G-1 Stack Pattern 1: Instrument Testing.

The motivation for this flight is to test instruments and to evaluate characteristic values of key measurements at different heights in both clear air and in the presence of clouds. This will be one of the first flights to be done during the campaign.

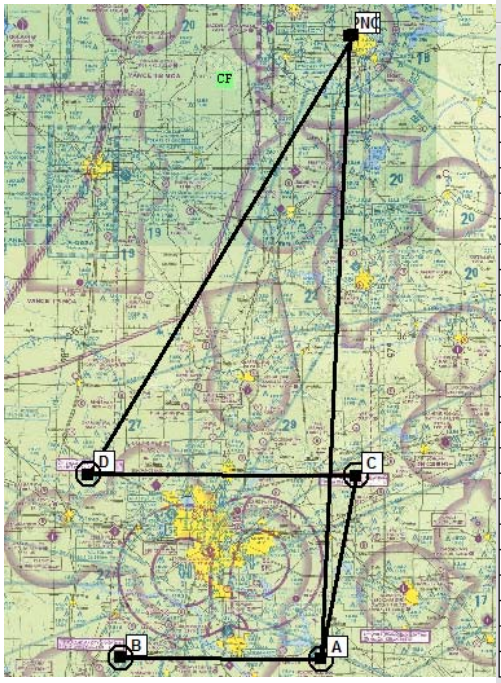
We would like to fly one stack of four (4) flight legs approximately 14 nm upwind of Will Rogers World Airport, followed by a single stack of six (6) horizontal flight legs approximately 14 nm downwind of this airport. Each upwind leg will be 30 nm long, and each downwind leg will be approximately 40 nm long.

The legs in the upwind stack will consist of 1) one transect below cloud base at approximately 3,000 ft MSL, 2) a transect within the cloud layer (with the AMS sampling the CVI inlet), 3) a second identical transect within the cloud layer (with the AMS sampling the isokinetic inlet) and 4) one transect above cloud top.

The legs in the downwind stack will consist of transects made at 1) 3,000 ft MSL, 2) just below cloud base, 3) within cloud with the AMS sampling through isokinetic inlet, 4) at the same altitude within cloud with the AMS sampling through CVI inlet, 5) higher altitude within cloud with AMS sampling through isokinetic inlet CVI inlet [this leg will likely be above some cloud tops], 5) at the same altitude, but with the AMS sampling through the CVI inlet and 6) free atmosphere.

Although we have drawn the pattern using a reference wind from the south we would like the option to rotate it to match the drift of the plume from Oklahoma City on a given day. For this flight pattern, we anticipate that the NASA King Air will be flying above us at altitudes in excess of 25,000 ft MSL. G-1 waypoints are defined alphabetically, e.g., from PNC to Waypoint A, to Waypoint B., etc.

G-1 Stack Pattern 1: Instrument testing



Total Distance (nm): 594.14 Total ETE (min): 216.4

WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PNC	00:00:00	36.729	-97.110	1007				
A	00:27:58	35.177	-97.194	3000	200.0	173.0	93.21	28.0
B	00:37:58	35.178	-97.806	3000	180.0	260.6	30.03	10.0
B	00:41:58	35.178	-97.806	4000	180.0	spiral	12.00	4.0
A	00:51:59	35.177	-97.194	4000	180.0	80.6	30.03	10.0
A	00:55:59	35.177	-97.194	4000	180.0	spiral	12.00	4.0
B	01:05:60	35.178	-97.806	4000	180.0	260.6	30.03	10.0
B	01:09:60	35.178	-97.806	8000	180.0	spiral	12.00	4.0
A	01:20:00	35.177	-97.194	8000	180.0	80.6	30.03	10.0
C	01:29:16	35.632	-97.089	3000	180.0	1.2	27.80	9.3
D	01:42:37	35.632	-97.910	3000	180.0	260.5	40.05	13.3
D	01:46:37	35.632	-97.910	3500	180.0	spiral	0.00	4.0
C	01:59:58	35.632	-97.089	3500	180.0	80.5	40.05	13.3
C	02:03:58	35.632	-97.089	4000	180.0	spiral	0.00	4.0
D	02:17:19	35.632	-97.910	4000	180.0	260.5	40.05	13.3
D	02:21:19	35.632	-97.910	4000	180.0	spiral	0.00	4.0
C	02:34:40	35.632	-97.089	4000	180.0	80.5	40.05	13.3
C	02:38:40	35.632	-97.089	5000	180.0	spiral	0.00	4.0
D	02:52:01	35.632	-97.910	5000	180.0	260.5	40.05	13.3
D	02:56:01	35.632	-97.910	5000	180.0	spiral	0.00	4.0
C	02:56:01	35.632	-97.910	5000	180.0	170.5	0.00	0.0
C	03:00:01	35.632	-97.089	8000	180.0	spiral	0.00	4.0
D	03:13:22	35.632	-97.910	8000	180.0	260.5	40.05	13.3
PNC	03:36:23	36.731	-97.100	1007	200.0	21.3	76.71	23.0

