




WIND JET

Volcanic Ash Awareness Workshop

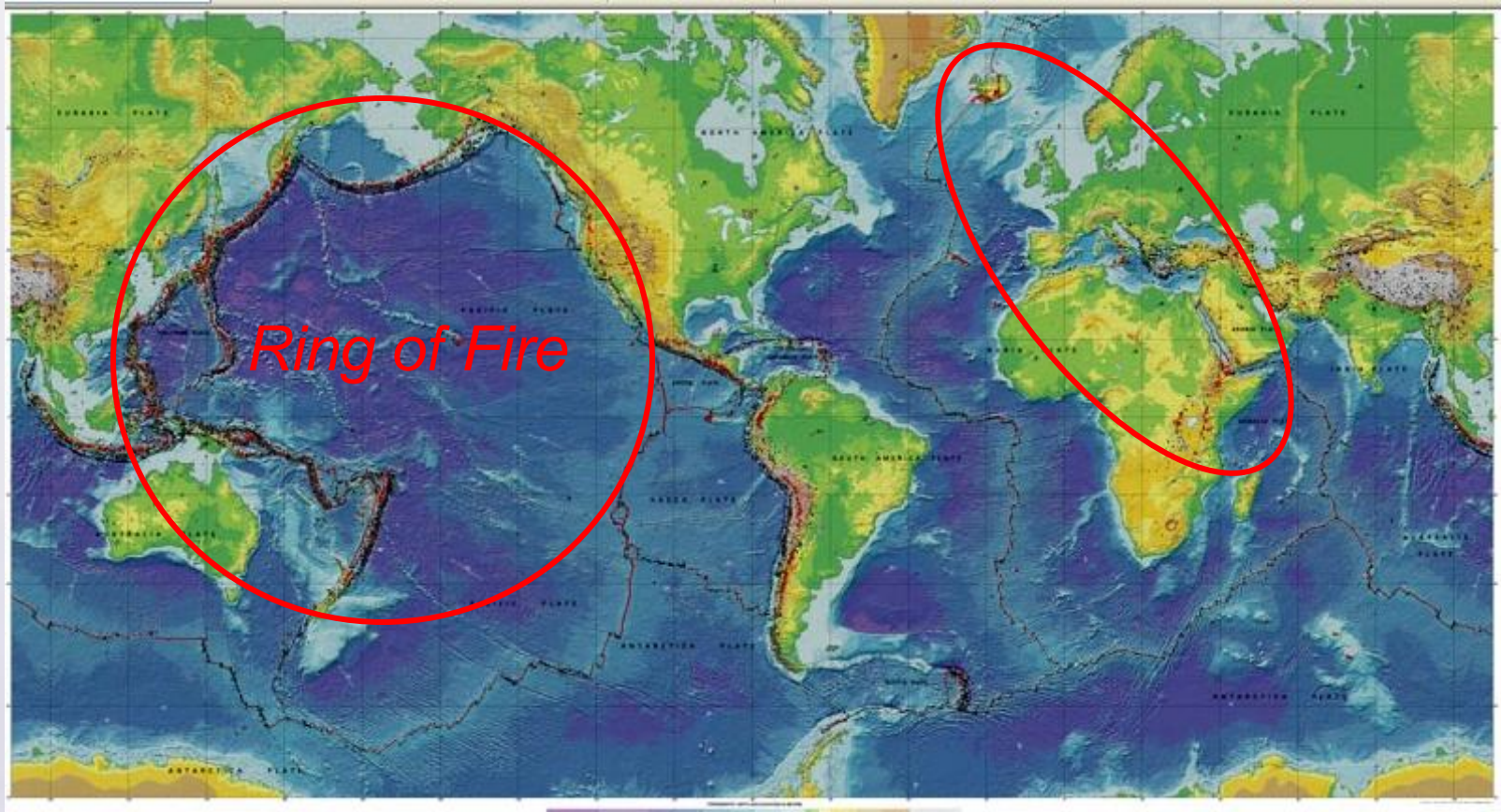
"Pilot Perspective on Volcanic Ash"

Head of Flight Safety

CPT Dario CATALISANO

- 
- ✓ **Introduction;**
 - ✓ **Volcanic Ash Effects;**
 - ✓ **Factors Involved in Volcanic Ash Encounter;**
 - ✓ **Consequences of Volcanic Ash Encounter;**
 - ✓ **Handling Volcanic Ash Encounter Effects on Aircraft;**
 - ✓ **Prevention;**
 - ✓ **Wind Jet Initiative;**
 - ✓ **Conclusion – Golden Rules –**

Between the 1980 and 2000 **over 80 Aircrafts** have experienced Volcanic Ash Encounters within the Pacific Area



V.A. Encounters have occurred until 2400 NM from the active volcano up to 72 hours after eruption.

