

CHAPTER VIII IN RETROSPECT

At the opening of this **History** with the creation of Huntsville Division for the SENTINEL mission in 1967, the observation was made that the unit was a unique formation born out of unprecedented need in the deployment of a nationwide BMD system. No other Corps division had been mobilized for a single task; no other division had its wide geographic responsibility; no other division had to plan, execute, and manage a procurement like the GFP program for the BMD mission. Though the Division is now nine years old and the BMD mission had largely come and gone, the organization retain its legacy of uniqueness within the Corps of Engineers. Several post-BMD missions have underscored the fact that the Division's record of achievement in specialized engineering and procurement tasks has made it a valuable asset to the Corps, the Army, and the nation.

As this **History** has recounted, the Division was specifically chartered to engineer and construct facilities for the nation's first and only BMD deployment. Although two years have now passed since completion, deactivation, and dismantling of the Grand Forks sites and five years have elapsed since the SALT I Treaty effectively terminated BMD deployment, a definitive judgment about the performance of the facilities must remain speculative. The criteria for the buildings are still confidential for security reasons, and because of this secrecy, it is presently impossible for the layman to accurately assess just how successfully the criteria delineated by SAFSCOM were met. In any case, the abandonment of deployment in the wake of the ABM Treaty makes the question largely academic in 1977.

What can be said with certainty is that as a military engineering mission, SENTINEL (and later, SAFEGUARD) qualifies as one of the most demanding feats in the history of the U.S. Army. It is the belief of this author that leaving questions of its wisdom or worth aside, it will eventually be judged one of the boldest engineering endeavors of all time. In stringency of design parameters, the BMD system should be put into the same category as the MANHATTAN¹ Project or the space program that culminated in the 1969 Apollo XI moon landing. The starkly simple geometric forms that now rise above the wheat fields of North Dakota belie the solution of not one or two but many complex, often conflicting, engineering requirements for hardening and habitability under the most extreme conditions of nuclear holocaust. That the design was done at all is impressive; it becomes little short of amazing when the

high pressures of scheduling and funding prevailing in 1968 and 1969 are considered. The same might be said of the contracting and construction under the largest single contract awarded up to that time by the Corps of Engineers. Though there will never be any testimonial inscriptions emplaced there, the Grand Forks SAFEGUARD buildings stand as their own silent witness to American ingenuity in general and the engineering and constructional ability of the Corps and its contractors in particular.

As has been seen, the Army's BMD program was first the victim of public controversy, then of arms limitation talks which cut short the deployment and ultimately abolished it altogether. Before this transpired, however, another singular factor materialized out of the BMD program. This was the decision for maximum standardization among and between facilities, and the subsequent procurement of large quantities of standard items through GFP procedures. From FY 1969 through FY 1974 the Division awarded 130 contracts for tactical support equipment, support of the SAFEGUARD Central Training Facility, and for repair parts and consumable items. These contracts totalled approximately \$62.5 million; the total would have been many times greater had the program not been prematurely terminated. Without speculating on the exact amount that might have been saved, it can be said that the SAFEGUARD experience demonstrated the workability of the GFP concept, would have resulted in some cost reductions, and would have permitted the deployment to continue smoothly on its tight schedule. For these reasons, the SAFEGUARD GFP procurement was historic to the Corps; it was historic to Huntsville Division because it created the team expertise that later brought the assignment to the Postal and Saudi Arabian GFP procurement missions.

In retrospect, it appears that the most important ingredient in the Division's success in the BMD program was the unusually experienced staff attracted to the SENTINEL program at its inception. Each of the three crucial task areas--engineering, construction, and procurement--was led by highly qualified and seasoned experts who were able to execute the jobs laid before them with exceptional proficiency. Other areas of the Division such as the Office of Counsel also benefited from the experience of the men attracted to them. One notable result of this highly qualified staff was that the Division was able to begin functioning on its mission assignment almost immediately after mobilization and was able to become administratively

independent within six months, despite the turmoil of starting up, a transfer to Huntsville, and explosive growth in personnel. Conversely, it is a matter of great importance for the Division's future to recruit new personnel that will sustain the expert community assembled early in the SENTINEL era.

None of the missions following SAFEGUARD have been as spectacular as the high-priority BMD program, and none has left tangible monuments comparable to the SAFEGUARD buildings. Instead, the evidence of Huntsville Division's role in these missions is more subtle and less susceptible to historical evaluation. In the Postal mission, for example, the Division's participation revolved about the preparation and administration of GFP contracts. Perhaps the best testament to Huntsville Division in this mission was a savings to the USPS of about \$35 million out of initial estimates of \$200 million needed for the Bulk Mail Center equipment. In the Postal mission, as with SAFEGUARD, the Division's successful GFP program did much to ensure that the buildings were completed on time, enabling the USPS to maximize economies arising from new facilities.

