



University of Wyoming The Wyoming King Air PBL Exploratory Experiment KAPEE 2010

June 1, 2010 - June 30, 2010

Photo courtesy of Vanda Grubisic; DRI

- [King Air Data](#)
- [Contacts](#)

Date	Flight # (* .kml)	Status	Times (UTC)	Hours	Crew/Notes
Jun 25/ Jun 26	RF19	Target clouds north of Laramie, some of the cloud were "messy" but spent 1.75 hours flying mostly above clouds, some below cloud. No known instrument problems	0200- 0415	2.3	B Wadsworth Z Wang J French B Liu
Jun 24/ Jun 25	RF18	Target clouds east of laramie range (alto-cu/strato-cu), base/tops from FL190 to FL220. Because of alt/temperature no strong Raman signal so this turned into more of an ice/liquid cloud physics study with the lidars. Down window became dirty through the flight No known instrument problems	0213- 0450	2.7	T Drew Z Wang J French B Liu
Jun 23/ Jun 24	RF17	No clouds so decided to fly directly east at lowest possible night altitude along flyway from Cheyenne to Sydney and beyond and turn around back to Laramie along same course. Very little structure in aerosol and water vapor. Elevated aerosol layer just east of laramie, left-over from earlier in day? No known problems	0243- 0450	2.3	B Wadsworth Z Wang J French B Liu
		Initially fly south to sample aerosol along front range between Laramie and Ft. Collins and to the east. Then few below (and above) very small clouds that were forming just over and east of ridge			B

Jun 23	RF16	in Laramie Range. Last 15 minutes flew low-level back/forth across Laramie river. Gain for WCL was changed prior to flight Nephelometer bulb was turned off from 1923-1945 due to temperature. No known problems.	1739-2021	2.8	Wadsworth Z Wang J French D Lukens
Jun 22	RF15	Initially fly southwest to sample smoke plume from fire burning in western Colorado. Smoke plume mostly dissipates by afternoon flight; we discover strong moist/dry gradient line just east of ridge line of Laramie Range and make several passes trying to map out the line. Nephelometer bulb burnt out in middle of flight, apparently due to heat. WCL shutdown for middle portion of flight due to turbulence/low water indicator.	1950-2215	2.5	B Wadsworth Z Wang J French L Battistelli
Jun 21/ Jun 22	RF14	Night flight investigating water vapor variations around growing cumulus flew around periphery of large cu-congestus on east side of Laramie Range Nephelometer was inop, bulb died at end of RF13 PIR (up and down) looked like it was not working properly (circuit Breakers pulled and not noticed)	0207-0353	1.9	B Wadsworth Z Wang J French B Liu
Jun 21	RF13	Investigating aerosols in regions south of Laramie to Greeley and west into North Park. Entire flight in Boundary Layer, no cloud penetration, all VFR. No known problems with data during flight, nephelometer bulb burnt out at landing, WCL overheated ~10 minutes prior to landing.	1635-1845	2.2	B Wadsworth Z Wang J French P Wechsler
Jun 20	RF12	Looking at tree generated aerosols. Flew over the Snowy Range, towards Hayden, north of Rocky Mountain National Park and back to Laramie.	1902-2041	1.8	B Wadsworth Z Wang L Oolman B Liu
Jun 18	RF11	Aerosol flight near Denver PCASP replaced with the one we received from NOAA. Nephelometer lamp burned out 2/3 of way through flight.	1935-2206	2.7	T Drew Z Wang L Oolman N Mahon
Jun 17/ Jun 18	RF10	Night flight to the east of Laramie Range. Target strong water vapor gradient on north/south line from western Nebraska to Northern Colorado. PCASP data noisy otherwise, no known problems	0230-0445	2.3	B Wadsworth Z Wang B Liu J French
Jun 17	RF09	Severe Clear, objective to test Raman Lidar following lab work of last two days. Shortly after takeoff, RTB'd because lidar cover was not removed and could not do alignment. Also, TCAS inop, needed to MEL; left data system running, spent ~45 minutes on ground and tookoff all instruments operating good, PCASP noisy especially at higher altitudes (less noise near surface). entire flight within Laramie valley, very dry	1939-2000 2051-2200	1.8	B Wadsworth Z Wang C Yong J French
		(takeoff after OZ on 15 June) First shot at an evening flight. Raman lidar was way out of alignment			

