Assigned Proposal Number: ___

Director's Research and Development Fund Proposal FY 2006
Due Date: Friday, March 24, 2006 by 5 pm PST

1. Title

Design Study for JPL-Dartmouth Sounding Rocket Payload

2. Principal Investigator - include only one JPL PI (First Last) - Org./Affiliation

Anthony Mannucci – 335G/JPL

3. Co-Investigators (First Last) - Org./Affiliation

Kristina Lynch - Dartmouth College
Karl Yee – 3841/JPL
Xiaoyan Zhou - 3263/JPL

4. Budget

New Proposal [X]
FY06: $35.4K

Approved Renewal [ ]
FY04:
FY05:
FY06:

5. Technology Readiness Levels (if applicable)
Starting TRL (1-9): na
Anticipated TRL (1-9): na

6. Check box if **Off-Lab** Field Work/Testing Required [ ]

7a. General Objectives: (Clearly and concisely state the proposal objectives and goals and what are the expected deliverables/products of the proposed work.)

The objective of this proposal is to develop a design study for an auroral sounding rocket experiment. The deliverable will be a report on the feasibility of such a design.

7b. Quantitative Objectives: 1) Discuss quantitative capability goal of proposal. 2) Compare with current capability both at JPL and outside JPL

(1) The goal is to initiate a design study that could lead to a joint proposal for an auroral sounding rocket.

(2) Current capabilities are in the areas of scientific experience at JPL as well as at Dartmouth with auroral experiments, and engineering capabilities to design the needed hardware.

8. Approach: Describe how you plan to achieve your objectives. Give specific tasks and milestones that will be accomplished.

Design Study for JPL-Dartmouth Sounding Rocket Payload.

We propose to use this seed money to initiate a design study that would lead to a NASA sounding rocket proposal from Dartmouth and JPL. Our sounding rocket group (Dartmouth, Cornell, UNH, UAF/GI) has worked with JPL teams in the past on similar projects (the ``hockey-puck'' rocket in 1999 with Ray Goldstein, the MEMS gyro flight this winter with K Yee), and there is much to be gained from collaborations between JPL and the rocket program. As a starting point we would like to consider the development of small low-resource sensorcraft that could carry a plasma density probe (such as a Langmuir probe or a retarding potential analyzer), a GPS (for positioning), and a magnetometer (for science and attitude.) If these could be made small enough that up to 10 of them could be thrown from a sounding rocket platform, it would be extremely interesting to deploy them over the AMISR radar at Poker during an auroral event. There are some interesting wave modes that may be related to or caused by density structures (NEIALs in the radar community, possibly the same as BBELF activity in the in-situ community) that are related to auroral ion outflow and upflow.

During the design study phase funded by this effort, we would investigate the feasibility of such a sensorcraft; optimize plans for power and telemetry; discuss any new instrumentation or subsystems that JPL may want to try out on such a mission; and pull together a team that would commit to contributing to such a rocket proposal. My expectation would be that the academic groups would provide the instrumentation, and JPL would take the lead on power and TM systems. Two particular instrumentation concerns would be (a) magnetic cleanliness and the science magnetometer measurements, and (b) spacecraft charging and the thermal particle density measurements. Initial studies that would need to be made would be magnetic cleanliness testing of a prototype (which could be done at the WFF facility), and thermal plasma measurements with a source (which could be done at our facility at Dartmouth.) How much experimental testing of prototypes could be done with the available funding at present is questionable, but the design study would be set up to lead towards this goal.

Another potential collaboration between our auroral group and JPL is with Dr Zhou's imaging program. The science goals here are similar but the approach (ground based camera imaging) is very different. However, both of our groups are involved in both projects, and we can dedicate some effort to furthering this collaboration as well. To this end, graduate student R Michell from Dartmouth will be at Poker this winter during the moon-down campaign, and can work with Dr Zhou in collecting and interpreting auroral image data.

The attached budget requests funding for a Dartmouth engineer (Kevin Rhoads), the PI (Kristina Lynch), a graduate student (R Michell), and travel for the student. Funding is also requested to enable JPL engineers and scientists to contribute to the design.

