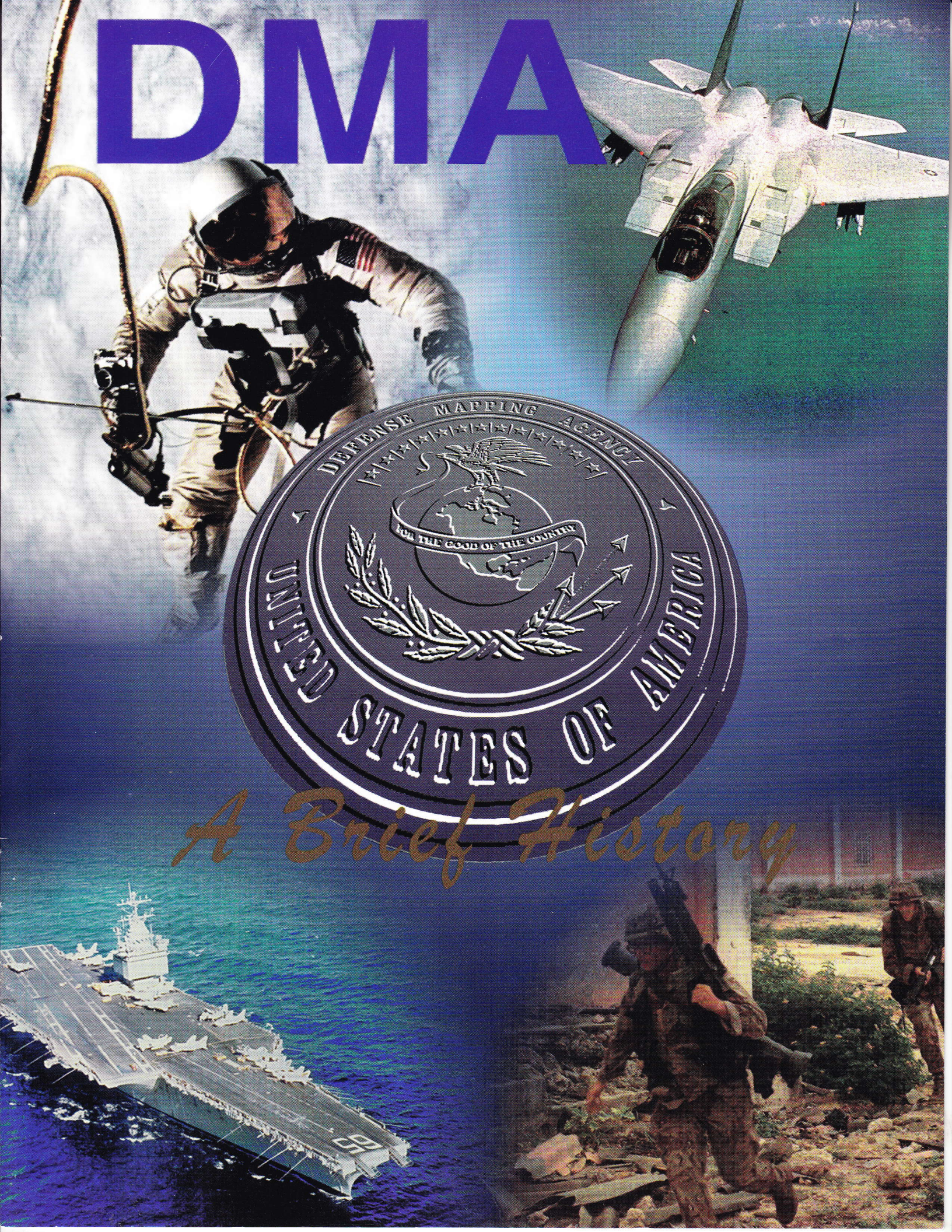
DMA



A Brief History

A Letter From the Past

DEFENSE MAPPING AGENCY
WASHINGTON, D.C. 20301

1 July 1972

D/hav

SUBJECT: DEFENSE MAPPING AGENCY

TO: ALL PERSONNEL OF THE DEFENSE MAPPING AGENCY

1. Today, elements of the Army, Navy, Air Force and the Defense Intelligence Agency merge to become the Defense Mapping Agency. We have been given a challenging and imposing job to do. DMA is truly world-wide, both in its organization and in its responsibilities. Our people are located from California to Rhode Island, from the Pacific to Europe and from Alaska to South America. MC&G products are spread throughout the world-and beyond. These products support our military forces while they preserve our security and guard the peace, guide our astronauts while on the moon and assist the mariner while on the high seas.

