



Your Magazine for Air Force Weather

OBSERVE R

July 1998

Vol. 45 No. 4

**6 SOPS Closes -
DMSP in new hands**

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SPOTLIGHT

On the cover an artist's rendition of one of the workhorse weather-satellite systems for the military – the Defense Meteorological Satellite Program or DMSP. This month's spotlight is on the closing of the first satellite-flying unit, 6th Space Operations Squadron that controlled DMSP for 35 years and turned over control on June 11 to the National Oceanic and Atmosphere Administrative in an historic first. The image on the back cover is one of the last F13 visible images received by 6 SOPS over the Middle East.



SPACE: The Final Frontier or the Next Hub?

by Brig. Gen. Fred P. Lewis, Air Force Director of Weather

Know your enemy, your victory will be assured; know the ground, know the weather, your victory will then be total. Sun Tzu, 500B.C.

As the Air Force begins the transition to the Aerospace Force of the future, the wisdom of Sun Tzu still rings true. As such, we in the weather community must continue to enlarge our vision to encompass the new high ground, Space. Air Force Weather, in close concert with Air Force Space Command, is working hard to ensure this happens.

Military operations, from peace to war, are becoming increasingly dependent on space or space based assets. The daily phone calls we make, platoon leaders transmitting daily SITREPS to Command Centers, transmission of information to support worldwide operations, and navigation systems like the Global Positioning System, all of these are increasingly reliant on space. The use of space is an integral part of future concepts-like the digitized battlefield and Joint Vision 2010-will help the U.S. maintain a military advantage over known and potential adversaries.

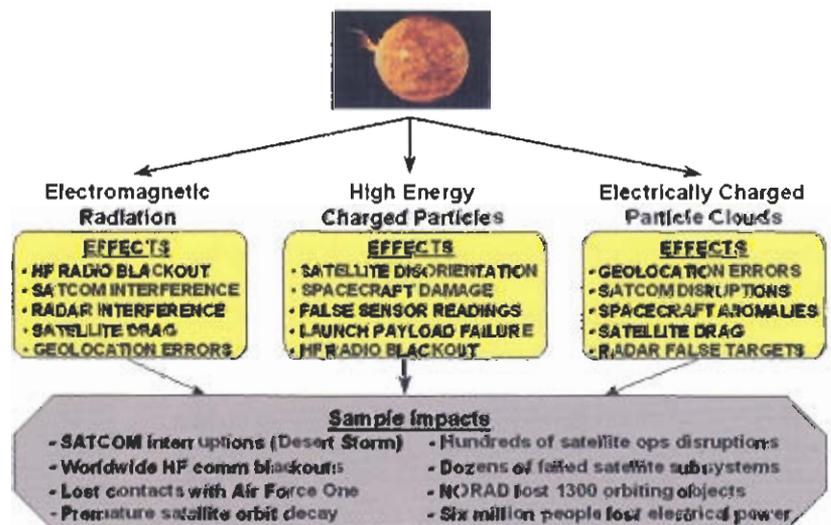
Unfortunately, this increased reliance, when coupled with other factors like miniaturization and the use of commercial, less hardened, spacecraft creates a dimension of vulnerability for military forces. While intentional hostile actions against our space-based capabilities are possible, the space environment presents an equally disruptive and pervasive enemy. This is where we can help in the area of space weather.

Far from the benign environment we may have envisioned years ago, the space environment can be very severe. Space weather storms can and do impact our spacecraft with effects ranging from temporary loss of signal to the loss of the spacecraft. Air Force Space Command published a pamphlet last year (which the AFWA reprinted as FYI 37) describing the impacts of space weather on military operations. All of you should take the time to read this pamphlet as the space weather impacts described in it will become more and more a part of our daily routine. We will need to develop and transmit fused space and terrestrial weather products so that operators of the future can take full advantage of the technologies provided to our forces.

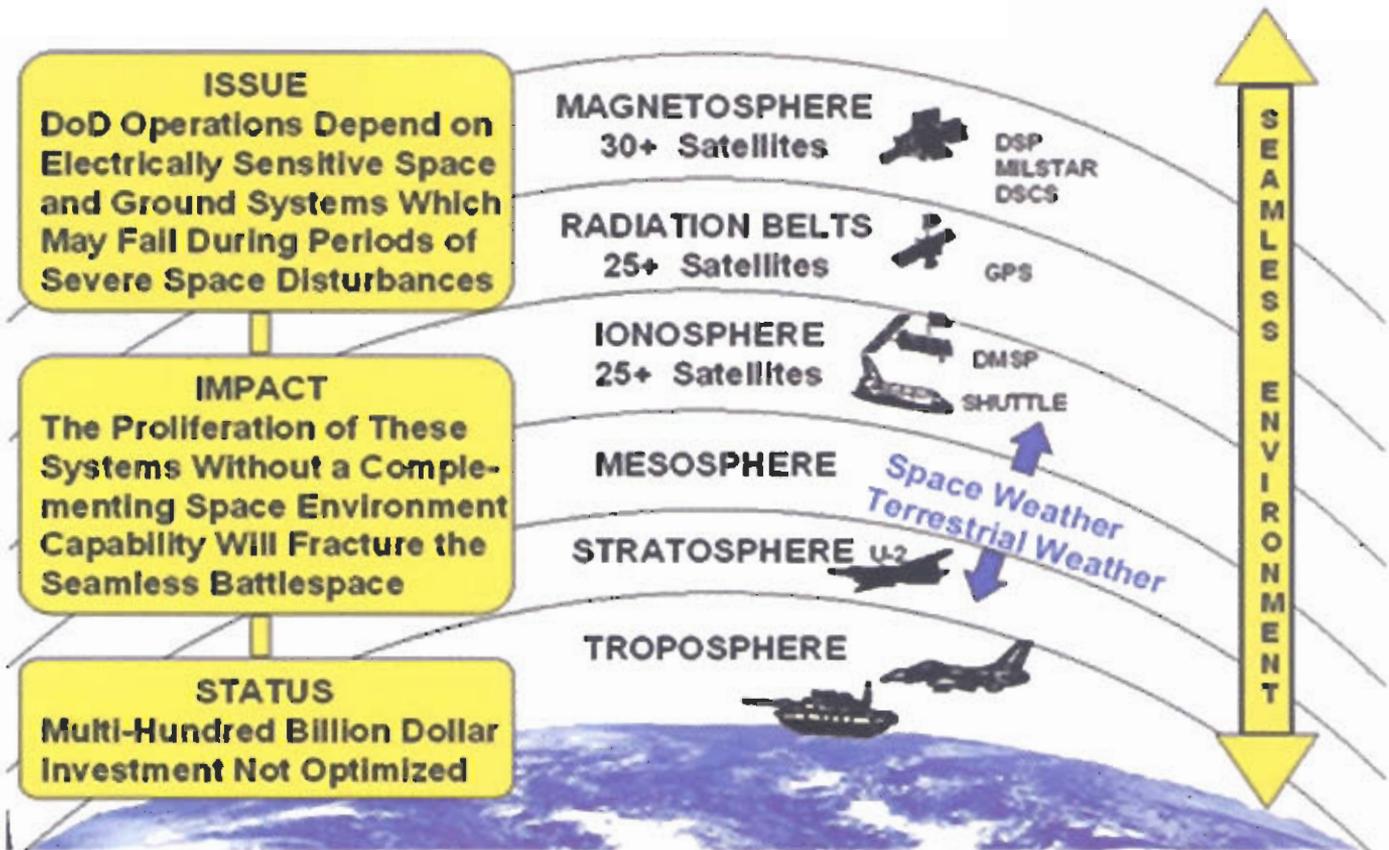
The 55th Space Weather Squadron is leading the charge in this area. If you want to get in on one of the waves of the future, talk to the folks out there and see how you can become a part of their efforts. The people of the 55th are already issuing products which are used operationally in places like Alaska where aircrews are warned of deviations in the ionosphere which might impact GPS accuracy for that day's mission. Scintillation warnings are used at BLUF. FLAG to train senior decision makers on the significance of "space weather" phenomena on their ability to communicate.

At the same time that we are moving forward in studying space weather, we are also progressing in studying terrestrial weather from space. We are investigating ways to use data from "non-traditional" weather platforms like the Defense Support Program (DSP) or the Space Based Infrared System (SBIRS) to improve our weather data refresh rate. The Special Operations folks are developing a deployable weather observing system called the Remote Miniature Weather Sensing System (RMWSS) which will send back its data via a low earth orbiting (LEO) communications satellite. We are also expanding our weather communications pipeline by exploiting existing satellite communications systems to replace aging, expensive land lines. Further, improved Defense Meteorological Satellite Program (DMSP) satellites will

- SPACE DISTURBANCES AND IMPACTS -



- AEROSPACE ENVIRONMENT -



be launched shortly after the turn of the century. These new DMSP satellites will provide improved multi-spectral imagery, atmospheric temperature and humidity profiles, and space environmental data.

In about 2007, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) will replace DMSP and NOAA's Polar-orbiting Operational Environmental Satellite (POES) and take us to an even greater level of remote sensing capabilities. We have run studies comparing NPOESS baseline capabilities with the optimum capability available from DMSP and POES for supporting various operational systems. In each case, the products from NPOESS data significantly enhanced the capabilities of each weapon system. Remember, these studies were conducted using baseline capabilities. Breakthroughs in technology and the pressures of competitive procurement should provide even better capabilities for our weather forces to use in supporting worldwide operations.

In closing I would add that space is no longer a concern of the future. The "future" is here today, the frontier has been explored, and now it is time to start settling in and refining/improving our capabilities. One way or the other, we will all soon be using space weather products in our briefings, forecasts, and decision aids. My challenge to all of us is to learn more about space weather now. Check out the opportunities to work in space related areas available at Space Command, AF/XOW, or the Air Force Weather Agency. Space is moving rapidly into our daily operations and we must all train to meet this challenge. We in XOW are working closely with AFSPC, AETC, and the AF

Weather Agency to provide the programs to train our people in space weather and its effects to move along with the Air Force into the future. Please take the fullest advantage of these new opportunities as we move forward into the next century.

TWO THUMBS UP

At 2352Z on July 6, Air Force Weather Agency's point weather warning forecaster, Mr. Wolfgang Perl, issued a warning for the 132nd Fighter Wing, Iowa Air National Guard at Des Moines International Airport. A severe thunderstorm containing hail greater than ¾ inch and winds greater than 55 knots was headed toward the unit. At 0215Z, severe thunderstorms moved into the local flying area of the airport, producing 69 knot winds, four miles northwest of the airport. At 0233Z, a gust of 43 knots was recorded at the airport. The 132nd Fighter Group was given two hours and twenty minutes lead time before the severe thunderstorm moved within five nautical miles of the airport.