In spite of entity of the natural phenomena the Aeronautical response is proactive. Experience teaches us that on large scale calamity prompt information sharing is essential.

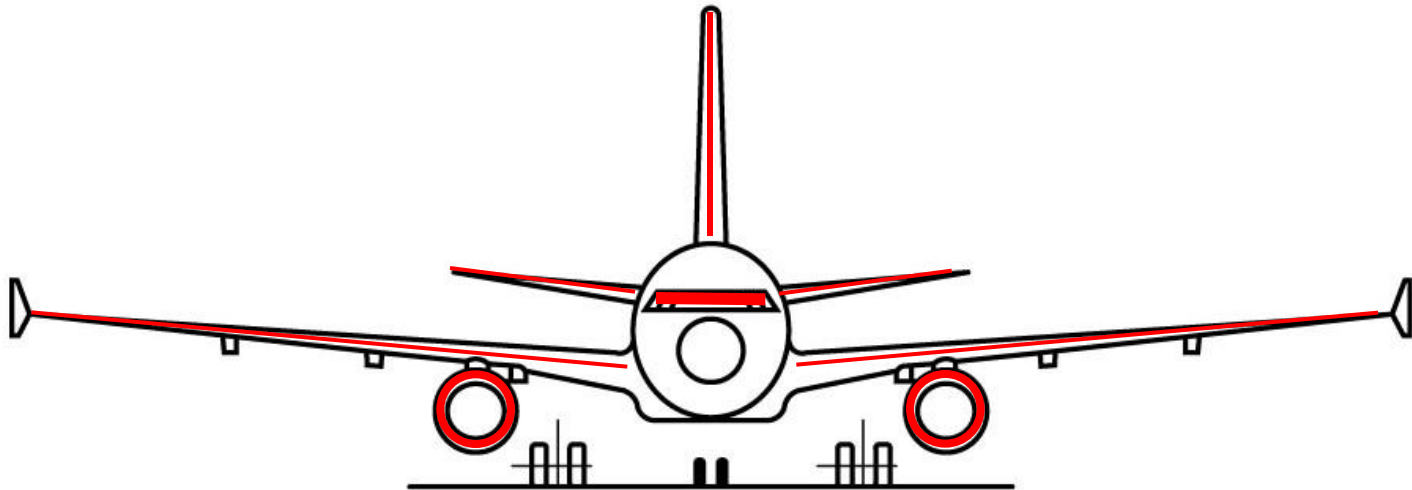


The use of satellites, standardization of communication and dedicated facilities help to make flights safer.

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Volcanic Ash particles generally may damage following aircraft's parts:

- ✓ Windshields;
- ✓ Forward cabin windows;
- ✓ Navigation and landing lights cover;
- ✓ Wing, stabilizer and fin leading edges;
- ✓ Engine nose cowl and thrust reversers
- ✓ Pitot and static probes.

