Airborne Measurement Subcommittee: Areas - Reps.

- **In Situ Measurements**
  - Gases - Bill Brune (Penn. State Un.)
  - Aerosols - Tony Clark (Un. of Hawaii)
  - Clouds - Al Cooper (NCAR)

- **Remote Measurements**
  - Passive
    - Optical - Ken Jucks (H-S Center for Astrophysics)
    - Microwave - Al Gasiewski (NOAA ESRL)
  - Active
    - Optical (Lasers/Lidar) - Ed Browell (NASA LaRC)
    - Microwave - Pulsed - Al Gasiewski (NOAA ESRL)

- **General Airborne Measurements**
  - High-Altitude & UAV's - Dave Fahey (NOAA AL)
  - Med/Low Altitude - Haf Jonsson (Naval Post Grad.)
Airborne Measurements
Subcommittee Objectives

- Identify Current Airborne Measurement Capabilities and Instruments
- Determine Near-Term Instrument and Measurement Improvements
- Establish Future Needs and Technologies for Specific Airborne Measurements
STATUS

- Two meetings:
  - First (Nov 2006) to review objectives and provide input to questionnaire
  - Second (May 2007, phone) to review status of survey responses

- First: Included some presentations of instruments and measurements in various areas (lidar, chemistry, clouds, other remote, and others)

- Second: Developed strategy to try to supplement responses
Airborne Measurements: Current

- Identify Current Airborne Measurements
  - Measurement Characteristics
    - Parameters
    - Resolutions (Time/Horizontal & Other (e.g., Vertical))
    - Accuracy
    - Precision
  - Instrument Physical Characteristics
    - Subsystems & Overall Physical Sizes
    - Subsystems & Total Weights
    - Total Power by Type
    - Minimum Number of Operators
    - Platforms Operated On (Potential Platforms w/o Major Mods)
  - Point of Contact
  - References for Above
Airborne Measurements: Near-Term

- Identify Near-Term (<3 years) New/Improved Measurements (Funded & Unfunded)
  - New/Improved Measurements
    - New Parameter(s)
    - Increased Resolution (Time/Horizontal & Other)
    - Improved Accuracy and/or Precision
  - Instrument Characteristics or Improvements
    - Reduction in Physical Size, Weight, and/or Power
    - Reduction in Minimum Number of Operators
    - Integrated on New Aircraft
  - Funding Source(s)/Requirements
  - Point of Contact
  - References
Airborne Measurements: Future

- Identify Future (>3 years) Needs and Technologies for Major Advancements in Specific Airborne Measurements
  - Future Measurement Requirements
    - New Parameters/Resolutions/Accuracy/Precision
    - Modes of Operation (e.g., scanning, multiple parameters)
    - Measurements from New Platforms
  - Technology Advancement(s) Needed for New Measurements
    - Candidate Approach
    - Needed Technology Development
    - Time & Funding for Development
- Identify Possible Funding Source(s)
- Point of Contact
- References
We want level of confidence, reliability, HIAPER compliance to match level of need. Conclusion: OK.

<table>
<thead>
<tr>
<th>Species/Parameter</th>
<th>Need</th>
<th>LOD</th>
<th>Time</th>
<th>Estimated Need; or Confidence, Reliability, or HIAPER Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
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</tr>
<tr>
<td>pressure</td>
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<td>1 s</td>
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<tr>
<td>temperature</td>
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<td>1 s</td>
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<tr>
<td>altitude (pressure)</td>
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<td>1 s</td>
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<tr>
<td>altitude (radar/GPS)</td>
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<td>1 s</td>
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<tr>
<td>aircraft parameters</td>
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<td>1 s</td>
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</table>

We want level of confidence, reliability, HIAPER compliance to match level of need. Conclusion: OK.
## Gas phase in situ

<table>
<thead>
<tr>
<th>Species/Parameter (types, number)</th>
<th>Need</th>
<th>LOD</th>
<th>Time</th>
<th>Confidence Reliability</th>
<th>HIAPER compliance</th>
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<tr>
<td><strong>O₃</strong> (2, &gt;2)</td>
<td>Seldom</td>
<td>3 ppb</td>
<td>1 s</td>
<td>HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>H₂O</strong> (&gt;2, &gt;2)</td>
<td>Sometimes</td>
<td>10 ppm</td>
<td>1 s</td>
<td>HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>H₂O</strong> (~2, &gt;2)</td>
<td>Often</td>
<td>0.5 ppm</td>
<td>1 s</td>
<td>10%? HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>CO</strong> (2, &gt;2)</td>
<td>Always</td>
<td>3 ppb</td>
<td>1 s</td>
<td>EOL/HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>CO₂</strong> (1, &gt;2)</td>
<td>Seldom</td>
<td>0.5 ppm</td>
<td>1 s</td>
<td>HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>CH₄</strong> (1, &gt;2)</td>
<td>Sometimes</td>
<td>10 ppb</td>
<td>1 s</td>
<td>HAIS</td>
<td></td>
</tr>
<tr>
<td><strong>N₂O</strong> (1, ~2)</td>
<td>High Questions</td>
<td>1 ppb</td>
<td>10 s</td>
<td>?</td>
<td></td>
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<tr>
<td><strong>SO₂</strong> (2, &gt;2)</td>
<td>Low</td>
<td>10 ppt</td>
<td>1 s</td>
<td>HAIS</td>
<td></td>
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**Estimated Need; or Confidence, Reliability, or HIAPER Compliance**

<table>
<thead>
<tr>
<th>Need</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Seldom</th>
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<tr>
<td>Ability</td>
<td>High Questions</td>
<td>Low</td>
<td>None</td>
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</table>

**Conclusion:** generally OK; some calibration & reliability issues.
Issues:

- Poor response:
  - Those with large numbers of instruments, like facilities, have found it awkward to respond because of the large number of instruments and amount of data requested.
  - As an alternate, we are exploring a different way of responding:
    - We first provide some of the basic information for an instrument or instrument type;
    - We then ask respondents to “check” those they have and provide any special information regarding their instrument;
    - We provide a link to one entry for contact, access method, etc., so that they only have to provide that with a general response;
    - We provide a spreadsheet format that they can fill in and return, which can be entered into the database here (perhaps automatically).
Issues:

- Gaps: We have been missing a few members from meetings and so have some areas not yet represented well. We have planned to fill these gaps by special action from those members.

- Needs: We haven’t spent enough time yet discussing areas of weakness and gaps, but perhaps the fall workshop is a better venue for that.

- Overlaps: We will need to resolve overlaps (emerging technology, especially) but now are assuming that duplication in the database stage is OK.