A valid historical judgment on Huntsville's four most recent assignments is virtually impossible since none of these missions is complete. Some brief comments, however, on two missions may be in order. The Division entered the MPBSCP at a time when that program was experiencing travail from its complexity and ambitious scope. After introducing three years of central supervision by Huntsville Division and other corrective measures, it may be said that the MPBSCP is progressing satisfactorily and is on the way to successful completion. The crucial milestone reporting system maintained by the Division is now operational, enabling the MPBME Project Manager, DARCOM, and the Department of the Army to make more certain decisions about project priorities and to extract maximum returns from funding for the dozens of existing or anticipated projects. Only the Division's next historian, however, will have the long-range perspective to analyze the savings resulting from improved central management. To fully assess the role of Huntsville Division in the MPBSCP, he will also have to examine the evolution, application, and efficacy of suppressive shielding, pollution abatement, seismic disturbance protection, and other facilities technology currently being developed or considered for the program.

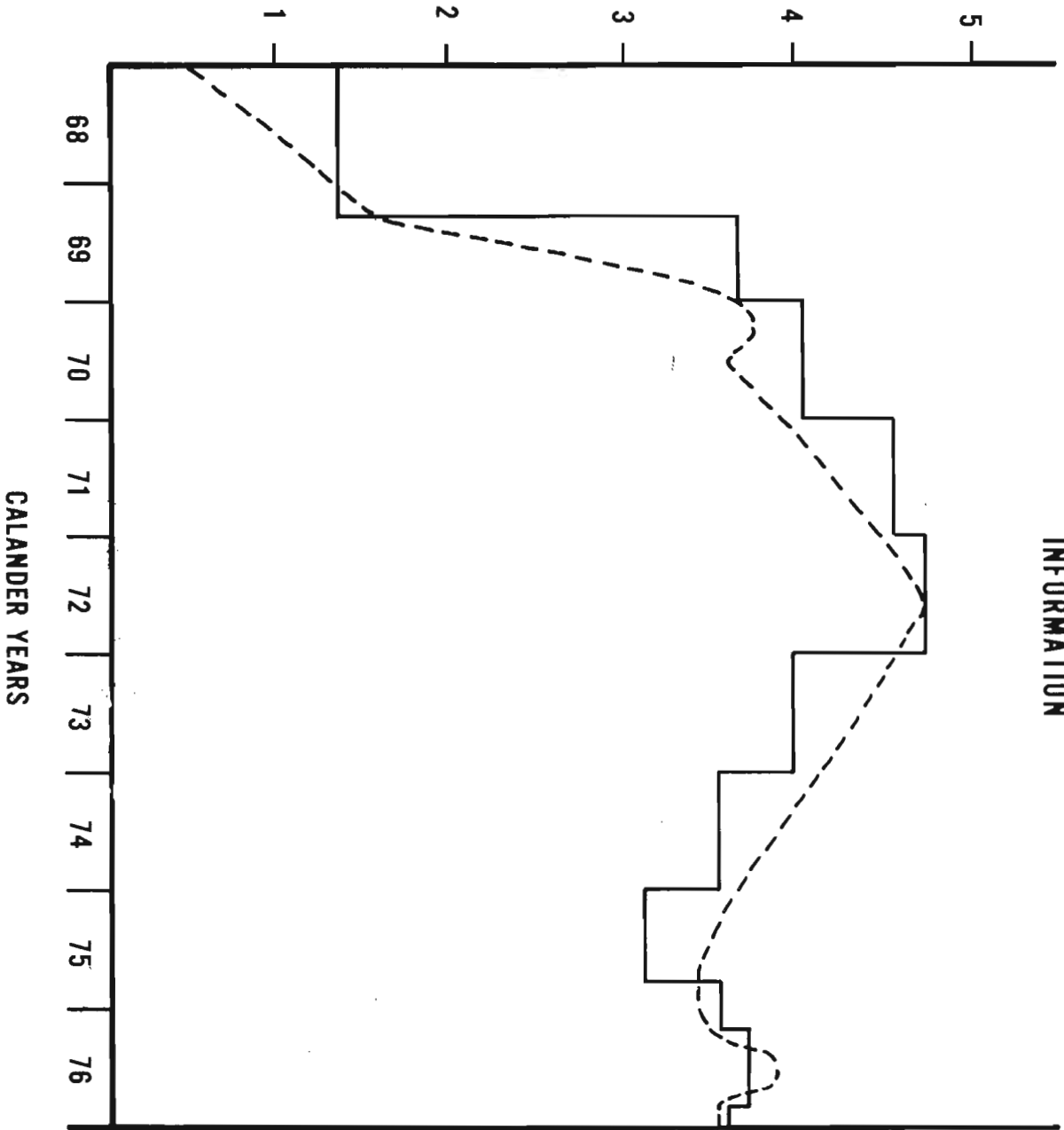
During the next several decades of American history, the Saudi Arabian GFP support mission may well become Huntsville Division's largest mission to date, both in dollar value and in terms of influence on

the national course. The Kingdom of Saudi Arabia presently occupies an unusually sensitive place in world affairs, and American influence there may prove to be a decisive factor in preserving the West's petroleum supply as well as encouraging peace and stability in a major world trouble spot. Scarcely ever has the Corps of Engineers had a greater or more crucial opportunity to represent the United States than in this desert kingdom. In retrospect, it is an ironic but sanguine train of events that in nine years has led Huntsville Division from building BMD systems to nation-building through the offering of American knowhow and goods, also in the interests of peace and the betterment of human conditions.