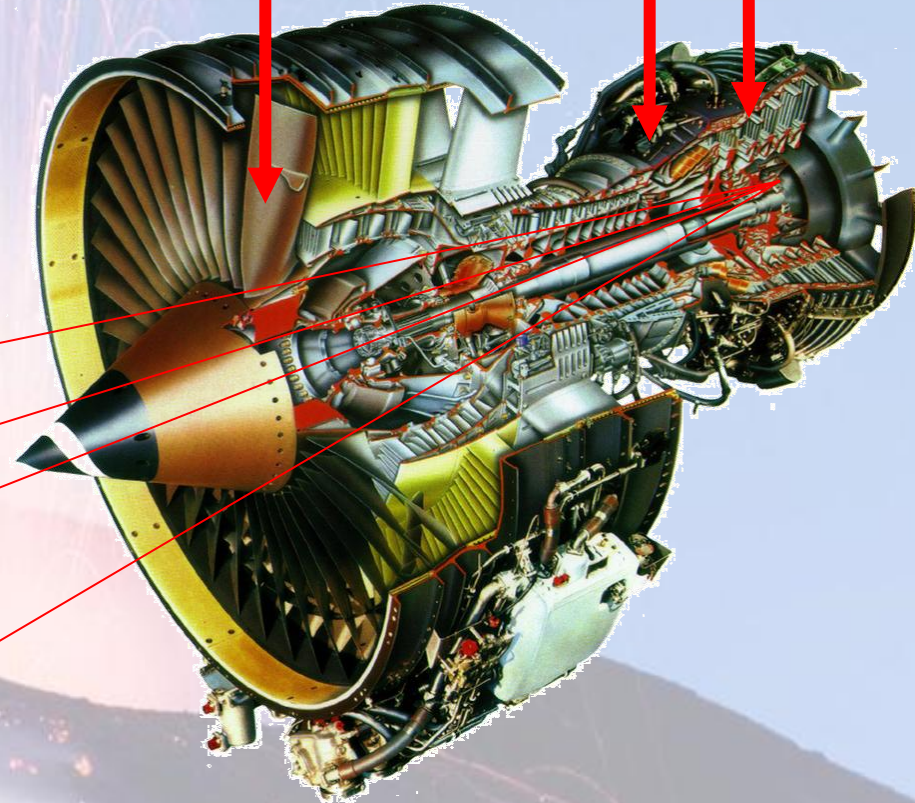


Engines performance deterioration may occur due to:

- ✓ Erosion of moving parts;
- ✓ Fuel nozzles (partial or complete block);
- ✓ Melted Volcanic Ash on turbine stage;

VA Melting Temperature
1100°C

Airflow Turbine Temp.
1200-1500°C



Volcanic Ash particles can easily penetrate on the engine bleed air system creating several malfunctions:

- ✓ **Clog bleed filter system with consequent loss of pressurization;**
- ✓ **Short circuit and intermittent failure on electronic components;**

Volcanic Ash can also obstruct Pitot and Static system leading to unreliable speed situation.

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The higher threat related with the VA phenomena is

LOW DETECTABILITY

Volcanic Ash is not detectable with the weather radar nor with other (on board) aircraft instruments, for that reason

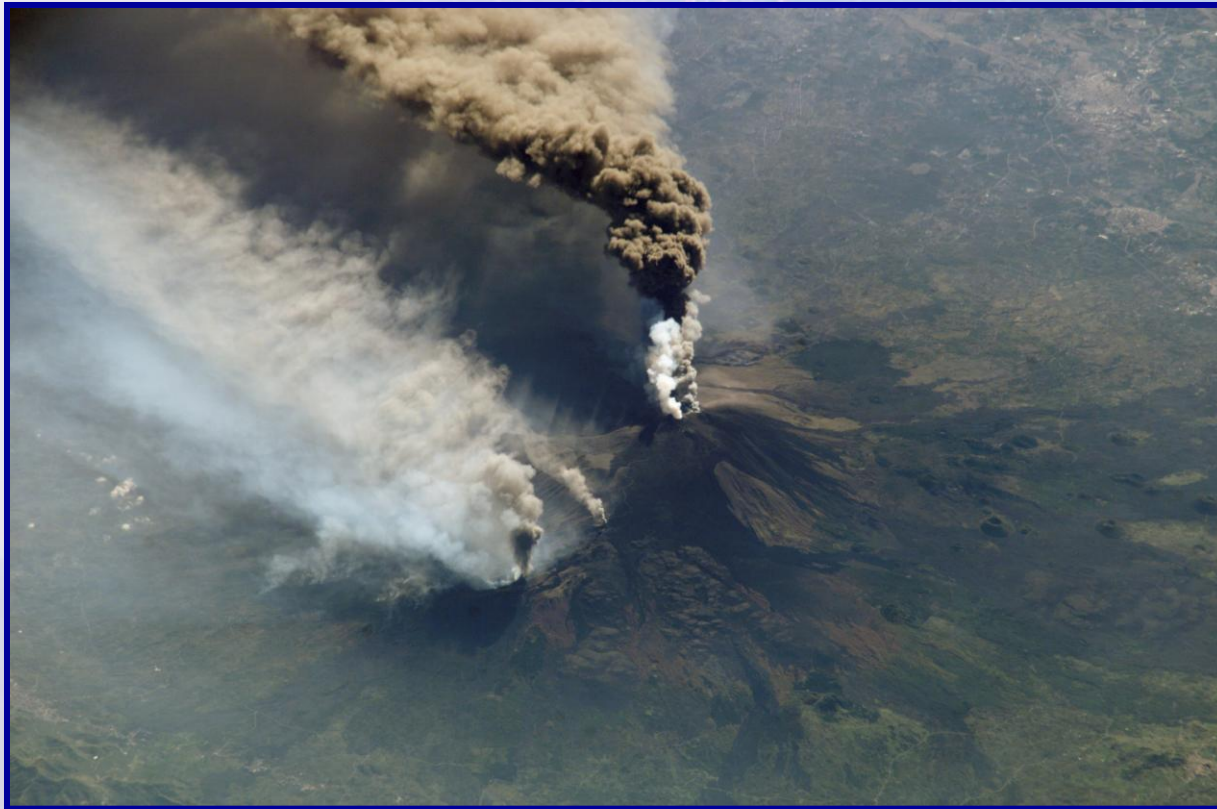
“NIGHT” and **“IMC”** flights are more exposed to VA encounter risks.

