The present thesis incorporates the results of studies on X-ray astronomy by a number of rocket and balloon flights, as well as the results from the first measurements of equatorial low energy gamma rays at balloon altitudes. Out of the four rocket flights conducted from Thumba Equatorial Rocket Launching Station (TERLS), India, the thesis describes, in detail, the results from three successful flights, concerning the investigation of low energy (2-18 Kev) X-ray flux from several discrete X-ray sources, such as Sco X-1, Tau X-1, Cen X-2 and Cen X-4. The same rocket measurements have been utilised to provide reliable estimate of diffuse cosmic X-ray background in the range 2-18 Kev. The thesis describes the analytical method, developed by the author, which uses earth and its atmosphere as an effective shutter, to derive the flux of cosmic X-ray background.

Extension of the X-ray astronomy studies to higher energies has been attempted at balloon altitudes using scintillation detectors on oriented platforms. Even though premature balloon failures largely aborted these attempts, a successful flight was made in 1967, to investigate the diffuse X-ray background.

Besides these flights, the author has also participated in four additional rocket flights, two of
which were conducted from TERLS, and the other two from
Kagoshima, Japan in 1969. The flights were a part of
Indo-Japanese collaboration for the simultaneous measure­
ment of optical and X-ray luminosities from Sco X-1.

Preliminary results, on the physical characteristics of
the Sco X-1 source and their variation with the variation
of temperature and optical luminosity derived from these
observations, are reported in the thesis.

The author, working at Physical Research
Laboratory, Ahmedabad, India, under the guidance of Prof.
U.R. Rao, took a leading part in the design, development
of all the instrumentation for both the balloon and rocket
flights from Hyderabad and TERLS. In addition to the
construction of all airborne electronics systems, consist­
ing of pulse height analysers, telemetry systems, aspect
sensors, and orientation systems for both balloon and
rocket experiments, the author also took a leading part in
the design and construction of ground telemetry receiving
equipment for balloon experiments. Besides the experimental
work, the author actively participated in the flight
checkouts and in the analysis and interpretation of data.

Observations of the cosmic diffuse X-ray back­
ground in the range 2\textendash}500 KeV, follow power law spectra
with different exponents indicating a flattening at the
lower energies. Amongst the salient results obtained from
the investigation of discrete sources, may be mentioned the