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CONTINGENCY AND DISASTER PLANNING

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This pamphlet supports AFI 10-210, Prime Base Engineer Emergency Force Program and AFI 10-211, Civil Engineer Contingency Response Planning. It discusses contingencies for which civil engineers must be prepared. It contains practical information to help unit-level civil engineers plan their responses to contingencies, disasters, war, and other military operations. It explains how to identify requirements and get resources; to organize civil engineer response teams; and to train and exercise those teams. It concludes by presenting a brief history of Air Force Civil Engineers. It applies to all Civil Engineers, including Air National Guard (ANG) units and Air Force Reserve Command (AFRC). Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF IMT 847, Recommendation for Change of Publication; route AF IMT 847s from the field through Major Command (MAJCOM) publications/forms managers. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 37-123 (will convert to 33-363), Management of Records, and disposed of in accordance with the Air Force Records Disposition Schedule located at **https://afrims.amc.af.mil/**. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This pamphlet has been updated and changed to add significant historic accomplishments of United States Air Force (USAF) civil engineer (CE) personnel during the 1990s through 2007; specifically in regards to Operations ALLIED FORCE, ENDURING FREEDOM and IRAQI FREEDOM. Significant changes were incorporated regarding planning for deployments supporting other than USAF units, terrorist threats and chemical, biological, radiological, nuclear, and high yield explosives (CBRNE) events. The update also incorporates Air Force Incident Management System (AFIMS) guidance for planners as related to Homeland Security Presidential Directive (HSPD-5) mandating the use of the National Response Plan and National Incident Management System as planning source documents.

Chapter 1

DISASTERS AND CONTINGENCIES

1.1. Introduction. Contingencies and crises arrive with many names – natural disasters, accidents, terrorist actions, war, and military operations other than war. In colloquial English, a contingency is something that can happen, but that generally is not anticipated, while a disaster is generally defined by the outcome of a specific contingency. Hurricanes, tornados, earthquakes and successful terrorist attack are generally disastrous when they impact our installations or local community. Disasters are not measured by the chain of results, only the final impact. Who/What was hurt, damaged, destroyed or lost and how long will it take to restore full mission capabilities? Only rarely, can humans prevent them or control their intensity. However, we can minimize their effects and should always be ready to respond through the development of various contingency plans. A contingency plan is a set of procedures prepared in advance to respond to specific or multiple contingencies the base and unit may face. Many plans fail due to restrictive thinking—"that's never happened"—and for failure to think outside the box. A good plan is tailored to the base or unit specific situation and looks at contingencies and second to third order effects. Likewise, a good plan does not look so far outside the box that it includes things that will not happen or is too unwieldy. For instance, if assigned to Ellsworth AFB, South Dakota, a plan is not required for hurricanes or tidal waves, but would include winter storms that bases in tropical areas would not consider. By anticipating problems and planning for them, the base and unit can rapidly mobilize the technical, financial, administrative, and engineering resources needed to minimize detrimental impact to the base. For CE units to respond effectively to emergencies, contingencies and disasters, procedures and plans must be in place when the incident occurs. Effective post-disaster or post-attack response begins with planning and base preparations well before a crisis threatens. The chaotic environment following a disaster or an attack is not the time or place to begin thinking about how to respond. This pamphlet will help you plan for contingencies and disasters and lay out ways to minimize their impact on the mission and the personnel at your installation.

1.2. Overview. This chapter outlines what civil engineer units must do to prepare for a contingency. It begins with an overview of potential disasters—natural, man-made and hostile actions—that civil engineers may encounter and the potential effects that accompany such events. The remainder of the chapter outlines AF responses to disasters and outlines the differences of an on-base response versus a response in support of the local community or external government agency. Ultimately, our focus is to "hammer home" the importance of predisaster planning and the direct effect it has on successful contingency responses.

1.3. Natural Disaster. Natural disasters are defined as any emergency that occurs due to an act of nature. Natural disasters include hurricanes (cyclones and typhoons), tornadoes, blizzards, floods, earthquakes, volcanic eruptions, tidal waves (tsunamis), wildfires and severe drought. **Table 1.1.** lists damage that can be expected for the different strengths of natural disasters. The following paragraphs describe the causes and effects of some of these natural disasters and give civil engineer personnel some examples and potential effects they may have on personnel, resources and the base.

Table 1.1. Natural Disaster Strength and Damage Expectations Matrix.

HURRICANES – The Safir-Simpson Scale		
Category	Category Description	Level of Damage
1	Wind Speed: 74-95 MPH Storm Surge: 4-5 feet above normal	Primary damage to unanchored mobile homes, shrubbery, and trees. Some coastal road flooding and minor pier damage. Little damage to building structures.
2	Wind Speed: 96-110 MPH Storm Surge: 6-8 feet above normal	Considerable damage to mobile homes, piers, and vegetation. Coastal and low-lying escape routes flood 2-4 hours before landfall of hurricane center. Buildings may sustain roofing material, door and window damage. Damage to small craft in unprotected moorings.
3	Wind Speed: 111-130 mph Storm Surge: 9-12 feet above normal	Mobile homes destroyed. Some structural damage to small homes and utility buildings. Flooding near coast destroys smaller structures; larger structures damage by flooding debris. Terrain continuously lower than 5 ASL may be flooded up to 6 miles inland.
4	Wind Speed: 131-155 mph Storm Surge: 13-18 feet above normal	Extensive curtain wall failure with some complete roof structure failure on small residences. Major erosion of beaches. Major damage to lower floors of structures near the shore. Terrain continuously lower 10 feet ASL may flood (and require mass evacuations) up to 6 miles inland.
5	Wind Speed: 155 mph Storm Surge: > 18 feet above normal	Complete roof failure on many homes and industrial buildings. Some complete building failures. Major damage to lower floors of allstructures located less than 15 ASL and within 500 yards of the shoreline. Massive evacuation of low ground residential areas may be required.
TORNADOES – Enhanced Fujita (EF) Scale		
EF Category	Intensity Phrase (mph)	Potential Damage
0	Gale Tornado 65 - 85	Light damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	Weak Tornado 86 - 110	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows broken.

2	Strong Tornado 111 - 135	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
3	Severe Tornado 136 - 165	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.	
4	Devastating Tornado 166 - 200	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.	
5	Incredible Tornado Over 200	Incredible damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural deformation; incredible phenomena will occur.	
Table 1.1 continued on next page.			
Modified Mercalli Scale	EARTHQUAKES		Richter Scale
Category	Category Description	Level of Damage	Category
1-4	Instrumental to Moderate	No Damage	</+ 4.3
5	Rather Strong	Negligible Damage: small unstable objects displaced or upset; some broken dishes and glasses	4.4-4.8
6	Strong	Slight Damage: windows, dishes, glassware broken. Furniture moved or overturned. Weak plaster and masonry cracked.	4.9-5.4

7	Very Strong	Moderate Damage in well built structures: considerable damage to poorly built structures. Furniture and weak chimneys broken. Masonry damaged. Loose bricks, tiles, plaster and stones will fall	5.5-6.1
8	Destructive	Structural damage considerable, particularly to poorly built structures: chimneys, monuments, towers, elevated tanks may fall. Frame houses moved. Trees damaged, cracks in wet ground and steep slopes.	6.2-6.5
9	Ruinous	Severe structural damage: some facilities will collapse; general damage to foundations; serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground; liquefaction.	6.6-6.9
10	Disastrous	Most masonry and frame structures and foundations destroyed. Some well built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Sand and mud shifting on beaches and flat land. Visible cracks in land.	7.0-7.3

1.3.1. Hurricanes. A hurricane (called a typhoon or tropical cyclone when formed in the Pacific Ocean west of the International Dateline or a cyclone in the Indian Ocean) is a potentially deadly and devastating storm system accompanied by high winds, torrential rainfalls and lightning. Military personnel assigned to any coastal region of the world could face preparing for and recovering after a hurricane/typhoon. Historically, hurricanes are some of the most destructive natural events, since they spawn flooding, tornados and landslides. **Table 1.2.** highlights some of the major hurricanes and tropical storms that had effects to Air Force bases.

Table 1.2. Hurricanes and Tropical Storms since 1988 that Affected Air Force Bases.

Name	Date	AF Bases Affected	Winds (Sustained)	Rain	Deaths	Damage (Billions)
Katrina	Aug 2005	Keesler	140 mph	8-10”	1,000+	$100+ (estimated)
Ivan	Sep 2004	Eglin, Hurlburt, Tyndall,	165 mph	8-12”	57	$13
Frances	Sep 2004	Cape Canaveral	145 mph	13”	47	$9
Table 1.2 continued on next page.						
Charley	Aug 2004	MacDill	127 mph	8-12”	20	$14
Isabel	Sep 2003	All East Coast bases	125 mph	4-12”	47	$3.37
TS Allison	June 2001		50 mph	30-37”	24	$5.1
Floyd	Sep 1999	Langley, Shaw, Andrews, Bolling, Pope	135 mp h	10-20”	77	$6.1
Georges	Sep 1998	Hurlburt, Eglin, Tyndall, Moody	155 mph	15-30”	16	$5.9
Fran	Sep 1996	S-J, Pope, Shaw, Charleston	120 mph	10”	37	$5.0
Opal	Oct 1995	Hurlburt, Eglin, Tyndall, Moody, Robbins	150 mph	2-10”	59	$3.0
TS Alberto	July 1994	Hurlburt, Eglin	65 mph	10-28”	32	$1.2
Iniki	Sep 1992	Hickam	130 mph	5-10”	7	$1.8
Andrew	Aug 1992	Homestead, Keesler	145 mph	7-12”	65	$27.0
Bob	Aug 1991	Pope, S-J, Andrews, Bolling	115 mph	5-8”	25	$2.1
Hugo	Sept 1989	Charleston, S-J, Shaw, Pope	134 mph	5-10”	86	$12.0
Gordon	Nov 94	Cape Canaveral	86 mph	4-15”	1145	$0.4

1.3.1.1. Some of the most noteworthy hurricane /typhoon related disasters occur in third world countries where construction codes and standards are not as developed as in the US. This situation results in storms hitting areas where poorly constructed residences are located in flood prone areas resulting in massive loss of life and property. In 1970, a tropical storm killed 200,000 in East Pakistan (now Bangladesh), according to official estimates; unofficial estimates put the death toll as high as 500,000. Hurricane Camille ravaged the Gulf Coast of Mississippi in 1969 leaving 265 people dead, another 55 missing, and caused $1.5billion in damage. In 1992, the mega-storm Hurricane Andrew struck the lower tip of Florida and the Gulf Coast of Louisiana (**Figure 1.1.**). The hurricane caused over 60 deaths and property damage exceeded $25 billion. In that storm, Homestead AFB was severely ravaged with damages exceeding $100 million. In 2005, hurricane Katrina caused an estimated $100 billion in damage when it swept across the Gulf Coast facility on August 29. Keesler AFB suffered extensive damage to its industrial and housing areas as a result of its sustained winds of 110 miles-per-hour and the base wide flooding reached as high as six feet in many areas (**Figure 1.2.**).

1.3.1.2. Hurricanes originate in the warm, moist air masses of the tropics and move west and northward with enormous destructive force. The hurricane's most devastating forces are wind, torrential rains, and storm surge. Winds within 100 miles of the hurricane's eye can range from 75 to 200 miles per hour. Lesser, but still destructive, winds may reach out as much as 250 miles from the center. Rainfall accompanying a hurricane is generally heavy, averaging 5 to 10 inches. Rates in excess of 20 inches in a 24-hour period have been observed. The extreme tide, or storm surge, which can inundate the coastline, is especially hazardous. As the storm front moves inland, the heights of these hurricane tides may vary from 3- to 20-plus feet.

Figure 1.1. Aftermath of Hurricane Andrew at Homstead AFB, FL.

Figure 1.2. Keesler AFB, MS, Flooding from Hurricane Katrina.

1.3.1.3. The destructive force of a hurricane is awesome. High tides, as well as the flash floods generated by the torrential rains, present walls of water which slam into structures with great impact. Devastating winds, accompanied by tornadoes spawned by the hurricane, create flying debris and mass destruction over a widespread area. Taking in and converting to energy a quarter of a million tons of water every second, the average hurricane generates a force equal to 500,000 atom bombs of the Nagasaki-type.

1.3.1.4. The hurricane storm surge is a large dome of water, 50 to 100 miles wide, that sweeps across the coastline where a hurricane makes landfall. Storm surges can easily reach depths of 15 feet at their peak. Along the coast, hurricane related storm surge is the greatest threat to life and property.

1.3.1.5. In 1995 two hurricanes, Erin in August and Opal in October, caused over $100 million in damages at Patrick, Eglin, Hurlburt, and Tyndall AFBs. Some areas were submerged in up to 18 feet of water as the hurricane forced water ashore. In 2003, Hurricane Isabel came ashore at the mouth of the Chesapeake Bay at high tide, resulting in a 20 foot storm surge that flooded Langley AFB, leaving CE to recover the base (**Figure 1.3.**).

Figure 1.3. Engineers at Langley AFB during Hurricane Isabel.

1.3.1.6. On 29 August 2005, Hurricane Katrina made landfall near New Orleans, Louisiana as a Category 4 hurricane with sustained winds of 140 mph. The resulting storm surge, with 20 to 30 foot waves, breached the levees that protected New Orleans from a nearby lake and put 80 percent of the city under flood water as high as 20 feet deep (**Figure 1.4.**). Because the storm was so large, its winds and storm surges also caused widespread devastation along the central Gulf Coast, including Keesler Air Force Base in Biloxi, Mississippi. The final death toll in Louisiana, Alabama and Mississippi is unknown, but is well-over 1,000—including those deaths directly caused by winds, flooding and storm surge and those caused indirectly by subsequent accidents, fires and health issues. The economic impact is predicted to reach as high as $200 billion, including uninsured losses. Federal disaster declarations cover 90,000 square miles, an area almost the size of the United Kingdom. By affecting such vast urban and industrialized areas, Hurricane Katrina has been called the worst catastrophe in the history of the United States.

Figure 1.4. Levee Breach in New Orleans Caused by Hurricane Katrina.

1.3.2. Tornadoes. Tornadoes are the most violent weather phenomena known to man. Although the areas affected by these funnel-shaped clouds are generally limited from 1/4 to 1/3 of a mile wide and seldom more than 16 miles long, the rotating velocities can reach 300 miles per hour (**Figure 1.5.**). Air pressure within the funnel can be so low as to cause buildings to explode from the higher pressure inside the structure. These high winds and pressure differentials make tornadoes one of the biggest natural disaster killers in the United States.

Figure 1.5. Tornado Moving Across Land.

1.3.2.1. During the past 25 years, tornadoes have killed almost three times as many people as hurricanes. Tornadoes occur in all 50 states, but are most prevalent in the Midwest and Southeast. Although tornadoes occur throughout the year, weather conditions for tornado development are best from April through June. Unlike other weather disasters, the suddenness and the erratic path of the tornado seldom afford an opportunity to evacuate the danger area. For these reasons, timely warning, good predisaster planning and immediate availability of shelters become critical factors in saving lives and minimizing damage.

1.3.2.2. On April 26, 1991, an F-5 catastrophic tornado touched down and tracked through McConnell AFB. The Wichita/Andover Tornado caused $62 million damage to the McConnell flightline and facilities, tracking within 2,000 yards of 80 F-16 fighter aircraft (**Figure 1.6.**). Tinker AFB also had tornados touch down in 1948 and 1982 causing millions in damage. CE units in tornado-prone areas must be ready to respond to not only recover the base but also support local communities when they are hit.

Figure 1.6. Tornado Damage at McConnell AFB, April 1991.

1.3.3. Blizzards and Severe Cold. Although blizzards and severe cold do not normally cause the widespread structural damage and death associated with tornadoes and hurricanes, this type weather can greatly hamper normal airbase operations. The heavy snows which accompany blizzards cause many activities to grind to a halt. The build-up of ice makes roads and runways unusable as well as snaps overhead power lines. Water supply lines may freeze and rupture. Record low temperatures put a strain on heating systems, causing numerous failures that have to be repaired if operations are to continue. A significant limiting factor under these conditions will be the reduced effectiveness of personnel and equipment required to make repairs in an extremely cold environment. Also, reduced visibility is a "must consider" factor. Individuals can easily get lost responding to a problem during a blizzard.

1.3.4. Earthquakes. An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as huge plates that form the Earth's surface move slowly over, under and past each other. Sometimes the movement is gradual. At other times, the plates are locked together , unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the earth to shake. Most earthquakes occur at the boundaries where the plates meet, however, some earthquakes occur in the middle of the plates.

1.3.4.1. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tidal waves/tsunamis). Building with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during large scale earthquakes. When earthquakes occur in populated area they can result in large death tolls and extensive property damage.

1.3.4.2. Northridge California was struck by a 6.7 magnitude Earthquake on 17 January 1994. The death toll in this densely populated area was 60 with another 1,500 injuries. Electricity, gas and water service was damaged and interrupted for almost 50,000 people. The relatively low casualty and structural failure rate is credited to US construction seismic codes and superior construction standards. Although the damage seemed relatively low for an earthquake of this magnitude, the economic impact was estimated at $20 billion. Conversely, Kobe Japan, exactly one year to the day later, was hit by a 7.2 magnitude earthquake. The earthquake lasted 20 seconds and collapsed houses, wrecked roadways, ignited fires and destroyed Japan's sixth largest city. It resulted in 5,500 deaths, 35,000 injuries, approximately 180,000 buildings damaged and 310,000 people homeless. At an economic impact of $147 billion, the Kobe earthquake is one of the costliest natural disasters on record (**Figure 1.7.**). A December 2003 earthquake in the town of Bam, Iran resulted in an estimated 50,000 casualties and reduced and entire city to rubble. Many poor and developing countries have very few construction guidelines which results in low-grade construction and weak buildings structures. Good planning, construction standards and federal/local guidelines allow the US to minimize damage. Although CE cannot eliminate earthquake damage, engineers can significantly mitigate the threat through sound construction practices and strong predisaster planning.

Figure 1.7. Earthquake Damage in Kobe, Japan.

1.3.4.3. A repetition of the 1906 San Francisco earthquake under current conditions would cause billions of dollars in damage and result in the loss of thousands of lives. The small 1989 Loma Prieta quake just south of San Francisco measured only 7.1 on the Richter scale, but killed 62 people and damaged property valued over $6 billion.

1.3.4.4. Earthquakes strike suddenly, without warning. There is no particular season as with monsoons or hurricanes, and they can occur anywhere. The state of California experiences the most frequent damaging earthquakes, while Alaska has the greatest frequency of earthquakes. The largest US earthquakes were felt during a three-month period from 1811 to 1812 along the New Madrid Fault line in Missouri. These 8.0 magnitude earthquakes were felt throughout the Eastern United States in Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas and Mississippi experiencing the strongest tremors.

1.3.4.5. Depending on the magnitude, the primary effects of earthquakes can be dramatic and devastating. Large horizontal and vertical land mass displacements can create fissures along major fault lines. Bridges, buildings, dams, tunnels and other rigid structures can be sheared in two or collapse when subjected to the extreme lateral forces created by earthquakes. Water in tanks, ponds and rivers frequently overflow their banks. In lakes, an oscillation sometimes occurs in which the water surges from one end to the other reaching heights sufficient to create a mini-tidal surge. During the 1964 Alaskan earthquake, this lake effect caused a tidal surge of six feet in Memphis, Tennessee, 5,000 miles from the center of the earthquake. The January 1994 Northridge Earthquake, near Los Angeles, which measured 6.6, injured more than 7,300 people, killed 56 people and caused damage exceeding $15 billion to buildings and roads and ruptured power, water and gas lines.

1.3.4.6. Secondary effects of earthquakes are often more destructive than the earthquake itself. Landslides resulting from earthquakes in mountainous areas are frequently a major cause of lives lost. In May 1970, an earthquake registering 7.9 on the Richter scale created a massive avalanche of the glacier on Mt. Huasaran, Peru. This avalanche started as a sliding mass of glacial ice, rock and mud 3,000 feet wide and one mile long. The avalanche swept away 11 miles of Earth destroying the villages of Yungay and Ranrahirca at speeds in excess of 100 mph. The death toll from this earthquake and subsequent floods was approximately 66,000 people with another 600,000 left homeless. Fire is often a by-product of earthquakes. The damage caused by these fires can also be greater than normal, due to loss of firefighting equipment, blockage of access routes to the fire scene, and the breaking of water mains essential to firefighting. This was demonstrated during the San Francisco earthquake of 1906, in which 80 percent of the half billion dollars in damage was due to the fires which raged out of control for days following the tremor. Other secondary effects of earthquakes include disruption of utilities, transportation, and communication systems, and the creation of tsunamis (seismic sea waves).

1.3.4.7. On 26 December 2004, an underseaearthquake occurred in the Indian Ocean off the western coast of Sumatra, Indonesia. The earthquake's magnitude was estimated at 9.15 and lasted nearly ten minutes, whereas most major earthquakes last no more than a few seconds. The earthquake created a 750 mile rupture in the sea bed, displaced an estimated 20 square miles of water and triggered a devastating tsunami. A tsunami is a series of waves generated when water is rapidly displaced on a massive scale—earthquakes, landslides, volcanoes and large meteorite impacts all have the potential to generate a tsunami. The 2004 tsunami was the single worst in recorded history, killing over 300,000 people (**Figure 1.8.**). The true death toll may never be known because tens of thousands were swept out to sea and reported as missing, while an incalculable number died from subsequent disease. Perhaps the most striking example of the power of this disaster was that deaths attributed to it were recorded up to 5,000 miles from the earthquakes epicenter. Despite a time lag of several hours between the earthquake and the impact of the tsunami, nearly all the victims were taken completely by surprise. One possible reason: there were no tsunami warning systems in the Indian Ocean. In thedisaster's aftermath, there is a new awareness of the need for such warning systems and there are proposals to create a unified global tsunami warning system, to include the Atlantic Ocean and Caribbean.

Figure 1.8. Before and After Pictures of Tsunami in Banda Aceh, Sumatra.

1.3.5. Floods. Flooding can occur from any accumulation or rise of water on a land area (**Figure 1.9.**). Unusually heavy rains can run into streams or rivers causing it to overflow its banks. Runoff from the sudden melting of accumulated winter snow can add great amounts of water to rivers causing flooding downstream. The heavy rains and storm surge which accompany hurricanes can cause flooding of low-lying coastal areas. Some floods result from the failure of man-made barriers, such as dams and levees, which attempted to control water flow.

Figure 1.9. Flooded Homes in New Orleans After Hurricane Katrina.

1.3.5.1. The primary effects of floods are due to inundation and the force of the currents. Floodwater and current-borne debris can drown, displace, or injure local residents. These same currents and debris can cause structural damage to bridges, buildings, and roads as well as interrupt vital utility services over a large area. Health hazards can be created through disruption of water and sanitary systems. Electrical fires can be caused by short circuits and the hazard of fire or explosion can be increased from broken gas mains. Environmental and public health hazards are created when chemical storage facilities are damaged.

1.3.5.2. Floods may occur at any time of the year. They are more common because of heavy winter rains or the spring thaw of accumulated ice and snow in the United States. The warmer, more humid regions of the world often experience flooding during the monsoonal or rainy seasons. The duration of a flood's impact varies. Flash floods generally rise rapidly over a period of just a few hours and subside just as quickly, while floods in the great river basins may last for weeks. In the great flood of 1993, the Mississippi River exceeded flood stage in some areas for over 100 days.

1.3.6. Volcanic Activity. Volcanoes are a rare but a very potent menace. Some 80 percent of all volcanoes are contained in the "ring of fire" which circumscribes the Pacific Ocean. Active volcanoes in these areas are few in number, and the areas near most active volcanoes are sparsely populated. However, as Mount St. Helens in Washington State (**Figure 1.10.**) proved in 1980 and Mount Pinatubo in the Philippines (**Figure 1.11.**) in June 1991, even inactive volcanoes should be considered as only dormant and a potential source of danger. The Pinatubo explosion caused over $300 million in base damage at Clark AB and contributed to its closure and that of nearby Subic Naval Base.

Figure 1.10. Mount St Helens Eruption, May 1980.

Figure 1.11. CE Break Area at Mount Pinatubo Recovery, Clark AB.

1.3.6.1. The underlying cause of volcanoes is the formation of molten rock (magma) through the process of orogenesis (mountain building). Shifting rocks are forced to great depths, where increased temperature and pressure cause them to dissolve and be converted to magma. Once formed, this magma exerts pressure on surrounding solid material. If solid material has fissures running toward the surface, molten rock will surge upward to form a volcano.

1.3.6.2. The major dangers posed by volcanic eruptions are lava flows, airborne clouds of volcanic ash, toxic gases, and volcanic mudflows. Because of devastating forces of volcanic eruptions, reduction of damage has proved to be difficult. Lava flows may be slowed or diverted by strategically located stone barricades, but major protection involves evacuation of personnel and equipment away from the danger zone.

1.3.7. Lightning. Lightning is an electrical discharge from mature storm clouds (**Figure 1.12.**). Lightning is one of the deadly off spring of hurricanes, tornados and normal storms. On average, lightning causes more casualties annually in the US than any other storm related phenomena, except for floods. Simple training and basic planning can reduce many of the dangers posed by lightning.

Figure 1.12. Lightning Strikes.

1.3.7.1. In 1996, a single lightning strike at Eglin AFB, Florida, resulted in the death of one and injury of 11 Airmen working on the flightline. During natural disaster contingency response, resources and personnel are limited. Through proper training and planning, CE can maximize the effectiveness of the response force.

1.3.8. Wild Fires. A wild fire is defined as an unplanned fire requiring suppression action. In contrast, prescribed wilderness fires burn within prepared lines, enclosing a designated area, under predetermined conditions. Due to a severe lack of clearance of underbrush and periodic drought years, our brush lands, forests and foothills are tinderboxes during late summers. Often a series of lightning strikes or careless actions by humans will result is a series of fires burning in a localized area.

1.3.8.1. Air Force firefighters and Readiness/ Emergency Management personnel are often requested to assist with suppression and planning actions when local resources become stretched to thin. During many of the California wild fire months, Vandenberg and Beale have found themselves with large brush fires encroaching upon the base (**Figure 1.13.**).

Figure 1.13. Southern California Wild Fires, 2003.

1.3.8.2. The Base Civil Engineer, Base Fire Marshal, and the Fire Chief must be prepared to defend the base from wild fires as well as support local fire fighters when required. Off base support should be determined well in advance through mutual aid agreements, memorandums of understanding or support agreements. Military firefighters have matured this concept to include joint training exercises and operations thereby solidifying a working relationship. This partnership results in almost seamless operations during an emergency response since all of the parties understand their roles and responsibilities and have practiced them in joint exercises.

1.3.9. Conclusions. There are numerous other natural disasters that civil engineer units might be forced to contend with in worldwide operations. In planning for contingencies and disasters, the Civil Engineer and base leadership should consult with local emergency managers to ensure they include responses to common local contingencies not listed above. All civil engineers should remember one important point: never underestimate the destructive force of nature. Effective warning systems are needed, as is a mitigation plan. The plan should be designed to limit damage or casualties through pre-planned actions (i.e., site selection, permanent dikes, shelters, etc.) or expedient actions (i.e., sandbagging, tying down, shoring up, evacuation, etc.).

1.4. Man-Made Disasters. A man made disaster is defined as an emergency that occurs directly or indirectly because of some human action. Civil engineer units may be faced with overcoming the effects of man made disasters that occur on base or off base. This section outlines potential man made disasters and addresses the anticipated recovery environment presented by each. The Federal Emergency Management Agency (FEMA) now refers to man made disasters as "technological disasters."

1.4.1. Fire and Explosion. Fires and explosions are closely related disasters. In many cases, a fire raging out of control in an area where flammable materials are stored can cause an explosion; or, an unexpected explosion can spread flame and hot debris over a large area causing the start and spread of a major fire (**Figure 1.14.**). While some fires, such as those caused by lightning, can be considered a natural disaster, the majority of fires start as a result of some human action.

Figure 1.14. Aftermath of Explosion at Industrial Plant.

1.4.1.1. Fires can be grouped into two general categories: facilities and grasslands. The first category can range in intensity from those involving man-made structures, facilities, or a small kitchen fire to a major aircraft or petroleum fire aerospace vehicles and those involving forests or involving thousands of gallons of highly flammable material. Forest and grassland fires can be an even greater problem. They can cover thousands of acres, requiring wide dispersal of limited firefighting equipment, and resources.

1.4.1.2. Explosions present a threat to personnel near the blast. There is danger from the force of a blast, flying debris, and intense heat and flame that may be produced by an explosion. Natural gas, liquid petroleum, and munitions storage facilities are potential explosion sites. In December 1984, a gas explosion and resulting inferno in a Mexico City suburb demonstrated the destructive force of these type disasters. A series of explosions destroyed four spherical tanks, each holding almost 500,000 gallons of liquefied gas, and sent enormous steel shards spearing into nearby houses. Flames from the blast shot more than 300 feet into the dawn sky, instantly engulfing homes and other structures that surrounded the gas plant. Subsequent blasts hurled 50-foot-long propane cylinders into the air, crushing houses as far as half a mile from the explosion site. It was several hours before firefighters could contain the flames sufficiently to enter the area. When they finally entered the zone of devastation, they found corpses carbonized in gestures of self-defense. Some were huddled together; others lay alone in their beds, arms raised in defense.

1.4.1.3. Response to a fire or explosion involves both firefighting and rescue of endangered personnel. The first step is to contain the blaze as much as possible and rescue any personnel in the area. The next step is to gain control of the fire to minimize further damage. After these tasks are accomplished, major efforts are devoted to completely extinguish the fire. Other civil engineer teams may be called on to support the firefighters. Reconstruction following a fire or explosion depends on the magnitude of the disaster, but likely, it will require combined efforts of craftsmen with varying skills.

1.4.2. Hazardous Materials and Radioactive Contamination. If allowed to escape into the environment, toxic gases, harmful chemicals, or radioactive contaminants can pose significant hazards to humans. These substances can be accidentally released into the environment at manufacturing plants, at storage facilities, during transit to another location, or at points of use. Nuclear power plants, toxic gas and chemical manufacturing facilities, and hazardous materials storage depots have numerous safeguards to prevent accidents. When these dangerous substances are transported, they are normally encased in special rupture-proof containers to prevent leakage in the event of a road or rail accident. But even with all these special precautions, accidents have and will continue to occur. When this happens, the accidental escape of these lethal substances into the atmosphere or on the ground could result in thousands of deaths.

1.4.2.1. The 1984 toxic gas leak in India serves as an example of how quickly toxic fumes can engulf and kill thousands. Methyl isocyanine, a deadly chemical used to make pesticides, began to escape from a Union Carbide plant on the outskirts of Bhopal a few minutes past midnight. Within an hour, the gas had formed a vast, dense fog of death that drifted over the city, leaving hundreds dead as they slept. As word of the cloud of poison began to spread, thousands began to flee the fumes.

1.4.2.2. Many individuals died while fleeing the noxious vapor, while others who had inhaled the fumes died hours later from the effects, having reached what they thought was safety. By week's end, more than 2,500 people were dead, and thousands more suffered permanent blindness or disabling respiratory disorders (**Figure 1.15.**).

Figure 1.15. Clean Up After Union Carbide Plant Gas Leak in India.

1.4.2.3. Toxic gases, harmful chemicals, and radioactive contamination can have a lasting impact on the environment. Some of these substances can render large land areas and water sources unusable for years. To minimize the effects of these toxic materials, civil engineers must be prepared to assist in containment and cleanup activities.

1.4.3. Petroleum Spills. Unlike the highly toxic substances discussed in the preceding section, petroleum spills are not normally life-threatening to humans even though they do present a fire hazard. However, a petroleum spill can have a devastating impact on the environment. Water supplies can be contaminated, plants destroyed, and wildlife killed or injured. Marine plants and animals are especially susceptible to the effects of petroleum spills in or near water sources and particularly our oceans. As with toxic materials, a civil engineer's primary responsibilities will be to assist in containment and cleanup activities.

1.4.4. Major Accident. With humans, accidents are not just possible; they are probable. Around an airbase, aircraft accidents are always a possibility (**Figure 1.16.**). Whether involving a military or a civilian aircraft, a major aircraft accident could require the assistance of civil engineers. Trained firefighting and rescue personnel could be required to extinguish fires associated with an aircraft crash and use special skills to rescue persons trapped within an aircraft. If the accident occurs in an inaccessible area, rescue and investigation teams may require the support of other civil engineer personnel and equipment to gain access to the crash site. However, not all major accidents will involve aircraft. The possibilities are endless. An accident can be the act that complicates a disaster by triggering an explosion, a petroleum spill, or a toxic gas leak. Major accidents require multi-unit response by the base Disaster Response Force (DRF). Minor accidents are handled by responders such as the fire department, security forces, and medical services.

Figure 1.16. Airshow Aircraft Accident.

1.4.5. Planning for Man made Disasters. The types of man made disasters that could occur are too numerous to make specific plans for each. Effective planning in this area consists of evaluating the base and its surrounding area to identify activities that have potential to develop into a damaging emergency. After the evaluation, courses of action and prioritized activities should be established to reduce the seriousness of such emergencies, should they occur.

1.5. Hostile Actions. Hostile actions, although they can come from many sources, have the same basic objectives. They are intended to kill personnel, destroy equipment and facilities, and generally reduce the ability of a base to carry out its assigned combat mission. The following paragraphs highlight the types of attacks that are expected, based upon the current world situation.

1.5.1. Conventional Attack. A conventional attack can take many forms: ground forces supported by artillery and armored vehicles; airborne troops and equipment dropped behind our defenses; high speed bombers and fighters dropping bombs and firing missiles; and naval bombardments from off-shore ships or submarines. The primary objective for strikes against our airbases will be to destroy aircraft and weapons systems, command and control systems, and if that is not possible, then inflict heavy damage on runways, POL storage areas, and munitions storage facilities. This damage is intended to prevent us from being able to launch and recover combat aircraft, and it is that damage which civil engineers will be called on to fix first.

1.5.1.1. The explosion of a typical bomb or missile produces shock waves and concussion which can level structures and kill personnel near the point of detonation. Flying debris and bomb fragments or shrapnel can cause severe damage and injury at distances well beyond the impact point. The extreme temperatures that accompany an explosion can start major fires, particularly if flammable materials are in the proximity of an explosion. If incendiary bombs are used, their thickened burning agents will create havoc over widespread areas. Other fires may originate from shorted electrical circuits, ruptured gas lines and fuel tanks, and the spread of burning embers.

1.5.1.2. Even after an attack is over, danger still lurks in the form of unexploded ordnance. World War II history records that approximately 10 percent of all bombs dropped during an air raid failed to explode, either through some type of malfunction or because they were fused for delayed action. Also, buried and exposed mines and sub munitions intentionally create a very difficult postattack environment. Regardless of reasons, civil engineer's explosive ordnance disposal (EOD) and repair crews will have to function in this hazardous environment.

1.5.2. Chemical Attack. Often called the poor man's atomic bomb, chemical agents have been developed to kill and disable opposing forces dating as far back as the ancient Greeks. In this century, during World War I, thousands of troops were killed or seriously injured by the effects of mustard and chlorine gas as they fought in the trenches of Europe (**Figure 1.17.**). Italian Premier, Benito Mussolini, ordered the use of mustard gas in several battles in 1936 during Italy's invasion of Ethiopia. Herman Goering, former Marshal of Hitler's Reich, testified at the Nuremberg war crimes trial that the Germans would have used gas against the Allies in the invasion of Normandy but for the danger to horses that were a vital part of Germany's transportation system. Major General Alden H. Waitt, Chief of US Army Chemical Warfare Service at the time, estimated that German use of chemical weapons would have delayed the invasion by six months and made new landing points necessary. Is chemical warfare a thing of the past? Although both sides denied it, the use of chemical warfare agents was confirmed in the 1980-1988 conflict between Iran and Iraq. Soldiers returning from the front were treated for severe burns and blisters, a common symptom of exposure to certain chemical agents. In some cases, whole villages were affected. Within one week of ending the war with Iran in March 1988, evidence and testimony indicates that Saddam Hussein utilized CW against the Kurds in Northern Iraq, killing at least 5,000. Further evidence indicates that forces supported by the Soviet Union used chemical warfare agents in Laos, the Khmer Republic (formerly Cambodia) and Afghanistan during the 1980s.

Figure 1.17. Casualties from Chemical Attack.

1.5.2.1. How will modern chemical warfare be employed next? Chemical agents could be dispensed from large and small missiles or rockets, dropped from airplanes in canister-type bomblets, sprayed from aircraft, or dispensed by ground troops as they advance on strategic positions. Regardless of the method, the results would be the same—no mushroom cloud or devastation of the airbase – only a fine mist or cloud that drifts gently over the area. It could easily be invisible, odorless, and tasteless. Perhaps individuals would breathe a sigh of relief at being spared from a nuclear attack or a blitz of 1,000-pound bombs and return to normal activities. Within minutes, many people outside during the attack could be dying from massive seizures and convulsions, while the base and its weapons systems are left intact and undamaged.

1.5.2.2. Those who survive the initial chemical attack cannot consider themselves completely safe. Air Force chemical, biological, radiological and nuclear (CBRN) defense operations rely upon risk-based decision making, individual and collective protection equipment, and integrated individual, unit, and airbase actions.

1.5.2.2.1. Air Force units will retain the ability to operate under all conditions, but will focus their primary efforts on conducting combat operations under the CBRN conditions expected at airbases. Single attacks and factors such as the type of agent and environmental conditions, may require wearing protective equipment for several minutes to hours. Multiple attacks, the use of newly developed chemical or biological agents, and unfavorable weather conditions may extend wear times or require repeated donning and doffing over extended periods.

1.5.2.2.2. Airmen and leaders develop plans and execute attack response actions to limit contamination. They perform immediate and operational decontamination and conduct rapid post-attack reconnaissance to detect, identify, and/or segregate contaminated resources and areas.

1.5.2.2.3. Personnel should use uncontaminated assets to the extent possible in the post-attack environment. The UCC directs unit personnel to accomplish mission essential tasks and stop non-mission essential tasks. The UCCs monitor the contamination status of people, equipment, and areas. UCCs also instruct unit personnel to minimize movement, especially between contaminated and uncontaminated zones. Individuals or teams do not enter or exit contaminated areas or move contaminated equipment into uncontaminated areas without UCC or EOC approval. Personnel go to contamination control areas or reduce MOPP when directed by their unit or the EOC. See AFMAN 10-2602, Nuclear, Biological, Chemical, and Conventional (NBCC) Defense Operations and Standards, for more information on the Air Force CBRN operational concept.

1.5.3. Biological Attack. Biological warfare is not new. The Black Death (plague) was transmitted to the Europeans in the 1300s when a Kipchak army , besieging a Genosese trading post in the Crimea, catapulted plague-infested corpses into the town. The British employed biological warfare against the Indians in the French and Indian War in the mid-1700s. Of all types of warfare, a biological attack is the most difficult to recognize. At first, it may seem just a routine illness such as a cold or flu. But as a lot of personnel begin to show the same symptoms or when those symptoms become increasingly serious and personnel become ill and die, individuals begin to realize they have been exposed to biological agents.

1.5.3.1. Many pathogens can be employed as biological warfare agents. The effects of these pathogens range from a minor incapacitating illness to sudden death. Aircraft spray, aerosol bombs and generators, missiles, infected animals, vials, capsules, or hand dispensers can disseminate biological agents. The effectiveness of biological agents depends on the targets, the nature of the military operations at the target, and the weather.

1.5.3.2. Combating a biological agent is very difficult. Since there are no suitable antidotes for the more virulent strains of pathogens, the best defense is to prevent them from entering the body through the common routes – nose, mouth, and skin. Outside of the body, these pathogens do not easily survive. They are killed by variations in temperature, lack of moisture, exposure to sunlight, and application of various germicides. One of the best defenses against pathogens is to have personnel don protective ensembles at the first suspicion of an attack. Maintaining good personal hygiene and physical conditioning, along with keeping immunizations current, go a long way to prevent infections. Currently, detection of biological agents is very difficult. They are normally identified only after their effects start showing up.

1.5.4. Nuclear Attack. Of all of the types of attacks that may be experienced, the nuclear attack is the most awesome and frightening. A single nuclear bomb can cause more death and destruction than thousands of conventional bombs and has the additional effect of making an entire area uninhabitable for months, or even years, to come. However, with sufficient warning and appropriate precautions, the devastating effects of a nuclear blast can be reduced. The explosion of two nuclear bombs over Japan in August 1945, the first and only nudear weapons ever used against an enemy, caused unprecedented casualties. Yet, many of these casualties could have been prevented if there had been sufficient warning to permit clearing the streets, and if the people of Hiroshima and Nagasaki had known what to expect and what to do. For example, only 400 people out of a population of almost a quarter of a million were inside the excellent tunnel shelters at Nagasaki that could have protected 75,000 people.

1.5.4.1. A nuclear explosion, like a conventional explosion, is due to the rapid release of a large amount of energy all at once. However, with the nuclear explosion, the energy results from rearrangement within the central portion, or nucleus of an atom, rather than among the atoms themselves as in a chemical explosion. Since the forces existing between protons and neutrons in a nucleus are much greater than are forces between the atoms in a molecule of chemical explosive material, the resultant release of energy is enormous.

1.5.4.2. Effects of a nuclear attack are numerous. There are extreme blast or shock waves, thermal radiation, nuclear radiation, and enormous electromagnetic energy. The blast or shock wave is the most destructive (**Figure 1.18.**). It accounts for 50 percent of the expended energy, creating tremendous over pressures and winds that can crumble buildings and other structures for a considerable distance around the detonation point. The atmosphere immediately surrounding a detonation point is raised to temperatures approaching those in the center of the sun, instantly vaporizing buildings and people in the area. This thermal radiation also has the effect of causing secondary fires and serious burns to exposed persons miles from the point of detonation. Nuclear radiation is especially intense close to ground zero. The lingering, cumulative effect of exposure to radioactive fallout can continue to cause death and radiation sickness for days, weeks, or longer following an attack. In addition, the great electromagnetic energy, generated by nuclear weapons, can temporarily disrupt radio communications and permanently damage electronic components.

Figure 1.18. Nuclear Test at Bikini Atoll.

1.5.4.3. Radioactive fallout will be the greatest danger during operations following an attack. Personnel working in contaminated areas will have to be closely monitored for cumulative radiation doses and complete personal decontamination will have to be accomplished prior to their return to shelter areas. Additionally, the civil engineer unit will likely be called upon to decontaminate certain areas of the base so that recovery activities can proceed.

1.5.5. Terrorism. While terrorist acts were once mainly viewed as random acts of deranged individuals, they have emerged as highly organized operations, conducted with military precision against strategic activities and targets. September 11th, 2001, brought home the deadly reality of terrorism in the United States. Nineteen men affiliated with the Al Qaeda network of Islamic organizations, highjacked four commercial airliners. They intentionally crashed two airliners into the World Trade Center in New York City and another one into the DOD headquarters, the Pentagon, in Arlington, Virginia (**Figure 1.19.**). The fourth plane crashed into a rural field in Somerset County, Pennsylvania, following passenger resistance. This terrorist attack killed 2,595 people in New York, 189 at the Pentagon and 45 in Pennsylvania, including everyone aboard the four airliners; altogether 2,986 fatalities. These were the most lethal terrorist acts ever carried out in the United States and most lethal individual attacks in the world. Al Qaeda had previously been involved in attacks on American targets overseas, notably American embassies in Kenya and Tanzania in 1998 and the USS Cole in Yemen in 2000. Previously, an attack was made on the US Marine compound in Beirut in 1983 (**Figure 1.20.**). In that attack, the terrorist crashed a truck laden with explosives through the compound fence, killing more than 200 US servicemen. This incident also demonstrated that our future protective measures would have to go beyond what would stop a reasonable person. This method of attacking US service personnel was also used in November 1995 at the United States Military Training Mission in Riyadh, Saudi Arabia, which killed seven individuals and again in June 1996 in the bombing of the USAF dormitory at Khobar Towers, near Dhahran, Saudi Arabia, killing 19 US servicemen.

Figure 1.19. Pentagon Recovery Operations after Terrorist Attack.

Figure 1.20. Khobar Towers Dormitory in Saudi Arabia after Explosion.

1.5.5.1. In the words of former Secretary of State George Schultz, terrorism is "a new kind of warfare" and is being practiced with an increasing degree of frequency. No longer is terror the exclusive weapon of the fanatic, terrorism is now endorsed, encouraged, and funded by governments in an attempt to achieve political objectives.

1.5.5.2. It is no longer safe to assume that only those exposed locations in areas of international tension are at risk. The world terrorist honors no country's borders, traveling widely to bring death and destruction to those considered as enemies. In fact, terrorists from the Middle East have boasted that even the residents of the White House should not consider themselves safe from extremist actions. "Home grown" terrorists are just as deadly.

1.5.5.3. The most frightening aspect of terrorism today is that highly technological weapons of war, once possessed only by military forces of the world's larger nations, are now available to these radical groups. What would happen if sophisticated nuclear, chemical, or biological weapons fell into the hands of these unpredictable elements? The consequences, in light of their ruthless disregard for innocent human lives, are unthinkable. The 1993 bombing of the World Trade Center in New York, the 1995 release of nerve and blister agents in the Tokyo subway, and the 1995 bombing of the federal building in Oklahoma City reinforce this point.

1.6. Operations Other Than War. With increasing frequency, military forces are used for operations not associated with combat. Such operations include Operation PROVIDE COMFORT following the Persian Gulf War in 1991; the peacekeeping efforts in Haiti in 1994; and the rescue, detainment, and housing of Cuban refugees during both the Muriel Boatlift in 1980 and the over water exodus of 1994. It is difficult to deliberately plan for these operations since their requirements, timing, and location are unknown. However, the common threads in many operations are a need to beddown forces or provide a camp for refugees or disaster victims. These are activities which military forces should be able to support through normal readiness activities.

1.7. Air Force Involvement. Disasters and other crises temporarily change Air Force activities on a base—but not priorities; the mission still comes first. In a crisis, all base organizations must focus on restoring or maintaining the primary base mission, saving lives, reducing damage, and restoring mission essential resources. The nature of a crisis dictates the magnitude, the urgency, and the specific responses of the base recovery effort. In most cases prompt action is mandatory, and a team effort is required to mount an effective response. But a team effort does not just happen. The base team has to be built, equipped, trained, and exercised. The unpredictable nature of crises requires that each base and unit be prepared for a variety of circumstances. While a base cannot be prepared for every possible crisis, it can be prepared for realistic worst-case scenarios. A measure of a base's preparation is its ability to quickly adapt to unplanned situations.

1.8. Civil Engineers' Role. Civil engineers play a key role on an airbase. Each day, civil engineer personnel support more activities and units on a base than does any other organization. Not surprising then, civil engineers are involved in more pre- and post-disaster tasks than any other unit. We take the lead in emergency response planning. Engineers assist in vulnerability reduction by constructing shelters, dispersing equipment, camouflaging facilities, and much more. We assess damage, fight fires, clear hazards, provide emergency utilities, beddown military forces and disaster victims, repair facility damage, and control and monitor contamination.

1.8.1. Superb civil engineer support is vital for an airbase to perform its mission before, during, and after a crisis. Effective support of the airbase mission requires each member of the civil engineer team to be organized, equipped, and trained to react to a variety of contingencies. This is true for everyone from the commander to the lowest ranking Airmen. It applies to all CE specialties including firefighting, EOD, and Readiness/Emergency Management. The civil engineer's response to disasters and other contingencies is not limited to a unit's home base. Mobile engineer forces must be capable of providing CE support anywhere in the world on short notice.

1.8.2. While civil engineers are major players, always remember that civil engineers are only part of the base team. We must work cooperatively with the other base units to plan, prepare for, and respond to peacetime emergencies, man-made disasters, and war.

1.8.3. Engineer forces must be prepared to fulfill their mission requirements across the broad spectrum of conflicts and under a full range of environments. In addition to providing essential facilities, utilities, and support whenever and wherever required to support CONUS and theater operations, CE forces will:

1.8.3.1. Perform emergency repair of war damage to airbases.

1.8.3.2. Support force beddown of Air Force units and weapons systems.

1.8.3.3. Accomplish essential operations and maintenance functions for existing, as well as additional bases, facilities, and utilities.

1.8.3.4. Provide aircraft rescue fire fighting (ARFF), fire suppression, and other emergency services.

1.8.3.5. Perform detection, manage MOPP transition point requirements, collect detection information from UCCs, perform risk management assessment, conduct plume analysis, and advise commanders on contamination risks and recommended mitigation in a CBRN environment.

1.8.3.6. Identify, safe, and dispose of unexploded ordnance.

1.8.3.7. In the event the decision is made to abandon the airbase; CE will be instrumental in base denial, which is the functional destruction by any means available of facilities, utility systems, and equipment to deny their use to the enemy.

1.8.3.8. Manage or oversee all repair, construction, operation, and maintenance activities conducted by Air Force, Army, wartime host nation support (WHNS), or contractor organizations on Air Force facilities and installations.

1.8.3.9. Augment Major Command/Numbered Air Force (MAJCOM/NAF) staffs.

1.8.3.10. Ensure that the mission is carried out in a manner consistent with national environmental policies.

1.8.3.11. Assist in reconstitution of bare base assets following their use.

1.8.3.12. Provide installation emergency management support, coordination of incident management efforts, incident action planning, and manage the installation common operating picture during responses to all installation incidents.

1.8.3.13. Support of deploying of aircraft and personnel during wartime.

1.8.3.14. Reception of evacuees/casualties from overseas theaters.

1.8.3.15. Accomplishment of predisaster tasks to minimize loss of life and facility damage in anticipation of enemy attack.

1.8.3.16. Recovery, search and rescue, decontamination and personal support services.

1.8.3.17. Assistance to civilian authorities for Civil Defense actions when resources are available, or as directed by higher authorities.

1.8.3.18. Minimum operations and maintenance support of mission essential facilities, utilities, and airfields.

1.8.3.19. Support of tenant's wartime essential requirements.

1.8.3.20. Support of forces staged in preparation for deployment.

1.8.3.21. ARFF and structural fire protection.

1.9. Off-Base Support. Disasters are not limited to base boundaries and neither is the Air Force response. While the base mission has first priority, the Air Force does not ignore the needs of its civilian neighbors. Historically the Air Force has been a good neighbor and provided much needed assistance when civil resources were overcome by disaster.

1.9.1. There are numerous examples of this assistance: December 1955 and February 1986, Beale Air Force Base helped the local communities following catastrophic flooding in the Marysville and Yuba City communities. In March of 1964, Elmendorf Air Force Base assisted the city of Anchorage in the aftermath of the devastating Alaskan earthquake. August 1969 saw personnel from Keesler Air Force Base rapidly responded to calls for aid from Gulf Coast communities struck by Hurricane Camille. In April 1982, a Prime Base Engineer Emergency Force (BEEF) team from Carswell Air Force Base was instrumental in reconstruction efforts after a tornado ripped through the town of Paris, Texas. Overseas in November 1980, Air Force personnel supported rescue and recovery efforts in Avellino Province after the southern Italy earthquake. This history of support continues even today.

1.9.2. There are numerous ways that Air Force personnel, equipment, and materials may become involved in providing assistance during civilian emergencies. Under the Homeland Security Act of 2002, the Secretary of Homeland Security is designated the "principal Federal official" for domestic incident management and is responsible for coordinating Federal resources used in response to or recovery from terrorist attacks, major disasters or other emergencies. Specific Air Force roles and responsibilities are established in Air Force Policy Directive (AFPD) 10-8, Homeland Defense and Civil Support, and further described in AFI 10-802, Military Support to Civil Authorities. Air Force resources can also be committed without prior coordination if the local installation commander deems it necessary to save lives, prevent human suffering, or mitigate great property damage. Reciprocal agreements between military and civil fire departments and agreements between explosive ordnance disposal teams and local civil authorities are other ways that Air Force resources may become involved in off-base emergencies. At overseas locations, Air Force resources are normally committed within the context of US and host government agreements.

1.9.3. Always keep Air Force support to civilian communities in perspective. Local civil authorities are responsible for leading the response to disasters in civilian communities. The Air Force can play a support role, but does not take over. The Air Force only assists when asked by local authorities, but proper approval must be coordinated through the appropriate command level prior to providing support. Usually, that assistance is only provided if it will not take away from support of the base mission—however, the Secretary of Defense can direct otherwise. The authoritative guidance on Air Force support to civil authorities is found in AFI 10-802.

1.10. The Need for Planning. The need for predisaster and preattack planning should already be obvious. Why then so many words on this topic? Quite simply: to emphasize the need. Individuals usually know they should make plans, but too often do not get around to it They have good intentions, but they procrastinate. Some, however, do not even see the need to plan. They believe they are smart enough to decide what to do on the spot. In other cases, they fail to plan because they do not recognize a potential crisis. Even worse, a few refuse to think about a potential disaster because the cost to reduce the risk is "too much". No matter the reason, the consequences—and costs—for failing to plan can be staggering.

1.10.1. Experimental Evidence. The results of an interesting study by psychologist Alexander Mintz help make the case for the value of planning. His study clearly showed the wide difference between planned and unplanned responses in a period of stress. His tests involved 42 experiments with 15 to 21 subjects. Experimental situations consisted of a large glass bottle with a narrow mouth into which had been inserted a number of aluminum cones. These cones were attached to strings each of which was held by one of the participants in the study. The idea was for each person to pull his or her cone out of the bottle. When emergency conditions were simulated, there was an "every man for himself" attitude and traffic jams resulted. Sometimes only one or two cones were jerkedfree before the rest were hopelessly snarled. As the experiment progressed, participants were given time for prior consultation and planning. This prior planning eliminated traffic jams and, in one case, all cones were removed in under 10 seconds. This simple experiment dramatically demonstrates what happens when there are no plans for possible disasters. Cones get jammed, and strings get twisted. The real life results are much more devastating—personnel are killed and injured; resources are destroyed; minor emergencies become major disasters.

1.10.2. Planning Versus Panic. After the ship Titanic hit an iceberg, Mrs. Dickinson Bishop left $11,000 in jewelry behind in her stateroom, but asked her husband to run back to pick up a forgotten muff. Another passenger grabbed three oranges and a good luck pin, overlooking $300,000 in securities he had in his cabin. Still another passenger carried nothing but a musical toy pig into the lifeboat. There are numerous cases of people who, in their haste to escape hotel fires, jump from upper floor windows located just a few feet from a fire escape. Panic causes such strange and illogical behavior, and it can undermine effective disaster response. While planning, preparation, and training may not eliminate panic, they certainly can reduce its effects.

