



solution brief

reaching new heights

the business case for heavy lift drones on remote
transmission tower projects

Introduction

a new role for drones

New drone technology is going to change the way power companies build or repair transmission towers on remote construction sites.

Remote projects are difficult, expensive, and dangerous. Project managers carefully plan for costs not required on construction sites with flat land and easy road access. Small errors can cause scheduling delays, budget problems, or worse.

Heavy lift drones can reduce those risks and costs.

We all know drones are popular on construction sites. Those lightweight machines carry cameras or GPS equipment. They fly over the job site collecting important data.

Now imagine a drone carrying rebar instead of a camera. Imagine that drone lifting a 150 kg load and moving it 700 metres to a crew building a tower foundation on the side of a mountain. That lift capacity is possible right now with today's drone technology.

Moving construction material is just one benefit that heavy lift drones can bring to your job site. There are many others.

Take a few minutes to read this report. You'll learn how heavy lift drones can:

- improve remote construction workflow and safety
- produce financial benefits with a positive ROI
- begin working on your job site right now

Delivering solutions

smart technology for remote sites

How would your team use a drone that can lift 150 kg, or more?

We asked ourselves the same question. To make a list of possible drone tasks, we created a workflow scenario. In this scenario, we want to build transmission towers on mountains. The remote construction sites are not close to access roads. Chart 1 shows the scenario workflow.

Opportunities

Based on the Chart 1 workflow, we think heavy lift drones can do three kinds of work: logistics, construction, and stringing. Based on these opportunities, we see six kinds of benefits, as shown in Figure 1.

