



BUILDING A MINING DRONE PROGRAM

DJI's step-by-step guide to successfully
build a drone program for your mining
operations

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INTRODUCTION

Mining has traditionally been known as one of the most dangerous professions in the world. But rapid breakthroughs in robotics and automation in the last few decades have ensured that fewer and fewer people are put into harm's way in a mining environment. So, it is only logical that the mining industry openly embraces new technologies when it comes to improving safety, increasing productivity, and reducing downtime.

And among all the new mine-site technologies that companies big and small are exploring these days, it is drones that are witnessing the highest rate of adoption.

According to [recent research](#) by market intelligence firm GlobalData, while 44 percent of mines had invested in drones to some extent in 2018, that share had risen to 64 percent by the end of 2020. And those who were yet to invest in the technology, expected to do so in the coming two years.

This is precisely why you're also here, reading this playbook. You know the writing is on the wall: Investment in drones is not expensive, especially when you consider the payback in terms of operational risk reduction, cost savings, faster decision-making, and improved efficiencies in a post-COVID world.

So, whether you've realized the benefits of using drones from your own experience or heard about the value the technology has brought to your competitors, this guidebook will help you take the next step: building your own, in-house drone program and realizing your drone ambitions.

This eBook offers an overview of the different types of results that drones can deliver for mining professionals, the common challenges that mining firms face while building a drone program and how to overcome them, the leading drone solutions available in the market, budgeting and cost considerations, training and maintenance requirements, the ROI realized by early adopters, and the steps your organization can take to harness the incredible potential of drone technology.

THE ROLE OF DRONES IN MINING



THE ROLE OF DRONES IN MINING

Commercial drones are transforming workflows at mining sites in more ways than one. Drones bring much-needed consistency and accessibility to an otherwise erratic workflow, giving mining sites the stepping stones they crave to eradicate information silos and conquer age-old data collection challenges.

Leading resources company, BHP, for example, regularly conducts drone operations at its portfolio of tier one assets for the following applications:



Automated surveying and mapping:

Surveying and mapping mine sites is typically a time-consuming process. But by using drones, instead of low-flying planes or terrestrial based survey equipment, BHP has the flexibility to conduct unlimited aerial data capture and not rely on third-party flight schedules.



Quantifying and monitoring stockpiles:

Accurate knowledge of stockpile volumes is vital information that is used in predicting profits, auditing results, and governing decisions about whether to extract more material to fill orders. Drones allow BHP to measure the inventory safely, more often, more accurately and at about half the cost of traditional ground-based volumetrics.



Berm and haul road safety analysis:

With regular visual assessment of the state of berms and haul roads, BHP mine managers rely on the data captured by drones to ensure the height of berms are built correctly and will stop a truck from breaching the bund and falling into the pit. The data captured by drones also ensures that haul roads have safe grades and super elevation angles on corners.



Asset integrity inspection:

Drones also provide the BHP maintenance team with a continuous stream of aerial inspection data on the status and condition of mining assets and infrastructure. This includes everything from the powerlines, pipelines, and structures such as washplants, crushers and conveyors to radio towers and earth moving equipment, ensuring that crews do not have to work at height. Another hazardous inspection task occurs inside confined spaces, where the buildup of toxic gases can be fatal. Conducting this work with a drone keeps the operator safely out of harm's way whilst the appropriate images can be saved for later review.



Monitoring blast site security:

Since explosives rank as one of the key sources of mining accidents worldwide, BHP records aerial videos of blasts to identify misfires and unsafe work areas after a blast has detonated. Prior to the blast, drones can be used to inspect exclusion zones and assist in ensuring that no personnel remain in the danger area.



Tailings management:

When drones are used to measure tailings dams, it eliminates the need for manual surveying within the proximity of the wall. BHP utilizes aerial data to review the structural integrity of tailings dams and develop appropriate controls to prevent failure.



Streamlining operations:

When your team has been offsite for one week or more, providing them the knowledge of pit hazards and working conditions is vital for personnel safety. BHP uses aerial imagery and videos for the crew handover process, ensuring full transparency and situational awareness. Moreover, drones are utilized to install pump and cable infrastructure over inaccessible walls by establishing guide ropes and allowing access to areas that would have otherwise been impossible or require costly re-routes.



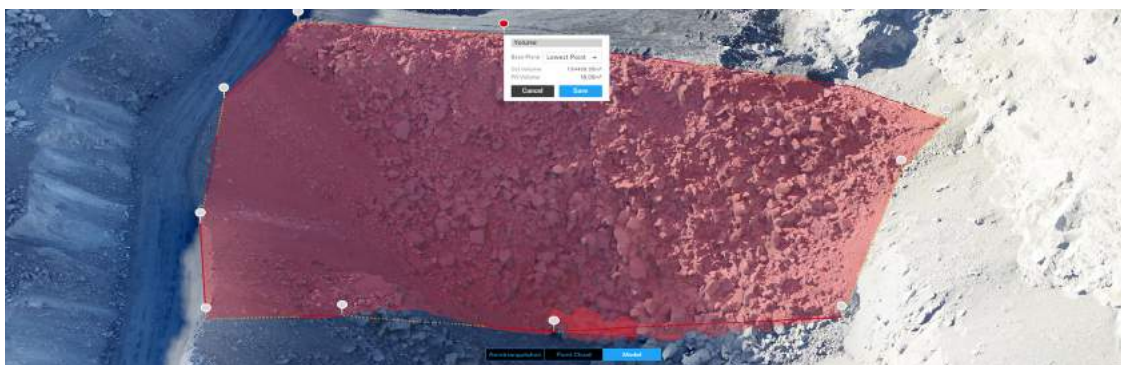
Water sampling:

