

RPAS for ILS maintenance

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Techno Sky: Provider for ILS Ground Inspection

Ground Maintenance of ILS is a complementary activity to ILS Flight Inspection.

ILS Localizer and Glidepath signals are today measured with a special vehicle equipped with a telescopic mast, a measurement antenna and ILS receiver.

ILS ground maintenance is performed by our CNS technicians at all italian civil airports equipped with a Cat. III ILS



RPAS innovative solution for ILS maintenance: Advantages

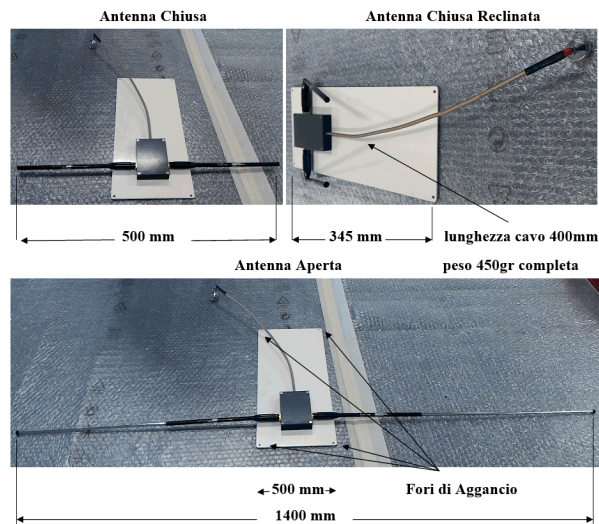
- ❑ Less expensive than current measurements vehicle
- ❑ Less intense preparation activity
- ❑ Reducing the time the runway is blocked
- ❑ Quality of the measurements improved due to the higher flexibility of the drone
- ❑ Low maintenance and running costs
- ❑ ILS signal can be measured further and higher in the air, providing more accurate results in the far-field, especially for the glide path
- ❑ Correlation with flight inspection data for overall optimization of ILS
- ❑ Reducing flight inspections with the corresponding savings



Experimental Project: UAV for ILS near ground maintenance

Experimental projects are currently ongoing with a purpose-designed measurement UAV.

The Drone developed by **Techno Sky** for this task, is equipped with a compact ILS receiver/analyzer and antenna



Experimental Project: Pre-Conditions and Approvals

- ✓ Safety requirements from airport and RPAS operator are fulfilled
- ✓ Risk assessment is approved
- ✓ Excellent coordination between the drone team and the airport control tower
- ✓ Flight procedure and mission description has been communicated and agreed between ATC and RPAS operator
- ✓ Time slots and duration has been agreed between RPAS operator and ATC
- ✓ VLOS/EVLOS approval to RPAS operator has been provided by authority
- ✓ RPAS ILS inspection procedure is approved
- ✓ Experimental trials at airports is approved by authority
- ✓ ATC, airport authority are informed

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Direzione Regolazione Navigabilità

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00156 ROMA
operazioni@technosky.poste-cert.it

p.c. Direzione Regolazione Aeroporti e Spazio Aereo

Oggetto: Progetto R&S_Sperimentazione_NMD_(Navigation Maintenance by Drones)

Sulla base della richiesta di rinnovo dell'autorizzazione, ns. prot. n.73039 del 4/07/2018, comunco che, ai sensi dell'art. 9 comma 10 del Regolamento "Mezzi Aerei a Pilotaggio Remoto" Ed.2 del 16/07/2015 Em.4 del 21/05/2018, codesta società è autorizzata a proseguire l'attività di ricerca e sviluppo fino al 31/12/2018.

