Aerial Alchemy
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/ˈerēəl/ - /ˈalkəmē/

adjective

1. existing, happening, or operating in the air: “an aerial battle”

2. a seemingly magical process of combining possibility thinking with flying machines to collect aerial data resulting in profitable conclusions.

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Digital Inspection and Asset Management for Utilities

The use of Unmanned Aircraft Systems (UAS) for industrial Inspection has grown significantly over the last few years and continues to be a catalyst for data-driven workflows. New systems, applications, sensors, and techniques make UAS operations an important tool in the utilities industry.

Most of the 3,500 substations in California are not yet in a digital format, and this has pushed the demand for 3D as-built models. Aerial Alchemy has developed technologies and techniques that allow us to combine data from existing sources with new scan data to build accurate reality models. This provides the basis for later stages and becomes a “single trusted source of truth.” Aerial Alchemy seeks to work with select clients to continue to improve the data collection process to create additional value by making the data more actionable.

We propose doing this by co-developing a digital workflow with you, a framework that is continually maintained from the initial stages of ideation through the deployment of the “digital-twin.” This effort will incorporate digital technologies that add value to operations management and the collected data including:

• Data required to populate operational software systems (maintenance, reliability, inspection systems, etc.)

• Data and documents required for specific work processes (operational readiness, lock-out/tag-out, leak detection and repair, inspection, design etc.)

• Data and documents required for process safety management compliance

The technologies we will be exploring are:

• Object-based integration through APIs where tags automatically flow between design disciplines based on design maturity rules

• Airborne drones to monitor progress and plans

• Artificial intelligence to optimize, standardize, and ensure the integrity of design across areas within a facility and across projects

• A system with cross-platform mobile apps and cross-application orchestration, enabling greater access to the digital twin, capture information and respond to work processes in the field

The challenge for project information management is not purely technical, therefore any solution must be accompanied by changes to the overall workflow. Aerial Alchemy has created a unified approach that defines the relationship between different views of the project information. Our open and extensible approach integrates data between different disciplines in a single management platform. The consolidated view improves maintenance, inspection, and operation processes while boosting compliance and safety.
Aerial Alchemy has developed a flexible, efficient and accurate service methodology, enabling companies to collaborate both internally and across their value chains in ways that can provide a step change in productivity as well as design and maintenance. By providing a more agile and responsive development environment, we address long-standing challenges associated with complexity, uncertainty, and rapid change.

By creating an environment that is open and extensible, our data-centric framework VerticalScan™, integrates data between different disciplines into a comprehensive management platform that spans deployment, data collection, processing, analysis and report generation. This consolidated view of the entire process empowers management by improving the way work is performed as part of the maintenance, inspection, and operation processes. The result is a simplified, integrated framework for standardized processes that includes real-time analytics, improved decision-making, reduced project costs and more realistic schedules.

This framework enables managers, operators, and service providers to communicate their area of responsibility more effectively. Automated and manual annotation of issues is tracked in all phases of the workflow. All activities are coordinated so they can take the appropriate actions based on real-time situational awareness. Managers and Executives can make better informed decisions about the company’s assets while improving overall safety.

In addition to the safety benefits of Aerial Alchemy’s enhanced inspection process, our open framework offers managers valuable insights remotely and at geographical scale, providing an overall improvement in operating costs.
We solve data collection problems critical to measuring, safeguarding, and improving the fundamental elements - food, water, and environment - to meet human needs.

Aerial Alchemy develops purpose-built UAVs capable of capturing the data needed to create an accurate digital representation of analog assets. This digital representation helps engineers predict the problems in advance by providing early warnings to mitigate risk, prevent downtime, develop new opportunities and reduce the cost of future projects.

The digital transformation of projects is not new. What is new is the convergence of digital technologies such as artificial intelligence (AI), remote sensing, big data, etc., that have been successfully applied in other industries such as automotive, aerospace, and entertainment.

The founders of Aerial Alchemy were an important part of the transition from analog to digital in the entertainment industry, earning five Academy Awards for technical achievement. This background has helped us to create the managed data pathway that bridges the gap between the needs of the utility industry and what is technically possible.

Aerial Alchemy’s strategy for working with you is designed to foster a shared vision to achieve focused results. We are passionate about innovating and transforming the way that remote data is collected and processed to solve large-scale infrastructure issues. We combine science and technology with imagination to provide a solution to critical problems by working with you in seven key areas.
HOW WE DO IT

It all begins with identifying the data you need based on the issue you’re trying to solve. This discovery phase ensures a purpose-built solution that combines the appropriate remote sensing technologies, platforms, and mission planning to deliver results at a more granular detail than conventional inspection methods. We identify issues like:

- Cracked insulators
- Corrosion
- Vegetation
- Structural issues
- Missing, damaged or improperly installed hardware

There are many long-standing challenges associated with large projects, including complexity, flexibility, and understanding. Working with PG&E on the enhanced wildfire inspection project, Aerial Alchemy recognized the need to develop a framework that managed dynamic variables in an uncertain and rapidly changing environment.

