

DTIC FILE COPY

(2)



DTIC  
ELECTE  
DEC 21 1988  
S H

AD-A201 504

AN HISTORICAL ANALYSIS OF THE EFFECTS  
OF MANPOWER LEVELS ON UNITED STATES  
AIR FORCE CIVIL ENGINEERING  
WARFIGHTING CAPABILITY IN THE  
UNITED KINGDOM

THESIS

Manfred W. Puscher  
Captain, USAF  
AFIT/GEM/LSR/88S-14

DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY  
**AIR FORCE INSTITUTE OF TECHNOLOGY**

Wright-Patterson Air Force Base, Ohio

**DISTRIBUTION STATEMENT A**

Approved for public release;  
Distribution Unlimited

88 12 20 003

AFIT/GEM/LSR/88S-14

AN HISTORICAL ANALYSIS OF THE EFFECTS  
OF MANPOWER LEVELS ON UNITED STATES  
AIR FORCE CIVIL ENGINEERING  
WARFIGHTING CAPABILITY IN THE  
UNITED KINGDOM

THESIS

Manfred W. Puscher  
Captain, USAF  
AFIT/GEM/LSR/88S-14

DTIC  
ELECTE  
DEC 21 1988

H

Q

Approved for public release; distribution unlimited

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.

AFIT/GEM/LSR/88S-14

AN HISTORICAL ANALYSIS OF THE EFFECTS OF MANPOWER LEVELS  
ON  
UNITED STATES AIR FORCE CIVIL ENGINEERING  
WARFIGHTING CAPABILITY IN THE UNITED KINGDOM

THESIS

Presented to the Faculty of the School of Systems and Logistics  
of the Air Force Institute of Technology  
Air University  
In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Engineering Management

Manfred W. Puscher, B.S.  
Captain, USAF

September 1988

Approved for public release: distribution unlimited

## Preface

This historical analysis of Air Force Civil Engineering (AFCE) development in the United Kingdom (UK) identifies the sources and impacts of the AFCE manning levels the UK. The research includes standard military histories of WW-II in Europe, unit histories of US military civil engineering (CE) forces, end of tour reports from wing commanders, interviews, and questionnaires. Secondary materials trace the political trends that influenced AFCE development in the UK. Findings are presented in five chapters:

- 1) Introduction and Methodology; 2) WW-II Years (1942-1946); 3) Rebuilding Years (1948-1962); 4) AFCE Organizational Development (1962 to the Present); and
- 5) Summary, Lessons Learned, and Conclusions and Recommendations.

This research indicates that the objective of AFCE manning decisions in the UK was to reduce costs. To compensate for the limited AFCE manning, UK civilian CE organizations perform peacetime USAF base facility maintenance and repair. The ability of UK civilians, however, to maintain essential facilities and services to sustain air operations during wartime or emergency situations is untested. AFCE manning levels, therefore, place USAF contingency operations at risk in the UK.



|         |                                     |
|---------|-------------------------------------|
| ion For |                                     |
| GRA&I   | <input checked="" type="checkbox"/> |
| AB      | <input type="checkbox"/>            |
| anced   | <input type="checkbox"/>            |
| ocation |                                     |

|                    |                      |
|--------------------|----------------------|
| Distribution/      |                      |
| Availability Codes |                      |
| Dist               | Avail and/or Special |
| A-1                |                      |

Four actions could reduce this risk: 1) integrate UK civilian and USAF military CE managers; 2) increase UK civilian participation and training in AFCE wartime operations, 3) assign more military AFCE craftsmen to the UK, and 4) integrate UK civilian and USAF military workcenters.

### Chronology of Significant Events

|      |        |                                                                                       |
|------|--------|---------------------------------------------------------------------------------------|
| 1942 | Jan    | ARCADIA Conference established AAF airfield requirements in the UK.                   |
|      | Apr    | AAF advance planning team arrived in the UK.                                          |
|      | Apr    | Joint Organization and Maintenance (US) S.D. 348 Air Ministry Agreement written.      |
|      | Jun 9  | First US Army Aviation Engineer Battalion (EAB) arrived in the UK.                    |
|      | Jun 13 | US Army Supply of Services (SOS) activated in the UK.                                 |
| 1943 | Jan    | Casablanca Conference delayed cross-channel invasion until 1944.                      |
|      | Mar 23 | AAF assets diverted from UK to support Operation TORCH.                               |
| 1945 | Sep    | Standard Operating Procedures for Eighth Air Force Engineers published.               |
| 1946 | Jan    | Tedder-Spaatz Agreement to lengthen runways on 4 airfields in the UK to accept B-29s. |
|      |        | All US forces departed the UK.                                                        |
| 1948 | Mar 17 | Berlin Blockade started.                                                              |
|      | Jun 27 | B-29s approved for entry into the UK.                                                 |
|      | Jul 16 | HQ 3AD established.                                                                   |
| 1949 | Jan 4  | Initial Facility Maintenance Agreement signed for USAF airfields in the UK.           |
|      | Apr 9  | US joins NATO.                                                                        |
|      | Sep 23 | Soviets successfully explode atomic bomb.                                             |
| 1950 | Apr    | Ambassadors Agreement signed.                                                         |

|      |        |                                                                                          |
|------|--------|------------------------------------------------------------------------------------------|
| 1950 | Jun 5  | 928th Engineer Aviation Group placed under control of 3AD.                               |
|      | Jun 25 | Korean War starts.                                                                       |
| 1951 | Feb    | Special Construction Program formulated.                                                 |
|      | Mar 20 | HQ 7AD (SAC) activated in the UK.                                                        |
|      | May 16 | 3AF and 7AD sign Joint Transfer Agreement.                                               |
|      | Jul 1  | US-UK Cost Sharing Arrangement signed.                                                   |
| 1957 | Mar    | EABs depart the UK.                                                                      |
|      | May 16 | "Big Shuffle" Program reductions in the UK.                                              |
| 1960 |        | Operation control of UK base level AFCE organizations transferred to HQ 17AF in Germany. |
| 1962 |        | Preventative Maintenance (PM) program started in the UK.                                 |
|      | Sep    | 60-day AFCE base level reduction test began at RAF Bentwaters and RAF Lakenheath.        |
| 1963 | Apr 1  | Air Ministry of Public Works changed to Ministry of Public Buildings and Works.          |
|      | Apr    | "Third Rally" reorganization of HQ 3AF.                                                  |
|      | Jul 1  | 3AF base level AFCE reduction plan implemented.                                          |
| 1964 | Dec    | Control Center integration initiated.                                                    |
|      |        | RAF Bentwaters converted to F-4C.                                                        |
| 1965 | Jun 30 | Terminated A-B services at HQ 3AF.                                                       |
| 1965 | Jul    | 7AD deactivated.                                                                         |
|      |        | RAF Alconbury converted to RF-4C.                                                        |
|      |        | RAF Alconbury introduced "LEAN BEEF."                                                    |
| 1966 |        | France withdrew from NATO.                                                               |

|         |                                                                                                                                       |
|---------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1966    | Project "Mix Fix" military-civilian conversions started.                                                                              |
| 1968    | HQ 3AF reduction and relocation.<br>HQ 3AF/DE vacant.                                                                                 |
| 1969    | AFCE manpower standards established.                                                                                                  |
| 1970    | Ministry of Public Buildings and Works changed to Department of the Environment. Property Services Agency is base level organization. |
| 1973    | South Ruislip closed. HQ 3AF relocated to RAF Mildenhall.                                                                             |
| 1973-75 | Third PROBE test at RAF Bentwaters.                                                                                                   |
| 1975    | USAFER 85-3 published.                                                                                                                |
| 1977    | RAF Lakenheath converted to F-111F.                                                                                                   |
| 1978    | RAF Bentwaters converted to A-10.<br><br>Collocated Operating Base programming transferred to 3AF bases level AFCE units.             |
| 1979    | RED HORSE assigned to RAF Wethersfield.                                                                                               |
| 1980    | USAFER 85-3 revised.                                                                                                                  |
| 1982    | AFCE manpower standards developed for the UK.                                                                                         |
| 1983    | Control of 3AF Rapid Runway Repair (RRR) assets transferred to base level AFCE units.                                                 |
| 1984    | RRR becomes a pass/fail item for 3AF inspections by HQ USAFE.                                                                         |
| 1985    | HQ 3AF/DE re-established in the UK.                                                                                                   |

### Acknowledgements

Several individuals were instrumental in the completion of this thesis. First, I would like to thank Dr. Freda Stohrer, my thesis advisor, for the many hours she spent reviewing and commenting on my research. Her advice was instrumental in keeping on track and putting on paper what was so easy to verbalize. Next, I would like to thank Capt Carl Davis for his suggestions that helped me focus my research effort. My sincere thanks to them for their contributions to this thesis effort.

I would also like to thank the staff at the Air Force Historical Research Center at Maxwell AFB. Without their assistance I could never have obtained essential materials for my research.

I would also like to thank MGen Joseph A. Ahearn and BGen John R. Harty for taking out time from their busy schedule for an interview. Their comments were a significant contribution to this thesis.

Finally, I must thank my wife, Helena, for her patience and support during the many hours I neglected her working on this thesis.

Manfred W. Puscher

## Table of Contents

|                                                                                              | Page |
|----------------------------------------------------------------------------------------------|------|
| Preface . . . . .                                                                            | ii   |
| Chronology of Significant Events . . . . .                                                   | iv   |
| Acknowledgements . . . . .                                                                   | vii  |
| List of Figures . . . . .                                                                    | xiii |
| List of Tables . . . . .                                                                     | xiv  |
| Abstract . . . . .                                                                           | xv   |
| I. Introduction and Methodology . . . . .                                                    | 1    |
| Overview and Justification . . . . .                                                         | 1    |
| Specific Research Problem . . . . .                                                          | 4    |
| Justification for Historical Research . . . . .                                              | 5    |
| Procedure . . . . .                                                                          | 7    |
| Scope . . . . .                                                                              | 9    |
| Presentation . . . . .                                                                       | 9    |
| II. The WW-II Years (1942 - 1946) . . . . .                                                  | 12   |
| Air Force Organizational Development . . . . .                                               | 13   |
| Autonomy for the Army Air Force (AAF) . . . . .                                              | 13   |
| Establishment of AAF in the UK . . . . .                                                     | 14   |
| The US-UK Working Relationship . . . . .                                                     | 15   |
| Command and Control of AAF Engineering in the UK . . . . .                                   | 17   |
| Eighth Air Force Engineering Structure . . . . .                                             | 17   |
| Air Ministry Engineering Structure . . . . .                                                 | 19   |
| US Army Engineering Structure . . . . .                                                      | 21   |
| US-UK Installation Engineering Agreements . . . . .                                          | 25   |
| The Initial Agreement . . . . .                                                              | 26   |
| The Final Agreement . . . . .                                                                | 29   |
| AAF Construction in the UK . . . . .                                                         | 29   |
| Initial Requirements . . . . .                                                               | 29   |
| Aviation Engineer Battalions (EABs) . . . . .                                                | 32   |
| Reduced Requirements . . . . .                                                               | 34   |
| Increased Requirements . . . . .                                                             | 35   |
| General Aviation Engineering Problems Encountered in the UK During WW-II . . . . .           | 37   |
| Aviation Engineering Problems Encountered Due to Lack of Direct Control by the AAF . . . . . | 38   |

|                                                                    | Page |
|--------------------------------------------------------------------|------|
| Post WW-II Demobilization . . . . .                                | 39   |
| Reduction of Forces . . . . .                                      | 40   |
| Post WW-II Construction (Tedder-Spaatz Agreement) . . . . .        | 40   |
| III. Rebuilding Years (1948 - 1962) . . . . .                      | 42   |
| Early Post WW-II Developments . . . . .                            | 43   |
| An Independent Air Force . . . . .                                 | 43   |
| Political Factors . . . . .                                        | 45   |
| Return of the USAF to the UK . . . . .                             | 47   |
| The Berlin Blockade . . . . .                                      | 49   |
| Soviet Development of Nuclear Capability . . . . .                 | 52   |
| Ambassadors Agreement . . . . .                                    | 52   |
| NATO . . . . .                                                     | 54   |
| Korean War . . . . .                                               | 55   |
| Special Construction Program . . . . .                             | 56   |
| US-UK Airfield Maintenance Agreements . . . . .                    | 59   |
| Initial Facility Maintenance Agreement                             | 59   |
| First Modification . . . . .                                       | 60   |
| Second Modification . . . . .                                      | 60   |
| Construction . . . . .                                             | 62   |
| Facility Maintenance and Repair . . . . .                          | 62   |
| AFCE in the UK . . . . .                                           | 63   |
| HQ 3AF AFCE Organization . . . . .                                 | 65   |
| Major Problems for HQ 3AF AFCE . . . . .                           | 65   |
| Constantly Changing Airfield Requirements . . . . .                | 65   |
| Transferring Funds Between the USAF and the Air Ministry . . . . . | 66   |
| Standardizing Criteria . . . . .                                   | 68   |
| Resolving Conflicts Between Two USAF Major Commands . . . . .      | 69   |
| Losing Control Over Base Level AFCE Operations . . . . .           | 71   |
| HQ 3AF AFCE Improvements in Operations . . . . .                   | 72   |
| HQ 3AF AFCE Manning . . . . .                                      | 73   |
| Base Level AFCE Organization . . . . .                             | 74   |
| Base Level AFCE Problems . . . . .                                 | 75   |
| Army Engineer Battalions (EABs) . . . . .                          | 78   |
| Aviation Engineer Battalion (EAB) Manning . . . . .                | 79   |
| Aviation Engineer Battalion (EAB) Problems . . . . .               | 80   |

|                                                                     | Page |
|---------------------------------------------------------------------|------|
| IV. AFCE Organizational Development (1962 to the Present) . . . . . | 83   |
| AFCE Operations in the UK in 1962 . . . . .                         | 84   |
| HQ 3AF AFCE . . . . .                                               | 84   |
| Base Level AFCE . . . . .                                           | 85   |
| 3AF AFCE, 1962 to 1968 . . . . .                                    | 87   |
| Reduction of USAF Military Forces in the UK . . . . .               | 87   |
| HQ 3AF/DE Reductions . . . . .                                      | 88   |
| Base Level AFCE Reductions . . . . .                                | 89   |
| 3AF AFCE Manning Studies . . . . .                                  | 95   |
| HQ 3AF Manning Study . . . . .                                      | 95   |
| Base Level AFCE Manning Studies . . . . .                           | 96   |
| Increased AFCE Responsibilities in the UK . . . . .                 | 97   |
| NATO Programming . . . . .                                          | 97   |
| Withdrawal From France . . . . .                                    | 98   |
| Mission Changes . . . . .                                           | 99   |
| Effects on AFCE Operations, 1962 to 1968 . . . . .                  | 100  |
| Manpower Availability . . . . .                                     | 101  |
| Costs . . . . .                                                     | 102  |
| Responsiveness . . . . .                                            | 103  |
| Warfighting Capability . . . . .                                    | 105  |
| Initiatives to Improve Operations . . . . .                         | 106  |
| 3AF AFCE, 1968 to 1979 . . . . .                                    | 107  |
| HQ 3AF/DE Reduction (RED COSTE) . . . . .                           | 107  |
| Standardization of Base Level AFCE Operations . . . . .             | 109  |
| AFCE Manpower Standards . . . . .                                   | 109  |
| Third Personnel Requirements of Base Engineers (PROBE) . . . . .    | 110  |
| Increased Responsibility . . . . .                                  | 113  |
| Collocated Operating Base (COB) Programming . . . . .               | 114  |
| Mission Changes . . . . .                                           | 115  |
| Effects on AFCE Operations, 1968 to 1979 . . . . .                  | 115  |
| Costs . . . . .                                                     | 116  |
| Responsiveness . . . . .                                            | 117  |
| Warfighting Capability . . . . .                                    | 120  |
| Initiatives to Improve AFCE Operations . . . . .                    | 121  |
| 3AF AFCE, 1979 to the Present . . . . .                             | 122  |
| HQ 3AF AFCE Reorganization . . . . .                                | 122  |
| Introduction of AFCE Construction Forces . . . . .                  | 122  |
| HQ 3AF/DE Reestablished . . . . .                                   | 123  |
| Base Level AFCE Reorganization . . . . .                            | 124  |
| Base Level AFCE Manpower Study . . . . .                            | 125  |

|                                                                                                                      | Page |
|----------------------------------------------------------------------------------------------------------------------|------|
| AFCE Readiness in the UK . . . . .                                                                                   | 126  |
| Effects on AFCE Operations,<br>1979 to the Present . . . . .                                                         | 129  |
| Responsiveness . . . . .                                                                                             | 130  |
| Warfighting Capability . . . . .                                                                                     | 130  |
| Standards . . . . .                                                                                                  | 131  |
| AFCE Personnel Comments . . . . .                                                                                    | 133  |
| V. Summary, Lessons Learned, and Conclusions and<br>Recommendations . . . . .                                        | 138  |
| Summary of US-UK Civil Engineering<br>Relationship . . . . .                                                         | 140  |
| Lack of Unity of Command Over AFCE Operations<br>in the UK . . . . .                                                 | 142  |
| Peacetime Requirements . . . . .                                                                                     | 144  |
| Military Spending Decisions . . . . .                                                                                | 145  |
| AFCE Military Manning Decisions . . . . .                                                                            | 147  |
| Lessons Learned . . . . .                                                                                            | 147  |
| Conclusions and Recommendations . . . . .                                                                            | 150  |
| Appendix A: AAF Installations in the UK,<br>1942 and 1945 . . . . .                                                  | 154  |
| Appendix B: Air Ministry Method to Accomplish<br>AAF Installation Construction,<br>Maintenance, and Repair . . . . . | 157  |
| Appendix C: Standard Operating Procedure, Engineer<br>Section, Eighth Air Force . . . . .                            | 159  |
| Appendix D: Minor Maintenance and Minor Works<br>Services Arrangement on USAF<br>Installations in the UK . . . . .   | 165  |
| Appendix E: 3AF HQ AFCE Organization (1951, 1959,<br>and 1962) . . . . .                                             | 167  |
| Appendix F: 3AF Base Level AFCE Organization<br>(1962 to 1980) . . . . .                                             | 180  |
| Appendix G: Preventative Maintenance (PM) Scheme in<br>the UK . . . . .                                              | 185  |
| Appendix H: 3AF Base Level AFCE Reduction Test in<br>the UK . . . . .                                                | 190  |
| Appendix I: Third PROBE Organizational Description                                                                   | 192  |

|                                                                                                                       | Page |
|-----------------------------------------------------------------------------------------------------------------------|------|
| Appendix J: Maintenance of Real Property Facilities<br>in the United Kingdom (Excerpts from<br>USAFER 85-3) . . . . . | 203  |
| Appendix K: Comparison of AFCE Manpower Standard<br>Formulas . . . . .                                                | 215  |
| Appendix L: PSA Wartime Base Maintenance Support,<br>RAF Lakenheath . . . . .                                         | 218  |
| Appendix M: Opinions of AFCE Personnel Assigned<br>to the UK, 1988 . . . . .                                          | 223  |
| Bibliography . . . . .                                                                                                | 248  |
| Vita . . . . .                                                                                                        | 271  |

### List of Figures

| Figure                                                                                                                 | Page |
|------------------------------------------------------------------------------------------------------------------------|------|
| 1. AAF Organization Chart for Construction Under Section XLIII, Joint Organization and Maintenance Agreement . . . . . | 20   |
| 2. US Army Organization Chart for Airfield Construction in the UK . . . . .                                            | 22   |
| 3. Final AAF Engineering Organization Chart in the UK During WW-II . . . . .                                           | 24   |
| E-1. HQ 3AF AFCE Organization Chart, 1951 . . . . .                                                                    | 170  |
| E-2. HQ 3AF AFCE Organization Chart, 1959 . . . . .                                                                    | 171  |
| E-3. HQ 3AF AFCE Organization Chart, 1962 . . . . .                                                                    | 179  |
| F-1. 3AF Base Level AFCE Organization Chart, 1962 . . . . .                                                            | 182  |
| F-2. 3AF Base Level AFCE Organization Chart, 1980 . . . . .                                                            | 184  |
| I-1. AFCE-PSA Organization Chart Under Third PROBE . . . . .                                                           | 193  |
| J-1. PSA Base Level Organization Chart, 1980 . . . . .                                                                 | 205  |

List of Tables

| Table                                                                                        | Page |
|----------------------------------------------------------------------------------------------|------|
| 1. Aircraft and Personnel Requirements for the<br>Planned Cross-Channel Invasion, April 1943 | 30   |
| 2. AAF Requirements in the UK as of March 1943                                               | 33   |
| 3. Estimated Cost of Approved Projects on 3AF<br>Installations, Fiscal Year 1951 . . . . .   | 58   |
| 4. AFCE Scope of Work in the UK, 1951-1953 . .                                               | 66   |
| 5. NATO Programming for 3AF Installations,<br>1962-1966 . . . . .                            | 98   |
| 6. RAF Alconbury Work Request Analysis,<br>1962-1963 . . . . .                               | 105  |
| P-1. Average Manning of 3AF Base Level AFCE Units,<br>1962-1980 . . . . .                    | 181  |

Abstract

This analysis of Air Force Civil Engineering (AFCE) in the United Kingdom (UK) covers the development of AFCE during three periods: 1942 to 1946; 1948 to 1962; and 1962 to the present. Interwoven with the study of AFCE organizational changes are political trends and commanders' comments on AFCE operations in the UK. A questionnaire for AFCE officers assigned to 3AF bases in 1988 was used to further validate the findings derived from this research.

This research indicates that the primary objective of the AFCE organizational changes in the UK was to reduce costs. The consequent reductions in AFCE manning means that UK civilians are responsible for maintaining essential facilities and services to sustain air operations during peacetime and wartime or emergency situations. The limited AFCE manning levels, therefore, place USAF contingency operations at risk in the UK.

Four actions may reduce this risk: 1) integrate UK civilian and USAF military civil engineering (CE) managers; 2) increase UK civilian participation and training in AFCE wartime operations; 3) assign additional military AFCE craftsmen to the UK; and 4) integrate UK civilian and USAF military CE workcenters.

AN HISTORICAL ANALYSIS OF EFFECTS OF MANPOWER LEVELS  
ON UNITED STATES AIR FORCE CIVIL ENGINEERING WARFIGHTING  
CAPABILITY IN THE UNITED KINGDOM

I. Introduction and Methodology

Overview and Justification

Rapid recovery of an airfield following an attack is the primary wartime mission of all Air Force Civil Engineering (AFCE) military personnel. Specific wartime functions include:

- (1) Force Beddown - providing the minimum expedient facilities necessary for deploying units to become operational ready and survive an enemy attack (23:4).
- (2) Damage Assessment - the process of identifying and locating damage and unexploded ordinance, on the airfield and in buildings, following an enemy attack (23:8).
- (3) Rapid Runway Repair (RRR) - rapidly restoring airfield pavements to make launch and recovery of aircraft possible (23:18).
- (4) Expedient Repair - the least amount of immediate repair to damaged facilities, pavements, and utility systems to permit continued operation of the installation's primary mission (23:4).
- (5) Area Decontamination - the process of making an area safe (roads, grounds, buildings, facilities, or airfield pavements) by neutralizing or removing chemical or biological agents or radioactive material from the area (23:9).
- (6) Operating and Maintaining Facilities During Contingencies - maintenance and repair of real

property, operation of utilities, and provision for other services such as refuse collection and disposal, pest management and control, and snow removal (23:4).

Excluding firefighters, approximately 274 AFCE military personnel (11 officers and 268 enlisted) are required to accomplish these wartime functions on overseas airbases (23:27-33).

Without the wartime mission, the need for AFCE military forces would not exist (50:9). Therefore, during peacetime, the primary duty for all AFCE military forces should be to train "to be prepared to go to war" (34:3) so that an air base can continue to launch and recover aircraft in a hostile environment. A secondary responsibility for AFCE military forces, routine maintenance and repair of base facilities, airfield pavements, and utility systems, keeps the air base operational during peacetime (44:4). However, Lieutenant Colonel David M. Cannan points out in his US Army War College Study, Air Force Civil Engineering Wartime Training, that

the assigned wartime taskings of the Air Force's civil engineers bear little resemblance to their routine peacetime activities. Consequently . . . [AFCE personnell] have been uniquely dependent upon specialized training to prepare them for the kinds of work they will face in war. . . . [but] training for war must compete with daily customer demands. Most often, this struggle has always favored the peacetime routine to the detriment of combat readiness [7:2].

AFCE manning policies also influence the ability of AFCE units to train for war. The standard USAF practice is

to man AFCE units for their peacetime workload and augment overseas forces to perform wartime operations. As a result, AFCE military forces must train to be ready for war while being constrained by the peacetime maintenance and repair workload that drives base level manning (45).

Air Force Manpower Standards are used to calculate the number of personnel authorized to an AFCE organization to accomplish peacetime requirements (27:4, 45). The manpower standards authorize a typical AFCE unit approximately 100 to 250 non-firefighting military personnel to accomplish the AFCE peacetime mission. Under the Prime Base Engineer Emergency (BEEF) team concept, these same military personnel perform the peacetime maintenance and repair functions and the essential recovery mission during emergencies or wartime operations (24:6).

The conventional manpower standards do not apply to AFCE units in the United Kingdom (UK). A unique situation exists in the UK because the British civilian Property Services Agency (PSA) work force is responsible for most of the AFCE maintenance and repair tasks on United States Air Forces in Europe (USAFE) bases in the UK (25:1-6, 26:6). Therefore, approximately eighty percent of the non-firefighting AFCE military personnel assigned to a typical AFCE organization are replaced by PSA.

Arbitrary decisions set the initial AFCE manning levels in the UK significantly lower than levels applied elsewhere

in Europe (45). These decisions were based on a risk assessment of USAF bases in Germany and in the UK, and on the Congressional limits on the total number of US military personnel that could be stationed in Europe (35, 335:26). As a result, 30 to 40 non-firefighting AFCE military personnel are assigned to a typical USAFE airbase in the UK while AFCE units in Germany are assigned the typical 100 to 250 non-firefighting civil engineers.

These UK AFCE military personnel are the core for all AFCE readiness training on USAFE bases in the UK and are responsible for ensuring that all AFCE wartime functions can be performed by in-place manpower until additional forces arrive from the US. AFCE units in the UK must also rely on PSA to maintain the base and perform expedient repairs to facilities and utility systems during emergency operations. This reliance on PSA is "a compromise that puts at risk our [USAF] ability to turn sorties to meet the [USAF wartime commitment]" (1).

#### Specific Research Problem

The reduced level of manning in the UK raises an important question. Can the small cadre of AFCE personnel at USAFE installations in the UK perform their peacetime duties and still maintain adequate proficiency in tasks required for their wartime mission? In order to answer that question, I analyzed the effect of the AFCE manpower levels

in the UK to draw conclusions about the ability of AFCE units to perform their wartime mission.

An analysis of the historical background of a problem we may show us ways to overcome the problem. Therefore, to answer the primary question, I first analyzed the historical origins of the situation in the UK using the following questions:

1. Why was the USAF presence in the UK so important in WW-II and in the years following the end of the war?
2. How were the UK and US civil engineering forces integrated to accomplish the USAF buildup in WW-II and in the years following the end of the war?
3. What problems were encountered by civil engineering forces in the UK during the USAF buildup in WW-II and in the years following the end of the war?
4. How were AFCE manpower standards developed in the UK?
5. How did AFCE manning in the UK affect the ability of AFCE units to perform peacetime duties and train for their wartime duties?
6. What initiatives were taken to help AFCE units in the UK perform their peacetime and wartime training duties? Were they effective?

#### Justification for Historical Research

The Air Force Directorate of Engineering and Services, HQ USAF/LEE, is soliciting historical research in an effort to develop an AFCE doctrine. Lieutenant Colonel Floyd A. Ashdown's 1984 Air War College report, A History of the Warfighting Capability of Air Force Civil Engineering (3),

and a 1985 Air Force Institute of Technology (AFIT) Masters Thesis by Captains L. Dean Waggoner and M. Allen Moe, A History of Air Force Civil Engineering Wartime and Contingency Problems from 1941 to the Present (334), are two primary historical documents that have been written on the development of AFCE warfighting capability. To date, though, no historical documents exist for AFCE units in the UK. Without an analysis of the AFCE structure in the UK, no AFCE doctrine can consider the unique AFCE situation that exists in the UK. This thesis will be submitted to the Air Staff with the hope that it will support the formulation of AFCE doctrine with an account of AFCE operations in the UK. Historical research is used to achieve this objective because it "gives us a perspective that can do much to help us understand our present [situation] . . . [and to] help to establish a sound basis for future progress and improvement" (5:260). We can use this cause and effect analysis to help develop the present AFCE planning process. But historical analysis is also a never ending process, as Will and Ariel Durant point out, because conclusions that are drawn from past events are constantly altered "by the acceleration of change . . . [that] compels a fresh adjustment of behavior and ideas" (28:12).

The effects of past actions and decisions can be determined and these consequences should be analyzed when conducting historical research. But historical researchers

must guard against judging past actions and decisions outside the context in which they were made when using such hindsight because, as the Durants warn,

Our knowledge of any past event is always incomplete, probably inaccurate, beclouded by ambivalent evidence and biased historians, and perhaps distorted by our own patriotic or religious partisanship [28:11,12].

### Procedure

This research concentrates on AFCE units in the UK and documents the impact of the manpower levels on AFCE mission performance. Primary and secondary materials were used.

Materials from the AFIT School of Engineering and Systems and Logistics libraries at Wright-Patterson AFB were used to document the development of the US commitment to the North Atlantic Treaty Organization (NATO) and the political environment which led to the assignment of USAF forces in the UK.

The USAF Historical Research Center at Maxwell AFB, Alabama was the primary repository of supporting documents for the unit historical information and commander end of tour reports for this research effort. Unit histories of the following USAF installations in the UK provided the bulk of the background material: Royal Air Force (RAF) Alconbury, Bentwaters, Lakenheath, Mildenhall, Upper Heyford, Wethersfield, and the Headquarters Third Air Force Civil

Engineering Directorate. In addition, the US-UK Cost Sharing Arrangement was reviewed. This document established the financial arrangements for construction, maintenance, repair, and land acquisition of USAF airfields in the UK and outlined the duties and responsibilities for AFCE and the British work forces on airfields in the UK that are used by USAFE forces (26:8).

Questionnaires were sent to Base Civil Engineers and their staffs at RAF Alconbury, Bentwaters, Greenham Common, Lakenheath, Mildenhall, and Upper Heyford to document their attitudes about their ability to accomplish the AFCE wartime and peacetime missions in the UK.

Finally, interviews with the following individuals provided the viewpoint of top level management on the role of AFCE units in the UK:

MGen Joseph A. Ahearn, former HQ USAFE Deputy Chief of Staff, Engineering and Services.

BGen John R. Harty, HQ USAFE Deputy Chief of Staff, Engineering and Services.

Col Dennis Cocheo, former HQ 3AF Civil Engineer.

Col Dennis G. Zody, former USAFE Inspector General Civil Engineering Team Chief.

Mr. Andrew R. Jackson, Civil Engineering Manpower Consultant, Air Force Engineering and Services Center, Tyndall AFB, Florida.

## Scope

AFCE units in the UK are composed of seven branches: Administration, Engineering, Fire Protection, Housing, Operations, Readiness, and Financial Management. This thesis addresses the effect of AFCE manning levels and the US-UK working relationship on AFCE operations in Engineering, Operations, and Readiness for these reasons:

(1) AFCE Administration Branches in the UK are authorized fewer personnel than branches in AFCE organizations in Germany and reduces the overall AFCE manpower available for wartime recovery operations. However, problems that exist within this branch are universal to all AFCE organizations.

(2) Fire Protection and Housing Management functions are an AFCE only responsibility.

(3) Financial Management and Housing Management functions are predominately staffed civilians in all AFCE organization.

## Presentation

This thesis analyzes in four chapters whether AFCE organizations in the UK can perform their peacetime duties and still maintain adequate proficiency in their wartime tasking:

a. Chapter 2 covers the period from 1942 to 1946. A temporary US military presence was first established in the UK as a result of WW-II. But by the end of 1946, all the US military forces had left the UK. The Air Force was under the operational control the Army during this period, so AFCE units did not exist. Instead, US airfield construction, maintenance, and repair forces were composed of Army Aviation Engineers, the forerunners of AFCE forces.

b. Chapter 3 covers the period from 1948 to 1962. The USAF returned to the UK to counter the perceived Soviet threat in Europe. Headquarters Third Air Force (HQ 3AF) AFCE was tasked to coordinate all USAF airfield construction activity in the UK with the British government. Therefore, HQ 3AF AFCE dominated the AFCE growth and development in the UK during this period.

c. Chapter 4 covers the period from 1962 to the present. During this period, uniquely numbered AFCE units were established on USAF airfields in the UK while the HQ 3AF AFCE staff was reduced. An AFCE RRR training commitment was also undertaken when a Rapid Engineer Deployable, Heavy Operational Repair Squadron Engineering (RED HORSE) was assigned to RAF Wethersfield. A summary of opinions of AFCE personnel assigned to the UK in 1988 conclude this chapter.

d. The final chapter summarizes the development of the wartime capability of AFCE organizations in the UK and lists general observations made during this research of the AFCE

development in the UK. The chapter closes with conclusions and recommendations for improving the AFCE-PSA working relationship for peacetime operations and wartime preparedness in the UK.

## II. The WW-II Years (1942-1946)

During the first 12 months following the US entry into WW-II, the war generated a need for over 100 US airfields and support facilities in the UK, a nation "a little smaller in size than the state of Oregon" (2:2). By August 1942, the number of US airfield in the UK was 28, but by 1945, the number had grown to 170 (see Appendix A) (2:14, 15:619). The extraordinary demand and the method used to accomplish the construction successfully laid the foundation for all future construction, maintenance, and repair policies on USAF installations in the UK and for the present day US-UK AF civil engineering organizational structure.

This chapter discusses the years from 1942 to 1946. These five years cover the joint US-UK civil engineering effort required to construct the US airfields in the UK to support the Allied air war in Europe. It all started in 1942, the year that US Army Air Force (AAF) buildup began in the UK. The US presence in the UK was intended to be temporary, to last only until the end of hostilities. Therefore, by 1946, all AAF personnel had left the UK, ending the first chapter in the development of AFCE in the UK.

### Air Force Organizational Development

Although the AAF buildup began in 1942, events took place two years earlier which affected the growth and development of an independent AAF during WW-II.

Autonomy for the Army Air Force (AAF). A trend toward greater autonomy and expansion for the Air Force had already begun before the US entered WW-II (15:115). The special needs for airfield requirements planning and programming were recognized when an Air Engineer position was established in HQ AAF in 1940 (334:39). Two initiatives (one in 1941 and one in 1942) gave the AAF total control over flying units.

The first initiative converted the Army Air Corps into the more independent AAF (June 20, 1941). Lieutenant General Henry H. "Hap" Arnold was appointed Chief of the AAF, and became a Deputy Chief of Staff within the Army command structure (13:232, 15:260). The second initiative (March 9, 1942) grouped together functional areas into three separate commands under the Army Chief of Staff: Army Ground Forces to train and organize ground combat troops, Army Air Forces to equip and train air units, and Army Services Forces (ASF) to perform procurement, supply and general housekeeping services and provide the manpower for ground and air forces (15:264,265).

These initiatives affected what would become AFCE in very important ways. Control of flying units moved to the AAF. All US military construction responsibilities were retained by the Army. The Army, therefore, continued to assign, man, and train AAF construction forces throughout the war (55:25-37).

Establishment of AAF in the UK. European airfields had to be used by the AAF when the US entered WW-II because the Atlantic Ocean, while isolating the US from the European battlefields, also made it impossible for existing US aircraft to strike European targets from American bases (33:195). But by the time that the decision was made to concentrate on the defeat of Germany before focusing attention on the Pacific Theater, the UK was the only European combatant country that "had not been invaded or occupied or defeated" (56:123).

The requirement for US airfields in the UK was generated during ARCADIA, the first Allied wartime conference. President Roosevelt and Prime Minister Churchill decided that an expanded strategic bombing campaign against Germany would be the first major Allied offensive (15:237-248, 58:129).

Gen Arnold and his British counterpart, Air Chief Marshall (a rank equivalent to a US General Officer) Sir Charles Portal, estimated that 127 US airfields were needed

to support the ARCADIA plan. While some UK airfields were available for immediate use by the AAF, the vast majority had to be built. To do that, a joint US-UK construction effort was needed (15:631, 41:1).

The US-UK Working Relationship. The strong Anglo-American bond which existed when the US entered the war contributed to the success of the Allied air war in Europe. The mutual spirit of cooperation helped with the massive US airfield construction effort in the UK. More important, the working relationship that evolved as a result of the joint US-UK construction effort influenced all US-UK base maintenance agreements on US installations in the UK.

The British people received the AAF personnel with open arms when they arrived:

All England from the brass hats at Whitehall [equivalent to the U.S. Congress] down to the average man on the street, was touchingly grateful at least to have an ally actually on the scene - men they could see and talk to and who spoke the same language - not like the far away Russians. . . . Nothing was too good [for AAF personnel] . . . They were invited into British homes, offered free beer at pubs, [and were] kissed by the girls [58:141].

A willingness to convert the "beautiful Wycombe Abby School for girls, a sixty-acre park of historic buildings and elegant grounds" (58:142) to the Eighth Air Force Bomber Command Headquarters is another example of the existing UK commitment for total cooperation with the AAF.

AAF leaders also contributed to the development of an atmosphere of mutual cooperation. Brigadier General Ira C. Eaker, commander of the Eighth Air Force Bomber Command, encouraged AAF personnel under his command to develop strong interpersonal relationships with the local communities:

The mayor, the police chief and other leading citizens were invited to the American mess at PINETREE [the code name for Eighth Air Force Bomber Command Headquarters]. . . . he [Gen Eaker] urged his officers to take a gift of some kind if invited to British homes, pointing out that . . . a can of Del Monte fruit, easily available to the Americans, cost the British a month's coupon ration (58:153).

However, the AAF did not enjoy a similar spirit of cooperation with the US Army command structure in the UK. Major General James E. Chaney, commander of all US Armed Forces in the British Isles (USAFBI), fully supported the Army General Staff's pre WW-II views. These views held "that aviation was [only] useful as an observation facility . . . [and] saw no need in the big, long-range bomber" (58:108, 13:276) that was used during the strategic bombing campaign against Germany.

AAF leaders thought that Gen Chaney was a hindrance to the growth of the AAF in the UK, primarily because Chaney "was too short-sighted . . . [and] knew a lot of reasons why you couldn't do something, but too few reasons why you could" (58:159). But Gen Chaney also wanted total Army control over all Eighth Air Force activities, a desire that Gen Arnold considered totally unacceptable (13:272).

Fortunately for the AAF, Gen Chaney was replaced on June 11, 1942 by someone who supported independent AAF operations in the UK, Major General Dwight D. Eisenhower. The importance placed on the AAF role in the Allied air war was stressed in the instructions Gen Eisenhower received from General George C. Marshall, Army Chief of Staff:

[the plan was to] integrate all US air units in [the] UK into Eighth AF . . . [with a] broad objective . . . to attain air superiority over Western Continental Europe in preparation for future invasion of the Continent [8:21].

#### Command and Control of AAF Engineering in the UK

Although Gen Chaney was not able to establish Army control over the AAF flying units in the UK, AAF engineering forces in the UK continued to be affected by "the five year suppression of army air [forces] by the [Army] general staff from 1935-1940" (58:107). While the AAF attempted to achieve total control over all airfield engineering forces in the UK under Eighth Air Force, the Army succeeded in isolating the airfield planning process from the airfield construction, maintenance, and repair process.

Eighth Air Force Engineer Structure. Initially (from April to June 1942), all AAF engineering activities in the UK were under the Eighth Air Force Engineer's control: planning the construction, maintenance, and repair of

facility projects; programming the maintenance and repair activities on facilities; and directing and training of US military construction and maintenance forces in the UK. The AAF plan established the Eighth Air Force Engineer as the single point of contact with the Air Ministry for all AAF engineering activities in the UK.

The planning function was the first AAF engineering activity established in the UK as a small advanced team of engineers arrived in April 1942. Brigadier General D.A. Davidson, Chief Engineer, USAFBI, knew how important the planning effort was for the 127 US airfields to support the ARCADIA plan. At his request, Lieutenant Colonel R. E. Smyser, Chief of the Engineer Section, Air Force Combat Command, was sent to the UK to develop a joint US-UK airfield construction and maintenance plan with the Air Ministry (this organization is the British equivalent of the US Department of the Air Force) (26:6, 41:1).

When the Eighth Air Force Engineer Section was activated on April 23, 1942, Lt Col Smyser, as Chief, Eighth Air Force Engineer Airdrome Section, continued to carry the responsibility for all AAF requirements planning and programming in the UK (41:1).

The first Engineer Aviation Battalions (EABs) to arrive in the UK (on June 9) were temporarily assigned to Eighth Air Force Engineer (June 9 to June 13, 1942). Then, because of the initiatives already discussed, all EABs were

transferred to the Supply of Services (SOS) Command (on June 13, 1942). EABs, therefore, were effectively commanded by the Army (15:265, 41:2,4).

Air Ministry Engineering Structure. During the preplanning period (April to June 1942), Lt Col Smyser and the Air Ministry developed an joint AAF-Air Ministry engineering structure for operations in the UK (Figure 1). Key features of this joint structure included:

(1) Overall engineering policy decisions and negotiations were accomplished between the Chief Engineer, USAFBI and the Air Ministry.

(2) Major construction projects were coordinated between the British Director General of Works and the Eighth Air Force Engineer.

(3) Maintenance and repair issues were coordinated through the British Chief Engineer and the US Air Command Engineer.

(4) Maintenance and repair operations were accomplished by the British Clerk of Works in conjunction with the aviation engineers.

Col Smyser accepted this joint US-UK organizational structure for three primary reasons: it was modeled after the British system that existed and already worked in the UK; it was simple to understand; and all UK engineering



policy decisions were handled between the Eighth Air Force Engineer and the Air Ministry (41:1).

Work control under the joint AAF-Air Ministry structure was accomplished through a joint effort. The AAF military generated AAF airfield requirements. The Air Ministry performed the construction, maintenance, and repair to satisfy the AAF requirements (see Appendix A). This structure worked during the preplanning period (April to June 1942), but it was never tested after the SOS command was activated (June 13, 1942).

US Army Engineering Structure. The Army established its own engineering organizational structure when the SOS arrived on June 13, 1942 (Figure 2). The Army took control of all AAF engineering activities in the UK except requirements planning. In effect, the Army structure removed the Eighth Air Force Engineer from all airfield construction and maintenance activities on AAF airfields in the UK.

On June 13, 1942 the SOS Command was activated under Major General J. C. H. Lee and caused an immediate confrontation between the US and Air Ministry engineers. The Army structure was different than the structure used by the Air Ministry on RAF stations. But more important, the Army structure was different than the joint AAF-Air Ministry structure that Lt Col Smyser agreed to in May (41:2).

