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JANUARY 3, 2018

Operations and Services

Volcanic Ash, NWSPD 10-15

VOLCANIC ASH ADVISORY CENTERS

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SUMMARY OF REVISIONS: This directive supersedes NWSI 10-1501, "*Volcanic Ash Advisory Centers*," dated February 3, 2012. Changes made to reflect the NWS Headquarters reorganization, effective April 1, 2015, and to reflect reorganization by the International Civil Aviation Organization.

Signed 12/20/2017
Andrew D. Stern Date
Director
Analyze, Forecast and Support Office

Volcanic Ash Advisory Centers

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1. Purpose

This instruction describes the National Oceanic and Atmospheric Administration's (NOAA) two U.S. Volcanic Ash Advisory Centers (VAACs): the National Environmental Satellite, Data, and Information Service's (NESDIS) Washington VAAC, located in College Park, Maryland (MD); and the National Weather Service's (NWS) Anchorage VAAC, located in Anchorage, Alaska (AK).

2. Overview

Volcanic ash is a serious hazard to aviation. It can cause significant damage to aircraft and potentially lead to fatal accidents. In response to this acknowledgement, the International Airways Volcano Watch (IAVW) was created.

The IAVW is coordinated by the International Civil Aviation Organization (ICAO), and sets out arrangements between volcanological, aeronautical, and meteorological organizations to facilitate the provision of warnings to aircraft on the presence of ash in the atmosphere.

The Anchorage and Washington VAACs are two of the nine VAACs around the world that have been established within the framework of the IAVW.

The procedures of the IAVW are described in ICAO Doc 9766: *Handbook on the International Airways Volcano Watch (IAVW)* (*Handbook*). Any inconsistencies between the *Handbook* and this document should be brought to the attention of the VAAC Managers.

VAACs are primarily responsible for issuing Volcanic Ash Advisories (VAAs) and Volcanic Ash Graphics (VAGs), which provide information on the distribution and forecast movement of ash. Under the ideal operation of the IAVW, the VAA message and VAG provides guidance to the appropriate Meteorological Watch Office (MWO), which then prepares the Volcanic Ash SIGMET (Significant Meteorological Information). The Volcanic Ash SIGMET is the official aviation warning product.

3. General

The VAACs were established in 1997 by ICAO. These roles are defined by ICAO and the World Meteorological Organization (WMO), as well as various U.S. government agencies. The Federal Aviation Administration (FAA), the lead U.S. agency, has designated the NWS to provide the required aviation weather products and services.

The FAA is the meteorological authority, as defined by ICAO, for the United States, and works closely with the NWS on U.S. VAAC requirements. The FAA has designated the NWS as the meteorological provider. The FAA represents U.S. interests at ICAO meetings, and the U.S. VAAC managers generally serve as technical advisors to the FAA.

4. Goal

The goal of the volcanic ash program is to provide worldwide warnings and advisories to aviation interests regarding volcanic ash hazards.

5. Volcanic Ash Advisory Centers (VAACs)

The VAAC is defined in ICAO Annex 3, *Meteorological Service for International Air Navigation*, Section 3.5, as a meteorological center designated by regional air navigation agreement to provide advisory information to MWOs, area control centers, flight information centers, World Area Forecast Centers (WAFCs), and international operational meteorological (OPMET) databanks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions. VAAC information includes text-based VAA and graphical-based VAG products.

VAACs are responsible for providing ash movement and dispersion guidance to MWOs and neighboring VAACs. Two VAACs cover the United States: the Anchorage VAAC, which is part of the Alaska Aviation Weather Unit (AAWU) in Anchorage, AK; and the Washington VAAC, which is part of the National Environmental Satellite and Data Information Service (NESDIS) Office of Satellite and Product Operations (OSPO) Satellite Analysis Branch (SAB) in College Park, MD.