1.10.3. No Disaster Plan. An example of a disaster that could have been averted with proper planning occurred in Galveston Bay in 1947. It all began with a few wisps of smoke from a cargo of fertilizer carried on board the French ship SS Grandcamp. A crewman investigated, but even after shifting several bags of fertilizer, he could find no evidence of flame. He tried throwing several buckets of water in the direction of the smoke, with no effect. Next he tried a fire extinguisher. Still there was no effect. So he called for a fire hose. The foreman objected, since hosing down the cargo would ruin it. The captain was informed and he ordered that the hatches be battened down and the steam jets turned on. Turning on steam to fight fires is standard marine firefighting practice and has been used for many years. But this cargo of fertilizer was ammonium nitrate which becomes a high explosive when heated to about 350 degrees Fahrenheit.

1.10.3.1. Someone should have known how to deal with this explosive fertilizer. Someone should have made plans for putting out a possible fire in or near ammonium nitrate. But no one had done the necessary planning. So, at 0912 on the morning of April 16, 1947, the 10,419 ton SS Grandcamp and all those aboard were blown to bits. The explosion, calculated as equivalent to 1.25 kilotons of dynamite, dropped 300-pound pieces of the Grandcamp three miles away. The blast flattened surrounding oil refineries and chemical plants and set off fires and explosions to other nitrate-filled ships, grain warehouses and chemical storage tanks in the port of Texas City (**Figure 1.21.**). The accident destroyed one third of the homes in the town of 16,000 and killed at least 576 people. Additionally, the first explosion killed 26 firefighters and destroyed all of the city's firefighting equipment, leaving the city helpless in the wake of subsequent explosions. Property loss was estimated at $67 million.

Figure 1.21. Explosion of the SS Grand Camp, Texas City, Texas 1947.

1.10.3.2. As a result of this explosion, and the subsequent more violent blasts, Texas City became a scene of chaos. Although local agencies and citizens of the city worked valiantly to help the injured and reduce property damage, for the first few hours, their work was uncoordinated. There was no adequate plan for disaster.

1.10.3.3. The head of the city's disaster organization stated that they had plans for protection against a hurricane, but not for an emergency that came without warning like this massive explosion. In fact, in a meeting to expand the disaster organization's function just three weeks before the explosion, individuals had scoffed at the idea.

1.10.4. An Effective Disaster Plan. An exploding ammunition ship presented South Amboy, NJ, with a similar situation as Texas City, but the New Jersey community had a disaster plan all set to go into operation. The community response force immediately executed the plan and shifted into high gear. Personnel knew where they were supposed to go and quickly responded to their assignments. Firefighters were available to control blazes and prevent further explosions. Roadblocks were established to keep curious sightseers out and provide clear access routes for critical supplies. Effective communications and liaison channels were established between the involved agencies, as outlined in the disaster plan. Although property loss was great, loss of life was reduced and the emergency was brought under control much sooner than the Texas City disaster. The examples in this section cover peacetime disasters, but there is no less of a need to plan for the contingencies of war.

1.11. Summary. Crises can cover a wide range of very different situations. They may be highly localized, like a tornado or terrorist attack, or they may impact a large area, like a hurricane or nuclear attack. Regardless of how different each emergency may be, they have several traits in common. Almost all crises are very unpredictable and require prompt action if lives are to be saved and essential services restored. The descriptions of natural disasters, man made disasters, and hostile-actions provide an idea of the environments in which civil engineers must operate following an emergency. The discussion on the Air Force involvement in crises and the associated civil engineer's role sets the stage for more detailed discussions on CE contingency response planning.

Chapter 2

MAKING PLANS

2.1. Introduction. Experience and history have shown that actions taken during an emergency, contingency, and disaster response and recovery actions are much more effective if planned. Plans help engineers respond to crises and minimize the time it takes to organize and begin recovery actions. The longer it takes CE units to react effectively—the potential for loss of life and USAF resources is increased. Plans help focus our efforts so we do the right things quickly and the most important things first. When more than one person is involved, plans help sort out who does what and when. Plans, operating instructions, and checklists are commonly considered the products of planning. When preparing plans, never forget that personnel—organized, equipped, and trained to respond to a variety of contingencies—are the most important "product" of planning. This chapter outlines a number of plans that CE is the author, owner or part of the development team. All plans should cover some very basic areas:

2.1.1. Plans should clearly designate a chain of command, roles, and responsibilities of each level of command, and how authority is transferred (i.e., at what point does the Incident Commander officially transfer incident command on-scene).

2.1.2. Notification list for various responses.

2.1.3. Specific training and exercise requirements for teams responsible for actions outlined in the plan.

2.2. Overview. This chapter discusses contingency planning activities that civil engineers can expect to perform at base level. It lists preparations civil engineers should plan for before a crisis threatens; lists some of the capabilities needed to respond following a disaster, and also provides brief descriptions of the major plans which civil engineers must prepare or contribute to. In each case, the reader is referred to sources where he or she can find information to help prepare those plans. This chapter presents additional guidance on the preparation of the CE Contingency Response Plan as well as a discussion of the support civil engineers get and give to other base units. Formal and informal agreements that impact civil engineers are briefly discussed as are environmental protection considerations in contingency planning. The chapter touches on the need and value of checklists, discusses whose job it is to plan, and provides hints on preparing the plans.

2.3. Major Planning Efforts. Crises—major accidents, hostile actions, and natural disasters—are unpredictable and full of the unexpected. This unpredictability dictates that a base reduce its vulnerability and develop flexible responses in advance to ensure Air Force operations continue during war and after a disaster. Because of their significant roles in first and emergency response, and post-attack/post-incident base recovery, civil engineers are heavily involved in advance planning. This chapter outlines the contingency planning civil engineers are most often called on to do at base level and identifies sources to retrieve additional information for developing plans. The focal point for CE-related contingency planning is typically the Readiness and Emergency Management Flight with heavy involvement from Fire Emergency Services (FES), Operations, and EOD flights.

2.3.1. The four tables that follow contain generic lists that may help stimulate thinking on what tasks and capabilities are required to be considered during planning efforts. **Table 2.1.** outlines predisaster preparations; **Table 2.2.** highlights postdisaster CE response capabilities; **Table 2.3.** lists preattack preparations; and **Table 2.4.** presents postattack capabilities. Do not rely solely on these tables; otherwise, important preparations or capabilities may be overlooked. To further assist, the tables identify source documents to find more information on each topic. There are other useful reference materials on many of the topics, but start with these sources.

Table 2.1. Predisaster Preparations.

PLAN FOR	SOURCE DOCUMENT
A. CE Command and Control Structure 1. Organization and procedures 2. Facilities 3. Communications 4. Continuity of operations	AFPAM 10-219, Volumes 2 and 3 AFI 10-2501
B. Response Teams 1. Personnel (notification/recall/ accountability) 2. Vehicles 3. Supplies, equipment, and materials 4. Communication procedures 5. Training	AFPAM 10-219, Volumes 1, 2 and 3
C. Protection of Resources 1. Shelters (construction/stocking/management teams) 2. Dispersal (personnel/equipment)	AFPAM 10-219, Volume 2 AFMAN 32-4005 (will become AFMAN 10-2502, Volume 2)
D. Utility System Protection 1. Energy Security 2. Utility Isolation	AFPAM 10-219, Volume 2
E. Base Evacuation 1. Support for the base 2. Unit actions 3. Facility/equipment preparations 4. Unit individuals/families	AFI 10-2501, AFPAM 10-219, Volume 2

Table 2.2. Postdisaster Response Capabilities.

PLAN FOR	SOURCE DOCUMENT
A. Disaster Response Force Operations	AFI 10-2501
B. Damage and Hazard Assessment 1. Base wide 2. CE unit	AFPAM 10-219, Vol 3
C. Emergency Response (Firefighting and crash rescue)	AFI 32-2001; AFPAM 10-219, Vol 3
Table 2.2 continued on next page.	
D. Search and Rescue 1. Off-base aircraft crash 2. Collapsed facility 3. Confined spaces	AFPAM 10-219, Vol 3
E. Hazard Clearance (Downed power lines)	AFPAM 10-219, Vol 3
F. Beddown 1. Sheltering disaster victims (shelters/latrines/showers) 2. Refugees	AFPAM 10-219, Vols 2 and 5, AFH 10-222, Vols 1 and 22
G. Emergency and Backup Utilities 1. Electrical (supply/generator servicing) 2. Water (supply/treatment/ distribution)	AFPAM 10-219, Vols 2 and 3
H. Sanitation 1. Sewage disposal 2. Garbage disposal 3. Pest control (insects/rodents)	AFPAM 10-219, Vols 2 and 3
I. Debris Removal	AFPAM 10-219, Vols 2 and 3
J. Facility and Utility System Repairs	AFPAM 10-219, Vol 3
K. Contamination Monitoring, Containment, and Control (Hazardous Material response)	AFI 10-2501

Table 2.3. Preattack Preparations.

PLAN FOR	SOURCE DOCUMENT
A. CE Command and Control Structure 1. Organization and procedures 2. Facilities, Communications 3. Continuity of operations 4. Workforce rotation/rest and relief	AFPAM 10-219, Vols 2 and 3
B. Response Teams 1. Personnel (notification/recall/ accountability) 2. Vehicles, Supplies, equipment, and materials 3. Communication/authentication procedures 4. Training 5. CBRN Detection	AFPAM 10-219, Vols 1, 2 and 3
C. Beddown 1. Incoming military forces 2. Overseas dependent evacuees 3. Refugees	AFPAM 10-219, Vols 2 and 5; AFI 10-404
D. Resource Protection 1. Facility/utility system redundancy 2. Facility/utility systems/equipment hardening 3. Equipment/material/personnel dispersal 4. Shelters (construction/stocking/shelter management/ training) 5. Contamination Avoidance	AFPAM 10-219, Vol 2; AFMAN 32-4005; AFI 10-404
Table 2.3 continued on next page.	
E. Security and Base Defense 1. Anti-terrorist protective measures 2. Airbase defense preparations 3. Key CE asset/vital point protection	AFPAM 10-219, Vol 2; AFI 10-2501
F. Utility System Protection (Energy security and Utility isolation)	AFPAM 10-219, Vol 2
G. Base Evacuation 1. Noncombatant evacuation support 2. Support for the base 3. Unit actions 4. Facility/equipment preparations	AFI 10-2501; AFI 10-404, AFPAM 10-219, Volume 2

Table 2.4. Postattack Response Capabilities.

PLAN FOR	SOURCE DOCUMENT
A. Damage and Hazard Assessment (Base wide, CE unit)	AFPAM 10-219, Vols 2 and 3
B. Emergency Response 1. Structural and aircraft rescue fire fighting 2. Auxiliary Firefighting	AFPAM 10-219, Vol 3; AFI 32-2001
C. Search and Rescue 1. Collapsed facility 2. Confined spaces	AFPAM 10-219, Vol 3
D. Hazard Clearance 1. UXO safing and clearance 2. Downed power lines	AFPAM 10-219, Vol 3; AFI 32-3001
E. Airfield Damage Repairs	AFPAM 10-219, Vol 4
F. Emergency and Backup Utilities 1. Electrical (supply/generator servicing) 2. Water (supply/distribution/treatment)	AFPAM 10-219, Vols 2 and 3
G. Contamination Monitoring, Containment, and Control 1. CBRN hazards 2. Water supply monitoring 3. Limited area/CE equipment decontamination 4. HAZMAT response	AFPAM 10-219, Vol 3 AFI 10-2501; AFMAN 32-4006
H. Facility and Utility System Repairs	AFPAM 10-219, Vol 3
I. Security and Base Defense 1. Work party security 2. Convoy defense 3. Counter-terrorist operations 4. Support of airbase defense operations	AFPAM 10-219, Vol 2; AFI 32-3001; AFI 31-101; AFI 31-301
J. Sanitation 1. Sewage disposal, 2. Garbage disposal 3. Pest control (insects/rodents)	AFPAM 10-219, Vol 3
K. Debris Removal	AFPAM 10-219, Vol 3
L. Base Denial	AFPAM 10-219, Vol 3

2.3.2. While the CE unit may not be the office of primary responsibility (OPR) for all of the items in the aforementioned tables, CE does have a unit responsibility for each one. This planning is necessary for an effective CE response, and the results should be included in the CE Contingency Response Plan and associated checklists.

2.3.3. Planning for any response must automatically include provisions for the personnel/teams, leadership, equipment, vehicles, supplies, and communications needed to perform the task. It should also include provisions for training and required support from others.

2.4. Formal Plans. Considering the Air Force's worldwide commitment, it should come as no surprise that there are a plethora of Air Force plans. It is not uncommon for a base to prepare more than a dozen plans and to support another dozen or so. Unfortunately, there is not a standard list of plans. Major command (MAJCOM) planning requirements are not identical since the commands have different missions and geographical areas of responsibility. There are even differences between bases within a command. Consequently, it is not always easy to find the specific guidance desired. This section provides assistance with the planning process by highlighting the plans that civil engineers commonly contribute to, prepare, or use. These plans may not be required for all locations; however, there may be required plans that are not listed. At major bases, the BCE is often tasked to develop separate civil engineer annexes or an appendix to base plans. These annexes or appendices should briefly describe the support civil engineers provide to satisfy the plans and the support CE requires from the other base organizations. Such annexes and appendices are usually supported by more detailed information in the CE Contingency Response Plan. Always contact the base OPR and refer to source documents on each plan for preparation guidelines and format. The Wing Plans office often prints a synopsis of plans that apply to the wing. MAJCOM war plans are listed in the USAF War and Mobilization Plan (WMP), volume 2.

2.4.1. Wing Operations Plans. Each wing prepares operations plans (OPLAN) to show how the wing will execute its taskings in support of MAJCOM OPLANs. Generally, but not exclusively, wing OPLANs cover wartime taskings. OPLANs detail how the wing will fight in support of MAJCOM or air component command OPLANs. This is mentioned to distinguish these plans from a base support plan which outlines preparations which the wing must take before hostilities and what actions must occur after hostilities to "keep the jets flying" while executing an OPLAN. The Wing Plans office is the OPR for preparing war fighting OPLANs. AFMAN 10-401, Volume 2, Planning Formats and Guidance, and MAJCOM/air component command OPLANs are the source documents for wing OPLANs.

2.4.2. Comprehensive Emergency Management Plan (CEMP) 10-2. At any USAF base, the CEMP 10-2 is the "master" plan for base level emergency response to physical threats resulting from major accidents; natural disasters; enemy attack or terrorist use of chemical, biological, radiological, nuclear or high-yield explosives (CBRNE). This plan outlines actions and assigns responsibilities to agencies required to cope with catastrophes caused by the incidents mentioned above—especially those that involve nuclear or other hazardous material. This can be a very useful and versatile document. A planner can add appendices to the annexes to cover almost any disaster. A few other plans are often incorporated in this way. Civil engineers are responsible for preparing this plan, but it requires the input of many other organizations on base. This plan helps provide the basis on which to build the CE Contingency Response Plan. The directing document for the CEMP 10-2 is AFI 10-2501, Air Force Emergency Management (EM) Program Planning and Operations. This publication lays out the basic requirements; however, the MAJCOM may provide additional details.

2.4.3. CE Contingency Response Plan. This plan should provide detailed guidelines, information, and direction to help CE personnel to respond to crises. This plan should provide CE-specific guidance for supporting implementation of the base's CEMP 10-2 and other base level plans. Preparing this plan requires a major effort by the CE unit. A contingency response plan is not required for each separate operating site at a base. Separate appendices or paragraphs within the CE plan are usually adequate. At a small base, a remote site or an Air Force station, CE support responsibilities may be described in pertinent paragraphs of the CEMP 10-2. MAJCOMs ensure CE contingency response plans are prepared for USAF-controlled bases with contracted civil engineer functions. The directive for this plan is AFI 10-211, Civil Engineer Contingency Response Planning.

2.4.4. In-garrison Expeditionary Support Plan (IGESP). This is an omnibus plan (formerly known as Base Support Plan) that identifies base level actions required to support MAJCOM operations plans or contingencies of any kind. An IGESP is usually written to get a base and its units ready for war, but it is also used to support military operations other than war, such as humanitarian relief. Often this plan focuses on force beddown and accommodating transient aircraft, units, and personnel. Its purpose is to integrate all base support requirements. MAJCOMs may permit consolidation of all base-level supporting plans into the IGESP, including the installation CEMP 10-2. Total consolidation can create an unwieldy plan, so to avoid duplication the IGESP may refer to other base plans. Each MAJCOM sets the plan format within their command. This is a major plan which civil engineer planners should review. CE directly contributes to many of the annexes: CBRNE defense operations; airbase operability; EOD support; base reception; base maps; facility utilization; temporary facility plans. Engineers also provide inputs to annexes in the plan written by other units. The master source document is AFI 10-404, Base Support and Expeditionary Site Planning. In addition, refer to the plans which the IGESP supports. The Logistics plans shop normally leads development of this plan. IGESP requirements are included in the Joint Support Plan for a collocated operating base (COB).

2.4.5. Base Reception Plan. When operations plans call for the addition of forces to a USAF-controlled base, there is a need for a reception plan to effectively and efficiently receive incoming forces by ensuring arriving personnel are provided immediate protection from the effects of enemy attack, adequate living and working facilities; and arranging for the expeditious movement of arriving equipment to unit work areas. Civil engineers help bed those forces down; but even before that, engineers help determine if existing facilities can accommodate the additive forces or if temporary facilities are required. To do that, engineers need to know how many and what types of units will be arriving, when they will be arriving, when they will be leaving if the base is serving a through-put base, and where they need to work on base. The location of any temporary facilities and utility systems can then be determined and beddown plans prepared. This plan is normally an annex to the IGESP.

2.4.6. Civil Engineer Support Plan (CESP). The CESP is not a stand-alone plan. When used, it is an appendix to the logistics annex, or separate annex, of unified command war plans and is not normally included in Air Force plans. The CESP identifies the minimum essential engineering services and construction requirements required to support the commitment of military forces. Extract the base's requirements from the unified plan CESP to incorporate in the IGESP. To those requirements, add local construction and facility requirements that the base will satisfy. Explain how all requirements will be satisfied and any preattack actions that must be taken by the base.

2.4.7. Base Dispersal Plan. This plan is intended for overseas bases subject to attack. The plan provides for relocating key assets to secure locations on and off the base. Provisions must be made to be able to easily recall the assets. This information may be a stand alone plan or included in the IGESP.

2.4.8. Base Denial Plan. Overseas bases that could be attacked and overrun by an enemy force must prepare a plan to deny the use of facilities, supplies, and equipment to the enemy. The priorities and extent of denial will be decided by the commander ordering it, taking into account the potential value of the assets to the enemy. Once the order has been given, the denial of military equipment and supplies is the responsibility of the using organization. Civil engineers have a big task destroying utility systems and pavements. A plan is needed to ensure the more important items are denied first. At the many overseas locations not "owned" by the United States, denial planning is limited to denial of US-owned assets only. This plan is directed by theater OPLANs. The denial plan may be incorporated into the IGESP or a warfighting OPLAN.

2.4.9. Joint Support Plan (JSP). If deploying to an overseas base operated by the host nation, read the joint support plan for that base. The plan outlines, among other things, what part of the base and what facilities are available to deploying Air Force forces. The plan also specifies who is responsible for what tasks and who provides what support. Usually these plans are prepared by the theater MAJCOM (in USAFE by Regional Support Groups). If planning is tasked to an Air Force support base, the OPR for this plan is usually the Logistics Plans office. In that case, the support Base Civil Engineer may be tasked with providing inputs similar to those for a IGESP. The JSP should also be available from the gaining theater MAJCOM Civil Engineer Readiness and Emergency Management Office. Copies may also be available, but probably in very limited numbers, from the reception team provided by the gaining command's sponsor base.

2.4.10. Survival, Recovery, and Reconstitution Plan (SRR Plan 8044). This plan (formerly numbered the SRR Plan 55) provides guidance to improve survivability of the strategic forces and to enhance the recovery and reconstitution of those forces in the event of a nuclear attack on Air Force bases that have strategic weapon systems. As with all war plans, civil engineers are tasked with providing the facilities, utilities and services needed to support the base mission. If called for in the plan, some of the civil engineers may deploy with members of other base units to dispersal bases. If the main base is attacked and cannot support the mission, the deployed force is in a position to try to recover and reconstitute the strategic assets at undamaged dispersal bases. The deployed engineers provide as much wartime CE support—utility operations, damage assessment and repair, weapons safing, CBRNE monitoring, firefighting and crash rescue, etc.—as they have capability. Because many dispersal locations are at civilian airfields, civil engineers may be able to get support from civil resources. That support often requires prior agreements. Only bases with a SRR tasking prepare this plan. The Wing Plans office normally leads the base level planning for the SRR plan. The US Strategic Command Directive 8044 and the MAJCOM's supporting plan are the source documents for the base-level plan.

2.4.11. Installation Security Plan. This plan outlines responses the base should take when priority assets are threatened. In peacetime, the primary threat is terrorist activities; other scenarios include riot, civil disturbance, sniper, and hostage situations. Civil engineers are called on to support this plan in many ways such as EOD troops to safe a bomb, firefighters to provide Fire trucks as a psychological deterrent, and heavy equipment to block access to priority resources. Critical facilities may also require hardening, traffic barriers constructed, and fences and alarm systems installed and repaired. The Security Forces unit is the OPR for this plan and the source document is AFI 31-101, The Air Force Installation Security Program (FOUO).

2.4.12. Resource Protection Plan. Similar in purpose to the Installation Security Plan, this plan provides for protection of non-priority assets and CE support is essentially the same. At bases with priority assets, the provisions of this plan are often incorporated into the Installation Security Plan. Under this plan, all base units including civil engineers should make provisions to protect unit assets (equipment, vehicles, supplies, etc.). Civil engineers need to make sure key features of the base utility systems are not easy targets such as transformer stations, wells, water treatment facilities, pump houses, etc. Instructions for this plan come from AFI 31-101.

2.4.13. Base Defense Plan. The terrorist attacks of 11 September 2001 highlighted the fact that all USAF bases, CONUS or OCONUS, are subject to a potential threat and should prepare a Base Defense Plan. Although this is usually overseen by security forces or OSI, civil engineers may be tasked to provide construction expertise, counter mobility barrier erection and augmentation manpower for the base defense force. CE should strive to have active representation on the Base Defense Planning Group as it can result in significant tasking for the CE squadron. The directing document is AFI 31-301, Air Base Defense.

2.4.14. Stop Alert Plan. Every base with aircraft has a Stop Alert Plan. It dictates how the base responds to prevent unauthorized movement, theft or hijacking of aircraft. It also outlines how the base may assist aircrews of hijacked aircraft from other locations. The civil engineer role is usually limited to support from FES to use their vehicles to block the movement of the aircraft and EOD to counter any explosive devices that the highjacker may use. The lead for this plan is the Operations Support Squadron. Their basic guidance comes from AFI 13-207, Preventing and Resisting Aircraft Piracy (Hijacking).

2.4.15. Hazardous Material (HAZMAT) Emergency Planning and Response Plan. AFI 10-2501 and AFMAN 32-4013, Hazardous Material Emergency Planning and Response Guide, requires installations to prepare a plan that outlines how the base responds to the spill of hazardous materials, other than nuclear and explosives. While the base civil engineer is responsible for the HAZMAT plan, it requires the active support of many base organizations. Rather than a stand-alone plan, it can be incorporated as an appendix in the CEMP 10-2. At overseas installations, the guiding document for this plan is AFI 32-7006, Environmental Program in Foreign Countries. This plan will be familiar to some personnel by its previous title, the Base Spill Prevention and Response Plan.

2.4.16. Energy Contingency Plan. Also called the Energy Security Plan, this plan is developed to ensure electrical power remains available to priority mission users during and following a disaster. Many direct mission support functions on an airbase, such as aircraft maintenance and air traffic control, are dependent on electrical power; civil engineers have the job to supply it. This CE prepared plan outlines methods to protect the power system, to establish independent sources, and to provide power, including emergency backup, on a mission priority basis. The details of this plan are often included in the CE Contingency Response Plan. The source document for this plan is AFI 10-211.

2.4.17. Base Deployment Plan/Wing Mobility Plan. For bases and units with a mobility commitment, a deployment plan (sometimes called the wing mobility plan) is prepared to detail the responsibilities of getting base units ready to deploy. Base units, including the CE Prime BEEF teams; usually prepare attachments to the base/wing plan that are called mobility operating procedures or deployment procedures. Those procedures and associated checklists specify who goes, what to take, where to assemble, what to brief, who does what, etc. Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) squadrons develop their own plans, procedures, and checklists. Units will normally deploy as part of a Multiple UTC Group (MUG). The unit may be either Lead or Follow-on. Ensure compliance with the requirements in AFI 10-401 concerning MUG responsibilities. Generic information for deployment and mobility planning can also be found in AFI 10-403, Deployment

Planning and Execution. MAJCOM and base supplements are common. Additional information for CE Prime BEEF teams is contained in AFI 10-210, Prime Base Engineer Emergency Force (BEEF) Program, AFI 32-3001, Explosive Ordnance Disposal Program, the Prime BEEF Implementation and Planning Guide, and the Prime BEEF Equipment and Supplies Listings (ESL). RED HORSE guidance can be found in AFI 10-209, RED HORSE Program. RED HORSE deployment and employment information is also contained in the RED HORSE Concept of Operations.

2.4.18. Emergency Action Procedures (EAP). This is a classified document. Each level of command, including HQ USAF, delineates specific time-sensitive actions which subordinate commands are to take to prepare for war. These actions are usually packaged in the form of checklists. The specific actions vary with the level of the threat (alert condition). The actions and the method of communicating which actions are to be taken are called the Emergency Action Procedures (some commands may use a different term, but the product is essentially the same; e.g., HQ USAFE uses Emergency Action File). Subordinate units are directed to tailor the EAP and make unit specific checklists to implement the EAP taskings. CE EAP checklists can easily be included in Annex X of the contingency response plan. The wing EAP should be available within the civil engineer unit at a base; if not, contact the Wing Plans office.

2.4.19. Anti-Terrorism Plan. Commanders, down to installation and GSU level, will develop and implement an antiterrorism (AT) plan. Commanders may use a stand-alone plan or include AT annexes in their existing force protection plan. Guidelines on AT planning are found in AFMAN 10-401, Volumes 1 & 2. Stand-alone documents (i.e., Standard Operating Procedures, local regulations, or Operations Orders that articulate requirements for AT key elements) shall be replicated in and/or referenced in the AT Plan. Task appropriate level units for support, ensuring all organic, tenant and supported units are considered, and receive copies of the plans. See AFI 10-245, Air Force Antiterrorism (AT) Standards, for minimum key elements the plan shall address.

2.4.20. Medical Contingency Response Plan (MCRP). The MCRP/EOP establishes procedures for wartime, humanitarian assistance, homeland security/defense, and disaster response contingencies. The MCRP describes medical responses to contingency scenarios, clearly addressing planning aspects of mitigation, preparedness, response, and recovery. Additionally, a Hazardous Vulnerability Analysis will be included. Refer to AFI 41-106, Medical Readiness Planning and Training, for more information on the MCRP.

2.4.21. Disease Containment Plan. The installation commander will establish an installation-wide disease containment plan (DCP) incorporating tenant units, geographically separated units, civilians, dependents, and visitors (where applicable) to ensure the installation can effectively respond, mitigate, and recover from disease outbreaks as a result of biological terrorism/warfare or from naturally occurring diseases of operational significance. See AFI 10-2604, Disease Containment Planning Guidance, for more information on the DCP.

2.5. CE Contingency Response Plan Guidance. This paragraph offers a few thoughts on preparing and packaging the contingency response plan. It contains information on plan content and format, supplementing the guidance contained in AFI 10-211. Use the standard Air Force OPLAN format which is divided into two parts: the basic plan and its supporting annexes. That format can be found in AFMAN 10-401, Volume 2. The guidelines on formatting contingency response plans can be found in **Attachment 2** of this pamphlet. Bases located in overseas theaters will incorporate the Base Attack Recovery concept of operation in CE contingency plans.

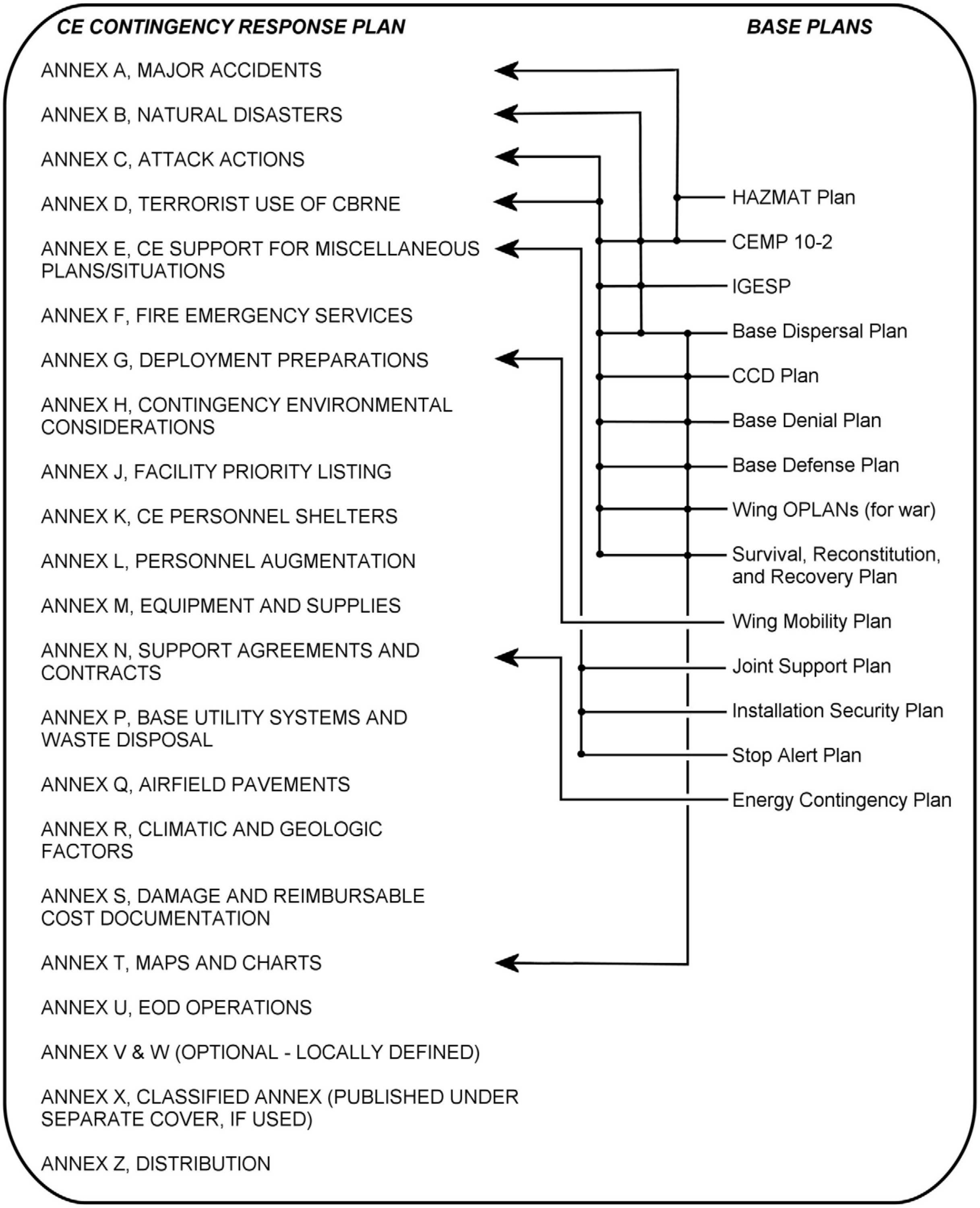
2.5.1. The Basic Plan. The basic plan contains seven sections: references, task organizations, situation, mission, execution, administration and logistics, and command and signal. When writing or editing the base plan, keep it brief—save the details for the annexes.

2.5.2. Supporting Annexes. AFI 10-211 delineates the annexes which must be used for all CE contingency response plans written by Air Force civil engineers. The preparation of a comprehensive set of annexes will require the majority of effort devoted to plan development.

2.5.3. Relationship to Other Base Plans. An effective contingency response plan consolidates CE taskings that are specified in the various base plans, and it expands on those taskings with additional details. The contingency response plan should be organized so it is easy to identify initial actions that civil engineers must take in a contingency. **Figure 2.1.** shows where in the contingency response plan to incorporate and expand on taskings from other base plans. The solid lines show the annexes that contain the details for support of the various plans. This recommended approach is offered to promote commonality between Contingency response plans. There are many possible variations, but be sure variations are necessary and "make sense." The example does not include a complete list of possible plans. Incorporate these and other plans in the annexes as appropriate to the base.

2.6. Support To and From Others. Plans should document the support civil engineers provide to others and the support received in return. Much of that support is obvious and is done routinely every day. This paragraph focuses on a few not so common tasks. This listing is a memory jogger to ensure these points are covered during the planning process. Some of these items apply more often to overseas Air Force installations, but not exclusively. Be sure to coordinate the support required with the supporting unit in advance. That support should also be documented in the CEMP 10-2 or IGESP.

Figure 2.1. CE Contingency Response Plan Relationship to Other Base Plans.



2.6.1. Mortuary Officer. Few contingencies or disasters would likely cause great loss of life on an airbase, but war is one. While the likelihood of a major attack on US airbases has diminished, the base mortuary officer (usually the services squadron commander) must still plan for processing and burying human remains when the numbers of deaths exceed the base's capability to store the remains or to ship them home quickly. The Base Civil Engineer should help the mortuary officer pre-identify burial locations. Make sure the burial sites do not create an environmental problem or interfere with other uses for the proposed sites. If interment is required, civil engineers can further help by providing equipment and operators to help dig and close the graves. EOD assists during the processing of remains by removing any explosive hazards/residue contained in the remains.

2.6.2. Tactical Deception Officer (TDO). The TDO works for the Operations Group Commander and has the job of developing plans to deceive the enemy about the use of base aircraft. This can involve base activities, the physical concealment of facilities, and deceptive use of facilities. Many other units may be involved to include civil engineers. Specific actions vary with the situation. Possible actions that engineers and others may take are presented in volume 2 of this pamphlet series.

2.6.3. Medical Group. Base medical services personnel are responsible for identifying medical and public health problems and for recommending corrective actions. This includes contingency response operations. Good teamwork can prevent a minor health problem from becoming a major impact to the base's mission. Specific responsibilities of the medical unit, as identified in AFI 41-106 include the following actions:

2.6.3.1. Provide professional and technical guidelines to DRF personnel and mobility personnel on the medical aspects of both peacetime and wartime contingency operations.

2.6.3.2. Provide technical policy to installation commanders on protection and operations in CBRN environments.

2.6.3.3. Detect, identify, and monitor CBRN conditions on installations and medical treatment facilities and medical units.

2.6.3.4. Conduct food and water vulnerability studies for employment sites and fixed installations overseas.

2.6.3.5. Ensure that applicable preventive medicine guidance is provided to unit personnel for deployments and exercises.

2.6.3.6. Verify that pre-deployment medical screening and immunization requirements for deploying personnel are identified and completed.

2.6.3.7. Provide self-aid and buddy care training to designated unit trainers.

2.6.4. Vehicle Maintenance. In addition to the normal in-shop support, arrange for mobile maintenance and repairs, especially for the heavy equipment. To facilitate this support, attempt to support them when they need help (e.g., provide them with a generator during a base power outage). Not only will it allow them to support the base and look good in the process, itwill also help ensure CE vehicles get repaired. In a contingency, contract maintenance is a possibility.

2.6.5. Base Fuels. An agreement with this shop to get heavy construction vehicles fueled in the field is most helpful. Field refueling can save a lot of time and problems. If they cannot help, look into setting up a CE refueling operation; this also applies to refueling emergency generators.

2.6.6. Base Supply. Special levels help ensure the critical, but little used and items that are not readily available from local suppliers are available for facility and utility system repairs when needed. It requires an enormous amount of funds to maintain special levels; therefore, base supply works hard to keep those levels to a minimum. A good working relationship with base supply can help make sure the items required are stocked. There is no one-time solution to this issue; the relationship must be routinely nurtured by working together and not blaming each other when needed supplies fail to show up.

2.6.7. Contracting. A good working relationship is required with contracting personnel in order to obtain supplies and equipment from local sources in a hurry. Just as important, cooperation from base supply and the base comptroller is required to ensure the paperwork gets to contracting quickly.

2.6.8. Aircraft Maintenance. Aircraft maintenance units have equipment that can prove useful in times of recovery. One of the most useful items, especially during night operations, is light carts; they usually have more than any unit on base. They also have air compressors and portable air conditioners and heaters that may be useful. Obtain the contact information of the lowest ranking person that has authority to release the assets. When requesting support, demonstrate how their cooperation will benefit the mission, because they most likely will have to divert equipment from one of their maintenance activities and live with the consequences.

2.7. Formal and Informal Agreements. Formal agreements are sometimes required to "guarantee" support called for in base plans. Such agreements are usually prepared when support crosses MAJCOM lines, is from one country to another, or is between military and civilian authorities. An effective agreement specifies what support will be provided, by whom, under what conditions, and who will pay for what.

2.7.1. As a CE planner, know what base agreements are in place, how they are implemented, and how they can be adjusted or renegotiated. Determine if additional agreements would be helpful and worth the effort to develop. Agreements are especially important when support is required from uncooperative organizations.

2.7.2. The names of the formal agreements sometimes change, but the purpose remains the same. If the agreement name is unfamiliar, ask what it is and if CE has a role. The Logistics Plans office is the base OPR for these agreements in almost every case. Whenever in doubt, start with them.

2.7.3. The following is a brief review of common agreements which can impact civil engineers:

2.7.3.1. Host Nation Support (HNS) Agreement. The term memorandum of understanding (MOU) is used interchangeably with HNS Agreement. This is a high level agreement between two countries. Rarely are base level organizations involved; however, bases may be the beneficiaries. For that reason, know what support, if any, is provided for the base or deployment location by such agreements. Some bases have received assured HNS for airfield damage repair (ADR) and for supplies through this type of agreement. If the Logistics Plans office does not have the answer, ask the MAJCOM counterpart if there are any such agreements that affect the base. Details that affect units deploying to a host nation installation can be found in the Joint Support Plan.

2.7.3.2. Joint Support Plan (JSP). This plan is a formal agreement between the host nation installation commander, the USAF commander who will use the facilities, and the USAF support base commander. It implements more general country-to-country agreements. Consequently, it will probably not be easy to alter the agreement, nor will it be done quickly. The terms and conditions in Joint Support Plans differ by country and by base. Guidance for this plan is theater specific.

2.7.3.3. Defense Support of Civil Authorities (DSCA) and Mutual Aid Agreements. These agreements are those activities and measures taken by DOD Components to foster mutual assistance and support between the Department of Defense and any civil government agency in planning, preparing for, or applying military forces and resources in response to, civil emergencies or attacks, including national security emergencies. As the name implies, they set up arrangements where organizations with like capabilities can support each other when called upon in an emergency. Fire and Emergency Services, security forces, and the medical group often enter into these agreements with their off-base counterparts. A major advantage to these agreements is the speed in which support can be initiated. Usually only a phone call from one organization to the other is needed. Agreements are not limited to those three functions; arrangements for other activities, such as environmental hazard response, can also be secured. While wartime support is not excluded, these agreements will most often be invoked for peacetime emergencies. The guiding document for these agreements is AFI 25-201, Support Agreements Procedures.

2.7.3.4. Host-Tenant Support Agreements (HTSA). These agreements detail the relationship between a host base and tenant units. The agreement specifies what support the host base provides to a tenant organization and the responsibilities of the tenant. Because this is a routine peacetime agreement, there is not usually much in it that applies to emergency situations other than the disaster responses that a base provides anyway (e.g., FES). Occasionally, however, there are units on base that have special capabilities that can be used in a disaster. Two examples are: a mobile communications installation unit has special purpose equipment which can assist in base recovery tasks: trenchers, backhoes, line trucks, etc; and a mobile air combat control unit may have portable generators that could be made available. Because of their mobility commitment, these units may not be available for every disaster, but attempt to get their agreement to participate when they are available. This agreement is the way to document their commitment. The authorizing document for the host-tenant support agreement is AFI 25-201.

2.7.3.5. Interservice Support Agreement (ISSA). Nearby military installations have capabilities to respond to disasters. Find out what they can and are willing to provide. Let them know what CE can do. Document the proposed support with an inter-service support agreement. In some cases, a mutual aid agreement does the same thing. Remember that the Logistics Plans office is the OPR for any agreement. Often, these agreements must be approved by the MAJCOM.

2.7.3.6. Inter-Departmental Service Agreement. Occasionally other federal agencies in the area have capabilities that can help the base handle an emergency. If not already provided for in a mutual aid agreement, an inter-departmental service agreement can be prepared to formalize any agreement the base can reach with the other agency. Count on additional preparation time, because this agreement must be approved above base level.

2.7.3.7. Informal Agreements. Informal agreements are probably the most useful in obtaining emergency response support and are also the most common. They are quicker to produce, and a nod of the head or a handshake is enough to seal an agreement. Certainly, the value of such agreements depends on the personality and integrity of the participants. True, informal agreements are easier to break than a formal agreement. But in most cases, except possibly with a foreign host, they probably achieve the same results (foreign hosts may be willing, but they are often severely limited as to what they can do without getting approval from higher headquarters). The major drawback of informal agreements is that they do not usually have longevity. When the individuals who make the agreements leave, it is a dead issue unless their successors continue to embrace the agreement. Be sure informal agreements with outside DOD agencies are not in violation of law by coordinating agreements with the base legal office.

2.8. Environmental Protection Considerations. Common sense suggests a base would not write environmental impact statements to wage war, respond to aircraft accidents, or put out fires. But that same common sense should also indicate that environmental awareness is still important in those circumstances.

2.8.1. War and disasters can create unexpected environmental problems. How CE responds can reduce the hazards, leave them unchanged, or increase them. In crises, CE may not have environmentally acceptable choices of action, but should at least understand the consequences of the choices. Do not use an emergency as an excuse to ignore environmental considerations. That is not smart. Poor choices can affect the base immediately, such as allowing a toxic chemical spill to get into the base drinking water. As a minimum, civil engineer disaster response actions should not make an environmental problem bigger.

2.8.2. In planning for disaster and postattack responses, be sure to cover two important environmental considerations. First, be ready to deal with hazardous materials. Identify the different points on the base where the runoff of such liquids can be contained. Ideally construct containment devices before disasters threaten. However, at most bases this is impractical, because there are so many places where runoff leaves a base. By determining where most hazardous materials are stored or transported, CE can construct containment structures in the few locations likely to do the most good. This prevents any hazardous material from contaminating the base's water sources and those of neighboring communities. Second, also be prepared to handle hazardous or contaminated solid materials temporarily in war. Identify locations to bury those materials temporarily so that the locations do not interfere with other base activities. Select sites that minimize ground water contamination from leaching action. Both of these actions should be covered in the HAZMAT Plan.

2.9. Checklists. Once a plan is written or updated, one final planning task remains—and it may be the most useful one. The CE unit should prepare or revise supporting checklists. Generally, checklists should be created for each operating instruction contained in the CE contingency response plan. Checklists should also be prepared for all other CE contingency or emergency support not otherwise covered in that plan. A good checklist summarizes the tasks specified in an operating instruction or plan; gives each task (and subtask) a number; identifies the OPR (who will do the task); and states when the task or subtask should be started and/or completed (be sure to clarify which). An execution checklist format can be simple: Task Number (also number subtasks in this column); Task Description; OPR; and Timing (if needed).

2.9.1. Prepare checklists for Emergency Operations Center (EOC) positions, unit or damage control center (UCC or DCC) positions, fire alarm communication center (FACC) telecommunicator, CBRN control center positions, shops, and response teams. It is helpful to use the same or similar task descriptions for checklists prepared at every level in the unit for the same threat or emergency. It helps communication when the DCC talks to a shop about a major accident response, for example, and both have similarly numbered checklists. The tasks are more general at the control center level and more detailed at the team/shop level. If an action does not apply to a team or shop, that number is skipped in the shop checklist. Tasks can be further divided into subtasks. For subtasks, use the same task number but add a letter or number suffix (i.e., 2a, 2b, 2c, etc., or 2.1, 2.2, 2.3, etc). It is suggested that checklists are prepared in a format similar to Emergency Action Procedures.

2.9.2. Checklists are only memory joggers that outline tasks to be performed by each CE DCC staff member and by each CE recovery or response team for each likely response situation. They give focus to a team's efforts. They help a team to get moving quickly on a recovery task versus spending valuable time deciding what needs to be done. Checklists are especially helpful when tasks are not performed often. They are great for pre-disaster preparations and can help keep complicated recovery efforts on track.

2.9.3. Checklist preparation involves more than one person and each team leader should write their own. They can include as much or as little detail as their team members need. Checklists should include such points as the tasks to be done; who will do each one; when each task must be started or completed; what equipment, tools, and vehicles should be used; and, if required, where the task is to be done. Team leaders should provide copies to the Readiness Flight whom ensures all required checklists are written. The Readiness and Emergency Management Flight then provides current copies for the CE DCC and in the EOC. Use local exercises to check the usefulness of the checklists and benchmark the best to share up, down, and across the CE organization.

2.9.4. Keep checklists current. Do not wait for a plan to be revised to update or improve checklists. Update them more frequently than the plans they support because of changes in points of contact, etc.

2.9.5. Consider sizing checklists used outdoors to fit into BDU pockets and make them water resistant. Flight crew checklist binders (5 1/2" x 8 1/4") work well for this.

2.10. Whose Job Is It To Plan? Every civil engineer unit must plan for disasters and contingencies. The plans for some units can be quite simple, for others they must be extensive. The number of plans and level of detail included in each will vary with each unit based on mission and exposure to disasters, contingencies, and war. This chapter focuses on the planning done by a civil engineer unit with base maintenance responsibilities. However, even CE units with only mobility commitments need to understand what planning is required, so they can better support those plans when they deploy. **Table 2.5.** highlights some of the planning that CE units are likely to perform or contribute towards based on their location and base maintenance responsibilities.

Table 2.5. Typical CE Planning Responsibilities by Type of Unit.

Plan	CONUS CE UNIT1	CE UNIT WITH PRIME BEEF MOBILITY1	OVER-SEAS CE UNIT	SOURCE DOCUMENT
CE Contingency Response Plan	X		X	
CEMP 10-2	X		X	AFI 10-2501
Emergency Action Procedures Checklists	X	X	X	
Joint Support Plan			Note 2	
IGESP			X	
HAZMAT Emergency Planning & Response Plan	X		X	AFI 32-7006
SRR Plan	Note 3		Note 3	Directive 8044
Installation Security Plan	X		X	AFI 31-101
Base Defense Plan			X	AFI 31-301
Table 2.5 continued on next page.				
Stop Alert Plan	Note 4		Note 4	AFI 31-301
Energy Contingency Plan	X		X	AFI 10-211
Base Dispersal Plan			X	
Base Denial Plan			X	
CE Support Plans				
Resource Protection Plans				AFI 31-101
Base Reception Plan				
Base Deployment and Wing Mobility Plan/ Checklists	X	X	X	
Host-Tenant Support Agreements	Note 5		Note 5	AFI 10-201
Mutual Aid Agreements	X		X	AFI 32-2001

NOTES:

Mobile Prime BEEF teams could be tasked to prepare or contribute to any of these plans once deployed to a base where none exist.

Only at host bases when tasked by their MAJCOM.

Only at bases with a SRR Plan tasking.

Only at bases with aircraft operations.

Only at a base where a tenant requires CE support.

2.10.1. Good local plans cannot be written at the Pentagon or MAJCOM headquarters and mailed out for civil engineer units to put in to effect. Local plans must be made using sound engineering principles, experience, and common sense. Traditionally, the Readiness and Emergency Management Flight does the CE planning, but in fact, many unit members have a role.

2.10.2. Anyone who leads a CE response team should participate and provide their inputs to each plan. The CE commander has the option of choosing anyone in the unit to lead the planning effort for one or more of the plans. This helps spread out the workload and gets more personnel knowledgeable with the unit response capabilities and requirements.

2.11. Hints for Plan Development. This section offers some hints for preparing CE plans.

2.11.1. The Process. The planning process is as important as the product. While gathering information and developing solutions for the plans, much is learned about the unit's mission, capabilities, and shortfalls. The knowledge gained from gathering information about the unit's mission, capabilities and shortfalls, and developing solutions for the plans, makes the unit better able to respond to crises. The more individuals in the process, the more knowledge expands throughout the unit and builds depth into the CE "team." Plans and checklists only document the results of the process.

2.11.2. Keep Plans Simple. Good plans do not have to be elaborate, but they do have to be easy to understand. Generally, simple plans are better and are easier to follow and more likely to be successful. No plan can cover every conceivable contingency, and experience shows that no crisis goes according to plan. Rely on the common sense and good judgment of the personnel to adapt to the situation. The planning will be adequate if personnel are organized to respond to the crises, know what to do, and have the resources to do it.

2.11.3. Answer Key Questions. The planning process is essentially an effort to answer a few key questions. There are many ways to phrase the "who, what, when, where, why and how" questions.

2.11.3.1. What does the plan's OPR want from me? Know the purpose of the plan, what inputs the OPR expects, and what format to use. The OPR should be able to provide the basic plan or at least an outline of the information from the standard five sections: situation, mission, execution, administration and logistics, command and signals.

2.11.3.2. What is the threat? What contingencies do engineers need to be prepared for? Identify all the likely natural and man-made threats to the base and its missions. Ideally, that information should be presented in the situation section of the basic plan. If not available from the OPR, review chapter one of the basic plan. It is a good place to start, but contact the wing intelligence office for terrorist and wartime threats. Threats change over time, so keep up to date. The base weather office can provide useful data on weather related emergencies. This should include the frequency and magnitude of the natural threats. Provide the commander several proposals on what threats should be included. The commander can often offer valuable insights here.

2.11.3.3. For each threat, what is likely to be targeted/damaged and how important is that function/facility to the mission? Identify the most probable targets and the most vulnerable functions and facilities for each threat. Anticipate the impact on the mission if those functions or facilities are damaged.

2.11.3.4. What permanent or temporary solutions can be employed to reduce the vulnerability of the mission-critical functions and facilities? There will never be enough money to properly protect the key facilities identified on the Critical Facilities list established through the base contingency planning group. Efforts should be made to get the most protection for the available dollars.

2.11.3.5. Based on the mission, in what priority should the base respond to recovery tasks and facility damage? This information should be updated as threats or missions change or as hardened facilities are built.

2.11.3.6. What CE capabilities are required to respond to each disaster?

2.11.3.7. What resources are needed for each response capability: personnel, equipment, vehicles, supplies, etc? What is available? Determine resource shortfalls and decide how to satisfy those shortfalls.

2.11.3.8. Who in the unit will be responsible for what tasks and what support? Establish who is to do what, with what resources and, if possible, when they are to do it.

2.11.4. Set Up A Planning Team. Many plans are the result of a few smart personnel thinking about a problem and developing common sense solutions. Certainly, one person can prepare CE plans, but that is not a formula for success; major advantages are gained by setting up a planning team. As stated earlier, getting more personnel involved in the planning process yields a better-informed unit. The additional brainpower tends to yield more suggestions and better solutions—and a better plan. In addition, when individuals feel they are part of the solution, they are more willing and better able to execute the plan or provide support for it. A part-time ad hoc team works best. Team membership can change with each plan. The team does not have to meet often. In fact the team members can meet with the leader and each other only as needed to get guidance, coordinate efforts, and turn in their work.

2.11.5. Take Advantage of the Experienced. Seek out personnel who have been at the base or in the area for a long time and ask for their help. Some will freely share their thoughts and others may ask a lot of questions. They will usually have a wealth of information and invariably reveal overlooked, but important, facts.

2.11.6. The Planning Leader's Job. The planning leader guides plan development, assigns tasks, consolidates inputs, resolves conflicting requirements, and usually drafts the plan. The leader has an obligation to improve and streamline the effort so the team does not waste time, individually or collectively. Here are some thoughts on what the leader must do.

2.11.6.1. Learn all about the plan before meeting with the team. Get and read the reference materials. Have a copy of the plan to be updated. Know it thoroughly. Find out what the OPR wants—in both details and format.

2.11.6.2. Outline the objectives for the effort. Put them on paper to explain them clearly to the team. Ask a friend to review them; if they are not clear, rewrite them until they are.

2.11.6.3. Identify the required planning tasks and designate the person responsible for each task. Specify the level of detail and format expected from them. Encourage team members to identify any additional required tasks to make the plan more complete.

2.11.6.4. Set deadlines when the tasks are to be complete. Make progress checks on the long lead-time tasks.

2.11.6.5. Encourage imagination and ingenuity. If team members develop a good idea, give them time and flexibility to verify the idea.

2.11.7. Minimum Alert Preparation Plan. One common assumption in war plans is that there will be some period of warning before an enemy attacks. During this period, the base would implement the OPLAN and begin the preparations it calls for. Most planning also calls for a minimum alert preparation plan to cover the possibility that there would be very little advance notice. When planning, identify the most critical preattack preparation tasks and place them in priority order. Do this for tasks that support the entire base and those for just the unit. Highlight those tasks in the plans.

2.11.8. Do Not Plan In A Vacuum. Civil engineers are just part of the base team. Good planning can happen only when all base units contribute. This is the only way to identify support requirements and develop agreements to provide or get that support. Be sure to coordinate unit plans with organizations outside CE whenever the plans call for or modify support requirements.

2.12. Plan Updates. It is rarely necessary to totally rewrite a well-written plan, but do not assume predecessors did a perfect job; they could have overlooked something important. Review plans on a regular basis, usually once a year, and update them when necessary. Time-sensitive material requires the most frequent updating. If such material has been properly filed by annex, appendix and tab, it is necessary only to correct those individual items. When the new material requires coordination with other agencies, distribute a copy to each agency simultaneously and use a coordination log to simplify follow-up actions. Keep a record file of coordination sheets.

2.13. Sources of Information. Few individuals, if any, know everything needed to prepare contingency response plans. Some useful documents and publications are listed here. Another good source is the experiences of others.

2.13.1. MAJCOM Instructions and Planning Guidance. MAJCOMs prepare guidance that each base in the command is expected to follow. There is no standard content or format for this guidance and is often provided in OPLANs. A CE planner can spend a lot of time and energy trying to find out if there is any special MAJCOM guidance. Start with the CE Readiness and Emergency Management Flight to see what information they have. Two other units on base may also have command guidance, the Wing Plans and Logistics Plans office. Call MAJCOM CE Readiness and Emergency Management personnel and ask for a list of current command guidance and instructions. If written guidance cannot be found on base, ask the MAJCOM functional representatives to send copies.

2.13.2. War Plans/OPLANs with Associated Time-Phased Force and Deployment Lists/ Time-Phased Force Deployment Data (TPFDL/TPFDD). Operations plans tell where and how forces will be postured to respond to a military threat. The TPFDLs are a good source to find out what units and how many personnel to beddown. These plans can be found in the Wing or Logistics Plans offices. These documents are not the most user friendly, hopefully this information is already included in the base reception plan.

