OPENING SESSION

Conference Goals and Objectives

Goals of the Second International Conference on Volcanic Ash and Aviation Safety

- ***Consolidate and communicate*** the substantial progress made in the technical, operational, and scientific aspects of ash hazard mitigation since the first international meeting in 1991.
- ***Identify requirements and opportunities for further improvements*** in each component of the coordinated, international mitigation system.
- ***Leverage the ongoing investment*** of effort and resources by the international programs, technology R&D partners, and the aviation industry to ensure the greatest return in reducing risks to safety and socioeconomic consequences.

The Risk to Aviation from Airborne Volcanic Ash

More than 100 commercial aircraft have had ash-encounter incidents. Damage to a single aircraft has been as high as $80 million.

Airborne volcanic ash poses a serious threat to aviation, but this threat can be mitigated through the combined efforts of scientific specialists, the aviation industry, and air traffic control centers. More than 100 commercial and military aircraft have unexpectedly encountered volcanic ash clouds in flight. The consequences of an aircraft flying into an ash cloud can include degraded engine performance (including flameout), loss of visibility, and failure of critical navigational and operational instruments. Several encounters have resulted in multiple engine failures, and disastrous crashes have been only narrowly averted. In addition to major repair costs from encountering a dense plume (up to $80 million in damages have occurred to a single aircraft), aircraft encountering less dense volcanic ash clouds have required increased maintenance of engines and external surfaces.

The safest mitigation strategy is for aircraft to avoid flying into an ash plume. Avoidance requires knowing where an ash plume exists before entering it. Dispatchers, pilots, and air traffic controllers must be quickly informed of pre-eruptive volcanic activity, explosive eruptions, and the location and direction of ash plumes anywhere these may occur around the globe. On average, about 15 major explosive eruptions—those powerful enough to inject ash above 25,000 feet into the stratosphere—occur per year. The ash plume from a major eruption, such as Mt. Pinatubo in 1991, can affect aircraft thousands of miles downwind. When Mt. St. Helens erupted in 1980, the plume reached an altitude of 90,000 ft. in 30 minutes and was 50 miles wide.

In 15 hours, the Mt. St. Helens plume traveled 600 miles downwind. After 2 weeks, ash had circled the Earth.

An International Problem that Requires an International Solution

Volcanic ash is a worldwide aviation problem that demands an international solution. A volcanic "ring of fire" circles the Pacific basin from South and Central America through the Pacific Northwest and Alaska, and around to Kamchatka, Japan, Indonesia, the Philippines, and Micronesia. This region is often cited as having the greatest volcanic ash risk because of the number of active volcanoes and their proximity to major aviation routes. About 100 potentially dangerous volcanoes lie under air routes in the North Pacific region alone. Other regions of volcanic activity are in the Caribbean and Mediterranean basins and south Asia, as well as Iceland and the Azores in the Atlantic basin. Ash carried downwind from an eruption in any of these regions can endanger aircraft flying in its path.

The International Civil Aviation Organization (ICAO) began adopting provisions in 1987 for volcanic ash warnings to be included in aviation SIGMETs. In 1998, ICAO established the International Airways Volcano Watch, which consists of nine Volcanic Ash Advisory Centers (VAACs) to provide an interface

between volcano observatories, meteorological agencies, and air traffic control centers. Each VAAC uses reports from volcano observatories and satellite imagery to track volcanic activity and ash clouds in its designated region.

Improving the International System for Volcanic Ash Risk Mitigation

The 1991 symposium on volcanic ash and aviation safety brought international stakeholders, as well as U.S. Federal agencies and many R&D partners, together for the first time. Since then, the nine VAACs have been established, along with channels for rapid communication of volcano eruption and plume movement information to the aviation community. Methods for observing and analyzing the indicators of an impending eruption have been improved. New satellite-based remote sensing techniques are being used or developed for both volcano monitoring and ash-cloud identification and tracking.

