



The **French-German Research Institute of Saint-Louis (ISL)** situated in the border triangle of Germany, France and Switzerland is an internationally renowned research institute belonging to a global industrial and economic network. The spectrum of our core activities comprises a variety of topics: aerodynamics, energetic and advanced materials, lasers and electromagnetic technologies, protection, security and situational awareness. Our activities are related to both basic and applied research.

ISL is offering a **PhD Position**

Research field: Flight dynamics, Control, Automatic control

Guidance and control for highly manoeuvrable drone interceptor



HESA Shahed-136 loitering munition (left), Raytheon Coyote Block II "missile-like" drone (middle), Anduril Roadrunner VTOL drone (right).

Contexte

Unmanned Aerial Vehicles and loitering ammunitions, also known as "suicide drones" pose significant challenges to the armed forces, as evidenced by recent conflicts. One example is the HESA Shahed 136, a low-cost, high-endurance loitering munition with a large payload capacity and precision strike capability. Current systems targeting short to medium range airborne threats mostly rely on legacy air defence system designs. These were developed to destroy combat aircraft or helicopters. As a result, their performance against combat drones is very poor and the costs are excessively high. On the other hand, gun-based systems offering cost-effective effectors have a limited range and low hit success rates. The worst-case scenario being a saturation attack by a swarm of low-cost UAVs.

To counter this rising threat, a fast and manoeuvrable interceptor is needed. The cost of such an interceptor should be kept to a minimum and it should be quickly deployable e.g. from light tactical vehicles. To meet this demand, ISL is currently working on a reusable Vertical Take-Off and Landing (VTOL) tailsitter interceptor that will be able to quickly climb to its ceiling and transition to cruise flight for interception or tail chase.

In the same time, ISL has demonstrated top-attack and impact-angle constrained manoeuvres against ground targets using low-cost UAVs. ISL has also developed a control design framework addressing the trade-off between actuator control effort, stability, and manoeuvrability.

Based on this research work, the goal of this PhD thesis is to contribute to the guidance and control system of the tailsitter drone interceptor. This involves leveraging reduced stability control and trajectory shaping guidance in order to maximize the manoeuvrability and flight path tracking capabilities. It includes study of the vertical take-off and landing, along with transitioning between hover and forward flight.

Candidate profile

- Master's degree in automatic control
- Experience in flight dynamics is advantageous
- Excellent command of English in speaking and writing
- Personal initiative, reliability, teamwork and communication skills

Benefits

- Ph.D. degree in the field of automatic control
- Multi-disciplinary experience
- Working in an international environment
- Competitive salary

Localization

The project is carried out in cooperation between the French-German Research Institute of Saint-Louis (ISL) and the University of Strasbourg

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