G-1 Stack Pattern 2: **Basic Oklahoma City Cloudy Air Flight Plan**.

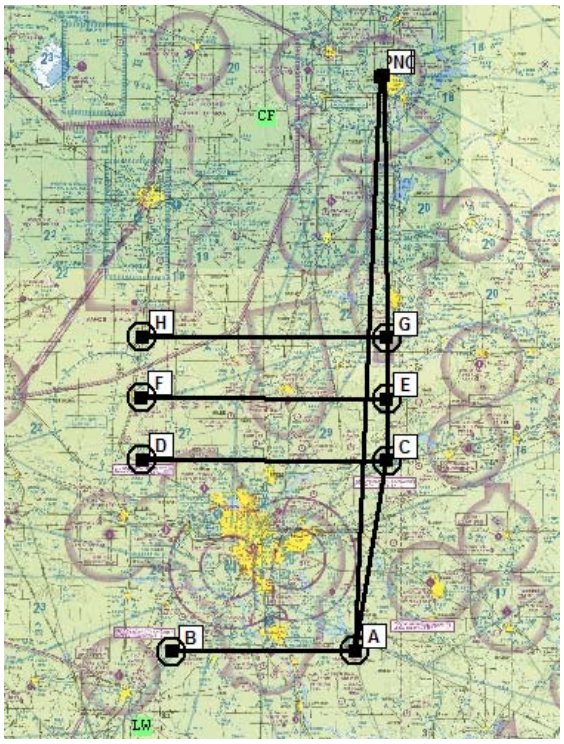
This pattern is the basic OKC Cloudy Air Flight Plan. The motivation for this flight is to characterize aerosols in regional and dirty air, below and within clouds. This is the primary flight pattern for the campaign, and some will be coordinated with the ER-2.

This flight plan consists of one stack of four (4) flight legs flown upwind of Oklahoma City, and a set of two or three stacks of four horizontal flight legs flown downwind of Oklahoma City (the exact number will depend on fuel concerns, and be determined by the pilots). Each upwind leg will be approximately 30 nm long. We would like to fly the upwind stack of four transects approximately 14 nm upwind of the Will Rogers World Airport, and the first downwind stack 14 nm downwind of the Will Rogers World Airport. Each subsequent downwind stack will be flown 5 to 15 nm downwind of the previous stack. The legs in each stack will consist of the following transects: 1) one below cloud base at approximately 3,000 ft MSL, 2) one within the cloud layer (with the AMS sampling the CVI line), 3) a second identical transect within the cloud layer (with the AMS sampling the CVI inlet), 4) and one above cloud top. The last downwind stack can be terminated early, or eliminated entirely depending on the elapsed time, fuel reserves, etc.

The King Air will perform a series of coincident level legs transects above (~25,000 ft MSL) the locations of the G-1 to map out the aerosol and cloud distributions at various distances downwind of Oklahoma City. These transects, like the G-1 transects, will be oriented perpendicular to the mean 850 mb wind and the Oklahoma City plume. The King Air transects will be slightly longer than G-1 transects in order to locate and sample the entire horizontal width of the plume as well as regions outside of the plume. While traveling en route to the anticipated location of the coordinated G-1 pattern, the King Air will perform a “zig-zag” pattern oriented roughly perpendicular to the expected location of the Oklahoma City plume. This pattern is designed to help define the exact location of the plume and to direct the G-1 to the optimal position to sample the plume.