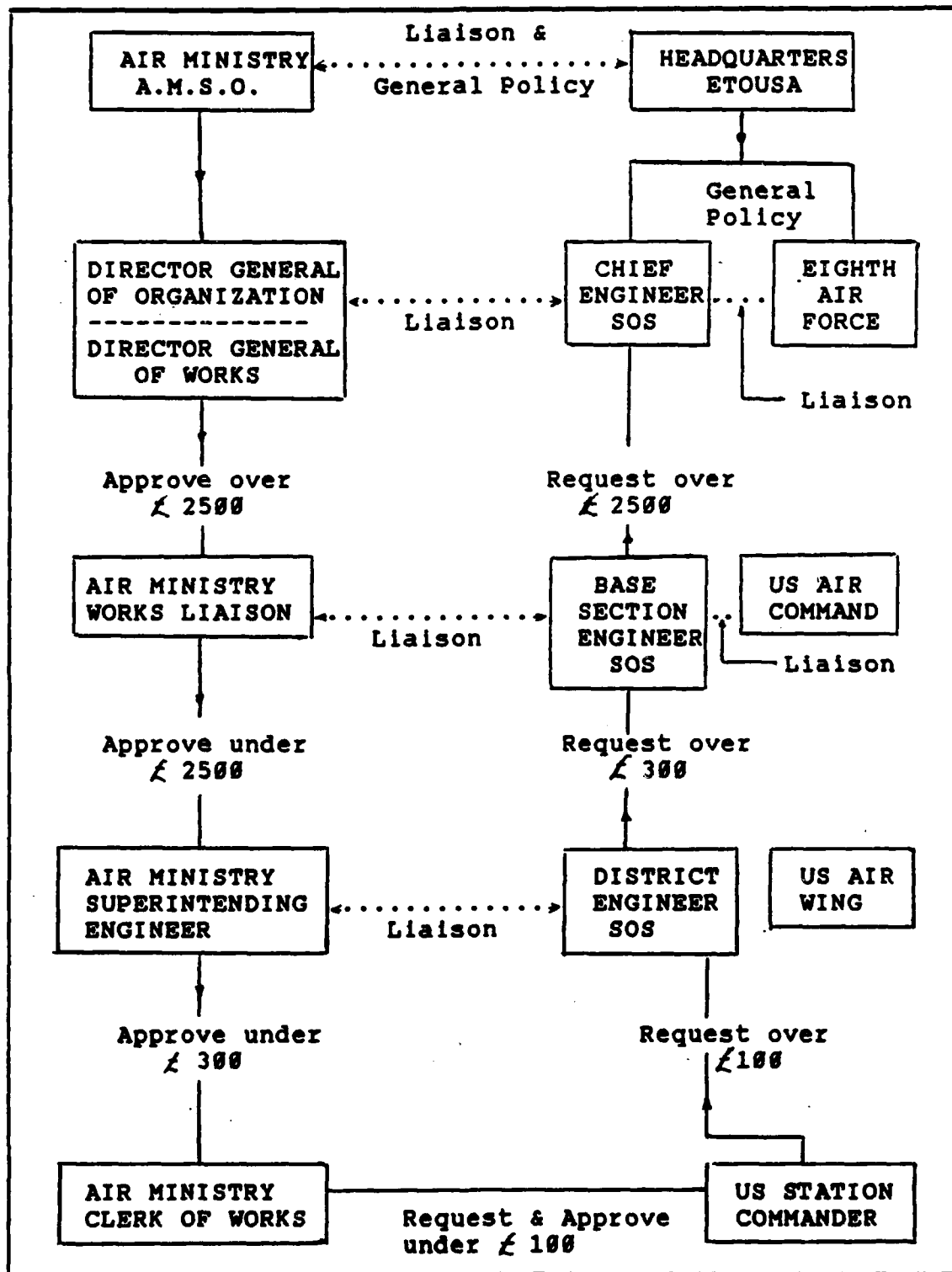


Figure 2. US Army Organization Chart for Airfield Construction in the UK (41).

Three actions were taken as soon as the SOS Command was activated in the UK (June 13, 1942). These actions reinforced the Army's determination not to lose more ground to AAF independence that occurred in 1941 and 1942. The Army, therefore, took control of all AAF engineering activities and reduced the effectiveness of the AAF engineering forces in the UK.

(1) All EABs in the UK were immediately transferred from Eighth Air Force to SOS. Although SOS control of EABs was intended to be a temporary measure, all aviation engineers were permanently transferred to SOS as soon as their units arrived in the UK (41:2).

(2) The Eighth Air Force Airdrome Section, the planning and programming activity for the Eighth Air Force Engineer, was transferred to the SOS Construction Division (41:2).

(3) The Eighth Air Force Engineer Section was eliminated and responsibilities were transferred to the Eighth Air Force Service Command (41:3).

Figure 3 illustrates the AAF engineering organizational chart after all the reorganizations were completed. The consequences of the realignment of AAF engineering functions in the UK were serious:

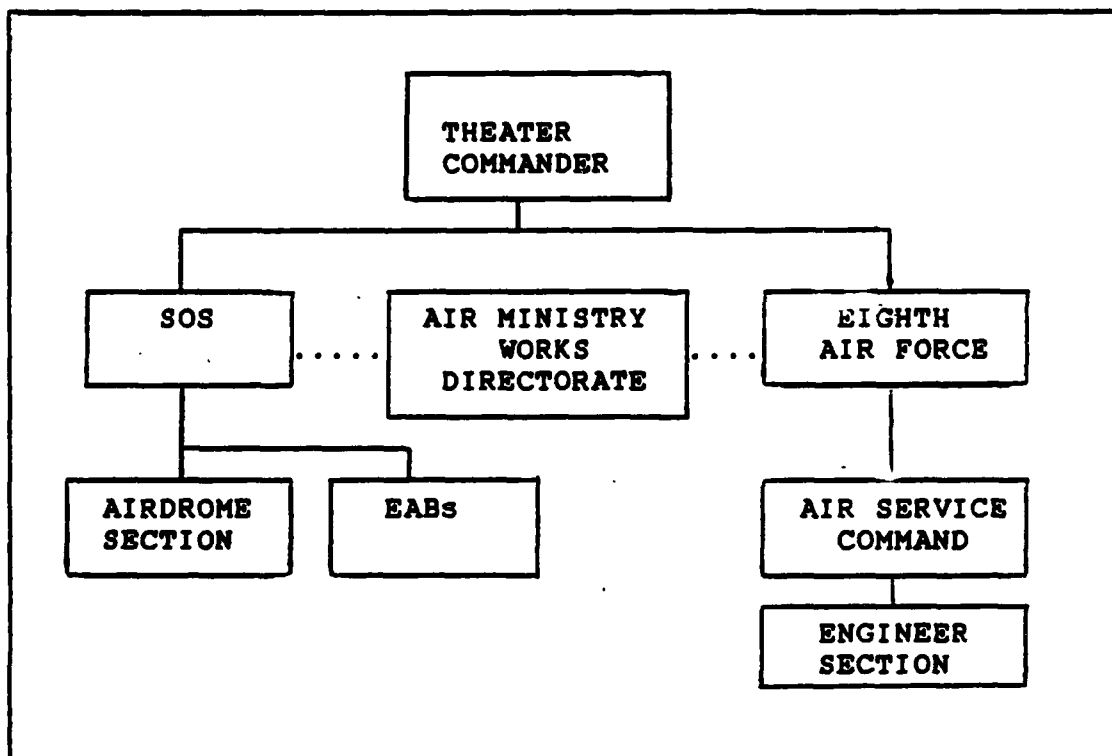


Figure 3. Final AAF Engineering Organization Chart in the UK During WW-II (15:583).

(1) Planners in the Eighth Air Force Service Command Engineer Section generated construction requirements but had no way of knowing the limitations on the availability of US manpower or materials to satisfy the requirements (41:3).

(2) Redirection of construction efforts to meet changing AAF priorities was more difficult (41:3).

(3) The additional echelon within the engineering organizational chain of command between the planners, Engineer Section, and the builders, EABs, delayed the construction start time. Requirements were identified by

Eighth Air Force, programmed by the Eighth Air Force Service Command Engineer Section, and planned by the SOS Construction Division before the requirements were received by the EABs (41:3).

(4) The Eighth Air Force Engineer could not direct SOS to increase the time allowed for wartime training of EABs. The time allocated for training, one hour per day, was inadequate to prepare EABs for the rapid construction and combat techniques needed after the D-Day invasion (334:40).

(5) How EABs were employed was beyond the control of Eighth Air Force Engineer. EABs were tasked to perform activities not related to their primary mission of airfield construction and maintenance. Jobs included building dams, roads, port facilities, oil storage systems, storage depots, bridges, and dams; loading and unloading cargo ships; and arming and refueling aircraft (334:40, 41, 50, 51).

(6) The influence of the Eighth Air Force Service Command Engineer Section over direct airfield construction or maintenance was reduced. Under the reorganization, this section became a staff function of the Commanding General of the Service Command (41:3).

#### US-UK Installation Engineering Agreements

An agreement for construction, maintenance, and repair on US installations in the UK was established shortly after Lt Col Smyser arrived in the UK. This joint US-UK agreement

provided a "solid foundation for Anglo-American co-operation" (15:629) and became the basis for all future US-UK civil engineering agreements. A testament of the thoroughness of the initial agreement was that no major revisions were necessary during the war and only minor modifications were made to the basic agreement for all future US-UK civil engineering agreements discussed in chapter 3 of this thesis.

The Initial Agreement. The initial US-UK agreement on construction, maintenance, and repair was spelled out in Section XLIII of the Joint Organization and Maintenance Agreement (US) S.D. 348 Air Ministry (41:1). Terms of the agreement included:

(1) The Air Ministry accepted full responsibility for all airfield construction in the UK as the sole UK construction agent (41:1). The Air Ministry used private civilian contractors under the Ministry's direct supervision and EABs under US military supervision to construct airfields (71:1).

(2) The Eighth Air Force Engineer coordinated all AAF requirements through the Air Ministry and was the liaison between the Air Ministry and Eighth Air Force on all construction, maintenance, and repair issues on US airfields in the UK (71:5). These functions were assumed, however,

by the Chief Engineer, SOS, when the reorganization of AAF engineering occurred in July 1942.

(3) The Air Ministry's generic RAF airfield design was the standard for all airfield construction in the UK. This standard design made it possible for the RAF to operate from US airfields in the UK when the AAF returned the airfields to the RAF (71:1).

The standard UK airfield had to be enlarged when the AAF in the UK grew to 4,000 aircraft and 185,000 officers by December 1943 and then doubled in size by June 1944 (58:155). In addition, because British airfields were normally constructed to accommodate either one or two RAF squadrons (16 to 32 aircraft), the standard airfield design was too small for an entire AAF bomber group of 32 to 52 aircraft (15:631, APPENDIX 1).

(4) RAF standards applied to all facility construction in the UK. These standards were accepted by the AAF in the wartime environment but were unacceptable in peacetime. Exceptions to the standards could be made to accommodate unique AAF operational needs or to eliminate requirements peculiar to the RAF that were not required by the AAF. However, all concessions had to be approved by the Air Ministry (15:632, 71:1,2).

(5) Expedient construction standards were used to provide an operational capability (41:1). Facilities were also designed for temporary use on installations in the UK.

The critical factor for all airfield construction in the UK was time. Providing essential services under such conditions resulted in the use of unskilled labor and poor grades of construction materials. Therefore, the construction practices and heavier than normal use of facilities during WW-II caused a rapid deterioration of facilities in the UK and increased the maintenance and repair effort when the USAF returned in 1948 (71:12).

(6) All real property on all airfields in the UK was owned by the British Government (15:632, 71:1).

(7) The Air Ministry provided all labor and materials for all airfield construction "without formal requisition or reimbursement" (41:2).

(8) The Air Ministry of Works Directorate performed all normal airfield maintenance and repair. But tasks unique to AAF operations, such as fire fighting and camouflage, were the sole responsibility of the AAF.

When the AAF took over operational control of an existing an RAF station, US engineers shared installation maintenance and repair responsibilities with the assigned British civil engineering staff. On those installations which the AAF only would use, the responsibilities for maintenance and repair were delegated entirely to EABs. In either case, an RAF Station Commander was assigned to the station to ensure RAF interests were protected and RAF construction standards used (2:4-6, 41:1-4, 71:2,16).

The Final Agreement. The initial US-UK agreement and the procedures used to construct and maintain US installations during WW-II were formalized when Standard Operating Procedures (SOP) were published by Eighth Air Force Service Command Engineer Section on September 25, 1945 (Appendix C). The SOP stated that

(1) The British Government would continue to assert complete ownership of all real property on all airfields in the UK.

(2) The British Government would accept full responsibility for "all capital expenditures on airfields constructed for or improved by [aviation engineers]" (2:4).

(3) The Utilities Officers, assigned to each AAF installation in the UK by HQ SOS, were the forerunners of the Base Civil Engineers. They were the "agents responsible for coordination of all construction and maintenance work in progress or anticipated on their respective stations" (71:14).

#### AAF Construction in the UK

Initial Requirements. Planning for the massive AAF buildup in the UK was a difficult task for the AAF engineers. Requirements were never constant. Changes in the Allied war strategy throughout 1942 and 1943 continually

increased and decreased the number of US aircraft and armed forces programmed into the UK (15:632).

The initial AAF requirements in the UK were based on a planned cross-channel invasion in April 1943, identified as operation BOLERO. The preplanning team (April to June 1942) worked with a US aircraft arrival schedule for 1942 that included: 589 heavy bombers; 1,744 medium bombers; 2,745 light bombers; 4,858 fighters; 482 observation aircraft; and 852 transport aircraft (15:248).

By the time that AAF aircraft started to arrive in June 1942, the number of US aircraft scheduled to arrive had changed. Table 1 summarizes the revised number of aircraft and personnel required.

Table 1. Aircraft and Personnel Requirements for the Planned Cross-Channel Invasion, April 1943 (15:651, APPENDIX 1).

| <u>A/C TYPE</u> | <u>GROUPS</u> | <u>A/C</u> | <u>OFFICERS</u> | <u>ENLISTED</u> | <u>TOTAL</u> |
|-----------------|---------------|------------|-----------------|-----------------|--------------|
| Heavy Bombers   | 21            | 641        | 3,188           | 19,236          | 22,344       |
| Medium Bombers  | 8             | 416        | 1,632           | 7,872           | 9,504        |
| Light Bombers   | 9             | 468        | 988             | 7,596           | 8,496        |
| Fighters        | 17            | 1,275      | 1,899           | 12,366          | 14,265       |
| Observation     | 6             | 458*       | 738*            | 3,788*          | 4,518*       |
| Transport       | 8             | 416*       | 888*            | 6,752*          | 7,552*       |
|                 | ==            | =====      | =====           | =====           | =====        |
| TOTALS          | 69            | 3,696      | 9,877           | 61,368          | 78,445       |

\* Estimated composition for group.

AAF planners had to use one set of numbers. The actual figures used to develop the overall construction requirements, therefore, were based on the reduction in the BOLERO buildup which evolved by July 1, 1942. Aircraft identified for Eighth Air Force were reduced to 43 groups (approximately 2,195 aircraft and 43,687 military personnel): 17 heavy, 18 medium, and 3 light bombardment groups (1,228 planes, 4,856 officers, and 27,944 enlisted) and 13 fighter groups (approximately 975 planes, 1,455 officers, and 9,432 enlisted) (15:653).

In April 1942, Lt Col Smyser's primary job was coordinating fluctuating AAF requirements between Eighth Air Force and the Air Ministry. Air Ministry planners, however, had already completed preplanning for potential AAF airfields in the UK: sites were selected and surveyed, land was acquired, and construction schedules for 68 airfields were formulated (58:141, 71:1). When Eighth Air Force Headquarters became operational (June 18, 1942), therefore, the Air Ministry had 87 potential airfield sites available (8:21).

Despite the fact that the Eighth Air Force Engineer was acknowledged as the liaison between the AAF and the Air Ministry, engineering planning problems multiplied as aircraft began to arrive in the UK in July 1942 (58:168). "Each Command, as well as sections within Commands, . . . [began] negotiations to meet their own needs" (41:3).

The Air Ministry was quickly inundated with requirements, many overlapping, from various sources other than the Eighth Air Force Engineer. To overcome this problem, the Eighth Air Force Engineer prepared an consolidated list of requirements (Table 2) and presented the list to the Air Ministry on July 31, 1942 (42:3).

Aviation Engineer Battalions (EABs). The shortage of UK construction crews during the AAF buildup forced the Air Ministry to use foreign labor. Five established RAF airfields were immediately turned over to the Eighth Air Force Bomber Command (58:142). But the Air Ministry quickly realized that they needed help to construct the remainder of the US airfields in the UK (2:4, 41:1).

The US helped by sending 28 EABs to the UK (41:2, 2:4, 71:1). An EAB contained engineers, site surveyors, plumbers, electricians, carpenters, masons, and equipment operators. Each EAB was authorized 228 pieces of equipment and 31 officers and 766 enlisted men. Therefore, each unit was a self-sufficient construction crew, capable of performing all airfield construction as well as facility and utility maintenance and repair (8:248, 72:5, 331:3).

The help from a US military construction force did not keep the Air Ministry from exercising overall control of all airfield construction in the UK. Air Ministry Resident Engineers were assigned EABs. In addition, Air Ministry

Table 2. AAF Requirements in the UK as of March 1943  
(41:3,4).

|                                      |           |           |
|--------------------------------------|-----------|-----------|
| Airfields required:                  |           | 98        |
| Released by the RAF:                 | 52        |           |
| Constructed by the British:          | 29        |           |
| Constructed by the US:               | 17        |           |
|                                      | ==        | ==        |
|                                      | 98        | 98        |
| Storage Required (Square Feet):      |           | 4,000,000 |
| Released by the RAF:                 | 2,372,000 |           |
| Existing Facilities:                 | 762,000   |           |
| Constructed by the British:          | 560,000   |           |
| Constructed by the US:               | 250,000   |           |
|                                      | =====     | =====     |
|                                      | 3,942,000 | 4,000,000 |
| Repair Depots Required:              |           | 3         |
| Released by the British:             | 1         |           |
| Constructed by the British:          | 2         |           |
|                                      | =         | =         |
|                                      | 3         | 3         |
| Headquarters Installations Required: |           | 26        |
| Constructed by British:              | 26        |           |
|                                      | ==        | ==        |
|                                      | 26        | 26        |
| Housing Accommodations Required:     |           | 240,800   |
| Accommodations Existing:             | 85,500    |           |
| Constructed by the British:          | 129,200   |           |
| Constructed by the US:               | 26,100    |           |
|                                      | =====     | =====     |
|                                      | 240,800   | 240,800   |

Resident Engineers provided EABs with construction plans and supplied all construction materials at no cost to the EABs (41:2, 71:1).

Unfortunately, the EABs were ineffective for several months after they arrived in the UK in 1942. Every EAB arrived without their construction equipment. The persistent shortage of in-country construction equipment only compounded the problem despite efforts to obtain a priority shipment of construction equipment from the US (41:4).

Aviation engineers were originally tasked to construct 17 airfields in the UK. Their equipment problems, their late arrival in the UK, and changes in the US airfield requirements in the UK, however, reduced the number of airfields EABs actually constructed to only 14 (2:6, 41:2).

The first EABs arrived in June and by September 3, 1942 the agreement to provide EABs in the UK was officially sanctioned. US Secretary of State Cordell Hull and British Member of Parliament Sir Charles Ingram Cortenay Wood agreed that the UK would provide all facilities required by the AAF in the UK and EABs would help construct the needed airfields (2:4).

Reduced Requirements. By the end of July 1942, BOLERO planning became an academic exercise (15:654), and airfield construction requirements in the UK were reduced. Operation

TORCH, the invasion of North Africa, delayed the cross-channel invasion until 1944 and diverted US aircraft and personnel scheduled into the UK to support TORCH (15:654, 55:60).

A new AAF Construction Program (March 25, 1943) incorporated the decreased scope of work in the UK resulting from diversion of resources for TORCH. This program reduced the number of divisions scheduled for the UK from five to four and abandoned AAF plans for six proposed airfield sites (42:1).

By this time, though, 88 airfields were already under construction in the UK. However, the work was behind schedule (2:6, 42:1). Therefore, the Air Ministry concentrated its efforts on finishing construction on the most advanced airfields in the UK to satisfy the existing AAF requirements.

Increased Requirements. The Allied war conference at Casablanca in January 1943 revived the plan for the cross-channel invasion in 1944 (55:69). The introduction of a tactical mission to complement the existing strategic bombing mission of the Eighth Air Force also added additional airfield and depot support facility requirements in the UK (42:1-2).

A massive AAF buildup occurred in the UK to support the plan which doubled the size of the AAF in the UK within 12

months. AAF requirements for the invasion included 11 heavy bomber and 3 fighter groups by May 1943, and 21 heavy bomber and 11 fighter groups by December 1943. This translated into 84,000 AAF personnel by the end of 1943 and an aircraft arrival schedule of 1,671 US aircraft by June; 2,619 aircraft by September; 3,061 aircraft by October; and 4,242 aircraft by December 1943 (16:635-637, 42:2, 58:289).

Once again, Army support for the increased AAF engineering effort in the UK was minimal. On June 28, 1943 Col Smyser was again placed in charge of coordinating the increased AAF requirements with the Air Ministry. The SOS Command, however, authorized only three of nine available SOS engineers to support Col Smyser despite the fact that approximately 80 percent of the planning workload was related to AAF activities (42:2).

Once more, US construction requirements overloaded the construction capability in the UK. The total construction capability within the UK at this time included approximately 32,000 British civilians and 13,500 aviation engineers. However, the requirements under the revised construction program, completed on August 1, 1943 included: housing for 515,000 personnel, over 5.5 million square feet of storage and repair space, 120 operation airfields, and storage for 158,000 tons of munitions (42:2).

Col Smyser adopted a Schedule of Priorities to cope with the massive amount of new work that was identified and

the limited labor available in the UK, including EABs. The criteria were used to establish the construction priorities were the same criteria used throughout the AAF buildup in the UK. The two factors considered were minimum essential construction for efficient operation and the greatest need (42:1-2, 71:2).

General Aviation Engineering Problems Encountered in the UK During WW-II

The Army Corps of Engineers supplied all US Army engineers during WW-II. Several problems were caused by assigning aviation engineers from a general pool of Army engineers.

(1) EAB replacements were inexperienced, untrained, or unfit. Experienced aviation engineers reinforced forward Army combat units. At that time all Army engineer resources were pooled. No specialized training program existed for aviation engineers. Replacements, therefore, arrived unprepared (334:111).

(2) Shortages of equipment, spare parts, and construction supplies plagued EABs. SOS controlled the procurement of all construction materials common to both the ground and air forces. The needs of the ground forces, therefore, were often placed above the needs of the air forces (334:110).

(3) Multiple orders delayed the completion of work. Commanders (tactical and service area) and Eighth Air Force Engineer staff officers all gave EABs their specialized set of instructions. Work stopped, was undone, and restarted in a different way (334:43).

The Air Ministry experienced problems similar to those of the EABs. However, the Air Ministry also received engineering requirements from RAF military leaders.

Aviation Engineering Problems Encountered Due to Lack of Direct Control by the AAF

Several problems occurred because the EABs were not under the direct control of the Eighth Air Force Engineer.

(1) EABs could not be redirected with changes in AAF priorities (41:3).

(2) EABs could not become proficient in their combat mission. EABs were allocated only one hour per day for combat training. The Eighth Air Force Engineer had no authority to change the situation (334:40).

(3) EABs performed duties that took them away from their primary AAF support mission. Construct facilities not related to airfields, construction for Army Corps of Engineers or Navy construction forces: building roads, port facilities, oil storage systems, prisoner of war facilities, storage depots, bridges, and dams. Aviation

engineers also loaded and unloaded cargo from ships and armed and refueled aircraft (334:40,41,51,52).

(4) EABs lacked a standard command and control structure. Theater commanders decided how engineers were employed and controlled. Therefore, the structure used was dependent on the attitude and personality of the theater commander (334:40).

#### Post WW-II Demobilization

In spite of all the problems with supply and scheduling, by the end of the war, over 140 airfields in the UK were constructed by or improved for use by the AAF (2:5). Fourteen of those airfields were constructed entirely by EABs. The "free" use of airfields and support facilities, construction labor and materials, and base maintenance and repair services by the US military forces in the UK was not offered solely because a strong US-UK bond existed.

Instead, the use of airfields in the UK was an application of the Reverse Lend-Lease Act of 1941 at work, which permitted

US Theatre Commanders to arrange for the use of local facilities, and for the procurement of local supplies, without cash transaction . . . [and] obtain US troop support in food stuffs, clothing, buildings, some equipment, labor, and services [60:23].

The Reverse Lend-Lease Act allowed the UK to repay the US by means other than by a cash payment for the US supplied war fighting equipment, supplies, and materials supplied under the Lend-Lease Act (60:22,23).

Reduction of Forces. A reduction of military forces was the primary goal of the US government when peace came to Europe. The speed of the demobilization of US forces is illustrated by the reduction of total US military strength, from more than 3 million in 1945 to about 390,000 by the end of 1946 (57:14). The last of the AAF personnel left the UK by the end of 1946, bringing to a close the initial AFCE involvement in the UK (69:1).

Post WW-II Construction (Tedder-Spaatz Agreement). Before leaving the UK, EABs completed one more construction task for the AAF. General Carl A. Spaatz, Commander of the AAF in Europe, recognized the strategic importance of airfields in the UK to prevent the Soviets from overrunning post WW-II Europe (26:3). To ensure the availability of airfields to accept B-29 bombers, the only long-range nuclear capable aircraft at the time, Gen Spaatz completed an informal agreement with British Air Marshall Sir Arthur Trenchard in January 1946 (36:2, 56:86).

Under the Tedder-Spaatz agreement, runways on four airfields in the UK were lengthened from the standard length

of 5,000 feet to 8,000 feet. The US provided the troop labor, EABs, and the Air Ministry supplied the materials and funds (2:4). The Air Ministry also installed all the required equipment and completed all facility modifications to make two RAF airfields capable of "handling some very special purpose" bombers that Spaatz viewed as vital for counterbalancing Russia in post WW-II Europe (65, 66).

Thus, when the USAF found itself returning to the UK in the future (1948), both the US and the UK were not entirely unprepared.

### III. Rebuilding Years (1948-1962)

From the departure of the last AAF units in 1946 until the return of the USAF to the UK in 1948, the deteriorating relationship between Russia and the rest of the WW-II Allies resulted in a major shift in the US military policy in Europe (56:81). This policy shift set a precedent: never before in US history had a large US military force been committed to peacetime preparedness in a foreign nation (37:3, 336:43).

The small, temporary US Occupational Air Force in Europe, established as a major command in 1945 as the United States Air Forces in Europe (USAFE), had been stationed in Germany (69:1). But by 1948 USAFE was transformed into a large, permanent military force stationed throughout Europe (38:54). The USAF buildup in the UK during this period was similar to the AAF buildup in the UK during WW-II.

(1) Changes in requirements led to increases and decreases in the USAF airfield construction in the UK.

(2) Each incremental increase in USAF airfield construction included detailed US-UK negotiations that established the procedures, payments, responsibilities, and the overall scope of construction (37:3). All of the post WW-II agreements, however, were simply modifications of the initial agreement Lt Col Smyser achieved with the Air Ministry in 1942 (Joint Organization and Maintenance

Agreement (US) S.D. 348 Air Ministry) as discussed in chapter 2.

(3) The USAF-Air Ministry relationship on airfields in the UK did not change. The USAF remained a tenant on installations owned by the British government (38:47). The Air Ministry assumed responsibility for all construction and routine maintenance, repair, and alteration.

(4) The HQ 3AF Civil Engineer, like the Eighth Air Force Engineer during WW-II, was the primary USAF airfield planning agent with the Air Ministry. However, unlike the Eighth Air Force Engineer, the 3AF Engineer was also in charge of all USAF airfield construction forces in the UK.

US government leaders sought ways to reduce military spending by eliminating a redundancy of functions within the services. This was one of the major reasons why AFCE was not authorized a construction capability when it separated from the Army in 1947. In the UK, the US could also take advantage of the shared responsibility for USAF airfield facility maintenance. Therefore, fewer AFCE personnel were assigned in the UK to avoid "a duplication of Air Ministry effort" (38:48) and to lower US military spending.

#### The Early Post WW-II Developments

An Independent Air Force. At the same time that the rift opened between Russia and the rest of the Allies, the

USAF was undergoing a major organizational change. The National Security Act of 1947 established an independent Department of the Air Force, equal in status to the Departments of the Army and Navy. With this reorganization, Air Installation Officers (AIOs), the forerunners of the Base Civil Engineers, became responsible for the day-to-day maintenance and repair on airfields (334:117,118).

One critical factor, however, did not change for the AFCE organization. The Army retained the design and construction responsibility, troop construction capability, and the AFCE warfighting role for the Air Force for more than 17 years after the Department of the Air Force was established (3:11,13). A USAF troop construction capability existed through Army Special Category Army With the Air Force (SCARWAF) units. But the SCARWAF program simply extended of the rivalry for resources between the Army and the Air Force. Manpower authorizations and funding were the responsibility of the Air Force. The Army selected, recruited, trained, equipped, and assigned personnel to SCARWAF units (3:7-12, 334:120).

Because the Army retained the responsibility for training and assigning personnel, the AFCE organizations had no control over the quality of training or personnel for SCARWAF units (334:120). AFCE units found the Army training inadequate for airfield construction. In addition, personnel assigned to SCARWAF units often lacked the job

skills required for a position. Cooks and bakers were assigned to critical skilled slots and an imbalance between supervisors and operators existed (334:128,129).

The proven success of the Air Ministry during the WW-II airfield buildup alleviated the need for a large AFCE construction force in the UK. The Air Ministry, therefore, continued to perform as the sole construction and installation maintenance agent (26:6). As a result, fewer AFCE personnel were required in the UK than in the rest of USAFE.

Political Factors. The post WW-II political climate helped shape the US military policy in Europe. As early as 1943, Winston Churchill predicted that Russia would be the world's greatest land power after WW-II and that a US-UK alliance would be necessary to counter Soviet power in post WW-II Europe (4:412,413). Churchill's famous Iron Curtain Speech in Fulton, Missouri on March 6, 1946 illustrated his continuous effort to lobby for a post WW-II US-UK alliance to oppose Russia in Europe (14:119,120).

Professor W. Barton Leach, a personal friend and advisor of President Truman, reiterated the possibility of a US-Soviet rift in February 1947 when he wrote "if we have war it is going to be with Russia. If we have no war with Russia we shall have no war at all for at least two decades" (33:201).

Disagreements over the "interpretation and execution of Occupational policies and programs" (30:80) added to the tension between Russia and the rest of the Allies. These disputes were compounded because Russia continued to keep its armed forces, estimated to exceed 4 million men, "on a wartime footing . . . [and] its war industries going at full blast" (57:14) while demobilization reduced the size of the US Occupational Air Force to just over 18,600 military personnel by 1948 (69:1).

By 1948, Western Europe was on the verge of a Russian takeover. Russia had gained total control over Albania, Bulgaria, Rumania, Eastern Germany, Poland, Hungary, and Czechoslovakia (57:15). George F. Kennen, US Ambassador to Russia, described this rapid Soviet expansion as "a fluid system that threatened to fill up every nook and cranny" (14:111). And there was no indication that the expansion was slowing down.

President Truman soon came to believe that military power was "the only thing that the Russians understand" (14:19), the only thing that would stop further Soviet expansion in Europe. This belief and the economic conditions in post WW-II Europe led Truman to formulate a policy to contain further Soviet expansion in Europe. The Truman Doctrine included financial assistance for the economic recovery of Western Europe and membership in NATO, a Western European defense alliance (30:80,81, 56:81).

### Return of the USAF to the UK

In 1947, General Hoyt S. Vandenberg, Chief of Staff of the Air Force, summarized the purpose of the post WW-II USAF in a letter to the USAFE Commander as

a minimum Occupational Air Force which could be augmented on short notice by dispatch of combat units from the US to present a show of force when considered expedient [332].

This "token Air Force" (332) provided air transport for US Occupational forces, conducted aerial photography, disposed of surplus Air Force equipment, and performed base maintenance to support the European rotational training program of B-29s from the US (30:83). These activities occurred primarily in occupied Germany.

Many US military leaders considered air superiority essential for victory in future wars and viewed the European theater as the most likely location for any future conflict. Gen Arnold wanted airfields as close to the enemy as possible. He saw the future USAF as a "global striking force employed from strategically located bases . . . to meet and overpower an aggressor's air threat as near as possible to its source" (33:155). Gen Spaatz agreed. He argued that "only from forward air bases can the mass of American air strength . . . gain control of the enemy air space. And not until we have won control could we be absolutely sure of the outcome of a war" (33:219).

Operational airfields close to Russia, perceived by the US military planners as the most likely opponent in a post WW-II European conflict, implied a USAF presence in Germany (33:281). The numerical superiority that Russia enjoyed in Europe, however, gave Russia the ability to launch a massive conventional attack with little or no warning (6:30). Therefore, by 1948, Air Force planners realized that airfields in Germany were vulnerable to a massive assault by numerically superior Soviet conventional forces stationed less than 150 miles away (6:30, 54:281).

USAF planners turned to the UK to balance the threat posed by the Russian numerical superiority in Europe. Additional USAF airfields in the UK were the solution for several reasons:

(1) British airfields were insulated from a massive Soviet ground assault by a body of water, giving these airfields additional defense against a Soviet attack. These bases also satisfied Gen Spaatz's requirement for bases close to Warsaw Pact nations (333).

(2) The use of British airfields as platforms to launch US aircraft in defense of Western Europe was politically acceptable to the British government. Chancellor of the Exchequer, Sir Stafford Cripps, reflected the views of the British government in 1949 when he stated, "Britain must be regarded as the main base for the

deployment of American air power and the chief offensive against Russia must be the Air" (33:217).

(3) Bases in the UK were strategically necessary for the USAF. Existing USAF bombers did not have the range to strike Soviet targets from the US unless their developments were to be suicide missions (54:494, 56:86).

Four events between 1948 and 1950 are credited for establishing a permanent USAF presence in the UK: the Berlin Blockade, the Soviet development of a nuclear capability, the US commitment to NATO, and the Korean War (33:275, 56:81).

The Berlin Blockade. The start of the Berlin Airlift on March 17, 1948 triggered the return of USAF forces to in the UK. The USAF mission was classified but included "setting up of air bases and depots for the operational training and maintenance of B-29 aircraft of the Strategic Air Command (SAC)" (37:1) and maintenance of the transport aircraft employed in the airlift operation (37:3). Under the Tedder-Spaatz informal agreement in 1946, four bases were already prepared for a USAF B-29 mission with RAF maintenance funds. These bases, RAF Scampton, RAF Marham, RAF Waddington, and RAF Lakenheath were used to accommodate the USAF bombers. RAF Sculthorpe was quickly added to the list of available bomber bases and RAF Burtonwood provided the supply and depot maintenance functions (26:5, 37:3).

The distrust Gen Spaatz and Air Marshall Tedder had for Russia after WW-II meant that no major construction was necessary on the four initial bomber bases in the UK. However, rehabilitation of the rundown facilities on RAF Burtonwood was necessary before the depot maintenance functions would be preformed. This work, like the majority of the work accomplished during the WW-II buildup in the UK, was performed by the Air Ministry (26:3).

The British government initially approved the deployment of B-29 nuclear capable bombers from the 28th and 307th Bombardment Groups to the UK on June 27, 1948, for a 30 day training period, and the USAF wasted little time in establishing operational capability in the UK (33:216, 37:1). On July 16, Headquarters Third Air Division (Provisional) was established at RAF Marham (37:1). On August 7, Major General Leon W. Johnson arrived in the UK and assumed command of the USAF forces in the UK (37:2).

By that time that Gen Johnson arrived, Third Air Division (3AD) was assigned to USAFE. Lieutenant General Curtis E. LeMay, USAFE Commander, had revised and published a new USAFE mission statement that reflected the growing tensions in Europe and the increasing USAF responsibilities caused by the Berlin Airlift operation (30:83). Gen LeMay stated the change in philosophy: "the Command was going back on a wartime basis - not getting ready for war" (30:149). This new readiness posture, which still applies today,

emphasized "defensive preparedness through increased training, high operational efficiency, and development of mobility" (30:150).

An AFCE combat support role developed when USAFE bases were restructured into Wing-Base Organizations on July 1, 1948. A unique organization, the Installation Squadron, the forerunner of the AFCE Squadron, was created on each base to perform the airfield maintenance and repair "vital to the proper functioning of the wing" (30:187). AFCE participation, however, was limited to maintenance and repair because the Army was still tasked with the AFCE combat support role. In addition, the responsibility for airfield maintenance and repair in the UK continued to be a joint US-UK effort with the assigned Air Ministry Works Directorate civil engineering staff (38:47). Therefore, while the restructuring established what became the Base Civil Engineering Squadron, the reorganization did not improve the AFCE warfighting capability.

A temporary buildup of the USAF was planned for the Berlin Airlift operations. But by April 15, 1949, changes established a permanent force which continues in the UK today: 3AD had been reassigned to HQ USAF as a major command, the Air Ministry informed USAF that a long term use of British stations could be assumed, and HQ 3AD had moved to a permanent location at South Ruislip Air Station just

outside London with an authorized strength of 56 officers and 84 airman (30:156-158, 36:2-4,10, 37:4).

Soviet Development of Nuclear Capability. Russia did not possess an atomic bomb at the end of WW-II. Therefore, US political and military leaders considered nuclear superiority the key factor preventing the Soviets from overrunning post WW-II Europe (6:31). By 1948, the threat of nuclear retaliation in a general war with Russia in Europe became the cornerstone of US defense policy (54:477). The SAC presence in the UK during the Berlin Airlift represented an application of this strategy (54:477). However, the unexpected explosion of an atomic bomb by the Soviet Union on September 23, 1949 forced the US to reconsider its nuclear strategy in Europe (36:11, 51:540). Estimates by the Joint Chiefs of Staff suggesting that Russia would possess a stockpile of atomic weapons to rival the US by 1954 increased the urgency of the US strategic buildup in Europe (33:275).

Ambassadors Agreement. The US response for a strategic buildup included negotiations with Britain to increase the number of SAC bases in the UK (36:3). And in April 1950, US Ambassador Lewis Douglas and the British under-secretary for Air, Aidan Crawley, signed the "Ambassadors Agreement." Four additional SAC bomber bases were established in the UK

under the agreement: RAF Upper Heyford, RAF Greenham Common, RAF Brize Norton, and RAF Fairford (26:6). These bases would be available for use by the USAF for as long as the units were "considered desirable in the interest of common defense" (36:3,11).

Once again, a US-UK construction effort became necessary to prepare airfields in the UK for USAF forces. The required work was identical to the jobs completed on the four bomber bases identified in the Tedder-Spaatz agreement of 1946: runways, taxiways, and aircraft parking aprons had to be enlarged to accommodate B-29s, WW-II facilities had to be rehabilitated and modified, and special bomb handling equipment had to be installed (26:6).

US-UK negotiators agreed to accomplish work in the same way that Gen Spaatz and Air Marshall Tedder accomplished the work in 1946. The Air Ministry maintained sole responsibility for all airfield construction for these bases and the US offered the 928th Engineer Aviation Group (EAG) as troop labor to augment the British work force, "conditional upon the projects being started immediately" (26:280). This offer was credited with concluding the negotiations which led to the signing of the Ambassadors Agreement and to the start of construction in 1951 (26:280).

For the USAF, the 928th EAG represented the only AFCE wartime construction capability in the UK until 1979. The use of US troop labor in the UK also appealed to the Air

Ministry for the same reasons that US troop labor appealed to them during WW-II: it represented a source of free labor for the British, who otherwise would have to hire private contractors, and it compensated for the limited supply of a local work force in the out-of-the-way locations for the proposed USAF installations (26:6,280,281).

NATO. The NATO Alliance affected both AFCE manning and the US construction philosophy in Europe. The UK could not afford to support a large military force and rebuild its economy at the same time. Therefore, the UK looked to the US to provide the NATO conventional ground and air forces to deter the Soviets in Europe (54:484). Once again, the UK became "the 'receiving end' of the Atlantic lifeline and jumping-off place for forces entering Europe" (11:52) in the event of a European conflict.

The formation of NATO on April 9, 1949 established a US military commitment "for as long as necessary . . . on the European continent" (57:36). However, Secretary of State Dean Acheson knew that the Senate would not support a treaty if it committed the US to a large peacetime military buildup outside the US. He assured the Senate Foreign Relations Committee the US "would not be required to send large numbers of troops to Europe" (70:8). Congress, therefore, approved the treaty with the understanding that a large number of US troops would not be sent to Europe in

peacetime. To guarantee this assurance, Congress also imposed limits, which exist today, on the total number of US military personnel assigned to Europe.

The Congressional manpower limit affected the overall manning of AFCE in Europe. USAFE could, however, reduce the number of AFCE personnel required in the UK for peacetime maintenance and repair because the Air Ministry shared this responsibility. And that is exactly what USAFE did. Fewer AFCE personnel, therefore, were assigned to the US installations in the UK than were assigned to bases in Germany.

The NATO alliance committed the USAF to a long term presence in the UK. AFCE construction standards changed with the long term NATO commitment. Permanent facilities replaced temporary structures. More airfields were developed in the UK for the NATO tactical mission in addition to the existing USAF strategic mission.

Korean War. NATO member nations believed that the Korean War intended to divert attention from an overall Soviet assault on Europe (33:375, 36:11). A buildup of Soviet conventional forces in Europe in early 1951 was additional proof for NATO of an impending assault (33:281). In response, the US accelerated its European military buildup. The defense budget quadrupled in the early 1950s, and the USAF benefited the most (54:485,494). In the UK,

this buildup included negotiations additional tactical airfields in addition to the nine approved SAC bomber bases (33:281, 36:3).

By the time that the massive buildup began in the UK for the second time within a decade, the command structure for USAF forces in the UK had undergone several changes. Third Air Division was reassigned to HQ USAFE jurisdiction on January 21, 1951 (37:3,4). And on May 1, 1951, 3AD was redesignated a numbered Air Force within USAFE, Third Air Force (3AF) (36:3, 37:4).

Special Construction Program. The outbreak of the Korean War in 1950 initiated another massive US-UK airfield construction effort in the UK. The Special Construction Program (SCP), signed in February 1951, supplemented the already existing Ambassadors Agreement to provide 26 additional tactical USAF airfields in the UK (26:6, 36:3,12). Just like the WW-II AAF buildup in the UK, all costs were shared by the USAF and the Air Ministry, and all projects required joint approval by HQ 3AF and the Air Ministry before work was authorized (37:37).

The USAF buildup under the SCP, however, was not as large nor as time critical as the construction effort experienced during WW-II. No new airfields were built. Instead, existing used WW-II airfields were modified and rehabilitated to accommodate the USAF. Table 3 illustrates

the scope of work for a typical fiscal year program during the SCP buildup. Modifications to the WW-II airfields were necessary because modernization of US aircraft, some jet powered, required

the newer aircraft required longer and wider runways, larger taxiways and parking aprons, and more stringent design criteria for . . . pavement thickness. Larger fuel storage and munitions facilities as well as more maintenance support facilities were [also] needed [3:15].

Projects within the SCP were generally divided into two classes: construction performed by the 928th EAG and modifications to existing facilities by the Air Ministry of Works Directorate (AMWD) civil engineering staff assigned to an installation (37:37).

Existing US troop labor was used on SCP projects once work was completed on the four strategic bomber bases identified in the Ambassadors Agreement for two primary reasons. First, the additional construction required under the SCP was identical to the work that the 928th EAG units were already doing on the SAC bomber bases. Second, a shortage of British construction workers still existed (26:281).