Mining companies need to conduct monitoring programs to manage the ecology of water bodies with which their operations come in contact. Further, when a mining pit closes and fills with water, law mandates that water also be analyzed at regular intervals. The use of drones for water sampling keeps crews out of potentially high risk situations and also allows sampling to occur in areas where access has been lost.



Vegetation analysis:

To ensure compliance with legislative rehabilitation requirements, BHP creates a 'paper trail' of drone data and maps, documenting environmental assessment and vegetation health analysis.



MAIN BENEFITS DRONES BRING TO MINING OPERATIONS

As is evident from these applications, by virtue of being a less invasive data capture method, the use of drones in mining operations has several advantages.

Improved efficiency

With the help of drones, surveyors not only get more information but they get more precise information at more frequent intervals. By some estimates, flying a drone to survey a mine site is up to [10x faster](#) than using traditional ground-based methods. Further, the highly accurate volumetric measurements (up to 3cm) that drones deliver allow for better valuation of stockpiles, as compared to conventional surveying methods. On-demand aerial surveying data also enables more efficient design and management of site operations.

Time savings

Drones deliver tremendous time savings in mining operations. For example, the use of drones by mining giant Vale for geotechnical field surveys at its Sossego Mine in Pará, Brazil has [cut down](#) the process time from 3 hours to 20 minutes.

Similarly, a bi-annual survey of Nelson Aggregate's six quarry sites used to take about 240 person-hours before the company switched to DJI drones. Today, the same job is completed in just [12 hours](#), delivering a savings of 228 person-hours.

Meanwhile, Ferrexpo, a mining company based in central Ukraine, is able to complete stockpile measurements [90 percent faster](#) with DJI drones, as compared to measuring stockpiles with a total station. Moreover, instead of calculating stockpiles only once a quarter, measurements can now be taken as often as once a week or once a day, allowing mine operators to make better business decisions.

Increased workplace safety

The nature of mining operations is such that employees are exposed to multiple hazards daily. In 2020, members of the International Council on Mining and Metals, a global mining trade group, recorded [44 deaths](#). As such, it is eminently desirable to use drones for some of the most laborious and dangerous tasks, and remove human workers from risky processes.

BHP, for example, uses drones to inspect the [flare tips](#) at its onshore US oil processing plants. Since flares form part of the plant's safety and environmental management system, they are required to be operational 100 percent of the time. Visual inspections can normally happen only during a complete plant shut down. But drones allow the inspections to be carried out even while the plants are online.

Cost savings

Cost savings is another big benefit of mining drones. These flying machines not only reduce the expenses associated with mining processes, but they also help companies to improve their bottom line by eliminating downtime. Ferrexpo, for instance, estimates that stopping their machinery for just 30 minutes would cost the company tens of thousands of dollars.

At the same time, by replacing planes with drones to get aerial footage and 3D maps of its sites in Australia, BHP has been able to achieve annual savings of [\\$3.8 million](#) from its sites in Queensland alone. Traditional mapping equipment can cost a lot more than the price of a drone. By replacing this equipment with cheaper drone technology, a surveyor can complete the same task, to a higher standard, from a safer location, with less capital expense.

CHALLENGES IN SETTING UP A MINING DRONE PROGRAM



CHALLENGES IN SETTING UP A MINING DRONE PROGRAM

There can be a lot of unknowns about how to get a drone program up and running on your mining site, beginning with the determination of costs and output requirements to ensuring regulatory compliance. The good part is, rapid strides in drone technologies in the last few years have made operating drones safely and skillfully easier than ever. As such, the key criteria for success now relates more to project management as well as systematic organization and utilization of drone data.



Challenge #1: Defining the Problem Statement

There are many drones available in the market. Not all drones suit all tasks. In fact, some of them may not be suitable for mining environments at all. Therefore, it becomes essential that you first jot down the specific problems you are trying to solve. Think along the lines of:

- We need accurate measurements of material movement and stockpile volumes
- We want to remove our crews from high-risk areas, such as working at heights or exposed edges
- We need more efficient asset integrity inspections
- The mining crew coming back after days off is not familiar with the area. We want to bring them up to speed

Not only will a well-thought-out problem statement back up the decisions of what and why, but it will also provide you with a benchmark for success at the time of project completion.



Challenge #2: Ensuring Regulatory Compliance

It is vital the solutions you plan comply with the relevant regulatory landscape. So, once you know the problem statement, you would want to ensure you are going to operate legally as well as safely (more on that later). Since mines are big, you would typically want to fly higher and further. And, in most countries, this will require prior approval from local authorities.

