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COASTAL ZONE COLOR SCANNER

by

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The Coastal Zone Color Scanner (CZCS) spacecraft ocean color instrument is capable of measuring and mapping global ocean-surface chlorophyll concentration. It is a scanning radiometer with multiband capability. It operated successfully for 7 years on Nimbus VII. The engineering model of CZCS underwent extensive functional testing and some environmental testing during the development of the flight instrument at the contractor, Ball Brothers. The engineering model is presently in a Code 674 laboratory. With new electronics and some mechanical, and optical re-work, it probably can be made "flight worthy." Some additional components of a second flight model are also available. An engineering study and further tests are necessary to determine exactly what effort is required to properly prepare the instrument for spaceflight and the nature of interfaces to prospective spacecraft (e.g., AEM, BSS, Eos Polar Platform). The following is an outline of a proposed preliminary study by our branch to assess the value of further pursuing a spaceflight opportunity for this instrument. We estimate that this in-house study could be completed in 12 months at a cost of about \$25K.

1. Goal
 - 1.1. Instrument Status
 - 1.2. Rework Feasibility

2. Science & Applications
 - 2.1. Global Ocean Color
 - 2.2. Ocean Productivity & Currents
 - 2.3. Global Biogeochemical Cycles (e.g., CARBON)

- 2.4. Commercial & Operational Uses
- 2.5. Value-Added Industry
- 3. Engineering Model Status
 - 3.1. Flt Model History: 7 Yrs Lifetime
 - 3.2. E/M Previously Tested
 - 3.3. E/M Available
 - 3.4. Appears Good Condition
- 4. Study & Test Effort
 - 4.1. Optical
 - 4.1.1. Alignment Verification
 - 4.1.2. Spectral Characteristics
 - 4.1.3. IFOV
 - 4.1.4. Detector Sensitivity
 - 4.1.5. Spectral Characteristics
 - 4.2. Mechanical
 - 4.2.1. Fit on Small Satellite (E.G. AEM, BSS)
 - 4.2.2. Requirements & Mods to Fly on Scout
 - 4.2.3. Environmental Considerations
 - 4.2.4. Materials
 - 4.3. Electronic
 - 4.3.1. Evaluate/update Scan Motor Drive Circuit
 - 4.3.2. Evaluate/update Signal Analog Circuits
 - 4.3. Define Instrument Parameters (Characteristics SPECS)
 - 4.4. R&QA Rationale (e.g., OCE STRATEGY)
- 5. Cost
 - 5.1. Contractor Mechanical Engineer & Technician
 - 5.2. "Breadboard" Parts; Mechanical & Electronic
- 6. Milestones
 - 6.1. Review & Document Test & Study Results
 - 6.2. Document Recommendations

The CZCS provides operational instrument capability for monitoring of ocean productivity and currents. It could be a simple, low cost alternative to developing new instruments for ocean color imaging. Researchers have determined that with global ocean color data they can: specify quantitatively the role of oceans in the global carbon cycle and other major biogeochemical cycles; determine the magnitude and variability of annual primary production by marine phytoplankton on a global

scale; understand the fate of fluvial nutrients and their possible affect on carbon budgets; elucidate the coupling mechanism between upwelling and large-scale patterns in ocean basins; answer questions concerning the large-scale distribution and timing of spring blooms in the global ocean; acquire a better understanding of the processes associated with mixing along the edge of eddies, coastal currents, western boundary currents, etc., and acquire global data on marine optical properties¹.

The technique for processing and archiving the data from the CZCS instrument would utilize the CZCS global data processing and archiving system existing at GSFC. Existing algorithms would be used.

¹System Concept for Wide-Field-Of-View Observations of Ocean Phenomena from Space, August 1987.