“Special Obs”: Hub Stand-Ups and Remembering The Way We Were

by Chief Master Sgt. Tony Ramirez, Chief, Enlisted Matters, Air Force Directorate of Weather

It's hard to believe but it's true. Our reengineering path has brought us to a time for cutting ribbons, making speeches, drinking red punch and celebrating. It's also a time to remember the past, take pride in our history, and re-connect with the people who got us where we are today. Last week's travel schedule allowed the General and I to experience a first, real glimpse into the future of Air Force Weather at Elmendorf Air Force Base, Alaska and Sembach, Germany. Then, as timing would have it, we had an opportunity to meet with many of our retired Air Force Weather family at the Air Weather Association reunion in St. Louis. Maybe all this occurred during the same week by coincidence maybe not.

As the sun reached summer solstice, we headed North to start a week of “travel by night” TDY's across 10 time zones. At Elmendorf, the sun really didn't go down. The never-ending daylight seemed really appropriate for the ribbon cutting of the first AFW reengineered weather unit, the Alaskan Weather Operations Center—the AWOC. The AWOC is truly a diamond in the rough. The members of the AWOC have built a fine start to our reengineering vision. Before retiring from the Air Force later that day in a ceremony officiated by Brig. Gen. Lewis, Lt. Col. Tom McPhail attended the ribbon cutting and passed the AWOC lead to Lt. Col. Dave Sautter. As we bid farewell to Lt. Col. McPhail, we need to thank him for his superb leadership in guiding the Alaskan reengineering effort. Thanks colonel for covering our northern flank so well.

It was evident that Maj. Rod Grady and Senior Master Sgt. Mark Campbell had prepared the unit well for the ribbon cutting agenda. The stand-up culminated with Brig. Gen. Lewis “clicking the mouse” and sending out the AWOC's first operational TAF for Eielson AFB, the first TAF for the unit's growing CWT partnership base. Hub operations proceeded, seemingly uninterrupted, despite the fanfare. Well done, AWOC, and all the Alaskan Theater weather folks. Just outstanding. Col. French, Chief DeLaOssa, I know you're extremely proud too.

After a short stop back at the Pentagon, we headed East this time. East to Germany and the ribbon cutting of the

USAFE Operational Weather Squadron at Sembach. As you know, the Sembach OWS will ultimately provide reach-back and regional weather support to the entire EUCOM theater of operations including all of Europe and most of Africa. The body language was simple to read this day. Brig. Gen. Lewis, Col. Mike Neyland, and Col. Paul Harris were showing immense pride. These true leaders have always been quick to give the credit to the troops. But I can tell you, having witnessed reengineering from day one, we simply wouldn't have gotten to this point in USAFE without their leadership, extremely hard work, and willingness to fight the tough battles. Like the AWOC, the Sembach Hub is also a gem, but on a much larger scale. Lt. Col. Ralph Stoffler, the OWS' commander and Senior Master Sgt. Bryan Goforth, its first superintendent, are rightfully assigned having put their hearts and souls into the siting, planning, and development of the Air Force's first large operational weather squadron. Senior Master Sgt. Jeff Fries deserves a lot of credit for building the provisional operational weather squadron capability at Ramstein proving the concept in Europe, then transitioning Ramsteins' BWS into USAFE's first combat weather flight. Chief Evans, the impact of your “common sense” leadership and influence from USAFE/DOW was evident as well. Great work USAFE OWS, you're building our future, showing us the way, and making us all proud.

Our week came to an end with a short trip to St. Louis and the Air Weather Association's reunion. “Serving the present—Remembering the Past—Air Force Weather” is their motto. The list of attendees included some of our most distinguished retired AFW leaders: Major Gen. (Ret) Russ Pierce, Major Gen. (Ret) John Collens, Brig. Gen. (Ret) Al Kachn and Brig. Gen. (Ret) Jack Kelly. A moving and inspirational poem entitled “The Way We Were”, written and recited by Col. (Ret) Dale Flinders, reminded us that there continues to be a lot of pride in the Air Weather Service of yesterday—rightfully so. We in Air Force Weather today evolved from a prestigious weather warrior legacy. Our “support the warfighter” mission hasn't changed. It was extremely encouraging to experience the support from our retired community as they responded to the briefing Brig. Gen. Lewis provided on our AFW reengineering strategy. Many questions were asked and much two-way feedback occurred. Some attendees commented that, in many ways, our strategic plan returns Air Force Weather to similar organizational and operational structures of the past. It was encouraging to see our retired weather family remaining engaged — if only in a supportive role—with us. The general encouraged them to remain engaged in our future.

I really hadn't intended to drop so many names in this article. But the more I wrote the more I realized that the strength of Air Force Weather is really built on the commitment of our people, past and present. People like you are building our future and people like those at the AWA reunion have built our proud foundation. As we keep our eyes focused on the AFW vision, let's never forget the way we were.



USSTRATCOM METOC's Critical Weather Mission

by Maj. Dean Corpman, USSTRATCOM Chief of METOC
Mobile Operations

More than 50 years ago two nuclear explosions fundamentally changed the course of human history. With the world's first employment of atomic weapons against an enemy, the United States established itself as a nuclear power, and initiated the policy of **deterrence** that has arguably been the guarantor of its security ever since.

Today, the U. S. Strategic Command (USSTRATCOM) enforces that policy, exercising control over a continuously ready nuclear triad of submarine-launched ballistic missiles, land-based intercontinental ballistic missiles, and bombers.

Vital to the command and control of these forces are the fixed underground command post beneath USSTRATCOM, the **Airborne National Command Post (ABNCP)** aircraft-the **Looking Glass**, and the **ground vehicle-based** Mobile Consolidated Command Center. As is the case with conventional forces, understanding the environment is crucial to the maintenance and employment of nuclear forces. Thus, USSTRATCOM Meteorological and Oceanographic (METOC) officers are assigned to support each of these command centers.

"Our mission is straight forward: we provide warfighters the meteorological and oceanographic (METOC) information they require at critical points in their decision cycles," explained Maj. Dean Corpman, USSTRATCOM Chief of METOC Mobile Operations.

"We train and are equipped to perform this mission during all phases of war, from prehostilities through decisive combat to posthostilities. While our mission appears similar to our conventional counterparts, the nuclear aspect of our mission makes what we do unique.

Like our counterparts, we use state-of-the-art, fixed and deployable U. S. Navy and U. S. Air Force METOC data acquisition systems and common user networks such as the **Global Command and Control System**, to access METOC data from **government** and commercial sources. However we must **synthesize** and distill this data into information critical to strategic operations running the gamut from generating aircraft, to anticipating **electromagnetic pulse** effects on command and control **communications**, to predicting nuclear fallout dispersal patterns."

The 12-member USSTRATCOM METOC Support

Branch staff is assigned this mission. An effective team of seven Air Force (five active and two reserve) and five Navy (four active and one reserve) officers provide the core of this capability. In wartime, an additional four augmentees join the battle staff. In total, these numbers enable the branch to surge to a 24 hour day support for all three command centers and to also support USSTRATCOM's newest mission, the Theater Planning Response Cell (TPRC).

According to Navy Cmdr. Brian Williams, the USSTRATCOM Senior METOC Officer, properly aligning and maintaining this complex organizational Rubik's cube is no small feat.

"At any given time, I must be prepared to provide five flyers for the Airborne Command Post, two deployers for the MCCC, three deployers for the TPRC, and six watchstanders for the underground command center said Williams. "To say the least, this results in a challenging and sometimes staggering array of manpower, training and logistical requirements to orchestrate."

According to Williams, the team practices wartime missions with all three command centers at least three times a year, during Exercises GLOBAL ARCHER and GLOBAL GUARDIAN. In addition, they are rated on training effectiveness during the Joint Chiefs of Staff, Staff Assistance Visit.

"Routinely, we conduct approximately 20 ABNCP training flights per month, two to five training days per person per month, one person on ground alert at the alert facility every day, one person on backup alert every day, a day watch in the command center each weekday, a challenging action officer workload, and the occasional temporary duty to attend meetings and conferences," said Williams. "You could make a case to say we have enough work to keep us busy."

This complex mission and operations tempo requires strong teamwork and innovative thinking. "Several years ago," explained Williams, "METOC people were individually assigned to only one, or possibly two command and control platforms." Williams explained that usually meant that there were enough extra manpower positions to accommodate for the operations tempo. However, with the manpower reality today and the expanding responsibilities, the team has to come up with smarter and more efficient ways to organize and accomplish the mission.

According to Williams, all active duty members of the branch occupy flying billets, including Navy Lt. Tim Raglin, from the intelligence directorate at USSTRATCOM. While some may



U.S. Strategic Command METOC Support Branch Manning

- **9 Active Duty**
 - 1 (O-5) USN Branch Chief (Senior METOC Officer)
 - 3 (O-4) 2- USAF, 1- USN
 - 4 (O-3) 2- USAF, 2- USN
 - 1 (O-2) USAF
- **3 Reserve**
 - 2 (O-4) 1- USAF (IMA), 1- USN
 - 1 (O-3) USAF (IMA)
- **4 Augmentees (active duty)**
 - 3 USACOM Provided (E-7 to O-3)
 - 1 (O-3) USSTRATCOM/J2 (USN)

USSTRATCOM

focus on supporting a particular platform, everyone has a baseline expertise for supporting all the platforms. This is more efficient from a manpower standpoint and has the added benefit of guaranteeing cross flow of METOC techniques and procedures across the platforms.

Additionally Williams added, "we factored the 'total force' into our manning solution. Our reservists take the lead for supporting the fixed command center."

During Exercise GLOBAL GUARDIAN 1998, the reservists demonstrated that they were trained and ready to support the USCINCSSTRAT's Senior (Flag-level) and Support Battle Staffs.

"I was impressed with their performance, so much so," Williams said, "that I tasked one of our reservists, Capt. William (Clay) Smith to represent the branch at the upcoming GLOBAL GUARDIAN 1999 Mid-Planning Conference."

The branch has faced and solved similar challenges. Newspapers and news broadcasts across the nation have reported the upcoming retirement of the Air Force's aging EC-135C aircraft fleet from the LOOKING GLASS mission. In October 1998, the U. S. Navy's E-6B TACAMO (Take Charge and Move Out) aircraft will take over the mission.

To accommodate the reduction of the battle staff created by the induction of the new aircraft, METOC flyers picked up the consequence assessment and residual capabilities analysis tasks previously performed by engineer officers aboard the EC-135C.

"Certification training for these new tasks has been quite a challenge," said Williams. "However, the change was a plus because it expanded our participation from a supporting role to that of an integral part of the battle staff."

At the same time the ABNCP role was changing, USSTRATCOM's role was changing. "USSTRATCOM's focus has

shifted," added Williams, "to the increasing threat posed by weapons of mass destruction and their means of delivery."

USSTRATCOM's answer to the shift in focus was the Theater Planning Response Cell (TPRC) teams. The METOC Support Branch was in on the ground floor when the TPRC concept of operations was drafted. Williams realized that there were parallels between TPRC METOC tasks and those tasks performed by METOC personnel on the three command and control platforms.

