

**AN**  
**AIR WEATHER SERVICE HISTORY OFFICE**  
**SPECIAL STUDY**

**MISSION ACCOMPLISHED:**  
**THE AIR WEATHER SERVICE**  
**IN**  
**DESERT SHIELD/DESERT STORM**

**August 1990 - April 1991**

by

**DR. WILLIAM E. NAWYN**

**Air Weather Service Historian**

Edited by

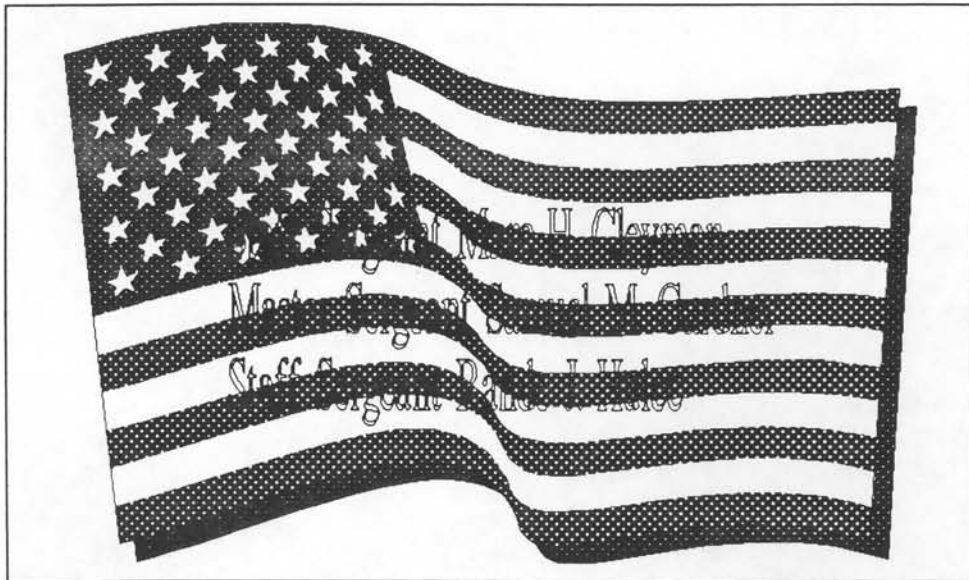
**RITA M. MARKUS**

**UNITED STATES AIR FORCE**  
**AIR WEATHER SERVICE**  
**SCOTT AIR FORCE BASE, ILLINOIS**



## DEDICATION

This book is dedicated to all the men and women of Air Weather Service who served in the Operation DESERT SHIELD/DESERT STORM weather support force between 7 August 1990 and 28 February 1991, and especially Staff Sergeant Marc H. Cleyman, Master Sergeant Samuel M. Gardner, and Staff Sergeant Rande J. Hulec, who were killed in the crash of a Military Airlift Command C-5 aircraft at Ramstein AB Germany, on 29 August 1990 while deploying to Operation DESERT SHIELD, and First Lieutenant Cynthia A. Borecky, who was severely injured in the same accident.



# DECLARATION

The undersigned do hereby certify that the following is a true and correct copy of the original as the same appears in the records of the Department of the Interior, Bureau of Land Management, Washington, D. C., and that the same is a true and correct copy of the original as the same appears in the records of the Department of the Interior, Bureau of Land Management, Washington, D. C., and that the same is a true and correct copy of the original as the same appears in the records of the Department of the Interior, Bureau of Land Management, Washington, D. C.





## FOREWORD

Operation DESERT SHIELD/STORM tested our mettle. Air Weather Service personnel were involved in all facets of both operations and served at all organizational levels. The support effort involved the total AWS team. Active and reserve military and civilian weather troops worked together to provide the full spectrum of products and information combatant commanders needed to help them attain national security objectives. Troops in the theater as well as those who remained at home worked long hours and surmounted numerous challenges and obstacles. Those in the field lived in austere conditions, were separated from their loved ones for an extended period, and some moved with the Army to engage Iraqi forces. Everyone focused on the mission and got the job done. We must never forget our successes came at a cost--three of our comrades-in-arms lost their lives accomplishing the mission.

To all who served, this history outlines what and how you did, the hurdles you overcame, and the difference you made. To future generations of weather warriors, this history will, hopefully, better equip you to face future challenges.



JOHN J. KELLY, JR.  
Brigadier General, USAF  
Director of Weather  
DCS/Plans and Operations

FOREWORD

The Commission on the Status of Women, established in 1946, has been instrumental in the development of the concept of gender equality. The Commission's work has been guided by the principle of equality between men and women, and it has been a pioneer in the field of women's rights. The Commission's work has been a continuous process, and it has been a source of inspiration for many other organizations and individuals who are working for the advancement of women. The Commission's work has been a testament to the power of international cooperation and the importance of women's participation in the development of their countries. The Commission's work has been a source of pride for all women and men who are committed to the cause of gender equality.

Each year, the Commission publishes a report on the progress of women's rights in various countries. The report is a valuable source of information for governments, organizations, and individuals who are interested in the status of women. The report also provides a platform for women to voice their concerns and demands for change. The Commission's work has been a source of inspiration for many other organizations and individuals who are working for the advancement of women. The Commission's work has been a testament to the power of international cooperation and the importance of women's participation in the development of their countries.

*[Handwritten Signature]*  
Secretary-General  
United Nations  
New York, N.Y.

## PREFACE

Operation DESERT SHIELD/DESERT STORM was the largest and most important military operation in which the United States engaged since the war in Southeast Asia almost a generation ago. It was not only large and important, it was, from a military standpoint, hugely successful. Beginning as a limited defensive contingency operation intended to protect Saudi Arabia from Iraq, it ended as a large, full-scale, air and ground offensive war aimed at ejecting Iraqi forces from Kuwait. The combat phase of the operation was not only successful, it was short and relatively free of casualties.

When the Persian Gulf contingency operation began in early August 1990 few, if any, persons in Air Weather Service anticipated that before it was over it would extend and challenge Air Weather Service to its utmost, perhaps as never before. But such was the case. Nevertheless, Air Weather Service, due especially to the hard work and dedicated efforts of its people in the deployed weather support force, was able to successfully accomplish its mission of providing weather support to the air and ground forces participating in the operation. To be sure, it encountered its share of problems and experienced some failures and shortcomings, but overall, Air Weather Service had a right to be proud of its performance.

In the special study that follows, I have attempted to tell (and document) the complete story, from start to finish, of Air Weather Service's participation in DESERT SHIELD and DESERT STORM, the buildup and combat phases, respectively, of the Persian Gulf operation, I have employed both chronological and topical approaches in this account, using whichever one seemed most suitable for illuminating a particular facet of the story. Chapters I, II, VI, and VII are, to a large extent, chronological in nature, portraying the evolution of Air Weather Service support to the operation from the inception of DESERT SHIELD through the end of DESERT STORM, and briefly noting the drawdown of weather support operations and the weather support force during the redeployment period. Chapters III, IV, and V are primarily topical, describing the weather information system used by Air Weather Service in the operation; the centralized products, satellite imagery, and other means through which Air Weather Service supported its weather support force deployed in the DESERT SHIELD/STORM theater; and the operations of the weather support force. Chapter VIII, also topical, deals primarily with the lessons learned by Air Weather Service in the operation.

I wish to express my appreciation to the many people who helped make it possible for me to write this account. I want to especially thank the nearly 50 people who consented to be interviewed by me as part of my research for this project. Some were members of the deployed weather support force, others directed or supported the weather support force from positions at Headquarters Air Weather Service, the 5th Weather Wing, Air Force Global Weather Central, or the US Air Force Environmental Technical Applications Center. They provided me with insights and information I otherwise would not have been able to obtain. Particular thanks goes to several persons who submitted to extraordinarily lengthy interviews (ranks and positions indicated are those during DESERT SHIELD/STORM): Brigadier General John J. Kelly, Jr., Commander, Air Weather Service; Colonel James W. Goldey, Commander, 1690th Weather Group Provisional; Lieutenant Colonel Gerald F. Riley, Officer in Charge of the US Central Command Air Forces weather support element; Lieutenant Colonel William S. Weaving, Vice Commander, 1690th Weather Group Provisional; Lieutenant Colonel William H. Campbell, Officer in Charge of the US Central Command Army Forces weather support element; and Colonel William S. Koenemann, Commander, 5th Weather Wing.

Additionally, I want to thank the Headquarters Air Weather Service Crisis Action Team and Headquarters 5th Weather Wing for providing me access to their voluminous collection of DESERT SHIELD/STORM documents. I also wish to acknowledge the support provided to me in this project by

Colonel Gene J. Pfeffer, Vice Commander, Air Weather Service; Colonel Gerald F. Riley, formerly Chief, Exercise and Contingency Management Division, Headquarters Air Weather Service; and Colonel Carlton L. Bjerkaas and Lieutenant Colonel Thomas N. Walker, former and present Directors of Resource Management, Headquarters Air Weather Service. Janice E. Hoffmann, Sue W. Oller, and Darlene M. Sandheinrich contributed to the editing and assembly of this document. Special recognition is due to Ms. Rita M. Markus, my editorial assistant. I am greatly indebted to her for the vast amount of work she did in editing this document and preparing it for publication.

*William E. Nawyn*

WILLIAM E. NAWYN  
Air Weather Service Historian  
December 1992

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# CHRONOLOGY OF EVENTS

## 1990

### July

- 17 Jul Saddam Hussein accused Kuwait and the United Arab Emirates of conspiring with the US to lower world oil prices and weaken Iraq. Warned he might have to take direct action.
- 18 Jul Iraqi foreign minister accused Kuwait of stealing Iraqi oil, building military installations on Iraqi soil, and refusing to forgive Iraq's debts to Kuwait incurred during Iraq's war with Iran.
- 24 Jul Iraq reported to have 30,000 troops massed along Kuwaiti border.
- 29 Jul United States (US) Central Intelligence Agency warned the White House an Iraqi attack on Kuwait was imminent.

### August

- 2 Aug **100,000 IRAQI TROOPS INVADE KUWAIT**; capture Kuwait City.  
  
US President George Bush condemned invasion.  
  
US Central Command Air Forces (USCENTAF or CENTAF) activated response cell.  
  
5th Weather Wing (5WW) received Joint Chiefs of Staff warning order; activated crisis action team (CAT).
- 3 Aug United Nations (UN) resolution condemned Iraqi invasion of Kuwait and demanded immediate and unconditional withdrawal of Iraqi forces.
- 4 Aug President Bush decided US should put a military force in Saudi Arabia as a warning to Saddam Hussein not to invade Saudi Arabia.
- 5 Aug President Bush promised that Iraq's invasion of Kuwait "will not stand."
- 6 Aug UN Security Council imposed economic sanctions against Iraq.
- 7 Aug King Fahd approved the deployment of multinational forces into his country for defense against possible Iraqi attack.  
  
**PRESIDENT BUSH ORDERED US AIR AND GROUND TROOPS TO SAUDI ARABIA** as part of multinational force.  
  
**OPERATION DESERT SHIELD COMMENCED** with deployment of two F-15 Squadrons from the 1st Tactical Fighter Wing, Langley Air Force Base (AFB), Virginia, and elements of 82d Airborne Division, Fort Bragg, North Carolina. The 1st Tactical Fighter Wing weather

officer, Capt Judith E. Dickey, immediately deployed to support F-15 squadrons. Arrived at Dhahran, Saudi Arabia, in evening of 8th.

Initial USCENTAF headquarters element deployed to Saudi Arabia.

Headquarters Air Weather Service (AWS) established CAT.

8 Aug Iraq declared permanent annexation of Kuwait.

UN Security Council demanded immediate withdrawal of Iraqi troops from Kuwait.

The first AWS person to arrive in the DESERT SHIELD theater, SSgt John N. Poole of Detachment 3, 26th Weather Squadron, landed at Riyadh, Saudi Arabia, at 1010 local time with a Military Airlift Command (MAC) airlift control element. About 3 hours later the next two AWS persons to arrive in the theater, 1Lt Todd M. Fasking and TSgt Keith E. Daniels, both from Detachment 10, 15th Weather Squadron, landed at Dhahran with another MAC airlift control element.

Lt Col Gerald F. Riley, USCENTAF staff weather officer (SWO), and commander, 3d Weather Squadron, accompanied by two other weathermen, deployed from Shaw AFB, South Carolina, to Riyadh to provide weather support to USCENTAF, form CENTAF Forward weather support element, and become acting officer in charge (OIC) of the DESERT SHIELD WSF (WSF). Arrived in morning of 9th.

First Army support weather team deployed from Fort Bragg to Dhahran to support XVIII Army Corps and 82d Airborne Division. Arrived on 9th.

5WW activated prepositioned emergency support assistance request as contained in 5WW Operations Order 02-FY to support DESERT SHIELD operations.

Air Force Global Weather Central (AFGWC) began to function as tactical forecast unit for DESERT SHIELD theater.

9 Aug UN resolution declared Iraq annexation of Kuwait null and void.

5WW transmitted initial concept of operations for DESERT SHIELD.

AWS had deployed 49 persons to DESERT SHIELD theater by end of day.

10 Aug Arab League condemned Iraq's action and agreed to send troops to defend Saudi Arabia.

Total US forces in DESERT SHIELD theater reached 25,000.

AWS weather team at Incirlik Air Base (AB), Turkey, began Quick Reaction Communications Terminal (QRCT) transmissions to DESERT SHIELD theater.

CENTAF Weather became operational in Riyadh; sent first situation report (sitrep) to US Central Command (USCENTCOM or CENTCOM) and 5WW.

11 Aug CENTAF Weather received first SWO bulletins from AFGWC via Department of Defense's Automatic Digital Network (AUTODIN).



- 12 Aug First full day of successful QRCT network operations; four nodes on net.
- 5WW assumed direct management of the Time-Phased Force Deployment Document for Air Force weather forces.
- First special operations weather team (from Air Force Special Operations Command) arrived in DESERT SHIELD theater.
- 13 Aug CENTAF Rear constituted at Headquarters Tactical Air Command, Langley AFB.
- Headquarters USCENTCOM Army Forces (USARCENT or ARCENT) weather team arrived in Riyadh.
- Headquarters CENTCOM Special Operations Forces (SOCCENT) weather team arrived in DESERT SHIELD theater.
- 14 Aug First meeting between AWS and Saudi Arabian Meteorological and Environmental Protection Administration (MEPA) officials. Lt Col Riley represented AWS.
- MEPA requested AWS assistance in acquiring a chemical downwind forecast capability.
- AWS had deployed 112 persons to twelve different locations in the DESERT SHIELD theater.
- mid-Aug US Air Force Environmental Technical Application Center (USAFETAC) began issuing seasonal small area descriptive climatologies and point climatologies for DESERT SHIELD theater.
- 16 Aug Brig Gen John J. Kelly, Jr., AWS Commander, directed reorganization and enlargement of AWS CAT.
- General Kelly approved deployment of Mark IV Defense Meteorological Satellite Program (DMSP) van to DESERT SHIELD.
- 17 Aug CENTAF Weather send/receive Automated Weather Network (AWN) teletype became operational.
- 19 Aug CENTAF commander requested deployment of Mark IV DMSP van.
- SOCCENT Weather receive-only AWN teletype became operational.
- 20 Aug DESERT SHIELD Forecast Unit (DSFU) produced and transmitted its first joint operational area forecast (JOAF).
- 21 Aug MEPA authorized AWS personnel access to its forecast offices at several airfields.
- MEPA letter to Lt Col Riley recommended using existing New York to Jeddah circuit to provide direct link for exchange of weather data between MEPA and AFGWC.
- 22 Aug CENTAF tasked deployment of two Marwin tactical rawinsondes.
- AFGWC issued its first chemical downwind message.

General Kelly appointed 5WW as lead wing for Operation DESERT SHIELD.

- 24 Aug Col James W. Goldey, CENTCOM SWO and 1st Weather Squadron commander, arrived in Riyadh accompanied by two weather officers to support CENTCOM and become OIC of the Operation DESERT SHIELD WSF. Lt Col Riley became full-time CENTAF SWO and OIC of the CENTAF weather support element.
- 26 Aug General H. Norman Schwarzkopf, Commander in Chief, USCENTCOM, arrived in Riyadh.
- 28 Aug CENTCOM Weather became fully operational in Riyadh.
- 29 Aug MAC C-5 bound for DESERT SHIELD crashed on takeoff at Ramstein AB, West Germany, killing 13 of 17 persons aboard. Dead included three AWS non-commissioned officers. Survivors included one severely injured AWS officer.
- 30 Aug Mark IV DMSP van arrived in Riyadh.
- 31 Aug Total US forces in DESERT SHIELD theater reached 90,000.
- DSFU took over as QRCT/Goldwing net control station.
- AWS had deployed 240 persons to 22 different locations in the DESERT SHIELD theater.

## September

- 3 Sep Mark IV DMSP van became operational and provided first satellite imagery to DSFU and CENTCOM SWO.
- ARCENT Weather became fully operational in Riyadh.
- 4 Sep US confirmed presence of American forces in other Persian Gulf states besides Saudi Arabia.
- 6 Sep Headquarters AWS held special memorial service remembering the three AWS members who lost their lives in the C-5 crash at Ramstein AB on 29 August.
- DSFU divided JOAF into two parts: an unclassified weather bulletin and a classified special support bulletin.
- ARCENT Weather came up on QRCT/Goldwing network.
- 7 Sep Headquarters AWS directed a complete scrub of the WSF with a view to paring it to the smallest size possible.
- Receive-only Air Force Digital Graphics System (AFDIGS) facsimile circuit became operational at CENTCOM Weather.
- QRCT Plus transmit-only system became operational at Incirlik AB.

- 9 Sep US President George Bush and Soviet Union President Mikhail Gorbachev met in Helsinki, Finland, and issued joint declaration condemning Iraqi invasion of Kuwait.
- Lt Col William S. Weaving, Director of Operations, 5th Weather Squadron, arrived in Riyadh to become ARCENT SWO and OIC of the ARCENT weather support element.
- 12 Sep Headquarters AWS requested DMSP System Program Office (SPO) to accelerate acquisition of a small tactical satellite terminal for use in DESERT SHIELD theater.
- mid-Sep DSFU began to obtain weather graphics products via Naval Oceanographic Data Display System.
- 21 Sep DSFU achieved full operational status; AFGWC became DSFU back-up.
- 26 Sep CENTCOM Weather attained full send/receive AWN capability.
- 28 Sep QRCT/Goldwing network divided into separate CENTAF and ARCENT networks.
- General Kelly directed formation of a provisional weather group in DESERT SHIELD Theater.
- 30 Sep AWS DESERT SHIELD WSF consisted of 291 persons stationed in 28 different locations.
- late-Sep Embryonic, six-node CENTAF tactical facsimile in-theater circuit, with DSFU as network control station, became operational.

## October

- early-Oct ARCENT weather obtained receive-only AFDIGS circuit.
- Two Army communications maintenance detachments arrived in theater. Part of their task was to provide maintenance support to Goldwings and QRCTs.
- 2 Oct US Congress adopted resolution supporting President Bush's deployment of US military forces to the Persian Gulf.
- Nearly half of Iraq's one million-man army now deployed in Kuwait and southern Iraq.
- 4 Oct USCENTCOM imposed an overall 250,000-person ceiling on DESERT SHIELD forces. Air Force limit was 32,500.
- ARCENT Weather began receiving weather data over AWN.
- 5 Oct Headquarters AWS requested MAC to support acquisition of six Marwin rawinsondes.
- 6 Oct US officials reported buildup of forces in DESERT SHIELD theater was virtually complete.
- 12 Oct ARCENT Weather took over net control responsibilities for Army Goldwing weather network.

MEPA approved using existing Jeddah, Saudi Arabia, to New York circuit to provide direct link for exchange of weather data between MEPA and AFGWC.

18 Oct Taif, Saudi Arabia, had first reported thunderstorm in the Persian Gulf theater during DESERT SHIELD.

ARCENT Weather send/receive AUTODIN terminal became operational.

30 Oct ARCENT SWOs provided the Army's 513th Military Intelligence Battalion with a detailed scientific and climatological analysis of the fall and winter weather in the DESERT SHIELD theater, which the battalion briefed to General Schwarzkopf.

31 Oct Total US forces in DESERT SHIELD theater reached 228,000.

Headquarters AWS announced 300-person limit on DESERT SHIELD WSF.

AWS DESERT SHIELD WSF consisted of 303 persons stationed in 33 different locations.

late-Oct All tactical air base weather teams had receive-only AWN capability.

## November

1 Nov MAC activated Headquarters 1690th Weather Group Provisional (WGP). Included 20 detachments and 8 operating locations.

8 Nov **PRESIDENT BUSH ORDERED AN ADDITIONAL 200,000 AMERICAN TROOPS DEPLOYED TO DESERT SHIELD.** The majority of the troops would come from the Army's VII Corps in Germany.

9 Nov Secretary of Defense Richard C. Cheney announced that the Pentagon no longer planned to rotate troops to DESERT SHIELD forces. Troops already deployed would stay for the duration of the operation.

16 Nov DMSP SPO awarded contracts to two corporations for production of prototype Rapid Deployment Imagery Terminals (RDITs).

19 Nov Saddam Hussein announced he was sending 250,000 more troops to Kuwait and southern Iraq.

Lt Col Weaving became vice commander of 1690WGP. Lt Col William H. Campbell, Director of Operations, 7th Weather Squadron, became ARCENT SWO and OIC, ARCENT weather support element.

27 Nov ARCENT Weather relocated to Eskan Village complex in Riyadh, resulting in loss of all its hardwire communications for approximately 7 weeks.

29 Nov **UN SECURITY COUNCIL ADOPTED US SPONSORED RESOLUTION 678 AUTHORIZING THE USE OF FORCE AGAINST IRAQ (if it did not withdraw from Kuwait by 15 January 1991.)**

30 Nov AWS DESERT SHIELD WSF consisted of 305 persons.



## December

- 1 Dec DMSF satellite F-10 launched by Air Force Space Command at request of AWS Commander.
- 21 Dec Saddam Hussein reasserted Iraq would not leave Kuwait by UN deadline.  
ARCENT US Army, Europe Automated Weather System network became operational in DESERT SHIELD theater.
- 24 Dec AFGWC began to issue medium range (4-7 days) forecasts for DESERT SHIELD theater.
- 31 Dec Total US forces in DESERT SHIELD theater reached 331,000.  
General Kelly directed 5WW to begin aggressive effort to obtain full send/receive teletype and facsimile capability for all deployed units in DESERT SHIELD theater.  
AWS DESERT SHIELD WSF consisted of 412 persons.

## 1991

### January

- early-Jan DSFU received its first usable facsimile data from AFGWC over AFDIGS circuit.
- 1 Jan AWS, with CENTCOM approval, requested Air Force Systems Command (AFSC) to provide Saudi Arabia a copy of a chemical dispersion model produced by Armstrong Aeromedical Research Laboratory.
- 5 Jan President Bush warned Iraq to withdraw from Kuwait or "face the terrible consequences."
- 7 Jan Operation PROVEN FORCE in support of DESERT SHIELD/STORM officially began.
- 9 Jan US Secretary of State James F. Baker, III, met with Iraq Foreign Minister Tariq Aziz at Geneva, Switzerland, in unsuccessful effort to resolve Persian Gulf crisis.
- 11 Jan TPS-68 tactical weather radar shipped from West Germany to Taif, Saudi Arabia.
- 12 Jan Congress adopted resolution authorizing President Bush to use force against Iraq pursuant to UN Security Council Resolution 678.  
ARCENT Weather began to produce the tactical operations area forecast for Army support weather teams.
- 14 Jan First AWS (2d Weather Wing) personnel deployed from West Germany to Incirlik AB in support of Operation PROVEN FORCE.

- 15 Jan Iraq had approximately 550,000 troops in Kuwait and southern Iraq.
- UN deadline passed without Iraqi withdrawal from Kuwait.
- An in-theater reconstituted DSFU became available for operations at Taif.
- AWS weather teams in DESERT SHIELD theater began to acquire their own Standard Base Level Computer system send/receive terminals.
- 16 Jan MEPA activated MEPA-DSFU weather data circuit.
- 17 Jan **THE GULF WAR BEGAN; OPERATION DESERT SHIELD BECAME OPERATION DESERT STORM.** At 0050 (1650, 16 January, Eastern Standard Time), coalition air forces launched air campaign against Iraq and Iraqi forces in Kuwait.
- Total US forces in DESERT SHIELD/STORM theater reached 454,000.
- 18 Jan Iraq launched first Scud missile attacks on Israel and Saudi Arabia.
- MEPA-National Weather Service (Jeddah-Washington DC via New York) weather data circuit became operational.
- 19 Jan US ground forces in Saudi Arabia began to move north to positions closer to the Saudi-Kuwait border.
- 22 Jan Iraq began setting fire to Kuwaiti oil refineries and oil fields.
- AFSC shipped Armstrong Laboratory chemical dispersion model to Saudi Arabia.
- 23 Jan AFGWC began transmitting work charts based on data received from special sensor microwave imagers mounted on DMSP satellites to the DSFU.
- 25 Jan Iraq released millions of gallons of Kuwaiti crude oil into the Persian Gulf.
- Total CENTAF aircraft sorties against Iraq reached 25,000.
- 26 Jan ARCENT Weather issued its first contingency weather package.
- 27 Jan Coalition air forces achieved air supremacy over Iraq.
- 29 Jan CENTAF Weather began issuing separate 3-day (72-hour) planning forecasts for Baghdad, northern Iraq, and Kuwait Theater of Operations (KTO) three times per day.
- 30 Jan TPS-68 tactical weather radar became operational at Diego Garcia in support of Strategic Air Command operations.
- 31 Jan AWS DESERT STORM WSF consisted of 459 persons.



## February

- Feb USAFETAC published SWANEA (Southwest Asia-Northeast Africa): A Climatological Study, Vol II: The Middle East Peninsula.
- 2 Feb AFGWC issued its first extended medium range (6-10 days) forecast for the DESERT STORM theater.
- 8 Feb US ground forces completing movement into tactical assembly areas; some moving into forward assembly areas and attack positions.
- 10 Feb The six Marwin rawinsondes procured by AWS arrived in the DESERT STORM theater.
- 11 Feb AFGWC issued its first extended range (11-15 days) outlook for the DESERT STORM theater.
- 13 Feb All major ARCENT combat elements in place.
- 15 Feb DMSP SPO awarded contract to Harris Corporation for the production of five RDITs.
- 16 Feb Total CENTAF aircraft sorties against Iraq reached 75,000.
- 17 Feb ARCENT Weather began briefing a weather effects matrix for the KTO to the ARCENT Commander and his staff.
- 20 Feb First RDIT arrived in DESERT STORM theater.
- 22 Feb General Schwarzkopf noted that all combat forces dedicated to DESERT STORM had arrived in theater.
- President Bush set noon, 23 February, Eastern Standard Time, as the deadline for Iraq to begin withdrawing from Kuwait.
- 23 Feb Saddam Hussein failed to comply with the deadline set the previous day. President Bush ordered General Schwarzkopf to "use all forces available, including ground forces, to eject the Iraqi Army from Kuwait."
- AWS DESERT STORM WSF reached peak strength of 475 persons stationed at 40 different locations.
- 24 Feb **GROUND OFFENSIVE AGAINST IRAQ BEGAN** at 0400 (2000, 23 February, Eastern Standard Time); coalition forces rapidly advance into Kuwait and Iraq.
- Saddam Hussein declared "the mother of battles" had begun.
- Total US forces in the DESERT STORM theater reached 537,000.
- 25 Feb Eleven of 27 ARCENT weather teams were in Iraq or Kuwait.
- 26 Feb Saddam Hussein ordered Iraqi forces to withdraw from Kuwait.

USAFETAC reported to General Merrill E. McPeak, Chief of Staff of the Air Force, that the weather for DESERT STORM was worse than climatology suggested it would be and that it was the worst in at least 14 years.

27 Feb Coalition forces liberated Kuwait City and swept into Iraq as far as the Euphrates River and the vicinity of Basrah.

Twenty-five Iraqi soldiers surrendered in western Kuwait to Capt F. Paul Bridges and A1C Charles M. Limbaugh of the Army's 1st Infantry Division (Mechanized) weather team.

Iraq agreed to UN terms for a cease-fire; promised to comply with all 12 UN resolutions directed against it.

27/28 Feb **PRESIDENT BUSH**, declaring that Kuwait was liberated, the Iraqi army defeated, and US military objectives met, **ORDERED A PROVISIONAL CEASE FIRE EFFECTIVE 2400, 27 FEBRUARY, EASTERN STANDARD TIME, (0800, 28 FEBRUARY, IN THE DESERT STORM THEATER)**, exactly 100 hours after ground campaign began.

28 Feb Total number of CENTAF DESERT STORM aircraft sorties reached (and ended at) 108,000.

The weather team of the Army's 3d Special Forces Group entered Kuwait City with an American military convoy.

A MAC airlift control element weather team and an AWS Army special operations weather team tactical element arrived at Kuwait City International Airport to set up weather support operations.

## March

1 Mar CENTAF Commander issued redeployment concept of operations which included "first in, first out" as general redeployment principle to be followed.

2 Mar Four members of the 3d Special Forces Group weather team participated in first post-liberation flag-raising ceremony at American embassy in Kuwait City.

3 Mar Coalition and Iraqi military commanders met to discuss cease-fire terms and issues. Iraqis accepted coalition terms.

5 Mar Total US forces in DESERT STORM theater reached peak of 541,000.

7 Mar Redeployment of a symbolic representative contingent of US troops (approximately 5,000) included two members of AWS WSF, one each from Air Force and Army support teams.

10 Mar **LARGE-SCALE REDEPLOYMENT OF US TROOPS FROM OPERATION DESERT STORM BEGAN.**

15 Mar CENTAF Weather shut down the QRCT network. Base weather station at Incirlik AB assumed responsibility for transmitting weather data to the AWS weather teams remaining in the DESERT STORM theater.

- 18 Mar DSFU issued its last product and ceased operations. AFGWC reassumed function as tactical forecast unit for DESERT STORM theater.
- 27 Mar Lt Col Riley redeployed. Maj Curtis A. Reutner succeeded him as CENTAF SWO and OIC, CENTAF Weather.
- 28 Mar Colonel Goldey redeployed. Lt Col Weaving, 1690WGP Vice Commander, succeeded him as Commander, 1690WGP.

## April

- 1 Apr Approximately 300 persons left in AWS DESERT STORM WSF.
- 3 Apr UN Security Council passed resolution establishing permanent cease-fire in the Persian Gulf, subject to Iraq's acceptance of terms.
- 7 Apr Iraq accepted terms of UN permanent cease-fire resolution.
- 12 Apr **UN PERMANENT CEASE-FIRE RESOLUTION WENT INTO EFFECT (11 APRIL IN US); PERSIAN GULF WAR OFFICIALLY ENDED.**
- 18 Apr CENTCOM Weather ceased operations.
- 20 Apr Lt Col Weaving redeployed. Lt Col Campbell, ARCENT SWO and OIC, ARCENT Weather and ARCENT weather support element, succeeded him as Commander, 1690WGP.

## May

- 1 May Lt Col Campbell redeployed. Lt Col Jerry R. Thornberry, VII Corps SWO, succeeded him as ARCENT SWO, OIC, ARCENT Weather, and Commander, 1690WGP.
- Approximately 120 persons left in AWS DESERT STORM WSF.
- 11 May ARCENT Weather ceased operations.
- 12 May Lt Col Thornberry redeployed. Maj Reutner, OIC, CENTAF Weather, succeeded him as Commander, 1690 WGP.

## JUNE

- 1 June Only approximately 50 persons left in AWS DESERT STORM WSF.
- 25 Jun The four remaining 1690WGP units in Persian Gulf area became part of sustaining WSF.

July

26 Jul The last person to have served in AWS DESERT SHIELD/STORM WSF prior to the initial cease-fire on 28 February redeployed.

October

1 Oct The 1690WGP <sup>in</sup> deactivated.





three subsequent wars between Israel and Arab countries, a joint British-French military intervention in Egypt, internal violence in Lebanon, an Islamic revolution in Iran, an Israeli invasion of Lebanon, and war between Iraq and Iran. With its vast oil resources and its strategic location in the Cold War, the Middle East was a continuing concern to the United States (US). Consequently, the US often pursued a vigorous diplomacy in the area and, on two occasions prior to 1990, intervened militarily in Lebanon.