The AFCE wartime construction capability in the UK disappeared in the UK until 1979 with the decision by the Secretary of Defense to dissolve the SCARWAF program by March 1, 1956 (334:190). The 928th EAG, however, continued

Table 3. Estimated Cost of Approved Projects on 3AF Installations, Fiscal Year 1951 (37:38).

| <u>INSTALLATION</u> | <u>UNDER \$2,000</u><br><u>NO.</u> | <u>AMOUNT</u> | <u>OVER \$2,000</u><br><u>NO.</u> | <u>AMOUNT</u> | <u>TOTAL</u><br><u>NO.</u> | <u>AMOUNT</u> |
|---------------------|------------------------------------|---------------|-----------------------------------|---------------|----------------------------|---------------|
| Lakenheath          | 138                                | 48,425        | 34                                | 270,559       | 172                        | 318,804       |
| Sculthorpe          | 82                                 | 37,295        | 59                                | 529,640       | 141                        | 586,936       |
| Manston             | 104                                | 33,001        | 29                                | 273,403       | 133                        | 306,405       |
| HQ 3AF              | 144                                | 70,062        | 71                                | 611,817       | 215                        | 681,879       |
| Mildenhall          | 97                                 | 37,866        | 21                                | 232,404       | 118                        | 270,271       |
| Burtonwood          | 228                                | 79,323        | 57                                | 691,878       | 285                        | 771,202       |
| Fairford            | 26                                 | 12,485        | 15                                | 65,893        | 41                         | 78,378        |
| Upper Heyford       | 18                                 | 16,551        | 10                                | 55,931        | 28                         | 72,483        |
| Brize Norton        | 79                                 | 20,838        | 11                                | 97,172        | 90                         | 118,010       |
| Marham              | 18                                 | 4,842         | 3                                 | 19,293        | 21                         | 24,136        |
| Burderop Park       | 24                                 | 33,192        | 57                                | 448,642       | 81                         | 481,834       |
| Croughton           | 17                                 | 11,244        | 8                                 | 182,874       | 25                         | 195,118       |
| Barfor St. John     | 14                                 | 8,509         | 3                                 | 88,899        | 17                         | 94,409        |
| Norton Barracks     | 5                                  | 1,164         | 0                                 | 0             | 5                          | 1,164         |
| Middleton Stoney    | 5                                  | 8,390         | 16                                | 194,920       | 21                         | 203,311       |
| Bentwaters          | 9                                  | 4,904         | 7                                 | 52,331        | 16                         | 57,235        |
| Greenham Common     | 1                                  | 1,261         | 1                                 | 22,335        | 2                          | 23,597        |
| Shepherds Grove     | 3                                  | 2,878         | 3                                 | 33,735        | 6                          | 36,611        |
| Prestwick           | 1                                  | 1,800         | 3                                 | 33,003        | 4                          | 34,803        |
| Shaftesbury         | 1                                  | 1,736         | 7                                 | 105,251       | 8                          | 106,987       |
| Wimpole Park        | 0                                  | 0             | 29                                | 395,248       | 29                         | 395,248       |

SUMMARY

No. Projects Under \$2,000: 1,014  
 No. Projects Over \$2,000: 444

=====

Total Number of Projects: 1,458

Cost of Projects Under \$2,000: \$ 435,595  
 Cost of Projects Over \$2,000: \$4,402,236

=====

Total Cost of all Projects: \$4,837,832

to support USAF construction efforts in the UK until March 1957, when all Army units, including the 928 EAG was withdrawn (36:16).

Airfield modifications in the UK were not cheap. The total costs on fiscal year 1952 and 1953 for the initial USAF construction program were \$33,000,000 and \$173,000,000, respectively (38:49).

#### US-UK Airfield Maintenance Agreements

The arrangements for construction, maintenance, and repair of USAF installations in the UK evolved as the size of the USAF forces increased and shifted to a permanent presence. Two major modifications to the initial facility maintenance agreement established the method of operations for AFCE activities in the UK which exist today.

Initial Facility Maintenance Agreement. A formal agreement for the peacetime construction, maintenance, and repair on USAF installations in the UK became necessary with the shift to an "extended stay" concept (26:4). HQ 3AD on received the initial agreement on January 4, 1949, signed by R.C. Chilver, assistant under-secretary of State (General) of the Air Ministry, titled "Financial Arrangement for Supplies and Services in the United Kingdom." This Johnson-Chilver Agreement was used from the time that the USAF returned to the UK until July 19, 1949.

The agreement reaffirmed the policies and practices used during the AAF buildup in WW-II. The Air Ministry provided all supplies and services at no cost to USAF that were within the scope of normal RAF requirements or standards. All work above RAF standards, however, would be paid by 3AD (26:341, 36:11).

First Modification. Shortly after the Berlin airlift ended, the conditions of the Johnson-Chilver Agreement changed. The goal of the first modification was to reduce the Air Ministry administrative overhead time required to process claims for services on 3AD bases. Instead of paying for services above RAF standards, 3AD now paid all maintenance costs on USAF airfields. Then the Air Ministry reimbursed 3AD for the estimated costs for applicable installation maintenance and repair efforts. This change took effect on July 19, 1949 and lasted until June 30, 1951 (26:342).

Second Modification. The final evolution of the USAF financial arrangements for installation construction, maintenance, and repair on USAF installations in the UK was initiated on July 1, 1951 (26:381). The arrangement became official in September 1953, when Lord de L'Isle and Dudley, Secretary of State for Air, Air Ministry, and US Ambassador Winthrop Aldrich signed the US-UK Cost Sharing Arrangement

(36:14). This "single package 'omnibus agreement' that could be more easily be applied to further expansion" (26:8) consolidated all previous construction agreements and established a US-UK cost-sharing plan (36:14). Although modified to accommodate future financial issues caused by the USAF expansion in the UK, this arrangement is the basic cost-sharing plan used today.

The underlying concept of the Cost Sharing Arrangement was the principle of extra cost. Simply stated, this principle implied that the British would provide all "facilities, equipment, services, and supplies free of charge, so long as these items do not involve expenditures beyond normal RAF standards or requirements" (26:289). Airfields operated solely by the USAF were considered above normal RAF requirements. The extra cost principle, therefore, evolved to the point where the USAF now pays for all construction, maintenance, and repair on USAF installations in the UK.

By March 1955, the increased USAF activity in the UK made an easy to use, comprehensive agreement essential (26:8-10):

- (1) Over 80 thousand personnel.
- (2) Sixty-four separate arrangements completed or under negotiation.
- (3) A USAF-Air Ministry construction program exceeding \$600 million.

(4) A budget for routine maintenance approaching \$50 million per year on USAF stations in the UK.

Construction. Under the US-UK cost-sharing plan, the UK contributed approximately \$63 million toward airfield and facility construction, as well as over \$200 million worth of existing facilities on 43 British airfields. The US paid the balance of the estimated \$300 million in construction for the USAF buildup in the UK (26:8, 36:5).

The arrangement was a bargain for the USAF. At that time, the average construction costs for a bomber base was approximately \$32 million and approximately \$12 million for a fighter base. The actual USAF cash outlay, however, to convert an established RAF installation in the UK into a bomber base was only \$17 million and only \$7 million for a fighter base (26:263,264).

Facility Maintenance and Repair. Under the US-UK cost-sharing plan, routine base maintenance and repair on USAF installations in the UK was the responsibility of the Air Ministry. The USAF assumed financial responsibility for all routine maintenance costs on USAF bases in the UK under the Minor Maintenance and Minor Works Services Arrangement (a USAF contract (AF 61-718-87) signed on January 3, 1953 by Mr. B. L. Kirk, Assistant Secretary, Head of F.5 (Works Finance), Air Ministry, and Major Robert H. Ammon,

Contracting Officer, HQ 3AF). This contract was included as a US contribution in the Cost Sharing Arrangement (26:341,342).

On 3AF bases, the Base Commander, through the AIO, managed base maintenance activities and ensured RAF standards were satisfied as a bare minimum (26:344). But actual work remained the responsibility of the Air Ministry civil engineering staff and was divided into two basic categories by the Air Ministry.

(1) Minor maintenance which included routine work that did not exceed \$200.

(2) Minor works which referred to work with an estimated cost exceeding \$200. This type of work was subcatagorized into minor repairs, alterations, and minor construction.

The procedure established by the Air Ministry to pay for base maintenance under the Minor Maintenance and Minor Works Services Arrangement is outlined in Appendix C. For minor maintenance, a quarterly allocation of funds was issued to the Clerk of Works. Each separate job for minor works, though, required an individual obligation of funds (26:344-346).

#### AFCE In the UK

AFCE forces returned to the UK to accomplish a peacetime USAF buildup beginning in 1950. Unlike WW-II,

though, all AFCE activity was controlled under a single Air Force organization, the HQ 3AF Directorate of Installations.

At first, the Air Ministry Works Directorate (AMWD) shared joint responsibility with the Installation Squadron for base level facility maintenance and repair on installations turned over to 3AF (37:29). USAF cost saving initiatives and reduced USAF requirements, however, affected the peacetime manning of AFCE personnel assigned in the UK. When the AFCE manpower cuts occurred in the UK, HQ 3AF started using US civilian Architect-Engineer (A-E) personnel to prepare plans and programs for US airfields in the UK while the British civilian AMWD assumed more responsibility for base level peacetime installation maintenance and repair.

Major developments during the AFCE buildup in the UK in this period (1950-1962) were at HQ 3AF. AFCE personnel assigned to individual installations were primarily firefighters and HQ 3AF AFCE representatives who monitored construction and airfield maintenance and repair. The HQ 3AF AFCE development is discussed first. Next, the effects of the HQ 3AF AFCE developments and the changing US-UK working relationship as the USAF presence changed from temporary to permanent stay are discussed for base level operations. Finally, contributions of the Army Engineer Battalions are discussed. Problems encountered by each

group are summarized at the end of each AFCE organizational level of discussion.

HQ 3AF AFCE Organization. The 3AF Directorate of Installations, under the Assistant Chief of Staff (ACS), Materiel became the single USAF point of contact with the Air Ministry for all USAF construction programming and planning, installation maintenance and repair policies, and acquisition of land in the UK (37:29). By July 1951, the 3AF Directorate of Installations reorganized to more efficiently coordinate planning efforts for the SCP (Appendix E) (37:29). By 1959, however, the HQ 3AF Directorate of Installations reorganized again (Appendix E) to further specialize engineering responsibilities.

Major Problems for HQ 3AF AFCE. The HQ 3AF engineer had to overcome several problems during the USAF buildup in the UK: constantly changing airfield requirements, difficulties with transferring funds between the USAF and the Air Ministry, standardizing criteria, resolving conflicts between two USAF major commands, and losing control over base level AFCE operations.

Constantly Changing Airfield Requirements. As in WW-II, the engineering planning process during the USAF buildup was difficult because requirements changed

constantly. Table 4 summarizes the AFCE effort in the UK during 1950-1953 on the 9 SAC bases and 26 tactical bases (26:266).

Table 4. AFCE Scope of Work in the UK, 1951-1953  
(37:30,31, 324:14).

| <u>FISCAL</u><br><u>YEAR</u> | <u>MILITARY</u><br><u>CONSTRUCTION</u><br><u>(\$MIL)</u> | <u>OPERATIONS &amp;</u><br><u>MAINTENANCE</u><br><u>(\$MIL)</u> |
|------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|
| 1951                         | 53.6                                                     | 16.3                                                            |
| 1952                         | 19.9                                                     | 8.4                                                             |
| 1953                         | 51.1                                                     | 27.0                                                            |

Airfield construction requirements were reduced, however, as the immediate threat of a conflict with Russia diminished. By 1955, USAF requirements in the UK were reduced to 26 installations and the SAC mission was cut in half in the UK (36:5,6). By April 1957, Programming Plan 57-3 (Big Shuffle) closed ten more bases and resulted in non-acceptance of two other stations programmed for 3AF (36:16).

Transferring Funds Between the USAF and the Air Ministry. Funds transfer for routine maintenance and repair and construction on USAF installations in the UK was cumbersome. Several channels of coordination were required by the Maintenance and Construction Divisions, which obligated USAF funds and budgeted for 3AF installation

projects (37:30). Within USAF channels, coordination was required with HQ USAFE and the Base Comptroller for funds. In addition to USAF channels, coordination was required with the local AMWD for routine base maintenance and repair as well as construction, maintenance, and repair project execution.

The obligation of USAFE funds for routine maintenance was complicated by the difference in the fiscal year between USAF and the Air Ministry. The USAF fiscal year started on July 1. The Air Ministry fiscal year, however, started on January 1. Claims for routine maintenance on installations were submitted according to the Air Ministry fiscal year rather than the USAF fiscal year (322:7).

Obligation of funds for projects was equally difficult. The installation AMWD staff prepared cost estimates for operations and maintenance projects, but USAF did not have any administrative control over the AMWD staff. Delays in the receipt of cost estimates and the limited approval authority of RAF Station Commanders delayed obligation of funds and execution of projects. To streamline the obligation process, the AMWD was given authority to bypass the RAF Station Commander and accept requests directly from USAF Installation Commander for work under \$10,000 (322:7-8).

Standardizing Criteria. Standard USAF policies and procedures did not apply very well to AFCE operations in the UK. All AFCE work in the UK had to satisfy British construction standards and RAF policies on master planning (38:47,48). Several initiative were taken at the HQ 3AF level, therefore, to standardize AFCE procedures in the UK.

By the end of 1952, the Maintenance Branch began to standardize procedures for processing work requests on USAF bases in the UK. The objective was to comply with USAF regulations but also to stay within the Air Ministry structure. USAF Installation Officer representatives in the UK met and reviewed all the regulations concerning the procedures for processing USAF maintenance and operations work orders in December 1952. The result of their conference was publication of 3AF Regulation 85-1, the UK standard for processing work requests (26:13).

The Plans Branch concentrated on determining standard criteria under which airfields or installations would be developed (26:32). A particular problem for the Plans Branch was the development of a single troop housing standard. Several troop housing criteria existed. Projects to construct troop housing were delayed to overcome a constant shortage of troop housing in the UK. In some cases, the lack of available housing forced the USAF to use tents or rent trailers for married personnel (37:42,323:19). But by December 19, 1951 the Plans Branch had developed one

standard for all troop housing in the UK: 60 square feet for enlisted and 120 square feet for officers as a normal standard and 45 square feet for enlisted and 60 square feet for officers during emergency operations (324:6).

Resolving Conflicts Between Two USAF Major Commands. Seventh Air Division (7AD), a Strategic Air Command (SAC) headquarters, was established on March 20, 1951 as a second major command element in the UK (26:4, 36:4). To have one headquarters (7AD) report to one major command (SAC) and a second headquarters (3AF) report to a different major command (USAFE) made it more difficult to negotiate, coordinate, and control USAF installation construction, maintenance, and repair projects in the UK with the Air Ministry and establish a single method of operation for base level AFCE organizations in the UK in a hostile environment.

On May 16, 1951 Major General Archie J. Old, Commander of 7AD, and Gen Johnson signed a joint Transfer Agreement to delineate responsibilities between 3AF and 7AD. Seventh Air Division assumed full control over the twelve bomber bases and satellite installations in the UK and Third Air Force retained all "tactical and logistical activities, as well as depot maintenance, finance activities, and USAF-UK Military Construction Program and responsibility for dealing directly with the British Government" (26:4, 36:13).

3AF was responsible for all negotiations with the Air Ministry, but the Joint Transfer Agreement created problems: Installation Squadrons on 7AD bases received funding and reported to SAC; 3AF reported to USAFE (26:4). Both commands had specific missions and methods for accomplishing those missions. Therefore, 7AD bypassed 3AF and negotiated directly with the Air Ministry for facility construction on SAC bases in response to HQ SAC initiatives.

The rivalry between 3AF and 7AD was relieved when SAC units in the UK were reduced by almost 50 percent by 1955 (36:5,6). The problem, however, was not resolved. Once again, in 1958, the conflict between 3AF and 7AD grew when 60 Thor intermediate range missiles sites were programmed for construction in the UK (36:17). Seventh Air Division argued that it, not 3AF, should negotiate with the Air Ministry for construction of the sites because the missile sites were under the jurisdiction of 7AD. HQ USAF finally settled the matter when it reaffirmed that 3AF was the Air Force's single point of contact for all negotiations with the British government (36:17).

SAC and USAFE had different philosophies for wartime operations. The differences made it difficult to establish a single method of operations for AFCE units in the UK and affected the AFCE wartime training on installations in the UK. SAC uses long-range bombers and does not rely on recovery of airfields to accomplish its mission. In

addition, the initial AFCE runway repair techniques could not be used for the heavy aircraft assigned to SAC. Tactical wings, on the other hand, need usable bases for close air support operations and rely on rapid recovery of airfields following an airfield attack. Therefore, a different emphasis was placed on AFCE recovery mission and on unit readiness training.

#### Losing Control Over Base Level AFCE Operations.

By 1960, five tactical bases existed in the UK: RAF Alconbury, RAF Bentwaters, RAF Lakenheath, RAF Sculthorpe, and RAF Wethersfield (306). A 1960 cost savings initiative reduced the size of the HQ 3AF AFCE organization. Base level AFCE operations on all tactical airfields within USAFE were also consolidated at HQ 17AF, located in Germany (36:19). Most of the HQ 17AF AFCE staff never worked in the UK and were unaware of the unique problems for AFCE units in the UK.

The realignment reduced the size of the Installation Directorate staff from 96 to 38 authorizations. The directorate also reorganized: Facility Support, Facility Programs, and Special Projects divisions were abolished and Engineering and Construction Divisions were created (308:1). The Engineering Branch identified and developed the projects to meet requirements and the Construction Branch coordinated efforts to satisfy the requirements.

This effort to save money increased the workload for the already undermanned base level AFCE units in the UK (154). Tasks that were the responsibility of HQ 3AF AFCE were transferred to base level organizations with no increase in manning: master planning, project document preparation and submission, maintenance and repair activities, operation of utilities, custodial and refuse collection services, and fire and crash rescue operations (154, 308).

HQ 3AF AFCE Improvements in Operations. Despite the major problems for HQ 3AF AFCE organization, several initiatives were taken to improve the 3AF installation construction and rehabilitation effort in the UK.

(1) In 1951 3AF became the single point of contact for funds transfer. USAF-Air Ministry coordination and the funds transfer process became easier with the new HQ 3AF Installation Representatives Branch which controlled and coordinated construction programs and certified claims from the SCP projects (322:11).

(2) In 1951 a single point of contact within the Air Ministry for all construction issues on USAF installations in the UK was established. The Chief Engineer of the Air Ministry Directorate of General Works moved to HQ 3AF to expedite and coordinate the SCP project execution and become the liaison between 3AF and the Air Ministry (323:10).

(3) HQ 3AF received project approval authority from HQ USAF of \$100,000 for recurring maintenance and major repair and rehabilitation projects, \$40,000 for emergency repair projects, and \$20,000 for modification and minor construction projects. The project approval process , therefore, was quicker (323:11). (The Installation commanders' approval authority was also raised to \$3,000).

(4) Approximately \$1.6 million was spent improving the HQ 3AF airfield planning and design capabilities (38:61). The Air Ministry approved the use of three Architect-Engineer (A-E) firms from the US to help develop master plans of USAF bases in the UK for fiscal years 1951 to 1953 (37:36).

These three A-E firms compensated for the lack of a fully manned AFCE Engineering Branch within the 3AF AFCE organization by carrying "out all engineering work up to the point of final construction drawings" (38:65,66). Not only did the Air Ministry approve the use of US civilians A-E firms, but the Air Ministry also hired their own Architect Firm to help design projects for the SCP (37:36,37).

HQ 3AF AFCE Manning. HQ 3AF AFCE manning increased during the 1950s USAF buildup in the UK. The number of personnel responsible for preparing projects for the 32 USAF installations in the UK, however, could not keep pace with the buildup. Only 27 officers, 22 airmen, and 18 civilians

were assigned the responsibility for the entire UK program (38:48). The A-E staff at HQ 3AF, therefore, continued to increase to compensate for the shortage of military engineers (320).

Base Level AFCE Organization. The base level AFCE organization in the UK was not manned for project development. Instead, project development was left up to HQ 3AF. When an installation was transferred to USAF control, though, an Installation Squadron and a Ministry of Buildings and Public Works (MBPW) staff shared joint responsibility for routine base maintenance. The Installation Officer was normally no more than a Captain and no more than two additional officers were assigned to the squadron (99).

While most of the assigned enlisted personnel were firefighters, a limited AFCE maintenance capability existed on the base. AFCE craftsmen assigned to the base level organization included: carpenters, roads and grounds specialists, heavy equipment operators, power production specialists, and fuels maintenance technicians as well as work control specialists (99, 152).

By 1960, Installation Squadrons were redesignated Civil Engineering Squadrons, a little more familiar in 1988 (151).

The assigned MBPW staff was also too small to cope with all the installation requirements. Term contractors

(contractors who were awarded base maintenance contracts for a specified period of time, usually three years), therefore, supplemented the AMWD staff for maintenance and repair tasks and local construction contractors for construction projects (99).

Base Level AFCE Problems. Until the USAF became a permanent presence in the UK, certain base level problems of US-UK working relationship were not apparent. One of the effects that were caused by temporary nature of the USAF was low "morale of the airmen of the 3d Air Division [in 1948] . . . chiefly because messing and Special Services facilities were below Air Force standards" (30:45-50). The problems that developed can be described with an analogy of

a good friend coming for a week-end and staying not only for the week-end, but for the next several months . . . and bringing along not only his immediate family but most of his living relatives and quite a few close acquaintances [26:9].

(1) In the 1950s, the WW-II facilities began to deteriorate and increased maintenance and repair effort was required, the different Air Ministry construction standards and practices created significant problems for the USAF personnel who had to work and live in the facilities. In general, US standards allowed for more square footage than an RAF standard but, to a large extent, British workers

built facilities according to the accepted British construction practices.

The perceived British construction practices also provided quality that was lower than USAF construction standards. These standards were much different than the USAF forces were accustomed to: mounting electrical conduit pipe, switches, and sockets on interior office walls, and separate cold and hot water taps instead of mixer taps.

(2) The Air Ministry used the terms of the cost-sharing agreement to refuse to allow use of US contractors on USAF airfields in the UK (37:147-149). The USAF, therefore, had to accept with the British construction standards and procedures. Only under unique or special circumstances would the Air Ministry approve the use of non-British materials or equipment for facility construction, maintenance, or repair activities on USAF bases in the UK (37:34). As a result, many USAF equipment items made in the United States were not compatible with UK support systems.

(3) USAF construction demands overloaded the British industrial capacity to meet the demand. Therefore, a critical shortage of mechanical and structural materials and equipment developed during the early 1950s USAF buildup: steam and hot water boilers, unit heaters, radiators, pumps, pipe valves and fittings, air conditioning units, and wall board were just a few of the items in short supply.

The problem was compounded by the reluctance of the Air Ministry to approve the use of non-British materials. The British realized, however, that their industrial output could not hope to meet the increasing USAF demand. When the Air Ministry approved the importation of construction materials, price of materials had increased. But the construction program was already approved using the lower material costs. These cost increases, therefore, reduced the overall construction program by fifteen percent (37:39).

(4) Up until 1960, the AMWD staff on USAF installations did not have an on-call station engineer to cope with non-duty hour emergencies. This problem was resolved, however, when the Air Ministry Director General of Works issued Order Number A1472, which put all USAF stations in the UK on an on-call scheme for British staff (306).

(5) The constant turnover of contractor personnel and the lack of skilled personnel hampered day-to-day base maintenance and repair. The turnover created backlogs of as much as four weeks of work where there had been a zero backlog before (99, 152). As time progressed, this backlog grew until it was impossible to catch up.

(6) A shortage of military heavy equipment operators to support airfield sweeping activities was constant (99, 152). Snow removal operations were affected by this shortage and augmentees were used to help perform this function. Augmentees were not the answer: they were

difficult to train and they were always being replaced with new people. When AFCE personnel were used, the day-to-day AFCE activities came to a standstill.

Army Engineer Battalions (EABs). The role of the 928th Aviation Engineer Group (EAG) was substantial during the USAF buildup between 1950 to 1957. These Army engineers represented the only AFCE military construction capability in the UK from 1950 until 1979, when the 819th Rapid Engineer Deployable, Heavy Operational Repair Engineering Squadron (RED HORSE) was assigned to RAF Wethersfield as discussed in chapter 4.

Although the initial task of the Army engineers was to construct airfield pavements on USAF bomber bases in the UK under the Ambassadors Agreement, their task was quickly enlarged to help construct the 26 USAF tactical bases included in the SCP. Some of the problems that the Army engineers encountered existed during WW-II. Some problems are still faced by AFCE units today.

Under the SCARWAF program, the 928th EAG was placed under the operational control of the 3AD Commander on June 5, 1950. The Group had two missions in the UK.

(1) Their primary mission included construction, extension, and reinforcing of airfield pavements, installation of airfield lights and drainage systems, and construction of roads, munitions and jet fuel storage

facilities, and security fences on USAF installations in the UK (72:1).

(2) Their secondary mission was a wartime mission: ground defense, to include bomb damage repair during emergency operations (72:1).

The 928th EAG was composed of a group headquarters stationed at RAF Brize Norton, the 801st, 803rd and 817th Engineer Aviation Battalions (EABs) assigned to RAF Upper Heyford, RAF Brize Norton, and RAF Fairford respectively, and the 620th Engineer Aviation Maintenance Company, 1st Motor Transport Maintenance Squadron, and 916th Engineer Aviation Depot Company stationed at RAF Brize Norton. The 804th EAB was assigned to the Group on April 1, 1951 to begin construction on the fourth strategic bomber base, RAF Greenham Common.

Overall command and control was provided by 928th group headquarters. Base construction was performed by the EABs. Maintenance and repair of construction equipment and vehicle support was provided by the 620th Maintenance Company and the 1st Motor Transportation Maintenance Squadron. Supply functions and the receipt and warehousing of construction materials were performed by the 916th Engineer Aviation Depot (63, 72).

Aviation Engineer Battalion (EAB) Manning. EAB troop strength was affected by the peacetime environment.

The normal wartime manning for an EAB was approximately 800 personnel. Under a December 14, 1951 force reduction plan, one construction platoon from each EAB and authorizations for equipment operators in the Group were deleted providing a peacetime end strength in each EAB of 22 officers, 7 warrant officers, and 668 enlisted personnel (321:7).

Aviation Engineer Battalion (EAB) Problems. The EABs encountered several problems that affected troop construction in the UK.

(1) Adverse weather and poor soil conditions on USAF airfields in the UK was one of the biggest obstacles that hampered construction project completion times.

(a) The concrete supplied by the Air Ministry required rigid moisture control in a nation that was very damp.

(b) The poor soil conditions required more time to prepare the subgrade than was allocated on the construction schedule (37:39, 72).

(2) Manning levels and the lack of skilled personnel delayed the completion of projects on time. To speed up the construction progress, the equipment utilization rate of two shifts per day, seven days per week was initiated. Equipment platoons, however, had to borrow construction platoon personnel to maintain this utilization rate. This

created a backlog in the work normally performed by the construction platoons.

No manning relief arrived. Requests for manning assistance for additional construction personnel were unsuccessful. A shortage of skilled labor in the local area only added to the problem. With no immediate relief in sight, construction platoon had to work longer hours and delay target completion times (37:40).

(3) Equipment problems occurred as soon as the first EABs arrived. Breakdowns caused by improper maintenance while in storage or from daily use, damage or delays in shipment of equipment, and the unavailability of needed equipment forced EABs to rent construction equipment. This delayed project completion times and added extra costs to each project. For example, the cost increase for the first quarter of 1951 was \$15,000 just from equipment rental fees (72).

(4) EABs faced shortages of spare parts and critical construction materials (37:40). Local purchase procedures were approved to overcome some of these problems. But unexpected problems also caused undue delays.

For example, a peculiar problem encountered in the UK was a shortage of cement bags. Therefore cement could not be delivered to the construction sites. Without cement construction crews could not do their job. This problem is best described in the words of the 928th EAG historian:

Until mid August 1951 British cement plants were able to supply the required amounts of cement [for construction commitments] to the entire Group. Then without advance notice delivery dropped to nil; explanation as given by Superintending Engineer, Midlands Airfields, AMWD was that bags were in short supply (37:41).

The shortage of cement bags disappeared by the end of the year. To avoid a similar problem in the future, though, 3AF decided to construct a bulk cement plant at RAF Brize Norton, Upper Heyford, Fairford, and Greenham Common (323:12).

(5) HQ 3AF decisions affected the efficient operation of EABs. A specific example was Gen Johnson's decision in August 1951 to complete construction at Upper Heyford for SAC operations by December 1, 1951. Double shift operations were required on concrete and asphalt work to meet Gen Johnson's target completion date. Therefore, on August 24th three line companies of the 804th EAB were redeployed from RAF Greenham Common to Upper Heyford (37:40).

(6) A peacetime duty - wartime training conflict occurred. The high priority was placed on the EAB construction effort by HQ 3AF reduced the time available for wartime training. The problem became so severe that the unit wartime readiness was impaired (331:3).

#### IV. AFCE Organizational Development (1962 to the Present)

Cost reductions were the primary influence on AFCE operations in the UK from 1962 to the present. This chapter discusses the cost reduction decisions and their effect on the development of AFCE operations in the UK in three phases: 1962 to 1968; 1968 to 1979; and 1979 to the present. Each phase in the development of AFCE operations in the UK addresses three major topics: AFCE reorganization and reduction, AFCE manning studies, and increased AFCE responsibility. Each phase concludes with a summary of the overall effects on AFCE operations.

In the first two phases (1962-1968 and 1968-1979), the primary emphasis was on an AFCE organization that performed peacetime base maintenance and repair. No AFCE wartime capability existed in the UK. AFCE manpower was reduced to save costs.

The third phase (1979 to the present) was different. Base level AFCE organizations were tasked with an active wartime recovery mission. AFCE manpower increased to support the wartime mission. Cost reduction decisions from 1962 to 1979, however, restricted the base level AFCE organization's ability to perform the added AFCE wartime mission.

The British organization responsible for installation maintenance and repair also experienced several

reorganizations throughout this period. The main focus of this chapter, however, is on AFCE development in the UK. Only the name changes of the British civilian civil engineering organization, therefore, are discussed to establish a time reference. The Air Ministry of Public Works (AMPW) was renamed the Ministry of Public Buildings and Works (MPBW) on April 1, 1963. By 1970, the MPBW was renamed the Department of the Environment (DOE) (90). The DOE organization responsible for maintenance of USAF airfields was identified as the Property Services Agency (PSA) (131).

#### AFCE Organizations in the UK in 1962

HQ 3AF and base level AFCE organizations in the UK are described as they existed in 1962, when the first AFCE military reductions began in the UK. These initial AFCE organization structures serve as the baseline for comparisons of the effects of the cost saving initiatives that followed.

HQ 3AF AFCE. The HQ 3AF AFCE organization in 1962 was stationed in London (see Appendix E). Functional responsibilities, though, were divided and given to two primary groups.

(1) The 7500 Air Base Group, stationed at West Ruislip (HQ USAFE/DER) directed the US Military Construction Program

(MCP) in the UK for the Army, Navy, and Air Force (major projects in excess of \$200,000). This organization was, in fact, a HQ USAFE engineering function, placed in the UK to "deliver design and construction" (1) and reduce the temporary duty costs for HQ USAFE engineers in Germany (35).

(2) The 3AF Deputy Chief of Staff (DCS) Civil Engineering Directorate (hereafter referred to as HQ 3AF/DE), stationed at South Ruislip, liaised with the British Government on the day-to-day maintenance and repair activities on USAF installations in the UK. The directorate also prepared and managed base level Operations and Maintenance (O&M) projects (construction, maintenance, and repair projects under \$200,000). Responsibilities for the HQ 3AF/DE staff are described in Appendix E.

HQ 3AF/DE activities were aligned closer to the 3AF base level AFCE units than HQ USAFE/DER. This chapter, therefore, discusses only the HQ 3AF/DE and the base level AFCE development from 1962 to the present.

Base Level AFCE. In 1962, before the major reductions in AFCE manpower took place, AFCE military craftsmen were available to perform most of the routine maintenance and repair tasks. A typical AFCE organization in the UK is illustrated in Appendix F. The Work Control Section was the heart of the organization. This section

received and processed all customer work requests and service calls, dispatched radio controlled AFCE craftsmen, and was the AFCE command and communications control center during emergencies or disasters. The Maintenance and Repair Section personnel performed the routine airfield pavements, grounds, and base facilities maintenance (74). Appendix F summarizes the manpower of an average AFCE organization in the UK from 1962 to 1980 using RAF Alconbury, RAF Bentwaters, RAF Lakenheath, RAF Mildenhall, and RAF Upper Heyford manning levels. Approximately 70 firefighters were assigned to an average AFCE unit. The typical Base Civil Engineer (BCE)/AFCE Commander was a captain.\*

Base level AFCE units in 1962 were still under the operational control of the HQ 17AF in Germany. AFCE units in the UK, therefore, were subject to policies, decisions, and funding from a headquarters that was unaware of the unique problems associated with the joint US-UK civil engineering environment or of the impact of HQ decisions on the base level organization in the UK. The distance between HQ 17AF and HQ USAFE in Germany and the 3AF base level units in the UK would influence the decisions made over the next 10 years. Decisions were made that affected AFCE operations

\* After 1970, however, with the increased responsibilities of the base level AFCE organizations, the position was upgraded to a Lieutenant Colonel.

in the UK. But the decision makers did not have to live with the consequences of their decisions, nor did they have much experience or knowledge of the unique situation of AFCE operations in the UK.

### 3AF AFCE, 1962 to 1968

The US government, seriously concerned about the US balance of payments, began a series of cost reductions in the 1960s (336:134). Throughout Europe, military activities and functions were consolidated or reduced and military positions were eliminated or converted to civilian positions.

Reduction of USAF Military Forces in the UK. USAF in general, and AFCE organizations in the UK in particular, were seriously affected by the effort to reduce US military spending in Europe. The number of USAF installations within 3AF were reduced. USAF military personnel, including the HQ 3AF/DE staff and base level AFCE manning in the UK, were also decreased. The HQ USAFE Management Assistance Group, stationed in Germany, was assigned to develop programs to reduce USAF spending in the UK.

Three primary actions reduced USAF military costs in the UK between 1962 and 1968. Two actions reduced the number of USAF installations and personnel that supported

the installations. The third action directly affected HQ 3AF/DE military manning.

1) In November 1963, a plan was developed to return RAF Chelveston, RAF Fairford, RAF Greenham Common, and RAF Sculthorpe to the Air Ministry by the end of June 1964 (36:20). Overall 3AF operating costs were reduced. In addition, USAF military positions on the four installations were eliminated.

2) By the end of June 1965, SAC's 7AD was inactivated, "marking the end of SAC large-scale operations in the UK" (36:22). RAF Brize Norton was returned to the Air Ministry (36:21). USAF military positions supporting the SAC mission were also eliminated.

3) By the end of 1966, Project "Mix-Fix" eliminated 90 HQ 3AF military positions but added 70 civilian positions for a net loss was 20 positions at HQ 3AF (39:20).

HQ 3AF/DE Reductions. The HQ 3AF/DE staff was hit hard by the HQ USAFE cost reduction programs introduced between 1962 and 1968. HQ USAFE took over some HQ 3AF/DE functional responsibilities and some responsibilities were assumed by the base level AFCE units in the UK. AFCE services were eliminated. Therefore, the HQ 3AF/DE ability to support the 3AF Commander decreased.

USAFE Programming Plan 536-63 (Project Third Rally), dated April 5, 1963, reorganized the HQ 3AF to "provide a

capability to direct, supervise, and monitor peacetime and wartime operations of assigned forces. . . . [and a staff] to support the Commander in his 'single point of contact' role in the UK" (39:14). While operational control of base level AFCE units in the UK was returned to HQ 3AF/DE from HQ 17AF in Germany, HQ USAFE also assumed the responsibilities of the HQ 3AF/DE Directorate of Facilities Support (see Appendix E) (39:14, 312). The first reduction of the HQ 3AF/DE staff was followed by an even more severe reduction in 1965.

Architect-Engineers (A-Es) compensated for the lack of a HQ 3AF/DE military engineering design capability from 1962 to 1968. But, on June 30, 1965, a second manpower reduction terminated the A-E services used by HQ 3AF/DE for ten years. Sixteen AFCE spaces were authorized to replace the 130 A-E personnel employed by HQ 3AF/DE (39:14). The AMPW organization had to compensate for the elimination of the HQ 3AF/DE engineering design capability.

Base Level AFCE Reductions. The progressive HQ USAFE cost saving initiatives between 1962 and 1968 affected base level AFCE operations in the UK as much as they affected the HQ 3AF/DE operations. Installation maintenance and repair responsibilities were transferred to the British civilian civil engineering organization as AFCE military manning was reduced.

In 1962, AFCE military manning was reduced for another reason when a Preventative Maintenance (PM) program (discussed in Appendix G) was officially implemented by the MPBW in 1962. Dedicated local civilian teams were assigned to carry out PM type work (simple repairs that took no more than 3 hours). The AMPW provided most of the laborers and AFCE units supplied all the materials for the PM teams (43).

Two major problems, however, reduced the effectiveness of the PM concept in the UK.

(1) An inability to hire skilled civilian craftsmen in the local area limited the number of PM teams on an installation. The AFCE organization was also not large enough to make up the deficit with all military PM teams (310:6).

(2) The "Buy US" policy reduced the ability to provide PM team supplies. Delays in material arrivals, the long lead time to order and receive materials from the US, and non-compatibility of US made items in the UK contributed to the problem (310:6).

The problem of supplying materials for PM teams, however, was resolved when the MPBW relieved the base level AFCE organization of the responsibility to furnish all stores as of July 1, 1964 (78). The shortage of skilled labor for PM teams, however, was never resolved.

On August 15, 1962, HQ USAFE, based in Germany, initiated a test of reduced AFCE personnel at the base level in the UK (Appendix H). The test was to determine whether AFCE manpower reductions would reduce support for facility maintenance and repair. In fact, this test was the first in a series of progressive reductions of AFCE base level manning in the UK. Only firefighters were excluded from the test. Sweeping of airfield pavements and maintaining aircraft arrestor systems and facility security alarm systems were the only maintenance activities that remained an AFCE responsibility. The rest of the AFCE organization was immediately reduced to an administrative staff which coordinated work requests between USAF organizations and the AMPW staff.

The initial 60-day test began in September 1962 at RAF Bentwaters and RAF Lakenheath and determined those functions which could be transferred to the Air Ministry without affecting USAF flying operations. Once the reductions had taken place, 18 military personnel made up the entire AFCE organization (67, 68). The test demonstrated that RAF Bentwaters and RAF Lakenheath could operate with a significant reduction of AFCE military personnel.

HQ USAFE declared the test a success and established July 1, 1963 as the implementation date for all AFCE units in the UK. They argued an estimated \$300,000 savings per year was possible if they cut 226 base level AFCE military

positions throughout the UK (310). The dollar savings would seriously reduce the effectiveness of AFCE organizations in the UK. Therefore, HQ USAFE decided to implement the AFCE reductions over the serious objections presented by HQ 3AF/DE (102). HQ 3AF objections included:

(1) The test was conducted before the British announced the reorganization of base maintenance responsibilities from the AMPW to the MPBW in 1963. A construction and maintenance agreement existed between USAF and the Air Ministry under the old AMPW system. No similar agreement, however, existed under the new MPBW system. The effect of a newly mandated base maintenance support agreement, therefore, was unknown (67).

(2) Base maintenance responsibilities were increasing on 3AF installations. The Air Ministry, however, did not intend to provide more base maintenance support than it had in the past (67). Any additional base maintenance would have to be performed by the AFCE workforce.

(3) The test did not include emergency situations or wartime operations (67). AFCE ability to recover from damage caused by war or natural disaster was already severely limited by the small number of AFCE personnel assigned. The proposed AFCE structure virtually eliminated the ability of AFCE units in the UK to form teams or train augmentees to accomplish bomb damage or emergency repair (76).

Nevertheless, the AFCE cost reduction program was implemented throughout the UK as scheduled. The MPBW had to overcome several problems not anticipated in the earlier planning though, after the AFCE reductions were implemented. These problems related to managing the British workforce caused by the 3AF practice of maintaining satellite installations in the UK and the difficulty of filling skilled positions on the MPBW staff (76):

(1) The Resident Works Engineer (RWE), the British equivalent to the USAF Base Civil Engineer, did not have the authority to work outside his clearly defined district. Instead, the RWE had to coordinate work outside his district with his counterpart in the other district affected. Direct support for base activities outside the RWE's district, therefore, was hampered.

(2) The RWE had no control over the quality of the work performed outside his district. Yet, he took the blame for poor performance on satellite installations.

(3) Transfer of USAF funds from one RWE district to another was slow as funds travelled through the British bureaucracy. Priority USAF projects, therefore, could not be completed as quickly as USAF planners expected. Once again, the RWE took the blame.

(4) The RWE had a difficult time keeping required positions filled. Lack of skilled and semi-skilled workers

in the local area continued to be a major problem for the RWE.

Total success of base support after the AFCE reductions were implemented throughout the UK, however, relied on the integration of MPBW and AFCE personnel into the control center, the heart of the AFCE unit. This integration began in 1964.

In December 1964, the RAF Bentwaters Control Center became the model for the AFCE-MPBW integration for all USAF installations in the UK. In January 1965, the final obstacle for a fully integrated control center was overcome when the MPBW agreed to integrate control center operations (314). British employees were now placed in the AFCE control center as liaisons between MPBW and AFCE organizations (105, 313).

Despite the British commitment to integrated control centers throughout the UK, successful control center integration was delayed on all 3AF installations for three primary reasons. First, a shortage of British technical staff could not be overcome. Second, the base level MPBW staff on some installations opposed the integration. Finally, the MPBW insisted that the USAF pay for all construction and modifications associated with the integration with USAF funds that were already scarce (313).

3AF AFCE Manning Studies. In 1965, HQ USAFE began to emphasize the use of engineering manpower standards to justify AFCE positions in the UK. The manpower team arrived in the UK after the reductions of 1962-65 had taken place. Their findings would reflect a concern over AFCE manning levels where AFCE reductions had been implemented. Det 1, 7250 Support Group was assigned at RAF Alconbury to deal with manpower issues in the UK and develop USAF manpower standards for the UK. A HQ 3AF and a base level AFCE manning study were conducted by the newly assigned Det 1, 7250 Support Group staff between 1962 and 1968. Both studies identified requirements for additional AFCE manning in the UK.

HQ 3AF Manning Study. A HQ 3AF Functional and Manning Study was conducted from August through October 1966 to examine the "Command's functional responsibilities, manning, and organization" (39:13). The study concluded that the AFCE organizations in the UK performed functions unlike anywhere else in the world and recommended additional manning should be authorized to HQ 3AF/DE (39:18).

The study identified HQ 3AF/DE as one of the functions that reported directly to HQ USAFE in Germany. The 3AF Commander was unable to "judge, influence, and control his construction and maintenance requirement" (39:17) and, therefore, had little or no influence over civil

engineering activities in the UK. This situation limited the 3AF Commander's ability to "effectively direct, support, and control the [3AF] combat force" (39:16).

