

Orientor

Defense Mapping Agency Aerospace Center

October 11, 1991

**WHAT
WE
DID...**



**FY 91
IN
REVIEW**

DMAAC Meets Challenge of Changing World

During the fiscal year that ended Sept. 30, the world situation and advancing technology provided the Defense Mapping Agency Aerospace Center opportunities to strengthen its position as the principal provider of aerospace mapping, charting and geodetic (MC&G) products to the armed forces.

In addition, the requirements of the Persian Gulf war called for unprecedented cooperation between DMAAC and its sister components, and joint production of non-aerospace MC&G products was expanded.

As production quickened, with many personnel working seven days a week and 10- to 12-hour shifts during Desert Shield and Storm, preparations also intensified for the introduction of a new Digital Production System (DPS). Under this system, production is to be accomplished in a softcopy (digital) format, bypassing the use of photographic film as a source material. Some DPS segments arrived during FY 91 and were quickly pressed into production to meet Desert Storm requirements. At the same time, planning went forward for a comprehensive reorganization, known as Phase 2, to align the work force for production in a DPS environment. Much testing of new DPS software and equipment, both in-house and off-site, also took place throughout DMAAC.

To present MC&G information in the most suitable form for DMA users, a variety of formats was used for DMAAC products, including paper charts and books, filmstrips, magnetic tape, and compact disk with read-only memory. This overview of FY 91 production will present some of the year's highlights. For more information, see the production department reports, which begin on page 4.

Maps and Charts

Map/chart production broke all records in FY 91 with 31.6 million copies of 919 maps and charts printed at DMAAC and another 10.4 million copies (277 maps and charts) by



*"You
Never
Failed
Us,"*

Lt. Gen. Charles A. Horner, 9th Air Force commander and architect of the Air War in the Persian Gulf, tells employees in a Parade Ground address, thanking employees for their "amazingly helpful products."

contractors for Desert Shield and Storm alone. Total production in FY 90 was 18.7 million copies including contractor support. For FY 91 the figures were 48.5 million copies of 1,875 maps and charts, including contractor support.

Source preparation, compilation and finishing were performed in record time to produce hundreds of Joint Operations Graphics (JOGs) and 1:50K Topographic Line Maps (TLMs) for Operations Desert Shield and Storm. JOGs are used for joint land and air operations and TLMs to guide troop movements. JOGs were also produced for Counter Narcotics activities. A special JOG was produced in 48 hours to support the recovery from the disaster in Bangladesh.

TLM production was performed for the first time at DMAAC in conjunction with the DMA Hydrographic Topographic Center. To expedite production for Desert Shield/Storm, TLMs were compiled, for the first time, from digital data obtained at Feature Extraction work stations. Finishing in a digital mode was also begun with the arrival of a Mark 90 system, the Map Publishing Environment (MPE). Using a laser printer, the system produces color separations from digital files. In addition to

TLMs, about 150 1:100K Landsat Image Maps (LIMs) were finished with MPE equipment. For some of the LIMs, compilation was also performed on the MPE, as training was suspended so that personnel could use the equipment in the war effort. LIMs are an interim product to be used until more detailed 1:100K TLMs are available. Desert Storm production also included five 1:200K Air Target Material (ATM) Charts.

Special Products

To support Desert Storm, DMAAC expanded its series of Evasion Charts and developed and produced the first Blood Chit since the Vietnam War.

EVCs, which are designed in-house, are based on JOGs but contain much additional information to help a downed air crew member escape and survive in enemy territory. EVCs are printed on a tough material that can collect water and provide shelter.

Blood Chits contain special information that promises a reward for aiding downed pilots. A unique serial number is imprinted on each Blood Chit so that claims can be verified.

A filmstrip of the Desert Shield area was produced for the HH-53 helicopter. Filmstrips of conventional

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COVER: Launching of a Tomahawk Land Attack (Cruise) Missile.

Talking Point ●

It Was a Career Year

IN BASEBALL there is an expression, "He's having a career year." Basically it means all the elements of a baseball player's game are coming together. His statistics are good. He's playing well, hitting the ball, driving in runs. All in all having the best year of his entire career.

If you could project the same criteria on an institution, then you could honestly say over the last 12 months the Aerospace Center had its own career year.

That year started on an ominous note, as the Aerospace Center along with the rest of the Defense Mapping Agency monitored events in the Middle East.

President Bush had drawn a line in the sand. Operation Desert Shield was underway, and the world waited to see what would be Saddam Hussein's next move.

BUT THE PEOPLE of the Aerospace Center were not casual observers in the drama unfolding on the world stage.

By then we were already working around the clock meeting the demands of military units deploying to the Gulf. We were major players in the airlift of millions of tons of equipment and thousands of troops to the desert of Saudi Arabia. Our maps and charts led the way.

And once our forces were deployed we provided the maps, charts and data to train for whatever they might face during a showdown with Iraqi forces.

We updated, printed and distributed our entire product series over the region. So that in January when time ran out for Saddam Hussein our forces were ready with the best charts and digital data ever available to a combat force in battle.

Desert Shield would quickly become Desert Storm. DMA was in its "first" war.

AS THE AIR WAR got underway, the Aerospace Center's role became obvious with each dispatch coming out of Baghdad. That is the way it continued every day until the truce was signed weeks later in a tent erected next to a small airstrip inside Iraq. Desert Storm was over.

For months the men and women of the Aerospace Center had to put forward an extraordinary effort. The final victory the allies achieved was



From Col. Marcus J. Boyle, Director, DMA Aerospace Center

due in no small measure to the hard work of every member of the Aerospace Center team.