2.13.3. Base Comprehensive Plan. Component Plan O (Contingency Plan) of the comprehensive plan contains information on land use that can be helpful when updating other base and unit plans. This component plan should address issues such as wartime disposal of toxic wastes, human wastes, and solid refuse. This plan reflects the results of other contingency planning.

2.13.4. USAF War and Mobilization Plan (WMP), Volume 1, Civil Engineer Supplement. The WMP, HQ USAF, and MAJCOM planning documents provide mission requirements, direction, and guidelines for periods of national emergency or war. These documents also give general guidelines to aid in disaster planning. The primary audience is MAJCOM planners, but the Civil Engineer Supplement provides good background information for the base level planner. An airbase WMP can be found in the Wing or Logistic Plans offices. The CE information is unclassified.

2.13.5. Identify applicable laws and regulations. Different laws and regulations may apply based on the location of the installation and whether the operation is supporting a peacetime or wartime mission.

2.13.5.1. Occupational Safety and Health Administration (OSHA). Within the CONUS, equipment worn by Emergency Responders must be compliant with the Occupational Safety and Health Act and DOD Instruction 2000.18. According to the Joint Program Executive Office for Chemical and Biological Defense (JPEO CBD) this applies to Emergency Responders, both on military installations and in support of civil authorities. Detailed guidance and standard exclusions are available from the Department of Defense Chemical and Biological Defense Non-Standard Equipment Review Panel.

2.13.5.1.1. Individual Protective Equipment (IPE). IPE is personal clothing and equipment required to protect an individual from chemical, biological, and some nuclear effects in a CBRN-warfare environment. The protective mask also protects the respiratory tract from radioactive particles. IPE items may, but do not necessarily, meet the requirements of PPE for emergency response where OSHA/NIOSH or AFOSHSTDs apply.

2.13.5.1.2. Personal Protective Equipment (PPE). PPE is equipment designed to protect individuals exposed to hazards from injury or illness in non-military unique occupational environments where OSHA/NIOSH or AFOSHSTDs apply, including emergency response to CBRNE incidents in the United States.

2.13.5.1.3. Military Unique Operations. Military-unique operations are exempt from needing OSHA/NIOSH and AFOSHSTDs approval; however, using this exemption within the CONUS is very dangerous. Avoid pre-planning that includes actions that break laws. During an emergency, the installation commander may do what is right and protect personnel the best way possible, but pre-planning that places people in a situation without proper equipment and training may lead to civil and/or criminal actions.

2.13.5.2. Peacetime vs. Wartime. Whether an event is an act of war or a crime is a complex determination, the implications of which will continue to challenge planning and execution for DOD in the operational environment. Within the Homeland, military responders and support personnel must be able to interact at an appropriate level with local, State, territorial, and tribal government agencies responsible for protecting their citizens. In the interim, personnel must be capable of operating under the most restricted guidance provided by current Federal and State laws.

2.13.6. Additional Sources. Many more sources for contingency planning information are listed in **Attachment 1** of this publication, particularly the instructions, manuals, and pamphlets in the 10-series publications.

2.14. Summary. Preparing plans is an important step in getting civil engineers ready to respond to a crisis. The process is more important than the product. Civil engineers contribute to most plans written at a base; however, CE is the OPR for the CEMP 10-2. Good planning is a major effort and should involve more personnel than just the Readiness Flight. Any one of the unit officers should be able to lead the preparation of the CE contingency response plan. This chapter provides guidelines for preparing that plan and identifies other planning that civil engineers must accomplish. A quote by British General Sir John

Monash puts this chapter in perspective: "The main thing is always to havea plan; if it is not the best plan, it is at least better than no plan at all."

Chapter 3

RESOURCES

3.1. Introduction. Plans give focus to contingency responses, yet are worthless unless the resources are identified and available to carry plans out. Planning identifies the personnel, supplies, equipment, vehicles, and resources required to conduct disaster responses, base recovery, and other military operations. There is one universal truth with regard to contingencies: you have to respond with the resources at hand. Consequently, preplanning should place an emphasis on acquiring required resources before a crisis threatens. Planners should also know how to get additional assets if a crisis exceeds their assigned capabilities.

3.2. Overview. This chapter is written from a civil engineer's perspective to help identify requirements and obtain resources. It is not an authoritative document on personnel, supply, transportation, contracting or other functions. Since those agencies will all execute some level of predisaster planning, contact them if detailed information on their specialties is required. The purpose of this chapter is to provide enough information and plant enough ideas to work with those organizations successfully.

3.3. Personnel. Personnel are the most important resource for all aspects of preplanning, recovery and post disaster actions. CE squadrons are comprised of talented military, government civilians and contractors—the front line forces in a disaster and recovery response. It is imperative that planning considers risk management factors and encourages safe practices. Further, planned exercises should actively assess risk assessment processes and safety practices. The next several paragraphs will discuss broad groups of people that can assist in a response, but it is this core of people assigned and ready-for-duty when disaster strikes that are the most valuable in the early hours of response. We must ensure they are available when needed by performing risk assessments to prevent careless injury with proper safety and risk management planning.

3.3.1. In-Place Forces. Each Base Civil Engineer has a substantial recovery force already in-place in the form of their squadron members (**Figure 3.1.**). Without exception, every CE unit has many talented and dedicated individuals. These very same troops routinely perform mini-miracles when given a little direction, support, and encouragement. Assigned base level CE Squadrons have the home field advantage, because they are already on-scene, intimate with the infrastructure and utility details of the base, and are already organized into a cohesive team. They will also have a strong motivation to recover their base, homes and communities. A crisis, especially war, dictates a different CE organizational personality than the one that exists during peace. The organization must switch from decentralized low intensity facility maintenance to focused high intensity repairs. Rarely will the number and mix of skills in the unit be ideal for the crisis at hand. However, a CE unit can improve its ability to respond by freely loaning personnel from one work center to another. A skilled craftsman can make many repairs with the assistance of untrained, but willing helpers from other CE shops. But this works only if individuals are more concerned with getting the job done and less concerned with having the "right" specialties on the job.

Figure 3.1. Engineers Conduct Hurricane Katrina Recovery Operations at Keesler AFB.

3.3.1.1. Military Personnel. At CONUS bases and a few overseas bases, most CE military personnel will be assigned to Prime BEEF teams. These individuals are subject to deploy on short notice. Consequently, there can be no guarantee these troops will be available to respond to a local contingency. A prudent BCE will assess the capabilities of the remaining military and civilian personnel and then prepare plans to respond to disasters with these personnel.

3.3.1.2. Civilian Personnel. Civilians in the BCE work force constitute a vital component of the disaster response and base recovery force. Civilian and military positions absolutely required to provide an initial contingency response force must be designated as “key” or "emergency essential." Emergency or mission essential employees are those who are employed at CONUS locations and are vital to the mission at their current duty station or another CONUS base during a crisis response. An emergency-essential employee is a DOD civilian employee whose assigned duties and responsibilities must be accomplished following the evacuation of non-essential personnel (including dependents) during a declared emergency or outbreak of war. The position occupied cannot be converted to a military billet because it requires uninterrupted performance so as to provide immediate and continuing support for combat operations and/or combat systems support functions. The civilian personnel office will help in designating key or emergency-essential positions. The basic guidance for establishing key and emergency-essential positions is found in AFI 36-507, Mobilization of the Civilian Workforce. Don’t let anyone harbor the idea a civilian position is not important if it is not coded key and essential. Disaster response may not be a condition of employment for the civilians in those positions, but experience shows they too are “critical” and many will make themselves available during and after a crisis without being specifically called. They are no less dedicated than the military workforce. There is one special wartime consideration at airbases in foreign countries. For security reasons, the locally hired civilians may not be allowed on base following an attack. Consequently, CE military personnel must be able to perform all base recovery tasks—without the knowledge and skills of their local civilian coworkers. Additionally, determine whether existing agreements exempt local national employees from mobilization into their national armed forces. They too may "deploy." Before planning to use locally hired civilian employees in an emergency, check with the civilian personnel office. Find out if there are any host nation laws to consider.

3.3.2. Outside Help. Even with the best planning and preparations, disasters can occur that overwhelm the capabilities of the CE organization. A fully manned and in-place CE force will not normally have enough personnel to perform all base recovery tasks as fast as needed or to operate 24 hours-a-day. There are many ways to augment the CE unit such as individual augmentees, Prime BEEF teams, RED HORSE, Army and Navy engineer units, host nation engineers, and contracts.

3.3.3. Individual Augmentees. Augmentees are available from within CE, from other base organizations and from many off-base sources. Local augmentees have the advantage of being readily available. Off-base sources usually require longer times to marshal, and may ask for TDY cost reimbursement. Keep in mind that most augmentees require training. The Readiness/Emergency Management and EOD functions have used augmentees for many years.

3.3.3.1. The Ideal Augmentee. The most useful augmentees usually come from within the organization. There is less hierarchy to go through to get them; they are easier to get for training; and they are generally more familiar with the mission. USAFE and PACAF CE units often look within the squadron first for EOD augmentees.

3.3.3.2. On-Base Augmentees. Define requirements for and request local military augmentees from the base Augmentation Duty program manpower pool which is administered by the local military personnel flight. CE will compete with other base organizations for personnel, so develop and request Augmentation Duty requirements early. Augmentees will require supervision, transportation, tools, equipment, and training. Before requesting them, decide if their muscle power is worth the extra efforts required; usually, it will be. See AFPAM 10-243, Augmentation Duty and the military personnel flight for additional information on this program.

3.3.3.3. Uniquely Qualified Individuals. Sometimes civilian employees and military personnel in other base organizations may have especially useful skills. Do not hesitate to ask for their help.

3.3.3.4. Personnel from Other Bases. For local disasters, other bases may be able to provide assistance. Decide what skills and numbers are needed, including supervisory personnel, then make the request to the MAJCOM by phone and follow up with a message. The MAJCOM staff will determine the source of augmentation. Depending upon conditions, these troops can arrive within 2 or 3 days following the request. Feeding, housing and transportation are the unit's responsibility; this applies to both civilian employees and military personnel.

3.3.3.5. Reserve Components. Air National Guard (ANG) and Air Force Reserve Command (AFRC) unit assigned personnel (individuals, UTC packages and/or entire units) may also be used for temporary manpower augmentation. Reserve component members are ordered to active duty (voluntarily or involuntarily) under Secretary of the Air Force written authority through their respective gaining MAJCOM. Funds for pay and allowances are provided from the USAF Military Personnel Appropriation (MPA man-days for volunteers or direct allocations during involuntary call-up) and are apportioned to each gaining command. Travel and per diem are paid from the using unit's (or MAJCOM's) operations and maintenance (O&M) account. Man-days can be made available to bring individuals and teams on board quickly. This works best if the personnel requested is known and are available. Request these personnel by telephone (and message) through the MAJCOM.

3.3.3.6. Civilian Over-hire. Hiring additional civilian personnel from the local economy is an option for some installations. Normally, this can take 30 to 90 days, because position descriptions must be written; the positions have to be classified and graded by the civilian personnel office, and then the jobs recruited. However, the hiring process can be expedited during an emergency, and strong emphasis from the mission support group commander can help. The availability of local craftsmen will be the unit's biggest obstacle. The over hire approach only works well when the local market has excess labor. Even then, the excess may or may not have the needed skills. Keep in mind that the unit will have to compete for this labor with the local contractors if the disaster impacts the surrounding communities. Funds must be available to pay for these forces. The money can come from the CE budget, from the base budget, or from the MAJCOM.

3.3.3.7. Mutual Aid Support. Do not overlook mutual aid agreements. While designed to provide immediate short-term support, there may be possibilities to modify the agreement to arrange for longer-term assistance. Be prepared to pay, however, for the additional help.

3.3.3.8. Military Retirees and the Standby Reserve. Active duty retirees may be ordered to active duty if the Secretary of the Air Force determines their skills are critical to mission accomplishment and not available from other military categories. Retirees do not usually deploy overseas, but replace active duty personnel who do. Standby Reserve personnel have completed all obligated or required service or have been removed from the Ready Reserve due to circumstances of civilian employment, temporary hardship, etc. These reservists maintain affiliation but are not assigned to a unit, do not perform training, and are only available during full and total mobilization.

3.3.3.9. Individual Mobilization Augmentee (IMA). One last source has limited application for most bases. IMAs may be available for use during war or the mobilization period preceding war. IMAs are Selected Reserve members not assigned to an organized Reserve unit. They are normally assigned to active duty organizations to fill individual manpower requirements during contingency or wartime operations. Forward requests, with justification, for IMA manpower requirements to the MAJCOM counterpart. Access to IMAs for contingency operations is similar to the process used for ANG/AFRC unit personnel, discussed in paragraph **3.3.3.5.**

3.3.4. Prime BEEF Teams. When a lot of outside help is needed in a hurry, the best choice is to have the assistance of another Prime BEEF team. Assuming the MAJCOM supports the unit's request, a Prime BEEF team can be on-site within two days. While supervision is not needed, arrangements for supplies, vehicle support, billeting, and messing will be required. If necessary, a Prime BEEF team can bring their own housekeeping or home station training sets so they have a place to sleep. This is unusual, so make a special request for this action. Given a contingency that occurs with limited warning, Air Force Reserve or Air National Guard Prime BEEF teams may require a longer lead time than acceptable for rapid on-scene support. However, if aware of such units in the local area that can and are willing to help, include this information in the request to the MAJCOM.

3.3.5. RED HORSE. While RED HORSE support cannot be written into the plans, ask the MAJCOM for their help. The big advantage with RED HORSE is that their squadron is essentially self-sufficient. They have the talent, vehicles, and heavy equipment to do most major work (**Figure 3.2.**). While their heavy equipment may take some time to get to the base, RED HORSE has proven they can move fast. An advance team for the 823rd RED HORSE Squadron was in place at Keesler AFB less than 24 hours after Hurricane Katrina hit the base. The follow-on team arrived within the next two days. Based on the track of the storm, they anticipated they might be needed and prepared to deploy even before Katrina struck.

Figure 3.2. RED HORSE Members Assist with Hurricane Recovery Efforts.

3.3.6. Army/Navy Engineers. Do not overlook the possibility of getting help from nearby Army and Navy engineer units. Like RED HORSE, Army combat engineer units and Navy Seabees have the talent and heavy equipment for base recovery tasks. Contact these units to see if they are willing to help, and then formally request their assistance through the MAJCOM.

3.3.7. Host Nation Engineers. A few overseas bases may be able to get support from host nation engineer units. Find out what their capabilities are, who to contact, and what procedures are required to get their support. If the crisis affects a large area, they may ask for support, since CE is likely to have more capability than the host nation units.

3.3.8. Contractors. Local construction companies can provide excellent engineer support; however, getting them on contract may be a challenge. Four conditions must exist to get timely contract support for crisis response. First, contractors must be available; that will be a problem if they have suffered substantially the same conditions that produced the problem on the installation. In addition, potential contractors may already be committed to the local public or private sector. Therefore, unless the contract is financially worth their effort, they will have no incentive to redirect their personnel and equipment. Second, put in writing what the contractor is to accomplish; this does not always mean detailed plans and specifications. Third, funds must be available. The contracting office must have money, or a very good promise of it, to enter into a contract Fourth, a good relationship and preplanning with the contracting office to ensure they are ready to use the inherent flexibility within the procurement regulations to provide crisis support is crucial. Present the requirements to the contracting office and let them decide how to meet the need. Identify possible sources, include names, addresses, and phone numbers if known. When the crisis is over, be sure to acknowledge the good support received, if the contracting office is used.

3.3.8.1. Use Requirements Contracts. Requirements contracts can sometimes be used to help with emergencies. This type of contract is used in peacetime when the Air Force knows what goods and services it desires, but does not know exactly how much it will need during a year. A unit price is agreed upon for the contractor to perform a service or deliver goods. When there is a need for an agreed service, the Air Force provides the money and informs the contractor how many units of service is desired. These contracts are usually good for just one year and have a minimum number of units the Air Force must ask for and a maximum number the contractor has to deliver. CE has used requirements contracts to remove snow, clear debris, and paint buildings. Simplified Acquisition Base Engineer Requirements (SABER) contracts are ideal for contingency support; almost every kind of construction possible is within its scope. If such a contract exists, some basic provisions may already include tasks needed to help with base recovery. There is no reason not to include anticipated base recovery tasks. Ensure the contracting office, and the contractor, knows the tasks are for emergencies. If possible, do not apply the minimums or maximums to those items, but be fair. In an emergency affecting civilian areas as well AF property, the price of construction materials tend to increase. Contractors may have to be allowed to recover material costs in such a situation. The contractor cannot afford to subsidize the Air Force for factors beyond their control. If the contractor is treated fair and a good relationship developed during normal times, there is a reasonable chance the contractor will remain loyal to the AF during a crisis. That relationship is important, because there is practically nothing that can be done if the contractor was already obligated and could not support the requirement. Be sure to include a list of these contracts in the CE contingency response plan.

3.3.8.2. Develop Emergency Contracts. Attempt to secure an emergency contract to cover a situation when no other contract is available. These types of contracts will always occur faster and be better when there is a strong relationship between the engineers and the contracting office. That relationship is developed from consistent peacetime cooperation and earned trust; command emphasis also helps. Do not overlook any avenue to satisfy mission requirements. Be aware of the level of contract effort taking place on the base and understand what waivers are required to accomplish diversion; it may involve adding a contingency clause. If unable to find a solution working with the base-level contracting office, seek advice from the MAJCOM.

3.3.9. CONUS Sustaining Backfill Requirements. When Prime BEEF mobility personnel deploy in support of major contingency operations, the losing BCE must:

3.3.9.1. Quantify the expected voids in the work force and indicate which voids contract support can fill and which will require active or reserve military backfill.

3.3.9.2. Identify and prioritize all mission-essential tasks that backfill forces must perform (e.g., sewage, water, power, and heat plant operations; emergency service call operations; readiness/emergency management, EOD, FES, etc).

3.3.9.3. Identify all mission-essential tasks that require special licenses and certifications (e.g., water plant operations, industrial waste plant operations, FES, etc.).

3.3.9.4. Address the use of the base's non-deployed active duty personnel and critical essential civilian members to support the installation's mission.

3.3.9.5. List minimum training augmenting forces will require to become familiar with the base's equipment and operations.

3.4. Supplies and Equipment. Traditionally, CE turns to base supply or the base contracting office—before and after disasters—for supplies and equipment. This section presents ideas on how to obtain the supplies and equipment needed.

3.4.1. Situation. The rules for getting supplies and equipment have become less rigid over the years. The Air Force is moving away from mandatory worldwide procedures and giving commanders more latitude and authority. Users, base supply, and the contracting office have far more flexibility to set up local procedures to handle local needs. Many Air Force instructions and manuals still apply, but they present guidelines for smart individuals rather than inflexible procedures. This does not mean that roadblocks are nonexistent. Look for the experts in each organization that understand how the supply system works. It also helps to become familiar with AFMAN 23-110, USAF Supply Manual.

3.4.2. Funding. Increased flexibility and local control discussed in the previous paragraph requires additional local funding. Less centralized funding of supplies and equipment requires users to fund for more of the materials needed. This puts an added challenge on installations when preparing for contingencies. Engineers must divert funds from their budgets to build reasonable stockpiles of supplies and equipment required to respond to disasters. Due to limited funds, it may take engineers a few years to build the needed stockpiles. Air Force budgets do not reserve funds for peacetime emergencies or disaster relief operations. Air Force commanders must use available funds as they see fit to protect life and property. Recurring conditions present a different situation. Civil engineers can and should budget each year for supplies and equipment for snow removal and other recurring events that can become crises.

3.4.3. Determining Requirements. In addition to receiving assistance from the MAJCOM, the following approach may help when developing requirements.

3.4.3.1. Timing. The best time to determine requirements is while preparing or updating plans. Identify materials and equipment to support the plans. Use a planning group to scrub the requirements and be careful not to overstate them; each recommendation should be justified.

3.4.3.2. Planning Factors. Determine equipment and material quantities by using planning factors. Requirements vary by base, the severity of the disaster, the solution one chooses to solve a problem, and many other variables. Some planning factors and requirements are relatively easy to develop; the number of sandbags in a berm is a good example, which follows. The standard bag size of 4"x8"x16" yields a volume of 0.3 cubic foot per bag. Determine the dimensions of the sandbag structure, calculate the volume of soil needed (in cubic feet), and divide by 0.3 to determine the number of sandbags required.

3.4.3.2.1. Most material planning factors and requirements for base recovery are very difficult to determine. In those cases, make an educated guess. If available, borrow planning factors from other bases exposed to the same crises. Unit personnel are in the best position to make the assumptions and to use good engineering judgment to develop the planning factors and requirements. Document any planning factors used in the contingency response plan or in a permanent, not-to-be-retired-or-destroyed file in the Readiness and Emergency Management Office.

3.4.3.2.2. The Readiness and Emergency Management Flight officer should review the planning factors at least once during their assignment to make sure they are still valid. This should be a common-sense look versus a detailed technical review.

3.4.3.3. Reality Check. After determining the necessary amount of requirements, look at the results to verify if the numbers look reasonable and if there is balance in the requirements; if not, adjust the numbers. Unrealistic numbers are possible if the calculations are blindly relied upon. There are no criteria to perform this assessment; the reality check is an intuitive, common sense assessment.

3.4.3.4. Availability Check. Once requirements are known, determine the quantity already on-hand or normally available. Also, ascertain what and how much is readily available through local sources. The difference between the sum of these numbers and the total requirements will be the deficit and must be ordered for contingency stockpiles.

3.4.3.5. Common Items for Disaster Response. **Table 3.1.** lists supplies commonly needed in emergencies; however, there may be many other needed items, but this list should stimulate thinking. Do not forget common shop equipment the unit uses every day, especially radios and batteries, and specialized firefighting, readiness/emergency management, and explosive ordnance disposal equipment.

3.4.3.6. Minimum Stocks Required. Contact the MAJCOM for required peacetime and wartime stock levels. Some examples of items which may have minimum levels include:

3.4.3.6.1. Firefighting Agents. AFI 32-2001, The Fire Protection Operations and Fire Prevention Program, details the peacetime minimum stock levels of firefighting agents equal to the total capacity of assigned firefighting vehicles at the fire station. Check with the MAJCOM for any guidance on required wartime stock levels for firefighting agents.

3.4.3.6.2. Demolition Explosives. Explosive Ordnance Disposal (EOD) flights are required to maintain demolition explosives according to AFI 32-3001. The type and quantity of explosives are listed in the EOD Equipment and Supplies Listing (ESL) for Prime BEEF mobility teams and AFCAT 21-209, Munitions Allowances for Individual Training and Training Units for training munitions. Check to see if there are MAJCOM directives pertaining to demolition explosives. Demolition explosives listed in the ESL are configured and maintained in readily deployable condition for either air or over the road movement.

3.4.3.6.3. Heating Fuels. While no longer dictated by Air Force publications, MAJCOMs may specify minimum levels for solid, liquid, and gas heating fuels.

3.4.4. Classes of Supply. The supply system categorizes materiel in ten classes. Those classes are listed in the USAF WMP, Volume 1 and are shown in **Table 3.2.**

Table 3.1. Common Items for Disaster Response.

SPECIAL LEVEL IN BASE SUPPLY	ITEMS IN SHOPS OR CE STORAGE AREAS	ITEMS IN HOLDING AREA	BULK STORAGE
large motors, generator parts, pesticides, fire extinguishing agents, pumps, transformers, aircraft arresting system tapes and pendants, compressors, air conditioning equipment for computer support, tar and roofing materials, sandbags, demolition explosives	small motors, lumber/plywood/glass, power pole insulators, wire, plumbing items (pipes, fittings, valves, etc.), generator parts, cement, pumps, transformers, electrical items (wire, switches, bulbs, fuses, circuit breakers, etc), ventilator fans, small heaters, shovels, foul weather gear, binoculars, streamers, stanchions, traffic cones, surgeon's masks, leather work gloves, magnetic compasses, field tables, desks, flashlights, coveralls	sandbags, flares, nails, steel cable, rope, emergency lights, reflectors, tarpaulins, common use tools, large plumbing items, special use pumps, plastic sheeting, small generators	sand, gravel, clay, select fill (ADR), snow & ice control chemicals, salt, water treatment chemicals, fire extinguishing agent, concrete block, brick, culverts, snow fencing, fencing

NOTES:

1. Items in each column are suggestions only. Storage location and mode (bench stock, special level, etc.) are determined at each base. Some items may appear in more than 1 column. Either or both areas can be used. The first column is suitable for high value, critical items, and items with shelf-life codes.
2. Columns 2 and 3 may duplicate shop bench stock, but held in reserve for emergencies.
3. The third column constitutes the only distinct effort to warehouse supplies and equipment for base contingency response separate from day-to-day operations for the BCE. To minimize cost and warehousing requirements, keep shelf-life items to a minimum. A complete list of these items should be included in the CE Contingency Response Plan.
4. The last column is the normal mode of storage for these items.

Table 3.2. Classes of Supply.

CLASS	TITLE
1	Subsistence
2	General Support Items
3	Petroleum, Oils, and Lubricants (POL)
4	Construction and Barrier Materials
5	Ammunition
6	Personal Demand Items
7	Major End Items
8	Medical Materiel and Medical Repair Items
9	Repair Parts (less medical repair items)
0	Mail

3.4.5. Sources of Supply. WMP, Volume 1 also lists general sources of supplies that the military planner must consider. For convenience, those sources are listed here as well.

3.4.5.1. In-theater peacetime operating stocks (POS).

3.4.5.2. Accompanying supplies (items that deploying forces take with them).

3.4.5.3. Prepositioned War Readiness Materials (PWRMS) at or near point of use.

3.4.5.4. HNS.

3.4.5.5. PWRMS outside the CONUS (requires transportation to move).

3.4.5.6. Stocks on prepositioned ships.

3.4.5.7. Wholesale stocks outside the US.

3.4.5.8. Stocks from in-theater commercial production.

3.4.5.9. CONUS stocks dedicated to a theater of operations.

3.4.5.10. Wholesale CONUS stocks.

3.4.5.11. Stock from CONUS commercial production.

3.4.5.12. Excess stock from another theater.

3.4.6. On-Base Stock and Stockpiles. This paragraph outlines the sources most often used by base engineers. The first place one turns to get supplies and equipment is obviously from the stock already on-base. Experience has shown that the supplies and equipment available for day-to-day operations are often adequate for many peacetime contingencies or disaster situations.

3.4.6.1. Base Supply Stock. Some of the items needed in an emergency may be available on the shelves in base supply warehouses. To be responsive to customer needs, base supply attempts to keep a backup stock of high use items. Supply uses its computer to track demands on each item they handle and to develop a historic demand level. Base supply uses stock funds to buy high use items that users have not yet called for. Base supply reorders items based on the demand level. In other words, supply will often order high demand items in bulk. Items with a low consumption rate are ordered infrequently, and it is possible none will be on the shelves. High demand items will be more readily available, because a pipeline for them has been established. The user pays for these items when issued.

3.4.6.2. Bench Stock. The CE bench stock is set up to support the day-to-day facility operation and maintenance activities of the CE organization. However, bench stock can be a ready source of supplies for the CE DRF. Bench stock puts high use, expendable items near the user rather than keeping them in the base supply warehouses. This convenience makes bench stock the first stop for supplies—after shop stock, of course. They are good sources for materials in an emergency, because they include the items most commonly used every day by CE. There are many items in bench stock, but quantities of each item are limited and can only support small disasters.

3.4.6.2.1. A key feature with bench stock is that the user controls them. The using organization decides what items are added and deleted and sets the authorized level for each item. This is only fair since the user pays for the bench stock items at the time of issue from base supply even though the items are not used until a later date. Bench stock is built around shop foremen recommendations.

3.4.6.2.2. Pure contingency response items can also be added, but keep two points in mind: 1) whatever is added must be paid for immediately; 2) low usage items have a way of being misplaced, usually out of neglect but sometimes from theft, and may not be available when needed.

3.4.6.2.3. Setting up a bench stock requires continuous management. Base supply does not automatically refill bench stock; to get replenishment, a refill demand has to be placed on base supply. A bench stock item is normally reordered when the number of items in a bin is less than 50 percent of the authorized level. The percentage is arbitrary and set by the user. It can be lower or higher and does not have to be the same for all items. This process allows the organization to control the amount of money it spends on bench stock.

3.4.6.2.4. When bench stock items have not been reordered for long periods, the base supply computer will highlight the item as a candidate for deletion from bench stock. This is the ideal time for the organization to reassess that contingency item to make sure it is still required. New technologies make some items obsolete, but do not arbitrarily eliminate a serviceable item just because there is a new technology. The shop foremen should be involved in identifying requirements for contingencies so they will understand why each item is included in the bench stock during the periodic bench stock reviews. This logic applies to all contingency items and sources.

3.4.6.2.5. A practical way to enhance bench stock support for emergencies is to increase the authorized levels for items the planning team anticipates the unit will need most during contingencies. If an authorized level based on normal consumption is adequate to cover contingency requirements, no adjustments are necessary. Increasing the stock levels over 2 to 3 years may be necessary to control costs. Bench stock is not an efficient method for providing low demand, high value, or bulk items.

3.4.6.3. Self-Help Store. This source is separate from base supply stocks and CE bench stock at many bases but remains a generally healthy source of common facility maintenance parts. Be cautious about accounting as some self help stores stock a mix of housing-purchased and Facility Operations purchased items driving a potential need to account and reimburse.

3.4.6.4. Special Levels. Special levels may be established in base supply to ensure critical items are on hand in the required quantities to support base contingencies. The demand for such items usually does not warrant addition to bench stock, but are mission essential and must be readily available. The user identifies the minimum quantity to be kept on hand, but do not expect supply to stock more than that number. Special levels are very important at overseas bases, especially in countries where supplies and equipment are not readily available from local suppliers. Be sure to list special level items that support contingencies in the CEMP 10-2. Doing so provides the authority and justification for base supply to maintain those special level items. Special level requests are submitted on AF Form 1996.

3.4.6.4.1. Special levels are attractive, because the user does not pay for those items until they are issued from base supply. This arrangement ties up base supply's limited stock fund, so focus on getting special levels for the most mission critical items and those with the longest lead times. Naturally, it is desirable to get the more expensive items covered as well. Attempt to get all necessary items on special level, but be prepared to compromise, listen, and work within the supply system.

3.4.6.4.2. Base supply usually stores and keeps track of special level item(s), but special arrangements can be made to store selected items in the CE area. This gives CE physical control, but CE will also have to find the room to store the items, and keep track of them. This reduces the chance that base supply will misplace the item or classify it as excess. However, CE runs this same risk if the items are not clearly marked and routinely inventoried.

3.4.6.4.3. The chief of supply has the option to establish contracts for special level items, either blanket purchase agreements (BPAs) or requirements contracts. As BPAs involve no expenditure of funds until exercised, this type of contract is most often favored by base supply. From the BCE perspective, this means that the item is not physically "on the shelf" in base supply, but must be purchased when the demand is made; a lead time delay may be involved.

3.4.6.5. Seasonal Items. Some items have a higher demand at different times of the year. Consumption is so irregular on these items that the demand level does not provide satisfactory support. Work with base supply to ensure adequate stock of seasonal items is on hand at the right times. This approach can help units better prepare for cyclic conditions that can turn into an emergency, such as an exceptionally heavy blizzard. Order these items early and keep track of their delivery status. The unit may have to negotiate as to which items base supply will hold in their warehouses and which CE must pay for up front. Some seasonal items are purchased by the user as bulk delivery items.

3.4.6.6. Bulk Delivery Items. Some items are logically ordered in bulk; sand, gravel, salt, rock, urea, bark-mulch, crushed sea shells, water and sewage treatment plant chemicals (including industrial water treatment) and oil absorbent are a few examples (**Figure 3.3.**). They often find extra applications during emergency situations. Most bulk items are ordered by sending a purchase request from the user to the contracting office. Base supply is not usually involved, because bulk items are difficult to manage. For example, it is hard to count the cubic yards in a pile of gravel and know if two yards are missing. Operating level for each item should be periodically reviewed, and quantities should be adjusted when warranted.

Figure 3.3. Stockpile Storage Yard.

3.4.6.7. Residual Holding Area. This BCE holding area contains residue from work orders, and may contain useful items in an emergency. Do not count on any specific item being there when a disaster hits; inventories often change. Items may be identified and marked for disaster support. The unit has already paid for these items and requires no additional funds.

3.4.6.7.1. Occasionally, walk through the holding area to make sure the contingency support items are still there. The BCE must keep track of what supplies and equipment are in the holding area. In addition, keep track of items by looking at the periodically updated inventory sheet. The shop foremen should definitely know what is in the holding area inventory.

3.4.6.7.2. There is a good chance that mechanical and electrical equipment stored in the holding area and exposed to the elements will not work if stored for a long time. It is a good idea to store these type items in an indoor holding area, and if important, have the shops periodically inspect and service them.

3.4.6.8. CE Contingency Stock. CE can always buy critical supplies and equipment. These items may be stored in the shops, in the residual holding area, or at any location selected by the BCE. The best way to justify buying and storing these items is to list them in the IGESP or the CE Contingency Response Plan. Inventory these stocks periodically to ensure they are still available. Do not count on backup stock in base supply unless the unit routinely orders these items.

3.4.7. Contractor Operated Civil Engineer Supply Store (COCESS). The supply system is often not responsive to CE needs because of all the non-standard parts engineers deal with, unlike the aircraft on base which the supply system can support well. Civil Engineers have tried many ways to improve supply support and one of most successful is COCESS. For most CE units, COCESS is the key to getting needed supplies and equipment quickly. This is true for both routine and disaster support. Of course, CE still has access to base supply, but they generally try to follow one basic rule in this case: only one source of supply for an item. Base supply does not want to handle items available through COCESS. This keeps base supply from having to tie up their stock funds to put backup items on their shelves which have low demand levels. Conversely, COCESS should not stock items that are also used by other organizations on base. Those items belong in base supply.

3.4.7.1. COCESS is essentially a requirements contract. The CE unit lists the types of supplies and equipment and approximately how much of each item it will need in a year. CE also provides a facility for the contractor. The COCESS contractor sets up a bench stock operation and gets materials for work orders. The prices for most of the items are set by the contract. There are provisions to get unanticipated materials as well.

3.4.7.2. Under COCESS, special levels can be set up. The BCE can either require the contractor to stock selected items (usually done at a premium price) or ask the contractor to pre-identify sources of supply that can satisfy emergency requirements within acceptable time limits.

3.4.8. Local Vendors. Each CE unit should be aware of the civilian suppliers in the area that possess the types of inventories useful to the unit. Even with COCESS, this backup is needed should the COCESS contractor fail to meet the unit's needs. In fact, identify and list these vendors in the CE contingency response plan as a source of materials following an emergency. Primary concerns when dealing with off-base civilian suppliers are transportation and payment requirements.

3.4.8.1. For the supplies to be useful , they must be transported to the work area. If CE does not have vehicles available to pick-up the needed supplies, ask the vendor if they can deliver. This can be a problem during emergencies. The vendor may not have enough trucks to transport the supplies, or the roads leading to the base from the vendor location may be impassable. It is generally not advisable to depend on the vendor to deliver supplies under emergency conditions. Base supply or transportation may be able to help.

3.4.8.2. Suppliers are normally paid by government check after receiving the bill and being assured by the receiving unit that the goods have been delivered in serviceable condition. During emergencies, a civilian supplier, especially in overseas areas, may be reluctant to accept the government's promise or check in payment for goods received. In that case, provisions will have to be made for a cash payment.

3.4.8.3. Other factors that might limit or eliminate the use of civilian suppliers are:

3.4.8.3.1. Civilian resources may be damaged or destroyed from the same disaster which impacted the base.

3.4.8.3.2. The civilian vendor may have previous commitments to furnish supplies to the civilian community.

3.4.8.3.3. The civilian vendor may take an opportunistic approach at the time of the emergency and sell goods only to the highest bidder.

3.4.8.3.4. If the emergency involves a hostile action, the civilian supplier in the overseas area may change alliances at this critical time and refuse to sell goods to the US.

3.4.8.3.5. In some overseas theaters, civilian suppliers of the military may become targets of terrorists and other covert action groups.

3.4.8.3.6. Overseas suppliers may also fall in the category where their inventories are essentially nationalized by their national military forces.

3.4.9. GOCESS. In some instances, government operated civil engineer supply store (GOCESS) is used in lieu of COCESS. While there are some procedural differences, the two operations look the same to the user.

3.4.10. CE Mobility Equipment. If the unit is short of hand tools and equipment following a disaster, do not forget about the Prime BEEF team kits. There is no better reason to use them than a crisis. Let the MAJCOM know that the unit is no longer ready to deploy immediately if the Prime BEEF kits are used. Details of Prime BEEF team kits are contained in the Prime BEEF Equipment and Supplies Listing.

3.4.11. War Reserve Materiel (WRM). WRM assets, managed according to the policies contained in AFI 25-101, War Reserve Materiel (WRM) Program Guidance and Procedures, once were essentially untouchable during peacetime; this has changed. MAJCOMs set the policy for the assets under their control. With some restrictions, WRM may be used in peacetime for disaster relief, mercy missions, and humanitarian purposes (flood, earthquake, major accidents, etc.). Generally, the wing commander of the storing base can authorize the peacetime use of WRM without advance approval from HQ USAF or other approval authorities when such equipment is required for an imminent emergency of political or humanitarian significance. When this authority is exercised, HQ USAF or other approval authority must be notified promptly. If these assets are not on base, but needed, ask the MAJCOM to provide them quickly.

3.4.11.1. Prepositioned Assets. Most WRM assets are prepositioned to place the asset as close as practicable to its point of use. Prepositioning depends on such variables and constraints as warning time, unit readiness, security of the area, terminal facilities, storage capacity, maintenance, distribution capability, and survivability. Some WRM assets are dispersed to enhance their survivability. In the event of total mobilization, airlift capability would be a limiting factor. Therefore, certain prepositioning actions have already been accomplished that will help civil engineer forces (and others) accomplish their wartime mission. For instance, both USAFE and PACAF have Base Expeditionary Airfield Resources (BEAR) housekeeping packages in storage. RED HORSE and ADR heavy equipment are also stored at several locations in Europe. In addition, USCENTAF has great quantities of BEAR equipment and vehicle fleets stored in Southwest Asia in order to support rapid deployment forces to that part of the world. These housekeeping and heavy equipment packages have their own UTCs and are pushed to their employment locations based on OPLANs. Bases that are to receive these packages should write operating instructions for setting up the assets and include them in the CE contingency response plan.

3.4.11.2. ADR Equipment Sets. Prepositioning ADR sets has increased the crater repair capability at selected overseas main operating bases (MOB). These sets are generally located at bases vulnerable to attack, and may be deployed to other sites if needed (**Figure 3.4.**). Prepositioning crater repair and spall repair materials and equipment has enhanced Air Force civil engineers' ability to support the wartime flying mission. The MAJCOM evaluates specific regional threats to determine ADR set requirements and appropriate levels of WRM, such as crushed stone, fiberglass mats, precast concrete slabs, and spall repair materials for each base. ADR vehicle sets are described in UFC 3-270-07, Airfield Damage Repair.

Figure 3.4. Airfield Damage Repair (ADR) Equipment.

3.4.11.2.1. ADR war reserve materiel assets must be kept serviceable at all times as directed by AFI 25-101. Several organizations (supply, civil engineer, and transportation) store and maintain portions of the ADR set. Special stock levels should be established as required by each MAJCOM to keep the ADR equipment serviced and in-commission at the base.

3.4.11.2.2. The WRM mobility section of base supply and the user must periodically inventory and inspect WRM equipment and materials. While in storage, inspections are made to ensure the items are present and serviceable. After use and before being returned to stock, tools and components should be inventoried and serviced.

3.4.11.3. Other WRM (O-WRM). Some bases are authorized to keep a special stock of supplies and equipment called Other WRM. These items do not usually directly support aircraft operations but are important to sustain wartime operations. In effect, these stocks are special levels, but paid for by WRM funds supplied by the MAJCOM.

3.4.12. Home Station Training Sets. Items in the home station training sets can be used to support emergencies. The allowance for these sets is contained in AS 429. They are authorized at CONUS units with a mobility tasking and are not WRM assets.

3.4.13. Military Supply Points. Military supply points are established to bring supply support closer to the user. They may be used to support Air Force activities at any contingency location where there is no base supply function. In effect, the supply point becomes a base supply to the users in those situations. Military supply points are also used overseas to support large or specialized supply items that are normally available only from a depot located thousands of miles away and requiring weeks, or even months, to reach the requesting unit. For example, the 38 CTS at Ramstein AB, Germany serves as a military supply point for generators and aircraft arresting systems for USAFE units. The MAJCOM can inform the unit if such supply points exist for CE items.

3.4.14. Resupply. A few words are needed about resupply for overseas bases during wartime or major contingencies. During major crises, military supply sources may be unable to support resupply requests from all units. Main base supply organizations will rapidly exhaust their resources. Quick resupply from depots or CONUS locations is doubtful due to limited airlift availability, especially in the early stages of a conflict. During that period, aircraft will be fully involved in moving military forces and their equipment into the theater of operations. Resupply by air is even less likely for the bulky construction materials needed by civil engineers. For these reasons, planning guidance emphasizes that overseas units should be capable of operating for 30-60 days without resupply during wartime. This gives time for the military to establish the land and sea resupply pipeline. MAJCOMs set the prepositioning objectives, but they do change, so follow MAJCOM guidance.

3.4.14.1. Traditionally, Class IV materials are "pushed" to a theater of operation during the early stages of a conflict. The items are sent based on requirements outlined by the theater unified/joint command in its CESP, which is part of the command's OPLAN. MAJCOM requirements are consolidated with the other US military services in theater. The requirements may not cover every possible item needed. They provide for a variety of items within a supply class. The user then has to make do with what arrives. Eventually, with the supply pipeline operating, the resupply operation begins to accommodate "pulled" items. Those items are shipped based on specific user requests. Unless moved by air, the Air Force depends on other services to move goods from the CONUS to the theater ports and then to airbases; by itself this is not a problem. However, the unit may or may not get what is needed. Items have a way of being diverted or stolen at the ports and at other intermediate destinations. Other units with the same requirements also compete for supplies. Whenever authorized, order materials against aircraft support priorities. Working with the MAJCOM, understand what Class IV supplies are available through the joint command and what must be done to get them. Also, find out if there are agreements for resupply from local sources. Good HNS will reduce prepositioning requirements.

3.4.14.2. The need for supplies and equipment can vary greatly depending on mission, location, extent of damage, etc. In future conflicts, expect more flexible resupply procedures to be used. This was accomplished during Operations DESERT SHIELD/STORM. A military supply point was set up at Langley AFB to handle Air Force requirements. The supply point had the capability to order and track material just as a base supply operation could. This unit also coordinated airlift requirements and set movement priorities. The use of computers and satellite communications allowed for very rapid ordering of supplies and equipment. Requests were often processed from the units in the AOR to vendors within a matter of hours. To speed delivery to the units, items were often shipped from the supplier directly to the final destination (e.g. by Federal Express) rather than by truck from the supplier to a CONUS aerial port to await transshipment by military or contract aircraft.

3.4.14.3. Even with new technologies and procedures, engineers must still face the reality that bulky construction materials will not get high priorities for movement from the CONUS. While they may eventually be shipped by sea, civil engineers must develop local sources of resupply.

3.4.15. Informal Sources. There are some informal sources of supply when little else is working. The supply sources that a civil engineer unit normally uses will be limited or nonexistent during times of disaster. Since it is during these times of limited resources that the services of the civil engineer unit are most important, no source of resupply should be overlooked. An effective salvage operation can complement the resupply network. Facilities damaged beyond repair during the emergency should always be considered sources of equipment and materials for base recovery. Another option is to cannibalize undamaged lower priority facilities to get materials to support high priority facilities. As a last resort, borrow, scrounge, or barter from nearby units of any service. Although many items will not be available through these methods, the innovative use of the resources that can be recovered or obtained will reduce the demands on the supply system at this critical time and will hasten the recovery effort.

3.4.16. Protect Supplies and Equipment. Protect materials after receiving them. There are many ways to lose supplies; here are a few to consider:

3.4.16.1. While not wanting to dwell on it, the greater the shortage, the more materials are at risk from pilfering.

3.4.16.2. Materials can also be lost due to war damage or natural disaster. Consider protecting the most critical materials by dispersing them or putting them in protected areas such as revetments. Unfortunately, dispersing puts material at greater risk of pilferage.

3.4.16.3. The biggest challenge to keep materials intact is the routine use of contingency stockpiles. There is a tendency to raid those stockpiles when a unit runs short of an item in its regular stock. There is nothing wrong with either practice as long as supplies are quickly replaced. Too often that is not accomplished, usually due to a shortage of funds. Even when no disaster threatens, materials have a way of vanishing without any record. Periodic availability checks and inventories help expose these problems.

3.4.16.4. Weather-sensitive products should be monitored closely (like urea). Open storage of salt and urea should be avoided. The greatest chance for contamination of ground water is at the storage site. The weather may degrade the product, rendering it useless. Runoff from stockpiles may clog storm drains, so monitor drainage systems carefully.

3.4.16.5. Rotate stock with a shelf life. The CE logistics section should have procedures to make sure shelf-life materials do not go bad, but they need the cooperation of the shop foremen.

3.4.17. Cost Accounting. Certain expenditures during contingency operations are reimbursable. This places great importance on accurate and timely recording of expenditures. However, the initial response phase of a contingency operation is not the time to worry about reimbursements; take care of the situation first. The CE contingency response plan should contain an operating instruction for maintenance engineering to open a work order and to notify financial management to track costs.

3.4.18. Emergency Requisition. Rather than cite the public laws or Federal Acquisition Regulations which change, it is sufficient for civil engineers to know that both base supply and the base contracting office have provisions for getting supplies and equipment expeditiously under emergency conditions. Check with them in advance to find out what must occur for them to use those provisions.

3.5. Vehicles. Obviously, vehicles are needed to move personnel, supplies, and equipment. Special equipment is also needed to perform heavy construction and base recovery tasks. The CE fleet includes both general and special purpose vehicles which are often adequate for most situations encountered during contingencies. The best way to ensure vehicles are available for a contingency is to have an active day-to-day vehicle management program and good maintenance support. That program is outlined in AFI 24-301, Vehicle Operations. State all vehicle requirements in the CE Contingency Response Plan or IGESP whether the unit currently has them or not. Sometimes units only copy their vehicle authorization list and fail to include special purpose vehicles they need for a recovery effort.

3.5.1. General Purpose (GP) Vehicles. GP vehicles form the backbone of the fleet. Allowance Standard 019 lists vehicles allowed for normal operations. The unit should review the Allowance Standard to confirm its allowance and then submit a request to the transportation squadron stating the unit's requirement with justification. The base must assign priorities to all requests. When the wing Logistics Group commander approves the request, it is then sent to MAJCOM where it competes for command priority with requirements from the other bases in the command. The MAJCOM gets funding targets from the Air Staff. The command will recommend buys from its priority list until reaching each fiscal year funding target. MAJCOM requirements are sent to the Air Staff and consolidated for fiscal year buy programs by Warner-Robbins Air Logistics Center. This process often requires annual updates and revalidation, because there is very limited funding for replacing vehicles. Acquiring a new vehicle can easily take three to four years—or longer.

3.5.1.1. Occasionally, the unit may get a temporary loan from the transportation squadron to replace a vehicle that is deadlined for maintenance or parts. Usually, the unit must accommodate the need within its fleet or temporarily rent a vehicle.

3.5.1.2. Civil engineers (and other support units) have one recurring problem with GP vehicles. These vehicles are subject to recall and redistribution to other base units with a higher priority, especially during contingencies when CE also needs them most. There has not been many effective ways to counter this problem. Let the commanders know the impact on the unit's capabilities when this happens. Work with the transportation squadron and the logistics group commander to ensure unit vehicles are listed with appropriate priorities for the various contingencies. Know which of the unit vehicles are subject to being pulled away to support others and do not count on them being available. The commander's weekly update briefing (if applicable) is a good forum to highlight overall vehicle status and specific problems.

3.5.2. Special Purpose Vehicles. Experience shows that this category of vehicles is most often critically short during contingency operations (**Figure 3.5.**). Depending on the installation's mission, other base agencies may be authorized vehicles similar or identical to those in the CE fleet. If this is the case, a listing of such specialized equipment, by type or capacity and by organization (including Army Air Force Exchange Service, non-appropriated funds, etc.) should be maintained in the CE CRP.

Figure 3.5. Special Purpose Contingency Vehicles.

3.5.2.1. The unit receives special purpose vehicles in the same manner as that of general-purpose vehicles. However, special purpose vehicles tend to be expensive and compete for the same pot of money as general-purpose vehicles. The temptation is very strong for the command to recommend buying ten pickups for daily use rather than one excavator. There are no good solutions except to be thorough when preparing the request; make the justification strong, but realistic. Line up MAJCOM support in advance by letting the MAJCOM CE staff know what the unit needs and why. They can, and should, support those needs. Occasionally, the MAJCOM or Air Staff will provide vehicles in a downward directed program. Many ADR and firefighting vehicles were purchased that way. To obtain a vehicle not listed in an allowance standard requires a powerful justification and usually needs to show cost savings. Based on experience, the special purpose vehicles listed in **Table 3.3.** are critical assets during contingencies.

Table 3.3. Special Purpose Vehicles Important for Contingency Operations.

Special Purpose Vehicles	
Crane	Dump Trucks
Front-End Loader and Attachments	Bulldozer
Backhoe	Line Truck
Grader	Mobile Emergency Operations Center (MEOC)
Low Boy with Tractor	ADR Equipment and Vehicle Set
High-Reach/Bucket Truck	Aircraft Rescue Firefighting (ARFF) Vehicles
Sweeper (Flightline and Street)	HAZMAT Response Van/Trailer
Water Distribution Truck	Up Armored Heavy Hummer Variant (HHV)

3.5.3. Firefighting Vehicles. Firefighting vehicles (**Figure 3.6.**) are authorized based on aircraft assigned, or supported, and as specified in AS 019. MAJCOM Fire and Emergency Services identify special requirements. The total number of personnel authorized in each fire department is based on the number of firefighters required to manage various emergency events. When contingency circumstances dictate the use of alternate water sources or refueling points, include this data in the CE CRP for quick reference.

Figure 3.6. Firefighting Vehicles.

3.5.4. Explosive Ordnance Disposal Vehicles. Both general and special purpose EOD vehicles are authorized based upon the mission and MAJCOM unique requirements, and as allowed in AS(s) 012, 156, and 456. Special purpose vehicles include the armored vehicles listed in **Table 3.3.** The vehicles listed in AS 156 are prepositioned at overseas locations, at CONUS bases supporting bombing and gunnery ranges, and the Silver Flag Exercise site only.

3.5.5. Readiness and Emergency Management Vehicles. The mobile emergency operations center (MEOC) is an alert vehicle assigned to the CE Readiness and Emergency Management Flight. It provides the incident commander with command, control, and communications support for disaster response operations. It is typically equipped with communications equipment (radios, cellular telephone, fax machine, public address systems), sirens, maps/charts, and other disaster response equipment.

3.5.6. Rental Vehicles. The unit may be able to satisfy shortfalls by renting vehicles and heavy equipment. Operation DESERT SHIELD/STORM revealed that this is true for bare bases as well as for main bases. However, this method of obtaining vehicles and equipment is highly dependent upon the beddown locations. Less developed nations cannot supply many types of special purpose vehicles as was experienced in Operations ENDURING and IRAQI FREEDOM.

3.5.6.1. Shortfalls may exist on a main base when vehicles are damaged, when out-of-commission for parts or maintenance, or when there are simply not enough assets. A list of off-base sources for general and special purpose vehicles should be compiled by the base and maintained in the CE CRP. Where renting is contemplated, blanket purchase agreements (BPA) will prove sufficient at most main bases. For predictable conditions, such as snow removal, requirements contracts can be considered. In either case, actual or sample purchase requests (AF Form 9) can be prepared in advance with as much data filled in as possible. File these forms in a convenient location and note this information in the CE CRP. Sample forms can be included in the plan.

3.5.6.2. In the case of bare bases, WRM or other vehicles may not be there at all. This is especially true for ADR and other heavy equipment. Arranging for these items in advance may not be possible, but it becomes a high priority after a CE team arrives. The team leader must locate available civilian equipment and simultaneously make contact with the contracting officer. This information should be covered in the joint support plan for the beddown location.

3.5.7. Borrowing Vehicles. Depending on the location, it may be possible to borrow vehicles from neighboring bases or other governmental agencies. If so, be sure to include what type of vehicles and points of contact in the CRP.

3.5.8. Spare Parts. Because vehicles are so vital to CE performance, keeping them operating should have a high priority. Work with base transportation to ensure specialized vehicle repair parts and tires are available.

3.6. Air Force Contract Augmentation Program (AFCAP). AFCAP is a contingent tool to provide Civil Engineer and Services personnel with a force multiplier by leveraging use of the commercial sector in meeting urgent mission requirements. AFCAP is a cost reimbursement or firm-fixed price contract tool providing cost effective, responsive solutions to meet urgent realities of today. The AFCAP tool is only available for contingency situations and designed for rapid design/construction, service contracts and logistics/commodity solutions. Depending on urgency, degree of requirements definition or task stability, contracts can be tailored into firm-fixed price, cost-plus fixed fee or cost-plus award fee task orders.

3.6.1. AFCAP consists of five key players; 1) the customer, 2) MAJCOM Civil Engineer or Director of Services, 3) AFCAP program managers located at HQ AFCESA/CEO, 4) AFCAP contracting officers (AETC Contracting Detachment at AFCESA), and 5) the six AFCAP contractors (Bechtel, CH2M Hill, DynCorp, Readiness Management Support, URS and Washington Group). The customer is responsible for providing on-site contract administration, quality assurance and task order surveillance. The MAJCOM Civil Engineer/Director of Services (or delegated individual) provides resource advocacy, appropriate programming and guidance on execution method to complete tasks. The AFCESA AFCAP program managers work as an interface between customers and the AFCAP contracting officers to solidify requirements available under this contract.

3.6.2. AFCAP can be the right choice to satisfy increased support requirements and sustain forward locations facing extended operational life. The AFCAP contract has provided continuity—many AFCAP contractor personnel have been deployed for one year, or in many cases, longer. Power production and professional engineers are two examples across Southwest Asia. AFCAP can and has provided everything from air traffic controllers, WRM equipment augmentation, power plants, heavy equipment leases, and even rock quarry operations and concrete batch plants. For civil engineers, the products and services can include: planning and design; infrastructure and facility construction, operation, maintenance, sustainment, revitalization; reconstitution—tear-down, clean-up, repacking, site restoration, environmental restoration; disaster recovery (terrorist or natural disaster), and the list goes on. Basically, AFCAP can perform any task expected from a CE, Services, or RED HORSE squadron, with only a few exceptions.