Other TRICKY element on VA detection, is

LOW CONCENTRATION

In flight recognition became difficult due to low contrast
(it looks like a normal thin cloud)

VA encounter effects are rapid and penalize significantly aircraft efficiency.



Only a rapid Pilots response can reduce the consequences of the event.

Pilots **key elements** to recognize VA encounter are:

- ✓ Acrid odor (similar to electrical smoke or SO_2);
- ✓ Rapid onset of engines problem;
- ✓ St Elmo's fire;
- ✓ Bright white/orange glow appearing in the engines inlets;
- ✓ Dust and smell in cockpit;
- ✓ Outside darkness;
- ✓ Airspeed fluctuation;
- ✓ Landing lights casting sharp, distinct, shadow.

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VA encounter consequences can be divided in “Active” and “Latent”.

Active Consequences are flight events involving Aircraft efficiency.

Magnitude is strictly connected with:

- ✓ Time from eruption;
- ✓ Engines thrust;
- ✓ Pilots response time.

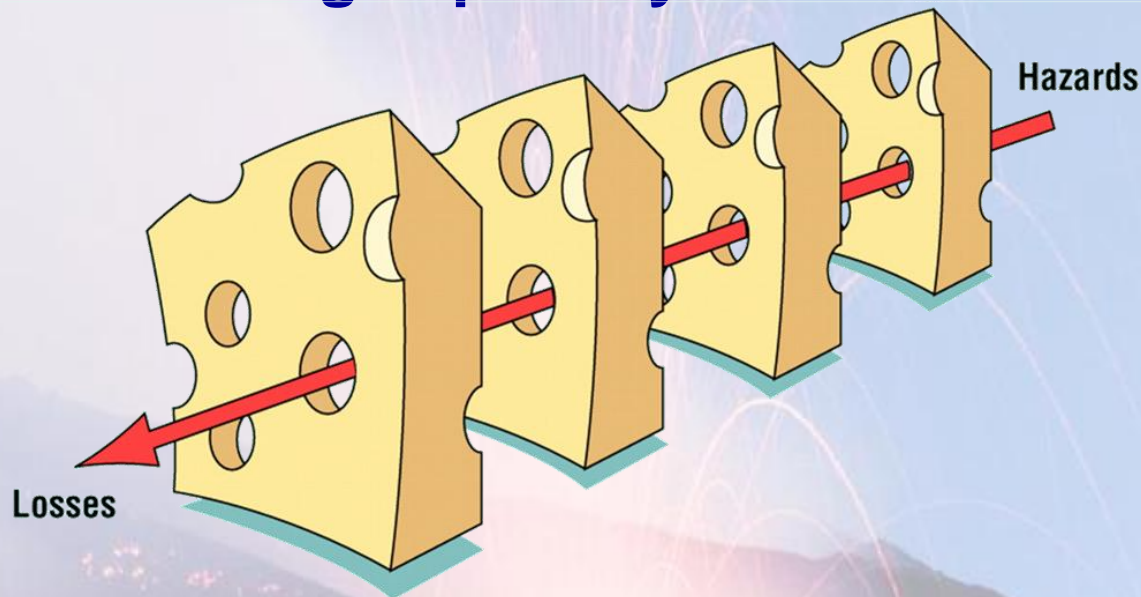
Active Consequences

*In service events show that **high ash concentration** on volcanic clouds generated within hours from eruption can cause the loss of engines power within one minute.*

***High engines thrust** setting also effectively supports melted ash deposit on turbine chamber.*

Latent Consequences are all the other events connected with both in flight and on ground Aircraft operations.

