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November 22, 1982

Mr. John P. Corrigan  
Code 602.0  
NASA Goddard Spaceflight Center  
Greenbelt, MD 20771

RE: NAG5-117, Prof. C.S. Bowyer, Principal Investigator

Dear Mr. Corrigan:

Attached please find three copies of the Final Technical Report for the above mentioned grant.

If you need any further information, please do not hesitate to contact me at (415) 642-0816.

Sincerely,

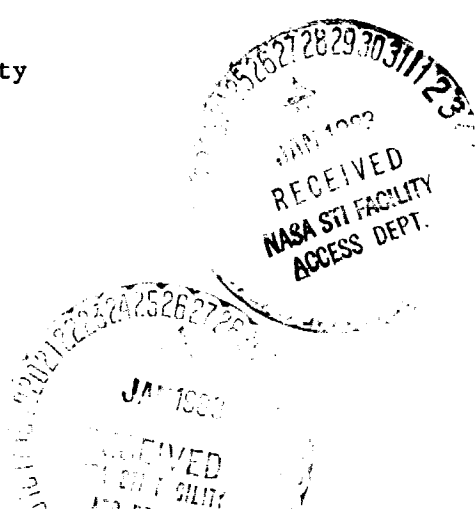
*Trish Dobson*

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Space Astrophysics Group

TD:jg

cc NASA Scientific & Technical Information Facility

Encl: (1)



(NASA-CR-170479) LONG TERM X-RAY  
OBSERVATIONS OF SYSTEMS WITH UNUSUAL OPTICAL  
COUNTERPARTS AND MODULATION MEASUREMENT OF  
SELECTED ASTRONOMICAL SOURCES Final  
Technical Report (California Univ.) 3 p

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FINAL TECHNICAL REPORT

NAG 5-117

"Long Term X-Ray Observations of Systems with Unusual Optical Counter-  
Parts and Modulation Measurement of Selected  
Astronomical Sources"

Professor C. Stuart Bowyer, Principal Investigator

Prepared by:

  
\_\_\_\_\_  
Michael P. Raffanti  
November 19, 1982



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LONG TERM X-RAY OBSERVATIONS OF SYSTEMS WITH UNUSUAL OPTICAL COUNTER-  
PARTS AND MODULATION MEASUREMENT OF SELECTED  
ASTRONOMICAL SOURCES

This NASA grant was the combination of two observing projects on the OAO-Copernicus satellite performed for the purpose of studying in greater detail the X-ray emission behavior of a few especially interesting variable sources.

The first project entailed X-ray observations over a period of several months of the low mass X-ray binary sources 2A1822-371 and 4U2129+47 in a search for variability similar to the 35 day on-off cycle observed in Her X-1. At the time the proposal was prepared both of these sources were known to exhibit  $\sim 5$  hours photometric periodicities in these binary systems. An additional observation proposed to study the related system Cyg X-2 both optically and in X-rays covering one complete binary cycle of 9.8 days. The result of the UCL X-ray telescope observations was that no periodicities or obvious variability other than the known orbital periods were detected. However, the ground-based optical spectroscopy performed in conjunction with this project has supported the interpretation of the photometry periodicities as representing orbital motion in 2A1822-371 as reported by Charles, Thorstensen, and Barr (1980), and detected radial velocity motions on the photometric period in 4U2129+47, as reported by Thorstensen and Charles (1982).

The second project was to investigate in more detail the shape and length of the 4.8 hour periodicity in the X-ray emission from Cyg X-3. At the time this proposal was originally written, several

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workers had claimed that the period of Cyg X-3 was increasing based on a comparison of data from different satellites, and the slope of the X-ray light curve appeared non-sinusoidal, suggesting a measurable ellipticity in the system orbit (Mason et al. 1976). Our proposal was to obtain additional OAO-Copernicus data on Cyg X-3 to measure the light curve and look for a change in the period and/or to obtain an improved measurement of the slope of the light curve to study the orbital parameters and specifically the mass ratio of the binary system. Unfortunately, these new data were of insufficient quality to rule out the reported change in period or to significantly improve our knowledge of the shape of the light curve.

REFERENCES

- Charles, P.A., Thorstensen, J.R. and Barr, P. 1980, Ap. J., 241, 1148.
- Mason, K.O. et al., 1976, Ap. J., 207, 78.
- Thorstensen, J.R. and Charles, P.A. 1982, Ap. J., 253, 756.