APPENDIX I

NUMBER OF PERSONNEL (HUNDREDS)

HUNTSVILLE DIVISION
MANPOWER MANAGEMENT
INFORMATION



— AUTHORIZED
- - - ACTUAL

BIBLIOGRAPHY

The sources used in the preparation of this essay naturally represent only a small fraction of those bearing on the subjects therein. The Huntsville Division has been in existence a scant ten years, and this fact presents the would-be historian with both a blessing and a curse. The author has found that unlike most other conventional history projects, almost every document bearing on the Division's history could be had in original or copy form. This survival even includes the most miniscule detail of contract records, many of which had been retired to the Redstone Arsenal Record Holding Area (RHA) but few of which had been destroyed. It was theoretically possible, therefore, for the author to examine the life history of virtually any contract awarded by the Division since its mobilization. Recourse to this level of detail, however, was necessitated for only a few minor points.

The modernity of the Division's foundation has also resulted in accessibility to many of the men who made the history recorded on these pages. Working from an office located on Division premises, the author was able to continuously question the Division's staff and to discuss with it the programs described herein. In virtually every case except SENTINEL and SAFEGUARD, the author was able to interview the project managers or engineers responsible for the decisions taken. Unfortunately, by 1977 the march of time had almost eliminated the original engineering staff responsible for SENTINEL and SAFEGUARD. These personal interviews have resulted in a rich fund of information made all the richer by reviews, suggestions, and comments on preliminary drafts.

The Division has also made some effort to systematically record its history. Two such efforts have come to light, both of which have been indispensable. The "History of the Office of Counsel" was put together by Roy Denney, Chief of Contracts and Claims, Office of Counsel, during the years 1967 through 1972. During these years, Denney reviewed events and documents and prepared a semi-annual or annual summary running to several dozen pages. The organization was by topical headings, and the whole was thoroughly indexed in the table of contents. In addition to a textual summary, selected documents were chosen for inclusion in separate volumes of exhibits. These exhibits provided a vast body of primary documents, some of which, of course, were duplicated elsewhere but without the convenience of reference to be found with the "History" listings. The ensemble of text and documents were reviewed and

approved each year by the Division's General Counsel, Emil Vuch, and a typescript was prepared by Marie McGahee. The focus of the "History of the Office of Counsel" is naturally a legal one, but references may be found there to almost every significant Division activity during the years covered. Unfortunately, the "History" was discontinued after 1973. The future historians of the Division will be the worse for it.

The "History of the Grand Forks Area Office" also represents a treasure of information about the operations of the Grand Forks Area Office from opening in November 1969 to closing in June 1975. In physical form, it is a three-inch thick ring-bound typescript, of which an unknown number of copies exist. Entries were made day-by-day in diary or chronicle form by Miss Jean Bailey, Program Analyst in the Grand Forks Area Office. In the course of a telephone conversation with Miss Bailey early in 1978, the author learned that the "History of the Grand Forks Area Office" was prepared from newspaper clippings, weekly area office reports, and contact with the area office staff. The fundamental value of this collection is the vast quantity of firsthand information therein; much of it is infused with an earthy human interest flavor brought by Miss Bailey's diligent attention to events not directly related to the construction.

The Public Affairs Office has contributed heavily to this essay in the form of its annual "Historical Summaries" and the "Information Bulletin." The "Historical Summary" was an annual publication prepared by the Public Affairs Officer for the years 1968-1975. The "Historical Summary" was discontinued in 1976, but the raw material for 1976 is presently on file in the Public Affairs Office and data from it has also been utilized. Each issue of the "Historical Summary" comprises two volumes, a "Narrative" and a collection of documents exhibits. The narrative volumes take the form of a day-by-day-chronicle of important events with entries between one line and several pages in length. The "Documents" volume represents a more heterogenous collection of excerpts from the "Information Bulletin," copies of important messages or letters, tables of Divisional organization, data charts, and most importantly, a "Contractual Activities" section containing important facts about each contract awarded or modified during the fiscal year.

The Division's "Information Bulletin" is a small, two-to-four-page in-house news sheet prepared at irregular intervals by the Public Affairs Officer since

1968. A great deal of the material in its article has been derived directly from statements and data contributed by Division employees. It is, therefore, a worthwhile source of newsworthy happenings. Brief vita of Division staff may also be found in earlier issues. The "Command Information Fact Sheet" was a short-lived photographic information sheet issued twelve times during the heyday of SAFEGUARD construction to publicize the doings at Grand Forks and Malmstrom among Division employees. The "HND Liaison Bulletin" was an even more abortive (three issues) effort at communication among SENTINEL elements during 1968.

