



PICTURING

Rafale carrying
a SCALP cruise
missile

SPOT 5 scene,
resolution 2.5 m

“Advances in weapons technology, increasingly complex missions and the need to control collateral damage have put geodata at the heart of modern defence systems.” That’s the verdict of the French White Paper on defence, making it clear that geodata are today a key requirement for all kinds of military action. *“Ten years ago, only a handful of weapon systems used geodata. Today, not a single one is without this capability,”* the paper underlines. Modern precision-strike systems rely heavily on highly accurate geospatial data, and finding new, effective ways to generate these data is a strategic challenge.

A precise picture of the target

It would be a mistake to think that data freely available on the Internet are good enough for this purpose. Lieutenant-Colonel Thierry David, programme officer at BGHOM¹, the French Joint Staff’s geographic, hydrographic, oceanographic and meteorological survey, explains: *“Google Earth now covers the entire globe, but the data are only accurate to 100 metres. A cruise missile that misses its target by 100 metres could spell disaster.”*

EGI², the joint forces geographical office, centralizes and disseminates digital geodata, notably those produced for the French DNG3D defence programme, originally designed to support the SCALP cruise missile. SCALP needs a precise picture of the terrain below and of its target to navigate effectively. This is provided by a digital elevation model (DEM) and a three-dimensional representation of the target.

¹ Bureau Géographie Hydrographie Océanographie Météorologie

² Etablissement Géographique Interarmées



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terrain with precision

EVER-MORE-SOPHISTICATED AIRCRAFT AND WEAPONS SYSTEMS NEED ACCURATE DIGITAL DATA TO PERFORM EFFECTIVELY.

DEMs are vital in new weapon systems that require an extremely reliable 3D picture of terrain. They are derived from data acquired by a dedicated instrument on the SPOT 5 civil satellite. “For the Geobase programme, we task the instrument to acquire imagery of areas of interest and we then generate DEMs,” explains Thierry David. “Our aim is to obtain a very-high-quality model of the terrain.” For SCALP to be able to identify a target, it needs to know what it looks like. Thierry David continues: “Once it reaches its target, the missile compares the image in its database with what it actually sees. So generating this picture is a crucial step.” This involves producing a highly accurate 3D image of the target and its geospatial environment. Data are acquired and formatted by a dedicated tool called APM3D capable of generating 2D and 3D digital models. These DEMs are also used by the AASM IR infrared-guided modular air-to-ground weapon. Like SCALP, when AASM IR reaches a target, its sensor takes a picture and matches it against a database stored in memory. Since the missile strikes vertically, a 2D model is sufficient.

Precision of relief is all

Geobase is the other key French programme for cruise missiles and low-altitude missions flown by the Rafale. Generated from SPOT 5 data, Geobase products—their commercial equivalents are sold under the name Reference3D—offer the ability to characterize relief with extreme precision. “Geobase represents the highest quality obtainable from satellite imagery,” says Thierry David. The programme has built up a large repository of imagery from which coordinates can be extracted to guide modern missiles and bombs. When the pilot is ready to fire the AASM missile, he must first enter the target coordinates in the system. The weapon will then home in on this point, with an accuracy of 10 metres. “It’s important to have precise coordinates so as not to add an extra degree of approximation,” stresses Thierry David.





EGI

EGI, the joint forces geographical office, has a staff of 120 people operating at Creil air base. It handles and disseminates land and air-land geospatial information in digital and print form, from both national and international sources.

- ▶ These high-accuracy data are also used for the future hybrid laser/GPS-guided weapon that will provide enhanced capability for combat aircraft in poor weather. This system trains a laser beam on the target to guide the bomb. However, if the laser is unable to illuminate the target due to cloud cover, the GPS guidance system takes over immediately and follows the coordinates provided by the aircraft. The Rafale also employs digital elevation data under the Geobase contract, giving it a terrain-following capability.



TLE: Target Location Error, indicates the horizontal accuracy of coordinates in the viewed area.

Joint international map production

"When we're in France, we know that maps will be available," explains Thierry David. "But in Afghanistan or certain African nations, maps are completely lacking and we have to produce them." Covering areas of military interest is a major task and this store of maps has to be updated regularly. "No nation can map the entire globe alone," he says. "That's why France is part of the Multinational Geospatial Co-production Program (MGCP)." The 28 nations taking part in this programme are looking to share maps in order to cut costs. The cost of mapping 20% of the globe's land surfaces is estimated at \$2.5 billion. Through MGCP, each participating country has committed to produce maps of certain regions and to check maps compiled by other countries. France is compiling maps of certain military areas of interest, which have proved useful in particular for EU operations in Chad and the Central African Republic. The French programme supporting this international co-production effort is called Topobase. Some of the work is being performed by industry. Production of digital geodata for the military has to keep pace with evolving weapons technologies and assure their continued support. "Operations in the future won't be anything like they are today. The White Paper sets out performance objectives in terms of upgrades, coverage and precision," says Thierry David. EGI is currently working on Geode 4D, a programme that intends to produce oceanography, hydrography, meteorology and other geophysical environment data that could be accessible to all military users and possibly even government users. ■

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