9. For Approved Renewal Proposals Only: Discuss the specific accomplishments you achieved in FY04 and/or FY05 and why you need further work.

Na

10. Describe the innovative features of this proposal. Specify if this proposed work is a natural evolution advancement or a major breakthrough.

This project is for the design of a highly innovative experimental rocket payload that would eject numerous small measuring instruments directly into an active aurora in order to measure the auroral properties in situ; such an experiment would be a major breakthrough if carried to completion.

11. Contribution of External Investigators. What strengths do the team members bring to the proposal?

Strong experience in field measurements of auroras.

12. Significance and impact of results on JPL missions and programs

Advances in JPL capabilities in Earth Science and Sun-Earth connections, and future Earth missions.

13. Has the proposal been submitted elsewhere? If yes explain

no

14. Institutional Partnerships – describe

Dartmouth is a Strategic Partner with JPL. The MOU setting up this partnership was signed in January 2007.

15. Plans for follow-on funding

The project expects to apply for follow-on funding for FY 2008.

16. Budget - Please fill out the budget sheet below. Contact your Section Administrator or Business Administration Manager for current FY07 rates and assistance in filling out the form.

17. JPL PI Division Manager Approval Signature
Name: Kent Kellogg Org: 3300

18. External Affiliation Signature:
Name: Christine Bothe (see attached memorandum) Org: Dartmouth College

19. JPL Principal Investigator Signature
Name: Anthony Mannucci Org: 335G

20. External co-Principal Investigator Signature
Name: Kristina Lynch Org: Dartmouth College

Budget Sheet

Category	**AT JPL**	**AT EXTERNAL INSTITUTION(S)**
DIRECT COST		
1. Salaries *(Itemize) (Only "itemize" the person names or job classifications and the number of hours for each. You can show one total $ salary figure for labor.)*	Sr. Engineer: 14 hours Total Labor Cost: $0.90K	Lynch: 0.5 month Rhoads: 1.0 month Mitchell: 1.2 month Total Labor Cost: $17.26K
2. Labor Fringe Rates - Employee Benefits	$0.45K	
3. Cat A Labor (Itemize) *(Only "itemize" the person names or job classifications and the number of hours for each. You can show one total $ figure for labor.)*		
4. Procurements –Equipment, Materials and Supplies (Itemize). JPL - Do not list the contracts for outside collaborators. This total is on line #12 on the external collaborator column.		
5. Procurements – Subcontracts (PS – contracts other than with collaborators) (Itemize)		
6. Services – (Itemize) (JPL be sure to include in-house services at JPL)		
7. Domestic Travel *(only as a research cost; and domestic conference travel is allowed up to a maximum 5% of the total budget*) Itemize with what and where the travel is required.		$1.5K Two weeks at Alaska or JPL.
8. Other (Itemize) *(Chargebacks, etc.)*	Chargebacks: $0K	
9. Total Direct Costs (total of dollars 1 through 8)	$1.35K	$18.76K
10. ALLOCATED DIRECT COSTS (ADC)	$4.1K	
ADC **FY07** - See Section Administrator or Business Administration Manager for current rates. ADC costs are calculated on the JPL's total direct costs Item #9 and the external institution(s) budget item #12.		
ADC at JPL consisting of: a. Labor ADC b. Contracts ADC c. Purchase Orders d. General ADC Enter total on Item #10	Labor ADC: $0K Contracts ADC: $1.1K General ADC: $3.0K Total ADC: $4.1K	
11. Overhead -external Institution		$11.24K
12. Individual Budget: *(JPL add Item #9 Direct Cost and #10 ADC costs for total JPL budget)* *External Institution add Item #9 and Item #11 Overhead for total)*	$5.4K	$30.00K
13. Combined Budget: *(JPL Budget plus External Institution Budget)*	$35.40K	

Figures, Graphics, Tables, etc.

(Please do not use "text-wrapping" when incorporating graphics at the end of the report.)

No figures.