We have drawn the pattern using a reference wind from the south but would like the option to rotate it to match the drift of the plume from Oklahoma City on a given day. G-1 waypoints are defined alphabetically, e.g., from PNC to Waypoint A, to Waypoint B., etc.

G-1 Stack Pattern 2: Basic Oklahoma City cloud air flight plan drawn for southerly winds (some in coordination with ER-2)



Total Distance (nm): 932.70 Total ETE (min): 310.9

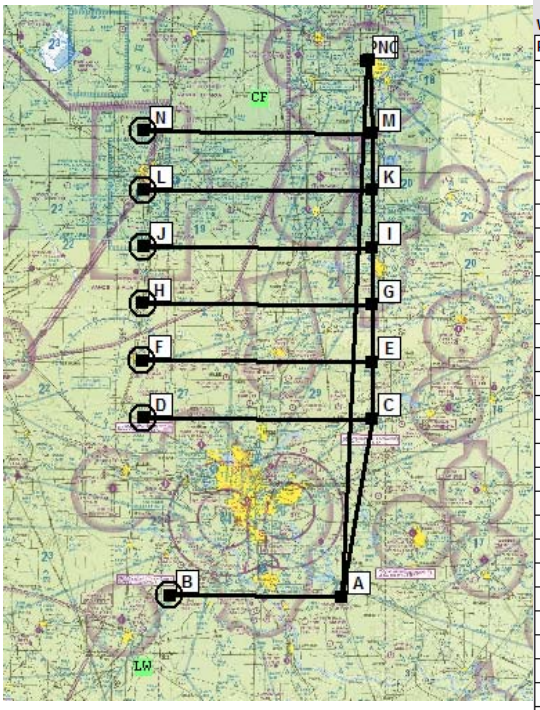
WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PNC	00:00:00	36.729	-97.110	1007				
A	00:31:19	35.165	-97.194	3000	180.0	173.0	93.93	31.3
B	00:41:19	35.161	-97.805	3000	180.0	260.0	30.00	10.0
B	00:45:19	35.161	-97.805	5000	180.0	spiral	12.00	4.0
A	00:55:19	35.165	-97.194	5000	180.0	80.0	30.00	10.0
A	00:59:19	35.165	-97.194	5000	180.0	spiral	12.00	4.0
B	01:09:18	35.161	-97.805	5000	180.0	260.0	30.00	10.0
B	01:13:18	35.161	-97.805	9000	180.0	spiral	12.00	4.0
A	01:23:18	35.165	-97.194	9000	180.0	80.0	30.00	10.0
C	01:33:49	35.683	-97.089	3000	180.0	359.8	31.51	10.5
D	01:47:09	35.683	-97.910	3000	180.0	260.5	40.00	13.3
D	01:51:09	35.683	-97.910	5000	180.0	spiral	12.00	4.0
C	02:04:29	35.683	-97.089	5000	180.0	80.5	40.00	13.3
C	02:08:29	35.683	-97.089	5000	180.0	spiral	12.00	4.0
D	02:21:49	35.683	-97.910	5000	180.0	260.5	40.00	13.3
D	02:25:49	35.683	-97.910	9000	180.0	spiral	12.00	4.0
C	02:39:09	35.683	-97.089	9000	180.0	80.5	40.00	13.3
E	02:42:29	35.850	-97.090	3000	180.0	350.4	10.00	3.3
F	02:55:51	35.851	-97.914	3000	180.0	260.6	40.10	13.4
F	02:59:51	35.851	-97.914	5000	180.0	spiral	12.00	4.0
E	03:13:13	35.850	-97.090	5000	180.0	80.6	40.10	13.4
E	03:17:13	35.850	-97.090	5000	180.0	spiral	12.00	4.0
F	03:30:35	35.851	-97.914	5000	180.0	260.6	40.10	13.4
F	03:34:35	35.851	-97.914	9000	180.0	spiral	12.00	4.0
E	03:47:57	35.850	-97.090	9000	180.0	80.6	40.10	13.4
G	03:51:19	36.018	-97.090	3000	180.0	350.4	10.10	3.4
H	04:04:39	36.016	-97.914	3000	180.0	260.3	40.00	13.3
H	04:08:39	36.016	-97.914	5000	180.0	spiral	12.00	4.0
G	04:21:59	36.018	-97.090	5000	180.0	80.3	40.00	13.3
G	04:25:59	36.018	-97.090	5000	180.0	spiral	12.00	4.0
H	04:39:19	36.016	-97.914	5000	180.0	260.3	40.00	13.3
H	04:43:19	36.016	-97.914	9000	180.0	spiral	12.00	4.0
G	04:56:39	36.018	-97.090	9000	180.0	80.3	40.00	13.3
PNC	05:10:54	36.731	-97.100	1007	180.0	349.9	42.76	14.3

G-1 Stack Pattern 3. Basic Oklahoma City Clear Air Flight Plan.

