



# Project HALO — High Altitude Lift-Off

## A Project of the Huntsville Alabama L5 Society

### Executive Summary

Project HALO, for “High Altitude Lift Off”, was conceived to explore the scientific and economic potential of using high altitude balloons as launch platforms for rockets.

The balloon-launched rocket concept, known as “rockoon,” was first put to use by Dr. James Van Allen in the 1950’s. Rockoons allowed Dr. Van Allen to conduct pioneering studies of the upper atmosphere. Because of increased efficiency for small rockets above the drag of Earth’s atmosphere, Dr. Van Allen was able to boost the altitude attained by the Deacon rocket from 60 thousand feet to over 300 thousand feet. As larger military rockets capable of reaching orbit from the ground became available, rockoons were for the most part abandoned. The Van Allen Radiation Belt was discovered by a ground-launched probe.

The Huntsville Alabama L5 Society (HAL5) chapter of the National Space Society (NSS), thus started Project HALO as a means to use today’s better balloon and small rocket technology to push the rockoon concept to its full potential as an economical means of reaching extremely high altitudes.

#### Project HALO Phases

Project HALO will consist of several distinct phases, each of which in itself will provide opportunities for HAL5 to build the managerial and technical skills and resources to proceed to the next step. Each step will provide unique opportunities for student involvement, original research on the edge-of-space environment, and suggest commercial uses of rockoons.

**Phase 0 – Subsystem Test** – Balloons carrying rocket components and subsystems to altitudes of 20 miles.

**Phase I – Proof-of-Concept** – Rockets launched from high-altitude balloons.

**Phase II – Operational Rockoons** – Sub-orbital rockoons providing routine cheap access to space and the near-earth micro-gravity environment.

#### HALO Phase 0, Subsystem Test

This step takes advantage of well-developed and cheap balloon technology for carrying payloads above 99 percent of Earth’s atmosphere. It consists of attaching a payload to a helium-filled balloon and sending it to an altitude of 20 miles or more. A balloon-borne platform will be the basis of all HALO missions.

Because of the low cost, this phase can be repeated many times during the overall program to prove the space-worthiness of components of subsequent phases. It is in Phase 0 that student participation is likely to be broadest. Principles of radio and satellite communication can be demonstrated. Student-conceived experiments having to do with ozone and other atmospheric phenomena are anticipated.

Since this phase allows access to temperature extremes and near-vacuum conditions similar to those encountered in orbit and beyond, experiments in space life-support systems could be

carried out here. Astronomy from such a platform could take advantage of conditions similar to those enjoyed by the space telescope.

#### HALO Phase I, Proof-of-Concept

This phase will use balloons as launch platforms. Its objective will be the development of the family of vehicles which will carry HALO to completion. Small, experimental rockets previously tested on the ground will be evaluated for performance, safety and practicality at high altitude. Systems integration and launch procedures will be perfected.

Student experiments during this phase will likely deal with rocket technology, effects of acceleration, vehicle tracking and possible recovery. For safety reasons, most Phase I missions will be flown from coastal regions.

#### HALO Phase II, Operational Rockoons

As proficiency with high altitude rocket launches is achieved, a major milestone for HALO Phase II will be to meet or exceed the altitude record for ground-launched, privately-developed rockets. Our goal would be to reach such a height with a larger payload and smaller budget than is practical for a rocket that must plow through Earth’s atmosphere.

Unique opportunities for experiments exist in this phase as well. On-board cameras could take photographs or transmit live video from this vantage point which would cover hundreds of square miles of the planet’s surface. Microgravity payloads would experience a “weightless” environment for at least a minute or two — enough time to do some short experiments. Again, the emphasis is on cheap access to space for student and private experimenters on tight budgets.

#### Goals for Project HALO

It is our hope that Project HALO will demonstrate that extreme altitudes are reachable by amateurs; that by pushing rockoon technology to its limits, we will inspire ourselves and those who participate with us as student experimenters or commercial developers to push technology and ourselves to reach ever higher.

While we at HAL5 and NSS support and applaud the achievements of NASA and other national space programs, we believe that the scale of human space activity we envision will come about only when the public has frequent, affordable access to space. With Project HALO, we hope to help lay the groundwork of organization, technology, and imagination that will make cheap access to space a reality for us all.

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**Web Site:**

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