Jun 14/ Jun 15	RF08	so cut flight. PMB analog connector was not hooked up to data system. Noted prior to flight that WCL data on all previous flights had additional field (photon counting). Photon counting channel turned off prior to this flight. WCL water low during flight, water added following flight. Raman lidar removed following flight.	0200- 0225	0.5	B Wadsworth Z Wang L Oolman J French
Jun 11	RF07	Aerosol flight near Denver WCL data has extra (unused) channel recorded in file.	1813- 2020	2.2	T Drew Z Wang L Oolman P Wechsler
Jun 10	RF06	Worked under and above cloud base near Medicine Bow and Laramie. WCL data has extra (unused) channel recorded in file.	1611- 1851	2.8	T Drew Z Wang L Oolman B Liu
Jun 9	RF05	Worked developing cumulus 17,000-26,000 feet. WCL data has extra (unused) channel recorded in file.	1819- 2101	2.8	T Drew A Bandani L Oolman Z Wang
Jun 8	RF04	Upward cloud lidar installed. WCL data has extra (unused) channel recorded in file.	2331- 0101	1.6	T Drew J Snider L Oolman Z Wang
Jun 3	RF03		1910- 2124	2.3	T Drew C Yong L Oolman Z Wang
Jun 2	RF02	Flight mostly east of Laramie Range, along Platte River from Wheatland to Scottsbluff. Flew a few clouds on way back. Nephelometer removed to replace the bulb. Data System timing was screwy--timestamps are correct but data was written late and display was late (and falling further behind) throughout the flight	1926- 2116	2.0	T Drew Z Wang J French Bo Liu
Jun 1	RF01	Nephelometer bulb burned out. Licor reference flow accidently set to zero. Possible leak in CPC. PCASP moved from left wing to right with scarf tube downward.	1935- 2052	1.4	T Drew Z Wang L Oolman Bo Liu
May 27b	TF06	Gast pump left off because the vibrations interfere with the lidar computer. There is no meaningful Licor, CPC, or Nephelometer data.	2130- 2239	1.2	T Drew Z Wang J French L Oolman
					T Drew

May 27a	TF05	Gast pump left off because the vibrations interfere with the lidar computer. There is no meaningful Licor, CPC, or Nephelometer data.	1816-1859	0.8	P Wechsler L Oolman Bo Liu
May 26b	TF04	Ended flight after the lidar computer froze.	1750-1821	0.7	T Drew Z Wang L Oolman Bo Liu
May 26a	TF03	Ended flight after the lidar computer froze.	1617-1653	0.7	T Drew Z Wang L Oolman Bo Liu
May 17	TF02	Flew stepped stack to test the nephelometer. Wind calibration maneuvers near end of flight.	1654-1834	1.8	T Drew P Wechsler C Yong L Oolman
Apr 22	TF01	Aerosol test flight. Data system problem left numerous data gaps.	1625-1711	0.9	T Drew P Wechsler C Yong L Oolman
Test Flight Hours	6.1/15			Research Flight Hours	40.9/32

Flight 19

Date: 6-25-2010

Pilot: Brett

Crew: Zhien, Jeff, Bo

Objective: Night flight just over clouds. Filed to MBW to delay.

Actual: Found clouds NW of MBW. Worked within 20 DME of MBW 330/50. Denver gave a block of 200 – 230. No issues.

KAPEE 10

25/26 June (night flight)

RF19

Crew:

B Wadsworth

Z Wang

J French

B Liu

LOD: D Lukens

OBJECTIVE:

Target clouds north of Laramie

PRE-FLIGHT:

Lots of clouds around, will be difficult to target isolated clouds.

0150 Z; 150/15 1.0 OVC, 23/02 30.14

FLIGHT:

0200 Wheels up

0204 Lidars started

0216 level at FL210, begin zero on neph

0218 had to climb ~1000 ft to avoid clouds

0224 finish zero, turning descend to FL205 to work clouds

0225-0240 repeated passes about 500' above clouds

0240 moving south in search of better of clouds

0247 work more promising looking cloud cluster, tops around 20 kft

0302 breaking off bigger clouds moving into area, moving further north

0335 maintain constant 30 degree bank over top of cloud

033930 end constant bank

0340 descend to below cloud base

0345 FL186 below clouds, head back to Laramie

0415 wheels down

POST-FLIGHT:

No issues

Flight 18

Date: 6-24-2010

Pilot: Tom

Crew: Zhien, Jeff, Bo

Objective: Intent was for a night flight to fly clouds near CYS, with a backup plan of heading into Western Nebraska and flying at lowest IFR altitude.

Actual: Arriving over CYS, decided to go to clouds to the North by Torrington. Worked clouds between FL18-22. Descended to Airway MEA and flew airway back to LAR.

KAPEE 10

24 June/25 June (night flight)

RF18

Crew:

T Drew

Z Wang

J French

B Liu

LOD: D Lukens

OBJECTIVE:

Will try to target clouds east of Laramie Range...clouds look fairly high, so may not get good water vapor signal

PRE-FLIGHT:

020836Z 210/13 1.0 CLR 21/-01

FLIGHT:

0213 Wheels up

0218 started lidars, begin zero on neph at FL110

0228 climbing to FL175, targeting a few clouds around Wheatland

0240 climbing to FL200 through clouds, probably will need to go higher to get on top

0245 passing through thin clouds at FL200 (cold, -15)

0250 climb to FL210, skimming top at this altitude

0251 reverse course for another pass, up to FL212

0257 reverse course, checked window, no visible condensation or ice

0311 reverse course

0317 reverse course back to west

0325 reverse course to east, descend to FL195 to pass underneath clouds

0335 reverse course to west, descend to FL190

0343 reverse course, climb to get above clouds again, clouds appear to be dissipating, trying to target larger areas of clouds.

