TECHNICAL REPORT: Mission Instrumentation Analysis

Module 3 Technical Report

Purpose

The purpose of this assignment is for scholars to explore and analyze a mission supported by one of NASA Wallops Flight Facilities (WFF) platforms. Scholars will write an APA style technical report that focuses on the instrument package utilized during the chosen mission. Through this assignment, scholars will develop their research and analytical skills by thoroughly examining the mission instrument package, contributing to a deeper understanding of the scientific endeavors facilitated by NASA Wallops Flight Facility.

Background

NASA's Wallops Flight Facility provides agile, low-cost flight and launch range services to meet government and commercial sector needs for accessing flight regimes worldwide from the Earth's surface to the moon and beyond.

Wallops' flight assets, ranging from research aircraft, unmanned aerial systems and high-altitude balloons, to suborbital and orbital rockets, provide a full-range of capability while operational launch range and airfield capabilities meet ongoing and emerging needs in the science, aerospace, defense, and commercial industries. In addition, Wallops is a multi-user/multi-tenant facility in a geographic location ideal for supporting satellite tracking and commanding, military operations and training, scientific investigations, technology development and testing, as well as commercial aerospace. The facility's diverse mission sets and on-site partners, including the U.S. Navy, National Oceanic and Atmospheric Administration, the Federal Aviation Administration, Virginia Space and the Mid-Atlantic Regional Spaceport, is a model for leveraging and optimizing multi-organizational capabilities and support services.

Wallops provides many different platforms for science and technology research, including Sounding Rockets, Scientific Balloons, Airborne Science and SmallSat Support. NASA launches suborbital and orbital missions from sites established in the U.S. and around the world to meet investigators' needs.

For this assignment, your technical report will explore and analyze one of 10 missions supported by NASA Wallops Flight Facility. The focus will be on examining the chosen mission and analyzing the instrumentation utilized.

Directions

Part I. Mission Selection. For this assignment, begin by selecting **one** of the ten missions supported by NASA WFF below. NOTE: A single resource webpage is provided in the table below, however you will need to research and find additional credible resources to complete this assignment.

Sounding Rocket Missions	
1	**Mission**: APEP **Objective**: To study the ionosphere during Solar Eclipses **Resource**: https://sites.wff.nasa.gov/code810/files/APEP_litho.pdf
2	**Mission**: RAISE **Objective**: To study radio waves that escape through the Earth's ionosphere **Resource**: https://sites.wff.nasa.gov/code810/news/story192.html
3	**Mission**: PolarNOx **Objective**: To measure the intensity of nitric oxide in the mesosphere and lower thermosphere in the polar region **Resource**: https://sites.wff.nasa.gov/code810/news/story202.html
Scientific Balloon Missions	
4	**Mission**: SuperBIT **Objective**: For the SuperBIT telescope to to map dark matter around galaxy clusters by measuring the way these massive objects warp the space around them **Resource**: https://blogs.nasa.gov/superpressureballoon/category/2023-campaign/superbit/
5	**Mission**: BARREL **Objective**: Study X-rays in Earth's atmosphere **Resource**: https://science.nasa.gov/mission/barrel
6	**Mission**: GUSTO **Objective**: Study all phases of the stellar life cycle **Resource**: https://science.nasa.gov/mission/gusto/
Airborne Science Missions	
7	**Mission**: IceBridge **Objective**: Image Earth's Polar Ice **Resource**: https://science.nasa.gov/mission/icebridge/
8	**Mission**: IMPACTS **Objective**: Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms **Resource**: https://espo.nasa.gov/impacts/content/IMPACTS
SmallSat Missions	
9	**Mission**: CeREs **Objective**: Study charged particle dynamics in Earth's radiation belts **Platform**: SmallSats **Resource**: https://science.nasa.gov/mission/compact-radiation-belt-explorer/
10	**Mission**: Firefly **Objective**: To study the relationship between lightning and Terrestrial Gamma-ray Flashes (TGFs) **Platform**: SmallSats **Resource**: https://smallsat.wff.nasa.gov/missions/firefly.php