Each VAAC performs these functions:

- Provides model input parameters to the NOAA/NWS National Centers for Environmental Prediction (NCEP) Central Operations (NCO) Senior Duty Meteorologist (SDM), who executes volcanic ash dispersion models in real-time.
- Keeps up-to-date with information on volcanic activity within the region.
- Continuously uses satellite information to identify volcanic ash and to discriminate volcanic ash clouds from weather clouds.
- Issues VAAs and provides guidance to MWOs for SIGMETs involving volcanic ash.
- Issues VAGs that describe the VAA.
- Updates VAAs and VAGs at least every six hours.
- Cancels VAAs and VAGs when ash is no longer discernible or has entirely moved into adjacent VAAC area of responsibility (see section 11, Transfer of Responsibility).
- Provides advisory service to Regional Area Forecast Centers, MWOs, Volcanic Observatories (VOs), Center Weather Service Units (CWSUs), and other VAACs.
- Coordinates with the aviation community, the public, and neighboring VAACs about volcanic episodes.

The two VAACs are responsible for the detection, analysis, and forecasting of volcanic ash plumes across their respective areas of responsibility ***(Figure 1)***. The Washington VAAC is a partnership between the NWS and NESDIS. The NESDIS OSPO SAB is responsible for the detection, analysis, and forecasting of volcanic ash plumes, while the NCO is responsible for running and distributing the NOAA Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) ash dispersion model. The Washington VAAC staff, located at SAB, is also responsible for other programs such as tropical weather, marine pollution, heavy precipitation, and fire/smoke analysis. The Washington VAAC is staffed 24x7x365. Both groups (NESDIS OSPO SAB and NCO) are physically located in the NOAA Center for Weather and Climate Prediction in College Park, MD. The Washington VAAC services two U.S. and 21 international MWOs.

The Anchorage VAAC is a NWS entity, which is operated by the AAWU and is part of NWS Alaska Region. The AAWU also serves as the MWO for the Anchorage Flight Information Region (FIR). The AAWU/Anchorage VAAC staffs two desks 24x7x365. The VAAC desk is also staffed by the AAWU lead forecaster during eruptive events. Additional personnel are called in to assist during large volcanic ash events. The AAWU/Anchorage VAAC is co-located with the Anchorage Weather Forecast Office (WFO) and the Alaska-Pacific River Forecast Center (APRFC) in the NWS Sand Lake Facility in Anchorage, Alaska. The Anchorage VAAC services one U.S. MWO.

The VAACs are responsible for issuing VAA text and VAG products ***(Figure 2a and b)***. This is accomplished by using a wide array of remote sensing information (e.g., satellite, radar), in situ data (METAR, PIREP, Volcano Observatory reports), as well as ash dispersion and meteorological modeling output. In addition, each of the VAACs provide advice and consultation to the MWOs, WFOs, CWSUs, VOs, FAA Air Route Traffic Control Centers (ARTCC), and many other partners and users.

6. Groups Addressing Volcanic Ash Services

There are several groups both within the United States and internationally that are addressing volcanic ash service issues. NOAA VAWG (Volcanic Ash Working Group) team members actively participate as partners in these collaborative activities as needed. The following is a partial list of volcanic ash services related activities and a list of NOAA VAWG members who are associated with these groups.

6.1 ICAO Meteorology Panel (METP)

Establishment of the METP resulted from ICAO restructuring in 2014. The purpose of the METP is to determine operational requirements for aeronautical meteorological services in support of global air traffic management, and coordinate with the WMO to meet the requirements using sound scientific and/or technological solutions. To efficiently accomplish tasks in the work program, the METP has established several working groups, two of which have bearing on VAACs.

6.1.1 METP Meteorological Operations Group (MOG)

The MOG is responsible for operations of existing systems, including the IAVW and the World Area Forecast System (WAFS). The MOG monitors these systems to ensure they meet the needs of their users.

6.1.2 METP Working Group for Meteorological Information and Service Development (WG-MISD) Volcanic Ash Work Stream

The WG-MISD assesses user needs, determines gaps, develops concepts of operations, and identifies functional and performance requirements of meteorological information to support global air navigation. Because of the broad scope, the WG-MISD is divided into several work streams. The Volcanic Ash Work Stream focuses on tasks related to scientific and technological advances in provision of volcanic ash information to aviation.

6.2 IAVW

Until the ICAO reorganization that created the METP, international cooperation and arrangements for monitoring volcanic ash detection and warning were overseen by the IAVW Operations Group. The METP dissolved the Operations Group but continues to develop requirements for the IAVW in coordination with the WMO.