The motivation for this flight is to make measurements within and above the mixing layer to serve as a baseline for assessing the role of clouds in transporting material through the top of the mixed layer. The requested flight pattern defines a set of transects to be made within and above the mixing layer at increasing distances downwind of OKC. Each stack will consist of one transect made at 3000 ft MSL and a second transect made above the convective boundary layer (generally this transect will be flown between 4000 and 7000 ft MSL). These altitudes may vary as we learn more about the mixing properties of the Oklahoma City plume.

This flight plan consists of one stack of low and high transects flown upwind of Oklahoma City and sets of stacks of low and high transects flown at increasing downwind distances from Oklahoma City. Each downwind flight leg will be approximately 40 nm long. We would like to fly the first downwind stack 14 nm downwind of the Will Rogers World Airport, and fly each subsequent stack 5 to 15 nm downwind of the previous stack. The pattern will consist of at least 5 downwind stacks, with the exact number determined by the endurance of the G-1. The upwind stack will be 30 nm long and will be flown approximately 14 nm upwind of the Will Rogers World Airport. The NASA King Air will fly a similar pattern above 25,000 ft MSL. G-1 waypoints are defined alphabetically, e.g., from PNC to Waypoint A, to Waypoint B., etc.

G-1 Stack Pattern 3: Basic Oklahoma City clear air flight plan (drawn for southerly winds)



Total Distance (nm): 812.75 Total ETE (min): 267.4

WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PNC	00:00:00	36.729	-97.110	1007				
A	00:28:09	35.167	-97.198	3000	200.0	173.1	93.84	28.2
B	00:38:09	35.167	-97.809	3000	180.0	260.6	30.00	10.0
B	00:42:09	35.167	-97.809	4500	180.0	spiral	12.00	4.0
A	00:52:09	35.167	-97.198	4500	180.0	80.6	30.00	10.0
C	01:02:40	35.685	-97.089	3000	180.0	0.2	31.54	10.5
D	01:15:60	35.685	-97.910	3000	180.0	260.5	40.00	13.3
D	01:19:60	35.685	-97.910	4500	180.0	spiral	12.00	4.0
C	01:33:20	35.685	-97.089	4500	180.0	80.5	40.00	13.3
E	01:36:40	35.851	-97.090	3000	180.0	350.5	10.00	3.3
F	01:50:04	35.851	-97.916	3000	180.0	260.5	40.20	13.4
F	01:54:04	35.851	-97.916	4500	180.0	spiral	12.00	4.0
E	02:07:28	35.851	-97.090	4500	180.0	80.5	40.20	13.4
G	02:10:48	36.018	-97.090	3000	180.0	350.4	10.00	3.3
H	02:24:10	36.018	-97.916	3000	180.0	260.5	40.10	13.4
H	02:28:10	36.018	-97.916	4500	180.0	spiral	12.00	4.0
G	02:41:32	36.018	-97.090	4500	180.0	80.5	40.10	13.4
I	02:44:52	36.185	-97.090	3000	180.0	350.4	10.00	3.3
J	02:58:12	36.185	-97.916	3000	180.0	260.5	40.00	13.3
J	03:02:12	36.185	-97.916	4500	180.0	spiral	12.00	4.0
I	03:15:32	36.185	-97.090	4500	180.0	80.5	40.00	13.3
K	03:18:52	36.351	-97.090	3000	180.0	350.4	10.00	3.3
L	03:32:12	36.350	-97.918	3000	180.0	260.3	40.00	13.3
L	03:36:12	36.350	-97.918	4500	180.0	spiral	12.00	4.0
K	03:49:32	36.351	-97.090	4500	180.0	80.3	40.00	13.3
M	03:52:52	36.518	-97.090	3000	180.0	350.4	10.00	3.3
N	04:06:12	36.521	-97.920	3000	180.0	260.8	40.00	13.3
N	04:10:12	36.521	-97.920	4500	180.0	spiral	12.00	4.0
M	04:23:32	36.518	-97.090	4500	180.0	80.8	40.00	13.3
PNC	04:27:22	36.731	-97.100	1007	200.0	348.5	12.76	3.8