2. During the past four months, I have visited several of the organizations which are now part of DMA. I have been invariably impressed by the enthusiasm, professionalism and teamwork of all the civilian and military people I have met. I am sure that those of you I have not yet met are equally dedicated; I am looking forward to visiting with as many of you as I can in the coming year.

3. As Army, Navy, and Air Force organizations you have established enviable records. Our challenge as the Defense Mapping Agency is to serve the troops better. This challenge will face all of us; I am confident we will meet it successfully. It will require the best efforts of every one of us. I pledge you mine.

HOWARD W. PENNEY
Lieutenant General, USA
Director

DMA's first director General Penney (left) during a tour of the facilities.

About the cover

During its brief history, the Defense Mapping Agency played a vital role in national defense, supporting the military services and new weapon systems. That role is signified by the Army, Navy and Air Force photos depicted.

DMA also contributed to the success of numerous special operations and projects, like the manned space programs, represented by the astronaut.

The DMA seal, featured as the centerpiece, is stylized to resemble a survey marker, a basic tool in the creation of maps and charts.

Charting a New Course

Admiral Dantone at the groundbreaking of the agency's newest facility in Jefferson County, Missouri.

I am honored to have served as the Director of the Defense Mapping Agency. The people at the Defense Mapping Agency have demonstrated to the world that they are the leaders in mapping production and technology.

For more than 24 years, DMA's work force has supported missions in peace and war, on land and sea, in the air and in space. From Vietnam to the Persian Gulf, from Haiti to Bosnia, from NASA missions to the recovery of TWA Flight 800, DMA has been there to provide needed mapping information. The professionalism displayed by each member of this agency reflects a dedication that you can rightfully be proud of, and for which the nation owes you its gratitude.

DMA was created in 1972 by consolidating a number of DoD agencies to capitalize on newly emerging information and communications technologies to more effectively meet the mapping and charting needs of America's warfighters. Now, at the close of the 20th Century, these continuously evolving technologies have led us into the Information Age. With the creation of the National Imagery and Mapping Agency, resources are once again being combined to better leverage these technologies in support of our national and defense customers.

Although DMA is standing down, it is reassuring to note that you, the men and women of DMA, will form the largest part of this new and vital Agency. With your talents, drive and proven professionalism I am confident that NIMA will succeed.

J. J. DANTONE, Jr.
RADM USN

In a timeline of nearly 25 years it is hard to list every major development or event. With this brief history we chose instead to focus on a few significant milestones that typified the spirit, teamwork and talent that defined DMA.

Agencies Join to Form DMA

On November 5, 1971, the President directed that the Defense Mapping Agency be established. That directive was carried out in less than two months. DMA was created at midnight, January 1, 1972 and became operational July 1 of the same year.

The goal in combining these organizations was to reduce redundant efforts in the MC&G field by the military increasing efficiency and cutting costs.

The agency, representing a consolidation of most mapping organizations within the three services, became one of the largest mapping agencies in the free world. DMA became responsible for providing mapping, charting and geodesy support to the Secretary of Defense, the military departments, the Joint Chiefs of Staff and other Department of Defense components and organizations.

Army Lt. Gen. Howard W. Penney of the Army Corps of Engineers was chosen as the first director of the new agency. He, and his newly formed staff, began the arduous task of identifying which mapping, charting and geodetic functions and which military personnel could best be incorporated into the newly formed DMA. They also had to decide which elements should remain with the individual services.