BUT WHAT MAKES this accomplishment even more significant is that you did it while still meeting other production goals.

Couple that with all the budget uncertainties, drawdown of staffing and ramping up for the Digital Production System, it becomes even more impressive.

In my column today I've focused on our efforts during the conflict in the Persian Gulf. Certainly in the last 12 months you've had many other successes and triumphs, but in reality support to troops in combat is the ultimate report card on our ability to do the job our Nation has entrusted to us.

Day in and out, our job is to provide the military forces the best MC&G products to plan, train and prepare for contingencies worldwide. Desert Storm made our primary mission (combat support) a reality.

IT WAS ALMOST 20 years ago that the mapping services of the Army, Navy and Air Force were combined to create the cohesive force necessary to support combat operations such as Desert Storm, and to put it simply, the plan worked.

It worked because many people played an important role. Not just the employees of today, but everyone who has ever been a part of the DMA Aerospace Center family.

If you could freeze a moment in time, a "snapshot," if you will, that represents what those who created DMA envisioned its role would ultimately become, certainly the last 12 months was the image they had in mind.

For the last two years I've been honored to lead the Aerospace Center part of the DMA team. But never more so than during the last 12 months during AC's "career year" ●

Scientific Data

FISCAL YEAR '91 for the Scientific Data Department (SD) was an extraordinary production challenge. In a spectacular effort, SD met the challenges of Desert Shield/Storm and still fulfilled routine production requirements. Dedicated professionals of SD and other departments allowed DMAAC to meet wartime demands. During this period SD was able to meet, and in many cases exceed production requirements for Desert Shield/Storm and Counter Narcotics. During this period of intense production, SD continued to provide technical support for DMA's transition into the Digital Production System (DPS).

Within SDA, FY91 will long be remembered as the "Desert Shield/Storm Year." During this period SDA produced source packages for 12,500 airfields; 468 JOGs; 463 1:50,000 Topographic Line Maps; 49 1:100,000 Landsat Image Maps, and 1,500 rectangle control packages. This was further supplemented by several thousand feasibility studies, and 65 currency reviews. As the first step in the MC&G pipeline, SDA was constantly under the gun to provide accurate and timely packages. At the onset of Desert Shield/Storm there were no TERCOM matrices in Iraq or Saudi Arabia. Efforts to provide reliable matrices were hampered by flat terrain, poor photo source material, and unreliable vertical check source. Our TERCOM analysts overcame these problems and produced 68 separate matrices. The accuracy of these matrices were proven by the success of cruise missiles.

SDA was assigned several new programs/responsibilities during FY91, including: Synthetic Aperture Radar (SAR), Landsat/SPOT Control, Video Point Positioning Data Base (VPPDB), Interim Terrain Data (ITD), 1:100,000 Landsat Image Maps, and administration of film and magnetic media inventory.

SDE and SDF cartographers generated control for many charts produced by the Mapping and Charting Dept. During Desert Shield/Storm, SDE produced 71 TERCOM and 79 DTED cells, 39 rectangles, and feature extraction control for numerous Tactical Land Mass Charts. They combined parts of four Point Positioning Data Bases (PPDB) to form one single PPDB. SDF provided near real time positioning to support CENTCOM and other United States Commands involved in the Southwest Asian area. SDF analysts produced and distributed over 8,000 point positions and nearly 18,000 gridded photos to Air Force, Navy, and Marine Aviation units. They supported special units at the Pentagon and Defense Intelligence Agency (DIA) with positioning support, most of which had to be completed in less than two hours from receipt of request. On many occasions they received and completed over 200 requests per day.

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Addressing personnel at DMAHTC, General Colin L. Powell, Chairman of the Joint Chiefs of Staff, thanks all DMA employees for helping to win the war in the Persian Gulf.

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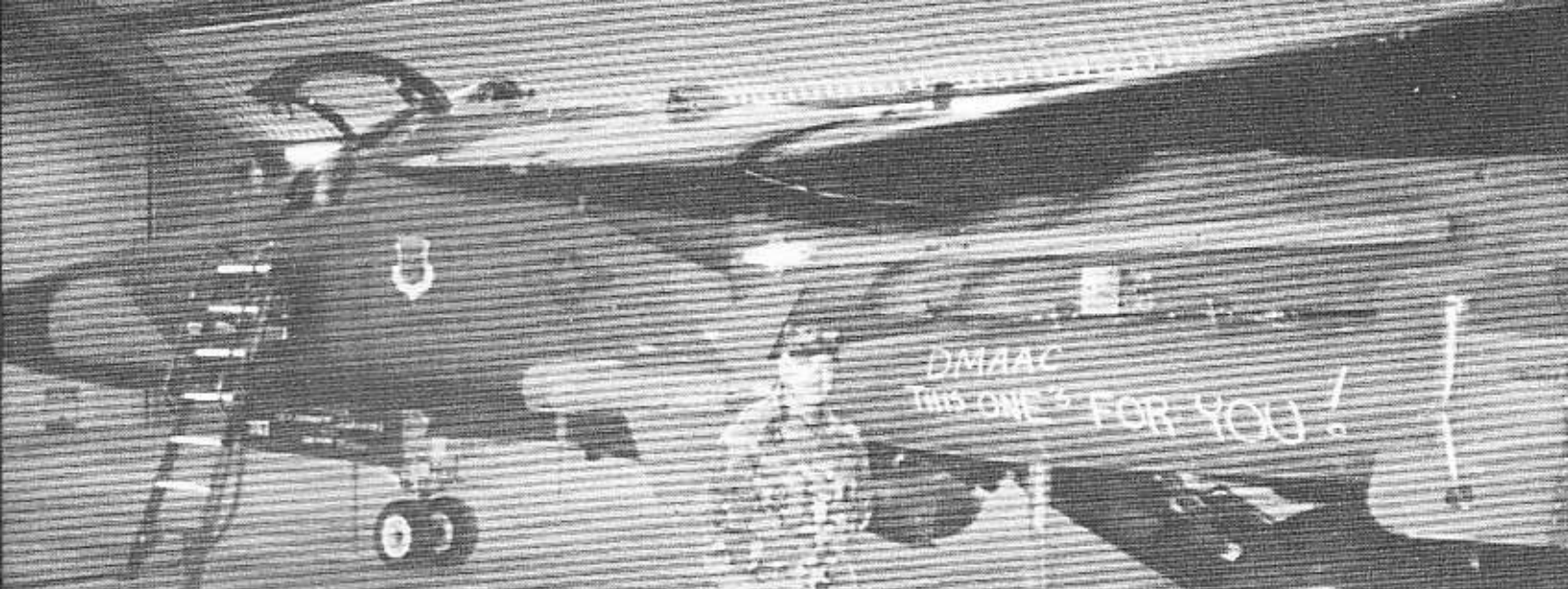
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AT RIGHT, Colonel Boyle (right) accepts the Tomahawk Flag with Battle "E" from the deputy program executive officer for the Cruise Missile, Gerald Miller, who cited DMA for its "key role in the successes and accuracy" of the missile during Operation Desert Storm.