6.3 Alaska Interagency Volcanic Ash Services Working Group

This Alaska Interagency group meets two to three times each year. The face-to-face meetings alternate between the U.S. Geological Survey (USGS) Alaska Volcano Observatory (AVO) and the NWS WFO in Anchorage. The group consists of members from NOAA/NWS, FAA, USGS AVO, the United States Coast Guard, the Alaska Department of Homeland Security and Emergency Management, the State of Alaska Department of Environmental Conservation Division of Air Quality, the State of Alaska Health and Human Services, and the Joint Task Force Alaska (Department of Defense, DoD).

Members include the NWS Alaska Region Volcanic Ash Program Manager (co-chair), the Anchorage VAAC Manager, the WFO Anchorage Warning Coordination Meteorologist (WCM), and the Anchorage CWSU (ZAN) Meteorologist-in-Charge (MIC).

6.4 National Marine Volcano Impacts Team

This NOAA-led team meets several times per year via telephone conference (telcon) to discuss specific issues with respect to volcano hazards and marine issues. The NOAA NCEP Ocean Prediction Center leads this group, which consists of NOAA/NWS, USGS Volcano Observatories, and the United States Coast Guard.

Members include the NCEP Ocean Prediction Center WCM (lead), the NWS Volcanic Ash Program Manager, Anchorage and Washington VAAC Managers, and WFO Anchorage WCM.

6.5 Office of the Federal Coordinator for Meteorology (OFCM)

The OFCM Working Group for Volcanic Ash (WG/VA) is an active group that meets several times per year either through telcon or face to face meetings in Silver Spring, MD. The group is comprised of representatives from several agencies including the FAA, NOAA, the USGS, the U.S. Air Force 557th Weather Wing (557WW), the National Aeronautics and Space Administration, the Smithsonian Institute, and the Airline Pilots Association.

Members include the NWS Volcanic Ash Program Manager (co-chair), the Anchorage and Washington VAAC Managers, and the NOAA Air Resources Laboratory (ARL) HYSPLIT program manager.

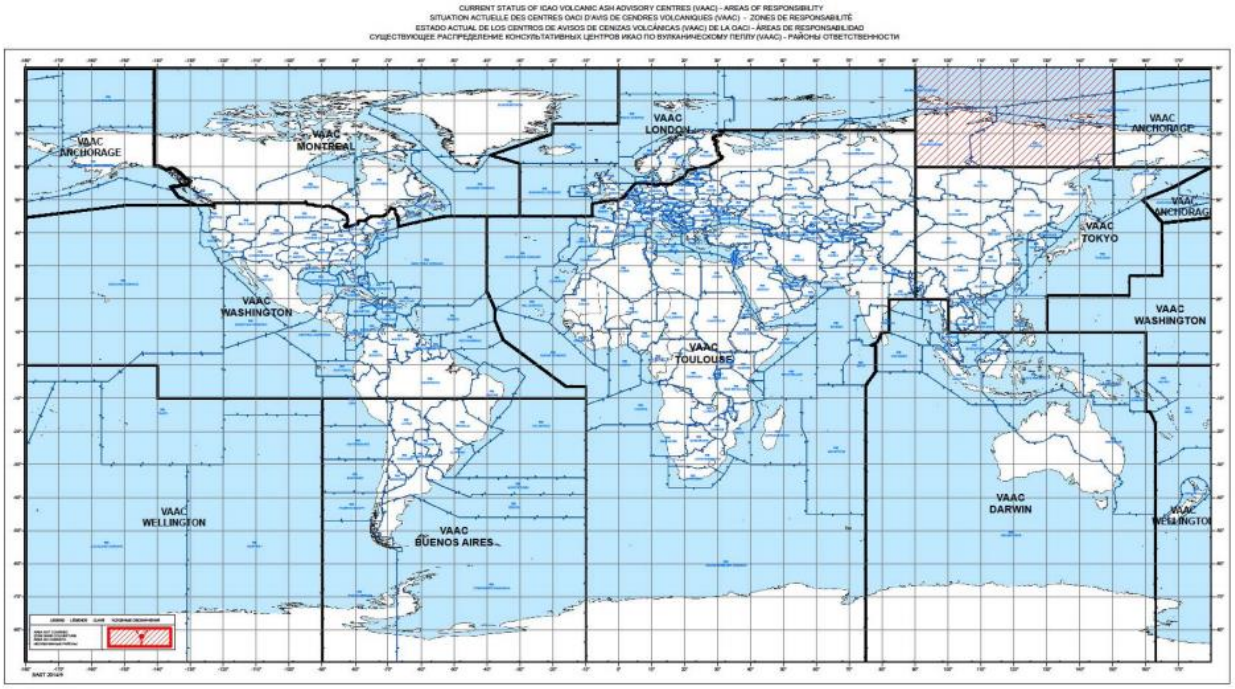

Figure 1: VAACs of the World (from ICAO Doc 9766)