Part II. Technical Paper Details. Once you have chosen a mission to focus on, do some research on the internet to gather information on the following:

Introduction

Mission Overview

- Mission Overview:
  - Introduce the mission's purpose and objectives.
  - Highlight the science goals of the mission.
  - Specify the platform supporting the mission.
- NASA WFF's Role:
  - Describe the role of NASA Wallops Flight Facility (WFF) in supporting the mission.
  - Explain the significance of the chosen launch site.
- Launch Vehicle Type:
  - Specify whether the mission involves a suborbital or orbital launch vehicle.
  - Provide details on how the mission is being launched and its location.

Mission Platform

If you chose: Sounding Rockets

- Rocket Description:
  - Provide details about the type of sounding rocket used and its capabilities.
  - Specify the launch location and whether the rocket/payload will be recovered.

If you chose: Scientific Balloons

- Balloon Description:
  - Describe the type of scientific balloon used and its capabilities.
  - Explain the launch location and the transportation method to that location.
  - Address whether the balloon/payload will be recovered.

If you chose: Airborne Science

- Aircraft Information:
  - Describe the kind of aircraft used for airborne science and its capabilities.
  - Specify the takeoff location.

If you chose: Small Satellites

- Launch Vehicle Description:
  - Provide details about the vehicle carrying the small satellite and its capabilities.
  - Specify the launch location and whether the small satellite will be recovered.

Instrumentation

- Primary Instrumentation:
  - Detail the primary instrumentation used for data collection in this mission.

    - Explain the instrument's purpose, selection criteria, and data collection methodology.
    - Discuss whether the instrument was specifically created for this mission or pre-existing.
    - Address limitations of the instrument.
- Diagram of Instrumentation:
    - Include a labeled diagram of the instrumentation (cite using APA Figure/image citations).
    - *NOTE: In APA, an image inserted into a technical report is called a "Figure"*

Conclusion

- Conclusion
- Student Reflection: Mission Contribution to NASA's Vision
    - Share your thoughts on how the mission contributes to NASA's vision, mission, and core values (reference Module 1 reading Chapter 4.1 for alignment).

Formatting

Your technical report should follow the below formatting guidelines. Please make sure to reference the *OWL Purdue APA Student Template for formatting assistance.*

- **Accepted APA Font Types**: 12-point Times New Roman; 11-point Calibri; 11-point Arial; 10-point Lucida Sans Unicode; 11-point Georgia; 10-point Computer Modern
- Your paper should include an introduction paragraph, a minimum of 3 body paragraphs, and a conclusion paragraph
- **You should use in-text citations in your writing**
- Double-spaced
- Page numbers flush top right
- Title page containing appropriately formatted title, name, course, instructor and date
- Separate References page at the end - **YOU NEED A MINIMUM OF 3 REFERENCES**
- All references must follow APA format guidelines with hanging indent
- Correct spelling and grammar
- **Word Count**: Minimum 500 to maximum 1,000 words, **not including the title page and reference page**
- Follow APA in-text citation guidelines for quotes
- Follow APA guidelines for Figure (image) citations - https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/apa_tables_and_figures.html
- Reference the APA student sample paper, including figure arrangement rules, here: https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/apa_sample_paper.html

Note: For a complete overview of APA, revisit our course APA presentation HERE or the OWL Purdue guidelines HERE.

Submission

Submit your assignment as a PDF to the assignment page. NOTE: It is your responsibility to review the PDF document *before* uploading it for grading. Sometimes formatting issues arise when converting a Word or Google Doc to a PDF, so please double check your paper before turning it in. Works submitted will be graded as is.

Grading

Scholars will be graded using the rubric attached to this assignment. Late submissions will be penalized according to the guidelines described in the rubric. Please read over the rubric before completing the assignment to achieve a successful score.