Continued from page 5.

One SDF manager stated, "The people of SDF were called upon to provide support at the expense of their family and community life. At no time was a request delayed for any reason. They worked large amounts of overtime and stayed with their assignments through completion and transmission to the requestor."

Concurrent with these efforts, SDF developed an off-site capability to produce Desert Storm support items at 8900 South Broadway. Among the many praises for their efforts, the one SDF employees especially enjoyed was a plaque from the Defense Intelligence Agency. Attached to it is a Scud missile fragment and the words "This Scud's for You."

SDD is the focal point for distribution of all digital data for DMA. By the completion of FY91 SDD had shipped 76,000 cells of DTED and 20,000 cells of DFAD. This division is also responsible for maintaining and distributing the following digital products: World Mean Elevation Data (WMED), Digital Landmass Blanking Data (DLMB), Local Slope Data (LSD), Standard Terrain Roughness Overlay (STRO), World Vector Shoreline (WVS) and Probabalistic Vertical Obstruction Data (PVOD). SDD supported 10 different Air Force and Navy simulators by supplying 2,400 cells of transformed data. The newest is the B1-B transformation program, for which SDD completed 400 cells during FY 91.

SDD performs CD-ROM DTED production consisting of retrieving and processing DTED and generating area-coverage graphics and textual information. This data is then copied onto CD-ROMs and returned to SDD for validation before shipment to the DMA Combat Support Center for distribution. Over 1,000 magnetic tapes of Synthetic Aperture Radar (SAR) data were validated, duplicated, and shipped by SDD in support of a special support project during FY 91, as well as 188 TERCOM map sets. At the beginning of FY 91, SDD was tasked to receive, store and distribute the new Interim Terrain Data (ITD). SDD processed over 400 sheets of ITD from producers at DMAAC and DMAHTC.

Once again SDR met the production challenge imposed on it by all the other departments' MC&G requirements by producing 892,650 photo products (this includes 317,751 for DS). SDR participated in the development of new products, such as the gridded photo. This division exemplifies the inter-dependencies within DMA's MC&G pipeline. Without their prompt photographic support all production throughout the plant would have been jeopardized. In addition to MC&G support, SDR also provided graphic, video and audiovisual support for all of DMAAC.

SD's support of MC&G activities is not restricted to direct production. During FY 91, SD supported DMA's transition to the Digital Production System (DPS). By providing extensive technical support during the development and testing of the Source Preparation (SP/S), Production Management (PM/S) and Data Services (DS/S) segments, SD helped ensure DPS's ability to support MC&G production.

*Dean Lakeman and Greg Anderson
with contributions by William Randall, Jacquelyn Hopkins, Jerry Jackson,
Robert Terry, Michele Danner, Elmer Lanigan, and Don Gardner*

ABOVE, MSgt. Charles H. Keeler, chief of DMAAC Facility Security from 1980-86, sends a message to everyone at DMAAC. Sergeant Keeler, who was stationed in Saudi Arabia during Desert Storm, is standing in front of an Air Force fighter-bomber, the F-111.

BELOW, the B-1B Bomber is the latest aircraft to use digital data produced at DMAAC to simulate radar and cockpit views for training.



DMAAC Meets Challenge

Continued from page 2.

charts provide a moving map display to automatically follow an aircraft's flight path at two scales.

Besides special products for Desert Storm DMAAC produced other special products. For the Joint Chiefs of Staff, the annual *Single Integrated Operations Plan* was prepared, including more than 300 charts. DMAAC also continued providing cartographic support for the NASA space shuttle.

Flight Information

DMAAC produced more than 15 million Flight Information Publications (FLIPs) for worldwide use by U.S. military aviators. The publications cover all phases of flight: planning, enroute and terminal. For the first time, FLIP editions covered former East German territory and Sino-Soviet areas.

For Desert Storm/Shield, an out-of-cycle volume of airfield graphics was produced. Hundreds of airfield reviews were performed for the war, as well as for Counter Narcotics. Reports of damage to Iraqi airfields were analyzed and files were subsequently updated on a daily basis.