Magnitude is strictly connected with the adequate planning and handling capability of all “actors” involved.

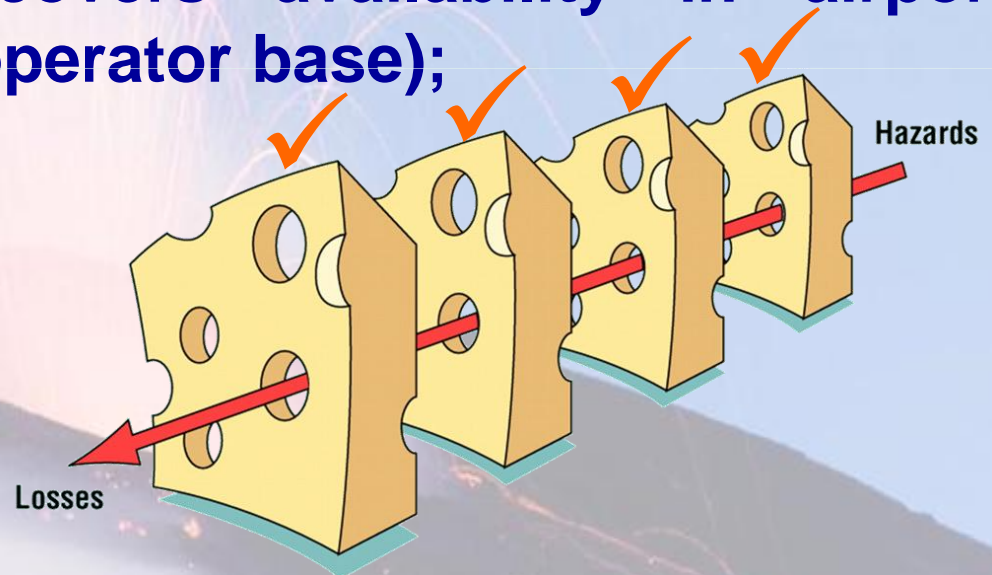



Volcanic Ash is NOT an Aeronautical Problem but a

“ Paramount Natural Phenomena “

Latent Consequences

- ✓ Deterioration of airdrome condition within VA affected areas (Ex: Runway contamination, Taxiway, ...);
- ✓ Airport operations;
- ✓ Aircraft handling on ground during overnight (Ex: Engines and Pitots covers availability in airport different from the own operator base);
- ✓ Operational Pressure.