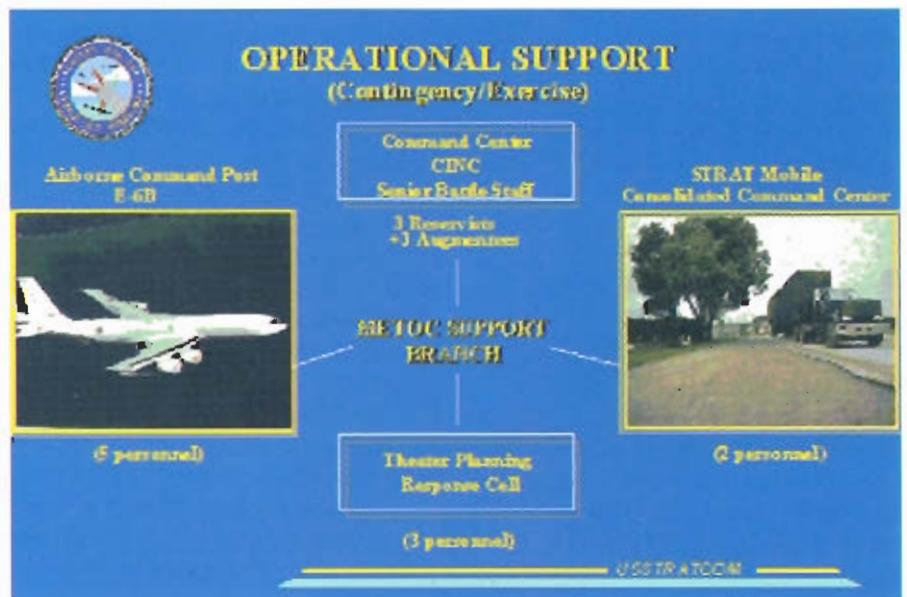
During this same time, the Defense Special Weapons Agency was developing a suite of consequence assessment tools called the Hazard Prediction and Analysis Capability. Recognizing its potential, the METOC branch helped draft USSTRATCOM software requirements and worked closely with DSWA during

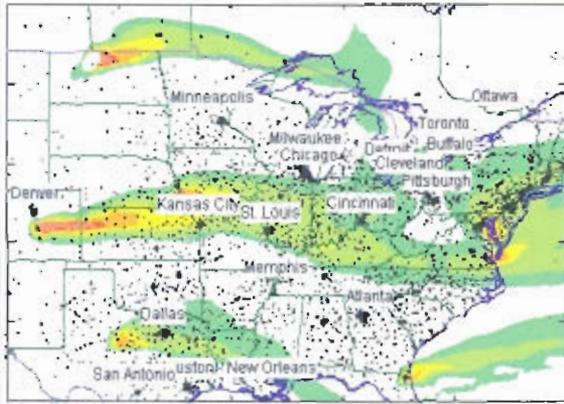
software development and testing, especially in the area of weather input to the NBC dispersion models.

"We realized early on that the 'long pole' in the tent was the weather input to dispersion models," said Williams. "If you can't predict where the wind will blow, you can't tell where down-wind hazards will occur."

An active partnership has been established between operators, developers and the weather communities. The result has been an efficient set of weather data servers at FNMOC, AFWA, DSWA and EUCOM that provide the essential fields needed for any NBC problem. Additionally, the METOC branch acquired powerful new laptop computers capable of running the software and automatically performing many of the previously manual consequence assessment tasks.

"We now have the capability to rapidly assess the meteorological impact of WMD/M in a manner that allows our flag decision makers to make better recommendations to the CINCs and to the National Command Authority from all of our Command Centers," added Williams.





Notional example of down wind hazard forecast produced by METOC Effects Planners on the "Looking Glass" aircraft for use in force protection decisions.



Members of the METOC Support Branch in front of the new Navy E-6B which will replace the venerable EC-135 in the "Looking Glass" Command and Control mission later this year. METOC fliers have been instrumental in the test and evaluation of the new platform, flying on every Operational Test mission.

"If you told me five years ago that a Naval Officer in the METOC community would be living next to a cornfield in Nebraska, leading a team of METOC officers that flies as aircrew on Air Force and Navy Jets, deploys to PACOM, EUCOM, and CENTCOM on a regular basis, I'd have thought you were making it up," said Williams.

"The optempo is high, but I've got a fantastic team of men and women in the METOC branch that have stepped up to

the challenge of working as integral members of these battle staffs. This has meant that they've had to expand their skills and work outside their "comfort zones," taking on missions and learning skills that fall outside the traditional METOC support role."

The mission of STRATCOM's METOC support branch is truly unique and challenging—but making significant contributors as warfighters to the mission of deterrence makes the job an interesting and rewarding one as well.

AIR FORCE RESERVE COMMAND

Almanac addition

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The Future meets the Present: Two Re-engineered Weather Units Open

The future of Air Force Weather began as two re-engineered weather units officially became operational. The Alaskan Weather Operations Center, Elmendorf Air Force Base, Ala. and the Sembach Operation Weather Squadron, Ramstein Air Base, Germany held ribbon cutting ceremony's in late June.

ALASKA HUB

by Airman George Woodward, 3rd Wing Public Affairs

Regional centers like the Alaskan Weather Operations Center are the critical elements in the effort to re-engineer the Air Force's weather operations, which became necessary in the face of a changing mission and decreased manpower. The effort is designed to improve support for worldwide joint operations while making more efficient use of resources — especially people.

"What we've done here is to combine highly skilled people with the best technology you can get," said Brig. Gen. Fred Lewis, Air Force director of weather. "The end result is highly relevant, on-target weather data tailored specifically to the needs of our customers — the warfighters, operators, and trainers."

The center is now responsible for handling military weather forecasts for Alaska. It is the first in a series of regional weather centers the Air Force plans to open in the United States and key theaters worldwide.

Forecasters at the center gather weather data from a variety of sources, including the Air Force Weather Agency, the National Weather Service and observing posts throughout Alaska. They then analyze and interpret that data to provide warfighters "the absolute best weather product possible," according to Maj. Rodney Grady, the center's operations director. "We want the weather to work for us rather than against us.

The transition to a regional weather center was not an easy one, however. "This took a lot of hard work and dedica-

tion from both the people here at the center and the weather folks out in the field," Grady said. "Because of their efforts, we were able to make the change without affecting the services we were already providing to our customers. The center's staff did a tremendous job of making this transition virtually seamless."

People, according to Lewis, are the key to making the effort successful. "The troops will make this happen," he said. "Technology will play a part, but only as an enabler. Our people — airman, NCOs (noncommissioned officers), officers, and civilians — in the regional centers and in the local weather units are the ones who will make this work."

People like Capt. Michael Petrocco, commander of the Combat Weather Flight at Eielson Air Force Base, Alaska, one of the units supported by the center here. Petrocco and his people will take the forecasts provided by the weather center and tailor them to the needs of the operators flying the missions at Eielson.

"The people at the center will focus on understanding the meteorology — the forecasting. We'll concentrate on understanding the mission. We will take the meteorology the center provides and use it to help put bombs on target," Petrocco said.

Petrocco's troops are integrated into the flying squadrons at Eielson, and they play a major role in planning operations. They are involved in everything from choosing the right ordnance to target selection.

"By the center taking the meteorology focus, it allows us to focus on operations," Petrocco said. "We can take more time to understand the different weapons systems and how weather affects them, for example."

The result, he said, is that pilots and operators have more confidence in the information they get from weather troops.

"Before we integrated with the flying units, confidence in our products was fairly low, because we would only spend about five minutes a day with the squadron for our daily briefing. Now, we're 100 percent integrated. We're with the

squadron 24 hours a day, giving them whatever they need whenever they need it, and they're fully confident in us and our products."

But pilots and mission planners aren't the only ones who will benefit from the re-engineering. Weather troops themselves will also see improvement, particularly in the training arena. "It takes a real commitment to bring people up



The Alaskan Weather Operations Center at Elmendorf Air Force Base, Alaska officially opened after a ribbon cutting ceremony officiated by Brig. Gen. Lewis, Air Force Director of Weather.

(photo courtesy of Elmendorf AFB public affairs)

right in our technically complex career field," said Chief Master Sgt. Tony Ramirez, chief of enlisted matters for Air Force Weather. "We've made that commitment, and the Air Force has dedicated the resources needed to meet it."

The commitment involves three major parts. The first is to consolidate the two separate weather career fields. "Today we have people who are observers and people who are forecasters," Ramirez said. "Our weather people start out as observers, and become forecasters only after reaching a certain skill level which takes about four to five years."

"As we re-engineer, we will be teaching observing and forecasting skills right up front," he said. "Our new people will be weather technicians who will have both forecasting and observing skills at the 3-, 5-, or 7-level. We expect this to be a real boost for job satisfaction."

The second part of the commitment involves assigning new weather people to work with weather experts. "The plan is to put our newest people in regional centers like the one here at Elmendorf, where they will work together with some of our most experienced people," Ramirez said. "They'll spend up to three years here, and then we'll send them back to school for additional training before they go out to work in the field units. When they show up at these operational squadrons, they'll already have three years of experience behind them and will be ready to provide relevant, accurate, mission-focused, weather support for the operators."

The third and most challenging part facing the weather career field is on-the-job. "There just weren't enough experienced people at our weather flights to do the training and still meet our mission requirements," Ramirez said. "So we set aside the resources to hire contract 'on-the-job' trainers — experienced weather people whose primary job will be to provide on-the-job-training to our new people while producing weather products."

Ramirez said that while the troops were apprehensive about the re-engineering at first, they're beginning to catch the vision. "As more of the details come out about how we're doing this, our folks out there are showing excitement with this approach and they are making it work."

"We'll face some challenges during the initial transition, but in about three years, we're really going to be in great shape."

Lewis agrees. "We're moving to a future where we are going to produce more relevant, accurate and mission-focused weather forecasts so the people in our operational units can have the information they need to accomplish their missions. That's what the re-engineering effort is all about — giving the best technology to our Air Force weather people, and focusing all their talents on meeting the needs of operators, trainers, and warfighters."

SEMBACH HUB

by 1st Lt. Todd Fleming, 86th Airlift Wing Public Affairs

The Sembach Hub at Ramstein Air Base, Germany will eventually have 135 weather forecasters and the enormous

responsibility of providing weather support to the entire European Command area of operations.

Teaming with combat weather teams at Air Force base/Army posts, the Operational Weather Squadron will be responsible for providing weather forecasts to Army and Air Force units stationed throughout Europe, a function previously handled only at the base level.

"In a few months, every weather unit in Europe will be able to reach back to Sembach and exploit the capabilities of this 135 member weather team," said Senior Master Sgt. Jeffrey Fries, the Ramstein weather station chief.