Drone batteries are classed as dangerous goods for shipment and travel. If you plan on moving your equipment between locations, decide whether you will need to transport it by air. Certain drone batteries are too large to ship via air so you will either need to ensure adequate battery supply at each operating location or select a drone that uses smaller capacity batteries. See DJI's [tips to keep drone batteries healthy and safe](#).

Only once you know the limitations of regulatory approvals, and perhaps also the limitations that have nothing to do with law, can you move on to the next step.



Challenge #3: Determining Data Accuracy and Output Requirements

Drone mapping data will need to be accurate, with all surface unevenness and undulation identified. Drone video information will need to be clear and viewable on large TV screens.

Determining the hard limits on these variables will guide your equipment selection. So, think about:

- Who is going to use the data? What format does it need to be?
- Are there company limitations on bandwidth or file storage?
- Do we know how to check the accuracy of the mapping data?



Challenge #4: Determining the Frequency of Operations

The frequency of drone operations could be governed by the limitations of regulatory approvals, the operating height, and the requirements you have identified while defining the problem statement. This stage of building your mining drone program is closely linked with determining the number of staff that need training, number of drone units desired to ensure coverage, expected maintenance requirements, the amount of batteries needed, and whether infield or office charging is required.



Challenge #5: Budgeting and Management Buy-in

Now that you have a fairly good idea of how frequently you want to fly, using which equipment, and to get what type of deliverables, it's time to get approval and funding from the top to build an in-house drone program.

Mining occurs in remote locations. Moving various personnel and equipment to these locations as and when desired may not be possible. As such, while preparing the budgetary requirements, you must take into account the availability of local support, reliable equipment, adequate inventory of spare parts, and time-efficient repair processes.

Broadly, the one-time implementation costs on the ground will comprise of:

- The mining drone equipment
- Equipment spares
- Operator training
- Regulatory approval
- Post-processing software and hardware

Additionally, you need to factor in ongoing or recurring costs for:

- Repair and maintenance packages
- Licensing fees
- Data backup



Challenge #6: Safeguarding and Preparation for Operations

A drone flight will be safe only when:

- You ensure your people meet all license and experience requirements
- The equipment is appropriate for the task and suitably maintained
- The power source is of an acceptable quality and sufficient quantity for the task
- The weather is acceptable, and
- The launch and landing areas are adequate for the drone you're going to use.

You must design and test preflight checklists to capture all common errors, and make their strict adherence mandatory for all drone operators before they undertake any mission. Also, use the OEM specifications to design, implement, and track maintenance schedules for all equipment.



Challenge #7: Developing a Plan for Data Storage, Analysis, and Reporting

If you think mines are big, you should know drone data is bigger. And so, you need a plan to store and archive this data before implementation. Think along the lines of: Who is going to use the data? Do they need to be given the answers or are they capable of deducing the information from raw data? How much time do you want them to be spending analyzing the data? How long do you need to store it for? Where will you store it?



Challenge #8: Putting Together a Team that Works

Since mining sites are remote, the drone operations team will also be remote. But with regular training and proficiency checks, your chief remote pilot will have the confidence that all operations are being conducted to the required standards. Do not assume that a pilot who has experience in mapping and surveying volumes will also have the competency for close range asset inspections. You must account for and develop training manuals and checklists for each unique task that will be performed at your mine site.



Challenge #9: Avoiding Project Scope Creep

Your mining business is investing in solving a specific problem statement, or a group of predefined statements. Do not be tempted to solve every problem at a mine site from the get-go. Drones require competent operators who understand the risks and how to achieve efficient operations. It is only through regular operations that your company will gain an appreciation for the risk/reward benefit.

So, get your first problem out of the way, with a view to incorporate the learnings into the next step. And remember, you cannot solve all your problems with a drone, nor can you solve all drone problems at once.

TIPS TO DEVELOP A MINING DRONE PROGRAM



UTILIZE PROGRAM MANAGEMENT TOOLS

If you are building an in-house drone program for the first time, you will realize there are a lot of steps to manage and implement. And these are usually governed by a set timeframe. All this can seem overwhelming, if not managed properly.

Therefore, it's prudent to use a program management tool, such as a Gantt Chart to track the progress and identify the key milestones. It will not only hold the team accountable but will also provide handy talking points when communicating the drone program's progress to the upper management.

WALK BEFORE YOU RUN

The key to getting your in-house drone ambitions off the ground is to start small. This may begin with developing a proof of concept for a single application, such as stockpile measurements.

Identify the hardware and software you plan to use for data-gathering and analysis, including any specialist payloads, and formalize your Standard Operating Procedures (SOPs). Then, once you have the drone data ready, compare its results with your traditional stockpile measuring methods.

Work closely with your pilot(s), those tasked with processing the data, as well as other stakeholders to iron out the pain points and make your drone operation workflow seamless. Once you have tangible results to show to the team at the top, it will become much easier to secure the management buy-in and get the funding approved.