0400 begin slow descent through and to below cloud level for sounding, conduct a couple of passes below layer

0415 descend to FL110 in spiral, then direct to LAR at lowest vectoring altitude

0422 direct to LAR at FL107

0450 Wheels down

POST-FLIGHT:

- No known major instrument problems
- Fox cart acting up on plug-in, intermittent—Don needed to unplug and re-plug it in to get good connection
- Need to clean down window prior to next flight
- At very high altitude, dewpoints <-40, neph gives bad status: humidity

Flight 17

Date: 6-23-2010

Pilot: Brett

Crew: Zhien, Jeff, Bo

Objective: Intent was for a night flight to fly clouds near MBW, with a backup plan of heading into Western Nebraska and flying at lowest alt possible on a Victor route. By the time we walked to the plane, it was clear that the clouds did not develop near MBW, so we took off with intent of just flying low altitude into Nebraska. Filed KLAR-MBW (Delay)-CYS V138 SNY V6 LBF V6 SNY V138 CYS 118 LAR KLAR

Actual: Denver Ctr gave me the clearance of direct to CYS then as filed. He did not notice the request to go to MBW and delay. It worked out. We turned back just short of LBF due to fuel and RTB'd to KLAR on the reverse route. No issues.

Hours: 2.3

KAPEE 10

23 June/24 June (night flight)

RF17

Crew:

B Wadsworth

Z Wang

J French

B Liu

LOD: D Lukens

OBJECTIVE:

No clouds, will target "low level" east west leg from Cheyenne to east of Sydney, NE

PRE-FLIGHT:

0236Z 120/14G20 1.0 CLR 16/06 30.36

FLIGHT:

0243 Wheels up

0249 Lidars running, level at FL120; begin zero on neph

0255 neph zero complete

0257 begin descent to FL080 (lowest possible IFR at this location)

0311 descending to FL076

0345 reversing course, back towards the west, same track

0358 begin slow climb upto FL080

0433 climbing to FL110

0450 wheels down

POST-FLIGHT:

- No known instrument problems
- Zhen has suggestions for display, will discuss at post-project debrief

Flight 16

Date: 6-23-2010

Pilot: Brett

Crew: Zhien, Jeff, Don

Objective: Planned to fly LAR-LAR145/055-GLL VFR at ~2000' AGL, then pick up an IFR clearance to the CYS 050/040 fix to delay for cloud work.

Actual: Flew to LAR 145/055-GLL then decided to remain VFR since no clouds had developed. Continued at ~2000 AGL back to the Laramie Valley, then did the same loop again. Finished by doing a little cloud work just to the east of Laramie over the range as a few puffies had developed. Finally went down to 1000' AGL over the river north of Laramie and spent ~15 minutes in a racetrack pattern.

Hours: 2.8

KAPEE 10

23 June

RF16

Crew:

B Wadsworth

Z Wang

J French

D Lukens

LOD: N Mahon

OBJECTIVE:

Fly Laramie-Ft Collins-Greeley "triangle" to look at aerosol along front range. Also, will target below clouds (any that may form into the flight).

PRE-FLIGHT:

Gain for WCL decreased prior to flight (to not saturate as we fly beneath clouds

1729Z 340/07 1.0 CLR 18/03 30.41

FLIGHT:

1739 Wheels up

1740 Neph started

1743 lidars on, level at FL105, begin zero on neph.

1745 on south bound leg FL105

1750 neph completed zero, descend to 2000 ft AGL and will try to maintain separation at that level

1806 turn east and descend toward Ft Collins, aerosol increase dramatically and dewpt increases

1813 passing eas of Ft Collins, no clouds in sight, will plan on continuing all VFR.

1821 turn NW to track back approx toward LAR

1841 turn to SW across Laramie to redo triangle pattern

1845 turning to SSE tracking along/cross mountains towards west of Ft Collins, for this triangle, shoot for 1000 to 1500 ft AGL

1857 turn east, descending down towards Ft Collins

1911 turning back to the NW, tracking towards Laramie

1923 turned off Neph lamp, Sample T reached 110, continue to collect data to monitor temperature

1928 broke off pattern to work underneath small, fair weather cu, just forming over Laramie range

1945 turned neph lamp back on

1946 climb to FL140 make passes above small cu

1956 broke off from cloud (background too bright for above cloud work, clouds too cold...); Descend to do a few minutes of low-level back and forth across Laramie river north of town

2000 FL085/080, crossing river

2016 break off ops and RTB

2021 Wheels down

POST-FLIGHT:

- Changed (reduced) gain on up-lidar prior to flight in anticipation of beneath cloud work
- Neph lamp had to be shutdown due to heat
- Front KADAS display quit updating midway through flight, needed to stop and restart
- Need to disable HP Health check on laptops
- Ztrue is still wrong

Flight 15

Date: 6-22-2010

Pilot: Brett

Crew: Zhien, Jeff, Loic

Objective: Planned to fly southwest into Colorado to sample smoke from fire near Rifle, Colorado. We would delay there and RTB, all VFR.