The weather station reorganization was motivated by the evolution of the Air Force to a more expeditionary force and the need to increase focus on the mission supported and enable Air Force and Army operators to "exploit the weather for battle." Other considerations were to vastly improve training capabilities and place the most experienced forecasters with the operators.

"The 20 Army and Air Force weather locations in Europe will evolve into combat weather teams or CWTs over the next twelve to 24 months," said Lt. Col. Ralph Stoffler, the USAFE operational weather squadron commander. As the base unit forecast support gradually transfers to the USAFE OWS, the manning at the Sembach hub will increase from 25 to about 125 forecasters.

The makeup of individual CWTs will vary at each operating location depending on wartime requirements but the concept for each is the same—they'll provide mission specific, mission-execution forecasts and airfield aviation weather support, said Stoffler.

This coincides with the plan that the wartime and short-term contingency missions will be maintained at the base/post level, while weather warnings, watches and advisories will be provided by the Sembach hub exploiting the latest in equipment and communication technology and the expertise of a team of weather forecasters.

The Sembach weather hub will also serve as the flight weather-briefing support team for the CWTs. More than 1000 flight weather briefings were provided by the Sembach hub in June and the number is increasing as customers become aware of the capabilities of the hub. The hub has provided support to a myriad of aviation customers including some Air Mobility Command channel missions, distinguished visitor flights and some Joint Forge support missions, he said. As part of the reengineering, Ramstein transferred six enlisted forecasters, one civilian forecaster and one officer to Sembach. Six weather forecasters remained at Sembach to make up the combat weather team, said Fries.

Fries stated that the Ramstein CWT seeks to integrate meteorological inputs into the tactical decision-making process, something the Army does very well. "Today, we can concentrate on the day's missions and positively influence the outcome. At the hub, the forecasters can apply more meteorology to forecasts and provide improved forecast products to the units. It's a win-win situation," Fries said.

By the end of 1999, all of USAFE and U.S. Army Europe weather support will be reengineered resulting in world class meteorological support provided by a team of weather experts at USAFE.

Check It Out

Providing a summary of new Headquarters, Air Force Weather Agency products and services.

HIGHLIGHTING MM5

The window resolution and model times on all **outer** nests are run at 36 kilometer grid spacing with products available from analysis through 48 hours in 3 hour intervals. All **inner** nests are run at 12 kilometer grid spacing with products available from 06 through 30 hours in 3 hour intervals.

Conus windows currently run one outer and three inner windows. The outer window covers the entire CONUS, while the three inner windows aren't fixed and can be moved to satisfy regional operational requirements.

The following products have added to the AFWIN/SAFWIN suites for all theaters: flight hazards, severe weather indices, precipitation, flight level winds, D values to 10,000, 15,000, 20,000 and 25,000 feet, surface visibility, and 500mb relative vorticity.

METEOGRAMS

Meteograms are graphic, time-phased forecasts of several parameters for a specific point for an extended time period. AFWA's meteograms can be found in the theater under the surface, upper-air, and models' directories. They are labeled either MM5 meteograms or MRF meteograms.

NEW AVN MODEL PRODUCTS

During the past month AFWA added several products based on NCEP's Aviation Model (AVN). Products are available for the following theaters: CONUS, South America, Southwest, Asia, Europe, Alaska and Asia/Korea. These products are created using our Vis5D software, and are similar to MM5 products for the outer nest windows covering the same regions.

GOES HIGH RESOLUTION, VISUAL IMAGES

New to AFWIN is the highest resolution GOES visual imagery available. **Overshooting tops, outflow boundaries,** and several other microscale phenomena not visible on lower resolution imagery can now be seen tracked on an hourly basis. Images are now available on AFWIN/SAFWIN for several CONUS sectors, Alaska and Hawaii. To find these images select **satellite images** under theater of choice, then go down to the **regional images** heading and select the products of choice with the title **GOES 8 High-Res Color** and the sector desired. Additional images covering parts of Central and South America will soon be added.

AFWA TN 97-001 FREEZING PRECIPITATION

This informative publication is now available in hard copy from the AFWA technical library, or on line via our ftp server. The ftp server URL address is <ftp://ws-ftp1.afwa.af.mil>. The publication can be found in the "pub" sub directory. The file is TN 97-001.PDF. Acrobat Reader is necessary in order to view this publication.

CONUS NEXRAD AND LIGHTNING DATA

NEXRAD and lightning products are now available in the CONUS Radar Data directory on both AFWIN and SAFWIN.

ADVECT CLOUD PRODUCTS FOR ALASKA AND CENTRAL AMERICA

AFWA added several cloud cover visualizations based on the AFWA ADVECT CLOUD model. The Alaska sector covers most of the state and a good portion of Eastern Siberia. The central American Sector covers the isthmus from the southern Mexican border to central Columbia. Products are updated every 12 hours, valid at 3hr intervals from 00 to 48 hours. To access these products go to theater, click **model charts** and then click **ADVECT CLOUD model**.

SOUTHWEST ASIA MILITARY WEATHER ADVISORIES

Military Weather Advisories for the Southwest Asia Theater are now being produced twice daily, prior to 00Z and 12Z. Products are available in the Southwest Asia Theater under the **Forecaster Generated** section on AFWIN and SAFWIN.

CONUS SEVERE WEATHER OUTLOOKS

The AFWA Severe Weather Cell now provides graphic severe thunderstorms/tornado outlooks each Thursday and Friday. In conjunction with the MWA and the MWA outlook, these will provide a severe weather outlook from time of issue valid through 96 hours. At present, AFWIN accounts are not required to access these weekend Severe Weather Outlooks.

NAVIGATING AFWIN IMPROVED

Navigating through the AFWIN homepage has become more convenient. Previously, if you were in the CONUS looking at a forecaster generated product and wanted to see a similar product in Europe, you had to "Europe" then **forecaster generated** in order to get the product you were looking for. Now, when you click "Europe" you will go directly to the **forecasted generated** menu.

Address questions, comments and concerns from any of the above topics to Maj. Steve Wilderoter, AFWA's concepts and procedures branch, DSN 312-271-5984 or Comm. (402) 294-5984, or email {wilderros@afwa.af.mil}.

First Satellite Flying Unit Inactivated

50th Operations Group Commander Col. Elwood Tircuit looks on as leaders of the 6th Space Operations Squadron - Lt. Col. John E. Hyten, commander; Master Sgt. Bryan Robinson, operations superintendent; and Master Sgt. Karl McKinney, 1st Sgt., retire the unit's guidon. The unit was officially inactivated in a ceremony held June 11, 1998. (photo courtesy of 6 SOPS)



by Capt. Mike Richmond, 55th Wing Public Affairs

A chapter of space history came to a close June 11 when the 6th Space Operations Squadron inactivated during a ceremony on the base parade grounds here.

The inactivation marked the end of 35 continuous years of service at Offutt by the Air Force's first satellite-flying unit, which stood up in the early days of the "space race" with the Soviet Union. The squadron controlled the workhorse weather-satellite system of the U.S. military — the Defense Meteorological Satellite Program, known as DMSP.

The inactivation has been in the works since 1994, when President Clinton directed that control of the DMSP program be passed from the Air Force to the National Oceanic and Atmospheric Administration. That act officially occurred May 29 when NOAA, operating out of its Satellite Operations Control Center in Suitland, Md., took over day-to-day operational control of the DMSP constellation.

Passing control of DMSP to NOAA was the first step in the eventual convergence of all U.S. weather satellites into a single system shortly after the turn of the century. The new system will be called the National Polar-orbiting Operational Environmental Satellite System.

The transfer of DMSP to NOAA is an historic first, according to Lt. Col. John Hyten, who has commanded the 6th SOPS since August 1996. "Never before has an operational military system been transferred to the control of a civilian agency," said Hyten. "But the world is changing, the military is changing, and the mission will still get done. Clearly, it's the right thing to do because of the efficiencies and economies that can be gained."

Convergence is expected to generate savings of more than \$1.3 billion over the lifecycle of the new system. Still, the inactivation was a somber occasion for Hyten and his troops.

"It's hard to give up a mission that you've bled over and sweat over for so long," said Hyten, "especially considering that we did this mission better than anyone. This team of

people made some amazing things happen."

Last year the squadron was named Best Space Operations Squadron and Best Communications-Electronics Maintenance Unit (small category) in Air Force Space Command. It also won top honors earlier this year at Guardian Challenge, the command's premier competitive event, a feat the squadron also accomplished in 1994 and 1995.

The irony of "going out on top" was not lost on Master Sgt. Bryan Robinson, the squadron's superintendent of operations.

"With the Guardian Challenge wins, with all the recognition of our people — at the group level, the wing level and the Air Force level — this has been really special," said Robinson. "This unit was a ground-breaker, the first to set up space operations in the Air Force."

Senior Airman Richard Wade, a maintenance technician on his first duty assignment, echoed Robinson's sense of loss. "It's one thing for a unit to inactivate," said Wade, "but it's something else for one with this unit's history and pride and professionalism to do it. The mission is still going to be accomplished, but it's weird that it's not going to be done by us."

Both Robinson and Wade agreed that a small measure of consolation is found in the fact that the 6th SOPS name will live on, despite the inactivation. Because of a requirement to maintain a back-up agency for NOAA's operations, an Air Force Reserve unit will keep the 6th SOPS name alive. In October, the Reserve's 8th Space Operations Squadron at Schriever Air Force Base, Colo., will inactivate and then reactivate as the 6th SOPS out of respect for the legacy of the 6th.

As for Offutt's 6th SOPS members, their numbers have been falling since August, and over the summer will diminish gradually, as people no longer needed for disposition of squadron equipment are re-assigned. About 30 people from the squadron will remain at Offutt in other squadrons. By September, everyone else will have been reassigned to other bases.

The organization we know today as the 6th Space Operations Squadron was initially activated as the 4000th Support Group in February 1963, under Headquarters Strategic Air Command at Offutt Air Force Base, Neb. At the that time, the group was comprised of the Group Headquarters at Offutt; Detachment 1 near Fairchild Air Force Base, Washington; Detachment 2 near Loring Air Force Base, Maine; and the 4300th Support Squadron at Vandenberg Air Force Base, California.

For nearly 35 years, the unit's mission has remained unchanged: to operationally command and control the orbiting weather satellites which form the space-based component of the Defense Meteorological Satellite Program (DMSP). The squadron's history has been marked by significant changes in its configuration, driven by changes to the Air Force command structure and by advances in satellite design and ground-based commanding systems.

In May 1967, due to a realignment of launch responsibilities, the 4300th was deactivated with a record of 16 launches without a launch failure. And in April 1990, Detachment 2 at Loring Air Force Base was deactivated after 27 years of operations.

In May 1983, the group was transferred to the newly formed Air Force Space Command under the 1st Space Wing and was given a new designation, the 1000th Satellite Operations Group. The group reorganized

to align itself with the structure of the 2nd Space Wing in 1985.