G-1 Generic Cloud Sampling Flight Plan

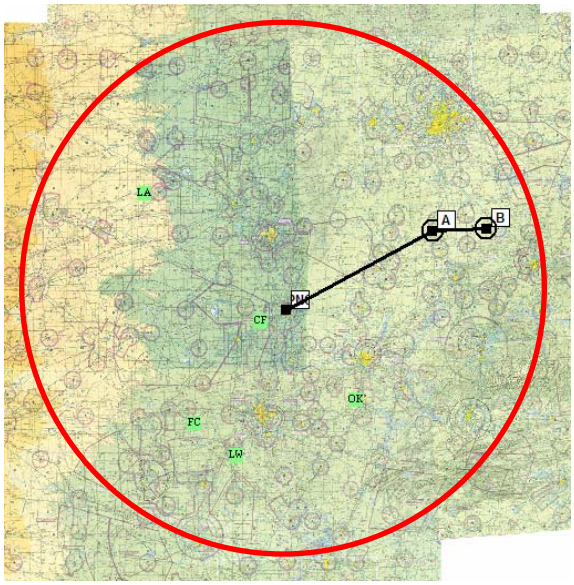
This is a generic flight plan to allow cloud sampling within a 200 nm region centered around Ponca City. It would consist of a flight along a radial from Ponca City to cloudy regions identified from satellite pictures. This pattern will be closely coordinated with the Cessna 206 and the CIRPAS Twin Otter. As we approach region, we would request that the G-1 descend and start an upward climb to allow the scientist/pilots to identify the height of cloud base and cloud top. At the specified distance, a set of four transects would be made, each on top of the other.

1. A low transect just below cloud base
2. A medium altitude transect, half way between cloud top and cloud base during which our AMS would sample through the isokinetic inlet
3. A second medium altitude transect half way between cloud top and cloud base during which our AMS would sample through the CVI inlet. And
4. A transect at cloud top

A repeat of these transects would be done, and the G-1 would then return to Ponca City. G-1 waypoints are defined alphabetically, e.g., from PNC to Waypoint A, to Waypoint B., etc.

The King Air will perform a series of coincident level legs transects above (~25,000 ft AGL) the locations of the G-1 transects

G-1 Pattern 4: Generic cloud sampling flight plan (away from Oklahoma City). Cloud fields assumed to be ENE of Oklahoma City.



Total Distance (nm): 935.82 Total ETE (min): 294.5

WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PNC	00:00:00	36.731	-97.100	1007				
A	00:37:27	37.654	-94.759	3000	200.0	54.2	124.86	37.5
B	00:50:51	37.650	-93.913	3000	180.0	80.8	40.17	13.4
B	00:55:18	37.650	-93.913	5000	180.0	spiral	13.33	4.4
A	01:08:41	37.654	-94.759	5000	180.0	260.8	40.17	13.4
A	01:13:08	37.654	-94.759	5000	180.0	spiral	13.33	4.4
B	01:26:31	37.650	-93.913	5000	180.0	80.8	40.17	13.4
B	01:30:58	37.650	-93.913	8000	180.0	spiral	13.33	4.4
A	01:44:21	37.654	-94.759	8000	180.0	260.8	40.17	13.4
A	01:48:21	37.654	-94.759	3000	180.0	spiral	12.00	4.0
B	02:01:44	37.650	-93.913	3000	180.0	80.8	40.17	13.4
B	02:06:10	37.650	-93.913	5000	180.0	spiral	13.28	4.4
A	02:19:33	37.654	-94.759	5000	180.0	260.8	40.17	13.4
A	02:23:59	37.654	-94.759	5000	180.0	spiral	13.28	4.4
B	02:37:22	37.650	-93.913	5000	180.0	80.8	40.17	13.4
B	02:41:48	37.650	-93.913	8000	180.0	spiral	13.28	4.4
A	02:55:11	37.654	-94.759	8000	180.0	260.8	40.17	13.4
PNC	03:32:39	36.731	-97.100	1007	200.0	234.2	124.86	37.5

