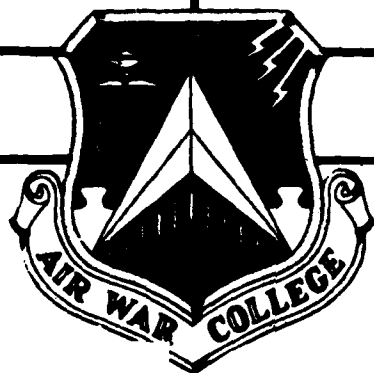


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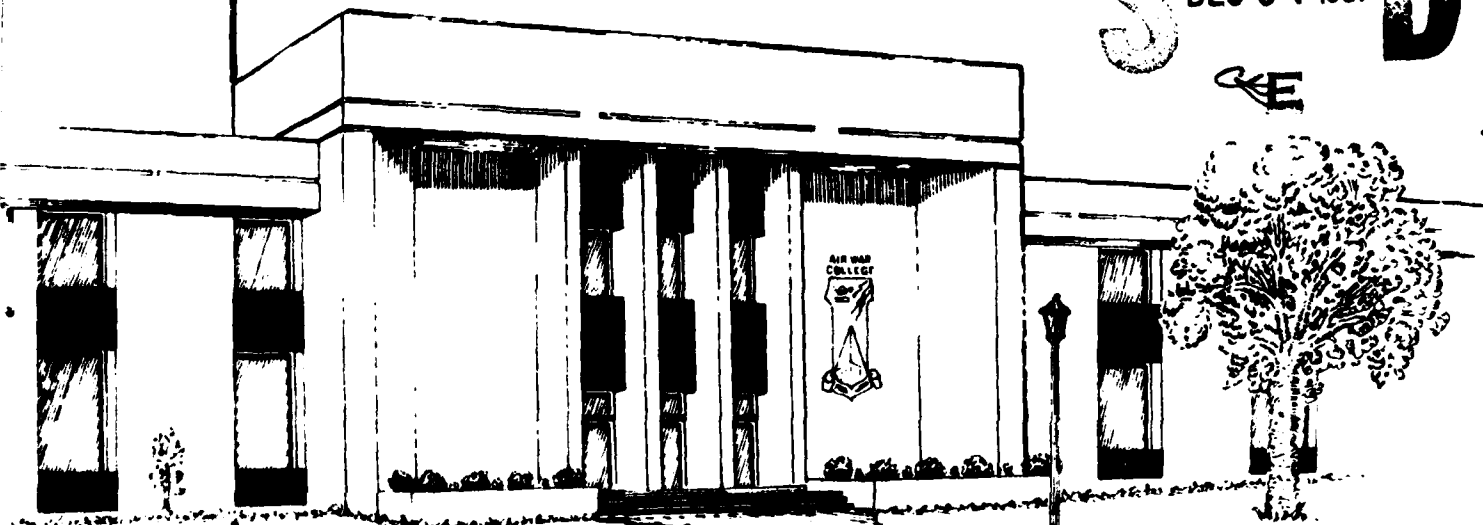
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A SURVEY OF STUDIES ADDRESSING GRADUATE
EDUCATION IN THE UNITED STATES AIR FORCE

By LIEUTENANT COLONEL MARCELLA V. POWERS

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MAXWELL AIR FORCE BASE, ALABAMA

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AIR WAR COLLEGE
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A SURVEY OF STUDIES ADDRESSING GRADUATE EDUCATION
IN THE UNITED STATES AIR FORCE

by
Marcella V. Powers
Lieutenant Colonel, USAF

A RESEARCH REPORT SUBMITTED TO THE FACULTY
IN
FULFILLMENT OF THE RESEARCH REQUIREMENT

Thesis Advisor: Colonel Walter E. Hines III
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MAXWELL AIR FORCE BASE, ALABAMA

April 1987

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AIR WAR COLLEGE RESEARCH REPORT ABSTRACT

TITLE: A Survey of Studies Addressing Graduate Education in
the United States Air Force

AUTHOR: Marcella V. Powers, Lieutenant Colonel, USAF

This report provides summaries of studies and other documents affecting graduate education. Presented chronologically, the summaries provide a historical perspective of the Air Force's graduate education program.

BIOGRAPHICAL SKETCH

Lieutenant Colonel Marcella V. Powers has been interested in Air Force education matters since her assignment to the plans and operations staff of the Air Force Institute of Technology beginning in 1977. Additionally, she has served on the staffs of Headquarters Air Training Command and Headquarters United States Air Force. Lieutenant Colonel Powers holds a Master of Arts degree in Business Administration and Management from Central Michigan University. She is also a graduate of the Air Command and Staff College class of 1981.

PREFACE

The author of this survey spent the years 1983-1986 working graduate education matters at Headquarters USAF/DPPE. While serving in that capacity, she became aware that many of the issues raised were not new but had been studied in previous reviews of graduate education policy. The chief issues that repeatedly came up for study focused on the need for officer graduate education, the subject areas that require graduate education expertise, numbers of the officer corps needing graduate education, the most costworthy methods of education, and incentives of graduate education for retaining officers in the military Service. It was felt that a summary of studies would be a helpful reference for those involved in management and policy decisions affecting graduate education matters.

Additionally, the Headquarters Air University Plans staff believed such a reference document was needed. Major Daniel P. Bangs, an Air Command and Staff College student in 1985-1986, and Major Glen A. Kendrick, an Air Command and Staff College student in 1979-1980, provided surveys for professional military education. The Headquarters Air University Plans staff found these products valuable and thought a companion survey on graduate education would be appropriate.

The author appreciates the opportunity to review the studies of the two officers named above. Additionally, she appreciates the support provided by the Headquarters Air University Plans offices and the members of the Air University Library.

CHAPTER ONE

Introduction

The objective of this project is to produce a single document that will provide managers of line-officer, degree-granting graduate education programs with summaries of studies that have been done on the subject of graduate education. The idea is to provide a useful tool that will preclude significant research to determine whether an issue or problem has been addressed before. It should thus save time for program managers.

To limit the scope of the project, student theses, Board of Visitors reports, and reports of the Educational Requirements Board (after the initial years which set the tone for the program) are excluded. Several of the reports reviewed for this project cover more than just graduate education. Inasmuch as some early reports pertain to the Air Force Institute of Technology as other than a graduate institution, several of the reports covered herein deal with that aspect of education. They are included for the perspective they provide on the development of the graduate education program. Also, other Services are included as an integral part of some studies and are therefore included incidentally in this project.

The Air Force line-officer graduate education program in its modern form began in 1946. This project, then, begins with that year, and continues to the present time. Following the summaries of studies, presented chronologically in Chapter Two, a listing of sister-Service studies is found in Chapter Three. Chapter Four contains a reference list of key terms from the summaries in Chapter Two.

The purpose of this report is.

CHAPTER II

SUMMARIES OF RESEARCH

February 1946. Report of War Department Military Education on Board on Educational System for Officers of the Army. (The Gerow Board). United States War Department. 83 pages.

PURPOSE: ⁴ To establish the basic structure for the education of Army (including Army Air Forces) officers. The charter of the board covered commissioned officers only.

SUMMARY: The military leadership emerging from World War II recognized that the United States would play a major role in world affairs. The military officers of the United States needed to be educated to assume military leadership under more complex situations and using more sophisticated technology than had been the case before that time. The bulk of this study, chaired by Lieutenant General Leonard T. Gerow, deals with professional military education. Annex 10 (which addresses Army Air Forces) includes the requirement for the Air Institute of Technology. At this early stage of the development of modern-day military education, no specific reference is made to graduate education. The board established the mission of the Air Institute of Technology as assuring "scientific technological development of Army Air Forces equipment and efficient operation of procurement, supply, maintenance, and service responsibilities assigned to the Army Air Forces." (p. 75) It would be heavily science-and-research oriented. Instruction would be provided in those subjects to prepare officers to serve in the Air Technical Service Command and tactical operating units. Provisions called for Reserve and National Guard officers to attend an associate, condensed course and for the Air Institute of Technology to provide a correspondence course for officers on inactive status. 7

Thus, the instruction to be provided by the Institute was seen as technically oriented. Its growth into a graduate school with the changing demography of the officer corps in the coming years was a natural extension of this orientation. The Institute (at Wright Field,) had been in existence in some form for many years, and the Gerow Board sanctified its continuation.

February 1946. Report of Army Air Forces Educational Conference, 18-20 February 1946. 131 pages.

PURPOSE: To discuss ways to integrate the education and training programs proliferating throughout the commands of the Army Air Forces.

SUMMARY: This conference was called to consider post-war education and training needs and the elimination of duplication. As a result of the lack of a single focus on education and training needs during the war, a duplication of effort and some waste of resources had taken place, according to the report. The conference committee (representing several commands) was charged with pulling all the requirements together into one coherent plan. Discussions of higher education focused on the need for the Army Air Force Institute of Technology, timing of attendance, types of educational programs needed, and the need for graduate work. The main points made are given here. The Army Air Forces Institute of Technology was regarded as necessary to ensure that the military had benefit of the latest technological knowledge. The committee believed emphasis should be on young officers, as they would be able to adjust quickly to the academic environment. Curricula at the Institute, according to the committee, should include supply and logistics, as well as engineering. It was noted that when World War II started, military personnel did not know how to figure requirements for spares; overproduction and waste resulted. Further, an integration of engineering with the supply-logistics-maintenance-procurement discipline (in which officers of each discipline would spend some time studying in the other) was believed necessary in order to provide a broad base of knowledge for the officers.

The major recommendations of the committee dealt with requirements for civilian institutions education and selecting officers to attend them. The committee recommended that the management of civilian institutions requirements be handled at Headquarters Army Air Forces level for the time being but should be moved eventually to Maxwell Field. When Maxwell Field assumed responsibilities for the requirements, the responsibilities would also include establishment of standards and qualifications for prospective students. Processing, selecting, and assigning students to attend civilian institutions, the committee believed, should be accomplished at an echelon higher than the school headquarters at Maxwell.

March 1946. "AAF Officers Technological Education" (Preliminary Report). (The Markham Report). Headquarters Army Air Forces. 32 pages.

PURPOSE: To study the technology education needs of the Army Air Forces officers of the post-war era and determine the best ways to provide that education.

SUMMARY: This committee, chaired by John R. Markham of the Massachusetts Institute of Technology, reviewed the charter of the Army Air Forces Engineering School and stated that the program established for the school needed to be extended. The committee found that the Army Air Forces needed about 700 officers with bachelor's degrees having a technological orientation and about 300 with some graduate work. Committee members addressed requirements by assuming an officer provided a technological education would serve a five-year tour of duty in one of the thousand designated positions. Therefore, about 200 officers a year needed to be graduated to keep the positions filled.

The committee found that Army Air Forces officers had an average of two years of college education and that civilian institutions did not serve the needs mainly because programs were too general to fit military needs. To meet the technological and supply problems of the Army Air Forces, the committee believed a school should be established, to be called the Army Air Forces Institute of Technology (AAFIT). (NOTE: AAFIT is referred to by the same name in the February 1946 conference.) Students completing the school should be awarded a Bachelor of Science degree, the report stated. For graduate work, the committee thought students should be sent to civilian institutions.