3.6.3. Air Force policy imposes a few constraints on AFCAP use. The initial response and force beddown for military operations or exercise scenarios cannot be contracted. Public Law limits contracted support for CONUS fire crash rescue to only circumstances where a shortfall is caused by military deployments. Also, contracted EOD support can be for range clearance operations only. Lastly, AFCAP is not allowed to run a mortuary operation (inherently Governmental) and cannot operate field exchanges (money generating activity).

3.6.4. In addition to AFCAP, other Air Force wide contracts may be in place to fill contingent needs.

3.6.4.1. Contact AFCESA/CEO, Operations and Programs Support Directorate, at DSN 523-2275 or commercial 1-850-283-2275 to discuss specifics and assist you in getting the process started. A task can be underway in 4 to7 working days, although in emergencies, it may take less than 24 hours.

3.6.4.2. The Air Force Center for Engineering and the Environment (AFCEE) also offers ready access contract support services. Contact their Environmental and Construction Contracting Directorate at DSN 240-6306 or commercial 210-536-6306 for inquiries.

3.7. Summary. Let personnel, supply, contracting, and transportation work unit requirements, but keep close track of what they are doing. If the unit cannot satisfy needs with assets on base, attempt to find sources in the local community, at other Air Force bases, at other DOD military installations, with other governmental agencies, or with HN military and civilian agencies. Always find out who to contact (name, phone number, address) and what procedures to follow to obtain the desired assets.

3.7.1. Document that information in the CE CRP. The MAJCOM can be a great source of help to get support moving to the base in a hurry. Make requests through the installation commander, but provide the MAJCOM civil engineer a heads up. By doing that, the MAJCOMCE staff can start working solutions to the problem even before a formal request for help arrives.

3.7.2. This chapter opened with a universal truth andcloses with a second. CE needs the help of other organizations to acquire resources. Unfortunately, they will not always—and sometimes cannot—deliver the goods. It is tempting to blame others when the unit cannot obtain needed material to support the mission; avoid the urge. Keep the commander informed and look hard for other ways to accomplish the job done. Do not take no for an answer, but be prepared to pay for the needed support.

Chapter 4

ORGANIZING TO RESPOND

4.1. Introduction. Organizing CE response teams before a disaster occurs reduces initial postdisaster confusion and helps initiate recovery activities quickly. A unit may not have all the personnel or equipment needed, but effective organization helps make the resources that are available more effectual. Anticipate what tasks will be required before, during, and after a crisis—and then ensure teams are organized and trained to perform each task.

4.2. Overview. This chapter highlights how a typical Air Force base organizes to respond to disasters and how civil engineers fit into that organization. It provides an example of how CE squadrons can organize for peacetime postdisaster response and wartime postattack response to recover the base. The chapter details the role and composition of special response teams that civil engineers may need, and offers tips for organizing those teams. It closes by discussing the organizational relationship the host CE squadron should maintain with augmentees during contingency operations.

4.3. Base Organization for Disaster Response. The Air Force relies on the Installation Control Center (ICC) and Emergency Operations Center (EOC) for both peacetime and wartime airbase command and control organization. Additional information on the organization and manning of the ICC and EOC can be found in AFMAN 10-2501. The base level organization for disaster response and base recovery can vary between bases, but the differences are not usually significant, often only in name. Regardless of how the base is organized, similar functions and tasks must be performed permitting some relatively universal observations about organizing for disaster and wartime responses.

4.3.1. Peacetime Emergencies. The base level disaster response structure is flexible, allowing it to adapt to the situation. Normal base emergency response forces (i.e., FES, security forces, or base medical services) handle minor incidents. As response requirements become more complex, the emergency response organizational structure expands both horizontally and vertically. The peacetime organization focuses on saving lives and protecting property. In 2004, the Air Force formally adopted the National Incident Management System (NIMS) and the Incident Command System (ICS) to comply with Homeland Security Presidential Directive (HSPD) 5 to have a single integrated disaster management system. The NIMS concept, and organizational and command structure, is used to respond to major accidents, natural disasters, and other peacetime contingencies beyond the full-time emergency response agencies. This concept is implemented as the Air Force Incident Management System (AFIMS) as defined in AFI 10-2501.

4.3.2. Base Attack Recovery Operations. In high threat areas, enemy combatants, terrorism, and insurgency actions can be expected. Bases should prepare for damage, intense recovery actions, and possible hazards, such as UXO and chemical warfare agents, following an attack.

4.3.2.1. The ICC, led by the wing commander, is responsible for controlling all wing activities to support higher headquarters' taskings. The activities include such things as sortie generation, aircraft maintenance, base defense, base recovery, etc. Since the ICC may be saturated with operational tasks and requirements, the EOC is established as a command and control element to direct and monitor preattack survival actions and postattack recovery. The EOC, normally directed by the mission support group commander, receives mission requirements from the ICC. The EOC then provides recovery guidance to lower level organizations, usually through their control centers. Just as with peacetime responses, civil engineers play a major role in base recovery operations.

4.3.2.2. This is not a wholesale organizational change from the peacetime disaster response structure. In fact, the two organizational structures are more alike than different. One difference in the wartime EOC is focus. The wartime EOC organization, like its predecessor the Survival Recovery Center (SRC), is created to restore mission capability first and then to save lives and protect property. In many locations the wartime EOC may closely resemble the SRC in manning and activities as the entities' requirements have not significantly changed and the EOC construct is flexible to allow for the similarities while the AF adopts a common set of terminology in line with NIMS and AFIMS.

4.4. Civil Engineer Squadron. Now to the real thrust of this chapter—organizing the CE unit for disaster response and base recovery. **Figure 4.1.** outlines the peacetime organization for a typical CE squadron, and **Figure 4.2.** shows a further breakout of the operations flight. Although the actual organization can vary between units, this basic structure is sound for responding to most crises. Some organizational adjustments must be made for a crisis, especially during war.

4.4.1. The base civil engineer generally controls CE responses from either the CE UCC or from the EOC, depending upon the situation. As a rule of thumb, the BCE will be in the EOC to provide support to the mission support group commander. When in the EOC, the BCE has a small staff from various flights within the CE community to run the CE operations within the EOC facility. This small staff is filling Emergency Support Functions (ESF) along with the Readiness and Emergency Management Flight (the installation's emergency managers and OPR for ESF 5). In a contingency environment, additional personnel are added to perform emergency management cell activities and to receive and plot facility damage and UXOs. The BCE provides direction to the CE DCC and to the few CE teams that are directly controlled from the EOC (normally FES, Readiness/Emergency Management and EOD teams through their senior staff representatives accomplishing ESFs 4 and 5 roles).

4.4.2. In any disaster, the Readiness and Emergency Management Flight Chief and flight personnel perform many key functions. They advise the mission support group commander and the BCE on response options. They act as facilitators and coordinators for the DRF. They activate the EOC and respond on-scene with the MEOC, depending on the situation. In each case, they are the custodians of the command and control facilities and are responsible for doing the little and big things needed to keep the EOC or the MEOC operating. The base readiness support team augments the primary Readiness and Emergency Management Flight personnel as required.

4.4.3. Other than the FACC, engineers must activate a control center to direct the efforts of CE forces. The control center keeps the CE forces focused on what is most important and arranges support for them. Normally, the Operations Flight Commander leads the control center and is supported by selected flight chiefs, element leaders, damage plotters, and radio operators.

Figure 4.1. Standard CE Squadron Organization and Manning.

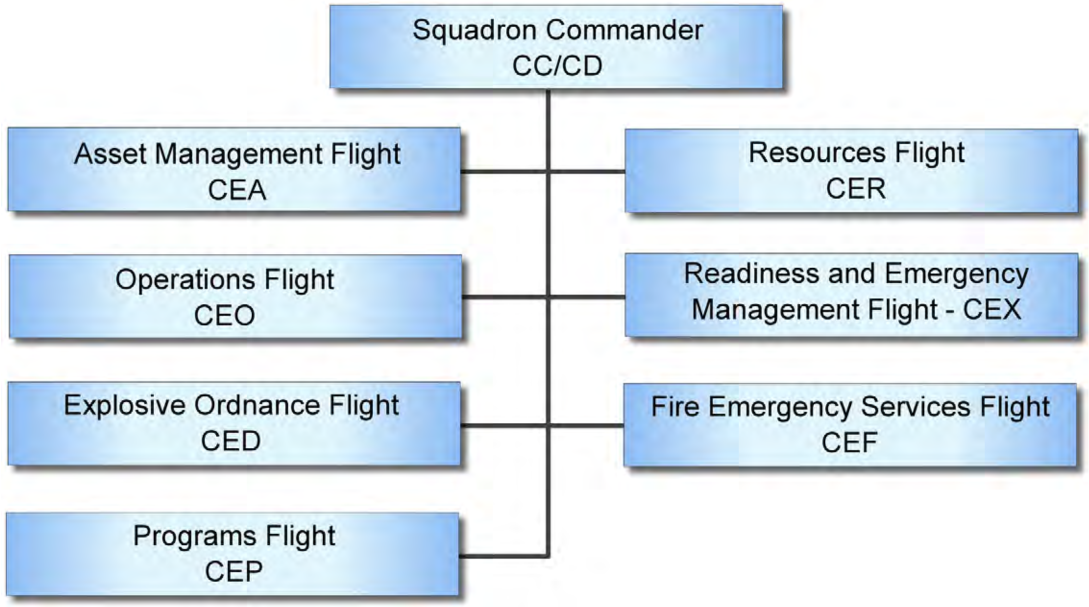
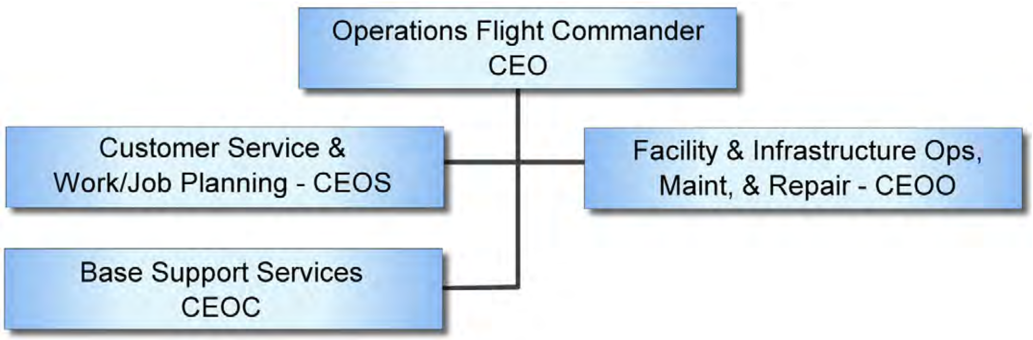


Figure 4.2. CE Operations Flight Organization Chart.



4.4.4. There are some conditions whenthe CE disaster control centersupports, but does not direct, the actions of selected CE teams. At major accidents and for "normal" emergencies, firefighters are controlled on-scene by an incident commander (IC) that is the senior fire officer (SFO), and supported by the FACC and the CE control center. During recovery operations, the IC will direct operations at the incident site. In addition, during recovery operations, the damage assessment teams (DAT) and EOD teams are normally controlled directly from the EOC due to time sensitive response requirements.

4.4.5. Another organizational adjustment is to form teams capable of responding to anticipated emergencies and performing recovery tasks in respons e to the emergency. When possible, organizing response teams should be nothing mo re than assigning anticipated tasks to existing BCE shops or flights. Ideally, every response team would consist of individuals from only one shop. Doing so eases command and control and logistics problems, esp ecially if the same crews and leaders are kept together for all tasks. But indi vidual shops are not always or ganized with the personnel, skills, or equipment to handle large scale or major multi-s kill tasks. Consequently, BCEs must often combine the capabilities from two or more shops, or flights, to respond adequately. Form a multi-shop team by selecting a lead shop to perform a task and augment that team from other shops when additional capabilities are needed.

4.4.6. Each crisis drives different requirements. However, the response and recovery tasks required during many crises are similar. Therefore, civil engineers can form relatively few teams to do common tasks. The process of building teams requires a unit to decide what situations to plan for, what tasks to perform for each situation, and what shops or multi-shop teams to assign to the tasks.

4.5. Civil Engineer Response Teams. Many peacetime emergencies can be handled without forming multi-shop teams, but a major natural disaster, a major accident, or a base attack definitely requires special teams in addition to standard shop support. The following paragraphs outline three scenarios and suggest the types of teams to form in response to each crisis. They are just examples and not meant to be all-inclusive. They are offered to help prepare for other crises that may be faced as well. The structure and personnel of the objective squadron are used for these examples. No distinction was made between military or civilian positions. In any shop, everyone must be able to do the assigned tasks. When appropriate, augmentees from the base augmentation duty program are used, especially the readiness support team. These scenarios do not apply to every base, so use what information applies and set aside the rest. Adjust the proposed teams to fit local base requirements and resources, and include the details in the contingency response plan (see **Attachment 3**).

4.6. Bomb Threat. Any installation can be the target of a bomb threat. The EOC usually directs the base response to bomb threats. Security forces and civil engineers play major roles. CE EOD forces render safe explosive devices while other CE forces take actions to limit damage should a device explode. This threat can involve a number of CE shops, but probably not the entire unit. This is a scenario that CE peacetime organization supports well. While the control center may be activated, no special multi-shop teams need to be formed. The CE response is outlined in **Table 4.1.** Additional details on other teams follow in **Table 4.2.** Other CE shops may also be players in a bomb threat. For example, the heavy repair element can build soil blast berms or place heavy equipment to form blast barriers or traffic barricades. When other shops are called on, they can expect to perform tasks they commonly do or require no extra training. Such tasks are identified on-scene and cannot be anticipated. Upon notification of a crisis, sharp shop leaders decide which work crews or individuals they would dispatch if called upon and give those individuals a heads-up. This last bit of common sense applies to every crisis.

4.7. Major Natural Disaster. No matter its location, every base is vulnerable to some form of natural disaster. In this scenario, reestablishing the flying mission may not be the most immediate priority, the ICC will provide guidance as to its relative priority. Support from off base or from other military units is available, but not necessarily in the local area. CE can assume facilities and utility systems are damaged across the entire base. Such a disaster requires a base wide response, and that response is controlled from the EOC through unit control centers. This example is included to show how an entire CE unit might respond to a situation that can be supported from the existing shops. A few multi-shop teams may be required. A logical assignment of functions to shops or teams is outlined in **Table 4.1.** Of course, an actual situation can easily dictate adjustments to this list.

Table 4.1. Potential CE Team Organization and Responsibilities Matrix.

Team	Description	Source of Members	Team Size	Comments
Bomb Threat Response Team	Command and Control: MEOC CE Unit Control Center	CE Readiness Flight	2 1	The MEOC is driven to the disaster site to provide communications capabilities for the incident commander. Readiness flight personnel advise and assist the incident commander on emergency response procedures. Team also maintains on-scene incident events log and an emergency communications capability through the MEOC. One person should staff the MEOC while the other stays close by the incident commander to advise him or her. Readiness personnel are not in command. During initial response, the senior Fire Officer, EOD or Security Forces representative will generally be the incident commander.
	Vulnerability Reduction—Utilities Isolation: Electrical Distribution Crew Utilities Crew	CE Operations Flight	1-2 1	
	Hazard Clearance	EOD Team	1-2	
	ARFF/Structural	Firefighter Crew	2-4	
	Other Support	Heavy Equipment Crew	*	
Emergency Support Function (ESF) (CE Rep)	The CE representative is a CE officer or Senior NCO. A SFO and Senior EOD representative serve on the CE Response team and lead the command effort during initial response actions.	CE Squadron	2-3	Advises the EOC director of CE related issues and coordinates CE recovery teams once senior FES, EOD or SF personnel turn over command after initial response phase is complete.
Emergency Operations Center (EOC)	Provides guidance to the Wing or MSG CC on passive defense actions, CBRN and UXO hazards, protective actions and CE base recovery activities.	BCE Rep (32EXX) CEX Rep (3E9X1) CEP Rep (3E5X1) EOD Rep (3E8X1) CEF Rep (3E7X1) CEO Rep (3E6X1)	3-6	Members record and plot damage and hazards; keep track of recovery status; answer phones and operate CE radios and keep counterparts in the DCC informed. CBRN Defense Cell directs the CBRN surveillance teams and provides technical guidance to unit shelter management teams.
Alternate EOC	Keeps duplicate CE related data from the EOC. Should be able to assume primary CE EOC role with little or no notice.	BCE Rep (32EXX) CEP Rep (3E5X1) CEX Rep (3E9X1) CEO Rep (3E6X1)	3-4	Depending upon perceived threat and availability of forces, this team may only consist of 2-3 personnel to maintain continuity if the primary center is destroyed. Some bases may choose not to staff an alternate EOC until

Table 4.1 continued on next page.

Team	Description	Source of Members	Team Size	Comments
Damage Control Center (DCC) or CE Unit Control Center (UCC)	Directs all CE response activities; coordinates those activities with other base organizations; arranges support from others as needed	BCE Rep (32EXX) CEO Rep (3E6X1) CEF Rep (3E7X1) Damage Plotters (2 – 3E5X1)	7-11	In this example, control and communications for FES is included in the CE control center. Some bases may choose to include a second infrastructure support representative so both water and electrical distribution are represented
Alternate DCC	Tracks and records information plotted at the primary CE control center, so it can assume the primary control center role if required. Provides backup control and communications for FES	BCE Rep (32EXX) CEX Rep (3E9X1) CEP Rep (3E9X1) CEO Rep (3E6X1) As reqd for contingency	4	Alternate DCC is established when a threat exists that the primary may be incapacitated due to natural or manmade problems. CEF and EOD manning may be included if significant Fire and UXO requirements are present. Normally present in contingency and expeditionary bases.
EOD Teams	Safing and eliminating UXO and explosive hazards	EOD 2 Ea (3E8X1)	2	This specialty is in short supply to support a base recovery effort of the magnitude in this example. Two augmentees are normally assigned to assist this team. Getting augmentees from within CE is ideal. That makes getting and training them easier. A base could expect up to 22 EOD technicians to support EOD activities in a contingency environment. That number includes the EOD representatives in the EOC. Four to five 2-person teams per shift are
CBRN Reconnaissance Team	Teams detect hazards and determine extent of contamination on-base.	CEX 2 Each (3E9X1) Augmentees as required by response	2	Technical jobs need to be performed by trained CEX technicians. Augmentees may perform visual inspections of passive and active detection measures on Recon runs post attack, but interpretation and up channeling of findings must be performed by CEX personnel
Table 4.1 continued on next page.				

Team	Description	Source of Members	Team Size	Comments
Contamination Control Teams	Decontaminates unit vehicles, equipment and personnel (as part of a personnel processing line).	2 each 3EXXX personnel	2	May also assist CBRN monitoring teams determine the presence and extent of CBRN agents as members of the CBRN Recon Team.
ADR Command and Control Team	Provides on-scene control and guidance for the ADR efforts to minimize the total repair time to bring the airfield back to a mission ready status.	Engineer (32EXX) CE Manager (3E000) Personnel should be sourced from CEO	3-5	The unit may not have sufficient officers to fill all positions; an option is to use senior NCOs. Unit may also choose to insert a Minimum Operating Strip (MOS) repair chief to guide efforts of 3 repair crews on the MOS and a repair chief to do the same on the remaining three crews working on the taxiways and MOS access routes.
Airfield Damage Assessment Team (ADAT)	Locates, identifies, and reports bomb damage and UXO on the airfield following an attack.	Eng Tech – 3E571 EOD Tech – 3E971 1 or 2 Augmentees – any AFSC	3-4	Initial efforts normally targeted towards airfield proper; but can also be employed elsewhere as deemed necessary. Equipped with an armored vehicle and communications to report observations to EOC. ADAT reports must be accurate because information is used in MOS selection.
Damage Assessment and Response Team (DART)	Conducts facility and utility damage assessment and isolates/safes damaged utility systems.	Electrician – 3E071 Struct. Tech – 3E371 Utilities Tech – 3E471	3	Assigned to the DCC
Crater Repair Crews	Repair craters located on the primary and secondary pavements of the operating airfield.	P&E Chief -3E2X1 7 Each – 3E2X1 Eng Tech – 3E5X1 Support – Any AFSC	9	The crew chief is sourced from the CEO heavy repair element.

Table 4.1 continued on next page.

Team	Description	Source of Members	Team Size	Comments
Taxiway Repair Team	Repair craters and infra-structure damage to airfield taxiways.	P&E Chief -3E2X1 2 Each – 3E2X1 Engineer Asst – 3E5X1 7 CE Infrastructure Support Personnel – Any CEO AFSC	11	Crew chief is sourced from the CEO heavy repair element. In this example, MOS repair team (three crews) is composed primarily of individuals from heavy repair element. Two individuals in each crew are shown from infrastructure support element. In fact, it would be better to place all six of them in one of the three crews to keep them together. The taxiway repair team also has three crews, and most of the
ADR Haul Team	Delivers fill material and foreign object damage (FOD) covers to the ADR and Taxiway Repair Crews	Team Chief – 3EXXX 16 CE Support Technicians – 3EXXX 5 Facility Maintenance Personnel – 3EXXX 8 Material Acquisition Personnel	36	CEO Personnel assigned to this team must be qualified and rated to operate any heavy equipment and prime moving assets required to complete haul actions (10 ton dump, tractor trailers, forklifts etc…)
FOD Removal Team	Clears debris from the MOS and taxiway access routes to permit resumption of aircraft operations as soon as the crater repairs are complete	6 Infrastructure Support Personnel 3 P&E – 3E2X1	14	The heavy equipment operators are needed to operate the graders. Any specialty can be designated as team chief
MOS Marking Team	Paints airfield markings for a new MOS and paints over old markings that would conflict with the new markings. Places edge and threshold markers	4 Structural – 3E3X1 2 Eng Asst – 3E5X1	6	
Spall Repair Teams	Repair spalls and minor pavement damage to airfield and taxiways	4 Facility Maint. Techs any CEO AFSC	4	

Table 4.1 continued on next page.

Team	Description	Source of Members	Team Size	Comments
MAAS Installation Team	Installs the mobile aircraft arresting system on the MOS	4 Power Pro – 3E0X2 2 Electricians – 3E0X1	6	
EALS Installation Team	Installs the emergency airfield lighting system on the MOS	4 Electricians – 3E0X	4	
Shelter Management Team	Stocks shelters and ensures proper operation of shelters to prevent introduction of chemical or biological contaminants into toxic free areas and shelters	Shelter Manager – any AFSC Contamination Control Monitor – Any AFSC 2 Augmentees – Any AFSC	2-4	Shelter management teams may be sourced from any AFSC. Only utilize CE personnel when they are supporting CE shelters. The CEX Flight and BCE should prepare a shelter management plan utilizing personnel outside of CE to manage shelters. Ideally occupant of the shelter should manage (i.e. shelter adjacent to the Maintenance shop should be managed by MX)
Firefighting Crews	Responsible for saving lives, mitigating damage and loss of USAF resources through initial emergency response operations	Varies depending on the type of incident response; refer to CEF		Firefighting teams are established based on the response requirement. FES teams are trained as initial responders for spill response, initial emergency medical treatment and search and rescue operations in addition to fire response.
Spill Response Team	Provide containment and remediation of hazardous waste spills.	Varies by base and response		Initial response is by firefighters with follow-up by the spill response team. The environmental flight manages and oversees equipping and training for Spill Response teams.

Table 4.1 continued on next page.

Team	Description	Source of Members	Team Size	Comments
Engineering Team	Provide engineering design, oversight and management functions for assessments, evaluation, contingency construction solutions and contract actions.	Varies with task requirement 32EXX 3E5X1 3E6X1		Engineering teams could be called on to provide structural assessments of damaged facilities to assess the hazard to rescuers during search and rescue operations. These teams may also provide siting for emergency shelters as well as provide design support for facility and utility system repairs. They may also be needed to
Housing Management Teams	Provide information and management in the event that disaster victims require housing	Varies		In normal contingencies, housing personnel are utilized as augmentees for other CE teams. Occasionally, (Mt Pinatubo eruption at Subic Bay, Typhoon Iniki Guam) victims require billeting. Housing management team can

* As required.

Table 4.2. Possible CE Team Response by Incident.

Team	Natural Disaster	Major Accident	Hazardous Material Spill	Terrorist Attack	Combat Attack	Bomb Threat	Aircraft Accident/IFE
EOC CE Team	■	■		■	■		
CE DCC	■	■		■		■	
Alternate EOC Team							
Alternate DCC							
ESF CE Rep	■	■	■	■		■	■
Bomb Threat Response Team				■		■	
EOD Teams				■	■		■
Engineering Teams	■	■		■	■		■
Firefighting Teams	■	■	■	■	■	■	■
MAAS Installation Team					■		
EALS Installation Team					■		
Spill Response Team	■	■	■	■			■
Housing Management Team	■						
ADR C2 Team					■		
ADR Haul Team					■		
ADR Crater Repair Team					■		
ADR Taxiway Repair Team					■		
ADAT					■		
BDAT/DART	■			■	■		

Table 4.2 continued on next page.

Team	Natural Disaster	Major Accident	Hazardous Material Spill	Terrorist Attack	Combat Attack	Bomb Threat	Aircraft Accident/IFE
Generator Response Team							
FOD Removal Team							
MOS Marking Team							
Contamination Control Team							
CBRN Recon Team							
Shelter Management Team							
Material Acquisition Team							
Electrical Response Team							
Heavy Repair Crews							
Infrastructure Support Crews							
Facility Maintenance Crews							
Maintenance Engineering Team							
MEOC							
Bomb Removal Crews							

4.8. Base Recovery Operations—Initial Response. This scenario applies to overseas bases that are subject to a major enemy air attack. In this example, assume airfield pavements, facilities, and utility systems are extensively damaged. The damage prevents the aircraft from flying and hinders aircraft generation activities. In the first few hours after the attack, the overriding base priority is to get the aircraft flying again. The base-wide response is controlled from the EOC through unit control centers. Support from off-base or from other military units is not available. This requires the use of ADR equipment. Special teams must be formed within the CE organization to give priority to recovery actions that quickly restore the flying mission. A listing of needed teams is outlined in **Table 4.1.** Because this effort is equipment intensive and there are not enough heavy equipment operators to cover all pieces of equipment, many specialties must learn to operate equipment they do not normally use. Except for firefighting, this organizational arrangement covers a 12-hour shift.

4.9. Thoughts on Organizing Teams. A few thoughts may help put the process of organizing response teams into perspective.

4.9.1. A unit can organize too much. It is so easy and tempting to organize every response, but the results become complicated and confusing; fight the urge and keep things simple. If it does not make sense to someone, it probably is not the best approach.

4.9.2. Team members must be told what team they are on, where to report when called, what tools and equipment they are to bring, and who is in charge.

4.9.3. Give a little extra attention to tasks that need quick team response, those that are not normally performed in the peacetime base O&M environment (things personnel have little experience with), and those that need extra training as a team to be effective.

4.9.4. Be aware of dual tasking shops; it is only a problem if two jobs require accomplishment simultaneously.

4.9.5. If someone can perform a task, it does not matter if that person has the right AFSC or is in the right shop.

4.9.6. A changing organizational structure is not a problem. Over the years, the CE organization has changed a number of times in response to functional transformations and technology integration. Engineers still have the same missions to accomplish and the same skills available. It remains a matter of assigning the right tasks to the right shop, and augmenting as needed.

4.9.7. There are no hard rules on organizing teams. Therefore, there is no right or wrong solutions; if it works—use it.

4.10. Augmenting Forces. Operations plans call for CONUS Prime BEEF forces to deploy overseas in support of deployed flying squadrons (**Figure 4.3.**). Upon arrival, a deployed Prime BEEF unit will augment the in-place CE organization, if applicable. If the team is a follow Prime BEEF team, it will augment the lead team. Ideally, preparations for this augmentation begin well before the team arrives, in the case of an in-place force. Vehicles and equipment need to be provided. Command and control relationships need to be worked out. To minimize the problems of integration, the augmenting Prime BEEF force is placed under the operational control of the host BCE or lead team commander.

Figure 4.3. CE Organization with Augmenting Prime BEEF Units.

4.10.1. This pamphlet and other documents consistently stress the value of team integrity and having personnel work for the same leaders, even in changing situations. If that concept is good for the unit, it also applies to a Prime BEEF augmentation team. When possible, they should maintain their unit integrity. Task them through their representatives in the control center in much the same way CE assigns tasks to their own forces. The augmenting unit commander then ensures those tasks are completed. This approach, rather than total integration, is taken since the Prime BEEF team and host unit are organized and trained separately. As a result, individuals know their leaders, have learned their coworker's strengths and weaknesses, and have learned to work as a team. This cohesion results in more efficient and better-controlled repair efforts.

4.10.2. There should be sufficient commonality of training so that both units can work side-by-side to recover the base. On some tasks, the combined skills of both units will be required. In those circumstances, a work crew/team from one unit should be detailed (loaned) to the other unit for a specific task. When that task is complete, the loaned crew should return to the control of its parent unit, unless the crew is immediately reassigned to another joint task.

4.10.3. Some recovery tasks require detailed knowledge of the host base, such as those involving the utility systems. When assigning those tasks to the augmenting unit, the host BCE should detail at least one host unit expert to help each augmenting work crew.

4.10.4. There are logical exceptions to this "rule." Forces deploying as part of small UTCs will integrate with the lead Prime BEEF team or the host USAF civil engineer organization. Personnel from the same UTC can still be assigned tothe same work crew to maintain some form of integrity. All firefighters will integrate with the USAF host or lead unit firefighters.

4.10.5. Not every Prime BEEF team deploys to a MOB. COBs offer even greater possibilities for variation since USAF units must integrate their efforts with host nation forces. As a deploying unit, determine how things are organized and adjust to the differences. Be sure to inform unit personnel what the adjustments are.

4.11. Summary. Civil Engineers are major players in most crisis responses. Consequently, the unit must anticipate what crises may be faced and what tasks to complete in order to provide adequate support to the base and its mission. Then, assign those tasks to existing shops or special teams with the required skill to accomplish the task at hand.

Chapter 5

TRAINING

5.1. Introduction. Plans can be perfect; equipment and supplies on-hand; the unit and response teams well organized, and yet not ready for war, military operations, or peacetime disasters. The unit must train for those contingencies—mentally, physically, individually, and as a team. Unlike many units, such as aircraft maintenance, civil engineers' contingency tasks are not the same as those accomplished in the course of everyday work. Just as football teams have preseason practice to hone skills lost during the off-season and to incorporate new players, civil engineers must have periodic practice to develop and maintain skills needed to respond effectively to disasters, military operations, and war. Such training is inherently a unit responsibility. Ideally, that training would be conducted entirely at home station, but the reality of limited resources makes that impossible. Consequently, civil engineers must rely on home station training to prepare disaster responses and to develop basic skills for other contingencies. Both military and civilian personnel must be involved. For training on equipment not available at home station, and for training in situations that cannot be recreated there, civil engineers mainly rely on training provided at one of the Air Force's Silver Flag sites and its associated exercise, which prepares key members of Prime BEEF teams to perform both force beddown and wartime base recovery tasks and assesses the success of training. There are other training opportunities for engineers, but these two programs—Home Station Training and the Silver Flag—are the foundation for Air Force Civil Engineer contingency and disaster response training. While Air Force instructions prescribe contingency training requirements, the unit's success in dealing with a contingency or a disaster depends largely on how well it defines training needs, how often it trains, and how well it plans and executes.

5.2. Overview. This chapter highlights CE contingency training requirements and demonstrates how individual training and the two foundation programs satisfy many of those requirements. Discussions include the classroom topics of category I home station training and the "hands-on" lessons of category II. The reader is introduced to other unit training for disaster response and a "leadership training work center" to improve leadership skills. Some special contingency courses are also mentioned. The target audience for this chapter is the Readiness and Emergency Management Flight staff, the unit officers, and anyone tasked to conduct unit level training. While targeted to Prime BEEF units, the information is useful for RED HORSE squadrons as well.

5.3. CE Training Requirements. "What training is mandated? What skills does the unit need? Where can the unit find out what it should do?" These are the universal and logical questions everyone asks who has ever been assigned to train others. This section should help identify individual and team training requirements for contingency and disaster responses. CE requirements are found in a number of Air Force publications, where they are adequately described. Rather than repeat the details, they are highlighted here and their source documents identified. Some requirements, however, will result from planning rather than from a publication. Most requirements can be grouped in one of the following seven categories: 1) individual specialty skills, 2) ancillary training, 3) wartime and other contingency tasks, 4) disaster response tasks, 5) base orientation, 6) leadership, and 7) command and control. Unit orientation requirements could be incorporated into other sections in this paragraph, but are treated separately to give them visibility. The actual training should be combined with in-processing activities and other training whenever possible. Deployed CE forces augmenting the unit also need this training and information. Make checklists to identify points to cover with augmenting forces.

5.3.1. Individual Specialty Skills. Individual specialty skills are the basis for everything done by civil engineers. When individuals are well qualified, not only can they perform the routine tasks, but also more importantly, they can figure out work-around methods when standard procedures do not work. This ability to adapt is critical for contingency and disaster responses, and it comes with improved skills and experience.

5.3.1.1. The skill requirements are found in the Career Field Education and Training Plan (CFETP) for each Air Force enlisted specialty. Part 2 of the CFETP contains the Specialty Training Standard (STS) that outlines specific core tasks that all personnel in that Air Force specialty are required to perform, along with other common skills routinely performed in the specialty. It highlights the required training that each individual attending apprentice technical training must receive and indicates the minimum tasks that mustbe mastered to upgrade their skill level. Ideally, when individuals meet these standards, they will be able to perform when called on in a crisis. Experts in each specialty update the required tasks in the CFETPs periodically, about every 3 years. In addition to being familiar with the 32EX CFETP, each officer should quickly review all CE enlisted STSs at least once and preferably after each update. Mobility team leaders should know what skills their personnel possess. If necessary, a craftsman in each specialty can explain unfamiliar skills to team leaders and provide an evaluation of the overall state of proficiency of the team.

5.3.1.2. For US civilian employees, the performance requirements for CE trades can be found in the Office of Personnel Management (OPM) Qualification Standards. OPM standards do not apply to local-hire civilian employees at overseas bases, but similar performance requirements can be found at the local Civilian Personnel Office. Individual job descriptions contain the most useful information.

5.3.2. Ancillary Training. The Air Force mandates a few training programs to ensure Air Force personnel have certain knowledge and skills that are not part of their specialty training. Civil engineers must complete these ancillary courses: Explosive Ordnance Reconnaissance (EOR) Course; Law of Armed Conflict; Protection from Terrorism; and Self Aid and Buddy Care. There are other courses, but these deal with emergencies and contingencies.

5.3.3. CE Wartime and Other Contingency Tasks. Skilled individuals are critical, but skilled teams enable civil engineers to meet their war fighting and contingency responsibilities. Team requirements are outlined in AFI 10-210. This instruction specifies tasks, team composition, and performance standards. It covers basic wartime knowledge plus mobilization, expedient repair and destruction, expedient field construction, expedient beddown, passive defense, base recovery, survivability support, fire and emergency services, readiness, and explosive ordnance disposal tasks. The instruction targets Prime BEEF teams both stationed overseas and in CONUS.

5.3.4. Disaster Response Tasks. AFI 10-2501 specifies mandatory training requirements to help prepare individuals and the base for peacetime disaster responses, wartime CBRNE defensive operations, and unit Readiness operations. Courses are presented to different groups on base to satisfy these requirements. All military personnel and emergency-essential civilians assigned to base level Civil Engineer units will receive Base Emergency Preparedness Orientation, Air Force Emergency Management Program Planning and Operations, and quarterly informational updates to support the Emergency Management Installation Information Program. The quarterly informational updates keep the base populace informed of seasonal hazards and protective actions; security and awareness measures specific to the installation; and types of attacks, major accidents, hazardous material incidents, and natural disasters most likely to occur at the installation. They also provide commanders an opportunity to update personnel on CBRNE related tasks and other procedures identified as needing improvement during exercises and inspections.

5.3.5. Emergency Response Training. Civil engineers must ensure that immediate response teams are well trained. Areas include: fire and emergency services, readiness support for command and control, and hazardous material (HAZMAT) spills. HAZMAT response training requirements are extensive and often require formal certification. See AFI 10-2501 for additional information on this subject.

5.3.6. Base Orientation. Unlike most CE training requirements that are relatively universal, a few apply only to the base CE unit. There is no comprehensive list, but the following provide some examples.

5.3.6.1. Job assignments and responsibilities.

5.3.6.2. Location of equipment.

5.3.6.3. Location of supplies.

5.3.6.4. Utility system isolation procedures.

5.3.6.5. Priority units and facilities.

5.3.7. Leadership. Effective leadership is the one universal and essential requirement a team, flight, or squadron requires in order to meet its mission taskings. The more critical and time sensitive the tasks, the more important good leadership becomes. Developing leadership skills can begin at school, but those skills can only mature in the field. Junior officers are often in charge of Prime BEEF and RED HORSE teams and sent on deployments to "help" develop their skills. Some do well in such "tests by fire" and some do not. But in any situation, it is not fair to the team or the leader when he or she is not adequately prepared and trained. The structure of the civil engineer squadron provides good leadership opportunities for a few officers, but not for all. Create opportunities at home station to help officers and NCOs develop and practice their leadership skills, especially those who are not currently in leadership positions.

5.3.7.1. The focus should be on junior officers and NCOs to create a pool of experienced leaders. Begin by giving them challenging jobs in local exercises. Have them set up and conduct unit-training programs or lead a squadron/unit bivouac. Form this group into teams and assign them a construction project to research, design, plan, order material, and build. Junior leaders need to learn how to balance taking care of their troops and completing the mission on time. This can be accomplished through ad hoc construction teams, or a more permanent "leadership training work center." The training opportunities are limited only by the unit's imagination and the willingness to try new things.

5.3.7.2. Whatever challenge the junior leaders are given, they need to be told what their task or job is to be and understand from their supervisor or commander what is expected of them. They need to be trained and then turned loose. Use unit training and local exercises or construction projects to test them. Junior leaders need oversight and constructive feedback, more so at the beginning and less as they gain experience. This is not solely the job of the commander. A unit's senior officers and NCOs have an obligation to guide their juniors. There is nothing wrong with a senior NCO giving private counsel to a junior officer. Hopefully, junior officers will recognize the value and ask for such feedback.

5.3.7.3. The commander must create the environment and set the tone for the senior leaders' participation. It takes an ongoing commitment to train junior leadership, because new ones continuously join the unit. In the short term, it seems like a sacrifice to take the lieutenants away from the drawing board and the junior NCOs out of the shops where they can be "productive." But training the next generation of leaders is a fundamental responsibility of all CE senior leaders.

5.3.8. Command and Control. This is another requirement that could be incorporated into other categories. Like leadership training, it is critical to the success of the CE mission and requires emphasis. This section highlights just two training topics that officers, senior NCOs, and key civilians need to prepare them to direct unit response effectively to crises, disasters, contingencies, war, or any other military operation.

5.3.8.1. OPLAN Familiarization. Unit leaders must become familiar with operations plans requirements (that affect the base), the In-Garrison Expeditionary support plan, the CEMP 10-2, the CE Contingency Response Plan, hazardous material spill plans, and checklists that support the plans. Each leader should depart from familiarization sessions knowing what their section must do to support each plan. Review the list of plans in **Chapter 2**. Before conducting those sessions, decide which plans are most important, not all need to be covered in one sitting. Prepare well for these sessions, short handouts and enthusiastic presentations will speed the learning process and help everyone focus.

5.3.8.2. Control Center Familiarization. Personnel working in the CE Control Centers (damage control center, FACC, etc.) or the EOC must become familiar with the layout and resources in their control center. They should know what sources of information are available and how to use the communications equipment.

5.3.8.3. Common Sense Requirements. Remember, the common sense approach to training requirements always applies. If the unit has to plan for something, then train for it. If not mandated in writing, but the task is a known requirement, train for it anyway.

5.4. Individual Training. Home station and Silver Flag training may be the foundation for CE contingency responses, but individual specialty skills remain the bedrock. Air Education and Training Command (AETC) teaches basic skills to enlisted military personnel before they report to their first duty station, but these airmen do not arrive fully qualified in all tasks. Using the football team analogy again, airmen come to the team with basic skills, but they need to improve on those skills to be effective team players. Each Airman will improve their skills through on-the-job (OJT) training, career development courses (CDC), and contingency training. Qualification Training Packages (QTP) and other multi-media products are used for upgrade and refresher training. Civilian employees also come to the job with mandatory minimum skills and can improve their skills on the job. Just as with the military, they may attend AETC courses to acquire additional skills.

5.4.1. Demand Quality On-the-Job Training. Most supervisors do a good job with OJT. However, if individuals from a shop consistently cannot perform a required task, the OJT program in that shop is probably weak. Use senior NCOs to find and fix these type problems. Occasionally, some supervisors are willing to pencil whip requirements to "help" a friend or make their records look good. That practice is illegal and it is unfair to Airmen who study and train hard to earn their upgrade. It also misleads the commander and the unit about its capabilities. If someone arrives in the unit who is unqualified to perform a needed task, return them to training status, even if the Airman was previously qualified. Otherwise, under-qualified Airmen may be put unknowingly in charge of a task.

5.4.2. Set Up a Study Center. Many units have already done this in the fire department and some in a separate training section. Make it comfortable and attractive. Fill it with current study materials including CDCs, videos, computer programs, etc. Provide more than one videocassette recorder (VCR) or digital videodisk (DVD) player to support multiple training activities simultaneously. Internet connectivity is a must now that many training programs are now web-based. Keep the study center quiet by utilizing headphones when possible to keep the noise levels down. Since multi-media computer based training is a valuable training tool, add fast computers (with a lot of memory) to the study center and begin with at least two. Attempt to keep the study center open during other than normal duty hours. This will require experimentation with the hours to determine when Airmen are best served. Since all shops benefit, share the manpower burden to keep the study center open among shops. Rather than operating the study center via a duty roster, designate Airmen for a 3- to 6-month "tour" to keep it open during the non-duty hours. Train the designated attendants so they can teach others how to use the equipment, know where to look for requested study materials, and know the procedures to loan materials. Rotate the attendants so the same ones do notalways get stuck with the least desirable hours. The usefulness of the study center will increase as the category I home station training program evolves and other multi-media training is added, such as Qualification Training Packages.

5.4.3. Encourage Officer and Enlisted Professional Reading. There is no career development course for CE officers, but that does not diminish their obligation to develop their contingency skills. Each officer should make a personal commitment to thoroughly read each of the volumes in this pamphlet series before he or she completes two years of service. This obligation also extends to reviewing the referenced documents and learning what information they contain. Likewise, they should make it a habit to read books on leadership and wartime conduct. Although, the focus above is on the officer professional reading, the professional NCO should also be encouraged to read similar books that will help them expand their skills and ability to provide solid NCO leadership.

5.5. Home Station Training. Home station is the primary place to develop basic skills the unit requires for military operations and disaster responses in war and peace. Some home station training is mandated, other elements are not, but all are intended to build capable teams. Home station training is extremely important. For 70 percent of the Prime BEEF team, this may be the only contingency training they will receive. This section explores six HST programs: Category I "classroom" training, Category II "hands-on" training, ancillary training, installation emergency management training, other unit training and exercises, and base exercises. AFI 10-210 is the source document for CE contingency training.

5.5.1. Category I Training. "CAT I" knowledge-level training provides the baseline information engineers need to perform contingency tasks as a team. The gained knowledge prepares Airmen for Category II hands-on training and is an important prerequisite for Silver Flag Exercise activities. Category I training takes on added importance when it is the only method toexpose engineers to a task when the unit does not have the needed equipment or resources for hands-on training. Personnel assigned to base level Civil Engineer units will receive initial and refresher training in all CAT I topics as shown in AFI 10-210, Attachment 2. Initial or recurring CAT I training can be satisfied by completing either unit classroom training, the General Contingency Responsibilities CD-ROM (GCRCD), or Web-based courses available on the CE Virtual Learning Center (VLC) website. See AFI 10-210 for more details on CAT I training options.

5.5.2. A synopsis of the CAT I training program follows.

5.5.2.1. Prime BEEF Orientation/General Contingency. Upon assignment to the unit, train all military and emergency-essential civilian employees on the unit's Prime BEEF and Emergency Management missions. Emphasize the individual's role and how it contributes to the program. Include an overview of Civil Engineer Doctrine and explain the organization, training, equipment, operating concepts, and contingency missions pertaining to the unit. The Prime BEEF manager will update unit personnel on significant changes to the programs as they occur. This sub-category training also includes general contingency skills such as Enemy Prisoner of War Handling, AOR Specific General Orders, Operations Security, and CBRNE Defense Awareness Training.

5.5.2.2. Combat Skills. Provide CE leadership and their personnel combat skills training, such as Troop Leading Procedures, Convoy Ops, Land Navigation and Map Reading, Air Base Defense, Work Party Security, Team Movement Techniques, Operating in a Joint Environment, and Use of Night Vision Goggles.

5.5.2.3. Field Sanitation and Health Training. This training includes Problems of Extreme Climates and Field Sanitation and Personal Hygiene.

5.5.2.4. Expedient Methods. Expedient methods training will address three areas: Force Beddown, Field Construction, and Repair Methods.

5.5.2.4.1. Force Beddown. Force beddown subjects will include information on BEAR assets as well as package configurations and playbook options. Lessons should cover items such as environmental protection; bare base layout; BEAR water, mechanical, and electrical utility systems; wartime construction management; and resource dispersal.

5.5.2.4.2. Field Construction. Field construction includes information on facility hardening and construction of field latrines, berms, and dikes.

5.5.2.4.3. Repair Methods. Repair methods will include techniques for DCC command and control, minimum essential restoration of damaged facilities or utility systems including electrical, plumbing, road, and building repairs; shoring and scabbing; and war damage repair to the airfield, facilities, and utilities).

5.5.2.5. Emergency Management and CBRN Response. This training is targeted towards Emergency Management personnel and covers CBRN Cell Operations and HAZMAT Awareness Level 1 and 2 Certification.

5.5.2.6. Force Protection. Force protection will introduce military Prime BEEF members to the concepts of military vehicle operator training, personal and work party security, revetments, and obstacles.

5.5.3. Category II Training. The ideal training method is for the trainee to physically perform a task and repeat it until becoming proficient—"hands-on" is the thrust of category II training. Make every effort to incorporate realism into CAT II training programs. Use field gear (to include primary weapons) as the "norm" rather than the exception whenever training on topics such as personal/work party security, convoy operations, defensive fighting positions, etc. Category II topics are highlighted in AFI 10-210, Attachment 3. To help guide CAT II training efforts, lesson plans for each task have been developed and posted on the AFCESA website at **https://wwwmil.afcesa.af.mil/Directorate/CEX/CEXX/ContingencyTrng/HST_LessonPlans.asp**. Use of these lesson plans is mandatory and will help assure continuity of training throughout the entire CE community. If a new topic is added, develop an in-house plan until the standard plan becomes available on the website. Often, the unit can combine the training of many tasks into a single training period. On the other hand, complex tasks, or those that require a lot of personnel, can be broken down into sub-tasks. Frequently, it is helpful to train smaller size crews in the sub-tasks before attempting to train an entire crew or team in the full task. With few exceptions, results will be better when training personnel in small groups of 10 to 15. Category II training is mandatory for CE personnel, but it can still be fun. It takes more effort to set up such a training program, but it is worth it. Train Airmen well the first time, they will require less frequent refresher training and those refresher sessions will be faster. Some observations concerning the general category II topics follow.

5.5.3.1. Government Vehicle and Equipment Operations Training. Airfield damage repair in a high threat environment requires many vehicles moving at the same time to make the needed repairs. In that situation, a typical CE unit has too few heavy equipment operators. To solve this shortfall, civil engineers must train other individuals in the unit to operate selected vehicles. AFI 10-210, Table 4.4, outlines the requirements. Overseas bases should have little trouble meeting these requirements if they have the equipment on-hand. CONUS Prime BEEF units have a huge challenge without the equipment. Consequently, train with what is available to the unit and borrow items from other bases if possible. Units may also send personnel to the Regional Equipment Operator Training Sites.

5.5.3.2. Unit CBRNE Defense Training. Basic CBRNE training is provided through the Installation EM Training Program as outlined in table 6.3 and paragraphs 6.6.1.2 and 6.6.1.3 of AFI 10-2501. However, additional unit training is required to gain proficiency. This includes task qualification training, equipment and large area decontamination training, shelter management training for selected individuals, and training to process in and out of a toxic free area. Each unit is required to ensure its personnel can perform their wartime roles in a chemical or biological warfare environment. For civil engineers, this means base recovery activities. Overseas bases have the advantage again because they have the equipment available. The biggest need is for personnel to experience the physical limitations they face when performing base recovery activities in chemical warfare defense ensembles. During task qualification training, practice equipment decontamination and shelter in- and out-processing; a shelter is not required to practice these steps. Open air contamination control area processing can be performed. Spray personnel and equipment with a telltale chemical before they decontaminate equipment or themselves. Under an ultraviolet light, the absence of the telltale chemical reveals whether or not if the decontamination efforts were successful.

5.5.3.3. Field Health. All Prime BEEF personnel will complete hands-on training in Self-Aid and Buddy Care training and Cardiopulmonary Resuscitation (CPR) certification.

5.5.3.4. Expedient Methods (Beddown). To maximize training opportunities, include some of these tasks in base exercises as well as during regular unit training. Tasks in this area include TEMPER tent and small shelter system erection, preway heater set up, and generator set operations. Unfortunately many of the assets are not available at home station. To compensate for this shortfall, emphasize the information learned in category I training and make sure the personnel who attend the Silver Flag Exercise become “experts.”

5.5.3.5. Weapon Skills. All military Prime BEEF personnel assigned to a UTC will qualify with their primary duty weapon. Ensure individuals performing courier, guard, in-flight security, fire chief, or similar duties are trained to fire the pistol. Individuals assigned to Prime BEEF deployable and associated UTCs are included in arming Group B and will train to that frequency. Exception: Personnel in DXX coded standard deployable UTCs and in AXX coded associated UTCs will receive "just-in-time" training. Getting quotas can be a problem, especially for units that do not have a small arms range on base. Frequent communications and good working relationship with the Security Forces Squadron combat arms training (CATM) flight will eliminate most problems.

5.5.3.6. Combat Skills. In addition to weapons handling proficiency, Combat Skills training emphasizes command, control, and communications procedures; land navigation and map reading; individual/team movement techniques and combat organization; troop leading procedures; and construction of defensive positions. Train military Prime BEEF members on personal and work party security; night operations; convoy operations, and air base defense operations. Include defensive combat skills that could be required while performing contingency tasks.

5.5.3.6.1. Defensive combat skills and work party security training should concentrate on the basics: detection methods, sign/countersign measures, rules of engagement, and reporting procedures. Training in command, control, communications, and signals is especially important.

5.5.3.6.1.1. Find out if, how, and when Security Forces will plan to use CE in airbase defense operations and train for those roles. Security for convoy operations is also important. Lessons learned indicate that civil engineers often find themselves providing their own convoy security.

5.5.3.6.1.2. Civil engineers are weapons-limited, with RED HORSE being the exception. CE has no crew served weapons (like M-60 machine guns), mortars, grenades, etc. Without those items, personnel are limited to hunkering down, calling for help, and returning fire as best they can when attacked. Make sure personnel know how to do those three things effectively. Trainees should be able to answer the following seven questions when trained: 1) What do I do first? 2) How do I quickly determine the source of attack? 3) Where am I supposed to shoot? 4) What signals do I use? 5) How do I keep from shooting friendly units coming to help us? 6) Who do I call for help and by what means? 7) What do I do if receiving indirect fire?

5.5.3.6.1.3. Passive defense measures should include topics such as camouflage, resource dispersal, expedient hardening, blackout procedures, etc.

5.5.3.6.1.4. It takes considerable training to perform security roles well, but there is only limited category II training time available. Obviously, the time spent on security comes at the expense of other training, so the better-trained personnel are the first time will decrease the time required for refresher training.

5.5.3.7. Field Training Exercise (FTX). The annual field training is an opportunity to devote all time to contingency training. Rather than training on individual topics, it is a time to tie many of them together. Each Airman assigned to the UTCs listed in AFI 10-210, Attachment 3, must participate in a continuous 4 day FTX/bivouac once every 20 months (40 months for AFRC and ANG units). Exceptions: (1) A MAJCOM Civil Engineer may reduce/waive this field training requirement for those UTC-tasked units not having 4 FPE* and 4F9E* UTCs assigned. (2) To satisfy unique ANG/AFRC requirements, the applicable ANG/AFRC Civil Engineer may allow unit commanders to divide the 4 day requirement into two sessions. If divided, only one session must include a bivouac. However, units can elect to set up an encampment each session as needed. AFI 10-210 identifies the mandatory and optional items to include in the FTX.

5.5.3.7.1. The FTX must include command, control, and communications; CBRNE defense actions; unit beddown; self aid/buddy care; and field sanitation. Unique combat skills training such as individual and team movement techniques, troop leading procedures, land navigation and map reading, weapons handling and qualification, convoy operations, work party security, first aid firefighting and fire prevention, airbase defense, and night operations must also be incorporated into the FTX.

5.5.3.7.2. Additional training may include vehicle operations; personnel alert and recall procedures; deployment processing; equipment marshaling; pallet buildup procedures; hazardous materials preparation training; camp layout; erection of available bare base assets; EOR; expedient methods; appropriate multiskill training; plus any topic a unit wants to inject to make the training more effective. When applicable, Mission Essential Equipment Training should also be completed during the FTX.

5.5.3.7.3. Split the unit up for field training if possible. Training will be better; less time wasted, and more individuals will receive leadership experience. Place a different officer and NCO in charge of each group and provide them the training objective. Make them responsible for planning/conducting the training and arranging for support.

5.5.3.7.4. Allowance Standard 429 provides the Home Station Training Set used to conduct the FTX. Consider joint training with services, security police, and other support forces. Their participation adds realism and builds good working relationships.

5.5.4. Ancillary Training. All ancillary training can be taught separately, but some topics are easily incorporated into category I and II training. Explosive ordnance reconnaissance and self-aid and buddy care are examples. This training can easily be included in field training as well. Operations Security (OPSEC) and Communications Security (COMSEC) are classroom activities, but have a "hands-on" application.

5.5.5. Installation Emergency Management Training. This important training currently covers the following courses: CBRNE Defense (Orientation, Awareness, Survival Skills, Functional Area Task Qualification Training, and Key Leaders) Courses; Contamination Control Area Management and Operations Course, Post-Attack Reconnaissance Course, Unit Control Center Operations Course, Emergency Response Operations Course, Readiness Support Team Course, Shelter Management Team Course, Contamination Control Team Course, Exercise Evaluation Team Course, Unit EM Representative Course, Base Emergency Preparedness Orientation, and Air Force Incident Management Course. Civil engineers provide this training for the entire base. These courses are presented using standardized lessons that are adjusted to meet local conditions and threats. See AFI 10-2501 for additional guidance.