About 80% of DoD mapping, charting and geodetic resources were dedicated to the new organization. Included were the MC&G staff of the Defense Intelligence Agency; the Army Topographic Command, less its research and development unit and troop command; the Department of Topography of the U.S. Army Engineer School; the Inter American Geodetic Survey, formerly of the U.S. Army Forces, Southern Command; the chart production, nautical information and distribution activities of the Naval Oceanographic Office; the Aeronautical Chart and Information Center of the U.S. Air Force; as well as the Air Force's 1st Geodetic Survey Squadron and the MC&G elements of the 15th Reconnaissance Technical Squadron.

General Penney established an effectiveness program with an original goal of increasing productivity by 10 percent in the first three years. The goal was not only met, but exceeded.

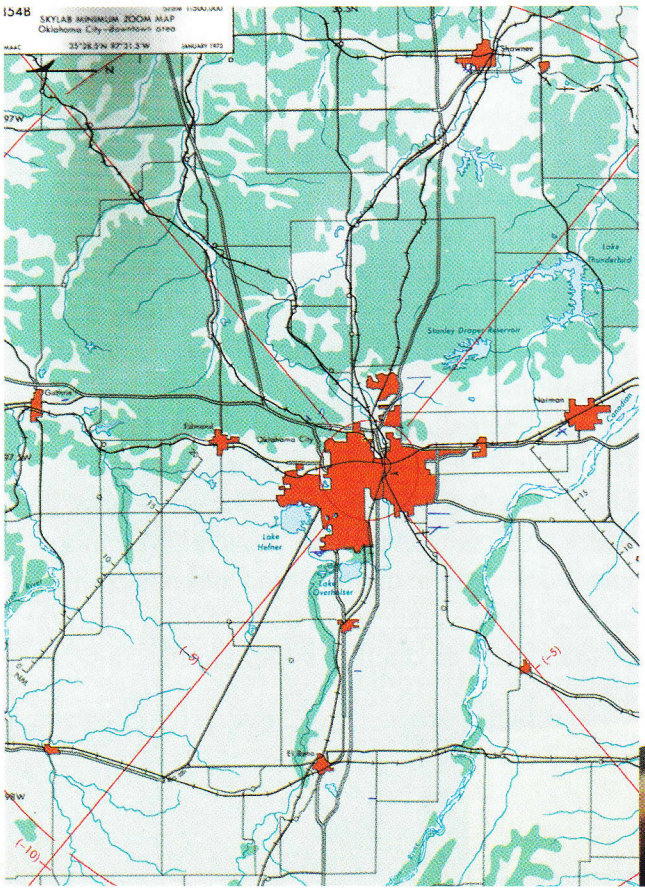
The Space Program

In 1973 the agency received a new tasking from NASA to support a new project, Skylab. Providing support to the manned space program was nothing new to DMA's predecessor organizations, which had a long history of providing information for even the earliest flights of the Mercury program. The Skylab mission was DMA's first joint venture into space.

Maintaining the cartographic needs of a manned space station in orbit posed a challenge for the new agency. Skylab requirements, as one cartographer noted, were much larger than earlier requests. "The massive facets of the program cartographically surpass the previous Apollo programs."

This project was quickly followed by another history making event. In 1975, the United States and the Soviet Union made plans for their first meeting in space. An Apollo Command Module would dock with the Soviet Soyuz spacecraft. DMA would once again support another historic event.

The support for NASA programs continued through the seventies with the space shuttle missions and will be carried on to the future. The recent signing of a new agreement for a joint NASA-DMA endeavor will result in the production of near-global, medium-scale Digital Terrain Elevation Data.



Providing support for space missions has been a long-standing DMA tradition. From the production of Skylab Minimum Zoom Maps(left) to supporting space shuttle launches, DMA has been there.

'Smart' Weapons of the 70s

In the mid-1970s, the rapid development of new weapons systems demanded the attention of DMA, and increased the need for digital data.

The agency became actively involved in developing priorities and planning for the cruise missile, a weapons system with the highest national priority at the time.

