DRONE

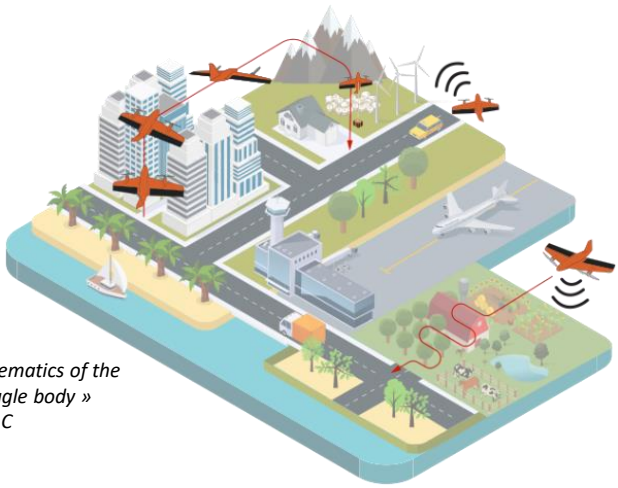
Model free control architecture for flight management of a convertible UAV

By placing itself in a variety of sectors, flying drones have seen their missions diversifying and complexifying. They are forced to perform long distance flights, combine hovering and advancing flight, operate in constraining environments, map areas or manipulate loads, all while improving their reliability.

So-called " toggle body1 " convertible drones effectively respond to these new challenges due to their design simplicity and their versatility, especially by combining hover and long endurance flight but also by taking off and landing in restricted areas.

DESCRIPTION*

- Software solution allowing **model-free control** of a convertible UAV, from hovering to forward flight
- Ability to maintain **stable and continuous transition flight** at a given angle even in the presence of external disturbances
- No identification of aerodynamic model nor actuators of the drone
- **One simple command law to implement** to enslave the entire flight envelope
- **Robust management of external disturbances** for vertical take-off and landing



[1]*Figure : Schematics of the donre « togggle body »*
Source : ENAC

TECHNICAL SPECIFICATIONS

Control architecture	- Model-Free Control (MFC) - Cascading position and speed loops - Real time calculation with a single control law
Structure variation robustness	< 50% of variations in weight, chord, wing surface and engine
Number of setting parameters	2 types to stabilize the flight envelope
Convertible drone comparison with known aerodynamic characteristics	In the presence of wind: - Transition angle error <3 ° - Speed of advance error <2 m / s

*Technology under license.

TOULOUSE TECH TRANSFER

COMPETITIVE ADVANTAGES

- Fast and inexpensive implementation (no digital model)
- Tolerant to material evolutions: payload, structure, engine...
- Low computing power consumption
- Full control of his flight outside the classic flight phases (hover and flat advance)
- Robustness to external disturbances
- Take off and landing in restricted areas
- Engine Failure Management

APPLICATIONS

- Logistics
- Mapping
- Monitoring
- Surveying / Meteorology
- Pruning
- Defence

INTELLECTUAL PROPERTY

- Patent application submitted
- Software protected by APP

DEVELOPMENT STAGE

- Experimental proof of concept

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LABORATORIES

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