6.6 Example of a VAA and VAG (Figure 2a)

```
FVXX21 KNES 211526
VA ADVISORY
DTG: 20160921/1526Z

VAAC: WASHINGTON

VOLCANO: TURRIALBA 345070
PSN: N1001 W08346

AREA: COSTA.RICA

SUMMIT ELEV: 10958 FT (3340 M)

ADVISORY NR: 2016/186

INFO SOURCE: GOES-EAST. GFS WINDS. VOLCANO WEB
CAMERA. OVSICORI-UNA.

ERUPTION DETAILS: NEW EM BEGINNING 1415Z.

OBS VA DTG: 21/1415Z

OBS VA CLD: SFC/FL140 N1022 W08349 - N1015 W08334
- N1001 W08330 - N1002 W08347 - N1022 W08349 MOV
N 10KT

FCST VA CLD +6HR: 21/2030Z SFC/FL140 N1028 W08402
```

```
- N1028 W08343 - N1002 W08344 - N1014 W08414 -
N1028 W08402

FCST VA CLD +12HR: 22/0230Z SFC/FL140 N1020
W08352 - N1002 W08346 - N1000 W08348 - N1016
W08419 - N1020 W08352

FCST VA CLD +18HR: 22/0830Z SFC/FL140 N1025
W08347 - N1002 W08345 - N1002 W08348 - N1019
W08414 - N1025 W08347

RMK: VA EXTENDS 10 NM FROM THE SUMMIT TO
NW...N...AND NE. HGT OF VA HAS INCREASED SLIGHTLY
BASED ON VO RPRT.   ...SZATANEK

NXT ADVISORY: WILL BE ISSUED BY 20160921/2130Z
```

Note on VAA Dissemination

VAA dissemination over NWS and international circuits uses a text (Traditional Alphanumeric Code, TAC) convention. In accordance with ICAO Annex 3 requirements (as amended), NWS will simultaneously disseminate VAAs using the ICAO Weather Information Exchange Model (IWXXM) data standard. IWXXM is a machine-readable language that enables digital communications, such that VAAs (and other TAC products) can be ingested and used digitally for visualizations and in decision tools. VAA conversion from TAC to IWXXM will be done automatically during VAAC production or prior to dissemination via NOAA telecommunications systems.

