Extravehicular Activity Next Generation Airlock Assessment

A NEW PARTNERING OPPORTUNITY

Reference No: NNJ15ZBH007L

Potential Commercial Applications: medical, under-sea exploration/production, industrial hard suited diving operations, Hazardous Materials (HAZMAT) safety, and others.

Keywords: Extravehicular Activity (EVA), space suit, spacewalk, rapid EVA, high frequency EVA, dust mitigation, Planetary Protection, suitport, suitlock, rear-entry airlock, next generation airlock, suitport-airlock, ingress, egress, inflatable airlock, exploration atmosphere

Purpose:
NASA JSC seeks partners to better assess vehicle benefits/impacts of next generation airlock technology associated with high frequency/low overhead EVA ingress/egress methods. State of the Art (SOA) technology does not include the same benefits of these methods.

- Readily available EVA capability
    - Short-duration EVAs with decreased prep and post time
    - Reduced crew time overhead, potentially reduced from 3.5 hours in microgravity to near zero prebreathe
    - Multiple EVAs during the same day, multiple days per week
    - Increased crew autonomy/decreased EVA planning
    - Reduced crew fatigue/injury
- Reduced consumables use
- Increased dust mitigation/planetary protection

This new partnering opportunity focuses on advancing the concept in design and analysis of the vehicle side to understand the benefits/impacts that could eventually lead to potential flight demonstrations.

Technology:
SOA methods of ingress/egress through airlocks use a large amount of consumables, long EVA prep and post time, and would have the crewmember traversing/translating directly through the dust (if present) that was brought in after an EVA both after the crewmembers doff their suits and prior to donning their suits. A next generation airlock is needed to provide readily available EVA capability with reduced consumables usage and dust mitigation/planetary protection by donning/doffing the rear-entry EVA suit through a bulkhead.

Space systems engineers and concept designers have identified rapid, high frequency, or readily available EVA capability to be a key figure of merit (FOM) in the efficacy of exploration human spaceflight architectures. NASA has recognized a number of potential applications for the technology including use as a suitport, rear-entry airlock (suitlock) or a combination thereof for spacewalking astronauts.

Engineers at the Johnson Space Center (JSC) are currently offering co-development opportunities focusing on three important assessments necessary for improving the

vehicle understanding of a next generation airlock. Impacts to the vehicle need to be understood further, this should include:

1. Trades/methods for integrating structure vs. add-on module, vehicle diameter, hatch placement, inflatable portions, etc.
2. Benefits and impacts to the vehicle including analysis of key FOMs (i.e. mass, volume, consumables, dust mitigation) for a next generation airlock.
3. Analysis of a materials and avionics list that need to be tested/certified to be at an exploration atmosphere of 8.2 psi/34% O2 (flammability constraints).

R&D Status:
NASA is currently studying next generation airlock system descriptions, interfaces, and design considerations for on-orbit and planetary surface ingress/egress methods. A white paper to address background, concept descriptions, past trades performed, and a list of trades for future exploration EVA ingress/egress methods is available. These include possible uses of a suitport, which is in an early prototype phase, rear-entry airlock, or suitport-airlock and has conceptual proposals for utilizing structures in cis-lunar and planetary crewed exploration spacecraft. Limited concepts have been developed and prototype testing has been executed with lessons learned tied to this activity.

Intellectual Property (IP):
Patents awarded:

- Suitport extra-vehicular access facility- US 4842224 A

Detailed information for the above mentioned technology furnished upon request.

This project may produce new IP that could be jointly owned by NASA and the partner.

Contact Information:
Please submit the attached Statement of Interest to:

Name: Jesse Buffington
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To view all Co-Development and Partnering Opportunities with the NASA Johnson Space Center please visit our website.

Response to Johnson Space Center

Announcement Seeking Potential Partners to Co-develop
Inflatable Structures

Reference No: NNJ14ZBH001L

STATEMENT OF INTEREST – ONE PAGE SUMMARY

RESPONDENT INFORMATION		
Company Name:		
Company address:		
City:	State:	ZIP Code:
U.S. Subsidiary of International Company Yes ☐ No ☐		
If Yes, Company Headquarters Country of Origin:		
Website:		
Company Size (Personnel; Gross Revenue/Yr):		
Company Product or Service Line:		
PRIMARY POINT OF CONTACT (POC)		
Name/Title:		
Email:		
Phone (office):	Phone (cell):	
CO-DEVELOPMENT AREAS OF INTEREST		
Provide rationale for why co-developing with JSC benefits your company:		

Send to jesse.a.buffington@nasa.gov