The fundamental question that must be answered before any proactive or prescriptive measures can be implemented is this: What to do with the data after it’s collected? Deceptive in its simplicity, this question often proves difficult to answer accurately. To answer this question, we created the Alchemy Framework, seven steps that are the catalysts to improve processes and outcomes at every level.
The digital conversion from the as-built model to the digital twin is incrementally built up from information submitted from contractors, legacy data, and real-time data as the project evolves. Complex relationships define the digital twin configuration, including those between design intent, supplier models, physical equipment and asset breakdown by geography need to be defined. One of the goals of our collaboration is to develop a tool for the continuous extraction of environmental information, the integration of this information with previous knowledge to form a coherent picture, and the use of that picture in directing future perception. A real-time digital-twin is in reference to a management dashboard, which provides an overview of the process status.

How logistics are managed depends in large part on how the requirements are defined. Aerial Alchemy would like to work with you to develop a scope of work that includes project plans with milestones and detailed schedules to monitor and track progress.

Logistics are more about workers than technology. VerticalScan™ uses technology to simplify how workers access the required information they need to do their job timely and effectively, but we can also work with you to implement a complete training and on-boarding program.

Whether Aerial Alchemy is providing teams in the field or training workers, our strategy assures that no matter who does the work it is performed as part of your Maintenance, Inspection, and Operation processes while boosting compliance and safety.
There is no "one-size-fits-all" solution or single right answer for supporting your geo-spatial inspection and repair requirements. With a common methodology for collecting data with manned aircraft, from the ground and using a drone, our Alchemy framework is more scalable and effective than using only drones.

Manually developing as-built models on such a large scale is tedious, complicated and limited in scope. With so many potential ways to collect data, the software platform to support this must be open and extensible to keep pace with the evolving sensing capabilities to support a variety of photogrammetry, terrain editing, and remote sensing tools.

**VerticalScan™** platform manages terabytes of data, including constantly updated aerial photography, satellite imagery, LiDAR data, and vector data, locally and securely.

To address the storage of this data, **VerticalScan™** has a middleware asset management layer with a well-documented API. With this system all of your data is stored and accessible in one distributed system. Capabilities include performing spatial and metadata searches, and delivering the data both through streaming and clip, zip, ship mechanisms. Data access is managed through role-based permissions.
A heuristic approach in the Alchemy framework is through automated transformation of data. It is considered to be a part of the decision-making process which consists of reformatting and normalizing RAW images for sharpness, exposure and creating a composite overview. This allows the operator to zoom into extreme region of interest, in order to view and analyze closely. Automated capture is quick, simple, and efficient. This facilitates human processing through image priority and data sorting while providing a common user interface. Our API also comes into play through added functionality and third-party algorithms.

Aerial Alchemy will deliver accurate 3D model as well as the underlying 2D photographs. The 3D models can be used for engineering measurement and design. The individual high-resolution photographs are useful for inspection or other detail-oriented work. These two sources will enable work to be completed without the need for expensive and time-consuming site visits. Also, additional capabilities can be added to meet specific application requirements.
Aerial Alchemy utilizes a management dashboard that provides an overview of the project. Ease of use lowers training costs, enabling both experts and non-experts to easily handle the data and expedite administrative responsibilities such as maintenance, easement documentation, dispatching teams, onboarding, and certification management. Non-GIS users have access to intuitive GIS-function tools to perform area, range, and distance queries.

This useful tool provides the ability to track the completion status, work in progress, vehicles, crews, data runners, and team efficiency. It enables the user to visualize the spatial dependencies of all assets in a map display and combine it with a maintenance management system to create a central system to manage all infrastructure data.

As part of our Alchemy Framework, we track our overall progress to compare our achievement versus goals. This leads to further analysis and overview relative to completion rate versus schedule, cost tracking, budgeting and the improvements we make along the way.

Aerial Alchemy is constantly preparing for future projects by developing various strategies along the way. This leads to cost reduction while better managing risks. As a result, we conclude all of our projects with an analysis of the results focused on process improvement for future projects.
Next Steps:

The transition from analog to digital workflows in the utilities industry is being driven by life-altering natural disasters, untimely shutdowns, and deteriorating assets. Organizations are being pushed to fundamentally change the way that they create, capture, and maintain information. However, for this digital transformation to succeed, a thorough understanding of the requirements is needed.

Aerial Alchemy can assist this transition by working with you to clearly define the requirements and also how to manage the transition. Our seven-step process provides a framework to improve outcomes at every level, from operators in the field through upper management.

We can help you examine the requirements, weigh the pros and cons, and determine the best business model for your organization. We can assist whether you decide to develop internal capabilities, outsource the work to a third-party vendor, or implement a hybrid approach with both internal and external resources.
Working with two of California’s top 6 utilities, Aerial Alchemy has already developed and operated a comprehensive end-to-end purpose-built data solution. Aerial Alchemy will work with you to guide the development of service implementation plans, which will provide a roadmap for achieving your goals while empowering management to improve maintenance, inspection, and operation processes.

Aerial Alchemy’s products, services and solutions are proudly Made in America. Our process is a combination of secure technology from platform design to data delivery, positioning us as a clear alternative to the cyber-security threat posed by offshore technology.

• Hardware/Software Platform – Designed and built in the United States

• Data Capture and Digitization – Secure command and control link, telemetry and data downlink

• Data storage, processing, analysis and distribution – Policy enforcement processing from start to finish