

AD-A064 241

HAZELTINE TECHNICAL DEVELOPMENT CENTER INC INDIANAPOLIS--ETC F/G 5/9
AN OVERVIEW OF ELECTRONICS EDUCATION IN POLAND AND ROMANIA.(U)
NOV 78 D K CHENG
ONRL-R-8-78

UNCLASSIFIED

NL

1 OF 1
ADA
064241



END
DATE
FILMED

4 -79
DDC



ADA064241



OFFICE OF NAVAL RESEARCH

BRANCH
OFFICE
LONDON
ENGLAND

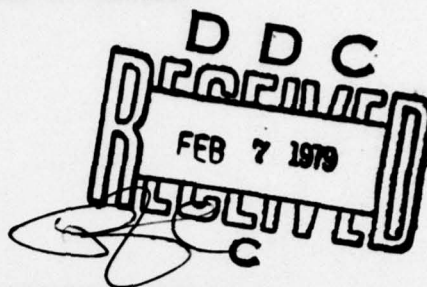
DDC FILE COPY

ONR LONDON REPORT

R-8-78

LEVEL II

5/2



AN OVERVIEW OF ELECTRONICS EDUCATION IN POLAND AND ROMANIA

DAVID K. CHENG*

20 November 1978

*Dept. of Electrical and Computer Engineering,
Syracuse University, Syracuse, NY

UNITED STATES OF AMERICA

This document is issued primarily for the information of U.S. Government scientific personnel and contractors. It is not considered part of the scientific literature and should not be cited as such.

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

79 02 05 089

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|-----------------------|---|
| 1. REPORT NUMBER R-8-78 | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle) ⑥ An Overview of Electronics Education in Poland and Romania | | 5. TYPE OF REPORT & PERIOD COVERED Technical, June 1978 |
| 7. AUTHOR(s) ⑩ David K. Cheng | | 6. PERFORMING ORG. REPORT NUMBER R-8-78 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of Naval Research Branch Office London Box 39 FPO New York 09510 | | 8. CONTRACT OR GRANT NUMBER(s) |
| 11. CONTROLLING OFFICE NAME AND ADDRESS | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) ⑭ ONRL-R-8-78 | | 12. REPORT DATE ⑪ 20 November 1978 |
| | | 13. NUMBER OF PAGES 8 |
| | | 15. SECURITY CLASS. (of this report) UNCLASSIFIED |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |
| 16. DISTRIBUTION STATEMENT (of this Report) UNLIMITED ⑨ Technical reptis | | |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) ⑫ 13 P | | |
| 18. SUPPLEMENTARY NOTES | | |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Poland-education Romania-education Electrical Engineering education Electronics education | | |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) To promote mutual understanding and exchange scientific ideas, the US National Academy of Sciences has established exchange programs with Eastern European countries. This article reports some factual information and personal impressions of the engineering education in general and electronics education in particular after a month-long trip to Poland and Romania. 265 000 | | |

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

S/N 0102-LF-014-6601

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

among peoples and
ing scientific

A

A

A

A

A

A

A

A

Warsaw, Poland's capital city, was reduced to rubble in WWII as a result of Nazi occupation and of brutal German reprisals against the unsuccessful uprising by Polish underground elements in 1944. Now the rebuilt Warsaw is a bustling city of 1.5 million inhabitants. The oldest university in Poland is Jagiellonian University in Cracow; it was founded in 1364 by King Casimir the Great and pre-dated Harvard University by 272 years.

Socialist Republic of Romania. The territory of Romania was inhabited by the Dacians (a Thracian tribe) around 400 B.C. Since then it has been the scene of many invasions and migrations. The Romans, in particular, having colonized it from 98 to 271 A.D., left their mark upon the country and its inhabitants. The Romanians remain essentially a Latin people surrounded by Slavic and Hungarian neighbors. Their principal religion, the Romanian Orthodox, however, is inherited from Byzantium.

After centuries of hardship and struggle, an independent Romanian state was achieved in 1877. It was a monarchy until its abolishment in 1947 when it was proclaimed the Romanian People's Republic. The name was changed to the Socialist Republic of Romania in 1965 by the Grand National Assembly.