The recommendations of the committee followed from its deliberations. Officers should be carefully selected so that they would be prepared for a rigorous academic schedule. The curriculum should consist of two fields of study: engineering-maintenance-procurement and logistics. Although the two curricula were to be separate, a requirement for integration was seen as needed so that even though a curriculum was specialized, it was as broad as could be. In other words, all AAFIT students would take certain core courses, no matter which curriculum they pursued. Policy recommendations from the committee dealt with entry requirements, grading, individual references libraries, and types of degrees to be awarded. The committee recommended that all entering AAFIT students have two years of college. Officers already possessing bachelor's degrees should complete one of the two AAFIT curricula before beginning graduate work at a civilian school. The grading system recommended by the committee reflected systems commonly found in civilian schools. A "C" average would be required in order to maintain school standing. The committee recommended that AAFIT students be allowed to retain their textbooks after completion of studies in order to build reference libraries for

professional use.

August 1946. Second Army Air Force Educational Conference, 20-22 August 1946. Army Air Forces School. 34 pages, plus attachments.

PURPOSE: To continue efforts to build an integrated Army Air Force (AAF) education plan, eliminating the duplication of effort that had occurred during the war.

SUMMARY: This conference was a continuation of the earlier conferences on the same topic. The AAF expected soon to number its officer corps at above 52,000. The Air University had the mission of all training in the AAF. Conferees recognized the need for officers with undergraduate and graduate degrees and discussed a report on the number of officers in school and their fields of study. (These details were not given in the report, although it is clear from the report that the discussion on fields of study emphasized guided missiles, logistics, supply, procurement, storage, distribution, and maintenance.) A briefing on the Army Air Forces Institute of Technology (AAFIT) brought out the possibility of conferring degrees on graduates of the school. The briefer pointed out that the Air Materiel Command needed personnel with both graduate and undergraduate degrees to fill requirements in various materiel career fields. To this end he proposed an "Advanced Supply and Maintenance School." (p. 14) The Air University position was that such a school should be operated by AAFIT under the auspices of the Air Materiel Command. Conference members also discussed AAFIT grading vis-a-vis officer effectiveness reports. They discussed whether an officer's academic grades should be a part of his personnel record and concluded that although an academic rating must be made, it should not be a part of the personnel profile. All education programs were to be fitted into an officer's overall career development ladder. The conference discussed the issue of whether Army Air Force officers all needed a baccalaureate-level education. Further, it dealt with the significance of grades vis-a-vis the officer effectiveness report, recognizing that an otherwise outstanding military officer may not fare well academically. The committee also recognized the necessity of maintaining serious, long-term relationships with civilian institutions once begun.

The recommendations pertaining to higher education were as follows. A college degree would be a requisite for commissioning as an rated officer. For non-rated, an individual must have a degree or be a graduate of Officer Candidate School. An Air Academy was suggested as a way to help fulfill requirements for the education of Air Force officers. The subcommittee reviewing undergraduate and

graduate education provided three broad recommendations. First, that the education level of all officers be brought up to two years of college. (This might require "subsidized enrollment" (p. 31) in civilian universities, or use of GI Bill, for example.) Second, the committee recommended further study on ten aspects of graduate education; areas included scholastic achievements, choice of school, selection of subjects of study, and the establishment of long-standing arrangements between the Army Air Force and universities. Third, a need for a particular type of expertise would have to exist before the education program could be established.

September 1949. Research and Development in the United States Air Force. (The Ridenour Report). Air Force Scientific Advisory Board. Variously paged.

PURPOSE: To review the status of the Air Force's research and development activities.

SUMMARY: The Ridenour Committee, chaired by Louis N. Ridenour, Professor of Physics and Dean of the Graduate College of the University of Illinois, reviewed all aspects of Air Force research and development, including mission, functions, funding, and personnel policies (which, in turn, included education). The report detailed three major recommendations of the committee affecting the education of Air Force officers. They are summarized below.

The first dealt with civilian university research. The committee recommended that the Air Force sponsor fundamental research in some of the nation's universities, funded from the Air Force research and development budget. According to the report, a small amount of funds from that budget should be dedicated over the long term to contracting with civilian education institutions for fundamental research.

The second education recommendation given in the report was the establishment of a fellowship supporting fundamental research. The committee reasoned that such a program would facilitate staffing Air Force research and development organizations with technically competent officers and would aid in the retention of those officers.

Last, the committee recommended that the Air Institute of Technology be converted into a graduate school of engineering to serve the needs of the Air Force. The school, as envisioned, would equal in quality the high-ranking civilian schools of the nation. The committee noted that the availability of research facilities at Wright-Patterson would greatly enhance an Institute graduate program. Further, such facilities were simply not available at civilian universities.

More importantly, research to be done under the Institute resident program had no equivalent in civilian universities. For these reasons the committee believed it necessary to establish a graduate school of engineering within the Air Force, specifically at the Air Institute of Technology.

November 1949. Research and Development in the United States Air Force. (The Anderson Report). Headquarters Air University. 23 pages.

PURPOSE: To study the Air Force research and development program to learn whether the structure could sustain air power requirements for continued superiority.

SUMMARY: Taking place shortly after the Ridenour Committee report, this study, chaired by Major General Orvil A. Anderson, Commandant of the Air War College, dealt with the structure of Air Force research and development. Reviewing policies affecting personnel, operations, administration, and procurement, the study committee found that support for research and development was generally given scant attention. According to the report, this reflected a lack of understanding of the importance of research and development and, perhaps more fundamentally, a lack of thought to the mission and capability of the Air Force of the future. The portion of the report pertaining to education refers to the Ridenour Committee recommendation that a graduate school of engineering be established at the Air Institute of Technology. The Anderson Board pointed out that the Institute would be better for teaching classified subject matter and that the availability of the wind tunnel and other laboratory facilities at Wright-Patterson made the establishment of the resident program even more desirable. Additionally, the committee noted, a higher quality of research employee would be attracted to the Wright Air Development Laboratories by the possibility of some teaching opportunities at the Institute, thus benefiting all concerned. In sum, the Anderson Board agreed with the Ridenour Report on the matter of establishing resident graduate engineering program at the Air Institute of Technology.

January 1950. Report of the USAF Military Education Board on the Professional Education System for USAF Officers. (The Fairchild Report). 42 pages.

PURPOSE: To review the Air Force education system to ensure it met Air Force needs.

SUMMARY: Chaired by General Muir S. Fairchild, president of the USAF Military Education Board, this board discussed the viability of the institution known by then as the U.S. Air Force Institution of Technology (USAFIT), the expansion of its

curriculum, and the numbers of officers to be educated. Thus, in general, the board members discussed the mission of USAFIT. Regarding USAFIT's viability, there were several major points of discussion. First, it was noted that the high level of education of officers entering the Air Force negated the need for an undergraduate institute; agreeing with previous studies, this board felt a better use of USAFIT would be as a graduate school. Such a conversion would provide the Air Force with a source of education not available from civilian schools. The Air Force needed officers educated in weapons engineering, which the board recognized to have no civilian counterpart. Facilities already available at Wright-Patterson Air Force Base would allow for this kind of study as nowhere else could. Also, because the facilities were already there, the board expected that no great expense would be incurred by a conversion.

As further justification for the continuation of USAFIT, the board referred to the needs of the new Research and Development Command, which was expected to obtain the best scientists. High-caliber scientists could be attracted to the Air Force by the opportunity for teaching and research. A graduate institute at Wright-Patterson would fulfill this need. The board felt, however, that the scope of studies at USAFIT should be broader than just that required by the Research and Development Command. The opportunity to study areas more broadly related to science and engineering should also be included in the Institute's curricula.

The board considered whether the volume of USAFIT's output justified its existence. (The report did not give numbers; it simply stated that only a small percent of the officer force was receiving USAFIT education.) It concluded that the student load was high enough to assure viability. The board stated that resident studies should not duplicate civilian institution programs, as this was unnecessary and could jeopardize continuation of the Institute. The resident graduate program, which the board recommended be developed over the five ensuing years, was not expected to cover all the Air Force's needs for graduate education. The board envisioned the resident program as oriented toward only the technical education needs of the Air Force. The board recognized that the viability of such a program would require hiring high-quality instructors and expected the availability of excellent research facilities at Wright-Patterson to attract the right caliber. The board also recommended that the undergraduate program be phased out.

Having determined the continued need of USAFIT, the board turned to the topic of organization. Although the discussion was not elaborated on, the conclusion was that the organizational alignment of USAFIT should be moved from Headquarters

USAF to the Air University. The board also concluded that responsibility for the civilian institutions program, already a part of USAFIT, should remain so. (Responsibility for civilian institutions had rested with Air University and Air Materiel Command previously.) Keeping the program at USAFIT would permit all the Air Force's on-duty college education matters to be managed from one location.

Finally, the board took up the question of attendance at USAFIT by Reserve officers. The point of contention was payback; an officer might complete his course of study and be separated from the Air Force soon afterwards. However, the board concluded that this possibility should not exclude a Reservist from attendance.

May 1952. Report on A Study of the United States Air Force Institute of Technology. (The Hammond Report). 56 pages.

PURPOSE: To analyze the activities of the U.S. Air Force Institute of Technology (USAFIT) and make recommendations for improvements.

SUMMARY: Soon after the re-establishment of the U.S. Air Force Institute of Technology, the leadership began to see its possibilities as a graduate school. This study, prepared by H.P. Hammond, looked first at the continuation of the undergraduate program, and concluded that in preparing students for graduate work in civilian institutions, the Air Force would need to continue undergraduate offerings for those whose backgrounds did not qualify them to pursue a master's degree in a chosen field of study. (The report noted that the better civilian schools were finding that Air Force students required two years of study to obtain master's degrees.)

In 1952, USAFIT did not have degree-granting authority. According to the report, this limitation diverted top-quality potential students to civilian institutions and made credit transfer from USAFIT to civilian colleges difficult. Further, it adversely affected drawing high-quality instructors to USAFIT. Therefore, authority to grant master's degrees was recommended as a near-term goal and to grant doctorate degrees a long-term goal.

The study further recommended that a coordinator be established to arrange research activities between USAFIT and the Wright Air Development Center laboratories. Under such an arrangement, faculty members could pursue research at the laboratories, while laboratory employees could lecture at the Institute. For faculty pursuing such research, the report recommended that the teaching load be correspondingly decreased. The study also recommended curriculum changes to

strengthen the academic program. It recommended the addition of courses in chemistry, metallurgy, engineering materials, and industrial engineering and the expansion of courses in nuclear energy, and report writing. These changes would require expansion of faculty, staff and facilities but would move USAFIT further along the road to top-flight institution status.

Of the 53 civilian and military members, only 12 held doctorate degrees; the study concluded that those members should be doubled. The civilian-military mix (29-24) was considered adequate. The turnover of military members would ensure introduction of new ideas and practices. In attracting and retaining civilian instructors, however, the Institute could expect to face stiff competition. To meet this challenge, the study proposed an increased salary range which, for top personnel, could mean an increase of some \$2200. To provide the additional courses and expanded instruction the report recommended an increase in the number of faculty members from 53 to 80.

The study recognized "a critical shortage of engineers and scientists throughout the country" and attributed that to both a drop in the birth rate in the 1930s and rumors in the 1940s of an oversupply of engineers and scientists. (p. 33) The Air Force requirements, in the meantime were expected to grow.

1956. United States Air Force Institute of Technology: Degrees. United States Statutes at Large, 84th Congress.

PURPOSE: To permit the conferring of degrees.

SUMMARY: This law (Title 10, Section 9314) grants authority to the commander of the Air University to confer degrees upon resident Air Force Institute of Technology students who meet degree requirements. (NOTE: Undergraduate degrees were first conferred in 1956, and the first graduate degrees in 1958.)

November 1956. Report of the USAF Educational Conference of 18-19 October 1956. (The Rawlings Report). 106 pages.

PURPOSE: To review officer education programs and make recommendations.