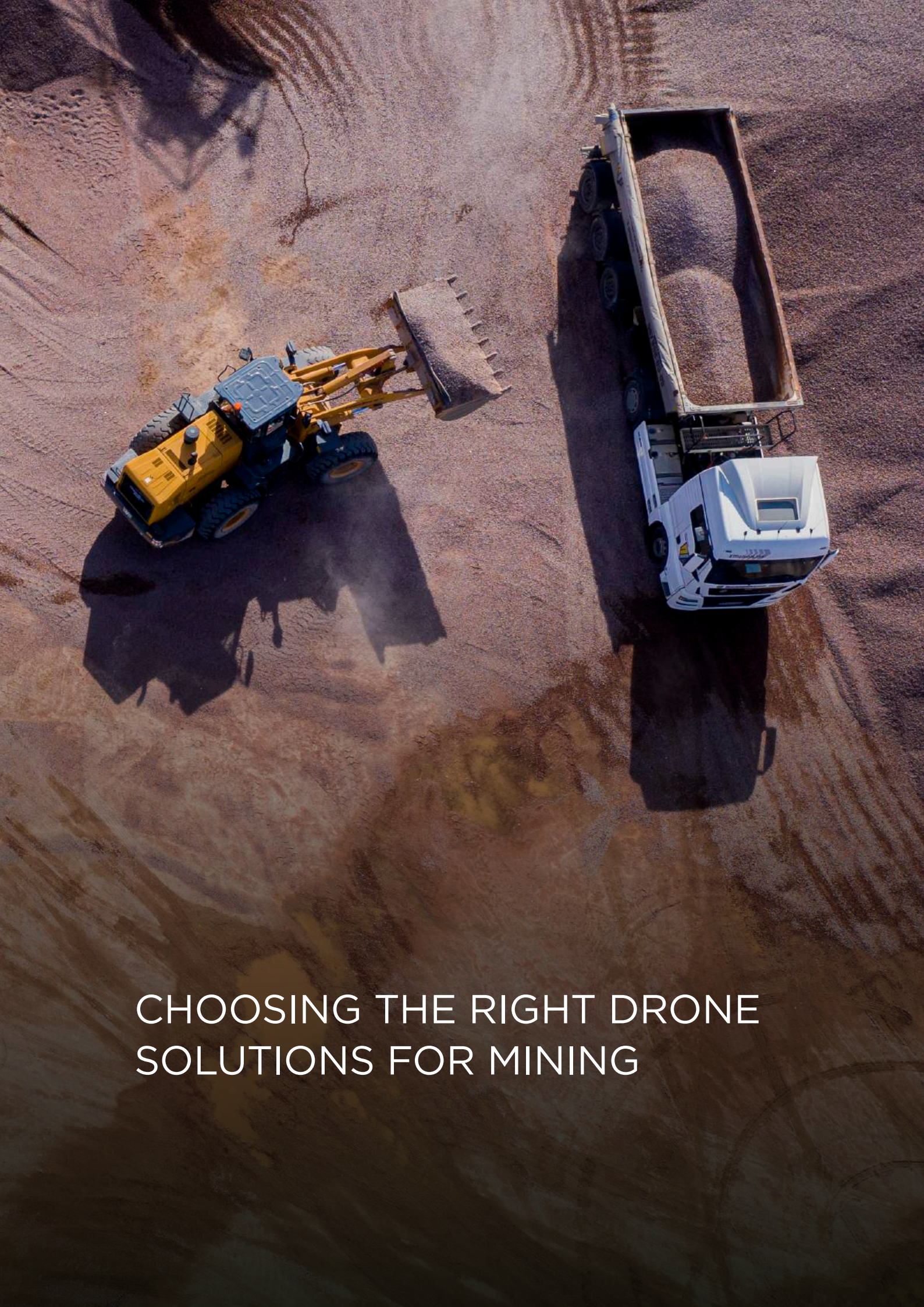
DON'T BE AFRAID TO DELEGATE

Hire a Drone Program Manager. Not only should this person be well-versed with the latest in drone technology, but they must also have a deep understanding of the technical, economic, and operational challenges of the mining industry. Task this person with the responsibility of implementing new workflows and operating procedures, and evolving the drone program on a day to day basis.

Also, if your mining drone operations are planned to occur across multiple locations, it may prove useful to design a training package for top performing staff, who can then facilitate the training requirements to other pilots down the line.



Image Source: BHP



CHOOSING THE RIGHT DRONE SOLUTIONS FOR MINING

DJI'S SOLUTIONS FOR MINING SITES

Your drone solution considerations will be based on the approved budget, project scope, and accuracy requirements. Before zeroing in on a solution, you may want to consider:

- Whether the drone can withstand the temperature range of the operating environment
- The actual flying time or area coverage you would get, whilst ensuring at least 20 to 30 percent battery remains upon landing
- The remoteness of the mine location and to what extent equipment maintenance can be undertaken without sending back to the manufacturer
- How does the accuracy claimed by the manufacturer translate to the undulating terrain of a mine site?
- For mapping, what ground control or post processing hardware is required
- For inspections, how does it perform without GPS? Would it benefit from a zoom lens?
- Does it need an internet connection to operate, process, or log data?

