MA^{3}V

Micro Autonomous Aero-Amphibious Vehicle

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Design objectives of an MAV using Bionic

The **micro air vehicle** (MAV) business has boomed in recent years, making them available to a wide range of persons and purposes such as surveillance, delivery of goods, mapping, and many more. Our business realized the potential of MAVs and intends to provide a **multirole surveillance drone** capable of effortlessly transitioning between **air** and **water** by exploiting **bionic** principles.

environemental factors

Echolocation

Regardless of terrain or visibility, **Bats** and **Whales** use **echolocation** to overcome certain commonplace obstacles.

1. Echolocation helps the MAV **navigate** and **avoid** obstacle in both water and air

2. **ultrasounds** allows for **communication** underwater

Air to Water Transition

Two traits are modeled after the **Kingfisher**, which has mastered **high-speed diving**:

1. The MAV slender **hydrodynamic design** helps with **breaching** the water at **high speeds**.

2. **Wings** and **propellers** are **collapsible** to further increase hydrodynamicity.

Hydrophobic coating

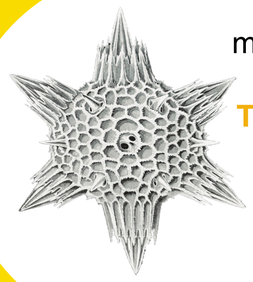
Vision and behaviour

Bees are interesting animals, and our innovative technology is eager to learn from them.

1. Our device, like bees, uses **compound vision cameras** to analyse and gather information from its surroundings.

2. Thanks to **emergent behavior AI**, several MAVs can collaborate and behave as a **swarm**.

Structural design



The drone's **3D printed** frame is modeled like marine organisms like **Sponges** and **Diatomea**.

Topological optimization, a novel technique, guarantees a **lightweight** but **sturdy** construction with insulation capabilities that shield delicate gear from impacts.

Defense mechanism

like a **Fugu** fish or the **Hooded Pitohui**, our MAV is coated with a **non lethal toxin** that is supposed to deter and protect against predators.

Underwater motility

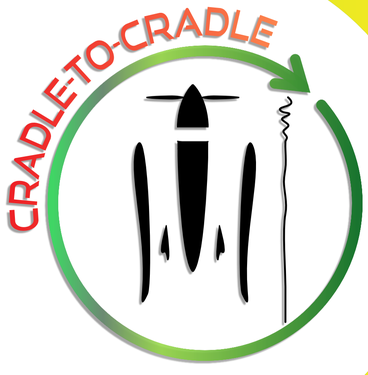
Similar to the **Anacondas** in the Amazonian Basin or certain **microorganisms** with their **flagellum**, while underwater the drone is **propelled by its tail**.

It can push itself and travel in 3D underwater space when agitated.

In flight, the tails serve as an **antenna** for RF transmissions and communications.

Circular Economy

Innovation through **biomimicry**, applied lifes principles, and all other techniques are incomplete without attempting **zero waste production** and developing a **cradle-to-cradle** product.



- The hull, propeller, and topologically optimized structure will be made from a 3D-printable **biodegradable** material, BiomeHTX.

- The components will be **modular** so that they can be replaced in the event of problems and fed into a new lifecycle.

- The electronics will be supplied protected so that they can be **recycled** back into the technical cycle.

What's next ?

This MAV prototype concept was developed over the last few months with the goal of learning as much as possible **from and about Nature**. Of course, this is merely the first of many revisions required to develop a **working prototype**.

The following are the most essential **takeaways**:

- **Structural integrity** and the transition from **air to water** do not need to be reinvented.

- The deployment of an MAV using a **cradle-to-cradle** strategy is within the realm of possibility.

Of course, there are still certain details to be worked out:

- What is the **source of energy**?

- What are the **data storage** options?

- How might a **transport function** be realized?

- Where could an MAV's **enlarged applicability areas** be?

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