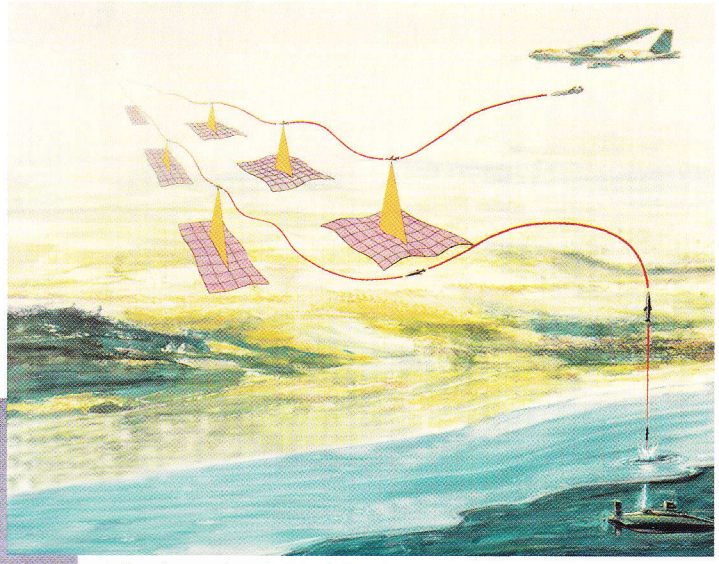
The new weapon system presented a myriad of challenges. Launched from land, sea, or air, the cruise missle was designed to utilize inertial guidance, then, after making a landfall, required low-altitude terrain contour matching guidance. One of the new generation of "smart" weapons systems, the cruise missle's brain is the on-board radar altimeter which takes readings at predetermined checkpoints along the route, comparing it with on-board DMA generated computer maps, correcting the missile's course as required, flying an extremely accurate profile to its target.

Five different products were required to support the cruise missile program. These were Terrain Contour Matching (TERCOM) reference scenes, Digital Scene Matching Area Correlation (DSMAC) reference scenes, Point Positioning Data Bases (PPDB), Digital Terrain Elevation Data (DTED), and Vertical Obstruction Data (VOD).

TERCOM reference scenes was the product used to periodically update their inertial navigation systems by correlating sensed terrain elevations with DMA stored reference scenes. It is very detailed and used for missile guidance up to the final minutes of the flight.

Digital Scene Matching Area Correlation is also a correlation guidance system used in the terminal area by the two conventional missiles and provides the additional accuracy required by those systems. DMA built the DSMAC reference scenes used during the development phase of the conventional systems.

In the interest of greater responsiveness and targeting flexibility, the system operators build these products in the field at their mission planning facilities. Mission planners placed these scenes into the same geodetic framework as the target through the use of DMA-produced PPDBs.



The introduction of the 'smart' weapons systems drew great support from DMA.

DTED and VOD are used extensively in mission planning, allowing planners to take advantage of terrain masking of enemy radars and to determine the optimal flying height.

DMA supported many test flights to prove the system as well as providing the primary product support needed for the government. Close coordination with all three military services was critical to planning for cruise missile operations.

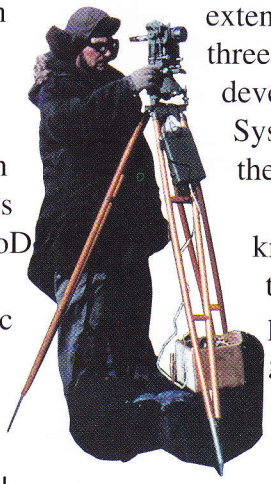
The increased reliance on digital products for the new weapons systems brought DMA closer together as an agency. The cruise missile was a watershed event that moved DMA more and more into the digital arena and poised the agency for the changes to come with the arrival of the digital production system in the mid-1980s.

WGS 84 Brings the World Together

The Department of Defense World Geodetic System 1984 provides a global geodetic three-dimensional terrestrial reference system. DMA-produced maps, charts, and geospatial products are referenced to WGS 84.

DoD brought the system to life in the late 1950s generating a geocentric reference system to which different geodetic networks could be referred and compatibility established between the coordinates of sites of interest. This effort led to the development of the DoD World Geodetic System 1960.