Almost in the center of the Middle East, at the head of the Persian Gulf and flanking the Tigris and Euphrates Rivers, lies the country of Iraq. Part of the Ottoman (Turkish) Empire prior to World War I, following the war it became, for all intents and purposes, part of the British Empire. It became a nominally independent monarchy in 1932 and, as the result of a leftist, pan-Arab revolution, a republic in 1958. A decade later, a faction of the international Baathist Arab Socialist party seized control of the country. In 1979 Saddam Hussein, a member of that party, took office as president, in effect dictator, of Iraq. Barely a year after Saddam Hussein assumed power, he launched an attack on Iran, Iraq's neighbor to the east, which had very recently experienced a successful revolution led by radical Islamic fundamentalists. After eight years of inconclusive fighting, 120,000 Iraqi casualties, and the expenditure of \$112 billion, Saddam agreed in August 1988 to a United Nations-brokered cease-fire with Iran.<sup>1</sup>

Three years later, undeterred by the severe human and monetary costs of the recently concluded war with Iran, Saddam Hussein militarily invaded Kuwait, Iraq's tiny, oil rich neighbor to the southeast. Kuwait had a population of 2 million and an area of 6,900 square miles compared to Iraq's 19 million people and 167,900 square miles. The discrepancy between the two countries in terms of military power was even greater. Iraq had a one-million man army, 5,500 tanks, and 500 military aircraft. Kuwait had an army of only 20,300 men and had only 275 tanks and 36 warplanes.<sup>2</sup>

Ostensibly, Saddam attacked Kuwait because it had failed to respond adequately to charges he leveled against, and demands made upon, it. For one thing, he alleged Kuwait was depressing world oil prices by exceeding production quotas established by the Organization of Petroleum Exporting Countries and demanded that it stop. The charge was not without substance, although Kuwait was not the only member of the organization guilty of this. Kuwait's production policy deeply rankled Saddam, particularly because he needed as much income as possible given Iraq's huge expenditures during the war with Iran. In addition, he accused Kuwait of illegally pumping oil from under Iraqi territory. He also demanded Kuwait forgive the \$10 to \$20 billion debt Iraq owed Kuwait as a result of Kuwaiti loans to Iraq during the Iran-Iraq War, and that it at least lease, if not sell, to Iraq the Kuwaiti island of Bubiyan which blocked much of Iraq's access to the Persian Gulf (without Bubiyan, Iraq had only about 18 miles of coastline). However, another reason for the invasion, one independent of anything Kuwait did or did not do, is found in Saddam's claim that, based on historical considerations, all of Kuwait should be, and as a matter of fact was, part of Iraq. But probably the most fundamental explanation for Saddam's attack and attempted annexation of Kuwait was his ambition for Iraq to become the dominant power in the Middle East.<sup>3</sup>

Iraq invaded Kuwait on 2 August 1990. Saddam had preceded the attack with a verbal assault on the country beginning on 17 July with his allegation Kuwait was depressing oil prices. Four days

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<sup>1</sup>The World Almanac and Book of Facts, 1991, p 720; art (U), Lisa Beyer, "The World Closes In," Time, 20 Aug 90, p 28.

<sup>2</sup>The World Almanac and Book of Facts, 1991, pp 720, 726; chart, Time, 13 Aug 90, p 17.

<sup>3</sup>The World Almanac and Book of Facts, 1991, p 68; art (U), Lisa Beyer, "The Crude Enforcer," Time, 6 Aug 90, pp 46-47; art (U) Lisa Beyer, "'Iraq's Power Grab,'" Time, 13 Aug 90, pp 17-19.



later, giving more force to his accusation, he began to move troops to the Kuwaiti border. By the end of the month, he had massed at least 120,000 troops along the border. Within five hours of the beginning of the invasion, Iraqi forces captured Kuwait's capital city, Kuwait City; they completed the occupation of the entire country in 12 hours. On 6 August, Saddam announced Iraq was annexing Kuwait. In the meantime, he began to mass troops along Kuwait's border with Saudi Arabia, an action possibly signalling an incursion into that country.<sup>4</sup>

## The US Response

The US and the United Nations (UN) reacted quickly to Saddam's conquest of Kuwait. Already on the day of the invasion US President George Bush denounced Iraq's action as "naked aggression" and banned imports from Iraq. The following day the UN Security Council condemned the invasion and demanded Iraq withdraw its forces. The same day the US and the Soviet Union issued a joint statement also condemning the invasion and called for an embargo against Iraq. Three days later the UN Security Council voted to impose economic sanctions against Iraq.<sup>5</sup>

On 4 August, President Bush, in consultation with Secretary of Defense Richard B. Cheney, Chairman of the Joint Chiefs of Staff Colin L. Powell, and Commander in Chief (CINC) of the US Central Command (USCENTCOM) General H. Norman Schwarzkopf, decided the US should put a military force in Saudi Arabia, particularly in view of Saddam's threatening gestures toward Saudi Arabia. The very next day Cheney, accompanied by Deputy National Security Advisor Robert Gates, General Schwarzkopf, and Lieutenant General Charles A. Horner, Commander of US Central Command, Air Forces (USCENTAF), traveled to Saudi Arabia to meet with King Fahd and persuade him to allow the US to use Saudi Arabia as a base for a military operation to counter Iraq's advance. The requested permission came on 7 August. The same day President Bush ordered US military aircraft and troops to Saudi Arabia. Operation DESERT SHIELD was underway. The next day, declaring that "a line has been drawn in the sand," the president informed the nation he had deployed US forces to Saudi Arabia to protect that nation from a possible attack by Iraq. He warned the American people to be prepared for a lengthy commitment.<sup>6</sup>

Over the next several weeks, in addition to rapidly building up American forces in Saudi Arabia, President Bush carefully constructed an international military coalition that would commit troops to Saudi Arabia under the auspices of the UN. The coalition eventually came to include more than 30 nations, including Britain, France, two Arab countries, Egypt and Syria, in addition to Kuwait and Saudi Arabia. By late October a multinational force of nearly 240,000 persons, well over 200,000 of whom

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<sup>4</sup>HQ USAF/CAFH, The Persian Gulf War: An Air Staff Chronology of DESERT SHIELD-DESERT STORM (S/NF/WN), an Air Staff Historical Study, compiled by Capt S. B. Michael, CAFH, 1992, hereafter cited as USAF/CAFH DS/DS Chronology (S/WN/NF), pp 1-13, info used (U); art (U), Lisa Beyer, "Iraq's Power Grab," Time, 13 Aug 90, pp 16, 19-20.

<sup>5</sup>USAF/CAFH DS/DS Chronology (S/WN/NF), pp 11-15, info used (U); The World Almanac and Book of Facts, 1991, pp 68-69.

<sup>6</sup>USAF/CAFH DS/DS Chronology (S/WN/NF), pp 12-15, info used (U); art (U), Lisa Beyer, "Read My Ships," Time, 20 Aug 90, pp 18-22.

were American military personnel, was in the Persian Gulf theater, mostly in Saudi Arabia, where it assumed defensive positions.<sup>7</sup>

Complying with President Bush's order, military authorities began deploying the first US military units to Saudi Arabia in the evening of 7 August. The initial deployment included a 2,300-man contingent from the Army's 82d Airborne Infantry Division from Fort Bragg, North Carolina; 48 F-15 fighter aircraft from the Air Force's 1st Tactical Fighter Wing at Langley Air Force Base (AFB), Virginia; several Strategic Air Command (SAC) B-52 bombers from airbases in the continental US; and a USCENTCOM headquarters element from MacDill AFB, Florida. Strategic airlift operations also began in the evening of 7 August with the departure from Charleston AFB, South Carolina, of a Military Airlift Command (MAC) C-141, manned by an Air Force Reserve crew, bound for Dhahran, Saudi Arabia. Even before this, an initial USCENAF contingent comprised of 9th Air Force personnel left Shaw AFB, South Carolina, at 0900 eastern daylight time, 7 August, aboard a specially equipped SAC EC-135, arriving in Riyadh, Saudi Arabia, at 0430 eastern daylight time (1230 local time) the following day.<sup>8</sup>

The USCENTCOM and USCENAF contingents were in the vanguard of deploying units because Saudi Arabia lay within USCENTCOM's geographic area of responsibility (AOR) and its commander in chief, General Schwarzkopf, would direct the Persian Gulf operation, quickly given the code name DESERT SHIELD. USCENTCOM, (or simply CENTCOM), given its AOR, had, of course prepared for possible operations in southwestern Asia. Indeed, when the Persian Gulf crisis erupted, CENTCOM was in the process of updating a 1988 Southwest Asia contingency plan, including the development of force requirements. Also by way of preparation, CENTCOM conducted various training exercises. Every other year it held GALLANT EAGLE in the desert areas of the southwestern US, an area similar in many respects to large portions of the CENTCOM AOR. Just shortly before the beginning of DESERT SHIELD it had fortuitously conducted a command post exercise at Eglin AFB, Florida, in which it practiced for operations in the Persian Gulf region. The command also biennially sponsored BRIGHT STAR, a large scale, combined exercise held in Egypt and other countries in the CENTCOM AOR, most recently in the fall of 1989. It also conducted other exercises in the AOR from time to time. Indeed, it was holding a combined exercise in the Persian Gulf region with several Arab states when Iraq invaded Kuwait.<sup>9</sup>

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<sup>7</sup>USAF/CAFH DS/DS Chronology (S/WN/NF), pp 136-37, info used (U); chron (U), TAC, "DESERT SHIELD/STORM Chronology, 2 August 1990 - 3 April 1991," n.d., hereafter cited as TAC DS/DS Chronology (U), p 36; art (U), Michael Kramer, "Wait a Minute," Time, 5 Nov 90, p 38.

<sup>8</sup>The World Almanac and Book of Facts, 1991, pp 68-69; TAC DS/DS Chronology (U), p 4; USAF/CAFH DS/DS Chronology (S/WN/NF), p 14, info used (U); rpt (U), n.a., "Conduct of the Persian Gulf War: Final Report to Congress Pursuant to Title V of the Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991 (Public Law 102-25)", Apr 92, hereafter cited as Title V Report (U), pp 44-46, E-17 - E-18, E-23.

<sup>9</sup>Report #2 (S), AWS, "An Analysis of Air Weather Service Support to Operations DESERT SHIELD/DESERT STORM," 6 Dec 91, hereafter cited as AWS DS/DS Report #2 (S), p 21 (Sec 3.1.1), info used (U); intvw (U), William E. Nawyn, AWS/HO, with Col Peter F. Abt, AWS DCS/DO, LTC Ronald R. Wall, AWS/ADO, Col Terry C. Tarbell, 5WW/DO, and Maj Norman E. Buss, AWS/DOJ, 10 May 91, hereafter cited as AWTB Intvw (U), p 6; intvw (U), W.E. Nawyn, AWS/HO, with Col James W. Goldey, CENTCOM/SWO, OICWSF, and 1690WGP/CC (and 1WS/CC), 16 May 91, hereafter cited as Goldey Intvw (U), p 2.

## The Air Weather Service Response

### *Initial Actions*

As the situation in the Persian Gulf became more threatening, Air Force and Army commands that would deploy forces to the area under the existing CENTCOM contingency plan started to make specific preparations for such an eventuality. Air Weather Service (AWS), too, began planning for the deployment of a Weather Support Force (WSF) to the Persian Gulf region. Under the contingency plan, AWS itself would deploy a sizable number of personnel to support Air Force units. On the other hand, Army weather support teams would automatically deploy with the Army units they supported. During the days and hours while they awaited possible orders to execute the deployment, major Army and Air Force commands developed and frequently revised their deploying force structure. As they did so, AWS also made changes in the force it planned to deploy. In keeping with guidance from Tactical Air Command (TAC), AWS planned for a 30-day operation with minimum force size.<sup>10</sup>

By 7 August AWS had decided upon an initial USCENTAF (or simply CENTAF) weather support element of 18 persons (four officers, eight forecasters, and six observers)--a force much smaller than that specified in the contingency plan. Based upon the units that the Army indicated it would deploy initially (an XVIII Corps advanced echelon and an 82d Airborne Division brigade), AWS planned for an initial US Central Command, Army [Forces] (USARCENT, or simply ARCENT) weather support element of two officers, two forecasters, and six observers. However, due to airlift constraints at the time of the actual initial deployment, AWS reduced the Air Force weather support element by one forecaster and the XVIII Corps team by three observers. It also, at the last minute, replaced one of the observers assigned to the 82d Airborne brigade with an additional forecaster.<sup>11</sup>

In mid-July, about the time Saddam Hussein was beginning his verbal assault on Kuwait, AWS received its first indication that a crisis was brewing in the Middle East. During the remainder of the month, Headquarters AWS considered its options should the situation lead to a US military operation. The crisis, of course, did lead to a US decision to deploy troops to the Persian Gulf. AWS, along with other American military organizations, immediately swung into action or, perhaps more precisely, reaction. For the next couple of weeks AWS had time to do little else than respond to the rapidly unfolding events and deployment taskings. Nevertheless, it did attempt to find some time to look ahead and anticipate what might happen next. But the immediate business following President Bush's first deployment orders was to establish a crisis action team (CAT) at Headquarters AWS. Formed within Deputy Chief of Staff (DCS) Operations, the CAT was composed primarily of Readiness Directorate personnel headed by Lieutenant Colonel Ronald R. Wall. Unfortunately, at the moment, AWS had no Deputy Chief of Staff for Operations. The DCS for Operations had departed on 3 August and his replacement, Colonel Peter F. Abt, had not yet arrived. Thus, the Assistant DCS for Operations, Colonel Terry C. Tarbell, was temporarily the acting DCS for Operations.<sup>12</sup>

On 16 August the Commander of AWS, Brigadier General John J. Kelly, Jr., directed DCS Operations to expand the membership of the CAT beyond its own personnel. Consequently, a number

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<sup>10</sup>AWS DS/DS Report #2 (S), pp 21-22 (Secs 3.1.1, 3.1.2), info used (U).

<sup>11</sup>AWS DS/DS Report #2 (S), pp 21-23 (Secs 3.1.2, 3.1.3, 3.1.4), info used (U).

<sup>12</sup>LTC R.R. Wall in AWTB Intvw (U), pp 1-4.



of individuals from the two other DCS's at Headquarters AWS, Program Management and Technology, also became members of the CAT. At the same time the CAT also began to operate around-the-clock. By the end of August there were 5 CAT teams working three, 8-hour shifts on a rotating basis. The day shift consisted of 9 or 10 persons, the swing and mid-shifts of 5 or 6. The CAT provided two briefings each day to General Kelly, one in the morning and the other in late afternoon. Preparing for the briefings and following up on questions raised at the briefings began to occupy much, if not most, of the CAT's time.<sup>13</sup>

Meanwhile, General Kelly, wanting all of his senior leadership present should hostilities erupt in the Persian Gulf, ordered Colonel Abt, then on leave in Europe, to report to Headquarters AWS immediately rather than in mid-October as originally scheduled. Colonel Abt arrived on 23 August. Following instructions from General Kelly to separate the responsibility for the day-to-day operations of the CAT from the management of DCS Operations, Colonel Abt made Colonel Tarbell the overall CAT director with Lieutenant Colonel Wall as his assistant, while he himself supervised DCS Operations and tried to look at the broad, larger picture of AWS's role in the rapidly expanding DESERT SHIELD operation.<sup>14</sup>

In late September General Kelly reduced the required CAT briefings from two to one each day. A short time later DCS Operations trimmed the size of the CAT teams to two or three personnel per shift. From mid-November to almost mid-January the CAT worked two 8-hour shifts a day with four or five people on each shift. Beginning on 11 January 1991, as hostilities became imminent in the Persian Gulf, and continuing until 27 February, when the initial, provisional cease-fire went into effect, the CAT again operated 24-hours-per-day with three shifts of two to four persons each. Meanwhile, in November Colonel Wall succeeded Colonel Tarbell as overall CAT director and Major Norman E. Buss replaced Colonel Wall as Director of Readiness and assistant CAT director.<sup>15</sup>

### ***Headquarters AWS and Lead Wing Roles***

Under Air Weather Service Regulation (AWSR) 55-2, "Operations: AWS Tactical Weather Support," and other existing war plans, in each contingency operation AWS would have a lead wing, that is, one weather wing that would function as the weather support coordinator and immediate manager of the deployed weather support force. In concept, the role of Headquarters AWS in a contingency operation was to develop AWS policy for the operation, provide guidance to the lead wing, and work multiple-wing issues upon the request of the lead wing. However, neither AWSR 55-2 nor any other written document delineated the exact roles of Headquarters AWS and the lead wing, creating a degree of ambiguity in roles that in DESERT SHIELD/STORM led to some confusion and blurring of functions and responsibilities. This, in turn, contributed to Headquarters AWS exercising

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<sup>13</sup>LTC R.R. Wall and Maj N.E. Buss, in AWTB Intvw (U), pp 4-5; msg (S), AWS/DO to AIG 8380/DO, "AWS CAT Activation," 172030Z Aug 90, info used (U); msg (U), HQ AWS/DOJ to 5WW/DOX, "Subject of Ref A: A Rigorous Analysis of AWS in Operations DESERT SHIELD/STORM," 071245Z May 91.

<sup>14</sup>Col P.F. Abt in AWTB Intvw (U), p 5.

<sup>15</sup>Msg (U), HQ AWS/DOJ to 5WW/DOX, "Subject Ref A: Rigorous Analysis of AWS in Operations DESERT SHIELD/STORM," 071245Z May 91; msg (U), HQ MAC/DPO to ALMAC/CC, et al, "Senior Officer Announcements," 071330Z Nov 90.

more direct management of the deployed WSF in the operation than originally envisioned under the lead wing concept, especially after it began to appear the lead wing did not have the capability of handling by itself the task of organizing and managing weather support for an operation as large and complex as DESERT SHIELD. Without doubt, DESERT SHIELD/STORM tested, taxed, and extended the lead wing role more than any preceding contingency operation.<sup>16</sup>

In addition to its general oversight and guidance functions, Headquarters AWS provided several valuable, more specific services during DESERT SHIELD/STORM. Perhaps the most important of these was acting as agent for the lead wing with the other wings, something on which it expended a great deal of time and effort. It also carried out projects to enhance weather support, such as arranging for new weather equipment. In addition, it worked with other Air Force commands such as MAC and the Air Force Communications Command (AFCC) to obtain support and assistance for these and other AWS initiatives and projects to improve weather support operations. Another much-needed function performed by the headquarters, especially as time went on and DESERT SHIELD developed into a lengthy operation, was to sit back and, from its vantage point, analyze and assess AWS performance, anticipate obstacles AWS might encounter if DESERT SHIELD continued on, and address issues before they became problems.<sup>17</sup>

Although AWSR 55-2 did not specifically spell out the role of the lead wing as compared to that of Headquarters AWS, it did state the lead wing was to "tailor the WSF to the specific requirements and operations of the supported forces." The regulation also listed several "factors" the lead wing was to take into consideration in carrying out its mandate. Together, the statement and the factors indicated the lead wing had "total, unequivocal managerial responsibility for caring, feeding, equipping, and sustaining a WSF specifically tailored for an operation." This, however, still did not necessarily make clear the focus of responsibility for certain actions and functions in every situation. Nor, of course, did it specify the methods and procedures for the lead wing to utilize in carrying out its responsibilities.<sup>18</sup>

For DESERT SHIELD/STORM, the lead wing role went to the 5th Weather Wing, commanded by Colonel William S. Koenemann. This was logical since the 5th Wing's 1st Weather Squadron supported USCENTCOM and CENTCOM's Special Operations Forces (SOF) component, while its 3d and 5th Weather Squadrons supported the Air Force and Army components of CENTCOM, CENTAF and ARCENT. As lead wing, 5th Wing's responsibilities encompassed almost all aspects of AWS's participation in DESERT SHIELD/STORM. Its initial responsibilities centered mostly around deploying

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<sup>16</sup>AWSR 55-2, "Operations: AWS Tactical Weather Support," 26 May 89, p 4; intvw (U), W.E. Nawyn, AWS/HO, with Brig Gen John J. Kelly, Jr., USAF/XOW (AWS/CC during DS/DS), 25 Feb 92, hereafter cited as Kelly Intvw, pp 4, 8-11; intvw (U), W.E. Nawyn, AWS/HO, with Col George L. Frederick, AWS/CC (AWS/CV during DS/DS), 19 Feb 91, hereafter cited as Frederick Intvw, pp 2-3, 5-6, 9; Col P.F. Abt in AWTB Intvw (U), p 5; AWS DS/DS Report #2 (S), pp 6 (Sec 2.1.1), 8-9 (Secs 2.1.2-i, 2.1.3, 2.2.1), pp 14-16 (Secs 2.2.2-g, 2.2.4), info used (U).

<sup>17</sup>Kelly Intvw (U), p 10; Frederick Intvw (U), p 2; Col R.R. Wall in AWTB Intvw (U), pp 9, 11, 13, 17.

<sup>18</sup>AWSR 55-2 (U), "Operations: AWS Tactical Weather Support," p 4; AWS DS/DS Report #2 (S), p 9 (Sec 2.2.1), info used (U); intvw (U), W.E. Nawyn, AWS/HO, with Col William S. Koenemann, 5WW/CC, 4 Jun 91, hereafter cited as Koenemann Intvw, pp 20-21.



and constituting a viable WSF. Once it accomplished this, its work focused on managing the WSF and supporting its needs.<sup>19</sup>

Fortunately, when DESERT SHIELD began, 5th Weather Wing had ready 5th Weather Wing Operations Order (OPORD) 02-FY, a document published in June 1989 that described the concepts and procedures for providing weather support to USCENTCOM and its components in the event of their deployment. It provided guidance for both the deployment and the employment of the WSF. It indicated not only what the 5th Wing, but also what other AWS units were to do, and included the types of products and communications circuits required.<sup>20</sup>

### *Initial Response of the 5th Weather Wing*

5th Weather Wing involvement in DESERT SHIELD began on 2 August. At approximately 0730 local time on that day, Mr. Stanley W. Tkach, 5th Wing's liaison with the TAC Battle Staff, received a telephone call informing him Headquarters TAC was activating the TAC Battle Staff. He and Lieutenant Colonel Mark D. Maxwell, 5th Wing's Chief of Plans, reported to the battle staff immediately and, at 0900, they received word Iraq had invaded Kuwait. The Joint Chiefs of Staff (JCS) had issued a warning order directing the Commander in Chief, CENTCOM (USCINCCENT) to consider courses of action to counter the Iraqi threat to Saudi Arabia. TAC, as the provider of tactical air forces to CENTCOM, responded to the JCS order by immediately beginning to mobilize its fighter wings. The 5th Weather Wing, as the provider of weather support to both CENTCOM and TAC, started immediately to make plans for a WSF to accompany the initial TAC aircraft assets that might deploy to Saudi Arabia. Over the next several days, until the order to deploy forces came on 7 August, the 5th Wing planners, under the direction of Mr. Tkach, developed as many as 16 different plans in response to constantly changing instructions from higher headquarters.<sup>21</sup>

Also on 2 August, the 5th Wing activated a CAT to handle matters related to the deployment operation that would likely occur soon. It did not, however, begin around-the-clock operations until a week later, after the deployment of American forces had already begun. At that time it formed three, five or six person CAT teams who worked twelve-hour shifts. Originally, the CAT consisted only of personnel from the Operations Division, but it soon became apparent the CAT needed people with various areas of expertise and, consequently, the wing added persons from other headquarter divisions as well. Conditions in the CAT in the early days of DESERT SHIELD became rather hectic and tense as the rapidly expanding operation increased the CAT workload and, thereby, the pressure on CAT

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<sup>19</sup>AWS DS/DS Report #2 (S), pp 9-15 (Secs 2.2.1, 2.2.2), info used (U); point paper (U), Col P.F. Abt, AWS/DO, "Management of the DESERT SHIELD Weather Support Force," 4 Jan 91.

<sup>20</sup>OPORD 02-FY (S), "USCENTCOM Weather Support (U)," 5WW, 15 Jun 89, pp iii, 1-6, info used (U).

<sup>21</sup>Intvw (U), W.E. Nawyn, AWS/HO, with Stanley W. Tkach, 5WW/DOX, hereafter cited as Tkach Intvw, pp 2-3; Koenemann Intvw (U), p 2.

members. Fortunately, the pace eased up a bit after a few weeks as the scheduled initial deployments started reaching completion.<sup>22</sup>

The 5th Wing's response to the sudden demands of DESERT SHIELD was hampered by the fact it was just undergoing the normal summer round of permanent change of stations and retirements when the operation began, causing temporary manning shortages. Particularly disruptive to 5th Wing operations was the retirement of two key lieutenant colonels a few days after DESERT SHIELD began. However, Headquarters AWS covered their loss by sending two other lieutenant colonels to the wing to take their place until permanent replacements arrived a couple of weeks later. It also dispatched a master sergeant to the wing on temporary duty. In addition to assigning them duties in their areas of expertise, the wing used all three to augment its CAT.<sup>23</sup>

One of the new arrivals was Lieutenant Colonel John V. St. Onge. At the recommendation of Colonel St. Onge, the wing formed a five-man team to oversee CAT operations--a kind of "senior battle staff," as the colonel later called it--that would act as the chief CAT decision-making body, control and coordinate CAT operations, ensure continuity, prevent duplication of effort, and interact with their counterparts at Headquarters AWS. Colonel St. Onge headed this body and as such, became the chief CAT director. The oversight body worked day shifts only--officially one twelve-hour shift five days per week, but frequently on weekends as well.<sup>24</sup>

As the lead wing, 5th Wing became the focal point for all DESERT SHIELD/STORM weather support activities and a "lifeline" connecting the WSF deployed to the Persian Gulf theater with AWS back in the continental US. To that end, it tried to remain in daily contact with the WSF by telephone or other means, which, because of the time differential, often meant calling in the middle of the night. For the duration of the operation the wing totally immersed itself in performing this role. Not only the CAT, but practically the whole headquarters staff became involved in supporting the WSF in some way.<sup>25</sup>

Beginning immediately, and lasting throughout the operation, one of the most important tasks of the 5th Wing was to plan and direct the deployment of the weather forces--deciding and arranging how many and who or what (that is, both people and equipment) would deploy, when they would deploy, and where they would deploy. To this end, the wing coordinated with its 3d and 5th Weather Squadrons, which were initially responsible for developing the CENTAF and ARCENT weather forces, respectively, time phased force deployment data (TPFDD) documents. Beginning 12 August, when Headquarters TAC began to function as CENTAF Rear, the wing assumed direct management of the TPFDD for Air Force weather forces. The 5th Squadron continued to manage the Army weather forces

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<sup>22</sup>Chron (S), HQ 5WW, "Narrative and Chronology of Operation DESERT SHIELD, 25 Jul-31 Dec 90 (U)," [Apr 91], hereafter cited as 5WW DESERT SHIELD Chronology (S), found in App 9, classified annex to hist rprt (U), 5WW, Jul-Dec 90, pp 9-1, 9-2, info used (U); intvw (U), W.E. Nawyn, AWS/HO, with LTC Donald R. Hood, 5WW/DOR, 6 Jun 91, pp 2-3; intvw (U), W.E. Nawyn, AWS/HO with LTC John V. St. Onge, Chief, 5WW/DOX, 3 Jun 91, hereafter cited as St. Onge Intvw, pp 2, 4; intvw (U), W.E. Nawyn, AWS/HO, with LTC John O. Nett, TRADOC SWO, 7 Jun 91, pp 3-5.

<sup>23</sup>AWS DS/DS Report #2 (S), p 6 (Sec 2.1.2-a), info used (U); 5WW DESERT SHIELD Chronology (S), p 9-2, info used (U); Koenemann Intvw (U), pp 32-33; St. Onge Intvw (U), pp 2-4.

<sup>24</sup>St. Onge Intvw (U), pp 2-3, 35-36.

<sup>25</sup>AWS DS/DS Report #2 (S), pp 9-10 (Sec 2.2.2-a), info used (U); Koenemann Intvw (U), pp 31-32; St. Onge Intvw (U), pp 8-9, 35.

TPFDD. The wing also had the task of arranging transportation for deploying weather personnel and equipment.<sup>26</sup>

Perhaps the foremost responsibility of the 5th Wing was to provide support of various kinds to the deployed WSF. It constantly monitored the needs of the WSF and provided decision assistance to its leaders. It gave guidance to the force in dealing with personnel issues such as manpower requirements, emergency leaves, and replacements for deployed personnel. It tracked the deployment and location of tactical meteorological equipment and helped sustain the WSF in the field by arranging for a continuing flow of supplies and equipment. As the primary point of contact in the US for "scientific" support to DESERT STORM, the wing coordinated the procurement of Electro-Optical Tactical Decision Aid (EOTDA) software and climatological data and their dissemination to the WSF. The wing also became involved in communications matters affecting the WSF--for example, serving as a conduit for the coordination of communications networks, monitoring communications equipment, providing communications security (COMSEC) materials, and dealing with communications maintenance issues.<sup>27</sup>

Another important function of the 5th Wing was gathering and disseminating information and being a "center of information [for AWS] on what was going on." This was a valuable service and, in time, this perhaps became the wing's biggest job. The wing expended much time and effort in coordinating and communicating with Headquarters AWS--answering its questions, serving as a conduit between Headquarters AWS and the WSF, and providing information to the AWS CAT for commander briefings. It also spent considerable time in communicating with its own squadrons and other wings and in preparing for its own briefings.<sup>28</sup>

All the other AWS weather wings also became involved with DESERT SHIELD/STORM to a greater or lesser degree. During the three weeks following the beginning of DESERT SHIELD each of the other numbered wings also activated CATs, beginning with the 2d and 7th on 7 August. AFGWC never activated a CAT as such. An important, if not the most important, function of the other wing CATs was to provide support to the 5th Wing as it levied assessments on the wings for personnel and equipment (both meteorological and communications) to deploy to the Persian Gulf theater. The 1st and 4th Wings roles in supporting the operation were very limited.<sup>29</sup>

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<sup>26</sup>AWS DS/DS Report #2 (S), p 10 (Sec 2.2.2-b), info used (U). For more detail on TPFDD development, see Tkach Intvw (U), pp 13-18.

<sup>27</sup>AWS DS/DS Report #2 (S), pp 12-14 (Sec 2.2.2-d,e,f), info used (U); St. Onge Intvw (U), pp 6-7; point paper (U), Col P.F. Abt, AWS/DO, "Management of the DESERT SHIELD Weather Support Force," 4 Jan 91.

<sup>28</sup>Koenemann Intvw (U), pp 6, 24; AWS DS/DS Report #2 (S), pp 8-10 (Secs 2.1.2-i, 2.2.2-a), info used (U).

<sup>29</sup>AWS DS/DS Report #2 (S), pp 17-18 (Sec 2.3), info used (U); hist rpt (U), 2WW, Jul-Dec 90, p 156; hist rpt (U), 7WW, Jul-Dec 90, DO Chronology, n.p.; msg (S), 3WW/DOJ to AWS/DOJ, "3WW/Sitrep [#1]," 092136 Aug 90, info used (U); hist rpt (U), 4WW, Jul-Dec 90, classified annex (S), Atch 1-1, info used (U); hist rpt (U), 1WW, Jul-Dec 90, Sup Doc 6.



## The First AWS Deployments

As already noted,<sup>30</sup> the first Air Force units to deploy to DESERT SHIELD were two squadrons of F-15 fighters from the 1st Tactical Fighter Wing at Langley AFB. The wing weather officer, Captain Judith E. Dickey, and a weather support team comprised of three noncommissioned officers (NCOs) and two airmen deployed ahead of the aircraft. Captain Dickey left on the morning of 7 August and arrived at Dhahran on the evening of the 8th. Three of the members of her team arrived on the morning of 9 August and the other two that evening.<sup>31</sup>

Captain Dickey, however, was not the first AWS person to set foot in the Persian Gulf theater to participate in Operation DESERT SHIELD. That honor belongs to Staff Sergeant John N. Poole of the 15th Weather Squadron's Detachment 3 at Charleston AFB, who landed in Riyadh aboard a C-141 airlifter out of Charleston with a MAC airlift control element at 1010 local time, 8 August. Next to arrive were First Lieutenant Todd M. Fasking and Technical Sergeant Keith E. Daniels, both from Detachment 10 of the 15th Weather Squadron at McGuire AFB, New Jersey. They came with another MAC airlift control element aboard a C-141 out of McGuire that touched down at Dhahran, at 1310 local time, 8 August. Technical Sergeant Fred A. Wilburn of the 26th Weather Squadron's Detachment 20 at Barksdale AFB, Louisiana, arrived at Riyadh a few hours later (approximately 1800 local time) aboard a SAC KC-10 tanker. Thus, when Captain Dickey debarked on the evening of the 8th of August, she became the fifth person from AWS to arrive in the DESERT SHIELD theater. These five constituted the vanguard of an AWS WSF that was eventually to become nearly 500 persons strong.<sup>32</sup>

Meanwhile, three members of AWS--Lieutenant Colonel Gerald F. Riley, Jr., Major Frank L. Kendrick, and Senior Airman Vince B. Bowman--had deployed from Shaw AFB in the early morning of 8 August with the second group of the advanced USCENTAF headquarters element, arriving at Riyadh late in the morning of the 9th. Colonel Riley was commander of the 5th Wing's 3d Weather Squadron and staff weather officer (SWO) to the CENTAF commander, Lieutenant General Horner, who had deployed to Saudi Arabia on a preceding flight to establish and head USCENTCOM Forward. Major Kendrick was chief of the Plans Branch at 3d Squadron and Senior Airman Bowman was an observer from the 5th Weather Squadron's Detachment 3 at Fort Bragg.<sup>33</sup>

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<sup>30</sup>See above, p 4.

<sup>31</sup>5WW DESERT SHIELD Chronology (S), p 9-1, info used (U); intvw (U), W.E. Nawyn, AWS/HO, with Capt Judith E. Dickey, Det 6, 1690WGP/CC (and Det 7, 3WS), 7 Jun 91, hereafter cited as Dickey Intvw, p 2; telecon (U), W.E. Nawyn, AWS/HO, with TSgt S.G. Green, Det 7, 3WS (and Det 6, 1690WGP), 16 Oct 91.

<sup>32</sup>Atch (U), [MAC] Movement Flow Chart, 7-9 Aug, to fax msg (U), SSgt J.N. Poole, Det 3, 15WS (and 1690WGP), to W.E. Nawyn, AWS/HO, 12 Dec 91; telecon (U), W.E. Nawyn, AWS/HO, with SSgt J.N. Poole, Det 3, 15WS (and 1690WGP), 17 Oct 91; telecons (U), W.E. Nawyn, AWS/HO, with TSgt K.E. Daniels, Det 10, 15WS (and Det 6, 1690WGP), 17 Oct 91, 12 Nov 91; telecon (U), W.E. Nawyn, AWS/HO, with MSgt F.A. Wilburn, Det 20, 26WS (and Det 28, 1690WGP), 16 Oct 91; telecon (U), W.E. Nawyn, AWS/HO, with LTC G.F. Riley, Chief, AWS/DOJ, 15 Oct 91.

