

Interactive comment on “A volcanic hazard demonstration exercise to assess and mitigate the impacts of volcanic ash clouds on civil and military aviation” by Marcus Hirtl et al.

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Important re-framing of the section 5 and consequently section 6 (conclusions) is needed, as the assumptions taken in the flight optimizations and simulations prevent from reaching the conclusions the authors wrote.

The authors state they do not take into account the airway structure (that is OK, as in crisis situations these are also removed), and the ATM flow restrictions. If the ATM flow restrictions are not taken into account then we can show that any intervention will bring marvelous results. However the ATM restrictions exist in the real life, and are there for the safety reasons - they do complicate and constrain the overall traffic, it is

C1

true. Other important things not taken into account (as are not mentioned, so I assume are not taken into account) are the individual airline Safety Risk Assessment - that is to say what decisions they take when ash is forecasted - a significant percentage of airlines would not fly in any forecasted concentration of ash. Further, the connections between flights are not taken into account - if an aircraft that is supposed to perform the flight does not arrive (or does not arrive in time), then the next flight will not happen (or will be delayed). It also does not say anything if the simulator keeps the aircraft separated (I assume it does, but it is not mentioned). As these things are not taken into account, the conclusion that only a small percentage would be cancelled and that most of the flights would not be affected are not valid! Take into account the presence of the weather fronts (which are a bit less dangerous to aircraft, and on which we have better information) creates havoc in the network - cancellations, enormous delays, then cancellations due to extensive delays, etc.

What probably should be better stressed is the inclusion of the maintenance cost in the trajectory optimisation which has an important impact on managing to automatically adjust the flight trajectory away from the cloud. As that is I think the most important point here. What is really important that came out of this exercise is the fact that if the maintenance costs are used in the flight trajectory planning software that optimises on costs, then the airlines can easily obtain trajectories that avoid the highest (and lower?) concentrations of the ash. At the moment, most of the trajectory planning in the presence of ash cloud has to be done manually or by manually imposing airspace restrictions in the trajectory planning tools. And are not taking into account the maintenance costs.

There are several other, smaller requests for clarification: 1. The difference between this demonstration exercise and actual operational setting in the ATM, should be mentioned, and you should cite the ICAO volcanic ash procedures for the EU region <https://www.icao.int/EURNAT/EUR%20and%20NAT%20Documents/EUR+NAT%20VACP.pdf> 2. Need to specify why certain concentration level thresholds were taken. 3. KPIs are

C2

mentioned several times in the paper, but are not elaborated on. Either elaborate - show which ones and how they were used, or do not mention them.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-265/nhess-2019-265-RC1-supplement.pdf>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2019-265>, 2019.