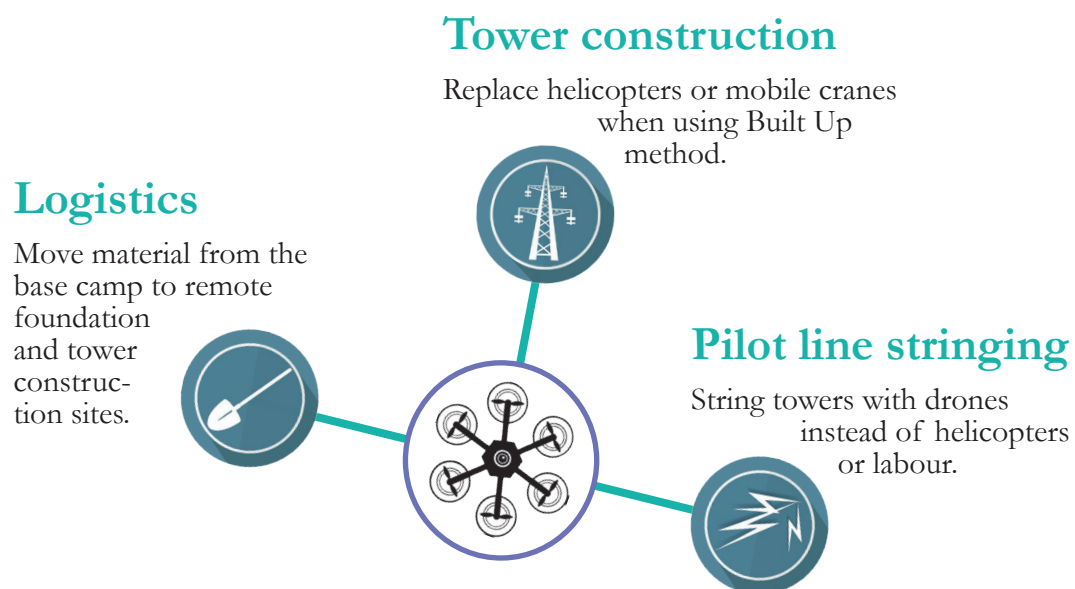
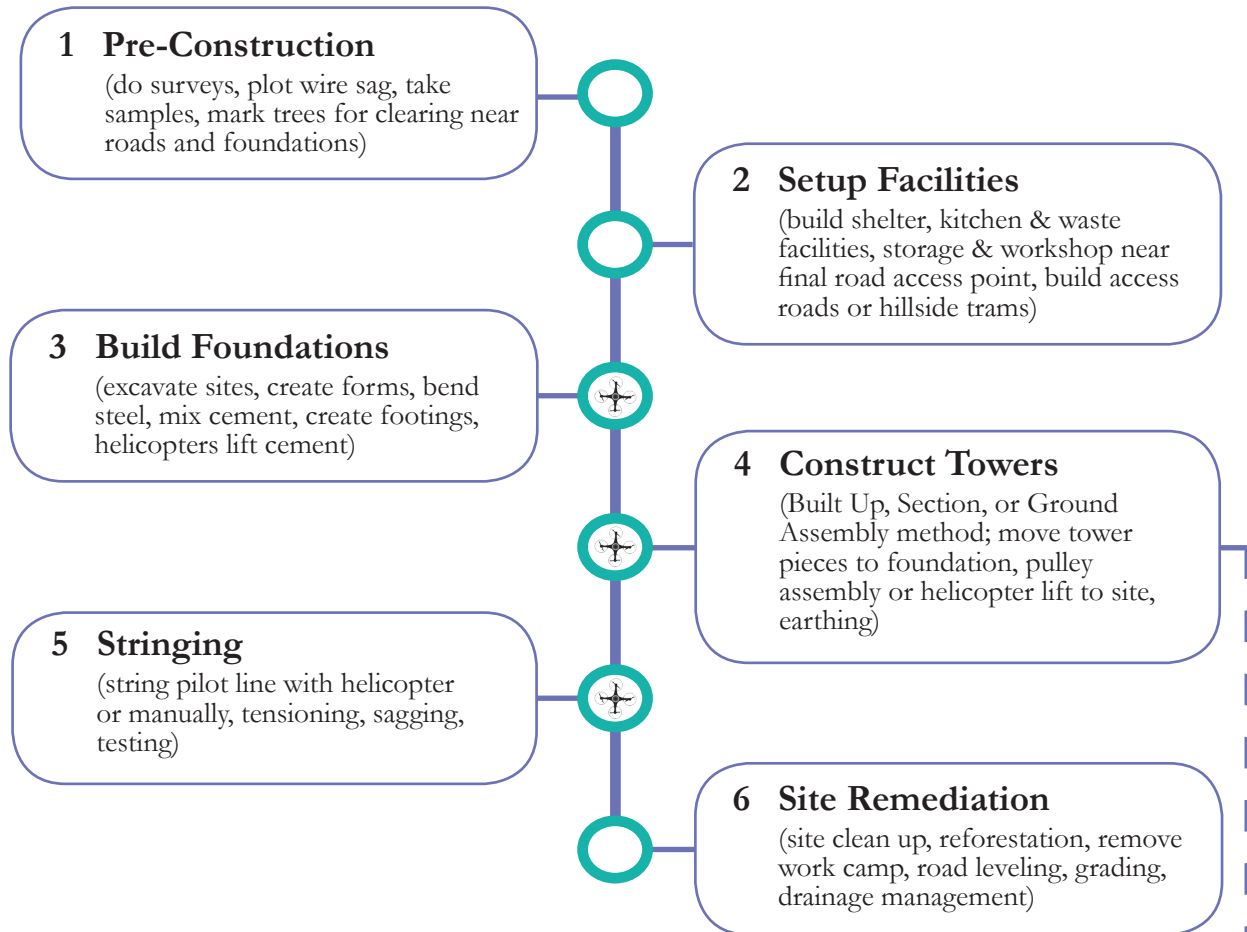
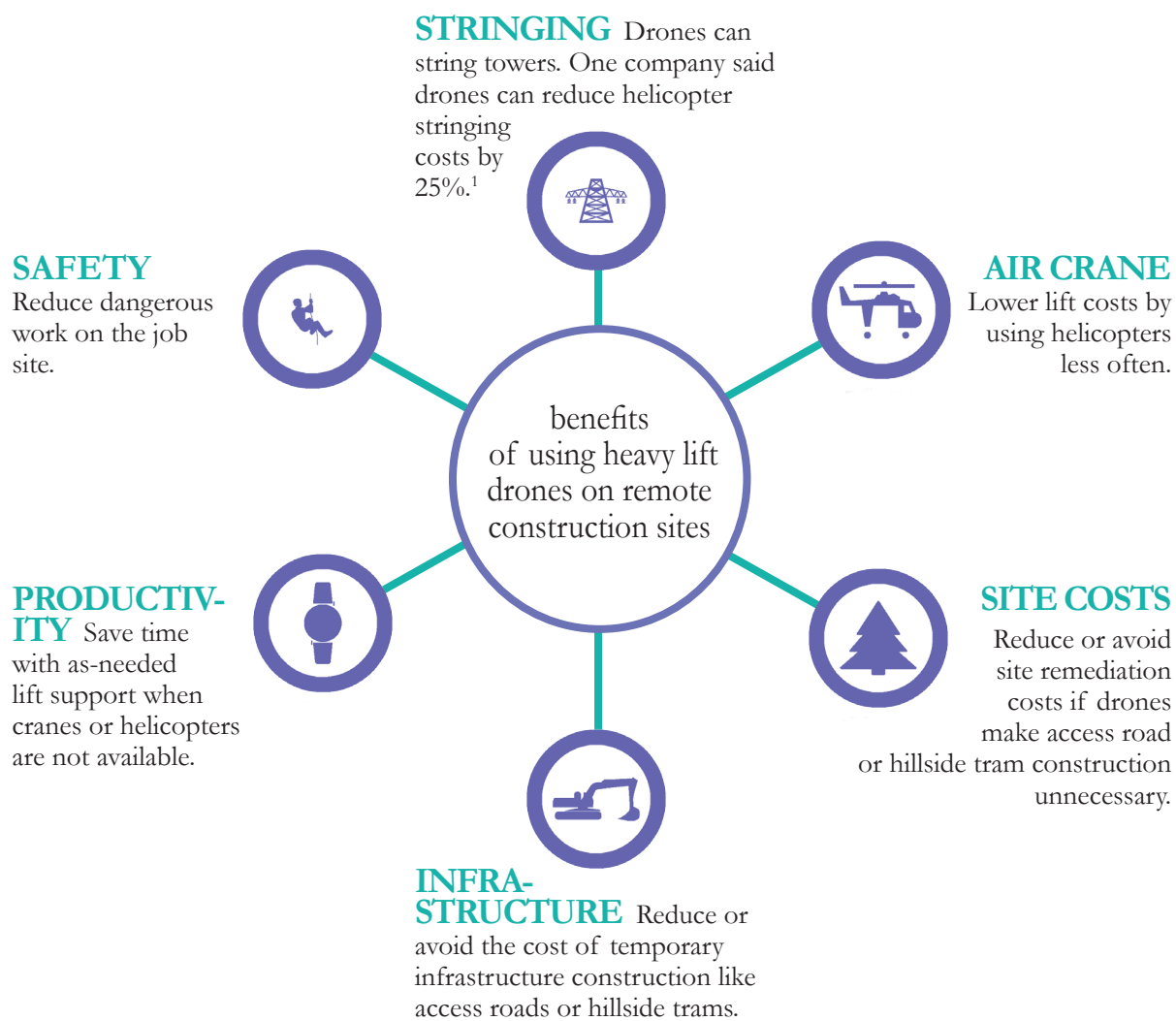


