USE CASE

AIRPORT MAINTENANCE

PAPI calibration at Paris-Le Bourget

1st business airport (Europe)

3 hours flights

80 light threshold detections

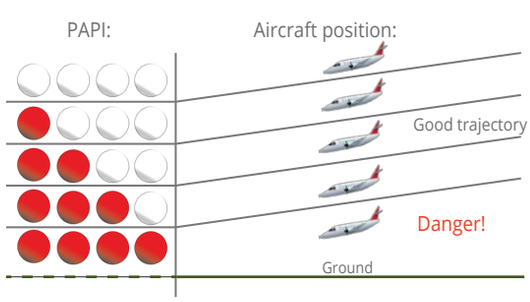
Paris Airport Maintenance

The Groupe ADP is the French airport authority which builds and manages airport platforms among which Paris-Charles de Gaulle, Paris-Orly and Paris-Le Bourget. In 2016, Paris Aéroport has welcome more than 97 million passengers in Paris-Charles de Gaulle and Paris-Orly, 2.2 million tons of freight and mail and more than 42 million passengers through abroad airports thanks to its subsidiary ADP Management. Paris-Le Bourget remains today the leading business airport in Europe.

PAPI instrument calibration

PAPI (THORN PU3L®)

The Precision Approach Path Indicator (PAPI) is a 4 light units block located beside landing runways, that provides visual guidance information to pilots for acquiring and maintaining a safe and accurate glide slope on final approach. Placed perpendicular to the runway approach path, generally on the left side, each PAPI unit fits a row of lights emitting red light below a certain angle, and white light over. This instrument can have an effective visual range up to 3 miles during the day and up to 20 miles at night.



While landing, pilots can determine if their approach is too high, too low or on the correct slope thanks to the red and white indicators. For a correct approach, the pilot must observe 2 red and 2 white lights as follow: 🔴🔴⚪⚪ . From 3 white lights and more, it indicates that the aircraft is too high. On the other hand, 3 red lights and more indicates that the aircraft approach is dangerously too low.

To maintain operational conditions and precision of the system, projected maintenance is carried-on using for instance flying machines or elevating work platforms. Blocking off the access to the runway, PAPIs checking is made by simulating sinusoidal approaches to verify threshold angles and ensure compliance with regulations. On the down side, the airport necessarily shuts down the runway, consuming up-time, imposing complicated logistics and taking risks by deploying operators in the air and on the runways.

The Solution

For achieving this aeronautical maintenance task, Groupe ADP deployed the Elistair tethered drone solution: the Safe-T station. Tethering an hexacopter carrying a x18 zoom handy-cam digital camera, this configuration permits an easy, safe and fast deployment within the airport.

Allowing a precise high-view point over the Paris-Le Bourget runways, the tethered drone has also been equipped with a vertical laser module in order to increase the precision of its geo-localization while performing the PAPI checking. Necessitating 2 operators on the ground, the solution is simple and secured by the umbilicus cable specifically built for resisting to high traction while supplying the drone in power and transferring high-speed data.

Effective deployment

The system satisfies aeronautical standards in terms of safety, speed completion and efficiency.

Wide coverage & secured operation

The drone flies tethered while airplanes perform their normal manoeuvres. No need to stop the airport air and ground traffic.

Unlimited & adaptable data

The system is modulable and can be adjusted for different kind of maintenance tasks.

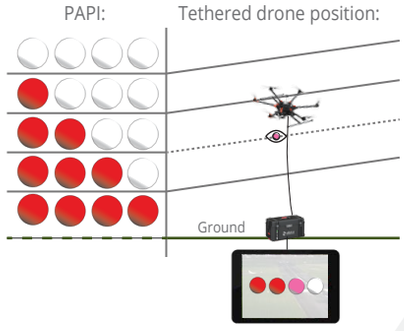
> Enabling drone usage within a complex and live airport environment, the Elistair tethered drone stations insure the respect of security standards set by airports and the French Civil Aviation Authority.

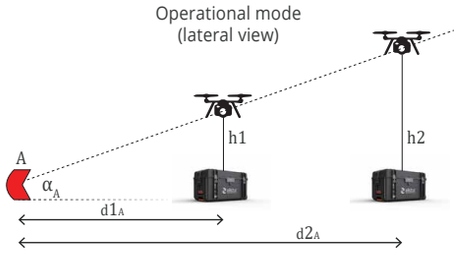
Rémy You, Innovation Manager at Groupe ADP.

The Operation

Using a flying tethered drone, inspections of PAPIs are much easier to carry-on. As flying tethered allows long stationary flights, the tethered drone can easily detect the precise pass through each different threshold indicators: mixing the white and red colours, the observation results in a pink threshold point as seen on the opposite illustration.

To provide more robust precision in the PAPI checking, the tethered drone is deployed at 2 minimum distances. Knowing the required PAPI threshold angle α_A and by basic trigonometry calculation, this angle can be verified by monitoring the precise altitude of the pink threshold detected, and at the 2 distances $d1$ and $d2$ (see illustration below).





On the ground and On Screen Display (OSD), both live video and geo-localization indicators display at the same time and permit to detect and pick up the PAPI light thresholds necessary for performing the recalibration. The integrated GPS - Baidu - Glonass module delivers the position in the horizontal plan X - Y. The drone piloted in Loiter mode, the drone takes off and lands in an area of diameter less than 1.2m. A laser is also integrated to enhance Z axis precision, with both satellite localization and laser measurement are displayed on the OSD.

The Result

Using the micro-tether, the Elistair drone flies in a controlled volume from 50m to 100m radius. Plus, by transferring the video through the micro-tether, data does not suffer from interferences. When checking the furthest distances, the camera can zoom on the PAPI and defocus: the way the lens renders out-of-focus the PAPI lights appears in a bigger and colourful diamond shape.

Elistair provides a tethered drone solution that respect 3 major key assets within the airport:

- Controlled & Safe **Volume**
- **No Risk** of fall down
- Distance check: **15 minutes**
- **Unjammable**

In direct link with the control tower, necessary secured conditions were satisfied for integrating the tethered drone in the air space over the runway while the rest of the airport kept running. Deployable at far distances without interrupting the rest of the airport traffic, the tethered drone allows to check safely in once all the PAPI thresholds, requiring only 1 hour full deployment per PAPI checking.

The Elistair tethered drone solutions firmly meets the airport maintenance standards insuring safety, efficiency and flexibility.

Safe-T

SMART TETHERING STATION FOR DRONES

TRULY SMART, SIMPLY POWERFUL

To learn more about the Safe-T, click here

Discover more about the innovative Elistair stations

and the other ranges of new drone applications. Visit our website and contact us!

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