In January 1966, a World Geodetic System Committee was charged with the responsibility of developing an improved WGS needed to satisfy mapping, charting, and geodetic requirements. The WGS Committee produced WGS 66, which served DoD needs once implemented in 1967.



Surveyors brave all elements to ensure precise measurements

Using knowledge gained from the creation of the first system, the group began work in 1970 to develop a replacement for WGS 66. After an extensive effort extending over a period of three years, the committee completed the development of the DoD World Geodetic System 1972, which served as a bridge to the latest DMA managed effort.

With large amounts of new data, knowledge, skills, and systems, DMA was tasked to develop and maintain a complete, accurate, and up-to-date global geodetic reference system. As a result, DMA developed WGS 84, published in 1987. This world geodetic system is now the recognized and accepted global reference system and continues to be enhanced to improve its effectiveness.

DPS Comes to the Mapping World

The principal function of the Digital Production System is to extract terrain elevation and feature data, primarily from imagery on a multi-product basis, whenever possible; store that data in a global database organized by data type and levels within data type; and use that data to generate a variety of graphic and digital MC&G products. It is a single production system, geographically dispersed to the production centers.

In 1982, DMA embarked on an ambitious modernization program to renovate the production of MC&G products and to improve its productivity and management effectiveness. This effort had three main objectives: implement the use of new digital source materials used in the making of MC&G products; improve productivity and reduce production time on key DMA products; and enhance the agency's flexibility to respond efficiently to new requirements and new technology.

Fulfillment of this modernization program would be realized in the development, delivery, and deployment of DPS. The $2.6 billion, 10-year program was developed in two phases; the first being, MARK 85, with the follow-on phase, MARK 90, achieving an Initial Operation Capability in November 1992.

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DPS

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MARK 85 was a transitional step that upgraded DMA's film-based production systems and provided initial digital exploitation capability using new source materials. It improved and enhanced hardcopy production methods, improved production management and database management, and provided initial softcopy production capability.

MARK 90 provided an all digital production system and achieved an end-to-end softcopy production capability, further improving production programming and resource management.

DMA guided and monitored the development activities of specialized DPS segments. These segments were keyed to various steps in the production of the defined set of major MC&G products, and automate, simplify, and expedite many cartographic and management tasks formerly requiring labor intensive techniques. The products earmarked for the DPS production are those that historically consumed the greatest portion of DMA's production resources.

Supporting Troops in the Gulf

The dawning of the 1990s has brought many challenges to DMA, starting with Iraq's invasion of Kuwait and the start of Operations Desert Shield and Desert Storm.

Almost as soon as Iraqi troops rolled over the border into Kuwait on August 2, 1990, DMA was called to action.

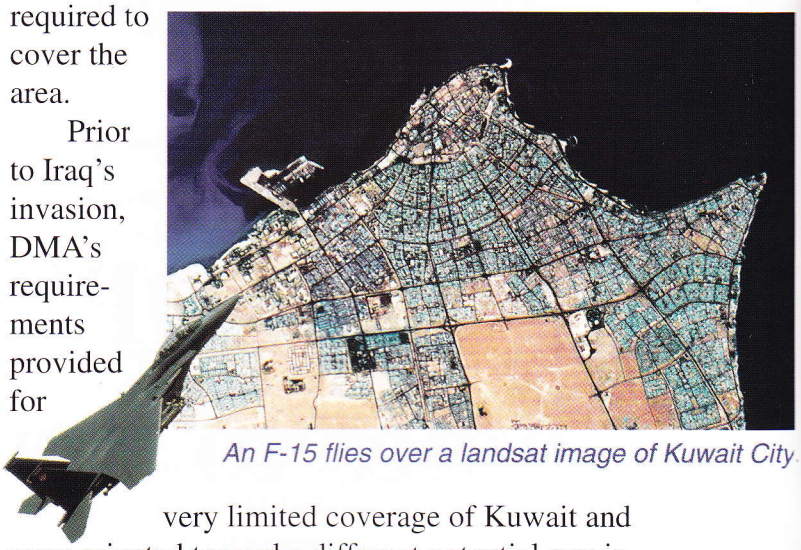
Shortly after the invasion, DMA activated it's Emergency Operations Centers. The EOCs were quickly flooded with requests to support the massive airlift and sealift of troops and tons of equipment to the Middle East.