Romania occupies an area of 237,500 km²; roughly that of New York and Pennsylvania combined. It has a population of about 22 million, and Bucharest, the capital city, has over 1.8 million inhabitants. The city is 500 years old, but it presents a well-planned mixture of the old with the new. It boasts many stately buildings and wide boulevards. Very few evidences remain from the destructive earthquake of 1977.

ENGINEERING DEGREES

In the European tradition higher technical education in Poland and Romania is conducted in separate independent schools, not in engineering colleges within larger universities. College-level institutions in Poland are the technical universities and those in Romania are called polytechnic institutes. Admission to these institutions is based on the results of competitive entrance examinations. The types and requirements of engineering degrees in the two countries are similar but not the same.

Poland. There are three types of engineering degrees:

1. Mgr. inż. (Magister inżynier)—Equivalent to the Master's degree; normally four years of full-time study plus one semester to do a thesis. There is also a four-year degree without the Master's thesis. It is called Inż. (Engineer) and is close to the BS in the US.

2. Dr. inż. (Doctor of Engineering)—The candidate must first pass two oral examinations; one on Marxist philosophy or political economy and the other on basic scientific knowledge. A doctoral dissertation based on original research is evaluated by two reviewers (one from outside the candidate's department). The candidate defends his work before a council consisting of all Professors and Docents (Associate Professors) of the department.

3. Dr. hab. inż. ('Doktor Habilitowany' of Engineering)—This is a kind of superdoctoral degree for distinguished contribution in an area of specialization, usually five or six years after the Dr. inż. degree. Recommendation of such a degree is based on the presentation of another dissertation and a demonstration of the candidate's total accomplishment; it is subject to approval by the Ministry of Education.

Romania. There are also three types of engineering degrees:

1. Ing. (Diploma Engineer)—Similar to the Polish Mgr. inż. degree, but the Romanian student must complete five full years of prescribed work, including a thesis. There is a strong emphasis on education-production integration, so 144 hours of workshop activities are required in each term for the first three years and 18 hours of research and design activities are specified for the last two years.

2. Dr. ing. (Doctor of Engineering)—Similar to the Polish Dr. inż. degree.

3. D. Sc. (Doctor of Science)—Similar to the Polish Dr. hab. and the British D. Sc. which is a step higher than the Ph.D.

FACULTY HIERARCHY

In both Poland and Romania there are four university faculty ranks which correspond roughly to the ranks of Professor, Associate Professor, Assistant Professor, and Instructor in US colleges. These are shown in Table 1. A Doctor's degree is normally required for the three top ranks.

The Professorial rank in Poland is further divided into two grades, namely, Ordinary, (Prof. zw.) and Extraordinary (Prof. nadzw.), the former being the higher grade. The teaching load for Professors is about 200 hours a year or approximately 7 hours per week. A Professor draws a base salary of about 8,000 zlotys a month. (The present official exchange rate for foreigners is 33.20 zlotys to 1 US dollar.) By doing contract research work, a Professor is allowed to earn 70% more than his base salary. It should be noted that in a socialist country there are no taxes and the government provides for education, health-care, and pension. Lodging is by assignment and is very inexpensive.

TABLE 1

Faculty Ranks in Poland and Romania

| In Poland | In Romania | U.S. Equivalent |
|-----------|------------------------------------|---------------------|
| Professor | Professor | Professor |
| Docent | Associate Professor (Conferentiar) | Associate Professor |
| Adjunct | Lecturer | Assistant Professor |
| Assistant | Assistant | Instructor |

In Romania the base salary for a Professor is about 5,000 lei a month which can be augmented 25% by doing contract research. (1 US dollar equals 12 lei at the official rate.) The weekly teaching load is 12 equivalent hours. Each lecture hour is counted as one and one-half equivalent hours, and an hour in the laboratory is one equivalent hour. The maximum percentages (ceilings) of Professors and Associate Professors on a faculty are 12% and 16%, respectively.

The governing structures of the technical universities in Poland and the polytechnical institutes in Romania are similar. At the top is the Senate which consists of a rector; vice rectors; faculty deans; representatives of the Romanian Communist Party, the Trade-Union Association, and the Communist Students Association; representatives of the teaching staff and students from each faculty; and representatives from industry. The rectors and vice rectors are elected by the Senate and the Deans by Faculty Councils for three- (in Poland) or four- (in Romania) year terms.