SUMMARY: The Rawlings Board, chaired by General E. W. Rawlings, Commander of the Air Materiel Command, reviewed four areas of interest concerning the Air Force Institute of Technology (AFIT). First, the board looked at the role of the resident college, which at this time comprised the School of Engineering, the School of Business, the Installations Engineering School, and the Logistics Education and Research program. Its undergraduate program consisted of aeronautical

engineering and electrical engineering; the graduate program included several engineering programs (for example, aeronautics, aircraft structural design, and nuclear engineering) and management programs such as comptrollership industrial administration, and logistics. The board recognized that in offering these graduate programs, AFIT was following the recommendations of the Fairchild Board and the Ridenour Committee. The board discussed the utility of the undergraduate programs in light of their value to the graduate programs and the change in force structure brought on by the Korean War. The undergraduate programs were seen as having unique military applications and supporting graduate students who needed to strengthen their backgrounds prior to taking up graduate studies.

Turning to the implications of the force structure change, the board recognized that many undereducated people were being commissioned, leaving the Air Force with the problem of upgrading their education levels. Retention of the undergraduate program was one way to attack the backlog. Because the shortage of scientists and engineers in both the Air Force and civilian life was severe and civilian institution enrollments were rising in response to the need, those institutions were expected to be very selective in screening applicants and less willing to accept Air Force officers. Along this line, the board discussed the possibility of increasing resident fields of study. Members also discussed the possibility of using incentives to attract resident students and the level of emphasis that should be given to the enrollment of Air Academy students upon their graduation.

A brief discussion of the Civilian Institution program focused on a lack of funding to support quotas. The board agreed that support for officer attendance at civilian institutions was necessary to the building of a properly educated force structure. The board had several recommendations concerning AFIT's role. It recommended that both the graduate and undergraduate programs be retained and that the resident graduate program be increased. The board also recommended that incentives be explored and that Air University continue to seek other ways to increase the numbers of AFIT applicants. Additionally, the board recommended increased priority on the funding of education programs.

Second, the board took up the question of what the annual output (graduate and undergraduate) should be. After noting that the Air Force could not always attract the best personnel from college, the board commented that the leadership needed to determine the importance of education and then support the program appropriately. The board noted that Air Force policy dictated a goal of a baccalaureate for all its officers, but

that of the officer strength at the time of 138,314, only 37 percent of the Regular officers and 34 percent of the Reserve officers possessed that level of education. Eight percent of the Regulars had a master's degree, while only three percent of the Reserve officers held that degree. Getting the officer strength up to a baccalaureate degree level was a chief concern of this part of the discussion. Finding volunteer applicants represented a significant limitation of the program.

The board recognized a need for long-range goals to solve shortcomings in education. The two recommendations from this part of the discussion were that the quotas for both graduate and undergraduate education be increased and that requirements be established in support of long-range goals. The total fiscal year 1958 requirement for officers with graduate degrees was 4,500, while the program was producing only 300 per year.

The third area dealt with the selection system for AFIT programs. The substance of the discussion was that since not enough officers were volunteering to support a high-quality program, nonvolunteers should be identified. The board believed a system to support this could be established through the use of machine coding. Recommendations were that a central selection system be established, along with a way to maintain academic transcripts.

The final topic concerned the effect of external factors on USAF education programs. The increased enrollment in civilian colleges was expected to reduce the attendance opportunity for Air Force officers, necessitating an increase of space required in AFIT'S resident programs. In addition, the board noted that the Air Force faced stiff competition with industry for highly qualified personnel. This would increase the pressure on the Air Force to provide better education programs to retain its best officers. With these concerns in mind, the board recommended that the Air Force increase its public relations efforts with accredited civilian institutions and review its capacity to handle an increased resident program (to accommodate officers not accepted into civilian institutions).

June 1958. Report of the Ad Hoc Committee on Research and Development. (The Stever Report). Air Force Scientific Advisory Board. 41 pages.

PURPOSE: To review the Air Force's Research and Development Program in all its aspects and recommend improvements.

SUMMARY: The committee reviewed education levels of officers in light of Research and Development requirements and technological advancements. It concluded that more officers in the research and development community needed advanced degrees.

The committee noted that although 93.5 percent of research and development officers holding technical assignments had bachelor's degrees, only 32 percent had master's degrees and 2.5 percent, doctorate degrees. Although the committee praised the Air Force for its efforts to upgrade the education levels of its officers, it called for a greater effort in order to keep pace with the growth of technology. The report recommended increasing the opportunities of officers for assignments to universities and other civilian research laboratories. The committee also stated that officers in the research and development career field should be allowed to stay in the community throughout their careers.

December 1959. Report of the USAF Educational Conference of 17 November 1959. (The Power Board). Headquarters United States Air Force. 91 pages, plus attachments.

PURPOSE. To review officer education programs in light of Air Force needs and provide recommendations.

SUMMARY: Chaired by General Thomas S. Power, the Power Board reviewed officer education needs in terms of quality, quantity, patterns, faculty education, students, financial support, and facilities. The report noted that earlier in 1959, an officer career management program had been established which was designed to address, among other things, the level and kind of education an officer needed for progression through a given career field. (This initiative included the appointment of a standing Educational Requirements Board.) Requirements for advanced degrees were determined on a percentage basis. For example, in the field of electrical engineering, all officers were required to have a baccalaurate degree, while five percent of the career field would be required to have master's degrees. This long-range plan would be used as a point of departure by the Educational Requirements Board in the future. The Power Board outlined the broad duties of the Educational Requirements Board, which included determining the academic preparation required to support all the career fields and determining the percentage of each career field required to possess the education level prescribed.

The board believed that scientific, engineering, and technical management needed increased emphasis in graduate education. The projected increase in total graduate degree holders from 8.6 percent to 12 percent in 1965 would not meet Air Force needs. The board recognized that quotas for attendance at the Institute of Technology had been increased over 16 percent to accommodate the increased need for technical education but that manpower resources were a limiting factor. Although it would be unrealistic to expect one hundred percent of the education requirements to be met, the Air Force needed to motivate

officers it wished to educate and to review entrance requirements to make sure they were not unrealistically high.

Next, the board addressed the topic of career patterns for officers. The discussion covered general needs of officers for all types of education, including the demand for both specialists and generalists. The report stated that "officers should be trained for a job and educated for a career." (p. 35)

Faculty qualifications were a matter of concern to the board. Discussion of this focused on the difficulties of getting highly qualified civilians for the Institute of Technology. As an incentive the board recommended that Air University select top civilian instructors to attend advanced education. As a further incentive, the board recommended that Air University try to increase the grade levels of its instructors.

Looking at student matters, the board discussed factors associated with filling assignments to the Institute. The factors listed are some of the same ones we face today: military performance, date of last PCS, recency of previous education programs, overseas tour dates, depth of military experience, and rated status. Board recommendations were that commanders should consider the education needs of their officers when making career decisions about them and that the factors listed above be used as guidelines.

Considering the question of whether active duty service commitments for the Institute were adequate, the board discussed the consequences of increasing the commitment. (In 1959 a 12-to-24-month student tour entailed a four-year commitment.) The board concluded that reducing the commitment might entice noncareer officers to seek an Institute education to further their civilian career goals. The average student had six years of service before an Institute tour of one to two years. A four-year commitment generally ensured the graduate's services to the Air Force for 12 years, and probably 20. The board recommended that the four-year commitment be retained.

June 1960. HQ USAF Report of Staff Study on Relocation of the Institute of Technology. Headquarters United States Air Force. Variously paged.

PURPOSE: To study the possibility of moving the Institute of Technology's School of Engineering.

SUMMARY: The committee met at the direction of the Vice Chief of Staff to study a proposal to transfer the School of Engineering to the U. S. Air Force Academy. Subsequently, the charter was enlarged to include a review of all Institute programs, as well as the viability of the Institute. The study

group visited the Institute and concluded that the school should be moved. They cited inadequate facilities and lack of funding for new facilities. Conversely, the facilities at the Academy were known to be modern and high-quality. The quality of the faculty and the academic atmosphere of the Academy were given as the other reasons for moving the School of Engineering to the Academy. The remainder of the Institute would be divided between three organizations. The School of Logistics would fall under the control of the Air Materiel Command; the Civil Engineering Center would operate under the auspices of Air Training Command; and the Civilian Institutions Program and the Admissions function would be handled directly by Air University. Throughout the majority report there was reflected a sense of competition between the Academy and the Institute. The minority view, which eventually held sway, argued that there was no competition between the Academy and the Institute. They were established for different reasons, argued the minority, and neither drew anything away from the other. The minority agreed that although the facilities needed improving, the Institute was still producing quality graduates that because of the proximity of the research laboratories, could not be produced elsewhere. The master's degree institute was further evidence of the Institute's excellence and its value to the Air Force.

October 1960. Report of Symposium on Long Range Air Force Qualitative Educational Requirements of 17-18 October 1960. Air Force Educational Requirements Board. 76 pages.

PURPOSE: To learn perspectives of the civilian community concerning long-range qualitative education needs of the Air Force.

SUMMARY: This symposium provided a forum for an exchange of views on Air Force education needs, graduate education being only one aspect of the discussions. A recognition of the high cost of education, according to the conferees, demanded a review of scientific and social trends to aid the Air Force in determining how best to guide the education program. The panel discussions of this conference included broad topics such as qualities of excellence desired in the officer corps and indications of future requirements. Some basic disciplines of study, such as economics, political science, and mathematics were seen as providing the "generality, permanence, and relevance for management" that would allow the nonspecialist to serve the Air Force in a variety of ways.(p. 19) The graduate education panel also recognized that the Air Force would have continuing requirements for specialization. One comment in this regard was that many officers would be both generalists and specialists. A growing requirement for scientists and engineers, urged in the late 1950s because of Soviet

technological advances, was expected to continue unabated. The commandant of the Institute of Technology discussed the efforts of the Institute of in that regard. He stated that in providing technological education to the Air Force, the Institute emphasized education rather than training. He further noted that not all the Air Force's engineer requirements were so highly specific as those addressed in residence. For the less specific disciplines, civilian institutions were ideal. On a related topic, the commandant spoke of the voluntary aspect of the education program. While Air Force leaders in the field called for officers with higher education, filling the needs depended on volunteers for both resident and civilian institution programs.

The remaining portions of the report dealt with topics of general interest to the military education community, broadly applicable to all military education programs. This report provides valuable insight into the thinking of the education community about its graduate education needs and reemphasizes the role of the Institute of Technology as an educational rather than a training institution.

June 1961. Inventory of Educational Requirements. Air Force Educational Requirements Board. 345 pages.

PURPOSE: To determine the education requirements of commissioned officers in six career fields.

SUMMARY: To determine education requirements in the career fields of civil engineering, comptroller, intelligence, maintenance, materiel, and operations, the board surveyed some 25,000 officers. Respondents were directed to show how much of their time was taken up by various functions belonging to their career fields. (Functions varied from the general--written communications--to the specific--inspection of manufactured items.) The survey included for each career field a list of university courses considered applicable to that career field; the respondents' tasking was to indicate which courses would be needed for the jobs they held at the time of the survey. If 50 percent responded that a particular course was needed, the board considered the need significant. An example will illuminate the survey. Of the 48 functions listed for production control officers (AFSC 6524), 92 percent of the respondents said written communications consumed most of their time. General English was the course seen as the most needed of the 69 courses listed. Written communications and spoken communications took second and third place. The board drew several conclusions from its survey. For instance, it concluded that this kind of survey was a successful way to determine the education needed to perform the functions of the six career fields. Further, the board found education in

communicative arts to be the greatest of all education needs listed. Management and technical functions were found to consume the bulk of an officer's day. This catalog of education requirements was probably very useful to the Educational Requirements Board as it sought to establish the base and the goals of the Air Force education program.