<sup>33</sup>5WW DESERT SHIELD Chronology (S), pp 9-1, 9-2, info used (U); intvw (S), W.E. Nawyn, AWS/HO, with LTC Gerald F. Riley, Jr, CENTAF/SWO and CENTAF WSE/OIC (and 3WS/CC), hereafter cited as Riley Intvw (S), pp 2-3, info used (U).

Colonel Riley added Senior Airman Bowman to the weather party a few hours before departure at the request of Major John A. White III, the XVIII Army Corps staff weather officer, so he could serve as a data relay for the Ready Brigade of XVIII Corps' 82d Airborne Division, which would be deploying very shortly. Senior Airman Bowman, thus, probably became the first AWS Army weather support person to arrive in the Persian Gulf area. However, Technical Sergeant Michael D. Nardi, also from Detachment 3 of the 5th Weather Squadron, and the NCO in charge (NCOIC) of the weather team supporting the Ready Brigade, arrived shortly afterwards.<sup>34</sup>

DESERT SHIELD weather support grew rapidly as other AWS personnel quickly followed on the heels of the earliest deployees. By the end of 9 August, AWS had already deployed 49 persons to the Persian Gulf.<sup>35</sup>

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<sup>34</sup>5WW DESERT SHIELD Chronology (S), p 9-1, info used (U); Riley Intvw (S), p 2, info used (U); telecon (U), W.E. Nawyn, AWS/HO, with MSgt S.A. Lord, Det 3, 5WS (and Det 3, 1690WGP), 17 Oct 91.

<sup>35</sup>List (U), S.W. Tkach, 5WW/DOX, [AWS Personnel Deployed to DESERT SHIELD/STORM,] n.d. [ca 15 Sep 91,] hereafter cited as Tkach, List of Deployed AWS Personnel (U), Sep 91.



## CHAPTER II

# BUILDING THE WEATHER SUPPORT FORCE

### Deployment Policies and Processes

The first task facing the 5th Weather Wing as lead wing when DESERT SHIELD got underway was to see to it that deploying Air Force and Army units had weather teams to go with them. This meant it had to determine how many and what weather support people it should deploy and make sure it sent out the taskings to deploy them. In theory, this should not have been too difficult. The principle covering how many and who should deploy was relatively simple and straightforward: Weather people would deploy with the customers they supported. Moreover, war plans such as OPlan 1002-88 stipulated the size of weather support teams required for various scenarios and circumstances (e.g., bare or equipped bases, number and types of aircraft).<sup>1</sup>

In practice, however, sizing weather support teams and selecting who should deploy proved to be far more complicated, at least for teams supporting Air Force units, than the basic principle suggested. In part this resulted from the speed with which the DESERT SHIELD deployment expanded, but also from the fact that, unlike Army support weather teams, AWS personnel supporting Air Force units, for several reasons, did not automatically deploy with the units they supported. The aircraft wing they supported did not always deploy in its entirety and, therefore, neither did its supporting weather team. Further, the Air Force frequently deployed more than one flying unit to a particular base in the DESERT SHIELD theater and they did not each need all of their normal weather support complement with them. Then, too, the 5th Wing frequently deployed weather teams in increments--first an initial person or two to accompany the advance element of the unit the team supported and then, later, the other members of the team. Sometimes, however, for one reason or another, including instructions from higher headquarters to deploy a minimum number of people and later the imposition of deployment ceilings, the others never did deploy. The 5th Wing's need for special expertise in certain deployed assignments also made the deployment process more complex.<sup>2</sup>

The deployment process AWS followed had at least two unintended consequences for deployed weather units supporting Air Force customers. First, it frequently led to the formation in the theater of composite weather support teams with members drawn from various stateside units who had never worked together before. Second, the personnel deployed tended to be relatively junior officers and enlisted persons. Often senior and more experienced officers and NCOs were left at home stations "minding the store." Deployed weather teams supporting Army units, on the other hand, although they included many young members, generally deployed as a unit with their customers and, therefore, had

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<sup>1</sup>Koenemann Intvw (U), pp 9, 19-21; St. Onge Intvw (U), p 5; Tkach Intvw (U), p 7.

<sup>2</sup>Tkach Intvw (U), pp 3-4, 6-8, 10-11; Maj N.E. Buss in AWTB Intvw (U), pp 10-11; Koenemann Intvw (U), pp 9-10; St. Onge Intvw (U), pp 5-6.

experience in working together prior to deploying. Moreover, commanders of the Army weather teams deployed with their troops; very few Air Force weather support detachment commanders did.<sup>3</sup>

It was not only the deployment process, however, that led to the deployment of relatively inexperienced personnel. Another factor was an initial perception that the operation would be a short one--only a show of force--and it was, therefore, not necessary to disrupt home station operations. Still another was the failure to fully realize and react soon enough to the fact that the US had begun a major contingency operation and AWS was deploying a very large WSF, a force that needed senior leadership even at the cost of disrupting home station operations. The failure was due, at least in part, to the early uncertainty as to what the real mission of the DESERT SHIELD operation was and to the many separate deployment decisions that had to be made quickly without much time to look at the overall picture.<sup>4</sup>

In determining the size of weather support teams, 5th Wing's deployment manager, Mr. Tkach, and his assistants used existing war plans as their beginning point. They then made changes up or down as needed--which meant many. Initially, as they responded to the guidance received to keep manning to a minimum, they tended to adjust downward rather than upward. Other factors also led to subtracting rather than adding. For example, restricted beddown facilities in the theater, the Air Force policy of frequently deploying less than all the aircraft from a particular unit, and the presence of two or more aircraft units at a particular deployed location, made it advisable to deploy less than the full doctrinally-prescribed complement of weather support personnel. Overall, however, because of the rapid expansion of the DESERT SHIELD operation, not only in personnel but also in the number of locations to which American forces deployed--far more than envisioned by the war plans, AWS deployed many more personnel than it had expected to under the war plans.<sup>5</sup>

TAC, in its capacity as CENTAF Rear, was the overall deployment manager for Air Force assets. It developed the basic Air Force deployment plan, the TPFDD which established requirements, means, and schedules for deployment of Air Force forces. The Army's Forces Command (FORSCOM) developed the TPFDD for the Army. The TPFDDs contained all the information necessary to deploy personnel and equipment. They were dynamic documents that changed almost constantly as TAC and FORSCOM planners added new requirements and modified others to reflect expanding and changing needs. The US Transportation Command kept an overall TPFDD covering the deployment of all US forces being sent to the Persian Gulf theater and was responsible for determining and providing all the necessary CONUS (continental US) transportation and overseas airlift and sealift.<sup>6</sup>

In general, the process for getting AWS personnel deployed in support of Air Force units involved determining and sourcing deployment requirements and then submitting them to TAC, which

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<sup>3</sup>Kelly Intvw (U), pp 30-31; Frederick Intvw (U), p 5; Tkach Intvw (U), pp 10-11, 24-25; Col T.C. Tarbell in AWTB Intvw (U), pp 29-30; Goldey Intvw (U), p 14; Riley Intvw (S), pp 17-18, info used (U); intvw (U), W.E. Nawyn, AWS/HO, with Col William S. Weaving, 1690WGP/CV (and 5WS/CC), hereafter cited as Weaving Intvw, pp 18-19; AWS DS/DS Report #2 (S), p 34 (Secs 3.2.9, 6.2-c), info used (U); Koenemann Intvw (U), pp 9-10; St. Onge Intvw (U), pp 10-11.

<sup>4</sup>Kelly Intvw (U), pp 3, 4-6, 31-32; Col T.C. Tarbell in AWTB Intvw (U), pp 29-30; Koenemann Intvw (U), p 9.

<sup>5</sup>Tkach Intvw (U), pp 4, 8, 24; St. Onge Intvw (U), pp 5-6; Koenemann Intvw (U), p 9; AWS DS/DS Report #2 (S), pp 35-36 (Sec 3.4), info used (U).

<sup>6</sup>Tkach Intvw (U), pp 7, 14; St. Onge Intvw (U), pp 7-8.

would enter them into the TPFDD. TAC accepted changes or deletions in the requirements up to five days before the scheduled deployment date. The 5th Wing established deployment requirements for AWS personnel and, working through Headquarters AWS, assigned requirements to the appropriate wing or wings, including, of course, itself. The 5th Wing did not directly source the requirements (except for its own). This was the responsibility of each individual weather wing. In actual practice, 5th Wing, Headquarters AWS, and the other wing or wings coordinated with each other to come up with the personnel needed to source each requirement. In choosing deployees they used various criteria. One was expertise. 5th Wing listed, in order of importance, experience with and/or in forecasting, Army support, VOLANT LIGHTNING (an AWS training exercise), EOTDAs, and Quick Reaction Communications Terminals (QRCTs), as desirable for deploying personnel. Other criteria used were availability (e.g., pending retirement, permanent change of station, or educational assignment), training, and the needs of their home stations.<sup>7</sup>

The procedures for arranging the deployment of Army weather support teams were quite similar. The 5th Wing's 5th Weather Squadron at Fort McPherson, Georgia, an Army support unit, was in a better position to build and source the requirements and to work with FORSCOM, the manager of the Army TPFDD. Therefore, while the 5th Wing and the 5th Squadron worked together in building and sourcing the requirements, the squadron took care of the mechanics involved in the process, including submitting the requirements to FORSCOM.<sup>8</sup>

Mr. Tkach and his people began the deployment process by identifying a requirement for weather support personnel and coordinating it with the supported Air Force unit. If the supported unit approved it, they coordinated the requirement with the wing or wings they determined should source it, usually requesting a certain person or persons from a particular unit or units. Once Mr. Tkach reached agreement with the wing or wings on the sourcing, the 5th Wing deployment manager submitted, with justification, the requirement. It now contained specific information concerning the persons deploying (personal information, from what unit, to where deploying, and what equipment each would carry) to the appropriate office at Headquarters TAC. After review and approval by this office, TAC entered it into the TPFDD--a line entry for each person. Next, the requirement went to the Joint Deployment System at Headquarters MAC which returned it to TAC for an accuracy check. Following this the TAC manpower people, who created the deployment manning document and built a levy flow, sent it to the base or bases at which the proposed AWS deployees were stationed. Each base then generated deployment orders. The TPFDD prescribed when and how the deployees would move from the base to the point of embarkation and their port of debarkation in theater. Of course, breakdowns and delays at certain points and other glitches sometimes disrupted the process.<sup>9</sup>

The 5th Wing encouraged deploying personnel to carry with them on their flight, besides their personal gear, as much job-related equipment as they could handle or weight-restrictions allowed. Thus, the deployees, particularly the early ones, frequently found themselves carrying tactical meteorological and communications equipment, meteorological satellite receivers, and/or small

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<sup>7</sup>Tkach Intvw (U), pp 6-7; Col P.F. Abt in AWTB Intvw (U), pp 8-9; msg (U), 5WW/CAT to AFGWC/CAT, et al, "Background Factors for DESERT SHIELD Deployed Personnel," 051844Z Dec 90; msg (U), 5WW/DP to AIG 8128/CC, "Personnel Actions in Support of Operation DESERT SHIELD--Personnel Policy Guidance Message Number 1," 241235Z Aug 90.

<sup>8</sup> AWS DS/DS Report #2 (S), pp 10-11 (Sec 2.2.2-b), info used (U); telecon (U), W.E. Nawyn, AWS/HO, with S.W. Tkach, 5WW/DOX, 24 Oct 91.

<sup>9</sup>Tkach Intvw (U), pp 13-18.



computers, and sometimes even supplies such as teletype or facsimile paper. The 5th Wing entered such equipment and supplies they took with them into the TPFDD.<sup>10</sup>

Mr. Tkach and his folks at the 5th Weather Wing also had the responsibility of keeping track of deployed personnel after they arrived in the theater. This was not an easy task. Nevertheless, they generally were able to say where a particular person was at a particular time. They passed on this type of information to Headquarters AWS and it, therefore, was also usually aware at all times of the location of each deployed AWS person.<sup>11</sup>

## Getting Established in Theater

### *CENTAF Weather*

As mentioned earlier,<sup>12</sup> Lieutenant Colonel Riley and two other AWS persons arrived in Riyadh on 9 August with part of the advanced CENTAF headquarters element. Dead tired, they disembarked at about 11:00 a.m. into a 100-degree plus temperature and, after waiting for about an hour, were taken to the Marriott Hotel which was to become their temporary home. After another hour of waiting in the lobby of the hotel, they were able to go to their room and rest a bit. However, their day was not yet over. Around 4:00 in the afternoon a bus arrived to take them to the location selected for Headquarters CENTAF, the Royal Saudi Air Forces (RSAF) headquarters building, approximately two miles down King Abdul Aziz Road from the Marriott. Here they worked until about 11:00 p.m. at which point they finally "crashed," as Colonel Riley put it, and went back to the hotel for some badly needed rest.<sup>13</sup>

The next day, 10 August, Colonel Riley and his people worked at getting the Headquarters CENTAF Forward weather station set up. Before the day was over they were able to send out the first situation report from CENTAF Weather to USCINCCENT at MacDill AFB. After operating out of an office on the second floor of the RSAF building for two or three days, they managed to get their own space, a conference room located on the third floor. Here they could set up their weather gear and communications equipment. From there they ran 250 feet of cable up to an antenna which they erected on the roof of the building. They began to present weather briefings, usually two per day, to

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<sup>10</sup>5WW DESERT SHIELD Chronology (S), p 9-21, info used (U); St Onge Intvw (U), pp 7-8; intvw (U), W.E. Nawyn, AWS/HO, with Major Robert P. Callahan, 5WW/DOK, and MSgt Joe E. Brackett, 5WW/DOK, 6 Jun 91, hereafter cited as Callahan/Brackett Intvw, p 2; msg (U), TAC/5WW to ALL, "TACMET/TACCOM Equipment," 141716Z Aug 90; Dickey Intvw (U), pp 3-4.

<sup>11</sup>Tkach Intvw (U), p 18; LTC R.R. Wall and Maj N.E. Buss in AWTB Intvw (U), pp 10, 43.

<sup>12</sup>See above, Chapter I, p 11.

<sup>13</sup>Riley Intvw (S), pp 2-4, info used (U).

Major General Thomas R. Olsen, vice commander of the Ninth Air Force and acting CENTAF Forward commander, and his staff almost immediately.<sup>14</sup>

Approximately 6 weeks later CENTAF moved the weather station to the basement of the building, primarily so it would be close to the CENTAF Operations staff, most of whom were in the basement. It shared an area with personnel from CENTAF's Communications and Computer Systems. The RSAF command post was also in the basement. The CENTAF's Tactical Air Control Center was located, at least until December, outside in the parking lot of a building located behind the RSAF building.<sup>15</sup>

Meanwhile, many more AWS personnel began to arrive in the Persian Gulf theater on the heels of the initial arrivals. Among the earlier arrivals were the first two weather support persons to Special Operations Command, CENTCOM (SOCCENT), Captain Steven D. Skidmore, the staff weather officer to the commander, and Technical Sergeant Glynn Erwin, both of whom deployed to Riyadh on 12 August. They, however, did not remain in Riyadh but went with SOCCENT headquarters to King Fahd Air Base (AB) near Dhahran.<sup>16</sup>

Colonel Riley initially not only functioned as the CENTAF Forward SWO and officer in charge (OIC) of the CENTAF weather support element, but also as the senior AWS officer in the theater and as the acting commander of the entire DESERT SHIELD WSF. As such, he attempted to keep abreast of who was arriving, when they arrived, and where they were. But given the limited communications capabilities, both intratheater and intertheater, this was not an easy job. For making contacts with other locations in theater, he had to use primarily tactical telephones. Communications with the CONUS was mostly via the Automatic Digital Network (AUTODIN), which had a terminal at the US Military Trade Mission located in a compound adjacent to the RSAF Headquarters area.<sup>17</sup>

### ***CENTCOM Weather***

Colonel Riley served as acting officer in charge of the AWS DESERT SHIELD WSF (OICWSF) until Colonel James W. Goldey arrived in Riyadh on 24 August. Colonel Goldey was commander of the 1st Weather Squadron, the AWS unit that supported CENTCOM, and as such, the SWO to the USCENTCOM commander in chief, General Schwarzkopf. According to doctrine, the CENTCOM SWO deployed when the commander in chief did. Initially, General Schwarzkopf deployed CENTAF Commander Lieutenant General Horner to the Persian Gulf to set up and become commander of USCENTCOM Forward while he himself remained in the CONUS for the time being. Consequently, Colonel Goldey did not deploy at that point. When General Schwarzkopf left for the Gulf in late August, Colonel Goldey and two CENTCOM staff weather officers, Majors Nancy E. Holtgard and

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<sup>14</sup>Riley Intvw (S), p 4, info used (U); msg (S), COMUSCENTAF FWD/WE to USCINCCENT/CCJ3-W, et al, "Initial Report," 101100Z Aug 90, info used (U); msg (S), COMUSCENTAF FWD/WE to COMUSCINCCENT/CCJ3-W, et al, "USCENTAF Weather Sitrep 02," 111900Z Aug 90, info used (U).

<sup>15</sup>Riley Intvw (S), pp 4-5, 7, info used (U).

<sup>16</sup>Riley Intvw (S), pp 5, 15, info used (U); Tkach, List of Deployed AWS Personnel (U), Sep 91.

<sup>17</sup>Riley Intvw (S), pp 5-6, info used (U).



Joseph D. Brod, deployed with him. Even then it did not occur, however, without a hitch. Colonel Goldey and his team were, due to shortages of space on aircraft, more than once cut from flight manifests. Finally, the colonel in effect told the CENTCOM assistant chief of staff that if he thought General Schwarzkopf wanted weather support segments in his staff briefings, he better get the three CENTCOM staff weather officers on a flight soon. The assistant chief of staff thereupon immediately put them on the manifest for an early flight.<sup>18</sup>

Colonel Goldey and his two majors left MacDill AFB aboard a crowded MAC C-141 about noon on 23 August and arrived in Riyadh at approximately 2100 local time on the following evening. Their first order of business was to proceed to the billeting arranged for them by CENTCOM Forward in separate hotels, and get some sleep. The colonel's hotel was immediately across the street from the Ministry of Defense and Aviation (MODA), a building complex that included a beautiful five-story stone and marble structure which would become the site of USCENTCOM headquarters. Like the RSAF building where Headquarters CENTAF was located, the MODA complex fronted on King Abdul Aziz Road, but three miles to the south.<sup>19</sup>

The next morning Colonel Goldey visited the MODA building to find out where his work space would be. It turned out to be four stories underground in an area of the building never before occupied. The Saudi Arabian government had specifically prepared this area about ten years before for possible use by the US in the event of some sort of contingency. The area was wired for electric current and it had a few telephones, but in general, its communications capabilities were totally inadequate. It was also devoid of furniture. The Saudi government, however, quickly rectified the situation. In a few days a commercial contractor had installed a switchboard and many new communications lines. Colonel Goldey's team had furniture within 2 days. CENTCOM communicators had already established circuits for weather teletype and facsimile systems, so they were ready to turn the circuits on as soon as the hardware and internal lines were in place. Thus, in 2 or 3 days CENTCOM Weather was able to receive alphanumeric weather data from the CONUS on its teletype. Due to modem problems, however, it was a little longer before CENTCOM Weather received facsimile products. By 28 August, the three CENTCOM SWOs were providing daily weather briefings to General Schwarzkopf and his staff.<sup>20</sup>

The CENTCOM SWO office was strategically located in the center of the whole CENTCOM work area. General Schwarzkopf's war room was only about 15 feet away. The Joint Operations Center was next door in one direction and the Joint Intelligence Center was across the hall. Next door in another direction was the Combined Coalition Center Command Post. Center personnel frequently cut through the weather office to go from center to center. The classified vault where planners were to make many targeting decisions later on was not far away.<sup>21</sup>

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<sup>18</sup>Goldey Intvw (U), pp 2-3.

<sup>19</sup>Goldey Intvw (U), p 4; atch 3 (U), [Col J.W. Goldey, 1690WGP/CC], "Draft Article Submitted to AWS/PA by Col Goldey," n.d., hereafter cited as Goldey Draft Article, to ltr (U), LTC W.S. Weaving, 1690WGP/CV, to Maj Gen J.W. Collens, USAF (Ret), "Request for Information--Desert Shield/Storm," 15 Apr 91, w/6 atchs, hereafter cited as ltr (U), Weaving to Collens, 15 Apr 91.

<sup>20</sup>Goldey Intvw (U), pp 4-5; atch 3 (U), Goldey Draft Article, to ltr (U), Weaving to Collens, 15 Apr 91.

<sup>21</sup>Note (U), Col W.S. Weaving, USAF (Ret), to W.E. Nawyn, 10 Jan 95.

Meanwhile, Colonel Goldey established contact with Lieutenant Colonel Riley at CENTAF Weather and assumed his assigned post as OICWSF, enabling Colonel Riley to devote full time to his duties as the CENTAF SWO and OIC of the CENTAF weather support element. The two officers quickly decided to leave the theater tactical forecast unit (TFU), which CENTAF Weather had already begun to set up, at CENTAF rather than move it to CENTCOM, as called for by AWS weather support doctrine. The chief reason for this decision was that CENTCOM Weather simply had no space available in its office area for the TFU. It shared what was only a medium-sized office with four other Headquarters CENTCOM functional areas and, consequently, the room already had as many as 15 people and eight desks in it, not to mention the weather teletype and facsimile machines. There was no other room available for CENTCOM Weather. Besides, CENTCOM Weather's location four stories underground was not conducive to effective TFU operations. The two men briefly considered moving the TFU to Riyadh AB, which would give it the advantage of being near the Defense Meteorological Satellite Program (DMSP) tactical readout van, but concluded that the location would be too remote from the three WSF headquarters. The 5th Wing subsequently concurred in their decision to collocate the TFU with CENTAF Weather. The TFU, soon referred to as the DESERT SHIELD Forecast Unit (DSFU), remained at CENTAF Weather as long as it continued in operation.<sup>22</sup>

Colonel Goldey and Colonel Riley also agreed to assign the TFU the task of tailoring its general forecast products to Air Force operations, which was the primary function of a tactical weather analysis center (TWAC), so they would not have to establish a separate TWAC. To a large extent the lack of additional space, this time at CENTAF, drove this decision, too. But pressure from the rear, e.g., Headquarters MAC, for AWS to hold down the number of people deploying (a separate TWAC called for an additional 12 persons) also played a role. Indeed, by this time the two officers were spending many hours trying to figure out at what locations in the theater they could safely reduce manning by one person in order to fill new in-theater manpower requirements.<sup>23</sup>

### ***ARCENT Weather***

Senior Airman Bowman and Technical Sergeant Nardi were the earliest Army support weather persons to arrive in the Persian Gulf theater, but not far behind was the six-man weather team of the 82d Airborne Division's Aviation, or Ready Brigade, headed by First Lieutenant Peter C. Clement and Master Sergeant Stephen A. Lord. It arrived at Dhahran either later on the 9th or on the 10th of August. Major White, the XVIII Corps staff weather officer, also landed at Dhahran about the same time. Other Army weather support personnel followed.<sup>24</sup>

Meanwhile ARCENT, the Army component of CENTCOM, established its headquarters in the basement of the Royal Saudi Land Forces (RSLF) building, located on King Abdul Aziz Road only two blocks from CENTCOM. The approximately 500 Headquarters ARCENT personnel, including two weather support people, found themselves "housed" for the first month or so in the vast, unpartitioned

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<sup>22</sup>Goldey Intvw (U), pp 5-6; msg (S), USCINCCENT/WE to 5WW/CAT, et al, "Weather Support Concept (U)," 072300Z Sep 90, info used (U); msg (S), 5WW/CAT to USCINCCENT/WE, et al, "Weather Support Concept (U)," 081600Z Sep 90, info used (U).

<sup>23</sup>Goldey Intvw (U), p 6.

<sup>24</sup>Telecon (U), W.E. Nawyn, AWS/HO, with MSgt S.A. Lord, Det 3, 5WS (and Det 3, 1690 WGP), 17 Oct 91; Riley Intvw (S), p 5, info used (U).

underground parking garage of the building, with sleeping cots lined up in long rows, no air conditioning, only a couple of showers, one bathroom, and the noise associated with one room containing 500 people. Living conditions in this place were not very pleasant, although compared with those under which their Army colleagues in the desert existed, perhaps no so bad.<sup>25</sup>

Major White was the senior ARCENT weather support officer present, but Captain Michael Davison, who reached Riyadh around the 11th or 12th of August, functioned as the ARCENT SWO for approximately a month. Realizing that a more senior officer than a captain was needed as SWO to the ARCENT commander, AWS leaders directed Lieutenant Colonel William S. Weaving, Director of Operations for the 5th Weather Squadron at Fort Bragg, to deploy to Saudi Arabia. After undergoing a crash mobility training session and enduring a lengthy, 53-hour airplane trip, Colonel Weaving arrived at Riyadh on 9 September to assume the dual role of ARCENT SWO and officer in charge of the ARCENT weather support element.<sup>26</sup>

When Colonel Weaving arrived, Captain Davison and Senior Master Sergeant Paul D. Bradley were in the process of setting up ARCENT Weather in a room they had just been assigned a day or two before on the seventh floor of the RSLF building. Colonel Weaving soon managed to get a desk in a next door room, giving him a quiet place to work. The room actually belonged to a Saudi Arabian prince who was in the field and not expected to return until after DESERT SHIELD was over. The first real task facing the colonel after his arrival was to get the station operational. The biggest challenge associated with this was to acquire a communications capability--particularly to establish connections between the Army and Air Force weather communications systems and with deployed Army weather teams in the field. Communications experts spent many days studying how to make all the necessary connections. Implementing the circuits posed even greater difficulties. As a result, a considerable amount of time elapsed before ARCENT Weather obtained the communications capability it needed.<sup>27</sup>

### ***Initial Organization and Manning***

After Colonel Goldey's arrival, the DESERT SHIELD WSF organizational structure took on the form it was to have for the next two and a half months. Colonel Goldey was the senior officer present in the DESERT SHIELD theater and, as such, was the OICWSF. He also served as the Chief of the Weather Division, Directorate of Operations, USCENCOM, and SWO to USCINCENT, General Schwarzkopf. Immediately under Colonel Goldey were Lieutenant Colonel Riley, OIC of the CENTAF weather support element--i.e., all the weather teams supporting Air Force resources deployed to DESERT SHIELD; Lieutenant Colonel Weaving, OIC of the ARCENT weather support element (beginning 10 September)--i.e., all the weather teams supporting Army units deployed to DESERT SHIELD; and Captain Skidmore, SWO to General James J. Lindsay, the SOCCENT commander. However, in keeping with the ARCENT organizational scheme, the ARCENT weather teams at the division, brigade, and regiment level reported directly to the XVIII Corps SWO, Major John R. Conley (after 23 September), who, in turn, reported to Colonel Weaving. Colonels Riley and Weaving, of course, also continued to

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<sup>25</sup>Weaving Intvw (U), p 3; atch 4 (U), rpt, LTC W.S. Weaving, 1690WGP/CV, [Col Weaving's Comments,] n.d., hereafter cited as Weaving Comments (U), to ltr (U), Weaving to Collens, 15 Apr 91.

<sup>26</sup>Weaving Intvw (U), pp 2-3.

<sup>27</sup>Weaving Intvw (U), pp 5-6.



function as SWOs to the CENTAF commander, Lieutenant General Horner, and the ARCENT commander, Lieutenant General John J. Yeosock, respectively.<sup>28</sup>

Colonel Goldey at first had only a small, five-person staff at CENTCOM Weather. Consequently, he found it difficult to fulfill his responsibilities as both SWO to CINCCENT and OICWSF of the growing WSF, particularly the latter, and he and his staff ended up working long and hard hours with little time off. His preferred management style was to leave his three subordinates in charge of CENTCOM component weather elements free to perform their jobs with a minimum of interference on his part. Nevertheless, he coordinated with Lieutenant Colonels Riley and Weaving daily by telephone, proffered advice as needed, and tried to find time for a staff meeting every week. He also provided guidance to Captain Skidmore, the SOCCENT SWO, although, since the SOCCENT headquarters was not located in Riyadh, he did not have many personal meetings with the captain. Colonel Goldey was never able to find time to make personal visits to WSF units. However, Lieutenant Colonel Weaving, with a larger staff and a smaller geographic area to cover, made several trips to the Army weather support teams in the field and Lieutenant Colonel Riley, who initially also had a very small staff, began travelling to CENTAF units in October.<sup>29</sup>

Lines of command were not as easy to establish for the several weather teams supporting DESERT SHIELD from outside of the immediate Persian Gulf theater. AWS attached weather teams at Cairo West AB, Egypt, and, after a time, the Indian Ocean island of Diego Garcia (geographically located in the US Pacific Command AOR) to the DESERT SHIELD WSF. Following a period of some uncertainty, it placed weather teams deployed to Europe (Moron AB, Spain, and a few bases in Great Britain and France) to support SAC DESERT SHIELD/STORM operations to the 2d Weather Wing.<sup>30</sup>

The experiences of AWS personnel setting up operations at locations in the theater outside of Riyadh, especially at bare airbases and Army encampments, generally were quite different from those of the people establishing weather offices and stations at command headquarters in Riyadh. By comparison, headquarters personnel had few and relatively minor problems. Weather teams (sometimes individuals) often deployed to isolated locations in strange environments where they had to start from scratch, frequently having nothing in the way of working facilities, furniture, and even, sometimes, equipment. In spite of this, they somehow managed to begin operations within a short time, frequently taking weather observations within 24 hours. Generally their working facilities (and living accommodations) continued to be much more spartan than those of their colleagues in Riyadh. This was particularly true for Army weather teams.<sup>31</sup>

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<sup>28</sup>Msg (S), 5WW/CAT to 1WW/CAT, et al., "AWS Concept of Operations/Operation DESERT SHIELD (U)," 070706Z Sep 90, info used (U); atch 3 (U), Goldey Draft Article, to ltr (U), Weaving to Collens, 15 Apr 91; Goldey Intvw (U), pp 8-9; AAR (U), USARCENT SWO, [ARCENT Weather Team Final After Action Report--Operations DESERT SHIELD and DESERT STORM,] n.d., hereafter cited as ARCENT SWO AAR, pp 1-2 (Secs I-1 and I-2); intvw (U), W.E. Nawyn, AWS/HO, with Maj John R. Conley, XVIII Corps/SWO (and 6WS/DO), 18 Jul 91, hereafter cited as Conley Intvw (U), p 2.

<sup>29</sup>Goldey Intvw (U), pp 7, 11, 32-33; Weaving Intvw (U), p 16.

<sup>30</sup>JULLS Long Reports (S), SAC/DOWXP, JULLS Number 31234-62871 (00010), [Area of Responsibility Operational Control (U),] and JULLS Number 31524-73069 (00026), [Non-AOR Provisional Weather Units (U),] in SAC JEMP Report (S), 29 Mar 91, pp 9, 24, info used (U); AWS DS/DS Report #2 (S), p 61 (Atch 4), info used (U).

<sup>31</sup>Dickey Intvw (U), pp 3-6; atch 3 (U), Goldey Draft Article, to ltr (U), Weaving to Collens, 15 Apr 91; Riley Intvw (S), p 8, info used (U).

In a few instances commanders sent some of their weather support people back to the United States or refused to accept as many persons as AWS wanted to send to them. This was not necessarily because these commanders did not want or sufficiently appreciate weather support, but perhaps because they had insufficient facilities and/or logistical support available (a number of places were short on tents, cots, and even food) or were under manning ceilings (some imposed by host nations).<sup>32</sup>

Late in August, as a result of a tragic aircraft accident, AWS incurred its first and only DESERT SHIELD/STORM-related fatalities. Shortly after midnight on 29 August a MAC C-5 airlifter crashed almost immediately after takeoff from Ramstein AB, West Germany. The plane carried medical supplies, dry rations, material handling equipment, and, in addition to ten crewmembers, seven military passengers destined for the DESERT SHIELD theater of operations. Thirteen of the 17 persons aboard died in the crash. Four AWS personnel were on the aircraft; three, all from the 2d Weather Wing, perished. Those killed were Staff Sergeant Marc H. Cleyman and Master Sergeant Samuel M. Gardner, Jr., of Detachment 14, 31st Weather Squadron, and Staff Sergeant Rande J. Hulec of the 31st Weather Squadron's Detachment 2. First Lieutenant Cynthia A. Borecky of Detachment 5 of the 5th Wing's 3d Weather Squadron survived, suffering two broken ribs, two broken ankles, and second-degree burns over 60 percent of her body. AWS remembered the three AWS members who lost their lives in the accident in a special memorial service at Scott AFB on 6 September.<sup>33</sup>

## **Initial Buildup of the Weather Support Force**

### ***Manning Growth and Geographic Expansion***

The AWS DESERT SHIELD WSF grew by leaps and bounds. By 14 August, only one week after the first AWS deployees left for the Persian Gulf, AWS had deployed more than 100 persons to twelve different locations, including Moron AB in Spain and the American naval base on the British-owned island of Diego Garcia in the northern Indian Ocean. Five of the locations were in Saudi Arabia: Riyadh, Dhahran International Airport, Jeddah (King Abdul Aziz International Airport), King Khalid International Airport near Riyadh, and Taif. The others were Al Dhafra and Bateen in the United Arab Emirates, Thumrait and Masirah in Oman, and Shaikh Isa in Bahrain. By 31 August AWS had deployed 240 persons to 22 locations, including one Army field encampment. During September, the force increased to a total of 291 persons assigned to 28 locations, including four Army field encampments. September saw the essential completion of the initial AWS (and overall US) DESERT SHIELD deployment. The WSF expanded by only twelve persons in October, but by the end of the month,

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<sup>32</sup>Goldey Intvw (U), pp 19-20, 22; Koenemann Intvw (U), p 7; Tkach Intvw (U), pp 3-4.