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Effects Analysis

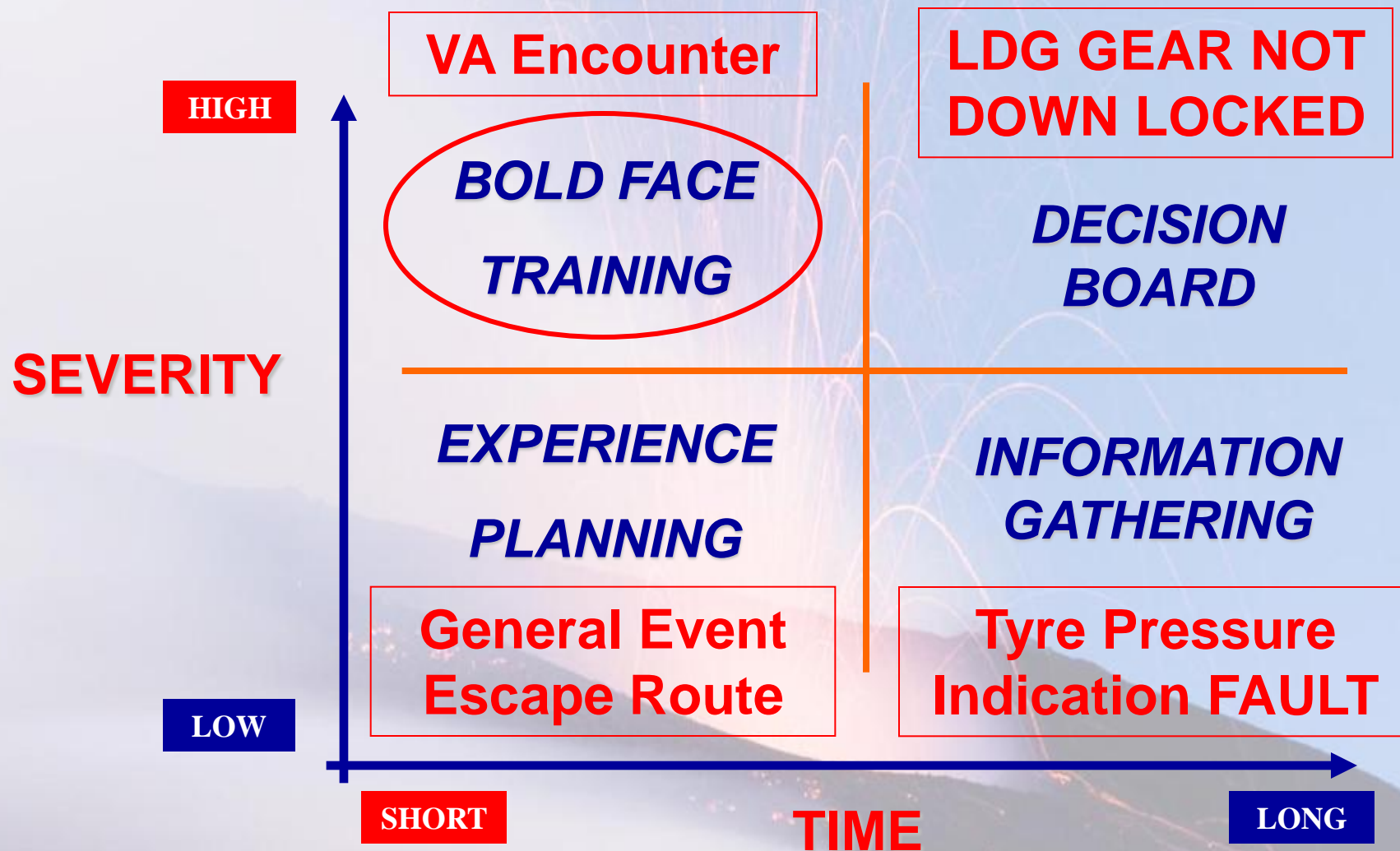
From a Pilots point of view following items can be highlighted:

Precursors:	→	Difficult to identify (VA);
Consequences:	→	Significant;
Evolution Time:	→	Short.

These characteristics have a strong relevance on decision making process and define the high condition risk of these types of events.

Handling VA Effects on Aircraft

Role of **Time** and **Severity** on Decision Making Process.



VOLCANIC ASH ENCOUNTER

Accomplish the following, while making a 180° turn.

– ATC NOTIFY

Accomplish the following, while making a 180° turn.

- CABIN CREW NOTIFY
- PASSENGER OXYGEN AS RQRD
- ENG ANTI ICE ON
- WING ANTI ICE ON
- PACK FLOW HI
- APU START
- ENGINE PARAMETERS MONITOR
- AIRSPEED INDICATIONS MONITOR

If airspeed is unreliable or lost, use the UNRELIABLE SPEED INDICATION/ADR CHECK PROC procedure (2.15).

1. . *If both engines flame out and speed indications are lost, use the DUAL ENGINE FAILURE procedure (1.16) to get the optimum relight speed.*
In case of engine failure, switch off the wing anti-ice before engine restart.
2. *If sufficient visibility is not granted for approach due to windshield/window damage, consider AUTOLAND. If AUTOLAND is not available, consider opening the sliding window on the PF's side, after cabin depressurization. To manually depressurize the cabin :*
 - CAB PRESS MODE SEL MAN
 - MAN V/S CTL FULL UP

Due to the increased noise level, pay particular attention to visual warnings.

VOLCANIC ASH ENCOUNTER

Accomplish the following while making a 180° turn.

- ATC NOTIFY
- A/THR OFF
- THRUST (conditions permitting) DECREASE
- CREW OXYGEN MASKS ON/100%
- CABIN CREW NOTIFY
- PASSENGER OXYGEN AS RQRD
- ENG ANTI ICE ON
- WING ANTI ICE ON
- PACK FLOW HI
- APU START
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1. . If both engines flame out and speed indications are lost, use the DUAL ENGINE FAILURE procedure (1.16) to get the optimum relight speed.

