

# **EIGHT CONDITIONS**

Clifford E Carnicom  
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The following are conditions that are expected to be satisfied in identifying certain particles or compounds regularly emitted into the atmosphere from recorded aircraft aerosol operations since the beginning of 1999. This set of conditions is not intended to encompass all phases of the operations, and they do not exclude further consideration given to materials of a fibrous or gel-like nature, along with biological components that have been identified within received samples. These conditions will be revised as circumstances, information or research requires.

1. The material of concern is most likely a salt, since salts are the most effective cloud condensation nuclei, and most of them absorb moisture starting at relative humidities of 70% or greater.

2. The salt form that is being searched for absorbs water at relative humidities as low as 30%, due to repeated observations of this occurrence in the southwest U.S. high desert regions. That such salts do exist is evidenced by such examples as strontium chloride, a salt form which will absorb water at relative humidities as low as 27%. Special attention should be given to elements in the same group (Group IIA) of the periodic table of the elements for this same characteristic. Examples of the elements included within this group are magnesium, calcium, and barium.

3. The salt form is expected to form a hydroxide when combined with moisture in the atmosphere, due to recent pH testing which indicates a higher alkaline level than is expected. At this stage of the investigation, the results are statistically significant. Additional pH test results are urgently needed from across the country to confirm or to refute this

hypothesis.

It is emphasized once again that:

"The single most important chemical species in clouds and precipitation is the hydrogen ion ( $H^+$ ), whose concentration can be indicated by specifying the solution's acidity, or pH value.

You may recall from high school chemistry that the pH scale ranges from 0 to 14, low pH values indicating high acidity (high concentrations of  $H^+$ ) and high pH values indicating high alkalinity (low concentrations of  $H^+$ )"

from Atmosphere, Climate, and Change by Graedel and Crutzen, Scientific American, 1997.

4. The salt form is expected to be highly soluble.

5. The salt form(s) is expected to be white in color, both before and after the hydration occurs, and is expected to be of a powder or crystalline nature.

6. The reaction involving hydration is expected to be

exothermic in nature, releasing heat to the surroundings.

7. The salt form is expected to have commercial applications for desiccation, or drying.

8. The pressure of the water vapor within the hydrated compound at equilibrium at  $-50^{\circ}\text{C}$ . is expected to be approximately .0143 torr, based upon the assumption of moisture at a relative humidity level of approximately 30%.

**Additional notes:**

1. It remains the case that the linked set of compounds that includes barium oxide, barium hydroxide and barium hydrate, appear thus far to satisfy the conditions stated above.

2. An anonymous, but stated to be reliable source, has stated that barium salts are used within the aerosol operations.

3. In consideration of item 2 of the conditions stated above,

there  
are four prominent salt forms  
that occur within Group IIA of  
the  
periodic table of the elements:

#### **Salt Solubility Constant**

**MgOH<sub>2</sub> 5.61E-12**

**CaOH<sub>2</sub> 4.86E-6**

**SrOH<sub>2</sub> 6.40E-3**

**BaOH<sub>2</sub> 1.30E-2**

The solubility of BaOH<sub>2</sub> stands  
as unique amongst the group,  
especially when compared with  
the absorption properties of  
strontium  
chloride referenced above. The  
metallic nature of the elements  
increase from the top toward the  
bottom of the list.

Based upon the results above, an  
urgent need exists for  
environmental  
trace metal testing and pH  
testing of rainwaters in order to  
confirm  
or refute the hypotheses which  
are presented.

**Clifford E Carnicom**

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**Authored at Lake Heron, NM**

**Please also refer to:**

[A Case For Testing](#)

[pH Test Alert](#)

[pH Test Results](#)

[Back to Aerosol Operations](#)

[Main Page](#)