

THE TITAN SKY SIMULATOR™ New low cost cryogenic test facility available.

Developed for Titan balloons but suitable for many applications.

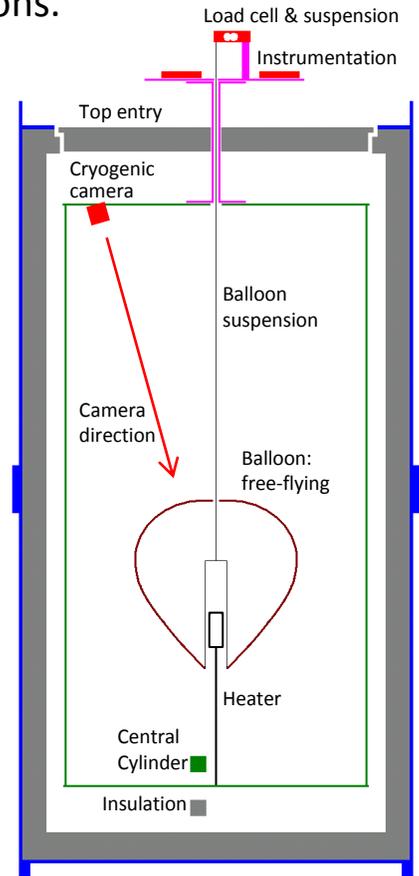
The Decadal Survey "Vision and Voyages for Planetary Science" recommends developing Titan balloons. The Titan Sky Simulator™ is a low cost facility to test balloons or other Titan hardware. A fully instrumented working prototype Titan balloon has been flown at 95°K / *minus* 180°C.



The Titan Sky Simulator™. Chair gives scale.



Balloon flying at 95°K, an interesting environment. The 4th power in Stefan's law means negligible heat transfer by radiation, quite unlike all other balloons.



Schematic: the red arrow shows the position of the camera which took the picture of the flying balloon.

CONFLICTING REQUIREMENTS exist for testing a Titan balloon. The cold gas must circulate fast for uniform temperatures yet the balloon needs perfect calm. This is achieved with a highly insulated outer section. Liquid nitrogen is sprayed in and gas circulated rapidly with a fan. A calm zone is created in an aluminum "Central Cylinder": a cylinder is convenient for CFD. While it takes many hours for all the insulation to reach temperature equilibrium, only the circulating gas and Central Cylinder need to be at a stable temperature for measurements to start and this is rapidly achieved.

IMPROVED SIMULATOR

Useful data has been produced including an "AIAA Journal" paper. An improved version is being developed in Santa Barbara, California, using everything learned, many detail changes, a much improved insulation arrangement and weighing 50% less, all allowing for easy operation.

AVAILABLE TO THE COMMUNITY

The new Simulator in Santa Barbara will be available for rent. Or with low cost/student labor, building a version is inexpensive, perhaps \$10,000 for materials. This could be an ideal student team project, simultaneously creating a useful, long term research facility. The basic concept is simple but as so often there are numerous difficulties with details. A few examples include insulation sealing and attachment, nitrogen inlets and adapting inexpensive lights and cameras for cryogenic use. Nott Technology is happy to supply knowhow to solve these problems.

For more information see IPPW-8, Session 2, "Advanced Design for a Titan Balloon" or visit:

titanography.com Titan-o-graphy as in oceanography.

Or contact: Julian Nott, Nott Technology LLC, Santa Barbara, California, USA
nott@nott.com +1.805.708.8100 Affiliated with U.C. Santa Barbara © Julian Nott 2011

Central Cylinder: ladder give scale.

