Task Book Report Generated on: 04/19/2024

Fiscal Year: FY 2020 Task Last Updated: FV 1022/2020 FI Name: Rahman, Arfir Ph.D. Project Tiple: Medical Oxygen Delivery System in Exploration Atmosphere Minimizing the Risk of Fire  Program/Discipline: Pro				
Project Title: Medical Oxygen Delivery System in Exploration Almosphere Minimizing (the Risk of Fire Division Name: Human Research Program/Discipline:  Program/Discipline- Element/Subdispline:  Joint Agency Name: TRISH—TRISH  Joint Agency Name: None Human Research Program Risks: None Human Research Program Risks: None Space Biology Cross-Element: None Space Biology Cross-Element Discipline:  Space Biology Special Category: None PI Email: mid-Shawaiiinmoontienlab.com Fav: FY PI Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Name: Department of Electrical Engineering PI Address 1: Department of Electrical Engineering PI Address 2: PI Web Page:  City: Honolulu State: HI Zip Code: Solicitation Fyunding Translational Research Intention for Comments:  Project Type: GROUND Solicitation Fyunding Translational Research Intention for Pictorical Engineering PI Address Comments:	Fiscal Year:	FY 2020	Task Last Updated:	FY 10/22/2020
Division Name:   Human Research	PI Name:	Rahman, Arifur Ph.D.		
Program/Discipline: Program/Discipline- Element/Subdiscipline: Program/Discipline- Element/Subdiscipline: Disting Agency Name: None  Human Research Program Elements: None  Human Research Program Risks: None Space Biology Element: None Space Biology Element: None Space Biology Special Category: None PI Email: arifichavasilimovationlab.com PI Email: PI Organization Type: UNIVERITY Phone: 808-308-3275  Organization Name: University of Hawaii, Honolulu PI Address 1: Department of Electrical Engineering PI Address 2: PI Web Page: City: Honolulu State: HI Zip Code: 96822 Congressional District: I Comments: Project Type: GROUND Solicitation / Funding Translational Research Institute for Source: Space Health (TRIST) Postdoctoral Fellowship Source (Space Health (TRIST) Postdoctoral Fellowship Source (Space Health (TRIST) Postdoctoral Fellowship Source (Space Health (TRIST)) Postdoctoral Fellowship Source (Sp	Project Title:	Medical Oxygen Delivery System in Exploration Atmosphere Minimizing the Risk of Fire		
Program/Discipline—  Elemen/Subdiscipline-  Elemen/Subdiscipline-  Elemen/Subdiscipline-  Yes	Division Name:	Human Research		
Intention	Program/Discipline:			
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  PI Email: arifichavaiiinnovationlab.com Fax: FY  PI Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Name: University of Hawaii, Honolulu  PI Address 1: Department of Electrical Engineering  PI Address 2:   PI Web Page:  City: Honolulu State: HI  Zip Code: 96822 Congressional District: 1  Comments:  Project Type: GROUND Solicitation / Funding Space Health (TRISH) Postdoctoral Followships  Start Date: 09/01/2020 End Date: 08/31/2022  No. of Pat Does: 1 No. of PhD Degrees: No. of PhD Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's Candidates: No. of Bachelor's Candidates: Monitoring Center: TRISH  Contact Monitor: Contact Honie: Flight Assignment: Key Personnel Changes/Previous PI:  COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)  Grant/Contract No.: NNXI6AO69A-P0504		TRISHTRISH		
Human Research Program Risks: None  Space Biology Element: None  Space Biology Cross-Element Discipline: None  Space Biology Special Category: None  PI Email: arif@hawaiiinnovationlub.com Fax: FY  Pl Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Name: University of Hawaii, Honolulu  PI Address 1: Department of Electrical Engineering  PI Address 2:  PI Web Page:  City: Honolulu State: HI  Zip Code: 96822 Congressional District: 1  Comments:  Project Type: GROUND Solicitation / Funding Source: Space Health (TRISH) Postdoctoral Fellowships  Start Date: 09/01/2020 End Date: (8/831/2022  No. of Post Does: I No. of PhD Candidates: No. of Master' Degrees:  No. of Master's Candidates: No. of Master' Degrees:  No. of Master's Candidates: Monitoring Center: TRISH  Contact Monitor: Contact Hone:  Contact Email:  Flight Assignment: Key Personnel Changes/Previous PI:  COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)  Grant/Contract No.: NNXI6AO69A-Po504	Joint Agency Name:		TechPort:	Yes
Space Biology Element: None  Space Biology Cross-Element Discipline:  Space Biology Special Category: None  PI Email: arifi@hawaiinnovationlab.com Fax: FY  PI Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Name: University of Hawaii, Honolulu  PI Address 1: Department of Electrical Engineering  PI Address 2:  PI Web Page:  City: Honolulu State: HI  Zip Code: 96822 Congressional District: 1  Comments:  GROUND Solicitation / Funding Fana Bainburk (FIRSH) Postoctoral Fellowships  Start Date: 09/01/2020 End Date: 08/31/2022  No. of Post Does: 1 No. of Master' Scandidates: No. of Master' Contact Phone: Contact	<b>Human Research Program Elements:</b>	None		