In addition to the above sources, the author has benefited greatly from a voluminous collection of news clippings maintained by the Public Affairs Officers during the SENTINEL and SAFEGUARD programs. Of a similar nature is a bulky scrapbook of news clippings maintained by the Boston Area Office during 1967-1969 and forwarded to the Huntsville Division after closure of the office. Each of these collections encompasses articles from newspapers great and small in the regions around Boston and the North Dakota sites. Because of these news clipping

collections, the author has not had to have recourse to a systematic newspaper search. The nature of the Division's programs has also obviated the necessity of a wide serials publication search. The BMD programs remain largely in the domain of secrecy to this day, while programs such as the munitions program, ERDA program, and Postal Bulk Mail Centers program have received little, if any, serious exposure in national magazines. Copies of articles found in files or referred to by employees have been examined and cited where desirable.

The reader should observe that all materials utilized for this study are unclassified. The author made no attempt to secure a security clearance knowing that the information obtained thereby would have to remain confidential. In the case of the SENTINEL and SAFEGUARD programs, some details of the facilities or weapon systems are still classified. The unavoidable result had been a certain ambiguity, imprecision, and perhaps even contradiction in places. In general, however, the author also believes that the description presented is the most comprehensive unclassified account of the BMD construction yet published.

I. ARCHIVAL AND FILE MATERIALS

One eight-inch thick scrapbook of newspaper clippings maintained by the Boston SENTINEL Area Office during the period Sept. 1968 through March 1969. Includes national reports on SENTINEL System as a political issue. This scrapbook is now in the possession of the Public Affairs Office, USAEDH. Citations have been made to individual newspapers rather than to the scrapbook.

Four boxes of mounted unbound newspaper clippings dealing with the Grand Forks and Malmstrom SAFEGUARD sites and the SAFEGUARD program as a national issue, 1969 through 1975. Two of the cartons only have Redstone Arsenal Records Holding Area (RHA) designations: RHA 304 1/2 and 305 2/2.

Four boxes of Grand Forks SAFEGUARD contract records:
RHA 1506 1/34 Chris Berg, Inc.
RHA 1511 6/34 Woerfel Corporation and Town Realty
RHA 1520 15/34 Woerfel Corporation and Town Realty
RHA 1401 4/85 Morrison-Knudsen & Associates

One ringbound notebook containing copies of the AE Contracts Records File maintained by R.L. Phillips, AE Contracts Section, USAEDH-ED. This notebook contains complete financial record of amounts and modifications of each AE contract let by the Division, 1967-1976.

Division Engineer File 1501-07, Munitions Production Base. Executive Office, USAEDH.

Public Affairs Office, "Historical Summary FY 1976" and "Historical Summary FY 1977" raw input data files.

USAEDH-Procurement and Supply Division (PS), Post Support Mission File.

ERDA Liaison Office Working File: Clean Boiler Fuel Demonstration Plant (CBFDP), Pipeline Gas Demonstration Plant (PGDP), and Fuel Gas Demonstration Plant (FGDP). ERDA Liaison Office, USAEDH.

NASA Project Descriptions File maintained by William Major, Project Management Branch, USAEDH—ED.

Jordanian Armor Rebuild Facility Working File maintained by Henry O. Everitt, Project Management Branch. USAEDH-ED.

Command Inspection Reports for Huntsville Division:

Command Inspection, U.S. Army Engineer Division, Huntsville, 28-29 May 1969

Command Inspection, U.S. Army Engineer Division, Huntsville, 24-26 February 1971.

Command Inspection, U.S. Army Engineer Division, Huntsville 9-13 July 1972.

Command Inspection, U.S. Army Engineer Division, Huntsville, 16-18 January 1974.

Command Inspection, U.S. Army Engineer Division, Huntsville, 28-30 July 1975.

II. ORAL HISTORY SOURCES

The following individual supplied magnetic recordings for the preparation of this essay:

Col. John Lillibridge (USA, Ret.), Grand Forks SAFEGUARD Area Engineer, provided the author with a ninety minute magnetic recording of his experiences at Grand Forks, North Dakota.

The following individuals were orally interviewed one or more times in the course of preparation:

Ray Aldridge, Chief, Planning and Control Branch, Procurement and Supply Division, USAEDH.

Thor S. Anderson, Chief, Procurement and Supply Division, USAEDH (1967-1976)

George Barter, Jr., Project Manager for ERDA and MPBME Acid Plants, Project Management Branch, Engineering Division, USAEDH.

Phil H. Bradley, Liaison Officer, ERDA Fossil Energy Office, USAEDH.

Leo Carden, Project Engineer, ERDA Coal Conversion, Project Management Branch, Engineering Division, USAEDH.

Gerald D. Dupree, Chief, Management Analysis Branch, Office of the Comptroller, USAEDH.

Kenneth A. Edmundson, Project Engineer for MPBME Propellants and Explosives, Project Management Branch, Engineering Division, USAEDH.

Roy E. Edwards, Contract Specialist, Planning and Control Branch, Procurement and Supply Division, USAEDH.

Henry O. Everitt, Project Engineer, Jordanian Armor Rebuild Facility, Project Management Branch, Engineering Division, USAEDH.