October 1961. DOD Conference at U.S. Naval Postgraduate School--16-20 Oct 1961. Headquarters Air University. Variousy paged.

PURPOSE: To review trends and consider ways to accommodate them in the education community.

SUMMARY: This conference dealt with topical matters of interest to the military education community. Those pertaining to graduate education had to do chiefly with making the best use of resources, sending civilians to graduate programs, determining requirements, and establishing academic ratings. The conference considered the use of professors of air science (PAS) as a monitor of the activities of graduate students at civilian institutions. The Navy had such a system and the question for discussion was whether the Air Force should adopt a similar approach. The Air Force's system differed from the Navy's in that the senior graduate Air Force student at a civilian campus performed the duties for that the Navy PAS performed for Navy students. Air University felt that for Air Force students its system worked well and that no change should be made.

Another consideration concerned the exchange of information between the Air Force Institute of Technology (AFIT) and the Naval Postgraduate School (NPS). A greater information exchange was seen as advantageous to both institutions. Air University noted that efforts for an increased exchange would continue.

Conferees further noted that NPS had begun cost studies on its operations in anticipation of Congressional interest and urged AFIT to develop cost studies, too. It was recommended that the two institutions keep in contact throughout the studies in order to provide a sound statement to Congress if required. The group next discussed the establishment of educational programs for officers on submarines and missile launch sites and at other isolated locations. Air University was not optimistic, noting that the Extension Course Institute had tried unsuccessfully to get the American Council on Education to evaluate its courses for credit. Air University also referred to a Strategic Air Command program used by alert crews for which the command was attempting to secure accreditation through the University of Omaha. Finally, the conferees

addressed the education of civilians. Both civilian and military manpower resources of all Services were expected to come under scrutiny of DOD and Congress. Air University stated that the Air Force Education Requirements Board was looking into the matter for the Air Force.

November 1961. AU Report of a Staff Study to Increase the Emphasis of Education in the Air Force. Headquarters Air University Cover Letter AU/CC to HQ USAF/DP dated 2 November 1961. Variously paged.

PURPOSE: This study actually is a report of several efforts the Air Force had going on at this time. Thus, the report covered various facets of the education program.

SUMMARY: For the purpose of this summary, four topics will be covered: the requirement for all officers to have at least a baccalaureate degree, the expansion of AFIT, extension of the George Washington University-Air War College cooperative degree program, and the shortage of scientists and engineers.

First, the study recommended that the Air Force should cease recruiting officers without baccalaureate degrees and help those already on board obtain degrees. The study group found that some 60,000 AF officers were without degrees and considered several possibilities to alleviate the situation. For example, the study proposed that promotion boards add points to the scores of officers holding baccalaureate degrees. Correspondence courses, off-duty course work at nearby colleges and on-base extension programs, credit for service schooling and work experience, and temporary duty status to complete a nearly-finished degree were some recommendations. The second topic was related to the first. It was the expansion of the Air Force Institute of Technology School of Engineering by 500 new entries a year. A hundred of those entries would be topnotch personnel without baccalaureate degrees, and the remaining 400 would enter to pursue master's degrees. To accommodate the expansion, it was contemplated that changes would be required in the curricula of electronics, materials science, mechanical engineering, and engineering-space physics. Furthermore, the study group believed a graduate program in civil engineering would have to be built. To support this, additional facilities would be needed, through new construction or expansion into other base buildings. The 1963 military construction program had an Institute facility already planned for a student load of 500. The Congress had taken an interest in the cost of AFIT facilities, however, and the study group recognized that funding could be a stumbling block. Nevertheless, the Institute provided, as part of the study, a plan to accommodate the curriculum changes for the expansion.

A third aspect of this study concerned an arrangement between George Washington University and Air University, through which Air War College students could get master's or bachelor's degrees. Through this arrangement a student could get 15 credits from George Washington University extension courses. Disciplines included international economics, diplomacy, and history.

The fourth relevant aspect of the study, reflected a growing shortage of personnel in science and engineering disciplines. The study suggested that older officers be cross-trained into the needed disciplines through attendance at the Institute of Technology.

December 1961. Study of Minuteman Launch Control Officers Unoccupied Duty Time. Strategic Air Command. 8 pages.

PURPOSE: To establish graduate education extension programs in engineering for Minuteman launch control officers.

SUMMARY: The study group examined the morale problems launch control officers were expected to face while on duty in missile launch control centers (LCCs). The LCCs were just being established; the first was to be at Malmstrom Air Force Base. Full manning for all sites would be 600. The limited nature of LCC duties, while requiring alertness, would engender boredom, the report noted. A master's degree program officers would work on during duty hours was seen by the study group as a way to relieve boredom, allow officers to pursue educational goals, and provide a return to the Air Force. (It was envisioned that the officers obtaining master's degrees through this program would be utilized for one tour in a position outside missile duty that required the advanced education acquired while serving in launch control duties.) The study group thought the Air Force Institute of Technology should establish the program with local civilian institutions, arranging for branches to be set up at the missile bases. Because of the small size of the student body at each base, only one course of engineering study would be established at each. It was assumed that an officer serving a three-year tour would have ample time to complete his studies. This study, while containing some good ideas, does not address some obvious questions, such as costs (manpower, salaries, and facilities) and the feasibility of assigning to launch control duty officers holding undergraduate engineering degrees when officers with those qualifications were needed elsewhere. These problems are outlined in some Air University documentation available with the study. Air University concerns, however, were overridden, and a program was established.

July 1962. A Procedure for Raising the Educational Level of Air Force Personnel Through the Base Education Program. Headquarters Air University. Variousy paged.

PURPOSE: To establish procedures for raising the level of officer education in order to help Air Force fill requirements for baccalaureate and master's degrees.

SUMMARY: This task group established a systematic method for Maxwell and other interested bases to pursue higher education opportunities for officers. Using Maxwell as a model, the method consisted of determining the existing education levels, reviewing opportunities available, determining whether local opportunities needed expansion, and encouraging officers to participate. The instruments used by the task group were an extensive survey of officers and a review of programs available.

March 1963. Air University Plan for the Development of Air Force Professional Education, 1963-1973. Headquarters Air University. 66 pages.

PURPOSE: To provide a plan to guide the officer education program through the 1960s and early 1970s.

SUMMARY: This plan reviewed graduate and other specialized education as well as professional military education. It listed several major trends affecting education. Trends included a shift toward more emphasis on space activities, increased centralization of decision-making, and more involvement with sister Services and the armed forces of other countries. Several educational implications of these trends were noted. For one thing, a highly educated officer corps would become increasingly important, with science, engineering, and management disciplines taking the spotlight. The space mission was expected to engender a general revision of the educational program. Advanced education in science and engineering were expected to become even more critical as the space mission developed. The line between military and political matters was expected to grow hazier and that there would be fewer and fewer decisions that were exclusively military. The author foresaw an increased need for studies in politics, economics, and culture. The centralization of decision-making would require coordination among services and better communication techniques. The Air Force would need to continue relying on civilian institutions for courses of study that were not Air Force-unique. However, to support needs that could not be met in civilian schools, an increase was seen as required in resident capability. Having studied trends and Air

Force education needs resulting from them, the author developed several objectives. Those pertaining to higher education are summarized here.

The first objective was to achieve an officer corps in which all would have bachelor's degrees. The plan noted that the Air Force was continuing to procure officers without degrees and recommended that this practice be stopped. Further, the plan recommended that officers without degrees be encouraged to pursue them, that the Air Force Institute of Technology (AFIT) be used to the extent possible to service this need, and that the Air Force pursue the establishment of programs through civilian institutions in which students were not required to be resident at the university.

The plan's second objective was to increase the number of advanced degree holders. The plan cited the shortage of more than 8,000 such degrees, chiefly in science and engineering, and stated that the shortage was expected to grow. The production of officers with advanced degrees through AFIT was expected to exceed 17,000 in the decade to come, but the requirement over the same period would be a production of 20,000. The plan recommended that quotas be expanded by 400 a year to meet this deficit and that the Minuteman Education Program be extended. The use of the Bootstrap was seen as a third alternative.

The next objective treating advanced education was to increase curriculum flexibility. The space mission, technology advancements, and a shift in the kinds of wars being fought necessitated flexible curricula. Air Force education principles would need to assure that civilian institutions understood this, and emphasize adaptability in the AFIT resident schools.

The fourth objective was to raise the educational requisites for faculties of Air University schools. The plan commented that little attention had been given to the education levels required for faculties in professional military education in spite of the attention focused on advanced education elsewhere in the Air Force. An ad hoc committee, formed to review the matter, concluded that the prestige of the professional military education schools would suffer unless faculty education levels were upgraded. The committee also recommended the upgrading of faculty education levels at AFIT, the Warfare Systems School, and the Academic Instructor and Allied Officer School. Although most of the AFIT instructors already had master's or doctorate degrees, the plan recommended that 100 percent have advanced degrees. For the other schools, the committee recommended that more than half have advanced degrees.

June 1963. Final Report of Professional Military Education
Task Group of Air Force Educational Requirements Board.
Variously paged.

PURPOSE: To establish professional military education (PME) objectives, to ascertain topics of study appropriate for career development, and "determine the proportion of the officer force that should attend" the PME schools. (p. 1-1)

SUMMARY: Only one aspect of this study dealt with graduate education. The task group objected to the George Washington University program at Maxwell, which had been established to encourage PME students to pursue master's degrees while attending resident intermediate and senior PME. The group reviewed the George Washington University program at Maxwell and the curriculum development guidance of the Command and Staff College (CSC) and found that the latter apparently deferred to the former. According to the task group, the guidance stated that CSC curriculum hours for the class of 1963 had been reduced to allow students time to attend university courses. The task group also noted that the guidance on theses stated that a student's thesis for CSC would also have to meet the requirements of the university. Furthermore, CSC class activities terminated early three days a week to allow for participation in the university program. The task group believed the George Washington University program thus interfered with the operation of CSC. Another objection of the task group was that some of the CSC staff and faculty provided their services to the university program as thesis graders, time the task group thought should be devoted to their primary duties. The most serious problem, however, was seen as the conflict the dual program caused for the student. The George Washington University program had been established as part of the Air Force's efforts to upgrade the educational level of its officers. Therefore, many PME students arrived at Maxwell motivated to participate in the university program. They were motivated not only by the career development dimension, but also by the prospect of the usefulness of the degree in later civilian life. When the study requirements of the two programs competed, the task group reasoned, the student would be inclined to favor degree studies. As for students who chose not to participate in the degree program, the study group believed they would have less than a challenging course of study since the 1963 CSC curriculum was built with the degree program in mind. In summary, although the group admitted the importance of advanced degrees to officer development, it concluded that the overall effect of the George Washington University extension program at Maxwell was detrimental to the PME mission. The group recommended that the university program be discontinued.

December 1964. A Self Study Prepared in Support of a Request for Accreditation at the Ph.D. Level of the School of Engineering. Air Force Institute of Technology. 87 pages.

PURPOSE: To begin the process for accreditation of a doctoral program in engineering at the Air Force Institute of Technology.

SUMMARY: This study constitutes the Air Force Institute of Technology (AFIT)'s application to the North Central Association of Colleges and Secondary Schools to establish a doctoral program in engineering at AFIT. Following preliminary communications between AFIT and the Association, AFIT was advised on 9 April 1964 that the self study would be the first step in obtaining accreditation of the proposed program. On 3 August 1964, the Air Force Chief of Staff notified Air University that the Secretary of the Air Force had approved the doctoral program in aerospace engineering, pending accreditation.