Actual: Flew LAR 190/046 then turned West toward Hayden. Turned back after ~15 miles and retraced our path back to Laramie Valley. Crossed the Laramie Range about 15nm north of the VOR and continued NE toward Wheatland. 7 miles South of KEAN, we turned South towards Cheyenne. Flew under a large thunderstorm that was building 15nm North of KCYS, then turned West after encountering grapple. Crossed E/W across the Laramie Range several times before landing back at Laramie. Entire flight was at 1000' AGL – 2500' AGL.

Hours: 2.5

KAPEE 10

22 June

RF15

Crew:

B Wadsworth

Z Wang

J French

L Battistelli

LOD: D Lukens

OBJECTIVE:

Try to target smoke plume SW of Laramie due to fire burning in western CO. Smoke plume in satellite dissipating as flight approaches...midway through flight break off smoke chase to investigate dry/moist boundary just east of ridge line in Laramie Range.

PRE-FLIGHT:

All Instruments working

1939Z 190/17G24 1.0 CLR 25/-5 30.14

FLIGHT:

1950 Wheels up

1954 both lidars running, started zero on neph at FL105
2013 at south end of North Park turn to the west, FL105
2017 turn back to the east and descend into valley
2022 turn along wind direction, heading ~010, descend to FL095 (1000 AGL)
2028 climbing over mountain ridge at NE end of North Park
2034 in Laramie valley, continue to NNE to fly along wind, 1400 ft AGL
2049 Just on eas side of Laramie Range, dewpoint increases from -10 to +5, CPC from 2000
 to rail, PCASP from 1200 to 800, wind switched to easterly
2054 approaching Wheatland, turn right (to south)
2104 passing under large Cu-Congestus, little or no precip apparent coming out of base
2106 turn away quickly, saw some lightning and small graupel
2112 cross over airmass boundary again (from moist to dry) at FL095, will climb and
 reverse course to see it at higher altitude
2118 reverse course, FL115
2130 back to the west at 2000 ft AGL, 213040 cross boundary

2133 setup for racetrack back and forth across boundary—end up flying a “box”, trying to define boundary of the airmasses

2200 noticed WCL shutoff due to low-water indicator (turbulence...)

NEAR very end of flight, both laptop displays get “error occurred in shared variable in KA Display” Connection to server lost, restarted display and all was OK

2215 Wheels Down

POST-FLIGHT:

WCLI computer hung on bootup, needed to connect keyboard (and monitor) hit F2 on keyboard to continue

Flight 14

Date: 6-21-2010

Pilot: Brett

Crew: Zhien, Jeff, Bo

Objective: Planned to fly KLAR-BFF260/060 and delay. Planned to work in & out of clouds.
Night flight.

Actual: Flew to the BFF 260/060. Was a decent thunderstorm just NE of that location. Shifted our anchor point several times as the T-stm moved NE. Denver was very flexible in giving us anything we wanted. Stuck with a 15nm radius, all quadrants around the fix. They gave us a 2000 foot altitude block to work in. On the way back, we dropped down to the lowest IFR altitude they would allow. Initially down to 8000, then when north of Cheyenne they climbed us to 10000, and finally to 11100 to cross the Laramie Range.

Hours: 1.9

KAPEE 10

21/22 June (21 June Local, 22 June UTC)

RF14

Crew:

B Wadsworth

Z Wang

J French

B Liu

LOD: D Lukens

OBJECTIVE:

Fly clouds east of Laramie Range to investigate water vapor variations at cloud edges.

PRE-FLIGHT:

Large Thunderstorms east of Laramie Range, will try to work flanks on upwind side of storm
0159Z 240/07, 1.0 CLR, 18/03, 30.11

FLIGHT:

0207 Wheels up

0211 both lidars are on

0214 level at FL150

0234-35 clipped very upwind edge of large cu-congestus

0240 setting up for second penetration at FL160

0245 3rd pass on very edge, lightning in main cloud, we stayed well clear of that

0247 new block altitude, FL12-14, try to get lower with higher dewpoints

0251 penetration at FL140

025530 penetration at FL140

0257 over some lower level clouds around edge of storms

0306 need to move anchor to NE as storm drifts

0311 over low clouds around periphery of storm

0314 clouds falling apart, decid to return to Laramie, go back as low as possible.