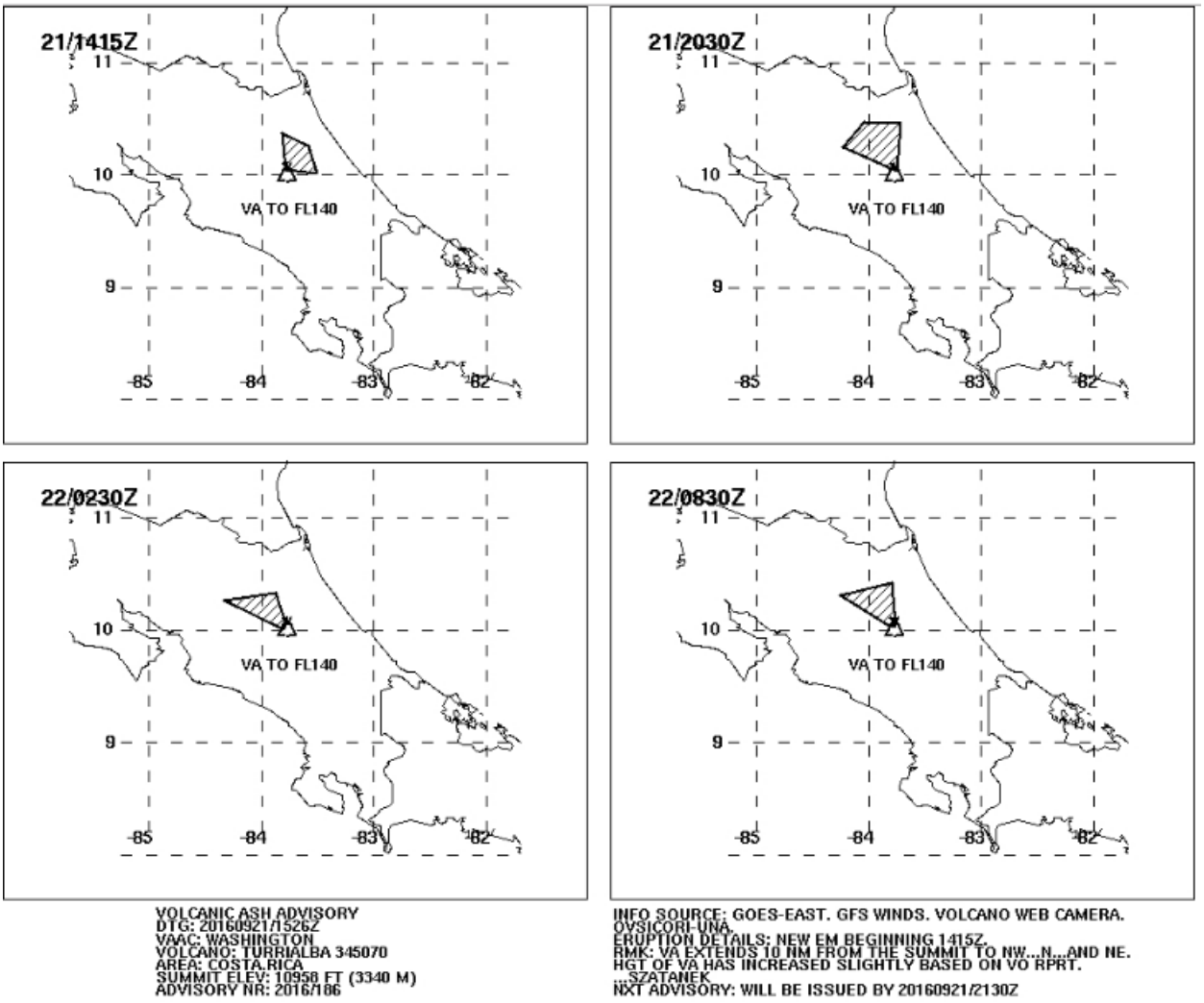

Figure 2b: Example of a VAG

7. Dispersion and Trajectory Models

Dispersion and trajectory model output is used by the VAACs to assist with the preparation of forecast ash boundaries. The models should be initiated as soon as possible after ash is detected to allow timely preparation of forecast positions. The model output may also assist with the detection of ash on satellite imagery, as it can help locate where the ash may be expected to be on the image.

The primary (official) dispersion model used by the Anchorage and Washington VAACs is the HYSPLIT model. Other models are consulted such as the PUFF model (http://puff.images.alaska.edu/monitoring.shtml, site requires password) and Canadian Emergency Response Model (CANERM). NOAA's ARL also distributes trajectory forecasts which are frequently used by the forecasters as well (http://ready.arl.noaa.gov/READY_traj_alaska.php).

8. U.S. VAAC Description

8.1 Anchorage VAAC

Although the area of the Anchorage VAAC is one of the smallest VAAC areas, it covers air routes over some of the most active volcanic areas in the world. Alaska has 80 percent of all active U.S. volcanoes and eight percent of the active volcanoes world-wide. Alaska contains over 100 volcanoes and over 40 of these have been active in recent time.

The north Pacific air routes connecting Alaska to the East Asia carry 10,000 people per day, and up to 50,000 aircraft per year. Some routes pass over the Kamchatka Peninsula with its 32 volcanoes. The Anchorage VAAC in cooperation with the AVO and the Kamchatka Volcanic Eruption Response Team has initiated a series of informal agreements to provide advisory assistance about volcanic activity on the Kamchatka Peninsula.

The AVO continuously monitors several of the Aleutian volcanoes and relays its observations and forecasts to the NWS and the FAA.