The study consisted of an overview of AFIT schools and staff, a general description of each of its departments, a discussion of the funding process, a statement of the need for the proposed program, letters of support from various Air Force agencies, and a plan for the program itself. One of the chief attributes of AFIT pointed out in the study was its ability to develop new curricula quickly in response to Air Force needs. Examples included the study-research program with the laboratories, the establishment of a graduate engineering program at Malmstrom Air Force Base, and the development of new curricula such as the Space Facilities curriculum in support of evolving needs of the Air Force. The planned doctoral program was considered an extension of major programs already offered through the master's degree level.

The study noted that AFIT had a high standing in the academic community. The Institute held membership in the American Council on Education, the American Society for Engineering Education, and the Engineers' Council for Professional Development, among other groups. Additionally, members of AFIT routinely visited civilian institutions to keep abreast of developments in the academic world. An assistant dean of research had been appointed, which increased the emphasis on that aspect of the school's development.

Early in the decade, the report noted, the Air Force had begun to increase its interest in research activities, and a greater number of doctoral degree holders would be required in the near future. The study group believed AFIT should be at the forefront of the response to this Air Force need.

The plan called for the establishment of a doctoral council, which would establish faculty criteria, as well as standards for student selection and admission. The students would be Air Force members, and the plan called for 12 entries per year. Course work was expected to take a year and be followed by a year in a laboratory for dissertation research (under the joint supervision of a laboratory scientist and an AFIT faculty advisor.) The curriculum focus would be aerospace engineering, making use of resources from all departments as well as the laboratories.

Although the study group was eager to get the program underway, the members recognized that such a serious undertaking would probably encounter unforeseen difficulties, and thus the group stated a wish to proceed with deliberation and careful monitorship of the progress for at least three years before contemplating program growth. This care and deliberation seemed to characterize the entire study.

March 1966. Report of the Ad Hoc Group on Updating S & E Competency. Air Force Systems Command. 40 pages.

PURPOSE: To seek ways of upgrading the abilities and skills of scientists and engineers assigned to Air Force Systems Command (AFSC).

SUMMARY: The study group reviewed several topics affecting the scientist and engineer population (both military and civilian), three of the topics affecting graduate education. The first, AFIT professional education and training, broadly summarized the AFIT programs and noted that the participation was ultimately based on validated needs for positions requiring advanced academic degrees. The group recommended that lower echelon commanders be more vigilant in determining requirements for advanced degrees and that officers new to Systems Command be encouraged to apply for AFIT programs.

The second topic, Operation Bootstrap, was considered a good alternative for attaining degree goals. The report recommended the bases brief new officers on the possibility, and that commanders provide recognition to officers completing their education by that method.

Third, the study group reviewed the recruitment of Reserve Officer Training Course (ROTC) graduates into graduate scientist and engineer programs. The group noted that only small numbers of ROTC graduates were permitted to pursue graduate studies immediately upon graduation. Loosening this restriction, the group believed, would increase competition for

AFIT programs, thus raising student quality. ROTC graduates who were selected were required to attend AFIT resident programs rather than having an option to apply to a civilian institution. The group saw this as a disincentive. Last, the study group noted that the Air Force active duty service commitment for funded education was three months for one, whereas the Army and the Navy each had a two-for-one commitment. The group made no specific recommendations on these problems, except that their effects be briefed to influential members of the science and engineering community and the education community.

June 1966. Procedure for Raising the Educational Level of the AU Faculty. Headquarters Air University. 14 pages, plus attachments.

PURPOSE: To find ways to upgrade the educational level of the Air University resident faculty and the Headquarters staff.

SUMMARY: This study group reviewed the history of faculty education levels and a recently completed Air Force survey of advanced degree requirements as a departure point for its efforts. The group made some adjustments to the Air Force survey, arriving at a shortage of 38 doctoral degree and 72 master's degree requirements. Most of the shortages were in business administration, education, and political science. Considering ways to reduce the deficit, the group decided that a combination of two alternatives would be the best approach to solving the problem. First, a minimum education level should be established as a prerequisite for assignment into advanced degree positions. Second, the group recommended the allocation of 28 AFIT spaces per year to help satisfy the need. The group believed that this two-pronged approach would be the best method of upgrading the faculty of the Maxwell schools and the Headquarters Air University staff.

July 1966. "Officer Education Study" (Draft). Office of the Secretary of Defense (Manpower). 592 pages.

PURPOSE: To provide the military community a reference point concerning officer education and recommendations for its improvement and to furnish a departure point for future studies.

SUMMARY: This lengthy report provides a thorough review of the policies of officer education for all the services. Air Force officer strength stood at 128,193, while total Air Force strength was 839,409 (31 December 1965 figures). Total strength was 2,844,518.

The study examined several aspects of graduate education, chief

many them, the oversight of postcommissioning programs, student quotas and requirements, enrollments, costs, and utilization of graduates. In describing the Air Force program, the study notes that the Air Force Institute of Technology (AFIT) was authorized by law to confer undergraduate, graduate, and doctoral degrees. As to organization and responsibilities, AFIT had five sub-organizations at that time: the School of Engineering, the School of Systems and Logistics, the Civil Engineering Center, the Defense Weapons System Management Center, and the Civilian Institutions Division. The first two were degree-conferring schools. The undergraduate program still comprised aeromechanical engineering and electrical engineering. The Engineering School's master's degree program included several degree tracks averaging 21 months in length. Its graduate program (aerospace engineering) was 24 months long. The School of Systems and Logistics, largely a professional continuing education school, had one master's degree program, logistics management, a 12-month program. The Civilian Institutions (CI) division had a quota of 922 graduate and 219 undergraduate students. Nuclear engineering effects, geophysics, international relations, and business administration were representative of the many courses of study administered by CI. The quota for USAF Academy instructors was 67, AFIT instructors eight, and scholarships 15. In addition to these figures, there were 150 Training-With-Industry quotas in 12 broad areas of study.

Attendees at all these programs were volunteers who met academic qualifications. In spring 1966, enrollment in graduate programs was 1,816. An additional 86 officers were in Training-With-Industry. The bulk of the students were pursuing degrees in engineering, management, and the biological and physical sciences.

Quotas for attendance in 1966 were based on the two-digit utilization field. Of the 1,385 quotas for the 1966 program, nearly 83 percent went to the warfare support category, .9 percent to direct warfare, and the remaining 16 percent to service support.

AFIT faculty consisted of 113 officers, 51 civilians, and 33 contract civilians, for a total faculty strength of 197. Total AFIT strength at the time, including contract civilians, was 444. Eighty-four percent of the faculty held either a master's or doctorate degree. AFIT policy permitted its professors to spend one academic quarter per year at research under the direction of school deans. The study recognized the value of this both in terms of faculty development and support to Air Force projects.

The study provided some cost data but concluded that the

figures were of questionable value because of the variation in cost elements among services. Areas of cost study included operations and maintenance funds, other appropriations tied to the school mission, salary, base support costs, student pay and allowances, and cost per student. The analysis showed that student pay and allowances and travel accounted for more than half of the operating costs. Excluding student pay and allowances and travel, cost per student in the School of Engineering (303 graduates per year) was \$5,696. For the School of Systems and Logistics (12 graduates per year), it was \$10,476, and for CI (1,489 graduates), \$1,633. The study recommended that the Assistant Secretary of Defense (Comptroller) develop a more accurate way of reporting cost data.

Following its deliberations on costs, the study addressed requirements. The board noted that JCS Policy Memorandum No. 149, 17 March 1964, directed that "military personnel receiving graduate education (be) utilized in positions requiring such education" with consideration given to career management. (p.358) Criteria for identifying positions requiring graduate education fall into these general categories: positions so declared by law or DOD policy, positions in which the duties could not be performed adequately by an incumbent without a degree, positions supervisory to those requiring a degree, and positions requiring a particular field of knowledge.

According to the study, the Air Force determined its positions requiring graduate education by surveying the field and having the surveys validated by the Air Staff agency responsible for a particular Air Force Specialty Code.

Referring to a 1964 OASD (Manpower) survey on the utilization of advanced-degree holders, the board noted that more than two-thirds of the survey respondents believed their degrees to be "either desirable or essential" to their jobs; 30 percent believed they had not been properly utilized; and the remainder thought they had been "reasonably well utilized". (p. 417) The report stated that the Air Force fared better than the other Services in utilizing graduates whose studies it paid for. The report also reviewed the use of advanced-degree holders who obtained their degrees off-duty and concluded that the Air Force did not make use of those degree holders as well as the other Services did of their off-duty graduates. Finally, the report looked into the utilization of officers with graduate degrees, both immediately after graduation and in subsequent tours. The study noted that every month of education an officer obtained at Air Force expense, required three months of obligated service. The Air Force assigned about 93 percent of its graduates into the utilization field for which they were trained upon graduation. The remainder, according to the

report, were largely those who had to return to rated duties in accordance with career management priorities and Air Force needs. Policy required that those officers fulfill a utilization tour later. The conclusions of the study were that although all the Services had acceptable methods for immediate utilization of their graduates, all needed to consider re-utilization for optimum education value and that the services needed to review their policies on the utilization of officers who obtained their advanced degrees on their own.

July 1966. The Effects of Education on Air Force Officer Performance. Headquarters U.S. Air Force, Directorate of Personnel Planning. 58 pages.

PURPOSE: To determine whether a relationship existed between civilian education level and officer performance.

SUMMARY: This study was undertaken to support the 1966 Comprehensive Review of Military Compensation by the Office of the Assistant Secretary of Defense (Manpower). The study group analyzed the education levels and mean scores on officer effectiveness reports (OERs) for all officers on active duty as of 31 December 1965. (Officers who had not yet had their first OERs were excluded, as were general officers, on whom OER data was not available.) Officers were categorized by level of education: high school graduate or less, some undergraduate work, bachelors degree, master's degree, or doctorate degree. Further, the officer corps was grouped by years of experience. These data were studied in the following groupings: all officers, line officers, operations officers, science and developmental engineering officers, technical officers, and hard-core science officers. The study group recognized the shortcomings of the OER when used for the purposes of this type of analysis but pointed out that it was the best tool available. The chief shortcomings discussed were inflation and the tendency for higher ranking officers to get better ratings than lower ranking officers.

The study group found that officers with lower education levels received lower OER ratings. They found that greater educational achievement led to greater effectiveness. This was particularly true in the science and developmental engineering and the hard-core science fields.

Circa 1970. Headquarters United States Air Force Advanced Degree Career Management Program. Headquarters U.S. Air Force, Directorate of Personnel Planning. 49 pages.

PURPOSE: To provide a profile of advanced degree needs in light of mission goals and career management policies.

SUMMARY: This is a programming document, probably from the early 1970s, expanded to include rationale and opinions concerning the career management of officers holding advanced degrees. Its value now lies chiefly in the observation that difficulties with balancing officer career needs and personal goals with Air Force needs of that time are the same problems we face today. For example, in treating the specialist/generalist issue, the author recognized that technology advancements thrust the Air Force in two directions: that of the broadly focused officer who is more mission oriented than job oriented and that of the more narrowly focused officer who is job oriented. With regard to requirements for advanced degrees, the author commented that the system for determining requirements must offer a long-term view while recognizing that requirements fluctuate to accommodate changing career and job patterns.

January 1970. Graduate Education of Air Force Line Officers. Air Force Human Resources Laboratory. 21 pages.

PURPOSE: To provide numerical data on Air Force line officers possessing advanced academic degrees.