0325 notice time on KADAS system monitor started drifting, drift about 1 second every
3 seconds, display appeared fine, will check recorded data following flight

0353 wheels down

POST-FLIGHT:

Up and Down PIR look bad, I think PSP is OK.

Need to check time in recorded data, at shutdown KADAS monitor indicated DAS time of last data block was 550 seconds behind actual time....earlier flights indicate this is not a problem with recorded data...

Flight 13

Date: 6-21-2010

Pilot: Brett

Crew: Zhien, Jeff, Perry

Objective: Planned to fly KLAR-LAR 220/045-CHE 076/036-GLL-LAR 120/030. We expected to delay SE of LAR. Filed a VFR flight plan.

Actual: Good weather throughout the flight with some low broken decks and reduced visibility around Ft Collins. We flew the planned route across Rocky Mtn National Park. As we descended down towards Ft. Collins, it looked like we would have to remain above the broken layer as the vis looked very poor. As we got closer, it became much better with ~7nm of visibility underneath. We were able to get below it before crossing the westernmost edge of the layer and remained at ~1500' AGL for entire time in the front range area. After reaching GLL, we headed north. Were gradually getting squeezed between the broken layer and the rising terrain so I picked an area where it was scattered clouds and got above the layer. The layer dissipated shortly afterwards as we got further NW. We then deviated from the plan and headed west a bit before turning south again and flying down the Rockies just to the east of the divide. We intercepted the original flight path from CHE to GLL and repeated that leg (GLL to LAR) again. Finished the flight by flying the RNAV 12 into LAR for pilot proficiency.
Hours: 2.2

KAPEE 10

21 June

RF13

Crew:

B Wadsworth

Z Wang

J French

P Wechsler

LOD: D Lukens

OBJECTIVE:

Investigate aerosol south of Laramie from North Park east to Ft. Collins and Greeley and back NW to Laramie

PRE-FLIGHT:

Haze to the south, indicative of lots of aerosol and high humidities.

Expect all (or mostly all) clear air/hazy

1624Z 150/10, 1.0 CLR, 21/05, 30.15

FLIGHT:

1635 Wheels up

1641 over Snowy Range, level at FL115, dropped slightly to FL107

1653 turn south along east side of Zirkels

1700 turn east along south side of North Park

1704 start climb as we approach mountains bordering east side of North Park

1722 dropped to FL065 into a high aerosol boundary layer, NE of Ft Collins

1726 turn back to the northwest, towards Laramie

1739 as we get close to hills decide to climb up above low fairwx cu

1756 complete N/S leg, turn east towards Ft Collins

1810 near Gill (NE of Ft Collins) turning NW once again towards Laramie

1845 WHEELS DOWN

POST-FLIGHT:

Raman works great, strong signal, highest vapor content seen in this experiment

Up lidar overheated at end

Pilot made verbal acknowledgement of all terrain warnings.

KAPEE pilot notes

Flight 11

Date: 6-18-2010

Pilot: Tom

Crew: Zhien, Larry, Nick

Objective: Fly down towards Ft. Collins at about 3000 AGL. Descend fly I25 at 6500 and 7500. Fly East West track from Longmont. Return to LAR.

Actual: Took off flew to Ft. Collins area and turned south along I25. Very high density VFR traffic. Returned north and maneuvered west for east run from Longmont but gave buffer to Longmont airport. Flew east leg and dropped 1000 ft and returned west. Repeated North/South leg and continued north past Ft. Collins. Turned to LAR and climbed to 14,500. Flew over Lake Hattie on way home.

Flight 10

Date: 6-17/2010

Pilot: Brett

Crew: Bo, Zhien, Jeff

Objective: Night flight. Originally Zhien wanted to stay in the Laramie valley and do low altitude work. As we briefed, we decided it was best to head over into Western Nebraska and get on a low altitude route and take IFR handling down to MEA.

Actual: Filed for LAR V524 BFF V169 AKO and then to reverse the plan. I asked to descend to arrive on V524 at MEA. It worked out nicely. Winds were pretty calm in Nebraska and smooth (good for Bo). On track back to BFF we came off early and proceeded direct to LAR. Initially they only made us climb to 8000 MSL. Later we climbed to 11100 to cross the Laramie range. Total flight time for both was 2.3 hrs.

KAPEE 10

17/18 June (17th local, 18th UTC)

RF10

Crew:

B Wadsworth

Z Wang

J French

B Liu

LOD: B Glover

OBJECTIVE:

First flight night flight of project...to determine sensitivity in environment with less background. Focus for flight will be low-level, clear air, BL moisture.