<sup>33</sup>Msg (U), AFNEWS/IIBD to AIG 9333, et al., "Air Force News Service," Item #533, "C-5 Galaxy Crash," 292200Z Aug 90; AWS Form 5 (U), "AWSLine Report," [29 Aug 90], w/1 Atch: AF Form 1924 (U), "Events Log," 28 Aug 90; msg (U), AWS/CC to AIG 8380, "Air Weather Service News Releases," 131700Z Sep 90.



AWS weather teams were deployed to a total of 33 locations, 20 of them in Saudi Arabia (including ten Army unit camps in the field).<sup>34</sup>

### ***Manning Restrictions***

Although the WSF increased rapidly, the rate of growth was still barely sufficient to keep up with the expanding requirements and, taking the force as a whole, manning never became excessive. From the beginning, AWS policy was to keep manning to a minimum. Higher authorities, including TAC and MAC, as well as the Army's FORSCOM, largely drove the policy, either explicitly or by implication. TAC, for example, instructed the 5th Weather Wing to go with the bare minimum of people and FORSCOM's guidance to the wing for initial Army weather support manning was similar. In another example, CINCMAC, General Hansford T. Johnson, initially implied that perhaps there were too many weather people in the DESERT SHIELD theater since there wasn't much "weather," i.e., variation in the weather, in Saudi Arabia. AWS later convinced General Johnson that weather would have an impact on DESERT SHIELD operations. Nevertheless, the benign weather in the theater during the initial deployment contributed to the minimum manning policy. Another factor was the conclusion reached by some deployed Air Force wing commanders in the early phase of the operation that they had too many weathermen.<sup>35</sup>

On 7 September AWS directed a complete "scrub" of the WSF, i.e., a careful, hard reappraisal of weather support requirements with a view to paring the support force to the smallest size possible. Between this date and 31 October, AWS, 5th Wing, and the CENTCOM SWO scrubbed and rescrubbed the WSF. Meanwhile, on 4 October USCINCENT imposed an overall ceiling of 250,000 in DESERT SHIELD forces. The Air Force limit within the total was 32,500. On 14 October USCENTAF forbade supporting major commands to deploy any additional personnel to the DESERT SHIELD theater without, in effect, its approval. The only exception was a one-for-one replacement of personnel who had to leave the theater for emergencies, separation from the service, or other special reasons. As a

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<sup>34</sup>Tkach, List of Deployed AWS Personnel (U), Sep 91; 5WW DESERT SHIELD Chronology (S), pp 9-3, 9-5, 9-7, and 9-10, info used (U); AWS DS/DS Report #2 (S), p 52 (Atch 3), info used (U); sitrep (S), 5WW Alert Staff to AWS/DOJ, et al, "Sitrep 07 (U)," 141600Z Aug 90, info used (U); sitrep (S), 5WW/CAT, "5WW Sitrep Nbr 24/Operation DESERT SHIELD (U)," 311531Z Aug 90, info used (U); sitrep (S), 5WW/CAT, "5WW DESERT SHIELD Sitrep #55--as of 01/1500Z Oct 90 (U)," 011700Z Oct 90, info used (U).

The 20 locations in Saudi Arabia were Riyadh, King Khalid International Airport near Riyadh, Dhahran International Airport, King Abdul Aziz International Airport near Jeddah, Taif, Khamis Mushait, King Fahd Air Base, Al Jubail, Tabuk, King Khalid Military City, and the encampments of the U. S. Army's XVIII Corps, 82d Airborne Division, 82d Airborne Division Aviation Brigade, 24th Infantry Division, 24th Infantry Division Aviation Brigade, 1st Cavalry Division, 1st Cavalry Division Aviation Brigade, 3d Armored Cavalry Regiment, 3rd Cavalry Regiment Aviation Squadron, and 12th Aviation Brigade. The other 13 locations were as follows: Al Dhafra, Bateen, Sharjah, Al Ain, and Al Minhad in the United Arab Emirates; Thumrait, Masirah, and Seeb in Oman; Shaikh Isa in Bahrain; Doha in Qatar; Cairo West AB in Egypt; Moron AB in Spain; and the island of Diego Garcia. See sitrep (S), 5WW/CAT, "5WW DESERT SHIELD Sitrep #83--as of: 29/1600Z Oct 90 (U)," 291730Z Oct 90, info used (U).

<sup>35</sup>Tkach Intvw (U), pp 7-8; AWS DS/DS Report #2 (S), pp 32-33 (Sec 3.2.7), info used (U); Col R.R. Wall in AWTB Intvw (U), pp 12-13; Koenemann Intvw (U), pp 7-8.

consequence of the scrubs and the manning ceilings, AWS on 31 October announced that it was limiting the WSF to 300 persons (60 officers, 137 forecasters, 101 observers, and two administrative persons) and instructed Colonel Goldey to redistribute the force as necessary to comply with the final manning scrub.<sup>36</sup>

The personnel ceilings, the AWS/5th Weather Wing manning scrub, and deployment and manning policies in general, together or separately, had several detrimental effects on AWS WSF manning. The deployment policy of at first deploying to particular locations only the minimum number of people required to accomplish the initial set up work, with the idea of increasing the manning later as needed, made a lot of sense when AWS inaugurated it. The second stage, however, never worked the way it was supposed to since the manning scrub and deployment ceilings imposed in October made it very difficult to deploy additional persons to the theater. As one consequence, larger, key units in the theater such as CENTCOM Weather and CENTAF Weather lacked sorely needed managerial expertise since AWS deployment doctrine called for sending management-trained persons in later, rather than in initial deployments. Under the circumstances, very few ever deployed. In addition, the manpower scrub and limitations made it virtually impossible to correct, at least in the short term, the overly junior composition of the Air Force WSF by deploying more senior officers and NCOs to the theater. By making it necessary to do much reshuffling of deployed weather personnel, these scrubs helped to bring about the composite weather units found in many locations.<sup>37</sup>

The ceiling and scrubs, by causing AWS to resort to non-doctrinal manning, also led to manning shortfalls at some weather units in the theater. For example, doctrine called for one officer, four forecasters, and three observers at deployed Air Force base weather stations, but AWS scrubbed the manning to 1-3-3. The NCO dropped was, in many cases, an experienced station chief. Further, the limitations prevented the deployment of full doctrinal Army weather support. The scrub reduced Army corps weather teams from 25 to 16 persons, standard division teams from 25 to 15, and the 101st Air Assault Division team from 34 to 30.<sup>38</sup>

Manning constraints also contributed to personnel shortages at higher headquarters levels. As previously noted,<sup>39</sup> at CENTCOM Weather Colonel Goldey found it difficult to perform all his duties with an initial staff of only five people (two officers, two NCOs, and an administrative specialist). Although in this case the scrub increased his staff to 11 persons (5 officers, 5 forecasters, and 1 administrative specialist), 2 of whom were assigned to operate the DMSP van, which was not collocated with CENTCOM Weather, manning was still less than adequate. At CENTAF Weather Lieutenant Colonel Riley, for a time, made do with himself, two other officers, an NCO, and an airman.

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<sup>36</sup>AWS DS/DS Report #2 (S), pp 23-24 (Sec 3.1.4), info used (U); Frederick Intvw (U), p 5; Col R.R. Wall in AWTB Intvw (U), pp 12-14; Tkach Intvw (U), pp 8-10; msg (S), USCINCCENT/CCCC to USCENAF FWD HQS Element, et al, "Force End-strength Ceiling," 041700Z Oct 90, info used (U); msg (S), USCENAF/CV to AIG 10322 and USCENAF Rear/BS, "Operation DESERT SHIELD Air Force Manpower Limitation," 141110Z Oct 90, info used (U). For AWS DESERT SHIELD weather support force manning under the final AWS/5WW scrub, see AWS DS/DS Report #2 (S), p 41 (Atch 2), info used (U).

<sup>37</sup>AWS DS/DS Report #2 (S), pp 23 (Sec 3.1.4-a [S]), 34-35 (Secs 3.2.9, 3.3 [S]), info used (U); Tkach Intvw (U), pp 7-11, 24-25; Col R.R. Wall in AWTB Intvw (U), p 10.

<sup>38</sup>AWS DS/DS Report #2 (S), pp 32-36 (Secs 3.2.7, 3.3, 3.4), info used (U); Tkach Intvw (U), pp 24-25; LTC R.R. Wall in AWTB Intvw (U), p 16.

<sup>39</sup>See above, this chapter, p 21.

Late in the year, after CENTCOM lifted the October manpower limitations, CENTAF Weather finally received additional people and reached the pre-planned manning level of seven persons (consisting, however, of four officers and three NCOs, rather than the doctrinal five officers and two NCOs), which proved to be at least adequate. Manning at ARCENT Weather (eventually four officers, four forecasters, six observers, and one administrative specialist) was sufficient. The SOCCENT weather team was also adequately manned, although it had only one person (an officer) assigned to it. It originally had two (one officer and one forecaster), but this turned out to be more than needed and the forecaster was soon reassigned elsewhere.<sup>40</sup>

The manning shortages did not result in a WSF incapable of doing its job. The two major shortfalls were those at CENTCOM Weather and CENTAF Weather. Overall, although manning was limited and weather teams had to work hard and put in long hours, the Air Force and Army weather teams had sufficient manpower to perform their mission.<sup>41</sup>

Females constituted nearly nine percent of the DESERT SHIELD/STORM WSF. A total of 39 women deployed during the course of the operation, 26 in the initial buildup before 31 October. Ten of the 39 were officers (1 major, 3 captains, 6 lieutenants). However, the maximum present in the theater at any one time was 37. Culturally-formed attitudes and customs toward women in the Arab host nations sometimes created problems for base weather stations with females in leadership positions as well as for the women themselves. Arab, particularly Saudi Arabian, male officers were reluctant to deal with American female officers on an equal basis. In situations where such dealings were necessary, they sometimes refused to have anything directly to do with their American female counterparts, working instead with or through the women's male subordinates. Obviously, this made communication difficult, or at least inefficient, and made the work of the AWS women officers harder, not to mention the personal frustrations this situation created for them.<sup>42</sup>

## Training for Deployment

Some AWS personnel deployed to DESERT SHIELD without adequate training in certain respects. The relative youth and inexperience of the deployed WSF was a contributing factor to this, but there were others also--for example, training policy and training practices. There are different kinds of training--for example, forecasting and observing, equipment, and mobility. All deployees were well trained professionally, that is, in forecasting and observing. Army support personnel, who trained and exercised as teams with the units they supported, were generally better trained for deployment than Air Force support personnel. Many of the Air Force support personnel deployed were deficient in mobility training, particularly in regards to Southwest Asia. All deployees were trained up to the basic level (Phase I) standard required by AWSR 55-50. However, only persons filling primary and alternate mobility positions had to be trained up to the most advanced or Phase IV level, which included

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<sup>40</sup>AWS DS/DS Report #2 (S), pp 24-27 (Secs 3.2.1-3.2.5), pp 34-35 (Sec 3.3), info used (U); Goldey Intvw (U), pp 6-7; Riley Intvw (S), pp 15-17, info used (U); Col T.C. Tarbell in AWTB Intvw (U), pp 33-34.

<sup>41</sup>AWS DS/DS Report #2 (S), pp 34-36 (Secs 3.3, 3.4), info used (U); Tkach Intvw (U), p 10; Col R.R. Wall in AWTB Intvw (U), p 13.

<sup>42</sup>Tkach, List of Deployed AWS Personnel (U), Sep 91; Riley Intvw (S), p 18, info used (U); Dickey Intvw (U), pp 18-20.



acquiring familiarity with Southwest Asia. The size of the DESERT SHIELD deployment necessarily resulted in many AWS personnel being sent to Southwest Asia with only Phase I mobility training.<sup>43</sup>

Many AWS Air Force deployees also had little or no training in the tactical, meteorological, and communications equipment they had to use in the theater mostly because the equipment systems were new and not all AWS units had yet received the equipment. But also, in some cases, units had not displayed a sufficient sense of urgency in getting its people trained in the equipment. Further, frequently deploying personnel had little experience with high frequency (HF) radio communications operations. AWS had only begun to field the QRCT HF systems used by its Air Force support units in 1990 and some of the deployees had never even seen one before arriving in Southwest Asia. Consequently, the junior AWS officers and enlisted personnel in the Air Force weather support units had much to learn when they arrived in the Persian Gulf theater. For the most part, however, they learned rapidly and were able to cope with the challenges posed by the DESERT SHIELD/STORM operation.<sup>44</sup>

After it began to be evident to AWS that the DESERT SHIELD operation was going to be both large and lengthy and likely require the rotation of personnel after a time (which, incidentally, never actually occurred), and in view of the training shortcomings of the persons already deployed, it began to address the question of whether it had enough persons with tactical training to sustain future deployments. It quickly determined it should inaugurate special tactical training programs for potential future deployees. On 30 August the 5th Wing requested Colonel Abt, AWS DCS for Operations, to consider developing an AWS-wide accelerated tactical training program. The very same day Headquarters AWS made the decision to proceed with such a program and assigned the task of developing it to a working group looking at long term issues. The following day the AWS CAT requested AWS wings to intensify electro-optical and tactical communications training and instruction in Southwest Asia climatology as well as to identify personnel who already had experience or training in these and other technical areas.<sup>45</sup>

By 20 September AWS had decided to tailor its existing VOLANT LIGHTNING tactical training course, conducted by the 6th Weather Squadron at Eglin AFB, to DESERT SHIELD operations and to schedule seven 5-day sessions between 1 October and 7 December designed for persons with limited experience in a tactical environment. The course would include a Southwest Asia meteorological orientation and hands-on training on QRCTs and in the use of tactical meteorological satellite imagery dissemination systems including Wraase satellite receivers. Up to 28 persons, drawn primarily from the AWS wings located in the continental US, could attend each session.<sup>46</sup>

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<sup>43</sup>Kelly Intvw (U), pp 16-17, 26; Koenemann Intvw (U), pp 38-39; AWS DS/DS Report #2 (S), pp 229-231 (Secs 6.2, 6.3), info used (U); Col T.C. Tarbell in AWTB Intvw (U), pp 28-29; Weaving Intvw (U), pp 17-18.

<sup>44</sup>Kelly Intvw (U), pp 17-19; AWS DS/DS Report #2 (S), pp 229-231 (Secs 6.2, 6.3), info used (U); Col T.C. Tarbell in AWTB Intvw (U), pp 28-30; Riley Intvw (S), p 18, info used (U).

<sup>45</sup>Tkach Intvw (U), pp 22-23; msg (U), AWS/CV to AIG 8380/CV, "DESERT SHIELD Personnel Rotation Plan," 141530Z Sep 90; msg (U), 5WW/CAT to AWS/DO, et al, "Accelerated Tactical Training," 300325Z Aug 90; msg (U), HQ AWS/CAT to AIG 8366/DO, "DESERT SHIELD Long-Term Challenges," 312125Z Aug 90. For Brig Gen Kelly's views on personnel rotation issues, see Kelly Intvw (U), pp 3, 6-7.

<sup>46</sup>Msg (U), HQ AWS/DO to 1WW/DO, et al, "DESERT SHIELD VOLANT LIGHTNING," 201900Z Sep 90.



In response to a suggestion from Headquarters AWS, both the 1st and 2d Weather Wings also stepped up tactical training. The 1st Wing quickly arranged, through its 20th Weather Squadron, for training sessions, dubbed VOLANT LIGHTNING WEST, at Kadena AB, Okinawa, Japan. The squadron conducted the first session from 15 through 19 October. The course included chemical warfare defense equipment and weapons training. The 2d Wing expanded QRCT training to include potential DESERT SHIELD deployees and sent out headquarters personnel to assist personnel at subordinate units to complete their training.<sup>47</sup>

In a separate action later, the Commander of AFGWC, Colonel Adrian A. Ritchie, Jr., in November ordered preparations begun for an in-house DESERT SHIELD tactical training course at AFGWC. His main concern was to ensure AFGWC would be ready to deploy additional personnel (up to that time it had only deployed six) should this become necessary to replace casualties the DESERT SHIELD WSF might incur if hostilities broke out in the Persian Gulf theater. During January and February 1991 AFGWC conducted several sessions of the 1-week course which nearly 100 persons attended. Using 5th Weather Wing training materials as well as AFGWC experts, the course aimed to train attendees for deployment either to the DESERT SHIELD Forecast Unit or to tactical base weather stations. It included chemical warfare defense equipment, weapons, and full Phase I and Phase II mobility qualification training, as well as technical training specifically tailored to Southwest Asia.<sup>48</sup>

### Working and Living Conditions in Theater

CENTCOM Weather remained in its crowded quarters four stories underground in one of the structures in the MODA complex in Riyadh for the duration of the DESERT SHIELD/DESERT STORM operation. The building in which it was located was modern, but operating efficiently out of the tiny, cramped room to which it had been assigned was a challenge--even with only a small, six-person staff. However, the room was in a strategic location very near the CENTCOM war room and next to three important Headquarters CENTCOM directorates: Joint Operations, Joint Intelligence, and Coalition, Coordination, and Integration. Moreover, it was eventually able to acquire a second office in another building about a mile up the street, initially a small room on the fourth floor, later two rooms on the first floor. Unfortunately, due in part to the inadequate communications at the second location, CENTCOM Weather was never able to take full advantage of this additional space.<sup>49</sup>

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<sup>47</sup>Point paper (U), 1WW/DOJ, "VOLANT LIGHTNING WEST," 19 Oct 90; art (U), Capt R. Granger, Det 8, 20WS, "Constant Training Keeps WX Members Ready," AWS Observer, Aug 91, p 4; Hist Rprt (U), 5WW, Jul-Dec 90, p 17.

<sup>48</sup>Intvw (U), W.E. Nawyn, AWS/HO, with Col James A. Phillips, AFGWC/DO, 13 Jun 91, hereafter cited as Phillips Intvw (U), pp 2-3; intvw (U), W.E. Nawyn, AWS/HO, with Col Adrian A. Ritchie, Jr., AWS/CC, 12 Jun 91, hereafter cited as Ritchie Intvw (U); intvw (U), W.E. Nawyn, AWS/HO, with Maj James P. Millard, AWS/DOO, 20 Jun 91, hereafter cited as Millard Intvw (U), p 3; memo (U), AFGWC/DOO to AFGWC/WF, "DESERT SHIELD In-House Training," 5 Nov 90; draft msg (U), AFGWC/CAT to 5WW/CAT and USCINCCENT/Weather, "Background Factors for DESERT SHIELD Deployment Personnel Pool," [ca 4 Dec 90].

<sup>49</sup>Atch 3 (U), Goldey Draft Article, to Itr (U), Weaving to Collens, 15 Apr 91; atch 5 (U), rprt, LTC W.S. Weaving, 1690WGP/CV to Col J.W. Goldey, 1690WGP/CC, "After Action Input - DESERT SHIELD/STORM," 22 Mar 91, hereafter cited as Weaving DS/DS AAR, in AAR (U) CENTCOM/WE, [CENTCOM AARs,] n.d. [ca. 25 Mar 91], w/11 atchs, hereafter cited as CENTCOM Weather Staff

Meanwhile, CENTCOM Weather personnel continued to enjoy excellent housing. They lived in hotels until around the end of September, at which time they moved to furnished apartments, paid for by Saudi Arabia, in a walled compound about five miles from the MODA complex. They used buses, also provided by the Saudi government, to travel back and forth between their working and living facilities.<sup>60</sup>

CENTAF Weather remained in its second assigned location, a former storage area in the basement of the RSAF building in Riyadh that it shared with another function, for about 2 months. In November it moved to another area of the basement, this time to a room of its own. As a former storage area, the room wasn't lavish--pipes and vents were hanging from the ceiling, but it provided sufficient space and adequate power for CENTAF Weather's needs and it was only a short distance from General Horner's war room. However, being in the basement, it was not well suited for HF operations. By this time it was clear the air war, if there was going to be one, would be directed from the RSAF basement. Thus, CENTAF Weather found itself in a strategic location--a prime spot upon which other functions cast envious eyes. More than once Colonel Riley had to fight to keep it. But he managed to hang on to it, and CENTAF Weather remained in these quarters until the end of DESERT STORM.<sup>61</sup>

The Saudi government first billeted CENTAF Weather personnel in hotels in downtown Riyadh, but after about six weeks, i.e. in mid-September, it moved them out to a mammoth, virtually brand new housing complex about 20 miles south of the center of Riyadh consisting of many individual townhouse-type dwellings and apartment buildings, including one high rise, perhaps 5,000 units all told. The Saudi government had constructed the complex, called Eskin Village, several years before as, according to one version, a place to house members of Saudi Arabia's nomadic, desert-roaming Bedouin tribes. The Bedouins, however, had found the buildings too confining and preferred to remain in the desert. Eskin Village remained empty until the Saudi government, largely for security reasons, began moving in thousands--perhaps as many as 20,000--American military personnel during DESERT SHIELD. It wanted to get the Americans out of the downtown hotels because it feared terrorist attacks. For this reason, too, it set up tight security and a perimeter defense at the complex. The Eskin Village location made it necessary for CENTAF Weather personnel to commute, at least once daily, between their living and working quarters. The Saudi government, however, provided buses for this purpose.<sup>62</sup>

Although the Eskin Village buildings were new, due to their lengthy vacancy, they needed repairs in order to make them fully habitable--e.g., many of the plumbing and electrical fixtures were out of order. Fortunately, however, the already installed air conditioning system still worked. The buildings had refrigerators and stoves when the Americans moved in, but lacked other kinds of furniture. Colonel Riley and his people at first occupied largely barren rooms devoid of beds and other furnishings. Before long, however, the Saudi government provided them with comfortable beds, couches, chairs, and other furniture. In January, they even received, compliments of the government

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AARs (U).

<sup>60</sup>Atch 5 (U), Weaving DS/DS AAR, to CENTCOM Weather Staff AARs (U).

<sup>61</sup>Riley Intvw (S), pp 6-7, info used (U); AAR (U), LTC G.F. Riley, Jr, CENTAF/SWO, [CENTAF SWO After Action Report,] n.d., Sec E, hereafter cited as CENTAF SWO AAR (U).

<sup>62</sup>Riley Intvw (S), pp 11-14, info used (U); Weaving Intvw (U), pp 3-4.

of Japan, television sets for their quarters. At that point, they were, as Colonel Riley remarked, "living in tall cotton."<sup>53</sup>

The ARCENT weather team moved from its living quarters in the basement garage of the RSLF building out to Eskan Village at approximately the same time as the CENTAF Weather people. On 27 November ARCENT Weather, after operating out of its assigned room on the seventh floor of the RSLF building for more than 2 months, and on the orders of the ARCENT chief of staff, also moved out to Eskan. ARCENT moved it to Eskan, at least in part, to give it the additional space it needed as a result of the deployment of the Army VII Corps to the DESERT SHIELD theater. Nevertheless, wanting to remain near the intelligence and operations staffs at the RSLF building, ARCENT Weather initially opposed the move. Lieutenant Colonel William H. Campbell, now the OIC of the ARCENT weather support element even tried, without success, to persuade the ARCENT chief of staff to reverse his decision. ARCENT was also moving several other headquarters functions to Eskan. This was partly because the Saudi government desired to reoccupy some of the offices in the RSLF building and partly because ARCENT wanted to reduce, in the interests of increased efficiency and security, the great amount of traveling between Eskan Village and downtown Riyadh made necessary by the fact that many Headquarters ARCENT personnel now lived at Eskan. American military personnel always traveled by bus from one location to the other, but the possibility of a terrorist attack on the buses was never totally absent. None, however, ever actually occurred.<sup>54</sup>

The shift to Eskan worked out well for ARCENT Weather, at least after a few weeks. It now had the additional space needed because of the increase in its personnel resulting from the arrival of VII Corps. Its new quarters were relatively spacious--a five-room apartment in the Eskan high rise. The move, however, initially resulted in severe communications problems. For approximately a month ARCENT Weather was without operational hardwire circuits. In the meantime, it had to rely entirely on HF communications. Fortunately, hostilities did not begin during this time and, by the end of December, the circuits were installed and operational. Also on the negative side, ARCENT Weather, for a time, still had to operate a work center at the RSLF building to support the intelligence and operational staffs since Eskan did not have the necessary communications circuits. This required a good deal of traveling back and forth which put an additional strain on its personnel. This situation came to an end in early January when the intelligence and operational staffs, as well as the ARCENT command section, also moved to Eskan.<sup>55</sup>

SOCCENT Weather was collocated with Headquarters SOCCENT in a new building at King Fahd International Airport near Dhahran for the entire DESERT SHIELD/STORM operation. The weather teams supporting Headquarters Air Force Special Operations Command (AFSOC) and Headquarters Army Special Operations Command (ARSOC) were located in the same building, as were the headquarters they supported. The SOCCENT and AFSOC weather teams were billeted approximately seven miles from SOCCENT headquarters; the ARSOC team had quarters immediately next to the headquarters building.<sup>56</sup>

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<sup>53</sup>Riley Intvw (S), pp 12-14, info used (U).

<sup>54</sup>Goldey Intvw (U), pp 9-10; Weaving Intvw (U), pp 2-3; ARCENT SWO AAR (U), Atch 1-2-2.

<sup>55</sup>ARCENT SWO AAR (U), pp 3, 4-5 (Sec I-3a).

<sup>56</sup>AAR (U), Capt T. Lauten, SOCCENT/SWO and Det 1, 1690 WGP/CC (and HQ 1WS), to USCINCCENT/J3-W, "DESERT SHIELD/STORM AAR," 6 May 91, w/7 atchs, hereafter cited as SOCCENT SWO AAR (U), p 4; Riley Intvw (S), p 5, info used (U).



Working and living conditions in the field, with the field defined as anywhere in theater outside of Riyadh, were generally far more austere than in Riyadh, except perhaps for other large urban centers such as Dhahran or Jeddah. As Colonel Goldey put it, "overcoming difficulties was what [life in the field] was all about." Each weather team had to adapt to its environment if it was to accomplish its mission of providing effective support to its customers. Generally speaking, AWS weather teams supporting Air Force units worked under circumstances much superior to those of the teams supporting Army units. Among the former, personnel staffing base weather stations at civilian airports and permanent airbases usually enjoyed better working facilities than did their colleagues at temporary, more or less bare bases. Some base weather stations were located in airport terminal buildings, others in tents.<sup>67</sup>

Army support weather teams, going where their supported units went, found themselves not only in the desert away from population centers, but also sometimes in isolated locations miles from main roads (e.g., the 101st Air Assault Division's 3d Brigade weather team was about 50 miles from a main road). Mostly, the Army support teams worked out of tents or vans or even, sometimes, outside in the open. Under such conditions, sand in their equipment was a constant problem. The 82d Airborne Division weather team was probably unique in that at both the division's initial and forward positions it operated in a "hard" facility (i.e., a building).<sup>68</sup>

The weather team supporting the 1st Infantry Division (Mechanized) had what Lieutenant Colonel Weaving called "probably...the best designed five-ton van in the Army's inventory." It had its entire weather station set up in the van:

[Their observing work station has] everything that they need at their fingertips,...places for their barometers, places for their clocks, and everything...all either tied in or framed in. They've got places to lay out their charts [and] places for all of the regs that they need to have right at their fingertips. They've got a separate work station for their GOLDWING. They've got...all their communications equipment lined up so that their air conditioning unit keeps it all cool. They've got a sink, they've got a microwave, they've got a refrigerator. The sink drains on to the ground for their equipment so that when they are in a sandy environment...[the] water coming down draining into the ground hole helps establish a good ground for their equipment. They keep bunks set up inside their van so that they are all individually lighted and...air conditioned so that people that are trying to sleep can control their...sleeping area....There is also a little work station for the SWO to sit at a small desk and preview his briefing slides and so on before

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<sup>67</sup>Atch 3 (U), Goldey Draft Article, and Atch 4 (U), Weaving Comments, to ltr (U), Weaving to Collens, 15 Apr 91; Goldey Intvw (U), pp 15-16; Koenemann Intvw (U), p 28; Dickey Intvw (U), pp 15-16.

<sup>68</sup>Weaving Intvw (U), pp 22-23; intvw (U), W.E. Nawyn, AWS/HO, with LTC William H. Campbell, ARCENT/SWO, ARCENT WSE/OIC (and 7WS/DO), 1 Jul 91, hereafter cited as Campbell Intvw (U), pp 11-12; intvw (U), W.E. Nawyn, AWS/HO, with Capt F. Paul Bridges, 11D(M)/SWO and Det 19, 1690WGP/CC (and Det 8, 5WS/CC), and SSgt Duane P. Bullard, 11D(M)/ASWO and Det 19, 1690WGP (and Det 8, 5WS/NCOIC), 19 Jul 91, hereafter cited as Bridges/Bullard Intvw (U), pp 7-8.



he...gives a briefing. The whole thing is self-contained and easily set up...in about 2 hours time or less.<sup>59</sup>

The majority of the WSF lived in tents, sometimes in 10- to 15-person tents located in tent "cities." A considerable number of Air Force support personnel, however, had "hard" billets such as trailers or hastily-erected, pre-fabricated buildings, but Army weather support people, since they usually lived in more austere locations out in the desert, generally did not. Among the few who did were several persons at King Fahd International Airport who slept in the parking garage of the terminal building and the 82d Airborne weather team that slept for a time in a warehouse. Many Army weather teams slept in large "double-hulled" Bedouin tents, others wound up in small, two-man pup tents. Some didn't even have tents, but slept out in the open on cots--perhaps under camouflage, covered with a poncho, or partially protected by a jerry-rigged shelter of some sort. There were also times and places where two persons working different shifts had to share the same cot. At the 3rd Brigade of the 101st Air Assault Division, the three-man observer team dug into the side of a sand dune to make a sleeping area. They placed sandbags all around the dug out area and covered it with tent canvas and camouflage. The only furnishings in the dugout were three cots for sleeping. A few Army weather teams, however, enjoyed the luxury of air-conditioned tents.<sup>60</sup>

Everywhere out in the field, heat, sand, and creatures such as scorpions, snakes, and extremely aggressive flies combined to make life rather miserable. At first the challenge was to survive the heat, later on, to endure the cold. The ubiquitous sand and dust got into everything--equipment, tents, clothing, not to mention hair and mouths. Army weather teams out in the desert again generally had the worst of it. Even though their overall water supply was always adequate, they often did not have the luxury of a shower available. If they did, the shower probably had only cold water. In many places, persons simply poured water over themselves in an attempt to simulate a shower. The Army teams ate mostly "meals, ready to eat" (MREs), but also generally had one regular hot meal per day and in some instances, two. They usually had radios in their tents and, later on, after the first of the year, even television sets--once again compliments of the government of Japan.<sup>61</sup>

For the most part, the morale of the WSF remained high during Operation DESERT SHIELD/STORM. A small minority complained, but most members of the force accepted and learned to cope with whatever situation they found themselves in, worked hard, and kept their spirits high. However, AWS had to return several persons to the US for medical or psychological reasons. It also found it necessary to discipline three members of the WSF for violating the ban on the use of alcoholic beverages in the theater. Probably the hardest thing on morale was the uncertainty that surrounded the duration of their deployment. The abandonment of rotation plans which military authorities had contemplated for a time added to that uncertainty. Deployed personnel now became more eager than ever to get the operation

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<sup>59</sup>Weaving Intvw (U), p 32.

<sup>60</sup>Atch 3 (U), Goldey Draft Article, atch 4 (U), Weaving Comments, and atch 6 (U), rpt, LTC W.S. Weaving, [Iraq/Kuwait Visit,] 11 Apr 91, to ltr (U), Weaving to Collens, 15 Apr 91; brfg slides (paper) (U), [AWS/DOJ], "DESERT SHIELD Orientation," n.d.; Goldey Intvw (U), pp 15-16; Weaving Intvw (U), pp 22-23; Campbell Intvw (U), pp 11-12; msg (S), ARCENT Main/G2-SWO to USCINCCENT/Weather, et al, "Fourth Visit to DESERT SHIELD Army Support WETMS," 081718Z Nov 90, info used (U).

<sup>61</sup>Atch 4 (U), Weaving Comments, to ltr (U), Weaving to Collens, 15 Apr 91; Goldey Intvw (U), pp 15-16; Weaving Intvw (U), pp 22-23, 24; Campbell Intvw (U), pp 11-12; msg (S), ARCENT Main/G2-SWO to USCINCCENT Weather, et al, "Fourth Visit to DESERT SHIELD Army Support WETMS (U)," 081718Z Nov 90, info used (U).

over. Thus, morale soared when the air war commenced in mid-January and they could begin to see the end coming.<sup>62</sup>

## Management of the Weather Support Force

Under the lead wing concept, management of the WSF resided with the 5th Weather Wing. However, as was mentioned earlier,<sup>63</sup> Headquarters AWS also became involved in direct management, due, at least partly, to the lack of a clarity as to the exact roles of the lead wing and Headquarters AWS and the consequent blurring of their respective functions. But it also resulted from a desire on the part of the AWS commander to stay on top of matters concerning the deployed WSF. This required the AWS staff to remain informed of what was transpiring in the Persian Gulf theater and, frequently, why. This, in turn, led Headquarters AWS to send, through the 5th Weather Wing, many requests for information--over 300 during the course of the operation--to WSF leaders. The stream of questions placed an extra burden on the WSF headquarters staffs--especially at CENTCOM and CENTAF, forcing them to direct time and energy away from resolving issues before they became problems, which, ironically, resulted in another round of questions from the rear.<sup>64</sup>

This Headquarters AWS practice was not popular with either the deployed WSF or the 5th Wing. It gave rise to charges from both, as well as from within Headquarters AWS itself, that Headquarters AWS was doing too much micromanaging of the WSF. Colonel Goldey, at CENTCOM Weather, as well as Lieutenant Colonel Riley at CENTAF Weather, found themselves, with their limited staffs, in the position where they frequently did not have either the time or the resources to answer all the Headquarters AWS questions. This experience, which they and all the senior deployed weather personnel found very frustrating, created an "us" versus "them" outlook in many instances. Colonel Koenemann called the frequent inability of the 5th Wing to answer questions to the complete satisfaction of Headquarters AWS the most disappointing aspect of the wing's role in Operation DESERT SHIELD/STORM. The questions were most burdensome, however, during the first four months of Operation DESERT SHIELD. They began to taper off in December, after the WSF became more settled and manning stabilized. They became relatively few in number after actual hostilities began in mid-January. Although at the time the questions, suggestions, and proddings from HQ AWS

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<sup>62</sup>Atch 4 (U), Weaving Comments, to ltr (U), Weaving to Collens, 15 Apr 91; Goldey Intvw (S), pp 11-12, 15, 30, info used (U); Weaving Intvw (U), pp 23-24; Campbell Intvw (U), p 11; Koenemann Intvw (U), pp 26-27; Conley Intvw (U), 18 Jul 91, p 4.