Extended work hours and overtime rapidly gave way to a three-shift schedule. The agency produced approximately 35 million maps during the first couple of months of the build up of coalition forces — Operation Desert Shield — as compared to the average output of about 50 million maps a year during peacetime.

Even before the start up of war — Operation Desert Storm — DMA's production had exceeded what was done during both Korea and Vietnam. New technologies made this possible.

The operational area was just over one million square miles, twice the size of the allied Western European air and land theater in World War II. It was 15 times larger than Korea and four times the area of Southeast Asia. More than 4,500 different MC&G product lines were required to cover the area.

Prior to Iraq's invasion, DMA's requirements provided for very limited coverage of Kuwait and were oriented toward a different potential war in the Middle East.



An F-15 flies over a landsat image of Kuwait City.

In six months DMA produced more than 12,000 individual products; printed more than 100 million sheets; and produced over 600 digital products. These products included 1:50,000 scale Topographic Line Maps, Terrain Contour Matching references, coastal, harbor and approach charts.

The war effort found many heroes at DMA dedicating themselves to production. The agency and it's people were praised for their work.

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Chairman of the Joint Chiefs of Staff Army Gen. Colin Powell gave his personal "thanks" during a visit to the agency.

"I come to you today to say thank you. You saved the lives of young men and women who went out to accomplish their mission for the nation. You preserved the independence of a free country that had been overrun by aggression. You were an essential part of the Department when we put this effort together. Each and every one of you should have a deep sense of pride in your personal accomplishment as well as the accomplishment of the Defense Mapping Agency."

> *We put a heavy reliance on you. It was amazing. It was flawless.*
>
> **Lt. Gen. Charles Horner**
> **Commander of allied air forces**

His accolades were echoed by the commander of the allied air forces, Air Force Lt. Gen. Charles Horner who told DMA employees how important they were to the success in the mission in the desert.

"The one thing the American people would not stand for was casualties. So we turned to the products you provided. We put a heavy reliance on you. It was amazing. It was flawless."

Crisis Support: The Way to the Future

In 1995, DMA played a pivotal role in the Bosnian Peace Talks at Wright-Patterson Air Force Base, Ohio.

Some 55 mapping support personnel, led by DMA and armed with more than $4 million in high-tech equipment, provided round-the clock mapping support.

The talks centered around the boundries of control separating the warring factions. Negotiators wanted to see changes as they were suggested. Mappers made that happen on screen and on paper, providing a complete end-to-end mapping operation on site.

In many instances the action began with a line drawn on a map. Mappers would digitize the line and import the vector information into a terrain visualization system, showing a 3-dimensional perspective of the terrain to depict where the line apportioned the land.

Mappers computed the land percentages, ensuring the integrity of the required 49 to 51 percent. On the terrain visualization system, the line could be moved to accommodate any change in near real time.

Flexibility was crucial because "the only constant was change" in Dayton. No matter how frustrating at times, mapping support kept pace with the numerous changes.

DMA's team also manned the agency's Remote Replication System creating maps with Digital Terrain Elevation Data merged with Arc Digitized Raster Graphics information. Between 1,000 and 1,500 map products were printed on the RRS during the final six days of negotiations.

In addition to their regular mapping requirements, DMA employees worked with legal experts to help write the mapping language that was essential to the peace document.

Support to the Bosnia effort continues even today. DMA employees are stationed in various sites throughout the theater with a Remote Replication contingent at an air base in Hungary.

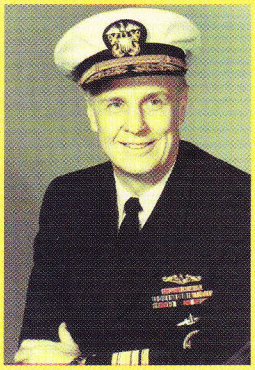
Crisis response was key in Bosnia and has been around the world. In such places as Haiti, Somalia and Rwanda, DMA has been called upon to deliver products quickly with as much information as possible, a trend that will continue into the future.