L'autorizzazione è valida per i seguenti scopi:

- sviluppo dei processi manutentivi nel settore ATC tramite droni per conto della controllante ENAV S.p.A.;
- studio sulle modalità di comunicazione con l'ENTE ATS per le operazioni di verifica funzionale sugli impianti di radioassistenza tipo LS (GS/LOC) all'interno degli Spazi Aerei controllati e nelle vicinanze di un aeroporto;
- operatività dell'APR rispetto alle weather conditions in considerazione del peso del ricevitore R&S EVSF100 e delle rispettive antenne (due semidipoli orizzontali);
- valutazione risk assessment associato al tipo di operazione;
- definizione procedure ad hoc per l'esecuzione della missione specifica nelle operazioni di maintenance.

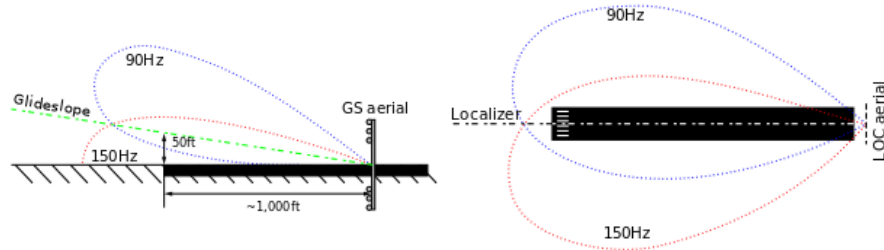
Come previsto dall'art. 32 comma 1, del Regolamento "Mezzi Aerei a Pilotaggio Remoto" Ed.2 del 16/07/2015 Em. 4 del 24/03/2017, le operazioni con l'APR già oggetto della precedente autorizzazione, ns. prot. n.31516 del 26/03/2018, con scadenza 30/06/2018, potranno essere svolte solo se è in corso di validità un'assicurazione concernente la responsabilità verso terzi e adeguata allo scopo.

sede legale: Viale Castro Pretorio, 118
sede operativa: Via Gasta, 3
00185 - Roma
centro: +39 06 445961
c.f. 07150380584
RNA

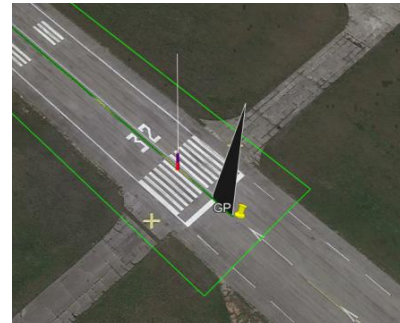
tel. +39 06 44596724
fax +39 06 44596611
navigabilita@enac.gov.it
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www.enac.gov.it

Experimental Project: Operational Scenarios

- ✓ Runway closed during UAV operations
- ✓ UAV operations take place in period of low activity
- ✓ Operations partly VLOS (segment close to pilot and observer) and partly EVLOS for more remote segment down the runway
- ✓ Speed will range from stationary hovering for the GP scenario to about 10 m/s for LOC scenario



A. Vertical flight profile to measure the ILS GP antenna

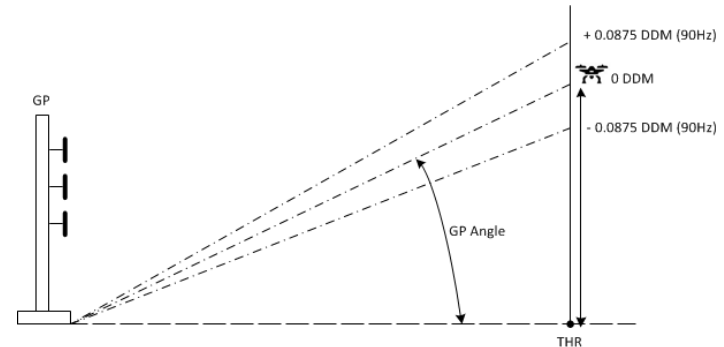
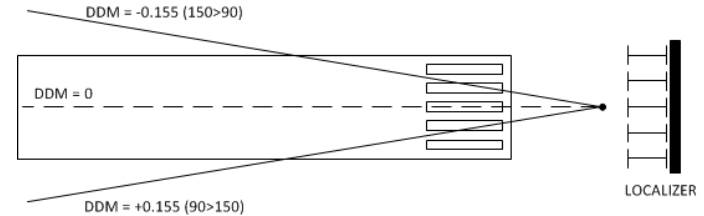


