Tracing Imaging Technology's Institutional Evolution

Mapping and charting efforts in the U.S. remained relatively unchanged until World War I, when aerial photography became a major contributor to battlefield intelligence. Using stereo viewers, photo interpreters reviewed thousands of images. Many of these were of the same target at different angles and times, giving rise to what became modern imagery analysis and mapmaking. The institutional evolution of mapping and charting in the U.S. reflects efforts to respond to both the evolution on the technological front and the needs of the Nation during periods of peace and war.

Engineer Reproduction Plant

Located on the grounds of the Army War College, The Engineer Reproduction Plant (ERP) was the Army Corps of Engineers' first attempt to centralize map production, printing, and distribution. Prior to ERP's establishment, topographic mapping was largely a function of individual field engineer units using field surveying techniques or copying existing or captured products. ERP assumed the "supervision and maintenance" of the War Department Map Collection in April 1939.

Army Map Service / U.S. Army Topographic Command

With the advent of the Second World War aviation, field surveys began giving way to photogrammetry, photo interpretation and geodesy. Out of this emerged Army Map Service (AMS), which absorbed ERP in May 1942. AMS was designated as an engineer field activity, combining also many of the Army's remaining geographic intelligence organizations and the Engineer Technical Intelligence Division. AMS was redesignated the U.S. Army Topographic Command (USATC) on September, 1, 1968, and continued as an independent organization until 1972, when it was merged into the new Defense Mapping Agency (DMA) and redesignated as the DMA Topographic Center (DMATC) (see below).

Aeronautical Chart Plant

After the war, as airplane capacity and range improved, the need for charts grew. The Army Air Corps established its Map Unit. The unit was renamed Aeronautical Chart Plant (ACP) in 1943 and located in St. Louis, Missouri. Later, ACP became known as the U.S. Air Force Aeronautical Chart and Information Center (ACIC). (See DMAAC below).

Defense Mapping Agency

In 1972, the Defense Mapping Agency (DMA) was created to consolidate all U.S. military mapping activities. Headquartered initially at the U.S. Naval Observatory in Washington, D.C. and later in Falls Church, Virginia, DMA's civilian operations were concentrated in Bethesda, Maryland; Northern Virginia; and St. Louis, Missouri. The Agency comprised several centers, including:

- DMA Hydrographic Center (DMAHC), which was responsible for creating terrestrial maps of coastal areas worldwide and hydrographic charts;
- DMA Topographic Center (DMATC), which was responsible for creating topographic maps worldwide; and
- DMA Aerospace Center (DMAAC), which originated with the U.S. Air Force's Aeronautical Chart and Information Center (ACIC).

National Photographic Interpretation Center

The National Photographic Interpretation Center (NPIC) was created in January 1961 by President Dwight D. Eisenhower, shortly before leaving office. NPIC was a component of the CIA's Directorate of Science and Technology (DDS&T) and its primary function was imagery analysis. The Center played an important role in the Cuban Missile Crisis, by analyzing images from U-2 overflights captured on film and sent to Earth in canisters ejected by orbiting Corona satellites. The images, which showed Soviet missiles on Cuban soil, were presented by Adlai Stevenson to the United Nations Security Council in October 1962

National Imagery and Mapping Agency

The National Imagery and Mapping Agency (NIMA) was established in 1996, by the National Defense Authorization Act for Fiscal Year 1997. The creation of NIMA centralized responsibility for imagery and mapping in support of defense activities and intelligence production, principally in support of national policy makers.

National Geospatial-Intelligence Agency

In 2003, NIMA was renamed National Geospatial-Intelligence Agency (NGA) in order to better reflect its primary mission in the area of GEOINT. As part of its new mission focus on surveillance,

NGA has begun using commercial imagery such as that produced by DigitalGlobe and GeoEye.

Imaging technologies

Before photography was invented, military commanders depended on scouts's eyesight and memory to get an idea of the enemy territory. Photography "froze" tactical information in time, preserving details which enhance the quality of the information.

Ground-based and aerial photographic collection began in World War II, enhancing the ability to access timely and accurate intelligence. This type of information was so valuable that observers in tethered balloons and scout planes were attacked, first with crude weapons and later with machine guns or fighter aircraft.

Film which could detect non-visible wavelengths in the infrared spectrum was invented in the 1930s. One of its first applications was for detecting forgeries in rare art collections.

Radar made its appearance during World War II, primarily in its early warning capability. Radar navigation enhanced by radar scopes on larger surveillance aircraft contributed to enhanced collection of tactical information.

Color film was introduced in the 1960s, but photo interpreters to this day continue to use black and white film because it provides more detail. Strategic collection of data also made its entrance during this time frame, quickly becoming as indispensable as collection of tactical information.

Airborne infrared sensors, which use differences in temperatures between objects, were introduced in the post-Vietnam era and were used to detect targets on the ground. Later developments in transmission technology would enable periodic data dumps and further the evolution of real-time collection.

Synthetic aperture radar was developed in the later part of the Cold War. The concept of an optical camera aperture affecting the image acquisition process would be emulated with radar waves, providing an undisclosed amount of detail. An example is the NASA photo released in the late 1980s and showing a previously hidden African dry riverbed.

In about the same time frame, ultrasound made its appearance, initially in viewing variations in tissue density, which made it possible to detect possible tissue and organ anomalies. Another application was that of detecting material flaws in manufacturing.

The intelligence community and medical researchers were the first to use digital manipulation of monochromatic (black and white) imagery to enhance the acquisition of actionable information. Refinements by the medical profession resulted in the introduction of the CAT Scan and the echo-cardiogram. Magnetic resonance imaging (MRI), which helps detect tissue and blood-flow anomalies, is a more recent development.

Scientists have also explored the possibilities of exploiting multi-spectral imaging (an example is the 1970's LandSat) in agriculture and landscape sensing, and of astronomical gamma-ray imaging.

Imaging applications

Besides the traditional tactical and strategic use by civilian and military intelligence, other entities have made extensive use of imaging technology.

Law enforcement is using imagery in forensic crime scene documentation to determine how crimes were committed.

The United States Border Patrol uses imaging technology to determine transit routes or detect illegal aliens trying to escape into the interior.

Highway departments make use of stereo and terrain analysis techniques to create detailed transportation maps useful for commerce, taxation, city planning, and infrastructure.

The most important applications have, however, been for medical and research purposes, where imagery technology is contributing to an ever greater body of knowledge and treatment options.

The introduction of LandSat in the mid 1970s made possible new applications in the fields of agriculture, geology, mining, and the environment. The raw data coming from LandSat sensors were initially in the grey scale; later, designers would find it necessary to assign colors for each type of return, creating a multicolored map.

In the winter of 2010, we witnessed the power of another application of imaging technology in our everyday lives—meteorological imagery, which since the 1960s has assisted meteorologist to detect and monitor severe weather well in advance of its arrival. Archaeology is another field benefiting enormously from imaging technology.

— facts from Wikipedia