TECHNICAL UNIVERSITIES IN POLAND

There is a technical university in each large city in Poland, but a separate Electronics Faculty exists only in the technical universities at Warsaw (Warszawa), Danzig (Gdańsk), and Breslau (Wrocław). The Technical University of Warsaw with 23,000 students is not only the largest technical university but also the largest of all universities in Poland. Its Electronics Faculty is divided among five Institutes; namely, Institute of Basic Electronics, Institute of Automatic Control, Institute of Radioelectronics, Institute of Electron Technology, Institute of Telecommunications, and Institute of Computer Science. In recent years the annual output of this Faculty has averaged about 110 Inż.'s, 240 Mgr. inż.'s, and 26 Dr. inż.'s.

The Institute of Basic Electronics alone has a teaching staff of about 95 plus an administrative and supporting staff of 35. It has

4 Professors (2 Ordinary and 2 Extraordinary), 5 Docents, and 20 Adjuncts. Currently there are 12 research groups working on synthesis of active systems, topological methods of linear network analysis and design, nonlinear network theory, analog electron circuits, pulse and digital electronics, biocybernetics, microwave and solid-state electronics, optoelectronics, measurement of nonelectrical quantities, digital measurement systems, parameter measurements of nonlinear networks, and reliability problems. It is a very active Institute and is doing high-quality work. I did not have an opportunity to visit the other Institutes.

The Electronics Faculty at the Technical University of Danzig is one of the University's nine faculties. Danzig was made a Free City in 1918, after World War I. Since then, it was one of Europe's most sensitive trouble spots. It was there the first shots of WWII were fired from the German battleship Schleswig-Holstein on 1 September 1939. Like Warsaw, about 85% of the city was destroyed. Also like Warsaw, most of the city's historical buildings as well as landmarks have been painstakingly rebuilt and restored.

The Electronics Faculty at Danzig has about 1,000 students and consists of 3 Institutes: Institute of Telecommunications, Institute of Cybernetics, and Institute of Electronic Technology. The Institute of Telecommunications alone has a total staff of 200, and its teaching duties are distributed among 6 Chairs: in microwaves, electroacoustics, radio communication, wire communication, theory of electronic circuits, and information system theory. Because of my own special interest, I visited the microwave laboratories of Professor dr. hab. inż. Krzysztof Grabowski. Current research projects there include passive MIC (microwave integrated circuit) devices, automation of microwave measurements, receiver-noise elimination, frequency stabilization of X-band radio link, and wave propagation in anisotropic media. The people are competent and dedicated. One staff member is interested in the problem of detecting underground running water by radiation measurements. It appeared that he could detect radiation in the neighborhood of 1.42 GHz over underground running water at some locations.

I did not have an opportunity to go to Breslau, but I did visit the electronics institutes at the technical universities in Łódź and Cracow (Kraków). Łódź (pronounced "wootch," believe it or not!) with a population of 800,000 is the second largest city of Poland. It is an industrial city and is known as the "Manchester of Poland" because of its many textile factories. Fortunately it did not suffer much destruction in WWII. There is no separate Electronics Faculty at Łódź, but there is an Institute of Electronics that is four years old. The Institute has a teaching staff of 46 and an administrative and supporting staff of 15. No microwave work is done there. The Institute has been involved in instrumentation work, as well as in the design and fabrication of 5-kW, 20-25-kHz ultrasonic generators and of testing apparatus for TTL circuits. Some work on microprocessors and computer-aided design is also being carried out.

Cracow was the seat of Polish monarchs from the 11th to the end of the 16th century and hence is rich in historical, cultural, and intellectual heritage. By some miracle of fate it escaped the havoc of the last war. Today it is a prosperous city of 700,000. The Technical University at Cracow is 32 years old and has 6 faculties, but it does not have a separate Electronics Faculty. The Institute of Electronics, established in 1974, is a part of the Faculty of Transport. It has a teaching staff of 37 and an administrative and supporting staff of 14. The main interest of the staff lies in electric machines, automatic control, and digital and analog circuit modules.