5.5.6. Other Unit Training. There are other training requirements civil engineers should perform. These tend to be base unique requirements that do not fit well into other categories.

5.5.6.1. Physical Fitness. Engineers must be in good physical condition to handle the strenuous tasks inherent in contingency operations. Good physical conditioning is important to CE readiness. FES and EOD technicians have had a physical conditioning program for years. In fact, the FES program was the model for the Air Force. Physical conditioning is a personal responsibility, but CE units can help by emphasizing the value of physical conditioning. One way is to conduct weekly physical training sessions, as many units currently do. Consider asking the Services unit to help develop a unit or individual fitness program. Physical fitness is important in contingencies and battle. A person can endure the stresses of battle better and longer—physically and mentally—when the body is fit.

5.5.6.2. Unit Orientation. Individuals should be oriented to the base during in-processing and the first few weeks on the job; a number of topics should be covered.

5.5.6.2.1. Job Assignments and Responsibilities. Each individual needs and deserves to know what tasks they could be asked to perform in a contingency or disaster. If an Airman has a specific job during a contingency, he or she needs to know what it is, what the responsibilities are, and where to report. Everyone needs to practice or walk through his or her tasks at least once. Do not forget the jobs that backup someone else.

5.5.6.2.2. Location of Equipment. Engineers need to know what equipment is available, where it is located, and how to operate each item. They need to know how to get the equipment and where to find the keys.

5.5.6.2.3. Location of Supplies. Show new personnel what supplies are available and where they are located. Explain the procedures to get the materials.

5.5.6.2.4. Utility System Isolation Procedures. Utilities personnel need to know how to isolate water and electrical systems. They need to know where main water shut off valves are located, where circuits can be killed, etc. They need to know any special safety considerations. This information should be included in the CE Contingency Response Plan, but it must be passed along and practiced. This information is often needed for day-to-day activities, but occasionally one sees the knowledge residing with only one or two individuals. It will stay that way if the knowledge is viewed as job security. Superintendents and element leaders must be involved to overcome such a situation.

5.5.6.2.5. Priority Units. Some units on base, by the nature of their mission, enjoy a high priority and deserve more urgent attention when they call for CE help. This knowledge is not self-evident. Be sure all CE personnel understand which facilities get priority attention.

5.5.6.2.6. Recall Procedures. Brief individuals on recall procedures and explain their responsibilities to contact others.

5.5.6.2.7. Alarm Signals. Individuals need to know what the local alarm signals mean and what they should do when they hear a signal. This is especially true at overseas locations where alarm signals and meanings can vary because of agreements with host nations.

5.5.6.2.8. The natural inclination is to assume base-unique training "automatically" takes place. The shop foremen or NCOICs usually do it well. Make sure good base-unique training occurs by encouraging each shop chief to incorporate contingency related requirements into his or her newcomer's orientation checklist. Checklists can be useful for orienting the more senior individuals when they arrive as well. Some orientation activities such as learning the location of valves should be hands-on. This reduces problems such as finding a valve for the first time at night with only a base utility map to help locate the valve.

5.5.6.3. OPLAN Reviews and Exercise Preparation. Do not wait for base-wide exercises to see how well the unit can respond to disasters and contingencies. CE units should periodically run their own OPLAN reviews and pre-exercise drills. These reviews and drills can be accomplished to get the unit ready for a specific base-wide exercise or to make sure the unit is prepared for actual contingencies. The emphasis should be on command, control, and communications—that is where units tend to have the most problems.

5.5.6.3.1. Everyone who leads a response team should be involved. This is their best chance to learn what their teams may be called upon to perform. They can then decide what they must do to get their teams ready. The number two person on each team should also be involved. Some might argue the experienced unit leaders who have been around for some time are wasting their time—not true. Since they have "heard and seen it all before," their insights can help educate new personnel.

5.5.6.3.2. OPLAN reviews and exercise preparations can be conducted as briefings, talk-through sessions, walk-through drills, command post exercises (CPX), and full up unit exercises. All have their advantages and all have essentially the same purpose: get Airmen informed so they know how and when to respond. Briefing the entire unit consumes a lot of man-hours, but everyone hears the same message and it can minimize rumors. It can also be a morale booster if done well, but the unit may want to reserve this for major inspections. These sessions are good opportunities for the participants to "talk through" an OPLAN or exercise and resolve support problems. Use the checklists for the plan being reviewed and find out if they are adequate. When the session ends, the participants should understand what is to be done, by whom, and in what sequence. Work out task timing and highlight critical support requirements. Ask each leader to list what his or her team or shop must do to get ready, to set the dates he or she plans to have all preparations complete, and to identify all limiting factors and capability shortfalls. As individuals become more experienced, these sessions can be completed faster.

5.5.6.3.3. Sometimes, more than talk is needed. A walk-through, talk-through drill in the field helps individuals see what they must do and what resources they have. With these drills, individuals actually step through the tasks in order. Speed is secondary to learning the what, who, when, where, how, why, and in what sequence. A walk-through is helpful to train new personnel; to teach complex tasks; to de-conflict activities that involve a lot of personnel whose efforts could easily interfere with each other; to resolve timing problems; and to help personnel sitting in control center jobs to understand what happens in the field. A walk-through can involve a few, or all leaders, or target specific crews or teams that may be having problems.

5.5.6.3.4. A unit CPX in the CE control center (or Damage Control Center) can help fix command and control problems without impacting the workforce. These sessions are beneficial to get new personnel and augmentees familiar with facilities and their job in the control center. A CPX allows participants to develop communication and COMSEC procedures, work out the flow of information, and gain experience in making base recovery and resource allocation decisions in a hectic environment. Any other CE control locations can be added into these exercises, such as the FES alarm room.

5.5.6.3.5. Conduct unit exercises when unit personnel know what to do but need practice to do it well. Frequently, complex tasks must be repeated to get the timing right. A unit can waste a lot of valuable time on exercises if personnel and leaders are not prepared. Use a combination of these pre-exercise activities. For example, start with a talk through with the leaders. Have walkthroughs with a selected team or teams. Then conduct a limited unit exercise. Very rarely does every section and shop need to get involved. The exception might be for an ADR or base recovery after attack practice at an overseas base.

5.5.6.3.6. Adequate exercise preparations will enable CE leaders to answer the following questions at a minimum:

5.5.6.3.6.1. What is supposed to happen?

5.5.6.3.6.2. What am I expected to do?

5.5.6.3.6.3. What resources—personnel and equipment—do I have to work with?

5.5.6.3.6.4. What do my teams and I have to do to get ready?

5.5.6.3.6.5. Who supports me?

5.5.6.3.6.6. Who is my boss?

5.5.6.3.6.7. How am I to communicate? By messenger, phone, radios? And with who? Are there any codes?

5.5.6.3.6.8. Are there any special rules to follow?

5.5.6.4. Certification Training. Be aware that some CE specialties must be specially trained and certified to perform certain tasks. This is especially true in FES, EOD, barrier maintenance, and utilities shops. Learn what tasks require certification. For example, the unit does not want to deploy to a bare base, install a mobile aircraft arresting system (MAAS), and find out that there is no one qualified to certify that the MAAS is ready to catch planes. Firefighters and others in the unit must be certified on some HAZMAT tasks. The best way to find out about certification requirements is to ask each shop foreman. Share that information with all CE officers.

5.5.6.5. War Stories. Invite individuals that have been on real-world deployments to relate their experiences, share their lessons learned, identify the problems they encountered, and the solutions they developed. "War stories" are an invaluable and interesting way to expose junior troops to the potential problems they may encounter. Find the individuals in the unit with interesting deployment experiences. Invite individuals from other base units that can offer different perspectives. Experiences can be shared with the entire unit or targeted to the personnel in a shop or on a team.

5.5.6.6. CE Officer's Call. A periodic gathering of the unit's officers can be used to help prepare them for their leadership responsibilities. Topics can come from daily experiences, home station field training, or Prime BEEF deployments—almost any topic is valid. Successes and failures should be highlighted. Getting individuals to talk about their failures can be tough, but those are often the most useful stories. Officer development should be the focus, but attendance does not have to be limited to officers. Civilians, and especially senior NCOs, can contribute to and learn from the discussions. Shop visits can be a good Officer's Call activity. Periodically, have the officers visit a different shop. Each flight chief or shop foreman should give a tour and highlight shop capabilities, limitations, and the biggest challenge he or she faces. Be sure to look at all utility systems. Also, visit the EOD, FES, and readiness flights. These visits help officers know who is in charge of each flight or shop and help them to understand the unique features of their unit and base.

5.5.6.7. Augmentee/Unit Integration Training. Augmentees, whether individuals or members of Prime BEEF teams, require training to effectively support the unit. Readiness Support Team augmentees are trained through the formal course presented in the installation EM training. Ideally, EOD augmentees get recurring training one to two days per month, but they can also get a crash course when hostilities threaten. Prime BEEF, or other teams, that deploy to the base must get area and base familiarization training. They may also require base-unique task training. Identify these training needs in advance and acquire or develop lesson plans for them. Include training requirements and list responsibility for conducting that training in the contingency response plan. The unit must determine the timing, content, and frequency of augmentee training.

5.5.7. Base Exercises. Civil engineers do not respond to disasters and contingencies alone, but as part of a base team. To be effective, that team must periodically practice integrated responses to peacetime disasters and wartime attacks through base wide exercises. Such exercises help engineers get familiar with support they must provide to others, and highlight the support civil engineers need from others. Engineers must be willing and cooperative players. More information on base exercises and evaluations will be covered in the next chapter.

5.5.8. Annual Training Schedule. To provide visibility and control to home station training, each unit should prepare an annual expeditionary training schedule. It does not have to be complicated. The key is to pick tasks that the unit most needs and has the resources to perform. Next, determine how much time is needed to train each task and which ones can be grouped together. Identify prerequisite training for each task, because those must be scheduled first—then create the schedule. Some may argue that with all the external demands on CE, a schedule cannot be kept. The counter argument is with all the external demands; a schedule is needed to help meet all commitments. The schedule certainly can be changed, but follow it as closely as possible. This prevents having to go through all the work of canceling and rescheduling support from others.

5.6. Silver Flag. The Silver Flag program is essential to civil engineer readiness training. Many contingency tasks simply cannot be trained at home station. For example, few bases have sufficient real estate, mission flexibility, or equipment to explode holes repeatedly in the runway to allow the Prime BEEF team to practice airfield damage repair. Neither do civil engineer units have mobile facilities and utility systems to practice setting up a bare base. Silver Flag Exercise sites are free of many or all of those home station constraints and resource limitations.

5.6.1. The program provides intensive, hands-on team training and certification for Prime BEEF teams in traditional engineer skills, as well as in FES, EM and EOD skills. A number of core personnel on each Prime BEEF team train in special tasks required to support air operations anytime, anywhere. These core personnel then lead and train their teammates during those contingency operations. The team task certification is an important tool to demonstrate the training readiness of the mobile CE force.

5.6.2. The curriculum focuses on preparing crews (versus individuals) to perform both beddown and base recovery tasks. Trainees are grouped by functional area (technical specialty) into crews for specialized training, task evaluation, and certification. Most trainees participate in a multi-skill base recovery or beddown exercise at the end of the training period to allow students to see the "big picture" when beddown and base recovery activities require participation from many specialties.

5.6.3. During task evaluations, trainees must successfully perform the major tasks listed for their specialty. Because Silver Flag is important to Air Force Civil Engineer readiness, each Prime BEEF unit records successful completion of Silver Flag training in its SORTS report. AFI 10-210 provides criteria for MAJCOM Civil Engineers to grant CAT III training to units under specific circumstances.

5.6.4. Silver Flag activities depend on adequate home station preparation. Those requirements are detailed in a predeployment information package the training cadre sends to each unit weeks before the unit deploys.

5.6.5. Silver Flag training is not intended to be a one-time effort. The inability to practice many contingency tasks at home station drives the need for the core members of each Prime BEEF team to return to the Silver Flag site at least once every AEF cycle.

5.7. Special Training Programs. There are other training opportunities to consider.

5.7.1. Regional Equipment Operator Training Site (REOTS). REOTS is operated by the Air National Guard's 201st RED HORSE Flight at Ft. Indiantown Gap, Pennsylvania, and provides an intensive weeklong course of initial and refresher training to CE heavy equipment operators. Its purpose is to elevate equipment operator proficiency on wartime tasks. The students train on four key airfield damage repair vehicles: excavator, 4CY front-end loader, grader, and dozer. Active force 3E2X1 personnel should attend the REOTS course shortly after attaining the 5-skill level. Reserve component personnel must attend the REOTS course every 3 years. The course is available to active duty personnel as well as Guard and Reserve engineers. Each unit must pay trainee travel and per diem. See the course details in the AF Education and Training Course Announcement located at **https://etca.randolph.af.mil** in the HQ AFCESA section. Units request course quotas through respective MAJCOMs.

5.7.2. Expeditionary Combat Support-Training and Certification Center (ECS-TCC). The ECS-TCC at Dobbins ARB GA has a certified cadre that administers contingency training to strengthen CE core competencies. Task certification/re-certification, refresher, upgrade and just in time (in support of contingency requirements) training is this site's primary focus. Students receive individual hands-on war and contingency skills training. The cadre instructs core and diamond task items from the CFETPs on equipment and procedures not available at home station for 3-, 5-, and 7-level personnel, and provides CAT III preparation for UTCs and individuals. The site has mission essential equipment to include Mobile Aircraft Arresting System (MAAS), Emergency Airfield Lighting System (EALS), Reverse Osmosis Water Purification Unit (ROWPU), and mission support equipment to include the Contingency Airfield Marking System (paint striper), and Field Deployable Environmental Control Units (FDECUs). Beddown and sustainment equipment training includes bare base facilities setup and reconstitution, data collection and surveying using equipment and components from the Engineering GIS package, and mobile hydraulic crane certification and training up to a 50-ton capacity. The ECS-TCC also partners with local fire departments and offers proficiency training in live fire applications, drivers training, and MAAS rewind operations. Note: EOD and REOTS training is not administered at this site.

5.7.3. AETC Specialized Courses. AETC occasionally offers specialized courses that are tied to contingency training. Quotas can be difficult to get for these courses, because CE competes for limited funding with other Air Force functional areas. Let the unit's voice be heard when requesting quotas from the MAJCOM. Just as with REOTS, course details are located in the ETCA. Examples are the courses that cover bare base systems such as Bare Base Power Generation (Diesel), Bare Base Electrical Systems, Bare Base Water Purification and Distribution System, and Bare Base Structures Erection course (this course can be delivered to the unit for just two course quotas making it a very cost effective means to practically train the entire unit).

5.7.4. USAFE and PACAF Courses. HQ USAFE and HQ PACAF offer theater specific versions of the Silver Flag curriculum for theater CE units. This training is presented by the 38 Construction and

Training Squadron at Ramstein AB, Germany, and by Det 1, 554 RED HORSE Silver Flag Exercise Site at Kadena AB, Japan. The PACAF site sends a mobile training team to some of its bases to present selected contingency lessons. Each MAJCOM schedules its units.

5.8. Ideas about CE Contingency Training. Some random but useful ideas to help develop the training program follow:

5.8.1. Pick training emphasis each year by deciding what capabilities are most important for the unit. Make sure the unit can do those things well and then work on eliminating weak points. If there are many, decide which is most important and work it first.

5.8.2. Set training objectives for each lesson to include what must be done, what skills are needed, and who should be trained.

5.8.3. There are not enough personnel in the Readiness and Emergency Management Flight to plan and conduct all required category II training. Use other individuals in the unit and select them early so they have time to study their lessons. Consider dividing a Prime BEEF team into four to six groups. Put an officer and senior NCO in charge of each group for contingency training. At the beginning of the year, tell them what topics they need to cover and give them an annual schedule. They are to be totally responsible for planning and conducting the training for their group and should arrange their own logistical support. They can use experts to help present some of the lessons. They should use the standardized Prime BEEF lesson plans provided by HQ AFCESA/CEXX.

5.8.4. Good instructor preparation is essential. The best instructors are the ones who are excited about training. Occasionally ask the commander to visit a class for a short while—this gives a big boost to the instructor and demonstrates to the class that the commander is serious about contingency training.

5.8.5. Train on the difficult things also, not just the easy stuff.

5.8.6. Training should build on previous lessons.

5.8.7. Timing tasks and complex tasks need more training, more frequently.

5.8.8. Train by shop when possible; it makes sense to do so. This is more likely when tasks are assigned to specific shops as discussed in **Chapter 6**.

5.8.9. Performance, not talk, is the measure of capability. Have personnel demonstrate how well they can perform the job. Periodically and randomly ask individuals in the unit to explain their duties and their shop's mission in a particular contingency. If the individual cannot sufficiently convey the responsibilities, advise their supervisor that the individual requires training. If this is common in one shop, the supervisor is either not doing his or her job or needs training themselves.

5.8.10. Ensure that at least one expert is on the team for each contingency task.

5.8.11. Trainers should train their replacements.

5.8.12. To get the most out of Silver Flag training, ensure individuals complete prerequisite training before deploying.

5.9. Summary. Training occurs on three levels: individual, unit, and integrated with other base units. Training should be realistic and conducted as intended to fight. Having enough time and resources for contingency training is a historical problem. When a threat is not imminent, training is less emphasized. Yet, with a worldwide mobility commitment and peacetime disasters always possible, civil engineers must always be ready to respond. Often, the biggestobstacle comes from within the unit. How do individuals in the unit view contingency training, as a chore or a challenge? If seen as distracting from the day-to-day peacetime duties, training is probably considered a chore. If individuals focus on how to overcome the shortages of equipment, time, and money, training is hopefully a challenge. Good training is an attitude: it takes work to overc ome the obstacles. Help the comm ander by outlining a good training program, getting everyone involved, setting training objectives, and developing an annual training schedule.

Chapter 6

EXERCISES, EVALUATIONS, AND INSPECTIONS

6.1. Introduction. Exercise, evaluations and inspections—though not popular—are an important part of readiness and contingency response preparations. Exercises provide civil engineers with valuable opportunities to practice base-wide contingency responses and to train our personnel. Exercises enhance readiness, improve crisis response, boost combat capability, streamline procedures, and help units master OPLAN taskings. Evaluations and inspections provide important feedback to units and commanders on the adequacy of contingency planning, preparations, and training. The challenge is to intelligently use exercises, evaluations and inspections to enhance CE capabilities.

6.2. Overview. This chapter outlines civil engineer involvement in exercises. It highlights the local exercises engineers participate in and offers suggestions on planning unit activities. This chapter briefly discusses the joint service and MAJCOM exercises that CE teams may support. The chapter closes with a discussion on local exercise evaluations and offers tips for inspection preparation. While this chapter focuses on base CE organizations and Prime BEEF units, RED HORSE units are major exercise players.

6.3. Civil Engineer Involvement. Civil engineers are routinely involved in exercises. Usually, local exercises, but some engineers also have opportunities to participate in MAJCOM and joint service exercises. The degree of involvement depends upon exercise objectives and scenarios. In local exercises, units can usually dictate its level of effort by choosing to be a major player in exercise planning. The more CE is involved, the better the unit will be prepared to respond to crises. Unit attitude is important. A CE unit gains the greatest benefit when its personnel enthusiastically participate in all aspects of an exercise, from planning to final critique. It is no coincidence that in the best units the CE commander is actively involved in the exercises, evaluations, and inspections. Where engineers look upon these activities as hindrances to their "real job," there is usually a problem. These activities also are not taken seriously when personnel are under-involved and have a lot of "sit-around" time—they get bored. The unit can improve attitudes by helping create realistic local exercises that involve all members. Since only limited number of civil engineers have the opportunity to participate in joint service or MAJCOM exercises, unit leaders must push for engaged local exercises with maximum civil engineer involvement.

6.4. Local Exercises. Local exercises provide opportunities for training and evaluation. They are conducted more frequently than major off-base exercises, and the unit has more control over them. A FI 10-2501 directs the type, category, and frequency of exercises to be conducted. Functional publications provide additional exercise requirements. Some exercise requirements that involve civil engineers are:

6.4.1. Major Accident Response Exercise (MARE). Each of following MARE scenarios are to be conducted annually: a conventional munitions accident, a nuclear weapon accident if applicable to the base, off-base response, mass casualty accident, HAZMAT response, radioactive material, and air show response before an air show at the base. AFI 10-2501 and MAJCOM Supplements outline other requirements. If the base has a HAZMAT team, it should be exercised at least annually IAW with guidelines in AFMAN 32-4013.

6.4.2. Natural Disaster Response Exercise (or review). If the MAJCOM has identified the installation as being subject to catastrophic natural disasters, conduct annual exercises of the type specified. Other installations may conduct reviews.

6.4.3. Terrorist Use of CBRNE. Conduct two CBRNE exercises annually, one must be a biological incident.

6.4.4. Operational Readiness Exercise (ORE). If in a low threat area, conduct an annual CBRNE exercise that reflects the most stringent CBRNE threats in place, or that expeditionary forces could face. In medium threat areas, conduct semi-annual CBRNE exercises, one of which may be a table top exercise. In high threat areas, conduct CBRNE exercises quarterly, one during the year may be a table top exercise.

6.5. Planning the Exercise (CE portion). The Readiness and Emergency Management Flight and CE exercise evaluation team (EET) members work with the local EET chief to plan civil engineer exercise involvement. Push for realistic scenarios with minimum simulation. The more realistic an exercise, the greater its value as an evaluation and training tool. Be sure to receive the commander's input as to what he or she wants tested. Be ready to offer suggestions on what capabilities most need improvement and what areas could benefit most from being exercised.

6.5.1. Set Objectives. When planning CE inputs, first determine or set objectives for the exercise. The particular crisis or threat will dictate the basic thrust of the exercise. Also consider MAJCOM special interest items, Inspector General (IG) findings from other units, and deficiencies noted from previous exercises when setting exercise objectives. Do not overlook the common-core criteria detailed in AFI 90-201, Inspector General Activities. General information is also contained in AFI 10-204, Readiness Exercises and After-Action Reporting Program. Obviously, the scenarios should test response capabilities and evaluate response planning. Scenarios should also identify limiting factors (LIMFAC) and evaluation of the following:

6.5.1.1. Recall procedures.

6.5.1.2. Command and control.

6.5.1.3. Crisis management; the ability to respond to the situation (recovery actions).

6.5.1.4. Predisaster actions.

6.5.1.5. Security (OPSEC and COMSEC).

6.5.1.6. Deployment processing.

6.5.1.7. Postdisaster recovery.

6.5.2. Requirements Vary. Exercise requirements vary with unit location and mission.

6.5.2.1. CONUS Bases. CONUS forces must be capable of responding to peacetime disasters and emergencies. During wartime, they must also be capable of maintaining essential base functions. For wartime simulations, exercise planners should assume that Prime BEEF teams are deployed and that remaining forces and resources must sustain essential base functions. CONUS units should exercise the civil engineer contingency response capability at least once each year using only the non-mobile force. One possibility is to conduct a recovery exercise while the Prime BEEF mobile teams receive their annual bivouac training. The need to pay civilian overtime and to consider work conditions negotiated with a civil service union may limit options to have civilian employees participate in these exercises.

6.5.2.2. Overseas Bases. In-place forces should also exercise and receive evaluation in peacetime disaster responses as well as the traditional wartime tasks: EM operations; ADR; EOD; utility and facility operations and maintenance; emergency repair of utilities and facilities; FES; debris removal; base denial; and other personnel support. Some exercises should be held without the benefit of locally hired civilian employees. Become familiar with Status of Forces Agreement (SOFA) and other rules governing local civilian labor participation in exercises.

6.5.2.3. Prime BEEF Teams. During wartime, civil engineers must be able to provide base and facility support to satisfy mission requirements worldwide. These operations may be conducted in a wide range of locations including main, collocated, limited, standby, and bare bases. Prime BEEF personnel will normally form a base civil engineer unit or augment an existing civil engineer unit. Civil engineer support requirements for specific theater bases are normally documented in In-Garrison Expeditionary Support or Joint Support Plans. When available, use such information to enhance the exercises and evaluate the readiness capability of Prime BEEF mobility forces. Evaluate Prime BEEF forces on mobility and deployment planning and execution, employment, and redeployment.

6.5.3. Some Hints. Consider the following thoughts when planning civil engineer exercise involvement:

6.5.3.1. Avoid the stereotyped or "canned" exercise—no two exercises should be the same and vary the location. When exercising recovery response, incorporate different problems and different types of buildings and utility systems.

6.5.3.2. Be thorough when planning and designing scenarios. Include as many shops as reasonable in the exercise.

6.5.3.3. Build exercises as close to real-world scenarios as possible. Add details that help create the stress and pressure experienced in actual situations. For example, provide a plethora of damage input to the EOC and CE control center from many sources over a short period of time. Handling a lot of both useful and extraneous information stresses control center personnel, but it also gives them needed practice in sorting out what situations deserve priority attention.

6.5.3.4. Exercise when it is not convenient and under unique conditions. It may be a routine task to conduct a recovery exercise under normal circumstances; try it during non-duty hours with phones out of commission or under radio-silence.

6.5.3.5. If civilian employees are to participate in exercises during non-duty hours, prepare to pay overtime.

6.5.3.6. Be creative—setting up quality exercises can be exciting and create interest for unit personnel.

6.5.4. Implementing Realism. An example of one base implementing realism in an exercise went like this—they operated for five days without commercial power, using only back up or standby generators. To add even more realism, the exercise was conducted while Prime BEEF teams were deployed. Such an exercise has tremendous impact on the entire base. This is not an easy concept to sell to an installation commander. Such an exercise does not have to last much more than a day to gain major benefits, but it is best done as part of a larger base exercise with all units participating. All personnel learn their true dependence on CE-provided power. They get a realistic opportunity to identify their wartime limitations and develop work-arounds—the same applies to civil engineers. This type of exercise conveys realism and encourages enthusiastic participation by all civil engineers. The CE unit risks an immediate demand for emergency generators from every unit on base—that cannot reasonably be satisfied. Due to potential impact of such an exercise, the installation commander should inform the MAJCOM in advance.

6.6. Higher Headquarters Exercises. Civil engineers occasionally have the opportunity to participate in larger scale MAJCOM and joint service exercises. These exercises offer a great chance to hone contingency skills, both during the exercise and on exercise related construction. For these exercises, Prime BEEF and RED HORSE teams will not likely be involved in the exercise planning. That planning will be accomplished by the joint or MAJCOM engineers. CE teams often arrive first to beddown the exercise participants and leave last after camp teardown. Exercises offer an opportunity to test mobile forces' ability to meet time sensitive requirements. While these exercises usually last a week or more, they expose civil engineers to tasks and equipment not used very often. BEAR equipment is frequently used and expedient methods often required. This provides the important benefit of offering Prime BEEF and RED HORSE personnel the unique opportunity for additional "hands-on" training with this equipment under simulated wartime conditions. The following paragraphs provide examples of major exercises civil engineers support.

6.6.1. Exercise FOAL EAGLE, and Reception, Staging, Onward Movement & Integration Exercise (RSO&I). These exercises test the ability of the US military to reinforce its forces in the Republic of Korea in combined operations with South Korean forces. Prime BEEF and RED HORSE personnel are deployed to augment in-place civil engineer units to provide force beddown, operations and maintenance support, and base recovery capabilities.

6.6.2. Exercise BRIGHT STAR. This joint service exercise is conducted in Southwest Asia to evaluate USCENTCOM capabilities. Some CE personnel are deployed to provide force beddown and base operations and maintenance.

6.6.3. Exercise BRIM FROST. This joint service exercise is conducted in Alaska. The vast majority of Air Force civil engineer support comes from personnel assigned to units in Alaska. However, support from CE units in the "lower 48" is encouraged. This exercise presents an excellent opportunity to practice contingency skills in an extreme cold weather environment.

6.6.4. Exercise FUERTE CAMINOS (STRONG ROAD). This exercise has a humanitarian and civic action focus versus the operational employment focus of the other exercises. It occurs in Central America several times during the year, and provides engineers with an excellent opportunity to use and learn expedient construction methods.

6.6.5. MAJCOM Exercises. Many exercises are planned and conducted each year by individual MAJCOMs such as ACC, PACAF, USAFE, and AMC. Seldom are units from other than the sponsoring MAJCOM involved.

6.7. Benefits of Hosting Major Exercises. Hosting a major exercise can be taxing, but can be beneficial. For example, exercise funds may be used to construct exercise facilities that the unit can use later for local exercises. The construction provides valuable practice for CE teams. The MAJCOM or the joint command provides the exercise construction requirements, but the unit can certainly identify needs and attempt to develop mutually satisfying solutions.

6.8. Evaluations. An earlier paragraph mentioned the need to set exercise objectives. Each base has an exercise evaluation team to determine if exercise objectives are met. The installation commander appoints the EET chief. Each unit commander designates individuals to serve on the team to evaluate its own functional area. The evaluators need to be experts in their field and well-trained. Exercises should not be an "us against them" event for the EET members and they must avoid the temptation to nit-pick. The evaluator's role is to help the unit expose big problems and identify the reason for the problem. EET members should also be alert to give credit where credit is due.

6.8.1. In conjunction with the Readiness and Emergency Management Flight, the CE evaluators should develop checklists to aid in their evaluations; a good place to start is AFI 90-201. It provides common-core evaluation criteria for Prime BEEF, mobility, environmental, OPSEC, SORTS, and self-defense of deployed units (self-defense applies to RED HORSE). The common-core criteria outline baseline tasks to be measured, desired combat readiness status, and rating criteria to use by Operational Readiness Inspection (ORI) teams. The common-core criteria emphasize performance versus compliance. They are valuable tools when evaluating civil engineer planning and execution during contingency and disaster response exercises. Do not forget the guidance contained in MAJCOM supplements to AFI 90-201. As with exercises, checklists should not be static—the first checklists will not be perfect. As EET members learn, encourage them to update checklists.

6.8.2. Evaluations are worthless if identified problems are not corrected. In after-exercise critiques, designate who is to fix what problems. Establish a target date they can live with, and ensure everyone understands they are to fix the problems. Then follow up personally or appoint a trusted individual to make sure corrections are completed. Eliminate recurring deficiencies—the unit does not want repeats, especially during inspections and assessments.

6.9. Inspections and Assessments. While official MAJCOM inspections and assessments cause great anxiety and are not enjoyable, use them to improve readiness and contingency response programs. Anticipate what the inspectors will look for by looking at previous unit inspection reports and recent reports from other units. Ensure the unit can perform the common-core tasks. Call counterparts at units just inspected and get their personal perspective. During inspection preparation, the unit improves unit response capabilities.

6.10. Summary. Training and exercising as a unit produces unit cohesion and combat capability. Training alongside other functional and operational specialties develops integrated combat support. Exercises are important tools to measure the effectiveness of civil engineer contingency planning and preparations. Joint service exercises expose Prime BEEF teams to major contingency tasks under actual deployed (field) conditions. Unfortunately, few teams have the opportunity to participate. A MAJCOM operational readiness inspection measures a unit's capability to accomplish its wartime tasks, but these inspections are not frequent enough to give commanders a steady flow of readiness information. Local exercises remain the best way to give commanders adequate force readiness information and provide personnel with realistic training. Use creativity, imagination, and realism when planning and conducting any exercise. Follow-up to fix problems and deficiencies identified during exercises, evaluations, and inspections.

Chapter 7

INFORMATION COLLECTION, RECORDS, AND FORMS

7.1. Information Collections. No information collections are created by this publication.

7.2. Records. The program records created as a result of the processes prescribed in this publication are maintained in accordance with AFMAN 37-123 (will convert to AFMAN 33-363) and disposed of in accordance with the AFRIMS RDS located at **https://afrims.amc.af.mil/rds_series.cfm**.

7.3. Forms (Adopted and Prescribed).

7.3.1. Adopted Forms. AF Form 9, Request for Purchase; AF IMT 847, Recommendation for Change of Publication.

7.3.2. Prescribed Forms. No prescribed forms are implemented in this publication.

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Attachment 1

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Abbreviations and Acronyms

ADR—airfield damage repair

AFFF—aqueous film forming foam

AFIMS—Air Force Incident Management System

AFRC—Air Force Reserve Command

AFS—Air Force specialty

ANG—Air National Guard

ARFF—Aircraft Rescue Fire Fighting

AS—allowance standard

BRAAT—base recovery after attack

BCE—base civil engineer

BPA—blanket purchase agreement

CBI—China-Burma-India

CBRNE—chemical, biological, radiological, nuclear and high-yield explosive

CDC—career development course

CES—civil engineer squadron

CESP—civil engineer support plan

CFETP—career field education and training plan

COB—collocated operating base

COCESS—contractor operated civil engineer supply store

COMSEC—communications security

CONUS—Continental United States

CPX—command post exercise

CRP—contingency response plan

CSS—contingency support staff

CUP—core UTC package

DART—damage assessment and response team

DAT—damage assessment team

DCC—damage control center

DRF—disaster response force

EAB—engineer aviation battalion

EALS—emergency airfield lighting system

EAP—emergency action procedures

EET—exercise evaluation team

EM—emergency management

EOC—emergency operations center

EOD—explosive ordnance disposal

ESF—emergency support function

ESL—equipment and supplies listing

FEMA—Federal Emergency Management Agency

FES—Fire and Emergency Services

FOD—foreign object damage

GP—general purpose

HAZMAT—hazardous material

HE—Harvest Eagle

HF—Harvest Falcon

HNS—host nation support

HTSA—host tenant support agreement

IC—Incident Commander

ICC—installation control center

IG—inspector general

IMA—individual mobilization augmentee

ISSA—interservice support agreement

JSP—joint support plan

LIMFAC—limiting factor

MAAS—mobile aircraft arresting system

MAJCOM—major command

MARE—major accident response exercise

MOS—minimum operating strip; military occupational specialty

NAF—numbered air force

O&M—operation and maintenance

OPLAN—operation plan

OPM—Office of Personnel Management

OPR—office of primary responsibility

OPSEC—operations security

ORI—operational readiness inspection

O-WRM—other war reserve materiel

PACAF—Pacific Air Force

POL—petroleum, oils and lubricants

POS—peacetime operating stocks

Prime BEEF—Prime Base Engineer Emergency Force

PSP—pierced steel planking

PWRMS—prepositioned war readiness materials

RED HORSE—Rapid Engineer Deployable Heavy Operations Repair Squadron Engineers

REOTS—regional equipment operator training site

RTP—readiness training package

SABER—simplified acquisition base engineer requirements

SCARWAF—Special Category Army With Air Force

SOFA—status of forces agreement

SORTS—status of resources and training system

SRR—survival, recovery and reconstitution

STS—specialty training standard

SWPA—Southwest Pacific Area

TDY—temporary duty

TDO—tactical deception officer

TPFDD—Time-Phased Force and Deployment Data

TPFDL—Time-Phased Force and Deployment List

USAFE—United States Air Forces in Europe

UTC—unit type code

UXO—unexploded explosive ordnance

VCR—video cassette recorder

WHNS—wartime host nation support

WMP—war mobilization plan

WRM—war reserve materiel

Terms

Aerospace Expeditionary Force—Deployed US Air Force wings, groups, and squadrons committed to a joint operation.

Aircraft Arresting System—A series of components used to stop an aircraft by absorbing its momentum in a routine or emergency landing or aborted takeoff.

Aircraft Rescue Fire Fighting (ARFF)—The fire-fighting actions taken to rescue persons and to control or extinguish fire involving or adjacent to aircraft on the ground.

Airfield Damage Repair (ADR)—The process of using construction equipment, tools, portable equipment, expendable supplies, and temporary surfacing materials to provide a minimum operating surface through expedient repair methods.

Airlift—Operations to transport and deliver forces and materiel through the air in support of strategic, operational, or tactical objectives.

Airbase Defense—Those measures taken to nullify or reduce the effectiveness of enemy attacks on, or sabotage of, airbases to ensure that the senior commander retains the capability to assure aircraft sortie generation.

Air Force Civil Engineer Support Agency (AFCESA)—A field operating agency (FOA) located at Tyndall Air Force Base, Florida. The Directorate of Contingency Support (HQ AFCESA/CEX) acts as the Air Force program manager for Base Civil Engineer (BCE) Contingency Response Planning.

Alert Condition—A level of readiness which military forces are to achieve, usually based on a defined level of threat. Predetermined preparation instructions are implemented upon declaration of each alert condition. Examples of alert conditions include defense conditions (DEFCON), force protection conditions (FPCON), and hurricane conditions (HURCON). Within each condition, there are usually five levels of readiness.

Antiterrorism—Defensive measures used to reduce the vulnerability of individuals and property to terrorist acts, to include limited response and containment by local military forces.

Area of Operations—An operational area defined by the joint force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces.

Bare Base—A base having minimum essential facilities to house, sustain, and support operations to include, if required, a stabilized runway, taxiways, and aircraft parking areas. A bare base must have a source of water that can be made potable. Other requirements to operate under bare conditions form a necessary part of the force package deployed to the bare base.

Base Denial—The destruction or denial of vital airbase resources so the enemy cannot use them against friendly forces or for his benefit.

Base Recovery After Attack (BRAAT)—A theater concept of recovering a base after conventional attack where resumption of flying operations is the first priority. Other recovery activities may be conducted concurrently; however, these activities must not impede the resumption of flying operations.

Biological Warfare—Often included in the general description of chemical warfare, biological warfare involves the use of biological materials to incapacitate or kill enemy forces. While banned by international treaty, it has been used in modern times by some belligerents. Joint Pub 1-02 defines biological operations as employment of biological agents to produce casualties in personnel or animals and damage to plants or material, or defense against such employment.

B-1 Revetment—A galvanized metal revetment assembled using metal pins and filled with sand or similar material. B-1 revetments are often capped with concrete to prevent water from entering the fill material. They are primarily used to protect parked aircraft; however, they can also be used for facility hardening.

Cannibalize—To remove serviceable parts from one item of equipment in order to install them on another item of equipment.

Chemical, Biological, Radiological, Nuclear and High-yield Explosive (CBRNE)—An inclusive term typically used to describe the threats and hazards associated with terrorist use of these type substances as a weapon.

Chemical Warfare—All aspects of military operations involving the employment of lethal and incapacitating munitions/agents and the warning and protective measures associated with such offensive operations. Since riot control agents and herbicides are not considered to be chemical warfare agents, those two items will be referred to separately or under the broader term "chemical," which will be used to include all types of chemical munitions and or agents collectively.

Collocated Operating Base (COB)—An active or Reserve allied airfield designated for joint or unilateral use by US Air Force wartime augmentation forces or for wartime relocation of US Air Force in-theater forces. COBs are not US bases.

Command and Control—The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

Continental United States—United States territory, including the adjacent territorial waters, located within North America between Canada and Mexico.

Contingency—An emergency involving military forces caused by natural disasters, terrorists, subversives, or by required military operations. Due to the uncertainty of the situation, contingencies require plans, rapid response, and special procedures to ensure the safety and readiness of personnel, installations, and equipment.

Contingency Plan—A plan for major contingencies that can reasonably be anticipated in the principal geographic subareas of the command.

Contingency Response Plan—A base civil engineer plan of action developed in anticipation of all types of contingencies, emergencies, and disasters.

Conventional Weapon—A weapon which is neither nuclear, biological, nor chemical.

Damage Control Center—The operations center established by the base civil engineer (BCE) to control and conduct airfield damage repair (ADR) and other post attack recovery operations with BCE forces. The DCC usually is headed by the BCE operations chief and staffed with appropriate BCE personnel.

Damage Control—Measures taken before, during or after hostile action or natural or man-made disasters to reduce the probability of damage, minimize its effects, and initiate recovery.

Decontamination—The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing, chemical or biological agents, or by removing radioactive material clinging to or around it.

Deployment—The relocation of forces and material to desired areas of operations or to a staging area. Deployment encompasses all activities from origin or home station through destination, specifically including within the United States, inter-theater, and intra-theater movement legs, staging, and holding areas. (JP 1-02).

Disaster Relief Operations—The use of DOD resources to help civil authorities during peacetime domestic emergencies.

Disaster Response Force—The organization used at Air Force bases to respond to major accidents, natural disasters, and other peacetime emergencies. Variations from the DRF are used during war. AFDD 100 defines it as the organization used for contingency response, command and control, and recovery.

Doctrine—Fundamental principles by which military forces guide their actions in support of the national objectives. It is authoritative but requires judgment in application (JP 1-02).

Emergency Management—Managing physical threats facing military installations including major accidents, natural disasters, HAZMAT, terrorist use of chemical, biological, radiological, nuclear, or high-yield explosive substance, enemy attack and a broad spectrum of planning, response and recovery actions.

Emergency Operations Center—The command and control element that gathers information, directs, and monitors execution of an installation's actions before, during, and after a contingency. The EOC maybe collocated with, or immediately adjacent to, the installation operations center to facilitate rapid exchange of information and ensure expeditious resumption of flying operations after attack.

Exercise—A military maneuver or simulated wartime operation involving planning, preparation, and execution. It is carried out for the purpose of training and evaluation. It may be a multinational, joint, or single-service exercise, depending on participating organizations.

Explosive Ordnance Disposal—The detection, identification, on-site evaluation, rendering-safe, recovery and final disposal of unexploded explosive ordnance. It may also include explosive ordnance that has become hazardous by damage or deterioration.

Explosive Ordnance Reconnaissance—Reconnaissance involving the investigation, detection, location, marking, initial identification and reporting of suspected unexploded explosive ordnance, by explosive ordnance reconnaissance agents, in order to determine further action.

Fire Emergency Services—Prevent fires, minimize injuries and losses of lives, property, and the environment occurring in periods of peace, war, lesser contingencies, and humanitarian support operations. Included are both manmade and natural incidents; fire suppression or hazard mitigation; rescue; mitigation or containment of releases of hazardous materials, such as chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) agents, resulting from industrial accidents, terrorism; and emergency medical services.

Force Beddown—The provision of expedient facilities for troop support to provide a platform for the projection of force. These facilities may include modular or kit-type substitutes.

Hardening—The process of providing protection against the effects of conventional weapons. It can also apply to protection against the side effects of a nuclear attack or against the effects of a chemical or biological attack.

Harvest Eagle—A nickname for an air transportable, tent-based system of housekeeping support facilities designed to provide basic living accommodations, field feeding, and hygiene support for 13,200 persons under bare base conditions. Each kit is designed to provide softwall housekeeping support for 550 personnel. Examples of Harvest Eagle equipment are water purification units, tents, and showers. Mobile aircraft arresting systems and contingency airfield emergency lighting systems are also included.

Harvest Falcon—A nickname for an air transportable system of hardwall shelters, tents, equipment, and vehicles designed to provide worldwide support of personnel and aircraft under bare base conditions. The system provides direct mission and housekeeping support facilities for up to 55,000 personnel and 822 aircraft at up to 15 separate beddown locations. Harvest Falcon is sized into 50, 1,100-person bare base housekeeping sets, 15 flightline initial sets, 25 flightline follow-on support sets, and 15 industrial operations support sets. Harvest Falcon sets are designed to support squadron size aircraft deployments.

Hazardous Material—A substance (solid, liquid, or gas) that when released is capable of creating harm to people, the environment, and property.

High-yield Explosive—Any conventional weapon or device that is capable of a high order of destruction or disruption and/or of being used in such a manner as to kill or injure large numbers of troops. (DODI 2000.18)

Host Nation—A nation that receives the forces and or supplies of allied nations, coalition partners or NATO organizations to be located on, to operate in, or to transit through its territory.

Individual Mobilization Augmentee—An individual reservist attending drills who receives training and is preassigned to an Active Component organization, a Selective Service System, or a Federal Emergency Management Agency billet that must be filled on, or shortly after, mobilization. Individual mobilization augmentees train on a part-time basis with these organizations to prepare for mobilization. Inactive duty training for individual mobilization augmentees is decided by component policy and can vary from 0 to 48 drills a year. (JP 1-02)

Installation Operations Center—The top echelon of airbase defense operations and is led by the senior Air Force commander. The primary focus of the installation operations center is flight operations, airbase security and support to other forces on the airbase. The center's battle staff includes senior officers from the operations, maintenance, mission support, and medical groups. Members of the wing special staff or senior officers representing major tenant units or host-nation forces may also be present.

Host Nation Support—Civil and/or military assistance rendered by a nation to foreign forces within its territory during peacetime, crisis or emergencies, or war based on agreements mutually concluded between nations.

Infrastructure—A building and permanent installations necessary for the support, redeployment, and military forces operations (e.g., barracks, headquarters, airfields, communications, facilities, stores, port installations, and maintenance stations.

Joint Operation Planning and Execution System—A system that provides the foundation for conventional command and control by national- and combatant command-level commanders and their staffs. It is designed to satisfy their information needs in the conduct of joint planning and operations. Joint Operation Planning and Execution System (JOPES) includes joint operation planning policies, procedures, and reporting structures supported by communications and automated data processing systems. JOPES is used to monitor, plan, and execute mobilization, deployment, employment, sustainment, and redeployment activities associated with joint operations. (JP-1-02).

Joint Support Plan—A plan for the reception and beddown of forces that is collectively developed by the host nation, the theater in-place sponsor, and the affected augmentation unit. The plan outlines all facets of operations at a collocated operating base to include personnel, facilities, and equipment.

Limiting Factor—A factor or condition that, either temporarily or permanently, impedes mission accomplishment. Illustrative examples are transportation network deficiencies, lack of in-place facilities, malpositioned forces or materiel, extreme climatic conditions, distance, transit or over flight rights, political conditions, etc.

Main Operating Base—A base on which all essential buildings and facilities are erected. Total organizational and intermediate maintenance capability exists for assigned weapon systems. The inter-mediate maintenance capability may be expanded to support specific weapon systems deployed to the MOB.

Minimum Operating Strip—A runway that meets the minimum requirements for operating assigned and/or allocated aircraft types on a particular airfield at maximum or combat gross weight. (JP 1-02)

Minimum Operating Strip Selection—The process of plotting damage and unexploded ordnance (UXO) locations on a map of the airbase runway and using this information to select a portion of the damaged runway which can be most quickly repaired to support aircraft operations.

Mission Ready Technician—Graduates from Air Force technical schools who are fully trained and qualified to perform mission tasks when they arrive at their first duty location. The term applies only to selected critical specialties.

Mobility—A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission.

Natural Disaster—An emergency situation posing significant danger to life and property that results from a natural cause (JP 1-02).

Operation—A military action or the carrying out of a strategic, operational, tactical, service, training or administrative military mission.

Operation plan—Any plan, except for the Single Integrated Operation Plan, for the conduct of military operations. Plans are prepared by combatant commanders in response to requirements established by the Chairman of the Joint Chiefs of Staff and by commanders of subordinate commands in response to requirements tasked by the establishing unified commander. Operation plans either are prepared in a complete format (OPLAN) or as a concept plan (CONPLAN). The CONPLAN can be published with or without a time-phased force and deployment data (TPFDD) file.

a. OPLAN - An operation plan for the conduct of joint operations that can be used as a basis for development of an operation order (OPORD). An OPLAN identifies the forces and supplies required to execute the combatant commander's strategic concept and a movement schedule of these resources to the theater of operations. The forces and supplies are identified in TPFDD files. OPLANs will include all phases of the tasked operation. The plan is prepared with the appropriate annexes, appendixes, and TPFDD files as described in the Joint Operation Planning and Execution System manuals containing planning policies, procedures, and formats.

b. CONPLAN - An operational plan in an abbreviated format that would require considerable expansion or alteration to convert it into an OPLAN or OPORD. A CONPLAN contains the combatant commander's strategic concept and those annexes and appendixes deemed necessary by the combatant commander to complete planning. Generally, detailed support requirements are not calculated and TPFDD files are not prepared.

c. CONPLAN with TPFDD - A CONPLAN with TPFDD is the same as a CONPLAN except that it requires more detailed planning for phased deployment of forces.

Passive Defense—As used in this volume, measures taken on or around an installation to reduce the probability of and to minimize the effects of damage caused by hostile action.

Planning Factor—A multiplier used in planning to estimate the amount and type of effort involved in a contemplated operation. Planning factors are often expressed as rates, ratios, or lengths of time. From an engineering perspective, planning factors are often expressed as lump sums or on a per-aircraft or per-person basis.

Potable Water—Water that is safe for consumption.

Prime BEEF (Base Engineer Emergency Force)—A Headquarters US Air Force, major command and base-level program that organizes civil engineer forces for worldwide direct and indirect combat support or emergency recovery from natural disasters. It assigns civilian employees and military personnel to both peacetime real property maintenance and wartime engineering functions.

Readiness—The ability of US military forces to fight and meet the demands of the national military strategy. Readiness is the synthesis of two distinct but interrelated levels:

a. Unit readiness – the ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed.

b. Joint readiness – the combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions. (JP 1-02).

Readiness and Emergency Management Flight—The office of primary responsibility for all activities and measures the installation designs or takes to protect Air Force resources from the effects of attacks, natural disasters, and major accidents; to restore primary mission assets after disasters; and to fulfill the humanitarian disaster relief responsibilities of commanders.

RED HORSE—Squadrons established to provide the Air Force with a highly mobile, self-sufficient, rapidly deployable civil engineering capability required in a potential theater of operations.

Reverse Osmosis Water Purification Unit—A water purification device that uses a series of membranes to eliminate impurities. The ROWPU is capable of removing dissolved minerals.

Sortie Generation—This term refers to all activities needed to get an aircraft ready to fly. It is used most often in conjunction with fighter and attack aircraft during periods of intense flying activity, when good coordination of efforts is needed to prepare the maximum number of aircraft for flight in a short period of time over a period of days.

Subject to Deploy—Individuals whose Air Force specialty exists in any UTC or those assigned to a federal civilian position designated as Emergency Essential. Subject-to-deploy personnel must be fully trained and equipped on a time-available basis and as resources permit.

Survivability—Concept which includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Survivability tactics include building a good defense; employing frequent movement; using concealment, deception, and camouflage; and constructing fighting and protective positions for both individuals and equipment.

Tactical Deception—Activities designed to deceive, misinform and confuse an enemy concerning the intent, disposition, or employment of friendly forces. Such actions may be accomplished by electronic, visual, communication, and other methods.

Terrorism—The calculated use of unlawful violence or threat of unlawful violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological.

Time-Phased Force and Deployment List—Appendix 1 to Annex A of the operation plan. It identifies types and/or actual units required to support the operational plan and indicates origin and ports of debarkation or ocean area. It may also be generated as a computer listing from the time-phased force and deployment data.

Unit Type Code (UTC)—A Joint Chiefs of Staff developed and assigned code, consisting of five characters that uniquely identify a "type unit."

Wartime Construction Standards—Guidelines which determine the types of materials and construction techniques to be used at various stages of a contingency or wartime situation.

War and Mobilization Plan—The Air Force supporting plan to the Joint Strategic Capabilities Plan. The six volumes of the WMP extend through the Future Years Defense Program to provide continuity in short- and mid-range war and mobilization planning. It provides current planning cycle policies and planning factors for the conduct and support of wartime operations. It establishes requirements for development of mobilization and production planning programs to support sustained contingency operations of the programmed forces. The WMP encompasses all functions necessary to match facilities, manpower, and materiel with planned wartime activity.

War Reserve Materiel (WRM)—Materiel required in addition to primary operating stocks and mobility equipment to attain the operational objectives in the scenarios authorized for sustainability planning in the Defense Planning Guidance. Broad categories are: consumables associated with sortie generation (to include munitions, aircraft external fuel tanks, racks, adapters, and pylons); vehicles; 463L systems; materiel handling equipment; aircraft engines; BEAR assets; individual clothing and equipment; munitions and subsistence.

Attachment 2

PREPARING CIVIL ENGINEER CONTINGENCY RESPONSE PLANS

A2.1. General Guidance. The basic sources of information for OPLAN preparation are AFI 10-401, AFMAN 10-401, Volume 2, and Headquarters Air Force Functional Area Managers. These sources permit considerable latitude in format for plans other than MAJCOM OPLANs and concept plans (CONPLAN), which are written in support of joint service plans. The CE Contingency Response Plan (CRP) follows the basic format but varies to satisfy specific CE needs and to better support the CEMP 10-2. The format also makes it easy to add annexes or appendixes to support other plan taskings. The contingency response plan does not replace CE input to other plans. Rather, it provides a convenient place to expand upon those inputs and provide detailed CE-specific response instructions. **Table 2.5.** lists plans CE often supports. **Figure 2.1.** shows where details to support those plans can be incorporated into the contingency response plan. Some of those details are included in the examples in this attachment.

A2.1.1. The CRP contains a great deal of information in one convenient place to help civil engineers make quick and sound decisions in contingency situations. The large volume of information dictates that it be well organized to find needed information quickly. The ideal arrangement puts the most important information at the fingertips. The suggested format in this attachment will organize the plan in modules and then placed in binders, so all levels of the organization can easily grab the book required for each particular situation. The book designed for each shop, team, or control center position need not have a complete CRP, but it should contain execution checklists (derived from the plan's operating instructions); a copy of the applicable operating instructions; required maps and schematics; communication procedures, etc.

A2.1.2. Except for the annex letters and titles that are specified in AFI 10-211, the formats in this attachment are guides only. If a more useful format for the base exists, use it and share it with others. Send ideas to HQ AFCESA and indicate that they are for consideration in the next update to this pamphlet.

A2.1.3. The contingency response plan should help the CE unit respond to crises. Consequently, it must contain response procedures and useful supporting information. It is very easy to include so much information that the plan becomes arduous. Avoid this by starting with a clear idea of what to include and what level of detail. Always review the plan in progress to ensure it stays within the game plan. A plan does not need to cover every conceivable situation. It is a good plan if it clearly outlines the following for major situations.

A2.1.3.1. Who is to respond?

A2.1.3.2. What resources they are to take.

A2.1.3.3. Where to obtain resources, including any special access requirements.

A2.1.3.4. Where they are to go first.

A2.1.3.5. What initial tasks they are to do

A2.1.3.6. Who is in charge?

A2.1.3.7. How they are to communicate with their boss.

A2.1.3.8. And how they will resupply.

A2.1.4. When a contingency response plan is well researched and prepared, it will require few changes over the years, only tweaks to change names and equipment status. If the plan has many weaknesses, not all have to be corrected at one time. Pick one annex or appendix at a time and do a thorough job with it. Once completed with one of the first three annexes (A, B, or C), the remaining will be significantly easier.

A2.1.5. There are many ways to format a plan. Be consistent as possible, practical, and logical. Attempt to place the same type information in the same relative place and use similar titles throughout the different appendixes or tabs. For example, choose to place communication procedures last in all appendixes or tabs. Such consistency makes the plan user friendly.