Chart 1
Remote Transmission Tower Construction Workflow



Transmission Tower Construction Methods		
Built Up	Section	Ground Assembly
Tower is delivered to base camp or site in knock down condition. No heavy machinery is required to move pieces.	Large pieces of tower are assembled on ground. Each piece is lifted up and put into place with crane or gin pole.	Tower is constructed horizontally on ground. Once assembled, it's moved to foundation by crane or helicopter.

Figure 1
Benefits of Heavy Lift Drones on Remote Construction Sites



Limitations

We see many opportunities to use heavy lift drones on remote transmission tower construction sites. Like any tool, however, contractors need to know the limits of heavy lift drone technology.

Drones need a licensed pilot. Skill is required to safely fly a heavy lift drone around people, towers, and conductors.

Local regulations can impact the use of drones in the T&D industry. Some countries have regulations that might be called Beyond Visual Line of Sight (BVLOS). These rules say drone operators must be able to see the drone at all times. That limits how far a drone can fly.

Heavy lift drone technology won't replace all helicopter services. There are some jobs which heavy lift drones can't do.

- **Moving people.** Helicopters move workers to and from remote sites. Though possible, it's unlikely drones will be moving people in the near future.
- **Moving concrete.** Assuming a 360 litre payload (860 kg, or half a cubic yard) and 1 km between the foundation worksite and concrete source, one helicopter can deliver 20 loads per hour.² Current heavy lift drone technology can't compete with that level of service.
- **Tower construction.** Using the Ground Assembly method, current heavy lift drone technology might not be feasible. Tower weights vary but can weigh 7 tonnes, a figure that is too high for drones.

Essential drone features

wings, rotors, payload, and flight time

There are two types of commercial, non-military drones: fixed wing and multi rotor.

