NASA Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337

Coqui Dos

WHAT: A continuation of a 1992 study, Coqui Dos is using 11 suborbital rockets to examine atmospheric turbulence, composition and electrical properties. Such information will ultimately help the reliability of radio and satellite communications.

WHEN: February 12 - April 9, 1998

WHERE:
Camp Tortuguero Recreation Area;
near Vega Baja, Puerto Rico

ECONOMIC IMPACT:
$1 MILLION (Estimated)

PARTICIPANTS:
NASA Goddard Space Flight Center
NASA Wallops Flight Facility
National Science Foundation
National Astronomy and Ionosphere Center
Arecibo Observatory
University of Puerto Rico at Mayaguez
Clemson University
Cornell University
University of Texas at Dallas
Utah State University
University of Illinois at Urbana Champaign
Aerospace Corporation

Coqui Dos will be conducted from Tortuguero near Vega Baja, Puerto Rico. The temporary rocket range is the same site used for the El Coqui Campaign (above) and other NASA launches conducted in the late 1960s.

CAMPAIGN BACKGROUND

The 1998 campaign is very similar to that conducted during the highly successful El Coqui Campaign in 1992 from Tortuguero. The 11 rocket launches should be visible from most of Puerto Rico, especially along the northern coast and San Juan.

NASA selected Puerto Rico due to a combination of factors, including the fact that the latitude is ideal for these measurements and the unique opportunity to coordinate these launches with operations of the Arecibo Ionospheric Radar Facilities. The Arecibo Radar facilities are an essential part of the scientific mission and are unmatched anywhere else in the world. The launch site is the same as that used for El Coqui in 1992 and for other NASA launches conducted in the late 1960s.

During the Coqui Dos Campaign, a total of 11 launches will be carried out during the nighttime hours when ionospheric instabilities are present in the high altitude region above Puerto Rico. Nine launches are restricted to days when the moon is below the horizon. Two launches will be conducted during nighttime hours without moon-down restrictions.

Some of these rockets have payloads containing small amounts of the chemical Trimethylaluminum (TMA), which will be released into the ionosphere. TMA burns slowly and produces visible light so that the chemical tracers can be tracked visually and with camera equipment. The products of the reaction are aluminum oxide, carbon dioxide, and water. These chemical systems pose no threat to the public during preparation on the ground or during the release in space. Three payloads are chemical only, two payloads are chemical and instrumented, and six payloads contain instrumentation only.

When TMA is released it forms an artificial cloud in the ionosphere. These milky-white artificial clouds should be visible within several hundred miles of the launch site, across most of Puerto Rico and perhaps on some of the neighboring islands. The clouds should take approximately four to five minutes to form and may be visible for up to 20 minutes.

ENVIRONMENTAL ASSESSMENT

An Environmental Assessment was prepared for the 1992 El Coqui project and resulted in the publishing of a Finding of No Significant Impact. The 1998 Coqui Dos project is similar in scope and a Technical Information Document has been prepared by NASA.

Except for the addition of five launches and the construction of one additional rocket launcher foundation, all other aspects of the Coqui Dos and El Coqui campaigns will be accomplished with similar techniques and procedures. All equipment will be removed at the end of the project.

There were no long-term environmental effects as a result of the El Coqui Project in 1992. The launch vehicles being used for Coqui Dos are standard systems that have a long-standing flight history.

Residents living in the Vega Baja area will hear a sound similar to a thunder-clap when the rockets are launched. From 1981 to 1996, the NASA Suborbital Rocket Program has had a success rate of 97%.

The Coqui Dos Campaign has been named after a species of native frog, which is an ecological and cultural symbol of Puerto Rico.

SCIENCE BACKGROUND

Outer space, though often referred to as the "vacuum of space," is not empty. It is a dynamic mix of invisible magnetic and electric fields, energetic particles and electrically charged plasmas, electrons and atoms. The interactions of these elements are influenced by long-range electric forces and by the atomic collisions that govern the behavior of neutral gases. Approximately 40 miles above the Earth's surface is a shell of neutral gases that encompasses the Earth's weather and protects its life. The ionosphere, which extends from above the atmosphere to approximately 620 miles above the Earth, is an electrically charged transition zone between the atmosphere and the magnetosphere.

The ionosphere is an important region for satellite and Earth-based communications, and it is well known that the electrical properties of the medium, together with the naturally occurring atmospheric wind and wave systems in that part of the atmosphere produce a variety of layers with strong enhancements of electron densities, atomic species, or turbulent motions. The relationship between the various forces and chemistry that act on the ionosphere and the occurrence of such layers is still poorly understood.

Instrumentation on the Coqui Dos rockets will measure the physical characteristics of the ionosphere. Chemicals released into the ionosphere will act as a tracer of the motion of the neutral component of the atmosphere so that the winds and atmospheric turbulence in that region can be measured. The rockets carrying electronic instrumentation will measure the electric fields, charged particle concentrations, and chemical composition during a period when neutral or plasma instabilities are present in the medium.

The Arecibo Radar measurements will determine when the appropriate conditions exist and will provide critical information about the characteristics of the background medium when the instabilities, such as turbulent or sporadic layers, occur.

A Black Brant V suborbital rocket motor is prepared for flight during the 1992 El Coqui Campaign. The majority of launches during Coqui Dos will use the single-stage Black Brant V.

SUBORBITAL ROCKETS

The suborbital rockets for Coqui Dos are similar to those launched in 1992 and are solid-fueled, unguided rockets that are of the type used for scientific research.

The rockets will be launched over the Atlantic Ocean to altitudes from 71 to 236 miles, and will impact beyond 30 miles off shore. Flights will last approximately 15 to 30 minutes. The rockets will be one and two stage vehicles, ranging in length from approximately 26 to 42 feet. The rockets, the number of stages, and the number to be launched during Coqui Dos are listed below.

Rocket	**Stages**	**Coqui Dos**
Black Brant V	1	6
Taurus-Orion	2	3
Terrier-Orion	2	1
Terrier-Black Brant	2	1

This Fact Sheet is a publication of the NASA Goddard Space Flight Center's Wallops Flight Facility Public Affairs Office. For further information on NASA Wallops programs, call (757) 824-1579 or visit our homepage: http://www.wff.nasa.gov

September 1997