<sup>63</sup>See above, Chapter 1, pp 6-7.

<sup>64</sup>Draft Report #2 (S), AWS, "An Analysis of Air Weather Service Support to Operations DESERT SHIELD and STORM," Apr 91, hereafter cited as Draft AWS DS/DS Report #2 (S), Sec 2.2.2, info used (U); AWS DS/DS Report #2 (S), pp 8 (Secs 2.12-i, 2.1.3), 14-15 (Secs 2.2.2-g, 2.2.3-d), info used (U); Kelly Intvw (U), p 24; Koenemann Intvw (U), pp 24-25; Campbell Intvw (U), p 23; Goldey Intvw (U), pp 10-11, 13-14, 19; Riley Intvw (S), p 38, info used (U); Col R.R. Wall in AWTB Intvw (U), pp 11, 20; Col T.C. Tarbell in AWTB Intvw (U), p 30.

were not particularly appreciated out in the theater, many proved to be very valuable and useful, some even prescient.<sup>65</sup>

General Kelly agreed that he had micromanaged (although he preferred to call it microwatched), perhaps had even gone overboard, but had done so only when necessary "to ensure that what we had out there [was] ...a WSF...providing the support that was needed" and probably no more than many other senior commanders--CINCMAC, for example. "I was," he stated, "absolutely determined we were not going to replicate some of the dumb things we did in Vietnam." He maintained, however, that the number of questions was not excessive, given the length and size of the DESERT SHIELD/STORM operation and when, again, compared with other commanders. Moreover, he insisted, "most of the questions tended to focus not on questioning why, but questioning why not." He admitted, however, that answering the questions placed an extra burden on the deployed headquarters staffs in Riyadh.<sup>66</sup>

### Establishment of a Provisional Weather Group

About a month after the first WSF personnel arrived in the Persian Gulf theater and after it had become apparent the DESERT SHIELD operation might last for some time, AWS began to take steps to implement already existing plans to organize the deployed WSF on a more permanent basis. AWS contingency plans called for establishing a provisional weather group and appropriate subordinate units in the event of an extended operation. Forming a provisional organization had several advantages and no significant disadvantages. It would create a more efficient and more cohesive, as well as more visible, organization by better integrating the WSF and erecting a clear-cut command structure and chain of command. Perhaps equally important, it would promote esprit de corps and, thereby, the morale of the WSF. In addition, it would help deployees to locate their duty assignments when they arrived in theater, make it easier to account for deployed equipment and material, and provide weather support leaders with nonjudicial punishment authority (in other words, enable commanders to better maintain discipline). Besides, TAC and MAC were in the process of establishing in-theater provisional organizations. It seemed advisable for AWS to do likewise.<sup>67</sup>

AWS plans called for setting up a provisional weather group with two subordinate provisional squadrons, one for Air Force support, the other for Army support. This basically had been the plan followed by AWS in Southeast Asia during the Vietnam War 25 years earlier. However, after considerable discussion, AWS decided not to use the two squadron concept in Southwest Asia but

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<sup>65</sup>Koenemann Intvw (U), pp 30-31; Goldey Intvw (U), pp 12-14; Riley Intvw (S), pp 38-40, info used (U); CENTAF SWO AAR (U), Sec K-1; LTC R.R. Wall in AWTB Intvw (U), pp 11, 20; Maj N.E. Buss in AWTB Intvw (U), p 21; Col T.C. Tarbell in AWTB Intvw (U), pp 30-33; St. Onge Intvw (U), pp 9-10, 29-30, 34.

<sup>66</sup>Kelly Intvw (U), pp 11-16. For Colonel Frederick's view on this issue see Frederick Intvw (U), pp 4, 6-7.

<sup>67</sup>Frederick Intvw (U), p 8; Koenemann Intvw (U), p 22; LTC R.R. Wall in AWTB Intvw (U), p 40; AWS/XT hist input (U), Jul-Dec 90; ltr (U), HQ MAC/XPM to HQ AWS/DO, "Provisional Units for DESERT SHIELD," 18 Sep 90; msg (U), AWS/CAT to 5WW/CAT, et al, "Provisional Weather Units for DESERT SHIELD," 231305Z Oct 90; msg (S), AWS/CAT to 5WW/DO, et al, "Activation of DESERT SHIELD Provisional Units (U)," 022345Z Nov 90, info used (U).



instead appoint two deputy commanders under the provisional weather group commander, one to manage Air Force support and one to manage Army support, who would also function as directors of operations on the provisional group headquarters staff. AWS would establish detachments and operating locations as needed directly under the provisional weather group. The desire to keep WSF staffing to a minimum played a role in the decision, but probably the main driving force behind it was Headquarters AWS's reluctance to establish two squadrons at a time when AWS was undergoing a restructuring process that included the elimination of almost all existing AWS weather squadrons.<sup>68</sup>

On 6 September the AWS CAT asked MAC's Directorate of Manpower and Organization for advice on whether to establish a provisional organization in the Persian Gulf theater. As a major command, MAC had the power to create provisional structures when it deemed them necessary. The directorate replied on 18 September that MAC was currently reviewing the advisability of forming provisional units. Two days later Headquarters MAC announced it would establish a number of provisional units, including weather units. On 28 September General Kelly formally directed the formation of a provisional weather group, and 3 days later approved the proposed structure incorporating the two deputy commander concept and setting up a number of detachments and operating locations under the group.<sup>69</sup>

General Johnson, CINCMAC, approved the creation of the 1690th Weather Group (Provisional) (WGP) with the structure proposed by AWS on 9 October. On 20 October General Horner, the CENTAF Commander, concurred with its establishment. Meanwhile, AWS and the MAC Manpower and Organization Directorate worked out the specifics of the group's structure, including all the necessary detachments, operating locations, and work centers. On 31 October Headquarters MAC issued a special order activating the 1690th WGP at Riyadh, and another activating 20 provisional weather detachments and eight provisional operating locations at various locations in or near the DESERT SHIELD theater, all effective 1 November. Acting through its 1610th Airlift Division (Provisional), MAC also issued another special order on 11 November which appointed Colonel Goldey the commander of the 1690th WGP.<sup>70</sup>

Establishing the detachments and operating locations of the 1690th WGP had negative effects for Army support weather teams. They frequently failed to receive mail or equipment bearing numbered 1690th WGP designations instead of the more standard, familiar addresses (such as the SWO of a particular division). This meant that the teams had to track down the equipment they were supposed to get but didn't, not always an easy task. Moreover, by creating numbered detachments

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<sup>68</sup>Frederick Intvw (U), pp 5, 8; Koenemann Intvw (U), pp 22-24; LTC R.R. Wall in AWTB Intvw (U), p 40.

<sup>69</sup>Ltr (U), Col T.C. Tarbell, AWS CAT Dir (AWS/ADO), to HQ MAC/XPM, "Provisional Units for DESERT SHIELD," 6 Sep 90; ltr (U), HQ MAC/XPM to HQ AWS/DO, "Provisional Units for DESERT SHIELD," 18 Sep 90; msg (S), HQ MAC/CAT to USCENTAF Fwd Hqs Element/COMALF, et al, "SWA Base Level Organizational Structures (U)," 201300Z Sep, info used (U); brfg (S), n.a., "Decision Briefing: Provisional Units (U)," 1 Oct 90, info used (U).

<sup>70</sup>SSS (S), HQ MAC/XPM, "Organizational Concept for Airlift Provisional Units (U)," 12 Oct 90, w/4 tabs, tab 2-4 wd, tab 1: msg (S), CINCMAC/CC to CENTAF/CC, et al, "Organizational Concept for Airlift Provisional Units (U)," 131906Z Oct 90, info used (U); msg (S), CENTAF/CC to CINCMAC/CC, et al, "Organizational Concept for Airlift Provisional Units," 201100Z Oct 90, info used (U); ltr (S), HQ AWS/CAT to HQ MAC/CAT, "Request to Establish Provisional Units (U)," 8 Oct 90, w/2 atchs (S), info used (U); SO GA-11 (S), HQ MAC, 31 Oct 90, info used (U); SO GA-17 (S), HQ MAC, 31 Oct 90, info used (U).



at both the corps and division levels which reported directly to the provisional weather group, the new structure was at odds with the Army chain of command. Divisional weather teams consequently adopted the practice of reporting to the WGP through their corps weather team rather than directly.<sup>71</sup>

The special order establishing the 1690th WGP attached the group to the 5th Weather Wing for command, but to USCENTCOM for operational control and the host unit at Riyadh for logistical support. Operational control of the 1690th's Air Force support units rested with CENTAF, its Army support units with ARCENT. A 1690th detachment created specifically to provide weather support to special operations forces was under the operational control of SOCCENT. The two deputy commanders technically functioned as directors of operations for the 1690th WGP's commander, but also continued to serve in their respective capacities as SWO to the CENTAF commander and OIC of the CENTAF weather support element and as SWO to the ARCENT commander and OIC of the ARCENT weather support element. In addition to the 20 detachments and eight operating locations, the 1690th WGP also had four work centers, all located in Riyadh. Three--the Tactical Air Control Center, Airlift Control Center, and Base Weather Operations were under the supervision of the CENTAF's Deputy Commander for Operations, the other, the DESERT SHIELD Tactical Forecast Unit, operated directly under the 1690th WGP commander.<sup>72</sup>

### **Additional Buildup of the Weather Support Force**

By 31 October 1990, the US had deployed, as noted earlier,<sup>73</sup> over 200,000 personnel to DESERT SHIELD and total coalition forces numbered approximately 240,000. But Saddam Hussein still showed no signs of pulling his army out of Kuwait. On 8 November President Bush ordered the US military to deploy more than 150,000 additional troops to the Persian Gulf. Up to this time the deployed forces had adopted a purely defensive posture; the additional manpower would give the coalition an offensive capability. By 17 January US strength had reached 454,000, including 49,000 Air Force personnel and more than 1,100 aircraft. Most of the additional personnel came from Army forces stationed in West Germany.<sup>74</sup>

On 29 November the UN authorized the use of force against Saddam if he did not withdraw from Kuwait by 15 January 1991. Saddam, however, continued his refusal to leave. A final, last

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<sup>71</sup>Note (U), Col W.S. Weaving, USAF (Ret), to W.E. Nawyn, 10 Jan 95.

<sup>72</sup>Msg (S), HQ MAC/CAT to USCENTAF Fwd HQ Element/COMALF, et al, "Implementation of Provisional Organization Structure," n.d. [ca early Nov 90], info used (U); msg (S), HQ MAC/CAT to USCENTAF Fwd Hqs Element/COMALF, et al, "SWA Base Level Organizational Structures (U)," 201300Z Sep 90, info used (U); tab 1 (S), msg, CINCMAC/CC to USCENTAF/CC, et al, "Organizational Concept for Airlift Provisional Units (U)," 131906Z Oct 90, to SSS (S), HQ MAC/XPM, "Organizational Concept for Airlift Provisional Units (U)," 12 Oct 90, w/1 tab, info used (U); Goldey Intvw (U), p 11; msg (S), AWS/CAT to 5WW CAT, et al, "Activation of DESERT SHIELD Provisional Weather Units (U)," 022345Z Nov 90, info used (U).

<sup>73</sup>See above, Chapter I, pp 3-4.

<sup>74</sup>Art (U), "Raising the Ante," Time, 19 Nov 90, pp 48-49; art (U) Richard Lacayo, "A Reluctant Go-Ahead," Time, 21 Jan 91; USAF/CAFH DS/DS Chronology (S/WN/NF), pp 132, 136, 240, 445, info used (U); Tkach Intvw (U), p 5.

minute meeting on 9 January between US Secretary of State James F. Baker and the foreign minister of Iraq ended without any progress in resolving the crisis. Three days later, both houses of the US Congress voted to support President Bush in the use of force if Saddam Hussein did not meet the 15 January deadline. On 16 January (Washington DC time), since Saddam still was giving no indication of leaving Kuwait, coalition air forces, primarily US, began hostile air operations against Iraq.<sup>75</sup> With the beginning of hostilities, DESERT SHIELD became DESERT STORM.

The AWS WSF grew commensurately with the increase in the DESERT SHIELD combat forces. When CENTCOM lifted the overall Persian Gulf theater ceiling following President Bush's orders to send more troops to the theater, it also lifted the manning cap on the AWS WSF. From 31 October to 15 January the force increased from 303 to 428 persons. Most of the growth occurred in December, which saw AWS deploying more than 100 additional personnel. When the air war began, the WSF operated from 35 locations--20 in Saudi Arabia (including all of the Army weather teams), seven in the United Arab Emirates, three in Oman, and one each in Qatar and Bahrain. Three weather teams remained at MAC and SAC DESERT SHIELD support bases outside of the Persian Gulf theater. AWS's regular peacetime weather detachment at Incirlik AB, Turkey, augmented by more than 20 persons drawn mostly from the 2d Weather Wing in West Germany, also provided support to DESERT SHIELD. Over the next 6 weeks, while US and other coalition air forces conducted their air campaign against Iraq, the WSF continued to grow, reaching a peak in late February of 475 persons stationed at 40 different locations.<sup>76</sup> (See Figures II-1 and II-2.)

Over half of the growth in the WSF in the November to mid-January timeframe occurred in the Army support element, due mostly to the deployment to the Persian Gulf theater of the VII Corps from Germany and the 1st Infantry Division (Mechanized) from the US. This increased from 103 persons on 31 October to 201 on 17 January. Integrating the VII Corps weather teams, who had never trained for a Southwest Asia deployment, became one of the major challenges of the period for the DESERT SHIELD WSF. On the whole, the process went well even though the weather teams from Europe had a lot to learn in a short time. To help raise their level of readiness as quickly as possible, the 5th Wing

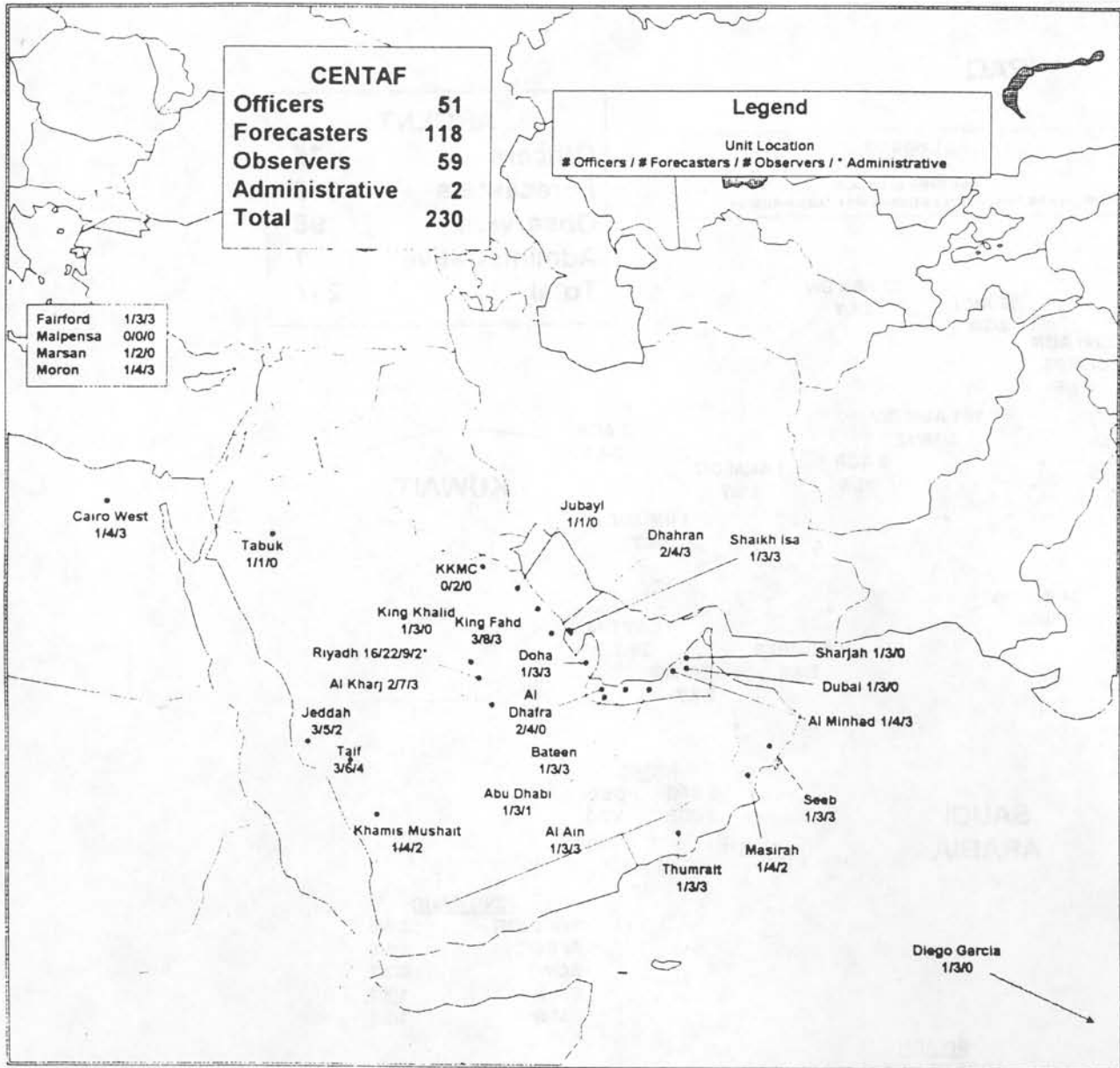
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<sup>75</sup>USAF/CAFH DS/DS Chronology (S/WN/NF), pp 160, 221, 226, 239, info used (U).

<sup>76</sup>LTC R.R. Wall in AWTB Intvw (U) p15; Tkach, List of Deployed AWS Personnel (U), Sep 91; AWS DS/DS Report #2 (S), pp 24 (Sec 3.1.4-d), 47-51 (Atch 3), 56-69 (Atch 3), info used (U). For a complete breakdown of the weather support force at its peak, see AWS DS/DS Report #2 (S), pp 42-44 (Atch 3), info used (U).

The locations as of 24 February 1991 were as follows: In Saudi Arabia: Air Force, Army, and special operations support - King Khalid Military City; CENTCOM, Air Force, and Army support - Riyadh; Air Force and special operations support - King Fahd AB; Air Force support only - King Khalid Int'l Airport (Riyadh), Dhahran Int'l Airport, King Abdul Aziz Int'l Airport (Jeddah), Al Jubail, Al Kharj, Khamis Mushait, Tabuk, Taif; Army support only - encampments of the Headquarters VII Corps, Headquarters XVIII Corps, 1st Armored Division, 1st Cavalry Division, 1st Infantry Division (Mechanized), 3d Armored Division, 24th Infantry Division, 82d Airborne Division, 101st Air Assault Division, 12th Aviation Brigade, 2d Armored Cavalry Regiment, 3d Armored Cavalry Regiment. In the United Arab Emirates: Abu Dhabi, Al Ain, Al Dhafra, Al Minhad, Bateen, Dubai, Sharjah. In Oman: Masirah, Seeb, Thumrait. In Bahrain: Shaikh Isa. In Qatar: Doha. Outside of the Persian Gulf: Moron AB, Spain; Cairo West AB, Egypt; British naval base, Diego Garcia; RAF Fairford, United Kingdom; Mont De Marsan AB, France. See AWS DS/DS Report #2 (S), pp 50, 59 (Atch 3), info used (U).

**LOCATION AND ASSIGNED MANNING STRENGTH OF  
CENTAF SUPPORT WEATHER UNITS  
ON OR ABOUT 17 JAN 91**

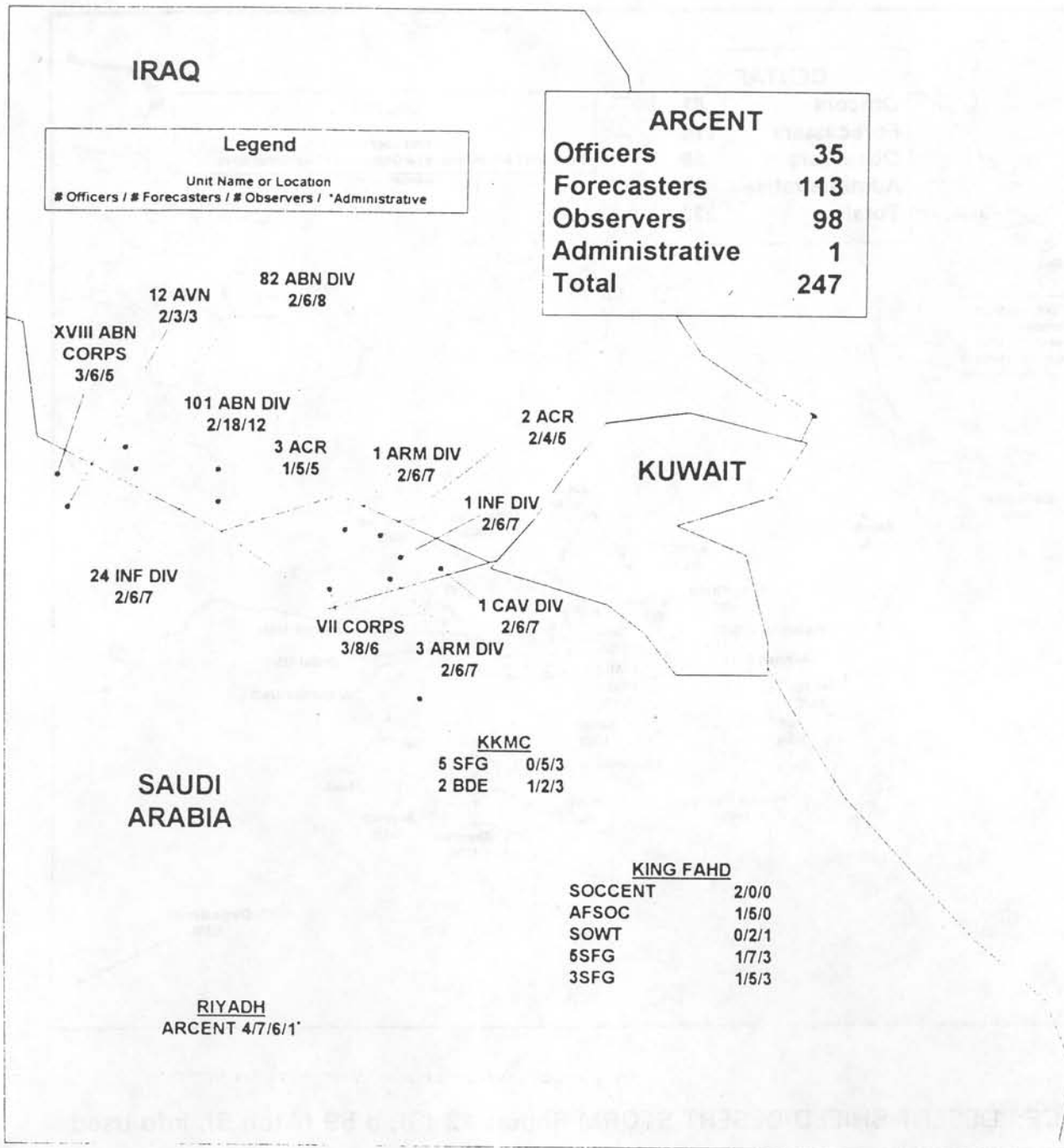


SOURCE: DESERT SHIELD/DESERT STORM Report #2 (S), p 59 (Atch 3), info used (U).

Figure II-1

**LOCATION AND ASSIGNED MANNING STRENGTH OF  
ARCENT SUPPORT WEATHER UNITS**

24 FEB 91



SOURCE: DESERT SHIELD/DESERT STORM Report #2 (S), p 51 (Atch 3), info used (U)



sent them training materials (e.g., climatology and forecasting techniques for the Persian Gulf region).<sup>77</sup>

With the expansion of the WSF and the consequent need to station weather support teams at more locations, AWS, on three occasions--once in November 1990 and twice in January 1991--requested MAC to activate additional provisional units. In response, on 11 January, MAC issued a special order activating four more provisional detachments (but also inactivating one operating location) effective 15 January. On 6 February, during the DESERT STORM period, MAC promulgated yet another special order which activated an additional three detachments and three operating locations effective immediately. This made for a total of 27 provisional weather detachments and 10 provisional weather operating locations, the peak number of units the 1690th WGP reached during Operation DESERT SHIELD/STORM. Fifteen detachments and eight operating locations supported CENTAF units, 11 detachments and two operating locations ARCENT forces, and one detachment SOCCENT units. These figures do not include the AWS operating locations at Moron AB and those at Royal Air Force Base (RAF) Fairford, United Kingdom, and Mont de Marsan AB, France, in February nor the AWS detachment at Incirlik AB, all of which AWS considered part of the DESERT SHIELD WSF, although not part of the 1690th WGP.<sup>78</sup>

Meanwhile, on 16 November Lieutenant Colonel Campbell replaced Lieutenant Colonel Weaving as the ARCENT SWO and deputy commander of the 1690th WGP for Army weather support. Colonel Weaving then became 1690th vice commander, although in reality he functioned more as the group's director of operations, to which post he was able to bring valuable knowledge and understanding of Army weather support operations. Colonel Campbell had been director of operations for the 7th Weather Squadron at Heidelberg, Germany, which provided weather support to the VII Corps. He was, therefore, well acquainted with VII Corps leaders and familiar with its weather support requirements. Lieutenant Colonel Jerry R. Thornberry became the VII Corps SWO when it deployed to DESERT SHIELD. Colonel Thornberry and Major Conley, the XVIII Corps SWO, worked directly under Colonel Campbell.<sup>79</sup>

As the 15 January deadline approached and the likelihood of hostilities increased, CENTAF Rear at Langley AFB directed all functional managers of deployed personnel to make plans for "attrition replacements", i.e, additional personnel and equipment to send to the Persian Gulf to replace wartime casualties and equipment losses. In response, the 5th Wing developed a personnel attrition replacement concept which called for AWS to acquire and maintain an ongoing ten percent attrition replacement capability. Under the concept, AWS would designate, by name, the persons who it would deploy as attrition replacements and require these individuals to be ready to deploy within 72 hours of notification and also create an additional ten percent backup attrition capability. At the request of the 5th Wing, Headquarters AWS took the lead in developing a specific plan for implementing the

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<sup>77</sup>AWS DS/DS Report #2 (S), pp 47, 50 (Atch 3), info used (U); ARCENT SWO AAR (U), pp 3-4 (Sec I-3a); Campbell Intvw (U), p 24; Koenemann Intvw (U), p 39; msg (U), AWS/CAT to 5WW/CAT, et al, "DESERT SHIELD Technical Training Package," 301741Z Nov 90.

<sup>78</sup>Ltr (S), HQ AWS/CAT to HQ MAC/CAT, "Request to Establish Additional Provisional Units (U)," 14 Nov 90, w/1 atch, info used (U); ltr (S), HQ AWS/CAT to HQ MAC/CAT, "Request to Establish Additional Provisional Units (U)," 8 Jan 91, info used (U); SO GA-42 (S), HQ MAC, 11 Jan 91, info used (U); ltr (S), HQ AWS/CAT to HQ MAC/CAT, "Request to Establish Additional Provisional Units (U)," 31 Jan 91, w/1 atch, info used (U); SO GA-48 (S), HQ MAC, 6 Feb 91, info used (U); AWS DS/DS Report #2 (S), pp 42-44 (Atch 3), info used (U).

<sup>79</sup>Weaving Intvw (U), pp 16-17; Campbell Intvw (U), pp 2, 21.

concept. By 11 January it had completed a plan which gave the 5th Wing authority to directly task particular wings and identify specific individuals for deployment. Fortunately, AWS never had to implement the attrition plan since it did not incur any combat casualties.<sup>80</sup>

Shortly after the beginning of DESERT SHIELD, AWS began to consider whether, in the light of the lengthening and expanding operation and President Bush's decision to activate up to 200,000 reservists, it might have to recall Air Force Reserve individual mobilization assistants (IMAs) to active duty, as provided for in its planning documents. AWS concluded it could profitably use IMAs as backfills for AWS units with empty slots created by deployments to DESERT SHIELD. However, the Air Staff's requirement that active forces demonstrate that active duty personnel were not available to fill a manning requirement before using Air Force Reserve or Air National Guard personnel made it difficult for AWS to use IMAs. Nevertheless, AWS was eventually able to acquire the services of 13 Air Force Reserve and Air National Guard personnel as backfills in CONUS weather stations.<sup>81</sup>

Although Air Force policy during DESERT SHIELD/STORM called for using all available active duty resources before activating reserve forces, MAC advised AWS if the Army called up a combat unit for which an Air National Guard unit provided weather support, AWS should ask for the activation also of the supporting weather flight. AWS subsequently sought and successfully obtained the activation of one Air National Guard weather flight. On 5 February 1991 AWS requested MAC to immediately activate the 165th Weather Flight, Louisville, Kentucky, on the grounds it provided weather support to the 20th Special Forces Group, an Army National Guard unit that had been ordered to active duty on 1 February. MAC, after coordinating with the National Guard Bureau and the state of Kentucky, acceded to AWS's request and on 11 February ordered the 13-person weather flight to mobilize. Four days later MAC directed the flight to deploy to Fort Bragg by 23 February to train with the 20th Special Forces Group in preparation for deploying with it to the Persian Gulf theater at a "later date." That later date, however, never came since DESERT STORM ended before the two units completed their training.<sup>82</sup>

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<sup>80</sup>Tkach Intvw (U), pp 22-24; msg (U), 5WW/CAT to AWS/CAT, et al, "Attrition Replacements," 041832Z Jan 91; msg (S), 5WW/CAT to AWS/CAT, "Personnel Attrition Replacement Concept (U)," 071956Z Jan 91, info used (U).

<sup>81</sup>Msg (U), HQ AWS/CAT to MACOS/XPPX, "Scrub of IMAs for 200K," 302230Z Aug 90; AWS DS/DS Report #2 (S), p 33 (Sec 3.2.8), info used (U); ltr (U), [5WW/]RF to [5WW/]DO, "Use of ANG Weather Flight Personnel," 12 Oct 90; msg (U), HQ MAC/CAT to AWS/CAT, et al, "Activation of Air National Guard Weather Flights," 232345Z Nov 90.

<sup>82</sup>Intvw (U), W.E. Nawyn, AWS/HO, with LTC Donald R. Hood, 5WW/DOR, 6 Jun 91, pp 5-7; SSS (S), AWS/DOJR, "Mobilization Request for 165th Weather Flight (U)," 5 Feb 91, w/1 atch, info used (U); msg (U), AWS/CAT to 5WW/CAT, et al, "Calling Up ANG Weather Flights," 270145Z Nov 90; msg (U), HQ MAC/CAT to 123TAW/CC, et al, "Execution - Presidential Mobilization of Selected Ready Reserve - Operation DESERT STORM," 111800Z Feb 91; msg (U), HQ MAC/CAT to 123TAW/CC, et al, "Deployment Order for the 165th Weather Flight," 152317Z Feb 91.

## CHAPTER III

### THE WEATHER INFORMATION SYSTEM

#### Tactical Meteorological Equipment

##### *TACMET Deployed*

AWS deployed several types of tactical meteorological (TACMET) systems to the DESERT SHIELD/STORM theater for the use of its WSF: the GMQ-33 Tactical Cloud Height Detector Set, AN/TMO-34 Tactical Meteorological Observing Set, TMO-36 Tactical Wind Measuring Set, Back-Up Observing System (BOS), Marwin Tactical Upper Air Sounding System, TPS-68 Tactical Radar Set and, for obtaining satellite data, the Wraase Satellite Receiver, Rapid Deployment Imagery Terminal (RDIT), and Mark IVB DMSP readout van. All except the TPS-68 radar and Mark IVB van were small, easily transportable systems which could, if necessary, be carried by deploying personnel, which, as mentioned earlier,<sup>1</sup> is exactly what many AWS deployees did in the early stages of DESERT SHIELD. Later, however, much of the equipment arrived by airlift.<sup>2</sup>

All of these systems except the Marwins and the RDIT were in the AWS inventory when DESERT SHIELD began. However, the GMQ-33, TMO-34, and TMO-36 were all new, recently purchased systems with which AWS personnel as yet had not become very familiar. The GMQ-33 was a self-contained, battery-powered device using laser technology capable of measuring cloud bases to at least 3,000 feet. It weighed 31 pounds, measured 14 by 12 by 14 inches, and could generally be set up by one person in less than 30 minutes. The TMO-34 was a 20-pound, battery-powered unit which enabled weather observers to manually measure precipitation and electronically measure barometric pressure, temperature, dewpoint, and wind speed and direction. One person could set it up in five minutes. The TMO-36 was a somewhat larger, also battery-powered, 120-pound system shipped in five containers. It took about half an hour for one person to set it up. It consisted of a digital readout-recorder, three remote digital readout devices connected by wire, and a collapsible mast equipped with sensors. It measured wind speed and direction, gust strength and spread, peak winds,

<sup>1</sup>See above, Chapter II, pp 15-16.