Russell C. Hellier, Project Engineer, ERDA Coal Conversion, Project Management Branch, Engineering Division, USAEDH.

J.A. Henderson, Chief, Planning and Analysis Office, USAEDH.

Dale King, Network and Analysis Branch, Construction Division, USAEDH.

William L. Little, Chief, Engineering Division, USAEDH.

William Major, Project Management Branch, Engineering Division, USAEDH.

Carl Manley, Project Management Branch, Engineering Division, USAEDH.

Walter Petersen, Chief, Mechanical-Electrical Branch, Engineering Division, USAEDH.

Sam Presson, Project Management Branch, Engineering Division, USAEDH.

R.L. Phillips, Chief, AE Contracts Section, Engineering Division, USAEDH.

James Reynolds, Contract Specialist, Procurement and Supply Division, USAEDH.

Dewey Rhodes, Manpower Management Officer, Personnel Office, USAEDH.

Ned Rizzardi, Technical Services and Surveillance Branch, Construction Division, USAEDH.

Stephen V. Rhohr, former Labor Relations Officer, USAEDH.

Robert K. Sawyer, Chief, Project Management Branch, Engineering Division, USAEDH.

B.G. Scott, Chief, Requirements Branch, Procurement and Supply Division, USAEDH.

Ray Segelhorst, Project Management Branch, Engineering Division, USAEDH.

George G. Stewart, Public Affairs Officer, USAEDH.

Emil Vuch, General Counsel, USAEDH, 1967-1976.

Clyde C. Wright, Mechanical-Electrical Branch, Engineering Division, USAEDH.

III. USAEDH Publications

- USAEDH-DB (Planning & Analysis Office). "Planning & Design Status Report: Production Base Support Projects." 30 September 1976, 4 February 1977.
- USAEDH-ED (Engineering Divisions). "Anti-Ballistic Missile Engineering Criteria Manual for Tactical Site Selection." USAEDH, Huntsville, Alabama, November 1967. 60 pp. Typescript with drawings.
- USAEDH-GF (Grand Forks SAFEGUARD Area Office). "History of the Grand Forks Area Office." USAEDH Grand Forks Area Office, Langdon, North Dakota, 1975. Typescript, Irregular pagination.
- USAEDH-OC (Office of Counsel). "History of the Office of Counsel." USAEDH, Huntsville, Alabama. "First Year" plus five numbered Supplements, October 1968 - October 1972. 362 Exhibits in separate volumes.
- USAEDH-PAO (Public Affairs Office). "Command Information Fact Sheet for Employees." USAEDH, Huntsville, Alabama. 12 issues, June 1970 - October 1972.
- USAEDH-PAO (Public Affairs Office). "Government Furnished Property (GFP) After Action Report: Bulk Mail Postal Procurement Program, USPS Modernization Improvement Program." USAEDH, Huntsville, Alabama, April 1977.
- USAEDH-PAO (Public Affairs Office). "Government Furnished Property (GFP) After Action Report: SAFEGUARD Ballistic Missile Defense Program." USAEDH, Huntsville, Alabama, April 1977. 18 + (12) pp.
- USAEDH-PAO (Public Affairs Office). "Historical Summary." USAEDH, Huntsville, Alabama. 8 annual issues, FY 1968 through FY 1975. Vol. I, Narrative; Vol. II, Documents.
- USAEDH-PAO (Public Affairs Office). "HND Liaison Bulletin." USAEDH, Huntsville, Alabama. 3 issues: 22 July, 6 September, 28 October 1968.
- USAEDH-PAO (Public Affairs Office). "(HND) Information Bulletin." USAEDH, Huntsville, Alabama. Irregular serial. Vol. I, No. 1 (19 August 1968) to date.
- USAEDH-PAO (Public Affairs Office). "SAFEGUARD: A Step Toward Peace [title page reads "SAFEGUARD Ballistic Missile Defense System Facilities]." USAEDH, Huntsville, Alabama, n.d. (1974). 30 +V+A-1-A-37 pp. Typescript. Plates + illustrations.

IV. OTHER OFFICIAL PUBLICATIONS

A. OCE

- (OCE) Lavery, Dennis S., Phd. "The Postal Support Effort in the Corps of Engineers." n.p., 17 February 1976. Typescript.
- OCE. "Corps of Engineers NIKE—X Mobilization Plan." OCE, Washington, D.C., May 1967. 61 pp. Typescript.
- OCE. "Operations Manual for Munitions Production Base Support Construction Program (MPBSCP)." n.p., 13 September 1976.