SUMMARY: Reviewing the line officer population from 1961 through 1968, this study established sets of data reflecting several dimensions of the contingent of the line population holding advanced degrees. The intent was to establish a data base that could be used in future studies of personnel issues. According to the study, 48 percent of degree holders had obtained their degrees through the Air Force Institute of Technology. (More of those attended AFIT civilian institution programs than AFIT resident programs.) Among their general findings were a growth rate of advanced degree holders that greatly exceeded the growth rate of the line officer force. Charts in the study displaying this data reflect a growth rate in advanced degree holders of from 5.20 percent to 11.37 percent of the force. Another interesting, but not unexpected, statistic was the growth of advanced degrees in the scientific and development engineer population group. Just over 32 percent of advanced degree holders held this kind of degree in 1961; by 1967, it was over 51 percent. Retention rates were lower among advanced degree holders of eight years service or less than their nonadvanced degree holder counterparts.

April 1970. Cost Benefit Analysis of AFIT Advanced Education. Lieutenant Stephen W. Chapel and Captain Robert C. Wilburn for

Headquarters U. S. Air Force, DCS Personnel, Directorate of Personnel Planning. 117 pages.

PURPOSE: To analyze the returns of resources expended for graduate education in the Air Force.

SUMMARY: This study developed a way to measure the benefits derived from the Air Force investment in graduate education. The study was done in two parts: the first considered retention; the second, costs per manyear. In the first part of the study, the authors prepared an historical data base showing the reasons officers left the Air Force between 1959 and 1967. This statistical base included factors such as aeronautical rating upon graduation and upon leaving the Service. Arraying the data in that fashion rather than showing annual retention figures, the authors stated, allowed them to follow a sample group over an eight-year period, providing a more meaningful dimension to the data. They proceeded to build cost-benefit analysis information using a mathematical formula to estimate graduate education costs based on the "expected productive manyears" of an officer after graduation. (pp. 1-4). Several charts and graphs were provided in the report to show cost amortizations over 20-year and 30-year periods for different categories of officers (for example, rated, nonrated, total). The part of the study pertaining to retention provided several conclusions. Officers attending AFIT programs very early in their careers had a lower retention rate than did older officers. Graduates of the resident engineering program had higher retention figures as a whole than did engineering students graduating from civilian institution (CI) programs. Otherwise, there were no differences between resident and CI retention data. Officers with only bachelor's degrees had higher retention rates than did officers with master's degrees.

The authors of the study determined that retention rates did not provide a good measure of the benefit the Air Force obtained from advanced education because the rates did not measure the time an individual officer remains in the Service after graduation and they disregarded the education costs. A better way to figure benefits, the authors believed, would be through determining the "cost per degree [based on] expected length of service after graduation." (p. 7)

The second part of the study provided several findings. Among them, the authors demonstrated that the expected productive manyears after graduation greatly affected costs; the more years in the Air Force officers had left after graduation, the less expensive their degrees. Degrees for regular officers were found to be less expensive than those for reserve officers (who had poorer retention rates). Degrees for nonrated officers cost less than those for rated. Comparing costs for AFIT resident students to AFIT CI students based on direct and indirect costs, the authors showed the cost of education

through CI to be less expensive than resident and recommended maximum use of that method to meet Air Force needs.

August 1970. Improvements Needed in Determining Graduate Education Requirements for Military Officer Positions.
Department of Defense, Comptroller General of the United States
Report to the Congress. 42 pages.

PURPOSE: To determine whether positions designated as requiring advanced academic degrees really warranted that level of education.

SUMMARY: This General Accounting Office (GAO) report reviewed the advanced academic degree (AAD) program to see whether it was being administered in a proprietary fashion. To perform the evaluation, GAO representatives visited the headquarters of all the Services as well as some subordinate units. The subordinate Air Force units visited were Air Force Systems Command, Air Training Command, and a sampling of their lower-echelon organizations, where the GAO representatives examined graduate education program administration and surveyed degree holders, incumbents of validated positions, and some supervisors of positions requiring advanced degrees. The findings were grouped into three categories: criteria for the identification of positions, lack of uniformity among the Services in following the criteria, and the evaluation of requirements. The criteria established by the Joint Chiefs of Staff (listed in the summary of the Officer Education Study by OSD (Manpower), July 1966) were considered too broad to be useful to the Services as a guide for identifying positions requiring AADs. The criteria permitted validation of positions from those that were essential to the merely desirable. In surveying 242 incumbents and supervisors of AAD positions, the GAO representatives found that many incumbents believed their positions did not require advanced degrees. According to the report, respondents were also asked their opinions of alternative methods of needed education, and many stated that short courses could satisfy some of the needs. A review of civilian positions revealed that those positions were not validated as requiring AADs when comparable military positions were designated as AAD positions.

The GAO noted that in some cases where a command job description document stated a requirement for an AAD, the Air Force Officer Classification Manual stated that only a bachelor's degree was required. Similar discrepancies were found in the Army. These discrepancies suggested to the GAO that the AAD validations may have been incorrect in some cases. The GAO found a lack of Service uniformity in following the Joint Chiefs of Staff criteria for designating positions as requiring AADs. Some positions were validated as requiring the degrees, while similar positions elsewhere were not. As an example, the report cited procurement officer spaces which in

the Air Force were validated but in the Army were not although the job descriptions were similar. The report recommended uniformity in applying the criteria. The GAO criticized the Services for lack of thorough evaluation of AAD positions. In some cases, the report stated, evaluations were not made regularly and in other cases, evaluations were "administrative" rather than "substantive." (p. 17)

The GAO provided several recommendations to the Secretary of Defense for the improvement of the AAD program. First, it recommended guidance be provided to the Services on the objectives of the AAD program. It recommended that definitive criteria be provided to guide the Services in validating AAD positions and that the Services be required to follow the criteria consistently. The GAO further recommended a greater use of civilians in AAD positions. Finally, the report recommended maximum use of AAD holders. This instructive report points out the subjectivity inherent in a program of this nature.

April 1971. An Analysis of the System for Determining and Validating Air Force Professional Education Requirements. Gene E. Talbert, John P. Hourigan, and James L. Hoyt. 95 pages.

PURPOSE: To evaluate the Air Force system for determining and meeting needs for education programs managed by Air University.

SUMMARY: This study reviewed the systems by which education requirements were established and validated, how personnel were selected to attend school, and how they were assigned after graduation. It studied the roles of the agencies involved, evaluated the system, and built an alternative model for establishing and prioritizing needs. The study covered the spectrum of Air University programs, graduate education being only one aspect of it.

The authors saw the education system as composed of four parts: requirements (identification of needs), personnel (selection for school), academic aspect (establishment of curriculum methods, and other academic matters), and validation (determination of how well needs were being met). Concerning the use of the education product (assignment after completion of school), the authors stated that though that was not part of the education system itself, it was in assignment and utilization that validation of the system was to be found. The authors next outlined the procedures for subsystems, including utilization. Procedures as shown in the report are essentially the same as those in use today.

In evaluating the total system the authors referred to it as "encountered" rather than "designed," meaning that it evolved over the years, with small changes being made to fit changing needs. (p. 46) Still, they stated that the system functioned

as a body, serving the purposes of Air Force education. Because it was an evolved system, however, it had generated an informal superstructure of personal contact which in some cases, the authors contended, overtook the formal process.

In the requirements aspect of the system, the authors found many avenues for input which provided Air University planners a good view of needs of the community served. However, the report noted, the requirements subsystem lacked a method for deriving needs based on trends in economics, politics, and technology. The authors found no clear method for prioritizing requirements. While acknowledging the difficulties inherent in this task, they felt that efforts should nevertheless continue. The expected growth in educational requirements was viewed as making prioritization increasingly important. The authors commented that lack of a priority system generated confusion as to which level of authority should decide what to delete when resources were insufficient to meet the educational needs.

Looking at the personnel aspect of the education system the authors concerned themselves mainly with selection, delineation of requirements, and integration of educational programs. They stated that the selection process dealt more with quantity than with quality. They commented that information available in the personnel system should be used to greater advantage in selecting courses of study suited to an officer's abilities. This they attributed to a lack of careful delineation of uses to be gained from the education program under consideration.

The authors found that officers were selected for participation in advanced academic degree programs based on their officer effectiveness ratings rather than academic aptitude.

The authors believed professional military education, graduate education, and professional continuing education (short courses) should be considered together as an entity when reviewing the education needs of an officer's career. They noted a lack of this integration in the Air Force system. The authors praised the education system's flexibility and its ability to translate requirements into course content.

September 1972. Report of a Study on AFIT Resident Programs and Costs. Air Force Institute of Technology. 78 pages.

PURPOSE: To provide an analysis of the costs and benefits of AFIT graduate degree programs, comparing resident programs with civilian institution programs.

SUMMARY: This detailed study resulted from Headquarters Air Force concerns over the costs of the School of Engineering graduate degree programs. Headquarters representatives thought the costs excessive compared to costs of similar programs at civilian universities. Air University directed AFIT to perform

the study, charging the study committee to review all the resident graduate programs, explore differences between those and similar civilian institution programs, and compare the costs of AFIT resident and similar civilian institution programs. As a departure point, the committee reviewed literature from the U. S. Office of Education and other pertinent sources to obtain cost data and other information for the years 1964-65, 1967-68, and 1969-70. Next, working with the 2750th Air Base Group (Wright-Patterson Air Force Base) and Headquarters Air University, the committee built detailed cost data of the resident graduate programs. The programs of both the School of Engineering and the School of Systems and Logistics were analyzed from the points of view of curriculum validity, flexibility in meeting Air Force needs and costs. The conclusion was that the resident graduate programs provided a unique service to the Air Force that could not be replicated in civilian institutions. The report stated that the AFIT resident programs were designed for purely Air Force needs and could be changed in response to changing Air Force requirements. Further, the committee stated, the unique proximity of the schools to the laboratories on base could not be duplicated elsewhere. Another advantage of the resident programs quoted in the report was that because the students were on an Air Force base wearing their uniforms, their membership in the Air Force was constantly reinforced. (In a study of retention data, the committee found that retention for AFIT resident graduates was twice that of AFIT civilian institution graduates.)

Cost comparisons were displayed in several ways. A representative cost table compared cost per student week with cost per quarter hour for each of the resident schools and civilian institutions. Excluding student pay, and operations and maintenance costs, the table showed per-quarter-hour costs to be \$52.97 in civilian institutions, \$149.47 in the School of Engineering, and \$112.40 in the School of Systems and Logistics. With the latter two factors added in, civilian institutions had much less of an edge over the School of Engineering, and was more expensive than the School of Systems and Logistics. The computed cost per graduate for an engineer in an AFIT civilian institution program in 1972 was \$27,428, while an engineer in the AFIT resident program would cost \$40,720. The committee pointed out that the figures would fluctuate in the resident program since costs per graduate depended in part on the number of students enrolled; the higher the enrollment, the lower the cost per graduate.

The value of this study lies in the many ways in which it displays data and the explanations of what is included in the cost-per-graduate data obtained from various sources. It would be worthwhile to have the information in this cost study updated periodically.

May 1973. Officer Graduate Education Study. Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs). 241 pages.

PURPOSE: To evaluate Service systems for meeting needs for officers with graduate degrees, and to review policies and management practices supporting graduate education in the Services.

