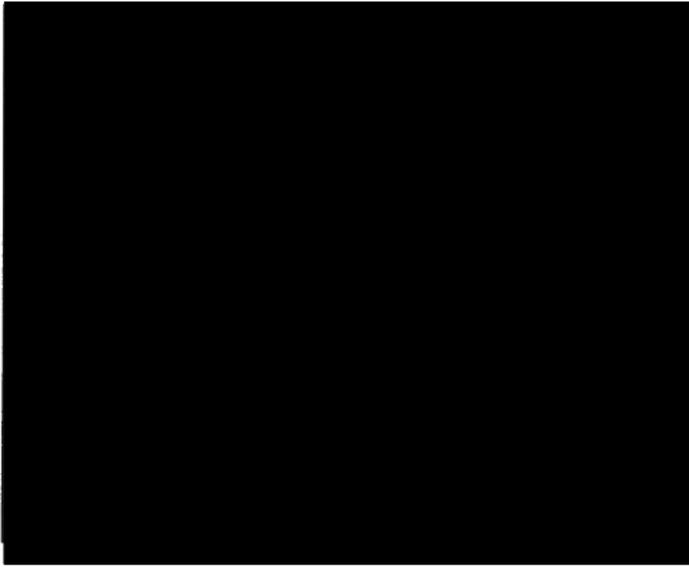


1. CONTRACTOR: Northrop Grumman Innovation Systems 7500 Greenway Center Drive, Suite 700 Greenbelt, MD 20770	2. CONTRACT NO.: <b>NNG15WA53C</b>	3. TASK-MOD NO.: <b>Task 032 Rev. 0</b>
4. TASK NAME/PROJECT: <b>Launch Spool Enhancement &amp; Redesign</b>		

- 5. DESCRIPTION OF WORK TO BE PERFORMED (OBJECTIVES OR RESULTS DESIRED):**  
This Cost-Plus Fixed Fee Task Order (CPFFTO) enables provisions for a.) required refurbishment/enhancement to the existing launch spool(s) planned for use during the upcoming Palestine, Fort Sumner, Antarctica and New Zealand Campaign in accordance with NASA approved specifications and requirements subsequent to the Fort Sumner 2019 Spool Investigation; and b.) support for data collection and analysis needed for possible redesign of the launch spool (see accompanying Statement of Work, SOW).
- 6. TASK DOCUMENTATION REQUIREMENTS/DELIVERABLE ITEMS:** Completion of required refurbishment/enhancement of existing spools is required prior to use on launch campaigns starting with the FY2019 Palestine campaign. Completion of the spool instrumentation, data collection, analysis and report are required prior to January 31, 2020.
- 7. PERFORMANCE/MILESTONE SCHEDULE:** The Period of Performance ends January 31, 2020
- 8. QUALITY ASSURANCE REQUIREMENTS:** As set forth under NNG15WA53C.
- 9. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:** As set forth under NNG15WA53C.
- 10. STANDARDS and METRICS:** As set forth under NNG15WA53C.
- 11. OTHER (FUNDING, NTE, REGULAR HOURS, PREMIUM HOURS, ETC.):**



<b>MARKITA Walker</b> Digitally signed by MARKITA Walker Date: 2019.06.05 15:23:44 -04'00'	16. THIS TASK ORDER IS ISSUED PURSUANT TO THE TERMS OF THE CONTRACT.  CONTRACTING OFFICER'S SIGNATURE/DATE  <i>Lisa B Hall</i> 6-6-19  Lisa B. Hall
12. TASK ORIGINATOR/MONITOR/CODE/PHONE: David D. Gregory / 820 / 2367	
13. FUNDING WBS/ACCOUNT NUMBER:	
14. BPO CHIEF CONCURRENCE: Deborah A. Fairbrother / 1453	
15. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE: David D. Gregory / 820 / 2367 <b>MARKITA Walker</b> Digitally signed by MARKITA Walker Date: 2019.06.05 15:24:08 -04'00'	

**NBOC IDIQ Statement of Work (SOW)  
In Support Of**

**NASA Heavy-Lift Scientific Balloon Launch Spool  
Analysis, Design & Fabrication**

***(An IDIQ Task Order SOW in compliance with NASA Balloon  
Operations Contract [NBOC]: NNG15WA53C)***

BPO's Objective

The NASA Balloon Program Office (BPO), GSFC/WFF/Code 820, requires support for evaluation, analyses, design, testing, fabrication and implementation of a prototype or first build, then subsequent replication of heavy-lift scientific balloon Launch Spool(s). This project will be directly managed by NASA BPO and this Task Order may include partial or complete redesign of the current Launch Spool. Project's goals include, but are not limited to: a.) a baseline definition of operating parameters and requirements necessary for Launch Spool design and operation; b.) a robust and versatile design and construction that will support NASA's BPO for the foreseeable future; c.) configuration and design traceability that will be maintained by NASA BPO or CSBF; d.) preventive maintenance definition & schedules, testing and certification requirements will be maintained in a centralized system, to include high level inspections and detailed inspections to the level of disassembly, inspection, maintenance and verification of operability of components; and e.) a Bill of Materials, Design-to-Build & Fabrication Package that can be released for reproduction of Launch Spools.

Task Order SOW, Initial Release

NASA BPO requests a study to understand the dynamic loads in and around the use of the Launch Spool used for stratospheric balloons. The study must include, but not be limited to, accelerometer measurements of the spool in-use configuration during release following inflation, and high definition video and photographic records taken of the spool during release as well. An analysis of the recorded measurements using

advanced modeling techniques to understand the actual stress seen by the spool is requested. It is expected that all launches after the start of the FY2019 Palestine Campaign and forward be instrumented with an accelerometer attached to the latch end plate of the spool, at a minimum. Additional accelerometers may be placed on the catch arm or the pivot end plate of the spool, as may be requested during the progress of this study following initial analyses of early balloon releases.

Detailed analysis should be conducted for each balloon release for the upcoming Palestine, Fort Sumner, and Antarctic Campaigns. Currently, a minimum of 10 launches is expected in order to satisfy the requirements for this study. It is understood that the launch configuration for this study is dependent upon the flight manifest. Coordination with NASA BPO will dictate when enough testing has been completed to satisfy the requirements for this testing.

### Deliverables and Schedule

It is expected that testing and analysis be done on or before 15 January 2020 following the completion of the FY2020 Antarctic LDB Campaign, along with a report to be completed by 31 January 2020.

Written monthly status reports in PowerPoint format will be expected to coordinate testing opportunities as well as discussing results from previous measurements. The final report must present a comparison between the analytical model utilized previously and actual data captured. An analysis of variance gauge repeatability and reproducibility study should also be completed once the data has been collected and presented with the final results.

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Andrew T. Hynous  
Mission Operations Manager  
NASA Balloon Program Office