<sup>2</sup>AWS DS/DS Report #2 (S), pp 217 (Secs 5.2, 5.2.1), 219-220 (Sec 5.2.2-d through h), info used (U); intvw (U), W.E. Nawyn, AWS/HO, with CMSgt Rufus D. Grizzle, 5WW/DOOF, and MSgt William A. Brothers, 5WW/DOOJ, 5 Jun 91, hereafter cited as Grizzle/Brothers Intvw (U), pp 2-3.



and the standard deviation of wind speed. AWS sometimes referred to the three systems together as the Tactical Observing System.<sup>3</sup>

The Back-up Observing System (BOS), a designation introduced during DESERT SHIELD, consisted of a belt weather kit, Sims anemometer, and Taylor barometer. The belt weather kit included a compass, thermometer, rain gauge, and sling psychrometer, as well as several circular hand computers used to calculate pressure altitude, station pressure, and dewpoint. The sling psychrometer was a thermometer on a chain which was slung in a circle to measure air temperature and dewpoint. As its name indicates, the BOS was a secondary system to be used in the event the primary systems, the GMQ-33, TMQ-34, and TMQ-36, failed. As it turned out, since many CONUS-based AWS units still did not possess the primary systems, their personnel deployed only with belt weather kits and, consequently, many deployed units at first also had only belt weather kits.<sup>4</sup>

When DESERT SHIELD began, AWS had a TACMET employment policy in place, but experience in and feedback from the theater soon brought AWS to review its original policy. The result was that on 15 October General Kelly approved a new TACMET deployment policy. Building on the previous policy, the new policy required the following to have a GMQ-33 and TMQ-34: each weather team supporting flying missions or a special forces operations base; the Army support tactical operations center; each Army airfield, landing zone, and mobile observing team; each special forces operations or forward operating base; each special operations weather team; the Air Force Special Operations Control Center and the Air Force Special Operations Detachment. It required only one TMQ-36 at each base airbase instead of two as under the old policy. In addition, the new policy stipulated there should be a BOS at every location and/or with each weather team. However, the TMQ-34, not the BOS, was the doctrinally designated primary back-up system for the GMQ-33 and TMQ-36.<sup>5</sup>

The increasing number of weather support teams deployed to the Persian Gulf, along with the new TACMET requirements, created an ever greater demand for tactical equipment. The demand was immediate since many deployed units did not have the new TACMET equipment. The 5th Wing, therefore, immediately began to collect and ship TACMET to units in the theater. Not surprisingly, for the first month or so there was a degree of confusion as to what, where, and how much equipment had been deployed, and to what was left. Inevitably, shortfalls (as defined under the new AWS TACMET policy) appeared at deployed units. However, after it began to require TACMET status reports three times per week from the field (including what TACMET was where and its operational status), the wing soon got the TACMET situation under control.<sup>6</sup>

<sup>3</sup>CMSgt R.D. Grizzle in Grizzle/Brothers Intvw (U), p 2; hist (S), AWS, CY 89, pp 252-257, info used (U); brfg (U), Capt M.S. Sorrels, HQ AWS/DOJR, to AWS/CC, et al, "TACMET Doctrine," 15 Oct 90.

<sup>4</sup>St. Onge Intvw (U), p 13; msg (S), 5WW/CAT to AWS/CAT, et al, "DESERT SHIELD TACMET Requirements," 271630Z Sep 90, info used (U); atch 1 (U), "Draft Concept of Operations for Tactical Meteorological Equipment," to memo (U), HQ AWS/DO to 1WW/DO, et al, "Draft TACMET COP," [ca 5 Apr 90], w/1 atch; CMSgt R.D. Grizzle in Grizzle/Brothers Intvw (U), p 2.

<sup>5</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.2.2-a,b, info used (U); AWS DS/DS Report #2 (S), pp 217-218 (Sec 5.2.2-a), info used (U); msg (U), AWS/DO to AIG 8148, "New TACMET Doctrine," 152300Z Oct 90.

<sup>6</sup>AWS DS/DS Report #2 (S), pp 217-218 (Sec 5.2.2-a,b), info used (U); St. Onge Intvw (U), p 12; intvw (U), W.E. Nawyn, AWS/HO, with Maj Daniel V. Ridge, 5WW/DNC, 7 Jun 91, pp 3, 6, hereafter cited as Ridge Intvw (U); CMSgt R.D. Grizzle in Grizzle/Brothers Intvw (U), p 2.



The 5th Wing began by sending whatever equipment it could spare from its own units. After exhausting its own assets it began to task the other AWS wings, and even some Air National Guard weather flights, for available equipment. In essence, it requisitioned all AWS TACMET except for equipment which wings or other units had to hold in reserve for other possible contingencies. The 5th Wing also ordered 40 TMQ-34s and all the GMQ-33s in stock from the Sacramento, California, Air Logistics Center (SM-ALC) equipment depot. Meanwhile, Headquarters AWS and the 5th Wing agreed to a ten percent spare rate for all the TACMET, but later, the 5th Wing unilaterally raised the TMQ-34 spare rate to 20 percent due to the many operational failures this system was experiencing. By the end of DESERT SHIELD/STORM, AWS had deployed 73 GMQ-33s, 105 TMQ-34s, and 13 TMQ-36s in support of the operation.<sup>7</sup>

### ***TACMET Performance***

TACMET performance was mixed. Overall, the equipment probably proved to be less rugged than advertised. Performance of individual types ranged from very good for the TMQ-36 to poor for the TMQ-34. The TMQ-36 worked almost flawlessly. None of the 13 sets failed; it had a 100 percent in-commission rate for the operation. The Taylor barometer operated reliably as did, for the most part, the belt weather kit and the Sims anemometer. The thermometers in the belt weather kit had a tendency to break easily and sand and dust getting into the rotating mechanism of the anemometer sometimes degraded its performance. The GMQ-33 generally did well. Only 13 of the 73 sets deployed had problems, usually when moisture got into their optical sensors. The 5th Wing restored seven of the sets to service by replacing their optical units. Three of the sets were still at 5th Wing awaiting replacement of their optical units when DESERT STORM ended. The wing returned two sets to depot because of multiple problems. The overall in-commission rate of the GMQ-33 was 78 percent.<sup>8</sup>

The TMQ-34, however, had many problems. Both heat and moisture adversely affected its performance. The former caused the most trouble in the early part of DESERT SHIELD, the latter during the later stages of the operation. The ever present dust and sand also degraded its performance. Deployed units experienced problems with almost all of the TMQ-34's component parts, including the wind sensor, temperature-dewpoint sensor, computer unit, barometer, circuit cards, rain gauge, wiring, and cable. The 105 TMQ-34s deployed to DESERT SHIELD/STORM experienced 51 failures. Deployed units sent 18 systems back to the 5th Weather Wing for repairs, 15 due to the failure of component parts and three because of wiring problems. The TMQ-34's overall in-commission rate was a low 59 percent.<sup>9</sup>

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<sup>7</sup>AWS DS/DS Report #2 (S), pp 218-220 (Sec 5.2.2-b,d,f,g), info used (U); St. Onge Intvw (U), pp 12-13; intvw (U), W.E. Nawyn, AWS/HO, with LTC Donald R. Hood, 5WW/DOR, 6 Jun 91, pp 4-5; Grizzle/Brothers Intvw (U), pp 2-3, 15-16.

<sup>8</sup>AWS DS/DS Report #2 (S), pp 219-220 (Sec 5.2.2-d,f,h), info used (U); Riley Intvw (S), pp 25-26, info used (U); Grizzle/Brothers Intvw (U), pp 2, 8.

<sup>9</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.22-h, info used (U); AWS DS/DS Report #2 (S), pp 220 (Sec 5.2.2-g), 223-224 (Atchs 26, 27), info used (U); Goldey Intvw (U), pp 24-25; Riley Intvw (S), pp 25, info used (U); Campbell Intvw (U), p 17; ARCENT SWO AAR (U), pp 28-29 (Sec III-1).

The TMQ-34 components that failed most frequently were the temperature-dewpoint and wind sensors. Eleven of the 18 systems returned to the 5th Wing needed replacements for their sensor units. The system was designed for the observer to step outside wearing the sensor unit around his or her neck and then take it back inside after making the required observation. But the wind sensor needed several minutes to stabilize and during this time, in the hot desert environment, the unit heated up causing the temperature-dewpoint sensor to provide an inaccurate reading. Meanwhile, blowing sand, if present, sometimes got into the wind sensor, making it too inaccurate. Consequently, observers found it difficult, if not impossible, to use both the wind sensor and the temperature-dewpoint sensor in the same observation. The sensors also became inaccurate in the rain.<sup>10</sup>

There were also several other problems with the TMQ-34. For example, the cable connecting the sensor and computer units was only six feet long, so observers could not remote the sensor unit outside to provide continuous data while keeping the computer unit inside. Moreover, the constant wrapping and unwrapping of the cable which the observing procedure required sometimes resulted in the cable breaking.<sup>11</sup>

In fairness to the TMQ-34, it should be pointed out that deployed weather teams often did not use it in the way they should have in terms of its design. As suggested by its short cable and the observing procedure it required, the manufacturer had not designed the TMQ-34 for remote operations. Yet weather teams frequently left the equipment mounted outside where it was exposed continuously to the elements, thus contributing to its failures. In the case of the Army weather teams out in the field, this was usually unavoidable; they had no "inside" to which they could take their equipment." In a sense, the fact that it, as a meteorological system intended for operating in a tactical environment, was not designed to be operated remotely or where it might be outside all the time was perhaps the system's basic flaw, which suggests that the system should not have been procured for the purpose intended.<sup>12</sup>

The weather teams deployed to DESERT SHIELD were not the first to encounter problems in operating the TMQ-34. AWS had received reports of shortcomings in the system, including the difficulty of obtaining accurate, simultaneous readings with the wind and temperature/dewpoint sensors, in March and April 1990, but it had not had time to rectify these problems before DESERT SHIELD began.<sup>13</sup>

As the magnitude of the problem with the TMQ-34 became apparent, Headquarters AWS and the 5th Wing, as well as units in the field, set to work to devise temporary work-arounds. One obvious action for units in the theater was to fall back on the BOS when the TMQ-34 failed. Some units, if

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<sup>10</sup>AWS DS/DS Report #2 (U), pp 220 (Sec 5.2.2-g), 223-224 (Atchs 26, 27), info used (U); Riley Intvw (S), p 25, info used (U); Campbell Intvw (U), p 17; Grizzle/Brothers Intvw (U); Goldey Intvw (U), pp 24-25.

<sup>11</sup>Grizzle/Brothers Intvw (U), p 7.

<sup>12</sup>Note (U), LTC T.P. Walters, HQ AWS/DPM, to W.E. Nawyn, HQ AWS/HO, [TMQ-34 Performance,] 4 May 92; note (U), LTC R.R. Wall, HQ AWS/DDO, to W.E. Nawyn, HQ AWS/HO, [TMQ-34 Performance,] 11 May 92; AWS DS/DS Report #2 (S), p 220 (Sec 5.2.2-g), info used (U); Goldey Intvw (U), pp 24-25; note (U), Col W.S. Weaving, USAF (Ret), to W.E. Nawyn, 10 Jan 95.

<sup>13</sup>Msg (U), AWS/PML to AIG 8380/DOO, et al, "TMQ-34, Tactical Meteorological Observing Set, Performance," 152237Z Mar 90; ltr (U), HQ 1WW/DOO to AWS/PML, "TMQ-34 Meteorological Observing Set Performance," 19 Apr 90, w/1 atch wd.

their entire TMQ-34 system did not fail, continued to use the parts that worked and substituted the BOS for the ones that didn't--e.g., if the wind sensor broke, use the Sims anemometer instead--while awaiting a replacement system. Colonel Riley made an attempt to create a repair capability in Riyadh, but this failed because the necessary test equipment and spare parts were lacking. Thus, deployed units had to go along with the established maintenance concept, which meant sending the broken TMQ-34s back to the US for repair. The approximate turn-around time for this process was at first a totally unacceptable 2 months.<sup>14</sup>

The existing AWS logistics support concept for deployed TACMET equipment called for returning a broken system to its home unit if it could not be repaired locally. Trained maintenance personnel at the home base would either repair the equipment or, if repairing it was beyond their capability, send it to the repair depot at SM-ALC. The 5th Wing succeeded in cutting the turn-around time for the TMQ-34s down to 3 to 5 weeks by getting permission for deployed units to send the broken TMQ-34s directly to the depot and persuading the depot to send out a replacement before it received the broken system. However, this was still too long, so the 5th Wing's Chief Master Sergeant D. Rufus Grizzle and Master Sergeant William A. Brothers, with the help of the TAC communications people, made arrangements to have the TMQ-34s repaired at Langley AFB, which would make it unnecessary to ship the equipment all the way across the continent to California. This further expedited the repair process and reduced the turn-round time to less than 2 weeks.<sup>15</sup>

The 5th Weather Wing's decision to raise the TMQ-34's spare rate from 10 to 20 percent also helped to overcome the problems created in the field by the system's high failure rate. To implement this new policy, the 5th Wing requisitioned as many additional systems as it could find and shipped them off to the Persian Gulf. As a result of the shorter repair time and the 20 percent spares policy, the deployed WSF had plenty of operational TMQ-34s on hand by the time DESERT STORM hostilities began in mid-January.<sup>16</sup>

Meanwhile, Headquarters AWS and the 5th Wing, with the assistance of SM-ALC, began working on more permanent and/or long-term solutions to the TMQ-34 problem. They were hampered in this effort, however, by the fact that the manufacturer of the TMQ-34, the Tele-Signal Corporation, had ceased to exist and they could, therefore, not obtain its assistance in making basic changes in the system itself. AWS, therefore, enlisted the help of SM-ALC in devising ways to improve TMQ-34 performance. However, events overtook this project. DESERT STORM ended before it got very far.<sup>17</sup>

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<sup>14</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.2-h, info used (U); AWS DS/DS Report #2 (S), p 220 (Sec 5.2.2.2-g), info used (U); Riley Intvw (S), pp 25-26, info used (U); Grizzle/Brothers Intvw (U), pp 8-9.

<sup>15</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.2.2-h, info used (U); AWS DS/DS Report #2 (S), pp 218-219 (Sec 5.2.2-c), info used (U).

<sup>16</sup>AWS DS/DS Report #2 (S), pp 218-219 (Sec 5.2.2-c), info used (U); Riley Intvw (S), p 25, info used (U); Grizzle/Brothers Intvw (U), pp 4, 15-16.

<sup>17</sup>Msg (S), 5WW/CAT to AWS/CAT, et al, "Lessons Learned," 071927Z Dec 90, info used (U); msg (U), 5WW/CAT to AWS/CAT, "TMQ-34s," 221307Z Jan 91; mfr (U), 2Lt W.S. Strickland, AWS/PMT, to AWS/PMT, "SM-ALC Actions to Improve TMQ-34 Uptime," 24 Jan 91; memo (U), LTC P.J. Johnson, AWS/PMT, to AWS/APM, et al, "Cat Tasker #17--(Items 3A and 3C)," 30 Jan 91; point paper (U), AWS/PMLM, "TMQ-34 Transportable Meteorological Observing Set Supportability for Col Frederick's Executive Review at SM-ALC," 20 Feb 91.



Obtaining timely maintenance was a problem connected not only with the TMQ-34, but with all deployed TACMET equipment. The AWS TACMET maintenance concept going into DESERT SHIELD was not workable for a contingency operation conducted a long distance from the US. This came through loud and clear from the theater. It simply took too long to return a broken TACMET system to the US for repairs and then ship it all the way back to the Persian Gulf theater.<sup>18</sup>

The 5th Wing's aggressive action to shorten the TACMET repair turn-around time by taking greater control over the repair process, not only of the TMQ-34, but all TACMET, even to the point of doing the repairs itself, was successful, but it still was only a short-term fix. The 5th Wing recognized this and, consequently, began to consider, as a long-term solution to the problem, establishing an in-theater TACMET maintenance capability. This would require, among other things, deploying repair technicians to the theater along with the testing devices and spare parts they would need to do their job. The wing soon concluded, due to the lack of spare parts, it would not be feasible, at least at that time, to repair TACMET equipment in the theater. It, therefore, began instead to concentrate on building up in the theater a large store of spare systems which deployed weather units could tap as the need arose.<sup>19</sup>

### ***Procurement of the Marwin Tactical Rawinsonde***

AWS also deployed eight Marwin tactical rawinsondes (i.e., upper air sounding systems), which provided upper air data needed for chemical dispersion, turbulence, and other kinds of forecasting, to the Persian Gulf theater during DESERT SHIELD/STORM. A small, lightweight system manufactured by the Vaisala Corporation of Woburn, Massachusetts, a Marwin system consisted of a processor unit, printer, and antennas, all of which could be shipped in three boxes weighing a total of 122 pounds. This was exclusive of the spare parts kit and the radiosondes, balloons, and helium needed to operate the system. The system was easy to use and could be operated by one person.<sup>20</sup>

The Marwin was not in the AWS inventory when DESERT SHIELD began. At that time the GMD-5 transportable rawinsonde set was AWS's tactical upper air sounding system. The GMD-5, however, was a large, bulky, piece of equipment that for its deployment required an entire C-130 aircraft, two 10-ton tractors, and one 36-foot van, as well as an 18-wheeler flat-bed truck at its point of debarkation to take it to its deployed location. It was, in other words, not a truly tactical system. Consequently, particularly since airlift was hard to come by, AWS never seriously considered deploying the GMD-5 to DESERT SHIELD. Instead, it initiated an effort to quickly acquire and deploy several of the much smaller and more mobile Marwin systems, which, several months before, it had already

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<sup>18</sup>Riley Intvw (S), pp 25-26, info used (U); Weaving Intvw (U), pp 19-20; Campbell Intvw (U), p 13; Koenemann Intvw (U), pp 16-17.

<sup>19</sup>AWS DS/DS Report #2 (S), pp 218-219 (Sec 5.2.2.2-c), info used (U); Koenemann Intvw (U), pp 16-17, 31; msg (S), 5WW/CAT to AWS/CAT, et al, "Lessons Learned," 071927Z Dec 90, info used (U); msg (U), 5WW/CAT to AWS/CAT, "TMQ-34s," 221307Z Jan 91; tasker (U), [AWS]/CAT to AWS/PM, "TACMET Maintenance Concept," [ca 22 Jan 91], w/2 atchs, atch 2: memo (U), LTC P.J. Johnson, AWS/PML, to APM, et al, "Cat Tasker #17--(Items 3A and 3C)," 30 Jan 91.

<sup>20</sup>AWS DS/DS Report #2 (S), p 219 (Sec 5.2.2-e), info used (U); mfr (U), Capt J.J. Baer, AWS/PMT, "MARWIN (Vaisala) System," 17 Jul 89; St. Onge Intvw (U), p 31.



decided to procure. Meanwhile, it was able to borrow two Marwins from the US Navy, which was already using the system, and deploy them to the Persian Gulf before the end of August.<sup>21</sup>

AWS had recognized the mobility problem with the GMD-5 for at least two years prior to DESERT SHIELD and, in February 1989, had inaugurated a program to acquire a lightweight, tactical rawinsonde. By early 1990 AWS had settled on the Marwin. However, by the time DESERT SHIELD began, AWS had not yet obtained the money to purchase the 12 Marwins it wanted, nor did funding seem to be imminent.<sup>22</sup>

By September 1990 Headquarters AWS had concluded that it needed six Marwins to deploy to the Persian Gulf theater (including the two needed to replace the systems borrowed from the Navy), particularly on the grounds that if war broke out it might not continue to receive the upper air data it was currently obtaining from Saudi Arabian sources. The 5th Weather Wing concurred. CENTCOM Weather was not so sure; it felt the data being received from the two borrowed systems and the Saudis were adequate for the present. Headquarters AWS, however, was not as confident as CENTCOM Weather that the Saudis would continue to provide upper air data in the event of hostilities. It, therefore, decided to launch an attempt to procure six Marwin systems under the new Rapid Response Process Program the Air Staff announced on 28 September. The new program was specifically designed to "execute directed programs to quickly bring needed operational capability on line." Headquarters AWS felt that the Marwins qualified for the program.<sup>23</sup>

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<sup>21</sup>AWS DS/DS Report #2 (S), pp 156 (Sec 4.4.2-b), 219 (Sec 5.2.2-e), info used (U); Frederick Intvw (U), pp 6, 7; hist (S), AWS, CY 89, p 250, info used (U); msg (S), AWS/CAT to All AWS Wing CATs, "Lessons Learned from DESERT SHIELD (U)," 100404Z Sep 90, info used (U); msg (S), HQ AWS/CAT to 5WW/CAT, "DESERT SHIELD Upper-Air Observations (U)," 242231Z Sep 90, info used (U); msg (S), COMUSCENTAF FWD HQ/CC to USCINCCENT/CCCC, et al., "Movement of Mobile Rawinsonde Equipment to AOR (U)," 220335Z Aug 90, info used (U); msg (S), 5WW/Alert Staff to AWS/DOJ, et al., "5WW SITREP Nbr 16/Operation DESERT SHIELD (U)," 231121Z Aug 90, info used (U).

<sup>22</sup>Hist (S), AWS, CY89, pp 249-252, info used (U); point paper (U), HQ AWS/PMT, "Letter to US Navy on Joint Procurement of Tactical Rawinsonde Equipment," 23 Feb 90; ltr (U), HQ AWS/PM to SPAWAR PMW 141, "Procurement of Tactical Rawinsonde Equipment," 28 Feb 90; memo (U), AWS/XTP to AWS/PMT, "TACRAWIN Table of Allowance Issue," 15 May 90; ltr (U), HQ AWS/XTPP to 1600 MES/CC, "FASCAP Proposal for Light TACRAWIN Systems," 1 Aug 90, w/1 atch; point paper (U), HQ AWS/PMT, "Letter to US Navy on AWS Commitment to Participate in Contract to Purchase Tactical Rawinsonde Equipment," 21 Sep 90; ltr (U), HQ AWS/PM to SPAWAR PMW 141, "Procurement of Tactical Rawinsonde Equipment," [ca 25 Sep 90].

<sup>23</sup>Koenemann Intvw (U), p 19; memo (S), LTC D.P. Regan, HQ AWS/PMC, to LTC R.R. Wall, AWS/DOJ, [MARWIN Purchase and Employment,] 13 Sep 90, w/reply and 2 comments, info used (U); msg (S), AWS/CAT to 5WW/CAT, "Today's Questions (U)," 151425Z Sep 90, info used (U); memo (S), Col T.C. Tarbell, AWS/ADO, to AWS/XT, "Tactical Rawinsonde - MARWIN MW 12 Justification," 21 Sep 90, info used (U); msg (S), HQ AWS/CAT to 5WW/CAT, "DESERT SHIELD Upper-Air Observations (U)," 242231Z Sep 90, info used (U); msg (S), 5WW/CAT to AWS/CAT, et al., "DESERT SHIELD Upper Air Observations (U)," 291410Z Sep 90, info used (U); telefax (U), AWS/CAT to 5WW/CAT, [AWS Package for CINCMAC Concerning Need for Tactical Upper Air Data Collection,] 5 Oct 90, w/4 atchs.

On 5 October Headquarters AWS requested MAC to support its Marwin initiative. The same day it directed the 5th Wing to instruct Lieutenant Colonel Riley to advocate the initiative before Colonel James C. Crigger, who, as the CENTAF Director of Operations, would have to validate the requirement for the Marwins. MAC approved the Marwin proposal a few days later. On 16 October Colonel Crigger validated the Marwin requirement, but warned that he could not authorize additional manpower to operate the systems. On 22 October MAC informed the Air Staff of the need for tactical rawinsondes in the Persian Gulf theater. The Vice Chief of Staff of the Air Force, General Monroe W. Hatch Jr., who had principal responsibility for the Rapid Response Process Program, approved the tactical rawinsonde initiative on 5 November. In addition, he directed the Air Force Logistics Command (AFLC) to procure the six systems requested by using a contract the Navy had awarded to Vaisala on 30 September. The Air Staff, he added, would provide \$437,000 to fund the acquisition. On 15 November SM-ALC transferred to the Navy the funds necessary to pay Vaisala for the six Marwins. By December all the procurement actions were complete.<sup>24</sup>

Under the Navy contract, Vaisala was to deliver the Marwins no later than 28 March 1991. However, it had the systems ordered for AWS ready for government inspection by 20 January. Consequently, in late January AWS was able to ship all six to the theater, where they arrived on 10 February--still in time to be of some use during DESERT STORM, the combat phase of the Persian Gulf contingency operation, already in progress. CENTCOM Weather deployed three of the new systems to King Fahd AB (two to replace the borrowed Navy units and one to be used as a spare) and one to King Khalid Military City, both in Saudi Arabia, and one each to Thumrait and Seeb, both in Oman.<sup>25</sup>

The maintenance concept for the Marwin was similar to that for other TACMET equipment. If any Marwin experienced a problem the operators could not rectify by using the spare parts kit, they would have to send the system back to the 5th Wing which would return it to Vaisala for repair. However, the Marwin proved to be a reliable piece of equipment; only one had to be sent back to the US.

### ***Deployment of the TPS-68 Tactical Weather Radar***

Another tactical meteorological system deployed by AWS in support of DESERT SHIELD/STORM was the TPS-68 tactical weather radar. It deployed two--one to Taif, Saudi Arabia;

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<sup>24</sup>Telefax (U), AWS/CAT to 5WW/CAT, [AWS Package for CINCMAC Concerning Need for Tactical Upper Air Data Collection,] 5 Oct 90, w/4 atchs; msg (S), USCENTAF/DO to HQ MAC/XRA, et al, "Validation of TACRAWIN Acquisition (U)," 161600Z Oct 90, info used (U); msg (U), HQ MAC/XR to HQ USAF/XOX, et al, "Combat-Mission Need Statement for a Tactical Upper Air Data Collection Instrument," 221945Z Oct 90; msg (U), HQ USAF/XOO to HQ MAC/XR, et al, "Tactical Upper Air Data Collection Instrument," 062130Z Nov 90; ltr (U), COMSPAWARSYSCOM to HQ AWS/PM, "Procurement of Tactical Rawinsonde Equipment," 2 Nov 90; msg (U), HQ AWS/PMT to 5WW/DOO, et al, "Tactical RAWIN System," 231900Z Nov 90; msg (U), HQ AWS/PM to SAF/AQLZ, et al, "Tactical Upper Air Data Collection Instrument," 032100Z Dec 90.

<sup>25</sup>Msg (U), HQ AWS/PM to SAF/AQLZ, et al, "Tactical Upper Air Data Collection Instrument," 032100Z Dec 90; msg (U), HQ AWS/PM to SAF/AQLZ, et al, "Tactical Upper Air Data Collection Instrument," 182100Z Dec 90; msg (S), USCINCCENT Weather to 5WW/CAT, et al, "MARWIN Operations (U)," 271443Z Jan 91, info used (U); AWS DS/DS Report #2 (S), p 156 (Sec 4.4.2-b), info used (U).

the other to Diego Garcia. Neither arrived at its assigned location until January 1991, relatively late in the operation. However, once operational, both radars performed well and provided useful weather data. They were the first TPS-68s to support combat operations.<sup>26</sup>

The officer in charge of the weather team at Taif had already in September called for the deployment of a TPS-68 to Taif since the Saudi weather radar there was inoperable. Headquarters AWS decided, however, that the deployment could be deferred until around the beginning of 1991 since climatological data indicated a very low probability of thundershowers or, for that matter, any precipitation at that location before then. On 7 October the 5th Wing informed Headquarters AWS that in its view a TPS-68 was definitely required at Taif and requested the headquarters staff to assist in filling the requirement. After the CENTAF Director of Operations, Colonel Crigger, validated the requirement and formally requested AWS to station a tactical radar at Taif, the 5th Wing proceeded to make arrangements to deploy the TPS-68 based in Germany. The radar was shipped to the Persian Gulf on 11 January, but because of the demands on intratheater airlift, it took some time before it actually arrived at Taif.<sup>27</sup>

AWS began considering the possibility of deploying a tactical weather radar to Diego Garcia in support of the SAC forward operating location there in early November 1990. On 26 November the 4300th Bomb Wing (Provisional) on the island requested a weather radar. Before the end of the month the 1st Wing, headquartered at Hickam AFB, Hawaii, had begun making arrangements to deploy the AWS TPS-68 at Andersen AFB, Guam, to Diego Garcia. On 18 January Pacific Air Forces approved the deployment; the following day the 1st Weather Wing directed its 20th Weather Squadron to immediately deploy the radar. It arrived in Diego Garcia on 28 January. Various factors contributed to delaying the deployment until late January: the initial inoperable condition of the Andersen radar; the unavailability of qualified operators and maintainers; delays in receiving the required in-theater validation for the deployment from CENTAF Forward; and difficulties in obtaining airlift for the deployment both because MAC had higher airlift priorities and because only a C-5 was big enough to carry the 6,500-pound, 83 by 87 by 147 feet radar. However, once it arrived, the radar was immediately installed and reached full operational capability on 30 January.<sup>28</sup>

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<sup>26</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.2-d, info used (U); AWS DS/DS Report #2 (S), pp 221 (Sec 5.2.3), 284 (App D), info used (U).

<sup>27</sup>Msg (S), USCINCCENT Weather to 5WW/CAT, et al, "USCENTCOM Weather Support Force SITREP 21 (U)," 151920Z Sep 90, info used (U); msg (S), 5WW/CAT to USCENTCOM/CCJ3-W, et al, [classified title,] 162218Z Sep 90, info used (U); msg (S), 5WW/CAT to AWS/CAT, "Radar Requirements (U)," 071628Z Oct 90, info used (U); msg (S), USCENTAF/DO/WE to USCENTAF Rear/DO/SC/WE, et al, "Deployment of Tactical Weather Radar (U)," 140310Z Dec 90, info used (U); msg (S), 5WW/CAT to USCINCCENT Weather, et al, "AOR Action Items (U)," 120227Z Jan 91, info used (U); msg (S), 5WW/CAT to HQ AWS/CAT, "CAT-to-CAT Question 19 Jan 91 (U)," 191718Z Jan 91, info used (U).

<sup>28</sup>Draft AWS DS/DS Report #2 (S), Sec 5.2.2-d, info used (U); hist rpt (U), 1WW, 1 Jan-30 Jun 91, p 5, Sup Doc 14: rpt (U), 1WW CAT to HQ AWS/CAT, "Lessons Learned--Deployment of Tactical Weather Radar, AN/TPS-68," n.d.; 1WW DESERT SHIELD SITREPS, Nbrs 28, 30 (16, 18 Jan 91) (S), info used (U); 1WW DESERT STORM SITREPS, Nbrs 1-10 (19-28 Jan 91) (S), info used (U); AWS DS/DS Report # 2 (S), pp 221 (Sec 5.2.3), 284 (App D), info used (U).



## Meteorological Communications Systems

AWS cannot perform its mission without meteorological equipment, both fixed and transportable, but communications systems are equally essential. Communications is "the life blood for weather support."<sup>29</sup> It does little good to have meteorological equipment that ingests all sorts of weather data if there is no means to disseminate the data to those who need it to develop weather products and to pass on the products to those who use them. Weather communications systems provide these absolutely essential means.

In DESERT SHIELD and STORM, AWS utilized essentially two types of communications systems: fixed, long-range systems and tactical (or transportable), intratheater systems. AWS used the first to get data from the Persian Gulf theater to the US and weather products from the US to the theater; the second to disseminate raw data and weather products within the theater, collect weather data for transmission to the US, and distribute products received from the US within the theater. The long-range systems transmitted data primarily by means of a combination of landline circuits and satellite communications. Intratheater communications used mostly HF radio equipment, although it also included microwave, troposcatter and satellite relay systems, and eventually some hardwire circuits as well. CENTCOM's Joint Communications Support Element had responsibility for configuring long-range circuits and arranging to have them brought into the operational theater. AFCC and other communications engineers provided and maintained fixed communications; AWS was responsible for its own tactical communications.<sup>30</sup>

AWS employed primarily two long-range systems to transmit weather data and products between the US and the Persian Gulf: the Automated Weather (teletype) Network (AWN) and the Air Force Digital Graphics (weather facsimile) System (AFDIGS). It also used the Automatic Digital Network (AUTODIN), a common-user Department of Defense communications system, and the Navy's Naval Oceanographic Data Dissemination System (NODDS). In theater, AWS relied heavily on an HF radio system called the Quick Reaction Communications Terminal (QRCT) by AWS and the Goldwing by the Army's FORSCOM and, after the Army's VII Corps arrived in Saudi Arabia beginning in late November, on the US Army, Europe, Automated Weather System (UAWS), another HF system. It also acquired a fixed intratheater tactical facsimile (TACFAX) circuit and a Tactical Imagery Dissemination System (TIDS) for in-theater distribution of weather graphics products and satellite imagery, respectively.

AWS contingency weather support doctrine called for full duplex (i.e., send/receive) teletype and receive-only facsimile circuits from AFGWC to all headquarters weather units and all Air Force airbase support weather teams in the operational theater. Army weather teams at the division level would have access to Army multi-channel circuits providing similar capabilities. According to the doctrine, Air Force weather teams deployed to the field would rely on HF radio for the first 30-60 days, by which time AWS would have deployed its Tactical Weather System (TWS) and hardwire lines would be in place to each location. However, weather communications doctrine had to give way to the imperatives of the operational situation. Various factors such as airlift constraints, communications

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<sup>29</sup>Phillips Intvw (U), p 5.