In May 1989, Detachment 1 at Fairchild Air Force Base, Wash. was upgraded to squadron status, becoming the 5th Satellite Control Squadron. In August 1989, Air Force Space Command accepted the turn over of Fairchild Satellite Operations Center as the new DMSP command and control facility.

Later in the year, the Multi-Purpose Satellite Operations Center (now SOC 61) at Offutt Air Force Base was retro-fitted with a new multimillion dollar ground system.

Distinguished History of 6 SOPS

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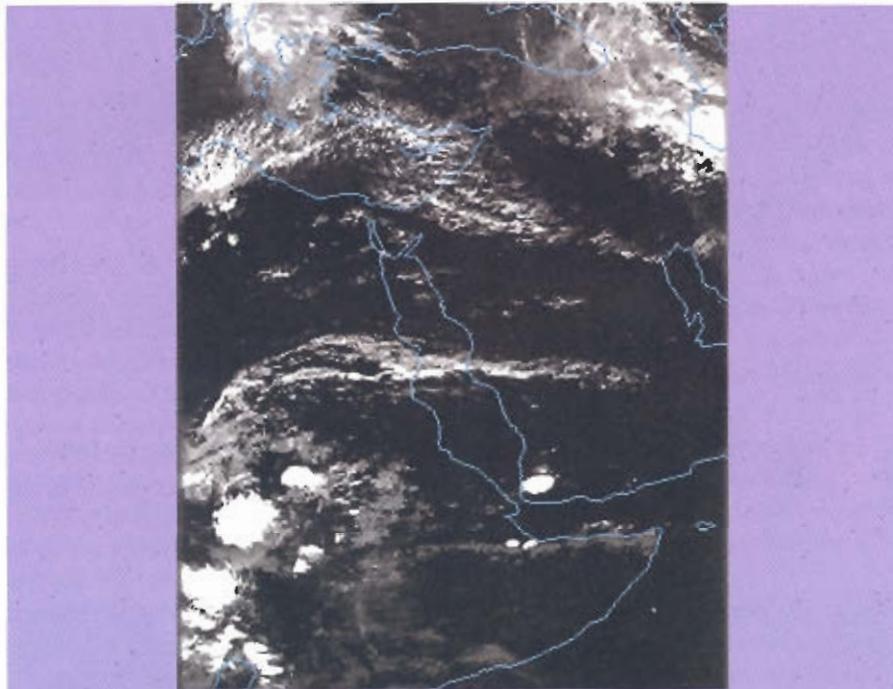
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In July 1992, the One Grand downsized from a group to a squadron and was redesignated as the 6th Space Operations



*The final satellite image was received by the 6th Satellite Operations Squadron on May 29 at 1806 taken over the Middle East.
(photo courtesy of 6 SOPS)*

Squadron aligned under the 50th Space Wing, which had also been renamed from the 2nd Space Wing. Likewise, the 5th Satellite Control Squadron at Fairchild Air Force Base reorganized and became Detachment 1 once again.

In May 1994, President Clinton directed the convergence of the DMSP program with the Department of Commerce National Oceanic and Atmospheric Administration (NOAA) Polar-orbiting Environmental Satellite (POES) program. As part of the convergence process, Detachment 1 at Fairchild Air Force Base, Wash. closed in 1997.

During 1997, their last full year of operation, the 6 SOPS accomplished a record number of satellite missions ... 22,221 and also achieved the highest mission effectiveness rating in its 35-year history. For this, the unit was named the 1997 recipient of the General Richard C. Henry Award given to the best space operations squadron in the Air Force. On 29 May 1998, the 6th Space Operations Squadron transferred satellite control authority of DMSP to NOAA as a result of the 1994 Presidential directive.

A twelve time recipient of the Air Force Outstanding Unit Award, the 6th Space Operations Squadron has long been recognized as one of the finest units in the Air Force. The dedication and professionalism of its members has allowed the squadron to continually go ... Above and Beyond.



Air Force Weather Agency Commander Col. John L. Hayes presents a plaque to Lt. Col. John Hyten in appreciation of 6th SOPS dedication to delivering DMSP imagery to AFWA. (photo courtesy of 6 SOPS)

6 SOPS Closed... What Does it Mean?

by Capt. Ron Comoglio, USAF METSAT Programs Manager
Air Force Weather Agency

When I was a Wing Weather Officer at a fighter wing in USAFE, my understanding of the Air Force Global Weather Central/Center/Air Force Weather Agency was limited. In fact, I thought of it mainly as a "black box" from which alphanumeric and Horizontal Weather Depictions flowed. Other formal "globalites" would hear my comments and smirk at me, saying, "There's more to AFGWC than meets the eye!" I have always hated being outside a good secret, so I was eager to find out about the black box for myself.

Part of what is not widely known about AFWA is the Defense Meteorological Satellite Program (DMSP)—the polar orbiting satellites dedicated to high-resolution cloud imaging—has been commanded from the basement of the Martin Bomber building at Offutt AFB, NE, almost directly below AFWA.

Those of us who have been a part of the DMSP community may recall some of the names of the units tasked with that function as the support evolved through the years: the 4000th Aerospace Applications Group, the 4000th Satellite Operations Group (SOG), the 1000th SOG (a.k.a., the "One Grand"), and the 6th Space Operations Squadron (6 SOPS). These satellite operators were dedicated to delivering DMSP imagery to AFWA to support National Programs, carrying AF I-1 priority.

Today, a new era has dawned, with a presidential mandate to converge America's polar orbiting constellations (DMSP and TIROS). As a first step, the C2 activity has moved to the NOAA Satellite Operations Control Center (SOCC), located at Suitland, MD. The close proximity historically enjoyed by weather and satellite personnel is a thing of the past, replaced by telecons, emails, and frequent TDYs.

The typical weather forecaster may be thinking, "That's great, but what does that mean to me?" After all, at the weather flight level DMSP imagery may **not be routinely used** (except for going away gifts). Actually, DMSP products are key to achieving a global METWATCH. Perhaps forecasters raised on geostationary satellite loops have experienced the frustration of METWATCHing an area north (or south) of about 55 degrees latitude. Without polar orbiters, you could not effectively do this.

Each day, the current constellation refills the databases with cloud positions—roughly covering the entire globe about every 8 hours. And it has only been recently that AFWA has had the tools available to communicate such products to the field. If you don't already do so, log into AFWIN and check out what is posted.

Furthermore, the imagery is not the only data available. Special sensors on board measure discrete microwave frequencies to construct soundings, used to augment the RAOB networks (i.e., fill the data sparse gaps), and to retrieve sea conditions and sea surface temperatures. All of these products then initialize NOGAPS and other atmospheric models, including those at NCEP.

Even though DMSP is no longer under military C2, the data will continue to flow and be used by forecasters (military and civilian) in a variety of ways. In fact, as units receive their Small Tactical Terminals (STTs), AFWA will begin to appreciate and increasingly exploit the DMSP assets flying over their areas of responsibility—and the civilian controllers at Suitland are key to allowing the ops to continue.

Air Force Weather going...



by Jodie Grigsby, Air Force Weather Agency public affairs

The American Forces Network (AFN) is attempting to keep servicemen and their families out of the rain, snow, sleet, and all sorts of weather. The Air Force Weather Agency along with the Armed Forces Radio and Television Services (AFRTS), which operates AFN, have formed a cooperative effort to provide a new AFN weather service to audiences world-wide.

"We know we are pioneers," stated Staff Sgt. Darren Hughes. As one of the six men and women who will now be broadcasting the first worldwide weather forecasts for US military members and their dependents, he is right.

Previously those stationed in these remote areas had to rely on local weather forecasts, although usually not in English. A fortunate few might be stationed where a military meteorologist went above his or her duty and provided a non-operational local weather forecast. However, most simply had to do without.

These first ever world-wide weather broadcasts will provide a familiar weather format to Armed Forces television viewers. The Americanized broadcasts will include all the comforts of home: high and low temperatures, cloud cover, significant weather predictions, and extended forecasts for key military locations, which can sometimes be a great distance from the host nation's major cities.

The weather reports will vary from one to two minutes, depending on the region being reported. They will be aired in the morning and again during the evening, and available to anyone with access to the Armed Forces Network.

The forecasts are not designed for operational use by military forces. They will simply add to the quality of life of those stationed in remote areas by providing weather and travel planning information.

The Armed Forces Network weather broadcasts are currently scheduled to provide weather information to 118 cities in 61 countries and 2 territories. The demand for this service is immense; AFRTS receives requests for additional sites daily. Air Force surveys in the Pacific have indicated that local weather information is the most desired improvement for the AFN.

The home of the AFN Weather Center is located within the Air Force Weather Agency at Offutt AFB, Nebraska. Although a long way from many of the intended forecast sites, customers can expect accurate up-to-date forecasts. The latest weather observations, model data, and forecast products are collected through a variety of sources, including the Internet, AFWIN, SDHSU, and the Weather Services International (WSI) WeatherProducer system.

These world-wide broadcasts are a testimonial to the state-of-the-art technology and forecasting techniques available. The broadcasts will be transmitted from Offutt AFB to the AFRTS Broadcast Center at March AFB, California. The weather reports will then be added to the AFN news broadcasts.

The Special Assistant to the Commander for Agency and Systems Integration, Col. Thomas Accola, agrees that Agency forecasters are capable of creating accurate weather forecasts for the world-wide consumer. "We are the one place that can bring together people, information, and processing power to broadcast world-wide weather."

Some concerns have been raised about this new service replacing weather services already provided in some locations served by a local AFN station. However, the Chief of the AFN Branch, Senior Master Sgt. Michael Moore, reassures that this new service is intended to compliment and not replace current services. Moore stated that there will be "different forecasts, for different audiences."

In fact, Moore says that the meteorologists stationed in these remote areas will be key to the success of the AFN broadcasts. "Their observations, forecasts, and discussions will be essential elements in the weather products we air."

When asked whether he believes his team will be up to the challenge, Moore seemed confident in their abilities. He stated that it would be an excellent opportunity to "demonstrate world-wide capabilities and showcase the spirit and dedication of Air Force Weather personnel."

Staff Sgt. Hughes was also optimistic of their abilities. "It's a challenge we can meet— we'll succeed at this challenge."

AFWA backs up Aviation Weather Center

by Paige D. Rowland, Air Force Weather Air public affairs

The Air Force Weather Agency became National Weather Service's Aviation Weather Center back-up facility May 29 after successfully completing a series of six live back-up tests.

AFWA's CONUS Severe Forecast Operations work center will issue regional short-term icing, turbulence and thunderstorm forecasts for all commercial aviation in the event that the AWC is unable to produce those products.

"I enjoy working with the military forecasters," said AWC's Lead Forecaster Bill Hirt. "They understand the importance of forecasting for specific weather conditions."