B. SENSCOM-SAFSCOM-BMDSKOM

- SENSCOM. "NIKE-ZEUS & NIKE -X Development." n.p., n.d. [Huntsville, Alabama, 1968]. Typescript. 5 pp. extract from SENSCOM annual summary.
- SAFSCOM. "SAFEGUARD System Command Site Activation Program Status Report (SSCS-127): Grand Forks." Vol. II, Section I, No. 18. Huntsville, Alabama, 31 October 1974.
- SAFSCOM. "SAFEGUARD System Command Site Activation Program Status Report (SSCS-127): Malstrom." Vol. II, Section II, No. 5. Huntsville, Alabama, 31 January 1972.
- SAFSCOM. "Summary of the SENTINEL Program FY 68." n.p., n.d. [Huntsville, Alabama, 1968]. Typescript. Extract from SAFSCOM annual summary.
- SAFSCOM. "Summary of Program Progress Through FY 71." n.p., n.d. [Huntsville, Alabama, 1971]. Typescript. Extract from SAFSCOM annual summary.
- SAFSCOM. "Summary of Program Through FY 72." n.p., n.d. [Huntsville, Alabama, 1972]. Typescript. Extract from SAFSCOM annual summary.
- SAFSCOM. "Summary of SAFEGUARD Program, FY 73." n.p., n.d. [Huntsville, Alabama, 1973]. Typescript from SAFSCOM annual summary.

- BMDSCOM. **ABM Research and Development at Bell laboratories: Project History.** Western Electric Co., Whippany, New Jersey, October 1975.
- BMDSCOM. "Ballistic Missile Defense Program Summary, FY 74." n.p., n.d. [Huntsville, Alabama, 1974]. Typescript. Extract from BMDSCOM annual summary.
- BMDSCOM. "Summary of BMDSCOM Activities, FY 75." n.p., n.d. [Huntsville, Alabama, 1975]. Typescript. Extract from BMDSCOM annual summary.

C. MISCELLANEOUS

- Turnbull, W.J., and Hendron, A.J., Jr. "Missile Bases: Design and Construction Problems." CE Waterways Experiment Station Miscellaneous Paper No. S-68-27. USAEDH and USAE Waterways Experiment Station, December 1968.
- "Design Criteria: 105-mm Projectile Manufacturing Facility Modernization Project AMC 5762532." Prepared by Day & Zimmermann, Inc., plant contractor-operator, Texarkana, Texas, 1975.
- NASA. "National Aeronautics and Space Administration Space Shuttle Fact Sheet." n.p., October 1972.
- NASA. "Shuttle Construction Projects Data Book." Marshall Space Flight Center, Huntsville, Alabama, 30 April 1976.
- U.S. Army Audit Agency. "Report of Audit: Audit of the Army's Production Base Support Program." Audit Report: MW 73-62. n.p., 31 May 1973. 168 pp. Typescript.
- U.S. Army Engineer District Omaha, Nebraska. "U.S. Army SAFEGUARD System Command Community Impact Report Grand Forks Deployment Area." Omaha, Nebraska, April 1970.
- U.S. Army Engineer District Omaha, Nebraska. "U.S. Army SAFEGUARD System Command Community Impact Report Malmstrom Deployment Area." Omaha, Nebraska, July 1970.
- U.S. Army Materiel Command MPBME Project Manager's Office. "Munitions Production Base Twelve Year Modernization and Expansion Program." n.p. [Dover, New Jersey], 25 July 1973.
- U.S. Army Materiel Command MPBME Project Manager's Office. "Review and Command Assessment of the Munitions Production Base Modernization and Expansion (Recap)." n.p. [Dover, New Jersey], 11 September 1973; 18 December 1973; 25 April 1974; 19 September 1974; 29 January 1975; 8 April 1975; 29 July 1975; 9 March 1976; 17 August 1976; 16 November 1976.
- U.S. Army Materiel Command MPBME Project Manager's Office. "Annual Historical Review Fiscal Year 1977 (RCS: CSHIS-6)." Dover, New Jersey, 1 July 1978.
- U.S. Department of Defense News Release No. 868-67. "Address by Honorable Robert S. McNamara, Secretary of Defense Before United Press International Editors and Publishers, San Francisco, California, September 18, 1967."
- U.S. Department of Defense News Release No. 188-69. "Ballistic Missile Defense--History Fact Sheet (March 14, 1969)."
- U.S. General Accounting Office (Atlanta Regional Office). "Summary on Survey of the Mechanization Acquisition for the National Bulk Mail System (Code 22269)." February 1974.

V. GOVERNMENT DOCUMENTS

- U.S. **Congressional Record**, 1968-1969.
- U.S. Department of State. **United States Treaties and Other International Agreements**, Vol. XXIII, Pt. 4. "Limitation of Anti-Ballistic Missile Systems," TIAS No. 7503, 26 May 1972.
- U.S. House of Representatives. Briefing Before the Committee on Appropriations. **SENTINEL Anti-Ballistic Missile System**. 91st Cong., 1st Sess., 1969.
- U.S. House of Representatives. Hearings Before Subcommittees of the Committee on Appropriations. **SAFEGUARD Antibalistic Missile System**. 91st Cong., 1st Sess., 1969.
- U.S. House of Representatives. Hearings Before a Subcommittee of the Committee on Appropriations. **Department of Defense Appropriations for 1971**, Pt. I. 91st Congress, 2nd Sess., 1970.
- U.S. Senate. Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services. **Status of U.S. Strategic Power**. 90th cong., 2nd Sess., 1968.
- U.S. Senate. Preparedness Investigating Subcommittee of the Committee on Armed Services. **The United States Guided Missile Program**, prepared by Charles Donnelly. 86th Cong., 1st Sess., 1959.
- U.S. Senate. Hearings Before the Subcommittee of International Organization and Disarmament Affairs of

the Committee on Foreign Relations. **Strategic and Foreign Policy Implications of ABM Systems**, Pts. I, II and III. 91st Cong., 1st Sess., 1969.