Background: A Tactical Pilotage Chart of Bosnia and Herzegovina

USA

LTG Howard W. Penney
1972-1974

USN



VADM Shannon D. Cramer Jr.
1974-1977

USAF

Lt. Gen. Abner B. Martin
1977-1979

USAF

Maj. Gen. William L. Nicholson III
1979-1981

DMA Directors

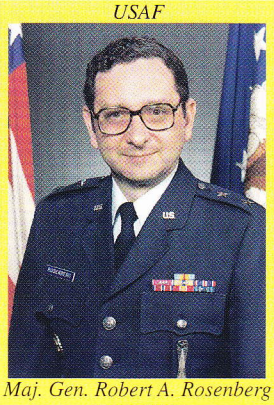
USA

MG Richard M. Wells
1981-1983

USN

RADM E.A. Wilkinson
1983-1985

USAF



Maj. Gen. Robert A. Rosenberg
1985-1987

USAF

Maj. Gen. Robert F. Durkin
1987-1989

USAF

Maj. Gen. William K. James
1989-1991

USAF

Maj. Gen. Raymund E. O'Mara
1991-1994

USAF

Maj. Gen. Philip W. Nuber
1994-1996

USN

RADM J.J. Dantone Jr.
May-October 1996

Deputy Directors Management & Technology

Thomas C. Finnie *1972-74*	Owen Williams *1979-1982*
Charles Andregg *1974-79*	Lawrence Ayers *1982-87*
William Riordan *1979-79*	Penman R. Gilliam 1987-1991

Deputy Directors

Penman R. Gilliam
1991-1993

Dr. Kenneth Daugherty
1993-1995

W. Douglas Smith
1995-1996

Chief Scientists

Dr. Kenneth Daugherty
1991-1993

Dr. Annette Krygiel
1993-1994

Dr. Walter Senus
1994-1996

DMA Awards

Over it's 24-year history DMA has been nominated for and received many awards. These awards are praise for the contributions by individual employees as well as the agency as a whole. The following is a list of DMA's recognitions, including the citation accompanying the agency's second Joint Meritorious Unit Award scheduled to be presented at the formal sunsetting ceremony.

Joint Meritorious Unit Awards

DMA
1 June 1982 - 1 June 1984
DMA Aerospace Center
2 August 1990 - 12 March 1991
DMA Hydrographic/Topographic Center
2 August 1990 - 12 March 1991
DMA Combat Support Center
2 August 1990 - 30 September 1991

Hammer Award

1995

Finalist President's Award for Quality

1996

CITATION TO ACCOMPANY THE AWARD OF THE
JOINT MERITORIOUS UNIT AWARD
(FIRST OAK LEAF CLUSTER)
TO THE

DEFENSE MAPPING AGENCY

The Defense Mapping Agency (DMA) distinguished itself by exceptionally meritorious service from 1994 July 21 to 1995 November 21. During this period, often under emergency conditions or with little or no advance warning, DMA provided extraordinarily efficient mapping, charting, and geodetic services to the armed forces in support of critical military operations worldwide. DMA also provided exemplary mapping services to the Drug Enforcement Agency for counter-drug operations in the Western Hemisphere, and extended special cartographic support for humanitarian relief efforts in Africa, the Caribbean, and other regions as an integral part of U.S. disaster relief operations. DMA flawlessly executed mapping agreements in behalf of the Department of Defense with nations throughout Central and Eastern Europe and the Far East. During the Balkan proximity accord negotiations in November, 1995, in a Herculean effort DMA led its joint services team in round-the-clock support of the exacting mapping requirements of the three Bosnia national entities, concluding in an historic peace agreement that captured the attention of the world. By their exemplary performance of duty, the members of the Defense Mapping Agency have brought great credit upon themselves and to the Department of Defense and added luster to the finest traditions of the United States armed forces.

Director, Defense Mapping Agency
J.J. Dantone, Jr., RADM, USN
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