<sup>30</sup>AWS DS/DS Report #2 (S), p 201 (Sec 5.1.2.1), info used (U); intvw (U), W.E. Nawyn, AWS/HO, with Maj Robert W. Keefer, AWS/DOJ, 23 Jul 91, hereafter cited as Keefer Intvw (U), pp 2-3; Tkach Intvw (U), pp 25-26.



engineering limitations, communications saturation, and the sheer size of the DESERT SHIELD/STORM operation itself led to deviations from doctrine and pre-contingency plans.<sup>31</sup>

One of the first doctrinal casualties was AWS's TWS. This system consisted of six Tactical Weather Analysis Centers and six Tactical Airbase Weather Stations. Each center and station was housed in large transportable shelters (six for each center and four for each weather station) requiring 36 tons of airlift for deployment. Although Lieutenant Colonel Riley, the acting OIC of the deployed WSF, had not asked for it, the 5th Wing immediately requested TAC to deploy the TWS. However, by mid-August TAC's Deputy Chief of Staff for Command, Control, Communications, and Computers, in conjunction with CENTAF's communications people, had decided not to deploy the system due to a shortage of airlift as well as other reasons. The system was, for example, basically outdated. Moreover, TAC considered the plan to use the TWS unworkable because the system was incompatible with modems and facsimile receivers that would be used in the operational theater. Besides, the rapid expansion of the operation soon resulted in many more locations in the theater requiring tactical weather communications than the TWS could service. TAC did agree, however, to strip the shelters of their usable equipment and send it to the theater.<sup>32</sup>

Scrapping the TWS did not terminate AWS's requirements for tactical teletype and facsimile communications systems. Thus, communications experts at TAC and the 5th Wing, in coordination with CENTAF's Deputy Chief of Staff for Communications-Computer Systems and CENTAF Weather, immediately set to work to devise a workable substitute system. They completed the task by mid-September. The new configuration pared down the number of hardwire teletype send/receive locations to four and placed greater and more long-term reliance on HF radio communications than original plans envisioned.<sup>33</sup>

The difficulties associated with the TWS was only the beginning. As in previous contingencies, AWS continued to encounter many communications problems throughout the DESERT SHIELD/STORM operation. This was not something unique to AWS. Communications problems were usually widespread in contingencies--for example, in URGENT FURY, the Grenada incursion of 1983. Actually, AWS probably had less difficulty with communications in DESERT SHIELD/STORM than in earlier contingencies, even though there was, of necessity, a lot of last-minute, on the scene improvisation. Moreover, communications tended to improve as time went on.<sup>34</sup>

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<sup>31</sup>AWS DS/DS Report #2 (S), pp 171 (Sec 5.1.1.1), 201 (Sec 5.1.2.1), 207 (Sec 5.1.3.1), info used (U); LTC R.R. Wall in AWTB Intvw (U), pp 21-22; Tkach Intvw (U), pp 25-26; Keefer Intvw (U), 13 Jul 91, pp 2-3.

<sup>32</sup>AWS DS/DS Report #2, p 202 (Sec 5.1.2.2-b), info used (U); Col P.F. Abt in AWTB Intvw (U), p 6; Keefer Intvw (U), p 3; Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 3; msg (S), 5WW/CAT to AWS/CAT, et al, "DESERT SHIELD Fixed Weather Comm History (U)," 071528Z Dec 90, info used (U).

<sup>33</sup>AWS DS/DS Report #2 (S), p 202 (Sec 5.1.2.2-b), info used (U); Keefer Intvw (U), p 3; msg (S), 5WW CAT to AWS/CAT, et al, "DESERT SHIELD Fixed Weather Comm History (U)," 071528Z Dec 90, info used (U).

<sup>34</sup> Goldey Intvw (U), p 22; Riley Intvw (S), pp 21-22, 24, info used (U); Campbell Intvw (U), p 17.

## ***Long-Range Communications Systems***

Weather data traveled between the Persian Gulf theater and the US and western Europe via a combination of landlines and satellite links. However, the relatively low priority assigned to weather information during the early stages of DESERT SHIELD led to slow implementation of weather circuits--anywhere from 2 to 6 months. Indeed, communications engineers did not finish installing three of the four hardwire teletype circuits provided for by the substitute communications plan agreed to in late September until mid-January. Deteriorating weather in the theater as winter approached provided significant impetus to the installation process. But, in any event, the number of long-range lines dedicated to weather data under the plan was limited. In addition, once installed the circuits experienced problems. Serious signal deterioration occurred, particularly in AFDIGS circuits, due to multiple analog-digital conversions of the data (made necessary by the use of different types of circuits and several satellite hops) and frequent circuit bridging. Moreover, incompatible modems complicated interfaces between landlines and satellite links and between the automated digital weather switches (ADWS) at Carswell AFB, Texas, and RAF Croughton, United Kingdom, and terminal equipment in the operational theater. A shortage of terminal equipment caused additional problems.<sup>35</sup>

## ***Automated Weather Network***

AWS's alphanumeric weather teletype circuits (the AWN) to CENTCOM and CENTAF went by landline from AFGWC through the Carswell weather switch to Forts Meade and Detrick, Maryland, and by satellite relay from there to the Persian Gulf theater. ARCENT received its teletype data from the Croughton switch via an Army communications site at Landstuhl, Germany. CENTCOM Weather bridged teletype data to SOCCENT. The DSFU at CENTAF Weather had full duplex teletype capability by the middle of August; CENTCOM Weather had receive-only capability by 28 August and full send/receive capability by 26 September. ARCENT Weather, although able to receive teletype data via the AWN, never acquired full send/receive capability.<sup>36</sup>

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<sup>35</sup>Draft AWS DS/DS Report #2 (S), Sec 5.1.3.8, Atch X, info used (U); AWS DS/DS Report #2 (S), pp 203 (Sec 5.1.2.2-b), 205-206 (Sec 5.1.2.3), 208 (Sec 5.1.3.2-a), 210 (Secs 5.1.3.3, 5.1.3.4), info used (U); Phillips Intvw (U), p 5; msg (S), 5WW/CAT to AWS/CAT, et al, "DESERT SHIELD Fixed Weather Comm History (U)," 071528Z Dec 90, info used (U); msg (S), USCINCCENT/CCJ6-CP to USCINCCENT/J3-Weather, et al, "AWN/MEDS Circuitry Channelized over SHF Satellite (U)," 101818Z Sep 90, info used (U); msg (U), CENTAF SYSCON/SCX to HQ TAC/BS-SC, et al, "Tactical Weather 1200bd Teletype Interface," 061006Z Feb 91; atch 1 (U), rpt, "Lessons Learned Listing," to ltr (U), HQ 5WW/DOX to AWS/DOJ, "DESERT SHIELD/DESERT STORM Lessons Learned," 27 Mar 91, w/1 atch, hereafter cited as 5WW/DOX Lessons Learned Listing; atch 1 (C), "DAMI-POI JULLS Inputs," to ltr (C), USAF/XOWX to AWS/DO, "Lessons Learned Inputs from HQ, Department of the Army, Directorate of Policy and Operations, Imagery Division," 15 Apr 91, info used (U).

<sup>36</sup>Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 12, 16; intvw (U), W.E. Nawyn, AWS/HO, with Maj Larry J. Waite, AFGWC/DOOK, 12 Jun 91, hereafter cited as Waite Intvw, p 14; msg (S), CCSC/XPW to USCINCCENT/CCJ6-CP, et al, "DESERT SHIELD Weather Communications Plan (U)," 201815Z Sep 90, info used (U); msg (S), USCINCCENT/CCJ6-CP, to AWS/CAT, et al, "DESERT SHIELD Weather Communications Summary (U)," 041000Z Oct 90, info used (U); chart (S), n.a., "Phase I Teletype Network (U)," n.d. [ca Jan 91], info used (U); atch 11 (U), rpt, Maj J.D. Brod, CENTCOM/ASWO, to 1690WGP/CC "Desert Shield/Storm After Action Report," 25 Mar 91, hereafter

The full send/receive AWN teletype circuits for weather teams at all airbase locations in the Persian Gulf theater, as called for by AWS doctrine, never materialized. Indeed, reality fell far short of doctrine. Dedicated circuits were at a premium, especially on communications satellites. It was simply impossible for AWS to obtain the channels on the satellites it would need to implement the doctrinal requirements. Besides, neither the Carswell nor the Croughton switch had enough ports to support a send/receive capability at each location. It was also unlikely that AWS would be able to get the necessary hardware lines in theater. Thus, the substitute communications plan developed in September requested only four dedicated, full duplex circuits--the one already in operation at the DSFU and one each from Carswell to Dhahran, Al Dhafra, and Taif, all in Saudi Arabia. Air Force communications engineers, however, were slow to install the three remaining circuits. Dhahran and Taif did not become operational until mid-January, just before the air war began; Al Dhafra not until early February. Thus, for all of DESERT SHIELD, the WSF had only one dedicated send/receive AWN circuit available. This was, however, bridged as a receive-only circuit to other bases. To transmit data, the weather teams at these locations had to use their HF radios.<sup>37</sup> (See Figure III-1.)

Meanwhile, Army communications engineers worked at getting AWN teletype circuits to Army weather support units. Army weather communications doctrine called for send/receive teletype capability at echelons above corps, corps, divisions, aviation brigades, and armored cavalry regiments. On 28 September, Colonel Weaving, the ARCENT SWO, requested the ARCENT Directorate of Information Systems for Command, Control, Communications, and Computers to connect both ARCENT Weather and the XVIII Corps weather team to the AWN. ARCENT Weather had a receive-only capability (via the Croughton switch) by 4 October. But Army communications engineers determined they could not provide the bridging necessary to bring the AWN from ARCENT to the XVIII Corps, much less to lower echelons. Instead, the Army acquired a line directly from the Carswell switch to the corps. Later, after the VII Corps also deployed to the Persian Gulf, the Army obtained a dedicated line for that corps as well, but, in this instance, via Croughton.<sup>38</sup>

### ***Standard Base-Level Computers***

By late December Headquarters AWS began to feel that, with DESERT SHIELD now underway for more than 4 months, it was high time to acquire the send/receive teletype capability at all Air Force

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cited as Brod DS/DS AAR (U), to CENTCOM Weather Staff AARs (U), p 2; brfg (S), 5WW/DOX, "The DESERT SHIELD/STORM Weather Story," paper copy, [circa 30 May 91], slides (paper copies) 12, 30, 36, hereafter cited as 5WW DS/DS Summary Brfg (S).

<sup>37</sup>AWS DS/DS Report #2 (S), pp 201 (Sec 5.1.2.1), 203 (Sec 5.1.2.2-b), info used (U); LTC R. R. Wall in AWTB Intvw (U), pp 22-23; Riley Intvw (S), pp 21-22, info used (U); Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 5; 5WW DS/DS Summary Brfg (S), slides (paper) 25, 30, 36, info used (U); msg (S), USCINCCENT/Weather to 5WW/CAT, et al, "Answers to DESERT SHIELD AOR Action Item #4 (U)," 091501Z Jan 91, info used (U); chart (S), n.a., "Phase I Teletype Network (U)," n.d. [ca Jan 91], info used (U).

<sup>38</sup>Weaving Intvw (U), p 6; ARCENT SWO AAR (U), pp 18-19 (Sec II-1c,d,e); memo (S), USARCENT/SWO to USARCENT/G6, "Request for Services - Weather Communications for DESERT SHIELD (U)," 28 Sep 90, info used (U); memo (S), ARCENT/SWO to CENTCOM/SWO, "Weather Circuits for XVIII Corps (U)," 2 Oct 90, info used (U); msg (S), USCINCCENT/CCJ6-CP to AWS/CAT, et al, "DESERT SHIELD Weather Communications Summary (U)," 041000Z Oct 90, info used (U).



**CENTAF COMMUNICATIONS**  
**17 JAN 91**

		TTY S/R	TTY R/O	QRCT	TACFAX/ TIDS	SBLC 14 Feb 91)
Riyadh BWS	1690 WGP	+	■	■	■	■
CENTCOM		+	■	+	■	+
CENTAF DSFU		■	+	■	■	■
Diego Garcia	OL-D	+	+	+	+	+
Tabuk	OL-E	+	■	■	■	■
Jubayl	OL-F	+	+	■	+	+
Al Dhafra	DET 2	■	■	■	■	■
Bateen	DET 2, OL-A	+	■	■	■	■
Abu Dhabi	DET 2, OL-J	+	■	■	■	■
Al Minhad	DET 4	+	■	■	■	■
Sharjah	DET 4, OL-B	+	■	■	■	■
Dubai	DET 4, OL-K	+	□	■	■	■
Dhahran	DET 6	■	■	■	■	■
Shaikh Isa	DET 6, OL-C	+	■	■	■	■
King Fahd	DET 8	+	■	■	■	■
Doha	DET 10	+	■	■	■	■
Taif	DET 12	■	■	■	■	■
Jeddah	DET 14	+	■	■	■	■
Thumrait	DET 16	+	■	■	■	■
Al Ain	DET 18	+	■	■	■	■
Masirah	DET 20	+	■	■	■	■
Seeb	DET 22	+	■	■	■	■
Cairo West	DET 24	+	■	■	■	■
Khamis Mushait	DET 26	+	■	■	■	■
King Khalid	DET 28	+	■	+	■	■
Al Kharj	DET 30	+	■	■	■	■

Legend	
■	Available
□	Programmed
+	Not Required

SOURCE: AWS DESERT SHIELD/DESERT STORM Report #2 (S), p 192 (Atch 21), info used (U).

Figure III-1



weather stations in the DESERT SHIELD theater called for by doctrine, rather than only at the DSFU and the other three scheduled, but still non-operational, locations. In early January, at the direction of General Kelly, the 5th Wing launched an aggressive effort to acquire the greater send/receive capability. It quickly called together communication experts from Headquarters AFCC, AWS, AFGWC, and the 5th Wing at the wing headquarters on 7 January, who came up with both a short-term and long-term proposal to achieve the desired goal without using more dedicated, long-range lines, which still remained pretty much of an impossibility. For the long term, they proposed obtaining "smart computers" that would immediately begin transmitting data when polled by the Carswell weather switch. The UGC-129 teletype terminals used in the Persian Gulf theater did not currently have such a rapid response capability. As a short-term measure, they recommended utilizing TAC's Standard Base Supply System/Computer Assisted Maintenance System network which already connected most Air Force bases in the theater. The idea of using this network originated in a suggestion from Colonel Buford R. Witt, CENTAF's DCS for Communications-Computer Systems, to Colonel Riley, who passed it on to the 5th Wing.<sup>39</sup>

The Standard Base Supply System/Computer Assisted Maintenance System was a standard Air Force communications network used primarily by TAC for supply purposes. It included not only intratheater circuits, but a long-range circuit to Langley AFB as well; in fact, it worked off of TAC's Standard Base Level Computer (SBLC) at Langley (leading AWS personnel to usually refer to it as the SBLC network). Since CENTAF Communications-Computers officials, CENTCOM Weather, and CENTAF Weather all advocated using the SBLC network, AWS and the 5th Wing decided to go ahead with this as the short-term solution. At the same time, however, they also decided to proceed with the proposed, long-term "smart terminal" plan. CENTAF Communications-Computers immediately began to implement the short-term initiative by quickly ordering additional SBLC terminals for the weather stations so weather teams could enter data directly into the network. While they awaited their terminals, weather teams could take their weather data in paper form to the nearest SBLC terminal. By the time the war started in mid-January, many CENTAF weather teams were already using the SBLC network. By 7 February 23 Air Force weather teams had received their own SBLC terminals.<sup>40</sup> (See Figure III-1.)

To utilize the SBLC network, weather teams at each base first entered their weather observations and other data into their own or nearest SBLC terminal. The data then went across the Atlantic Ocean to Langley and back to the DSFU in the theater via the long-range circuit. At the DSFU, personnel manually inserted the data into the AWN for transmission to other users, including AFGWC. As CENTAF Weather observed, the SBLC system was "manpower intensive [and] cumbersome" and still did not fully satisfy AWS requirements. It did, however, provide weather teams with a send capability of sorts and substantially improved the timeliness of their weather observations--observations

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<sup>39</sup>LTC R.R. Wall in AWTB Intvw (U), pp 22-23; Kelly Intvw (U), pp 19-21; Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 6-9; msg (U), AWS/CC to TAC/5WW/CC, et al, "DESERT SHIELD Weather Data," 312300Z Dec 90; msg (S), 5WW/CAT to USCINCCENT Weather, et al, "AOR Action Items (U)," 030347Z Jan 91, info used (U); msg (U) 5WW/CAT to USCINCCENT Weather, et al, "Transmit Capability for CENTAF WETMS," 082345Z Jan 91.

<sup>40</sup>LTC R.R. Wall in AWTB Intvw (U), p 23; Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 8-10; Waite Intvw (U), p 9; msg (U), 5WW/CAT to USCINCCENT Weather, et al, "TTY Send Capability," 101659Z Jan 91; msg (S), 5WW/CAT to USCINCCENT Weather, et al, "DESERT SHIELD Weather Comm Issues (U)," 142218Z Jan 91, info used (U); msg (U), USCINCCENT Weather to USCINCCENT Weather, et al, "Phase II Send/Receive Weather Teletype Terminals for CENTAF WETMS," 231100Z Jan 91; msg (U), 5WW/CAT to HQ AWS/CAT/PML, "Phase IIA Send/Receive Weather Teletype Terminals for CENTAF WETMS," 242203Z Jan 91.

now got to the DSFU approximately one hour after being taken instead of three. The system was not perfect, but it worked.<sup>41</sup>

### ***Air Force Digital Graphics System***

Unlike the AWN teletype circuits, the initial AFDIGS facsimile circuits to CENTCOM and CENTAF went directly from AFGWC to Fort Meade by commercial lines and then forward to the Persian Gulf theater by satellite relay. CENTCOM Weather had an operational receive-only facsimile circuit by 7 September. The story at CENTAF Weather, however, was very different. Although the DSFU acquired its circuit in August, technicians could not get it to produce usable data. In an attempt to overcome the problem, communications engineers routed the circuit into Thumrait, Oman, where the local communications technician was able to get acceptable data and pass it on to Riyadh by another satellite relay. However, this didn't work either. Apparently due to the multiple satellite hops and analog-to-digital conversions on the circuit, the terminal at the DSFU still did not provide usable data. Finally, in mid-December AFGWC was able to establish a facsimile circuit to CENTAF Weather by using a commercial line to Headquarters TAC at Langley AFB and a tactical satellite relay from there directly to the DSFU. At long last, in early January the DSFU received its first usable AFDIGS facsimile data. To receive the data, the DSFU used an Alden 9315TRT recorder, which produced excellent weather charts.<sup>42</sup>

During the long period it was unable to receive facsimile data over Air Force circuitry, the DSFU turned for help to the Navy's NODDS, which contained meteorological products from the Navy Fleet Numerical Oceanographic Central at Monterey, California. The DSFU personnel had deployed with the software and modem necessary to access the NODDS and they were, therefore, immediately able to tap into the system, which produced very useful data. Later, CENTAF approved accessing it through a commercial satellite link out of Riyadh which the Saudi Arabian government paid for. For the first

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<sup>41</sup>AWS DS/DS Report #2 (S), p 204 (Sec 5.1.2.2-b), info used (U); AWTB Intvw (U), p 23; Goldey Intvw (U), p 32; Riley Intvw (S), p 22, info used (U); Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 8-10; Waite Intvw (U), pp 9-10; msg (S), USCENTAF Weather to 1690WGP BWS/WE, et al, "Transmit Capability for CENTAF WETMs," 071700Z Jan 91, info used (U).

<sup>42</sup>AWS DS/DS Report #2 (S), pp 207-208 (Sec 5.1.3.2), info used (U); Riley Intvw (S), pp 21-22, info used (U); Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 5-6; atch 11 (U), Brod DS/DS AAR (U), p 3, to CENTCOM Weather Staff AARs (U); brfg slide (S), n.a. [AWS/DOJ], "CENTAF Fax Problem (U)," [9 Sep 91], info used (U); msg (S), 5WW/CAT to AWS/CAT, "CAT to CAT Questions (U)," 240250Z Sep 90, info used (U); msg (S), USCINCCENT/CCJ6-CP TO AWS/CAT, et al, "DESERT SHIELD Weather Communications Summary (U)," 041000Z Oct 90, info used (U); msg (U), HQ AFGWC/DOO to HQ AWS/CAT, et al, "EURDIGS Signal Retransmission from AFGWC to DESERT SHIELD AOR," 131700Z Nov 90; msg (S), AFGWC/CAT to 5WW/CAT, et al; "EURDIGS Signal Retransmission from AFGWC to DESERT SHIELD AOR (U)," 042145Z Dec 90, info used (U); msg (U), AFGWC/CAT to 5WW/CAT, et al, "DESERT SHIELD AFDIGS," 112250Z Dec 90; msg (S), AFGWC/CAT to 5WW/CAT, et al, "Bridging Equipment Needed for DESERT SHIELD AFDIGS Connectivity at AFGWC (U)," 121910Z Dec 90, info used (U).

4 months or more of its operations, the DSFU relied primarily on NODDS for the facsimile data it needed, although it was able also to intercept HF facsimile broadcasts from Moscow.<sup>43</sup>

ARCENT Weather, too, had problems getting decent facsimile data. It didn't have any at all until October. Early that month, at the request of Colonel Weaving, ARCENT's Directorate of Information Systems for Command, Control, Communications, and Computers took action to acquire facsimile data for ARCENT Weather via a dedicated European Digital Graphics System (EURDIGS) circuit originating at Croughton. The receive-only circuit, routed through Pirmasens, Germany, was soon operational, but the quality of the data it provided was not very good. When ARCENT Weather moved to Eskan Village in late November, it lost both its teletype and facsimile circuits. Both eventually became operational again, but data quality on the facsimile circuit did not improve. During this time ARCENT Weather was able to at least partially overcome its facsimile problem by intercepting HF facsimile broadcasts from Diego Garcia, the Soviet Union, and England. ARCENT Weather, like the DSFU, used an Alden 9315TRT to receive the facsimile weather charts.<sup>44</sup>

Since the Army was no more able to bridge the facsimile circuit than the receive-only AWN teletype circuit from ARCENT Weather to the XVIII Corps, ARCENT arranged for an AFDIGS circuit from AFGWC directly to the corps weather team. After the VII Corps arrived in the theater, it, too, obtained a facsimile circuit from Croughton, but the circuit never became very reliable. Both corps, however, lost their circuits when they moved forward to take positions along the Iraqi border shortly before the beginning of the war.<sup>45</sup>

### *Automatic Digital Network*

AWS was also able to use AUTODIN. Since this was a common-user teletype network used by all the Armed Forces for many types of messages (tasking orders, commander situation reports, requests for spare parts, and many more), it was generally the first communications system installed at deployed locations. Thus, it had the advantage of being available sooner and in more locations than the lower priority weather communications circuits. Moreover, communications engineers--whether Air Force or Army--were much more familiar with this system than with the often unique circuits that AWS required. In addition, it provided secure communication--it could handle messages up to the secret level. AUTODIN served as a very helpful and reliable backup hardwire communications system

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<sup>43</sup>AWS DS/DS Report #2 (S), p 208 (Sec 5.1.3.2), info used (U); Riley Intvw (S), p 21, info used (U); note (U), Col G.F. Riley, Chief, AWS/DOT, to W.E. Nawyn, AWS/HO, 22 Jun 92; Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 17-18; Capt J.D. Murphy in intvw (U), W.E. Nawyn, AWS/HO, with Capt John D. Murphy, DSFU/CC (and Det 7, 3WS/CC) and Capt Thomas E. Coe and Jeffrey E. Johnson, DSFU members (and 5WW/DNS), 7 Jun 91, p 12, hereafter cited as Murphy/Coe/Johnson Intvw (U).

<sup>44</sup>Weaving Intvw (U), pp 8-9; Campbell Intvw (U), p 15; intvw (U), W.E. Nawyn, AWS/HO, with MSgt William J. Boyle, ARCENT Weather/NCOIC (and 5WS/DOJ), 18 Jul 91, p 9, hereafter cited as Boyle Intvw; ARCENT SWO AAR (U), p 19 (Sec II-2d); memo (S), LTC W.S. Weaving, USARCENT/SWO, to USARCENT/G6, "Request for Services - Weather Communications for DESERT SHIELD (U)," 28 Sep 90, info used (U); msg (S), USCINCCENT/CCJ6-CP to AWS/CAT, et al., "DESERT SHIELD Weather Communications Summary (U)," 041000Z Oct 90, info used (U).

<sup>45</sup>ARCENT SWO AAR (U), p 19 (Sec II-2d); Conley Intvw (U), pp 7-8.



for AWS to use when necessary. The main problems with it were that it was not an AWS dedicated system, its teletype equipment was rather slow and cumbersome, and other military organizations with traffic of a higher priority than AWS units also used it. Moreover, the large volume of weather data AFGWC and deployed units sometimes poured into the system rather easily saturated it. They, therefore, had to use AUTODIN selectively.<sup>46</sup>

AFGWC was connected directly to AUTODIN for both transmitting and receiving weather data. It utilized AUTODIN to send out essentially two types of information: centralized products such as forecast bulletins created at AFGWC and raw weather data from units in the theater it received on the AWN through Carswell, which it then formatted and sometimes sent back to the field over the network. AFGWC normally sent the formatted data back via the AWN, but it could use AUTODIN when necessary. AFGWC could also receive weather data from the theater on AUTODIN.<sup>47</sup>

CENTAF Weather began to receive weather bulletins over Headquarters CENTAF's AUTODIN terminal on 11 August, only three days after Lieutenant Colonel Riley's arrival at Riyadh, but it did not acquire its own dedicated terminal until November. CENTCOM Weather and ARCENT Weather also had early access to their respective headquarters' AUTODIN terminal. The former got its own dedicated send/receive terminal on 28 September; the latter on 18 October. Later on, as a result of its move to Eskan Village, ARCENT Weather had an interval of nearly a month (27 November to 24 December) when it had no AUTODIN connectivity.<sup>48</sup>

The ARCENT weather support element probably made more use of AUTODIN than either CENTCOM Weather or the DSFU at CENTAF Weather. Since it was not possible to "lower" the AWN below the corps level, the CENTCOM Directorate of Information Systems, Command, Control, Communications, and Computers suggested that perhaps ARCENT Weather and the XVIII Corps weather team could utilize AUTODIN to send and receive weather data to and from Army division weather teams. Shortly thereafter, on 28 September (in the same letter in which he asked for dedicated teletype and facsimile circuits to the XVIII Corps and Army division weather teams), Colonel Weaving requested the ARCENT Directorate of Information Systems, Command, Control, Communications, and Computers to arrange for dedicated AUTODIN teletype circuits from ARCENT Weather to the XVIII Corps weather team and through it on to the division and aviation brigade weather teams. The XVIII Corps weather team soon got its dedicated send/receive terminal and the VII Corps team did also after it arrived in theater, but the requested dedicated terminals at the division and aviation brigade levels never became a reality. However, division and brigade weather teams were able to use their unit's AUTODIN terminals, which frequently were located quite near to the weather station.<sup>49</sup>

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<sup>46</sup>AWS DS/DS Report #2 (S), pp 205 (Sec 5.1.2.2-f), 206 (Sec 5.1.2.4), p 213 (Secs 5.1.4.3, 5.1.4.4), info used (U); Callahan/Brackett Intvw (U), pp 19-20; Waite Intvw (U), p 2.

<sup>47</sup>Callahan/Brackett Intvw (U), p 19; Waite Intvw (U), pp 3-4.

<sup>48</sup>Riley Intvw (S), p 9, info used (U); 5WW DESERT SHIELD Chronology (S), p 9-3, info used (U); atch 11 (U), Brod DS/DS AAR, p 3, to CENTCOM Weather Staff AARs (U); ARCENT SWO AAR (U), atch I-2.

<sup>49</sup>Weaving Intvw (U), p 6; Campbell Intvw (U), p 16; ARCENT SWO AAR (U), pp 5-6 (Sec I-3a), 15-17 (Sec II-2a); 54-55 (Sec VII-1t); memo (S), LTC W.S. Weaving, USARCENT/SWO, to USARCENT/G6, "Request for Services - Weather Communications for DESERT SHIELD (U), 28 Sep 90, info used (U); Itr (S), ARCENT/SWO to All DS Army Weather Units with GW Computer Systems, 10 Oct 90, info used (U).



AUTODIN proved to be very valuable to ARCENT Weather and the Army weather teams at the two Army corps. They could use it to exchange weather data with other Army weather teams in the theater and also send data to AFGWC for retransmission to other weather units. But it was not particularly beneficial to the weather teams at the division and brigade levels. Although they had acquired access to AUTODIN through their own unit's communications center, this generally did not work out very well because the unsophisticated teletype equipment found at this level often became saturated and was unable to handle all the weather data the teams wanted to send. However, since Army communications engineers installed AUTODIN lines quickly after a unit had "jumped" (i.e., moved to a new location)--which happened frequently immediately before and during the combat period, access to AUTODIN did sometimes enable weather teams to again send and receive weather data in a relatively short time after they had suspended operations due to the jump.<sup>50</sup>

### *Tactical Communications*

Tactical communications are no less vital to weather support than long-range communications; perhaps they are more so. As one AWS officer put it, weather people "live and die" with their tactical communications (TACCOM). They have to receive data from all over the potential or actual battlefield to make their forecasts. But, unfortunately, in DESERT SHIELD/STORM, AWS encountered a number of problems in this area. Some of these did not come as surprises. TACCOM had been an area of weakness for a long time. AWS had, however, introduced some improvements over the past several years and was still working to overcome the problems when DESERT SHIELD began. Just a few months earlier Headquarters AWS had formed a working group and then, in June 1990, convened a conference to address TACCOM issues. The conference identified a number of problems and proposed actions to solve them. However, the operation began before any substantial progress could be made to implement the solutions and so the problems remained.<sup>51</sup>

The distinction between long-range and tactical communications systems tended to break down within the Persian Gulf theater. Long-range circuits became, in effect, tactical circuits or were used as tactical circuits after reaching the theater. The SBLC system, tactical use of the AUTODIN by Army weather teams, and tactical extensions of the AFDIGS and EURDIGS facsimile circuits are examples of this. Moreover, TACCOM terminal equipment was, of necessity, sometimes employed in long-range as well as intratheater circuits. Still, AWS used certain equipment and established tactical communications networks in the theater that were clearly tactical in nature.

### *High Frequency Radio Communications (QRCT/Goldwing, UAWS)*

The primary tactical communications system used by AWS in the DESERT SHIELD/STORM theater was the QRCT/Goldwing. It provided the basic and most widely used means of communication within the theater. Indeed, it is not much of an exaggeration to say that it was the AWS TACCOM system. Without it, intratheater weather communications would have been virtually impossible.

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<sup>50</sup>Conley Intvw (U), pp 7-8; ARCENT SWO AAR (U), pp 5-6 (Sec I-3a), 15-16 (Sec II-2a), 54-55 (Sec VII-1t).

<sup>51</sup>Keefer Intvw (U), pp 9-10.

Although communication by QRCT/Goldwing had its share of problems, the system proved to be a lifesaver for AWS in providing weather support during DESERT SHIELD/STORM.<sup>62</sup>

Current AWS tactical communications doctrine called for a light-weight, "first-in" communications capability for contingency operations. The QRCT/Goldwing provided this capability. The QRCT (officially the AN/GRQ-27) resulted directly from URGENT FURY, the Grenada contingency operation of 1983. One of the lessons AWS learned in that operation was it needed a small, truly transportable TACCOM system that would not be dependent upon separate airlift for deployment--that is, it needed a system that deploying weather personnel could take with them. Over the next several years AWS worked with AFCC to procure such a system. Eventually it decided to purchase the same TACCOM system that the Army was procuring, i.e., the Goldwing. Slightly modified, the Goldwing in Air Weather Service nomenclature became the Quick Reaction Communications Terminal or QRCT. When DESERT SHIELD began AWS was just in the process of getting the QRCTs it had ordered and distributing them to its Air Force support units and, consequently, many of these still did not have any.<sup>63</sup>

The QRCT was a transportable, secure (i.e., equipped to transmit classified data) communications system using an HF radio designed to operate over medium distances (100 to 1,000 miles) and intended to provide tactical communications for the first 30-60 days of a contingency operation (i.e., until communications engineers installed fixed, hardwire circuits). It had both a voice and hardcopy transmitting and receiving capability and was able to receive weather data by either analog facsimile or alphanumeric teletype. It functioned as an information management workstation capable of displaying, processing, and manipulating data. Major components of the QRCT included a Transworld TW-100F HF radio, Gridcase 1307 laptop computer, Grid 2137 10-megabyte hard disk drive, Intel 8088 microprocessor, Grid Datawatch printer, Frederick 1280A modem, Alden 9315TRT-R weather graphics recorder, GRA-4 Insulator antenna, and a KG-84 cryptographic device.<sup>64</sup>

Personnel deploying to DESERT SHIELD carried their QRCTs and Goldwings with them and were, therefore, able to get the systems operational quickly--usually within 24 to 72 hours--after reaching their station in theater. Indeed, Army weather teams were able to set up their Goldwings in from 2 to 6 hours. CENTAF Weather at Riyadh had its QRCT operational and communicating with four other weather teams by 12 August, 3 days after the arrival of Lieutenant Colonel Riley, the CENTAF SWO. Over the next several weeks, as weather personnel deployed to additional locations, the QRCT/Goldwing network gradually expanded--6 nodes by 16 August, 19 by 2 September, 25 by 19 September. The DSFU at CENTAF Weather began to function as net control station on 31 August. ARCENT Weather came up on the network on 6 September. On 28 September, the network, having grown to an unmanageable size, CENTAF and ARCENT established their own separate networks of 20 and 5 nodes respectively. ARCENT Weather continued as a node on the CENTAF network. Two weeks later it took over net control station responsibilities for the ARCENT network. By mid-October

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<sup>62</sup>Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 12; atch 1 (U), brfg, [5WW/DO], "Lessons Learned," n.d. [ca 15 Mar 91], to ltr (U), 5WW/DO to 5WW/DOX, et al, "DESERT SHIELD/STORM Lessons Learned," 27 Feb 91, hereafter cited as 5WW/DO DS/DS Lessons Learned Brfg.