Phantom 4 RTK

This intuitive surveying solution captures centimeter-level accurate data to create georeferenced 2D maps and 3D models of project sites. The P4 RTK has been a trusted workhorse of the mining industry for years. Pricing starts at [\\$6,200](#)



- 1/10ft accuracy for stockpile measurements
- Real-time geotagging
- Less expensive than alternatives

Matrice 300 RTK + Hovermap

The light-weight, plug-and-play [Emesent Hovermap](#) payload enables the M300 RTK to autonomously navigate through tight, dark spaces beyond line-of-sight, even when GPS is not available. Its robust design and unique Simultaneous Localisation and Mapping capability, combined with the superior performance of the M300 RTK make it an ideal solution for the harsh underground mining environments. Mapping of stopes and other inaccessible areas happens in minutes rather than hours, while keeping personnel away from dangerous areas. The M300 RTK + Hovermap solution can also be used to map complex assets above ground to access valuable detailed insights.



- SLAM based 3D mapping
- Omni-directional field of view
- LiDAR-based collision avoidance
- GPS-denied position hold and velocity control
- Improves safety and reduces risk

Mavic 2 Enterprise Advanced

A highly versatile yet compact dual-imaging solution, the M2E Advanced supports up to 32x digital zoom and is capable of centimeter-level positioning accuracy with the RTK module. Perfect for mining site security and automated inspection to protect valuable resources and equipment. Pricing starts at [\\$6,500](#)



- High-resolution thermal and visual cameras
- HD live streaming
- Automated, detailed inspections
- Spotlight, speaker, beacon compatibility

Matrice 300 RTK + L1

DJI's first LiDAR solution for aerial surveying, the M300 RTK + L1 can render centimeter-accurate reconstructions, thanks to its high-accuracy IMU, a 2D and 3D information in medium to large-area operations.



- Centimeter-level precision
- 45 MP full-frame sensor
- Automated inspections
- Vision sensor for positioning accuracy, and the incorporation of GNSS data
- Real-time true color point clouds
- All-weather, nighttime operations

Matrice 300 RTK + P1

A complete aerial photogrammetry solution, the M300 RTK + P1 can generate orthomosaics that meet the 1:500 and 1:1000 accuracy requirements without GCPs. Perfect for capturing highly-detailed 2D and 3D information in medium to large-area operations. Combo starts at [\\$19,500](#)



- HD live streaming
- Dual-RTK GNSS system
- Intelligent battery management system
- Centimeter-level precision
- 45 MP full-frame sensor

Software: DJI Terra

As important as it is to obtain the right drone data, making that data actionable is critical to unlock the value from your mining drone program investments. And so, to complete this drone workflow puzzle, DJI has introduced a solution that fuses drone hardware and post-processing analysis together in absolute harmony, liberating the two from compatibility issues: DJI Terra.

Terra syncs seamlessly with DJI's Phantom 4 series as well as with Zenmuse P1 and L1 payloads. This means you get the best, most accurate results from your mining drone operations when you use Terra to process the data.

The software supports a [Smart Oblique Capture](#) feature, where the gimbal automatically rotates to take photos at different angles to meet 3D modeling requirements with centimeter-level accuracy. Moreover, Terra requires only 1 GB of RAM to process 400 images from the DJI P4 RTK, meaning any ordinary laptop can also be used for post-processing.

Interestingly, the software is so easy to use that drone data analysts do not even require any special training to get started. University of Debrecen, Hungary, has confirmed this in a [recent study](#), declaring DJI Terra the "most simple" software which "requires the least amount of expertise from the user to operate" when compared to similar solutions in the market.

Terra is primed for mining companies that desire a fully-integrated solution to take care of all their needs – right from mine mission planning and data acquisition to post-processing and analysis of the quarry data. As an intuitive software solution that fosters automation of complex mining missions, Terra hits the sweet spot in terms of mining operations management.

Find out more about DJI Terra [here](#).



HOW MUCH DOES A MINING DRONE PROGRAM COST?



HOW MUCH DOES A DRONE PROGRAM COST?

Let's understand this with the help of BMA's budgetary model.

At BMA, a 50% partnership between BHP and Mitsubishi Development, mine operations take place around the clock. Drone mapping surveys, meanwhile, are conducted daily during daylight hours. Around 600 flights are conducted every month across six mine sites with the help of over 50 pilots.

Realizing the tremendous value innovation can add to its business, BMA has implemented the Matrice 300 RTK + Zenmuse P1 as the primary mapping unit, replacing multiple models within its existing fleet.

BMA's mine sites are almost 1,000 km away from the nearest capital city. Meanwhile, the nearest DJI repair center is at least 3,500 km away. Since shipping and repairs can take upward of 2 to 3 weeks, the company makes sure it has spare equipment on hand to stand in for these periods.

EQUIPMENTS AND SPARES

For these six mine sites, BMA has implemented a fleet of seventeen M300 RTK + P1 units to ensure consistent coverage even during periods of downtime and annual servicing. At the same time, BMA ensures that its drone teams are never more than 50km away from the local mine office, which serves as the primary battery recharging power source. The mining company has purchased four pairs of batteries per drone unit to allow for adequate mapping coverage.

Additionally, two BS60 Intelligent Battery Stations have also been purchased per site to ensure continuity. Once the four batteries are exhausted, the teams generally head back to the office for lunch/post-processing/new instructions.