How the process works:

- AAWU VAAC meteorologists use input from the AVO, satellite pictures, radar imagery and pilot reports to determine if an eruption has occurred and to understand the intensity of the eruption.
- An eruption SIGMET is issued to warn pilots about the danger.
- One or more computer models are used to forecast ash movement in the atmosphere HYSPLIT, PUFF and/or CANERM.
- A VAA is issued describing the three-dimensional location of the ash. An accompanying graphic is also issued (VAG).
- SIGMETs and advisories are updated to keep everyone current with the situation.

8.1.1 Anchorage VAAC Duties

During a volcanic event, the AAWU initiates the Anchorage VAAC. The Anchorage VAAC responsibilities are handled by the AAWU lead forecaster; however, during significant eruptive events, the VAAC requires its own staffing. The AAWU does have a VAAC desk (fully equipped with the Advanced Weather Interactive Processing System (AWIPS), administrative computer and phone) to facilitate this function.

During a significant eruptive event the following options are available:

- Lead forecaster “load sheds” to the North Desk (as appropriate) and takes on VAAC duties.
- Lead forecaster calls on administrative shift forecaster (if available) to assume AAWU and/or VAAC duties.
- Lead forecaster calls on MIC or Science and Operations Officer (SOO) to assume either routine aviation (AAWU) duties or VAAC duties. Note that MIC or SOO may be busy with Alaska Division of Homeland Security & Emergency Management calls, coordination with other VAACs or MWO office managers, media calls, etc.
- Lead forecaster calls in overtime shift to cover AAWU and/or VAAC duties.

A volcanic event can range from a minor impact event (e.g., low level eruption in Kamchatka or Aleutians) to a high impact event (Cook Inlet volcano event).

The following products are issued by the VAAC forecaster:

- VAA and VAG (every six hours and updated as needed)
- Volcanic Ash SIGMET (AAWU only-every six hours and updated or amended as needed)
- Provide input parameters and coordinate with NCO on HYSPLIT run
    - Using the four ash reduction results provided by NCO, the Anchorage VAAC forecaster then needs to validate which solution is correct (by using remote sensing/observational data).
    - The Anchorage VAAC forecaster then coordinates with NCO to advise on which reduction to disseminate long line.
    - The VAAC forecaster also runs the PUFF model and uses hypothetical trajectories provided by the ARL to aid in VAA/VAG/SIGMET production.

8.2 Washington VAAC (W-VAAC)

The W-VAAC is a collaborative effort of both the NWS's NCEP and the NESDIS OSPO SAB. Most of the duties of the VAAC, however, are performed by the satellite analysts in SAB. The NCEP portion of the W-VAAC is responsible for maintaining and running the HYSPLIT model in a 24/7 operational environment on its computer system. NCEP also runs the Global Forecast System atmospheric model four times a day in six-hour cycles for input to the HYSPLIT model.

8.2.1 Washington VAAC Duties

The analysis of imagery and issuance of both the VAA and VAG are done by the SAB satellite analyst. When ash is reported or detected within the Washington VAAC boundaries, the analyst will discontinue other operational activities and immediately begin gathering information about the ash/eruption.

- The first priority is to notify the affected MWO(s), usually by phone, to facilitate their issuance of a Volcanic Ash SIGMET.
- Next, the analyst prepares a Quick or Full Standard VAA.
- If ash is detectable in satellite imagery, a VAG is also issued. The VAG consists of the current horizontal and vertical extent of the ash cloud and the +06, +12, and +18 hour forecasted positions of the ash.

While the analysis of the ash cloud is being done, the NCEP Senior Duty Meteorologist (SDM) sets up a file containing the inputs for the volcanic ash plume provided by SAB. The SDM then runs the model by requesting the NCO Systems Operations Specialist to run the computer job to generate the HYSPLIT graphic. Upon model completion, the graphic output is reviewed by SAB analyst for consistency with the meteorology fields, satellite imagery, and any observed data in the vicinity of the ash cloud. Once satisfied with the HYSPLIT depiction, another computer job is run to disseminate the HYSPLIT output to users. VAA, VAG, and HYSPLIT are updated at least every six hours, but sooner if the ash situation changes substantially.

