

OPATS – The Laser-based Automatic Landing System for UAVs

OPATS (Object Position and Tracking System) is an automatic UAV landing system that continuously measures the dynamic positions of the object of interest.

The measured positions are transmitted with a high update rate to a control system, and may be used as feedback in a speed or position control loop. The main purpose of OPATS is to provide reliable position data on the UAV during its approach and landing phase, and to send the data to the Ground Control Station (GCS). The system is cost-effective and easy to deploy, operate and maintain, while the device is run on a standard local battery and can be operated outdoors under a variety of climatic conditions.



OPATS system

OPATS Units

- Tripod with laser sensor on a movable platform (in azimuth and elevation)
- Electronic Unit
- Battery
- Platform contains:
 - servo drives with high feedback resolution in azimuth and elevation
- Laser Sensor contains:
 - Eye-safe class 3R, IEC 60825
 - 30*30 MRad field of view
 - Video camera with 100*30 MRad field of observation
 - UAV position update rate 40 ms



UAV reflector

Runway options

On ground with landing energy absorption (on grass or snow with hydraulic skids, by arresting cable system, by landing net, etc.)

On runway with braking action or into arresting cable

On runway for automatic takeoff

UAV equipment

- Passive optical retroreflector
- Glass cover (optionally heated)
- Flexible integration on UAV (e.g. nose or under the wing)

Qualified and proven performance

The OPATS design has proven its worth through a series of demanding environmental qualification tests (sand, dust, heavy thunderstorm, temperature extremes, transport vibrations).

OPATS is in service with a wide range of UAVs worldwide, ranging from tactical to MALE. Over 150 OPATS are deployed by more than 15 different customers. The system's several thousand successful landings testify to its reliability.

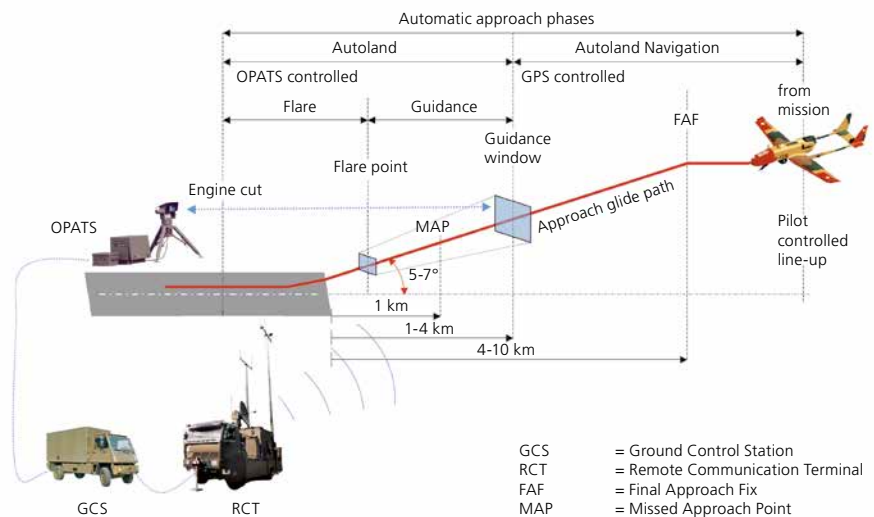
Performance data

Distance range in tracking mode:	35 m ... 4,000 m
Distance range in search mode:	150 m ... 4,000 m
Azimuth measuring range:	300 deg
Elevation measuring range:	-35 ... +55 deg
Position measurement interval:	40 ms
Distance measurement accuracy:	± 1.5 m
Angle measurement accuracy:	± 1 mrad (typical 0.3 mrad)
Landing deviation:	less than 1 m along glide path*
Temperature range, operation:	-35 ... +60°C
Temperature range, storage:	-35 ... +71°C
Power supply:	24 Vdc from battery
Operation time with one battery charge:	6 ... 20 hours
Weather conditions:	Visibility of at least 1,000 m recommended
Lateral speed of object:	Max. 20°/s
Radial speed of object:	Dependant on distance accuracy requirement

* subject to distance

Typical landing operation

- Navigation phase: The UAV returns from the mission and reaches the Final Approach Fix (4 ... 10 km before the landing strip)
- UAV is controlled by GPS or other means to the Guidance Window (1 ... 4 km before the landing strip)
- Guidance phase: UAV is controlled by OPATS and UAV control (closed loop) until the Flare Point is reached, or as long as the UAV needs guidance up to the end of the roll out
- During landing, the operator in the GCS supervises the procedure by means of the camera image from the laser sensor and data from the flight control



OPATS landing operation