Terrain Contour Matrices

A longstanding product of DMAAC, Terrain Contour Matrices (TERCOM) proved their value during FY 91, as scores of TERCOM map sets were produced for Desert Storm. The data was used in Tomahawk cruise missiles, which knocked out many of Iraq's defense systems, securing the skies for manned aircraft.

Digital Landmass Data

Production continued for the Digital Landmass System (DLMS) a data base that provides data used to simulate radar and realistic cockpit views for 10 Air Force and Navy aircraft trainers, among its applications. Two types of data are produced in-house and under contract for the DLMS, Digital Terrain Elevation Data (DTED) and Digital Feature Analysis Data (DFAD). The data is produced in one degree squares (about 2100 square nautical miles) at different levels of resolution and in different series. DFAD is composed of feature analysis data, which are

numerical representations of such land features as rivers, roads and population centers. DTED consists of elevation points.

While fulfilling standard production commitments for the DLMS and other digital cartographic data, as well as Desert Shield/Storm requirements, personnel took part in a number of special projects during FY 91. These included investigating the use of Fractals and Synthetic Aperture Radar to generate DTED and testing new production and security software.

Interim Terrain Data

For the first time, DMAAC joined with other DMA components in producing Interim Terrain Data, a digital cartographic product used in ground operations. The new product had been well received by U.S. forces in Europe, and with Operation Desert Shield, demand accelerated.

A significant example of an early attempt at multi-product production occurred when ITD cells were converted to DFAD using Feature Extraction equipment. DMAAC personnel also worked on a prototype

Continued on page 12.

QUOTED...

"The Aerospace Center set production records in FY 91. These accomplishments, under wartime conditions, show the flexibility, innovation, dedication and courage of our people."

—A. Clay Ancell
Deputy Director,
Programs, Production
and Operations



"The war showed we could do a phenomenal amount of work around here. Given an emergency situation, we worked incredibly well as a group."

—Cathy Bratton
(GAN)
Negative Engraving
Inspector



Contracting Enhancements

FY 91 was a record year in DMAAC for development of new contracting activities with excellent assistance from Mary Ann Klaner and her staff at HQ DMA(AQ). New contracting programs were developed and implemented for major product items including Interim Terrain Data (ITD), Digital Feature Analysis Data (DFAD) Level 1C/3C, and Compact Disc-Read Only Memory (CD-ROM) for Arc Digitized Raster Graphics (ADRG). Also, procurement documents for video PPDBs were completed with contract award scheduled for the first quarter of FY 92.

Also, during FY 91, DMAAC produced its first 1:50,000 Topographic Line Map (TLM) and Joint Operations Graphic (JOG) combination contract packages for the Center's end-of-year contract contingency plan. Using skilled employees from SD, MC, and GA, and with guidance from PPC program managers and help from DMAHTC Contracting Office Technical Representatives, DMAAC put together the source data, supplementary materials, and instructions necessary for contractor compilation and color separation. Contractor bids were received by DMA(AQ) and awarded using FY 91 contract dollars.

Looking into and preparing for the new production year, DMAAC has coordinated with HQ DMA(AQ) to prepare new contracts for the award of AT200s, JOG-Rs, and paired JOG-A/Rs. These contracts are currently being finalized. The efficiency learned from Desert Storm on paired JOG-A/R collection has been incorporated within the new contracts. Effort in the contracting field remains critical in coping with limited DMAAC in-house resources and increasing user requirements.

—Directorate of Programs, Production and Operations

Digital Products

THE DIGITAL PRODUCTS DEPARTMENT (DP) entered the 1991 Fiscal Year in a very high state of activity with the impact of Desert Shield support. Once again the personnel of DP measured up to their usual high standards and the Department's three divisions successfully met all of the year's challenges head-on.

Terrain/Feature Division I (DPI) produced a total of 226 Interim Terrain Data (ITD) cells and 107 1:50,000 Topographic Line Maps (TLMs) in support of Operation Desert Shield/Desert Storm; as well as directly supporting the military services by producing 30 coastal wetlands plots for the U. S. Navy, 268 symbolized ITD plots for the U. S. Marines, and by converting 147 ITD cells into DFAD for the U. S. Air Force.

In spite of the thousands of work-hours committed to Desert Shield support, DPI finished the fiscal year by meeting its rescheduled production program of 27 Level 1 DFAD cells and 34 Level 2 DFAD cells. The year was topped off by a major reorganization of the division, designed to better support DPI's role as a multipurpose division.

DPI is continuing technical improvements by working with contractors to produce TLMs using digital data from Feature Extraction equipment on the Map Publishing Environment (MPE). DPI has 62 TLMs compiled on the FE work stations which are being finished on the MPE. DPI is also working on a new Tactical Terrain Data (TTD) prototype. TTD is an enhanced form of ITD and contains all of the information normally contained in an ITD cell plus the data from the corresponding TLM and hydrographic data from a Combat Chart. Production of this highly detailed data base is an exacting test of the capabilities of both our collection systems and the DPI analysts.

As a part of its production improvement efforts, DPI is testing a Multi-Product Operation (MPO) concept for the Feature Extraction work station. The MPO concept entails identifying areas where requirements exist for several different products, and producing these products simultaneously, minimizing the duplication of effort that would occur if the different products were collected separately.

Extending the teamwork philosophy that worked so well during Desert Shield/Desert Storm, DPI has capitalized on the lessons learned by having its Quality Circle teams use a computerized file to analyze the ideas and problems that are fed back from production personnel. Coordination with the Process Improvement Office (PIO) on the identified issues resulted in a Process Improvement Team (PIT) being formed to study and resolve the issues.

