Fiscal Year:	FY 2022	**Task Last Updated:**	FY 01/04/2022
PI Name:	Kharangate, Chirag Ph.D.		
Project Title:	Line Chilldown and Transfer Process in Microgravity Onboard the International Space Station (ISS)		
Division Name:	Physical Sciences		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	FLUID PHYSICS--Fluid physics		
Joint Agency Name:		**TechPort:**	No
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:	44106-1712	**Congressional District:**	11
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 Physical Sciences NNH20ZDA012N: Fluid Physics. Appendix A
Start Date:	01/01/2022	**End Date:**	12/31/2026
No. of Post Docs:		**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:**	NASA GRC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Hartwig, Jason Ph.D. (NASA Glenn Research Center) Kassemi, Mohammad Ph.D. (Case Western Reserve University)		
Grant/Contract No.:	80NSSC22M0056		
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Performance Goal Text:			

Task Description:	Effective cryogenic fluid management will be important to the success of future crewed and uncrewed NASA missions. A key technological challenge in this, as recognized by NASA, is the line chilldown and transfer process. The objective of this proposal is to develop a thorough understanding of the fluid flow and thermal transport process during chilldown of transfer lines by utilizing a combination of experimental diagnostic techniques and high-fidelity computational fluid dynamics (CFD) simulations to investigate the boiling process under both terrestrial and microgravity environments. We will achieve this objective by designing a new experimental test module concept to investigate the line chilldown and transfer process that can be integrated with the Flow Boiling and Condensation Experiment (FBCE) facility onboard the International Space Station (ISS). In addition, we plan to develop a computational fluid dynamics framework for simulation of the boiling phenomena and also a reduced-order theoretical framework for the line chilldown and transfer process under terrestrial and microgravity conditions. The proposal directly addresses the critical need in Fluid Physics for NASA's future missions where reduced-gravity multiphase flows, cryogenics, and heat transfer are identified as areas of particular interest. The research will lead to the generation of a large database of chilldown tests under terrestrial and microgravity environments, and closure theoretical and computational models to aid NASA engineers in future mission planning.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2022.
Bibliography Type:	Description: (Last Updated: 11/16/2022)