<sup>63</sup>AWS DS/DS Report #2 (S), p 171 (Sec 5.1.1.1), info used (U); hist (S/NF), AWS, CY 85-86, pp 187-188, info used (U); hist (U), AWS, CY 87-88, pp 216-220; hist (S), AWS, CY 89, pp 264-267, info used (U).

<sup>64</sup>Atch 1 (U), "Quick Reaction Communications Terminal (AN/GRQ-27)," to memo (U), HQ AWS/DO to HQ AWS/XT, "Purchase of Tactical Communications Equipment," 17 Jan 91, w/2 atchs; art (U), "Weather Systems Give Allied Forces an Edge," AWS Observer, May 91, p 9.

CENTAF's QRCT net had increased again to 27 nodes. The ARCENT Goldwing net grew to as many as 18 nodes, although it averaged between 10 and 12 (the number varied as units gained and lost hardline communications). After the VII Corps arrived in the theater ARCENT sub-divided its network into XVIII Corps, VII Corps, and SOCCENT nets.<sup>55</sup> (See Figures III-1 and III-2.)

Since the QRCT was a new piece of equipment, most AWS personnel deploying to DESERT SHIELD to support Air Force units had little if any experience, or even training, with it or, for that matter, with HF communications in general. They, therefore, had a lot of learning to do after they arrived in theater. The AWS Army weather support teams, on the other hand, were very familiar with their Goldwings. Not only had they possessed them for some time, but they had also practiced using them while they trained in the field, as part of normal procedure, with the Army units they supported. They were, therefore, initially far more proficient in operating their Goldwings than their Air Force support counterparts were in using their QRCTs. However, the Air Force support teams, through dedicated effort and with valuable assistance from the few persons who were acquainted with the QRCT--e.g., Chief Master Sergeant Benjamin L. Coughran and Master Sergeant Dennis E. Nappier from CENTCOM Weather and Technical Sergeant Kenneth R. Gibson from CENTAF Weather, who traveled from unit to unit training personnel in operating their QRCTs, managed to get their QRCTs set up and working. The Air Force operators gradually became more adept at using their QRCTs, eventually to the point where they were probably as efficient as the Army operators. The operators of both the QRCT and Goldwing systems were mostly weather observers.<sup>56</sup>

High frequency communications can be hard to work with; it certainly was during DESERT SHIELD/STORM. It was very much affected by such factors as ionospheric propagation and the time of day. Performance changed from day to day, even from hour to hour, and it was very difficult to use at night, often for as much as 8 or 9 hours, due largely to atmospheric conditions. The quality of HF operations also depended upon operator skill. In order to make the adjustments necessary to enhance performance and, in general, to use the QRCTs and Goldwings effectively, operators had to be familiar with the vagaries of HF and the conditions that adversely affected its ability to transmit and receive data. Such familiarity came primarily through training and experience. Since Air Force operators initially were deficient in both, QRCT communication was, at least in the beginning, erratic and unsatisfactory. HF was fine as a first-in, temporary TACCOM system, but AWS and its Air Force WSF neither expected nor wanted to use the QRCT for the long term. Nevertheless, it remained a TACCOM mainstay for Air Force support weather teams throughout DESERT SHIELD/STORM. Army support weather teams, however, since the Army units they supported were mobile, expected to remain heavily dependent on their Goldwings for TACCOM throughout the entire operation.<sup>57</sup>

The rapid expansion and consequent increase in traffic on the QRCT and Goldwing networks and the inability to operate much at night made it necessary for the net control stations to establish

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<sup>55</sup>AWS DS/DS Report #2 (S), pp 174 (Sec 5.1.1.2-d(2)), 176 (Sec 5.1.1.2-f), info used (U); Keefer Intvw (U), p 6; 5WW/DO DS/DS Lessons Learned Brfg (U); 5WW DESERT SHIELD Chronology (S), pp 9-3, 9-4, 9-5, 9-6, 9-7, 9-9, info used (U); ARCENT SWO AAR (U), Atch I-2; brfg slide (U), [AWS/DOJ], "DESERT SHIELD HF Communications," n.d. [ca Jan 91].

<sup>56</sup>Col R.R. Wall in AWTB Intvw (U), pp 18-19; Keefer Intvw (U), pp 6-7; Koenemann Intvw (U), p 13; MSgt J.E. Brackett in Callahan/Brackett Intvw (U), p 20; Riley Intvw (S), p 31, info used (U); note (U), Col G.F. Riley, Chief, AWS/DOT, to W.E. Nawyn, AWS/HO, 22 Jun 92. For a discussion of the lack of training that Air Force weather support teams had on QRCTs, see Kelly Intvw (U), pp 17-19.

<sup>57</sup>AWS DS/DS Report #2 (S), pp 174-176 (Sec 5.1.1.2-d(2)(3)), info used (U); Koenemann Intvw (U), pp 13-14; Keefer Intvw (U), p 3; Conley Intvw (U), p 15.



**ARCENT COMMUNICATIONS  
24 FEB 91**

		TTY R/O	TACFAX/ TIDS	UAWS	GOLDWING
ARCENT	1690 WGP	■	■	■	■
12 AVN BDE	OL-G	+	+	+	■
2 BDE	OL-L	■	■	■	+
SOCCENT	DET 1	■			■
XVIII ABN CORPS	DET 3	□	□	+	■
18 ABN AVN		+	+	+	■
82 ABN DIV	DET 5	+	+	+	■
82 ABN DIV AVN		+	+	+	■
24 INF DIV	DET 7	+	+	+	■
24 INF DIV AVN		+	+	+	■
101 ABN DIV	DET 9	+	+	+	■
101 ABN DIV AVN		+	+	+	■
1 CAV DIV	DET 11	+	+	+	■
1 CAV DIV AVN		+	+	+	■
VII CORPS	DET 13	□	■	■	■
11 AVN		+	+	■	+
1 ARM DIV	DET 15	+	+	■	+
1 ARM DIV AVN		+	+	■	■
3 ARM DIV	DET 17	+	+	+	■
3 ARM DIV AVN		+	+	■	+
1 INF DIV	DET 19	+	+	+	■
1 INF DIV AVN		+	+	■	+
2 AIR CAV REG	DET 21	+	+	■	+
2 AIR CAV REG AVN		+	+	+	+
3 AIR CAV REG	DET 23	+	+	+	■
3 AIR CAV REG AVN		+	+	+	■

Legend	
■	Available
□	Programmed
+	Not Required

SOURCE: AWS DESERT SHIELD/DESERT STORM Report #2 (S), p 187 (Atch 20), info used (U).

Figure III-2



rules and times for operating on the network. Each established blocks of time and scheduled specific time periods within each block for field units and the net control stations to transmit data. Typically, the net control stations set up a 3-hour block with the net control transmitting to the field for one hour and the weather teams transmitting their data during the remaining 2 hours of the block in ordered sequence (near the end of the operation this got to be more like one-half hour for net control and two and one-half hours for the weather teams). This meant that each weather team could send out its weather observations only once every 3 hours, which made its data less timely than desirable, but the most timely possible under the circumstances.<sup>58</sup>

Very soon after DESERT SHIELD began, AWS, through its 2d Weather Wing, established a QRCT HF broadcast at Incirlik AB, Turkey, to relay AWN weather data to the weather teams deployed in the Persian Gulf theater. Indeed, the Incirlik QRCT served as the interim net control station until the DSFU assumed that function on 31 August. The broadcasts continued throughout the duration of the operation. Initially, the transmissions were not always successful because units in the theater frequently could not receive them. As a result, in late August the 2d Wing initiated action to increase the power of the Incirlik broadcast. This was successfully accomplished when the 31st Weather Squadron's Detachment 19, based at Incirlik, succeeded in hooking up a second QRCT to a three-kilowatt transmitter and a MAC World Airways voice antenna at Incirlik. The new jerry-rigged QRCT "system plus," which could transmit only, became operational on 7 September. The original Incirlik QRCT, however, continued to operate in both send and receive modes.<sup>59</sup>

When the Army's VII Corps weather teams deployed to the Persian Gulf beginning in late November 1990 they brought with them as their TACCOM system the UAWS, thereby introducing a second HF TACCOM system into the theater. US Army Europe had developed and procured UAWS for use in Europe by its weather teams independent of FORSCOM, which had purchased the Goldwing. It fielded UAWS in 1988. The system used a Zenith Z-248 computer and included a 500-watt Harris radio. Unfortunately it was not compatible with the Goldwing. Although the Goldwing used a different radio (125-watt Transworld TW-100F) and computer (Gridcase), the incompatibility resulted primarily from the modems the two systems used. UAWS employed the high-speed, 2,400 baud Harris 3466; the Goldwings used the much slower, 600 baud Fredericks 1280A. FORSCOM planned to rectify the incompatibility problem in a future Goldwing upgrade, but, obviously, that didn't help for DESERT SHIELD/STORM. Fortunately, AWS and Army communicators had devised and practiced a work-around well before DESERT SHIELD began. This involved positioning both a UAWS and Goldwing system at a particular site and then manually transferring floppy discs from one to the other for retransmission of the data they contained to deployed weather teams via the other system's network. This slowed down data handling, but it worked as a temporary fix.<sup>60</sup>

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<sup>58</sup>AWS DS/DS Report #2 (S), pp 175 (Sec 5.1.1.2-d(2), 176 (Sec 5.1.1.2-f), info used (U); Keefer Intvw (U), pp 3-4.

<sup>59</sup>Msg (S), 5WW/DO to 1WW/DO, et al, "Concept of Operations (U)," 090100Z Aug 90, info used (U); msg (S), 5WW/CAT to 7WS/DOX, et al, "AWS Concept of Operations/Operation DESERT SHIELD (U)," 291825Z Aug 90, info used (U); msg (S), 2WW/CAT to AWS/DOJ, et al, "Incirlik QRCT Use of Giant Voice Transmitter (U)," 290915Z Aug 90, info used (U); msg (S), 2WW/CAT to AWS/CAT, et al, "Data Flow for DESERT SHIELD Support Update (U)," 051415Z Sep 90, info used (U); action item #16 (U), [AWS] CAT Director, "Incirlik HF Broadcast Increased Power," opened 27 Aug 90, closed 9 Sep 90.

<sup>60</sup>Hist (S), AWS, CY 89, pp 268-269, info used (U); Campbell Intvw (U), pp 224-25; Boyle Intvw (U), pp 6-7.

Since UAWS and Goldwing were incompatible, ARCENT Weather had to establish two HF networks, one for XVIII Corps, the other for VII Corps. The ARCENT Weather net control station functioned as the Goldwing/UAWS interface. It had one person dedicated to operating each system at all times. The VII Corps UAWS net became operational on 21 December. The ARCENT net control station originally set up the network on a 1-hour data collection--data transmission cycle, the schedule followed in Germany, but when that proved to be unworkable for DESERT SHIELD, it switched the net to a more satisfactory 2-hour cycle.<sup>61</sup> (See Figure III-2.)

Once the VII Corps weather teams overcame a few initial problems, UAWS performed well in DESERT SHIELD/STORM, better than it had ever done during exercises in Germany. The UAWS maintenance concept called for returning broken equipment to Europe for repair, at best a cumbersome procedure. However, since VII Corps weather teams deployed with spares and there were few equipment failures, maintenance never became a problem. One user raved that UAWS had performed "beyond belief in its capabilities and overall performance." Lieutenant Colonel Campbell, the OIC of the ARCENT weather support element, observed that UAWS performance was "a real success story."<sup>62</sup>

### *QRCT/Goldwing Problems*

In contrast to its experience with UAWS, the WSF had many problems with the QRCTs and Goldwings. This was at least partly because the QRCTs and Goldwings were in continuous service for a much longer time than UAWS (almost seven months compared to slightly more than two months). Some of the problems arose out of the previously mentioned general shortcomings of any HF communication system--which to some extent the VII Corps weather teams were, because of their experience and through experimentation with the UAWS, able to mitigate to a certain extent--and the Air Force weather support teams' lack of training and/or experience with the QRCTs. But there were also problems attributable to other factors, including weaknesses in the QRCT/Goldwing itself and the absence of an adequate in-theater maintenance support capability.

Shortly after the start of DESERT SHIELD, Headquarters AWS found it advisable to replace the narrowband antennas that were part of the QRCT and Goldwing systems, although at the time leaders at the 5th Wing and of the WSF in the theater did not consider it necessary. QRCT operators currently had to manually recut and realign the antennas as they changed frequencies in response to changing atmospheric conditions and as day gave way to night and vice versa. In order to get maximum reception and transmission capability, it was vital they set the antennas accurately; lack of accuracy seriously degraded performance. As a result of the experience with and some investigation of the QRCT by some of its staff members, Headquarters AWS had concluded the deployed weather teams could improve QRCT performance, or at least operate their QRCTs more easily and efficiently, if their QRCTs had wideband antennas. Between 5 and 10 September Headquarters AWS developed a plan for procuring the new antennas. On 14 September it instructed the 5th Wing to immediately purchase

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<sup>61</sup>AWS DS/DS Report #2 (S), p 177 (Sec 5.1.1.2-g), info used (U); msg (S), 5WW/CAT to AWS/CAT, "CAT-to-CAT Questions Status (U)," 162222Z Nov 90, info used (U); Weaving Intvw (U), pp 12-13; ARCENT SWO AAR (U), pp 5 (Sec I-3a), 24-25 (Sec II-4a,b), Atch I-2-2; Campbell Intvw (U), p 24.

<sup>62</sup>AWS DS/DS Report #2 (S), p 179 (Sec 5.1.1.2-i), info used (U); ARCENT SWO AAR (U), pp 24 (Sec II-4b), 27 (Sec II-4e); Campbell Intvw (U), pp 24-25.

45 Barker and Williamson model A-C 3.5-30 megahertz continuous coverage folded dipole antennas. The antennas arrived in late October and November.<sup>63</sup>

The QRCT and Goldwing component causing the most trouble was the Grid hard disk drive system used with their Gridcase laptop computers. A significant number of hard drives crashed--9 for the CENTAF QRCTs alone--and several times as many of the removable 10 megabyte hard disk cartridges failed. There was no one cause for the problem. Certainly the hot and dusty environment in which the QRCTs and Goldwings operated was a major factor. When operators removed the hard disks from the computer, dust and sand could easily penetrate the drives. Operator mishandling also contributed to the crashes--for example, neglecting to remove the cartridges from the computer when not in use or, alternatively, removing them too soon, before the heads had retracted. An apparent inability to tolerate sustained use appeared to be another factor in the hard drive crashes. In any event, hard drive and disk breakdowns became a serious problem for the QRCTs and Goldwings.<sup>64</sup>

To alleviate the hard disk problem, 5th Wing purchased additional cartridges and shipped them to the theater as spares. In addition, the 5th Wing took steps to replace the Grid hard drives in the QRCTs with new units. FORSCOM, likewise, initiated an effort to procure new hard drives for the Goldwings. In January the 5th Wing joined FORSCOM's program and forwarded \$90,000 to FORSCOM to purchase 36 replacement hard disk drives for the QRCTs. The new drives, however, did not arrive in theater before the end of DESERT STORM.<sup>65</sup>

Other problems associated with the Gridcase computers, as well as a weakness in the radios used with the systems, also hampered QRCT and Goldwing operations. The computer handled data too slowly for efficient operations. Moreover, the software it used had several deficiencies. For example, the software was designed in such a way that the systems totally reject garbled messages. In addition, software limitations prevented the net control stations from polling the nodes on their network. AWS managed to arrange for several software improvements that rectified some of the problems, but others remained throughout the entire operation, including the rejection of garbled messages. AWS was still working the problem when DESERT STORM hostilities ended. The inadequate power (125 watts) of their TW-100F radios further impeded the operations of the two

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<sup>63</sup>AWS DS/DS Report #2 (S), p 174 (Sec 5.1.1.2-d(1)), info used (U); Col R.R. Wall in AWTB Intvw (U), pp 17-18, info used (U); Koenemann Intvw (U), pp 14-15; St. Onge Intvw (U), pp 14-15; action item #25 (U), HQ AWS/PM/XT, [Obtain Omni-directional Antenna for QRCT/Goldwing,] opened 5 Sep 90, [closed ca 15 Sep 90]; msg (U), USCINCCENT/Weather to 5WW/DO, et al, "AWS High Frequency Pamphlet," 091238Z Nov 90; msg (U), AWS/CAT to 5WW/CAT, "Dipole Antenna Purchase," 140355Z Sep 90.

<sup>64</sup>AWS DS/DS Report #2 (S), pp 178 (Sec 5.1.1.2-i), 180 (5.1.1.4), info used (U); St. Onge Intvw (U), pp 18-19; Keefer Intvw (U), p 8; Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 4; atch 4 (U), rpt, TSgt W.M. Anderson, NCOIC, 1690WGP/LG, "DESERT SHIELD/STORM After Action Report," 25 Mar 91, hereafter cited as 1690WGP/LG DS/DS AAR to CENTCOM Weather Staff AARs (U); msg (U), USCENAF/WE to 1TFW Deployed/WE, et al, [Goldwing (AN/GRC27) Hard Disk Drive Failures,] 310005Z Oct 90; msg (U), USCINCCENT/Weather to 5WW/DO, et al, "AWS High Frequency Pamphlet," 091238Z Nov 90.

<sup>65</sup>Koenemann Intvw (U), p 14; Keefer Intvw (U), p 8; Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 4; msg (U), 5WW/CAT to AWS/CAT, et al, "Evaluation of the Gridcase Hard-disk Drive Requirement," 192257Z Nov 90; msg (U), CINCFOR/FCJ3-CAT to 5WW/CAT, et al, "Goldwing/QRCT Issues," 071430Z Dec 90; msg (U), 5WW/CAT to AWS/PM, et al, "Hard-disk Drives for DESERT SHIELD Quick Reaction Communication Terminals," 111529Z Jan 91.



TACCOM systems. However, a bigger problem for QRCT and Goldwing operators was the shortage of usable frequencies on which to operate, something not the fault of the systems themselves.<sup>66</sup>

The lack of adequate maintenance support also threatened Goldwing and QRCT operations, especially the latter. Initially neither the Goldwings or QRCTs had any in-theater maintenance support. The Army weather support teams, however, had at least deployed with a few spares. On the other hand, the only way the Air Force support teams could get a QRCT replaced or repaired, if it could not be done on site, was to ship the broken system back to a depot in the US. This procedure, the weather teams found, was not feasible in practice. The 3 to 4 weeks it took was far too long. The Army's FORSCOM alleviated the situation when it deployed two communications maintenance detachments, the 158th from Fort Bragg and 159th from Fort Hood, Texas, to the theater. They did not arrive, however, until early October. At the request of AWS, FORSCOM authorized the detachments to maintain AWS TACCOM equipment, but with the provision that repair of Army Goldwings should take precedence over fixing Air Force QRCTs.<sup>67</sup>

The two detachments became invaluable for the continuation of Goldwing and QRCT operations. They deployed with six spare systems and a supply of spare parts. After arrival, they established a repair procedure whereby WSF units brought their broken Goldwings and QRCTs to the detachments for repair. If they could, they replaced a broken component immediately with a spare, if not, they repaired the system, usually within 48 hours. If for some reason they could not fix a particular system at all, they, as a last resort, returned it to the US. This procedure functioned extremely well for ARCENT weather support teams because the detachments were located at Dhahran, near to the deployed Army units, initially stationed in relatively close proximity to each other in northeastern Saudi Arabia. It didn't work out quite as well for the Air Force weather teams since they were scattered throughout the theater, making it harder for them to bring their broken QRCTs to the detachments. In actual practice, the teams shipped the QRCTs to CENTAF Weather, which sent them by intratheater airlift or, on two or three occasions, by automobile, to the detachments at Dhahran. Nevertheless, this procedure was immeasurably more effective than shipping the equipment back to the US and, on the whole and for the time being, worked acceptably.<sup>68</sup>

The Air Force weather support teams, however, began to find it much harder to follow the new maintenance procedure in January when the Army units started to move forward in anticipation of the outbreak of hostilities. When the Army units moved, the maintenance detachments moved with them, making it virtually impossible for the CENTAF weather teams to keep track of where they were. Even

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<sup>66</sup>AWS DS/DS Report #2 (S), pp 173 (Sec 5.1.1.2-d(1)), 175, 176 (Sec 5.1.1.2-d(2)), 179 (Sec 5.1.1.3-b), 180 (Sec 5.1.1.4-c), info used (U); msg (U), USCINCCENT/Weather to 5WW/CAT, et al, "Goldwing Software Modifications/Corrected Copy," 181357Z Dec 90; Tasker #21 (U), HQ AWS/CAT, "Goldwing Software Modifications," 7 Feb 91, w/1 atch; ARCENT SWO AAR (U), pp 22-23 (Sec II-3c,d).

<sup>67</sup>AWS DS/DS Report #2 (S), p 180 (Sec 5.1.1.3-d), info used (U); Col T.C. Tarbell and LTC R.R. Wall in AWTB Intvw (U), pp 25-26; msg (U), AWS to 5WW, et al, "AN/GRO-27 Component Replace Concept of Operations," 110245Z Aug 90; Conley Intvw (U), pp 16-17; Koenemann Intvw (U), pp 17-18.

<sup>68</sup>AWS DS/DS Report #2 (S), pp 178-179 (Sec 5.1.1.2-i), 180 (Sec 5.1.1.3-d), info used (U); LTC R.R. Wall in AWTB Intvw (U), p 26; Weaving Intvw (U), pp 20-21; note (U), LTC G.F. Riley, Chief, AWS/DOT, to W.E. Nawyn, AWS/HO, 22 Jun 92; Itr (S), ARCENT/SWO to CENTCOM/SWO, "Maintenance Support from the 158th and 159th Maintenance Detachments (U)," 5 Oct 90, info used (U).



Army weather teams at times lost contact with them. The new difficulties made it apparent that while having the Army detachments repair QRCTs might provide a solution to the maintenance problem during a relatively stable peacetime situation, it did not meet operational requirements under fluid wartime conditions.<sup>69</sup>

The need to use communications security (COMSEC) materials in QRCT and Goldwing operations created another problem area associated with these systems apart from the equipment itself. Since the QRCTs and Goldwings were intended to operate in a secure mode (i.e., transmit classified data), the weather teams that would be using them deployed with COMSEC codes and with keytapes for the KG-84 data encryption device that was a part of both systems. While some initial confusion existed over what keytapes to use at what time, the biggest and most persistent COMSEC problem was getting outdated keytapes replaced on time. Difficulties in this area hampered, sometimes delayed, and at times, threatened to prevent secure operations. Inasmuch as the weather teams had deployed with a 2- or 3-month supply of keytapes, some needed a new supply as early as 1 October. FORSCOM provided the initial supply for both the CENTAF and ARCENT weather support teams and agreed to replenish the ARCENT weather teams when necessary, but the 5th Wing, as lead wing, had to see to it that the CENTAF weather support units got the keytapes they needed.<sup>70</sup>

The 5th Wing had some difficulty in meeting its responsibility to replace CENTAF weather support unit keytapes. The CENTAF Communications-Computer Systems COMSEC custodian did not immediately establish in-theater COMSEC accounts (in fact, he did not do so until January 1991). As a result, since some AWS weather teams needed new keytapes by the beginning of October, the wing, working with Headquarters AWS, tried to find or devise an acceptable channel to resupply AWS units with keytapes directly from Langley AFB as expeditiously as possible. FORSCOM initially refused to approve the transfer of its keytapes to the 5th wing because CENTAF had not yet established the Air Force COMSEC account in the DESERT SHIELD theater. At this point, Headquarters AWS stepped in and, after extensive coordination with FORSCOM, developed a method of sending the tapes to the theater that was acceptable to the Army command. Under this method, FORSCOM would transfer the keytapes to the Langley AFB COMSEC account custodian and the wing then would make arrangements to transport the tapes to the theater by courier. The wing chose to use designated couriers, usually passengers on the TAC rotator flights out of Langley. The 5th Wing managed to send off its first shipment of tapes to the theater in late September.<sup>71</sup>

The courier method, while workable, was far from ideal. For one thing, it was slow. The flights from Langley to Riyadh went quickly, but the distribution of the tapes within theater took some time. Consequently, on the first shipment some CENTAF weather teams received their new keytapes with only hours to spare and one got its tape late, temporarily preventing it from transmitting data in

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<sup>69</sup>AWS DS/DS Report #2 (S), pp 178 (Sec 5.1.1.2-i), 180 (Sec 5.1.1.3-d), info used (U); Weaving Intvw (U), p 21; Keefer Intvw (U), p 11.

<sup>70</sup>AWS DS/DS Report #2 (S), p 214 (Secs 5.1.5.1, 5.1.5.2), info used (U).

<sup>71</sup>AWS DS/DS Report #2 (S), pp 214-216 (Secs 5.1.5.2-c, 5.1.5.4), info used (U); msg (S), HQ AWS/CAT to 5WW/CAT, "CAT-to-CAT Questions for 12 Sep 90 (U)," 121517Z Sep 90, info used (U); ltr (U), AWS/ADO to HQ MAC/SCO, "DESERT SHIELD Weather Communications Concerns," 24 Oct 90.

a secure mode. The method also created, because of the number of couriers involved, a greater risk of keytape loss or compromise.<sup>72</sup>

The 5th Weather Wing dispatched a second set of keytapes in early December. Meanwhile, Headquarters AWS arranged to have the National Security Agency develop a keytape specifically for AWS that would be valid for 1 year. While the agency had developed the keytape by mid-December, because of the continuing lack of in-theater CENTAF COMSEC accounts to handle distribution, AWS was not able to send it to theater until March 1991, after the war was over, with an effective date of 1 June.<sup>73</sup>

ARCENT weather teams also had trouble getting new keytapes. Even though ARCENT had COMSEC custodians in theater and the teams informed them of their keytape requirements, the teams frequently would still not get their keytapes from FORSCOM on time. As a result, some were unable to transmit on the Goldwing network for a time. On at least one occasion several units never got their tapes at all. FORSCOM shipped five Goldwing tapes from Army National Guard weather flights to units in the field, but only one of them received its tape.<sup>74</sup>

Overall, QRCT and Goldwing operating performance was mixed. The Goldwings performed well for the ARCENT weather teams, better than the QRCTs did for the CENTAF weather teams, due mostly to more skilled Army weather team operators and technicians and partly to easier access to the maintenance detachments. Nevertheless, the Air Force weather support teams, in spite of many problems with or related to the QRCTs and using them much longer than they ever anticipated, had in the QRCTs a workable TACCOM system that contributed much to their ability to perform their mission.<sup>75</sup>

### ***Tactical Facsimile Network***

The AWS WSF also established a second in-theater TACCOM network, an analog TACFAX network to disseminate weather graphic products among the deployed units. AWS plans called for a hardwire network that would connect the CENTCOM, CENTAF, ARCENT, and SOCCENT headquarters weather stations with each other, CENTAF Weather with weather teams supporting Air Force units,

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<sup>72</sup>AWS DS/DS Report #2 (S), pp 215 (Sec 5.1.5.2), 216 (Secs 5.1.5.3, 5.1.5.4), info used (U); ltr (U), AWS/ADO to HQ MAC/SCO, "DESERT SHIELD Weather Communications Concerns," 24 Oct 90; note (U), LTC G.F. Riley, Chief, AWS/DOT, to W.E. Nawyn, AWS/HO, 22 Jun 92.

<sup>73</sup>AWS DS/DS Report #2 (S), pp 215-216 (Sec 5.1.5.2-c,d), info used (U); msg (S), 5WW/CAT to AWS/CAT, et al, "Operational Readiness of the DESERT SHIELD Weather Support Force (U)," 041308Z Jan 91, info used (U); msg (C), "AWS/CAT to 5WW/CAT, "Key Tape Status (U)," 151325Z Jan 91, info used (U); msg (U), HQ AWS/CAT to Comdr FORSCOM/FCJ2-ISA, et al, "Requirements for USKAT-A10145," 021325Z Nov 90; msg (U), HQ AWS/CAT to 5WW/CAT, "COMSEC Support for Deployed AWS Units," 201347Z Dec 90.

<sup>74</sup>AWS DS/DS Report #2 (S), p 214 (Sec 5.1.5.2-b), info used (U).

<sup>75</sup>Campbell Intvw (U), pp 24-25; ARCENT SWO AAR (U), p 20 (Sec II-3a); St. Onge Intvw (U), p 19; Keefer Intvw (U), p 7; atch 4 (U), 1690WGP/LG, DS/DS AAR to CENTCOM Weather Staff AARs (U).

ARCENT Weather with Army corps weather teams, and Army corps and divisions with each other. An embryonic CENTAF network consisting of CENTAF Weather, CENTCOM Weather, and four CENTAF weather support units was operational by 30 September. The DSFU functioned as net control. CENTAF communications engineers had expanded the circuit to include 18 units by 31 October and all the CENTAF weather support units then in theater by mid-November. All the weather teams which arrived in the Persian Gulf theater during the additional DESERT SHIELD buildup beginning in early November had their TACFAX connection by mid-January. Until such time as they received the hardwire connection, the CENTAF units relied mostly on HF intercepts for facsimile data. Meanwhile, the DSFU could not transmit AFDIGS charts over the network or, for that matter, use AFDIGS data in generating its own products until it finally received its first usable data over the AFDIGS circuit from AFGWC in early January 1991. Prior to this time it transmitted or used only data it received from within theater or other sources, primarily NODDS. It used an Alden 9316B scanner to send out facsimile data.<sup>76</sup> (See Figure III-1.)

The story was different at ARCENT and SOCCENT. ARCENT Weather never received TACFAX data while it was located at the RSLF Building due to the lack of space in the building for additional hardwire circuits. However, on 7 January, a few weeks after it moved to Eskan Village, it finally got its TACFAX circuit, enabling it to receive data from the DSFU. Army Signal Corps engineers eventually succeeded in bringing the VII Corps weather team into the TACFAX network, but the XVIII Corps team never attained connectivity. The first weather TACFAX circuits for SOCCENT weather units did not become operational until mid-December. One unit did not receive its TACFAX until 12 February, almost 4 weeks after the air war had begun. Before they got their own TACFAX circuits, ARCENT and SOCCENT weather teams, like the CENTAF weather units, relied on intercepted HF weather broadcasts for their facsimile data.<sup>77</sup> (See Figure III-2.)

Apart from the fact that some weather teams did not get connected to the TACFAX circuit for some time, the main problem with TACFAX was that it had to share a circuit with the AWS's TIDS network, also operating in the theater.<sup>78</sup> Since AWS communications took up a great deal of circuit space, CENTAF Communications-Computer Systems simply did not have the circuit capacity in theater to allocate a dedicated circuit to each network. Sharing the circuit hampered operations and caused delay in data transmission on both networks. To make the operation of the shared circuit as efficient as possible, the DSFU established an around-the-clock transmission schedule of four hours for TACFAX followed by two hours for TIDS. In other respects the TACFAX circuit worked well. The circuit proved to be reliable and the charts and other data received were good.<sup>79</sup>

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<sup>76</sup>AWS DS/DS Report #2 (S), pp 176 (Sec 5.1.1.2-d(4)), 188-192 (Atch 21), 207-208 (Secs 5.1.3.1; 5.1.3.2-a,b), 188-192 (Atch 21), info used (U); Riley Intvw (S), pp 21-22, info used (U); Maj R.P. Callahan in Callahan/Brackett Intvw (U), p 5; note (U), LTC G.F.Riley. Chief, AWS/DOT, to W.E. Nawyn, AWS/HO, 9 Jul 92.

<sup>77</sup>AWS DS/DS Report #2 (S), pp 176 (Sec 5.1.1.2-d(4)), 188-192 (Atch 21), 209-210 (Sec 5.1.3.2-c,d), info used (U); Weaving Intvw (U), pp 8-9; Maj R.P. Callahan in Callahan/Brackett Intvw (U), pp 8-9; ARCENT SWO AAR (U), pp 17-18 (Sec II-2b), Atch I-2-2.

<sup>78</sup>See below, Chap IV, pp 87-88.

<sup>79</sup>AWS DS/DS Report #2 (S), p 208 (Sec 5.1.3.2-a), info used (U); Riley Intvw (S), p 23, info used (U); Campbell Intvw (U), p 15; Boyle Intvw (U), p 9; Atch 11 (U), Brod DS/DS AAR to CENTCOM Weather Staff AARs (U); ARCENT SWO AAR (U), pp 17-18 (Sec II-2b).



Probably no TACCOM equipment outperformed the Alden 9315 transmitter-receivers, whether the 9315TR (transmitter/receiver), 9315TRT (upgraded transmitter/receiver), or 9315TRT-R (further upgraded receiver only) versions. Since the 9315s were a basic component of both the QRCTs and Goldwings, every WSF unit, whether at headquarters or out in the field, possessed at least one. Users characterized the 9315 as rugged, reliable, and extremely well performing--in short, an excellent piece of equipment.<sup>80</sup>

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<sup>80</sup>MSgt J.E. Brackett in Callahan/Brackett Intvw (U), pp 11-12; Campbell Intvw (U), p 17; Koenemann Intvw (U), p 14; Keefer Intvw (U), pp 4-5; Atch 4 (U), 1690WGP/LG DS/DS AAR, to CENTCOM Weather Staff AARs (U).