Drone Hardware Analysis - BAE Systems

Team Search And Rescue Swarm (SARS)

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**Parrot Anafi** ($699.99)

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| Pros | Cons |
| * Extensive SDK support in Python * Additional iOS and Android Ground SDKs * Sphinx flight simulator with Python SDK support * Existing, active developer forums * Communication over WiFi * 21MP, 4K Camera module * GPS Module * 25 Minute flight time * 4 Km range with SkyController | * No onboard compute * No automatic obstacle avoidance * Each drone requires SkyController for full 4 Km range |

The Parrot Anafi has a well documented SDK that supports Python, iOS, and Android along with supporting developer forums. Developing for this platform will not have a steep learning curve because of the existing documentation. The Anafi does not have onboard computing and would require one offboard computer per drone. The SkyController is not necessary to develop the application, but will allow for the drone system to cover a larger range. We believe this is the best choice because of the existing documentation and support, as well as the simulation software that would allow for development without a physical drone.

[More Information](https://www.parrot.com/us/drones/anafi)

[Purchase](https://www.bestbuy.com/site/parrot-anafi-4k-quadcopter-with-remote-controller-black/6251616.p?skuId=6251616)

**DJI Mavic Air 2** ($799.99)

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| Pros | Cons |
| * Automatic obstacle avoidance * 10 Km native range * 12MP Camera module * 34 Minute flight time | * No onboard compute * Communication over proprietary radio signals * Unreleased SDK, set for late 2020 |

The DJI Mavic Air 2 has excellent specs for getting high quality images and staying in the air for extended periods of time. The automatic obstacle avoidance is a major advantage to picking this drone. However without an SDK, there is no way to communicate with the Mavic Air 2 without using the proprietary DJI controllers. While a backend could still be developed, there is no way to validate the software is working properly. We also would have to accept the risk of the SDK never releasing which would significantly impact development.

[More Information](https://www.dji.com/mavic-air-2?site=brandsite&from=nav)

[Purchase](https://store.dji.com/product/mavic-air-2?vid=91071)

**DJI Mavic 2 Pro** ($1,599.00)

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| Pros | Cons |
| * Windows SDK using .NET app * Existing, active developer forums * Obstacle avoidance in every direction * 10 Km native range * 20MP Camera module * 31 Minute flight time | * No onboard compute * High cost * No software simulation environment * Communication over proprietary radio signals |

The DJI Mavic 2 Pro uses the SDK that is currently unsupported for the DJI Mavic Air 2. The native Windows documentation is lacking, but there are active forums that would help to support development. This model still does not have onboard compute, and would require one controller per drone being controlled. Another downside is the lack of a software simulation environment, which would require all testing to be done on a live drone. Overall the Mavic 2 Pro is an excellent choice for this project, but there would be more time required to get the drone up and running as a result of the smaller documentation set and proprietary communication standard.

[More Information](https://www.dji.com/mavic-2)

[Purchase](https://store.dji.com/product/mavic-2?site=brandsite&from=buy_now_bar)

**Ryze Tech Tello** ($99.99)

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| Pros | Cons |
| * Low cost * Simple WiFi communication using UDP commands * Well documented SDK * Mechanical collision detection * Good flight time for size, 13 minutes * 5MP Camera module | * No onboard compute * Low range, only 100m * Poor performance in wind * Designed primarily for indoor applications * Cannot control more than one |

The Ryze Tech Tello would be perfect for a smaller project, but falls short for the scope of this. The biggest shortcomings are the small range, and the inability for more than one drone controlled at a time. All Tello drones use the same IP for the UDP server, so it is not possible to send commands to a single drone. While the cost and SDK are impressive, the Tello is not the drone for this job.

[More Information](https://www.ryzerobotics.com/tello)

[Purchase](https://store.dji.com/product/tello?vid=38421)

**DJI Matrice 210** (~$6,500.00)

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| Pros | Cons |
| * Directly supports onboard compute * Onboard SDK using Linux * Windows SDK using .NET app * Existing, active developer forums * Obstacle avoidance in every direction * 7 Km native range * 38 minute flight time * Support up to 2 Kg payload | * High cost * Onboard computer is separate, not included * No software simulation environment * Must call to order |

The DJI Matrice 210 includes support for an onboard computer that can be their proprietary Manifold computers or any small Linux machine, like a raspberry pi with the proper adapter. Using a raspberry pi, additional features could be supported like cross-drone communications. This is an excellent candidate for the project, but falls short with a high price tag. DJI also does not have a software simulator so all testing would be on a live drone. This would be a high risk, high reward solution as a mesh drone network would create a theoretically infinite range.

[More Information](https://www.dji.com/matrice-200-series)

[Purchase](https://www.dji.com/matrice-200-series#m200s-s6)

**Crazyflie 2.1** ($195)

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| Pros | Cons |
| * Open source firmware   + Onboard compute is possible * Ground SDK (Python) * Cheap | * Does not appear to have native camera or GPS (must be installed separately) * Max 7 minute flight time with standard battery * Onboard compute is very limited   + Would be working with KBs of memory * Limited to 1 km radio range line-of-sight * Drone-to-drone communication capabilities unclear |

While the Crazyflie 2.1 would support our desire for onboard compute with a relatively low price, it does so in a *very* limited capacity. Aside from this, its biggest shortcomings are short flight time and lack of native GPS/Camera hardware that our software would need. We assess that working around these limitations would be too high-risk.

[More Information](https://www.bitcraze.io/products/crazyflie-2-1/)

[Purchase](https://store.bitcraze.io/products/crazyflie-2-1)