A2.2. Plan Components. The components to an OPLAN submitted by a MAJCOM or NAF are normally consists of a cover; a letter of transmittal; security instructions and record of changes; plan and planning information releasability; a plan summary; a table of contents; the basic plan; attachments; execution checklists; and a distribution list. Include these components in the contingency response plan, but only three are necessary: the table of contents, the basic plan, and the attachments (with their annexes, appendixes, and tabs). These components are discussed in the following paragraphs. If the plan contains classified information, mark the plan according to the AFI 10-401, Volume 2, and add the security instructions component. Refer to AFI 10-401, Volume 2, for guidance on the other components. A cover is optional for the CRP, but adds a finishing touch to a plan (**Figure A2.1.**).

A2.3. Table of Contents. **Figure A2.2.** presents a sample format for a table of contents. Suggest the development of a draft or working table of contents early in the plan preparation process. It serves as a useful plan preparation guide and makes it easier for others to assist in plan development.

A2.4. Basic Plan. Format and guidance for the basic plan is included in **Figure A2.3.** This sample is written as an unclassified plan. It is recommended that the plan be written as an unclassified document. If classified material is required, incorporate that material into a classified annex that is printed and bound separately from the basic document.

A2.5. Attachments (e.g., Annexes, Appendixes, and Tabs). There is no required format or content for annexes, appendixes, or tabs. The following paragraphs offer some format and content suggestions. **Figure A2.2.** also highlights one way to organize the appendixes and tabs. The list of appendixes and tabs in the figure is not intended to be comprehensive, tailor it as needed. Add, drop, or consolidate appendixes to cover the situations at the base. Create tabs (operating instructions) to guide the response of each team organized for each situation. **Table 2.1.** through **Table 2.4.** in **Chapter 2** may trigger ideas for other appendixes and tabs; use as few or as many appendixes and tabs as required. If an annex is not needed, still list it in the table of contents with its corresponding letter, but mark it "Not Used." Use locally defined annexes U, V, and W if needed to include information that does not fit well into the other annexes. The letters "I" and "O" are generally not used as labels for annexes or tabs to avoid confusion with the numbers one and zero.

A2.6. Annex A—Major Peacetime Accident. The recommended format for this annex is the same as the basic plan, but this annex should provide more detail on major accident responses (**Figure A2.4.**). The emphasis in the basic annex should be on the conditions which trigger a response, the major CE taskings, and the command relationships. The appendixes and tabs provide the specific details for CE response teams. Likely accidents are covered in separate appendixes. The tabs to each appendix contain operating instructions for control centers and for each flight, shop, or team that must respond, either initially or in a support role. General information for the basic annex can be extracted from annex A of the CEMP 10-2, especially from the CE appendixes. Rather than duplicate that information in two plans, write it in one and cross-reference it in the other. If information is extracted from the CEMP 10-2 (or any other plan) and it is rewritten often, the contingency response plan may have to be updated just as often.

A2.6.1. Appendixes to Annex A. Prepare an appendix for each major accident likely to occur on or near the installation. Accidents that call for the same initial response across the organization can be consolidated into one appendix. While accident situations vary, the initial response will generally be similar. At least three appendixes will be needed: one for on-base accidents, one for off-base responses, and one for hazardous material (HAZMAT) spills. Accidents involving nuclear materials may trigger the need for another appendix; follow the CEMP 10-2 direction. See **Figure A2.5.** for the suggested format.

A2.6.2. Tabs to Appendixes in Annex A. Create tabs to provide specific instructions for the response of each flight, shop, team, and control center. Recommend that tabs be formatted as operating instructions as in **Figure A2.6.** CE control centers, flights, shops, and teams should develop execution checklists from their operating instructions (tabs). Checklists are not part of the plan.

A2.6.3. Common Appendixes and Tabs. When guidance applies to all teams, a common appendix or tab can be written. A common tab is useful when there is a large amount of identical information and when not wanting to duplicate it in all tabs. Unit recall and assembly procedures and communication procedures are two examples. Special notification and communication requirements should still be included in individual appendixes and tabs. If common appendixes and tabs are chosen, recommend using that format throughout the plan.

A2.7. Annex B—Natural Disaster. Tailor the basic formats to present the information required in this annex and its appendixes and tabs. Write an appendix for each "likely" natural disaster such as hurricane, tornado, wild fire, flood, etc. Where responses differ from those of an accident, write different operating instructions for each appendix. When responses are essentially the same, refer to a previous tab. Be sure to cover CE predisaster, dispersal, and evacuation actions. Also, address CE actions to provide temporary shelter for disaster victims. See **Figure A2.2.** for ideas about appendixes in this annex.

A2.8. Annex C—Enemy Attack. The instructions for annex B also apply to this annex, except the appendixes will reflect wartime activities. **Figure A2.2.** offers ideas on other appendixes and tabs for this annex. Content suggestions for some of the appendixes follow.

A2.8.1. Appendix 1—Notification, Recall, and Assembly. Outline procedures used to notify the unit of its need to respond. Describe instructions and assign responsibility to initiate unit recall. Cover individual responsibilities when notified to return to duty: recall responsibilities, what personal gear to bring, when and where to report, etc. Include notification, recall, and assembly instructions for each type of response. When the instructions apply to more than one situation, cross-reference rather than repeat the same instructions.

A2.8.2. Appendix 2—Base Reception Plan Support. Present the CE tasks and detailed instructions to beddown forces that augment the base, or temporarily accommodate forces flowing through during war. Also, cover all CE support to temporarily shelter non-combatant evacuees. Outline tasks by priority order and indicate who will do each. Include a schedule showing when tasks must be completed.

A2.8.3. Appendix 3—Expedient Hardening. Provide instructions for the expedient hardening tasks that CE must perform and for required support to other units engaged in hardening their own facilities and equipment. List the facilities involved, indicate what is to be done, by whom, and when.

A2.8.4. Appendix 4—Resource Dispersal. Identify resources to be dispersed, how they will be moved, who will do it, where they will go, and when. Also, identify any site preparation required for the locations where teams disperse as well as equipment and materials they should take to prepare those sites. Include classified information in annex X.

A2.8.5. Appendix 5—Non-Combatant Evacuation. If not included in the Base Reception Plan Support appendix, be sure to include CE support in some appendix. Since this is a base wide effort, show CE interface and timing.

A2.8.6. Appendix 6—Casualty Care. Following base procedures, explain what the unit and individual members are to do with casualties—both the wounded and the dead. Some details may not be able to be included, such as locations of casualty collection points, because that information may not be available until just before hostilities begin or after an attack. The fact that casualties should be taken to those locations can be noted in this appendix as well as requirements to notify team chiefs or supervisors.

A2.8.7. Appendix 7—Base Recovery After Attack Actions. While the type, intensity, extent, and duration of an attack cannot be known, this appendix and its tabs can provide the details for the initial CE response to a base attack. The details between an overseas and a CONUS base will naturally be considerably different. The example in **Figure A2.2.** outlines the situation at an overseas base.

A2.8.8. Appendix 8—Vehicle and Limited Area Contamination Control. Show how vehicles and limited areas (mission essential equipment, and command post entry points) can be decontaminated during peacetime chemical accidents or wartime CBRNE operations. Include a list of vehicles, equipment, and personnel used in decontamination operations.

A2.8.9. Appendix 9—Survival, Reconstitution, and Recovery. If the base has a SRR tasking, include CE support actions in an appendix. As with all responses, identify what is to be done, by whom, with what resources, by when, and where.

A2.8.10. Appendix 10—Security and Base Defense. Show how CE personnel designated to bear arms are to be used during contingencies and wartime operations. This requires direction from security forces. If they do not plan to use CE personnel, state that. Plans must contain provisions for command and control with emphasis on fire control. Include an indication of when CE personnel might be called on to help, such as a specific DEFCON or FPCON or a specific situation. Usually this will be included only at overseas bases.

A2.8.11. Appendix 11—Weapons and Ammunition Management. Civil engineer forces assigned or subject to performing recovery operations in a hostile environment should be armed, weapons-trained, and qualified to bear arms. In general, the management of weapons assigned to any civil engineer organization is a shared responsibility between the commander, the readiness flight chief, a deploying Prime BEEF team chief, and the individuals receiving the weapons. This appendix must address the management of the weapons authorized for use by Air Force engineers. Rather than a separate appendix, this information can be included as a tab (operating instruction) in the security and base defense appendix. Instructions relating to deployment preparations can be included in Annex F.

A2.8.11.1. Address the accountability and maintenance of all weapons assigned to the organization. The intent is to ensure that weapons and ammunition are controlled and that security procedures are followed when weapons are in storage or when they are issued to individuals. Stipulate the security procedures to follow when weapons are issued to ensure positive control is maintained at all times.

A2.8.11.2. Address storage of weapons and ammunition in garrisons and under field conditions. The instructions should spell out procedures used to protect the firearms as well as the method of sounding an alarm if a forceful theft is attempted. An armed response force must be reasonably available to protect the weapons.

A2.8.11.3. Also, address the movement of weapons. This includes the preparation, storage, marshalling, issue, courier, and safeguarding of small arms and ammunition deployed in support of contingency operations.

A2.8.12. Appendix 12—Base Denial. CONUS bases do not require this annex. Engineers are well qualified to execute denial operations with heavy equipment and demolitions, but other units must also be involved in denying their facilities and equipment. This annex must provide detailed instructions for carrying out CE denial tasks. When selecting facilities and equipment for denial, planners must consider national policy restrictions, if any, of the US or host nation. Coordinate, as required, with other functional areas, US elements, joint commands, and allied forces. Generally, these considerations should be covered in the installation denial plan. Theater commanders establish the policies governing denial operations in the theater, and delegate base-specific denial planning and execution to the lower level command. As a minimum:

A2.8.12.1. State conditions for base denial when possible.

A2.8.12.2. List the commanders having local denial authority.

A2.8.12.3. List specific facilities, utilities, equipment, and supplies to deny. Indicate the method and degree of denial. Assign those "targets" to specific denial crews for execution. Identify discretionary targets and the conditions in which they would be denied. Also, identify any prohibited targets, such as facilities which must not be damaged, because they have historical or cultural significance. Evacuation of equipment and materials is as much a part of denial operations as destruction and should always be considered first.

A2.8.12.4. List the priority for destruction or evacuation. Delineate the time phasing of denial. The amount of time available can affect the order in which items are denied. With little time, the higher priority facilities will likely be denied first. With additional time and an uncertain situation, the higher priority facilities may be saved until the last.

A2.8.12.5. For evacuation, specify what items will be moved, on what vehicles, and by whom.

A2.8.12.6. Describe availability of special civil engineer denial teams (such as RED HORSE demolition teams).

A2.8.12.7. Outline limitations on destructive denial.

A2.8.12.8. Describe safety and security measures to be followed.

A2.8.12.9. Describe how denial resources, from both on-base and off-base sources, will be allocated.

A2.8.12.10. Include instructions for removal or destruction of classified materials and documents.

A2.8.13. Appendix 13—Minimum Alert Preparations. There will always be a need to outline the most important actions to get ready for war with minimum notice. Consider including minimum alert preparations in each individual annex, appendix, and tab. Consolidate them in one appendix or include them in annex X, if classified. Because of the time sensitivity, be sure to list the tasks in priority order; identify who will do them; state what resources will be available, priorities for use of equipment; and specify when they should be completed.

A2.8.14. Appendix 14—Facility Operations and Maintenance with Limited Manpower. Identify what facility operations and maintenance tasks will be performed when not all members of the CE unit are available. This includes operation of utility and HVAC systems. Two scenarios come to mind: Prime BEEF teams have deployed or the civilian workforce is unavailable for any reason at bases in foreign countries. Cover each scenario as appropriate for the base.

A2.8.15. Appendix 15—Operations Security (OPSEC). Civil engineers must always be sensitive to operations security. Describe procedures to minimize transmission by non-secure radios, phones, computers, messages, etc., of information about base status and unit capabilities. The status of most tasks covered in this annex is OPSEC sensitive.

A2.8.16. Appendix 16—Communication Procedures. If not covered elsewhere, include a communications appendix. Be sure to cover the allocation of equipment, communication procedures and priorities, call signs, authentication codes, etc. Classified information should be included in annex X.

A2.9. Annex D—Terrorist Attack. Response to terrorist use of CBRNE requires many of the same response actions as other types of incidents; however, responders must also establish and maintain a chain of custody for evidence preservation as directed by the IC. Responders must be alert for physical indicators and other outward warning signs of additional CBRNE events, including armed assault. Also, they must consider the potential for secondary attack, such as chemical dispersal devices, secondary explosive devices or booby traps..

A2.10. CE Support for Miscellaneous Plans/Situations. This annex permits the plan to include CE support for situations that are peculiar to a base or do not logically fit into annexes A, B, or C. It is suggested to prepare an appendix with tabs for each of those plans or situations. Good examples include a bomb threat, the Stop Alert Plan, mortuary support, and the Installation Security Plan (or Resource Protection Plan). Joint Support Plans require certain actions to be taken by overseas USAF support bases when the plans are implemented. If the unit has such taskings, include them in this annex. Provisions to protect real property records and engineering record drawings from damage can be included here or in annexes B and C to tie them to a specific crisis.

A2.11. Annex E—Fire Emergency Services Operations. Describe ARFF structural firefighting, containment, other emergency services, and response actions to be taken during attack, natural disaster, major accidents, major fire incidents (as prescribed by AFIs 32-2001, 10-2501 and 10-210), and local operations plans. Emphasis should be on the total unit response and support for firefighting operations. “Normal” emergency responses and firefighting operations need not be included if they are covered by pre-fire plans. Include the following elements:

A2.11.1. FES vehicles and quantities of fire suppression agents available on base.

A2.11.2. Emergency off-base responses, including predesignated firefighting vehicles with their un-refueled on-road travel distances. Include logistics support requirements.

A2.11.3. Procedures to provide fire emergency services for nearby federal facilities if municipal employee strikes or slowdowns inhibit normal municipal fire suppression services.

A2.11.4. Conflagration hazards and natural cover fires.

A2.11.5. Alternate water sources.

A2.11.6. Vehicle resupply procedures (agent, water, and fuel), procurement of additional firefighting agent supplies, and the availability of personnel from other than the FES organization.

A2.11.7. Specific responsibilities of other organizations to support FES operations, types of equipment available by support agencies, and response procedures. This includes auxiliary firefighting.

A2.11.8. Reciprocal/mutual aid agreements for fire protection entered into by Air Force installation FES with other fire organizations. These agreements ensure adequate manpower and equipment are available to cope with major fire incidents and disaster situations that exceed the capability of the Air Force installation FES. The agreements should be summarized or the actual agreements included in annex M.

A2.11.9. Confined space rescue. Include procedures and support requirements for confined space rescue. Cover situations where the FES flight traditionally acts independently (such as rescues from a POL tank, an on-aircraft fuel cell, ora burning building) and situations that require an integrated effort by the disaster response force (such as a collapsed building rescue).

A2.12. Annex F—Deployment Preparations. As needed, include appendixes and tabs to define all actions required to prepare the Prime BEEF teams for deployment once they are alerted. Provide details for CE tasks outlined in the base deployment plan. Assign responsibilities to specific crews and identify when each task must be completed. Suggest the preparation of operating instructions for mobilizing the teams; preparing, marshalling, and transporting equipment and weapons; and if required, convoying the team to its port of embarkation. This annex should not duplicate information in the base deployment plan.

A2.13. Annex G—Contingency Environmental Considerations. Include instructions for environmental protection that are unique to contingencies or are so important that they need to be emphasized. By way of example, contractors dispose of toxic wastes for most bases. In war, contract disposal may not be possible. Identify procedures to temporarily store or permanently dispose of toxic materials when the unit cannot get access to an approved disposal location. If materials are to be buried, identify those sites in advance and determine what methods and materials that will be used to control runoff and leaching into the ground. Non-standard pollution prevention and clean-up procedures should be addressed. Address procedures to protect on-base water supplies from HAZMAT spills and indirect runoff.

A2.14. Annex H—Facility Priority Listing. List the priority of installation facilities in their importance to the installation mission. The list indicates which facilities get priority attention for actions such as expedient hardening, firefighting, damage recovery, or utilities isolation (in reverse order). The list should be used as a guide, not a hard, fast plan, since unforeseen circumstances can easily dictate deviations. In those situations, common sense and good judgment must prevail. **Figure A2.9.** illustrates a sample format.

A2.15. Annex J—CE Personnel Shelters. Provide instructions for sheltering civil engineers before, during, and after disasters and war. List the personnel shelters that civil engineers will occupy or manage. Extract that information from the base shelter listing or incorporate that list in its entirety. For each CE shelter, include capacity; the kind of shelter (CBRNE, tornado, flood, etc.); who owns and operates it and who else uses it; how long it should be prepared for occupancy; what utilities it has (heat, power, backup power, communications, etc.); protection factor and date of last survey if a nuclear shelter. Identify which part of the facility is to be used for shelter space if not the entire building. Include shelter preparation and operating instructions for CE shelter management teams. Provide shelter assignment instructions for CE shops/teams. Follow MAJCOM guidance if more specific.

A2.16. Annex K—Personnel Augmentation. This annex covers where additional personnel—both skilled and unskilled—are to be obtained. This includes Prime BEEF teams, contractors, reserve backfills, base augmentees, etc.

A2.16.1. Appendix 1—Base Augmentees. List augmentee requirements from the base Augmentation Duty program and highlight their duties and responsibilities and who in CE is responsible for each group.

A2.16.2. Appendix 2—Integration of Deployed Teams. Provide instructions for integrating Prime BEEF and other teams that are deployed to assist the unit. Identify facilities, space, vehicles, equipment, and communications equipment that will be provided to those teams. Outline the command and control arrangements and likely tasks the teams will complete. Suggest the inclusion of an outline for the in-brief or written information the unit should present to the arriving team and its commander/chief. Provide a situation brief, the information contained in this appendix, administrative and logistics support procedures, natural hazards in the area, and special safety concerns.

A2.16.3. Appendix 3—Civilian Contractor Capability and Unskilled Labor in the Area. Include the following information in this appendix:

A2.16.3.1. Available contractors by name, address, phone number, point of contact, and specialties.

A2.16.3.2. Contact points for obtaining unskilled laborers.

A2.16.3.3. Any restraints that would preclude using local civilians.

A2.16.4. Appendix 4—CONUS Sustainment Backfill Requirements. At some CONUS bases, reserve personnel backfill deployed Prime BEEF positions and provide essential facility operation and maintenance during war. List those requirements and plan to efficiently receive and employ backfill personnel.

A2.16.5. Appendix 5—Availability of Other Military Forces. List US military engineer forces (especially reserve and guard units) on or near the base that could rapidly backfill essential positions. Include the name, phone number, and address of the point of contact. These units have their own wartime taskings, so they may only be available in peacetime.

A2.17. Annex L—Equipment and Supplies. This annex provides a summary of required and on-hand civil engineer equipment, vehicles, and supplies. It outlines possible sources for those items if not on-hand.

A2.17.1. Appendix 1—Equipment under Direct Air Force Control. Include this information:

A2.17.1.1. General purpose, construction, and debris cleanup vehicles and support equipment required for contingency operations; list by type and quantity available. If the equipment is not under CE control, note its location along with the contact point for authorizing CE use.

A2.17.1.2. Equipment and vehicle dispersal procedures if not already included in Annex C. For peacetime dispersal at all bases and wartime dispersal at CONUS bases, include site location, vehicle restrictions, dispersal notification, support available at the site, etc. Kits enabling contingency response crews to survive and operate at each dispersed site should be identified in this appendix. Give copies of the OIs to each team leader involved, and place one copy in Annex L.

A2.17.1.3. Handwritten changes can be made to the copies of the plans in the EOC, CE control center/DCC, and the master plan in lieu of retyping and reprinting and distributing a new appendix.

A2.17.1.4. The suggested headings for this appendix is illustrated below:

Requirement (type/number)	Quantity Available	Source	Location	Type Agreement	Point of Contact

A2.17.2. Appendix 2—Equipment to be Acquired from Nearby Civilian or Military Sources, or Other State and Federal Agencies. Sources, types of agreement, types of vehicles/equipment available, and points of contact (including name, address, and phone number) should be listed. If mutual aid agreements have been made, include a copy of the document in annex M. Use the format in paragraph A3.16.1. To speed the paper work, include completed sample AF Form 9s except for the quantity of an item needed. Identify the fund citation to be used on the Form 9.

A2.17.3. Appendix 3—Construction Material Stockpiles. List construction materials stockpiled by type and quantity. Contact points to release materials should be noted if materials are not under direct BCE control. Use or modify the sample format in Appendix 1, but also include the NSN in the requirement line for each item.

A2.17.4. Appendix 4—Off-Base Sources of Basic Materials for Contingency Response Operations. Sources, contact points, and types of materials available should be listed. If reciprocal aid support agreements have been made, include a summary or a copy in Annex M. The recommended headings is illustrated below.

Type of Material	Source	Point of Contact

A2.17.5. Appendix 5—Prepositioned WRM. List prepositioned WRM that can be used in a contingency. Specify the location of the items—items may be stored at another base. Describe procedures for getting authorization to use the items and access to them.

A2.18. Annex M—Support Agreements and Contracts. Include a summary or copy of all support agreements that apply to contingency response activities. This includes formal mutual aid agreements, host tenant support agreements, interdepartmental support agreements, inter-service support agreements, host nation support, and informal agreements. The summaries should include the organizations involved in the agreement; a brief description of the specific support to be provided; the conditions and procedures for requesting support; and the names, addresses, and phone numbers of the points of contact. The most common for civil engineers are agreements for EOD and FES support.

A2.19. Annex N—Base Utility Systems and Waste Disposal. This annex should outline the layout and operation of the base utility systems, show how the systems can be isolated and protected, and explain backup measures. It should also describe unusual operating procedures required for special situations. It also covers procedures for disposal of garbage, solid wastes, and toxic wastes (if not covered in Annex G).

A2.19.1. Appendix 1—Electrical Power Supply/Distribution System. Describe the power supply and distribution system. Include primary and secondary voltages, circuit and substation locations, and source of power. Include record drawings and single-line diagrams of prime and emergency electrical systems; also include switch and circuit breaker positions. Identify areas that can be isolated from the main system. Note the number and location of other record drawings. Identify the point of contact for the local power company. Identify circuit or system components subject to frequent problems, as these tend to be the first to fail.

A2.19.2. Appendix 2—Alternate/Emergency Power Sources. Describe alternate primary power sources including connection locations, voltages, kilo-volt-amps, kilowatts (kW), and other details. List emergency generators, and floodlight sets by location and description. Show priority and sequence of recovery. They must be consistent with the facility priority list in Annex H. Describe procedures and schedule for refueling generators. Identify which emergency generators can assume the load directly and which units can be operated in parallel with the normal source. Describe the procedures for the base to handle an extended 30-day electrical power outage. Note mission critical facilities that require stable (conditioned) three-phase power. The suggested headings for listing equipment follows:

Priority	Location	Description (make/model)	Condition	Size (kW)	Fuel (Type)	Operation (Manual/Auto)	Approx. Running Time

A2.19.3. Appendix 3—Electrical Demand Reduction Plan/Utility Isolation. Include a demand reduction plan, in increments of approximately 10 percent of the normal maximum demand, to the minimum necessary to operate without degrading the essential base missions. Describe specific steps required to achieve each level of reduction. Outline procedures to isolate sections of the base and, if required, provide power to critical facilities in that area.

A2.19.4. Appendix 4—Water Supply/Distribution System. Describe the potable water supply source, storage, and treatment capacity. Include single-line diagrams of main distribution system with valve locations identified to facilitate shutdown and isolation; list record drawings by number and locations. Describe the vulnerability of the potable water supply to terrorist activities or natural disasters along with measures necessary to protect, monitor, and warn users when chemical or biological contaminants exist. If applicable, identify how to keep the water supplies and treatment facilities operating in flood conditions. Identify who will execute those measures and when. Include detailed procedures for operating any water treatment plants under emergency conditions. Specify procedures for maintaining proper chlorine residuals. Identify the point of contact for the local commercial water company. List all suitable off-base water sources. Describe water requirements to meet fire protection needs.

A2.19.5. Appendix 5—Alternate/Emergency Water Supply. Describe alternate or emergency potable and non-potable water sources on or near the base; include quantities available and describe the means for obtaining the water. Find a non potable water source that can be used exclusively for firefighting. Identify emergency water distribution points that can be used when water is hauled to the base. If considered necessary, include procedures for controlling access to the water under such conditions to avoid chaos. This may require security police assistance to control crowds. A steady supply of water will eliminate panic.

A2.19.6. Appendix 6—Water Demand Reduction Plan/Utility Isolation. As with the electrical system, include a demand reduction plan, in increments of approximately 10 percent of the normal maximum demand, to the minimum necessary to operate without degrading the essential base missions. Describe specific steps required to achieve each level of reduction. Outline procedures to isolate sections of the base and, if required, provide water to critical facilities in that area.

A2.19.7. Appendix 7—POL Supply, Storage, Distribution, and Emergency Backup. Describe the various POL systems, including storage capacity, location of tanks and distribution system, and source of emergency stocks; list record drawings by number and location. Include a complete gas distribution system map and a list identifying each building and its gas loads in the order in which gas service should be shut off. USAFE bases should include the point of contact and describe the repair capabilities of NATO pipeline crews. Describe the locations of primary and backup gasoline and diesel fuel (JP8) sources required for operating BCE emergency vehicles and backup generators.

A2.19.8. Appendix 8—Heating, Ventilation, Air Conditioning, and Refrigeration (HVACR) Systems. Describe the heating plant system(s) and the heating distribution system(s) in general terms; fuel types, storage capacities, and consumption rates must be included. Identify subsystems that can be segregated from the main system. Include refueling responsibilities and procedures; list record drawings by number and location. Identify HVACR systems that provide essential support to critical mission facilities. Describe each system, location of spare parts, and backup options.

A2.19.9. Appendix 9—Gas System. Describe the base gas distribution system. Identify the supply points and location, type and size of gas lines; list record drawings.

A2.19.10. Appendix 10—Airfield Lighting. Show layout of the airfield lighting system and describe its operation. Provide details on components, control system, and backup power. List the quantity and location of repair materials and backup capability. Cover procedures for laying out alternate systems.

A2.19.11. Appendix 11—Sewage Collection/Disposal System. Describe the sewage collection and disposal system. Also describe alternate or emergency waste disposal methods; list record drawings by number and location.

A2.19.12. Appendix 12—Solid Waste Disposal. Explain current procedures and identify disposal contractor's point of contact. Detail emergency procedures and assign responsibility for disposing of solid waste and garbage. This may require users to participate by taking their waste to a central location. There is no one good solution for all bases.

A2.19.13. Appendix 13—Toxic Waste Disposal. Describe current method of toxic waste disposal and identify the point of contact for current disposal contractors. Explain emergency disposal procedures and assign responsibility for accomplishment.

A2.20. Annex P—Airfield Pavements. Describe all airfield pavements by location and type; attach a drawing of airfield pavements. Identify all pavements that may be used as emergency runways or are capable of use by assigned or deployed aircraft. Identify pavement that can be used as alternate taxiways. Show locations of ADR patch components, FOD covers, and associated crater and spall repair materials and equipment. List other methods of repairs, such as local brands of cold or hot mix; list materials that are available on base to affect repairs. For materials that are not available on base, list sources of off-base supply.

A2.21. Annex Q—Climatic and Geologic Factors. Describe in general terms the climatic factors such as rainfall, snowfall, temperature ranges, potential wind storms, and other factors that can affect contingency operations. Also, include geographic factors, such as tides and elevations that can affect contingency operations.

A2.22. Annex R—Damage and Reimbursable Cost Documentation. This annex should outline procedures for documenting damage to base facilities, utilities, and pavements. Photographic documentation is often the most useful immediately following the crisis. Outline the local procedures for getting photographic support. The annex should cover CE support to the base legal office to document damage to civilian property as a result of an Air Force incident and to estimate the costs of repair or replacement. The annex should also outline provisions for capturing labor, equipment, and material costs in support of reimbursable activities. Approved Air Force support to civil authorities following a disaster is one example when this might be done. Open a collection work order for each incident.

A2.23. Annex S—Maps and Charts. List the base requirements for maps and charts to support contingency operations. Include instructions and an example showing how to read the base grid map.

A2.24. Annex T—EOD Operations. Describe the procedures the EOD flight will use to assess, clear, and dispose of unexploded ordnances.

A2.25. Annexes U, V, and W. These are optional annexes that can be locally defined to incorporate information or instructions which do not logically fit into other annexes.

A2.26. Annex X—Classified Annex. Since the vast majority of the information in this plan is unclassified, use a separately published classified annex to provide classified guidance and information without having to classify the entire plan. This annex can also incorporate CE-specific actions in support of the wing Emergency Action Procedures.

A2.27. Annex Z—Distribution. List the organization and number of copies each will receive. Include base agencies, the MAJCOM and all flights, sections, and shops within CE as needed.

Figure A2.1. Sample Cover.

325th CIVIL ENGINEER SQUADRON

1 December 2007

CIVIL ENGINEER CONTINGENCY RESPONSE PLAN

TYNDALL AFB, FLORIDA

Figure A2.2. Sample Table of Contents.

CONTENTS	PAGES
Table of Contents	i – iv
Basic Plan	1-5
ANNEX A—MAJOR PEACETIME ACCIDENT	**A1 - A3**
Appendix 1--Notification, Recall, and Assembly	A1-1 - A1-2
Appendix 2--On-Base Accident	A2-1 - A2-3
Tab A--Notification, Recall, and Assembly [If not already included in a common appendix.]	A2-A1
Tab B--FES Flight Operating Instruction	A2-B1-A2-B2
Tab C--MEOC Operating Instruction [If not included in CEMP 10-2.]	A2-C1-A2-C4
Tab D--EOC CE Representative Operating Instruction	A2-D1-A2-D5
Tab E--CE Control Center Operating Instruction	A2-E1-A2-E10
Tab F--ESF CE Representatives Operating Instruction	A2-F1 - A2-F3
Tab G--Readiness & Emergency Management Flight Operating Instruction	A2-G1-A2-G3
Tab H--EOD Flight Operating Instruction	A2-H1 -A2-H2
Tab J--etc.	A2-J1 - A2-J2
:	
:	
Tab Z--Communications Equipment and Procedures [If not included elsewhere.]	A2-Z1 - A2-Z3
Appendix 3—Off-Base Accident	A3-1 - A3-2
Tabs #--(associated operating instructions)	
Appendix 4--HAZMAT Spill	1-1 - 1-3
Tab A--Notification, Recall, and Assembly [If not included in a common appendix.]	1-A1 - 1-A2
Tab B--CE Control Center Operating Instruction	1-B1 - 1-B3
Tab C--FES Flight Operating Instruction	1-C1 - 1-C4
Tab D--Follow-on Spill Response Team Operating Instruction	1-D1 - 1-D4
ANNEX B—NATURAL DISASTER.	**B1 - B3**
Appendix 1—Hurricane	B1-1 - B1-3
Appendix 2—Tornado	B2-1 - B2-2
Appendix 3—Wild Fire	B3-1 - B3-2
Appendix 4—Flood	B4-1 - B4-3
Appendix 5—Resource Dispersal	B5-1 - B5-2
Appendix 6—Temporary Shelter for Victims	B6-1 - B6-2
Appendix 7—Evacuation	B-1 - B7-3
:	
:	
Appendix 10--Communication Procedures	B10-1 - B10-2

Figure A2.2. (cont) Sample Table of Contents.

Figure A2.2. (cont) Sample Table of Contents.

Figure A2.2 (cont) Sample Table of Contents.

REMINDER: This list of appendixes and tabs is only a guide and is not all inclusive. The absence of an appendix or tab from this list does not mean it is not needed. Likewise, its presence does not mean it is "required." Use as few or as many as needed to help the unit mount an effective first response to each contingency situation. Use annexes U, V, and W if locally defined annexes are needed.

Figure A2.3. Sample Basic Plan.

CIVIL ENGINEER CONTINGENCY RESPONSE PLAN (BASIC PLAN)

1. REFERENCES:
   a. List any maps, charts, plans, publications, or documents needed to understand the basic plan. Include date and title of the items.
   b. Avoid documents not available or that present common knowledge.

2. TASK ORGANIZATIONS: Since this is a CE plan, only task CE flights and sections.

3. SITUATION: Briefly describe the most probable conditions for implementing the plan. Separately describe the enemy attacks, major accidents or natural disasters which could threaten the base and any other contingencies that require CE support.
   a. Supporting Forces. List units or organizations outside CE that support this plan. This includes augmenting Prime BEEF teams, other US military units, civil authorities, and foreign military units.
   b. Assumptions. Outline major planning assumptions. Only assumptions that make the plan unworkable if not true and that are beyond the capability of the CE unit (or installation) to control should be included. An example of such an assumption is "spare parts will be quickly available to repair key vehicles needed for base recovery" or "all key vehicles needed for base recovery will be operational."

4. MISSION: Outline the basic purpose of the plan. Briefly state the mission of the installation and the CE unit when the plan is implemented. Regardless of installation location, CONUS or overseas, the CE mission is always the restoration or maintenance of the installation's capability to support its prime mission. The relief of human suffering and the protection of life and property are equally important missions that require civil engineer support. Be sure to include support provided to other services, nations, and civil authorities.

5. EXECUTION: Highlight the major tasks each flight or section must perform to carry out the plan and what major equipment will be available to the unit. This should include supporting forces added by operations plans or support agreements. Include details in the annexes to the plan.

Figure A2.3. (cont). Sample Basic Plan.

6. ADMINISTRATION AND LOGISTICS: Describe how civil engineers are to be supported and what support they must provide to themselves. In general terms, outline the sources for equipment and supplies and the support to be provided by others. In addition, list local support conditions that adversely affect plan implementation. As an example, an overseas base might be totally dependent on indigenous sources for one or more of its utilities. Since it is entirely possible that these services could be curtailed during a period of civil strife or war, highlight such information here.

7. COMMAND AND CONTROL: Identify command relationships both external and internal to the CE unit. List CE control centers to be used and designate who commands the CE forces, control centers, and recovery teams. Outline the succession of command. The chain of command should be well defined for all people; state provisions for continuity of command. Include sufficient alternates for round-the-clock management for two manning scenarios: (1) full strength and (2) military personnel only (at overseas theater bases) or civilian personnel only (at CONUS bases). Overseas theater bases will also include provisions for command and control of augmenting forces, such as CONUS Prime BEEF teams. Such provisions should allow augmenting units to maintain unit integrity when practical, even though responsible to the host BCE. Outline methods of communications to be used.

Annexes:
Annex A—Major Peacetime Accidents
Annex B—Natural Disasters
Annex C—Enemy Attack Actions
Annex D—Terrorist Attack
Annex E—CE Support for Miscellaneous Plans/Situations
Annex F—Fire Emergency Services
Annex G—Deployment Preparations
Annex H—Contingency Environmental Considerations
Annex J—Facility Priority Listing
Annex K—CE Personnel Shelters
Annex L—Personnel Augmentation
Annex M—Equipment and Supplies
Annex N—Support Agreements and Contracts
Annex P—Base Utility Systems and Waste Disposal
Annex Q—Airfield Pavements
Annex R—Climatic and Geologic Factors
Annex S—Damage and Reimbursable Cost Documentation
Annex T—Maps and Charts
Annex X—Classified Annex (PUBLISHED UNDER SEPARATE COVER)
Annex Z—Distribution

Figure A2.4. Sample Annex A—Major Peacetime Accident.

CE CONTINGENCY RESPONSE PLAN

ANNEX A—MAJOR ACCIDENTS

1. REFERENCES:
   a. Installation CEMP 10-2, 25 Aug 2004
   b. List any other maps, charts, plans, publications, or documents needed to understand major accident response requirements. Include date and title.
   c. TASK ORGANIZATION: List the CE flights and sections that are tasked.

2. SITUATION
   a. General. Briefly describe the likely accidents that would require implementing this part of the plan.
   b. Supporting Forces. List units or organizations outside CE that support this annex taskings. Include their titles or unit designations. This includes other US military, civil authorities, and foreign military units.
   c. Assumptions. Include planning assumptions. Only assumptions which make the annex responses unworkable if not true and which are beyond the capability of the CE unit (or installation) to control should be included.

3. MISSION. Briefly state the mission of the CE unit for responding to a major accident, both on- and off-base.

4. EXECUTION.
   a. Concept of Operations. Include a brief concept of operations. Be sure to include the basis for manpower requirements in the concept. For example: "Manpower requirements (except for the FES flight) should be based on two 12-hour shifts per day, 7 days per week for the first 30 days. Make provisions for responding with the total unit strength and with military-only at overseas bases. CONUS bases must make provision for responding with the total unit strength and with an essentially civilian-only force." Show how the unit will adapt using the fewer number of individuals, and describe what capabilities will be degraded until augmenting units and personnel can be found and trained. (This is especially important in annex C.)
   b. Tasks. Highlight the major taskings each flight or section must take to support a major accident response.

5. ADMINISTRATION AND LOGISTICS. Explain how civil engineers are to be supported and what support they must provide to themselves. In general terms, outline the sources for equipment and supplies and the support to be provided by others; also list local support conditions which adversely affect plan implementation.

6. COMMAND AND SIGNAL. Identify command relationship external and internal to the CE unit. List CE control centers to be used, and outline the succession of command. State methods of communications to be used.

Figure A2.4. (cont). Sample Annex A—Major Peacetime Accident.

APPENDIXES:

1—Notification, Recall, and Assembly [Use this appendix when there is too much detail to include in paragraph 5 above. This annex can be used to avoid repeating the same information in each appendix or tab in the annex. Do not use it if the information differs for each situation.]
2—On-Base Accident
3—Off-Base Accident
4—HAZMAT Spill
5—etc.
#—Communication Procedures [Use this appendix when there is too much detail to include in paragraph 5 above. This annex can be used to avoid repeating the same information in each appendix or tab in the annex. Include only common information that applies to all situations in the annex. Information that supplements or expands on this basic information for a particular situation or response team should be included in the appropriate appendix or tab.]

Note: The order and numbering of the appendixes is arbitrary. Use only the appendixes required by the base.

Figure A2.5. Sample Appendix for Annexes A, B and C.

CE CONTINGENCY RESPONSE PLAN
ANNEX A

APPENDIX 2—ON-BASE ACCIDENT

1. REFERENCES: List any maps, charts, plans, publications, or documents needed.

2. SITUATION. Describe the range of accidents this plan covers and the conditions in which they could occur, including weather conditions.

3. PROCEDURES.
   a. Notification. Describe procedures for notifying the unit and individuals to respond.
   b. Unit Response. Highlight the basic mission of each response team/shop for an on-base accident.

4. LOGISTICS. Identify required support from outside the unit.

5. COMMAND STRUCTURE. Describe the base and unit command structure for responding to an accident.

6. COMMUNICATIONS. Describe the communications available during the crisis. If more than one radio net is used (i.e., BCE net, EOD net, or FES net), procedures for passing and authenticating information from one net to the other should be described. All personnel using the net should understand individual or team call signs.

Tabs:
A—Notification, Recall, and Assembly [if desired]
B—FES Flight Operating Instruction
C—MEOC Operating Instruction [if not included in CEMP 10-2.]
D—EOC CE Representative Operating Instruction
E—CE Control Center Operating Instruction
F—ESF CE Representatives Operating Instruction
G—Readiness Flight Operating Instruction
H—EOD Flight Operating Instruction
J—etc.
M—Communication Procedures [if desired]

Note: The order of the tabs is not mandatory. Consider starting with the control functions and continue with the flights/shop/team in the order that they are likely to respond.

Figure A2.6. Sample Tab to an Appendix in Annexes A, B and C.

CE CONTINGENCY RESPONSE PLAN
ANNEX A—APPENDIX 2

TAB H—EOD FLIGHT OPERATING INSTRUCTION—ON-BASE ACCIDENT

1. REFERENCES: List needed maps, charts, plans, publications, or documents.

2. TEAM COMPOSITION.
   a. Team Leader. Identify source of team leader and position if possible.
   b. Team Requirements.

AFSC	Number Needed	Source
3E871	1	EOD Flight
3E8X1	3	EOD Flight

3. ASSEMBLY INSTRUCTIONS. Tell where the team/shop/flight is to assemble, how quickly the team must assemble, and what clothing and equipment each person is to bring to the assembly point. If certain individuals are to get vehicles, the instructions should specify who will get what vehicle in paragraph 4. The same applies to equipment and materials. When useful, indicate the minimum number of individuals needed for the team to respond.

4. TASK INSTRUCTIONS. Outline the function/mission of the team and specify each task the team must perform in order and, if required, tell when each task should begin and when it should be completed. For many tasks, this may not be possible due to the unlimited variations in accident situations or other crisis. Frequently, tasks can be foreseen, but their timing and location cannot. As a minimum, be sure to cover the tasks that must be done to get the team ready and positioned to respond. Also, include the likely initial tasks so the team can start work if communications are lost.

5. RESOURCES NEEDED.

   a. Vehicles. Type, quantity needed, source/location

   b. Special Equipment. Item, quantity needed, source/location

   c. Materials. Item, quantity needed, source/location

6. COMMAND AND SIGNAL. Explain to whom the team reports. Describe how the team chief is to communicate with his or her boss. Specify who the team chief reports to if he or she loses contact with the boss. Indicate if code words may be used.

7. SPECIAL INSTRUCTIONS. Include any other important information not covered in other sections.

Figure A2.7. Sample Common Appendix for Communications Procedures.

CE CONTINGENCY RESPONSE PLAN
ANNEX A

APPENDIX 9—COMMUNICATION PROCEDURES

1. REFERENCES: As needed

2. EQUIPMENT.
   a. Radios. Identify tactical and intrabase radio nets and the locations of the base stations and any relay sites. Indicate who will normally have the mobile or portable radios. Identify any other unit using the same net.
   b. Telephones. Outline what phone connections are available in the control centers. List phone numbers for the various positions; include cellular phones.
   c. Field Phones. Describe field phone capabilities and locations.

3. PROCEDURES.
   a. Radio Call Signs. List the CE call signs for each net used and the call signs for any other unit on the net. All personnel using the net should understand individual or team call signs.
   b. Radio Discipline. Outline procedures to limit use of the radio in periods of intense activity so the time-sensitive transmissions can be received. Identify who will serve as the "traffic cop" (for the CE net, recommend the radio operator in the CE control center).
   c. Authentication. If more than one radio net is used (i.e., BCE net, EOD net, or FES nets), describe the procedures for passing and authenticating information from one net to the other. Set up authentication procedures for an enemy attack scenario, but do not list the procedures here. They can be included in annex X.
   d. Non-verbal Signals. Describe any non-verbal signals that may be used and explain what they mean.
   e. Maintaining Contact with Response Teams. Outline responsibilities and procedures for maintaining contact with response teams and individuals. This is important in an attack environment so that attack information can be passed along to teams and individuals in the field.

4. MAINTENANCE SUPPORT. Identify units on- and off-base that can repair intrabase radio and tactical radio assets. List what capabilities they have and the point of contact. (Remember, taking a radio off base can compromise communications.)

Note: The information presented in this appendix should be presented as a tab if it applies only to the actions for one appendix.

Figure A2.8. Sample Common Tab for Unit Notification and Recall.

CE CONTINGENCY RESPONSE PLAN
ANNEX A—APPENDIX 1

TAB A—NOTIFICATION, RECALL, AND ASSEMBLY

1. REFERENCES: Installation CEMP 10-2

2. NOTIFICATION.
   a. Initial Notification to CE. Explain how CE is notified and by whom.
   b. CE Control Center Responsibilities. List the tasks and responsibilities of the CE control center and other control locations such as the FES alarm room.

3. RECALL PROCEDURES. Describe recall procedures to be used during and after duty hours. A pyramid recall system is most often used after hours.

4. ASSEMBLY. Explain where unit personnel are to assemble, how quickly, and what each person is to bring to the assembly point.

Notes: The information presented in this tab can also be presented as an appendix if it applies to all of the actions required in an annex.

To reduce confusion, only one approach to unit notification, recall, and assembly should be used for most situations. When selective recall or response is required, explain the variations in the appropriate appendixes or tabs.

Figure A2.9. Sample Annex H—Facility Priority Listing.

CIVIL ENGINEER CONTINGENCY RESPONSE PLAN

ANNEX H—FACILITY PRIORITY LISTING

Priority Grid Location Facility

Priority	Grid Location	Fac #	Facility Name
1	G.2/4.9	1151	Hardened Aircraft Shelter
2	C.0/8.3	563	Installation Operations Center
24	K.2/2.2	342	Nose Dock 4

Note: It is possible to assign the same priority to a group of buildings, for example TAB VEE shelters within a given area. Include the common name along with facility number as shown above.

Attachment 3

STEPS IN PLAN DEVELOPMENT

A3.1. Introduction. A contingency plan is a set of procedures prepared in advance to respond to specific or various contingencies a base and unit may face. A good plan is tailored to the base's and unit's specific situation (e.g., Ellsworth AFB, South Dakota, does not need to plan for hurricanes or tidal waves). By anticipating problems and planning for them, the base and unit can rapidly mobilize the technical, financial, administrative and engineering resources needed to minimize detrimental impact to the base. Remember, to respond effectively to emergencies, contingencies and disasters, procedures and plans must be in place when the threat occurs. Developing plans can be accomplished in a wide variety of methods and various levels of participation. This attachment outlines one proven method. Development is broken down into five steps: research, preparation, coordination, publication, and review. This approach is applicable to either military or civilian planning and can be utilized to develop everything ranging from support annexes to entire base support plans.

A3.2. STEP 1—Research. Plans are useful only if they are backed by good research. Determine what the unit (or base) may be required to do and the place, conditions, and circumstances that the unit (or base) may have to operate if the plan is executed. Research involves at least five sub-steps: understanding the planning task; learning the base mission; reviewing existing plans and guidance documents; analyzing the hazards and threats; and assessing unit (or base) response capability.

A3.2.1. Understand the Planning Task. This is the first step in any planning process. The expected task and outcome must be established up front. Understand what the plan's OPR wants from the unit. Be flexible, as more is learned during research, the task may need modifying.

A3.2.2. Understand the Base's Mission. The basis for any planning is to know the mission of the base. Know the types of aircraft, their likely munitions and fuel loads, and priorities of aircraft to fulfill the wing's priority mission(s) (e.g., fighters, loading bombs, loading missiles, tankers, ISR assets, etc.).

A3.2.3. Review Existing Plans and Directives. The unit will seldom need to create a plan from scratch. First, review the plan to modify. Then read the documents the plan references and the documents of the supporting intelligence. Many Intel shops have the Worldwide Threat to Air Bases and studies of the various weapon systems the enemy could bring against the base. Security Forces, FES, and supporting medical facility will have copies of their support agreements. The logistics plans office, contracting, and several other agencies may also have copies of support agreements with tenant units and local authorities. This step is necessary to avoid "recreating the wheel."

A3.2.3.1. Check the Supported Plans. Many base-level plans are written to support someone else's plans. Higher headquarters, another military service or agency, a local civilian agency, or the military and civil forces of another nation may have written the plan the unit is supporting. If possible, always obtain and review a copy of the plan the unit is supporting. It will identify, with a fair degree of clarity, what the authors expect the unit to do for them, who will control the implementation of the plan, where the unit will be expected to go, what the unit should bring, and so on. Plans written above the MAJCOM-level are normally too general to help write a base-level plan.

A3.2.3.2. Check Governing Directives. The AFIs, as supplemented by the MAJCOM, will usually contain good information about what the plan is supposed to address and how it is to be written. Specific support tasks or responsibilities may also be covered in the AFI, especially if the task is required by law. Support Agreements or contracts can provide another source of information about the extent of operations the unit may be required to perform, when, and under what conditions. A few examples of governing directives include AFI 10-211, AFI 10-403, AFI 10-2501, AFI 10-401 and AFMAN 10-401, Volume 2.

A3.2.3.3. Check for Related Publications. Check the Air Force electronic publishing site for related publications. If writing a hazardous material accident response plan, check the index for publications that refer to environmental, hazardous material and accident response subjects. A specific example would be AFI 10-2501.

A3.2.3.4. Verify Currency of Information. Nothing can destroy the value of the plan and its credibility as quickly as change.

A3.2.3.4.1. Check directives. Find out if the directives used to justify the requirements and to task other agencies have been superseded.

A3.2.3.4.2. Check the supported plans. As the down sizing of military forces continues, check the plans the unit is supporting. The unit may need to revise plans because units, or bases, being supported, or from whom the unit expected support, may have departed. Also, as the threat or wing's missions change, the unit may not be required to perform the same functions at the same intensity as before.

A3.2.3.4.3. Ensure all referenced materials are valid. These could be checklists, other annexes of the plan, other plans, regulations, forms, operating instructions and a variety of other items. The specific reference may have changed location, been deleted, or no longer applies to the situation described.

A3.2.3.4.4. Check background files for pending information. AFI(s) are subject to modification. Look for messages or memoranda that establish new procedures, policies, or requirements. For example, USAFE may decide to revise its policy on the operation and maintenance of the collective protection systems. The unit needs to know that before it starts writing the OPLAN Annex that deals with shelters. Similarly, if the MAJCOM or wing has just worked out a new support agreement with the local nuclear power station, the unit should incorporate the changes into the plan.

A3.2.3.4.5. Make certain the addresses, organizational symbols, abbreviations, etc., are correct.

A3.2.4. Hazard/Threat Analysis. A systematic hazard/threat analysis is an essential step in developing emergency, disaster, contingency, or operations plans. The analysis identifies all possible threats and vulnerabilities, presents historical information about past disasters, assesses future probability and frequency of emergencies, and validates gathered information. Considerations include predictability, frequency, controllability, duration, scope, and intensity of hazards or threats. There are three basic steps in conducting a threat and hazards analysis, and they are:

A3.2.4.1. Hazard/Threat Identification. Gather information on the specific major accidents, natural disasters, hazardous material spills, and enemy attacks the base could face. Know the kind and levels of damage to expect from foes. For example, how the attack will be conducted, what kind and size of weapons they will bring to bear against the base, what are their probable targets, how often will they attack, etc? Learn the location of the hazards.

A3.2.4.2. Vulnerability Analysis. Identify the parts of the base or off-base community that may be affected by each hazard or threat; the population within each zone that is subject to harm; critical facilities or functions at risk (for example, hospital and command post); and property and environmental systems that may be damaged.

A3.2.4.3. Risk Analysis. A risk analysis provides a means to judge the relative likelihood of a hazard/threat occurring and the magnitude of harm to personnel and mission should that hazard/threat occur. In other words, attempt to determine the most probable incidents and their worst possible impact. The analysis includes judgments of the probability of occurrence and severity of consequences. Consider natural disasters and major accidents as part of the planning for both peace and wartime. Nature is not patriotic and does not take vacations. During combat operations the chances of someone creating an accident go up because individuals are tired, equipment wears out, and individuals may not be paying as much attention to safety as they should. Know what kinds of incidents are most likely to occur and how they might affect the wing's mission in the worst manner. For example, ask if the base is subject to typhoons, hurricanes, tornadoes, floods, heavy snow storms, lightning storms, sand storms, earthquakes, forest fires, etc. Is the base likely to suffer from sabotage or terrorist attacks? How will these incidents affect central power stations, POL dumps or supply lines, natural gas or fuel lines, water lines or towers, pumping stations, access roads, etc.? Are there any points that multiple utility lines converge that could increase the danger or damage if affected by the incident? What key command and control functions could be adversely affected and how could they be protected?

A3.2.5. Capability Assessment. Next, develop a realistic evaluation of the base's ability to prevent or respond to accidents, natural disasters, hazardous material spills, and enemy attack. Understand what resources the wing can bring to bear on various peace and wartime contingencies, how well the wing is trained and prepared to respond, and where the wing is weak. For example, how many fire trucks, and what kind, are available during peacetime? What are their capabilities? Is this quantity and capability sufficient? Where are they located? Is this location close enough to allow them to fulfill their duties? Does this location provide adequate protection from accidents, disasters, or attacks? Will more trucks be available in wartime? If yes, where would the unit get them? Can wartime fire trucks be used to help respond to a peacetime incident if they were needed? Where are the additional trucks located? Are these vehicles protected? How quickly can they be reached, equipped, manned, and made fully operational? These same kinds of questions may be applied to nearly any wing organization.

A3.2.5.1. Be sure the capability assessment includes other military services, host nation, allied military forces, civil authorities, and government organizations that agree to help the base respond to and recover from a disaster, accident, or attack. Be familiar with the kind and levels of support that can be expected. For example, what kinds of facilities are available for use, what kinds of communications capabilities will they provide, how many vehicles, and what types, can they provide for support, etc.?

A3.2.5.2. Know who controls which resources, where they plan to locate the resources, and how well those resources are protected from the affects of weapons, disasters, or accidents. Since these resources will be used to respond to various contingencies outlined in the plans, know whom to contact in order to coordinate or implement the plan. Know where the resources are going to be and how well they will be protected so the unit can judge whether they will be readily available and undamaged when the need for them arises.

A3.2.5.3. Know the wing's priorities for protecting its resources. These priorities may change depending on the situation. For example, in a peacetime CONUS environment the wing may want to prioritize support for the local authorities during a natural disaster. During combat overseas, however, the wing will probably not be willing to expend many of its assets to respond in support of the civil authorities. Know what the wing wants to protect when, and how well it must be protected.

A3.2.6. Other Sources of Information. Two other sources of information should be considered when researching a plan.

A3.2.6.1. On-Base Agencies. The wing plans office should be able to tell the unit all about the wing's mission. Group and unit planning offices will usually know their capabilities and weaknesses and they will be able to tell the unit who owns what, where it is, and if it is protected. With them, CE may need to determine if the current level of protection is adequate. The wing's supporting intelligence shop and the Office of Special Investigation should be able to identify whom the enemies are. Security Forces, safety office, and FES should be able to help with records on major accidents or mishaps. The bioenvironmental engineers, FES, and the logistics group's maintenance, supply and transportation units should be able to provide the location, quantities, common uses, and transportation details of most hazardous materials on base. The supporting weather shop should be able to provide information on the local natural disaster hazards.

A3.2.6.2. Off-Base Agencies. Consult with local Civil Defense, Red Cross (or Red Crescent), host nation civil and military authorities, and other emergency response agencies and officials. This can help form a clear picture of the kinds of hazardous materials transported near the base and how often they pass. They may be able to provide a local history of the area's natural disasters, major accidents, and intentional acts that caused significant damage (set forest fires, vandalism on facilities, etc.). This consultation can also help clarify what they think CE can do for them and what they can do for CE. The US Army Corps of Engineers can help determine the probability of the base suffering floods or other kinds of related disasters. USAF units with similar missions, or in similar areas, and the MAJCOM can provide guidance on the historical trends of incidents that happen to bases in similar circumstances or with similar missions. If overseas, contact the units that provide short range and point air defenses and perimeter security (if other than USAF security police).