PRE-FLIGHT:

Lowest we can go at night is 2000' within 4 nmi. (or lowest we get from clearance), essentially IFR at night. Ground data suggest highest dewpoint in Nebraska and extreme NE Colorado, will try to work across strong gradient in that region flying N/S

0218Z 230/13, 1.0 CLR, 15/-04

FLIGHT:

0230 Wheels up

0237 climbing through FL160, PCASP gets really noisy

0240 level at FL190, headed east

0246 noticed that neph status was red, reading "humid", after 1 minute went to OK

0257 level at FL080, turning south onto route

0259 cleared to descent to FL074

0300 level at FL074

0302 started a neph zero, just after starting, go clearance to FL060

0306 down to FL060, then upto FL064

0312 as we continue south, dewpoints increase from 0 to +7 C

0318 Down lidar sees very strong signal and can pick up signal all the way to the surface, 2000' below us, MR ~9g/kg

0331 at AKO (south end of line), MR 9.5 g/kg, reversing course

0353 dogleg over Sydney

0354 ATC kicked us upto FL070

0405 turning left off line, climbin, heading back to LAR
0417 ATC pushes us up to FL111
0445 WHEELS DOWN

POST-FLIGHT:

Raman works good

Strong signal to DP of 0-5 C;

Up lidar—depolarization increased on climb even at warm T (12C outside), condensation on inside of glass?

Flight 9

Date: 6-17/2010

Pilot: Brett

Crew: Cai, Zhien, Jeff

Objective: Stay in the Laramie Valley to align the LIDAR, then make some low level passes at ~1000' AGL while remaining in the valley. Plan to remain VFR throughout.

Actual: Got airborne and headed north into the valley. We had to RTB shortly after to have a screw removed from the LIDAR. Departed again and picked up flight-following from Denver. Climbed to 15000' and tracked north to MBW, then returned to just west of LAR. We spiraled down to 1000' AGL. Denver lost radar contact with us around 10,200 MSL. Maintaining a good spiral (Zhien asked for about 500 FPF ROD, constant AOB) was difficult – particularly in the high winds (~250 at 30+ kts) and turbulent conditions downwind of Sheep Mountain. Then made a series of passes across the Laramie River at ~1000' AGL. Later made a couple of passes over the river at ~600 AGL. Received Terrain Alerts & Warnings. Kept an active outside scan going. Total flight time for both was 1.8 hrs.

KAPEE 10

17 June

RF09

Crew:

B Wadsworth

Z Wang

J French

C Yong

LOD: B Glover

OBJECTIVE:

First flight after Raman returned from the lab. Begin flight with alignment at or near FL150, then fly low level over Laramie valley to check lidar performance and sensitivity.

PRE-FLIGHT:

First flight after major in-lab optics alignment. All Clear air, remain in Laramie Valley.

1929Z 220/22G30, 1.0 CLR, 17/-08, 30.05

FLIGHT:

1939 Wheels up

1944 started both lidars, level at FL150

1946 Zhien begin alignment, Cai begins zero of neph

1950 cover on Raman adjustment knobs not removed prior to flight, no way to remove in flight, RTB to remove cover.

DECIDE to plug ground power on landing to turn around aircraft as quickly as possible

2000 on ground

NOTE: TCAS inop—Spanky MEL'd TCAS to allow another flight

2004 220/25G34 1.0 CLR, 18/-06

ALL ON SAME DATA FILE

2048 Wheels up (again!)

2056 FL122-top of BL, throughout BL CPC railed, PCASP<100 cm-3; from FL122 to FL135 we are in inversion, CPC drops <200, PCASP looks noisy (50-600) Why noise at this level but not at lower altitudes when there are more particles in CPC???

2058 level at FL155, Zhien begins alignment

2102 Zhien complete with alignment

2103 180 degree turn, setup for straight/level at FL155

2114 end leg, west of LAR, begin slow spiral down to 1000 ft AGL

2127 level off at 1000' AGL, PCASP noise decrease to almost zero, conduct legs across (above) Laramie River

2129 begin legs back/forth across river

2137 descend to 500' AGL and continue legs

214710 over lake hattie

214735 feet dry

2149 1000' AGL, begin zero of neph

2200 Wheels down

POST-FLIGHT:

Raman works good

PCASP noisy, worse at higher altitude

Although two flights, we count this as ONE, one data file

Flight 8

Date: 6-1142010

Pilot: Brett

Crew: Larry, Zhien, Jeff

Objective: Stay in the Laramie Valley to align the LIDAR, then make some low level passes at ~1000' AGL while remaining in the valley. As the sun set, we would pick up an IFR clearance at 15000 and head east. I filed for CYS 360/030, SYD 360/030 and to delay there for about 30 minutes.

Actual: Got airborne and headed north into the valley. Zhien attempted to align the LIDAR, but it failed. We RTB'd.

