

# OXYGEN IN THE MOON

## EXECUTIVE SUMMARY

The following report includes the results of a feasibility study on a process for lunar oxygen production. This work has shown that the development of a lunar oxygen production facility is possible within the constraints of current technology and resources available to the National Aeronautics and Space Administration (NASA).

The oxygen production facility designed during this work was made to compliment the new space exploration initiative proposed by President George W. Bush. This new process was planned to be fully operational by the year 2015, the earliest year which the new space initiative proposed to begin maintaining a permanently manned lunar outpost. The oxygen production system, which is described in detail in the following report, was developed with the capability of sustaining the respiratory oxygen needs of 10 people.

The production process was designed as a modular unit to ease future growth of the lunar outpost. For example, if the future finds the need to produce oxygen to be used as a fuel for transportation additional oxygen production units can quite simply be dispatched to the moon to increase the production capacity. This idea of modular growth will make the immediate implementation far more practical, both in terms of feasibility and economics, since there will be less unused capacity in the early days of the lunar outpost.

The chemistry used in the production unit is the reduction of solid lunar ilmenite by hydrogen gas. This reduction reaction creates water which, after further processing in an electrolysis chamber, is converted into breathable oxygen and hydrogen which is recycled to the reaction system. The power required to run the process will be provided entirely by photo-voltaic cells. This recycling of hydrogen and utilizing solar energy has made this process entirely self sufficient once constructed on the lunar surface.

The future exploration of space is dependent upon technology like this oxygen production facility. If man is to continue exploring the galaxy local resources must be utilized whenever and wherever possible to reduce the financial burden on the countries that are supporting the exploration. Implementing this oxygen production process will allow NASA and the United States to continue to be on the forefront of space exploration.

Aside from uncertainties associated with the lunar habitat, a significant constraint of the establishment of a lunar colony is the cost. The oxygen production facility itself is almost negligible compared with the costs associated with the logistics of establishing the colony. The transportation costs outweigh all other costs in developing a lunar colony. The price tag for this process alone is approximately \$5 billion. Since this project only considers a rather small colony much research must be done in the future to effectively reduce costs associated with transportation of materials to the lunar surface in order to fully establish the lunar colony.