PILOT TRAINING AND LICENSING

As part of this project, all BMA drone pilots receive external remote pilot license training in compliance with Australia's Civil Aviation Safety Authority (CASA). Additionally, 30 pilots require advanced permissions and approvals on top of their commercial drone pilot permit, the approvals and safety requirements for which are also overseen by CASA.

Meanwhile, when BMA made the switch to M300 RTK + P1, the company organized a 2-day Master-class for drone pilots. In this class, one key person from each location was invited to take a 'deep dive' into the capabilities of the Matrice 300 RTK system, and also refresh their knowledge on legislative procedures.

These new content experts then travelled back to their respective sites and passed on the knowledge to the other pilots while referencing BMA's internally-developed training documentation.

REDEFINING ROI WITH MINING DRONES



THE ROI IS PRICELESS: BHP

Ideally, your innovation investment payback should be a mix of short and long term. In addition to acting as a catalyst for short-term bottom-line improvements, your investments in a drone program should improve your business' long-term returns.

BHP was an early adopter of drones across its mine sites. Broadly, the introduction of RPAS (remotely piloted aircraft systems) to BHP's business has allowed the company to remove its people from hazardous environments, whilst acquiring data quicker and more cost-effectively. But how does this translate into hard numbers?

Aerial surveys

Luke Burton, Principal Governance and Compliance and Chief Remote Pilot at BHP, tells: "By acquiring the data from the air, instead of ground-based capture, we have reduced our excavator equipment downtime by approximately 30 minutes/per dig unit on a weekly basis."

Considering the company conducts three aerial surveys per week, this translates into 26 extra productivity hours per year for each dig unit. But, that's not all.

LiDAR scans

As Luke explains: "Before RPAS, laser scanner data was core to our spatial data capture strategy. This equipment is significantly more expensive than drone technology. By implementing drones, and DJI units in particular, we have reduced the cost of this equipment dramatically. This alone is such a tremendous saving. But when you factor in the enormous safety benefits that come from removing our people from busy circuits in the pit, the ROI becomes priceless!"

Post-blast surveys

Also, prior to drones, a typical post-blast survey at BHP could require 5-6 laser scans, each taking up to 15 minutes of active scan time, as well as the time to drive to and coordinate each station.

"Now we can capture the entire area, with one flight, from one setup location in less than one hour," says Luke. "Shadows in the data do not exist, there is less manual handling and the 'add-on' value of an image which is analyzed by our engineers who assess the effectiveness of the blast and check for any safety hazards well before we place equipment in the area."