POLYTECHNIC INSTITUTES IN ROMANIA

Engineering schools in Romania are called polytechnic institutes. There are four such institutes in Romania: at Bucharest, Timisoara, Cluj, and Jassy. In addition, electrical engineering is also taught at the universities in Frasov and Craiova where there are no polytechnic institutes.

The Polytechnic Institute of Bucharest has about 25,000 students and is the largest university in Romania. Its original buildings near the North Railway Station are rather old, but a much more spacious campus with impressive new structures is being built in another section of the city. The Department of Electronics is a part of the Electrical Engineering Faculty. It has a teaching staff of 3 Professors, 4 Associate Professors, 4 Assistant Professors, and 10 Instructors. A large number of textbooks have been published by the faculty. The books are all in Romanian, but a casual examination indicated that the coverage and treatment are comparable to those written in English for the same level. On-going research projects in the microwave area include synthesis and optimization of antenna arrays, frequency-scanned X-band waveguide slot arrays, digital radar speed measurement, high-power magnetrons and circulators.

The Polytechnic Institute of Timisoara has 5 faculties, in electrical, mechanical, chemical, civil, and agricultural engineering. The Electrical Engineering Faculty has 2,000 students and comprises 4 departments: electrotechniques (electric machines), energetics (power transmission and distribution), applied electronics and telecommunication, and computers. No microwave work is done there. The department on computers is particularly active. Their work is divided into 4 groups: hardware, software, automata, and process control. A plaque at the Timis County Museum claims that Timisoara has the distinction of being the first town in Europe with streets illuminated by electric lights, on November 12, 1884.

Cluj with a population of 300,000 is the second largest city (now challenged by Timisoara) in Romania. It has an outstanding botanic garden covering 14 hectares and is also an important medical center. The Polytechnic Institute of Cluj, founded in 1948, has 3 faculties,

in electrical, mechanical, and civil engineering. The Electrical Engineering Faculty has 800 students and is divided into 3 departments: electrotechniques, automation and computers, and electronics. Active work is being conducted on incremental-motion control systems and devices, measurement of nonelectrical quantities, and software system for computer control and optimization.

Jassy, a city of 250,000 in the northeast is only 15 km from the Russian border. Engineering education at Jassy, having its beginning in the early 19th century, is said to have the oldest tradition in Romania. The present "Gh. Asachi" Polytechnic Institute has 6 faculties and an enrollment of 14,000. The Electrical Engineering Faculty has 4 academic departments: electrical measurements and machines, electronics and computers, power utilization and automation, and electro-energetics. The Department of Electronics and Computers has a teaching staff of 18. The areas of specialization are: synthesis of sequential schemes, electronic systems for industrial control, nonlinear circuits, and software design for special problems.

GENERAL IMPRESSIONS AND COMMENTS

The purpose of my visit to Poland and Romania was not to seek specific information in my own area of specialization; it was rather to acquire an overview of engineering education in these two countries in general and electronics education in particular. Compared to the US, the engineering curricula in these countries put much more emphasis on the student's ability to design and actually produce some hardware, such as a multipurpose measuring instrument or an automatic control device. Many hours of workshop training are prescribed. This type of education-production integration may be very important in these countries because an engineer is often required to know not only how to design but also how to make a product.

The academic load for the student is heavy, varying from 34 to 38 contact hours a week, exclusive of the workshop activities. The contents and level of the formal courses listed in a 4½-year Polish Mgr. inż. or a 5-year Romanian Ing. degree program are comparable to those for an MSEE degree in the United States. Gymnasium graduates compete for a position at technical universities by taking entrance examination. The examinations are scheduled at the same time, and the admission standards are the same nationwide, hence an aspiring freshman does not have a second chance in the same year. The acceptance ratio is in the neighborhood of 2.5 to 1.

By US standards laboratory and library facilities are poor, especially in Romania. There are few sophisticated instruments, even for research. Set experiments requiring only elementary measuring instruments are found in student laboratories. Lack of adequate financial resources (in particular, foreign exchange) is a serious problem. There

were no minicomputers or time-sharing computer terminals in sight. I was asked to give a lecture and a seminar at the Polytechnic Institute of Bucharest, but no viewgraph or slide projector was to be found, and I was restricted to a small blackboard and chalk with a wet towel as an eraser. Visual aids were available in Poland.

