

# Bio-inspired flying robots for inspection and manufacturing



Building  
Manufacturing

Infrastructure  
Diagnostics and Repair

Underwater  
Inspection

# Aerial Additive Building Manufacturing

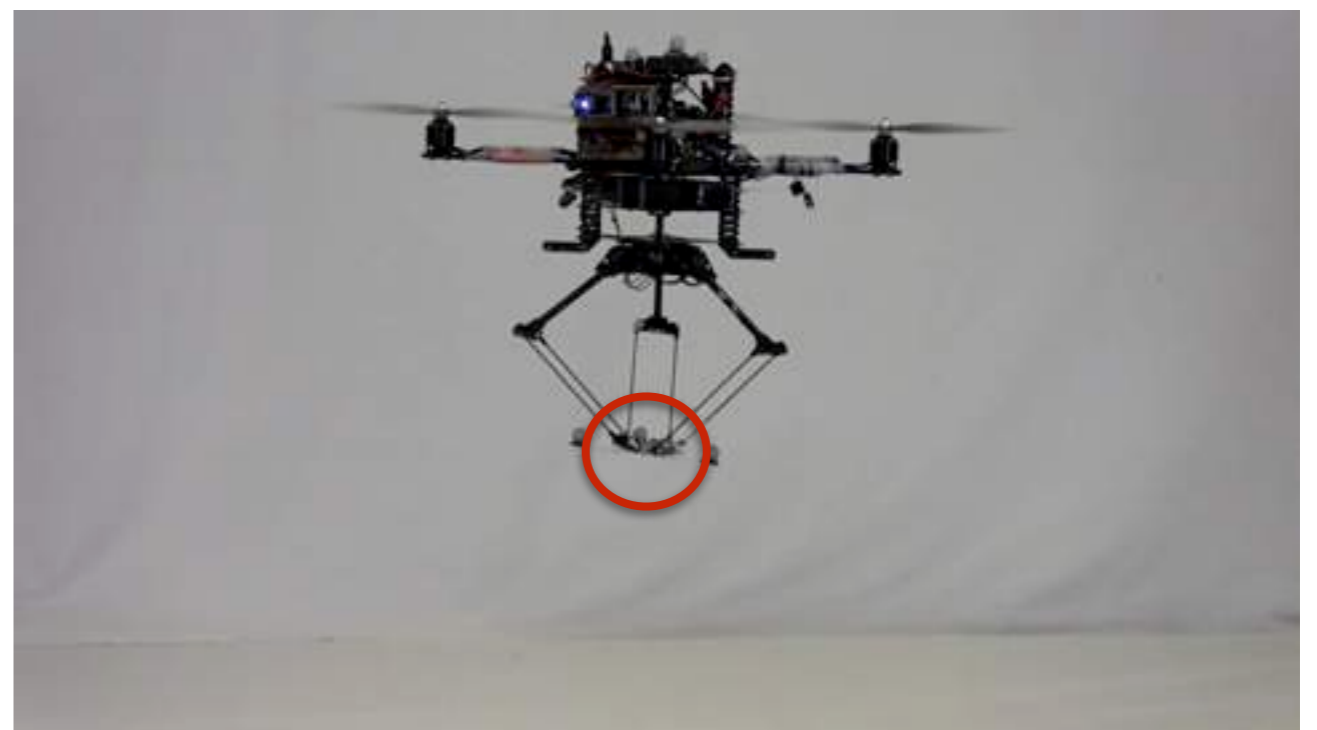
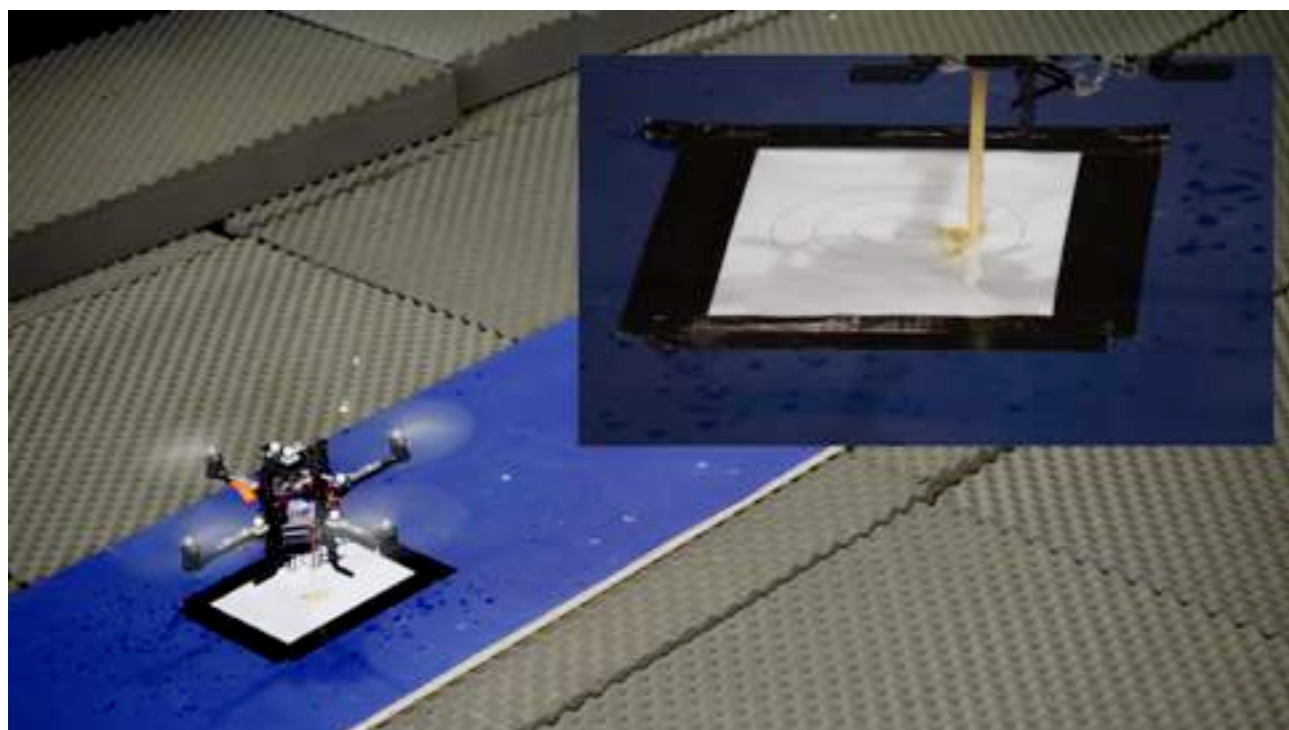
## 3D Printed Construction with a Swarm of Aerial Robots



