

Summary:

The University of Wyoming King Air (UWKA) is requested to participate as a research platform in support of the NCAR ASP Summer Colloquium. Depending on the availability of the NSF/NCAR C130, the UWKA will be either 1 of 2 or the only airborne research platform to be used in the Summer Colloquium. The primary objective of the Summer Colloquium is educational, to help develop graduate students capabilities in observational science. In particular, in the UWKA request, graduate students participating in the Summer Colloquium will have the opportunity to develop an experiment and flight plan with the guidance of the UW operations team to investigate specific science questions. The experiment/flight will be conducted with the students directing the flight and will work with the UW operations team to analyze measurements during the second week of the colloquium.

Hours Required:

The request includes a maximum of 4 flights of 4 hour duration over a two day period for a total of 16 research hours. If the NCAR/NSF C130 is available, the UWKA is requested to conduct 2 flights of 4 hour duration over the same 2 day period (8 research hours). For the remainder of this document, it is assumed that 4 flights in two days will be required. This represents the largest impact in terms of feasibility for project assessment.

Project Dates/Scheduling:

Requested dates for deployment of the UWKA during ASP Summer Colloquium are 5 June through 6 June, 2009. These dates are quite firm, and may only be moved 1 day in either direction, dictated by weather conditions or other unforeseen conditions that may require a shift in planning.

Currently there are no other planned projects for the UWKA during this period. However, planning for the installation and testing the new UWKA data system and the WCR-II is scheduled for April through August of 2009. The ASP Summer Colloquium falls in the middle of the planned testing period. This may impact the availability of some measurements requested for this project, see a more detailed discussion in the Instruments section below.

Operations:

Flights will be conducted out of Rocky Mountain Regional airport. We will use the NCAR/RAF hangar facility for the aircraft.

The actual flight patterns required for ASP are somewhat ill-defined at this stage, and as such are difficult to fully evaluate from a feasibility standpoint. However, it is apparent that there is a need to perform cloud flights (in and around growing cumulus) in the vicinity of the CHILL radar and a desire to perform BL measurement at either or both the Marshall and/or Platteville sites. At both locations, there are issues that need to be addressed for working in high traffic areas north of the Denver airport. The BL work can and will be done completely VFR, so if we can manage to arrange flight patterns to stay out of CLASS B airspace, accomplishing flight patterns will be much easier.

The cloud work further north, around the CHILL radar site, lines up with arrivals and departures both into and out of Denver. Depending on the altitude requirements, expect that we will be limited to asking for block altitudes, and that changing altitudes (to sample various levels in growing cumulus, for instance) will be difficult.

The required duty time for performing two 8 hour flights per day, on back to back days exceeds our crew duty limitations. For this reason, it will be necessary to deploy 2 pilots to meet the crew requirements. Expect that one pilot will take both morning flights, likely investigation of the BL, while the other pilot will take both afternoon flights, likely either cloud or BL investigation. For planning purposes, the crew duty guidelines are outlined below:

Crew-duty guidelines:

Activity	Hours
Flight in any 24 hour period	7
Flight in any 7 day period	35
Flight in any 30 day period	110
Crew duty period	14
Crew rest period	12
Consecutive work days	6 days

Hazards and other operational considerations:

The operations group and the project manager will plan a visit with Denver Center and Denver TRACON as soon as possible. Several issues need to be discussed relating to planned operations in the vicinity of DIA. Further, we should include the project coordinator from NCAR and perhaps one of the NCAR pilots, particularly if the C130 will be participating in the project.

The Flight Operations group has reviewed the proposal for the ASP Summer Colloquium. As presented, this project is feasible with respect to the flight operations. The following is a list of concerns and possible issues that will need to be considered during the planning phase of this project:

- The flight patterns requested appear to be in potential conflict with arriving and departing traffic from the Denver Metropolitan area. Heavy IFR air traffic flows are in the vicinity of the project area (see attached pictorials). In addition to the traffic patterns, operations also appear in close proximity to the Denver Class B airspace.
 - Plan and coordinate with Denver Center and Denver TRACON (Terminal Radar Control/Approach). Plan flights at off-peak traffic times to best maximize flight operations without undue delays to research operations while airborne. If flights require operations in the arrival and departure corridors, suggest that Chief Pilot and Project Manager request meetings at the earliest possible convenience with Denver Center and Denver TRACON to plan and coordinate flight operations. Without ATC coordination and approval, this project may be difficult to complete in some aspects.
- With the number of scientific observers requested, high elevation and potential high ambient temperatures (summer season) may limit the number of observers on the aircraft due to degraded aircraft performance.
 - Consider forecasted temperatures when scheduling the number of scientific observers. If a flight departs in the morning, temperature increases towards afternoon may limit aircraft performance later in the flight. Pilot and lead science personnel need to consider conditions and forecasted “high temperatures” and forecasted weather conditions for requested flight periods.
- Low altitude operations (500 feet agl) requested.
 - All low altitude operations will require compliance with applicable FAA waivers and authorization. Plan all low altitude operations away from congested areas and away from the high traffic density airports in the Denver Metro area.

Instrumentation Request:Optional Standard:

Full cloud physics (2DC, 2DP, FSSP, 1DC), PVM100, Eppley/Heimann

Non-standard:

Fast Response (LICOR/TRF or Friehe), UFN/CPC/PCASP,WCR

Power analysis:

Preliminary power analysis is favorable. Similar packages have been deployed in the past.

Space, weight/balance analysis:

Five PMS style instruments have been requested. The 2DP probe has been deleted following discussions with the PI's. Other instruments can be mounted as requested.

Mounting considerations:

Aerosol instrumentation deployment requires selection of appropriate inlet(s) and flow determination.

General instrumentation discussion:

Deployment to this project is complicated by the installation and testing of the new Kin Air data system. If this system is installed in the aircraft prior to the ASP project it will provide enhanced data access as well as the potential for more scientific observers. It may, however limit the possible instrumentation suite available. Instrument availability is summarized below:

- The nominal deployment will include:
 - State variables (Pressure, temperature, dewpoint, relative humidity, LWC)

- Position (GPS, IRS)
- Wind measurements
- Water Vapor/CO2 (Licor 6262)
- Other instrumentation with analog interface capabilities (radiation, PVM100, CPC)
- WCR1
- The 'second tier' instrumentation includes:
 - Radar altitude (APN232)
 - Serial interface devices (PCASP)
- The 'third tier' includes:
 - Cloud physics probes (FSSP, 1DC, 2DC, 2DP)
- Preliminary discussions indicate some interest in the WCL deployment. Integration of cloud physics, radiation, high frequency flux, WCR and WCL will make this a complicated 2 day deployment. Instrument calibration and support as well as data quality assurance, processing and data integration should be considered.

Deployment Considerations:

Although this is only a 2-day deployment, short lead-time and quick turn-around time will require a significant amount of ground support gear. It is expected the aircraft will deploy to Rocky Mountain Regional the day prior to the beginning of operations and will return the day following the end of operations. The N2UW trailer will also be deployed to carry ground support equipment, including GPU.

Because of the high intensity nature of this project, it will be necessary to have 2 pilots in the field. At least one engineering technician and possibly an engineer will be deployed. There will be at least one project manager/system's scientist deployed as well, although it is likely this person will be heavily involved with the day to day activities of the Summer Colloquium.