mated satellites for some applications. Man would also be utilized to repair or replace malfunctioning units in large sophisticated earth orbital systems.

As a result of meteorological experiments in the Apollo Applications program, many benefits can be realized. The two basic purposes for the continued research and development in meteorology, both automated and manned, are (1) to explore and understand the motion and behavior of the atmosphere; and (2) to reduce the impact of the weather on daily operations private and public, and upon the economy of nations.

Economic value of improved forecasting

Improved weather forecasting techniques provided by manned earth-orbital weather station could afford annual savings of about $2.5 billion based on a recent report of the National Academy of Sciences—National Research Council. The report states:

"* * * we arrive at a total of around $2.5 billion (annually) that would be saved by farmers, fuel producers, public utilities, builders, and water managers if they were equipped with better forecasting tools. This does not take into account the economic benefits that might be obtained in the various industries associated with tourism and recreation, or the intangible savings to individual families."

Improved forecasting techniques could permit optimum routing of commercial ships and aircraft and provide a good weather warning service to commercial fishermen.

Earth resources

Apollo Applications follow-on manned flight operations will provide a platform for many earth sciences and resources experiments. The overall objectives of the Earth Resources Survey program are to determine those earth resource data which can be best acquired from space and to develop technological capabilities for the acquisition and utilization of such data.

As in meteorology, Apollo Applications follow-on missions will support this discipline by providing a test bed for the multi-spectral sensors that are required to obtain earth resources data. To a greater extent than in meteorology, man in space will play an important role in this effort and some of the follow-on mission operational flights will be manned.

Five broad areas related to the earth's resources have been identified as potentially beneficial for the application of space technology. These areas are Agriculture and Forestry Resources; Geology and Mineral Resources; Geography, Cartography and Cultural Resources; Hydrology and Water Resources; and Oceanography.

Agriculture and forestry resources

The ultimate responsibility of adequately feeding, clothing and sheltering today's expanding population rests in large part with the agriculture and forestry community. Since the land, water and mineral resources are finite quantities, these resources must be utilized efficiently to meet present and future needs.

The broad earth resources experiments program objectives are (1) increasing the yield/quality from lands in cultivation; (2) decreasing losses in production from infestation and forest fires; and (3) increasing cultivated acreage.

Geology and mineral resources

Geology is the science of the earth, its composition, structure, stratigraphy, and history. Mineral resources include iron, copper, and gold; oil and gas; sand, gravel, and limestone.

The main objectives in this program of spacecraftborne remote sensing instruments are (1) to develop means of mapping geology and geophysics on a regional basis; (2) to develop methods of predicting earthquakes and volcanic eruptions; (3) to delineate regions of mineral potential for subsequent detailed study; and (4) to provide new methods of investigating major structural units.

Geography, cartography, and cultural resources

Geography is specifically concerned with the spatial relationships of human activity and natural processes. This includes the static and dynamic patterns of the spatial distribution of man's activity, rural and urban settlement patterns and land use, and transportation networks.