# PA - Evaluation of draft, waterline and spray using image processing and AI workflow

## Context and Objectives

The development and testing of seaplanes, particularly high-performance scooper aircraft like the FF72 (derived from the ATR 72), require precise understanding and characterization of the hull-water interaction. Key parameters such as draft (submerged depth), waterline position, and spray characteristics significantly impact hydrodynamic performance, stability, and aircraft structure (e.g., fatigue from water impacts).

Currently, these parameters are often assessed using visual observation, manual measurement, or basic instrumentation during water basin tests or flight tests. These methods can be time-consuming, subjective, and limited in their ability to capture dynamic, high-speed events, especially the complex patterns of water spray.

This project aims to develop a modern, automated workflow using advanced image processing and Artificial Intelligence (AI)/Machine Learning (ML) techniques to accurately and efficiently evaluate draft, waterline, and spray characteristics from video or high-speed photographic data acquired during testing.

## Key Objectives:

During the 6 month internship period, the candidate will address the following objectives:

1. **Literature Review and State-of-the-Art:** Research existing image processing, computer vision, and AI/ML techniques relevant to water surface detection, object segmentation (specifically of the aircraft hull, water, and spray), and motion tracking in complex fluid environments.
2. **Algorithm Development for Draft and Waterline:** Develop and implement algorithms (e.g., edge detection, segmentation models) to precisely identify and track the static and dynamic waterline on the aircraft hull/float from image sequences, allowing for accurate real-time draft calculation.
3. **Spray Characterization Workflow:** Establish an automated methodology for characterizing water spray, including parameters such as spray height, width, distribution pattern, and droplet velocity estimation (if feasible with available data). This will likely involve advanced segmentation and tracking techniques.
4. **Proof-of-Concept Implementation:** Implement the developed algorithms into a functional prototype workflow (e.g., using Python libraries like OpenCV, TensorFlow/PyTorch) and validate its performance against existing measurement methods using available test data.

## Required Skills

- Major in Computer Science, Image Processing, or Electrical Engineering.

- Proficiency in programming languages essential for data science and computer vision (e.g., Python, with libraries like OpenCV, NumPy, and ideally a ML framework like TensorFlow or PyTorch).
- Familiarity with fundamental concepts of fluid dynamics and/or hydrodynamics is a plus.
- Ability to work autonomously and demonstrate strong analytical skills.

## Expected Outcome

The successful completion of this internship will result in:

1. A comprehensive review detailing the applicability of computer vision and AI techniques to seaplane hydrodynamic testing.
2. A functional, documented software prototype (Python workflow) capable of autonomously processing test imagery to determine dynamic draft, waterline position, and key spray characteristics.
3. A final report summarizing the methodology, results, validation, and recommendations for integrating this workflow into Positive Aviation's test and evaluation process.

## Contact

Interested candidates are encouraged to submit their CV and a brief cover letter to jonathan.beck@positive-aviation.com for consideration.