The Kansas City, Mo. based organization sent Hirt and Aviation Forecaster Scott Tansey to train AFWA's severe section on AWC procedure.

The monthly testing with AWC for assuming the official back-up responsibility began in January. During the final live test, AFWA's severe section supplied forecasts for the airways over the entire United States for eight hours.

"Anyone flying in the United States right now is getting their weather information from AFWA," said severe forecaster, Staff Sgt. Chris Hahn during the test.

AFWA's severe section forecasts thunderstorms and flight hazards via the Military Weather Advisory and low-level flight hazards charts. When used together, they provide the same basic information used by AWC. The primary difference was forecasting the turbulence.

"Our low-level flight hazards charts depict only flight hazards which originate below 10,000 feet," said Tech. Sgt. Charles Elford, chief of AFWA's severe section. "The severe section doesn't depict clear air turbulence (CAT) which occurs above 15,000 feet. AFWA's Strategic Forecast work center forecasts cover CAT."

Forecasting CAT was not the only adjustment forecasters made to become proficient at backing-up AWC. During the training, forecasters in the severe section had to learn the AWC product format.

"Normally, we send our forecasts out as graphic images," explained Elford. "Our forecasters had to change gears to produce the text format used by AWC."

AWC sends their information directly to the aviation

community in a format that can be read on the radio, according to Hirt. The AFWA forecasters were taught the specifics on writing Airmen's Meteorological Bulletins and Significant Meteorological Bulletins, both AWC products.

"The back-up test went well," said Hirt after the initial test. "We haven't received any complaints and that's a great sign."

According to Elford, the severe weather team will periodically perform live backup exercises with AWC, in addition to conducting various types of in-house training.

For the last several years, the severe section has also been responsible of backing up the Storm Prediction Center located in Norman, Okla.

"We're ready to take on the additional responsibility," said Elford. "And we'll stay ready."



Staff Sgt. Chris Hahn and Tech. Sgt. Dan Radebaugh look at a line of thunderstorms over the Great Lakes region. Several minutes earlier they issued a thunderstorm warning for the Chicago area. (photo by AFWA/PA)



Explorers



by Capt. Mark Yeisley & Capt. Shannon Klug, HQ AFWA, Offutt AFB

What do you get when you turn loose 9 young weather enthusiasts in the city of Boulder, Colo.? A two-day adventure that will long be remembered! A group of dedicated meteorologists at Air Force Weather Agency recently accompanied Explorer Post 999 on an exciting (and educational) field trip to Colorado. The Explorer Post, officially sponsored by AFWA and led by adult volunteers working there, is the only weather-oriented Explorer Post in the nation. The trip was the culmination of months of hard work by both the Explorer youth and adult leaders, fundraising, planning, and performing community service work to "earn" the right to go!

The group of nine Explorers and four adult leaders headed out for Colorado June 9 in vans donated by a local dealership. They traveled all day to get to their first destination: Cheyenne, Wyoming, where they rested for the night. Even the trip across Nebraska was exciting, as they ran into a line of severe thunderstorms that produced large hail and spawned several tornadoes. Luckily the group was able to watch the severe weather pass to their south.

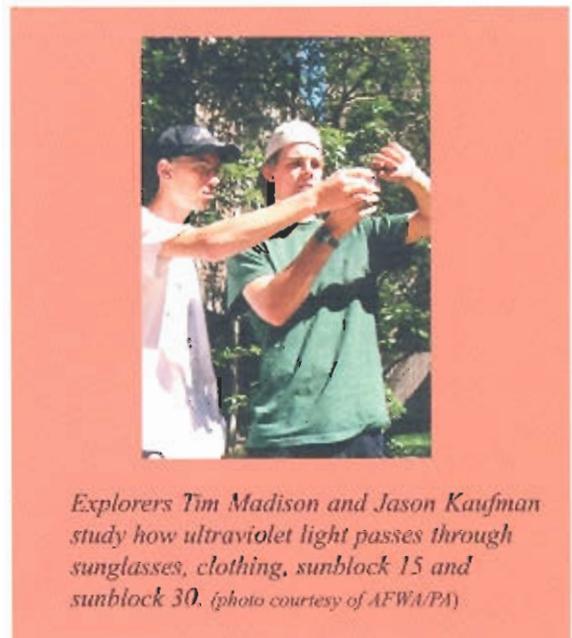
The real fun began the next morning at the National Center for Atmospheric Research (NCAR) Table Mesa Lab. Nestled in the foothills of the Rockies in Boulder, NCAR is truly an amazing place. Here they explored the world of research scientists intently studying the atmosphere. Viewing the Horizon 2000 super-computer and learning about its computing power was awe-inspiring. After the tour, the group went on a quick hike in the foothills, then proceeded to NOAA's Forecast Systems Lab to watch a demonstration of their developmental forecasting computer. As part of the demo the Explorers investigated the thunderstorms they had experienced first-hand the day before on the Nebraska-Wyoming border.

The group wrapped up the day with a tour of Ball Aerospace & Technology Corporation, where scientists design and build space instrumentation. Currently they are working on a satellite that will monitor ocean winds for determining global weather patterns, and instruments for the NASA Laser Altimetry Mission to make long-term measurement of the global ice mass balance in Greenland and the Antarctic. The Explorers observed the clean room, where precision instruments are built, and the "space room," where scientists replicate the drastic temperature differences in space. The Explorers also saw the "shaker table" that simulates vibrations that occur during a space launch.

The Explorers spent the following day on the campus

of the University of Colorado. At the CU Space Grant Consortium they learned about an undergraduate-level project to build a satellite that will monitor the earth's ozone levels. They also conducted a small experiment to study effects of ultraviolet radiation. After a final lunch in the foothills, the group returned to Omaha, tired but full of excitement over all they had seen and experienced.

The Explorers program began as an offshoot of the Boy Scouts of America, giving youth between 14 and 20 years of age a chance to learn about a particular career field by interacting with adults working in that area. Explorer Post 999 began two years ago by a group of military and civilian weather personnel stationed at AFWA. The focus of the group is to introduce Omaha youth to opportunities available to them in the field of meteorology. The Explorers meet twice a month from August through June and hear seminars from area meteorologists on a variety of topics, from auroras to zephyrs. They have also visited local TV meteorologists, weather stations, and planetariums. If you're interested in forming your own Explorers group, contact your local Scouting Office to get the details - it's a rewarding experience for both adult leaders and the Youth!



Explorers Tim Madison and Jason Kaufman study how ultraviolet light passes through sunglasses, clothing, sunblock 15 and sunblock 30. (photo courtesy of AFWA/PA)

A tribute to a great leader and true Air Force warrior,

COLONEL FRANCIS X. ROUTHIER, III

Col. Francis X. Routhier, III, Air Force Weather Agency's Director of Operations was laid to rest on 24 July at Arlington National Cemetery, Va. A funeral mass for Col. Routhier was held 17 July at Capehart Chapel, Offutt Air Force Base, Neb.



Born in Lowell, Massachusetts, on August 13, 1948, Col. Routhier received a Bachelor of Science Degree in Chemistry from Fordham University in New York City before entering active duty in September 1970 through the Reserve Officer Training Corps. He then studied meteorology at New York University and received a Master of Science in Atmospheric Chemistry from the Georgia Institute of Technology in 1980.

His first operational assignment was as a weather officer assigned to McCoy Air Force Base, near Orlando, Fla. In 1973, he began two consecutive assignments as an aerial reconnaissance weather officer with the 54th and 53d Weather Reconnaissance Squadron stationed at Andersen Air Force Base, Guam, and Keesler Air Force Base.

Following his tour at Georgia Tech., he was assigned to the Air Force Global Weather Central, Offutt Air Force Base, Neb., where he was a project officer for the Satellite Data Handling System integration. In 1983, he attended Air Command and Staff College, Maxwell Air Force Base, Ala., and was then assigned to command Detachment 2, 7th Weather

Squadron near Hanau, Federal Republic of Germany. In 1987, he began a 4-year assignment at Travis Air Force Base, California, first as the 17th Weather Squadron operations officer and then as commander. In 1991, he began a tour at Headquarters Air Weather Service as Chief,

Product Improvement Division. In 1992, he became the Director of Technology and, in 1993, the Director of Operations. In 1994, he was assigned to the Office of the Federal Coordinator for Meteorology, Silver Spring, Maryland. In 1995 he became the commander of the former U. S. Air Force Environmental Technical Applications Center, which is now the Air Force Combat Climatology Center, Scott Air Force Base, Ill.

His military decorations include the Meritorious Service Medal with five oak leaf clusters, the Air Medal with three oak leaf clusters, the Air Force Commendation Medal with one oak leaf cluster, the Air Force Outstanding Unit Award with five oak leaf clusters, the Air Force Organizational Excellence Award with two oak leaf clusters, the Combat Readiness Medal with one oak leaf cluster, and the National Defense Service Medal. He holds the Master Meteorologist Badge and the Senior Non-rated Officer Aircrew Member badge.

Col. Routhier is survived by his wife, Marie and their two children, Michele and David.

Thunderstorms and the upper stratosphere

by Kevin Gilmartin, Electronic Systems Center public affairs

Scientists from the Air Force Research Laboratory's Space Vehicles Directorate at Hanscom Air Force Base, Mass., recently discovered concentric bulls-eye-like rings in the upper stratosphere, 25 miles above the ground. The scientists said the rings are caused by thunderstorms.

The discovery came from examining images from a satellite's infrared imager and may help to one day identify ballistic missiles.

Many scientists have theorized that atmospheric disturbances such as thunderstorms create "gravity waves" that ripple across the atmosphere in the same way waves from a dropped pebble ripple

across a pond.

This theory was confirmed from space when the scientists observed the ripples on images from an experiment on board the Midcourse Space Experiment satellite. They then matched up the centers of the wave patterns to meteorological satellite images taken one to two hours earlier depicting a small isolated high altitude thundercloud.

Understanding what natural patterns exist in the atmosphere is essential to identifying a target such as a ballistic missile.

"To detect a missile from a space-based platform, it is essential to identify any background clutter, so you can be certain that what you are seeing is in fact a missile," said scientist Dr. Edmond Dewan.

Also, understanding how the energy and momentum of the waves is deposited throughout the upper atmosphere could help scientist understand atmospheric dynamics, energy balance and perhaps even how these effects contribute to and are affected by global warming.

"There is a great deal of interest in our findings, and this is the genesis of a new set of proposals to NASA and other space agencies incorporating these techniques," said Hanscom scientist Dr. Richard Picard. "We are also shipping our data to the designers of the next generation of Defense Department sensors for their use." (Courtesy of Air Force Materiel Command News Service)

6 AFWA members "Kick up a Storm"

by Maj. Peter Roohr, Technology Exploitation Branch, Air Force Weather Agency

Six Air Force Weather Agency members joined other community speakers at Eisenhower Elementary School, Dubuque, Iowa, and gave presentations about weather to the students. The school called it, "The Wide World of Weather: Eisenhower Kicks up a Storm".