There is no lack of enthusiasm and dedication on the part of the faculty in either country. They realize that they are operating under difficult conditions and that they are behind. They have endured frustrations. Politically and economically both countries belong in the "Eastern Bloc," but the people I talked with, without exception, expressed admiration for the Western system and accomplishments.

Poles and Romanians are frank and generous people. At the universities and academies I was always received cordially and with warmth. I firmly believe that science and technology are independent of national boundaries, races, or political philosophy, and that exchange of ideas and practices will encourage knowledge diffusion and progress. I am glad to have acquired many worthy new acquaintances in Poland and Romania and hope to have made a contribution toward the mutual understanding and friendship among these peoples.

| | | | | | |
|--|-----|---|-----|---|-----|
| S00020 Deputy Asst. Sec. General for Scientific Affairs USNATO APO US Forces 09667 | 001 | S00120 Dr. E. L. Hamilton Naval Ocean Systems Center Code 5311 (T), Bldg. 305 San Diego, CA 92152 | 001 | S00230 Commander Naval Sea Systems Command Code 0313 Dept of the Navy Washington, DC 20362 | 001 |
| S00040 Capt. R.S. Agnew Office of Defence Cooperation APO LOCAL 09777 | 001 | S00140 Office of Naval Research San Francisco Area Office One Hallidie Plaza - Suite 601 San Francisco, CA 94102 | 001 | S00240 Commander Naval Air Systems Command Code 503 Department of the Navy Washington, DC 20360 | 002 |
| S00050 American Embassy - Bonn Office of the Counselor for Scientific, Technical Affairs Box 280 APO US Forces 09080 | 001 | S00150 Commander Continental Air Defense Command Attn. Operations Analysis Ent Air Force Base Colorado Springs, CO 80912 | 001 | S00250 Commanding Officer Naval Intelligence Support Cent 4301 Suitland Road Washington, DC 20390 | 001 |
| S00060 Science Attache American Embassy APO US Forces 09794 | 001 | S00160 Library Colorado State University Fort Collins, CO 80523 | 001 | S00260 Defense Intelligence Agency Attn: DS-4C Washington, DC 20301 | 015 |
| S00081 DOCS/Repts/Trans Section Scripps Inst. of Oceanography Library C-075C University of California SD La Jolla, CA 92093 | 001 | 00161 Chief of Naval Operations Navy Department (OP-09B28) Washington, DC 20350 | 001 | S00270 Chief Army Nurse Corps DASG-CN Office of the Surgeon General Department of the Army Washington, DC 20310 | 001 |
| S00090 Lawrence Livermore Laboratory Technical Information Department L-3 P.O. Box 808 Livermore, CA 94550 | 001 | S00170 Director Navy Pub. & Printing Service Building 157, 3rd Floor Washington Navy Yard Washington, DC 20390 | 002 | S00280 Dr. James M. McCullough Science Policy Research Division Legislative Reference Service Library of Congress Washington, DC 20540 | 001 |
| S00091 Dr. Paul C. Fletcher Code 2000 Naval Ocean Systems Center San Diego, CA 92152 | 001 | S00180 Off of the Deputy Chief of Staff Research Dev. & Acquisition Attn: Dana-Arz-D Dept of the Army Washington, DC 20310 | 002 | S00291 Dr. R. C. Drew Executive Office of President Office of Science and Technology Policy Washington, DC 20500 | 001 |
| S00092 AF/RDQLR-W AF/RDQLR Liaison Officer 1700 Main Street Santa Monica, CA 90406 | 001 | S00190 Bradley F. Bennett Universities Research Association 2100 Pennsylvania Ave. Rm 828 Washington, DC 20037 | 002 | S00300 Library Code 2620 Naval Research Laboratory Washington, DC 20375 | 005 |
| S00100 Library U.S. Naval Postgraduate School Monterey, CA 93940 | 001 | S00200 Navy Satellite Comm Program Coordinator OP 541P2/986C Office of Chief of Naval Ops Washington, DC 20350 | 001 | S00310 Dr. Lynwood Randolph NASA HQ OAST CODE RR Washington, DC 20546 | 001 |
| S00110 Commanding Officer Office of Naval Research Branch Office 1030 East Green Street Pasadena, CA 91106 | 003 | S00210 Chief of Naval Material Department of the Navy Washington, DC 20360 | 002 | S00320 Mr. Phillip Yeager Committee on Science & Astronautics House of Representatives Washington, DC 20515 | 001 |
| S00112 General Reference Library Millikan Memorial Library 1-32 California Inst. of Technology Pasadena, CA 91125 | 001 | S00220 Commander Naval Electronic Systems Command Naval Electronic Systems Command Headquarters Washington, DC 20360 | 002 | | |