Accurate, timely reporting of an eruption, including premonitory information about the build-up phase and real-time detection of the eruption, is an important component of mitigating the risk to aviation. Various physical and chemical signals, called "volcanic unrest," are related to the rise of magma toward the Earth's surface. Tracking these signals over periods of weeks to years before an eruption, combined with knowledge of a volcano's eruptive history, allows volcanic unrest to be monitored and interpreted. Volcano observatories use this approach to forewarn, to the extent possible, of impending eruptions.

Once an explosive eruption occurs, polar-orbiting and geosynchronous satellites can use radiometry, multispectral analysis, and other techniques to detect and track ash clouds. These satellite images provide snapshots in time of the location of airborne ash. Atmospheric dispersion models provide forecasts of where an ash cloud is headed, to give pilots, dispatchers, and controllers warning in advance. Airborne detection systems for volcanic gas and ash detection are being developed and tested.

Just as important to risk mitigation as these technological advances is the operational experience of the aviation community—commercial carriers, pilots, air traffic controllers, flight service specialists, etc.—with the still-evolving international system for detecting and communicating volcanic ash hazards. The time is right to bring all these stakeholders together again, to assess how the current system is operating and to focus attention on the critical areas for improvement.

The Second International Conference on Volcanic Ash and Aviation Safety is designed to meet these objectives. Its plenary and breakout sessions cover the major components of volcanic ash hazard mitigation, progress in technology and operations, the needs of the aviation community, and future directions for coordinated efforts. Agenda topics for the 4-day conference include:

- Physical damage to aircraft from encounters with volcanic ash clouds and the socioeconomic consequences of the volcanic ash hazard.
- The volcanic source: operations and improvements in eruption monitoring and reporting.
- Ash-cloud observations and forecasting: improving ash-cloud detection and modeling capabilities.
- Operations and capabilities at the regional VAACs: improving VAAC communications and operational capabilities to meet world aviation safety needs.
- Aviation industry perspectives: transferring technology from research into operations to meet aviation needs.
- Education and outreach to pilots, air traffic controllers, dispatchers, the aviation industry, and the meteorological and communications support services to aviation.

Airborne volcanic ash will persist as a serious aviation hazard. Mitigation strategies are working now but can and should be strengthened. The Second International Conference on Volcanic Ash and Aviation

Safety brings the scientific, technology development, and aviation communities together to consolidate and communicate the progress that has been made, identify requirements and opportunities for further improvements, and leverage the ongoing investment of effort and resources to ensure the greatest return in reducing the risks.

Conference Objectives

- Identify new operational needs/requirements and the research and development needed to satisfy those requirements.

- Match operational and research and development needs/requirements to ongoing programs/projects to maximize partnership efforts.

- Develop a roadmap for improved volcanic ash-related education, training, outreach, and decision tools.

- Develop a framework for improved partnerships within the international volcanic ash community to leverage resources and capabilities across the spectrum of operations and research and development.

Keynote Address and Invited Presentations

Keynote Address:

The Keynote Address was to be given by the **Honorable Ted Stevens**, Senator, Alaska; however, Senator Stevens was unable to attend due to legislative obligations. A letter from Senator Stevens was read to the conference attendees (see p. 1-7). **Dr. James R. Mahoney**, Assistant Secretary of Commerce for Oceans and Atmosphere and National Oceanic and Atmospheric Administration (NOAA) Deputy Administrator, delivered the keynote address since Senator Stevens was not available. He discussed the role NOAA has played in the detection and monitoring of volcanic ash since the early 1980's. This role was made more formal in 1988 for aviation safety with the near real-time ash monitoring, tracking, and composition of global volcanic activities. NOAA's role also includes the operation of Meteorological Watch Offices, the development of numerical models for the forecasting of ash cloud motion, and the R&D of enhanced volcanic ash detection techniques for use in real-time operations.

