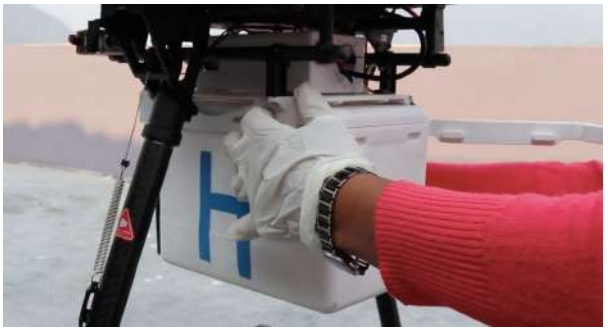
Collecting patient samples from rural clinics in Nepal

Droneports based at Pyuthan Regional Hospital and Bhingri Public Health Center servicing 4 remote clinics each

Doctor follows the flight cargo drone on a live map



Nurse removes cargo box containing patient samples

OVERVIEW	
Flying Labs	Nepal Flying Labs
Geographic area	Pyuthan Province, Nepal
Date	June - December 2019
Sector program	HealthRobotics

SCOPE	
Stakeholders (clients)	Birat Nepal Medical Trust (BNMP), Stony Brook University (SBU)
Challenge	More than 80% of Nepal's population lives in rural areas, and 50% live in remote, mountainous regions with poor access to healthcare. The majority of healthcare facilities in the country are not accessible by roads. On average, it takes 6-to-8 hours to travel between a hospital and healthcare facility in rural Nepal. This leads to shortages of essential medicines and explains why it can take so long to test patients for diseases like tuberculosis (TB) since patient samples can only be tested at diagnostic labs in major cities. Some 70% of Nepalis are carriers of TB, and many of them have full-blown versions of the disease. TB is the 4th leading cause of death in Nepal and the leading cause of death from infectious diseases.
Scope	Collect TB sputums from 8 remote clinics and transport them to two regional health facilities for rapid testing using affordable and locally operated cargo drones. Repurpose existing industrial mapping drones into cargo drones, and fully train local drone pilots with DR Flying Labs to operate the 100+ deliveries entirely independently.
Outcome	1) This pilot project demonstrated that affordable cargo drones can be locally operated to reliably collect patient samples for rapid diagnosis over an extended period of time (6 months). 2) This pilot is ready to be transformed into long-term delivery services. 3) The pilot project has been extensively documented and the full report is available here. 4) The same project can be implemented in other countries who wish to test cargo drone operations for sample delivery and are looking for an affordable, proven alternative with a successful and fully transparent track record.
Next steps	Nepal Flying Labs is securing local funding to continue cargo drone deliveries.

CARGO	
Cargo Transported	Sputum samples
Cold Chain	Not required

HARDWARE AND SOFTWARE	
Cargo Drone	DJI Matrice 600 repurposed into a cargo drone by WeRobotics
Precision Landing	GPS and optical image recognition using ArUco markers
Flight plan software	Mission planning software developed by WeRobotics (see screenshot below)

Mission planning software for cargo delivery developed by WeRobotics

FLIGHT OPERATIONS	
Delivery Distance(s)	Horizontal: 1-7 kilometers; Vertical: 1-1.8 kilometers (AMSL)
Number of Flights	106 (outbound and return)
Number of Deliveries	53
Flight Altitude	1.8km (AMSL)
Total Cargo Delivered	742 sputum samples (26 of which tested positive for TB)
Total Distance Flown	~400 kilometers
Takeoff/Landing sites	Flat rooftops of health facilities

COST BENEFIT ANALYSIS	
Speed Savings	Drone deliveries were 75% faster than ground deliveries
Cost Savings	Cost analysis is still ongoing so the following are initial estimates: • Aerial: $0.40 per kilometer • Land: $0.62 per kilometer This *tentatively* represents 55% cost savings (TBC) but this figure depends significantly on the number of deliveries made per day.