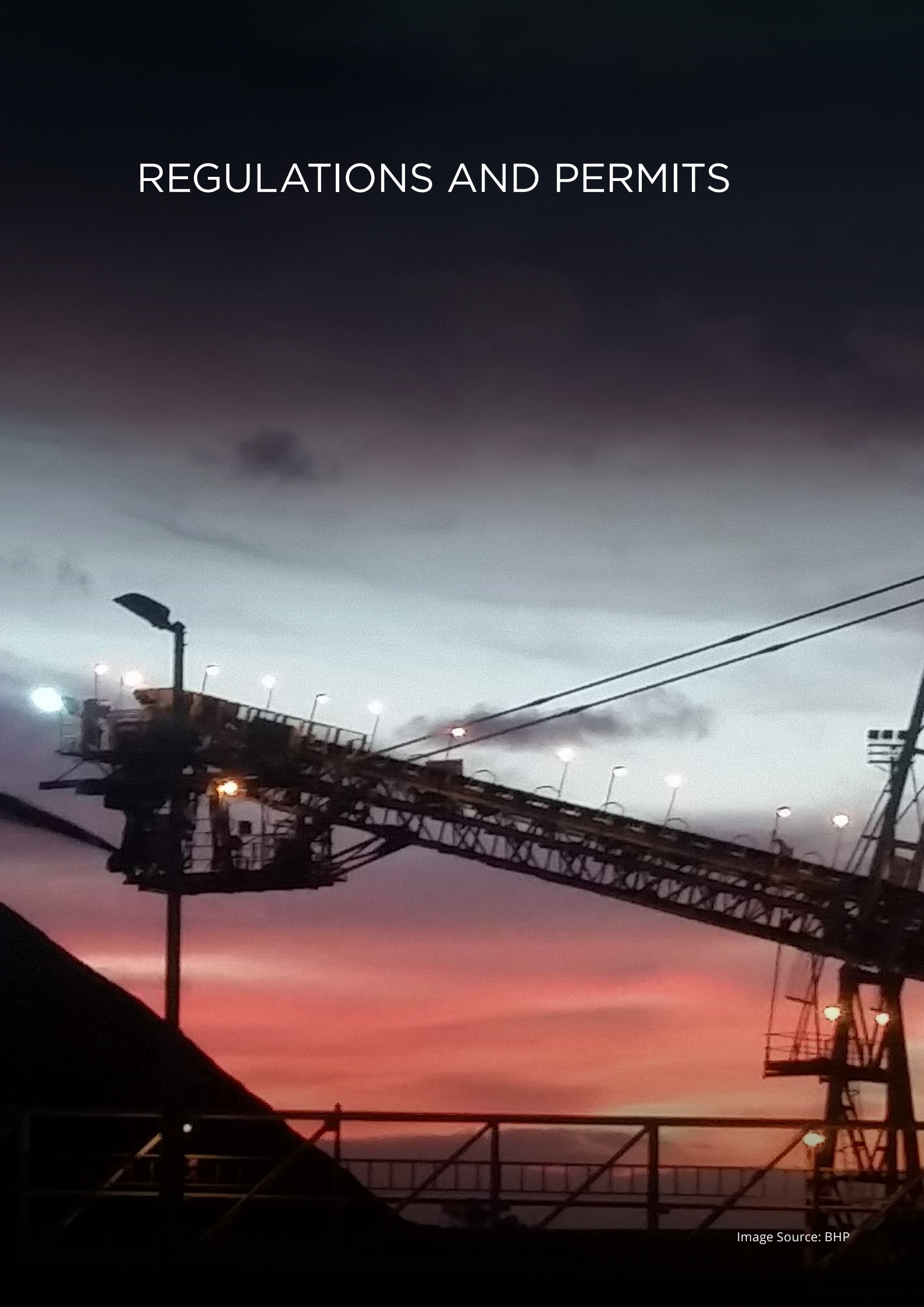
Ocean freight operations

BHP ships more than 300 million tonnes of iron ore, coal and copper to customers around the world annually, making the company a large charterer of dry bulk carriers. Using drones for the hold inspection reports has cut down inspection times per hold from an hour to 15 minutes.

Rashpal Bhatti, BHP's Vice President of Maritime & SC Excellence, explains:

"The hold inspection process involves ships which have five to nine holds which a person checks by climbing down ladders. The inspector has to be physically fit, use fall protection, and carry a parrot (oxygen meter) to make sure there is enough air in the hold. And it takes a lot of time. With drones, we can fly them into a hold and capture 4K images, but also infra-red, and other types of cameras that can show cracks or other specific parameters that cannot be seen with the naked eye."

REGULATIONS AND PERMITS



REGULATIONS AND PERMITS

The way the drone industry has rallied to face the unprecedented challenges put forth by the COVID-19 pandemic has made civil aviation authorities across the world realize the need to find the right balance between public safety and innovation on an urgent basis. And so, the regulatory picture is beginning to align, no matter where in the world you want to build a drone mining program.

UNITED STATES

Commercial drone pilots are subject to the Federal Aviation Administration's Small UAS Rule (Part 107), which states that operators must hold a [Remote Pilot Certificate](#) and register their drone with the FAA. Other Part 107 rules specify the allowable weight of a UAV, as well as where your drone can go.

Notably, drones must weigh less than 55 pounds, including payload, and must be kept within the pilot's visual line of sight in Class G airspace. However, many restrictions can be eased with a Part 107 waiver from the FAA. For example, in January 2021, the FAA [approved](#) first fully automated commercial drone flights.

Meanwhile, it's important to remember that commercial drone pilots must keep a printed copy of their remote pilot certificate in an accessible place at all times when working with a drone at a mine site. Each certificate is valid for two years, at which point a pilot will have to pass another knowledge test.

CANADA

Commercial drone flying is far less regulated in Canada than in the US or the UK. Transport Canada, the regulatory authority, relies on a risk-based distinction with Basic and Advanced Operations categories for operators.

If you want to operate drones in uncontrolled airspace, more than 30 meters (100 feet) horizontally from bystanders, and never directly over any uninvolved people, you qualify for Basic Operations.

On the other hand, if you want to fly in controlled airspace, over bystanders, or within 30 meters of uninvolved people, you would come under the category of Advanced Operations.

In both cases, you need to register your drone with Transport Canada before you fly it for the first time, and mark the machine with its registration number. Both types of operations require different kinds of pilot certifications. You can find out more about the examinations [here](#). It is essential that this pilot certificate is on your person at all times while operating a drone.

EU AND UK

The European Union and its member nations divide drones into three distinct categories based on their weight and use: Open, Specific, and Certified.

The Open category covers basic commercial drone use, where you are not required to fly over any uninvolved people. Then there is Subcategory A2, in which drones can fly within 30 horizontal meters of uninvolved people, and get as close as 5 meters if using the low-speed mode function. But for this, only drones manufactured in 2021 or later are eligible.

For most commercial drones though, Subcategory A3 rules apply. This class of Open drones can fly in an area where uninvolved people and buildings are outside the pilot's visual line of sight, typically about 150 meters.

The Specific and Certified categories of drones, meanwhile, include drones and uses with a greater level of risk. Drones covered in the Specific category require specific authorization before any given flight. In some cases, however, a pilot need only declare their intention to fly in advance. For Certified category flights, both the drone and operator must have special licensing.

Once you've determined which category best describes your situation, you can begin the licensing process by registering with your area's [National Aviation Authority](#) (NAA).

Notably, each country in the EU has its own NAA, while the UK's licensing process is handled exclusively by the country's [Civil Aviation Authority](#). From there, it's on you to ensure your drone is properly insured in your country and take the test for your category.