- ENG ANTI ICE ON
- AIRSPEED INDICATIONS MONITOR

In case of speed reference disagreement, the aircraft computers reject speed values transmitted by the sensors and/or

deposit of melted ash on the turbine. Speed monitoring enable pilots to apply the Unreliable Speed Procedure to set immediately proper speed and attitude.

Pilots can have other speed reference by on board GPS or via radio by ATC.

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Statistical data do not report significant events on the recent past.

- ✓ Increasing awareness concerning the VA;
- ✓ Prompt information relay between VAACs, ATCs and Airline Companies;
- ✓ Satellite availability and Technology;

Give a strong contribute to prevention.

For Airlines prevention goes through:

Crew Awareness

- ✓ International Airways Volcano Watch functions;
- ✓ Company Procedures;
- ✓ VA Encounter Reports;
- ✓ Information source (Pre-flight and In flight update).

For Airlines prevention goes through:

Pre-Flight Briefing Package and Documents

- ✓ General informations on active volcanoes through the maps and ICAO special reports;
- ✓ Informations gathering on eruption and affected areas through:
 - ✓ NOTAMs / ASHTAMs;
 - ✓ SIGMET;
 - ✓ Data and Maps about observed ash clouds, extension and trajectory forecast;
 - ✓ Upper wind analysis and forecast for FL;
 - ✓ Satellite Images;

Prevention

For Airlines prevention goes through:

Pre-Flight Briefing Package and Documents

Flight Dispatch has a key role on information management.

On that way it will be a good practise to involve flight dispatches on running simulation to give them a picture of whole scenario.

It will enable a proactive information sharing in order to fix, for example, the re-routing margin acceptable criteria for airline company to be used as GO/NO GO gate for Traffic Flow Management.

For Airlines prevention goes through:

In-flight Information Updating

- ✓ VA clouds scenario can rapidly change so, in order to minimize the risk of encounter, pre-flight briefing informations must be continuously updated.

Information sources:

- ✓ Company Frequency;
- ✓ ACARS;
- ✓ VOLMET;
- ✓ ATC;
- ✓ Pilot Reports.

For Airlines prevention goes through:

Crew Training

Volcanic Ash Awareness must be a part of Flight crew Initial and Recurrent Training.

- ✓ Understanding the Volcanic Ash and VA clouds phenomena and their threats for the flight.
- ✓ Highlight Avoidance, Recognisance and Handling VA procedure;
- ✓ Simulator session on DOUBLE ENGINE FLAME OUT procedure and slow acceleration characteristics to be expected after VA ingestion;
- ✓ Emphasize the importance of Flight Crew Air Report.

For Airlines prevention goes through:


On Ground Operations

- ✓ Use of engine inlet and Pitot covers, plugs to protect parts exposed to VA ingestion;
- ✓ Clean the aircraft before departure (residual ash can be ingested during start-up procedures);
- ✓ Do NOT use windshield wipers for dust removal;
- ✓ Limit use of APU at least for Engine Start (use of ASU is recommended);

For Airlines prevention goes through:

On Ground Operation

- ✓ Keep bleed valve closed during Taxi;
- ✓ Taxi with minimum Thrust;
- ✓ Allow ash and dust to settle on the runway before starting Take off roll;
- ✓ If possible use Take off rolling technique.

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Safety of Flight is achieved also through a Safe planning criteria and efficient information sharing between ALL COMPANY LEVEL INVOLVED.


Accordingly with this purpose Wind Jet will include the results of

**VOLCANIC ASH AWARENESS WORKSHOP
in the**

Wind Jet Volcanic Ash Awareness Handbook

It will be an internal document, developed in agreement to all company department containing the guidelines and procedure to manage the Operational Activities in presence of Volcanic Ash.

It will include also a dedicated Company E.R.P. section.

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- ✓ **DO NOT plan overfly over potential Volcanic ash areas;**
- ✓ **Consider Aircrafts declaring ash encounter as Emergency Flights:**

Volcanic Ash encounter can determinate a rapid downgrade of aircraft performance, being so the escape manoeuvre, 180° turn, is immediately executed and then communicated.

It can create a potential risk condition also for ATC and other following en-route flights.



*Nature is not an Enemy to be fought,
but an Ally to be Known.*

Questions ?

Thank you... and

Safety First !!!

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