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EFLIGHT 2003 - The Umbra on Ice from 35,000 ft

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Abstract

No total solar eclipse has ever been observed from Antarctica both because of the infrequency of occurrence and the logistical complexities associated with Antarctic operations. This paradigm of elusivity regarding Antarctic eclipses in the historical record of science and exploration is about to be broken. The next total solar eclipse, which occurs on 23 November 2003 U.T., the first in the Antarctic since 12 November 1985, will be very largely unobserved due to the geographic remoteness of the path of totality. Yet, interest in securing phenomenological observations of, and associated with, the eclipse by members of the scientific research communities engaged in solar physics, astrodynamics, aeronomy and upper atmospheric physics, as well as educators and amateur astronomers has been extremely high. The development of a flight concept to enable airborne observations, with a dedicated aircraft chartered from QANTAS Airlines, will permit the previously unobtainable to be accomplished. To do so successfully requires detailed preparatory planning for the execution of such a flight. The technical groundwork to achieving this goal has been pursued with diligence over the past four years and is predicated on a legacy and computational infrastructure capability founded on more than three decades of eclipse planning for ground, sea, and airborne venues. Here, given the geometrical circumstances of the eclipse, the uncertainties associated with weather, and the constraints of operations of the Boeing 747-400 aircraft, the requirements for the successful execution an intercept flight with the base of the Moon's shadow over the Antarctic are reviewed. The unequivocal need for real-time, in-situ re-computation of an executable flight plan in response to in-flight conditions is discussed. The mechanism for fulfilling that need, through the expert operation of EFLIGHT, a well-tested highly specialized software package of unique pedigree designed specifically for this purpose by the author of this report, working in concert with the flight crew on the flight deck is elaborated upon in the specific context of the requirements of this flight.