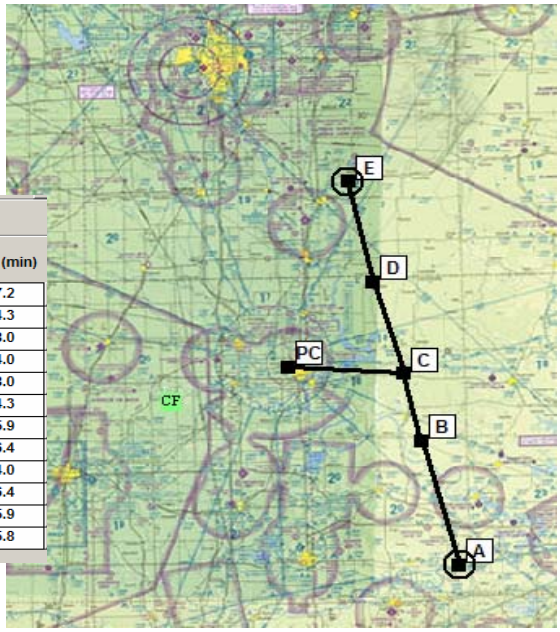
G-1 A-Train Underflights.

This flight pattern will require coordination with the overpass of the NASA A-Train satellites. The pattern would consist of a ferry flight, up to 60 nm from Ponca City. This pattern will be coordinated with the NASA King Air, CIRPAS Twin Otter, and Cessna 206. In clear and overcast conditions the aircraft will fly in a stacked pattern with the G-1 flying between 10,000 and 12,000 ft MSL along the satellite track. In cases with shallow clouds G-1 and the CIRPAS Twin Otter will fly within the clouds, but at different altitudes, with the G-1 near cloud top and the Twin Otter near cloud base (see second pattern). The patterns that are shown are for the satellite overpass on 12 June 2007, 19:46:51 UTC. G-1 waypoints are defined alphabetically, e.g., from PNC to Waypoint A, to Waypoint B., etc.

G-1 Pattern 5A: A-Train under flights, clear or overcast conditions. 2007-06-12 19:46:51

Total Distance (nm): 210.31 Total ETE (min): 70.3

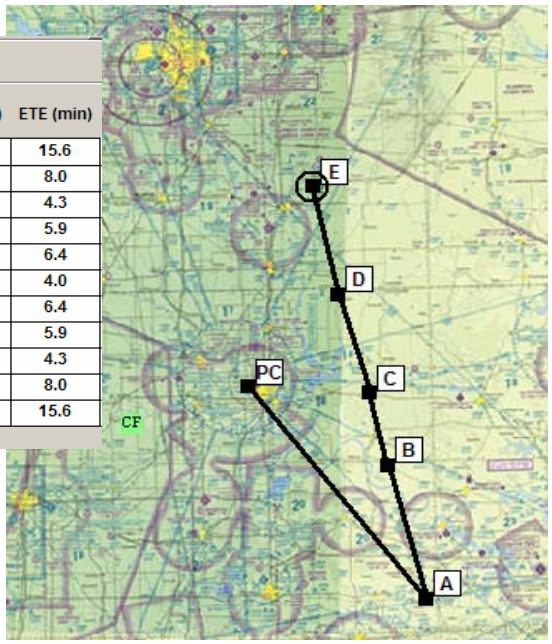
WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PC	19:11:00	36.731	-97.100	1007				
C	19:18:14	36.704	-96.700	10000	160.0	88.7	19.27	7.2
B	19:22:32	36.495	-96.643	10000	180.0	161.6	12.89	4.3
A	19:30:32	36.105	-96.525	10000	180.0	160.3	24.04	8.0
A	19:34:32	36.105	-96.525	12000	180.0	spiral	12.0	4.0
B	19:42:33	36.495	-96.643	12000	180.0	340.3	24.04	8.0
C	19:46:51	36.704	-96.700	12000	180.0	341.6	12.89	4.3
D	19:52:46	36.990	-96.798	12000	180.0	338.8	17.76	5.9
E	19:59:10	37.303	-96.878	12000	180.0	342.5	19.19	6.4
E	20:03:10	37.303	-96.878	10000	180.0	spiral	12.0	4.0
D	20:09:34	36.990	-96.798	10000	180.0	162.5	19.19	6.4
C	20:15:29	36.704	-96.700	10000	180.0	158.8	17.76	5.9
PC	20:21:16	36.731	-97.100	1007	200.0	268.7	19.27	5.8