The study recognized that the joint US-UK civil engineering structure that had been established over the past 18 years was unique within USAFE. No other AFCE unit had to defer so much of its operations to the host country civil engineering organization. Forty-seven spaces on the HQ 3AF/DE staff existed solely to support the unique civil engineering situation in the UK. The study, therefore, recommended an increase in the authorized manning for the HQ 3AF/DE staff of 2 officers, 1 airman, and 8 civilians to "to provide the [3AF] Commander with information insuring that [civil engineering project] priorities are in consonance with mission requirements" (39:18). The study also recommended that all 3AF AFCE activities be assigned to the direct control of the 3AF Commander instead of HQ USAFE. HQ USAFE, however, only authorized 1 officer and 1 civilian and rejected the proposal to put UK AFCE activities in the UK under the control of the 3AF Commander (317).

Base Level AFCE Manning Studies. In 1968 another study, this time a UK-wide base level AFCE manning study was completed. This study also recommended increased AFCE manning. The study identified 26 additional AFCE positions required on each 3AF installation for facility maintenance

and repair work, twice the number authorized (84). The package was submitted and approved by HQ USAF. Additional AFCE manning, however, did not arrive.

Increased AFCE Responsibilities in the UK. Between 1962 and 1968, the workload of AFCE units in the UK increased steadily. But with the added responsibilities, AFCE military manning levels continued to decrease in the UK.

NATO Programming. HQ USAFE/DER handled the initial NATO programming for 3AF. In 1966 however, HQ 3AF/DE assumed more airfield planning responsibilities with the addition of NATO requirements on RAF Alconbury, RAF Bentwaters, RAF Woodbridge, RAF Lakenheath, RAF Vethersfield, RAF Chelveston, and RAF Sculthorpe (36:27). The initial goal was to provide NATO essential services on 3AF installations: runways and taxiways to accept NATO member nation aircraft, adequate aircraft parking, and sufficient jet fuel and ammunition storage facilities. Table 5 summarizes the initial NATO programming for 3AF.

Table 5. NATO Program for 3AF Installations, 1962-1966 (313).

| <u>PROGRAM<br/>YEAR</u> | <u>NUMBER OF<br/>PROJECTS</u> | <u>COST<br/>(\$ MIL)</u> |
|-------------------------|-------------------------------|--------------------------|
| 62                      | 3                             | 0.31                     |
| 64                      | 37                            | 6.83                     |
| 65                      | 26                            | 4.92                     |
| 66                      | 16                            | 3.16                     |

In June 1966, a special section was created within HQ 3AF/DE to program NATO projects on all 3AF bases (Directorate of Plans and Resources). HQ 3AF/DE manning, though, did not increase. The responsibilities of this directorate included pre-financing cost estimates and recoupment of funds actions on NATO projects, coordinating with the MOD (Ministry of Defense) on NATO projects, acting as the liaison between 3AF and US Commander in Chief Europe, and developing AFCE plans in support of contingency operations and disaster control procedures (313).

Withdrawal From France. The AFCE workload in the UK increased once again when France announced her decision to "withdraw from military participation in the NATO alliance" in 1966 (36:23). As soon as the French decision was announced, HQ 3AF began to negotiate for additional bases in the UK to make up for the installations lost in France and the Air Ministry agreed to expand USAF

operations in the UK (317). Once again, AFCE manning did not increase in proportion to the increase in construction and maintenance associated with the move from France.

The increased workload for base level AFCE beddown support was substantial: two additional tactical wings, six squadrons, two bases converted to full operating status, storage for the USAF materials and equipment from France, and an increase of approximately 4,000 military personnel (39:16).

On April 25, 1966, tentative plans to relocate four units from France to the UK began: 322 Air Division (MAC) to High Wycombe Air Station, 513 Troop Carrier Wing to RAF Mildenhall, 22 Tactical Reconnaissance Squadron and the 66 Reconnaissance Wing to Upper Heyford. In addition, the Air Ministry agreed to use RAF Chelveston, RAF Sculthorpe, and RAF Greenham Common for storage of USAF materials arriving from France (36:27). In one case in particular, a severe shortage of AFCE manpower existed to help beddown the 513 Troop Carrier Wing at RAF Mildenhall that began to arrive in 1966 (211). As a result, AFCE units from Germany were sent to the UK to help prepare installations for the incoming forces from France.

Mission Changes. Modernization of USAF aircraft in the UK generated new construction and facility modification programs on USAF installations in the UK. For

a third time, AFCE manning did not increase with an increase in the workload. In 1964, new construction on RAF Bentwaters to convert to the F-4C cost \$2 million (105). In 1965, RAF Alconbury converted to the RF-4C at a cost of \$200,000 in facility modification projects (78).

Effects on AFCE Operations, 1962 to 1968. In 1968, a HQ USAFE inspection team at RAF Alconbury summarized the difficulties with establishing a US-UK AFCE organization:

full implementation of a modified US/BCE reorganization is not possible until the basic tools are provided the BCE. . . . [S]tandardized guidance and direction from the respective headquarters; . . . augment the "Blue suit" force; . . . and supplement existing directives for the UK/BCE operation [49:N-2].

Reduced AFCE manning in the UK meant that as the workload and responsibilities increased, 3AF had to rely more and more on British civilians to perform more AFCE duties. The MPBW staff planned and designed more USAF projects in the UK when American based Architect-Engineers were deleted at HQ 3AF AFCE (297). Local civilian craftsmen and contractors now performed the base maintenance and repair. 3AF bases, therefore, had to accept British construction standards that were considered inferior to US construction standards.

Adjusting to the standards of the British construction industry created one set of problems for the AFCE planners. Another was integrating the procedures of two different

organizations. Developing standard procedures for processing work requests and establishing a AFCE-PSA organization similar to an typical AFCE organization had been the goal at the beginning of this phase (103). However, as AFCE military manpower decreased in the UK, it became more difficult to apply the HQ USAF standard to AFCE operations in the UK.

AFCE operations in the UK were affected in four ways by the reduction of AFCE manning: the number of British civilian craftsmen available to perform base maintenance and repair was limited, the cost of using British labor was higher, responsiveness to USAF user work requests was lower, and AFCE warfighting ability was reduced. To overcome some of the AFCE limitations, self-help programs, multi-task training, and additional AFCE work response vehicles were implemented.

Manpower Availability. A lack of skilled and semi-skilled local craftsmen decreased the ability to perform adequate maintenance and repairs on 3AF installations. Military AFCE craftsmen were too few to compensate for the shortfall in British manning. Therefore, work simply did not get done.

The PM program was affected by the lack of skilled craftsmen. A sufficient number of PM teams could not be established on USAF installations in the UK. Minor

maintenance and repair had to be deferred. A 1965 HQ USAFE inspection team of RAF Alconbury identified the problem in their report. The inspectors rated the PM program marginal. Work was not accomplished. Insufficient PM teams was given as the cause (78, 310).

Costs. The shortage of funds between 1962 and 1968 affected the ability of 3AF civil engineering organizations to accomplish maintenance and repair on 3AF installations. The MPBW staff relied on term contractors (contractors awarded a base maintenance contract for a term of three years) to perform the majority of the minor maintenance and repair work. But the amount and quality of work performed depended on the AFCE funding levels. The limited number of AFCE craftsmen could not compensate for the shortage of base maintenance funds.

Maintaining USAF installations in the UK with the British civil engineering staff cost more than with an AFCE military staff. These costs, however, were not considered by HQ USAFE in the annual \$300,000 savings projected for the AFCE manpower reduction in 1963. Three examples of the cost difference were:

(1) In 1962, a cost comparison was performed on RAF Alconbury. Using troop labor to paint facilities cost \$400. The estimated cost using British station contractors was \$5,600 (74).

(2) From Jul-Dec 66, self-help work orders saved RAF Alconbury \$17,756 by using troop labor instead of the MPBW (74).

(3) The cost to move six portable buildings on RAF Wethersfield in 1965 was \$6,720 cheaper using military labor (296). An additional \$3,500 was saved when additional buildings were moved by military personnel in 1966 (298).

The quality of the work performed by the contractor was also affected by the funds available. The contractor tried to stay within the limited budget for installation maintenance and repair and also maintain a reasonable profit (79). Therefore, the contractor could not afford to concentrate on quality alone.

Responsiveness. Civil engineering response decreased with the reduced AFCE military manning. Work was delayed. Work completion rates also decreased. Project designs took longer in the British bureaucracy. The lack of a sufficient number of PM teams created backlogs in service calls and delays in response to PM type work (77).

Contractors concentrated most of their effort on more profitable, new work rather than the non-profitable small maintenance jobs. Job orders and service calls were generally low cost, minor maintenance or repair jobs that did not require a design, similar to calling a handyman to fix a stopped up drain. Work orders, on the other hand,

usually required more cost, more time to complete, a materials order, and time to plan the job. Job orders and service calls, as a result, were delayed because they received a lower priority by the contractors than work orders.

Turnover of term contractors contributed to reduced responsiveness for maintenance and repair on 3AF bases. In one case, a building and civil engineering term contractor on RAF Alconbury gave notice of termination in 1962 and refused to accept any new work (74). RAF Alconbury, therefore, had to delay the start of new work until a new contractor could be hired.

AFCE shops, in general, achieved a higher completion rate than MPBW shops for both service calls and works orders. Completion rates for work requests were measured by RAF Alconbury for 1962 and 1963 (Table 6). AFCE craftsmen maintained a completion rate above 95 percent. The MPBW completion rate, on the other hand, never exceeded 80 percent. Service calls were the primary source for customer impressions of AFCE support. The higher completion rate for AFCE craftsmen, therefore, indicated of the emphasis that BCEs placed on customer satisfaction.

Table 6. RAF Alconbury Work Request Analysis, 1962-1963  
(74, 75, 76, 77).

SERVICE CALL ANALYSIS

| PERIOD     | Received |      | Pct Complete |      | Pct Complete |      |
|------------|----------|------|--------------|------|--------------|------|
|            | MPBW     | AFCE | MPBW         | AFCE | MPBW         | AFCE |
| JAN-JUN 62 | 1554     | 1840 | 1230         | 1820 | 79           | 99   |
| JUL-DEC 62 | 1920     | 1418 | 1248         | 1408 | 65           | 99   |
| JAN-JUN 63 | 1374     | 798  | 1035         | 798  | 75           | 100  |
| JUL-DEC 63 | 1335     | 1219 | 557          | 1175 | 42           | 96   |

WORK ORDER ANALYSIS

| PERIOD     | Received |      | Pct Complete |      | Pct Complete |      |
|------------|----------|------|--------------|------|--------------|------|
|            | MPBW     | AFCE | MPBW         | AFCE | MPBW         | AFCE |
| JAN-JUN 62 | 197      | 96   | 157          | 62   | 80           | 65   |
| JUL-DEC 62 | 165      | 72   | 118          | 59   | 71           | 82   |
| JAN-JUN 63 | 65       | 16   | 17           | 13   | 26           | 81   |
| JUL-DEC 63 | 38       | 4    | 11           | 4    | 29           | 100  |

Warfighting Capability. The loss of AFCE military personnel also created a void for wartime recovery operations in the UK. HQ 3AF, as a result, requested that the MPBW base level staff establish disaster recovery teams and participate in exercises, but participation was voluntary (312). USAF inspectors recorded the harmful effects: in 1965, HQ USAFE inspectors reported that the shortage of personnel limited emergency services required by the established plans at RAF Alconbury (78).

Initiatives to Improve AFCE Operations. With smaller organizations, base level AFCE units had to accomplish more with less.

In 1965, RAF Alconbury introduced "LEAN BEEF," a program to train all assigned AFCE non-firefighting personnel to perform emergency construction, airfield sweeping, and snow removal operations (79). The primary emphasis was to train AFCE personnel and base augmentees to operate heavy equipment to compensate for the severe shortage of AFCE military heavy equipment operators on UK bases (162, 297). The rest of the AFCE organizations in the UK quickly followed RAF Alconbury's lead.

In 1968, Do-It-Now (DIN) trucks were put into service on USAF installations in the UK. DIN trucks improved response times for emergency service calls and reduced the travel time because common items were stored on the truck (84). Craftsmen could be dispatched by radio from one job to another from the control center. The DIN drivers performed such simple work as plumbing, electrical, carpentry, and glazing jobs (84). DIN trucks at RAF Alconbury immediately reduced the backlog of service calls to zero during the period from January to June 1968 (84).

### 3AF AFCE, 1968 to 1979

The second period, like the first (1962-1968), saw reductions in manpower at both the headquarters and base level AFCE organizations. HQ 3AF was relocated and HQ 3AF/DE became vacant. The worldwide AFCE manpower standards developed during this phase did not apply to 3AF AFCE units. Instead, another manpower reduction test was conducted. Like the previous phase, increased AFCE responsibilities were not accompanied by increased manning. Like the previous phase, therefore, AFCE operations in the UK were affected by the AFCE manning levels on 3AF installations.

HQ 3AF/DE Reduction (RED COSTE). In May 1968, HQ USAFE implemented a third in a series of HQ 3AF reduction programs since 1962, RED COSTE. When the RED COSTE plan was retired, HQ 3AF/DE was vacant. The two-phase plan reorganized and relocated HQ 3AF.

In phase one (1969), HQ 3AF was initially reorganized and consolidated within the London (319). Phase two (1971) saw HQ 3AF reorganized a second time and relocated. USAFE Programming Plan 4716-71 (Revised), dated December 7, 1971 reduced HQ 3AF to 67 authorized positions by the end of June 1972 (48:33). This reduction left the HQ 3AF/DE organization vacant. The HQ 3AF/DE staff, therefore, was reduced from a 1962 peak of 96 personnel to none ten years later (318).

Operational control of base level AFCE units reverted back to HQ USAFE, returning to the situation that existed in 1962. The lack of one group within the UK to guide the overall direction of 3AF base level AFCE units affected AFCE operations in the UK.

(1) Instead of one voice representing 3AF AFCE interests to HQ USAFE, each unit communicated independently with HQ USAFE.

(2) Standard AFCE operations and procedures on all 3AF installations was difficult to achieve.

(3) Policy, programming, and funding decisions for base level 3AF AFCE units were, once again, in the hands of a headquarters located in Germany.

(4) While the 3AF Commander was in charge of all USAF installations in the UK, he had little direct control or influence over the base level AFCE operations within his command.

Under RED COSTE, HQ 3AF was relocated. In 1973, South Ruislip closed. The installation was perceived as an "unnecessary expenditure of manpower and tax dollars" (48:41) with the reduced size of the HQ 3AF staff. HQ 3AF was relocated from South Ruislip to RAF Mildenhall, the present location for HQ 3AF. HQ USAFE/DER stayed in London, however, when the HQ 3AF/DE became vacant. The Operations and Maintenance functions that HQ 3AF/DE performed were transferred to West Ruislip (12).

Standardization of Base Level AFCE Operations. In 1975, standard AFCE operations were introduced in the UK when USAFER 85-3, Maintenance of Real Property Facilities in the United Kingdom was published (269). The regulation improved the ability of AFCE to accomplish work because it specified

responsibilities and procedures for the day-to-day maintenance, repair, and operation (of) real property facilities in the United Kingdom (UK) through coordinated efforts of the USAF and the Property Services Agency (PSA) [25:1-1].

Base level AFCE operations in the UK were changing so rapidly, however, that a revision of USAFER 85-3 was necessary by 1980.

AFCE Manpower Standards. Worldwide AFCE peacetime manpower standards were developed in 1969. The goal of establishing AFCE manpower standards was to link manpower to actual requirements. Workload data was collected from a cross-section of 43 USAF installations, representing all commands, to develop the equations on which the AFCE manpower formulas were based (27:4). These standards determined how many people were needed to perform a peacetime job (27:4).

AFCE units in the UK, however, were not included in the study possibly because

(1) The joint US-UK civil engineering working relationship did not represent the typical AFCE organizational structure.

(2) Greater political pressure was on USAF to reduce military spending in the UK than calculating manpower requirements.

(3) HQ USAFE, in Germany, believed that the British civil engineering staff was capable of performing the peacetime base support mission. Therefore, an AFCE manning study was unnecessary on 3AF.

Regardless of the reasons behind the decision, the AFCE manpower standards developed in 1969 did not apply to 3AF. Reductions in manpower, therefore, seemed to have been more important than actually determining how many people were needed to do any given job. Field tests were conducted in the UK as a substitute for manpower studies. One of these field tests was Third Personnel Requirements of Base Engineers (PROBE).

Third Personnel Requirements of Base Engineers  
(PROBE). RAF Bentwaters developed a plan (3rd PROBE) to integrate all base level AFCE-MPBW operations (Appendix I). The organizational structure contained in this plan was similar to the structure Lt Col Smyser and the Air Ministry developed during WW-II to accomplish AAF installation construction, maintenance, and repair (Figure 1). This plan

also excluded firefighters. The suggested AFCE manning under this plan was 44 personnel (4 officers, 33 enlisted, and 7 civilians), two and one-half times more than the 18 personnel assigned to 3AF bases under the 1963 AFCE reduction plan (110).

RAF Bentwaters began a 2-year test of their "Bentwaters Scheme" on January 2, 1973. Cost accounting, real property, and firefighting functions were unaffected by the test. The Bentwaters Scheme originally proposed that (131, 134):

- (1) The BCE become the acting Base Commander.
- (2) The Depot Superintendent perform all the duties of a BCE.
- (3) The Chief of Operations and Training become the AFCE squadron commander.
- (4) The British Directly Employed Labor (DEL) workforce be responsible for the day-to-day facility maintenance and repair functions.
- (5) PSA tech officers take over program development for the 5-year operations & maintenance, MCP, non-appropriated funds, schools, and hospital programs.
- (6) A Civil Engineering Liaison Officer (CELO) be assigned to the PSA staff to advise the PSA of USAF regulations.

The original Bentwaters Scheme organization was modified during the 2-year test. Several refinements were made to the organizational structure. But, instead of

integrating AFCE-PSA operations as the test had intended, these refinements separated responsibilities of the PSA and AFCE organizations. The refined organization was implemented throughout the UK (98):

(1) The BCE assumed his normal duties as the base Civil Engineer and Squadron Commander. However, the BCE is still referred to as the Civil Engineering Liaison Officer.

(2) The Depot Superintendent assumed duties as the British equivalent of the BCE.

(3) The Chief of Operations and Training assumed his normal duties.

(4) PSA became solely responsible over for work control functions, service call section, preparation of the In-Service-Work plan, the plan for routine maintenance and repair work, and all service contracts monitoring.

(5) The AFCE work control section was deleted.

(6) An all military AFCE emergency response team was added to the operations and maintenance branch.

(7) Responsibility for all generator maintenance was transferred to PSA.

(8) Control over spending for day-to-day maintenance was taken away from the AFCE organization. A quarterly allocation was transferred to PSA. PSA, in turn, allocated the money to accomplish specific tasks.

(9) The Programs section planning and work scheduling activities were consolidated and centralized.

The scheme relied on a good personal relationship between the AFCE and PSA staffs to function effectively (181). One reason why a good relationship was essential was the method for paying for routine maintenance and repair in the UK. USAF funds were transferred to PSA quarterly but actual outlays were controlled by PSA. As a result, the BCE could not use funding as a control over work priorities. Another reason that a good relationship as critical was that PSA performed all facility maintenance and repair on 3AF bases. The degree of success or failure of the integration, therefore, varied throughout the UK based on the type of working relationship that existed between the two local organizations. If the relationship was good, PSA response to work requests was excellent and integration was a success. If the relationship was poor, though, PSA response to work requests was poor and integration was a failure.

Increased Responsibility. Base level AFCE responsibilities continued to increase from 1968 to 1979, but the manning increases did not equate to the increased workload. One 3AF wing commander during this period pointed out that the manning of AFCE units in the UK was significant problem because

. . . there remains a definite need for a "blue suit" civil engineering minor construction and maintenance capability assigned directly to the Base Civil Engineer. . . . [I]t should include a proportionate number of critical skills such as masons, plumbers, carpenters, and electricians [61].

When HQ 3AF/DE was vacated in 1972, base level AFCE units were tasked to prepare O&M and NATO projects, but these units were authorized little increased manning. Some wartime emphasis was added to AFCE responsibilities when 3AF bases were tasked to prepare Collocated Operating Base (COB) development packages. Aircraft conversions also increase the planning workload at the base level.

Collocated Operating Base (COB) Programming. In 1978, the UK bases assumed planning responsibilities for the Collocated Operating Base (COB) program.

A Collocated Operating Base (COB) is an active allied airfield designated for use by US wartime tactical air augmentation forces. The COB concept exemplifies the total NATO force concept by placing high capacity US augmentation aircraft on allied airfields for NATO wartime operations [18:1].

Unlike WW-II, COBs are operational European airfields, pre-identified to receive US aircraft during a transition to war in Europe. For example, RAF Lakenheath was assigned the responsibility to program projects for three COBs in the UK and two COBs in Norway. The initial projects to provide essential services for USAF operations on the RAF Lakenheath

COBs was over \$114 million (201). Usually, only one officer was assigned the task of developing COB projects and preparing a war plan for each base.

Mission Changes. From 1968 to 1979, the USAF modernized aircraft in the UK, another example of increased responsibility with no increased manpower to support the facility modification programs. Facility support for the F-4D conversion to the F-111F at RAF Lakenheath in 1977 created approximately \$10 million worth of projects (196, 198). In 1978, RAF Bentwaters converted from the F-4C to A-10s, at a cost of approximately \$1.7 million in facility modifications (143).

Effects on AFCE Operations, 1968 to 1979. While not directly related to AFCE operations in the UK, the relocation of HQ 3AF to RAF Mildenhall affected the command structure of 3AF. The relocation removed the 3AF Commander from the people he dealt with on a daily basis in the London area: RAF Command, STRIKE Command, Support Command, the Ministry of Defense (MOD), and the Home Office through the American Embassy. A one-hour meeting, therefore, now took an entire day for the 3AF Commander with the added travel time between London and RAF Mildenhall (12).

Costs. USAF bases in the UK maintained an active self-help program to compensate for the high cost of doing business with PSA. PSA, however, had to approve all the work accomplished by troop labor. In 1971, the construction of a fire training pit on RAF Alconbury saved the USAF \$8,000 (91, 92). Painting security lines on airfield pavements and restoring bunkers with military labor on RAF Mildenhall saved the USAF another \$8,000 (222).

Any means were taken to improve the inadequate facilities on 3AF installations to compensate for the limited AFCE manning and base maintenance funds. A wing commander at RAF Upper Heyford found

Many facilities, including dormitories and dining hall, were constructed in the 1925-1930 period. These 50-year old facilities are not totally adequate for modern use (47:3).

The same wing commander found the facilities on RAF Bentwaters/Woodbridge equally inadequate

Many of the facilities . . . are still housed in World War II Quonset and Nissen huts. This leads to excessive expenditures on utilities and maintenance. Although we economize in all areas, working conditions were difficult (46:4).

Another wing commander found the cost of maintaining base facilities and the lack of control over how maintenance money was spent particularly frustrating

My greatest criticism is the expense of maintaining the base and the lack of control of how our O&M funds are spent. We have no way of auditing the system and no way of determining whether the monies that are allocated to PSA are properly managed. . . . The estimates provided by them [PSA] on minor construction and repair work are double those of comparable US costs. It appears that if PSA does not have the same priority as the wing commander for a project, they will price you right out of the job. Project documents are requiring higher headquarters approval are turned down because estimates are too high [31:2].

A third wing commander expressed a sense of relief when he received some unexpected, and needed funds, to pay for the higher cost to maintain facilities in the UK.

[We] received an unexpected windfall of \$3.2 million from USAFE in June [1974]; it was sorely needed. . . . [P]lant maintenance [had been neglected] for many years because of insufficient funds. We applied \$2.6 million . . . to reducing our huge backlog of essential base maintenance and repair [59:3].

Responsiveness. Identical problems occurred during the aircraft conversions during 1968 to 1979 and occurred during 1962 to 1968. The classification of the conversion plans created delays in developing facility support projects.

One example of the problems caused by the classification of information occurred at RAF Lakenheath. The official announcement to convert to the F-111F aircraft was delayed by six months after the decision was made to convert because British contractors were denied access to any classified

information (53:2). Once the announcement was made, though, the majority of the planning was already well underway.

For one 3AF wing commander the classification problem was unavoidable because the USAF had to "depend 100 percent on British contractors to do the necessary building and rehabilitation of facilities" (53:2).

Bureaucratic project design procedures within PSA contributed to the delays. Projects were designed by the local PSA staff. If the design was beyond the capability of the local level, the PSA Area Office prepared the design. When the Area Office could not handle the design, a consultant was appointed, similar to an A-E, to prepare the design (181).

One 3AF wing commander felt that design and construction projects took too long under the 3AF civil engineering structure.

Experience has shown that it is just not possible to get major construction work done quickly and on-schedule in England. No worthwhile penalty clauses for default could be written into construction contracts, and completion times were determined mainly by chance subject to the effects of weather, labor strikes, transportation, holidays, and the subcontractor's individual problems. . . . Planning far enough in advance has been a problem, especially where it concerns construction projects (61:3,11).

But base level AFCE units had no in-house design capability. AFCE units, therefore, could not reduce the

design delays. Two further conditions helped create a difficult situation.

(1) Classified projects "inhibited the effective planning, programming, coordination and communication" (61:2) between the USAF and British planners. British MPBW designers and local contractors were denied access to information nor could USAF planners discuss classified details of the projects with British planners.

(2) New construction and facility modification projects took longer to complete than expected by the USAF planners. One wing commander attributed the delays to two factors

no worthwhile penalty clauses for default could be written into construction contracts, and completion times were determined mainly by chance subject to the effects of weather, labor strikes, transportation, holidays, and the subcontractor's individual problems [61:3].

Project design and construction were not the only civil engineering functions affected by the AFCE-PSA organization on 3AF installations. Routine maintenance and repair jobs on 3AF installations also took longer to complete than commanders expected. AFCE units did not have a large number of military craftsmen assigned. Therefore, like the project design and construction operations, AFCE units could not significantly reduce the delays for routine maintenance and repair work. At least one 3AF wing commander was not comfortable with the US-UK base maintenance agreement.

I found difficulty with the rules and regulations by which I must operate the base. . . . I am not authorized to do any maintenance and repair of my base without the express approval of their [Property Services Agency] . . . The overall responsiveness of PSA is far below US standards [31:2].

A second wing commander believed that partial blame for routine maintenance and repair jobs taking longer than expected was the absence of "penalty clauses on any work orders placed with the term contractor when completion of work is not on schedule" (31:2).

Wing commanders in 3AF were not sympathetic to the unique AFCE-PSA structure within 3AF and the limitations of the BCE to respond to work requests. At least one wing commander recognized that commanders were partly to blame for a perceived lack of response by PSA.

It can . . . become very easy to confuse the responsibilities of each group [AFCE and PSA] and expect the same degree of efficiency and rapid reaction time from PSA that a commander becomes accustomed to in a regular CE [Civil Engineering] squadron [48:2].

Warfighting Capability. AFCE wartime readiness was also affected by the 3AF civil engineering structure. A local exercise at RAF Upper Heyford in December 1974 tasked AFCE personnel with disaster response activities. Their findings raised concerns about the ability of PSA craftsmen to respond to emergencies or disasters (270).

One 3AF wing commander expressed concern over the vulnerability of his base in the event of war.

I envision RAF Mildenhall [the gateway to the United Kingdom] being a very lucrative target for the enemy. Minor runway damage will totally incapacitate movement of aircraft from the base [31:1,4].

Response to real world disasters was also affected by the size of the base level AFCE workforce in the UK. One 3AF wing commander

had to utilize [non-AFCE military personnel] . . . as an emergency repair force to recover from a Christmas Eve wind storm which caused severe damage to some base buildings [48:2].

Initiatives to Improve AFCE Operations. As in 1965, AFCE units reorganized and introduced initiatives to make the unit as efficient as possible. AFCE units transferred personnel to other sections within the organization to get the work done. Most positions were one man deep. Manning levels, therefore, did not allow for any flexibility for fluctuations in manning due to sickness or rotation.

Industrial Engineering (IE) was an overhead management function that 3AF BCEs could not afford. Therefore, IE personnel were used for various duties: project development, construction management, administration of service and utilities contracts, construction surveillance, and Quality Control inspection of MPBW jobs (88, 96, 104, 178, 257).

Power production personnel were also used to monitor the generator maintenance contractors and sweep runways (78, 187).

### 3AF AFCE, 1979 to the Present

Unlike the two previous phases (1962-1968 and 1968-1979) where manning was reduced, 1979 to the present has seen significant increases in the AFCE manning. Other major changes would also occur. In 1979, a RED HORSE Squadron, with approximately 400 personnel, was assigned to the UK. In 1985, a HQ 3AF/DE was reassigned with a staff of four personnel. AFCE units also took an active wartime readiness task for the first time since being assigned to the UK.

HQ 3AF AFCE Reorganization. Two significant additions to AFCE manning occurred during this phase: RED HORSE arrived in 1979 and HQ 3AF/DE returned in 1985. RED HORSE was a HQ USAFE asset when it arrived in the UK: therefore, it will be discussed as a HQ reorganization.

Introduction of AFCE Construction Forces. For the first time ever, a true AFCE military construction force was deployed to the UK in August 1979. Unlike the SCARWAF units in the 1950s, the 819th RED HORSE was entirely a USAF asset, manned by USAF civil engineers. The unit was deployed to

RAF Wethersfield. However, unlike previous periods where the USAF troop construction forces stationed in the UK were under the command of HQ 3AF, the 819th RED HORSE was under the operational control of HQ USAFE. Once again, the 3AF Commander initially did not have control over another AFCE asset assigned within his area of responsibility.

PSA treated RED HORSE differently than other base level AFCE units in the UK. RED HORSE was given more flexibility and independence from PSA than a base level AFCE unit. PSA handled RED HORSE like any local civilian contractor, to "do a turn-key construction job and keep PSA advised of the project progress" (73:12, 25:1-1). PSA allowed RED HORSE to order materials, a significant change from the normal procedure where PSA ordered everything (73:18).

Finally, in 1985, the 819th RED HORSE was transferred to the operational control of HQ 3AF (12, 35). The 819th RED HORSE continued to perform construction throughout USAFE, from the UK to Turkey, but its independence from PSA and its connection with HQ USAFE distinguished this unit from the base AFCE organization in the UK.

HQ 3AF/DE Reestablished. By 1986, after 8 years without a HQ 3AF/DE, the US Military Construction Program (MCP) in the UK had grown so big that the personnel assigned to Operations and Maintenance (O&M) (previously a HQ 3AF/DE task) at HQ USAFE/DER were transferred to the MCP section.

With this reorganization, O&M projects were left totally up to one individual, the HQ USAFE/DER, a job too big for one person (12).

Five years later, though, the HQ 3AF/DE position was reestablished, after an absence of 13 years. The HQ 3AF/DE organization included 4 positions: two officers, one enlisted, and one secretary (12). Thus, by 1985, the 3AF AFCE organization saw reestablished in the UK a HQ 3AF/DE to manage the overall operations of AFCE units in the UK and a military construction capability (819th RED HORSE) for in the UK.

Base Level AFCE Reorganization. Many changes occurred in developing the AFCE-PSA structure after USAFER 85-3, the guideline for AFCE-PSA operations in the UK, was first published (1974). These changes were significant enough that USAFER 85-3 was revised and published again 14 March 1980 (Appendix J extracts portions of USAFER 85-3).

Base level AFCE units in the UK reorganized (Appendix F) to align to the revised USAFER 85-3. The basic concepts for the AFCE-PSA method of operation, however, did not change with the revision of USAFER 85-3.

(1) All work was a shared effort between PSA and the AFCE organization.

(2) Work requests were initially processed through the AFCE organization, and then passed to PSA.

(3) Funding was the responsibility of the USAF.

(4) Maintenance, repair, project design, and construction monitoring was a PSA responsibility.

In April 1985, 17AF centralized the "planning and wartime activation" (18:1) of 25 COBs maintained in Germany, Belgium, Netherlands, and Denmark (18:1,B-1). A central COB planning organization, however, did not appeal to 3AF units. BCEs in the UK preferred, instead, give up the benefits of a centralized operation and eliminate the potential loss of manpower. A decentralized COB function in the UK, therefore, gave the BCE additional manpower to use for other base level AFCE functions.

Centralized COBs was not the only initiative to "improve [the] wartime capability" (335) of AFCE units. In September 1987, AFCE organizations were restructured under Project Innovation Management Achieves Greater Effectiveness (IMAGE). This major initiative did not apply to the non-conventional AFCE units in the UK, however, because the restructure was part of a "world-wide initiative . . . [and does not] attend to the non-conventional [AFCE] units" (1).

Base Level AFCE Manpower Study. A 1982 AFCE manpower study led to the development of official manpower standards for AFCE organizations in the UK in December 1983 (269). Five bases were selected to collect data: RAF Alconbury,

RAF Bentwaters, RAF Chicksands, RAF Mildenhall, and RAF Upper Heyford.

AFCE base level operations, however, changed dramatically between the time that the study started (1982) and the standards were published (Dec 1983). A functional review of the UK manpower standards, therefore, was initiated on July 1983 to revalidate the not yet published standards. The same installations used to develop the original standards were used in the functional review. The final report on the revalidation was completed on May 1, 1986 and modified the 1983 manpower standards (325:1-1).

Appendix K compares manpower standards of seven workcenters common to both a traditional and a UK (non-traditional) AFCE unit. In general, the manpower equations favor the traditional AFCE organization.

AFCE Readiness in the UK. The 819th RED HORSE gave USAFE a military troop construction capability, but it also gave as AFCE units in the UK a warfighting capability. Unfortunately, base level AFCE organizations did not receive additional manning for their contribution to the increased AFCE readiness capability in the UK.

Prior to 1979, AFCE units in the UK had no Rapid Runway Repair (RRR) or bomb damage repair capability. UK airfield pavements were vulnerable to an attack by the Warsaw Pact

powers, therefore, because the responsibility for "repairing devastated airfield pavements in the UK fell on only 25 base personnel with little training or equipment" (73:6). Between 1962 and 1979, the shortage of base level AFCE personnel in the UK affected the AFCE ability to train and participate in wartime exercises.

For example, AFCE unit heavy equipment operators could not participate in exercises throughout 3AF. The peacetime airfield sweeping commitments and a shortage of operators and equipment existed on USAF bases in the UK (79, 136, 206, 313).

In 1979, the 819th RED HORSE deployed in the UK to bring an AFCE wartime recovery capability into the UK. The mission of RED HORSE was "to provide equipment operators to perform Rapid Runway Repair (RRR) . . . in the UK" (73:9). RED HORSE was authorized 324 personnel for this mission (73:9).

Under the RRR concept in the UK, a base RRR team consisted of a team OIC and NCOIC from the base, 51 base personnel to assemble the mat, and an NCOIC and 38 RED HORSE equipment operators. RED HORSE supported six UK bases: RAFs Alconbury, Bentwaters, Lakenheath, Mildenhall, Woodbridge, and Upper Heyford. Vehicles, equipment, AM-2 matting, and materials were stored at an Operating Location (OL) on each base. And each OL was staffed by two 819 RED HORSE personnel (73:21).

The RED HORSE mission quickly expanded from the UK RRR mission to include a world-wide mobility commitment that increased manning to 400 personnel (73:9). This secondary mission provided "a highly mobile self-sufficient civil engineering capability to perform construction and heavy repair [for HQ USAFE]" (305) and gave USAFE another peacetime military construction capability.

By 1983, the peacetime commitments reduced the RED HORSE readiness support for 3AF AFCE units. RED HORSE personnel were removed from each OL. The responsibility for OL operations, assets valued in excess of \$15 million, was turned over to the base level AFCE organization (210). As usual, no additional manpower arrived with this additional responsibility. Manning for management of the OL operations, therefore, came out of the limited base level AFCE manpower.

The biggest problem AFCE units faced during the implementation of RRR in the UK was educating base commanders about the importance of RRR training. USAF bases in the UK already had more wartime taskings than they had people to meet the commitments (73:22). RRR was considered just another a part time tasking by the commanders who provided by base augmentees. A HQ USAFE wartime readiness inspection of RAF Lakenheath in 1980 identified the manning problem for RRR: augmentees were not under the direct control of the OIC of RRR and the wing did not designate RRR

augmentees (206). Emphasis on RRR training began, however, when RRR became a pass or fail item on Operational Readiness Inspections in 1984 (29).

Although the role of AFCE military personnel was well defined for wartime operations, the wartime role for PSA was not defined. A HQ USAF Civil Engineering and Services Management Evaluation Team noted this problem during their visit to RAF Lakenheath in July 1980, stating "the part PSA will play in the base recovery program needs to be better defined since the military capability is limited" (52:2). PSA's responsibilities to maintain base facilities during contingencies (Appendix L), however, are significantly and directly affect the ability of USAF to generate sorties in the UK.

Effects on AFCE Operations, 1979 to the Present. Both AFCE responsiveness for base support and the warfighting capability were improved with the addition of AFCE manpower in the UK. HQ 3AF/DE reestablished a single point of contact that represented all 3AF AFCE unit interests to PSA and HQ USAFE. RED HORSE provided 3AF bases with the heavy equipment operators needed to perform the Rapid Runway Repair. Standards by which 3AF AFCE operations were evaluated, however, continued to be difficult with the AFCE-PSA working relationship in the UK.

Responsiveness. As the single point of contact for AFCE activities in the UK, the HQ 3AF/DE was again able to focus on setting uniform quality of work standards, establishing funds distribution, and getting BCEs within the UK to concentrate on the execution of projects.

AFCE units in the UK, therefore, were able to do a better job of maintaining installations in the UK (1). The HQ 3AF/DE could also represent 3AF AFCE interests as a whole to HQ USAFE whereas, before, individual bases lobbied for funds. The funds were sorely needed for installation maintenance, as one 3AF wing commander pointed out

In my first three years of my tour . . . maintenance of buildings and water lines was near non-existent [due to lack of funds] and this will geometrically decrease the lifetime of those and much more of the physical plant. . . . The base will never recover from some of the actions that had to be taken [64:8].

The reintroduction of a HQ 3AF Civil Engineer had an immediate effect. Third Air Force started to outperform 17AF not only for the number and quality of projects, but also in their ability to execute their programs (1, 35).

Warfighting Capability. Just like the USAF buildup in the UK during the 1950s, the cost for the expanded peacetime missions was at the expense of 3AF base level wartime training. The increased peacetime USAFE construction commitment limited the number of available

skilled RED HORSE equipment operators and supervisors to support the RRR exercises at UK bases (73:21, 305). One wing commander expressed his frustration over the conflict between peacetime operations and wartime training.

We never has a proper exercise in the four years I observed, planned, and participated in them. . . . The real world personnel did not wear gas masks, go to shelters, or play exercise (64:4).

Standards. Standard procedures and a standard organizational structure for all AFCE units within USAFE was a goal of HQ USAFE from 1979 to the present. The natural instinct was to standardize procedures and operations in the image of the HQ USAFE AFCE environment in Germany. Unique standards, however, had to be developed for the UK environment. Rating scales for inspections are the same for all AFCE units: Outstanding, Excellent, Satisfactory, Marginal, and Unsatisfactory. Comparing ratings between an AFCE unit in the UK to an AFCE unit in Germany, however, is difficult because

evaluators looked at the same things, . . . (but they) looked at things differently and . . . couldn't evaluate the same things. The things that PSA did alone . . . (evaluators) didn't have the authority to evaluate (338).

Ratings of AFCE units in the UK are also significantly affected by the personal relationship between the DWO and the BCE.

If they had a good working relationship, they (DWO and BCE) could get anything done and you saw a much more cooperative organization. . . . On the other hand, where they were always at loggerheads, it was terribly frustrating to get work done (338).

AFCE units in Germany do not have a similar military-civilian relationship. The BCE has direct control over his large military workforce. The work gets done, therefore, even though the workers may not like the personality of the commander (338).

Wartime exercises are also evaluated differently between 3AF and 17AF. The limited AFCE manning in 3AF means evaluators do not expect 3AF AFCE units to perform at the same level as 17AF AFCE units during exercises. More simulations (and less realistic training) are permitted for 3AF units. PSA, although responsible for installation maintenance and repair in wartime, can not be evaluated if they participate in exercises because USAF evaluators did not "fault civilians in peacetime exercises" (338). Therefore, the ability of PSA to support wartime operations is unknown.

3AF must use augmentees to perform AFCE wartime duties (three-fourths of the RRR team are augmentees). The effect of using augmentees in the UK on their parent organization during wartime exercises is not evaluated. Therefore, "the domino effect of pulling augmentees away from their normal jobs" (338) is unknown.

### AFCE Personnel Comments

An informal questionnaire was send to the AFCE organizations at RAF Alconbury, Bentwaters, Greenham Common, Lakenheath, Mildenhall, and Upper Heyford to validate the problems and frustrations identified in this chapter. The questionnaire was given to the BCE, and Chiefs of Engineering, Contract Management, Construction Surveillance, Operations, and Readiness on each installation. Participation on the questionnaire was voluntary.

Comments from interviews with Brigadier General John R. Harty, HQ USAFE Deputy Chief of Staff Engineering and Services, and his predecessor, Major General Joseph A. Ahearn, Deputy Director, Engineering & Services, are interjected into the analysis of the questionnaires that follows.

Appendix M summarizes the responses to the questionnaire. Most of the respondents were in the Air Force over four years. There were almost an equal number of respondents with no overseas experience as with some overseas experience. All the respondents were volunteers for an overseas assignment and this was their first assignment in the UK. The average work day for most of the respondents was 9 to 11 hours. Their duty day, however, is not any longer that the duty day for other AFCE assignments within USAFE.

Responses to the opinion questions provided some revealing thoughts on AFCE operations in the UK..

(1) The respondents (31 out of 32) agreed that working with PSA is very different than working with civilians in the US (Q-16). Unless individuals had prior experience in the UK, therefore, they could not prepare themselves for the experience.

Quality in the UK, according to Gen Harty, is tied directly to the personal relationships and understanding between base level AFCE and PSA personnel

many of the quality issues we have in the UK are being overcome as this relationship [between AFCE and PSA] improves. . . . An interesting phenomena occurred with the design awards program for 1987. PSA almost made a clean sweep. They probably won over two-thirds of the awards in USAFE. . . . And a good deal is because of the people [35].

(2) The respondents (30 out of 32) perceived that the AFCE organization would be more responsive to the customer's needs with a fully manned AFCE squadron instead of the AFCE-PSA mix (Q-28). Most respondents (29 out of 32) also agreed that their unit would be more effective with a full AFCE squadron (Q-19). These responses indicate that the individuals feel that they have more control over a military workforce than they have over the PSA workforce.

(3) Without base augmentees, respondents agreed (29 out of 31) that AFCE units in the UK could not perform their wartime role (Q-13). Some respondents, however, indicated a

concern about the training and availability of augmentees. Perhaps this indicates that AFCE personnel are uncomfortable with the situation in the event of an actual conflict.

For peacetime operations, Gen Ahearn was confident of PSA's ability to perform base level routine maintenance and repair. He went on to state that "PSA is a competent, dedicated, and capable workforce for peacetime operations" (1). However, during wartime, Gen Ahearn is a little more pessimistic: "the Property Services Agency and the Air Force relationship makes it cumbersome [to operate] in a theater of war" (1). Gen Ahearn continued by stating that the AFCE-PSA situation in the UK is, at best, a risky business in wartime

We have an enormous percentage of our vitals, our power projection vitals, in England - on those air bases. We have an enormous nest egg over there, and I know our adversary knows it. Those bases are vulnerable to our adversary, to all those weapon systems that they have. . . . [However] those bases are less vulnerable than the forward operating location bases in the central region (1).