A3.3. STEP 2—Preparation. Plans are easier to use when the information and guidance is pertinent, concise, clearly written and intuitively laid out. The best plans can be ruined by small things, like incorrect spelling, poor grammar, and misused punctuation. Poorly written plans lack validity to users, because they may feel that if it was not important enough to author correctly, it must not be important information.

A3.3.1. Content. Prepare a first draft. Keep it realistic, legal, and consistent with wing or higher headquarter guidance. The plan must answer the classic five Ws: who, what, when, where, and why; sometimes the plan may also need to address how. Discuss who will do what, when and where they will do it, why they will do it, how they will do it, and what they will use. The answers to these questions will change at different stages of preparation, response, or execution. Provide answers to at least the following questions.

A3.3.1.1. Who:

A3.3.1.1.1. Supports us?

A3.3.1.1.2. Do we support?

A3.3.1.1.3. Directs implementation or termination of which parts of the plan?

A3.3.1.1.4. Funds which parts of the plan?

A3.3.1.1.5. Commands or controls the resources (personnel, vehicles, supplies, materials, and equipment) that will be used to execute various parts of the plan?

A3.3.1.1.6. Will operate the equipment necessary to execute the plan?

A3.3.1.1.7. Will write what parts of the plan and the supporting documents (checklists, rosters, equipment lists, diagrams, etc.)?

A3.3.1.2. What:

A3.3.1.2.1. Situation, or set of circumstances, is each part of the plan designed to handle?

A3.3.1.2.2. Are the basic assumptions?

A3.3.1.2.3. Specific duties, or functions, are various agencies meant to perform in order to execute the different parts of the plan?

A3.3.1.2.4. Resources (personnel, equipment, vehicles, supplies, or material) are the various agencies meant to provide or employ to execute the different parts of the plan?

A3.3.1.2.5. Criteria will be used to judge progress of plan execution?

A3.3.1.3. When:

A3.3.1.3.1. Do different parts of the plan take effect?

A3.3.1.3.2. Will funds become available for each part of the plan?

A3.3.1.3.3. Must resources (personnel, equipment, vehicles, supplies, or material) be made available, prepared, positioned, or employed in order to execute each part of the plan?

A3.3.1.3.4. Does the plan terminate?

A3.3.1.3.5. Does CE file which reports?

A3.3.1.4. Where:

A3.3.1.4.1. Do personnel perform their duties or functions to execute each part of the plan?

A3.3.1.4.2. Must resources (personnel, equipment, vehicles, supplies, or material) be assembled, stored, sent or employed to execute or terminate the plan?

A3.3.1.4.3. The unit sends what reports?

A3.3.1.5. Why:

A3.3.1.5.1. Does CE write and execute this plan (purpose of the plan)?

A3.3.1.5.2. Does CE perform certain aspects of this plan in a certain order?

A3.3.1.6. How:

A3.3.1.6.1. Will CE communicate or pass notification?

A3.3.1.6.2. Will CE evaluate the effectiveness of operations or the quality of work?

A3.3.1.6.3. Should CE disperse resources?

A3.3.1.6.4. Does CE account for resources?

A3.3.1.6.5. Will CE protect resources?

A3.3.1.6.6. Does CE report operations, attack results, the wing's status, etc.?

A3.3.2. Format. The format is specified in the governing directives. For example, AFMAN 10-401, Volume 2, dictates the outline of an operation plan, and AFI 10-2501 provides the format for a disaster or accident plan. The format for each is similar.

A3.3.3. Style. Write the draft plan in a style easy to read. Common writing principles apply. Obtain a copy of AFH 33-337, The Tongue and Quill and use it.

A3.4. STEP 3—Coordination. Failure to properly coordinate a plan can cause confusion, consternation, and conflict. Plans should not come as a surprise to anyone except the enemy.

A3.4.1. Every agency that is tasked to participate in the plan should review and comment on it.

A3.4.2. Steps in Coordination. Revise the plan as necessary after each step in the coordination process. Some comments and recommendations for change are inappropriate or based on incorrect or outdated information. If a suggested change is not made, contact the individual that requested the revision and explain reasons for disapproving the modification.

A3.4.2.1. Have experts within the unit review and comment on the draft first. These individuals may have an insight, experience, or knowledge the author lacks. Their advice could improve the plan and save unit credibility.

A3.4.2.2. Obtain comments from functional experts. These are the working level experts dealt with regularly. They should be the most familiar with their units' abilities, responsibilities, and shortages. They help improve the plan and clear up the details before it goes to commanders for review.

A3.4.2.3. Obtain unit commanders' comments or approval. This is the opportunity for squadron commanders to provide their thoughts and beliefs. They will usually be particularly interested in funding, manpower, and equipment issues. They may need briefing a couple times before they approve the plan. Always brief the CE commander first.

A3.4.2.4. Receive coordination from local civil authorities, other services, and host nation equivalents when they are players.

A3.4.2.5. Obtain group commanders' comments or approval. As with the squadron commanders, group commanders will want to interject their thoughts. They may know less about the specific rules than the unit may, but they have a better view of the "big picture." Their comments may reflect larger issues.

A3.4.2.6. Obtain wing commander's comments or approval; this is the ultimate test. In general, if the plan gets this far there should be very little need for changes. Be ready to brief the wing commander if required, but only cover the highlights. Go into details when asked, so be prepared to cover them. The wing commander will probably have little knowledge of the mundane details, but will be extremely familiar with MAJCOM requirements, overall policy, and direction.

A3.4.2.7. Receive higher headquarters approval if necessary. Some of the plans may require coordination with higher headquarters, especially if in support of a particular contingency or crisis.

A3.4.3. Paperwork. Create a good paper trail during the coordination process. The unit may need to reengage individuals and get additional clarification or request more changes. Most commanders want proof that their experts reviewed and agreed with the plan before they review and approve it. The cover memorandum should inform individuals why they are reviewing the plan, the purpose of the plan, what parts of the plan they are to review, what they should do if they have questions or comments (do they contact CE, the OPR, write on the plan itself, or what?). In addition, it should let them know when they should return the plan and to whom, and any other information they should know (background, pending changes to policy or procedures, etc.).

A3.5. STEP 4—Publication. Find out who locally is responsible for publishing the plan. If not CE, it may be the responsibility of the wing plans office. They will usually require documentation of the plan review and make any required changes. They may also ask the author to prepare DD Form 844, Requisition for Local Duplicating Service.

A3.6. STEP 5—Review. Plans are never permanent. Plans require change for any number of reasons and scheduled reviews help keep plans up to date. In general, conduct reviews annually, when the threat changes, when the mission changes, and when unit capabilities change.

Attachment 4

OUR FOUNDATIONS: A HISTORY OF AIR FORCE CIVIL ENGINEERS

A4.1. A Proud Heritage. Air Force Civil Engineers have a proud heritage tracing back to before World War I. Originally, the engineering function was a small unit of the Army Signal Corps and construction was handled through the Office of the Chief Signal Officer. When the Air Service was established in 1918, the Building and Grounds Branch of the Division of Military Aeronautics inherited maintenance and construction responsibilities (in conjunction with the Construction Division of the War Department) for ten flying schools, one repair depot, and five balloon schools. In 1921, construction of Air Service projects was turned over to the Construction Service, Quartermaster Corps, working closely with the Air Service (later Air Corps) Building and Grounds office. Throughout the 1930s, the Air Corps continued to slowly expand. The availability of Works Progress Administration (WPA) funds facilitated construction that otherwise would not have been undertaken by the Air Corps. In 1940, construction of Army Air Corps facilities in the Zone of Interior (the continental United States) was transferred to the Corps of Engineers. For overseas construction, a new type of engineering organization was established.

Figure A4.1. Constructing Expedient Airfields During WWII.

A4.2. World War II. Long before Pearl Harbor, the growing Army Air Forces indicated the vital need for engineers specialized in the building of airfields overseas in support of tactical and strategic air operations. The Air Forces needed their own engineers; troops who trained with it, spoke its language and understood its needs. These men were to be trained and equipped to rapidly construct advanced airfields close to or even behind enemy lines. They were also to be trained to improve and maintain the existing facilities. They were to be skilled in the camouflage of airfields and the construction of defensive works. They were to be organized and prepared to repair airfields damaged by enemy bombing. Finally, with their trained riflemen and machine gunners, they were to be prepared to take an active part in the defense of their airdromes. Such was the concept of the Aviation Engineers—troops who were trained to construct, conceal, maintain and defend airfields.

A4.2.1. In June 1940, a handful of officers and 80 enlisted men assembled at Fort Benning, Georgia, to form the 21st Engineer (Aviation) Regiment, the first of its kind and the parent unit of the more than 100,000 Aviation Engineers who served in WWII. Originally established with 27 engineer officers and 761 enlisted men, each aviation engineer battalion was programmed for a lavish amount of equipment, including 220 items for construction and 146 vehicles—diesel tractors with bulldozers, carryall scrapers, graders, gasoline shovels, rollers, mixers, air compressors, drills, trucks, trailers, asphalting and concreting equipment, rock crushers, draglines, and pumps—for its mission. To protect themselves from air and ground attack, the Aviation Engineers were trained and equipped for combat as well as construction. They were armed with a variety of weapons including bazookas, antitank and antiaircraft guns, grenade launchers, armed half-tracks, antitank mines and a full complement of small arms.

A4.2.2. In addition to the regular aviation engineer battalions, airborne battalions were conceived in early 1942 for mobile use in an invasion. Sixteen airborne aviation engineer battalions were organized in 1943, each with a complement of 28 officers and 500 men and light equipment such as miniature tractors, scrapers, rollers, a supply of weapons, and radio equipment. These specialized units were designed to parachute into enemy territory, to establish an emergency strip, and, with light equipment landed by gliders, to improve the runway until it could accommodate transports and tactical planes (**Figure A4.2.**).

Figure A4.2. Lightweight, Air Transportable Heavy Equipment in use during WW II.

A4.2.3. One of their successful operations occurred in North Africa. Major General James H. Doolittle, Commander, 12th Air Force, needed a dry base close to the front for his heavy bombers. Brigadier General Donald A. Davison, Chief Engineer, Allied Forces, found a large sandy expanse near Biskra, deep in the Sahara. Because the conventional battalions were already busy on other projects, he called in the airborne engineers. Troop transport planes carried the engineers and their specially designed miniature equipment to Biskra, almost a thousand miles. They arrived on the evening of 13 December and began work immediately. Twenty-four hours later, the first B-17 arrived from Oran. The bombers were out of the mud and used the base until the following March, when spring winds blew sand in such quantities as to make operations impossible. The airborne engineers also functioned as smoothly and as efficiently as in a textbook exercise under conditions impossible for a standard battalion in Burma and at Tsili Tsili in New Guinea. But, in general, their equipment was too light and the whole concept of their purpose was too specialized for general use. Theater commanders greatly preferred the standard battalion, and the airborne units sometimes sat idle or were used in routine small jobs; eventually, many of them were either merged with other units or given normal size equipment and fought as standard battalions. The successes showed that there was some need for the airborne engineer unit but certainly not in the numbers which were formed.

A4.2.4. Immediately following the American entry into the war, aviation engineer units were sent to England to help service support engineers prepare bases for the scores of planes which would soon follow. The Aviation Engineers saw action in the deserts of North Africa beginning in November 1942. Four battalions stationed in England (809th, 814th, 815th, and 817th) accompanied the initial assault forces at Oran, Morocco.

A4.2.5. The battalions landed without incident and usually without their equipment. The men of the 814th walked 12 miles to their project site only to fill in holes, dig up duds, and remain idle because their heavy equipment had been appropriated by another unit after being unloaded. The ship carrying the 815th's equipment was sunk and the 809th's equipment was on a ship that had developed engine trouble 2 days out of England and turned back.

A4.2.6. When the units finally began their work in earnest, the major obstacle to constructing airfields along the coasts of North Africa was not the Germans or even the Italians, but “General Mud.” The engineers had landed during the rainy season. General Davison described the construction of the airdrome at Tafaraoui, “To any aviation engineer in North Africa, the word Tafaraoui does not mean an airport alone, it means also a malignant quality of mud; something like wet concrete and of bottomless depth. We still speak of any bad type of mud as Tafaraoui.”

A4.2.7. Through active planning and cooperation between engineer and planner, the Aviation Engineers were almost always at the front lines, or sometimes even ahead of them. One night General Davison was looking for the engineers of “B” company, 814th Battalion, when he was stopped by sentries from the 1st Armored Division, “They stopped me and asked me if I knew I was going out in front of their patrols. I said, ‘No that I didn't know that but I wanted to ask them one question—had a certain engineer company gone through and were they out in front?’ and they said ‘Yes, if you mean those damn fools who wouldn’t pay any attention to us and took those big machines out, we think they are about 10 or 15 miles down the road.’ and I said, ‘That was what I wanted to know.’ I found “B” company dug in with its defensive weapons in place and already at work. It was by keeping in touch with the planning…that we were able to do this.”

A4.2.8. The base at Bone, the easternmost port available to the Allies, was perhaps the most difficult but probably the most rewarding to build. The only possible site for the all-weather airfield was a delta in the Seybouse River mouth. But the area was pure mud. The solution was to use sand available along the coast. Unfortunately, the sand dunes were on the opposite side of the river from the construction site. The men constructed a causeway across the river, a roadway on the delta, and began to bring in sand from the dunes. Although the site was under Axis air attack, rain was the enemy the engineers feared most. A rare dry spell allowed the engineers to bring the sand across and finish the runway just hours before rain washed away the causeway.

A4.2.9. Shortly after completing the runway at Bone, the engineers received the most gratifying of rewards. A B-26 returning from a mission had become lost and was about to run out of fuel. While headed for a ditching in the Mediterranean Sea, the pilot happened to glance down and see the “longest runway he had seen in North Africa” at Bone. He made one sharp turn and landed without enough gas left to taxi his plane off the runway (**Figure A4.3.**).

Figure A4.3. Bomber Landing on Completed Portion of Airstrip.

A4.2.10. The Aviation Engineers proved themselves in North Africa. By the end of the campaign the ten battalions in theater had built or improved 129 airdromes. General Carl Spaatz, commander of the Northwest African Air Forces, stated, “the Aviation Engineers have become as nearly indispensable to the Army Air Force as is possible to ascribe to any single branch thereof.”

A4.2.11. The close working relationship forged between the engineers and the fliers in North Africa continued in Sicily and Italy and was a key to the Allies’ success on the European continent.

A4.2.12. In the Sicilian campaign, the task of the Army Air Forces (AAF) engineers was to provide airstrips in support of the US Seventh Army, and though their officers had little advance knowledge of conditions on the island, the Aviation Engineers were able to keep up with the whirlwind campaign. As it ended, the long-sought separate organization came with the formation of the AAF Engineer Command, which was to serve as a model for the larger structure used later in the invasion of northern Europe.

A4.2.13. The invasion of Italy called first for the familiar procedure of laying down emergency fighter strips, in Calabria and then for Anzio. Later came the less spectacular but more lasting task of building all-weather fields for strategic bombers in Apulia and around Foggia; in both areas the heavy rains of “sunny” Italy caused serious but not insurmountable difficulties. By comparison, the assignments in Corsica and southern France in connection with the DRAGOON operation were routine.

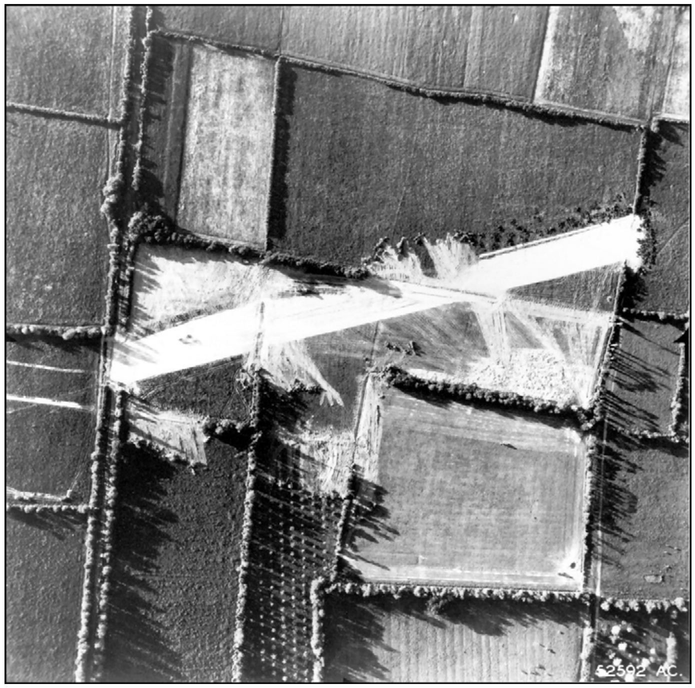
A4.2.14. Operation OVERLORD’s planners recognized that airfield availability would be a determining factor in its success or failure. A tactical air force, to be truly effective, required airfields as close to the front lines as possible to support a fluid and fast-moving operation. To provide these airfields, a new organization was established, the IX Engineer Command. Originally, no separate engineer command had been planned. However, because of the North African experience, where aviation engineers functioned as an integral part of the air force, Army Air Forces leaders such as Lieutenant General Lewis Brereton strongly pressed for an engineer command. A provisional command conducted the training for the aviation engineer battalions until March 30, 1944, when the IX Engineer Command was activated. Four regimental headquarters commanded sixteen battalions of engineers, while the command headquarters retained control of three airborne battalions and a camouflage battalion. Brigadier General James B. Newman became the Commander, IX Engineer Command (**Figure A4.4.**).

Figure A4.4. Colonel Karl Shilling and General Newman at Construction Site.

A4.2.15. At 1050, 6 June 1944, first squad, third platoon of Company A of the 819th Engineer Aviation Battalion landed at Utah Beach, under the command of First Lieutenant Herbert H. Moore. When the ramp was lowered, the engineers waded the final 200 yards to the beach in waist-deep water. A D-7 tractor followed closely behind and after that came the second squad, then a motor grader, the third squad, another grader, a 2 1/2 ton truck, and finally another D-7 tractor. Men and equipment dispersed on the beach with only one casualty from shrapnel. Lieutenant Moore had to wait until the infantry had taken the land for the emergency landing strip. Although the equipment had dispersed on what turned out to be mud flats, it was extricated and reached the site by 1800. Work commenced immediately and the engineers completed the strip by 2115 (**Figure A4.5.**). The men dug foxholes and spent their first night on the continent avoiding the considerable sniper fire.

A4.2.16. The landings at Omaha did not go as planned. Elements of the 834th, under the command of Lieutenant Colonel John Livingston, made repeated attempts to land at their scheduled location. Their landing craft grounded several times on beach obstacles in point blank fire. On D+1, the unit beached at the nearest feasible location, several miles east of the planned site. The remaining elements of the unit landed at various locations up and down the coast. The scattered troops met at their in transit area, but found the planned sites for airfields still under enemy control.

Figure A4.5. Expeditionary Airstrip Constructed During D-Day Invasion.



A4.2.17. The lead party of the 820th proceeded up Omaha Beach to within two miles from the shore when a Navy patrol ordered them to return and stay clear of the German shelling of the beach. Later in the afternoon, they succeeded in reaching the beach, but a shell struck close by just as the ramp was being lowered, injuring several men from other units who were also in the craft, and seriously damaging the craft itself. They turned back and tied up to a landing ship, tank (LST) for the night. The next morning, another landing craft towed them to shore.

A4.2.18. The two initially planned sites remained in enemy hands by D+2, so the engineers of the 820th and 834th found another suitable location near St. Laurent-sur-Mer. They rapidly scraped out an emergency landing strip at the site, still waiting for the other sites to be taken. The Army made an urgent request for an airstrip to evacuate wounded soldiers and receive emergency supplies, so the engineers continued to develop the St. Laurent-sur-Mer emergency landing strip into a transport strip. By 2100 on D+2, they had constructed a 3,500 by 140-foot runway that received its first aircraft the following morning. For the next several weeks, an average of 100 C-47s landed at the airfield daily. Although unplanned, this became the first operational American airfield in France.

A4.2.19. Engineers continued to construct airfields in the weeks following the invasion. Men of the 816th marched 14 miles inland to the site of their planned airfield at Cardonville. They arrived in time to help the Rangers clear the area of German soldiers, taking thirteen prisoners. On 13 June, they complete the new airfield that supported 500 fighter sorties in the first week. By the end of June, 11 American airfields were in operation and five more under construction. The original plans called for approximately two-thirds of the airfields to be built to fighter specifications—a 3,600-foot runway. However, the Luftwaffe's ineffectual reaction to the invasion permitted the Ninth Air Force to use their aircraft as fighter/ bombers, which dictated the construction of 5,000-foot runways.

A4.2.20. Aviation Engineers used three types of expedient runway materials during WW II: Marston Mat (known as Pierced Steel Planking or PSP), Hessian Matting, and Square Mesh Track. PSP was first tested at Langley Field, Virginia, in 1940. It was an example of design genius because of its simplicity, functionality, and endurance. Each section was 10 feet long, 15 inches wide, and weighed 66.2 pounds. Originally manufactured as a solid plank of ribbed steel, engineers decided that punching holes would reduce the weight by 17.5 percent, help drain water and allow drying of the soil underneath, permit backfill to be poured into soft spots or depressions, and contribute to camouflage and dust control by letting vegetation grow through the holes (**Figure A4.6.**).

Figure A4.6. Engineers Laying Pierced Steel Planking.

A4.2.21. Assembly of the PSP into a runway was a simple process. Each mat had thirty slots and L-shaped hooks on both long edges. One or two men dropped the hooks of one piece into the slots of another and then shoved it forward 2 inches, locking the pieces together. Easily removed U-shaped steel clips provided further locking protection on the runway edge. The engineers laid the mat lengthwise, across the runway, usually beginning in the middle and working towards both ends. As the aviation engineer troops became proficient, they were able to lay mat from both ends and the middle simultaneously. Any discrepancy was solved by dragging sections into place with bulldozers. The subsurface was a variety of materials, depending on the projected permanence of the runway, locally available materials, and the existing soil conditions. Leaves, palm branches, or straw created an effective barrier reducing the dust problem (**Figure A4.7.**). Repair of PSP was easy because the planks were laid with the hooks on one row facing the opposite direction of the next row. Two men with pry bars could remove a single mat or repair it in place. If the base below the PSP runway needed major repairs, large sections of planking could be rolled up to allow equipment to make the repairs. The runway could then simply be unrolled. At the end of the war, two million tons of PSP had been manufactured, enough to build nearly a thousand 150- by 5,000-foot runways.

Figure A4.7. Using Straw Under PSP to Control Dust.

A4.2.22. Prefabricated Hessian Surfacing, known as Hessian Matting, was a common runway material used on the continent of Europe following the D-Day Invasion. It was a Hessian cloth (a type of burlap) coated with bitumen that had no load bearing capacity, but served as a waterproof cover for the grade (**Figure A4.8.**).

Figure A4.8. Square Mesh Track Being Unrolled on Top of Hessian Matting.

A4.2.23. Hessian Matting was laid in longitudinal strips, using a 50-percent overlap, thus giving a double thickness throughout. To facilitate accurate overlapping, the material had a red center line. The British developed a machine known as a "Stamplicker" to lay the matting. This device applied solvent (usually diesel fuel) to the bottom of the material as it unrolled off the truck onto the ground. The ends of the rolls were stapled together as they passed through the machine to make one long strip. Because these runways were slippery when wet, engineers sprayed the completed runway with diesel fuel and applied a coating of sand that was rolled into the surface by rollers. This provided an effective anti-skid surface.

A4.2.24. Aviation engineers needed a temporary surfacing material for airfields to be used by light and medium weight aircraft. The runway material had to be lightweight, easily transportable, and quickly laid. In 1944, they began experimenting with concrete reinforcing mesh manufactured in England. Square Mesh Track had initial problems with excessive billowing and a failure of clips to hold the material together. The solution was to stretch the Square Mesh Track by pulling it with trucks and crimping individual wires.

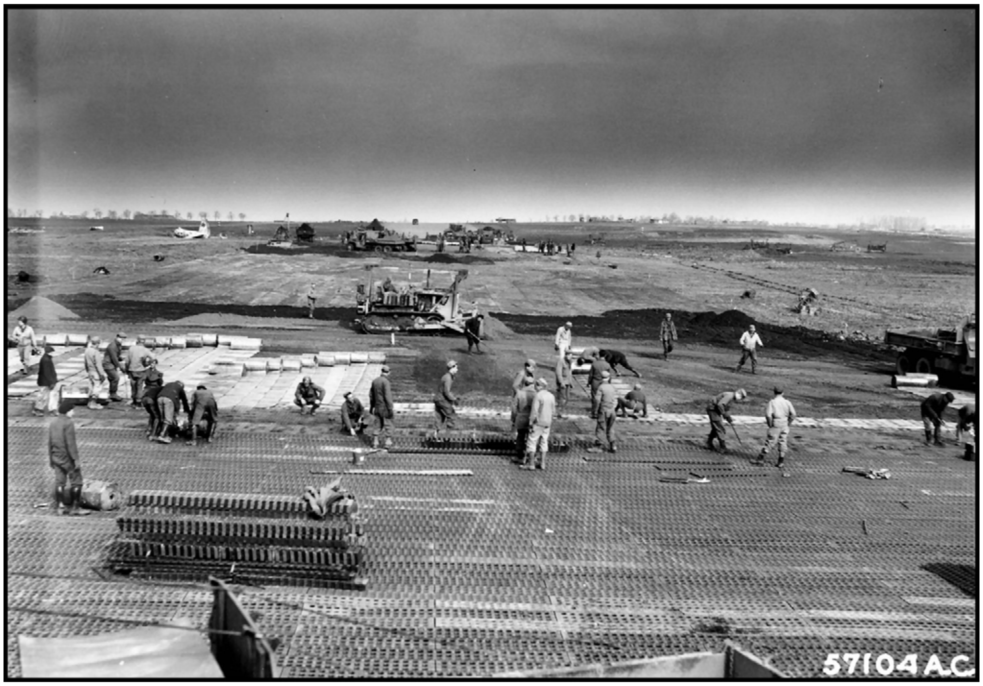
A4.2.25. Square Mesh Track's greatest advantage was its light weight. Square Mesh Track required only 250 tons of material for a 120- by 3,600-foot runway, compared to 1,150 tons for PSP. Engineers unrolled the track either by hand or by pushing it in front of a jeep. As engineers tried different methods, they found that Square Mesh Track laid on top of Hessian Matting provided a satisfactory runway material. When rain and snow caused PSP to be adopted as the main surfacing material, Square Mesh Track was used in many of the “Sandwich” jobs that included Hessian Matting, Square Mesh Track, and PSP (**Figure A4.9.**).

Figure A4.9. “Sandwich” Runway Surface.

A4.2.26. From D-Day until V-E Day the activities of IX Engineer command were intimately entwined with those of the tactical air forces and, indeed, with those of the ground troops. Along with other invading forces, the engineers were hampered by the rugged resistance of the Germans at the beaches and in Normandy; their schedules were disrupted by the slow breakout from the Cotentin and equally by the unexpectedly rapid advance thereafter. Important changes in plans were required by the need for more fighter-bomber fields than had been predicted and by the decision to base medium bombers on the Continent.

A4.2.27. As the First and Third Armies moved across France supported by, respectively, the IX and XIX Tactical Air Commands, the Engineer Command was split into the lst and 2nd Engineer Aviation Brigades, each with the duty of providing the advancing armies a series of airfields in immediate support. Supply and transportation were never adequate, and aviation engineers were hard put to keep up with the breakneck pace of the ground troops. By V-E Day, 8 May 1945, nearly 250 airfields had been constructed or reconditioned for Allied use from Normandy to Austria and Czechoslovakia; 182 were still in use on V-E Day. During their peak period, the IX Engineer Command put an airfield into service every 36 hours (**Figure A4.10.**).

Figure A4.10. Assault Airfield Nearing Completion—Started From Each End.



A4.3. Pacific Theater. Aviation Engineers saw action quite early during the War in the Pacific. The 803rd Battalion endured a 5-month journey to the Philippines in 1941, arriving just a few weeks before the Japanese attacked. The men repaired airfields, scraped out emergency runways and performed whatever engineering work was required. They soon found themselves serving as infantry troops, turning back a Japanese suicide attack at one point. The Japanese captured two of the companies on Bataan, with Company A managing to evade escape and reach Corregi dor. These engineers became consumed in the desperate and unsuccessful campaign to keep Kindley Fiel d operational, and eventually became one of the last units to surrender to the overwhelming Japanese attacked at Corregidor. The Aviation Engineering companies captured at Corregidor and Bataan would become part of and suffer through one of the greatest atrocities of World War II during the Bataan Death March. During this march the Aviation Engineers and other US Army units, over 75,000 personnel in all, were marched nearly 100 miles to Camp O'Donnell, a US constructed Philippine Training base captured by the Japanese.

A4.3.1. In the Pacific and Chi na-Burma-India (CBI) theaters, Aviation Engineers constructed airfields on coconut-forested atolls and in steamy jungles (**Figure A4.11.**), as the American forces closed in on the Japanese homeland supporting MacArt hur's island hopping campaign. The engineers were often forced to abandon their construction equipment and pick up their weapons to defend their positions against the Japanese. In few instances were the Aviation Engineers in the Pacific areas or in the CBI able to call on the resources of an industrial society. Their supply problems were compounded by distance and low priorities. In the Southwest Pacific Area (SWPA), Aviation Engineers began their operations at Darwin in Australia early in 1942 and finished fa r to the north as the war ended. From the first, they worked side by side with Army and Navy engineers.

A4.3.2. Aviation engineers on the other front of the Pa cific campaign fought extreme climatic and austere supply chains to create an aerial supply route across the Himalayas supporting British, Indian, Chinese, and American forces facing the Japanese. These airfields were critical to the support of these actions since the engineers constructing the overland route were faced with a virtually impassable barrier of mountains, rivers and jungles.

Figure A4.11. Airstrip Being Cut Out of a Tropical Jungle.

A4.3.3. As SWPA forces held at Port Moresby and then began the slow movement northward, each jump in the hopscotch pattern of advance depended upon the previous development of new air bases. The terrain often was rugged, living conditions were extremely primitive, and the climate was debilitating and unhealthy. Sites for airfields had to be chosen based on inadequate information, and land transportation was incredibly difficult. These factors made for the unorthodox methods, and in many cases, the standards accepted for airstrips were far different from those demanded in the CONUS or in the European theater of operations. But, whatever the book may have said, the strips laboriously hewn out of jungles or laid on coral islands (**Figure A4.12.**) still under enemy fire usually stood up to the pragmatic test of hard use. Road building frequently became a necessary adjunct to airfield construction, and more often than they liked, aviation engineers were employed in miscellaneous tasks bearing little relation to the air war.

A4.3.4. Occasionally, advance intelligence was so faulty as to require a radical revision of plans, as at Hollandia, where designs for a huge complex of bases to be built by 25,000 Aviation Engineers were scaled down to a minimum, with most of the force moving on to develop an airfield on another island instead. In regard both to construction supplies and provisions for their own existence, Aviation Engineers felt that they suffered unduly while the Seabees lived a life of plenty; they also felt some resentment when the highly publicized Seabees received wide acclaim for accomplishments no different from those of the unsung Aviation Engineers.

Figure A4.12. Airstrip Constructed on Pacific Coral Island.

A4.3.5. With the return to the Philippines, Aviation Engineers passed a crucial test under fire in the mud of Leyte, and then moved northward to Mindoro and Luzon, where a variety of tasks necessary for the restoration of those islands competed with airfield construction for the attention of the engineers.

A4.3.6. In the North Pacific the Japanese threat of June 1942 seemed to reinforce ideas about the strategic importance of Alaska and to demand the immediate extension of air facilities in the area. As a point of attack against Japanese-held Kiska and Attu, two companies of Aviation Engineers built a usable airfield on Adak, Amchitka, and Attu working under the extreme climatic conditions imaginable.

A4.3.7. In the China-Burma-India theater, the activities of the Aviation Engineers were as far from normal as were most operations in that vast theater of operations. In China there were no US aviation engineer units and only a handful of officers to advise General Chennault, and to some extent, the Chinese who built his airfields. In India the Tenth Air Force used fields prepared by native labor under British supervision. Until 1944, all five aviation engineer battalions in CBI were assigned to work on the Ledo Road, where they were joined later by three other battalions. Their fine work was finished only with the completion of the road early in 1945. Though some units then moved into China, they arrived too late to accomplish much before Victory in Japan or V-J Day. Perhaps the most nearly normal project in the theater was when Aviation Engineers, under AAF control, supported the campaign in Burma and developed the important complex of bases around Myitkyna.

A4.3.8. The task of preparing bases for the B-29s of the XXI Bomber Command in the Marianas was one of the largest jobs Aviation Engineers faced during the Pacific campaign, but it went smoothly. Fifteen battalions were available for developing the islands. Plans based on insufficient data had to be modified frequently. Nevertheless, the B-29 fields with their then generous airfield criteria were built in time to accommodate the constantly expanding force of heavy bombers. An even greater construction project, involving the use of 93 aviation engineer battalions, was planned for Okinawa but was canceled when Japan surrendered. Had World War II continued a few months longer, many of the veteran aviation engineer units of the European theater would have been assigned to this mammoth construction program. Instead, most of the Aviation Engineers went home and after discharge participated in the greatest building boom in American history.

A4.3.9. During most of World War II, general service engineers known as Post Engineers carried out maintenance and repair of Army Air Forces installations. At the end of the war, 1,435 airfields located in 67 foreign countries had been used, built, or improved for or by the Army Air Forces. In the Zone of Interior, 504 airfields were on an active status and 136 on a temporary inactive status.

A4.3.10. When the Air Force became a separate service in 1947, Air Force construction continued to be programmed and budgeted by the Army Corps of Engineers. The Air Force Civil Engineer function operated as the Directorate of Installations under the Deputy Chief of Staff, Materiel. At the base level, the Air Installation Officer was responsible for the repair and maintenance of installation facilities, grounds, and utilities.

A4.3.11. Early in WW II (38, 39, and 40) the ArmyHigh Command took a long look at itself and saw that serious reorganization was required to fight the war that was coming. Among the changes made was the reassignment of the ArmyFire Department responsibility from the Quartermaster Corps to the Corps of Engineers (COE) on 4 December 1941, three days before Pearl Harbor. The COE inherited an existing program and assumed all would roll along comfortably. On December 7 the COE discovered it would have to fight fire around the world with soldiers and with equipment designed for State side Army posts. During the next 6 months COE studied, designed, and planned their overseas fire departments. On 1 July 1942, the Engineer Fire Fighting Detachment (EFFD) and the Army Engineer soldier fire fighter (military occupational specialty, or MOS, 383) were authorized for activation. The first 10 EFFDs were activated at Camp Claiborne Louisiana on 31 August 1942. The cadre of each Detachment was drawn largely from Infantry units with the hope that at least some of them had some fire fighting experience. Very few did. The balance of the staffing was Selective Service inductees. The first 4 EFFDs (1, 2, 4 and 5) deployed 1 April 1943 to North Africa, 3, 6, 7, 8 to North Africa and 9 and 10 followed them shortly to England. The Detachments brought only personal gear and weapons. Vehicles and everything else was drawn on arrival.

A4.3.12. On 15 August 1943 these 10 EFFDs, and maybe more if more had trained and deployed by that date, were renumbered and renamed to the 1201st through 1210th Engineer Fire Fighting Platoons (EFFP). They were organized and equipped per T/O & E 5-337, 12 May 1943, Engineer Fire Fighting Platoon. It is here that these EFFPs would divide by function. EFFPs being general service fire fighters and the Engineer Aviation Fire Fighting Platoons (EAFFP) that would come a bit later appeared. The units were identical in officer and enlisted staffing and support vehicles.

Figure A4.13. Military Fire Trucks 1940s.

A4.3.13. Fire protection has been a critical part of the Air Force Civil Engineering since January 1945, when War Department Circular No. 36 transferred all crash rescue and firefighting activities and equipment from the Army Service Forces to the AAF. At HQ AAF, fire protection was assigned to the Assistant Chief of Staff, Materiel and Services, Air Installations Division.

A4.3.14. At the base, structural firefighting was under the post engineer, while aircraft crash rescue (**Figure A4.14.**) reported to the aircraft maintenance officer. In 1949, these were placed under the Air Installation Officer. The two functions were integrated under a single Air Force specialty code in 1953.

Figure A4.14. Firefighters Practicing a New Crash Rescue Technique (1945).

A4.4. Korean War. The Korean War presented tremendous challenges for Air Force engineers. Although the Air Force had become a separate entity under the National Security Act of 1947, it did not possess a separate and unique engineering capability. In response to a significant airfield engineering and construction need, the US Army created Special Category Army personnel with Air Force, or SCARWAF. SCARWAF troops were responsible for the construction, upgrading, expansion, and rehabilitation of airfields and operated under the Command of USAF control until 1951 when the Army resumed control and training. In 1951, the organization had the Air Force furnishing funding and manpower authorizations while the Army organized, trained, and equipped SCARWAF engineer units and then placed them under Air Force control.

A4.4.1. This confusing concept led to a number of problems that hampered the engineers throughout the war. At the beginning of the Korean War SCARWAF battalions combat effectiveness was rated at approximately 15% of the World War II Aviation Engineer battalions. Commanders and personnel assigned to SCARWAF units felt they belonged to neither the Air Force nor the Army as neither agency took responsibility for maintaining an effective and equipped engineering force.

A4.4.2. A SCARWAF battalion initially had an authorized strength of 800 men. In July 1951, each battalion increased to 977 personnel. During the first year of the war, most units were woefully ill equipped and under strength. The manning they did possess was often poorly trained and inexperienced.

A4.4.3. Two SCARWAF groups were assigned to the First Construction Command, Fifth Air Force. The 930th EAG Headquarters and Service Company oversaw civilian construction while military construction would be handled by the 931st EAG, assigned to 12th AF, with units located in Guam and Okinawa. This unit was disbanded in December 1950 and the Fifth Air Force Director of Installations was given command of both SCARWAF troops and installation squadrons.

A4.4.4. Company A of the 802d Engineer Aviation Battalion (EAB) was the first Aviation Engineer unit to land in Korea, coming from Okinawa. Beginning on 11 July 1950, engineers rehabilitated the airfield at Pohang, using World War II-vintage equipment. They put a 500-foot PSP extension on the east end of the runway and constructed a 40-foot wide taxiway with 27 hardstands for P-51 Mustangs. In early August, the engineers left their equipment and joined the infantry to defend the base against advancing North Korean troops.

A4.4.5. The 822d EAB arrived from Okinawa on 30 July with orders to repair the existing PSP runway without hindering current air operations and mission generation at Taegu Airfield. It had one sod runway, 4,000 feet long. Working around the clock, engineers, aided by 500 Korean workers, laid 4,300 linear feet of a new PSP runway and went to work on the existing parallel runway. On 16 August, North Korean forces attacked Tageu forcing the EAG to evacuate to Pusan. Returning a month later, the engineers completed the runway to a length of 6,215 feet with a 1,000-foot stabilized overrun. This allowed F-80 jet aircraft and heavy C-119 transports to use the airfield. The 811th EAB put Kimpo and Suwon airfields back into service just 10 days following the Inchon invasion. This pattern of construction, coming under attack, retreating and having to re-accomplish their work was a point of constant frustration for EAG personnel.

A4.4.6. During the early stages of the Korean War, the low level of readiness of the SCARWAF aviation engineer units seriously affected the conduct of air operations. This problem was compounded by the introduction of several new aircraft. Newer aircraft such as the F-80 and C-124 required longer and wider runways, larger taxiways and parking aprons, increased pavement thickness, and more stringent design criteria for gradients and clear zones. Larger fuel and munitions storage, and more support facilities were requirements that added to the burden. The result of the technological advancements in aircraft in Aviation Engineering terms was a much larger construction effort required to expand and support existing and new Korean airfields. In World War II, airfield construction was expressed in terms of battalion days or weeks; in Korea, it was battalion months.

A4.4.7. Other factors contributed to the reduced capabilities of SCARWAF Aviation Engineers during the early months of the conflict. Although the Far East Air Forces had 3,600 SCARWAF authorizations, only 2,322 were filled, and their equipment consisted of obsolete leftovers from World War II. These handicaps resulted in concentrating initial construction effort on upgrading South Korean and

WWII Japanese-built airfields. The newer, heavier and more performance driven aircraft of the Korean conflict quickly exceeded the design capabilities of the WWII airfields causing degradation, deterioration and increased maintenance and repair requirements. The Aviation Engineers attempted to solve the problem by overlaying the thin concrete surfaces with PSP without addressing the poor bearing capacity of the runway subgrade. The PSP overlay method was effective to support fighter operations but collapsed and failed under the weight of transport and bombers due to the inadequate sub grade bearing capacity. Operations had to continue to support combat operations, and as reported at the time, the PSP "rolled and buckled, clips worked loose and lacerated aircraft tires, while the perforated surface slowed the planes and increased the takeoff roll" (**Figure A4.15.**).

Figure A4.15. Damaged PSP Being Repaired.

A4.4.8. Since PSP was the only means of providing expedient airfield surfaces, the existing stock (5 million square feet) was soon depleted. By September 1950, with a supplemental shipment of another 5 million square feet, 8.3 million square feet of PSP matting had been laid in Korea and Japan. By December 1950, losses as a result of the Chinese Communist Forces offensive and other emergency requirements had once again depleted PSP supplies.

A4.4.9. December 1950 saw the Communist Chinese Forces launch a massive counter offensive over the Yalu River. By the end of the month UN forces and positions started to retreat and fall. During this retreat the 822nd EAB working around Pyongyang were forced to retreat. During this action the 822nd lost 75% of its equipment when an ammunition rail car exploded incapacitating the rails. By January 1951, the Chinese Communist Forces advance had been halted and UN forces began to take the offensive. UNC forces established a static forward battle line along the 38th parallel that became the main battlefield for the next two years.

A4.4.10. As the war entered into this stage, the lack of training, manpower, and worn-out equipment still plagued the aviation engineer units, severely degrading construction efforts. The acute shortage of repair parts and mechanics, and equipment abuse by untrained operators further aggravated an already difficult situation.

A4.4.11. The assessment of the engineers' role and accomplishments during the first 2 years of war was generally disappointing. The official Air Force history of the Korean War stated: "In two years of war in Korea no single factor had so seriously handicapped Fifth Air Force operational capabilities as the lack of adequate air facilities."

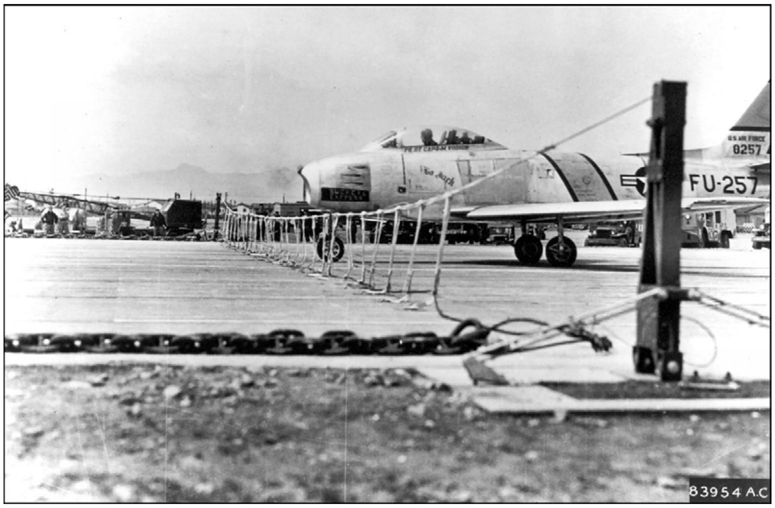
A4.4.12. Recognizing the problem of SCARWAF training, all CONUS training was placed under the control of the Continental Air Command and the Aviation Engineer Force was established. Ten aviation engineer units with a total strength of 3,484 personnel were assigned to Aviation Engineer Force. The creation of the Aviation Engineer Force was an important first step to correct the training problems, but it was far short of solving them all. It took 2 years after the start of the war, until June 1952, for the Fifth Air Force to attain its required aviation engineer capability of 10 battalions.

A4.4.13. Considering the many difficulties encountered by SCARWAF units during the conflict, their many accomplishments are doubly impressive. During the early stages, Aviation Engineers used expedient methods to get as many airfields operational as possible; it was the only viable option because time, manpower, equipment and materials were limited. As the frontlines stabilized in 1951, and more manpower became available, the effort shifted toward more durable construction methods. At Taegu, Kunsan, and Suwon 9,000-foot semi-permanent runways were built to last at least 2 years. From this point on, the construction effort in Korea increased dramatically. By the end of the war, Aviation Engineers had built or repaired 55 separate airfields from which the Air Force flew nearly 700,000 sorties.

A4.4.14. Installation squadrons operated and maintained the airfields. The squadron's three officers and 60 enlisted troops, supplemented by 300-400 Korean laborers, constructed prefabricated buildings, established utility systems, and provided fire protection. Working in concert with aviation engineer battalions, the installation squadrons transformed airfields into airbases. Engineers constructed housing, administrative facilities, operational and maintenance structures at South Korean bases to support prolonged operations. They also deployed forward to assist in the operation of temporary airfields near the front lines during the fluid portion of the war.

A4.4.15. Even with longer and wider runways, jet aircraft continued to be lost during takeoff and landing operations. The Air Force decided to test the application of an aircraft arresting barrier system similar to the Davis barrier used on aircraft carriers. The system adopted by the Air Force, the MA-1A, consisted of retractable stanchions which held the barrier in position and heavy anchor chain to decelerate the aircraft when it engaged the barrier (**Figure A4.16.**). In the first two weeks of use at Taegu, three F-84s (costing $200,000 each) were saved by the arresting system, which cost $17,000. Within six months of operation, the MA-1A had saved 36 aircraft through active engagements.

Figure A4.16. MA-1A Aircraft Barrier.



A4.4.16. Problems relating to heavy equipment centered around lack of standardization and, at least during the early stages of the conflict, operator training. Equipment obsolescence and insufficient replacement parts presented difficulties as well.

A4.4.17. Training deficiencies in the SCARWAF units posed a major problem throughout the conflict. Once the Aviation Engineer Force had trained ten of the rotational units, proficiency improved considerably. In its after action report, the Aviation Engineer Force concluded "...the Air Force had a vital need for aviation forces which were not combat engineers nor construction engineers but specialists in the art of building airfields."

A4.4.18. Following the war, the Air Force requested permission to organize its own engineering function and transfer the 30,000 SCARWAF engineers from the Army. In 1955, however, the Secretary of Defense decided to leave the engineers with the Army and abolish the SCARWAF, thus leaving the Air Force without its own combat engineers until the establishment of the RED HORSE program in 1965.

A4.5. A Professional Force. The 1950s were a period of significant growth in the basing of the Air Force. The elevation of the Directorate of Installations to Assistant Chief of Staff level from 1954 to 1957 was indicative of the increased engineering activities related to the massive strategic forces buildup.

A4.5.1. With the beginning of operational planning for the intercontinental ballistic missile (ICBM), the civil engineering activity was reorganized to provide for design and construction supervision of missile ground support facilities. The designer of the missile ground environment had to work in an integrated fashion with the designer of the missile itself. When the ICBM became a part of the aerospace force, it automatically introduced engineering considerations as a major element for the selection and employment of weapon systems and resulted in an increase in the scope and volume of Air Force engineering. The construction of dispersed missile sites at various bases presented significant difficulties in the areas of operations, maintenance and fire protection.

A4.5.2. The design and construction of the Dye radar sites, Ballistic Missile Early Warning System and Distant Early Warning Line (**Figure A4.17.**) installations presented many challenges. Extending from Greenland to Alaska, these sites were constructed under conditions that had never before been encountered and required ingenuity and perseverance to complete.

Figure A4.17. Distant Early Warning (DEW) Line Facilities.

A4.5.3. In 1954, Air Force engineers began construction of the new Air Force Academy near Colorado Springs, Colorado. The Air Force Academy Construction Agency was created to oversee the work. The new institution reflected the role that aerospace power would play in the future (**Figure A4.18.**).

Figure A4.18. Air Force Academy, Colorado Springs, Colorado

A4.5.4. Air Force Engineer leaders stressed professionalism and registration in the 1950s and 1960s. In 1959, the Air Force Director of Installations was renamed the Director of Civil Engineering. At the base level, Air Installation Officers became Installation Engineers (and later, Base Civil Engineers). This demonstrated the change in the perception of Air Force Engineers from "handymen" to professionals.

A4.6. Southeast Asia Conflict. In the 1960s, Air Force Engineers responded to several emergencies and the growing American commitment in Southeast Asia and as a result, gave the Air Force the contingency capability necessary to respond worldwide. The Lebanon crisis of 1958, Berlin crisis of 1961, and Cuban Missile Crisis of 1962 demonstrated a need for mobile civil engineer teams ready for immediate deployment to perform construction work during wartime or other emergencies. A HQ USAF study group recommended that Prime BEEF (base engineer emergency force) teams be created to respond worldwide when needed.

A4.6.1. As the Indochina War ended with the departure of French forces, Communist activities in Southeast Asia started to gain the attention of the United States. By late 1961, the insurgency in the Republic of South Vietnam began to threaten the country's continued existence. A decision was made to increase the US military advisory contingent. The buildup of personnel and equipment drove a concurrent requirement for new construction. Some PACAF civil engineers were deployed on temporary duty (TDY) to Vietnam to establish tent camps and basic support facilities as interim measures until permanent facilities could be constructed by contract. Other civil engineers on TDY also provided operations and maintenance support at several locations in South Vietnam. The US Military Assistance Command, Vietnam (USMACV) had initial responsibility for contract construction that then shifted to the Navy. As the construction effort continued to grow, the in-country contractor capability was soon saturated, while pressure to get the work done increased constantly. After President Johnson's statement on 4 August 1964 that the US would honor its commitment to South Vietnam, the US buildup of forces in Southeast Asia started to shift into high gear. The number of Air Force personnel and aircraft deployed to Tan Son Nhut, Bien Hoa, and Da Nang soon saturated these air bases. As a later study would show, the Army, as required by Department of Defense (DOD) Directive, had no dedicated units to meet Air Force troop construction requirements in an overseas theater. The Air Force, prohibited by that same directive from having its own wartime capability, had to rely on civilian contractors to provide its facilities for combat mission support.

A4.6.2. New bases became operational as the buildup continued, but the flow of CE forces did not keep pace, at least not until 1966. The BCEs relied on indigenous labor to provide beddown facilities for the incoming forces. Billets were not standardized and ranged from hardback tents to “Bien Hoa” huts, or whatever could be put together quickly with the skills available. Billeting was a minor problem compared to the constantly increasing challenges that confronted the BCEs. Water shortages in the dry season followed by floods during the monsoons; sanitation hazards; heavy demands on power generation and utilities, maintenance of aircraft barrier systems; and daily flightline emergencies were some of the major concerns. Because of the climatic effect on equipment and temporary facilities, constant maintenance became a heavy burden. During the Vietnam War, firefighters formed Pedro units, comprising airborne firefighters who responded to crash scenes away from a base. Air Force fire protection in Southeast Asia was the busiest fire protection organization in the world, responding to nearly 100,000 emergency calls a year.

A4.6.3. While CE forces had received no specific war fighting training prior to their Southeast Asia assignment, they nevertheless demonstrated the capability that was necessary to support the combat mission until better capabilities could be developed. The Prime BEEF program implemented in late 1964 was to fill the need; it was put to the test just a few months later.

A4.6.4. Lack of parking space and a rapid buildup in numbers made it necessary to park aircraft close together on existing ramps. The absence of shelters, with only a few protective revetments available, made aircraft highly vulnerable to accidental explosions and enemy attack. In May 1965, at Bien Hoa, the inevitable happened when a bomb accidentally exploded on a B-57 parked among a cluster of aircraft (**Figure A4.19.**). The sympathetic detonations that followed killed or injured 105 personnel and destroyed or damaged 45 aircraft. Some form of protection from a similar accident or enemy action had to be found.

Figure A4.19. B-57s Damaged and Destroyed, Bien Hoa Vietnam.

A4.6.5. After prototype testing at Eglin AFB, Florida, the Air Force decided on a steel bin revetment filled with compacted soil to provide the needed protection. Unable to obtain engineer support from the heavily committed Army to meet Air Force requirements (including revetment construction), three CONUS-based, 28-person Prime BEEF teams were deployed to construct revetments at Bien Hoa, Tan Son Nhut, and Da Nang. This group of three teams was known as Prime BEEF I. By the time their 120-day TDY ended in December 1965, Prime BEEF I had many accomplishments to their credit, including more than 12,000 linear feet of revetment constructed at three bases (**Figure A4.20.**). Not only had they provided greater protection for combat aircraft, these teams validated the Prime BEEF concept. Wartime necessity had given Air Force Civil Engineers a war fighting capability.

A4.6.6. Other groups of Prime BEEF teams followed to accomplish vital mission support projects. Prime BEEF II, an 18-person plumbing team laid over 2 miles of water lines at Tan Son Nhut; provided nine latrines and constructed sewer mains, septic tanks, and leaching fields.

A4.6.7. Prime BEEF III arrived in October 1965; composed of six teams with a total strength of 225 men, these teams were tasked to support the beddown of new Air Force units. Working with BCEs at various bases, each of these deployments was a success that attracted the attention of the leadership. By 1968, over 1,600 personnel from nearly 60 individual Prime BEEF teams had responded to support urgent facility requirements in Southeast Asia.

Figure A4.20. Aircraft A-2 Bin Revetments, Vietnam Era.

A4.6.8. A more permanent capability was required to meet the heavy construction and repair capability supporting the rapid force buildup in Southeast Asia. On 10 May 1965, Secretary of Defense Robert McNamara asked Secretary of the Air Force Eugene M. Zuckert if the Air Force had the capability to construct expeditionary airfields and, if not, what could be done to develop such a capability. In August 1965 the organization of Civil Engineering Squadrons (Heavy Repair) was proposed and two squadrons were requested for assignment to PACAF. The mortar attack on Bien Hoa during may 1965, when 11 aircraft were damaged, intensified the concern and need for a greater organic capability. One month after the proposal was made, the Tactical Air Command was tasked to organize, train, equip, and prepare two squadrons for deployment to South Vietnam. Called Rapid Engineer Deployable Heavy Operational Repair Squadron, Engineering (RED HORSE), these squadrons were to be self-contained units with their own equipment and supplies, capable of deploying anywhere in the world. RED HORSE squadrons were to maintain their own identity when operating in the field.

A4.6.9. The first two units were designated the 554th (Penny Short) and the 555th (Triple Nickel) Civil Engineering Squadrons, Heavy Repair (CES [HR]). By 15 December 1965, training of these units was underway at Cannon AFB, New Mexico; “graduation” took place on 26 January 1966. Even before training was completed, all of the 390 items of construction equipment to support the two squadrons were ready for shipment at the Gulfport, Mississippi port of embarkation; it was an extraordinary feat accomplished in just 85 days after Warner Robins Air Materiel Area had been tasked to provide this equipment.