79 02 05 089

| | | | | | |
|-----------------------------------|-----|-----------------------------------|-----|----------------------------------|-----|
| S00330 | 001 | S00430 | 001 | S00550 | 002 |
| Mr. William S. Aiken, Jr. | | Commanding Officer | | Commander | |
| Dir. Advanced Supersonic | | Office of Naval Research | | ERADCOM Tech Support Directorate | |
| Tech. Hypersonic Research | | Branch Office | | Technical Library Division | |
| Code RT NASA Headquarters | | Bldg 114, Section D, ATTN: TIO | | ATTN: DELSD-L | |
| Washington, DC 20546 | | 666 Summer Street | | Fort Monmouth, NJ 07703 | |
| | | Boston, MA 02210 | | | |
| S00340 | 004 | S00440 | 001 | S00560 | 002 |
| National Science Foundation | | U.S. Army Natick Laboratories | | Technical Information Office | |
| Attn: Librarian | | Attn. Technical Library | | European Office of Aerospace | |
| 1951 Constitution Avenue | | Natick, MA 01760 | | Research | |
| Washington, DC 20550 | | | | Box 14 | |
| | | | | FPO Local 09510 | |
| S00350 | 001 | S00450 | 002 | S00580 | 001 |
| Nicholas Wade | | Dir. Fogarty International Center | | Navy Liaison Unit, Munich | |
| Science | | National Institute of Health | | APC Local 09108 | |
| 1515 Mass. Ave. N.W. | | NIH Bldg. 31 Room B2C02 | | | |
| Washington, DC 20005 | | Bethesda, MD 20014 | | | |
| S00360 | 001 | S00460 | 002 | S00590 | 001 |
| Office of the Assistant | | Naval Ship Research & | | Dr. Edward Proctor | |
| Secretary of the Navy | | Development | | American Embassy | |
| Research & Development | | Carderock Library Branch | | Box 40 | |
| The Pentagon | | Code 5641 | | FPO LOCAL 09510 | |
| Washington, DC 20350 | | Bethesda, MD 20034 | | | |
| S00361 | 001 | S00462 | 001 | S00591 | 001 |
| Richard G. Katz NFRS | | Arthur L. Robinson | | Dr. John Granger | |
| NTNL Fire Prevention & Control | | Research News | | American Embassy | |
| US Dept of Commerce | | Amer. Assoc. for Adv. of Science | | Box 40 | |
| PO Box 19518 | | 1515 Massachusetts Ave. NW | | FPO LOCAL 09510 | |
| Washington, DC 20036 | | Washington, DC 20005 | | | |
| S00370 | 001 | S00480 | 001 | S00600 | 002 |
| Dr. Bodo Bartocha | | Commanding Officer | | U.S. Army Research and | |
| Office of International Programs | | Edgewood Arsenal | | Standardization Group Europe | |
| National Science Foundation | | Technical Support Directorate | | Box 15 | |
| Washington, DC 20550 | | Attn. SMUEA-TSTI-L | | FPO Local 09510 | |
| | | Edgewood Arsenal, MD 21010 | | | |
| S00390 | 001 | S00481 | 001 | S00610 | 001 |
| RDT&E Plans Div. OP-987 | | CAPT V. R. Milano, USN | | Office of Naval Research | |
| Office of CNO | | 4009 Clagett Rd. | | New York Area Office | |
| Rm 4B525 Pentagon | | Hyattsville, MD 20782 | | 715 Broadway | |
| Washington, DC 20350 | | | | New York, NY 10003 | |
| S00400 | 007 | S00500 | 002 | S00611 | 001 |
| Research & Documentation Division | | Commanding General | | K. W. Scott | |
| USA Foreign Science & Tech. Cen | | US Army Tank-Automotive Comd. | | Research Division | |
| Department of the Army | | Attn: AMDTA-UL Research Library | | The Goodyear Tire & Rubber Co. | |
| Munitions Building | | Warren, MI 48090 | | 142 Goodyear Blvd. | |
| Charlottesville, VA 22201 | | | | Akron, OH 44316 | |
| S00420 | 001 | S00520 | 002 | S00630 | 002 |
| Office of Naval Research | | Technical Library | | FTD NIIR | |
| Branch Office, Chicago | | U.S. Army Research Office | | WP AFB, OH 45433 | |
| 536 South Clark St. | | Durham Box CM | | | |
| Chicago, IL 60605 | | Duke Station, NC 27706 | | S00631 | 001 |
| | | | | ASD/FTD/ETID Area B | |
| S00421 | 001 | S00540 | 002 | Wright-Patterson AFB, OH 45433 | |
| Commanding Officer | | Commanding General | | | |
| Naval Ordnance Station (MDS25) | | U.S. Army Ordnance | | S00640 | 001 |
| Attn: Mr. T. A. Peake | | USAARDC | | CDR James A. Reed, USN | |
| Louisville, KY 40214 | | Samuel Feltman Laboratories | | East Stroudsburg State College | |
| | | Dover, NJ 07801 | | East Stroudsburg, PA 18301 | |