KAPEE 10

14 June

RF08

Crew:

B Wadsworth

Z Wang

J French

L Oolman

LOD: B Glover

OBJECTIVE:

First night flight for KAPEE. Primarily looking for reduction in background (noise) in Raman signals. Will try to fly both low level over ground and later in flight above clouds to look for water vapor variation at cloud edge.

PRE-FLIGHT:

Begin with alignment of lidar and zero nephelometer. Then spend 30 minutes of low-level work in Laramie Valley. Climb to ~15kft and chase clouds east of Laramie Range.

FLIGHT:

0200 Z Wheels up

Opened Nadir door, leveled off at FL100

Up-lidar, on starting got "low flow indicator", pwr up/dn supply then was OK

Started down lidar

Noted PMB was zero on data system display

Zhien began alignment, after 10 minutes Zhien noted alignment was way off and we need to return to base.

POST-FLIGHT:

Water for up lidar was changed prior to flight, not enough water, will add prior to next flight

PMB analog cable was disconnected

Need to remove Raman lidar and do a complete laboratory alignment prior to next flight

KAPEE pilot notes

Flight 7

Date: 6-11-2010

Pilot: Tom

Crew: Larry, Zhien, Perry

Objective: Head towards Denver below cloud base then drop down to around 3000 ft. and go south/north along west side of Class B. Then make east/west leg 6500 starting near Longmont. Then possibly work clouds on the way back to LAR.

Actual: Headed towards Denver VFR below cloud base then drop down to around 8000 ft. and went south along west side of Class B returned north at 7500(?). Then went north of Longmont and started east/west leg 6500 returned at 1000 AGL. Repeated N/S leg at 6500 but this time outside KBJC so we could leave the Lidar running. Came back on approximately the same north line as previous. Then climbed to cloud base north of Ft. Collins and returned to LAR. Thunderstorms approaching the airport so we landed before they arrived. Did not fuel due to thunderstorm proximity.

KAPEE pilot notes

Flight 5

Date: 6-10-2010

Pilot: Tom

Crew: Larry, Zhien, Liu

Objective: Head towards Northwest low altitude. Then climb to cloud base. Fly under cloud base, then fly in cloud, then below cloud.

Actual: Headed northwest at low altitude. Climbed up to cloud base N of MBW. Picked up IFR block north of MBW worked clouds under and in. Decided to head towards LAR. Noticed cloud band forming over Laramie range. Worked clouds under and in along range. Switched to a racetrack type pattern and continued. Returned to LAR.

KAPEE pilot notes

Flight 5

Date: 6-9-2010

Pilot: Tom

Crew: Larry, Zhien, Bandani

Objective: Head towards Pine Bluffs at high altitude. Fly under cloud base, then fly in cloud, then below cloud (repeat). Possibly drop down low on return to LAR. Decided to stay in Laramie valley before takeoff.

Actual: Climbed to 17,500 MSL NW picked up IFR worked cloud base at approx FL190 then tried to work in and below base NE-SW just north of LAR. Kind of messy clouds, hard to stay in or below as appropriate. Decided to climb above clouds and work tops. Climbed in stages ending at FL260. With ATC vector for traffic and drift ended up on East side of Laramie Range. Flew back to valley and started working clouds at 230-240. Worked a few tops north of LAR then descended into LAR.

KAPEE pilot notes

Flight 4

Date: 6-8-2010

Pilot: Tom

Crew: Larry, Zhien, Snider

Objective: Head towards clouds to east. Work bases of clouds then internal.

Actual: Climbed to East picked up IFR worked cloud base NE-SW at 11,100-12000. Later climbed to 14,000. Had to take a heading SW to accommodate Great Lakes coming off LAR. Later tried to fly over the tops of east side lower clouds that were in shadow. Then returned to LAR.

Kapee pilot notes:

Flight 3

Date: 6-3-2010

Pilot: Tom

Crew: Larry, Zhien, Yong

Objective: Head towards Sydney at high altitude. Do Zero span. Drop down to 2000 ft. near Sidney do a stack 200 ft. per line. Do another zero span. Return to LAR.

Actual: Climbed to 17,500 MSL headed east towards Sidney, did zero span. Dropped down to 3000 AGL Did stack (down) 200 ft each then later 300 ft. each pass. Did low-level zero span. Headed north- east at low level. Climbed to cloud base and headed towards LAR. Descended to 1000 AGL and returned to LAR.

Kapee pilot notes:

Flight 2

Date: 6-2-2010

Pilot: Tom

Crew: Jeff, Zhien, Liu

Objective: Head towards Wheatland at 1000 ft. Check alignment. Fly near powerplant, and then head down river valley 500-1000. Then fly above a cloud if possible.

Actual: Took off did climbed to 2000 agl to the east, checked alignment. Dropped down to 1000 AGL after crossing Laramie range. Flew by power plant and dropped to 500 AGL, flew North of KTOR and KBFF. Flew back along river then south towards CYS then climbed over clouds back to LAR.

