# Modeling, Simulation: The decision-making process
By AFCE Geospatial Integration Office

Since its inception in 1947, the U.S. Air Force and the technology it employs have played an essential role in our nation's defense. In the 21$^{st}$ century, technology continues to deliver revolutionary value as well as new challenges, influencing how the U.S. military adapts and conducts military operations.

Seeing the need to adapt to new times, AFCEC focused its attention on base recovery, adaptive basing, passive defense, and partner nation engagement. These four key areas were the inspiration for a proof-of-concept training exercise called Employment Driven Operational Assessment, or EDOA, that was conducted during the Air Force Installation and Mission Support Center's 2018 Installation and Mission Support Weapons and Tactics Conference.

The I-WEPTAC 2018 event brought together subject matter experts from across the Air Force to drive combat support innovations and a process to quickly turn those ideas into capabilities. The critical topic of adaptive basing was further studied in other proof-of-concept exercises. During this conference, members from the Headquarters Air Force's Studies, Analysis, and Assessments Directorate explored the adaptive basing concept in more detail to identify current Air Force capabilities, force projection and sustainment gaps.

As part of the exercise, Scott Ensign, the Air Force GeoBase Program Manager, leveraged his 30+ years of geospatial engineering and military experience, and shared his vast knowledge of expeditionary site selection and beddown operations. While the exercise provided excellent results, the cumbersome and time-consuming manual process exposed the need for a streamlined workflow to expedite the process and provide the ability to record the procedures for later study. Ensign quickly offered a geospatial-enabled solution to use Air Force GeoBase capabilities to achieve these objectives.

## Location matters

The GeoBase program provides combat support geospatial engineering services for the enterprise and its missions, enabling shared situational awareness for all Airmen and Guardians, and their organizations worldwide. Air Force GeoBase's unique geospatial engineering insight easily communicates differences, consistencies or patterns across the operational environment. The geospatial data that GeoBase creates produces other variables, highlighting certain trends and potential correlations. As technology continues to evolve at a rapid pace and new tools become available, Airmen and Guardians can tap into these resources and provide mission-specific analysis, such as modeling and simulation scenarios. GeoBase employs an enterprise Geographic Information System, or GIS, for capturing, storing and displaying authoritative installations built and natural infrastructure geospatial data.

Today, GeoBase collects and generates geospatial data from Air Force installations and geographically separated units, or GSUs, into the Air Force Geospatial Enterprise database. This data is accessible and can be integrated and manipulated by a geospatial analyst to describe and provide the context of roads, buildings, utilities' infrastructures and other geographic features, as well as their potential impact on military operations. One of the biggest advantages of using these technologies and processes is the ability to create and display spatial relationships between features. Once the desired data is combined, geospatial analysts can then produce custom data layers or maps to aid organizations in the decision-making process.

## Modeling the Future

After multiple Employment Driven Operational Assessment analyses in 2019, Headquarters Air Force partnered with the AFCEC Geospatial Integration Office to expand modeling and simulation efforts to better understand and paint a clearer picture of some capabilities in Air Force operations. Layering geospatial data generates information about the effects of a simulated attack on a single capability as well as the effects of the attack on the combined capabilities. The results of these analyses provide evidence that enables the AFCEC Geospatial Integration Office to fulfill quantitative and qualitative assessments, modeling, and simulations.

*Figure 1 – Geographic features displayed as layers*

"The geospatial data provided by GeoBase is at the start of every logistics and campaign study we do," said Lawrence C. Parthum, Headquarters Air Force Air Campaign Analysis Division Deputy Branch Chief. "Sometimes we can re-use the results without starting over. It is at the very core of our starting point for logistic and campaign analysis or assessments."

Data processing and data manipulation is accomplished by using a similar approach. Vector data is saved in a geospatial database that acts as the main hub. Data outputs from other software are brought into the EDOA geospatial application and processed to view the results of a simulated event. The AFCEC GIO integrates outputs from geospatial applications such as the Geospatial Expeditionary Planning Tool, known as GeoExPT, and other geospatial engineering applications to create laydown plans that support mission planners and engineers alike.
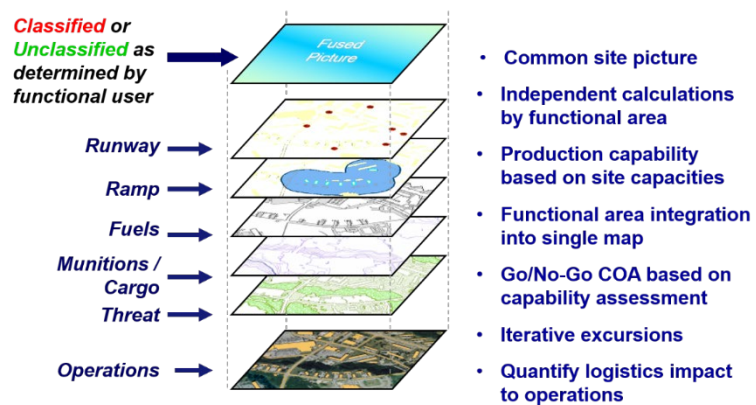
After a successful run, each custom geospatial layer generates data and information about the effects, with each run testing concepts, tactics, techniques, and procedures; and innovations to improve operational capabilities. The combined efforts of geospatial capabilities were vital in the development of this critical capability. The information derived is crucial to provide insights that help Air Force leaders with their investment and divestiture decision-making.

As we venture into the future, geospatial capabilities will continue to be used more and more within our daily lives. For example, in its simplest form, many people already use geospatial information to find a restaurant or plan a route while traveling.

For the Air Force and Department of Defense, the AFCEC Geospatial Integration Office will continue to use, and build upon, geospatial data and capabilities for analyzing complex spatial data for decision making and to support the Air Force mission.

(Editor's note: This article was authored by Anthony Dronkers (HAF/A9IC), Julio Toala (GeoBase Operations Manager), and Juan Morteo (AFCEC GIO Support Contractor)