SHIV SHAKTI

International Journal of in Multidisciplinary and Academic Research (SSIJMAR)

Vol. 4, No. 3, June 2015 (ISSN 2278 – 5973)

NASA'S HIGH DEFINITION EARTH VIEWING

Akankshaa

Electronics and communication

WCTM

Farrukhnagar, Gurgaon, India

Impact Factor = 3.133 (Scientific Journal Impact Factor Value for 2012 by Inno Space Scientific Journal Impact Factor)

Global Impact Factor (2013)= 0.326 (By GIF)

Indexing:

1. INTRODUCTION

On April 18, 2014, SpaceX launched the NASA High Definition Earth Viewing (HDEV) payload to the International Space Station (ISS). HDEV consists of four commercially available high definition (HD) cameras. It is one of the first payloads launched on a Dragon spacecraft, which has previously carried resupply items. HDEV was mounted to the ESA Columbus module by the station's robotic arm. The cameras cover three different perspectives: aft, forward and nadir view. Hence, the HDEV payload offers the unique possibility of combining human space missions and earth observation into one outreach project. The cameras stream live videos of Earth to be viewed online. It is the first large unpressurised NASA experiment to be assigned for delivery to the ISS. The HDEV system was developed by engineers at the Jhonson Space Center in Houston, Texas. High school students also helped design some of the cameras' components, through the High Schools United with NASA to create hardware program and teams of students are expected to remotely operate the experiment.

The system is configured on the Columbus- External Payload Facility on the exterior of the ESA's Columbus laboratory module where it is used to perform experiments to help NASA determine which cameras work best in outer space. The cameras are enclosed in a temperature specific housing and exposed to the harsh radiation of space. This experiment includes several commercial HD cameras. While the experiment is operational, views will typically sequence though the different cameras. Between camera switches, a gray and then black color slate will briefly appear.

2. OBJECTIVE

The primary objective of HDEV is to validate the space based performance of the cameras in a variety of operating modes to exercise and demonstrate the features and longevity of Commercial-off-the-shells equipment for future ISS program usage. The HDEV visible HD video cameras are a fixed payload camera system that requires no zoom or tilt mechanisms. The four fixed cameras are positioned to capture imagery of the Earth's surface. The video imagery is encoded into an

Ethernet compatible format for transmission to the ground and further distribution. In this format, the video can be viewed from any computer connected to the internet.

3. HDEV DESIGN FOR OPERATIONS

The HDEV operates one camera at a time. The HDEV is designed so that when the system is initially powered on after a 1-2 minute warm-up period. The cameras are turned on one at a time in repeating cycle. The forward looking camera is powered first followed by the Nadir and each aft looking camera such that the HDEV video follows a location on the Earth as the ISS passes overhead. As they cycle, each camera must turn off and the next camera turns on before the HD video starts, taking about 8 to 10 seconds to change. Through this cycling, comparable data can be collected on each camera; while also providing, as a bonus, different Earth viewing perspectives. This auto-cycle mode of the HDEV does not require any input from ground operators, so the HDEV can be operated any time that the ISS power and data resources are available, without requiring a ground controller present to operate the payload. The only command required, is the initial "power on" command, which is performed by the ESA's Columbus Control Centers scheduled by ISS Payload Operations.

Alternately, as desired by ground controllers, the HDEV video can be commanded. Ground operators have the choice to change the cycle of the image noted in the auto-cycle mode, or, if desired, ground controllers can command a single camera to remain powered on and no auto-cycle to take place.

The German Educational project "Cloumbus Eye – Live Imagery from the ISS in Schools", which is executed by the University of Bonn and is funded by the German Aerospace Center, aims at the implementation of the ISS live imagery and videos in a web portal. It primarily acts as a learning portal for pupils but also serves as a free access archive for the footage of the ISS HDEV cameras. Columbus Eye

accompanied the ISS mission of the German ESA astronaut Alexander Gerst.

4. SPACE APPLICATIONS

HDEV tests commercially available HD cameras for future space missions. Using off-the-shell products is often more cost effective than designing new ones for space applications. Ground tests have shown that these cameras could survive the simulated space environments, but actual exposure to the low earth orbit proves how durable and well they work in the extremely harsh conditions of space.

5. EARTH APPLICATIONS

This investigation conducts Earth observations using high definition video which provides broad area or panoramic view of how the Earth looks from the International Space Station.

6. ABSTRACT

Exhibiting a spatial resolution of 280m, the HDEV data is well suited for observing sudden and rapid changes and processes of the land surface and the atmosphere like volcano eruptions along the ISS orbital track. Furthermore, a data archive is currently developed, providing HDEV imagery free of charge via an open source web Geographic Information System. A nationwide road show at German schools links mission of Alexander Gerst and the fascinating bird's eye view of the HDEV payload. The road show has already involved an event during which pupils from a secondary school in North Rhine – Westphalia have talked to the astronaut via ham radio. This paper presents the valorization of the HDEV footage. It will demonstrate the possibilities of Earth observation and human space mission. The paper addresses the question of how characteristics of space missions can be used to enhance the fascination of Earth observation imagery in the light of problem based learning. Subsequently, the Canadian robotic arm mounted the

platform on the Columbus External Payload Adapter. This automated process was carried out for the first time in the ISS program. The cameras are part of the High Definition Earth Viewing experiment assigned to the ISS expeditions 39/40, 41/42, 43/44 and 45/46. Once installed, the main purpose of NASA's HDEV experiment is to test the robotic installation of external payloads and to examine the suitability of COTS HD cameras for upcoming space stations.