**NPS BUDGET JUSTIFICATION**

**BUDGET NARRATIVE**

Personnel and Work Effort; please see the NASA\_SSAT\_NPSBudget.xlc spreadsheet attached.

|  |  |
| --- | --- |
| **Senior Personnel (6)** | **Work Effort per Year** |
| Co-I: Isaac Kaminer, Professor | 10% of 12-month Calendar Year |
| Co-I: Vlad Dobrokhodov, Assoc. Professor | 25% of 12-month Calendar Year |
| Co-I: Kevin Jones, Assoc. Professor | 25% of 12-month Calendar Year |

**Personnel responsibilities:**

*Isaac I. Kaminer*, Ph.D. - Professor in Mechanical & Aerospace Engineering will provide consultation on control algorithm development as needed.

*Vladimir N. Dobrokhodov*, Ph.D. - Research Associate Professor in Mechanical & Aerospace Engineering will supervise software development and integration of the analytical code into the unified separation assurance environment, supervise software simulation and hardware-in-the-loop simulation validations prior to live-flight operations, and supervise ground-control-station functions during flight. He will also work on modeling and integration of the low-connectivity conditions to the secondary flight controller system to provide a documented framework for importing 3rd-party navigation code while assuring flight-system safety in degraded modes.

*Kevin D. Jones*, Ph.D. - Research Associate Professor in Mechanical & Aerospace Engineering will supervise aerial platform modifications, sensor integration and all flight operations. He will also coordinate safety-of-flight procedures included in the secondary controller development.

**Benefits:**

Fringe Benefits are calculated on labor at 45%. Indirect cost rate is $26.24 per labor hour.

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**Other Direct Costs**

1. **Subcontracts/subawards $0**

Not applicable

1. **Consultants $0**

Not applicable

1. **Facilities and Equipment $7600**
2. **Existing Facilities and Equipment**

*Facilities*

During the last year of research a set of representative scenarios will be developed that can be tested using high fidelity hardware-in- the-loop simulations and flight tests utilizing advanced capabilities which are available at NPS and NASA facilities. The separation assurance bounds will be investigated during comprehensive flight-testing by using different autopilots and UAVs instrumented with advanced Real-Time (RT) control capability. NPS operates a restricted airspace facility suitable for real-flight validation and verification. The facility is located at the Mc Millan airfield in Camp Roberts, CA(90 miles south of Monterey, CA).

Total expenses of $7600 per year is allocated to cover:

* Four 2-day flight operations per year (8 units of $700 each, see budget spreadsheet) - $5600- to cover the dedicated range time.
* Each experiment includes expendable supplies (gas, oil for the airplane engines) and transportation, ~$500 per person per trip. -4x$500=$2000

Additional flight-test opportunities may arise at no additional cost, but with constraints.

1. **Capital Equipment to be purchased $0**

Not applicable

1. **Materials and Supplies $0**

Not applicable

1. **Programmatic Travel (3 years budget) $29208**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **From Monterey, CA to domestic NASA Selected site** | | | | | | | |  |  |  |  |  |
| **Purpose: NASA technical meetings per solicitation** | | | | | | |  |  |  |  |  |  |
| **2 times per year for duration of 3-year project** | | | | | |  |  |  |  |  |  |  |
| # of Days | Conf Fees | Air Fare | Incidentals | Hotel | Meal Per Diem | # of Travelers | | 1 rental Car, parking, fuel | | **Subtotal per year (2 trips)** | | **Total:** 2 times a year for 3 years |
| 3 | N/A | 900 | 120 | 220 | 96 | x | 2 | + | 453 | 6,250 | | **18,750** |
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| **From Monetery, CA to domestic unknown destination** | | | | | | | |  |  |  |  |  |
| **Purpose: to present the results in AIAA Guidance, Navigation and Control conference** | | | | | | | | | | | | |
| **1 time during project** | | |  |  |  |  |  |  |  |  |  |  |
| # of Days | Conf Fees | Air Fare | Incidentals | Hotel | Meal Per Diem | # of Travelers | | 1 rental Car, parking, fuel | | **Subtotal per year (1 trip)** | | **Total:** 1 time a year for 3 years |
| 4 | 460 | 900 | 160 | 330 | 128 | x | 2 | + | 450 | 3,486 | | **10,458** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | **Grand total all Travel** | | |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | **$ 29,208** | |

1. **Other**
2. **Publication Costs $1000**

Funds budgeted for publication costs include the estimated cost of preparing, publishing, and dissemination of project results. Cost estimates are based upon previous purchase for same or similar items.

**Total project cost for the first year is estimated at $ 149,206.12**