G-1 Pattern 5B: A-Train under flights, broken clouds conditions. 2007-06-12 19:46:51

Total Distance (nm): 253.52 Total ETE (min): 84.5

WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PC	19:06:36	36.729	-97.110	1007				
A	19:22:14	36.105	-96.525	6000	180.0	137.0	46.88	15.6
B	19:30:14	36.495	-96.643	6000	180.0	340.3	24.04	8.0
C	19:34:32	36.704	-96.700	6000	180.0	341.6	12.89	4.3
D	19:40:27	36.990	-96.798	6000	180.0	338.8	17.76	5.9
E	19:46:51	37.303	-96.878	6000	180.0	342.5	19.19	6.4
E	19:50:51	37.303	-96.878	8000	180.0	spiral	12.00	4.0
D	19:57:15	36.990	-96.798	8000	180.0	162.5	19.19	6.4
C	20:03:10	36.704	-96.700	8000	180.0	158.8	17.76	5.9
B	20:07:28	36.495	-96.643	8000	180.0	161.6	12.89	4.3
A	20:15:29	36.105	-96.525	8000	180.0	160.3	24.04	8.0
PC	20:31:06	36.729	-97.110	1007	180.0	317.0	46.88	15.6



G-1 Instrument Intercomparison

This pattern was developed to allow us to compare measurements from similar instrument systems on the G-1, CIRPAS Twin Otter, and the Cessna Turbo 206. The three aircraft will leave Ponce City in sequence, with the Cessna leaving first and the G-1 leaving last. The aircraft will proceed to waypoint A, where each will turn and fly at an altitude of 4000 ft MSL towards waypoint D. As the aircraft proceed along the leg running from waypoints A to D, the Twin Otter will pass the Cessna. The G-1 will pass the Cessna and Twin Otter near waypoints B and waypoint C, respectively. All three aircraft will proceed to point D. After passing that point the Cessna will return to Ponca City, while the G-1 and Twin Otter will climb for a pass through the clouds. The G-1 will return through waypoint D and fly to waypoint A ahead of the Twin Otter. After reaching waypoint A, the G-1 will climb above the clouds and wait for the Twin Otter to pass through point A. The Twin Otter will start the above cloud leg first and be passed by the G-1 near waypoint C. After passing waypoint D, both aircraft will return to Ponca City.

(The Be-200 King Air will probably not participate in this intercomparison because of the different nature of the instruments on this aircraft relative to those of the Twin Otter and G-1).

G-1 Pattern 6: Aircraft intercomparison (drawn for southerly winds)

Total Distance (nm): 412.12 Total ETE (min): 137.4

WP	UTC Time	LAT	LON	ALT (ft)	SPD (kts)	HDG	Dist (nm)	ETE (min)
PNC	00:26:06	36.729	-97.110	1007				
					180.0	162.1	52.82	17.6
A	00:43:42	35.868	-96.885	4000				
					180.0	264.0	30.02	10.0
B	00:53:43	35.867	-97.502	4000				
					180.0	263.9	15.01	5.0
C	00:58:43	35.867	-97.811	4000				
					180.0	263.9	15.01	5.0
D	01:03:43	35.867	-98.120	4000				
					180.0	spiral	12.00	4.0
D	01:07:43	35.867	-98.120	7000				
					180.0	83.9	60.05	20.0
A	01:27:44	35.868	-96.885	7000				
					180.0	spiral	96.00	32.0
A	01:59:44	35.868	-96.885	12000				
					180.0	264.0	30.02	10.0
B	02:09:45	35.867	-97.502	12000				
					180.0	263.9	15.01	5.0
C	02:14:45	35.867	-97.811	12000				
					180.0	263.9	15.01	5.0
D	02:19:45	35.867	-98.120	12000				
					180.0	37.3	71.15	23.7
PNC	02:43:28	36.729	-97.110	1007