Final Design Cuts

**Overview**: In this document, preliminary designs that were downselected, and approved in the Feasibility Studies, thus, constituting designs that made the final design cut, will be presented.

**Camera**

1. **Arducam SKU B0240 IMX477 HQ Camera Model**
   1. Pros
      1. Small
      2. Module has 4-lane MIPI CSI-2 interface for quick data transfer
      3. Compatible with all Raspberry Pi models
      4. High frame capture rate (60 fps)
      5. Acceptable Field of View (65 degrees)
      6. High resolution (12.3 Mpx)
   2. Cons
      1. Untested camera
      2. Relatively heavy (70 g)
      3. Not sure if it can capture video

**Preliminary Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| Type of Interface Output Terminals |  |
| Operating Resolution (5 Mpx) |  |
| Frame Capture Rate (20 fps) |  |
| Field of View |  |
| Total Weight |  |
| Physical Length Dimensions |  |
| Available Documentation |  |
| Swath Width |  |

**Critical Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| Type of Interface Output Terminals |  |
| Operating Resolution Range (5 Mpx) |  |
| Frame Capture Rate (20 fps) |  |
| Field of View |  |
| Swath Width |  |

**Co-Processor**

1. **Raspberry Pi Model 4**
   1. Pros
      1. Plenty of documentation
      2. Light
      3. Sufficient processing/RAM

**Preliminary Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| Power Supply Voltage (5 V) |  |
| Compatible with USB and/or HDMI connection |  |
| Transmission Speed to/from autopilot | ? |
| CPU Frequency (Clock Time) (1 GHz) |  |
| CPU RAM (4 GB) |  |
| Total Weight |  |
| Physical Length Dimensions |  |
| Available Documentation |  |

**Critical Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| Power Supply Voltage (5 V) |  |
| CPU Frequency (Clock Time) (1 GHz) |  |
| CPU RAM (4 GB) |  |

**ATR System**

1. **OpenCV**
   1. Pros
      1. Easy to interact with and set up
      2. Can use photos, movies, and live feed as potential inputs
   2. Cons
      1. Training process using machine learning requires accurate initial photos/videos

**Preliminary Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| CPU Memory Needed (4 GB) |  |
| Direct Access to Camera to Acquire Image/Video Feed |  |
| Ability to detect targets |  |
| Ability to distinguish between smiley & frowny faces |  |
| Available Documentation |  |

**Critical Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| CPU Memory Needed (4 GB) |  |
| Ability to detect targets |  |
| Ability to distinguish between smiley & frowny faces |  |

1. **RGB Based Recognition**
   1. Pro
      1. Very simple to detect which of the blue tarps have contain the TOI’s due to color contrast of the tarps and target against the field
   2. Cons
      1. Difficult to discern the face of each TOI as they are both the same color

**Preliminary Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| CPU Memory Needed (4 GB) |  |
| Direct Access to Camera to Acquire Image/Video Feed |  |
| Ability to detect targets (TBR) |  |
| Ability to distinguish between smiley & frowny faces (TBR) |  |
| Available Documentation |  |

**Critical Criteria Check**

| **Criteria** | **Criteria Satisfied?** |
| --- | --- |
| CPU Memory Needed (4 GB) |  |
| Ability to detect targets |  |
| Ability to distinguish between smiley & frowny faces |  |