Space Biology Cross-Element Discipline:   None	Human Research Program Risks:	None		
Discipline: " None Space Biology Special Category: None PI Email: arifohawaiimovationlab.com Fax: FY PI Organization Type: UNIVERSITY Phone: 808-308-3275 Organization Name: University of Hawaii, Honolulu PI Address 1: Department of Electrical Engineering PI Address 2: PI Web Page: City: Honolulu State: HI Zip Code: 96822 Congressional District: 1 Comments:  Project Type: GROUND Solicitation / Funding Translational Research Institute for Source: Space Health (TRISH) Postdoctoral Fellowships Start Date: 09/01/2020 End Date: 08/31/2022 No. of Post Does: 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 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	Space Biology Element:	None		
PI Email: arif@hawaiiinnovationlab.com Fax: FY Pl Organization Type: UNIVERSITY Phone: 808-308-3275 Organization Name: University of Hawaii, Honolulu PI Address 1: Department of Electrical Engineering PI Address 2: PI Web Page: City: Honolulu State: HI Zip Code: 96822 Congressional District: 1 Comments:  Project Type: GROUND Solicitation / Funding Translational Research Institute for Source: Space Health (TRISH) Postdoctoral Fellowships Start Date: 09/01/2020 End Date: 08/31/2022 No. of Post Docs: I No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: Monitoring Center: TRISH Contact Monitor: 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		None		
Pl Organization Type: UNIVERSITY Phone: 808-308-3275  Organization Name: University of Hawaii, Honolulu  Pl Address 1: Department of Electrical Engineering  Pl Address 2:  Pl Web Page:  City: Honolulu State: HI  Zip Code: 96822 Congressional District: 1  Comments:   Project Type: GROUND Solicitation / Funding Translational Research Institute for Source: Space Health (TRISH) Postdectoral Fellowships  Start Date: 09/01/2020 End Date: 08/31/2022  No. of Post Does: 1 No. of PhD Degrees:  No. of PhD Candidates: No. of Master's 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 Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)  Grant/Contract No.: NNX16AO69A-P0504	Space Biology Special Category:	None		
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Zip Code: 96822 Congressional District: 1  Comments:  Project Type: GROUND Solicitation / Funding Translational Research Institute for Source: 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	PI Web Page:			
Comments:  Project Type:  GROUND  Solicitation / Funding Source:  Franslational Research Institute for Space Health (TRISH) Postdoctoral Fellowships  Start Date:  09/01/2020  End Date:  08/31/2022  No. of PhD Candidates:  No. of Master' Degrees:  No. of Master' Degrees:  No. of Master's Candidates:  No. of Bachelor's Degrees:  No. of Bachelor's Condidates:  Contact Monitor:  Contact Monitor:  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	City:	Honolulu	State:	HI
Project Type:  GROUND  Solicitation / Funding Translational Research Institute for Space Health (TRISH) Postdoctoral Fellowships  Start Date:  09/01/2020  End Date:  8/3/1/2022  No. of Post Docs:  1  No. of PhD Candidates:  No. of Master' Degrees:  No. of Master's Candidates:  No. of Master's Candidates:  No. of Bachelor's Degrees:  No. of Bachelor's Candidates:  No. of Bachelor's Candidates:  TRISH  Contact Monitor:  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	Zip Code:	96822	<b>Congressional District:</b>	1
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Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)  Grant/Contract No.: NNX16AO69A-P0504	Contact Email:			
Key Personnel Changes/Previous PI:  COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu)  Grant/Contract No.: NNX16AO69A-P0504	Flight Program:			
COI Name (Institution): Ohta, Aaron Ph.D. (MENTOR: University of Hawaii, Honolulu )  Grant/Contract No.: NNX16AO69A-P0504	Flight Assignment:			
Grant/Contract No.: NNX16AO69A-P0504	Key Personnel Changes/Previous PI:			
	COI Name (Institution):	Ohta, Aaron Ph.D. ( MENTOR: University of Hawaii, Honolulu )		
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Performance Goal No.:	Performance Goal No.:			
Performance Goal Text:	Performance Goal Text:			

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## 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 120°C. An indium tin oxide (ITO) coated transparent heater fabricated over the reservoir facilitates the oxygen desorption in case the BF4 salt is saturated.

**Task Description:** 

**Rationale for HRP Directed Research:** 

Research Impact/Earth Benefits:

Task Progress:

New project for FY2020.

**Bibliography Type:** 

Description: (Last Updated: )