Semi-annual Technical Report for NASA NAG 5-1260
Prepared by Dr. Lynn R. Cominsky, Principal Investigator
October 1, 1992

This report covers the period September 1, 1992 through August 1, 1993 for NASA grant NAG 5-1260 through the Astrophysics Data Program (ADP), for the project "**High Time Resolution Studies of Binary X-ray Pulsars**", Dr. Lynn R. Cominsky, Principal Investigator, Department of Physics and Astronomy, Sonoma State University, Rohnert Park, CA 94928.

During the past 11 months, we have concentrated on scientific analysis of the data, and have had to reanalyze several data sets, due to a newly discovered error in the unpacking of the count rate data. This error has now been corrected, but may have caused us to miss some scientific results, so we have gone back and reanalyzed the affected data sets, as well as continuing our analysis of other objects.

During this time, we have analyzed data from:

a) SMC X-1. We have re-searched most of the existing 5 ms data for this 0.71 s pulsar, but the source is turned off during most of these observations. Pulsations are only marginally detected in the 320 ms data, due to the closeness to the Nyquist limit. As timing accuracy is required in order to improve on the orbital period determination using the Doppler shift technique, it does not seems likely that this scientific objective will be able to be accomplished. We have, however produced a scan light curve for this source from the existing data.

b) LMC region. This is where most of our effort currently is being expended. We have succeeded in detecting several new outbursts from the 17 day cycle of A0538-66 (which is almost always confused with LMC X-4), and are now re-searching the data for evidence of the reported (but not confirmed) 69 ms pulse period. No evidence has yet been found. This is a huge effort, and is continuing.

c) Be-binaries. We are attempting to analyze all the observations of the less studied Be-binaries in the HEAO data base. We have been searching the observations of Gamma Cas in an attempt to find pulsations. None have yet been found. We are also starting to do pulse by pulse variability studies of 4U0115+63.

d) Black Hole Candidates - in collaboration with some scientists at SLAC, we are trying to develop techniques for doing aperiodic analysis of scanning data. This effort is just beginning. We have found some interesting data on a transient outburst from GX339-4, as well as another outburst from 4U1630-47. Due to their transient nature, both of these black hole candidates have not been very well studied, and we are hopeful that something scientifically interesting will result from our efforts.

The work done to date covers five of the six sources in the original proposal. We have not yet analyzed the data on 4U1626-67 but have added studies of the black hole candidates which appear more promising. We have received a one-year no-cost extension to continue these analyses.