In 2008, Earth Imaging Journal asked its Editorial Advisory Board (EAB) members to analyze the remote sensing industry’s strengths, weaknesses, opportunities and threats (SWOT). At the time, big players such as Google and Microsoft were entering the market. The high-resolution imagery market was evolving rapidly, driving numerous geotechnology market segments and often complementing sales of data acquired from aerial platforms. Moreover, innovative sensor technologies in space and aerial systems continued to offer enhanced information capabilities. Considering the fast-paced changes that have occurred during the last five years, we asked our EAB for another SWOT analysis to provide a unique look at the current state of the industry.

**Jack Cothren**
Director, Center for Advanced Spatial Technologies, University of Arkansas

**John Delay**
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What does the remote sensing industry do particularly well? What are some of the advantages the aerial side of the industry has over the satellite side of the industry and vice versa?

**Cothren:** If we specifically focus on the changes since 2008, it’s clear that in addition to the obvious advantages of superior resolution, the aerial side of the industry has two primary advantages: the availability of light detection and ranging (LiDAR) technology and high-quality oblique images. With the addition of a variety of new sensors and platforms, the satellite side of the industry continues to improve in terms of revisit time, spatial resolution and spectral range, but there’s no practical satellite alternative to either aircraft-based LiDAR or oblique imagery. In contrast, the satellite industry obviously has the ability in many circumstances to quickly respond to events across the globe and obtain data in areas that may be difficult to enter.

**Delay:** The satellite photogrammetric capabilities of remote sensing are very mature. Over time the industry has learned how to build many products from imagery data that are used widely within our intelligence community.

While the government has invested in commercial providers, the industry as a whole has been investing in new technologies that complement existing capabilities. The rapid increase in motion imagery sources like full-motion video and persistent surveillance, as well as LiDAR and hyperspectral sensors, will increase the value of today’s robust capabilities coming from both commercial and Department of Defense (DOD) providers.

Key differences among these new sensor classes offer capabilities that complement traditional satellite imagery. In particular, airborne sensors add a real-time aspect to imagery collection, bringing a much different temporal relevance to imagery data when combined with traditional imagery.
As the government continues to invest in rapid-response capabilities, we should see an increase in the number of new intelligence products that can be produced by combining traditional satellite imagery with other imagery data types. As we look to the future, the industry needs to do a better job of educating analysts and the community at large of the advantages and disadvantages that multi-intelligence remote sensing systems can bring to the intelligence community.

Hornsby: The Earth observation industry has continued to evolve, innovate and grow. Several key strengths that have developed in recent years include increased reliability, revisit, redundancy and imaging capability. This has been achieved through the development of optical and radar satellite constellations, along with global infrastructure improvements that enable rapid data collection and dissemination from most parts of the world.

John: The industry is highly competent in adhering to standards and developing rigorous models and algorithms to ingest imagery data and develop high-quality, highly accurate and valid products. In the United States and many other countries, government contracts are mainstays for a large number of aerial providers. In the United States, satellite imagery has been certified as meeting the requirements of programs such as the National Agriculture Imagery Program (NAIP), but it remains to be seen whether the collection deadlines can be met. Aerial imagery is viewed as more timely than satellite imagery, because aerial firms can quickly mobilize when the weather is good. This will continue to be an advantage for aerial firms.

Aerial companies are developing sensors and systems with rapid product and sometimes on-demand delivery capabilities, which continue to help them maintain their current market share. They’re delivering high-accuracy orthoimage maps within hours—even minutes—of a mission, with positional accuracy measured in centimeters. Such imagery can be integrated with different multispectral sensors and LiDAR technology. Advanced aerial sensors like these will continue to open new markets for aerial imagery use, even with the advancing technology of high-resolution commercial satellite imagery.

Satellite imagery providers still have the international advantage of seeing the entire planet daily. When difficult-to-image locations on Earth are clear, they can image much faster than an aerial asset can be mobilized. Currently there’s
a big difference between resolution and accuracy among aerial and satellite data collections. Airplanes collect with direct georeferencing while satellites require ground control points (GCPs). For high-accuracy mapping, aerial imagery providers may still have an advantage over satellite imagery providers once you add in the GCP cost.

**Philp:** The remote sensing industry, a technology-intensive industry by definition, does well in driving the science and technology of developing, deploying and using increasingly sophisticated sensor systems that produce a staggering array of valuable data products. The recent explosion in airborne LiDAR products is a good example. Today’s airborne-based systems can provide increasingly high-resolution imagery products for smaller areas—especially valuable for asset mapping and infrastructure management. In addition, cloud-penetrating airborne systems continue to provide an advantage in terms of the cloud-cover problem.

**Raber:** One thing you can always count on in our rapidly progressing remote sensing profession is that change is constantly occurring and is almost inevitable. Although change can be considered a challenging aspect with continuous investments in technology, training and workflow development, I believe that change is a positive for the profession because it plays a major role in retaining bright employees, attracting young and new talent to our field, providing exciting careers, and ultimately allowing “curious minds” to create innovative solutions and technologies that solve real-world challenges.

Let’s face it: Remote sensing and geospatial jobs are really cool. Just look at the eyes of a nontechnical person when you tell them what you do for a living. A visible result of our ability to adapt and change has created a sustainable profession that continues to be mentioned in the Department of Labor statistics as a growing and desirable profession. Most of us have relatively high-paying, high-tech jobs that typically provide high personal value to practitioners. In the future, these are the types of satisfying careers the U.S. economy must continue to produce and maintain as the information society and knowledge-based economy evolves. Embracing and leveraging change also lies at the source of personal and professional growth in our community.

Another significant strength of our profession is all the people who dedicate their careers to serve society and offer their “make-a-difference” attitude. There are countless professionals making a positive impact using their knowledge and technology to yield quality-of-life-changing results. Making the world a better, safer, more efficient, cleaner and healthier place, remote sensing practitioners use their spatial acumen to do great things for others in their daily careers or on a volunteer basis through various outreach programs. One example of this is GISCorps, which is sponsored by the Urban and Regional Information Systems Association. GISCorps’ mission is to coordinate short-term, volunteer-based geographic information system (GIS) services to underprivileged communities and respond in emergency situations.

**Stojic:** In its most fundamental form, imagery serves as a treasure chest that allows us to reveal information about Earth at any given time. Essentially, our industry provides the data and tools that record and track changes to our planet.

The information derived from the data can help predict future changes, shape policies and laws, and provide insight to make smarter decisions.

Aerial imagery allows us to be more agile when it comes to understanding change, providing data to an ecosystem of organizations that needs data quickly. Because the data come from airborne devices, which can be configured to support various mapping needs via aircraft and unmanned aircraft systems (UASs), it’s easier to get diverse, high-resolution content—ranging from optical, radar, hyperspectral and LiDAR data—in one payload.

Satellite imagery provides content across broad regions as well as the ability to revisit areas frequently for change-detection purposes. In addition, satellite imagery brings great spectral depth to a pixel, which allows organizations to dive deeper in terms of analytics.