, which was a troop command assignment. I had that for a year when they reorganized within Europe, and upgraded my command to a BG slot with some additional support units added. As a result I lost my command. Then, Jack Stoner got promoted out of the Kaiserslautern Army Depot, and since I was on the depot list too, they moved me into that job, rather than bring me back to the States. It was a short two-year tour in Europe, the only European tour I ever got.

CPT DOBSON: Sir, it's been most enjoyable, and I appreciate your cooperation.

MG STEVENS: Well, I hope you can edit this so that you can find something useful. And if you tell the Chief of Staff that I don't agree with his decision on the 170-knot helicopter, it's all right with me.

APPENDIX

6.1 money - Research

Includes scientific study and experimentation directed toward increasing knowledge and understanding in those scientific fields that are related to national security.

6.2 money - Exploratory development

Includes efforts toward solving specific military problems from fundamentals applied research to sophisticated prototype hardware, study, programming and planning efforts.

6.3 money - Advanced development

Includes all projects that have moved into developing hardware and nonmaterial technological prototypes of techniques for experimental or field tests.

6.3A - Development subsystems, technology demonstrations and nonmaterial technological demonstrations characterize advanced development involving non-systems.

6.3B - Advanced development efforts involving unique/specific, well-defined system objectives are undertaken in response to an approved requirement.

6.4 money - Engineering development

Includes those development projects for products that are being engineered for military service.

For more information concerning the Army Research, Development, Test and Evaluation (ARDTE) Program, see AR 70-1, para 3-9.