Terrain/Feature Division II (DPC) had a successful year with its ITD, RTAD, PLD, PVOD, and DFAD IC/3C programs in spite of some unexpected impacts. DPC had its work force reduced in order to support Desert Storm production in other divisions and the biggest impact was put on the ITD program. The ITD program rates were reduced from 73 to 30; however, DPC was tasked to support requirements for two separate exercises, the SIMNET exercise and the multinational REFORGER exercise.

The original FY91 Relocatable Target Assessment Data (RTAD) program given to DPC was for the production of one special. Due to Desert Storm production in other divisions, DPC was tasked to produce eight additional RTAD assignments. To further complicate matters, DPC was tasked to produce not only the digital data but for the first time, DPC cartographers were asked to accomplish the photo analysis compilation requirements. These decisions were made in February with a July due date. A tremendous effort was put forth to get equipment, materials, and training set up so that production could begin as quickly as possible. Due to the efforts of a dedicated work force and despite the fact that the average feature count of these assignments was four times the standard, DPC was able to meet the committed due dates.

During FY91, production responsibility for Powerline Data was broadened from one section to all of DPC. At this level of effort, the program was brought nearly to a conclusion, with requirements anticipated to be met in the FY 92 first quarter.

Continued on page 8.

QUOTED...



"There was no added accuracy requirement for Desert Storm, so this was evidence that our products are in fact as accurate as we had mathematically or analytically determined them to be."

--Gerald Schulz
Chief, Charting Branch
(PCC)



"It's been a morale booster for the computer operators to see what they are doing for the nation's defense. I'm very proud of them and proud to be working with them."

--Patricia Bell,
Section Chief,
Computer Operations



"DMA will be depending on the people in the production centers to make DPS work. We think we've got the quality of people who can pull this off."

--Kathleen M. Smith,
Chief, Digital Products
Dept. and member, DMA
Phase 2 Study Team

Digital Products

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Lessons learned during the difficult initial production year (FY 90) of Probabilistic Vertical Obstruction Data (PVOD) were incorporated into current production processes. These changes allowed overproduction on a program initialized at 4,400 one-degree cells.

New aspects of carto-based DFAD production were assigned to DPC, and the work force was trained in DFAD compilation practices using a variety of map sources. The DFAD IC program of 34 cells was completed in July. A contract was awarded in February for production of DFAD IC/3C. The bulk of the DFAD 3C commitment of 170 scenes was assigned to the contractor and DPC personnel performed inspection and acceptance activities on 78 scenes. That the work force changed a mind-set from "how we do it" to "satisfy the user" reflects well on the professional integrity of the DPC cartographers.

Terrain/Feature Division III (DPL) utilized its expertise and professionalism to meet the demands of FY 91. Desert Shield TERCOM support was completed in October with extraordinary competence, ambition, and timeliness and the resulting success of the TERCOM supported Tomahawk cruise missile is well-known.

Personnel resources were reallocated to meet changing Aerospace Center production requirements. The Division on-duty strength was reduced from 153 on 1 October 1990 to 97 on 1 August 1991, including 17 newly hired and 24 MC&G-certified cartographers.

Once again the personnel of DPL met the challenge of the rated DTED and TERCOM programs. As of 30 September, the Division had released 284 DTED cells of a FY91 program of 282 cells, including 56 Desert Shield priority cells. DPL released 684 DTED cells to the Cartographic Data Base (CDB), reducing the disk inventory from 480 cells at the fiscal year start to 60 cells on 30 September. In its TERCOM program, the Division released eight Desert Shield priority matrices and 15 landfall, 36 enroute, and 136 terminal matrices for the FY 91 program. DPL personnel enhanced their skills through participation in nine special projects for a variety of organizations and purposes, including investigating the use of Fractals and Synthetic Aperture Radar to generate DTED and the generation of DTED Level 1 and 2 data for the U.S. Army Engineer Topographic Laboratories. Division personnel continue to test production software on the UNISYS mainframe, the Pooled Analytical Stereoplotter Systems (PASSs), Edit Systems I and II, and HYPERchannel. Security accreditation documents were completed, new LOGON software was installed, and some UNISYS hardware was replaced, all to comply with DMA security regulations.


The accomplishments of the personnel of DPL remain constant and are a credit to the mission of DMAAC.

The Production Support Office (DPP) made many organizational changes during FY 91 in order to be aligned to the Phase 2 organizational structure. A new transition management branch was created to manage DP support in developing the Production Management Segment (PM/S) and Factory Exercise and Demo Support (FEDS) personnel. Two other transition management branches in DP support activities for the Digital Extraction and Product Generation Segments, as well as transition activities. With 62 people providing support, DPP expended 33 work-years on these efforts.

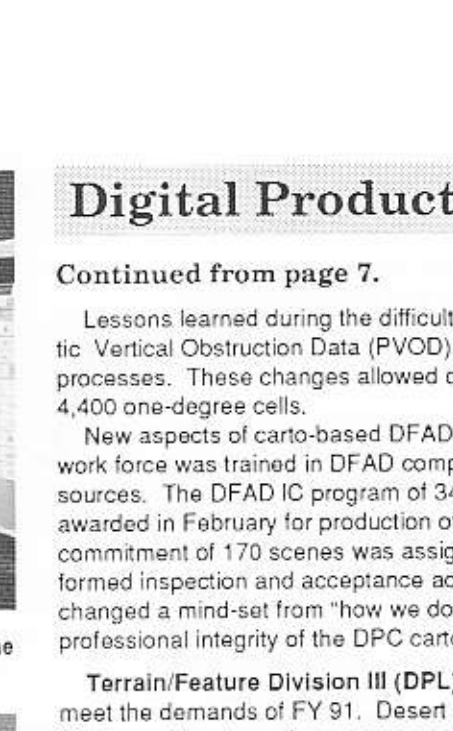
Fiscal Year 1991 has seen the Digital Products Department continue to restructure and prepare for the implementation of Phase 2 of MARK 90. Even with the huge impact of Desert Storm, personnel moves, program realignment, and restructuring of organizations, the talented and highly motivated personnel of DP have successfully completed their standard programs and are looking forward to FY92.