SUMMARY: This study examined Service policies and practices regarding billet validation procedures, selection criteria, and utilization procedures, and reported on a survey addressing management, career implications and alternative methods of obtaining degrees. Additionally, the study reviewed graduate education in industry for comparison purposes. The study found that various management systems for graduate education in the Services could not easily be compared, each having arisen to meet unique needs. Each, however, was considered to be effective. Still, utilization of officers with graduate degrees was thought to need improvement. Rank and assignment restrictions contributed to utilization difficulties. According to the report, officers surveyed in a 1973 DOD survey believed a graduate degree enhanced promotion possibilities. Regarding alternatives to fully funded programs, the study found two worthy of further exploration: partially funded programs and the substitution of professional military education for graduate education. The fully funded program was considered the best way to meet Service needs.

The study reviewed graduate education in several companies, and found their programs to be much smaller. Most could hire people already holding the desired degrees. The study group found that the Services had different management systems, which arose from the Service-unique circumstances. The Air Force program, for example, was headed by the Air Force Educational Requirements Board, with requirements reviewed periodically. Requirements were validated initially at supervisory level and ultimately by Headquarters USAF functional managers. The Educational Requirements Board approved ceilings for each field.

The selection process for graduate students began at the Air Force Institute of Technology (AFIT), where records were screened for academic qualification. Factors considered by the Air Force Military Personnel Center included military performance and career development needs. The additional duty service commitment (ADSC) was three months for every one month of school, with no maximum. The study group discovered that the retention rate for officers receiving fully funded education was 86 percent, whereas the overall rate was 30 percent. Officers with fully funded degrees and degrees obtained by other means were considered graduate-qualified Air Force assets for assignment purposes.

Regarding its review of advanced education programs in industry, the study group commented that industry representatives said that industry support of advanced education was "often . . . based on general faith in the benefits of education" rather than on specific identification of needs. (p. 120) As for career implications, the study group found fully funded education programs favorable for retention. Filling requirements by recruiting personnel already holding the desired degrees was not found to be practicable for several reasons, largely because not enough people with the right degrees elected to join the military service. Increasing the use of partially funded programs was considered one avenue that should be pursued although the study group recognized that this approach was not without problems (for example, the acceptance by one school of another's credits when a military member was transferred to a new duty station.)

A final area examined by the study group concerned taking short, non-degree-granting courses in support of advanced degree requirements. Based on the survey, the study group did not find this to be a suitable way to meet requirements.

March 1974. Survey of Department of Defense Full-Time, Fully Funded Graduate and Undergraduate Education Programs. Forrest R. Browne, General Accounting Office. 11 pages.

PURPOSE: To review DOD full-time, fully funded graduate and undergraduate education programs to determine whether management procedures were adequate.

SUMMARY: The author of this survey reviewed the Services' graduate education programs by studying the inventory of officers with advanced degrees against validated positions. In the aggregate there were nearly twice as many advanced degree holders as there were validated positions. This held generally true for the Air Force, whose ratio of degrees to positions was 1.58 to 1. The ratios were similar for the Army and the Navy and somewhat higher for the Marine Corps. Comparisons within disciplines, however, revealed greater imbalances in the Army and the Navy. For example, 10 Navy officers had attained their doctoral degrees in oceanography through the fully funded program although the Navy had validated no positions as requiring doctoral degrees in oceanography. Similar discrepancies were noted in the Army. The report revealed no discrepancies in the Air Force program. (In fact, the author did not mention the Air Force program after the initial references noted above.) The author concluded that the Services were not properly managing full-time, fully funded graduate education. To correct the discrepancies uncovered, the author recommended that officers not be allowed to pursue full-time, fully funded graduate studies in disciplines where there were already large

inventories of degree holders.

June 1974. "Evaluation of Graduate Programs of Civilian Institutions." Air Force Institute of Technology. (Internal Working Paper.) 85 pages.

PURPOSE: To review AFIT's efforts to place students in appropriate civilian schools and to review aspects of the program that affected student placement.

This thorough internal study described procedures and limitations of placing students in programs suited to their needs as well as to the needs of the Air Force. The first part of the study consisted of an overview and general evaluation of programs. First, the committee noted, students were placed only in accredited programs, and of those, program managers attempted to find the highest quality schools (using a college rating study). Additionally, program managers of the AFIT Civilian Institution offices constantly evaluated academic programs as they attempted to place students in appropriate schools. The study discussed the evaluation process in detail, using four disciplines as examples. For instance, to select the right school for a prospective civil engineering graduate student, the program manager would begin with the college rating study and would also refer to reports of the American Society for Engineering Education and consider the strength of a prospective school's research program. Before a tentative selection was made, still other factors would be considered, such as Air Force policies precluding attendance at some institutions. Additionally, visits to institutions and the development of personal contact influenced choices to some extent.

Based on its review, the study committee concluded that the program was a successful one, integrating the needs of the students with the needs of the Air Force. The value of this excellent study today is its explanation to the uninitiated of the workings of the AFIT civilian institution program.

September 1974. "Military Officer Graduate Education." (Draft Study). Office of Management and Budget. 44 pages.

PURPOSE: To review Service requirements for graduate education.

SUMMARY: In the early 1970s graduate education student loads were high, and Congressional attention was being focused on military education costs and associated benefits. This study was undertaken with that in mind and was performed from a cost analysis point of view. The study group reviewed Service programs and interviewed some degree holders and supervisors of degree holders. After studying the methods by which Services determined their needs and how they fulfilled them, the study

group looked at several major aspects of the program. One conclusion drawn by the committee was that validating needs was a subjective process and that needs were overstated. A review of literature as well as personal interviews indicated many degrees to be "desirable" rather than "essential." The consensus of the interviewees was that degrees were not essential. The interviewees, according to the report, were mostly in nontechnical career fields; interviews with more people in technical career fields might have provided a different consensus.

The committee compared the military program with the civil service program, noting that the Civil Service Commission substituted experience for graduate degrees in some cases. A resulting recommendation was that the civil service methods be examined for applicability to military graduate education requirements. Some military positions, the group believed, could be civilianized. The study committee criticized the Services for stating increased requirements for graduate degrees in technical career fields, commenting again on the subjectivity inherent in establishing positions as requiring graduate degrees. According to the report, the Air Force had 11,251 positions validated as requiring advanced academic degrees. The committee noted that all Services included a redundancy factor in determining their needs in order to allow for rotation, training, operational assignments, and such. To obtain requirements, the number of validated positions in a given career area was multiplied by the redundancy factor. The report gave the Air Force a redundancy factor as 1.5. It further noted that the inventory of usable degrees was a basis for determining requirements.

According to the study group, the Services utilized the fully funded graduate education program to fulfill their needs and did not give enough attention to full costs (especially pay and allowances.) The committee urged greater use of partially funded programs and other alternate means. In reviewing utilization of graduates after their initial tour in a validated position, the committee found some interferences with reutilization. Chief among those for the Air Force was flight pay legislation, which required an increased use of rated personnel in rated assignments, thus decreasing their utilization in validated degree positions. The committee suggested that the number of rated officers attending graduate school be decreased. Overall, the committee believed Service needs for graduate education to be overstated, that costs were not thoroughly considered, that the utilization of rated officers in graduate positions would be decreased because of flight pay legislation, that alternate methods of obtaining degrees should be used more extensively, and that some positions requiring graduate degrees could be converted to civilian.

February 1975. A Study of the Unique Value of the Air Force Institute of Technology (AFIT) Resident School to Air Force Systems Command (AFSC). Headquarters Air Force Systems Command. Variously paged.

PURPOSE: To determine the benefits gained by AFSC from the AFIT residence programs.

SUMMARY: AFSC prepared this study based on a request from Headquarters USAF for objective data indicating the value of the AFIT residence schools. To document the value of the school, AFSC surveyed its subordinate units, asking that they provide evidence of the value of the school by assessing the research efforts of students and faculty and the educational benefits of the school. Agencies that made use of student or faculty research and agencies graduates were assigned to strongly supported the residence programs in their responses. Command laboratories were especially supportive. However, they found it difficult to quantify benefits derived from the programs. The Air Force Weapons Laboratory response, for example, stated that the value inhered in the education itself rather than in specific cost savings on reports. Because the education programs were tailored to Air Force requirements, students were able to provide intangible, long-term contributions to the laboratory mission. The weapons laboratory response then proceeded to provide some statistics pointing up the value and benefits received as a result of its association with AFIT. It estimated that it had received 11 manyears of faculty and student research in 1974 alone. The report briefly described the research topics, which included the physics of oxygen discharge, thermal radiation, and transport calculations, among others. The Air Force Weapons Laboratory's response was typical of AFSC laboratories and other units closely associated with AFIT. Some units estimated cost savings provided by student and faculty research. The overall estimate was four million dollars saved as a result of AFIT research. In addition to providing helpful statistical information, this report points up the difficulty in quantifying the value of education.

November 1975. Postbaccalaureate Education: Conclusions and Initiatives. DOD Committee on Excellence in Education. (The Clements Committee Report.) Variously paged.

PURPOSE: To outline the Clements Committee's position on graduate education.

SUMMARY: Chaired by William P. Clements, this report is a part of the Clements Committee study of general military education policies and practices of the 1970s. The report is augmented by a report of a visit to the Air Force Institute of Technology and the Naval Postgraduate School. The committee recognized the need for postbaccalaureate education in the Services to

provide a capability for dealing with increasing levels of complexity faced in the late twentieth century. However, a competition for resources, as well as the principles of good management dictated the committee's efforts. The committee's review was covered under three broad topics. In the first, general policy, the report noted the lack of a way to match officer education achievements with job requirements, assignments and promotion. According to the report, careful definitions of educational requirements were called for. The initiative identified under general policy was the formulation of a policy that related graduate education to other professional education and career progression.

Under the heading of management, the committee reviewed management systems, cost accountability, and the use of academic institutions. Although it found the Service systems basically similar, enough differences were discovered to prompt the committee to direct that the Service programs be revised so that they were "essentially the same." Programs were to have central validation, Service single manager, central control of assignments, and monitorship of student performance. The committee praised the Air Force system. Finding it difficult to compare Service costs of postbaccalaureate education, the committee commented that such difficulties promoted doubts about the accuracy of accounting. To this end, it directed uniform cost accounting and evaluation methods be devised. Services were directed to conduct a review of programs jointly to ensure that each Service was aware of all programs and institutions used by the other Services. The committee believed this would reduce duplication and bring about cost savings. The last initiative, the use of institutions, was an amplification of the one just described. The committee directed that the Air Force Institute of Technology and the Naval Postgraduate School establish close ties and take advantage of each other's strengths in order to better serve the education needs of all the Services.

March 1979. Graduate Education in the Department of Defense.
Department of Defense. Variously paged.

PURPOSE: To respond to a House Appropriations Committee direction to review various aspects of the DOD graduate education program.

SUMMARY: This well-balanced report addressed these major graduate education issues: the validation process, the necessity for two in-house institutions, civilian faculties at Service schools and academies, and the use of tuition assistance to support shortages.

In its comments on the validation process, this report described some of the problems noted in the Clements Committee report and the 1970 Office of Management and Budget Report.

Subjectivity was considered the major weakness; other drawbacks seen were a lack of recognition of alternate methods, and the emphasis on graduate degrees rather than a level of education short of a graduate degree. The report noted that Service validated billets had been reduced by more than 4,000 since 1975; Air Force billets had been decreased from 11,251 to 9,009, a 20 percent reduction. The report cautioned, however, against too much reliance on quantification, stating that senior command billets, although not validated as graduate education billets, generally presupposed well-educated officers. It further noted that some other countries had higher education goals for their officer populations than did the United States. The report listed ways an officer's graduate education could be financed and commented that of some 9,000 advanced degrees earned by officers per year, only about one-sixth were financed through fully-funded programs.