AUSTRALIA

Commercial drone pilots in Australia need to obtain a [remote pilot licence](#), or RePL from the Civil Aviation Safety Authority. In addition, you or your employer must possess a [remotely piloted operators certificate](#) (ReOC) for commercial application of drones at a mine site. There are some allowances for operation of drones less than 2 kg, so ensure you check the details of your operation and operating area for any restrictions.

To obtain a RePL, pilots must first apply for an aviation reference number, a unique ID used by the government to identify pilots. From there, pilots must complete a required training protocol. Those with no previous experience must take a course with a certified training provider. For those who have some experience, such as those who have already completed an aviation theory course, a short competency test is the only requirement.

For more advanced operations, or those that do not comply with the Standard Operating Conditions, a [separate application](#) needs to be submitted to obtain approvals.

Find out more about obtaining a commercial drone license [here](#).

DATA AND REPORTING



DATA AND REPORTING

Data is at the core of every drone program, and the mining industry is no different. Efficient and secure data management is critical if you want to reap the full benefits of your in-house drone program.

Commercial drones can generate enormous amounts of data very quickly and, depending on the sensors, quite often in different formats. Ballooning data storage requirements are something you'll need to account for, particularly if you want to track progress over time and compare past data to current data.

There are several enterprise-level cloud data management solutions that could help to simplify the process of managing, sharing, and organizing your drone data. Using rigorous organization skills right from the beginning of the drone program goes a long way to ensuring the program's success.

At the same time, your corporate policies may mandate assurance that your data is secure at every stage. This can be achieved by utilizing secure servers at your own headquarters. DJI, on its part, offers a cybersecurity feature called [Local Data Mode](#) to help commercial drone operators keep sensitive data confidential.

TRAINING



TRAINING

Initial and ongoing pilot training would be key to the success of your mining drone program. If you're using DJI hardware, it would make sense to sign up for an [Unmanned Aerial System Training Center](#) (UTC) course offered by the DJI Academy.

These industry-specific application courses are available at over 200 training centers across the world, including in the United States, Canada, Australia, Italy, Ukraine, Portugal, Japan, Malaysia, and the Netherlands.

Each trainee gets access to:

- A professional curriculum that includes standard drone operation procedures using the latest DJI drone technology and DJI Pilot app
- An overview on safe flying and how to react during emergency situations
- Training on standard equipment maintenance
- An official manufacturer training certificate provided upon successful completion of the course

Sign up [here](#).



MAINTENANCE

MAINTENANCE

Regular maintenance and upkeep of crucial equipment are necessary to improve the efficiency and safety of your mining drone fleet. And while industry leaders like DJI make it a point to hand out [maintenance tips](#) for their top-of-the-line machines, maintaining an entire fleet to its optimum level requires a considerable amount of planning.

Fast-moving common parts need to be replaced after a certain number of flight hours, detailed maintenance reports need to be maintained to make future operations more reliable, firmware updates and calibrations need to be ensured, and so on.

So, even with a team of highly-skilled drone pilots, equipment maintenance may not be as simple a task as it may first seem. Mining drones, such as the M300 RTK, are extremely advanced with especially sophisticated engineering under the hood. This means these units require a high level of expertise to maintain and keep at optimal performance, and this level of expertise is not always easy to come by.

As such, it is recommended to build an appropriate repair schedule based on the usage of your drones with the help of an official maintenance guide.

DJI CARE ENTERPRISE

In addition to being on top of your maintenance game, it is also worthwhile to invest in a comprehensive accident protection solution, such as DJI Care Enterprise. This plan provides unlimited replacements or free repair services for accidental damage such as crashing, water damage, and signal interference.

With options of free shipping and rapid delivery, DJI Care Enterprise will give you the peace of mind you need to concentrate all energies on the mission itself. Read about different plan options [here](#).

DJI MAINTENANCE PROGRAM

This lifetime drone maintenance program is designed to raise the efficiency, increase the safety, and improve the recordkeeping of your drone fleet. The solution includes:

Deep cleaning:

Equipment that is cleaned and refreshed regularly is more likely to retain its operational efficiency.

Component replacement:

By proactively replacing overused parts, the lifespan of drones can be significantly extended, and the value of these assets can remain more stable.

Upgrading and calibration:

Ensuring that all equipment is up to date can help to improve performance and efficiency in the long-term.

The success of the DJI Maintenance Program is [already proven](#), with many companies using its guidelines to ensure that their drone fleet is consistently available for deployment, both for scheduled tasks and in the event of emergencies. Find out more [here](#).





CONCLUSION

CONCLUSION

The mining sector is returning to growth post-COVID, but organizations big and small now face a transformed and highly-competitive operating landscape. If mining companies are to survive and thrive in this new world, they must improve shareholder returns with bold, innovative strategies that accelerate productivity, improve workplace safety, and deliver significant time- and cost-savings.

With the right equipment, training, and support, an in-house drone program can be key to the success of your organization. As you have noticed throughout this guidebook, DJI has developed end-to-end hardware and software solutions for mining workflows that are guaranteed to streamline your operations and fatten your bottom line.

To get your drone program off the ground and discuss the options with a local DJI dealer, [click here](#).

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