Nick Decker

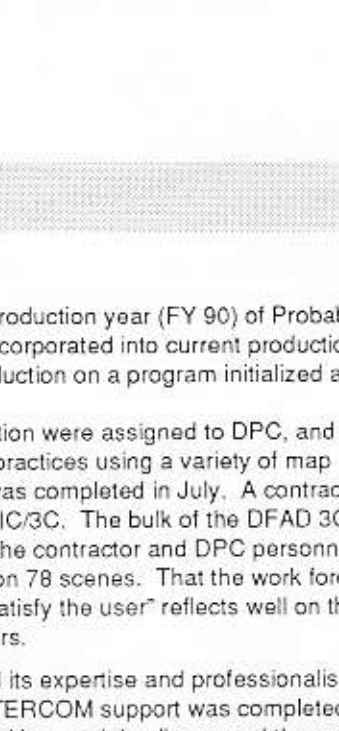
*with contributions by George Szigeti, Paul Lambeck,
Dave Wesloh and Steve Neville.*



Richard Chin (DPP) checks hardware for the Product Generation Segment of the DPS.



View from an aircraft simulator cockpit generated from Digital Landmass System data.



Personnel working on Desert Shield production the Saturday before Christmas enjoy a catered lunch prepared by volunteers.



ABOVE, Chris Hamby uses an MPE scanner to obtain cartographic information for reproduction on CD-ROM.

Mapping and Charting

WITH THE EARLY DELIVERY of the Map Publishing Environment (MPE), the Mapping and Charting Department (MC) immediately began operations on the system to support Desert Storm. The MPE was used to produce 151 Landsat Image Maps (LIM), 49 for Counter Narcotics and 102 for Desert Storm. The MPE also finished and produced color separates for 27 1:50,000 TLM's collected on Feature Extraction (FE/S) equipment and provided LIM support for Operation Provide Care.

In other highlights (listed in no particular order), MC--

- Supported the 34th Edition of the Joint Chiefs of Staff *Single Integrated Operations Plan*.

- Created process improvements through Desert Storm including a finishing section and staff review group.

- Reviewed hundreds of airfields in support of Counter Narcotics and Desert Storm.

This function has been transferred to the Scientific Data Dept. (SD).

- Provided NASA ongoing support for the space shuttle program.

- Worked two shifts/seven days a week throughout Desert Storm.

- Produced a special out-of-cycle volume of airfield graphics in response to Desert Shield/Storm (Volume 16).

- Provided the Graphic Arts Dept. (GA) and SD with support in the areas of photo processing, contract acceptance, and source packaging.

- Instituted the "Family of Charts" concept with the combined production of JOG A's and R's and using completed 1:100,000 TLM's for the production of JOG A's; this provided considerable savings.



ABOVE, an Air Force flight crew plans a mission with charts produced by DMAAC. BELOW, a helicopter pilot refers to a DMAAC Flight Information Publication.



- Produced and distributed over 15 million FLIPs. For the first time, produced publications to cover East Germany and the Sino-Soviet area.

- Provided support in the preparation of contract packages for JOG A's, 1:50,000 TLM's, 200's, JOG R's, JOG A/R combined, and filmstrips.

- Collected contours on the FE/S for 30 1:50,000 TLM contract jobs.

- Used the NARCs system to produce LIM's and SAR assignments.

- Produced nine 1C/3C assignments in less than one month (July 1991).

- Produced over 1,000 ADRG CD-ROM's.

- Received early delivery of Aeronautical Data Maintenance System, part of



the Mark 90 Product Generation Segment (PG/S). Target is to begin the production textual products is early in FY 92.

- Produced a special JOG to support recovery from the disaster in Bangladesh.

- Acquired the library functions from the former Data Services Dept.

Sue Pleimann

Geodesy & Geophysics

THE NEW GEODESY AND GEOPHYSICS DEPARTMENT officially became operational on 1 July 1991 when DMAAC took over the administration of all geodetic and geophysical (G&G) functions within DMA. These functions include the Satellite Geophysics Division in Brookmont, Md. (which will move to St. Louis in FY94); the Geodetic Surveys Division at F.E. Warren AFB in Cheyenne, Wyo.; four Test Range Detachments (Dets) at Vandenberg AFB, Calif.; White Sands Missile Range, N.M., Holloman AFB, N.M., and Patrick AFB, Fla., and the Geosciences Division (formerly DSG).

GG provides support for MC&G activities and advanced weapons systems through the acquisition, analysis, and reduction of data. This activity involves furnishing precise worldwide G&G data to support DoD strategic and tactical weapons and navigation systems; performing reliable geodetic, gravimetric, and astrogeodetic surveys; maintenance of satellite tracking and data acquisition systems; providing technical advice on the development of survey instrumentation and survey techniques; developing error analysis models for testing and operational use of G&G data in both manned and unmanned weapon systems; reduction of satellite altimetry data; and the operation of the DoD Gravity Library.