- Inspired by the way how animals (birds, bees, spiders ...) build structures
- Deployment of tensile elements and autonomous deposition of amorphous materials
- Localisation and mapping
- In flight stabilisation with delta arm

£3.4m, 2016-2020. PI: M. Kovac (Imperial), Co-Is: R. Stuart-Smith (UCL and AA), V. Pawar (UCL), S. Leutenegger (Imperial, Comp), R. Ball (U. Bath)

<http://www.aerial-abm.com>



# Aerial robots to detect faults, and perform smart repairs

## Buildrone



- Deposition of amorphous materials
- In flight stabilisation with delta arm
- Pipeline repair



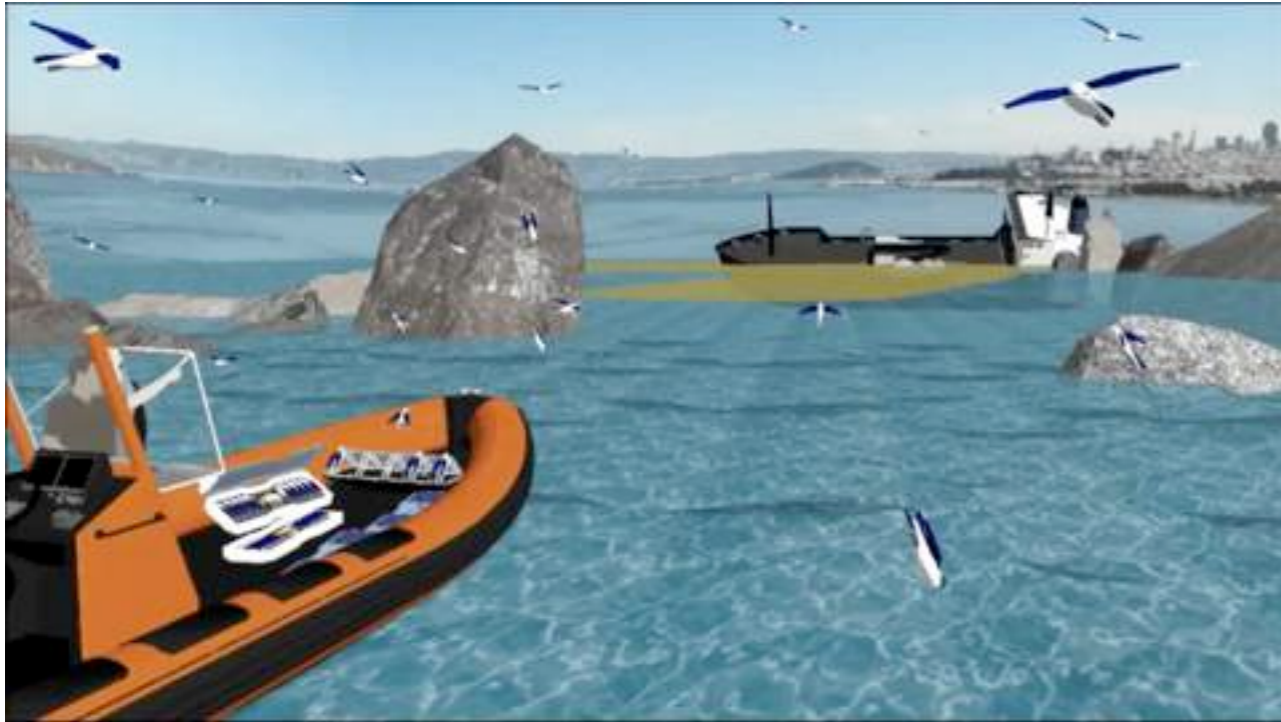
## SpiderDrone



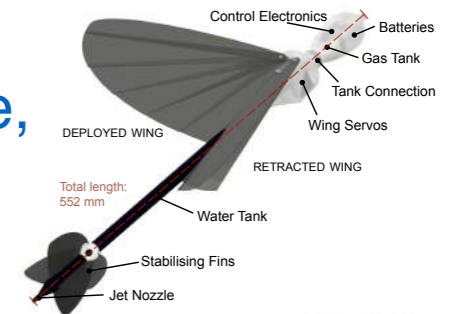
- String-based perching
- Adaptive anchoring
- Dynamic movement
- Sensor placement
- Precise infrastructure inspection



# Aquatic Micro-Aerial Vehicles for underwater inspection



- Inspired to aerial-aquatic animals such as flying fish, diving birds and gliding squids
- Aerial-aquatic mobility: multi-modal locomotion and sensing in unstructured environments
- Distributed water quality monitoring, search and rescue, disaster scene assessment, underwater exploration



# Research Team and Partners



**Team covers expertise in mechatronics, bioinspired design, embedded control, fluidics/structures. Research and development activities are in collaboration with national and international partners from academia and industry.**

Total funding:

- Research: £4m in external research funding + 9PhD studentships
- Equipment and facilities: £1.28m as PI and £4.5m as Co-I
- Network: £772k for network activities in US, EU and within Imperial College

# Aerial Robotics at Imperial College

## Multi-Terrain Flight Lab



Air/ground/water test areas  
-12m long, 10m wide 5.7m high  
- integrated workshops, meeting rooms and student spaces

## Extreme weather flight arena Imperial Robotics Forum



Aerial Robotics Test Section  
-12m long, 5.7m x 3.5m cross section  
- Top speed 13m/s  
- 17 Wind/water tunnels

- >35 PIs + >150 researchers
- Autonomous systems
  - Service and vehicle robotics
  - Healthcare and assistive robotics
  - Perception and cognitive robotics

[www.imperial.ac.uk/robotics](http://www.imperial.ac.uk/robotics)



# Thank you!

Aerial Robotics | Imperial College  
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<https://www.imperial.ac.uk/aerial-robotics>