Open Data Sources in Support of Engineer Reconnaissance

By Staff Sergeant Richard B. King

As brigades and below compete for dwindling engineer capabilities, open-source geospatial data can be leveraged to supplement traditional technical analysis methods in support of engineer reconnaissance missions.

In early 2024, the U.S. Army announced its proposal for restructured divisions to meet the challenge of large-scale combat operations. One of the most immediate and publicized effects of this force design update was a consolidation and net reduction of engineer assets, repurposed to support increasingly higher echelons. Previous contributors to Engineer have concurrently noted that engineer reconnaissance will play a critical role in the future battlespace.[1] Army Techniques Publication (ATP) 3-34.81, *Engineer Reconnaissance*, provides a prescient observation of the second order effect, stating, "The engineer contribution to operational success is highly desired by the commander. Demands for engineer reconnaissance support will often exceed capabilities. These capabilities are spread thin, and they compete with the commander's needs for other engineer applications."[2]

Current engineer reconnaissance doctrine acknowledges the role of geospatial engineers in supporting technical analyses of infrastructure and the physical environment. To that end, open-source geospatial data that is normally used to create broad-spectrum mission analysis products can be leveraged to provide commanders and other engineers with a baseline level of awareness. This enables the development of collection requirements for environmental and site-specific reconnaissance, which, in turn, allows divisions to more effectively prioritize limited capabilities.

This article provides an overview of areas in which open-source geospatial data can be used to support engineer reconnaissance efforts, both with and without the assistance of geospatial engineer teams. Some of the data repositories (where noted) are accessible only by using a common access card; while not truly "open" in the literal sense, these repositories are, nonetheless, available to all Soldiers who request their use at the unclassified level.

Lines of Communication

OpenStreetMap© data can serve as a starting point for building situational awareness of road and rail networks in areas of operation. OpenStreetMap is a fusion of worldwide transport data derived from surveys, aerial and satellite imagery, and other open-source geospatial data. Users can view the width, number of lanes, and surface characteristics of roads or track the gauge and electrification status for railways without the need for additional processing through a web-based map interface.

OpenStreetMap data also feeds into a National Geospatial-Intelligence Agency online platform (currently known as the Open Mapping Enclave) that allows any user to update route data and status, improving the baseline for every unit. A newer platform, now under development, will most likely be given a different name going forward.

Airfields and Seaports

The National Geospatial-Intelligence Agency maintains two separate databases containing basic engineering characteristics of airfields and seaports. The Aeronautical Content Exploitation System, a map-based website, allows users to view the location, maximum runway length, and maximum runway width of any airfield on record, which allows engineers to make an initial assessment of the capability of an airfield to support different airframes. The World Port Index, available both as a map-based website and a physical publication, contains information on maximum ship size, entry restrictions, and availability of support facilities (such as cranes and cargo holding areas) at seaports.

Soil Classification

Despite a wide range of applications in support of engineer reconnaissance, open-source data on soil characteristics is not always easily accessible. The most readily available global databases, SoilGrids©[3] and the Harmonized World Soil Database©,[4] categorize soil according to the World Reference Base (WRB)—a system that differs from the Unified Soil Classification System (USCS) favored by Army doctrine. While these databases can still be useful starting points for engineer assessments, WRB-based soil datasets require that users research the composition of each category to extract any information of value. On the other hand, the Visual Navigation dataset, produced by the National Geospatial-Intelligence Agency, is classified using USCS but requires

common access card access. Furthermore, unlike the other data sources mentioned, the Visual Navigation dataset is not easily visualized and requires geospatial engineer support for full display. The choice of which soil classification dataset to use will, therefore, depend on the time and personnel available.

Limitations

The use of open-source geospatial data to support engineer reconnaissance may create additional challenges. The open sources may present the data just as it was collected, without any of the edits necessary for clarity, thereby requiring further analysis before use. The sources may not be well known outside a specific field of study; uncovering those mentioned in this article required a dedicated search or the author's prior knowledge. Web interfaces for viewing the data available are not always intuitive, even for the geospatial engineers whose job it is to process such information for use by staff. Users should allocate time to familiarize themselves with the data sources well before their unit prepares to deploy or consult with their brigade geospatial team to mitigate these limitations.

Any open-source database is a continuously evolving product that is unlikely complete in every aspect. Open-source databases should be viewed as supplements to traditional methods of technical analysis—never as substitutes.

Conclusion

Open-source geospatial data can be a significant time saver when used to support engineer reconnaissance. Much of the hard work on the technical analysis of infrastructure and the physical environment has already been done worldwide. With the assistance of geospatial engineers, it can be leveraged for the benefit of the Army at a time when the demand for engineer capabilities is expected to keep growing.

Endnote:

[1]Nicholas W. Hill and Tabb D. Patrick, "The Future Role of Engineer Reconnaissance in Large-Scale Combat Operations," *Engineer*, 2024 Annual Issue.

[2]ATP 3-34.81, *Engineer Reconnaissance*, 1 March 2016.

[3]Soil Grids, <https://soilgrids.org/>, accessed on 7 January 2025.

[4]"Harmonized World Soils Database Version 2.0," *GAEZ Data Portal*, <https://gaez.fao.org/pages/hwsd>, accessed on 7 January 2025.

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