Fiscal Year:	FY 2020	**Task Last Updated:**	FY 10/22/2020
PI Name:	Rahman, Arifur Ph.D.		
Project Title:	Medical Oxygen Delivery System in Exploration Atmosphere Minimizing the Risk of Fire (Postdoctoral Fellowship)		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	TRISH--TRISH		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	96822	**Congressional District:**	1
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 TRISH-RFA-2001-PD: Translational Research Institute for Space Health (TRISH) Postdoctoral Fellowships
Start Date:	09/01/2020	**End Date:**	08/31/2022
No. of Post Docs:	1	**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	TRISH
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)		
Grant/Contract No.:	NNX16AO69A-P0504		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	POSTDOCTORAL FELLOWSHIP Astronaut's health is critical to the success of space exploration missions. Hence, onboard medical interventions may require addressing planned and unplanned health issues. Besides, NASA's recent change in Exploration Atmosphere to 8.2 psia and 34% Oxygen (O2) increased the risk of mild hypobaric hypoxia. The primary treatment for hypoxia is the administration of supplementary medical-grade oxygen, most commonly through the means of an oxygen mask. Currently, NASA uses a portable oxygen ventilator to supply medical grade oxygen which increases the oxygen concentration of the closed vehicle due to oxygen-enriched exhalation by the patient, which increases the likelihood of fire. This research effort aims to design an oxygen delivery system that is able to reversibly absorb the oxygen from the exhaled air of the patient through a chemical reaction. The system is comprised of an airtight, soft-cushioned, transparent, and low breathing resistance mask. The air inlet of the mask is connected to the ventilator, and the outlet is connected to a reservoir bag through a valve which allows the air to flow unidirectional out from the mask. The other end of the reservoir bag is fitted with an electric valve controlled by the signal from an embedded Zirconium oxygen sensor. The valve remains closed when the oxygen concentration inside the bag is higher than room air restricting the oxygen-enriched air to mix with room air. In addition, the inner surface of the reservoir bag is coated with cationic multimetallic crystalline cobalt complexes ([{CO2(bpdp)(O2)}2(bdc)] (BF4)4.5H2O.MeOH(2a(BF4)4.5H2O.MeOH)) which reversibly, selectively, and stoichiometrically chemisorb dioxygen from the air exhaled by the patient. Dioxygen absorption by BF4¯ salt is a reversible process where complete desorption takes place when the salt is heated to 120ºC. An indium tin oxide (ITO) coated transparent heater fabricated over the reservoir facilitates the oxygen desorption in case the BF4¯ salt is saturated.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated:)