(4) Respondents were of the opinion (27 out of 32) that their current job was more demanding than their previous job (Q-17). Most respondents (26 out of 32) also believed that they did not have enough time to train their people (Q-27). Inexperience may explain part of the problem, but that only strengthens the argument for adequate training and experience.

Gen Harty agreed that AFCE assignments throughout USAFE, to include 3AF, were more demanding than assignments in the US because

we're [AFCE] faced not only with the quality of life and peacetime operational issues, but we are also on the forefront and must be prepared for war. It's [threat of war] always persistent [in USAFE]. . . . But the personal rewards, the satisfaction to do well, are probably greater [35].

Gen Ahearn also agreed that jobs were more demanding as he focused in on the challenges faced by young AFCE officers in the UK. He states that AFCE officers are

drawn more into the leadership/management . . . of the planning and programming business. . . . for young officers, I would suggest that while there is a great deal of experience to be gained there. The younger they are, the more difficult it is for them to like that experience [1].

(5) The respondents had mixed opinions about the their ability to perform their wartime mission (Q-18) and whether PSA would be there in time of war (Q-28). Their responses may indicate a sense of uncertainty about what they can expect during war.

(6) The recurring theme for the open-ended questions was the lack of manpower and money to support the base. This ties directly to Gen Ahearn's funding policy when he was at HQ USAFE. He never funded on an equal share basis. Instead,

he did it on a first ready to use resources for quality project basis. . . . [H]e who was ready to expense resources on high impact projects or high impact programs were the ones who got the resources [1].

Third Air Force bases, representing "about 50 percent of the [USAF] aircraft in Europe" (12), unfortunately, were never ready to spend the money that was available while Gen Ahearn was allocating project money at HQ USAFE (1).

The respondents' sense of a lack of control, that their fate was in the hands of someone else, was also evident in many of their comments.

This brings the analysis of the AFCE development in the UK from 1942 to the present to a close. The next, and final chapter summarizes the forty-six year AFCE development in the UK. Finally, conclusions and proposed recommendations to improve AFCE operations in the UK are listed.

## **V. Summary, Lessons Learned, and Conclusions and Recommendations**

The specific research question posed in chapter 1 was, Can the small cadre of AFCE personnel at USAF installations in the UK perform their peacetime duties and still maintain adequate proficiency in tasks required for their wartime mission? The answer after completing this historical research is maybe. For the basic Rapid Runway Repair operations training is provided, but augmentees are the primary labor source. The uncertainty of PSA involvement during an actual conflict and their lack of participation during training and wartime exercises, however, places all 3AF flying operations at risk.

During WW-II, the UK was the gateway for US military manpower, equipment, and supplies entering Europe. Present USAF war plans identify UK airfields as launch and recovery platforms for US and NATO aircraft engaged in combat in Europe in the future.

Historically, USAF operations in the UK have depended on the success of the joint US-UK efforts in airfield construction, maintenance, and repair. During WW-II, recovery from airfield attack was not critical to air operations: weapons delivery systems were inaccurate, area bombing was used, and pilots did not rely heavily on airfield pavement conditions to launch and recover their

aircraft. Today, however, the military environment for an European conflict has changed: weapons delivery systems are extremely accurate, precision bombing is possible, and airfield pavement conditions are a critical factor for generating sorties of modern aircraft.

The peacetime AFCE organization and method of operation in the UK was also made based on the aviation engineering successes of WW-II. As a result, AFCE manpower was reduced to decrease US military spending in Europe. These reductions decreased spending but they also limited the AFCE organization's ability to support additional responsibilities, especially the warfighting support role of airfield and bomb damage repair that has become essential to the launch and recovery of modern aircraft.

The joint US-UK civil engineering relationship that developed from 1942 to the mid 1950s made AFCE operations in the UK unique. Other factors also influenced the development of the US-UK civil engineering relationship from 1942 to the present: the lack of unity of command over AFCE operations in the UK, peacetime requirements, military spending decisions, and AFCE military manning decisions. Each item, in turn, will be address separately. Finally, several general conclusions are discussed.

### Summary of US-UK Civil Engineering Relationship

The civil engineering support agreements established during WW-II, when the Air Force was still part of the Army, gave the British tremendous leverage over AFCE operations in the UK in the present.

(1) All real property on USAF installations in the UK is owned by the British government. The USAF is, therefore, a tenant on USAF installations in the UK.

(2) With few exceptions (firefighting, airfield sweeping, aircraft arrestor system and facility security alarm system maintenance, and airfield snow removal), the British civilian organization enjoyed a virtual monopoly on all civil engineering activities and services on USAF installations in the UK: facility designs, construction, and maintenance and repair of facilities and utility systems.

(3) The USAF pays for all civil engineering activities and services on USAF installations in the UK. The AFCE unit allocates a lump sum to the British Property Services Agency (PSA) to accomplish day-to-day maintenance and repair, but the District Works Officer (DWO), the British equivalent of the Base Civil Engineer (BCE), has total control over how the money is spent.

(4) PSA supplies all common use materials, manufactured in the UK and paid for by the USAF.

(5) PSA approves all minor construction, maintenance, and repair jobs in the UK before the jobs can be accomplished by USAF troop labor.

(6) Without prior approval by PSA, only British construction contractors can be used on USAF installations in the UK.

The consequences of the joint US-UK civil engineering relationship are that:

(1) The USAF has to accept British construction standards that are below acceptable US construction standards.

(2) The BCE has limited control over maintenance and repair jobs on installations that the AFCE unit is tasked to support.

(3) The BCE has limited control of the allocation of maintenance and repair funds.

(4) The BCE has lost the flexibility enjoyed with a traditional military AFCE unit.

(5) AFCE and PSA craftsmen work independently of each other. Civil engineering operations, therefore, are not a team effort.

(6) Overall quality and quantity of facility support activities depend heavily on the working relationship between the PSA and AFCE workforce, especially the top level civil engineering manager (DWO and BCE) relationship.

(7) Unique standards have been developed for AFCE operations in the UK. AFCE operations in the UK, therefore, are not easily understood outside the UK.

(8) BCEs in the UK experience increased stress caused by the uncertainty about PSA support for AFCE wartime operations and a sense of a lack of control over assets (money and manpower) and civil engineering support for the base.

#### Lack of Unity of Command Over AFCE Operations in the UK

Throughout the development of US civil engineering operations in the UK, aviation engineering forces periodically lacked one overall theater commander for engineering activities.

During WW-II, the US military construction forces answered to a different commander than the US military engineering planners. The direct link between plans and execution did not exist. As a result:

- (1) Flexibility to respond to priority changes was lost.
- (2) Different and competing priorities existed between the groups.
- (3) US military aviation construction forces were not always used or trained for their Air Force support mission. In fact, Army needs took priority over Air Force needs.

After WW-II, the 3AF Commander repeatedly lost control over AFCE forces under his command.

(1) Base level AFCE operations were placed under the control of 17AF HQ AFCE in Germany for some time.

(2) The HQ 3AF AFCE manning was reduced and eliminated from 1972 to 1985. Base level AFCE units, therefore, communicated directly with HQ USAFE in Germany.

(3) RED HORSE, the only AFCE military construction force in the UK, reported to HQ USAFE from 1979 to 1985.

(4) A second major command (SAC) controlled operations of AFCE activities on SAC bases in the UK and challenged the role of 3AF as the USAF single point of contact with the British government.

AFCE units must use base augmentees to perform AFCE wartime operations. However, augmentees are not in the direct chain of command of the AFCE organization.

The consequences of violations of unity of command include:

(1) Base level AFCE personnel frustrated trying to support a wing commander while answering to a major command headquarters that does not operate within the confines of the US-UK engineering system.

(2) Policies, decisions, and funding which favored operations in the HQ USAFE location (Germany).

(3) HQ USAFE tasked base level units with actions without prior coordination with appropriate British governmental agencies.

(4) Lack of control demonstrated to the PSA workforce of AFCE operations by base level managers.

#### Peacetime Requirements

From the first time that US aviation engineers arrived in the UK in 1942, wartime proficiency training was, at best, an afterthought.

(1) Engineer Aviation Battalions (EABs) were only allocated one hour per day to conduct the expedient engineering skills training needed for the post D-Day activities.

(2) Replacements for EABs arrived inadequately prepared to do their job.

Following the end of WW-II, peacetime priorities became a more dominant factor for AFCE operations in the UK.

(1) Airfield construction took top priority over all other EAB activities, including combat readiness training during the USAF buildup in the 1950s.

(2) AFCE military manpower was reduced to save money without considering the effect on unit readiness.

(3) AFCE manpower standards were developed that measured peacetime requirements only.

(4) Wartime exercises did not, and do not, disrupt peacetime services. Therefore, wartime training and exercises did not, and do not, adequately test the AFCE base support mission in wartime.

(5) Augmentees were used, and are used, in the in the UK to perform AFCE wartime operations without relief from their peacetime jobs. Augmentees must, therefore, perform two jobs (catch up on their peacetime job) following wartime training or exercises.

(6) PSA civilians did not, and do not, train with or participate in wartime exercises. PSA civilians, however, perform peacetime facility maintenance and repair.

The consequences of the peacetime priority is inadequate preparation for war for the AFCE military forces in the UK.

#### Military Spending Decisions

During WW-II, cost considerations were not a major concern for the US. The pressure to reduce military spending in Europe in the 1960s, though, was the primary factor that decreased AFCE manning in the UK.

(1) The HQ 3AF AFCE organization was reduced, and eventually eliminated (1972) to save money. Some functions were assumed by HQ USAFE and some functions became the responsibility of base level AFCE units.

(2) Base level AFCE military manning positions in the UK were deleted to reduce military spending. HQ USAFE turned to the civilian PSA organization to compensate for the military skills lost.

(3) The cost to maintain the same level of service on USAF installations in the UK increased under the administration of PSA.

Consequences of the cost reduction actions on AFCE operations in the UK were:

(1) Flexibility to use AFCE troop labor to compensate for the lack of funds for routine maintenance and repair decreased.

(2) Proper maintenance and repair jobs were not done on the WW-II facilities on USAF airfields in the UK caused by the lack of funds and shortage of AFCE military manpower to accomplish the work.

(3) Vacating the HQ 3AF AFCE in some cases isolated the engineering planners at HQ USAFE from the workers at 3AF installations. The consequence was a repeat of the isolation of engineering forces in the UK by the Army during WW-II.

(4) AFCE units had to rely totally on the civilian PSA for base maintenance and repair.

### AFCE Military Manning Decisions

The decisions to reduce AFCE manning in the UK were based on a reduction of costs instead of an evaluation of requirements. The civilian PSA organization filled the gap for peacetime maintenance and repair. The wartime workload, however, was not considered in the AFCE military manning reduction decisions.

Consequences of the decision to reduce AFCE military manning in the UK include:

(1) Reduction of the ability of AFCE units to recover from disasters or airfield attacks. AFCE units must rely on PSA to support wartime operations. Augmentees must also be used which has an effect on the operations of their parent organization.

(2) One deep positions for key AFCE jobs.

(3) Lost ability to compensate for poor performers.

(4) Less effective job proficiency training. The size of workforce cannot support both job performance and training.

(5) Less flexibility for the BCE to direct the available workforce to perform priority jobs.

### Lessons Learned

The purpose of this historical research was to learn lessons from past actions and use this knowledge improve

future decisions. Several lessons were learned during this research:

(1) PSA, a civilian organization, is fully capable of supporting the peacetime installation maintenance and repair. PSA wartime support, however, is uncertain. Therefore, the USAF wartime operations from the UK are at risk.

(2) A continuous cycle of increases and decreases occurs during a buildup. In a wartime environment, daily changes in planned requirements occur. For AFCE planners, the frequency and severity of these changes in requirements can be extremely frustrating, especially if prior planning was extensive. AFCE planners, therefore, should expect the constant changes in requirements as the norm in a wartime environment.

(3) AFCE operations in the UK are different than anywhere else in USAFE. Only actual experience in the UK can prepare an individual assigned to the HQ USAFE staff to deal with the problems associated with AFCE operations in the UK.

(4) Army combat engineer training does not adequately prepare Army engineers to perform in airfield construction and repair. To rely on US Army Engineers to support air operations in the UK places the USAF at risk.

(5) Modern aircraft rely on smooth airfield pavements to launch and recover. The rapid repair of damaged

pavements by AFCE forces is critical to the successful launch and recovery of USAF and NATO aircraft.

(6) Peacetime requirements in the UK have always taken priority over AFCE wartime preparedness training. Therefore, AFCE units are not adequately prepared to operate from the UK in a future conflict.

(7) Decisions to save money by cutting AFCE manpower do not take into account the side effects on installation facility support for both peacetime and wartime operations. Instead of just looking at the direct cost savings, an analysis of the cost for non-AFCE military support should be included in the analysis. In any case, however, the cost on wartime readiness cannot be quantified and cannot be easily applied to a cost analysis.

(8) It is easier to cut manpower and declare a savings than it is to authorize additional personnel for an increased workload. The tendency is to give assigned AFCE personnel the additional workload.

(9) During emergencies, natural disasters, or wartime operations, the key to success is getting the manpower, materials, and equipment at the right place at the right time. The ability to accomplish this logistical feat for AFCE operations has not been demonstrated. If the next war is a "come as you are war" (338), the risk to AFCE operations in the UK are that much more magnified. Neither

sufficient USAF AFCE manpower, materials, nor equipment exist in the UK to operate in a sustained conflict.

(18) The number of comments on the questionnaire sent to AFCE units in the UK indicates that personnel assigned to AFCE units in the UK are frustrated with their situation and the working relationship with PSA. The questionnaire served as a vehicle to express their thoughts.

### Conclusions and Recommendations

To improve AFCE operations in the UK:

#### CONCLUSION 1:

The working relationship between the DWO and the BCE, the top base level civil engineering managers in the UK, is critical for successful civil engineering support in the UK.

#### RECOMMENDATION 1:

Co-locate the DWO and BCE in adjacent offices. Better working relationships between these two individual is the key to success civil engineering support on the base. Co-location will

(a) Improve communication between the military and civilian civil engineering organizations.

(b) Improve liaison between the USAF work requestors and the British providers.

(c) Make joint problem solving easier.

(d) Make joint long-range and short-range planning easier.

**CONCLUSION 2:**

The wartime AFCE facility and utility maintenance and repair support from PSA civilians is unknown and untested.

**RECOMMENDATION 2:**

Increase PSA civilian participation in wartime training and exercises. Increased participation will

- (a) Improve preparedness of PSA workers.
- (b) Develop cohesion between the AFCE and PSA workers.
- (c) Demonstrate a sense of commitment to support USAF operations from PSA.
- (d) Improve the ability to assess the civil engineering wartime capability in the UK.
- (e) Assist in developing methods to improve wartime recovery operations.

**CONCLUSION 3:**

The base level AFCE manning in the UK has not kept pace with their increased AFCE wartime responsibilities and is, therefore, inadequate for the AFCE wartime support mission in the UK.

**RECOMMENDATION 3a:**

Increase the manning of AFCE craftsmen in the UK.  
Increased manning will

- (a) Improve the ability of AFCE personnel to support base recovery operations.
- (b) Reduce the dependence on base augmentees to support AFCE base recovery operations.

**RECOMMENDATION 3b:**

Integrate AFCE and PSA craftsmen into single shops.  
Integration will

- (a) Improve understanding of the problems and frustrations of both AFCE and PSA craftsmen.
- (b) Increase AFCE familiarity with the maintenance and repair methods employed by PSA craftsmen.
- (c) Develop cohesion between the PSA and AFCE craftsmen.
- (d) Improve peacetime and wartime base support.

**CONCLUSION 4:**

The US-UK civil engineering method of operation is not understood by USAFE AFCE military personnel not assigned to the UK.

**RECOMMENDATION 4a:**

Initiate an exchange program for AFCE forces within USAFE. Such a program will

(a) Increase the familiarization of AFCE personnel with the various AFCE operations throughout USAFE.

(b) Increase the knowledge base for AFCE personnel of AFCE operations throughout USAFE.

(c) Improve the transition from German AFCE operations to UK AFCE operations if evacuation is necessary in time of war.

**RECOMMENDATION 4b:**

Establish a "UK expert" position at HQ USAFE. This individual can provide informed input on HQ USAFE decisions and the effect of the decision on AFCE operations in the UK.

**RECOMMENDATION 5:**

Conduct joint US-UK AFCE wartime exercises. This will test the ability of two NATO member nations to operate in a wartime environment. The exercise will also provide a vehicle for the exchange of information, ideas, and civil engineering wartime procedures.

**RECOMMENDATION 6:**

Include problems, solutions, and lessons learned in AFCE units histories to increase the value of the documents. Although not related to AFCE operations in the UK directly, a wide range of information existed in the units histories. Most of the information, though, was the bare minimum.

**APPENDIX A: AAF Installations in the UK, 1942 and 1945**

This appendix lists the AAF installations in the UK when the AAF buildup began (August 1942) and at the end of WW-II (1945).

**AAF Installations in the UK, August 1942 (15:619)**

|                        |                       |
|------------------------|-----------------------|
| 1. Alconbury           | Bomber Station        |
| 2. Aldermaston         | Troop Carrier Station |
| 3. Atcham              | Fighter Station       |
| 4. Biggen Hill         | Fighter Station       |
| 5. Bovington           | Bomber Station        |
| 6. Brampton            | Headquarters          |
| 7. Burtonwood          | Depot                 |
| 8. Bushy Hall          | Headquarters          |
| 9. Bushy Park          | Headquarters          |
| 10. Eglinton, NI       | Fighter Station       |
| 11. Goxhill            | Fighter Station       |
| 12. Grafton Underwood  | Bomber Station        |
| 13. Greenham Common    | Headquarters          |
| 14. High Erroll        | Fighter Station       |
| 15. High Wycombe       | Headquarters          |
| 16. Ibsley             | Fighter Station       |
| 17. Kenley             | Fighter Station       |
| 18. Kircassock, NI     | Headquarters          |
| 19. Langford Lodge, NI | Depot                 |
| 20. Membury            | Headquarters          |
| 21. Merston            | Fighter Station       |
| 22. Molesworth         | Bomber Station        |
| 23. Old Canton         | Headquarters          |
| 24. Poddington         | Bomber Station        |
| 25. Polebrook          | Bomber Station        |
| 26. Ramsbury           | Troop Carrier Station |
| 27. Thurleigh          | Bomber Station        |
| 28. West Hampnett      | Fighter Station       |

AAF Airfields in the UK, 1945 (2:14, 337:218-223).

- |                     |                       |
|---------------------|-----------------------|
| 1. Abbots Ripton    | 46. Earls Colne       |
| 2. Alconbury        | 47. East Wretham      |
| 3. Aldermaston      | 48. Eglinton, NI      |
| 4. Andover          | 49. Eye               |
| 5. Andrews Field    | 50. Exeter            |
| 6. Atcham           | 51. Fairford          |
| 7. Attlebridge      | 52. Folkingham        |
| 8. Balderton        | 53. Fowlmere          |
| 9. Barkston Heath   | 54. Framlingham       |
| 10. Bassingbourne   | 55. Fulbeck           |
| 11. Beaulieu        | 56. Glatton           |
| 12. Biggenhill      | 57. Gosfield          |
| 13. Birch           | 58. Goxhill           |
| 14. Blakenhill Farm | 59. Grafton Underwood |
| 15. Bodney          | 60. Great Ashfield    |
| 16. Boreham         | 61. Great Dunmow      |
| 17. Bottesford      | 62. Greencastle, NI   |
| 18. Bottisham       | 63. Greenham Common   |
| 19. Bovington       | 64. Grove             |
| 20. Boxted          | 65. Halesworth        |
| 21. Broadwell       | 66. Hardwick          |
| 22. Bungay          | 67. Harowbear         |
| 23. Burtonwood      | 68. Harrington        |
| 24. Bury St Edmunds | 69. Hendon            |
| 25. Butley          | 70. Heston            |
| 26. Chalgrove       | 71. Hepworth          |
| 27. Charnydown      | 72. Hethel            |
| 28. Cheddington     | 73. High Ercall       |
| 29. Chelveston      | 74. Hitcham           |
| 30. Chilbolton      | 75. Homesly South     |
| 31. Christchurch    | 76. Honington         |
| 32. Chipping Ongar  | 77. Horham            |
| 34. Church Station  | 78. Horsham St. Faith |
| 35. Clunton, NI     | 79. Hurn              |
| 36. Colerne         | 80. Ibsley            |
| 37. Cottesmore      | 81. Keevil            |
| 38. Debach          | 82. Kimbolton         |
| 39. Debden          | 83. King's Cliff      |
| 40. Deccles         | 84. Kingston Buguize  |
| 41. Deenthorpe      | 85. Kirkstow, NI      |
| 42. Deopham Green   | 86. Kirton-in-Lindsey |
| 43. Down Ampey      | 87. Knettishal        |
| 44. Dunkeswell      | 88. Langar            |
| 45. Duxford         | 89. Langford Lodge    |

|                       |                       |
|-----------------------|-----------------------|
| 90. Lavenham          | 131. Scorton          |
| 92. Leiston           | 132. Sculthorpe       |
| 93. Leuchars          | 133. Seething         |
| 94. Little Staughton  | 134. Shipdam          |
| 95. Little Walden     | 135. Snailwell        |
| 96. Ludham            | 136. Snetterton Heath |
| 97. Magnaberry, NI    | 137. St. Mawgaw       |
| 98. Martlesham Heath  | 138. Stanstead        |
| 99. Matching          | Mountfitchet          |
| 100. Matlask          | 139. Steeple Morden   |
| 101. Maydown, NI      | 140. Stoney Cross     |
| 102. Membry           | 141. Storoway, NI     |
| 103. Mendlesham       | 143. Sudbury          |
| 104. Merryfield       | 144. Tarrent Rushton  |
| 105. Merston          | 145. Thorpe Abbots    |
| 106. Metfield         | 146. Thruxton         |
| 107. Middle Wallop    | 147. Thurleigh        |
| 108. Mill Isle        | 148. Tice, NI         |
| 109. Molesworth       | 149. Toome, NI        |
| 110. Mount Farm       | 150. Tibenham         |
| 111. Mullanghmore, NI | 151. Troston          |
| 112. Neaton           | 152. Upottery         |
| 113. North Duffenham  | 153. Valley, Wales    |
| 114. North Pickenham  | 154. Wakerly          |
| 115. North Witham     | 155. Warm Well        |
| 116. Northolt         | 156. Warton           |
| 117. Nuthampstead     | 157. Wattisham        |
| 118. Nutts Corner     | 158. Watton           |
| 119. Old Buckingham   | 159. Welford          |
| 120. Oulton           | 160. Wendling         |
| 121. Podington        | 161. Westhampnett     |
| 122. Polebrook        | 162. Weston Zoyland   |
| 123. Prestwick        | 163. Wethersfield     |
| 124. Rackheath        | 164. Winfarthington   |
| 125. Ramsbury         | 165. Winkleigh        |
| 126. Rattlesden       | 166. Wittering        |
| 127. Raydon           | 167. Woolfox          |
| 128. Ridgewell        | 168. Wormingford      |
| 129. Rivenhall        | 170. Zeals            |
| 130. Saltby           |                       |

**APPENDIX B. Air Ministry Method to Accomplish AAF  
Installation Construction, Maintenance,  
and Repair (26:343)**

This appendix describes the procedure established by the Air Ministry to accomplish facility construction, maintenance, and repair on AAF installations in the UK during WW-II.

Small routine maintenance projects are usually accomplished by the Air Ministry Works Staff assigned to each station under the direction of the Clerk of the Works and/or the Station Engineer.

The larger projects and those projects that are beyond the capability of permanently assigned Works Staff are usually handled by the Air Ministry Superintending Engineer with additional capability brought in for a specific project. This additional capability can be either Air Ministry staff or personnel employed by means of a private contractor.

For Air Ministry construction and maintenance purposes, the UK is divided into . . . Works Areas, each of which is in charge of a Superintending Engineer, responsible to the Director of Works at Air Ministry Headquarters. Each Works Area is further divided into a convenient number of sections, which serve the purposes of smaller administrative centers for the various installations in the particular geographical area concerned.

On most Air Ministry stations of any size, a small permanent party type maintenance staff is assigned, under direction of a Clerk of the Works and a Station Engineer. The size of this staff depends on the volume of work anticipated for the installation involved, and is made up of a variety of skilled and unskilled labor, so as to cope with the bulk of projects that normally arise in routine maintenance operations.

In this organization, the Clerk of the Works serves as an administrative engineer, and in this dual responsibility, supervises overall administration of the maintenance personnel assigned to the base, as well as being directly responsible for all civil engineering

type maintenance, i.e., buildings, sewage, plumbing, etc.

The station engineer is directly responsible for all mechanical and electrical type maintenance, i.e., heating and hot water, power and lights, etc. Generally speaking, this staff handles the bulk of the day to day recurring maintenance, but their capability is augmented as necessary by additional Air Ministry forces or by private contracts.

Where major construction is being implemented on a station, the Superintending Engineer usually assigns a Resident Engineer to the base involved. The Resident Engineer monitors and generally supervises the overall base construction program, and in fact, represents the Superintending Engineer. The Resident Engineer does not assume responsibilities for base maintenance, but in his overall capacity, assumes the position of general liaison officer for all construction type activity on the base.

**APPENDIX C: Standard Operation Procedure, Engineer Section,  
Eighth Air Force (71)**

This appendix summarizes the main points of the Standard Operating Procedures for AAF engineering activities in the UK written in 1945.

**1. CONSTRUCTION**

**a. GENERAL**

The execution of construction and maintenance work for the Eighth Air Force, in accordance with the provisions of section XVIII, Joint Organization and Maintenance Agreement (U.S.) S.D. 348 Air Ministry, is a responsibility of Air Ministry exercised through the Works Directorate. The Chief Engineer, Communications Zone (formerly SOS (Supply of Services)), ETOUSA (European Theater of Operations US Army) is charged with the responsibility of supervising all construction activities for the European Theater of Operations. Aviation Engineer Battalions and other US troops under the control of the Chief Engineer are utilized to assist the Air Ministry Works Directorate in the execution of construction work for the Eighth Air Force. . . .

**b. PROCEDURE**

The Eighth Air Force . . . being responsible for the technical supervision of all construction carries out this responsibility by maintaining constant liaison with and coordination between Eighth Air Force Headquarters lower echelon command Headquarters, and the construction agencies. . . . The Engineer of Eighth Air Force is also responsible for the processing of all requests for new construction, land, or existing facilities and for the proper coordination with the various staff sections of this Headquarters concerned. He further assists in the preparation of new plans of operation or in studies of field conditions in so far as they require changes or additions to existing facilities.

All construction within the accepted Air Ministry standards and scales of allowances . . . is performed automatically. . . . [An explanation of the procedure for requesting work above the scales of allowances followed.]

Requests for all new construction that are above the approved scales of allowances . . . have to be submitted through command channels to Air Ministry for approval. . . . [An example of an requirement above the standard allowance followed.]

Many requests for minor alterations and construction are handled directly either between the station and the Air Ministry Clerk of Works or between Command Headquarters and the District Engineer, CZ [Communications Zone], ETOUSA. Expediting problems are handled by the Engineer of Eighth Air Force directly with the Engineers, CZ, ETOUSA. . . .

Records, charts and other construction progress data is prepared by the Engineer Section and maintained up to date. . . .

All construction required is based on and controlled by various directives issued from Air Ministry, War Department, OCE [Office of the Chief Engineer], ETOUSA, USSTAF [United States Strategic Air Forces] and Eighth Air Force. . . . [A list of applicable policy letters and standards followed.]

## 2. ENGINEER SUPPLY

. . . In the European Theater of Operations the supply of all materials except Air Corps Supply for the U.S. armed forces is the responsibility of Headquarters, Communications Zone (formerly Services of Supply). Engineer supplies are processed by the Supply Division, OCE, CZ, ETOUSA, the Air Forces and Ground Forces obtaining their need through that agency. . . . [The regulation describing the general policy followed.]

The responsibility for the procurement of all supplies for the Eighth Air Force is that of the Commanding General, VIII Air Force Service Command. . . . The Engineer Supply Officer of VIII Air Force Service Command is the Engineer Supply Officer for the Eighth Air Force and is responsible for the procurement of all Engineer supplies. . . . [The procedure for submitting reports followed.]

### 3. MAINTENANCE

Under the provisions of Section XLIII Joint Organization and Maintenance (U.S.) agreement the Air Ministry, Works Directorate is responsible for maintenance of all USAAF stations in the United Kingdom.

The Chief Engineer, Communications Zone (formerly Services of Supply), ETOUSA, has been charged with direct American responsibility to the Theater Commander for the maintenance of all stations occupied by the United States troops. Insofar as the Air Force stations are concerned this responsibility is carried out by first step coordination with all British agencies engaged in this activity and by assisting with extraordinary maintenance by making use of the American troop personnel available for this work.

The maintenance of stations in the Eighth Air force is coordinated for the Commanding General by the Engineer Staff Section. This involves liaison and close relationship with all agencies engaged in this activity. . . .

#### a. British Personnel.

- (1) Air Ministry Works Directorate, including Superintending Engineers, Section Officers, Clerks of Works and other direct Air Ministry employes [sic].
- (2) Air Ministry maintenance contractors . . .
- (3) Air Ministry construction contractors.
- (4) RAF Works Squadrons.
- (5) Personnel and contractors of other Ministries of the British Government (i.e. Ministry of War Transport).

#### b. American Troop Personnel.

- (1) Engineer or other troops attached to CZ, ETOUSA. [Engineer Aviation Battalions, etc.].
- (2) Station Air Corps troops.

The work of all these agencies is reviewed and coordinated by this staff section in order to assure the Commanding General that all stations are maintained to the fullest operational efficiency possible. . . . The always present shortage of materials, materiel and personnel available for

this work brings to bear the constant need for full study of all maintenance requirements.

Assisting this staff by way of technical channels . . . are the Engineer Staff sections at each Division or Command. . . .

Maintenance work on stations may be divided for a first analysis as follows:

- a. Maintenance of all technical buildings, living and messing accommodations, roads, etc., all station facilities except the actual landing field, perimeter track and hardstandings.
- b. Maintenance of the airfield.

The work indicated in a. above can ordinarily be accomplished by the staff of the Clerk of Works, assisted according to local agreements, if necessary, by station troop personnel. In all cases, however, the Clerk of Works supplies the materials and equipment required. If there is considerable work of this nature to be accomplished the Clerk of Works . . . has a maintenance contract initiated. Under the provisions of these contracts the Clerk of Works is normally empowered to have 45 men available for this function. In some instances the construction contractor may be recalled to the station if satisfactory arrangements cannot be accomplished by the above method.

The progress of all the normal maintenance is closely watched by the Station Utilities Officer and the Engineer staff of the Division or Command concerned. . . .

In the second category . . . are found problems of the same kind only of a more extensive nature. The intimate relation between the status of facilities on the airfield and the operational efficiency of the station gives paramount importance to this work. The problem is further complicated as follows:

- a. Initial construction of many stations was accomplished when time was the dominant, critical factor making it necessary to use poor grades of materials and unskilled labor.
- b. The original designs did not fully anticipate the heavy loadings nor the amount of traffic to which these facilities are now subjected.

These two factors have resulted in rapid deterioration of much of the construction - for example there are at present 23 stations where part or all of the perimeter tracks are being or must soon be overlaid with eight inches of concrete.

c. The resources - materials, equipment and labor - available for maintenance are strictly limited.

d. All work must be closely coordinated with station flying. It is necessary to interfere as little as is absolutely necessary with operations while the work is in progress.

Airfield maintenance is accomplished by the several agencies very much in the same manner as indicated above for the maintenance of other facilities and ancillaries. . . . The Engineer Aviation Battalions and the larger contractors are now employed almost exclusively on this type of maintenance.

The most important duties of this section with respect to airfield maintenance are as follows:

a. Periodically visit the stations in all Commands and Divisions to . . . [verify] that the methods being employed are to the best operation interest of the Eighth Air Force, that all work is of a sufficiently high standard to warrant the expense to operational efficiency during progress, . . .

b. Regularly review the status of all airfields by means of reports submitted by the stations. . . .

c. Maintain contact with USSTAF, the Office of the Chief Engineer, CZ, ETOUSA and Air Ministry in regard to the overall maintenance program. . . .

Over and above the aforementioned work and procedure, with highest priority of all, is that maintenance required as a result of enemy action or other emergencies. Each District Engineer has been instructed by the Chief Engineer, CZ, ETOUSA, to have a workable plan ready for repairing all stations in event of such emergencies. . . .

The objective of all staff maintenance work performed by this section may be briefly summarized as follows: to insure always that the status of every facility on all stations in the Eighth Air Force is maintained in such a state that full utilization may be made of it in carrying out the combat mission.

#### **4. UTILITIES**

Utilities is a combination of construction and maintenance work on the stations. . . . Utilities Officers . . . are the agents responsible for coordination of all construction and maintenance and work in process or anticipated on their respective stations. . . .

The Station Utilities Officer is responsible for supervising the activities of Air Corps troop labor used as a supplement to the Clerk of Works Staff when necessary.

The varied duties of a Utilities Officer make it most necessary that he be sufficiently versed in engineer and construction problems as well as have an all around working knowledge of plumbing, carpentry, electricity, sewage and drainage and other problems. He must be acquainted with normal Engineer supply channels. . . .

#### **5. FIRE FIGHTING**

. . . [Basic fire protection regulations and standards were not listed] All airdromes built in the United Kingdom are planned and constructed to R.A.F. standards (with minor exceptions); in effect the stations are Air Ministry property leased by the USAAF. Fire protection equipment and fire prevention methods are consequently based on RAF and Air Ministry scales of equipment and standards of precautionary methods. . . . [Procedures for reporting fires, equipment authorizations, and duties followed.]

#### **6. SNOW REMOVAL**

. . . [The governing publications were not listed] In order to give an idea of the magnitude of this problem a typical airdrome of 325,000 square yards of runway and perimeter track covered with one inch of snow will require a mass of approximately 9000 cubic yards of snow to be moved an average distance of sixty feet. . . . [Materials and equipment listing followed.]

Normally snow removal is the duty of the station utilities officer although provision is made . . . for securing assistance from SOS troops or other nearby airfields in cases of emergency.

**APPENDIX D. Minor Maintenance and Minor Works Services Arrangement on USAF Installations in the UK**  
**(26:344-346)**

This appendix describes the procedures used by the British civil engineering organization to accomplish minor maintenance and services on USAF installations in the UK.

**Minor Maintenance (under \$200):** A blanket Notice To Proceed, stating the availability of funds, will be issued to the Clerk of the Works by the Base Contracting officer on a quarterly basis. As in the Military Construction Program, Air Ministry takes every possible measure to insure that this amount is not exceeded without prior approval from the Base Contracting Officer.

**Minor Works Services (over \$200):** The Base Contracting Officer will issue an individual Notice To Proceed for projects as they arise. This notice will be supported by a USAF Form 327 (Work Order) accompanied by detailed plans and specifications. The notice will further specify the amount of funds authorized, based on preliminary cost estimates furnished by the Base AIO (Air Installation Officer).

If the cost estimating is beyond the capability of the AIO staff, appropriate details will be furnished to the Clerk of the Works who will see that qualified Air Ministry Staff prepare a valid cost estimate. After review of this cost estimate by the Base AIO, it will be submitted with the previously mentioned USAF Form 327.

Upon receipt of the Notice To Proceed and supporting documents, the Clerk of the Works will indicate acceptance of the project, and notify the Base Contracting Officer of anticipated dates for starting and completion of the construction.

Channels for approval authority are:

1. Services estimated as costing less than \$10,000 may be jointly approved at Base Level.

2. Services estimated as costing more than \$10,000 but not over \$40,000 must be approved by Headquarters TAF (Third Air Force) and the Air Ministry Chief Engineer, attached to Hqs TAF.
3. Services estimated as costing in excess of \$40,000 will be approved at Hqs TAF and also forwarded to Air Ministry for final approval.

Reimbursement to Air Ministry for services performed in accordance with the terms of the Maintenance Arrangement will be on the basis of total certified costs. Reimbursement is made for the following items:

1. Expenditures for labor directly employed by the Air Ministry Works Directorate.
2. Value of materials issued by the Air Ministry Works Directorate plus the standard rate for initial carriage costs to depots (the standard rate was 2 percent as of June 30, 1955).
3. Expenditures in respect of contractor's accounts as paid by Air Ministry on behalf of USAF projects.
4. Departmental expense at 15%.

## **APPENDIX E. 3AF HQ AFCE Organization (1951, 1959, and 1962)**

This appendix lists the responsibilities and illustrates an organization chart (Figure E-1) of the HQ 3AF AFCE organization in 1951, an organization chart for the HQ 3AF AFCE organization in 1959 (Figure E-2), and a functional description and organization chart (Figure E-3) for HQ 3AF AFCE for 1962.

### **HQ 3AF AFCE Organization Functional Description, 1951 (37).**

#### **1. ACS [Assistant Chief of Staff] MATERIEL**

Coordinating staff responsibility for matters pertaining to supply, maintenance, transportation, installations, and services.

#### **2. DIRECTOR OF INSTALLATIONS**

[Responsible for coordinating with the Air Ministry and performing the following activities related to installations: master planning, engineering, construction, real estate, maintenance, design, costs, industrial resources, utilities, fire protection, crash rescue, dependent housing, field districts, and Engineer Aviation units.]

#### **3. CONSTRUCTION DIVISION**

Supervises and manages construction and airfield development activities.

Controls the standardization of American and British construction policies and techniques.

Supervises preparation of construction programs, plans, estimates, budgets, and cost data.

Monitors master planning of installations.

Supervises preparation and/or review of construction, designs and specifications.

Monitors construction projects for conformance to progress and standards requirements.

Controls and coordinates activities of installations districts and areas of the command.

Monitors operations of Engineer Aviation units.

Reviews Air Ministry construction claims for approval or disapproval.

Branches: Construction Control  
Construction Operations  
Installations Representatives  
Engineer Aviation

#### **4. MAINTENANCE DIVISION**

Supervises and manages building and grounds and utilities activities in the command.

Controls the standardization of American and British maintenance policies and techniques.

Supervises preparation of maintenance programs, plans, estimates, budgets, contracts and cost data.

Supervises preparation and/or review of maintenance designs and specifications.

Renders technical and procedural assistance to field agencies in preparation and processing of projects.

Monitors aircraft crash rescue and structural firefighting activities.

Reviews Air Ministry maintenance claims for approval or disapproval.

Branches: Maintenance Control  
Maintenance Operations  
Fire and Crash Rescue

#### **5. REALITY AND PLANS DIVISION**

Handles the procurement of real estate and facilities and maintenance of records pertaining thereto.

**Prepares the 3AF installations-portion of the USAF Program.**

**Determines and assures effective utilization of real property.**

**Supervises preparation of current and emergency plans pertaining to installations.**

**Supervises maintenance of installations inventory.**

**Coordinates all phases of installations plans and program.**

**Monitors assignment of dependent housing.**

**Branches: Real Estate  
Plans  
Installations Programs**

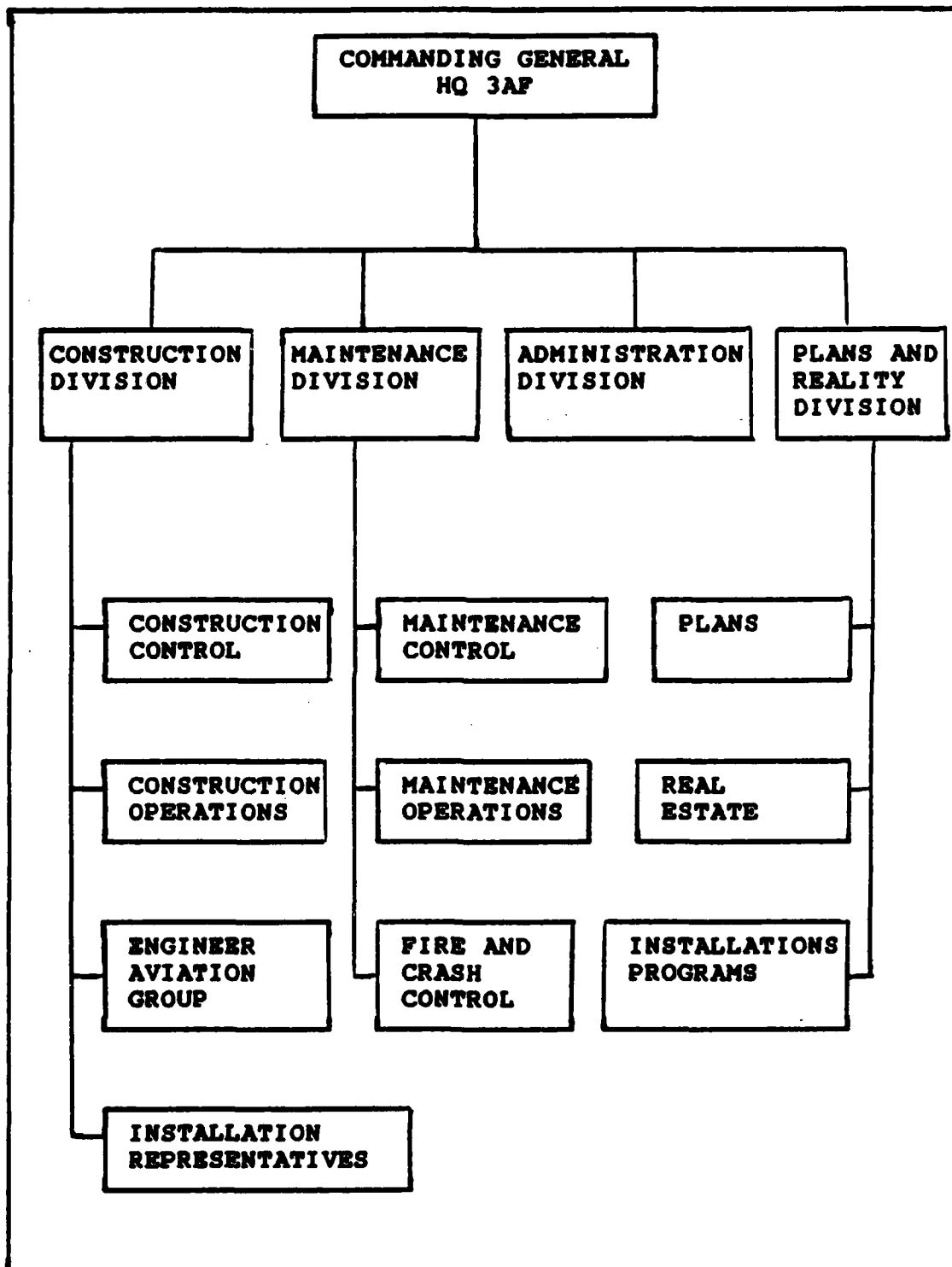


Figure E-1. HQ 3AF AFCE Organization Chart, 1951 (37:29)

HQ 3AF/DE Organization, 1959.