A4.6.10. The two RED HORSE Squadrons arrived in South Vietnam in February 1966 with the 554th assigned to Phan Rang AB and the 555th going to Cam Ranh Bay.

A4.6.11. The 554th at first concentrated on repair of the aluminum matting runway where severe rains and poor initial construction had caused the subbase to fail. Repair was accomplished by excavating to depths of up to 8 feet and replacing subgrade material, installing sub drains, and laying new base course material. The work proceeded without interruption of air operations. Later the 554th built aircraft shelters, shops and other support structures, constructed NAVAID facilities and taxiways, and installed aircraft arresting barriers.

A4.6.12. The 555th RED HORSE Squadron performed similar tasks to maintain continued flying operations at Cam Ranh Bay; they were also active in new facility construction and improvement of roads and the utility systems.

Figure A4.21. RED HORSE Engineers at Tuy Hoa Beach.

A4.6.13. By the end of 1966, six RED HORSE units had been organized and deployed to SEA. The 556th arrived at U Tapao AB, Thailand, at the beginning of July 1966 and engaged primarily in building construction. Members of the squadron also completed work at five other bases in Thailand. The 819th's role in Vietnam was unique among RED HORSE squadrons in that it deployed to an undeveloped area, classified as unsecured, to establish a base camp without recourse to any base support functions. The mission of the squadron was to construct the buildings at Phu Cat while the construction combine of Raymond International, Morrison-Knudsen, Brown and Root, and J.A. Jones (RMK/BRJ) constructed the airfield. Phu Cat became the one base in South Vietnam at which almost all building construction and a great percentage of earthen and paving construction was accomplished by a RED HORSE squadron—the 819th. The 820th deployed to Tuy Hoa AB in October 1966. This unit completed nearly 50 percent of all construction completed at Tuy Hoa, including: 170 aircraft protective revetments, 120,000 square feet of wooden buildings, and 175,000 square yards of AM-2 matting. In addition, the 820th operated a rock crusher 9.5 miles from the base and hauled aggregate through enemy-held territory to the base. The 823d reported to Bien Hoa AB in October 1966. Operating out of Bien Hoa, the squadron reorganized into four self-sufficient units. By January 1967, deployed units were in place at Tan Son Nhut, Vung Tau, Da Nang, and Pleiku, while a unit remained at Bien Hoa.

A4.6.14. As the many RED HORSE squadrons were beginning to prove their capabilities as a war fighting engineering force, they were organized into the 1st Civil Engineering Group directed by the 7th Air Force Civil Engineer. These squadrons carried out major construction on several bases and completed much of the vertical work left undone by the contractors. RED HORSE squadrons constructed nearly 400 concrete aircraft shelters at six bases in South Vietnam between 1967 and 1969. The RED HORSE squadrons succeeded in making the bases safer and much more livable for Air Force personnel.

A4.6.15. The first RED HORSE units deployed to Southeast Asia for 1-year tours. However, there was no program for training replacement personnel for the initial cadre. In 1966, Tactical Air Command established the Civil Engineering Field Activities Center at Eglin Auxiliary Field #2 and activated the 560th RED HORSE Squadron to operate the site. The 560th, comprised primarily of returning "Horsemen," conducted 60 days of academic and field training for RED HORSE replacement personnel. The hot, humid climate at Eglin Auxiliary Field #2 made it an ideal training site for Southeast Asia-bound personnel. Also, the isolated site allowed the training cadre to establish a "typical" Southeast Asia RED HORSE camp away from the main base. When RED HORSE requirements in Southeast Asia began to scale back, the training was no longer required. The Civil Engineering Field Activities Center closed in January 1970 after training over 5,000 personnel.

A4.6.16. At the peak of activity, RED HORSE in-theater strength reached 2,400 military personnel and 6,000-plus host nation personnel. In 1969 the workload for RED HORSE decreased, and some units were inactivated or redeployed to other locations, leaving two squadrons in South Vietnam by the end of 1970.

A4.6.17. In 1966, the Air Force was increasing its daily missions in support of the buildup of US ground forces in Southeast Asia. The Air Force had several squadrons of aircraft ready for deployment to South Vietnam. However, existing bases were loaded to the saturation point and building an additional base posed other problems. The construction capability of both the Army and Navy was already overburdened, as was the existing civilian construction combine, RMK/BRJ.

A4.6.18. The Air Force responded with Project Turnkey, a concept for constructing a new base in minimum time. Project Turnkey was a single package whereby the new base would be brought to combat operational status in just 7 months, with the complete air base to be finished within 12 months. This was a new experience for the Air Force, because it had never had sole responsibility for the construction of an operational air base.

A4.6.19. The site chosen for the new air base was on the coast, near the village of Tuy Hoa. The initial operational facility included a 9,000 foot runway of AM-2 matting, a taxiway, parking apron, pre-packaged tent facilities, and bladder systems for petroleum storage. This was followed by construction of sustained operational facilities to include a parallel 9,500-foot concrete runway, plus maintenance, cantonment, and operational facilities.

A4.6.20. The first shipments of construction supplies came in over the beach and were off-loaded by Filipino stevedores using landing craft. All of the contractor camp facilities were erected in their planned permanent locations for later Air Force use.

A4.6.21. A major part of the construction effort was first directed toward completion of the aluminum mat runway so that operational status could be achieved at the earliest possible date. By early October, the first sections of aluminum matting could be placed in position. Mat emplacement proceeded at a rate of 600-800 feet of runway per day. Simultaneously, construction was expedited on all basic facilities required for the interim operation of the base. The aluminum mat runway was finished by 12 November 1966, a full 6 weeks ahead of the projected completion date. On that same day the new Tuy Hoa runway received its first aircraft, an Air Force C-130 and a C-124. These transports brought in the ground control approach mobile unit and other navigational aids required for use of the runway. Three days later, F-100s of the 308th Tactical Fighter Squadron deployed to their new home at Tuy Hoa.

A4.6.22. The engineers then turned their attention to the construction of a concrete runway, concrete taxiway, and the base permanent facilities. As F-100s took off from the AM-2 runway on daily missions, paving operations on the parallel runway moved forward at an accelerated pace (**Figure A4.22.**). Working both day and night, the paving crews were able to complete the concrete runway by 6 April—a full month ahead of schedule.

Figure A4.22. Vietnamese Civilians Helping Build Tuy Hoa Parallel Runway.

A4.6.23. Simultaneously, the 820th RED HORSE Squadron also worked around the clock to complete all of the sustained operational facilities. By June 1967, the entire air base was finished. Air Force civil engineers had proven that when necessary they could assume responsibility for the construction of an operational air base and complete it successfully.

A4.6.24. In the middle of the Vietnam effort, Prime BEEF teams and the 557th RED HORSE Squadron deployed to South Korea in response to the rapid force buildup following the seizure of the USS Pueblo on 23 January 1968. These units constructed aircraft shelters, modular facilities, revetments, and other mission essential facilities to support the additional flying units in the country.

A4.6.25. During the period of rapid expansion, the civil engineering war fighting capability had transitioned from virtually no capability to a viable, battle-tested capability represented by its Prime BEEF teams and RED HORSE squadrons. We cannot fail to mention the dedicated legions of engineers who, during their year-long tours in Southeast Asia, operated and maintained the airbases. They may get little glory, but they were an essential force to help keep the aircraft flying.

A4.6.26. As American involvement in Southeast Asia began to wind down, RED HORSE capabilities were maintained at a high level of readiness. For the first time, the Air Force had organic heavy repair units designed for contingency support with no contingency at hand. In an effort to provide an engineer heavy repair capability as responsive and quickly deployed as the tactical aircraft they support, a training program was developed which produced tangible results by completing civil engineering projects which developed skills similar to those which would be required during a contingency.

A4.6.27. One such project was the construction of an aircraft bombing and gunnery range at Blair Lakes, Alaska. The project consisted of clearing 1,200 acres of forest, construction of personnel quarters, operations and maintenance buildings, and erection of observation towers 40 feet in height to provide a standard range for use by Arctic construction operations.

A4.7. A Peacetime Force. In 1975, the Directorate of Engineering and Services was created at HQ USAF when responsibility for mortuary affairs, housing, housing furnishings, bachelor quarters, and transient quarters transferred to the Directorate of Engineering. Other Services functions such as food service were transferred in 1979 when the Air Force Services Office moved from the Defense Personnel Support Center, Philadelphia, Pennsylvania to HQ Air Force Engineering and Services Center (AFESC), Tyndall AFB, Florida.

A4.7.1. In 1978, Services personnel began work on the Prime RIBS (readiness in base services) program to give the Services field a contingency capability for feeding, housing, and clothing deployed troops. By using a building block concept similar to Prime BEEF, the Prime RIBS teams provided the necessary flexibility to respond to a variety of situations. The Air Force now had the capability to support troops properly in the field.

A4.7.2. Air Force civil engineers assisted local communities recovering from natural disasters. Prime BEEF and RED HORSE teams responded in Northeastern Pennsylvania and Rapid City, South Dakota, to help in the search, rescue, and recovery operations following severe flooding. A tornado devastated Xenia, Ohio, in 1974. Engineers and firefighters from Wright-Patterson AFB, Ohio, assisted in the cleanup and helped put out many fires caused by gas leaks. In 1979, the 823rd RED HORSE Squadron assisted in recovery operations at Keesler AFB, Mississippi, which had been heavily damaged by Hurricane Frederick. More recently, Air Force civil engineers helped residents in recovery efforts following Hurricanes Andrew, Isabel, and Katrina.

A4.7.3. Protection and restoration of the environment became a major concern for Air Force Engineers in the 1970s. Responsibility for the Air Force environmental protection program was given to the Directorate of Engineering and Services. Terms such as Environmental Impact Statement, Installation Restoration, and pollution abatement became a part of the everyday language for Air Force civil engineers.

A4.7.4. Great improvements in the quality of life for Air Force personnel were made in the 1970s. High priority was given to upgrading housing, recreational facilities, child development centers, and the workplace.

A4.8. Readiness Rebirth. Programs set in motion during the 1960s and 1970s, such as Prime BEEF, RED HORSE, quality of life improvements, and environmental concerns continued to expand during the 1980s. The 1980s was a period of challenges for Air Force engineers as they found themselves working on major projects overseas.

A4.8.1. Air Force engineers were responsible for the overall program management for the construction of two Israeli airbases in the Negev Desert as part of the Camp David Accords. These projects presented special challenges because of the foreign government construction standards and the demanding construction schedule.

A4.8.2. Off-station Prime BEEF team training had its beginnings at Wright-Patterson AFB, Ohio. That training, which developed limited beddown skills, moved to Tyndall AFB, Florida in 1972 with its parent unit, the Air Force Civil Engineering Center, the forerunner to today's Air Force Civil Engineer Support Agency (AFCESA).

A4.8.3. In 1979, HQ AFESC (now HQ AFCESA) relocated the Prime BEEF training to Field #4 at Eglin AFB, Florida. The runways at Field #4 enabled civil engineers to learn rapid runway repair (later known as airfield damage repair or ADR) as never before—on blown craters, and ADR became the focus. Prime BEEF team members also received some hands-on training in bomb damage repair, force beddown, Harvest Eagle equipment, chemical warfare defense, and explosive ordnance reconnaissance. In October 1985, a major change occurred. The Prime BEEF contingency training conducted at Field #4 was greatly expanded to include other specialties. The new base recovery after attack (BRAAT) training combined the traditional Prime BEEF curricula with those of the disaster preparedness (later called Emergency Management, or EM), explosive ordnance disposal, firefighting, services, and commissary specialties. They learned how their individual functional areas interface for a coordinated base recovery effort. For 7 days, students trained and exercised together in a realistic wartime environment.

A4.8.4. Air Force Engineers were given the opportunity to display their capabilities during SALTY DEMO, an integrated air base survivability demonstration conducted in May 1985 at Spangdahlem AB, Germany. For 5 days, the Engineers were involved in almost every aspect of BRAAT. The demonstration opened a lot of eyes and focused attention on the importance of the air base and the engineers' role in air base recovery and sortie generation.

A4.9. Gulf War. Air Force Engineers played a vital role during the Gulf War. Beginning on 7 August 1990, thousands of men and women began deploying to Southwest Asia in support of Operation DESERT SHIELD/DESERT STORM—the largest movement of combat forces since World War II. US Air Force personnel initially deployed to two primary locations, Dhahran and Riyadh. This soon grew to more than twenty locations in the region, ranging from international airports, to airfields under construction, to modern military air bases with state of the art facilities. Prime BEEF teams used Harvest Falcon assets to beddown deploying forces. Created in the 1980s, Harvest Falcon is a complete bare base set that provides both housekeeping and aircraft maintenance facilities. It combines aspects of Harvest Eagle and Harvest Bare and uses soft-wall, and some hard-wall, shelters for base support and hard-wall shelters for aircraft support. All Harvest Falcon equipment is designed specifically for Southwest Asia operations.

A4.9.1. When billeting was unavailable at the sites, as was often the case, everyone went to work setting up "tent city" and not just the engineers. Although some Air Force personnel initially were housed in hotels downtown, the terrorism threat forced them on base. Soon, rows and rows of tents blossomed on the Saudi sand. Engineers erected approximately 5,000 tents during Operation DESERT SHIELD. Many of the bases gave their tent cities names such as "Camel-lot" and "Bedrock City."

Figure A4.23. Erecting a TEMPER Tent (Operation DESERT STORM).

A4.9.2. Electrical power was a critical element at all beddown locations, not only for aircraft support equipment, but for computer operations and air conditioning as well. For bare base operations, the Air

Force used primarily 60-kW, 100-kW, and 750-kW generators. Early in the deployment, the smaller 60-kW and 100-kW portable generators provided primary electrical power to small clusters of tents or facilities. Such improvising required frequent servicing of the equipment and refueling of generators and often led to generator overload resulting in equipment failure. When they were later replaced or supplemented by 750-kW diesel generators, most Air Force power production personnel were unfamiliar with the larger units. The problem was compounded by the unavailability of Technical Orders for the equipment.

A4.9.3. Generators began failing because of around-the-clock operations and a severe shortage of filters and spare parts that reduced the amount of scheduled maintenance that could be accomplished. The Air Force sent an eight-person civil engineering maintenance, inspection, repair, and training (CEMIRT) team to establish a depot repair capability for power production equipment at Thumrait, Oman.

A4.9.4. In August, a shortage of primary distribution centers complicated the establishment of efficient power distribution systems, which resulted in a lack of safe hookups to the primary electrical distribution source. By 26 September 1990, however, the CEMIRT team at Kelly Air Force Base, Texas, designed an acceptable replacement using commercial off-the-shelf components and shipped the thirty-four primary distribution centers to the Gulf region sites and one to Sheppard Technical Training Center.

A4.9.5. Water availability, its storage, and distribution were critical elements at beddown locations. USCENTAF Engineering and Services established a minimum secure water storage requirement of 100 gallons per person for 5 days. Drinking water initially was supplied as bottled water from local sources, and at some sites, it came from existing water distribution systems connected directly to commercial water sources. Nearly every site had to augment the in-place system. Other locations, such as Cairo West, had to haul water by truck (**Figure A4.24.**) and store it in bladders. The quality of water varied from site to site. A few sites only needed to add a small amount of chemicals to bring it up to standards. Others were required to process it through Reverse Osmosis Water Purification Units. Seventeen sites possessed water purification units.

Figure A4.24. Hauling Water to Support the Base (Operation DESERT STORM).

A4.9.6. Wastewater was collected either to underground storage tanks and pumped out by contractors or to a gray water pond for evaporation or absorption. However, soil conditions at some sites were a clay/sandy soil with a hard sandstone subbase that did not permit absorption, and high humidity slowed evaporation. Engineers constructed lagoon systems to pipe the gray water further from the cantonment area and reduce the potential health hazard.

A4.9.7. Air Force Civil Engineers had to overcome many obstacles. Most engineers had never trained on the set up of Harvest Falcon equipment, and when TEMPER tents and utility systems began to arrive, many without technical orders, the engineers were uncertain exactly what constituted a complete set, how they were to be assembled, or how to repair the equipment. Furthermore, the delivery of Harvest Falcon equipment was delayed, parts were missing, shipping containers inappropriately marked, and in some cases, equipment was appropriated by organizations other than the consigned. War Readiness Spares Kits (WRSK) for several Harvest Falcon items often did not accompany the delivery or were incomplete because of funding. Inevitably, the most critical items were missing from the kits. Filters for generators were scarce, and engineers resorted to using T-shirts or panty hose. Spares shortages forced operators to "abuse" their equipment. Many generators, for example, operated for sixteen maintenance cycles without any routine maintenance.

A4.9.8. Engineers' accomplishments the first days and weeks of the deployment were noteworthy. The following is a summary of a Prime BEEF team's first month's work at King Fahd International Airport, Saudi Arabia: The group accomplishments included laying over 4,000 tons of asphalt for roads, parking, Air Transportable Hospital, helicopter pads, and chow halls. We erected over 370 tents, set up 6 shower units, 10 latrines, a camp potable water and electric distribution system, a camp revetment system, designed and installed a bunker system, provided wood floors for admin/shop tents, constructed a mall complex consisting of a chapel, BX, movie tents, recreation center, laundry, and personnel facility. We have sectionalized the base for bomb damage repair purposes and set in place the teams to conduct those operations. We set up our own logistics operation to acquire material and tools we could not obtain elsewhere for which we continue to rely on for 100 percent of our support.

A4.9.9. Firefighters established a fire protection capability by assembling vehicles, equipment, and firefighting agent (halon, dry chemical, and aqueous film-forming foam). They assessed the fire protection requirements of the site, evaluated the host nation capabilities, and assisted engineers in planning site layouts.

A4.9.10. Their vehicles arrived from prepositioned storage sites in theater, some from European War Reserves Materiel storage and one from Korea. Many of them were not operational; arriving with broken pumps, dry-rotted fan belts and hoses, and few tools, hoses, or firefighting agent. Firefighting agent was not prepositioned and did not come with the vehicles. Empty prepositioned Flightline fire extinguishers had to be refilled on the local economy at a much higher cost. Firefighters also encountered problems with the connection required to service halon tanks on vehicles, since the threads of US-made vehicles did not match British-made equipment and required fabrication of connectors. Throughout the deployment, nearly all sites relied to some extent on host nation firefighting assistance whose capabilities varied from site-to-site. In the early weeks, Air Force firefighters often shared facilities and equipment with host nation firefighters.

A4.9.11. Engineers from the 823d and 820th RED HORSE Civil Engineering Squadrons began deploying in late September 1990. Soon the Air Force had a strong engineering capability available in theater. They broke up into smaller teams and spread throughout the region performing major construction work at numerous sites.

A4.9.12. In November, when President George Bush ordered additional forces to the Persian Gulf region to provide an offensive capability, Air Force operations expanded at several bases with additional planes and personnel. As many sites stretched to maximum capacity, Lieutenant General Charles A. Horner, USCENTAF Commander, requested additional aircraft basing at existing sites and dispersed airpower assets by opening additional bases. For engineers this meant another push to beddown deploying forces. This time, however, support forces prepared the support structure for the arriving forces. Nearly every existing base added blocks of tents, erected bathhouses, and assembled aircraft hangars, general-purpose (GP) shelters, and weapons storage areas.

A4.9.13. RED HORSE engineers tackled larger and heavier jobs such as parking ramps and taxiways. At Shaikh Isa Air Base, Bahrain, the project called for constructing: two concrete hardstands, (550 by 204 feet and 450 by 240 feet), grounding points, 100-foot wide asphalt taxi ways around each hardstand, and constructing a 100 by 3,200-foot asphalt taxiway running parallel to the northern side of the south loop. They erected 36 revetments for the incoming aircraft. At Al Minhad Air Base, they constructed a 390-foot by 1,050-foot concrete and asphalt parking apron for an additional F-16 squadron. At Jeddah, the Prime BEEF engineers moved more than 150,000-cubic-yards of earth and created more than 400,000-square-feet of weapons storage area. The availability of a large-scale construction industry in the region enabled Air Force engineers to complete this type of work on time by contracting it out or by leasing equipment.

A4.9.14. To put more aircraft closer to the Kuwaiti border, General Horner directed his engineers to open two new sites in Saudi Arabia. The first, about 60 miles south of Riyadh near the town of Al Kharj, had been programmed as a massive Saudi military installation, but only a runway, taxiway, and parking apron had been constructed. This project presented one of the biggest challenges facing Air Force engineers during the war. On 12 November 1990, RED HORSE accepted overall responsibility for construction, and the 4th Civil Engineer Squadron (CES) and other engineering personnel would augment them. The 4th CES would operate and maintain the base after completion. On 25 November, RED HORSE, Prime BEEF, and contractor personnel went to work. The engineers compacted more than 200,000 cubic yards of red clay to serve as the foundation for a tent city. Eventually, 630 TEMPER tents, 4 kitchens, a gymnasium, 21 latrines, and 26 shower and shave units were erected. They constructed a sanitary system, and a power plant of seventeen 750-kW generators, assembled an air-transportable hospital, and built six K-span structures. Al Kharj was ready for aircraft in early January 1991, and by the beginning of the war, the base was home to 4,900 Air Force personnel (**Figure A4.25.**).

Figure A4.25. Al Kharj Tent City (Prince Sultan Air Base), DESERT STORM.

A4.9.15. At the same time, another RED HORSE team was busy building a forward operating location only 50 miles from the Iraqi border at King Khalid Military City, Saudi Arabia. This was initially planned as a small, 800-person site with a quick turn-around capability for aircraft flying missions to Iraq and Kuwait and to recover damaged aircraft. This required the installation of aircraft arresting barriers and an expanded fire response capability. The base continued to expand until it reached a population of 1,650 in mid-January and nearly 2,000 in February 1991.

A4.9.16. One of the outstanding engineering accomplishments of the war was the construction of over 5 miles of revetment at King Fahd. The effort paid dividends when a missile on a parked A-10 accidentally fired into a revetment wall. The earth-filled revetment stopped the missile and prevented damage to aircraft parked nearby.

A4.9.17. Air Force civil engineers also deployed to Turkey, Spain, the Indian Ocean, England, Germany, France, Italy, Greece, Portugal, and within the United States. Torrejon Air Base, Spain, and Rhein Main Air Base, Germany, served as major transit bases for deploying to and from Southwest Asia. Rhein Main engineers redesigned the hydrant system enabling them to double the refueling capacity by using more trucks over a shorter distance.

A4.9.18. Preparations for deployment assumed a feverish pitch throughout many areas of the world. Engineering teams reopened RAF Fairford, United Kingdom, and Moron Air Base, Spain, to support flying operations. At Moron, they patched the runway between missions to keep it open during Operation DESERT STORM. Tankers were bedded down in France, Greece, and Italy. While host nations supplied the civil engineering support, Air Force firefighters deployed to provide crash and rescue operations for the aircraft. In the United Kingdom, engineers opened World War II-era contingency hospitals at Nocton Hall, Bicester, and Little Rissington, where water storage capabilities had to be supplemented with bladders.

A4.9.19. In December 1990, the civil engineer forces in Europe began deploying to bases in Turkey—Operation PROVEN FORCE. At Incirlik AB, Turkey, a seventeen-member Prime BEEF team from Ramstein AB, Germany, quietly worked inside a warehouse, ordering supplies and pre-assembling tent floors. When the Turkish government granted approval on 16 January, engineers, aircraft crews, and other support personnel deployed to Incirlik. The engineers constructed “Tornado Town” and helped bed down deployed personnel.

A4.9.20. When Operation DESERT STORM began, civil engineers at the sites were ready—equipment and materials were dispersed, personnel and structural protection was complete. Firefighters assumed 12-hour shifts to support coalition Air Forces with fire protection for integrated combat turns with hot pit refueling operations. As combat sorties increased, so did the in-flight and ground emergencies, barrier engagements, and malfunctioning ordnance responses. Firefighters also extinguished fires on armed aircraft with a variety of problems caused by battle damage. At King Khalid Military City, the firefighters responded to 157 in-flight emergencies and 785 integrated combat-turn standbys during Operation DESERT STORM.

A4.9.21. For the United States Army Patriot batteries at Riyadh Air Base, King Khalid International Airport, and near Eskan Village, RED HORSE personnel constructed security berms. They rigged front-end loaders to assist in reloading batteries, reducing the reload time from 45 to 5 minutes. The Air Force also provided electricity to Patriot batteries at Riyadh and Shaikh Isa Air Bases. On 17 January 1991, the 820th deployed to King Khalid Military City to complete the integrated combat-turn project abandoned by the contractor.

A4.9.22. In the days before the formal cease-fire, a joint RED HORSE-Explosive Ordnance Disposal team tackled the most challenging post-war project on 26 February, when General Horner tasked them to deny two airbases in southeastern Iraq to any future use by returning Iraqi forces. On 6 March 1991, two teams of engineers arrived at Tallil and Jaliba Air Bases in Iraq. At Tallil, RED HORSE used approximately 80,000 pounds of explosives, consisting primarily of 40-pound shape charges and MK-82, 500-pound bombs, to make cuts in the runway and taxiway every 2,000 feet. At Jaliba Air Base, the engineers denied a concrete runway and two parallel asphalt taxiways, with 27 cuts (72 craters up to 40 feet wide and 12 feet deep) in the pavement. Only 4 days later, on 10 March 1991, the final members of the team were aboard CH-47 helicopters returning to Saudi Arabia. When they were finished, the engineers concluded that it would cost less to build a new base than to clean up and repair the denied bases.

A4.9.23. During the Gulf War, more than 3,000 Air Force engineers bedded down 55,000 personnel and 1,200 aircraft at nearly 30 sites. They erected 5,000 tents and constructed 300,000 square feet of buildings. They demonstrated they can provide a good living and working environment to support the projection of air power around the world.

A4.9.24. Unlike previous wars or conflicts, civil engineers did not increase in numbers to support the war. Consequently, many CONUS base civil engineers had to provide essentially the same pre-war level of support to their home bases, but with no increase in manpower.

A4.9.25. Engineers also assisted in humanitarian efforts. Following the war, engineers deployed to Turkey and Iraq to help feed and shelter Kurdish refugees during Operation PROVIDE COMFORT. In 1992, both Prime BEEF and RED HORSE personnel traveled to Somalia to "Restore Hope" for the people there.

A4.10. Organizational Changes. The 1990s launched a period of considerable change, and opportunity, for Air Force civil engineers. In February 1991, the Directorate of Engineering and Services was realigned directly under the Chief of Staff and re-designated as The Civil Engineer, an Assistant Chief of Staff. This ended a 13-year tenure under the Deputy Chief of Staff, Logistics and Engineering and returned Engineering and Services to the organizational level of the 1950s when it was known as the Assistant Chief of Staff, Installations.

A4.10.1. Later in 1991, the 16-year union between Engineering and Services was ended when Services merged with Morale, Welfare, and Recreation. As Services was leaving, the Explosive Ordnance

Disposal and Disaster Preparedness functions joined Civil Engineering, bringing essential capabilities to the Civil Engineer team.

A4.10.2. Civil Engineer team training evolved once again in August 1993. The BRAAT training function, personnel and equipment were moved from Eglin to Tyndall AFB and placed under Air Combat Command. At the new location, designated the Silver Flag Exercise Site, program emphasis was adjusted to give increased attention to beddown skills. This change was driven by the most probable use of Air Force civil engineers in the era following the collapse of the Warsaw Pact threat.

A4.11. Explosive Ordnance Disposal. Prior to the United Kingdom's effort to cope with unexploded bombs during the 1940-1941 blitz on London, there is no record of organized ordnance disposal. In response to the many bombing raids to which they were subjected, the Royal Air Force formed their first bomb disposal units. Through many successful experiences, and failures, these personnel became bomb disposal experts.

A4.11.1. The United States EOD program dates back to April of 1941. The United States was not yet at war, but was actively preparing for that eventuality. Embassy personnel and military observers were reporting on the actions of warring nations and as the War Department Intelligence Section evaluated these reports, recommendations were made concerning actions that should be taken by the United States. One area stood out. Delayed-explosion-bombs were creating havoc in Europe, taking a heavy toll in lives and industry. It was expected that if the United States entered the war, it would experience bombing of its cities and industries. As a result, the need for a bomb disposal program in this country received immediate attention.

A4.11.2. In April 1941, the School of Civilian Defense was organized at the Chemical Warfare School, Edgewood Arsenal, Maryland, and part of the training was to be bomb disposal. It was later decided that the Army would train both military and civilian bomb disposal personnel, and the responsibility for bomb disposal was placed under the U.S. Army Ordnance Department. The location of the Bomb Disposal School was changed from Edgewood Arsenal to the Ordnance Training Center, Aberdeen Proving Ground, Maryland.

A4.11.3. In the interim the Navy, under a directive from the Chief of Naval Operations, instituted a Mine Disposal School in May of 1941. The school was located in Washington, D.C. and in December of 1941 was renamed the Navy Bomb Disposal School. In 1947, the Navy was assigned Joint Service responsibilities for basic bomb disposal training, making the bomb disposal career field one of the earliest joint service career fields established within the DOD.

A4.11.4. In 1942 the Royal Air Force started training United States Army Eighth Air Force personnel in bomb disposal procedures. At the same time, ordnance personnel were also being trained in bomb disposal techniques in the United States at the Army Bomb Disposal School, Aberdeen Proving Grounds, Maryland. These personnel supported combat operations in the Middle East, Sicily, and Italy from April 1943 through March 1944. Their duties included clearing unexploded bombs from Air Corps installations, clearing enemy ammunition dumps, and safing or disposing of booby traps.

Figure A4.26. EOD Mine Hunt.

A4.11.5. In the Pacific Island-hopping campaigns, bomb clearance challenges were numerous and enormous. Many times bomb disposal was being accomplished simultaneously with airfield recovery and construction. Bomb disposal personnel moved forward with advancing units using their talents to reduce the risk from both American and Japanese ordnance. The end of World War II signaled a slow-down for Army Air Force bomb disposal efforts. With the reduction of military forces during the 1946 to 1950 time frame, the bomb disposal organization was cut way back and its personnel scattered throughout the military.

A4.11.6. At the beginning of the Korean conflict, the function was revitalized, and the name Explosive Ordnance Disposal, or EOD, was adopted instead of "bomb disposal" to ensure that all new munitions developments were covered.

A4.11.7. On 21 May 1951, the Air Force picked up EOD responsibilities and assigned explosive ordnance disposal operational duties within the Zone of Interior to Headquarters Air Materiel Command (HQ AMC). Accordingly, AMC activated its first explosive ordnance disposal squadron, on 16 June 1952, when the 1st Ordnance Squadron, Aviation, was re-designated as the 1st Explosive Ordnance Disposal Squadron. The squadron was located at Wright-Patterson AFB, Ohio, with an authorized strength of 11 officers and 65 enlisted.

A4.11.8. Combat operations in Vietnam were unique in nature because EOD personnel not only had to eliminate explosive hazards from conventional weapons systems, they also had to contend with the ingenious ability of the Viet Cong to acquire dud US bombs and projectiles and emplace them as mines or booby traps.

A4.11.9. EOD's mission and responsibilities have continued to change and grow from its beginnings in World War II to Operation DESERT STORM and the present (**Figure A4.27.**). EOD involvement in joint and allied operations such as Joint Casualty Resolution Center missions in recovering missing in action (MIA) airmen in Vietnam and Laos; insertion behind enemy lines to destroy classified components of downed United States aircraft; base denial of enemy installations; support of intelligence gathering agencies; protection of the President of the United States and foreign dignitaries; and cleanup of ordnance storage depot catastrophes in foreign countries, highlight the diversity of EOD activities used by all levels of the United States government.

Figure A4.27. EOD Preparing to Destroy Unexploded Ordnance.

A4.11.10. The Air Force EOD mission is to protect personnel, resources, and the environment from the effects of hazardous ordnance. Air Force EOD must sustain the capability to disarm unexploded ordnance delivered or placed by enemy forces, and render safe United States ordnance made dangerous by accident or other circumstances. In addition, they are obligated to use their special expertise to assist federal and civil authorities when called upon in times such as dealing with terrorist or other criminal acts, accidents, and found explosive items.

A4.11.11. EOD in the United States is a joint service program. Each branch of the service has specific responsibilities assigned to it by DOD. Some of these responsibilities are unique to one service and some overlap between two or more services. In 1971, the Navy was designated as the single manager for all common EOD training and technology. Today, training continues to be provided by the inter-service staff at the Explosive Ordnance Schools located at Eglin Air Force Base, Florida.

A4.11.12. The Air Force EOD program has been managed by several disciplines, including Logistics and Operations, throughout its history, but has now found a home within the Civil Engineer community. There is precedent for this arrangement as well, as it is common with other US and foreign military services.

A4.11.13. EOD personnel have built their tradition, through achievements gained in minimizing potential explosive accidents throughout the years. They are truly a valuable addition to the United States Air Force Civil Engineer community.

A4.12. Disaster Preparedness. The Air Force Disaster Preparedness Program was established in 1965 as an outgrowth of the Disaster Control program of the 1950s, which had nuclear attack as its primary focus. The nuclear weapons accidents at Palmares, Spain and Thule Air Base, Greenland and Hurricane Camille which devastated the Mississippi coast, gave rise to a consolidation of several emergency, peacetime and wartime related activities into one comprehensive program. An officer career field was established and augmented with existing enlisted resources to create the Air Force Disaster Preparedness Program.

A4.12.1. As the US involvement in Southeast Asia grew in the late 1960s, Air Force Disaster Preparedness added to its list of responsibilities the need for planning, training for, and conducting conventional attack protective measures. As the Vietnam conflict came to a close, Disaster Preparedness moved its focus to the growing Soviet and Warsaw Pack threat against NATO. Limited capabilities for protection against the growing threat of chemical/biological attacks led to an accelerated program in the mid-1970s to equip and train USAF personnel against the chemical/biological threat. The Disaster Preparedness career field grew in numbers to meet these added responsibilities.

A4.12.2. As attention was focused on Airbase Survivability and Operability in the mid-1980s, Disaster Preparedness programs again expanded to address the many deficiencies identified during the SALTY DEMO air base operability capability demonstration held at Spangdahlem Air Base, Germany. Once again, as attention shifted to potential adversaries in Southwest Asia, Air Force Disaster Preparedness programs emphasized the importance of training, protective clothing, and equipment for the eventuality of chemical/biological and conventional attacks. In Operation DESERT STORM, Disaster Preparedness personnel mobilized and deployed to numerous bases and sites throughout Southwest Asia to ensure that all Air Force personnel were ready to survive and operate.

A4.12.3. Throughout these shifts in threat and as new responsibilities were added, Disaster Preparedness personnel continued to maintain a readiness posture and responded to numerous natural disasters, nuclear/conventional weapons accidents, incidents, hazardous materials incidents, and aircraft accidents. The Air Force Disaster Preparedness program in the past has ensured that commanders have the capability to prepare for and respond to all peacetime and wartime threats and hazards. In 2000, a Full Spectrum Threat Response (FSTR) office was established at AFCESA to lead all Air Force-related efforts, support joint service interests, and provide support to civil authorities. The FSTR program is designed primarily to support response activities on installations in the United States and overseas. The program was renamed as Emergency Management in 2006. As the Air Force prepares for the challenges of the future, CE Readiness and EM programs will continue to provide professional emergency management and airbase operability support to plan, train, equip, and respond to all peacetime and wartime threats.

A4.13. Challenges in Post Cold War Europe.

A4.13.1. The Balkans and Operation ALLIED FORCE (OAF). The breakup of Yugoslavia brought suppressed ethnic tensions to the surface in the 1990s. Engineers supported US deployments to the region during Operations DENY FLIGHT, DELIBERATE FORCE and JOINT ENDEAVOR. As a sign that the Cold War had truly ended, engineers bedded down forces at Tuszla AB, Bosnia-Herzegovina and Taszar AB, Hungary. Engineers' work in the Balkans continued throughout the nineties as the region reached a boiling point in 1999. Although tensions had been present in the region for centuries, the immediate cause of the conflict in Kosovo was Slobodan Milosevic, and his oppression of the ethnic Albanians there for the preceding decade. Oppression ultimately gave rise to violent opposition to Serb rule in the formation of the Kosovo Liberation Army, and then to the spiral of violence that ensued in 1998 and 1999. Civil unrest and Serbian use of force in Kosovo caught international attention and when negotiations broke down and Serbian troops swept in causing massive civilian disruption and an impending refugee crisis, NATO responded with Operation ALLIED FORCE on 24 March 1999. The American and NATO objectives in Kosovo were to stop the killing and achieve a durable peace that prevents further repression and provides for democratic self-government for the Kosovar people.

A4.13.2. Engineers directly supported the beddown of aircraft and personnel at bases throughout Europe. They worked to prepare RAF Fairford and Moron AB to host deploying forces but Aviano

AB, Italy, was the operation's main hub of activity. Already hosting added forces for Balkan operations, the base was soon packed with deploying forces. In February 1999, civil engineers from the 86th Civil Engineer Group at Ramstein Air Base Germany and 52nd Civil Engineer Squadron from Spangdahlem Air Base Germany began assisting the stressed 31st Civil Engineer Squadron at the bulging Italian base. They constructed a tent city designed to house up to 4,000 troops, resurfaced six F-16 parking pads and provided high-voltage power feeds for a new substation. In addition, civil engineers, as part of site survey teams, traveled to countries such as Poland, Czech Republic, and Hungary to identify potential beddown sites for the "Papa Bear" buildup. USAFE's Construction and Training Squadron engineers deployed to several bases to work projects. At Gioia del Colle AB, Italy, they worked with Spangdahlem's Prime BEEF troops to construct five parking ramps to reduce the explosive risk from parked A-10s. At Istres AB, France, the CTS team completed a ramp extension in concrete and asphalt.

A4.13.3. Beginning in April, civil engineers moved to Rinas Airport at Tirana, Albania, to begin Air Force beddown for Joint Task Force Shining Hope, established to provide immediate humanitarian relief to more than 450,000 ethnic Albanian refugees fleeing the Province of Kosovo into Albania and the Former Yugoslav Republic of Macedonia. Both Prime BEEF and RED HORSE engineers deployed to Albania to support not only the humanitarian mission but also the massive air movement of the Army's Task Force Hawk. The 823d RED HORSE engineers were tasked with deployment of a R-1 team to support USAFE operations on 11 April. By 13 April the team had arrived in Ramstein and was deploying teams forward to Tirana by the next day.

Figure A4.28. RED Horse Heavy Equipment Shipping to Tirana, Albania.

A4.13.4. Battling the mud at Tirana, 823d RED HORSE engineers replaced a failing C-17 operations ramp by constructing a new 975' x 150' x 18" concrete parking and marshalling area; building a new 987' concrete taxiway to replace the taxiway destroyed by SHINING HOPE operations; improving 3.5 miles of camp and perimeter supply roads; constructing a medical evacuation helicopter operations pad; completing an upgrade of the power grid for the USAF tent city and installing 100 environmental control units; constructing a German fuel pad and a US Forces fuel pad; and installing 600’ of access roads.

A4.13.5. Near the end of the conflict, Secretary of Defense William S. Cohen ordered the 820th RED HORSE Squadron to deploy a RH-1 team and two RH-2 teams to Tirana, Albania, to perform road and bridge repairs and to complete projects begun by the 823rd RED HORSE Squadron at Rinas Airport. For the humanitarian work in Albania, the Joint Staff decided to use the Air Force Contract Augmentation Program (AFCAP). The major project was to construct three tent cities in Albania to house up to 20,000 refugees in each complex. AFCAP completed Camp Hope and was well under way on Camp Eagle when hostilities ceased on 10 June.

A4.13.6. The remainder of the 823d R-1 team in Ramstein continued to support USAFE operations through contingency project evaluations, designs, and deployment/reception operations for two additional 823d R-2 teams that would deploy forward to various other countries. In Hungary, a 94-person RH-2 team from the 823rd RED HORSE Squadron deployed to Taszar AB to perform airfield repairs. 823d RED HORSE engineers also completed construction and beddown projects in Trapani, Sicily and Aviano, Italy supporting Operation ALLIED FORCE. In Turkey, 823rd RED HORSE and Prime BEEF engineers constructed a tent city at Balikesir AB in preparation for a beddown of F-15 aircraft. However, the war ended on June 10th, before the full force could move to the base. Following the war, Joint Air Force, Army, and Navy EOD teams were sent to Kosovo to locate and dispose of unexploded ordnance in the American sector.

Figure A4.29. RED HORSE Taxiway Repair Work, Taszar Hungary.

A4.13.7. Overall, engineers supported Air Force personnel as they deployed to 21 expeditionary bases and generated 38,000 sorties without a single combat casualty.

A4.14. A New Millennium. The events of 11 September 2001 brought a new emphasis on the expeditionary nature of the US Air Force and its ability to project power anywhere around the world. Engineers at bases throughout the Air Force suddenly began putting their bases on a wartime footing by constructing and installing antiterrorist/force protection measures and by preparing base populations to respond to terrorist acts. Within a matter of weeks, active duty, Guard and Reserve civil engineers found themselves bedding down forces in places such as Uzbekistan, Pakistan, Kyrgyzstan, and Afghanistan in support of the Global War on Terrorism. Eventually, more than 2,700 engineers deployed to 13 main bases, mostly in the Central Command area of responsibility, to support Operation ENDURING FREEDOM (OEF), the American effort to eliminate the terrorist breeding ground in Afghanistan. These bases ranged from austere sites to well-developed airbases. At one location, operators lived in a hangar without toilets for about a month before engineers arrived with Harvest Falcon assets to build a tent city.

A4.14.1. RED HORSE, firefighters, EOD, and Readiness/Emergency Management personnel were all heavily tasked. At Thumrait AB, Oman, engineers from 20 bases constructed more than 240 TEMPER tents, 13 California shelters, 6 latrines, 4 shower/shave facilities, 27 expandable shelter containers, and 2 power plants in the first 90 days as the mission grew from a tanker to a tanker/bomber base. Firefighters established two fire stations and placed in service nine special purpose emergency response vehicles with associated equipment. In the first 90 days firefighters responded to 49 emergencies at the base. In late September, members of the 2nd CES at Barksdale AFB, Louisiana, arrived at Masirah Island with a 55-person Prime BEEF lead team. Two 25-person teams arrived from Dyess AFB, Texas and Whiteman AFB, Missouri. By mid- October the team had erected three tent cities: Tent City-1 was an 1,800-person city erected in 7-10 days; Tent City-2 was a 2,200-person city erected and completely functional in 60 hours; Tent City-3 was a 1,400-person city completed by mid-October.

A4.14.2. As coalition forces captured bases in Afghanistan, engineers were put to the test as they worked to prepare them to receive aircraft and personnel. The country's infrastructure was in shambles from years of conflict and neglect. The pounding given the bases by coalition aircraft during OEF further damaged airfields and surrounding structures. At Mazar-e-Sharif airfield, RED HORSE engineers found a bombed-out runway and no supplies to repair it. The engineers turned to local contractors using 100-year old practices to fill the craters. This included pounding small rocks with hand tools and pouring boiled tar over the rocks until the craters were filled. Eventually, they were able to receive a deployable pavement repair system to make more permanent repairs enabling C-17s to use the base.

A4.14.3. The 86th Contingency Response Group from Ramstein AB, Germany, became the first Air Force team to deploy to Manas Airport, Bishkek, Kyrgyzstan in December 2001. Prime BEEF, RED HORSE, and 49th Materiel Maintenance Squadron personnel helped construct a tent city for 2,200 troops using four 550-person Force Provider sets in 30 days in the dead of winter. They experienced sub-zero temperatures frequently during the first four weeks of their deployment, with freezing pipes, boilers, and diesel fuel that gelled. RED HORSE built a fuel storage area for six 50,000-gallon bladders in five days. Truly a coalition base, eight different countries had troops on site, including France, Norway, Denmark, the Netherlands, and Spain.

A4.14.4. As combat operations in Afghanistan wound down, Air Force civil engineers kept busy preparing bases in the CENTCOM AOR for sustained operations in Afghanistan and to set the stage for Operation IRAQI FREEDOM (OIF). Building facilities at bases throughout the region aided in the preparation for combat. Bedding down personnel and weapons in several countries enabled the Air Force to provide superb support to the US drive to Baghdad and destruction of the Saddam Hussein regime.

A4.14.5. Although combat operations began on 20 March 2003, civil engineers had been active throughout the region for months. Some bases had been used for several years under Operation SOUTHERN WATCH, the patrolling of the no-fly zone over southern Iraq, but additional forces were headed for the region. Engineers began opening bases in Jordan and Saudi Arabia and expanding bases such as Camp Snoopy at Doha International Airport and Al Udeid AB, Qatar, and Ali Al Salem AB, Kuwait.

A4.14.6. On 6 January 2003, a 13-person team from the 16th Civil Engineer Squadron at Hurlburt Field deployed to Al Udeid to build a combined air operations center for the Joint Special Operations Air Component. They converted a Frame Supported Tensioned Fabric Shelter warehouse into a facility with 6,000 square feet of office space, intelligence areas, a sensitive compartmented information facility, a communications area, and a 5,000-square foot auditorium with live feed projection screens to track all operations in theater in just 17 days.

A4.14.7. Members of the 60 CES, Travis AFB, California, deployed to Shaikh Isa AB, Bahrain, in November 2002, just in time for the OIF buildup. Shaikh Isa became home to Air Force and Marines flying KC-135s and KC-130. As the camp grew from 800 to 2300 personnel, the engineers began construction on a 1600-person hard wall Expeditionary Village. The number of aircraft also grew to 53 aircraft requiring the engineers to construct a 385,000 square foot expeditionary ramp and later a $20 million ramp, in addition to an Air Force/Marine Joint Operations Center. Engineers at Shaikh Isa AB developed an expeditionary hydrant loop refueling system using 3,100 feet of six-inch diameter hose line to provide direct refueling capability to four aircraft parking spots. Constructed in less than 10 days, it provided 1,200 gallons per minute and up to 600 gallons per minute to any one refueling point. The system accounted for more than 20 percent of all fuel issued during OIF.

A4.14.8. US planners had envisioned opening a northern front into Iraq from bases in Turkey. Air Force engineers began work at the first of three bases in Turkey in mid-February as an initial 10-person contingent from the 16th CES at Hurlburt Field deployed to Diyarbakir AB, Turkey, to begin buildup of a tent city for an estimated 7,000 troops. Diyarbakir was slated to be the main northern operating base in support of operations against Iraq, if the Turkish government granted permission for the US to stage operations from its soil. However, the Turkish Parliament's approval to permit the deployment of up to 64,000 American troops to Turkish bases failed to garner enough votes. While the negotiations continued, the remainder of the 55-person EA team from Hurlburt arrived at Diyarbakir on 20 March. Although the population at Diyarbakir peaked at approximately 800 personnel, the big influx of troops and equipment never occurred and the Hurlburt team dismantled the contingency facilities and equipment and redeployed on 20 April.

A4.14.9. Engineers were called upon to support Special Operations Forces (SOF) at several locations. At one base in Saudi Arabia, members of the 375th CES from Scott AFB bedded down more than 4,000 SOF troops while operating under a 45-day communications blackout. They erected 420 structures—tents, Alaska shelters, GP tents, Bedouin tents, AFCAP-procured tents, Sprung shelters, and dome shelters. When additional engineers arrived from Moody and Beale AFBs, they created 1 million gallons of fuel capability with two hot refueling pits, set up a seven-megawatt power plant and a water distribution system with a water downloading point outside the gate, and used 9,000 square feet of AM-2 mat to build parking pads for diverted fighters. The engineers dismantled the facilities during May and redeployed forward to Baghdad International Airport in May.

A4.14.10. The 86th Contingency Response Group from Ramstein AB, Germany, deployed to Bashur Airfield, 255 miles north of Baghdad in northern Iraq. Among them were firefighters and bioenvironmental engineers. The 7,000-foot runway was being used for C-17 and C-130 airlift missions, dropping off approximately 1 million pounds of cargo a day to resupply coalition forces. The airfield, once used to fly in oil field equipment, had become a bustling airlift hub supporting US Army forces.

A4.14.11. The first civil engineer squadron assigned to Iraq arrived at Tallil on 27 March. 407th Expeditionary CES (ECES) personnel worked with British engineers to bed down and support A-10 missions. They repaired two concrete runways, installed an airfield lighting system, and constructed three fuel farms and more than 160 billeting tents, an electrical power plant and distribution system, shower and latrine facilities and a dining facility. A 55-person EA team from the 114 CES, South Dakota ANG, later joined them. The Guard team, together with a Reserve EP team from Beale built a tent city for 2,200 (2 housekeeping sets) and operations and maintenance facilities for the A-10 and C-130 missions at Tallil. Additional assets arrived from Cairo West on 28 April after that base closed. Tallil was a coalition base, with troops from Great Britain, the Netherlands, Italy, Estonia, Lithuania, and Korea.

A4.14.12. American forces entered and began securing Saddam International Airport, which they renamed Baghdad International Airport (BIAP), on 5 April. CENTAF/C7 tapped Maj Richard Reid to go to BIAP as the temporary BCE until another team could arrive. Major Reid was OIC of the 114 CES, South Dakota ANG Prime BEEF team. While at Baghdad, Major Reid and a handful of engineers began to lay out Air Force tent city but had no assets, vehicles, or equipment for several days.

Figure A4.30. Engineers Repairing Runway in Southwest Asia.

A4.14.13. On 17 April, an ADVON team headed by Lt Col Tracey Walker, including six firefighters and six EOD troops, traveled from Bashur AB to Kirkuk AB, Iraq, via Army convoy. The airfield was opened for operations just two days later.

A4.14.14. Air Force civil engineering tested a new capability during OIF with the fielding of Airborne RED HORSE (ARH) teams. ARH teams take 21 traditional RED HORSE members and augment them with six fire fighters, six explosive ordnance disposal technicians, and two chemical and biological readiness experts. Developed under Chief of Staff General John P. Jumper's direction, the specially trained and equipped teams could deploy into austere locations to assess airfield capabilities, prepare helicopter or aircraft landing areas, clear obstacles, install emergency airfield lighting, and make expedient airfield damage repairs. They could also perform expedient force protection construction and clear explosive hazards. The teams could either parachute into these areas or be inserted by "fast roping" from helicopters. Their equipment could be sling-loaded and carried by helicopter. The Airborne RED HORSE units faced their first operational tests during the war in Iraq. Three teams supported forward basing of Joint forces at seized Iraqi airbases. At Tallil, they helped recover the airfield in preparation for use by forward deployed air assets, cleared over 475 acres of airfield surface, swept a 15-acre joint service beddown area, recovered 13,000 small arms rounds, destroyed over 600 Gulf War-era munitions, exploited 30 "first seen" munitions items, and established a 20-acre explosive storage area. At BIAP, they evaluated one million square yards of airfield pavements, conducted EOD sweeps of mission critical areas, prepared four craters for permanent repair, installed and operated an Emergency Airfield Lighting System (EALS), and battled a large structural fire at the 4th Infantry Division's headquarters.

A4.14.15. RED HORSE units were active at nearly every base in the theater. At Al Udeid AB, members of the 823rd constructed a 17-acre parking ramp, valued at $9.1 million. Larger than 17 football fields, the ramp doubled the parking spaces for KC-135 and KC-10 aircraft and was finished in less than six months. While at Thumrait AB, Oman, RED HORSE engineers constructed a 47-acre parking ramp with blast deflectors, asphalt taxiways, hammerhead, and area/edge lighting. The Air Force engineers were able to complete the project in just six months, one-third the contractor estimate. Members of the 307 RHS also constructed a 200' x 200' concrete munitions holding pad and an 8000' x 24' asphalt road.

A4.14.16. A handful of EOD specialists were involved in an interesting project in Iraq. On 29 March, four Air Force EOD specialists from the 321st ECES and the 384th ECES and 10 Navy EOD troops formed a 14-man team to execute Operation RESTORE IRAQI OIL under direction of the 1st Marine Expeditionary Force. Over a period of 30 days they cleared paths to 700 oil wellheads in the Rumaylah, Az Zubayr, and Safwan oilfields in Iraq and cleared 14 gas-oil separation plants of unexploded ordnance and improvised explosive devices. In the course of their work they also uncovered numerous bunkers with weapons caches and destroyed more than 5,000 pieces of ordnance to help secure the valuable oilfields for the Iraqi people.

A4.14.17. Overall, more than 4,500 engineers were deployed in support of the initial OIF operations. They established 12 new bases in the region and expanded the mission on all 10 existing bases on the Arabian Peninsula. They set up 42 housekeeping sets or commercial housekeeping equivalents and supported more than 64,000 Air Force personnel, in addition to various Army, Special Operations, Marine, and coalition forces. They executed more than $329 million in construction through 211 new contracts. Engineers placed 820,000 square yards of concrete and asphalt, enough to build a four-lane highway from Orlando to Miami. They constructed 3.2 million square feet of contingency facilities or the equivalent of building a Mall of America in less than one year. Air Force engineers put up 3,200 bare base tents, installed 190 miles of expedient water piping, and built 200 million gallon petroleum, oils and lubricants (POL) storage and distribution systems.

A4.14.18. Since 2003, civil engineers have continued to support the American presence in the region. In 2004, they began to take on a new mission—direct support of the U.S. Army Combat Support Service throughout Iraq and Kuwait. Known as "in lieu of" missions, engineers through the 732nd ECES squadron at Balad AB Iraq were embedded into Army units providing engineering, design and firefighting support to Army units who were short of trained engineers. This also meant expanded training for engineers supporting the Army. This entailed intensive training on convoy operations in Kuwait, including a five-day live-fire exercise. The support to the Army expanded later to include RED HORSE squadrons.

A4.14.19. EOD forces have been heavily tasked to perform their missions in Iraq and Afghanistan in light of the expanded use of improvised explosive devices by insurgent forces. Air Force EOD operations "outside the secured perimeter" were essential to air base force protection and the freedom of operation of land-maneuver forces. Serving on weapons intelligence teams in Iraq and provisional reconstruction teams in Afghanistan, EOD technicians provided agile combat support to the combatant commander.

A4.15. Future Challenges. This brief history of Air Force Civil Engineers introduces a series of pamphlets to help today's Engineers prepare for future peacetime emergencies and wartime support when once again they are called upon to demonstrate their "Can Do—Will Do' spirit. To the extent possible, the volumes in this series update the lessons of the past and provide current guidance. Some of those lessons are timeless. Methods and procedures relating to newer systems, for which there are no historic precedents, await the innovative ideas the unit develops and then passes along to those who will follow. The gains of the past must not slip away, nor should anyone be satisfied with the status quo. The development of new initiatives to further strengthen the capabilities of all engineers poses a continuing and exciting challenge to every member of the force.

A4.16. Additional Information. For additional information on Air Force Civil Engineer history, contact The Civil Engineer Historian at HQ AFCESA/CEBH, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319. Additional sources for historical information are cited in **Attachment 1**.