VI. BOOKS

- Adams, Benson D. **Ballistic Missile Defense**. New York: American Elsevier, 1971.
- Fine, Lenore, and Remington, Jesse A. **The Corps of Engineers: Construction in the United States**. The United States Army in World War II: The Technical Services. Washington, D.C.: G.P.O., 1972.
- Irving, David. **Mare's Nest; the German Secret Weapons Campaign and Allied Countermeasures**. Boston: Little Brown, 1965.
- Klee, Ernst, and Merk, Otto. **The Birth of the Missile**. Trans. T. Schoeters. New York: Dutton, 1965.
- McGovern, James. **Crossbow and Overcast**. New York: W. Morrow, 1964.
- Newhouse, John. **Cold Dawn: the Story of SALT**. New York: Holt, Rinehart & Winston, 1973.

VII. ARTICLES

- Blunt, Thomas H., Sr. "Modernizing Our Munitions." **The National Defense**, Nov.-Dec. 1973, pp. 250-252.
- Covault, Craig. "Shuttle Engine Delays Overcome." **Aviation Week & Space Technology**, CV, No. 1 (5 July 1976), pp. 43-49.
- Covault, Craig. "Space Shuttle Engine Testing Delayed." **Aviation Week & Technology**, CIII, No. 14 (6 October 1975), 50-53.
- Fink, Donald E. "Orbiter 101 in Final Systems Check." **Aviation Week & Space Technology**, CV, No. 13 (27 September 1976), pp. 14-16.
- Garrett, Lee S., and Brewington, Percy. "The AE's Role in the Safeguard System." **Consulting Engineer**, Nov. 1972.
- Garwin, Richard L., and Bethe, Hans. "Anti-Ballistic Missile Systems." **Scientific American**, CCVIII, No. 3 (March 1968), pp. 21-31.
- Lewis, Frank D., and Stewart, George G. "The Corps and the Space Shuttle Program." **The Engineer**, VI, No. 3 (July-Aug.-Sept. 1976), pp. 28-31.
- London, Michael, "Safeguard: Is There A Choice?" **Space/Aeronautics**, November 1969, pp. 48-55.
- "MPBME Goals and Operations." **News from AMC-PM-PSM**, I, No. 6 (July 1975).
- Rathjens, George. "The Dynamics of the Arms Race." **Scientific American**, CCXX, No. 4 (April 1969), pp. 15-25.
- "Saudi Assignment Appreciated Abroad More than at Home." **Engineering News and Report**, 17 February 1977, pp. 28-38
- "Saudi Cast \$7-Billion City on Empty Desert Site." **Engineering News Report**, 13 July 1978, pp. 24-26.
- York, Herbert F. "Military Technology and National Security." **Scientific American**, CCXXI, No. 2 (August 1969), pp. 17-29.

ABBREVIATIONS AND ACRONYMS

- AAP - Army Ammunition Plant
ABM - AntiBallistic Missile
ABMDA - Advanced Ballistic Missile Defense Agency
ADP - Automatic Data Processing
AE - Architect-Engineer
AFB - Air Force Base
AMC - U.S. Army Materiel Command (Became DARCOM, 1976)
ARADCOM - U.S. Army Air Defense Command
ARMCOM - U.S. Army Armaments Command
BMC - Bulk Mail Center (USPS)
BMD - Ballistic Missile Defense
BMDATC - Ballistic Missile Defense Advanced Technology Center (Huntsville, Ala.)