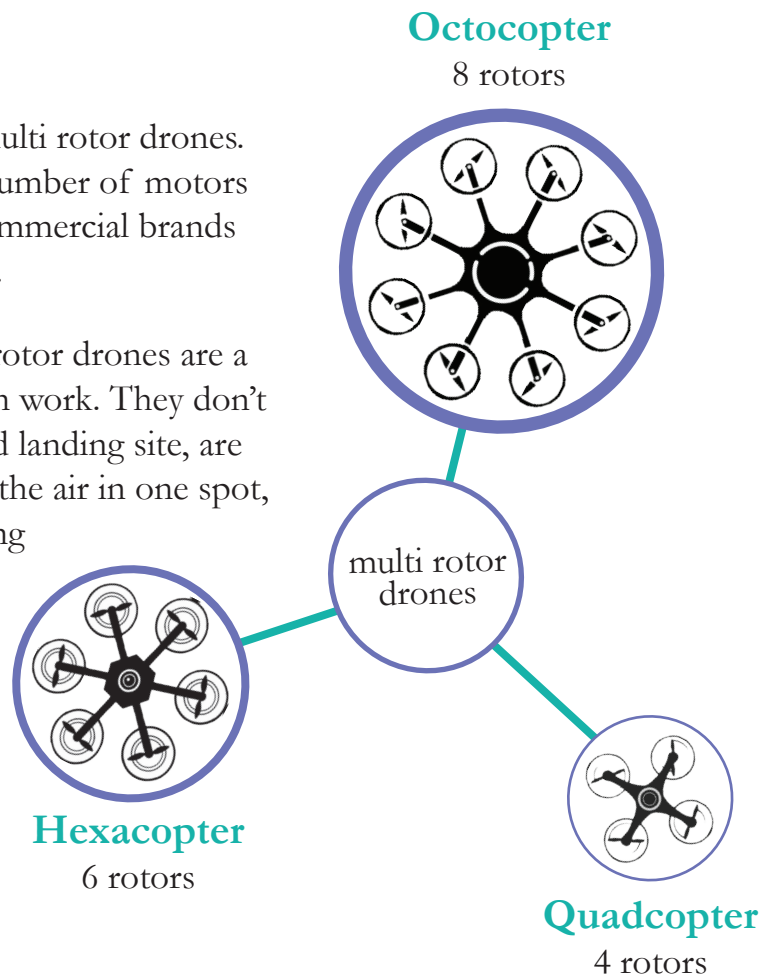
Fixed wing drones

Fixed wing drones look like small airplanes. Many fixed wing drones can fly long distances with heavy payloads. They are not often used for construction work. They need long take-off and landing zones and are difficult to fly around sensitive tower equipment.

Multi rotor drones

There are several types of multi rotor drones. The main difference is the number of motors and rotors (blades). Most commercial brands have between 4 and 8 rotors.

In the T&D industry, multi rotor drones are a good choice for construction work. They don't require a special take-off and landing site, are easy to turn, and can stay in the air in one spot, which is useful for off-loading work.



Payload

Payload means the weight a drone can carry. Payload does not include the weight of the drone itself. Some reports talk about total lift weight or MTOW (maximum take off weight). Total lift weight is not the same as payload. Total lift weight is the weight of the drone plus on-board equipment plus payload. Many popular data collection drones carry a payload of less than 10 kg. A small number of drones can carry a 20 kg payload.

Griff Aviation makes the only commercial, non-military drone that lifts payloads over 100 kg.

Flight time

Flight time means the number of minutes a drone can stay in the air. Flight time varies with payload and battery power. There is no industry standard for reporting flight times. Each company uses a different system. Some companies report flight times based on a rated payload. Some companies report flight time with no payload.



Griff 135 multi rotor drone Image credit: Griff Aviation.

Heavy lift drones

the next generation is already here

Drone technology is changing quickly. And so are people’s attitudes about drones.

Five years ago, drones were experimental and risky. Things are different today. Lightweight drones carry cameras, GPS systems, and other equipment. They are used in the T&D industry to collect data. Compared to other data collection methods, drones are faster, cheaper, and more accurate.

Big payloads will define the next generation of drone technology, and it’s already here. Today’s heavy lift drones have a proven ability to safely lift and transport a payload of 150 kg, or more.

As shown in Table 1, the Griff 350 can lift and carry a 150 kg payload for 20 minutes on a single battery charge. Its maximum payload is 200 kg but the flight time is less. Over the coming months, that payload capacity will increase to 800 kg, or more.

Table 1
Heavy Lift Drone Specifications

Name	Rated payload (kg)	Rated flight time (min)	Maximum payload (kg)
Griff Max	800	30	1000
Griff 350	150	20	200
Griff 135	30	45	75