Invited Presentations:

Dr. Charles G. Groat, Director of the U.S. Geological Survey (USGS) described the leading role of USGS in the global mitigation efforts to reduce the threat to aviation from volcanic ash, through an integrated program of volcanic monitoring and research, eruption reporting, and hazard education. Dr. Groat described the development of a color-coded notification alert scheme for volcanic ash warnings to the air carrier industry, which is now being recommended for worldwide use by the International Civil Aviation Organization (ICAO). With the establishment of the Alaska Volcano Observatory, the USGS has organized interagency communications procedures for volcanic eruption and airborne volcanic ash hazards in the North Pacific.

Rear Admiral James P. Schear, U.S. Naval Reserve (Ret.), Federal Aviation Administration (FAA) Air Traffic Organization's Vice President for Safety related that during the last two decades more than 80 jets suffered damage because of encounters with volcanic ash. These encounters resulted in hundreds of millions of dollars in damage to aircraft and unknown costs due to operational delays. The FAA has been a stakeholder in improving aviation weather services which has resulted in a safer and more efficient international airspace. RADM Schear stated that one of the principal goals is to "Increase the safety and capacity of the global civil aerospace system in an environmentally sound manner." The FAA works closely with ICAO to adopt common international safety standards, air traffic procedures, and technologies. In addition, the FAA supports the operations of the Volcanic Ash Advisory Centers (VAACs) and the ICAO International Airways Volcano Watch Operations Group. RADM Schear also stated that more advanced countries need to help countries with limited resources that have active volcanoes where early detection is critical for flight safety.

Mr. Ronald J. Birk, Director of the Earth Science Applications Division, Office of Earth Science, National Aeronautics and Space Administration (NASA), spoke on NASA's new vision of integrating Earth observations into decision-support tools for aviation and other applications of both national and international priority. NASA is working with the interagency Joint Planning and Development Office to produce a plan for a precise, continuous, and dynamic aviation weather digital database to support the aviation information infrastructure. Mr. Birk showed a movie, "A Vision of the Future," and invited the global community to share in this vision. One dimension for accomplishing this vision is to extend the benefits of the sensors on NASA and NOAA Earth observation satellites to provide critical information on the early detection and transport of volcanic ash and gas. NASA and its partners benchmark practical uses of observations and predictions from Earth science models for decision-support tools that serve operational and policy decision makers. Mr. Birk discussed the Advanced Satellite Aviation-weather Products project which is a partnership between NASA and FAA intended to integrate satellite observations into a wide range of graphical products, including volcanic ash.

Mr. Gianni Semenzato, Senior Flight Inspector with the Ente Nazional per L'Aviazione Civile (Italian Civil Aviation Authority) described the Catania Fontanarossa Airport's procedures for flight operations in the presence of volcanic ash. Based on information provided by ICAO, an organizational structure was identified of different civilian and military bodies involved in ensuring the operational condition for the airport during periods of strong volcanic activity. Mr. Semanzato spoke of the authorities involved, the monitoring and alarm capabilities, and the tasks and responsibilities of each group during an event. He concluded with the guidelines for evaluating the procedures.

United States Senate
COMMITTEE ON APPROPRIATIONS
WASHINGTON, DC 20510–6025
www.senate.gov/~appropriations

June 18, 2004

Mr. Sam Williamson
Federal Coordinator for Meteorology
Office of the Federal Coordinator for Meteorology
8455 Colesville Road Suite 1500
Silver Spring, Maryland 20910

Dear Sam:

I am honored to have been invited to be the keynote speaker at the 2nd Conference on Volcanic Ash and Aviation Safety. I regret that I am unable to attend due to obligations in Washington, D.C.

The threat to aviation posed by airborne volcanic ash is a serious matter. Volcanic ash poses a risk to aviation in Alaska due to the large number of active volcanoes in our state. As you know, Anchorage is one of the world's busiest cargo airorts and is a common technical stop for transpacific passenger flights. Additionally, seventy percent of Alaska's communities are not on the road system and depend on aviation for most goods and services. For this reason I have long supported a robust volcano monitoring system throughout Alaska and the North Pacific.

Thanks to all of you for the extraordinary job you have done making our skies safer.

With best wishes,

Cordially,

TED STEVENS