9. Distribution of Products

VAAC products are available from the following communications circuits:

- **VAA:** Global Telecommunications System and Family of Services
- **VAA and VAG, SIGMETS:** AAWU Internet home pages (AAWU and VAAC)
- **VAA and VAG:** OSPO Satellite Products and Services Division Internet home pages
- **VAA (no graphic), HYSPLIT:** World Area Forecast Satellite Broadcast System
- **HYSPLIT:** Digital Facsimile (DIFAX)
- **VAA and VAG:** NCEP AWIPS
- **VAA (no graphic):** AWIPS, and Aeronautical Fixed Telecommunications Network (AFTN)
- **VAA: Volcanic Ash ListServ** – Washington VAAC

FAXING SERVICES are discouraged as an operational method of dissemination.

10. Areas of Responsibility (Figure 1)

Anchorage VAAC: The Anchorage VAAC area includes the entire Anchorage FIR in addition to an area bounded on the west by 150 degrees East and on the south by 60 degrees North. This area includes all of the volcanoes within the state of Alaska, and closely monitors adjacent volcanoes located in Kamchatka Peninsula and the Northern Kurile Islands of Russia.

Washington VAAC: The Washington VAAC's area of responsibility stretches from 40 degrees West to 130 degrees East and includes the areas of the United States Continental, New York and Oakland Oceanic FIR, and southward through Central America, the Caribbean to 10 degrees South in South America.

11. Transfer of Responsibility of Volcanic Ash Products

In cases where volcanic ash cloud crosses the boundary between VAAC areas of responsibility, the first VAAC should retain responsibility for the issuance of advisories until such time as the hand-over of responsibility has been agreed between VAACs. Standardized operational procedures for the coordination and transfer of responsibility between VAACs for volcanic ash events are located in the IAVW Handbook (DOC 9766) and are explained below.

Note: In other words, while the volcanic ash cloud straddles the common boundary, only one VAAC will issue advisories at any time, and these advisories are sent by each VAAC to MWOs and Area Control Centers (ACCs) in their respective areas of responsibility.

VAACs should insert a note in their "last"/"first" advisory of the message and graphical series in the remarks section that the "handover" will take place at that message/graphic number.

As soon as one of the VAACs learns of an eruption (for a volcano erupting within five degrees latitude of the VAACs boundary) or when an ash cloud is expected to come within five degrees latitude of the VAACs and/or FIR boundary, the forecaster or "lead VAAC" will make an information/coordination phone call. The possibility of a hand-over will be discussed, if appropriate.

Handover of operational responsibility is coordinated by the lead VAAC with adjacent affected VAACs and MWOs when the ash cloud is not less than five degrees latitude from a VAAC and/or FIR boundary. In the rare situation of large or persistent ash emissions, adjacent responsible VAACs, upon coordination, may agree to divide the operational forecast responsibility.

Once a handover has been decided, the last volcanic ash advisory issued by the lead VAAC before hand-over will include the following at the end of the message (in the REMARKS):

"THE RESPONSIBILITY FOR THIS ASH EVENT IS BEING TRANSFERRED TO VAAC **aaaa** THE NEXT ADVISORY WILL BE ISSUED BY VAAC **aaaa** BY **xxxx** UTC UNDER HEADER **bbbb**."

Where:
aaaa is the name of the VAAC taking over
bbbb is the bulletin header that will be used by the VAAC taking over (FVCN01 CWAO, FVXX21 KWBC, FVAK20 PANC, etc.)
xxxx is the time in UTC
Example:
"THE RESPONSIBILITY FOR THIS ASH EVENT IS BEING TRANSFERRED TO VAAC MONTREAL. THE NEXT ADVISORY WILL BE ISSUED BY VAAC MONTREAL BY 2200 UTC UNDER HEADER FVCN01 CWAO."

The first volcanic ash advisory issued by the VAAC that has taken over responsibility will include the following:
"VAAC **cccc** HAS TRANSFERRED RESPONSIBILITY OF THIS EVENT TO VAAC **dddd**. THIS ADVISORY UPDATES MESSAGE **eeee**."

