

1. Key Process Improvements

1. Delivery Time Reduction

- Traditional delivery of medical supplies between hospitals during Hajj could take up to **90 minutes** due to traffic congestion, road closures, and crowd control.
- The drone delivery system reduced this to **5 minutes** (longest Route), providing a **93% improvement** in response time.
- This enhancement directly impacts the availability of life saving supplies and the responsiveness of nupco's team.

2. Delivery box

- Each payload was pre sealed, temperature checked and scanned prior to drone loading, and then verified by receiving medical staff upon delivery using real time shipment status monitoring chip.

3. Autonomous Route Execution

- Predefined geofenced flight corridors were used to automate drone navigation with minimal human intervention.
- Real time rerouting capability was tested and activated in case of weather shifts, no fly zones, or security alerts.

4. Integrated Communication Protocols

- Standardized communication channels were established between drone operators, nupco and Ministry of health.
- Emergency override protocols were embedded into the operational plan to allow instant mission termination or redirection if required.

5. Real-Time Visibility

- Live mission data was available to stakeholders including MoI ,Royal guards, and MoD through DJI FlightHub 2, ensuring transparency, accountability, and synchronized responses across the network.

2. Pilot Phase: Testing and Validation

Trial (Pre-Hajj Pilot Testing based on Royal Court memo) 1 month Before Hajj:

- A full test cycle was conducted one month prior to deployment to validate:
 - Payload stability and security in flight
 - Battery consumption under various payload weights
 - Emergency landing procedures
 - Communication protocols and stakeholder coordination
 - Ground handover process under realistic field conditions

Outcomes of the Pilot

- Confirmed drone endurance of payload
- Verified emergency rerouting worked
- Identified and resolved risks related to interference and signal blockage near hospitals
- Approved by Royal Court and Supreme Hajj Committee to Go operational during Hajj Season due to the success of the pilot