ATC: Majority of the time below radar contact. Some of the time below radio contact.

KAPEE 10

2 June

RF02

Crew:

T Drew

Z Wang

J French

B Liu

LOD: N Mahon

OBJECTIVE:

Fly low-level in region east of Laramie Range, likely along Platte River from Wheatland east. Low-level moisture increases to the east with dewpoint in upper 40's to low 50's.

PRE-FLIGHT:

No nephelometer. Leak was found on CPC after last flight, believed to be fixed for this flight.

FLIGHT:

1926 Wheels up

NOTE—no times from here on our—noticed (late in flight) that data system was “falling behind”, at end of flight realtime display was more than 15 minutes behind. All the data had correct timestamp was just delayed being display and written to disk, as if there was a huge buffer that the data were getting written into and served out at a slower rate....

Passing Wheatland power plant early in flight.

From Wheatland, dropped between 500 and 1000 AGL and proceeded east along the River valley, passed over Guernsey Lake.

On east end (near Scottsbluff), turned to come back west, zig-zagged across river valley and wheatfields. Crossed several dust plumes from tractors and cars driving on dirt roads. Also crossed several center-pivot sprinkler fields.

Passed through a couple of rainshafts before climbing and heading back to west side of Laramie Range.

POST-FLIGHT:

A/C not working?

ICE-Vane acting up?

Issue with data system display and writing data, unable to reproduce on ground. 2-3 weeks this event still have not seen this problem on any flight or ground test.

Kapee pilot notes:

Flight 1

Date: 6-1-2010

Pilot: Tom

Crew: Larry, Zhien, Liu

Objective: First check alignment. Then fly 1000 ft above mountains and 1000 ft above valley. Then fly above a cloud if possible.

Actual: Took off did climbed to west, did alignment and then went south. Returned to valley dropped to 1000 AGL over river and went north. Climbed up to cross over some clouds. Returned to LAR. Did some straight and level yaw's on return to LAR.

KAPEE - Test Flight 6

27 May 2010

Crew: Tom Drew, Zhien Wang, Jeff French, Larry Oolman

Objectives:

- Test the Raman lidar
- Gast pump will be left off.

Raman computer.

2130	Take off
2134-2146	FL130
2149-2155	FL180
2159-2213	FL230
2239	Land

Problems

- Noise on lidar seems high
- Still need to resolve pump vibration issue
- Would like a rear Lidar display to make alignment easier.
- In the 'Monitor' program, the sample time and host time were drifting apart.

KAPEE - Test Flight 5

27 May 2010

Crew: Tom Drew, Perry Wechsler, Larry Oolman, Bo Liu

Objectives:

- Leave Gast pump off
- Align the Raman lidar
- Test the Raman lidar

1816 Take off

1821-1835 FL170

1841-1844 Switch on Gast pump to prove it interferes with the Raman computer.

1859 Land

KAPEE - Test Flight 4

26 May 2010

Crew: Tom Drew, Zhien Wang, Larry Oolman, Bo Liu

Objectives:

- Test the Raman computer
- Align the Raman lidar
- Test the Raman lidar

1750	Take off
1750	Start the nephelometer
1753-1800	Zero the nephelometer
1753-1811	FL125
1821	Land

Problems

- Raman lidar computer froze shortly after trying to record data. Subsequently found that the Gast pump created enough vibration to interfere with the disk drive.

KAPEE - Test Flight 3

26 May 2010

Crew: Tom Drew, Zhien Wang, Larry Oolman, Bo Liu

Objectives:

- Align the Raman lidar
- Test the Raman lidar

1617	Take off
1618	Start the nephelometer
1623-1630	Zero the nephelometer
1624-1635	FL125
1653	Land

Problems

- Raman lidar computer froze shortly after trying to record data. Subsequently found that the Gast pump created enough vibration to interfere with the disk drive.

KAPEE - Test Flight 2

17 May 2010

Crew: Tom Drew, Perry Wechsler, Yong Cai, Larry Oolman

Objectives:

- Test data system.
- Test aerosol instruments. Will do stepped profile and zero the nephelometer at the lowest and highest levels.
- Wind calibration maneuvers

1654	Take off
1656-1718	FL095
1658-1706	Zero the nephelometer
1720-1727	FL115
1729-1736	FL135
1737-1743	FL155
1744-1816	FL175
1752-1759	Zero the nephelometer
1803-1816	Wind calibration maneuvers
1834	Land

KAPEE - Test Flight 1

22 April 2010

Crew: Brett Wadsworth, Perry Wechsler, Yong Cai, Larry Oolman

Objectives: Test aerosol instruments

1626 Take off in light rain.

1634 Started zero on nephelometer

1640 Late at turning on the radar altimeter

1711 Land

Equipment problems

- Left head set not working
- Upgrade of LabView changed things enough that there were frequent data gaps.