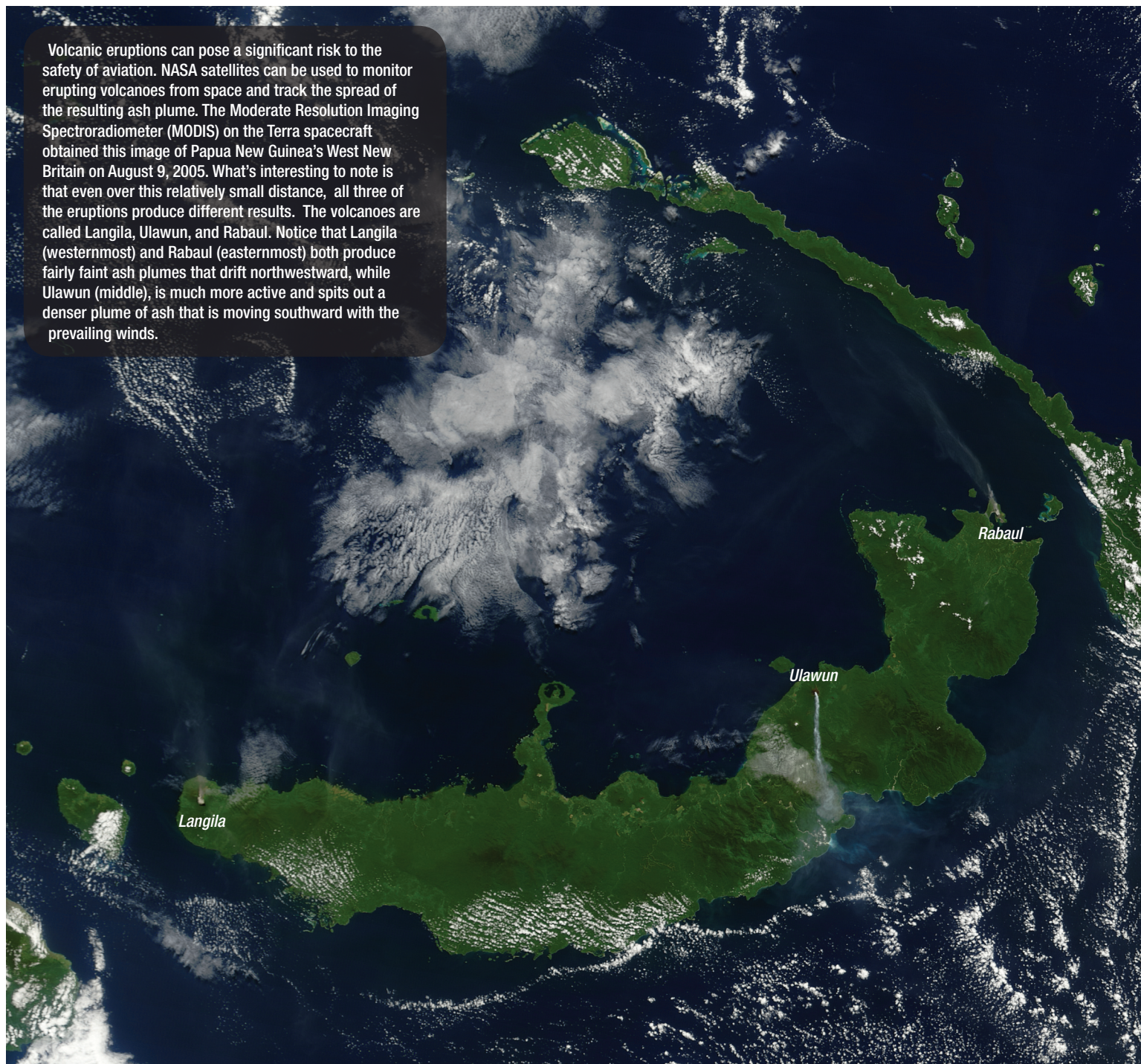


SCIENCE SERVING SOCIETY: AVIATION

Volcanic eruptions can pose a significant risk to the safety of aviation. NASA satellites can be used to monitor erupting volcanoes from space and track the spread of the resulting ash plume. The Moderate Resolution Imaging Spectroradiometer (MODIS) on the Terra spacecraft obtained this image of Papua New Guinea's West New Britain on August 9, 2005. What's interesting to note is that even over this relatively small distance, all three of the eruptions produce different results. The volcanoes are called Langila, Ulawun, and Rabaul. Notice that Langila (westernmost) and Rabaul (easternmost) both produce fairly faint ash plumes that drift northwestward, while Ulawun (middle), is much more active and spits out a denser plume of ash that is moving southward with the prevailing winds.



Langila

Ulawun

Rabaul

Weather is a contributing factor in over 30% of all aviation-related accidents. Incorporating NASA satellite data into computer weather forecast models leads to more accurate forecasts of when specific aviation hazards—e.g., in-flight icing, turbulence, convective weather, and reduced visibility—are likely to occur.