| | | | |
|-----------------------------------|-----|-----------------------------------|-----|
| S00650 | 001 | S00761 | 001 |
| Mark Sigismund Code EPM | | 7602 Air Intelligence Group/Inda | |
| Defense Indust Suppy Center | | Fort Belvoir, VA 22060 | |
| 700 Robbins Ave. | | | |
| Philadelphia, PA 19111 | | | |
| | | S00770 | 008 |
| | | Director | |
| S00670 | 002 | Ballistic Research Laboratory | |
| USAF School of Aerospace Medicine | | Aberdeen Proving Ground, MD 21005 | |
| Aeromedical Library | | | |
| Brooks AFB, TX 78235 | | | |
| | | | |
| S00680 | 001 | | |
| Mr. Paul D. Maycock | | | |
| 2401 Childs Lane | | | |
| Alexandria, VA 22308 | | | |
| | | | |
| S00690 | 001 | | |
| HQ US Army Material Command | | | |
| Attn: AMXCD-TL | | | |
| 5001 Eisenhower Avenue | | | |
| Alexandria, VA 22304 | | | |
| | | | |
| S00700 | 012 | | |
| Defense Documentation Center | | | |
| Cameron Station | | | |
| Alexandria, VA 23314 | | | |
| | | | |
| S00710 | 003 | | |
| Mr. R. Imus | | | |
| Code 102DI | | | |
| Office of Naval Research | | | |
| Arlington, VA 22217 | | | |
| | | | |
| S00711 | 001 | | |
| Dr. J.H. Schulman | | | |
| Code 100B | | | |
| Office of Naval Research | | | |
| Arlington, VA 22217 | | | |
| | | | |
| S00720 | 001 | | |
| Dr. M.A. Bertin | | | |
| Code 103C | | | |
| Office of Naval Research | | | |
| Arlington, VA 22217 | | | |
| | | | |
| S00730 | 001 | | |
| Dr. Leroy S. Fletcher | | | |
| Mechanical Engineering Dept. | | | |
| University of Virginia | | | |
| Charlottesville, VA 22901 | | | |
| | | | |
| S00740 | 001 | | |
| J. E. Scott, Jr. Dir. | | | |
| Project Squid Aerospace Engrn. | | | |
| Sch. of Engrn. & Applied Sci. | | | |
| University of Virginia | | | |
| Charlottesville, VA 22904 | | | |
| | | | |
| S00760 | 002 | | |
| Headquarters | | | |
| U.S. Army Transportation Res Com | | | |
| Transportation Corps | | | |
| Attn. Research Reference Center | | | |
| Fort Eustis, VA 23604 | | | |