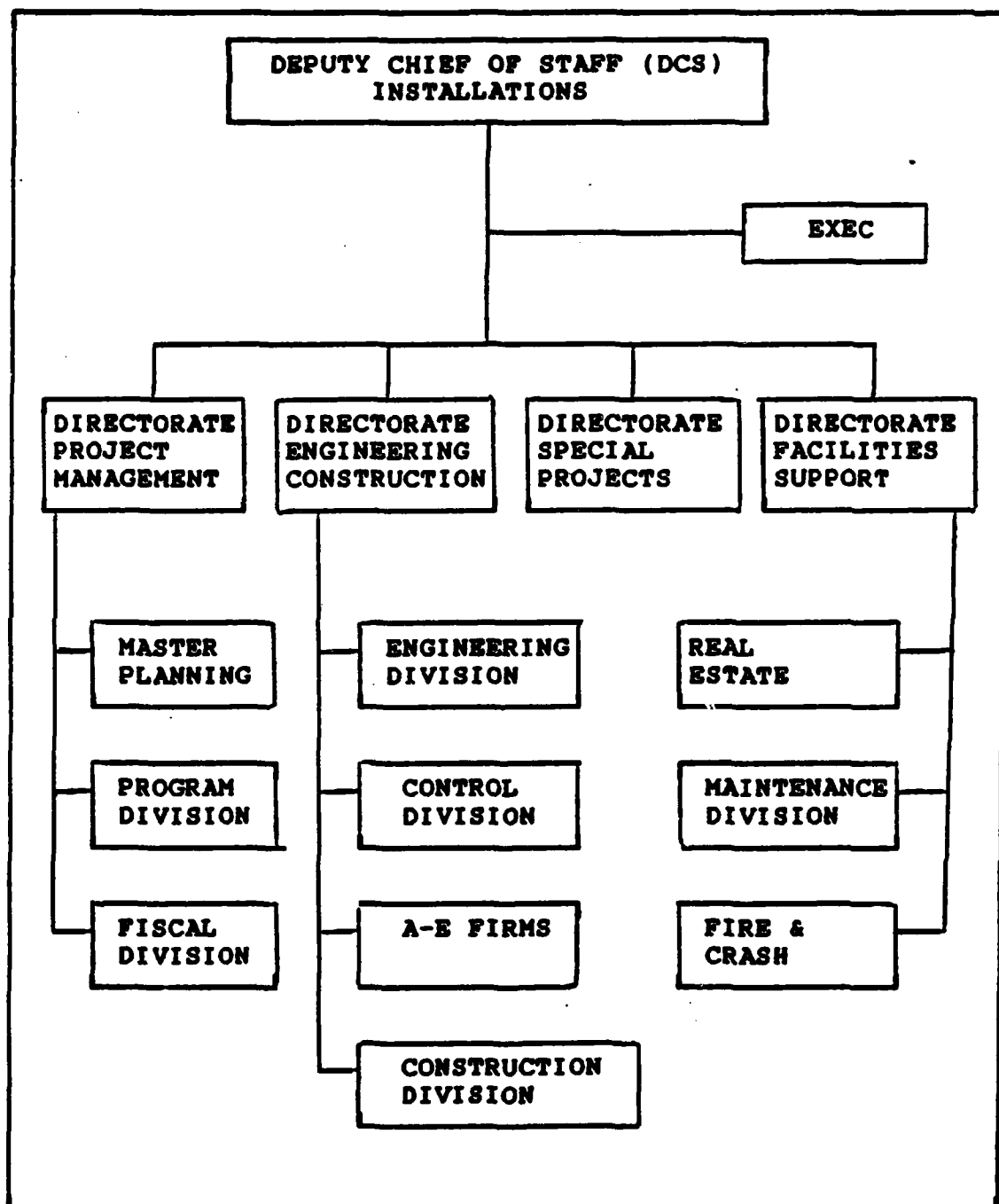


Figure E-2. HQ 3AF AFCE Organization Chart, 1959 (328).

HQ 3AF AFCE Organization Functional Description, 1962  
(310).

Sixty-four positions were authorized for the HQ AFCE organization in the UK: 25 positions for the HQ USAF/DER and 39 positions for HQ 3AF/DE. The responsibilities for HQ 3AF/DE organization are:

1. Deputy Chief of Staff (DCS) Civil Engineering

Responsible to the Commander, HQ Third Air Force for managing and directing US Military Construction and facility Maintenance Programs at all US Forces installations in the United Kingdom. This responsibility includes the preparation of programs, project designs, plans and specifications, negotiations of civil engineering matters with the British Air Ministry and other US and foreign agencies as required, construction surveillance and acceptance of completed facilities.

Responsible for technical direction of and assistance to Base Civil Engineers at subordinate levels.

2. BMEWS (Ballistic Missile Early Warning System) Project Office

Responsible for the control, management and direction of all Architect-Engineering and Construction functions associated with Special Projects.

Operates directly with Air Ministry and coordinates all information and technical details of the special project facilities. . . . Projects in this category will normally be those on which design is performed by Air Ministry headquarters, not the Air Ministry USAF office at Third Air Force headquarters, and construction funds are provided by Her Majesty's Government.

### **3. Directorate of Facilities Programs**

Responsible to DCS/Civil Engineer for supervision of acquisition and/or disposal of all Real Estate facilities for US Forces use in the UK through negotiations with Air Ministry and private owners of property.

Supervises the planning and programming of facilities required to carry out assigned missions and coordinates construction programs with all units in the UK.

Supervises the establishment and implementation of funds control over construction programs to insure that construction is within approved scope of funds.

Directly responsible for negotiating working agreements, as required, with the Air Ministry, the Ministry of Aviation and other US and foreign Governmental agencies covering all US Department of Defense agencies in the UK.

Acts as Executive Officer for the DCS/Civil Engineering.

#### **a. Real Estate Division**

Responsible for planning clearance, acquisition, inventory and disposal of real property for all US Forces in the UK and other areas of Third AF activity, through Air Ministry; negotiates and draws up leases or other documents relating real property interests with private property owners.

Coordinates at all levels of USAF and host governments for negotiations which affect real estate interests and procedures.

Acts on claims arising from use of real estate including rentals, leasehold restorations and general property rates.

Establishes procedures for real property accountability, inventory and reporting procedures throughout the UK.

Insures that all USAF installations are activated, designated, classified and assigned under USAFE special orders.

Provides data to assist in preparation of financial plans and programs.

Acts as command technical advisor in real estate matters.

Maintains real property accountable records for the US facilities in the London area.

**b. Facilities Planning Division**

Responsible for programming facilities required to carry out assigned missions for units in the Third Air Force, to coordinate construction programming of all units in the UK, including Military Construction Programs, Minor Construction, Major Repair and Modifications.

Monitors programs that are presented to the Facility Utilization Board and makes recommendations regarding use of Base facilities.

Responsible for planning and development of all US Forces' installations in the UK area. This responsibility entails the collection of comprehensive requirements, preparation of development plans and necessary coordinations to effect the preparation of approved master plans.

**c. Fiscal Control Division**

Responsible for establishing & implementing fund control procedures for all Construction programs funded from US military construction, minor new construction & major repair, maintenance & operation, non-appropriated, special & surplus commodity funds.

Maintains fiscal records pertaining to such programs.

Compiles detailed & timely reports of fiscal status of construction programs.

Assists in review of financial plan.

Coordinates fiscal matters with 3AF Comptroller & Hq USAFE & other agencies as required.

Maintains cost records for civil engineering O&M (Operations and Maintenance) work. . . .

### **3. Directorate of Engineering & Construction**

Responsible to the DCS/Civil Engineering for all engineering and implementation of military construction. This includes the preparation of project design, contract plans and specifications, negotiating with and issuing construction authorizations to the Air Ministry, construction surveillance and acceptance of completed facilities. This includes all engineering and technical decisions for each construction project, coordination with technical and using agencies, and final approval of all engineering prior to start of construction or during construction phase.

Responsible for the control, management and direction of all Architect-Engineering and construction functions to insure timely completion, technical sufficiency and compliance with USAF and British standards.

Maintaining cost records and certifying claims for payment submitted by Air Ministry.

#### **a. Operations Division One**

Responsible for coordinating engineering and technical criteria or preparation of plans and specifications to insure timely completion, technical sufficiency, compliance with USAF and British standards for projects as assigned by Director of Engineering & Construction.

Provides for surveillance of assigned projects under construction to insure quality control and compliance with plans & specifications; certification of quarterly cost cards; elimination of construction impediments.

On direct contracts responsible for inspection to ascertain that construction complies with plans and

Maintains project status and records.

Responsible for all Navaid projects.

#### **b. Operations Division Two**

Responsible for coordinating engineering and technical criteria or preparation of plans and specifications to insure timely completion, technical

sufficiency, compliance with USAF and British standards for projects as assigned by Director of Engineering & Construction.

Provides for surveillance of assigned projects under construction to insure quality control and compliance with plans & specifications; certification of quarterly cost cards; elimination of construction impediments.

On direct contracts responsible for inspection to ascertain that construction complies with plans and Maintains project status and records.

Responsible for all POL projects.

c. Architect Engineer (A-E) Division (Title I Services)

Conducts field surveys of existing conditions and prepare definitive Site and Setting-out drawings.

Translates definitive criteria and requirements to suit local codes and practices, preparatory to issuing Design Instructions.

Reviews all stages of Air Ministry working drawings to insure conformance with definitive criteria, standards of safety, economy of design, and to recommend final approval by USAF.

Investigates local problem areas (e.g. structural deficiencies, utility inadequacies, etc) and recommend remedial actions.

Produces working drawings, specifications and Bills of Quantities for projects approved for direct contract action.

Develops technical specifications for the purchase of USAF-procured equipment; review technical and monetary sufficiency of program documents.

Initiates and maintains flow of technical correspondence and engineering reports.

#### **4. Directorate of Facilities Support**

**Establishes procedures for the efficient and economical operation and maintenance of real estate facilities and utilities used by US Forces in the UK.**

**Monitors facility repair and modification work at US installations in the UK.**

**Provides technical advice and assistance to US military units in the UK.**

**Acts as contact agent with Air Ministry and other British Government agencies on Facility Maintenance and Utility Operation matters.**

**Directs and monitors Fire Prevention Programs for US activities in the UK.**

**Performs staff visits . . .**

**Provides engineering support and technical supervision to the Base Civil Engineer for the London Area.**

##### **a. Maintenance Division**

**Exercises staff control over all Civil Engineering, Maintenance & Operations activities at US facilities in the UK.**

**Establishes procedures for repairs and modifications, recurrent routine and preventative maintenance of Real Estate facilities, custodial services, trash collection and insect/rodent control. Provides contact with Air Ministry on such matters for all USAF Forces in the UK.**

**Reviews O&M projects for technical sufficiency and monitors progress.**

**Monitors the accomplishment of Maintenance and Operation of facilities through regular staff visits to Third AF subordinate units.**

**b. London Area Support Division**

Responsible for Civil Engineering activities at facilities in the London Area, including repairs, modifications, recurrent and preventative maintenance, custodial services, trash and refuse collections, insect control and fire prevention.

Prepares work orders and monitors progress.

Coordinates Civil Engineering matters and work schedules with using agencies.

**c. Fire Prevention Division**

Responsible for Fire Prevention, training and inspection of structural facilities, Fire and Crash/Rescue training, inspection, utilization and operation of firefighting equipment, and coordination of USAF firefighting activities, where necessary, with British Governmental Agencies and Civilian Fire Departments.

Responsibilities accomplished through regular scheduled and special staff visits to US installations in the UK.

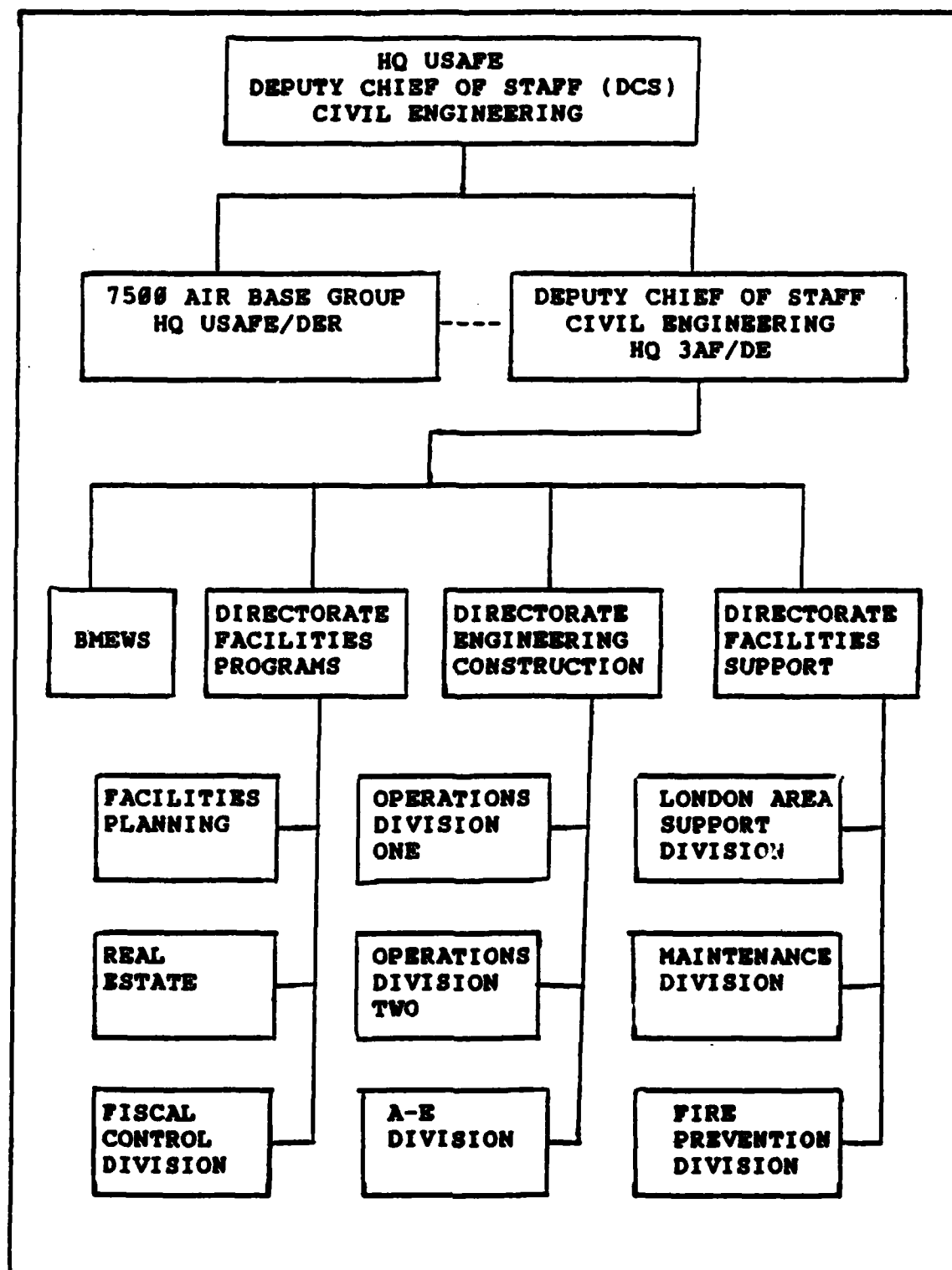


Figure E-3. HQ 3AF AFCE Organization Chart, 1962 (318).

**APPENDIX F. 3AF Base Level AFCE Organization,**  
**(1962 to 1986)**

This appendix lists the average base level AFCE manning in the UK from 1962 to 1986 (Table F-1), an organization chart for an AFCE base level unit in 1962 (Figure F-1), and a functional description and organization chart for an AFCE base level unit in 1986 (Figure F-2).

Table F-1. Average Manning of 3AF Base Level AFCE Units,  
1962-1980 (74-98, 100-205, 211-304).

| <u>AUTHORIZED/ASSIGNED</u> |                |                  |                 |              |
|----------------------------|----------------|------------------|-----------------|--------------|
| <u>PERIOD</u>              | <u>OFFICER</u> | <u>ENLISTED*</u> | <u>CIVILIAN</u> | <u>TOTAL</u> |
| Jan-Jun 62                 | 3 / 3          | 130 / 120        | 28 / 23         | 161 / 129    |
| Jul-Dec 62                 | 3 / 2          | 123 / 121        | 28 / 27         | 154 / 130    |
| Jan-Jun 63                 | 3 / 2          | 116 / 112        | 23 / 20         | 142 / 121    |
| Jul-Dec 63                 | 3 / 2          | 84 / 87          | 23 / 18         | 110 / 96     |
| Jan-Jun 64                 | 3 / 3          | 93 / 101         | 18 / 18         | 114 / 111    |
| Jul-Dec 64                 | 3 / 3          | 94 / 95          | 17 / 15         | 114 / 105    |
| Jan-Jun 65                 | 2 / 3          | 99 / 94          | 11 / 11         | 112 / 104    |
| Jul-Dec 65                 | 2 / 3          | 98 / 90          | 11 / 11         | 111 / 100    |
| Jan-Jun 66                 | 2 / 2          | 98 / 92          | 11 / 11         | 111 / 101    |
| Jul-Dec 66                 | 3 / 2          | 105 / 106        | 8 / 12          | 116 / 115    |
| Jan-Jun 67                 | 2 / 3          | 99 / 106         | 11 / 11         | 112 / 116    |
| Jul-Dec 67                 | 2 / 3          | 100 / 99         | 10 / 10         | 112 / 109    |
| Jan-Jun 68                 | 2 / 3          | 99 / 103         | 10 / 10         | 111 / 113    |
| Jul-Dec 68                 | 2 / 2          | 99 / 100         | 11 / 11         | 112 / 109    |
| Jan-Jun 69                 | 2 / 2          | 102 / 98         | 11 / 10         | 115 / 107    |
| Jul-Dec 69                 | 3 / 2          | 104 / 89         | 10 / 10         | 117 / 98     |
| Jan-Jun 70                 | 3 / 3          | 111 / 95         | 15 / 11         | 129 / 105    |
| Jul-Dec 70                 | 4 / 4          | 115 / 94         | 18 / 14         | 137 / 105    |
| Jan-Jun 71                 | 4 / 5          | 123 / 98         | 17 / 15         | 144 / 110    |
| Jul-Dec 71                 | 4 / 4          | 124 / 107        | 19 / 17         | 147 / 110    |
| Jan-Jun 72                 | 4 / 4          | 126 / 124        | 23 / 20         | 153 / 135    |
| Jul-Dec 72                 | 4 / 6          | 126 / 124        | 24 / 21         | 154 / 137    |
| Jan-Jun 73                 | 4 / 4          | 131 / 126        | 27 / 22         | 162 / 137    |
| Jul-Dec 73                 | 4 / 5          | 122 / 117        | 25 / 22         | 151 / 129    |
| Jan-Jun 74                 | 4 / 5          | 122 / 111        | 26 / 25         | 152 / 123    |
| Jul-Dec 74                 | 4 / 4          | 127 / 113        | 29 / 26         | 160 / 124    |
| Jan-Jun 75                 | 4 / 3          | 132 / 115        | 25 / 21         | 161 / 125    |
| Jul-Dec 75                 | 3 / 3          | 123 / 110        | 30 / 28         | 156 / 120    |
| Jan-Jun 76                 | 4 / 4          | 133 / 115        | 29 / 27         | 166 / 126    |
| Jul-Dec 76                 | 4 / 4          | 122 / 116        | 28 / 27         | 154 / 127    |
| Jan-Jun 77                 | 4 / 4          | 122 / 116        | 28 / 26         | 158 / 137    |
| Jul-Dec 77                 | 4 / 4          | 131 / 127        | 30 / 26         | 165 / 138    |
| Jan-Jun 78                 | 5 / 5          | 130 / 125        | 30 / 28         | 165 / 137    |
| Jul-Dec 78                 | 5 / 5          | 128 / 125        | 33 / 31         | 166 / 137    |
| Jan-Jun 79                 | 5 / 5          | 130 / 126        | 28 / 26         | 163 / 138    |
| Jul-Dec 79                 | 6 / 6          | 128 / 127        | 32 / 30         | 166 / 140    |
| Jan-Jun 80                 | 6 / 6          | 134 / 131        | 29 / 28         | 169 / 144    |

\*NOTE: Fire Department military manning throughout this period was approximately 70 enlisted personnel authorized and assigned.

AFCE Organization, 1962.

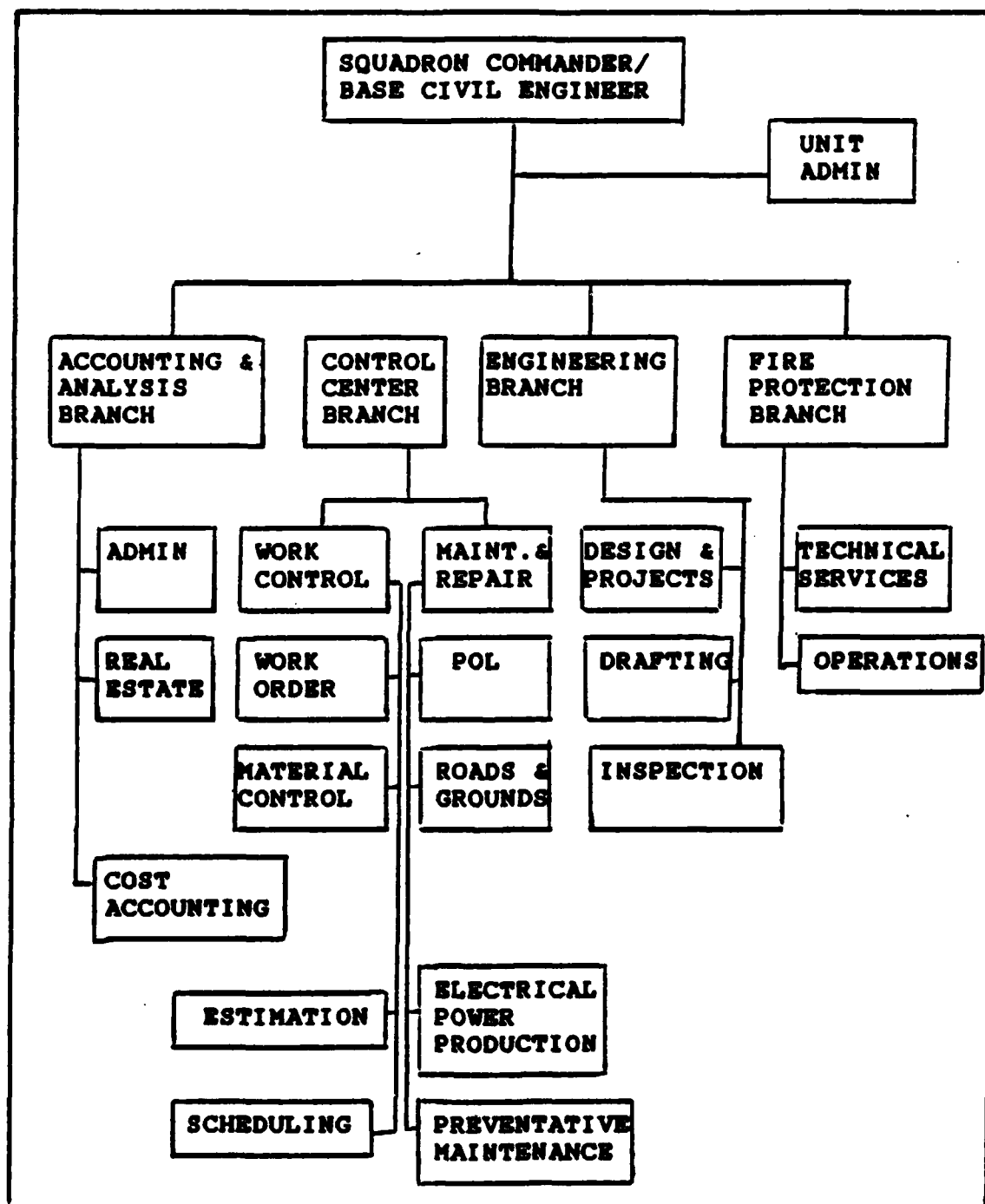


Figure F-1. 3AF Base Level AFCE Organization Chart, 1962 (74).

AFCE Organization, 1980.

Key organizational changes included in the revised  
USAFER 85-3, 14 March 1980, from the base level AFCE  
organization in 1962 were (208):

Financial Management Branch (DEB) was established and  
took over Cost Accounting . . . (and) Resource  
advisor (duties).

Engineering Contract Management Branch (DEE) was  
established to monitor all projects. . . .  
Construction Management . . . Real Property, Site  
Development, and Contract Planning.

Operations and Maintenance (DEM) . . . (assumed the  
responsibility for) the work order and Inservice Work  
Plan Functions . . . (in) Production Coordination.

The Housing Office, Fire Protection , and  
Collocated Operational Bases (COBs) and Plans Branches  
remained unchanged.

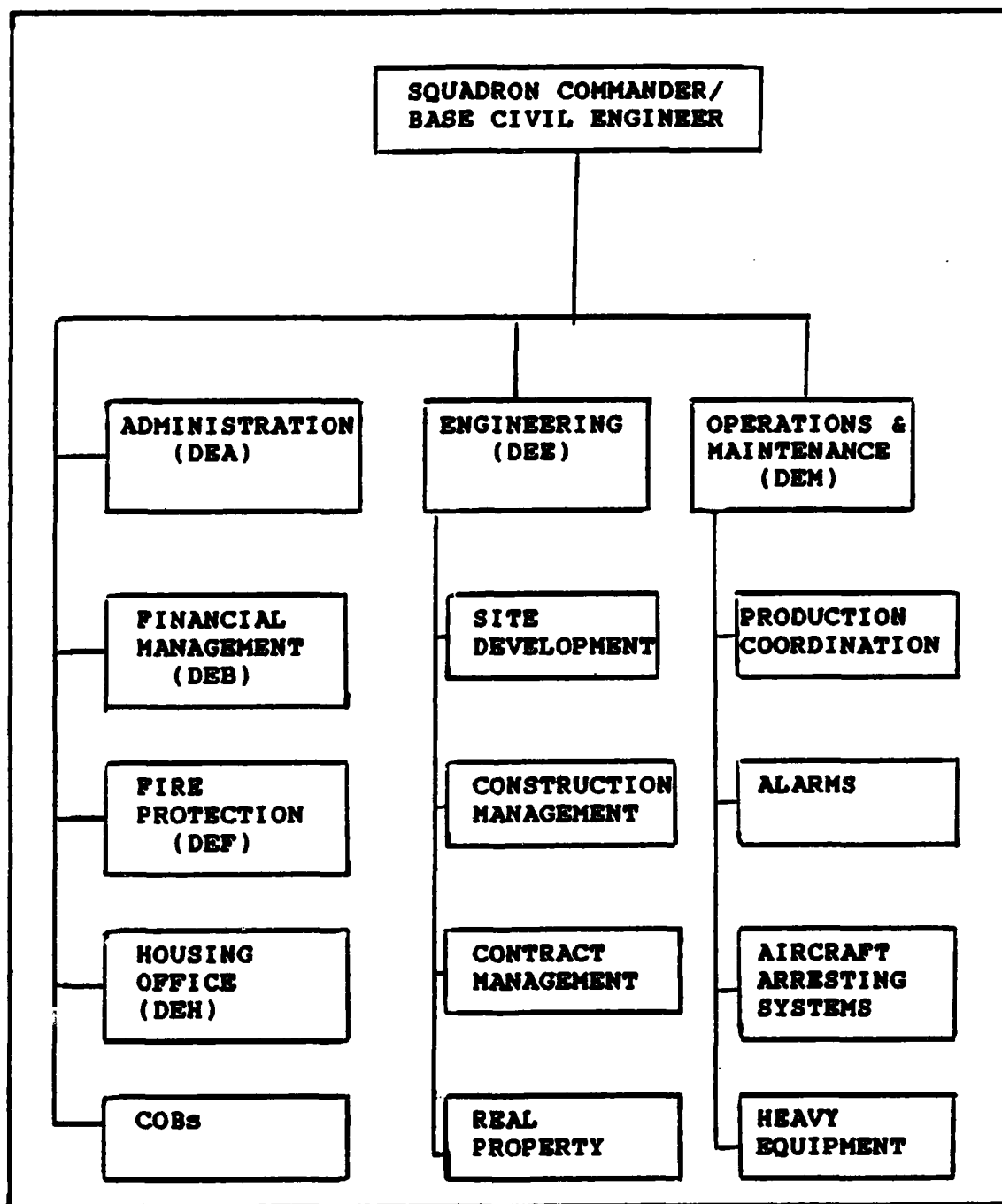


Figure F-2. 3AF Base Level AFCE Organization Chart, 1980 (288).

**APPENDIX G: Preventative Maintenance (PM) Scheme in the UK  
(43).**

**This appendix describes the order that the Air Ministry published to implement the Preventative Maintenance (PM) Program on 3AF installations in 1962.**

"A" SERIES

A.1674 - PLANNED PREVENTATIVE MAINTENANCE ON STATIONS  
OCCUPIED BY U.S. FORCES (HOME ONLY)  
(122/D. OF W.2)

1. Intention

It is intended to institute a system of preventative maintenance (additional to that which already exists for M&E [mechanical and electrical] installations) on certain stations occupied by US Forces as from 1st July 1962. This will be accomplished by setting up inspection and working teams who will be employed permanently on a pre-determined cycle of inspection and repair.

2. Method and Costing

Preventative maintenance will be carried out by Directly Employed Labour (DEL); but pending recruitment of the full numbers of DEL required, day-work labour from Term Contractors may be employed. . . .

3. Composition and Number of Teams

The number of teams per station and their composition will vary to meet the requirements of individual stations, but a typical team would consist of:-

- 1 Foreman of Trades
- 2 Carpenters
- 1 Plumber
- 1 Painter/Glazier
- 1 Electrician
- 1 Semi-skilled Labourer
- 1 MT (Motor Transport) Driver/Handyman

Depending on the size of the station there will be 1-7 such teams. Actual numbers and composition will be detailed by the Superintending Engineer of the Works Area concerned in collaboration with the USAF Base Civil Engineer, who will have a Representative with each team.

4. USAF Service Teams

The USAF reserve the right to employ Teams composed entirely of USAF Service personnel in certain areas on stations where suitable personnel exist. There will be no

AMWD (Air Ministry Works Directorate) participation in such teams.

**5. Operation of Scheme**

Each team will be assigned a pre-determined zone of their station and work will be planned so that every building and facility in that zone is visited on a ninety-day cycle. Normal action will be for the Foreman of Trades and Base Civil Engineer's Representative to inspect the building or facility to decide what requires to be done and then to issue specific written instructions to the follow-up work team as to the work to be performed. During the inspection note will also be taken of any item to be carried out by the station maintenance contractor. The Foreman of trades and the Base Civil Engineer's Representative will carry out a subsequent joint inspection to ensure that the job has been satisfactorily completed.

**6. Scope and Limitations - see also para. 11**

Work carried out by teams will be limited to genuine "preventative maintenance" work estimated to take not more than three hours per job; larger jobs will be passed on to the station maintenance contractor. Exceptional teams may be called on to deal with "trouble calls" in cases of real emergency when the station maintenance contractor has no suitable facilities and immediate action is required.

**7. Authorization by BCE (Base Civil Engineer).**

Authorized Directly Employed Labour is covered by the bulk annual AF Form 327 issued by the Base Civil Engineer. . . . When, however, day-work labour is ordered by RAF Form 1261 to be furnished by term contractors to bring these teams up to strength, separate RAF Forms 5653 will be raised by the Base Civil Engineer.

**8. Materials and Stores**

Materials and Stores required will normally be supplied by the USAF who will also provide a trailer for their transport and the Base Civil Engineer will be responsible for all control and accounting for these stores. . . . However, the Resident Works Engineer may have to take local purchase action within his powers for certain emergent (sic) items not available from USAF sources and in such case normal AMWD accounting action will be followed.

## **9. Tools**

Tradesmen will provide their own personal tools. . . . Power-driven hand tools will be provided by AMWD.

## **10. Transport**

A prime mover will be provided by Air Ministry for each team, to transport the members and their tools about the station and tow the Stores Trailer provided by the USAF. The USAF will be responsible for the security of the trailer and its contents.

## **11. M&E and H&V Installations**

The system will apply also to M&E and H&V (heating and ventilation) installations in so far as it concerns the periodic inspection and repair of installed services in buildings and facilities. . . . The existing M&E planned maintenance system will continue to operate as before for M&E Plant and Installations. Existing methods for the maintenance of H&V Plant and Installations will also continue as hitherto. The maintenance of POL Installations will be carried out under the M&E planned maintenance system and will not come within the orbit of this preventative maintenance scheme.

## **12. Control of Teams**

The Resident Works Engineer will appoint an officer who will be responsible for the operation of this scheme. This Officer will detail the programme of work to be carried out as requested by the Base Civil Engineer . . . All teams will report to him first thing every morning for instructions.

## **13. Access to Buildings**

It will be the responsibility of the USAF Base Civil Engineer, after consultation with the AMWD Appointed Officer, to arrange a programme for access to buildings both for the inspection and the working party.

## **14. Accommodation**

Existing AMWD accommodation on stations may be inadequate for the greatly increased numbers of DEL involved. At an early date, therefore, the Resident Works Engineer should review the existing accommodation, including canteen arrangements, and submit a scheme to the Base Civil Engineer for any improvements or extensions required for approval and funding. This should be treated as a matter of

urgency, since it will not be possible to implement this scheme until suitable accommodation is available on the station.

**15. Documentation**

The USAF operation of the preventative maintenance programme will be governed by US Air Force Directive AFM 85-2 Preventative Maintenance (December 1961) as modified by a Supplement which will be issued by Headquarters, Third Air Force. Copies of the Manual and Supplement will be furnished to each RWE (Resident Works Engineer). Under these procedures Base Civil Engineers will be required to keep Records Cards for all buildings and facilities on their Base. Base Civil Engineers should accordingly be permitted to obtain any information they require for the compilation of their Record Cards from the detail sheets or similar records maintained by AMWD for the major items of M&E or H(heat) Plant.

AIR MINISTRY  
1st JUNE, 1962

W.G.M. ANDERSON  
DIRECTOR-GENERAL OF WORKS

**APPENDIX H: 3AF Base Level AFCE Reduction Test in the UK**  
**(62).**

This appendix describes the base level manning in the UK for the AFCE reduction test at RAF Bentwaters and RAF Lakenheath. in 1962.

**Management**

**Base Civil Engineer (BCE), Major 5525**

- 1 LWR (Local Wage Rate British civilian) Steno, 70450**  
Performs stenographic services for the BCE; prepares correspondence for the organization.
- 1 Administration Supervisor, TSgt, 70270**  
Supervises the management unit control distribution of all administration matters pertaining to the BCE; monitors classified information; acts as reports control monitor.
- 1 LWR Accountant, 67170**  
Verifies and controls all Air Ministry expenditures; prepares financial and accounting report and assists in the development of financial plan.
- 1 LWR Real Property Clerk, 70270**  
Maintains real property records and prepares reports for the real property; maintains record of facility utilization; takes administrative action on redesignation of facilities.
- 1 LWR Clerk Typist, 70250**  
Maintains central files for the organization; maintains directives and publications in current status; assists in typing some reports and other miscellaneous matter.

**Coordination Center (Work Control Center)**

- 1 (OIC) Captain, 5525**  
Supervises the Coordination Center; assumes duties as assistant BCE; maintains close liaison with the RWE (Regional Works Engineer) on maintenance programming and procedures.

- 1 NCOIC, SMSGT, 56990  
Serves as assistant to the OIC of Coordination Center;  
directs the work of Coordination Center employees;  
monitors scheduling of work; supervises and controls  
the work of inspectors; directs the work of airmen  
assigned to airfield sweeping and snow removal etc.
- 1 LWR Engineer, 5564  
Prepares criteria and definitive sketches for project  
type work, maintains liaison with RWE on technical  
matters; develops O&M (operations and maintenance) and  
minor construction in MCP (Military Construction  
Program); maintains the SETAF master plan, etc.,  
advises the BCE on Technical matters.
- 1 LWR Draftsman, 22350  
Performs drafting services for programs and projects;  
operates reproduction equipment.
- 1 TSgt, 56970  
Develops maintenance schedules, processes work order  
requests and prepares for FUB (Facility Utilization  
Board); prepares for work orders, does material listing  
for requirements; maintains status of work in progress  
and to be done; investigates work requirements;  
prepares estimates.
- 1 LWR, 56970  
Same as TSgt, 56970.
- 1 SSgt, 54350  
Surveillance of contracts other than RWE.
- 1 LWR, 64650, Supply Clerk  
Maintains bench stock listings and stock levels for  
preventative maintenance; prepares requests for all  
supplies required to support the RWE.
- 1 LWR, 70250, Service File Clerk  
Receives all calls, relays emergency service calls to  
the RWE; maintains work order requests and work order  
register.
- 3 Airmen, 55151, Pavements Unit  
Performs airfield sweeping, snow removal and operates  
heavy equipment.

The Fire Department is not considered for this survey  
with the exception of the possibility of replacing an Airmen  
Clerk with a LWR.

**APPENDIX I: Third PROBE Organizational Description (110).**

This appendix describes the RAF Bentwaters AFCE manning proposal in 1967.

**Personnel Requirements Of Base Engineers (PROBE)**

at

**Third Air Force Bases**

**PREFACE**

This narrative briefly explains the background concepts of an "integrated functional organization" of USAF Civil Engineering and British Ministry of Public Buildings and Works, within the context of existing country-to-country agreements. . . . The objective of this proposal is to illustrate how the Civil Engineer in the United Kingdom can accomplish the tasks and achieve the results required for mission effectiveness:

- a. Through selective channels of liaison with the Ministry of Public Buildings and Works.
- b. Through comprehensive and coordinated programming, and
- c. Through analytical evaluation of work effectiveness.

[Figure I-1 is represents the organization chart under Third PROBE].

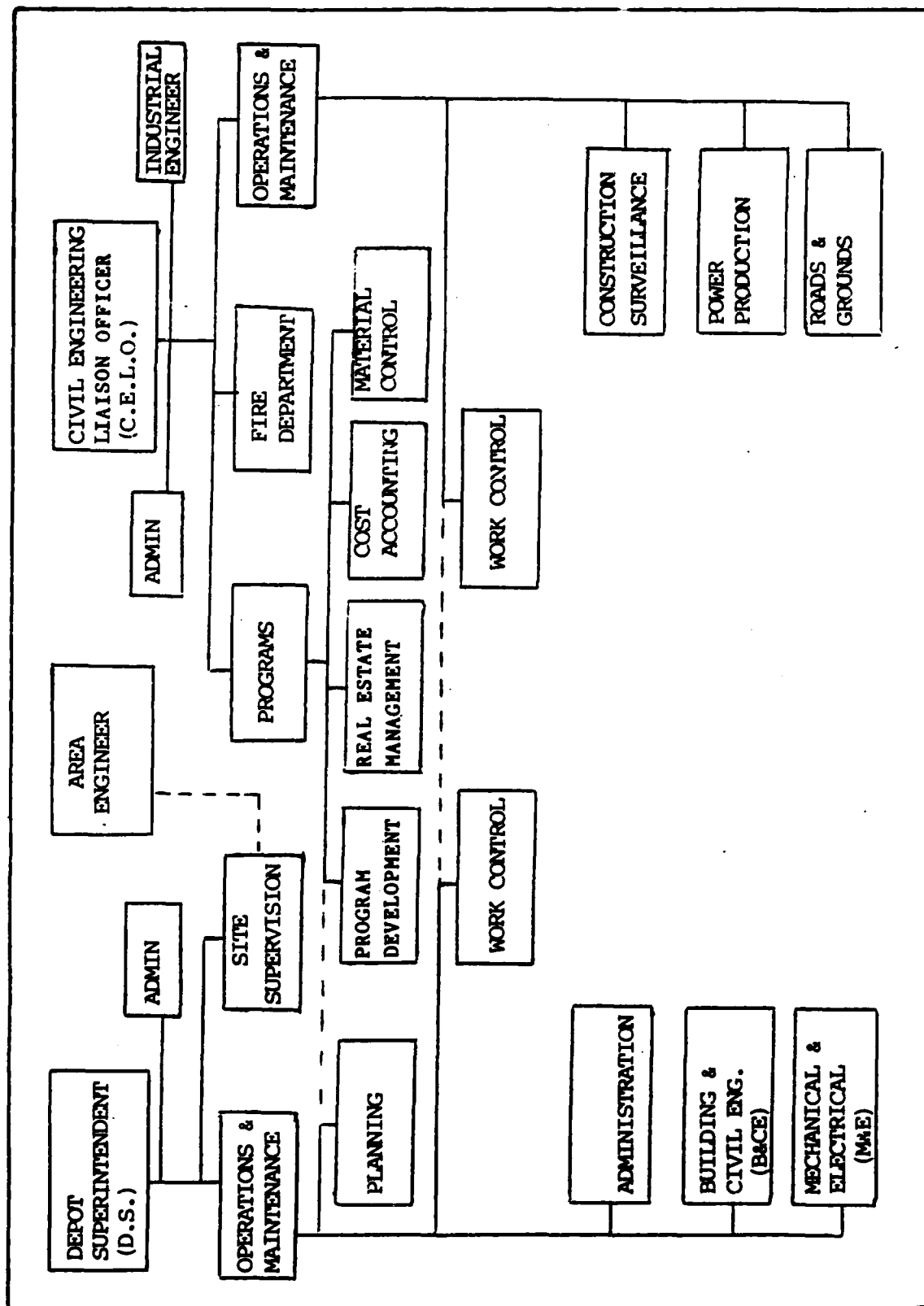


Figure I-1. AFCE-PSA Organization Chart Under Third PROBE.

## CE FUNCTIONAL CODES AS THEY APPLY IN THE UNITED KINGDOM

### **I. CIVIL ENGINEERING LIAISON OFFICE (4400)**

All activities related to the overall management of the Civil Engineering function including liaison with the British Ministry of Public Buildings and Works for functions where the MPBW has the authority and responsibility by country-to-country agreements.

**NOTE:** This title more accurately describes the Civil Engineering function in the United Kingdom. Current directives do not in many instances apply to the UK Civil Engineer. This results in constant misunderstanding and confusion on the part of the "customer", the Civil Engineer, and the MPBW.

#### **A. CIVIL ENGINEER UNIT AND MANAGEMENT ADMINISTRATION (4401, 4402)**

(AUTHORIZED: Major, MSgt, and airman)

Includes squadron commander, first sergeant, and unit administration.

Responsible for overall administrative management of the Civil Engineer liaison functions. . . .

#### **B. CIVIL ENGINEER INDUSTRIAL ENGINEER**

(AUTHORIZED: Captain, TSgt, and airman)

All activities related to the evaluation of the quality of work performed by Civil Engineering and MPBW personnel; evaluation of equipment and procedures for adequacy and effectiveness. . . .

Analyzes performance reports and prepares time standards for civil engineering work force.

## **II. CIVIL ENGINEER PROGRAMS (4410)**

**[AUTHORIZED: Captain]**

All activities related to the management of the development, preparation and justification of the Military Construction Program, Financial Plans and Budget Estimates, operation and Maintenance Program, and the annual and Long-Range Work Plans.

Manages all civil engineer financial matters.

Responsible for processing work rests (sic), work authorizations and material ordering.

Responsible for completion of cost data and for real property utilization, accounting and programming.

### **A. CIVIL ENGINEERING PROGRAM DEVELOPMENT (4411)**

**[AUTHORIZED: Lieutenant, MSgt, three Tsgt, SSgt, airman, and two civilians]**

All activities related to programming actions. Receives and processes work requests and approves work.

Develops, prepares, justifies, and monitors execution of Military Construction Program, Financial plan and Budget Estimates (CE portion), Operation and maintenance Program, Annual and Long Range Work Plans and master Plan.

Prepares CE emergency plans, operations plans and annexes.