In October, the school had sent a request to the Pentagon asking for a representative with weather expertise to share their experiences with elementary school students. AFWA members welcomed the opportunity to share their knowledge and publicized Air Force Weather.



The AFWA members who presented were Capt. Julie Novy, Maj. Ken Carey, Maj. Pete Roohr, Master Sgt. Ricky Keil, Tech. Sgt. Carlos Nieves and Staff Sgt. John Zanfardino. They spoke on a variety of topics including thunderstorms, rainbows and El Nino.

KEEPING IN TOUCH - STAYING INFORMED

The AFWA training division is available to provide help and assistance on Air Force Weather training issues. They have established an email address as an easy, efficient and convenient means for asking training related questions, such as career field formal weather training, systems training, computer training, etc. Send your questions, comments and concerns to afwadnt@afwa.af.mil.

Salutes from around the world

1997 BEST OF THE BEST

Outstanding Air Force Weather, Best Award, Staff Support, Enlisted Category – Master Sgt.

Ralph Ley, 720 STG, Hurlburt Fl., Fla.

(see April 98 OBSERVER Issue for other 1997 Best of the Best)

MASTER SGT. SELECTEES

Andrus, William E., Hurlburt Fl., Fla.
Billingsley, Chris, Keesler AFB, Mass.
Bitter, Michael R., Offutt AFB, Neb.
Botsford, David R., Offutt AFB, Neb.
Byant, Alan B., Yongsan, Korea
Campbell, Carl II., Shaw AFB, S. C.
Cockroft, Cynthia M., Offutt AFB, Neb.
Compton, Richard W., Fort Bragg, N. C.
Dennis, William H. J., Heidelberg AB, Germany
Dollison, Shelia M., Aviano AB, Italy
Eakle, Nancy M., Elmendorf AFB, Alaska
Ebarle, Zefanias E., Vandenburg AFB, Calif.
Flanagan, Dennis B., Peterson AFB, Colo.
Frazier, Carl E., Edwards AFB, Calif.
Geis, Daniel J., Fort Bragg, N. C.
Golden, Lloyd D., Edwards AFB, Calif.
Harris, Glenn M., Traben Trarbach AB, Germany
Harrison, Stephen, Misawa AB, Japan
Haugh, Patrick D., Elmendorf AFB, Alaska
Helton, Gary L., Keesler AFB, Miss.
Huebner, Vincent S., Sandhoffen, Germany
Huggins, Dennis J., Palchua, Hickam AFB, Hawaii
Hull, Rodney J., Fort Bragg, N. C.
Hyson, Raymond N., Kaiserslautern, Germany
Jeter, Donald L., Keesler AFB, Miss.
Johnson, John T., Asheville, N. C.
Jones, Daniel W., Holloman AFB, N. M.
Kammerer, Stephen W., Howard AB, Panama
Kelley, James III, Mildenhall AFB, England
Klinner, Kenneth O., Sembach, Germany
Kost, Joseph R., Offutt AFB, Neb.
Lammers, Klaus, Patrick AFB, Fla.
Lawson, Matthew R., Hurlburt Fl., Fla.
McCabe, Daniel, Hurlburt Fl., Fla.
McIntyre, Duke Y., Tyndall AFB, Fla.
Mikkelsen, Mona L., Fort Hood, Texas

Morris, Jeffrey L., Fort Drum, N. Y.
Nesius, Brian F., Tinker AFB, Okla.
Osteen, Richard, Patrick AFB, Fla.
Ratliff, Charles P., Keesler AFB, Miss.
Rowe, Kenneth A., Asheville, N. C.
Salmon, Ramon, McChord AFB, Wash.
Sincore, Michael D., Hill AFB, Utah
Smith, Gary C., Langley AFB, Va.
Southerland, Tony B., Asheville, N. C.
Timperio, Michaelle, Yokota AB, Japan
Walker, Charles, Elmendorf AFB, Alaska
Wynn, Brian, Fort Lewis, Wash.

TECHNICAL SERGEANT SELECTEES

Acuavera, Edward L., Eglin AFB, Fla.
Adams, Glenn R., Minot AFB, N.D.
Alexander, Robert J., Hanscom AFB, Mass.
Alicdan, Edward T., Travis AFB, Calif.
Anderson, James, Patrick AFB, Fla.
Bagby, James B., Pope AFB, N.C.
Bailey, Kirk D., Tinker AFB, Okla.
Beck, Thomas J., Offutt AFB, Neb.
Bennett, Randall A., Offutt AFB, Neb.
Betsch, Robin E., Ft Campbell, Ky.
Bloodworth, Charles E., Traben Trarbach, Germany
Bloor, Roger L., Asheville AFB, N.C.
Blount, Michael E., Hickam AFB, Hawaii
Bondi, Heidi C., Traben Trarbach, Germany
Booker, George E., Jr, Hurlburt Field, Fla.
Bowers, Susan L., Hunter AAF, Ga.
Brown, Steven D., Offutt AFB, Neb.
Bruns, Iwana L., Hanau, Germany
Buchanan, Michael D., Asheville AFB, N.C.
Budden, Edwin D., Ramstein AB, Germany to Sembach, Germany
Burge, Joseph C.
Burke, Timothy J., Scott AFB, Ill./Asheville AFB, N.C.
Cafiso, Paul T., Kelly AFB, Tx. to Osan AB, Korea
Carter, Gary B., Ramstein AB, Germany to Sembach, Germany
Childress, Chris C., Offutt AFB, Neb.
Christensen, Ray L., Tinker AFB, Okla. to Sembach, Germany
Colwell, Daniel, Elsworth AFB, S.D. to Traben Trarbach, Germany
Cordova, Gerald, Offutt AFB, Neb.
Cory, Robert E. II, Scott AFB, Ill./Asheville AFB, N.C.
Corriveau, Kevin S., Keesler AFB, Miss.
Crosswell, Arthur N., Asheville AFB, N.C.
Curry, Benjamin, Jr, Offutt AFB, Neb.
Deatherage, Michael, Keesler AFB, Miss.
Elie, Randy J., Ramstein AB, Germany
Fields, Keith D., Hickam AFB, Hawaii
Fitzgerald, Dennis, Keesler AFB, Miss.
Fitzsimmons, Cary R., Asheville AFB, N.C.
Garlington, William, Offutt AFB, Neb.
Gaudet, Timothy D., Asheville AFB, N.C.
Getgen, Garth L., Offutt AFB, Neb.
Gomez, Richard A., Offutt AFB, Neb.

Green, Lawrence H., Offutt AFB, Neb.
 Greene, Carlton T., Pentagon, Wash. D.C.
 Griffin, Lajuna K., Hurlburt Field, Fla.
 Gröff, Larry, Howard AB, Panama
 Gustilo, Mark R., Kadena AB, Japan
 Hamann, Ronald W. Jr., Offutt AFB, Neb.
 Harding, Earl W. Jr., Maxwell AFB, Ala.
 Hatfield, Melissa E., Andersen AFB, Guam
 Howard, Matthew A., Hickam AFB, Hawaii
 Hunte, Barry J., Luke AFB, Ariz.
 Jancic, Arleen, Eilson AFB, Alaska
 Jordan, Oliver L., Jr., Hurlburt Field, Fla.
 Kirwin, Craig M., Ft Bliss, Texas
 Lacosse, Wayne R., Offutt AFB, Neb.
 Lafleur, Kelly L., Offutt AFB, Neb.
 Lane, Christopher R., Offutt AFB, Neb.
 Lax, Imo M., Offutt AFB, Neb.
 Lindfors, John W., Jr., Bobliagen, Germany
 Lopez, Sammy D., Hurlburt Field, Fla.
 Louk, Russell W., II, Offutt AFB, Neb.
 Mango, Francis M., Offutt AFB, Neb.
 Martin, William J., Offutt AFB, Neb.
 Matthews, Glenn, Offutt AFB, Neb.
 Maytes Michael J., Bad Breuznach Germany to Spangdahlem
 AB, Germany
 McCormick, Daniel M., Offutt AFB, Neb.
 McCullogh, Garth A., Andersen AFB, Guam to Ft Rucker,
 Ala.
 McDonald, Kenneth, Keesler AFB, Texas
 McKinney, Christopher, Hohenfels, Germany
 McQuoid, Gregory J., Offutt AFB, Neb.
 Mercer, Andrew J., Jr., Maxwell AFB, Ala.
 Mest, Terry L., Dyess AFB, Texas
 Miller, Brian L., McGuire AFB, N.J.
 Mumford, Patrick D., Offutt AFB, Neb.
 Myers, Gregory N., Tinker AFB, Okla.
 Nixon, Roddy E., Jr., Robias AFB, Ga.
 Norman, Charlie L. J., YongSan, Korea to Andersen AFB,
 Guam
 Odom, Jimmy R., Randolph AFB, Texas to Lajes AB, Azores
 Osbon, John D., Pentagon, Wash. D.C.
 Pelletier, Raymond, Offutt AFB, Neb. to Shaw AFB, S.C.
 Pestana, Joseph G. I., Offutt AFB, Neb. to Kunson AB, Korea
 Ramsdell, Dennis B., Hill AFB, Utah
 Rice, Mark R., Offutt AFB, Neb.
 Rikard, Scott E., Offutt AFB, Neb.
 Rogers, Jody D., Patrick to Camp Hwnphreys
 Scott, Jimmy L., Langley AFB, Va.
 Smith, Kayne, Offutt AFB, Neb.
 Straw, Louis G., Offutt AFB, Neb.
 Ströhl, Mark A., Offutt AFB, Neb.
 Swan, Debrina A., Frankfurt, Germany
 Taylor, Billy B., Tinker AFB, Okla.
 Teeselink, Kyle J., Offutt AFB, Neb.
 Thiery, David R., Lajes AB, Azores
 Thompson, Martin R., Tinker AFB, Okla.
 Thompson, William E., Offutt AFB, Neb.
 Thurow, Ronald P., Lakenheath AFB, England
 Tinter, Terry J., Lakenheath AFB, England
 Weyer, Warren W., Laughlin AFB, Texas

Williams, Jimmy W., Yong San, Korea

AIR FORCE MERITORIOUS SERVICE MEDAL

Maj. Mike Christie, IIQ AFSPC/DORW, Peterson AFB, Colo.
Maj. Randy Thomas, HQ AFSPC/DORW, Peterson AFB, Colo.
Lt. Col. Billy Davis, HQ AFSPC/DORW, Peterson AFB, Colo.
Master Sgt. Barry Ortner, HQ AFSPC/DORW, Peterson AFB, Colo.
Lt. Col. Robert Frederick, IIQ AFSPC/DORW, Peterson AFB, Colo.
Maj. Kenneth Kiburis, HQ AFWA, Offutt AFB, Neb.
Maj. Sharon Buckley, HQ AFWA, Offutt AFB, Neb.
Master Sgt. Doretta Johnson, HQ AFWA, Offutt AFB, Neb.
Master Sgt. Gregory Shook, HQ AFWA, Offutt AFB, Neb.
Maj. Catherine Biddulph, HQ AFWA, Offutt AFB, Neb.
Senior Master Sgt. Jerry Sanders, HQ AFWA, Offutt AFB, Neb.
Maj. Susan Montgomery, HQ AFWA, Offutt AFB, Neb.
Master Sgt. Gary Justus, HQ AFWA, Offutt AFB, Neb.
Lt. Col. Susan Robbins, HQ AFWA, Offutt AFB, Neb.
Lt. Col. Sylvester Belcher, HQ AFWA, Offutt AFB, Neb.
Master Sgt. Fizal Hosein, HQ AFWA, Offutt AFB, Neb.
Maj. David Mucia, HQ AFWA, Offutt AFB, Neb.