Where:
cccc is the name of the VAAC which had the lead before the hand-off
dddd is the name of the VAAC which has taken over
eeee is the full bulletin header (e.g., FVAK PANC 261200) of the last message issued by the VAAC which had the lead before the hand-off.
Example:
"VAAC ANCHORAGE HAS TRANSFERRED RESPONSIBILITY OF THIS EVENT TO VAAC MONTREAL. THIS ADVISORY UPDATES MESSAGE FVAK20 PANC 261200."

When the lead VAAC is issuing messages covering a portion of another VAAC's area of responsibility, or an ash cloud is approaching within five degrees latitude the area of responsibility of a non-lead VAAC, the non-lead VAAC should issue a volcanic ash advisory directing the user to the correct product. It should be noted that the Washington and Anchorage VAACs refer to these as **"near"** or **"pointer"** VAAs.

The following wording is suggested:

"PLEASE SEE **ffff** ISSUED BY VAAC **gggg** WHICH DESCRIBES CONDITIONS OVER OR NEAR THE VAAC **hhhh** AREA OF RESPONSIBILITY."

Where:
ffff is the full bulletin header of the message issued by the lead VAAC
gggg is the name of the lead VAAC
hhhh is the name of the VAAC re-broadcasting the lead VAAC message

Example of rebroadcast message issued by VAAC Montreal:
PLEASE SEE FVAK20 PANC 121200 ISSUED BY VAAC ANCHORAGE WHICH DESCRIBES CONDITIONS OVER OR NEAR THE VAAC MONTREAL AREA OF RESPONSIBILITY"

Example of rebroadcast message issued by Anchorage VAAC:

FVAK23 PAWU 061818
VAAAK3
VA ADVISORY
VAAC: ANCHORAGE
VOLCANO: KIZIMEN 1000-23
PSN: N5508 E16019
AREA: KAMCHATKAN PENINSULA
SUMMIT ELEV: 8201 FT/2485 M
ADVISORY NR: 2011/001

PLEASE SEE FVFE01 RJTD ISSUED BY TOKYO VAAC WHICH DESCRIBES CONDITIONS OVER OR NEAR THE ANCHORAGE VAAC AREA OF RESPONSIBILITY.

For situations in which two or more distinct ash clouds would be present (different eruptions or one eruption for which the ash cloud has divided in two or more distinct parts), the "handover" only applies to the ash cloud approaching or crossing VAAC boundaries.

The ending of an advisory for a volcanic ash event is performed by the lead VAAC upon coordination with the adjacent affected VAACs and MWOs.

Only the lead VAAC issues volcanic ash advisories in graphical format on the NWS International Services and Communication Systems (ISCS) or Satellite Distribution System (SADIS).

12. Backup

The Washington VAAC performs back up operations for the Anchorage, Buenos Aires, and Montreal VAACs. The 557WW performs back up operations for the Washington VAAC. Back up procedures are defined in Appendix D of the IAVW Handbook (DOC 9766).

13. Contact information for Anchorage and Washington VAAC

ANCHORAGE (Alaska, USA)

Supervisor	Alaska Aviation Weather Unit - Meteorologist in Charge
Mailing Address	Alaska Aviation Weather Unit 6930 Sand Lake Road Anchorage, Alaska, USA 99502
AFTN address	via KWBCYMYX
VAA WMO header	FVAK21-25 PAWU
VAG WMO header	PFXD21-25 PAWU
Internet home page	http://vaac.arh.noaa.gov
Hours of operation	24 hour/day
Trajectory/dispersion model	HYSPLIT, PUFF dispersal model HYSPLIT dispersal model development: NOAA ARL Run PUFF: http://pafc.arh.noaa.gov/puffweb2/puffweb.php Occasionally reference the MLDP0 (Canadian) dispersal models

WASHINGTON (D.C., USA)

Supervisor	Satellite Analysis Branch, NESDIS
Mailing Address	5830 University Research Ct, Room 4030 College Park, MD 20740
VAA WMO Headers	FVXX KNES 20-27 and PFXD20-27 KNES
Internet home page	VAAs/VAGs: Main Page – www.ospo.noaa.gov/Products/atmosphere/vaac Advisory Page – http://www.ssd.noaa.gov/VAAC/
Hours of operation	24 hours/day
Trajectory /dispersion model	HYSPLIT dispersal model development: NOAA ARL NOAA Air Resources Laboratory Office of Oceanic and Atmospheric Research