In addition, develops functional requirements and prepares all "Statements of Work" for the professional services accomplished by the MPBW ENGINEERING & CONSTRUCTION (4420-MPBW).

Performs final acceptance of facilities from the MPBW, initiates design deficiency reports and provides technical advice on proposed new construction as well as on changes and repair to existing facilities.

### **B. MPBW PLANNING (4412-MPBW)**

All activities involved in the determination of facility maintenance and repair requirements.

Collaborates with Program Development in preparation and execution of programs and plans. . . .

Plans labor and material requirements and cost estimates.

**C. CIVIL ENGINEERING REAL ESTATE MANAGEMENT (4413)**

[AUTHORIZED: TSgt and two civilians]

All activities related to real property accounting and reporting.

Analyzes facility utilization . . .

Plans, develops, real property acquisition, disposals [sic]. . . .

**D. CIVIL ENGINEERING COST ACCOUNTING (4414)**

[AUTHORIZED: TSgt and two civilians]

All activities related to civil engineering cost accounting. . . .

**E. CIVIL ENGINEER MATERIAL CONTROL (4416)**

[AUTHORIZED: TSgt and one airman]

All activities related to civil engineering material control.

Acts as liaison with supply, procurement and MPBW.

Controls of CE shop stocks (4441, 4488, 4426, 4427); . . .

Operates forward supply point for issue of duty free USAF supplied items to MPBW and maintenance contractors.

**III. MPBW ENGINEERING AND CONSTRUCTION (4428-MPBW)**

All activities related to the management and preparation of technical data, studies and evaluations of facilities and systems in support of mission requirements.

**A. MPBW ENGINEERING-TECHNICAL AND DESIGN (4421-MPBW)**

All activities related to preparation, coordination and design of projects, (plans, specifications and cost estimate) for contract execution from "statements of Work" prepared by the CIVIL ENGINEER PROGRAM DEVELOPMENT (4411).

Performs engineering studies, furnishes technical assistance, operating drafting section, performs land surveys.

Prepares data for engineering portion of master plan. . . .

**B. MPBW CONSTRUCTION MANAGEMENT (4422-MPBW)**

All activities related to the performance of Civil Engineer responsibilities for accomplishment of work under contract is accomplished by the Depot Superintendent MPBW. . . .

Assists in final acceptance of military construction.

**IV. CIVIL ENGINEER FIRE PROTECTION AND CRASH RESCUE (4425)**

All activities relating to fire prevention, protection and aircraft rescue. . . .

**A. CIVIL ENGINEER FIRE OPERATIONS (4426)**

All activities related to fire fighting operations. . . .

Prime responsibility for operation and maintenance of aircraft arrestor gear in conjunction with POWER PRODUCTION and MPBW.

**B. CIVIL ENGINEER FIRE TECHNICAL SERVICES (4427)**

All activities related to the development of fire regulations and programs to reduce fire hazards and promote fire prevention practices. . . .

**V. CIVIL ENGINEER OPERATIONS AND MAINTENANCE (4438)**

**(AUTHORIZED: SMSgt)**

All activities related to the direction, coordination and control of the performance of all work approved and authorized for accomplishment by the Civil Engineer work force.

In addition, performs close liaison and coordination with the MPBW OPERATIONS AND MAINTENANCE DIVISION (4438-MPBW).

**A. CIVIL ENGINEERING WORK CONTROL.**

**(AUTHORIZED: MSgt, TSgt, SSgt, five airmen, and one civilian)**

All activities related to the scheduling of vehicles and work into appropriate work areas.

Reports status of work, operations control room, operates service call systems including radio dispatched DIN (Do It Now) vehicles.

Performs direct close liaison with the MPBW WORK CONTROL (4431-MPBW) for access to work sites and work progressing decisions in the control room.

**B. CIVIL ENGINEERING EQUIPMENT OPERATIONS (4441)**

**(AUTHORIZED: SSgt and six airmen)**

All activities related to the operation of assigned civil engineering base maintenance equipment.

Sweeps sand and debris and removes snow and ice from pavements.

**C. CIVIL ENGINEERING POWER PRODUCTION (4488)**

**(AUTHORIZED: TSgt and SSgt)**

All activities related to repair and maintenance of USAF electrical power production equipment. . . .

Maintains operation inspection and maintenance records.

Performs maintenance and repair of aircraft arrestor barriers . . . with assistance of the Fire Department and MPBW Internal Electrical Shop.

**D. CIVIL ENGINEER CONTRACT SURVEILLANCE (4431)**

**(AUTHORIZED: TSgt)**

All activities related to the surveillance, liaison and technical representation of civil engineering maintenance contracts. . . .

**VI. MPBW OPERATIONS AND MAINTENANCE (4430-MPBW)**

All activities related to the direction, coordination and control of the performance of all work approved and authorized for accomplishment by the MPBW work force or supplemental term contractors.

In addition, performs direct close liaison and coordination with the CIVIL ENGINEER OPERATIONS AND MAINTENANCE DIVISION (4430).

**A. MPBW WORK CONTROL (431-MPBW)**

All activities related to scheduling of work into appropriate work areas.

Reports status of work and operates control room.

Performs direct liaison and coordination with the CIVIL ENGINEERING WORK CONTROL (4431). . . .

**B. MPBW FAMILY HOUSING MAINTENANCE AND REPAIR (4432-MPBW)**

All activities related to the B&CE (building and civil engineering) and M&E (mechanical and electrical) maintenance, repair and minor construction of family housing units.

**C. MPBW HOSPITAL FACILITY MAINTENANCE (4433-MPBW)**

All activities related to the B&CE and M&E maintenance, repair and minor construction of hospital facilities.

**D. MPBW APPLIANCE MAINTENANCE & REPAIR (4434-MPBW)**

All activities relating to the maintenance and repair of commercial appliances including those in BOQs (Bachelor Officers' Quarters), dining halls and hospitals but excluding washers and dryers and appliances in family housing.

**VII. MPBW BUILDING & CIVIL ENGINEERING**

All activities related to the supervision of the MPBW work force engaged in maintenance, repair and construction of all building and civil engineering works as authorized for accomplishment.

**A. MPBW PAVEMENTS (4442-MPBW)**

All activities related to maintenance and repair of all pavements. . . .

Installs signs, posts and anchors.

**B. MPBW GROUNDS MAINTENANCE (4443-MPBW)**

All activities related to the performance of landscaping and grounds maintenance and repair. . . .

**C. MPBW NATURAL RESOURCES (4446-MPBW)**

All activities related to natural resources management and liaison with Forestry Commission and local County Council for control and disposition of timber.

**D. MPBW STRUCTURAL MAINTENANCE (4451-MPBW)**

All activities related to structural maintenance on facilities and installed equipment . . .

Installs and repairs fences.

Provides locksmith service.

Erects steel structures.

**E. MPBW PROTECTIVE COATING (4452-MPBW)**

All activities related to all types of protective coating applications, . . . .

Paint signs, applies airfield and road traffic markings.

**F. MPBW PLUMBING (4453-MPBW)**

All activities related to plumbing maintenance and repair on facilities and installed equipment. . . .

**G. MPBW METAL WORKING (4454-MPBW)**

All activities related to metal and welding repair and maintenance on facilities and installed equipment. . . .

**H. MPBW MASONRY (4455-MPBW)**

All activities related to maintenance and repair of masonry component of facilities. . . .

**J. MPBW WATER AND WASTE (4491-MPBW)**

All activities related to the operation and operator maintenance of water supply, processing and treatment plants and systems, waste processing plants and systems including exterior distribution and collection systems. . . .

**VIII. MPBW MECHANICAL & ELECTRICAL**

All activities related to supervision of MPBW work force engaged in the maintenance repair and construction of all internal and external mechanical and electrical units, plants and systems as authorized for accomplishment.

**A. MPBW REFRIGERATION AND AIR CONDITIONING (4416-MPBW)**

All activities related to the maintenance and repair of refrigeration and air conditioning systems. . . .

**B. MPBW LIQUID FUELS SYSTEM MAINTENANCE (4462-MPBW)**

All activities related to the maintenance and repair of liquid fuel systems and installed equipment. . . .

**C. MPBW HEATING SYSTEMS (4463-MPBW)**

All activities related to the installation, maintenance and repair of heater systems including exterior distribution lines.

Operates central and auxiliary plants and separate units when required.

Maintains operating logs and other required records. . . .

**D. MPBW INTERNAL ELECTRICAL (4472-MPBW)**

All activities related to the maintenance, repair, replacement and installation of interior electrical systems. . . .

Connects USAF standby generators and power units. . . .

Maintains NATO standby generator and power units. . . .

**E. MPBW EXTERNAL ELECTRICAL (4472-MPBW)**

All activities related to the maintenance, repair, replacement and installation of exterior lighting and electrical transmission systems. . . .

**APPENDIX J. Maintenance of Real Property Facilities in the United Kingdom (Excerpts from USAFER 85-3)**  
**(25).**

**Chapter 1. GENERAL**

. . . [Scope omitted]

1-2. Concept. . . . The PSA combined work force of Directly Employed Labor (DEL) and Term Contractors (TCs) constitutes the primary engineering resource on the base. . . . [Paragraph 1-3, Exclusions, and 1-4, Country to Country Agreement, omitted.]

**1-5. Exceptions to the Country To Country Agreement:**

a. Use of Military Troop Labor. Qualified military personnel are permitted to carry out work . . . with the specific approval of the DWO [District Works Officer]. . . .

(1) Routine and preventative maintenance within the scope of their (USAF BE [Base Engineer]) trades. . . .

(2) Minor new work (excluding mechanical and electrical work) not exceeding \$10,000 on any single project. . . .

c. Direct Contract by US Forces:

(1) In general, all works services must be accomplished through PSA [Property Services Agency]. The BE is permitted, however, to plan and let contracts for small works services. . . .

(a) Minor internal and external alterations to existing buildings.

(b) Internal and external decoration of buildings.

(c) Morale and welfare projects in both permanent and non-permanent construction.

(d) Urgent technical or operational installations.

(2) Expenditures . . . may not exceed \$100,000 at any one base in one year. . . .

**1-6. Service Level Agreements With The PSA:**

a. Headquarters Third Air Force (HQ 3AF) - Air Ministry Agreement for Minor Maintenance and Minor Works Services, signed 1 July 1959. . . .

b. Major construction administered by the PSA under procedures agreed at USAFE(DER)/PSA London Headquarters level. . . .

**1-7. PSA Organization: . . . [see Figure J-1 for base level organization chart]**

b. London Headquarters. The Directorate of Home Regional Services (DHRS) is professionally responsible for all regional operation and maintenance in the UK; . . . HQ USAFE(DER) is the single point of contact with PSA (DHRS). . . .

d. Regional Headquarters. Each PSA region is headed by a director who is responsible for all operations and Maintenance (O&M) work within the region. . . . Bases normally do not contact the Regional Headquarters directly. Contact with Regional Headquarters should be made through HQ USAFE/DER.

e. Area Offices. The director delegates executive responsibility for O&M work to the Area Officer who performs most of the O&M project design for the district/bases.

f. District Works Offices. The District Works Office is headed by the District Works Officer who is supported by Professional and Technical Officers (P&TOs) of both Building and Civil Engineering (B&CE), and Mechanical and Electrical (M&E) disciplines. Bases are subdivided by the DWO into areas of responsibility such as airfield, domestic site, housing, etc. . . . The District Works Officer is the Base Engineers' first point of contact on all services performed by PSA.

(1) The DWO is supported by Directly Employed Labor (DEL) . . . which is primarily used for operations and services job order work issued on PSA workdockets. . . .

(2) Base Maintenance Contractors. Operations and Maintenance work beyond DEL capability is performed by PSA maintenance term contractors in the Building and Civil Engineering, Mechanical and Electrical, or

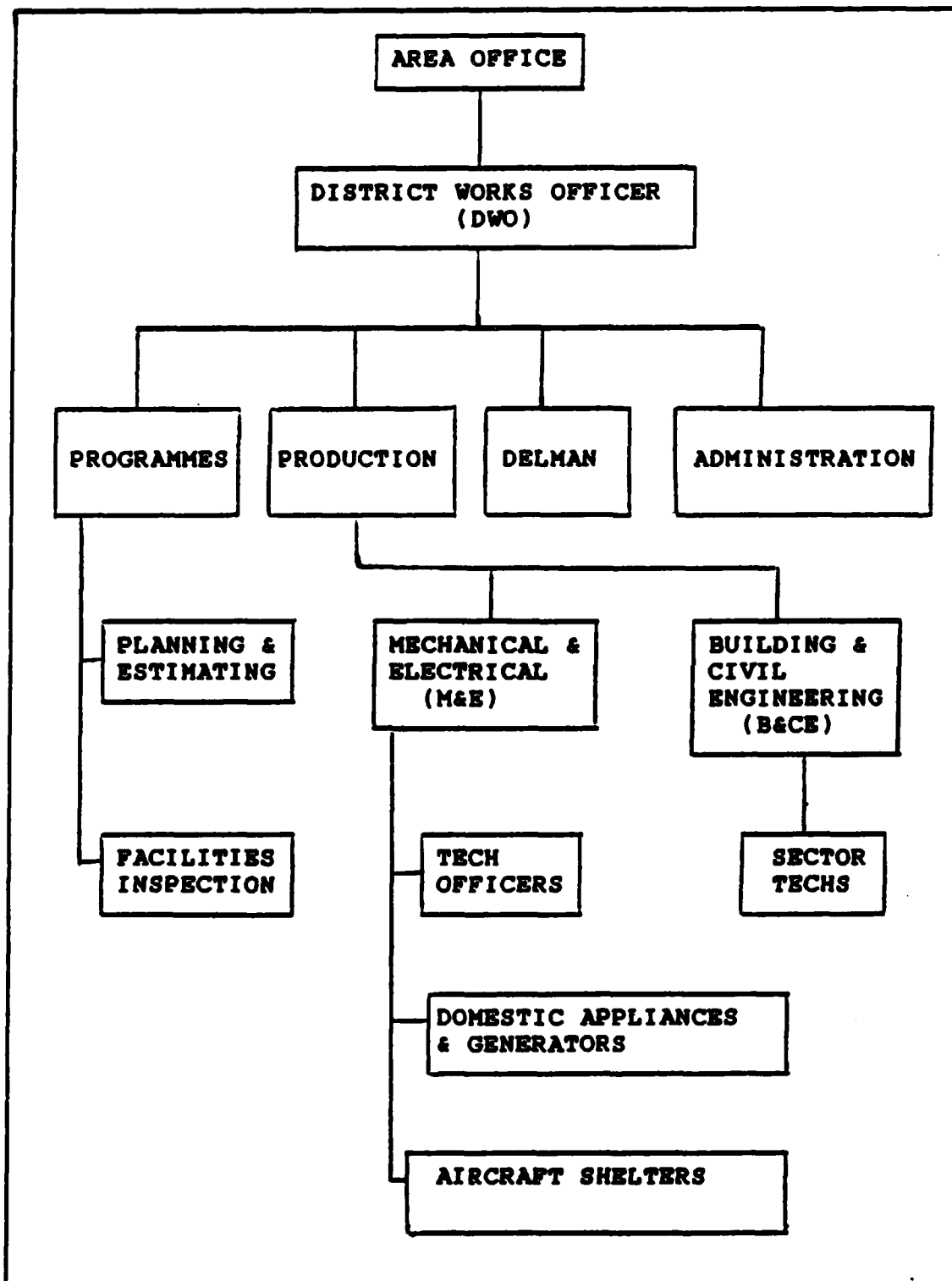


Figure J-1. PSA Base Level Organization Chart, 1980.

specialist categories. Term contracts are which cover maintenance, repair, and minor construction are let by the PSA Regions . . . over a fixed period of normally three years. . . . [Contractor schedules of price scales are omitted]

**1-8. Base Engineer Responsibilities.** The Base Engineer functions as the overall coordinator for base engineering and PSA activities. . . . as a liaison between USAF base management and the UK Property Services Agency for all matters pertaining to the operation and maintenance of real property. . . .

a. Programming for and approving design of base engineering O&M projects . . . preparing DD Forms 1391 and all related documents . . . maintaining CECORS [Civil Engineering Contract Reporting System] data and preparing/submitting the related reports. . . .

c. Approving work to be performed or services to be rendered by the PSA which are not already included in an In-Service Work Plan (IWP). . . .

e. Funding and controlling funds for all real property maintenance, repair, operation, and minor construction . . . The BE [Base Engineer] is NOT responsible for programming or scheduling PSA resources to accomplish work. . . .

j. Managing equipment operations, aircraft arresting systems and alarm systems.

k. Supporting Collocated Operating Bases (COBs).

l. Managing recovery from damage to facilities from any cause. . . .

**1-9. Department of the Environment (DOE) Responsibilities.** The DOE acts as the agent for the United States Government in providing works services at US occupied stations in the United Kingdom. . . .

**1-10. PSA Responsibilities.** The PSA is responsible for:

a. Providing manpower, material, equipment, and term contractors required to perform real property maintenance, repair and operation services normally performed by a standard USAF Base Civil Engineering organization. . . . PSA determines annual requirements by performing periodic facility inspections and includes the identified items in the In-Service Work Plan. PSA plans the work in the IWP, schedules identified requirements, and provides work control

procedures to include supervision, technical surveillance, and acceptance of work. . . .

1-11. District Works Officer Responsibilities. The DWO works closely with the US Base Commander and BE. . . . The direct responsibility for executing work rests with the DWO to whom the programming and corresponding PSA funds have been entrusted. The BE indicates work priorities on behalf of the Base Commander and every effort is made to meet these priorities. Any difficulties which cannot be resolved locally are referred to the Area Officer. . . .

a. Managing and administering works services on the base occupied by the USAF. . . .

b. Being directly responsible for the operation and maintenance of works services on the base. . . .

1-12. RAF Commander Responsibilities . . .

a. The RAF Commander is the senior RAF representative at the USAF occupied RAF station. The RAF Commander has the status, powers and responsibilities of a commanding officer. . . . [List of RAF Commander responsibilities and Chapter 2, Periodic Facilities Surveys were omitted]

### Chapter 3. PROCESSING WORK REQUESTS

. . . [Purpose omitted]

3-2. Terms Explained.

. . . [Verbal Request omitted]

b. BCE Real Property Maintenance Request (AF Form 1135). The AF Form 1135 . . . is used . . . to identify maintenance and repair requirements (including M&R contract requirements) that do not meet the emergency criteria for a service call or are not urgent in nature. . . .

c. Work Request. AF Form 332 . . . serves three basic purposes:

(1) As a requesting document. . . .

(2) As a work approval or disapproval document. . . .

(3) As a work authorization document. . . .  
(AF Form 332 Authorized Uses, 3-2(d), Work Request Register, 3-2(e), Work Request Review Panel (WRRP), 3-2(f), and Preparation of Written Work Requests (AF Form 1135 and 332), 3-3, are omitted)

**3-4. Processing AF Form 1135 (PSA Function):**

**a. Receipt.** The original and one copy of AF Form 1135 is received initially by the clerical officer in the PSA Programs Section, date stamped, registered, and forwarded to the Directly Employed Labor Manager (DELMAN). . . .

(1) If all items can be accomplished by DEL, the DELMAN . . . forwards the AF Form 1135 to the PSA service call operator. The service call operator initiates the required work dockets (PSA Form W1933) . . . . [omitted procedure for filling out AF Form 1135]

**d. Processing within the DEL Service Center.**

(1) The PSA service call operator prepares work dockets (W1933) for those items selected on the AF Form 1135 for DEL accomplishment. . . .

(2) The PSA service call operator records work docket control numbers and estimated completion dates. . . . Work docket control numbers are entered in the service call log maintained by the PSA service call operator.

(3) After the DELMAN reviews the actions taken on the AF Form 1135, both copies are forwarded to the PSA Programs Section.

**e. Processing within the PSA Programs Section:**

(1) If all items on the AF Form 1135 can be accomplished by DEL, one copy is filed in the facility jacket and the second copy returned to the requestor.

(2) If work requested on the AF Form 1135 cannot be accomplished by DEL, the PSA Chief of Programs selects one of the following options:

(a) Initiate a PSA Work Authorization Form (W2294) for work accomplishment by term contractor.

(b) Enter the work requirement in the PSA Forward Maintenance Register or In-Service Work Plan for future accomplishment. . . .

**3-5. Processing AF Form 332:**

a. BE Processing Actions - Receipt, review, and validation. All AF Forms 332, BCE Work Request, are reviewed by the BE production coordinator. . . .

b. BE Routing. If the requests passes the review and validation . . . the BE Production Coordinator:

(1) Assigns a number to the request . . .

(a) Sends a form letter to the requestor indicating that the request is acceptable, and the anticipated date of final approval/disapproval action.

(b) When work requested on an AF Form 332 can be approved on an AF Form 1135 . . . the BE Production Coordinator prepares an AF Form 1135 and forwards it to PSA. . . . (priority and coordination procedures omitted)

c. PSA Estimating:

(1) Work requests are not estimated before submittal to the WRRP (Work Request Review Panel). . . .

d. PSA Processing Actions. . . .

(1) Upon initial receipt of AF Form 332, the BE Production Coordinator assigns a work request number in the log and forwards the work request to the PSA Programs Section. . . . (BE/WRRP/Facility Board Processing Actions and Chapters 4, 5, and 6 omitted)

**Chapter 7. SELF-HELP**

. . . [Purpose, Terms, Requests for Self-help, Approval and Authorization omitted]

**7-6. Inspection.** PSA technical officers make "in-progress" and completion inspections of all self-help work. . . . [Documentation and Capitalization and Optional Procedures omitted]

## **Chapter 8. IN-SERVICE WORK PLAN DEVELOPMENT AND EXECUTION**

. . . [Purpose omitted]

**8-2. Concept.** The IWP [In-Service Work Plan] is the most important vehicle for justifying budget requests, programming orderly accomplishment of work requirements, and providing USAF approval of PSA O&M [Operations and Maintenance] work. The IWP is a plan on how to complete vital programs. PSA develops the IWP. . . .

**8-4. In-Service Work Plan.** The IWP consists of all Maintenance and Repair (M&R) work requirements to be carried out by the PSA, including work requirements revealed through the physical inspection of base facilities and from periodic surveys carried out by the PSA. . . .

### **8-6. Budget Estimate:**

a. . . . The maintenance (EEIC [Element of Expense Code] 570) budgets produced by the DWO. The overall budget is prepared by the BE financial manager and coordinated with the DWO. . . .

### **8-7. Development of the In-Service Work Plan (PSA):**

a. In-Service Work Plan (PSA). The IWP . . . [shows] how BE projected fund sources (EEIC 570) are to be expended for the upcoming fiscal year in order to satisfy known and projected facility work requirements, utility operations, grounds maintenance, equipment maintenance, service calls, etc. . . . [IWP Development steps omitted]

## **Chapter 9. PROJECT DEVELOPMENT AND MANAGEMENT**

. . . [Purpose omitted]

**9-2. Concept.** Facility projects by contract provide the bulk of needed improvements to our bases. . . . A viable three year O&M program is mandatory. PSA facility inspections are the most important means of identifying projects. . . . [Terms Explained, Outline of Procedures, and Identifying Requirements paragraphs omitted]

### **9-6. Preparation of Projects Documents.**

a. The BE programs projects as directed in AFR 86-1. . . .

**9-8. Processing Funded Projects:**

a. When a project is funded, the BE issues to the DWO a separate USAFE Form 100 for each project. . . .

b. The PSA Programs Section issues a PSA Form W2294 to the Production Branch for each USAFE Form 100 received for funded projects. Upon receiving the PSA Form W2294, the Production Branch appoints a technical officer as project officer or job officer for the project. . . .

**9-9. Project Design:**

a. There is little design capability at DWO level. The PSA Area Officer usually provides this service but the waiting time can be 2 to 3 months or even longer depending on the extent of the work. . . . For O&M projects, the design costs are included in departmental expenses (7 1/2% of the project final cost). . . .

**9-10. Estimating Project Costs.** The cost estimates on the DD Form 1391 are the basis for funding. . . .

**9-11. Project Execution.** The Property Services Agency provides resources required for work planning, development, control, and execution of maintenance, repair, and operation services normally performed by a USAF Base Civil Engineering organization. . . .

b. Execution of Work. Execution of work is monitored by the responsible PSA project officer. . . .

**9-12. Monitoring Contract Progress.** O&M project progress is monitored by:

a. BE Construction Surveillance assessing the need for predesign and design conferences and arranging as necessary. . . .

e. BE Construction Surveillance and PSA project officers (technical officers) inspecting the work for satisfactory quality. . . .

f. BE Construction Surveillance and PSA technical officer ensuring that work has been accomplished to design and scope agreed at the initiation of the project. . . .

**9-13. Inspection and Acceptance:**

a. In accordance with the country-to-country agreement the PSA is responsible for inspection and acceptance of all work on behalf of the USAF. . . .

b. The BE or BE Construction Surveillance will be present during the PSA final inspection and acceptance of completed work from PSA contractors. . . . the USAF reserves the right to reject or require the correction of items that fail to meet the specified requirements of the plans and specifications. . . .

**Chapter 10. MATERIAL CONTROL**

**10-1. Purpose.** This chapter provides procedures for material transactions processed by Base Engineering Material Control through the Standard Base Supply System (SBSS). . . . Procedures for submitting and processing supply requests are omitted]

**Chapter 11. PRODUCTION CONTROL**

. . . [Purpose and concept omitted]

**11-3. Functions Explained:**

a. PSA Production Control Center. The Production Control Center is the BE/PSA command and communications center and provides crossroads of information flow. . . . comprised of the chart room with visual displays of the IWP and O&M and MAF [Non-Appropriate Funds] projects; the Service Center, service call operation; the Chief of Production Control; and schedulers. . . . [The Production Control Center Consists of. . . .

(1) A chart room. . . .

(2) The PSA service call function located in a separate enclosure.

(3) PSA technical officers located in separate rooms. . . .

(4) PSA DEL Service Center comprised of the expeditor and service call functions. . . .

(a) The central point of control for the PSA DIN (Do It Now)/Urgent and taxi service.

(b) The initial PSA receiving point for all emergency, urgent and non-emergency requests for maintenance and repair work.

(c) The central point of customer contact on status of maintenance and repair work within the DEL operation. . . .

#### 11-4. Visual Charts.

a. IWP Charts. All IWP works order charts are maintained by PSA Production Control. . . . (Scheduling the IWP is omitted)

### Chapter 12. FUNDS MANAGEMENT

. . . (Purpose and terms explained are omitted)

#### 12-3. PSA & BE responsibilities.

a. PSA responsibilities include:

(1) Daily management of funds . . . furnished on USAFE Form 100. . . .

b. BE responsibilities include:

(1) Providing the funds for PSA work progress on USAFE Form 100. . . .

#### 12-4. Day-to-Day Maintenance Accounting Procedures (EEIC 570):

a. Annual EEIC 570 Funds Authorization. At the beginning of the fiscal year the BE financial manager will prepare USAFE Form 100 for each appropriation and installation as required to accomplish the IWP. . . .

#### 12-5. Separately Funded Projects (EEIC 52X) Accounting Procedures:

a. Authorization of Funds. USAFE Form 100 is the only document used to commit funds to PSA for accomplishing facility projects and other separately funded requirements. . . .

b. Management of Funds. PSA is responsible for day-to-day management of funds to ensure that funds authorized are used only on approved projects. . . . [detailed funds management procedures omitted, pages 12-9 to 12-15]

**Appendix K. Comparison of AFCE Manpower Standard Formulas**

This appendix compares the AFCE manpower formulas for a traditional AFCE unit and an AFCE unit in the UK for six workcenters common to both organizations.

**A. (1) USAFEMS [USAFE Manpower Standard] Engineering Contract Management (326).**

$$Y = 288.3 + .8052*(X1) + 11.55*(X2) + .2245*(X3)$$

X1 = Number of Projects in Design by PSA.  
X2 = Number of Projects in Design by DER.  
X3 = Number of Facilities Supported.

**(2) AFMS [Air Force Manpower Standard] Environmental and Contract Planning (18).**

$$Y = 170.8 + 6.964(X1) + (MAF)*(X2)$$

X1 = Number of contract work requests, work orders, and change orders.  
X2 = Environmental Planning Validated.  
MAF = Manpower Availability Factor.

**B. (1) USAFEMS Construction Surveillance (325).**

$$Y = -127.1 + 6.609*(X1) + 34.54*(X2)$$

X1 = Number of Projects in Construction and Design by PSA.  
X2 = Number of Projects in Construction and Design by DER.

(2) AFMS Construction Management (17).

Projects:  $Y = 13.29 + 28.57*(X1) + 51.94*(X2)$

Services:  $Y = 69.74 + 7.228*(X3) + .8126*(X4)$

X1 = Average Monthly Number of Active Projects

X2 = Average Monthly Number of Active Surveillance  
Projects

X3 = Average Monthly Number of Active Service  
Contracts

X4 = Annual Service Contract Cost

C. (1) USAFEMS Operations (329).

$Y = 149.6 + 8.488*(X)$

X = Base Population Supported.

(2) AFMS Operations (21).

$Y = 236.8 + .8835*(X)$

X = Average Number of Personnel in Subordinate  
Work Centers

D. (1) USAFEMS Production Coordination (338).

$Y = 66.46 + .05991*(X)$

X = Base Population.

(2) AFMS Production Control (22).

$Y = 1887 + .2121*(X1) + .0529*(X2)$

X1 = Average number of AF Form 327, Work Orders  
and Change Orders and AF Form 1879 Job Orders  
Received per Month.

X2 = Total Floor Space (In 1000 Square Feet).

**E. (1) USAFEMS Material Control (328).**

$$Y = 71.39 + .3434*(X)$$

X = MFH supported.

**(2) AFMS Material Control (20).**

$$Y = 320.89 + .1621*(X) - .00000294*(X^2)$$

X = Facilities Maintained By CE  
(In 1000 Square Feet).

**F. (1) USAFEMS Equipment Operations (327).**

$$Y = 489.8 + .2570*(X)$$

X = Total Pavement Surface Area  
(In 1000 Square Yards).

**(2) AFMS Equipment Operations (19).**

$$Y = 670.9 + 2796*(X1) + .00794*(X2)$$

NOTE: Additive for Snow Removal:

$$Y = -96.61 + .03800*(X1)$$

X1 = Total Pavement Surface Area  
(In 1000 Square Yards).

X2 = Acres of Improved and Semi-Improved Grounds.

**APPENDIX L: PSA Wartime Base Maintenance Support,  
RAF Lakenheath (32: Appendix 10 to Annex X).**

This appendix identifies the PSA support required to maintain essential facilities and services on RAF Lakenheath during emergency or wartime operations.

**1. GENERAL. . . .**

- d. PSA personnel requirements during a contingency or emergency include:**
  - (1) Utility cutoff and repair teams.
  - (2) Facility damage assessment teams.
  - (3) Facility and essential services repair teams.
  - (4) Damage control center representatives.
- e. PSA must train military additive forces to maintain essential services on RAF Lakenheath. . . .**

**3. SPECIFIC TASKS.**

**a. Technical/airfield site.**

- (1) Hardened aircraft shelters - 60-each . . .**
  - (a) Standby generator. . . .
  - (b) Aircraft winch.
  - (c) Main door and door motor drive.
  - (d) Interior lights.
  - (e) KMU-450 (A transportable chemical decontamination unit). . . .
- (2) POL installations (13 locations).**
  - (a) Buried storage tanks.
  - (b) Standby generator. . . .
  - (c) Pumps, filters, control valves.
  - (d) Interconnecting pipeline. . . .

- (3) NAVAIDS [Aircraft guidance and navigational systems, 4 each].
  - (a) Standby generator. . . .
  - (b) Electric cables and switching system.
- (4) Semihardened squadron operations [4 each]. . . .
  - (a) Standby generator. . . .
  - (b) NBC [Nuclear, Biological, and Chemical] filtration system. . . .
  - (c) Air compressor for NBC system.
  - (d) Essential services [light, heat, water, sewage disposal, etc].
  - (e) PA [Public address] system.
- (5) Airfield lighting vaults [4 each]. . . .
  - (a) Electric cables.
  - (b) Controls and switching gear.
- (6) Aircraft maintenance hangars [3 each]. . . .
  - (a) Standby generator. . . .
  - (b) Frequency converters. . . .
  - (c) Interior lights.
  - (d) Heat plant. . . .
- (7) Semihardened WOC [War Operations Center, 2 each]. . . .
  - (a) Standby generator . . . .
  - (b) NBC filtration system . . . .
  - (c) Air compressor for NBC system.
  - (d) Essential Services.
  - (e) PA system.
- (8) Munitions storage areas [3 each]. . . .
  - (a) Standby generator . . . .
  - (b) Security fence (interior and exterior).
  - (c) Security lights.
  - (d) UPS [Uninterrupted Power Supply] system. . . .
  - (e) Alarm system.
  - (f) Personnel and vehicle entry control gates, gears, and contact. . . .
  - (g) Heat plant. . . .

- (9) Control Tower. . . .
  - (a) Standby generator. . . .
  - (b) Airfield lighting and barrier controls and switches.
  - (c) Essential services.
- (10) Semihardened avionics. . . .
  - (a) Standby generators. . . .
  - (b) Frequency converters.
  - (c) NBC filtration system. . . .
  - (d) Air compressor for NBC system.
  - (e) Air conditioning system.
  - (f) Alarm system.
  - (g) Essential services.
- (11) WSC (Wing Security Control). . . .
  - (a) Standby generator. . . .
  - (b) KMU-450 chemical protection system.
  - (c) Alarm system.
  - (d) Essential services.
- (12) LOX (Liquid Oxygen) Plant. . . .
  - Doors and hinges.
- (13) Target intelligence. . . .
  - (a) Standby generator. . . .
  - (b) Alarm system.
  - (c) Heat plant. . . .

d. Domestic site.

- (1) Messing facilities (6 facilities). . . .
  - (a) Heat plant. . . .
  - (b) Essential services.
- (2) Medical facilities (5 facilities). . . .
  - (a) Standby generator. . . .
  - (b) Air conditioning systems. . . .
  - (c) Heat plant. . . .
  - (d) Essential services.

- (3) Communications facilities (5 facilities).
  - (a) Standby generator. . . .
  - (b) Air conditioning system.
  - (c) Electrical cables and switching systems.
  - (d) Essential services.
- (4) Data automation (3 facilities). . . .
  - (a) Standby generator. . . .
  - (b) Air conditioning system. . . .
  - (c) Heat plant. . . .
  - (d) Alarm system. . . .
- (5) Security police operations  
(2 facilities) . . . .
  - (a) Alarm system.
  - (b) Essential services.
- (6) Cold storage. . . .
 

Refrigeration system (33,000 CF).

**c. Essential services.**

- (1) Electrical distribution system.
  - (a) Electric lines and substations. . . .
  - (b) Standby generators not previously noted. . . .
  - (c) Switching network.
- (2) Water distribution system. . . .
  - (a) Boreholes and pumping stations.
  - (b) Storage tanks.
  - (c) Water treatment plants.
- (3) Heat distribution system. . . .
  - (a) Boilers.
  - (b) Fuel tanks.
  - (c) Hot water distribution lines.
  - (d) Alternate built-in localized heating systems.
- (4) Sewage disposal and treatment system.
  - (a) Sewage treatment plants. . . .
  - (b) Collection systems.

**(5) Runway lighting system.**

- (a) Main runway lights.**
- (b) Taxiway and taxitrack lights.**
- (c) Approach lights.**
- (d) Obstruction lights. . . .**

**APPENDIX M: Opinions of AFCE Personnel Assigned to the UK, 1988**

**DISCLAIMER: THIS QUESTIONNAIRE WAS NOT INTENDED TO BE A SCIENTIFIC INSTRUMENT. ONLY FREQUENCY OF RESPONSE WAS USED. THE PRIMARY OBJECTIVE OF THIS QUESTIONNAIRE WAS TO SOLICIT OPINIONS OF THE RESPONDENTS. THE QUESTIONS, THEREFORE, ARE VERY SUBJECTIVE.**

**Background.**

The questionnaire was sent RAF Alconbury, RAF Bentwaters, RAF Greenham Common, RAF Lakenheath, RAF Mildenhall, and RAF Upper Heyford.

Six questionnaires were sent to each base for Base Civil Engineer and the Chiefs of Engineering (DEE), Construction Surveillance (DEEC), Contract Planning (DEEV), Operations (DEM), and Readiness (DEO).

The DEM and DEO questionnaire was answered by the same individual on RAF Greenham Common. Therefore, out of the 35 questionnaires remaining, 32 completed questionnaires were returned (91% return rate).

Questions 1 through 11 provided demographic information on personnel assigned. Frequencies are listed after each response. Comments to each question appear after the questionnaire responses associated with the question. The response associated with the comment follows the comment and is in brackets.

1. What is your current rank?

|           |                   |
|-----------|-------------------|
| 2Lt: 0.   | Other: Lt Col: 5. |
| 1Lt: 0.   | SMSgt: 1.         |
| Capt: 24. | TSgt: 1.          |
| Maj: 0.   | SSgt: 1.          |

2. What is your total time in service?

Less than 4 years: 0.  
From 4 to 8 years: 17.  
Over 8 years: 15.

3. How long have you been assigned to your present organization?

Less than 6 months: 2.  
From 6 to 12 months: 8.  
From 12 to 24 months: 9.  
Over 24 months: 13.

COMMENT: Too long [From 6 to 12 months].

4. In what branch do you work?

Engineering (DEE): 19.  
Operations (DEM): 5.  
Readiness (DEO or DEEX): 1.

Other: Base Civil Engineer (DE): 5.  
Deputy Base Civil Engineer: 1.  
Ground Launch Cruise Missile (GLCM)  
Project Officer (DEG): 1.

NOTE: All but one installation structured Readiness within the Operations Branch (DEM).

5. Did you volunteer for an overseas assignment?

Yes: 32.

No: 0.

6. Did you volunteer for an assignment to England?

Yes: 31.

No: 1.

COMMENTS: Second choice (No).

7. Is this your first assignment to the United Kingdom (UK)?

Yes: 32.

No: 0.

8. How long have you been assigned to your present job?

Less than 6 months: 9.

From 6 to 12 months: 14.

Over 12 months: 9.

9. Before this assignment, did you have any overseas experience?

Yes: 15.

No: 17.

If yes, in what countries?

|           |    |                   |    |
|-----------|----|-------------------|----|
| Germany:  | 7. | Belgium:          | 1. |
| Korea:    | 4. | Guam:             | 1. |
| Thailand: | 3. | Italy:            | 1. |
| Turkey:   | 3. | Iran:             | 1. |
| Egypt:    | 2. | Marianas Islands: | 1. |
| Japan:    | 2. | Philippines:      | 1. |
| Vietnam:  | 2. | Saudi Arabia:     | 1. |
| Alaska:   | 1. |                   |    |

NOTE: Several respondents had more than one overseas assignment.

10. On the average, how long is your duty day?

|                      |     |
|----------------------|-----|
| Under 8 hours:       | 8.  |
| From 8 to 9 hours:   | 5.  |
| From 9 to 10 hours:  | 10. |
| From 10 to 11 hours: | 11. |
| Over 11 hours:       | 5.  |

COMMENTS: Plus average 3 at home (From 8 to 9 hours).

11. What is your present branch/section manning?  
[question was not used in the analysis]

Questions 12 through 28 asked respondents for their opinion about their present job using the scale below. Frequencies are listed after each response. Where comments are listed, the response to the question is in brackets.

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

12. I don't have enough military personnel in my squadron/branch/section to accomplish the assigned workload.

1: 15.              2: 7.              3: 5.              4: 5.              5: 0.

COMMENTS: Assigned work no problem. Additional duties, no time [NEUTRAL]!

In the UK, the manpower is a big problem [NEUTRAL].

13. We spend more time on readiness training and exercises than at our other assignments.

1: 4.              2: 3.              3: 3.              4: 6.              5: 16.

COMMENTS: Must accept the fact that readiness training and exercises are part of our assignment [NEUTRAL].

We should spent much more [DISAGREE]!

14. Without base augmentees, we would not be able to perform our wartime mission.

1: 20.              2: 1.              3: 1.              4: 0.              5: 1.

COMMENTS: TPF (Time Phased Forces) [DISAGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

15. I often have to ask young airmen (AB through SrA) assigned to my branch to perform duties outside their AFSC to get the job done.

1: 15.              2: 5.              3: 4.              4: 3.              5: 0.

COMMENTS: But this is not all bad [AGREE]!

No AB through SrA assigned  
[Five respondents].

90 percent of the work is outside the AFSC  
of the SSgt assigned [No rating provided].

16. Working with the Property Services Agency (PSA) is no different than working with the civilian work force in the US.

1: 0.              2: 0.              3: 1.              4: 6.              5: 25.

COMMENTS: [Three respondents rated the question above the upper limit, values of 6, 8, and 10. Their responses were included in the DISAGREE category.]

It is like night and day. It is terrible.  
They are basically a worthless waste of time  
and money [DISAGREE].

No comparison [DISAGREE].

PSA is a separate bureaucracy - very  
different than civil service [DISAGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

17. The workload of jobs in the UK are more demanding than at my previous assignments.

1: 19.              2: 8.              3: 2.              4: 2.              5: 1.

COMMENTS: Only due to low manning [AGREE].

Commander position is demanding everywhere, but there are unique demands in getting your job done through PSA [AGREE].

Setting up a GLCM base, . . . from scratch was much more demanding [MILDLY AGREE].

It is complicated by the PSA system and their procedures [MILDLY DISAGREE].

In Korea, all the officers averaged a 12-15 hr day, 6 days a week [DISAGREE].

18. I am confident that our organization can perform its wartime duties.

1: 5.              2: 13.              3: 5.              4: 5.              5: 2.

COMMENTS: With our 30 people [AGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

19. This organization would be more effective if we had a fully manned CE squadron.

1: 24.              2: 5.              3: 2.              4: 1.              5: 0.

COMMENTS: [One respondent rated the question below the lower scale limit, value of negative 3. This response was included in the AGREE category.]

I'd have more control, particularly for the "anklebiters" and off-duty hours  
[MILDLY AGREE].

20. This organization would be more responsive to our customers' needs if we had a fully manned CE squadron.

1: 22.              2: 8.              3: 1.              4: 0.              5: 0.

COMMENTS: [One respondent rated the question below the lower scale limit, value of negative 3. This response was included in the AGREE category.]

Money (budget) would still play a role  
[MILDLY AGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

21. To get the job done, I routinely ask my subordinates to work over 8 hours per day and on weekends.

1: 13.              2: 11.              3: 4.              4: 2.              5: 2.

COMMENTS: But sometimes required per job description, ie. snow removal [MILDLY AGREE].

Work seven days per week, be it at home or office [MILDLY AGREE].

22. We would receive better readiness training if we had a fully manned CE squadron.

1: 16.              2: 5.              3: 4.              4: 4.              5: 2.

COMMENTS: [One respondent rated the question below the lower scale limit, value of negative 3. This response was included in the AGREE category.]

Not better training but more homogeneous group. Presently 54 augmentees we never get the same group twice [AGREE].

Particularly in the RRR (Rapid Runway Repair) area. I really worry about that issue [MILDLY AGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

23. Only airman with a five level and officers with some experience should be assigned to the UK.

1: 11.              2: 10.              3: 1.              4: 6.              5: 2.

COMMENTS: Unless they provide more manning each person must be multi-talented [AGREE].

Would smooth working with PSA [AGREE].