Commenting on program decline in the last half of the 1970s, the report stated that the military services would not be able to maintain the same level of education as their counterparts in civilian life. The expiration of the G.I. Bill was expected to compound this problem; the use of tuition assistance and the Veterans Educational Assistance Program were not expected to offset the shortfall. Concerning Congressional perceptions of poor utilization of officers with graduate degrees, the report discussed first-time utilization and reutilization in the Services and concluded that the programs were, on the whole, well managed.

The next part of the report dealt with the Air Force Institute of Technology and the Naval Postgraduate School. Referring to the Clements Committee Report, this report emphasized the uniqueness and flexibility of these two schools, as well as the inability of civilian schools to meet Service-specific needs. It noted that the two institutions had worked together to develop a basis for cost comparison. Under the new method of costing, the average cost per graduate of a resident Air Force Institute of Technology student was \$49,900; from the Naval Postgraduate School, \$59,800. (Naval Postgraduate School course lengths are longer.) The report stated that in-house degree costs compared well with costs of senior professional military education and short course costs. Both institutions were considered well managed and performing necessary services. The report recommended no changes in the civilian-military faculty mix at the Service academies. Regarding to such measuring factors as education quality, student attrition, and officer competence, the DoD saw no purpose to be served in changing the mix.

The final topic covered by the report was tuition assistance. After reviewing history and Service policies vis-a-vis off-duty education funding, the report concluded that restricting tuition assistance funds in an effort to force more students

into graduate education shortages was not feasible. Off-duty programs were already being used to provide degrees in disciplines such as business administration/management and the social sciences. Engineering, physical science, and other similar disciplines could not be covered by this method due to lack of facilities and the lack of general interest in these hard-core areas.

March 1980. Education in High Technology Industry. Air Force Institute of Technology. Variousy paged.

PURPOSE: To compare the Air Force education program with the programs of high-technology industry.

SUMMARY: The authors of this study visited General Motors, General Electric, Hughes Aircraft Company, IBM Corporation, TRW, Inc., Western Electric Corporation, and Westinghouse Electric Corporation to review scientific and technical education programs. Across the board, they found a heavy emphasis on education. In addition to their visits to these companies, the authors reviewed Congressional documents and journals on the subject of education. The authors found a strong awareness in industry that the demand for scientific and technical personnel was outpacing the supply. Company education programs were a must for attracting and retaining high-quality employees. In fact, the study commented that nearly 4,000 employees would receive company-sponsored graduate or undergraduate degrees in 1980, and about 50,000 would participate in company-sponsored continuing education programs. Six of the seven companies visited operated in-house education programs.

The study noted that while almost all professionals being hired by high-technology companies had scientific-technological backgrounds, only 11 percent of the graduate degree holders in the line of the Air Force were educated in the scientific-technological disciplines. (For baccalaureate degree holders, the figure was somewhat higher, i.e., 19 percent.) The Air Force shortage of graduate degrees in those disciplines was 1,600; the annual entry of 515 would cause the shortage to become even greater. The companies visited expected to hire about 10,000 scientists-technologists in 1980. There was a consensus that U.S. institutions would not produce enough graduates in these disciplines in the 1980s to meet industry demands. Thus, the continuation of in-house programs appeared justified. Moreover, the authors concluded that since the Air Force is even more technologically oriented than industries in general, the Air Force should strengthen its scientific-technological education base.

May 1980. Report on the Critical Issues Affecting Engineering Manpower in the Air Force. Dr. J. S. Przemieniecki, Dean, School of Engineering, Air Force Institute of Technology. 26

pages.

PURPOSE: To review issues affecting the Air Force engineering shortage.

SUMMARY: Performed at the request of the Secretary of the Air Force, this study examined various issues affecting recruiting, training, and retaining engineers. Reviewing the general outlook for engineering, the author found both an Air Force shortage and a nationwide shortage and stated that it could affect the nation's overall technical capability. Recent enrollment increases, while a good sign, would not keep pace with the demand for engineers.

Focusing on the Air Force situation, the author quoted an Air Force shortage of engineers (civilian and military) of 3,200 engineers and 670 scientists. He noted that the Air Force had begun several initiatives to cope with its shortages, including a legislative proposal for incentive pay, increased recruiting, increased use of rated officers in science/engineering positions, pursuit of approval for additional education programs, and acceptance of newly accessed officers where qualified, into graduate science/engineering studies.

Referring to Department of Defense interest in converting military engineer positions to civilian slots as part of the shortage solution, the author stated advantages of the mix as it stood in 1980 (40 percent military; 60 percent civilian and commented that the Air force was already following the DOD policy of using civilians wherever possible in keeping with readiness requirements. Because existing accession sources were not considered adequate to meet the undergraduate engineering shortage, the study suggests the reestablishment of the undergraduate engineering program at the Air Force Institute of Technology. The author noted that some initiatives, such as increased Reserve Officer Training Corps scholarships, and special pay rates for civilians, were already underway.

Turning to educational programs, the study noted that degree programs, professional specialized education (PSE), and professional continuing education (PSE) addressed the needs of professionals such as engineers. Along with, and logically one result of, the above-mentioned shortfall in qualified officers from accession sources, production levels of engineers from graduate programs were inadequate to meet Air Force needs. The author recommended that the Air Force attempt to get the annual quota increased to support the science and engineering career fields and that a graduate program be implemented for Air Force civilian scientists and engineers. The PSE program, introduced at AFIT by the author, addressed the shortage partially by providing a succession of non-degree, graduate-level courses. The author believed this initiative showed promise and

suggested it be studied for extension. He also believed PCB courses could be used to greater benefit and suggested increased oversight to ensure maximum use.

The study referred to a new validation system being developed for aid in establishing graduate degree requirements in which percentages of graduate degrees would be stated by career field and work center. The author recommended that since civilians comprised 60 percent of the engineer work force, that this information be factored into the validation system. He further recommended that the resources of AFIT be used in developing a model for the validation. Finally, the study compared trends of U. S. military education to those of Germany, the United Kingdom, and the Soviet Union, concluding that our own education programs are not excessively long when viewed against the program lengths of the other nations.

February 1981. Report on Graduate Education of Officers.
Department of Defense. 6 pages, plus attachments.

PURPOSE: To respond to a House Armed Services Committee call for a five-year graduate education plan from the Services.

SUMMARY: Congressional concern over position validation, utilization, and use of in-house education capability generated the requirement for this report. The report outlined Service response to the engineering shortage, described the requirements determination process, and provided the five-year plan.

The report stated that all the Services were reviewing procedures for identifying positions requiring graduate education with a view to reducing the numbers. According to the report, improved utilization of graduates was evident throughout the Services. The utilization of graduates of fully funded programs who had served at least one pay-back tour had increased from 88 percent in 1975 to 93 percent in 1980. Concerning the use of in-house capability for graduate education, both the Air Force Institute of Technology and the Naval Postgraduate School had increased production over the previous five years. The requirements process, basically similar for all Services, was being refined by the Air Force and the Navy. (The Air Force was testing a requirements model based on percentages by career field.) Additionally, all Services had carefully reviewed their validated billet numbers. Air Force numbers had thus been reduced by some 30 percent and the Army's to a lesser amount. Navy numbers, after an initial reduction, were on the rise again by 1980 due to a relaxation of capping. According to the report, the Air Force had dropped 34 non-technical discipline from its requirements-determination bank, which reduced its validated position numbers considerably. Nevertheless, all Services still faced shortages in the technical career fields. The five-year plan

was a method by which a five-year quota for each Service would be approved, allowing each Service to change its input per year within the five-year period beginning in 1982 was 4,900; the other Services, somewhat less.

January 1982. "Graduate Education Report to Congress."
(Draft). Office of the Assistant Secretary of the Air Force.
20 pages.

PURPOSE: To respond to House Armed Services Committee concerns over the engineering shortages experienced by the Services.

SUMMARY: This report outlined steps the Services had taken to reduce the engineering shortage. The report addressed problems, initiatives, requirements, and the five-year plan to bring down the shortage. The biggest shortages faced by the Air Force, according to the report, were in electrical engineering and aeronautical engineering. Part of the problem was recruiting. The major recruiting problem resulted from a lack of ability to compete with private industry salaries and benefits. However, this problem was being alleviated through recent initiatives, such as a pay raise and the provision of engineer/scientist career continuation pay. Another part of the problem was retention, which for engineers was to be consistently lower than in other support fields. Although the Air Force planned to meet this problem through some changes to its accession and education programs. For example, the report states that an additional 3,000 Reserve Officer Training Corps scholarships (500 per year for six years) had been approved, quotas for the Airman Education and Commissioning Program had been increased, the College Senior Engineering Program had been established, and an increase in quotas for graduate education had been approved. The report concluded that although progress was being made, shortages still loomed ahead. The Services, however, were confident that with continued Congressional support the problem would be overcome.

CHAPTER THREE

Studies of Sister Services

Summaries of studies of graduate education accomplished by other Services are not included in this report. However, just as the Air Force program has evolved in support of its mission, so have the programs of the other Services. Department of Defense studies summarized in Chapter Two include the other Services although the summaries themselves address Air Force programs.

Some of the major Army and Navy studies are listed here as a departure point for the reader interested in pursuing the topic. The list is by no means exhaustive.

Army

February 1946. Report of the War Department Military Education Board on Educational System for Officers of the Army. (The Gerow Board). United States War Department.

June 1949. Report of the Department of the Army Board on Educational System for Officers. (The Eddy Board). United States Department of the Army.

July 1958. Report of the Department of the Army Officer Education and Training Review Board. (The Williams Board). United States Department of the Army.

February 1966. Report of the Department of the Army Board to Review Army Officer Schools. (The Haines Board). United States Department of the Army.

February 1973. Army Civil Schooling Program Review. United States Department of the Army.

March 1975. Education of Army Officers. United States Department of the Army.

February 1985. Professional Development of Officers Study.
United States Department of the Army.

Navy

July 1959. Report by the Ad Hoc Committee to the Chief of Naval Personnel on Naval Officer Education. (The Cook Board). United States Department of the Navy, Bureau of Naval Personnel.

October 1959. Report of Board to Study Billet and Post Graduate Educational Requirements in the Specialty Areas in the Line of the Navy. (The Keith Board). Office of the Chief of Naval Operations.

December 1964. Report of a Board to Study the Billet Requirements and Grade Distribution in the Subspecialty and Specialty Areas in the US Navy. (The Combs Board). Office of the Chief of Naval Operations.

July 1973. Report of the Graduate Education Study Committee. Naval Postgraduate School.

May 1974. Naval Officer Professional Development Study. (The Bayne Study). United States Department of the Navy.

September 1975. Report of Navy Graduate Education Select Study Committee. Office of the Secretary of the Navy.

CHAPTER FOUR

Reference List of Terms

Terms listed in this chapter are provided for facilitating reference. Numbers following the terms are the page numbers in Chapter Two where they can be found.

Active duty service commitment: 15, 26, 36
Advanced degree holders, growth of: 30
AFIT, requirement for: 3, 4, 8, 10, 11, 15
AFIT-NPS relationship: 18
Alternatives: 19, 25, 28, 32, 36, 39, 42
Civil Engineering graduate program: 19
Civilian Institutions: 4, 6, 7
Civilian Institutions, alignment of: 10
Civilian Institutions, time in: 10
Civilian-military faculty mix: 10, 27, 42
Conversion of AFIT to graduate school: 8, 9, 10
Cost information: 27, 31, 34, 41,
Curriculum: 3, 5, 11
Degree-granting: 6, 10, 11, 24
Doctoral program, resident: 24+
Education-job match: 28, 32, 41
Educational Requirements Board: 14
Education of civilians: 18, 44
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