SCIENCE SERVING SOCIETY: AVIATION

Overview of the Program

At present, an array of Earth observing satellites are in orbit, and additional launches both by NASA and others will continue throughout the next decade. Our ability to observe our home planet from space has never been greater. Increasingly, studies of the Earth focus on understanding the Earth's land, atmosphere, oceans, and life as a whole integrated system rather than as individual independent elements. NASA is an important contributor in this systems approach to Earth science studies.

In addition to providing Earth observing capabilities, NASA forms strategic partnerships with other government, academic, private, and international organizations. Through these partnerships, NASA's Earth science observations and measurements are linked to practical applications. NASA data, information, and predictive models help NASA's partners, and nontraditional users of Earth science, make timely and accurate decisions regarding management of resources and development of policy. The agency's goal is to maximize the benefit of science and technology to stakeholders by smoothly flowing Earth science data and information from NASA satellites to society.

Aviation

To compete in the global economy of the 21st Century, the United States requires a safe and efficient aviation infrastructure. Developing this infrastructure will require improvements to the safety, security, and capacity of the National Airspace System (NAS), as well as reductions in the environmental effects of aviation—such as noise and air pollution. Likewise, research has shown that the impact of the environment upon aviation—such as severe weather and other natural phenomena—could be substantially mitigated if existing satellite observations could be more fully utilized.

Congress has recently directed that the Federal Government should work to improve the safety of and triple the capacity of the NAS through the year 2025—see *Vision 100 – Century of Aviation Reauthorization Act—thomas.loc.gov/cgi-bin/query/z?c108:h.r.2115*. In response to this mandate, the government created the Next Generation Air Transportation (NGATS) Joint Planning and Development Office (JPDO). JPDO represents a partnership between several Federal agencies, including representation from the Department of Transportation via the Federal Aviation Administration (FAA), the Department of Commerce via the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense; the Department of Homeland Security, and NASA. NASA partners with the member organizations of JPDO, as well as with the Office of the Federal Coordinator for Meteorology (OFCM), to ensure that observations available from instruments on current and future Earth observing satellite missions are used in operational forecasting techniques in a more timely fashion.

One of the major areas where NASA Earth observations are making an impact is in aviation weather forecasting. Weather is a contributing factor in about 30% of all aviation accidents. It is also the predominant factor

in reducing the efficiency and capacity of the National Airspace System. To help reduce the impact of weather on aviation, pilots, dispatchers, and air-traffic controllers all need more accurate atmospheric observations with much greater frequency over time and space. Meanwhile, meteorologists need more accurate and complete information on the conditions above the surface to help them improve the accuracy of the forecast models they run. Precise observations of the atmosphere are currently sparse and infrequent. Existing NASA Earth-observing satellite missions such as Aqua, which carries the Atmospheric Infrared Sounder (AIRS), are contributing more precise, frequent, and densely distributed observations that numerical weather prediction models require. Planned missions such as the NPOESS Preparatory Project (NPP), which will carry the Cross-track Interferometer Sounder (CrIS), offer the potential for even greater model advancements through enhanced observations. Upper-air observations from these missions will be benchmarked both to improve the accuracy of weather model forecasts and to develop warnings for a wide variety of aviation weather hazards ranging from convective weather to in-flight icing, turbulence, and reduced visibility.

NASA Earth-observing satellites also make important contributions to other areas relevant to aviation. Terra and Aqua both carry the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor. MODIS contributes a wealth of other information including volcanic ash detection (see image on front for an example) and the ability to tell the difference between ash clouds and water clouds. The Ozone Monitoring Instrument (OMI) on NASA's Aura satellite adds additional capability to monitor volcanic ash clouds from space. Meanwhile, the NASA Tropical Rainfall Measuring Mission (TRMM) satellite obtains information on tropical/subtropical precipitation patterns. All of these measurements, along with observations from operational NOAA satellites, comprise the toolkit of the NASA Advanced Satellite Aviation-weather Products (ASAP) initiative. ASAP also leverages the ongoing efforts of the NASA Short-term Prediction Research and Transition (SPoRT) Center and the NASA/NOAA Joint Center for Satellite Data Assimilation.

New NASA and other partner missions planned for the coming decade will add even greater observation capabilities. NASA is creating next generation instrument technologies that will enable continuous, rapid measurements of atmospheric temperature and humidity to enhance regional weather prediction in support of aviation weather forecasts. These technologies are planned for integration into the next generation NOAA Geostationary Operational Environmental Satellite (GOES-R).

Incorporating these new, more frequent, more precise satellite observations into weather forecasts should lead to more accurate, dependable, and useful forecasts for aviation applications. Thus, NASA continues to fulfill its goal of enabling a safer, more secure, efficient, and environmentally friendly air transportation system.