The exception is the Fire Department [MILDLY AGREE].

Officers - yes, Airman - no [MILDLY AGREE].

Although assigning a new officer here would give him a very warped and bad impression of CE [MILDLY DISAGREE].

Not a fair question - we could make a case for the same thing at any theater base [Did not provide a rating].

24. The quality of work performed by the PSA is as good as at my previous assignments.

1: 4.              2: 7.              3: 2.              4: 7.              5: 11.

COMMENTS: Usually good quality [AGREE].

It depends on the type of work being done [MILDLY DISAGREE].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

25. The quality of work performed by PSA is better than at my previous assignment.

1: 0.                  2: 4.                  3: 5.                  4: 9.                  5: 14.

COMMENTS: Some trades - carpenters are more skilled; plumbing and heating is 20 years behind US [MILDLY AGREE].

They have totally different building code requirements [MILDLY DISAGREE]!!

It depends on the type of work being done [DISAGREE].

26. I routinely must ask young airmen (AB through SrA) to perform jobs that I would normally assign to personnel with more rank.

1: 15.                  2: 5.                  3: 5.                  4: 2.                  5: 1.

COMMENTS: No AB through SrA assigned [Five respondents].

You use what you have. If more rank was available, I could use it. However, our young folks do a good job [MILDLY AGREE].

I really do not have the staff to assign that much work. I do most of it myself [NEUTRAL].

AGREE      MILDLY AGREE      NEUTRAL      MILDLY DISAGREE      DISAGREE

1                      2                      3                      4                      5

27. The workload prevents me from providing adequate training for my squadron/branch/section personnel in their duties.

1: 12.              2: 14.              3: 1.              4: 4.              5: 1.

COMMENTS: Most needed training is how to work well with PSA. We are very busy. More time for training would be beneficial if [the] workload allowed it [MILDLY AGREE].

28. I believe that the PSA workforce will help CE accomplish its wartime mission.

1: 10.              2: 5.              3: 4.              4: 4.              5: 7.

COMMENTS: They have no where to run to! This is home. We need more PSA [Directly Employed labor] to accomplish wartime base recovery [AGREE].

Based on the personalities now on station. Tomorrow - who knows [AGREE]?

A big question mark. Although PSA says and states that they'll be here, I'd sure like the direct control I'd have with "blue suiters" [NEUTRAL].

They are civilians! Maybe they are supposed to, but really [MILDLY DISAGREE]?

I hope for your sake PSA does [not] catch wind of this survey [No response provided]!

Questions 29 through 33 were open-ended to solicit respondent candid opinions. (30 out of the 32 respondents provided comments on questions 29 through 33).

29. What is the biggest peacetime problem of this organization?

Manning (Mentioned by 9 respondents).

Lack of funds (Mentioned by 5 respondents).

Having two organizations trying to do one job.

We have 100 people - 2/3 of which are Fire Department. Yet we still receive taskings of any normal CE Squadron in the states.

Control of the PSA MTC (Measured Term Contract) contractor workforce to complete a job in a responsive time.

Amount of paper work required to get a job done, we have to write a letter to approve even the smallest changes.

Our primary problem is getting what the Wing Commander wants done through PSA and Measured Term Contracts. The PSA bureaucracy has more rules and constraints than the Air Force does. Working the two systems makes it difficult to get things done swiftly.

Many individuals assigned outside of their normal AFSC therefore not properly trained or possessing proper skills to perform their actual job. No countrywide standardization construction surveillance program, use of forms or documentation.

Too many additional duties. Lack of sound and supported base master plan.

The lack of higher ranking personnel carrying their share of responsibilities. The requirement of a full force CE squadron for an engineering branch.

Trying to rebuild a WW-II base with a handful of people.  
One deep positions (like customer service).

Lack of control over the PSA workforce. PSA is partially charged with "helping" us manage our money. If they don't agree with what we want done and have the money for, they can slow-roll us to death. We also have no idea of how all of our 57¢ funds are spent. The potential for kickbacks, fraud, and payoffs to terms contractors is unlimited.

The level of experiences of present manning and the amount of lower ranked enlisted assigned (to CE).

Unrealistic demands from commanders.

Control over PSA. Getting accurate status on work orders.

Same workload in many areas as a CE squadron many times larger (in the States), with a fraction of the people.

PSA.

UK bases are expected and graded on all the same peacetime requirements as a "blue suit" operation - not enough resources to go around.

Continuing wartime training exercises preventing or inhibiting proper accomplishment of assigned duties.

Although there's enough people to do the required work, there are too many additional duties equally as important as normal day to day work, and its tough to satisfy both requirements.

Lack of manpower to properly train augmentees and expedite command interest, time sensitive minor details related to the structural crafts.

Inability to get the response from PSA. They lack a sense of urgency unless the DWO (District Works Officer) directs an action to occur.

- 1) Too many chiefs, not enough indians.
- 2) Redundancy - doing job 2-3 times.
- 3) Old ways that people are afraid to change.

Though we have a very small O&M (Operations and Maintenance) branch, we're still called upon to do things that need a full CE force. This is especially true in the Heavy Equipment Shop. This work load also greatly impacts our ability to train our wartime mission and maintain our RRR (Rapid Runway Repair) fleet and WRM (War reserve Material) assets.

Bureaucracy to get something done. CE has no control over daily work or A-E (Architect-Engineer) for project design.

30. What is the biggest wartime problem of this organization?

Manning (Mentioned by 11 respondents).

Convincing HQ USAFE that we know what is needed in wartime, instead of being told what we need.

Making sure all augmentees are trained in their duties.

Dependence on RED HORSE talent for saw cutting and equipment operations (RED HORSE is 50 miles away and may never show up for a real war, if Speznaz is as good as predicted).

The excessive need for augmentees to perform [the] mission.

No time for training.

Dependence on augmentees and getting the augmentees from their organizations for training. Dual and triple taskings of some augmentees - mobility, RRR or mobility, DECON (area decontamination team) and DAT (Damage Assessment).

Training augmentees.

Money.

Lack of adequate training for augmentees and desire of augmentees is very low.

Lack of communications and standardization.

Dependence on RED HORSE.

Communications.

Lack of emphasis on training.

PSA.

No manning to do the RRR task and no way to recover in a timely manner.

Lack of RRR assets, materials, and equipment.

Lack of properly trained personnel.

Exercising a realistic scenario with in-place forces from the states. . . . similar to SAC Global Shield test for CONUS Sustaining Force.

Inadequate manning to effectively exercise. We require augmentees for many wartime activities.  
No readiness training.

Our having to depend on base augmentees. Base organizations often change augmentees. It's very hard to motivate the augmentees we get.

Augmentees just can't fill all the skills required.

31. Do you believe that the presence of a PSA workforce will benefit in a wartime environment?

Yes [Mentioned by 14 respondents].

Definitely! They are very familiar with the base and facilities. Also British systems (electrics, heat, plumbing). Things it would take GIs years to learn.

Tremendously. PSA workforce have the working knowledge and skills, especially on utilities work.

Without question - they know the base and the systems.

They will show up if the "balloon goes up".

But they should practice with us.

If they showed up!!!

If they are here it definitely will.

If they can be counted on to be here until reinforcements arrive.

Only with the knowledge of the base.

Provided they can get the support of local contractors to do the work.

It depends enormously on the wartime scenario.

Depends on the scenario. Semi-distant conventional war PSA will be available and very helpful. Chemical, biological, nuclear, or heavy/local conventional war - PSA will be unavailable, or very limited.

No [Mentioned by 6 respondents].

They can't even assist during peacetime.

Can't outfit them with CWEs [Chemical Warfare Ensemble] or force them to work without them [CWEs].

I believe they may stay for a short time but once the shooting starts, they will be the first to go.

If it does, it will be difficult to measure/quantify.

The technical knowledge of PSA is very important and will benefit from their knowledge of the base.

They are gradually exercising more and more along side of the military personnel during local . . . exercises.

In transition to war, we will depend heavily on PSA's knowledge of the base, primarily the utility systems. Their sources of supply and stores, as well as availability of contracted labor force, could be crucial to our survival over the long term.

Very limited benefit. When the bombs fly, they won't be any help. PSA has all the corporate knowledge of utility systems which would be hard to replace.

32. What is the one thing I would change to improve the way we do business in the UK?

Get rid of PSA [Mentioned by 5 respondents].

Dissolve PSA organization and fund positions which will fall directly under the control of the BCE.

Privatize PSA and put the base under a base support contract with a larger "blue suit" presence to monitor and evaluate the contract. We need a larger Engineering Section.

Hire MOD personnel and combine them into USAF system (or; USAF join PSA). We duplicate our effort too much, and waste too much time trying to find out what each other's been doing.

Increase manning [Mentioned by 4 respondents].

Change host nation agreement so that we military folks can perform some job/work orders. Right now all we can do is have our . . . people wire alarms and some self-help. The rest has to go to PSA.

If the area office would delegate more authority to the DWO.

With all the controversy over PSA, there are many bright spots. The local PSA . . . really tries hard to accommodate us within their rather rigid system. The Group and Regional levels aren't close enough to base problems to try to help. They tend to stick to the rules and tell you what you can't do.

The toughest link in a CE-PSA organization is between contract planning and PSA planning. Keeping these sections in sync is more than a full time job. We need a joint data base (computer) and to work in the same office to establish a close working relationship.

The relationship is critical. We must lose the them and us syndrome. The Brits are more than willing to meet us halfway on working these issues. PSA has an image problem with the Brits as well. The RAF is trying to get rid of them. And the Government is trying to reduce staff and cut wages. So its not an easy time being a PSA employee. Their salaries are actually going down.

More AF control over multi-million dollar projects to include: direct involvement on a weekly basis by AFRCE (Air Force Regional Civil Engineer at West Ruislip, UK); proper 553X0 (Engineering Assistant) personnel to surveil (sic) projects; and proper changes done through modifications to the contract rather than field changes. Also, halting of local diversion of funds from tonedown/revetment projects to extravagant rehabs of offices, etc. PSA needs to participate in wartime exercises to make our practice more realistic.

Reconstruct command. The UK presents problems/situations much different from that of the US or the rest of Europe. Lumping us with Germany adds to a lot of our problems.

Reduce the workload to a more manageable level or increase the manning.

Provide a better management tool over our resources.

Fully man and fund. It's too easy to withdraw 570 funds (for routine maintenance and repair work) because there's no workforce that would have nothing to do if we had no money.

Provide CE squadrons with state-of-the-art computer software.

The BCE to have overall control.

Improve the training and hiring programs for MOD (Ministry of Defense) and PSA in meeting USAF needs and regulations; develop similar program for incoming USAF personnel in understanding UK, PSA, MOD needs and requirements.

An enlargement of the CE workforce that would integrate with PSA in order to gain the knowledge necessary for wartime readiness. This would reduce our dependency on PSA to a great extent, if not totally.

If we could not get "blue suit", the next best option would be to allow us to absorb PSA (employ directly) and grant warrants (contracting type) to certain personnel so we could enter into contracts.

Implement WIMS now.

Use the proper AFSCs to do the mission.

PSA system needs to be streamlined to allow quicker response. Their contracts with their Measured Term Contractors allows too long of a delay in responding to routine type calls or work.

33. Please comment on anything this questionnaire may have missed or any other possible feedback.

PSA tries and wants to do a good job, but the two systems (ours and theirs) do not mesh smoothly. If we have only logical long range (ie. planning) requirements, PSA is great. It's the no-notice changes that upset the system. They cannot react to our changing requirements.

One of my biggest gripes is the lack of guidance from "on high". . . . [there could be] a contingent at MAJCOM who would deal solely with UK affairs. Along with that would be a Turkish specialist, an Italian expert, etc. Each area has unique problems and assets. Everyone at MAJCOM [HQ USAFE] insists on forcing all units into the Central Germany mold, and it just doesn't work.

Send more people.

Design and construct contracts are bad news. USAF does not get its money's worth on construction due to lack of direct control, and PSA's inability/unwillingness to assess financial penalties.

- 1) PSA is a big frustration, their attitude is that they are more than equal.
- 2) I don't believe there is enough push/pressure from MAJCOM, in this case 3AF.
- 3) MAJCOM at HQ USAFE will never and can never appreciate our manpower problems unless they themselves are stationed here.
- 4) In a few cases I think it also depends on how tough, decisive a BCE is.

You must live and work in the UK to appreciate the cultural and other differences in our working relationships. No one can predict what will happen in an actual conflict but we are in the hands of someone else. I am personally not comfortable with this nor are my counterparts at other UK bases.

With the manning level so low, I did not plan to answer this survey until I've noticed it might help the situation.

Improve the allocation of manpower and funding throughout the UK, based on base size, condition of facilities, backlog of maintenance and repair, number of unfunded but design-complete projects, etc.

Develop a standard, up-front annual budget . . . based on the [base size, condition of facilities, backlog of maintenance and repair, number of unfunded design-complete projects] so bases can spend their time managing resources and maintaining facilities, rather than playing games trying to get funds. MOD personnel should be better compensated for (higher pay) for high-pressure USAF jobs.

[A conversion of the DEE position to a UK civilian position] seems to work out very well although some problems do occur because of security clearances. . . . The "plus" side of having a UK civilian in charge is that familiarization of host nation procedures, regulations, contract and legal requirements are known. Also, during training exercises, the office is still operational.

The combined Civil Engineering team is a mixed blessing. Sense of urgency is sometimes lost in the interest of engineering efficiency/cost savings.

Civil Engineering in the UK is an excellent learning experience, but the PSA organization although it is part of CE, is an unknown quantity at times. It is very difficult to track the status of projects, work requests, and funds.

Exercises on runway damage are never realistic. Usually only 1-3 craters on one end of runway, so [we] never have to do MOS [Minimum Operating Strip] selection.

UK doesn't allow for proper training of our first term airmen. Specifically the heavy equipment operators and 555X0s [Production Control]. They really don't get a fair chance.

Although it would be great to change, the laws in this country would need to be changed. That would realistically never happen.

Questions which refer to wartime capabilities [14, 18, 22, and 28] are highly inappropriate for an unclassified document. Therefore, I have left them blank.

Question 24 and 25 cannot be determined as asked. Level of quality is only as good as what is asked for, and how well the work is surveilled (sic), or inspected. In other words, the quality is not for PSA or civil service in the US to determine; it is for the customer to determine what he will accept.

## Bibliography

1. Ahearn, MGen Joseph A., Deputy Director, Engineering & Services. HQ USAF Washington DC. Personal interview. March 18, 1988.
2. Anderson, Capt Barry J. Army Air Force Stations: A Guide to the Stations Where U.S. Army Air Forces Personnel Served in the United Kingdom During World War II. Report for the Research Division. USAF Historical Research Center, Maxwell AFB AL, January 31, 1985.
3. Ashdown, Lt Col Floyd A. A History of the Warfighting Capability of Air Force Civil Engineering. Air War College Research Report, Air War College (AU), Maxwell AFB AL, May 1984 (AU-AWC-84-#11).
4. Bauer, Lt Col E. The History of World War II. Jaspard Polus Monaco: Orbis Publishing, Ltd, 1979.
5. Borg, Walter R. and Merideth D. Gall. Educational Research: An Introduction (Second Edition). New York: David McKay Company, Inc, 1976.
6. Bowman, William R. Limiting Conventional Forces in Europe: An Alternate to the Mutual and Balanced Force Reduction Negotiation. Washington DC: National Defense University Press, 1985.
7. Cannan, Lt Col David M. Air Force Civil Engineering Wartime Training. US Army War College Report. Carlisle Barracks PA, March 25, 1988 (AD-A194093).
8. Carter, John D., and others. The Army Air Forces in World War II, Volume Seven. Edited by and forward by Wesley F. Craven and James L. Crate. Chicago IL: University of Chicago Press, 1958.
9. Carter, Kit C. and Robert Muller, compilers. The Army Air Forces in World War II: Combat Chronology, 1941-1945. Washington DC: US Government Printing Office, 1973.
10. Centralized COB Management: Concept of Operations. 7100 Combat Support Wing, Director of Operations. 19 Jul 87.

11. Churchill, Randolph S., ed. Stemming the Tide: Speeches 1951 and 1952 by Winston Churchill. Cambridge England: The Riverside Press, 1954.
12. Cocheo, Col Dennis, Base Civil Engineer, Vandenberg AFB CA. Telephone interview. March 28, 1988.
13. Coffey, Thomas M. HAP: The Story of the U.S. Air Force and the Man Who Built It, General Henry H. "Hap" Arnold. New York: Viking Press, 1982.
14. Crabb, Cecil V. Jr. The Doctrines of American Foreign Policy. Baton Rouge LA: Louisiana State University Press, 1982.
15. Craven, Wesley Frank and James Lea Cate, ed. The Army Air Forces in World War II, Volume One: Plans and Early Operations January 1939 to August 1942. Chicago IL: University of Chicago Press, 1958.
16. -----. The Army Air Forces in World War II, Volume Two. Europe: Torch to Pointblank, August 1942 to December 1943. Chicago IL: University of Chicago Press, 1949.
17. Department of the Air Force. Construction Management. AFMS 4422. Washington DC: HQ USAF, 30 October 1978.
18. -----. Environmental and Contract Planning. AFMS 4423. Washington DC: HQ USAF, 20 July 1984.
19. -----. Equipment Operations. AFMS 4441. Washington DC: HQ USAF, 11 January 1980.
20. -----. Material Control. AFMS 4483. Washington DC: HQ USAF, 4 January 1979.
21. -----. Operations. AFMS 4430. Washington DC: HQ USAF, 22 June 1979.
22. -----. Production Control. AFMS 4436. Washington DC: HQ USAF, 2 December 1980.
23. -----. Contingency Response Planning. AFR 93-2. Washington DC: HQ USAF, 14 November 1985.
24. -----. Air Force Civil Engineering Prime Base Engineer Emergency Force (BEEF) Program. AFR 93-3. Washington DC: HQ USAF, 20 November 1987.

25. ----- Maintenance of Real Property Facilities in the United Kingdom. USAFER 85-3. Ramstein AB GE: HQ USAFE, 14 March 1980.
26. Directorate of Plans and U.K. Financial Arrangements, ACS/Comptroller, HQ 3AF, London England. A Matter of Decision: A Philosophical-Historical Summary of USAF Financial Arrangements with the British Government as They Affected Decisions in the Growth and Development of Third Air Force through 30 June 1955. Report to Comptroller of the Air Force. Washington: HQ USAF (undated).
27. Donovan, Major John S. and Capt Michael J. Farone. An Analysis of Workload Factor Criteria Used In Determining Air Force Civil Engineering Manning Requirements. MS thesis, AFIT/LSR/39-76A. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, June 1976 (AD-A030216).
28. Durant, Will and Ariel Durant. The Lessons of History. New York: Simon and Schuster, 1968.
29. 819th CESHR RAF Wethersfield UK. "RRR ORI Criteria for the UK." Electronic message. 1111500Z 11 Oct 83.
30. A Five-Year Summary of USAFE History 1945-1950. Historical Division, HQ USAFE, Weisbaden GE, May 1, 1956.
31. Ford, Col Walter J. End of Tour Report. Commander, 513th Tactical Airlift Wing, RAF Mildenhall UK 6 June 1977 - 15 June 1979. 16 December 1987.
32. 48th Combat Support Group Base Civil Engineering (BCE) Contingency Response Plan. RAF Lakenheath England, 15 Feb 87.
33. Futrell, Robert Franklin. Ideas, Concepts, Doctrine: A History of Basic Thinking In the United States Air Force 1907-1964. Maxwell AFB AL: Historical Research Division, Aerospace Studies Institute (AU), 1971.
34. "General Ellis at AFIT: Highlights of His Presentation Before New CEs at AFIT," Engineering and Services Quarterly, 27:3-8 (Spring 86).

35. Harty, BGen John R., HQ USAFE Deputy Chief of Staff, Engineering and Services, Ramstein AB GE. Personal interview. School of Engineering and Services, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 13 April 1988.
36. Hildreth, Dr. Charles H., Command Historian, 3AF, RAF Mildenhall UK. Short History and Chronology of the USAF in the United Kingdom. Report prepared for the Historical Division, Third Air Force, HQ 3AF, RAF Mildenhall, UK, May 1967.
37. Historical Data, Headquarters Third Air Force: Volume I, May - December 1951. London England: Headquarters Third Air Force Office of Command Historian, April 9, 1952.
38. Historical Data, Headquarters Third Air Force: Volume I, January - June 1952. London England: Headquarters Third Air Force Office of Command Historian.
39. Historical Data, Headquarters Third Air Force: Volume I, July - December 1966. London England: Headquarters Third Air Force Office of Command Historian, May 1967.
40. Historical Data, Headquarters Third Air Force: Volume I, Fiscal Year 1973. RAF Mildenhall UK: Headquarters Third Air Force Office of Command Historian, February 11, 1974.
41. History of Engineer Section: Eighth Air Force and VIII Air Force Service Command 25 April 1942 to 31 December 1942. USAF Historical Research Center, Maxwell AFB AL.
42. History of Engineer Section: Eighth Air Force and VIII Air Force Service Command 1 January 1943 to 31 December 1943. USAF Historical Research Center, Maxwell AFB AL.
43. Kimsey, Col James W., Acting DCS/Civil Engineering, HQ 3AF. "Preventative Maintenance." Official correspondence, June 29, 1962.

44. Kohlhaas, Capt Colder D. and Capt Richard L. Williams. Investigation of the Adequacy of the Training Program for Civil Engineering Prime BEEF Contingency Force Teams. MS thesis, AFIT/GEM/LSSR/65-80. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1983 (AD-A134950).
45. Jackson, Andrew R., GS-12, Industrial Engineer and Manpower Consultant, HQ AFESC/DEMG, Tyndall AFB FL. Personal interview. School of Engineering and Services, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 8 March 88.
46. Larson, Col Gerald D. End of Tour Report Commander 81st Tactical Fighter Wing RAF Bentwaters/RAF Woodbridge 11 February 1976 - 5 May 1977. 5 May 1977.
47. -----. End of Tour Report Commander 20th Tactical Fighter Wing RAF Upper Heyford UK 6 May 1977 - 31 March 1978. 21 June 1978.
48. Lary, Col Buford D. End of Tour Report Commander 10th Tactical Reconnaissance Wing RAF Alconbury UK 17 March 1977 to 26 March 1979. 17 April 1979.
49. Management Effectiveness Inspection Report, RAF Alconbury. Ramstein AB GE: HQ USAFE, 29 January - 2 February 1968.
50. Marlin, Capt Ronald D. An Historical Development of the Structure of Air Force Civil Engineering Prime Base Emergency Forces (BEEF) From 1964 to 1978. MS thesis, AFIT/GEM/LSR/87S-17. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1987 (AD-A187914).
51. Matloft, Maurice, ed. American Military History. Washington DC: Office of the Chief of Military History, US Army, 1973.
52. Memorandum for Record: HQ USAFE Civil Engineering and Services Management Evaluation Team (CESMET) Visit to the 48th Tactical Fighter Wing, RAF Lakenheath UK 7-10 July 1980. 12 Sep 80.
53. Messerli, BGen Robert E. End of Tour Report Commander 48th Tactical Fighter Wing RAF Lakenheath UK 17 June 1975 - 26 March 1979. 26 March 1979.

54. Millett, Allan R. and Peter Maslowski. For Common Defense: A Military History of the United States of America. New York: The Freedom Press, 1984.
55. Millett, John D. United States Army in World War II: Army Services Forces: The Organization and Role of the Army Services Forces. Volume 10 Part 1. Washington DC: Office of the Chief of Military History, Department of the Army, 1954.
56. Nathan, James A. and James K. Oliver. United States Foreign Policy and World Order (Second edition). Boston MA: Little Brown Co., 1981.
57. North Atlantic Treaty Organization Information Service. NATO Facts and Figures. Brussels: NATO Information Service, 1969.
58. Parton, James. "Air Force Spoken Here:" General Ira Eaker and the Command of the Air. Bethesda MD: Adler & Adler, 1986.
59. Paulk, Col John R. End of Tour Report Commander 48th Tactical Fighter Wing RAF Lakenheath UK 20 Sep 71 to 18 Apr 74. 15 March 1975.
60. Peppers, Jerome G., Jr. History of United States Military Logistics: 1935-1985. 1986.
61. Pittman, Col Don D. End of Tour Report Commander, 48th Tactical Fighter Wing RAF Lakenheath UK 29 March 71 to 21 May 1973. 21 May 73.
62. Puryear, MGen R. W., 3AF Commander. "Reduction in BCE Personnel in the United Kingdom." Official correspondence. 21 Jan 1963.
63. Quarterly Status Report on Engineer Aviation Units Deployed in the United Kingdom - Period Ending 28 February 1951.
64. Rawlings, Col Gene D. End of Tour Report Commander 513th Tactical Airlift Wing RAF Mildenhall UK 15 June 1979 - 26 June 1981. 10 November 1981.
65. Reminder on Decisions taken during London visit, 25 to 28 June. Memorandum for General Spaatz. Clayton Bissell, Major General, GSC, Military Attache, American Embassy, London England, 28 June 1946.

66. Reminder on Decisions taken during London visit July 4-6, 1946. Memorandum for General Spaatz. Clayton Bissell, Major General, GSC, Military Attache, American Embassy, London England, 6 July 1946.
67. Riddle, BGen Kyle L., Deputy Commander, 17AF. "Ltr, Third AF (3 CMDR), 21 Jan 63, Reduction in BCE Personnel in the United Kingdom." Official correspondence. HQ 17AF Weisbaden AB GE, 24 January 1963.
68. 17AF Ramstein AB GE. "Reduction BCE In-House Forces in the UK." Electronic message. 261650Z, 26 April 63.
69. A Short History of the United States Air Forces In Europe 1945-1954. Report prepared by the Historical Division, Office of Information, HQ USAFE, Ramstein AB GE, 20 March 1954.
70. Sloan, Stanley R. NATO's Future: To A New Transatlantic Bargain. Washington DC: National Defense University Press, 1985.
71. Standard Operating Procedure, Engineer Section, Eighth Air Force. September 22, 1945.
72. Status Report of Engineering Aviation Units Deployed in the United Kingdom: September - November 1950.
73. Stowell, Col Dibrell C. End of Tour Report Commander 819th Civil Engineering Squadron/Heavy Repair (RED HORSE) July 1979 - June 1982.
74. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 January - 30 June 1962.
75. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 July - 31 December 1962.
76. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 January - 30 June 1963.
77. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 July - 31 December 1963.
78. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 January - 30 June 1965.
79. Unit History, 10th Civil Engineering Squadron, RAF Alconbury UK, 1 July - 31 December 1965.

80. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 30 June 1966.
81. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 July - 31 December 1966.
82. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 30 June 1967.
83. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 July - 31 December 1967.
84. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 30 June 1968.
85. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 July - 31 December 1968.
86. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 30 June 1969.
87. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 July - 30 September 1969.
88. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 October - 31 December 1969.
89. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 31 March 1970.
90. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 October - 3 December 1970.
91. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 31 Mar 1971.
92. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 April - 30 June 1971.
93. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 July - 30 September 1971.
94. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 October - 31 December 1971.
95. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 31 March 1972.
96. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 April - 30 June 1972.

97. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 January - 31 March 1973.
98. Unit History, 10th Civil Engineering Squadron,  
RAF Alconbury UK, 1 April - 30 June 1975.
99. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1958.
100. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1962.
101. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1962.
102. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1963.
103. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1963.
104. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1964.
105. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1964.
106. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1965.
107. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1965.
108. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1966.
109. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1966.
110. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1967.
111. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1967.
112. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1968.
113. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 31 December 1968.

114. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 30 June 1969.
115. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1969.
116. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1969.
117. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1970.
118. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1970.
119. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1970.
120. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1970.
121. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1971.
122. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1971.
123. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1971.
124. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1971.
125. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1972.
126. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1972.
127. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1972.
128. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1972.
129. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1973.
130. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1973.

131. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1973.
132. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1973.
133. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1974.
134. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1975.
135. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1976.
136. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1976.
137. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1976.
138. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1976.
139. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1977.
140. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1977.
141. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1977.
142. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1977.
143. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1978.
144. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1978.
145. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1978.
146. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1978.
147. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 April - 30 June 1979.

148. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 July - 30 September 1979.
149. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 October - 31 December 1979.
150. Unit History, 81st Civil Engineering Squadron,  
RAF Bentwaters UK, 1 January - 31 March 1980.
151. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1960.
152. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1960.
153. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1961.
154. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1961.
155. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1962.
156. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1962.
157. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1963.
158. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1963.
159. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1964.
160. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1964.
161. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1965.
162. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1965.
163. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 30 June 1966.
164. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 31 December 1966.

165. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 January - 30 June 1967.
166. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 July - 31 December 1967.
167. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 January - 30 June 1968.
168. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 July - 31 December 1968.
169. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 January - 30 June 1969.
170. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 July - 30 September 1969.
171. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 October - 31 December 1969.
172. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 January - 31 March 1970.
173. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 April - 30 June 1970.
174. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 July - 30 September 1970.
175. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 October - 31 December 1970.
176. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 April - 30 June 1971.
177. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 October - 31 December 1971.
178. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 January - 31 March 1972.
179. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 April - 30 June 1972.
180. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 July - 30 September 1972.
181. Unit History, 48th Civil Engineering Squadron, RAF Lakenheath UK, 1 October - 31 December 1972.

182. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1973.
183. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1973.
184. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1973.
185. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1974.
186. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1974.
187. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1974.
188. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1974.
189. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1975.
190. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1975.
191. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1975.
192. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1975.
193. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1976.
194. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1976.
195. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1976.
196. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1977.
197. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1977.
198. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1977.

199. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1977.
200. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1978.
201. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1978.
202. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1978.
203. Unit History, 48th Civil Engineering Squadron  
RAF Lakenheath UK, 1 October - 31 December 1978.
204. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1979.
205. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1979.
206. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 January - 31 March 1980.
207. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1980.
208. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 July - 30 September 1980.
209. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 April - 30 June 1981.
210. Unit History, 48th Civil Engineering Squadron,  
RAF Lakenheath UK, 1 October - 31 December 1983.
211. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 31 December 1966.
212. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 30 June 1967.
213. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 31 December 1967.
214. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 30 June 1968.
215. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 30 June 1969.

- 216. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 30 September 1969.
- 217. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 October - 31 December 1969.
- 218. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 31 March 1970.
- 219. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 April - 30 June 1970.
- 220. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 30 September 1970.
- 221. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 October - 31 December 1970.
- 222. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 31 March 1971.
- 223. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 April - 30 June 1971.
- 224. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 30 September 1971.
- 225. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 October - 31 December 1971.
- 226. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 31 March 1972.
- 227. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 April - 30 June 1972.
- 228. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 30 September 1972.
- 229. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 October - 31 December 1972.
- 230. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 31 March 1973.
- 231. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 April - 30 June 1973.
- 232. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 July - 30 September 1973.

- 233. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 October - 31 December 1973.
- 234. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 January - 31 March 1974.
- 235. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 April - 30 June 1974.
- 236. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 July - 30 September 1974.
- 237. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 October - 31 December 1974.
- 238. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 January - 31 March 1975.
- 239. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 July - 30 September 1975.
- 240. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 October - 31 December 1975.
- 241. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 January - 31 March 1976.
- 242. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 April - 30 June 1976.
- 243. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 July - 30 September 1976.
- 244. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 October - 31 December 1976.
- 245. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 January - 31 March 1977.
- 246. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 April - 30 June 1977.
- 247. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 July - 30 September 1977.
- 248. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 October - 31 December 1977.
- 249. Unit History, 513th Civil Engineering Squadron, RAF Mildenhall UK, 1 January - 31 March 1978.

- 250. Unit History, 513th Civil Engineering Squadron,  
RAF Mildenhall UK, 1 January - 31 March 1979.
- 251. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1970.
- 252. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1970.
- 253. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1970.
- 254. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1970.
- 255. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1971.
- 256. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1971.
- 257. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1971.
- 258. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1971.
- 259. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1972.
- 260. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1972.
- 261. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1972.
- 262. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1972.
- 263. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1973.
- 264. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1973.
- 265. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1973.
- 266. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1973.

- 267. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1974.
- 268. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1974.
- 269. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1974.
- 270. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1974.
- 271. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1975.
- 272. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1975.
- 273. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1975.
- 274. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1975.
- 275. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1976.
- 276. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1976.
- 277. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1976.
- 278. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1976.
- 279. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1977.
- 280. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1977.
- 281. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1977.
- 282. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1977.
- 283. Unit History, 20th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1978.

- 284. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1978.
- 285. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1978.
- 286. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1978.
- 287. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1979.
- 288. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 April - 30 June 1979.
- 289. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 July - 30 September 1979.
- 290. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 October - 31 December 1979.
- 291. Unit History, 28th Civil Engineering Squadron,  
RAF Upper Heyford UK, 1 January - 31 March 1980.
- 292. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield, 1 January - 30 June 1963.
- 293. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1963.
- 294. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1964.
- 295. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1964.
- 296. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1965.
- 297. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1965.
- 298. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1966.
- 299. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1967.
- 300. Unit History, 28th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1967.

- 301. Unit History, 20th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1968.
- 302. Unit History, 20th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1968.
- 303. Unit History, 20th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 January - 30 June 1969.
- 304. Unit History, 20th Civil Engineering Squadron,  
RAF Wethersfield UK, 1 July - 31 December 1969.
- 305. Unit History, 819th Civil Engineering Squadron  
(Heavy Repair), RAF Wethersfield UK,  
1 January - 30 June 1984.
- 306. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1960.
- 307. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1961.
- 308. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1961.
- 309. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1962.
- 310. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1962.
- 311. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1963.
- 312. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1963.
- 313. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1964.
- 314. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1965.
- 315. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1965.
- 316. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 January - 30 June 1966.
- 317. Unit History, HQ 3AF Deputy Chief of Staff/Civil  
Engineering, 1 July - 31 December 1966.

318. Unit History, HQ 3AF Deputy Chief of Staff/Civil Engineering, 1 January - 30 June 1967.
319. Unit History, HQ 3AF Deputy Chief of Staff/Civil Engineering, 1 July 1968 - 30 June 1969.
320. Unit History, HQ 3AF Deputy Chief of Staff/Installations, 1 July - 31 December 1959.
321. Unit History, HQ Third Air Force Director of Manpower, Organization, and Plans, 1 April - 31 December 1951.
322. Units History, HQ Third Air Force Office of Materiel, 1 April - 30 June 1951.
323. Units History, HQ Third Air Force Office of Materiel, 1 July - 30 September 1951.
324. Units History, HQ Third Air Force Office of Materiel, 1 October - 31 December 1951.
325. USAFE Functional Review Study Final Report: Construction Surveillance, FAC 442201. RAF Alconbury UK: Det 8, 7200 MES, 1 October 1986.
326. USAFE Functional Review Study Final Report: Engineering Contract Management, FAC 442001. RAF Alconbury UK: Det 8, 7200, MES, 1 May 1986.
327. USAFE Functional Review Study Final Report: Equipment Operations, FAC 444100. RAF Alconbury UK: Det 8, 7200 MES, 1 May 1986.
328. USAFE Functional Review Study Final Report: Material Control, FAC 444100. RAF Alconbury UK: Det 8, 7200 MES, 1 May 1986.
329. USAFE Functional Review Study Final Report: Operations, FAC 443000. RAF Alconbury UK: Det 8, 7200 MES, 1 May 1986.
330. USAFE Functional Review Study Final Report: Production Coordination, FAC 443802. RAF Alconbury UK: Det 8, 7200 MES, 1 May 1986.
331. Utilization of Engineer Aviation Troops in the Third Air Division, Ground Defense Plan. Plan prepared by the 928th Aviation Engineer Group.
332. Vandenberg, General Hoyt S., Chief of Staff, USAF. Personal correspondence to Commanding General, USAFE. Washington DC: HQ USAF 17 November 1947.

333. VHB Air Base Construction in the United Kingdom. Memorandum for General Spaatz. F. F. Everest, BGen, USA, Actg. AC/AS-5, Washington, undated.
334. Waggoner, Capt L. Dean and 1Lt M. Allen Moe. A History of Air Force Civil Engineering Wartime and Contingency Problems From 1941 to the Present. MS thesis, AFIT/GEM/LS/85S-23. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1985 (AD-A161142).
335. Wilinski, Lt Col Gregory T., Deputy Requirements & Orgn Div, Dir Manpower & organization. "Standard Organization - Base Civil Engineering." Official correspondence. 10 Apr 87.
336. Williams, Paul. The Senate and the U.S. Troops In Europe. New York: St. Martin's Press, 1985.
337. Woolnough, Lt Col John H. The 8th Air Force Yearbook. San Angelo TX: Newsfoto Yearbooks, 1981.
338. Zody, Col Dennis G., Deputy, HQ AFLC/DE, Wright-Patterson AFB OH. Personal interview. March 29, 1988.

## VITA

Captain Manfred W. Puscher [REDACTED]

[REDACTED] In 1974 he enlisted in the US Air Force and after 6 years as an electronic warfare systems specialist and computer programmer, he was selected for the Airmen Education and Commissioning Program. Captain Puscher graduated from Texas Tech University of Lubbock with a Bachelor of Science Degree in Industrial Engineering and was commissioned after attending Officer Training School in 1982. His first assignment as an officer was the 379th Civil Engineering Squadron at Wurtsmith Air Force Base, Michigan. In 1984, he was assigned to the 48th Civil Engineering Squadron at RAF Lakenheath in the United Kingdom serving as the Chief of Collocated Operating Bases (COBs), Plans, & Readiness. In 1987, Captain Puscher was selected to attend the Air Force Institute of Technology's School of Systems and Logistics, enrolled in the Graduate Engineering Management Program.

[REDACTED]

[REDACTED]

| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                       |       |                                                      |                                                                                   | Form Approved<br>OMB No. 0704-0188                      |                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------------|
| 1a. REPORT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                       |       |                                                      | 1b. RESTRICTIVE MARKINGS                                                          |                                                         |                                |
| 2a. SECURITY CLASSIFICATION AUTHORITY                                                                                                                                                                                                                                                                           |       |                                                      | 3. DISTRIBUTION / AVAILABILITY OF REPORT                                          |                                                         |                                |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE                                                                                                                                                                                                                                                                     |       |                                                      | Approved for public release;<br>distribution unlimited                            |                                                         |                                |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br><br>AFIT/GEM/LSR/88S-14                                                                                                                                                                                                                                          |       |                                                      | 5. MONITORING ORGANIZATION REPORT NUMBER(S)                                       |                                                         |                                |
| 6a. NAME OF PERFORMING ORGANIZATION<br><br>School of Systems & Logistics                                                                                                                                                                                                                                        |       | 6b. OFFICE SYMBOL<br>(If applicable)<br><br>AFIT/LSM |                                                                                   | 7a. NAME OF MONITORING ORGANIZATION                     |                                |
| 6c. ADDRESS (City, State, and ZIP Code)<br><br>Air Force Institute of Technology<br>Wright-Patterson AFB OH 45433-6583                                                                                                                                                                                          |       |                                                      | 7b. ADDRESS (City, State, and ZIP Code)                                           |                                                         |                                |
| 8a. NAME OF FUNDING / SPONSORING ORGANIZATION                                                                                                                                                                                                                                                                   |       | 8b. OFFICE SYMBOL<br>(If applicable)                 |                                                                                   | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER         |                                |
| 8c. ADDRESS (City, State, and ZIP Code)                                                                                                                                                                                                                                                                         |       |                                                      | 10. SOURCE OF FUNDING NUMBERS                                                     |                                                         |                                |
|                                                                                                                                                                                                                                                                                                                 |       |                                                      | PROGRAM<br>ELEMENT NO.                                                            | PROJECT<br>NO.                                          | TASK<br>NO.                    |
|                                                                                                                                                                                                                                                                                                                 |       |                                                      | WORK UNIT<br>ACCESSION NO.                                                        |                                                         |                                |
| 11. TITLE (Include Security Classification)<br><br>See Block 19                                                                                                                                                                                                                                                 |       |                                                      |                                                                                   |                                                         |                                |
| 12. PERSONAL AUTHOR(S)<br>Manfred W. Puscher, B.S., Capt, USAF                                                                                                                                                                                                                                                  |       |                                                      |                                                                                   |                                                         |                                |
| 13a. TYPE OF REPORT<br><br>MS Thesis                                                                                                                                                                                                                                                                            |       | 13b. TIME COVERED<br>FROM _____ TO _____             |                                                                                   | 14. DATE OF REPORT (Year, Month, Day)<br>1988 September |                                |
| 15. PAGE COUNT<br>290                                                                                                                                                                                                                                                                                           |       |                                                      |                                                                                   |                                                         |                                |
| 16. SUPPLEMENTARY NOTATION                                                                                                                                                                                                                                                                                      |       |                                                      |                                                                                   |                                                         |                                |
| 17. COSATI CODES                                                                                                                                                                                                                                                                                                |       |                                                      | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) |                                                         |                                |
| FIELD                                                                                                                                                                                                                                                                                                           | GROUP | SUB-GROUP                                            | Civil Engineering<br>Great Britain                                                |                                                         |                                |
| 15                                                                                                                                                                                                                                                                                                              | 06    |                                                      |                                                                                   |                                                         |                                |
|                                                                                                                                                                                                                                                                                                                 |       |                                                      |                                                                                   |                                                         |                                |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)                                                                                                                                                                                                                                    |       |                                                      |                                                                                   |                                                         |                                |
| <p style="text-align: center;">TITLE: AN HISTORICAL ANALYSIS OF MANPOWER LEVELS ON UNITED STATES AIR FORCE<br/>CIVIL ENGINEERING WARFIGHTING CAPABILITY IN THE UNITED KINGDOM</p> <p style="text-align: center;">Thesis Chairman: Freda F. Stohrer, PhD.<br/>Associate Professor of Technical Communication</p> |       |                                                      |                                                                                   |                                                         |                                |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT<br><input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS                                                                                                                                        |       |                                                      | 21. ABSTRACT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                       |                                                         |                                |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br>Freda F. Stohrer, PhD.                                                                                                                                                                                                                                                   |       |                                                      | 22b. TELEPHONE (Include Area Code)                                                |                                                         | 22c. OFFICE SYMBOL<br>AFIT/LSR |

UNCLASSIFIED

This analysis of Air Force Civil Engineering (AFCE) in the United Kingdom (UK) covers the development of AFCE during three periods: 1942 to 1946; 1948 to 1962; and 1962 to the present. Interwoven with the study of AFCE organizational changes are political trends and commanders' comments on AFCE operations in the UK. A questionnaire for AFCE officers assigned to 3AF bases in 1988 was used to validate the findings derived from this research.

This research indicates that the primary objective of the AFCE organizational changes in the UK was to reduce costs. The consequent reductions in AFCE manning means that UK civilians are responsible for maintaining essential facilities and services to sustain air operations during peacetime and wartime or emergency situations. The limited AFCE manning levels, therefore, place USAF contingency operations at risk in the UK.

Four actions may reduce this risk: (1) integrate UK civilian and USAF military civil engineering (CE) managers; 2) increase UK civilian participation and training in AFCE wartime operations; (3) assign additional military AFCE craftsmen to the UK; and (4) integrate UK civilian and USAF military CE workcenters. (thru). (FR)

Approved for public release IAW AFR 190-1.

WILLIAM A. MAUER *W. A. Mauer* 17 Oct 88  
Associate Dean  
School of Systems and Logistics  
Air Force Institute of Technology (AU)  
Wright-Patterson AFB OH 45433

UNCLASSIFIED