

# KI4Flight: Dataset for Drone-based Object Detection of Light and Ultralight Aircraft

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## Abstract

This document provides an overview of the “KI4Flight: Dataset for Drone-based Object Detection of Light and Ultralight Aircraft” dataset, an open-source dataset designed to train perception algorithms to detect light and ultralight aircraft. The dataset consists of images showing different light and ultralight aircraft, captured both in-flight by a drone and on the ground by stationary cameras. All images are annotated with bounding boxes. For some of the images, the distance from the camera to the aircraft is also provided. This work describes the structure of the dataset, its usage, potential applications, and licensing terms.

## 1 Introduction

The “KI4Flight: Dataset for Drone-based Object Detection of Light and Ultralight Aircraft” is a publicly available dataset that represents training data for detecting light and ultralight aircraft. The dataset consists of images that are pre-labeled by bounding boxes. Further, for some images the distance to the aircraft is also provided. The dataset can be accessed here:

<https://doi.org/10.5281/zenodo.14258778>

Some of the figures in the dataset are depicted in Figure 1. Two different on-board cameras and two different on-ground cameras are used. The images show flights of two aircraft: a gyrocopter and an airplane. The labels within the dataset are: gyrocopter, airplane, person, car, and drone.



(a) The on-ground image shows a car, a person, and a landing gyrocopter.



(b) The on-ground image shows a hovering drone and a gyrocopter.



(c) The in-air image shows an airplane and a car.



(d) The in-air image shows a gyrocopter flying by.



(e) The in-air images shows a landing airplane.



(f) Static camera image that shows an gyrocopter.

Figure 1: The subfigures show the different categories of labels in the dataset: airplane, drone, person, car, and gyrocopter. Figure 1a is taken by a phone, Figure 1b, 1d, 1e is taken by a flying drone's on-board camera, and Figure 1c is taken by another on-board camera, and Figure 1f is taken by a static-elevated camera that can be seen in Figure 1a next to the person.

## 2 Dataset Description

The dataset shows:

- **Aircraft:**
  - Cessna 172 labeled as airplane
  - AutoGyro MTOsport labeled as gyrocopter
- **Total number labeled images:** 874
- **Labels:** Airplane, gyrocopter, person, car, and drone
- **Distances:** The distance between the static camera and the aircraft is provided.
- **Cameras:**
  - on-ground: static-elevated 4k camera (3840px width, 2160px height)
  - on-ground: phone camera (1920px, 1080px)
  - on-board: two 4k cameras (3840px width, 2160px height, 1x200° and 1x67° field of view)
- **Three flights:**
  - First flight is a low-altitude gyrocopter flight with varying altitudes and turning points.
  - Second flight is a low-altitude airplane flight with varying altitudes and turning points.
  - Last, another low-altitude gyrocopter flight with the recording drone close to ground.

The “KI4Flight\_public\_dataset” folder is structured as follows:

- **in\_air/ :** Consists of images that are taken in air.
  - **cam\_0/**
    - \* **flight\_1/ :** Images of the first flight.
    - \* **flight\_2/ :** Images of the second flight.
    - \* **flight\_3/ :** Images of the last flight.
  - **cam\_1/**
    - \* **flight\_1/ :** Images of the first flight.
    - \* **flight\_2/ :** Images of the second flight.
    - \* **flight\_3/ :** Images of the last flight.

- `on_ground/` : Consists of images that are taken from the ground.
  - `phone/` : Consists of images that are taken by a phone.
  - `static/` : Consists of images that are taken by a static camera.
    - \* `flight_3/` : Images of the last flight.
    - \* `slope_distances.csv`: Provides distances between the static camera and the aircraft for each frame.
- `boundingboxes.json`: JSON-file that provides categories, filepaths, and bounding box information.
- `displayImages.py`: Python script that allows to inspect images as in Figure 1.

Please contact us, if further details or data are of interest.

### 3 How to Use

The script `displayImages.py` provides information on how to extract information. It first loads the `boundingboxes.json` file (Line 9-17) and then shows the individual images (Line 70-110). It also provides buttons to skip to the next (Line 27-30, 41-46) or the previous image (Line 31-34, 48-53) as well as a textbox to jump to individual images (Line 35-38, 55-67).

### 4 Licensing and Attribution

This dataset is licensed under <https://creativecommons.org/licenses/by/4.0/>. Users are required to attribute the dataset in any derived work as follows:

KI4Flight Dataset, created by Spleenlab&DLR.  
Available at <https://doi.org/10.5281/zenodo.14258778>

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