AIR FORCE COMMENDATION MEDAL

Staff Sgt. Oliver Fisher, 76th OSS/OSW, Kelly AFB, Texas
Capt. Jnlie A. Wyzywany, HQ ACC/DIWP, Langley AFB, Va.
Capt. Julie Novy, HQ AFWA, Offutt AFB, Neb.
Tech. Sgt. Dana Becker, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Steven Lehman, HQ AFWA, Offutt AFB, Neb.
Tech. Sgt. James Conry, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Paul Teff, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Raymond Pelletier, HQ AFWA, Offutt AFB, Neb.
Senior Airman James D. Milburn, HQ AFWA, Offutt AFB, Neb.
Tech. Sgt. Nathau Adcock, HQ AFWA, Offutt AFB, Neb.
Capt. Richard Ritz, HQ AFWA, Offutt AFB, Neb.
Tech. Sgt. Gregory Streetman, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Catherine Cotton, HQ AFWA, Offutt AFB, Neb.
Capt. Mark Yeisley, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Merle Richard, HQ AFWA, Offutt AFB, Neb.
Staff Sgt. Richard Carden, HQ AFWA, Offutt AFB, Neb.
Tech. Sgt. Scott Price, HQ AFWA, Offutt AFB, Neb.
Capt. Mark Mesenhrink, HQ AFWA, Offutt AFB, Neb.
1st Lt. Bryan Jensen, HQ AFWA, Offutt AFB, Neb.

AIR FORCE ACHIEVEMENT MEDAL

Senior Airman Brian, 76th OSS/OSW, Kelly AFB, Texas
Senior Airman Scott Sloniker, HQ AFWA, Offutt AFB, Neb.
Senior Airman Danette Riedl, HQ AFWA, Offutt AFB, Neb.
Senior Airman Patrice Hernandez, HQ AFWA, Offutt AFB, Neb.
Master Sgt. Michael Daniels, HQ AFWA, Offutt AFB, Neb.

PROMOTIONS

Major

Malcolm C. Walker, HQ ACC/DIWP

Master Sergeant

Jerry School, HQ AMC TACC/XOW

Scott Straw, IIQ AMC TACC/XOW

Gary Smith, IIQ ACC/DIWS

Senior Airman

Deidra Brown (BTZ), 76th OSS/OSW, Kelly AFB, Texas

HAILS AND FAREWELLS

Capt. Lester Roberts – to Ramstein AB, Germany from HQ AFWA, Offutt AFB, Neb.

Staff Sgt. Ruben Castillo – to HQ AFWA, Offutt AFB, Neb., from Aviano AB, Italy

Master Sgt. Joe Raab – to HQ AFWA, Offutt AFB, Neb., from Scott AFB, Ill.

Master Sgt. Lloyd Johnson – to Fort McPherson, Ga., from IIQ AFWA, Offutt AFB, Neb.

Master Sgt. Norman Prioleau – to Norfolk, Va., from IIQ AFWA, Offutt AFB, Neb.

Capt. Jennifer Roman – to Fort Polk, La. from IIQ AFWA, Offutt AFB, Neb.

Capt. David McDaniel – to Asheville, N. C. from HQ AFWA, Offutt AFB, Neb.

Tech. Sgt. Joseph Federico – to Mildenhall, England from HQ AFWA, Offutt AFB, Neb.

Tech. Sgt. Timothy Webb – to DIA, Washington D. C., from IIQ AFWA, Offutt AFB, Neb.

Maj. Kenneth Kiburis – to Detachment 7, Okla., from IIQ AFWA, Offutt AFB, Neb.

Senior Master Sgt. Rodney Rabenneck – to HQ AFWA, Offutt AFB, Neb., from Scott AFB, Ill.

Tech. Sgt. Rick Gardner – to HQ AFWA, Offutt AFB, Neb., from Winnipeg, Canada

Capt. Fritz Van Wijngaarden – to IIQ AFWA, Offutt AFB, Neb., from F. E. Warren AFB, Wyo.

Maj. Michael Farrar – to HQ AFWA, Offutt AFB, Neb., from Kunsan AB, Japan

Airman William Ward – to IIQ AFWA, Offutt AFB, Neb., from Keesler AFB, Miss.

Master Sgt. Christopher Imhof – to HQ AFWA, Offutt AFB, Neb., from Scott AFB, Ill.

Capt. Dan Shaltanis – to HQ AFWA, Offutt AFB, Neb., from North Carolina State, N. C.

Capt. William Fisher – to IIQ AFWA, Offutt AFB, Neb., from Maxwell AFB, Ala.

Master Donovan Sieler – to HQ AFWA, Offutt AFB, Neb., from Hickam AFB, Hawaii

Staff Sgt. Catherine Cotton – to HQ AFWA, Offutt AFB, Neb., from Scott AFB, Ill.

Capt. Paul Gifford – to AFELM NOAA Boulder, Colo., from Langley AFB, Va.

Maj. Ronald L. Dunic – to Pentagon, Washington D. C., from Langley AFB, Va.

Senior Airman Brian Aragon – to Keesler AFB, Miss., from

Kelly AFB, Texas

Staff Sgt. Paul Cafiso – to Osan AB, Korea, from Kelly AFB, Texas

Senior Airman Steve Balli – to Kelly AFB, Texas, from Kunsan AB, Korea

Lt. Col. Billy Davis – to Shaw AFB, S.C., from Peterson AFB, Colo.

Maj. Mike Christie – to 55th SWXS, Shriever AFB, Colo., from HQ AFSPC/DORW, Peterson AFB, Colo.

Senior Airman Brian Bell – to IIQ AMC TACC/XOW, Scott AFB, Ill., from AFCCC, Scott AFB, Ill.

Tech. Sgt. Eric Apple – to Lakenheath, England, from HQ AMC TACC/XOW, Scott AFB, Ill.

Staff Sgt. Richard Carden – to Camp Humphreys, South Korea, HQ AFWA, Offutt AFB, Neb.

EDUCATION

Airman Educational and Commissioning Program Selections

Staff Sgt. Ty Hunt, HQ AFWA, Offutt AFB, Neb.

Staff Sgt. James Slear, HQ AFWA, Offutt AFB, Neb.

NCO Academy

Tech Sgt. John Edwards, HQ AMC TACC/XOW, Scott AFB, Ill.

AWARDS

76th OSS Senior NCO of the Quarter – **Master Sgt. Jonathon Vereen**

76th OSS NCO of the Quarter – **Staff Sgt. Oliver Fisher**

76th OSS Civilian of the Quarter – **Ms. Andrea Rodriguez**

76th OSS Weather Observer of the Quarter – **Airman 1st Class Tracy Woodard**

76th OSS Commanders Sharp Troop Award (Jun 98) – **Airman**

1st Class Tracy Woodard

76th OSS Commanders Sharp Troop Award (Jul 98) – **Airman**

Jefferson Joseph

412 OSS/OSW Flight NCO of the Quarter – **Staff Sgt. Gary**

L. Davis

412 OSS/OSW Flight Airman of the Quarter – **Airman 1st**

Class Alicia L. Freeman

RETIREMENTS

Lt. Col. Robert Frederick, HQ AFSPC/DORW, Peterson AFB, Colo.

Tech. Sgt. Michael Persian, HQ AFWA, Offutt AFB, Neb.

Maj. Sharon Buckley, HQ AFWA, Offutt AFB, Neb.

Maj. Susan Montgomery, HQ AFWA, Offutt AFB, Neb.

SEPARATIONS

Senior Airman Lucretia G. King, 412 OSS/OSW, Edwards AFB, Calif.

BIRTHS

Celeste Nicole, to Monica and Tech. Sgt. John Diorio, IIQ AFWA, Offutt AFB, Neb.

Jordan Alexander, to Jodie and Senior Airman James Hicks, 412 OSS/OSW, Edwards AFB, Calif.

WEATHER

FACTS!

Taken from "The Handy Weather Answer Book" by Walter A. Lyons, Ph. D.

What is the smallest rainstorm in history?

In 1925, an English meteorologist reported that a rain shower fell from a small patch of altocumulus clouds at 12,000 feet altitude, moistening the sidewalk for a distance of only 20 yards.

What city has recorded the most rain in one year?

Cherrapunji, India, in the Himalayas, gets soaked by the annual monsoon rains. In 1942, the region experienced 1,042 inches of rainfall. Of that total, 364 fell in one month. In a more "normal" year Cherrapunji averages 450 inches of rain, the most in Asia.

What is the largest nonhuman death toll from a tornado?

On 26 April 1994, a tornado swept through a turkey farm in Barron County, Wisconsin, destroying the farm and killing approximately 10,000 birds

What is the coldest temperature ever recorded on Earth?

The coldest temperature ever recorded on the surface of the Earth was measured at the Russian research station at Vostack, Antarctica. The air temperature reached -126°F (-89°C) on 31 July 1993.

How many states are members of the "60 Below Club"?

Seven. Alaska, Colorado, Idaho, north Dakota, Minnesota, Wyoming, and Montana are the only seven states with recorded all-time minimum temperatures of -60°F or less.

How rapidly can temperatures fall?

At Springfield, Missouri, on 15 November 1955, the temperature fell from 77°F to 13°F overnight. The temperature at Browning, Montana, fell 100°F in 24 hours from 23 to 24 January 1916, tumbling from 44°F to -56°F .

The 11th of November 1911 had the warmest temperature for that date on record in Chicago, with one man becoming overcome by heat. Yet, overnight the temperature plunged 61°F , and two Chicagoans froze to death on 12 November.

In Fairfield, Montana, on 24 December 1924, it was 63°F at noon. By midnight it was 84°F colder, -21°F . On 12 January 1911 in Rapid City, South Dakota, the mercury fell 62°F in just two hours, from 49°F at six A.M. to -13°F at eight A.M.

Topping that, the temperature plunged 58°F in 27 minutes in Spearfish, South Dakota, on 22 January 1943, falling from 54°F at nine A.M. to -4°F at 9:27 A.M.