Highlights of FY 91 accomplishments are as follows:

- GGA (Geosciences Division) has acquired, through their off-the-shelf collection activities, approximately three million new gravity stations in support of current requirements; provided support for the Tactical Reconnaissance Aircraft (TR-1) in the form of gravity disturbances for a large area in and around the Mediterranean Sea; completed and shipped the Annual

TRIDENT Fire Control Update of various-sized gravity anomaly sets and error products to the Naval Surface Warfare Center (NSWC); completed and distributed gravity disturbances at various altitudes in support of the B-2 Bomber test area; provided World Geodetic System (WGS) datum transformations for DMAAC charting application throughout Desert Shield/Storm, and completed five-minute mean geoid heights and gravity anomalies in several coastal areas of the world utilizing adjusted satellite altimetry data.

- GGB (Geodetic Surveys Division) accomplished 54 gravimetric, geodetic and astronomic surveys (worldwide) in support of the Navy's TRIDENT program; Peacekeeper Rail Garrison; Desert Shield; and other special requirements, such as the Short Range Attack Missile (SRAM) and

DMAAC provided gravity data for a test area of the B-2 Bomber. Precision Measurement Equipment Laboratory (PMEL). Field surveys were also accomplished in Saudi Arabia in support of Desert Shield/Storm.

- GGD (Det 1) completed 46 geodetic surveys in support of the Air Force Flight Test Center at Edwards AFB. Some of the projects supported were: the Microwave Scanning Beam Landing System (MSBLS) for NASA's space shuttle; inertial update points on the C-17 parking ramp area; Edwards Test Range telemetry antenna and numerous reflectors; and Navigation Route Radar Reflector supporting the B-2 Bomber Program. In addition, the Western Space and Missile Complex at Vandenberg AFB was supported with 16 additional geodetic surveys.

- GGE (Det 2) completed 780 geodetic surveys at the White Sands Missile Range in support of various programs such as the space shuttle, Patriot, SRAM and STINGER missiles, and the B-1B aircraft.

- GGF (Det 3) provided extremely precise G&G survey support to U.S. Air Force 6585th Test Group's High Speed Sled Test Track, the U.S. Army's Yuma Proving Ground, and

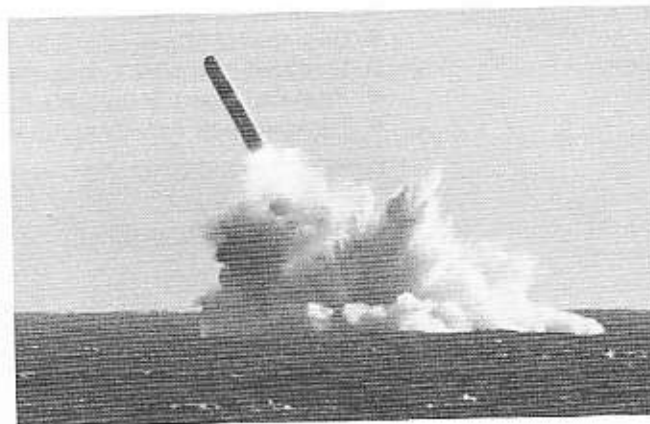
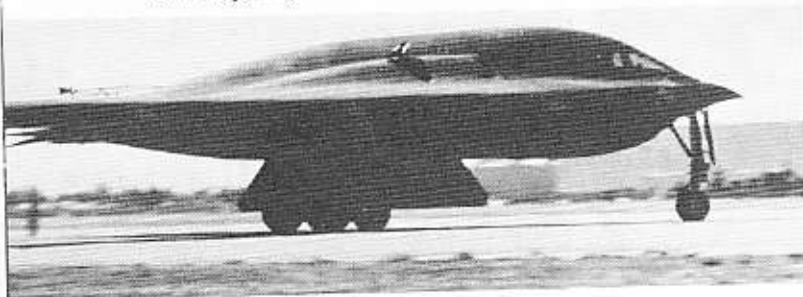
other DoD agencies within their area of responsibility. To date, 25 survey projects have been completed.

- GGG (Det 4) completed 25 geodetic surveys in support of the Eastern Space and Missile Center (ESMC), the Atlantic Underseas Test and Evaluation Center (AUTEC), the military services, and other DoD and U.S. government organizations.

Wayne Arms



Sergeant Pete Patera uses an antenna placed on a tripod to collect survey data in Saudi Arabia during Operation Desert Shield.



A TRIDENT II ballistic missile is launched from a submerged submarine in testing last November. DMAAC provides gravity anomaly sets and other support to the program.

Graphic Arts

ANOTHER YEAR, ANOTHER PRODUCTION SUCCESS STORY. For those who work in the Graphic Arts Department (GA), "hectic" mildly describes the pace; in addition to the fiscal-year program, there was the annual exercise production of the Joint Chiefs of Staff *Single Integrated Operations Plan* (JCS SIOP), NASA mission requirements, and completion of Desert Storm production.

Early delivery of Mark 90 equipment, i.e., cartographic work stations and film writers, enabled GA to produce 49 1:100,000-scale Landsat Image Maps and 27 1:50,000-scale Topographic Line Maps with laser-produced film from digital files.

The JCS SIOP requirement increased from 308 charts to 334 charts. Even though the pipeline was compressed by two months, GA was able to complete the charts ahead of schedule.