BMDO - Ballistic Missile Defense Organization (Huntsville, Ala.)
 BMDOA - Ballistic Missile Defense Operations Activity (Colorado Springs, Col.)
 BMDSCOM - Ballistic Missile Defense System Command (Huntsville, Ala.)
 BOD - Beneficial Occupancy Date
 BTL - Bell Telephone Laboratories
 CAMBL - Continuous Automated Multi-Base Line (for MPBME)
 CBU - Cluster Bomb Unit
 CE - Corps of Engineers
 CENXD - Corps of Engineers NIKE-X Division
 CEPSCO - Corps of Engineers Postal Support Construction Office (at OCE, became DPC)
 CERL - Corps of Engineers Construction Engineering Research Laboratory
 CISC - Construction Industry Stabilization Committee (Nixon Administration)
 COCO - Contractor-owned, contractor-operated (AAP)
 COR - Contracting Officer's Representative
 DARCOM - U.S. Army Development and Readiness Command (formerly AMC)
 DCAS - Defense Contract Administration Services
 DDM - Design Deficiency Memorandum
 DEMOD - Deployment Model (SENTINEL and SAFEGUARD BMD Systems)
 DPC - Directorate of Postal Construction (superceded CEPSCO at OCE)
 ECI - Engineer Contracting Instructions
 EEO - Equal Employment Opportunity
 ER - Engineering Regulation
 ERDA - Energy Research and Development Administration
 FCUSA - Finance Center, U.S. Army (superceded by U.S. Army Finance and Accounting Center, USAFAC)
 FEAT - Field Engineering Assistance Team (at SAFEGUARD Grand Forks, 1970)
 FEC - Federal Electric Corporation
 FMCS - Federal Mediation and Conciliation Service
 GE - General Electric Company
 GFP - Government Furnished Property (sometimes found as GFE)
 GOGO - Government Owned, Government Operated (AAP)
 HMX - High Melting Explosive
 HND - Huntsville Division
 ICBM - Inter-Continental Ballistic Missile
 IFB - Invitation For Bids
 IRBM - Intermediate Range Ballistic Missile
 LAP - Load, Assemble, and Pack (AAP)
 LH² - Liquid Hydrogen
 LOX - Liquid Oxygen
 MAF - Michoud Assembly Facility (Chalmette, Louisiana)
 MAP - U.S. Army Military Assistance Program
 MAR - Multifunction Acquisition Radar (NIKE-X System)
 MCA - Military Construction Appropriation, Military Construction Authorization
 MIRV - Multiple Independently Targeted Vehicle
 M-KA - Morrison-Knudsen & Associates (joint venture contractor, Grand Forks SAFEGUARD)
 MPBME - Munitions Production Base Modernization and Expansion
 MPBSCP - Munitions Production Base Support Construction Program
 MPTA - Main Propulsion Test Article (NASA)
 MSCB - Missile Site Control Building (official SAFEGUARD designation for MSR)
 MSFC - Marshall Space Flight Center (Huntsville, Ala.)

MSR - Missile Site Radar (SENTINEL and SAFEGUARD System)
 MTF - Mississippi Test Facility (NASA, superceded by NSTL)
 MTR - Missile Track Radar (NIKE-ZEUS System)
 NASA - National Aeronautics and Space Administration
 NEMP - Nuclear Electromagnetic Pulse
 NSTL - National Space Technology Laboratory (Bay St. Louis, Mississippi, formerly MTF)
 OCE - Office of the Chief of Engineers (Washington, DC)
 PAA - Procurement of Ammunition, Army
 PAR - Perimeter Acquisition Radar (SENTINEL and SAFEGUARD Systems)
 PARB - Perimeter Acquisition Radar Building (SENTINEL and SAFEGUARD Systems)
 P&E - Propellant and Explosive (AAP)
 PEMA - Procurement of Equipment and Missiles, Army
 PEP - Plant Equipment Package (for MPBSCP)
 PKS&A - Peter Kiewit Sons' Company & Associates (joint venture contractor, Malmstrom AFB SAFEGUARD)
 PMC - Preferential Mail Facility (USPS)
 PS&ER - Production Support & Equipment Replacement
 RCA - Radio Corporation of America
 R&D - Research and Development
 RDX - Research Department Explosive
 RFI - Radio Frequency Interference
 RFP - Request For Proposal
 RFTP - Request For Technical Proposal
 RLOB - Remote Launch Operations Building (for SAFEGUARD RLS's)
 RLS - Remote Launch Site (SENTINEL, SAFEGUARD SPRINT ABM installation)
 SAC - Sulfuric Acid Concentrator
 SAFCMD - U.S. Army SAFEGUARD Command (Nekoma, North Dakota)
 SAFLOG - U.S. Army SAFEGUARD Logistics Command (Huntsville, Ala.)
 SAFSCOM - U.S. Army SAFEGUARD System Command (Huntsville, Ala.)
 SAFSM - U.S. Army SAFEGUARD System Manager (Huntsville, Ala.)
 SAFSO - U.S. Army SAFEGUARD System Organization
 SALT - Strategic Arms Limitations Talks
 SCAMP - Small Calibre Ammunition Production (for MPBSCP)
 SENLOG - U.S. Army SENTINEL System Logistics Command (Huntsville, Ala.)
 SENSCOM - U.S. Army SENTINEL System Command (Huntsville, Ala.)
 SENSM - U.S. Army SENTINEL System Manager (Huntsville, Ala.)
 SENSO - U.S. Army SENTINEL System Organization
 SLBM - Submarine Launched Ballistic Missile
 SRB - Solid Rocket Booster (NASA)
 SSME - Space Shuttle Main Engine (NASA)
 TDY - Temporary Duty
 TIC - Target Intercept Computer (NIKE-ZEUS System)
 TNT - TriNitroToluene explosive
 TTR - Target Track Radar (NIKE-ZEUS System)
 USAEDH - U.S. Army Engineer Division, Huntsville
 USC - United States Code
 USPS - United States Postal Service
 V-1, V-2 - **Vergeltungswaffe** ("revenge weapon") -1, -2
 WECO - Western Electric Company
 WSC - Weapon System Contractor
 ZAR - ZEUS Acquisition Radar (NIKE-ZEUS System)