B. Horizontal flight profile along the runway centerline to measure the ILS LOC antenna



Experimental Project: Mission Objectives

- ❑ Dynamic analysis of Localizer, carried out across the runway axis at a constant speed and altitude, allows to analyse the magnitudes of interest
- ❑ Static analysis of the Localizer, carried out acquiring data in specific positions of the runway, allow to analyse the temporal stability of the magnitudes of interest
- ❑ Static and dynamic analysis of GP, carried out raising the drone to a predetermined altitude on a fixed point, allows to analyze DDM and its temporal stability at several altitudes of the runway perpendicular



Experimental Project: Flight Operations at Brescia Airport

Flight mission performed by
RPAS Techno Sky Operator

Purpose-Designed LOC and GP
measurement RPAS by Techno Sky



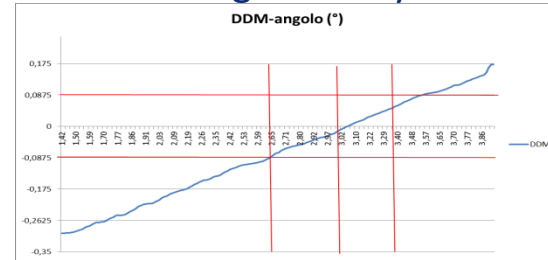
Measurement flights using drone
above the runway centeline in the
ILS localizer radiation field



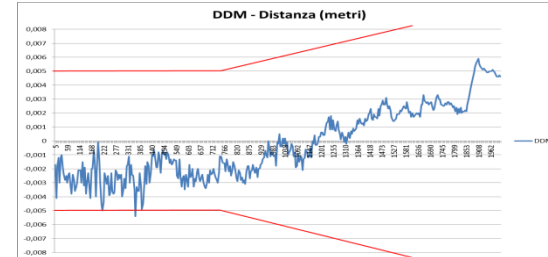
Experimental Project: RPAS Test Results

Ensuring that the ILS signal-in-space performs within the specified tolerances according to ICAO rules

GP Signal Analysis

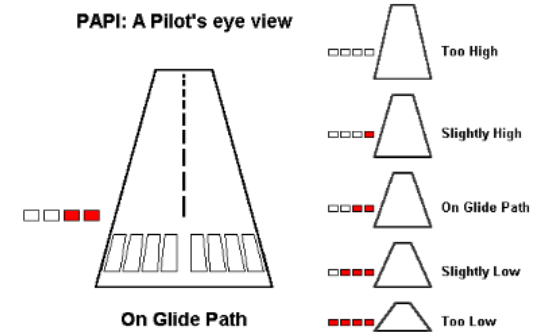


LOC Signal Analysis



RPAS for CNS Maintenance: Next Step...

- Testing the measurement flight in semi-circular patterns around the localizer
- Validation of ILS near-ground measurements by RPAS
- Testing drones for other applications (VOR, RADAR, PAPI)





TECHNO SKY SOLUTION WILL BE ALSO TESTED WITHIN THE U-SPACE DEMONSTRATOR DIODE

- DIODE aims to demonstrate how the implementation of the full set of the U-space services ensures a safe flow of drones that pursue specific business or recreational intents;
- Live demonstrations will take place in Rieti, a small province, close to Rome, known as "umbilicus italiae" with several different geographical situations, including rural, mountain and remote territories, industrial, urban and semiurban;
- These demonstrations will cover a wide range of operations: parcel delivery; road traffic patrol; professional photography; railway and power lines surveillance; search and rescue, **airport operations**; interaction with general aviation; and firefighting;
- DIODE is co-funded by SESAR JU (50% of its costs);
- Demonstrations will occur in summer 2019, final report by Q1/2020.



Questions?



Thank you for listening!