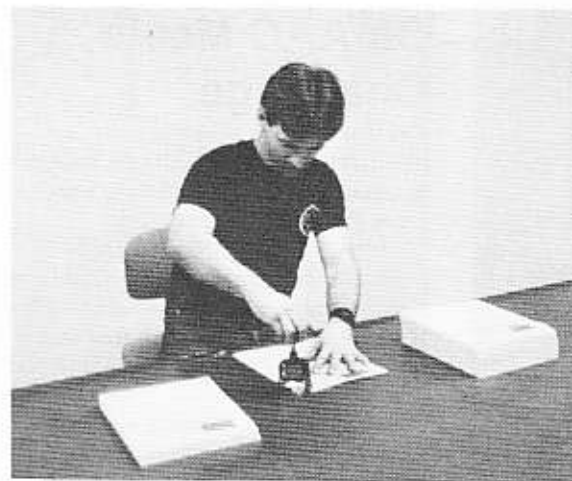
GA continued to support the ever-increasing Counter Narcotics (CN) program, producing 53 additional sheets over FY 90 and 36 Synthetic Aperture Radar (SAR) sheets.

The production count for Desert Storm at the end of the fiscal year was 10,406,000 copies of 277 maps/charts produced by the contractor and 31,659,285 copies of 919 maps/charts produced in-house. GA was able to produce these quantities by modifying specifications in order to print four maps/charts on a sheet of paper, which doubled GA's print capability.

As Desert Shield moved to Desert Storm, GA was asked to develop and customize a Blood Chit covering the Desert Storm area to assist downed air crews behind enemy lines during escape and evasion. Senior Master Sgt. Bruce Johnson from the Air Force Intelligence Agency, Fort Belvoir, Va., provided assistance in the completion of this project. GA printed and hand-stamped serial numbers on 20,000 copies in less than seven days. GA was informed that AFIA received several responses to the Blood Chit.

Fiscal year 91 was a year for "quick response" and change. In addition to the impact of an increase of production, GA also underwent a complete change of top management due to the retirements of both the Department Chief and Assistant Department Chief. Through creative innovations in production techniques, remarkable team spirit, personal sacrifice and the commitment of each GA employee, the FY challenges issued to GA were met.

Pat Nowicki
Production Support Office (GAM)

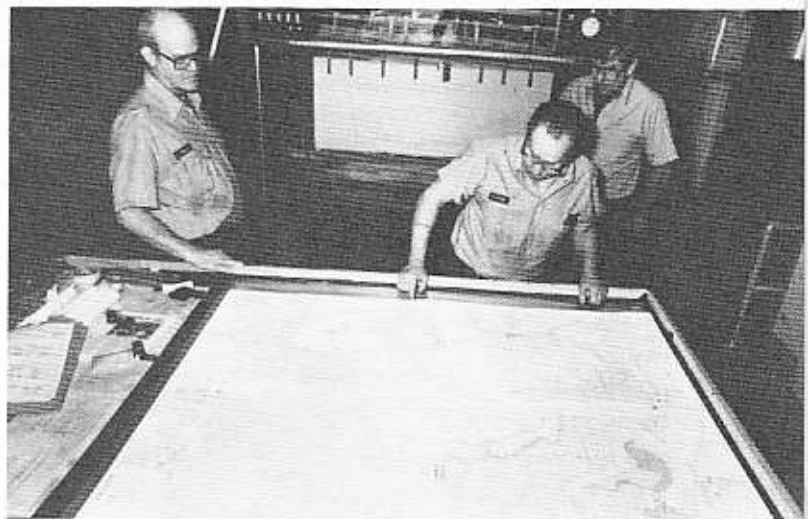


ABOVE, Jeff Miller hand stamps serial numbers on Blood Chits.



AT LEFT, in a dockside ceremony before dawn Jan. 9, DMAAC Director Col. Marcus J. Boyle (left) joins with employees to observe a milestone, as completed Topographic Line Maps are loaded for shipment to troops in Operation Desert Storm.

BELOW, pressmen check registration on a sample sheet.



DMAAC Meets Challenge

Continued from page 6.

product to replace ITD, to be known as Tactical Terrain Data (TTD), which incorporates additional information.

Positioning Data

Positioning data was provided in near real-time during Operation Desert Storm. Analysts produced and distributed over 8,000 point positions and nearly 18,000 gridded photos to Air Force, Navy and Marine aviation units. They also supported special units at the Pentagon and Defense Intelligence Agency with positioning support.

Besides positioning support, more than 890,000 photographic products were produced, including some 317,000 for Desert Shield and Storm. Many of these photographic products were part of Point Positioning Data Base (PPDB) packages that also included digital information.

CD-ROM

Production of DMA products on compact disk with read-only memory (CD-ROM) expanded, with the addition of several products that were previously unavailable in this format. For the first time, DTED and DFAD were produced on CD-ROM, as well as several charts that were previously available only in paper format, including 1:50 Topographic Line Maps and Joint Operations Graphics.

Geodetic Products

Gravity data was provided for the Tactical Reconnaissance Aircraft (TR-1) in the Mediterranean area, B-2 Bomber testing, and the TRIDENT submarine missile. Datum transformations, to correct for variations in datum systems, was provided to users of DMA products throughout the Desert Storm operation, and other assistance was provided to users of the Global Positioning System. Geodetic and geophysical surveys were performed on a worldwide basis for the TRIDENT program, Peacekeeper Rail Garrison, Space Shuttle program, Desert Shield, and for many other requirements of NASA and the military services.



MAJOR PRODUCTION INCREASES

Product

	This year	Last year
Topographic Maps	436	151
Line Image Maps	152	0
CD-ROMs	1037	623 (3/5ths of FY 91)
Filmstrips	14	11
Points	18,245	12,443 (2/3rds of FY 91)
Gridded Photos	275	144
Interim Terrain Data	257	78
JOG A/R	241	88

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