Open Skies Treaty Certification

Part I: Mission Summary

State Party Conducting the Certification		United States		
Aircraft Type and Model		OC-135B/61-2672		
Sensor	Type and Model	KA-91C		
	Installation	INT-4-V-90		
	Configuration Number	US-OP__-3004		
	Serial Number	1002		
	Depression Angle (degrees)	90		
Lens	Type	Pacific Optical / Recon Optical		
	Focal Length in millimeters	457.2		
	Maximum Aperature	f4.0		
	Serial Number	1002		
Scan Angles / Field of View		60 or 93 degrees		
Shutter Speeds		1/100-1/1500		
Type of Filter		WRATTEN #25		
Type of Film		3404	Roll Number	1
Velocity / Height Setting		Automatic		
Active frame center to edge (millimeters)		57.15		
Date of In-Flight Examination		5/10/2002		
Take-off Time	13:30 GMT	Landing Time	20:00 GMT	
Target Location	WPAFB	Target Lat / Long	39 46 35 N / 84 07 03 E	
Target Angle (degrees)		0		
Film Processing Information	Film Speed (ISO A)	150		
	Average Gradient (G-Bar)	0.91		
	Developer Temp (^{o} F)	104		
	Transport Speed (ft/min)	22		
Speed / Color		150R		
Percent Overlap		Max		

OS2554	US-OP__-3004	
H min	**H** min Expected	Difference With **H** min Expected
7188 Meters	6624 Meters	9%

Part II: Minimum Height Summary Configuration: US-OP__-3004

KA-91C	3404	WRATTEN #25

Pass Number	H_{min}	H_{min} Expected	Difference With H_{min} Expected
1	7652		
2	6649		
3	7689		
4	7364		
5	6587		
Total	35941.1		
Average	7188		
Standard Deviation	479		
H_{min}	**7188**	**6624**	**9%**

	Pass Number	1	2	3	4	5
	Frame Number	98	118	137	154	169
H_i	The height of the aircraft the moment the calibration target was photographed (met	6625	6641	6629	6633	6645
L_a	The agreed ground resolution (cm)	30				
L_2	Ground resolution based on the 80th-percentile rule	19.47	22.5	19.48	20.34	22.82
K_1	The agreed modulation at which ground resolution is defined	0.4				
K_2	The effective modulation from paragraph (C)	0.759	0.756	0.751	0.752	0.749
m	The agreed corrected exponent	0.45				
H_{min}	$= H_i \times \frac{L_a}{L_2} \times \frac{K_1}{K_2}^{m}$	7652	6649	7689	7364	6587

(A) Calculation of the height above ground level at which the optical camera would achieve a ground resolution of 30cm against a target which has the agreed modulation of 0.4 or equivalent contrast ratio of 2.3 to 1 against its background.

Part III: Ground Resolution

(B) Determination of the ground resolution of the optical camera at the altitude from which the calibration target was photographed, from a visual analysis of the image of the calibration target on the original film negative. The value of the ground resolution shall be equal to the width of a single bar in the smallest group of bars which can be distinguished as separate bars, in centimeters.

Widest Group Number	1
Size of Largest Group (cm)	75.6

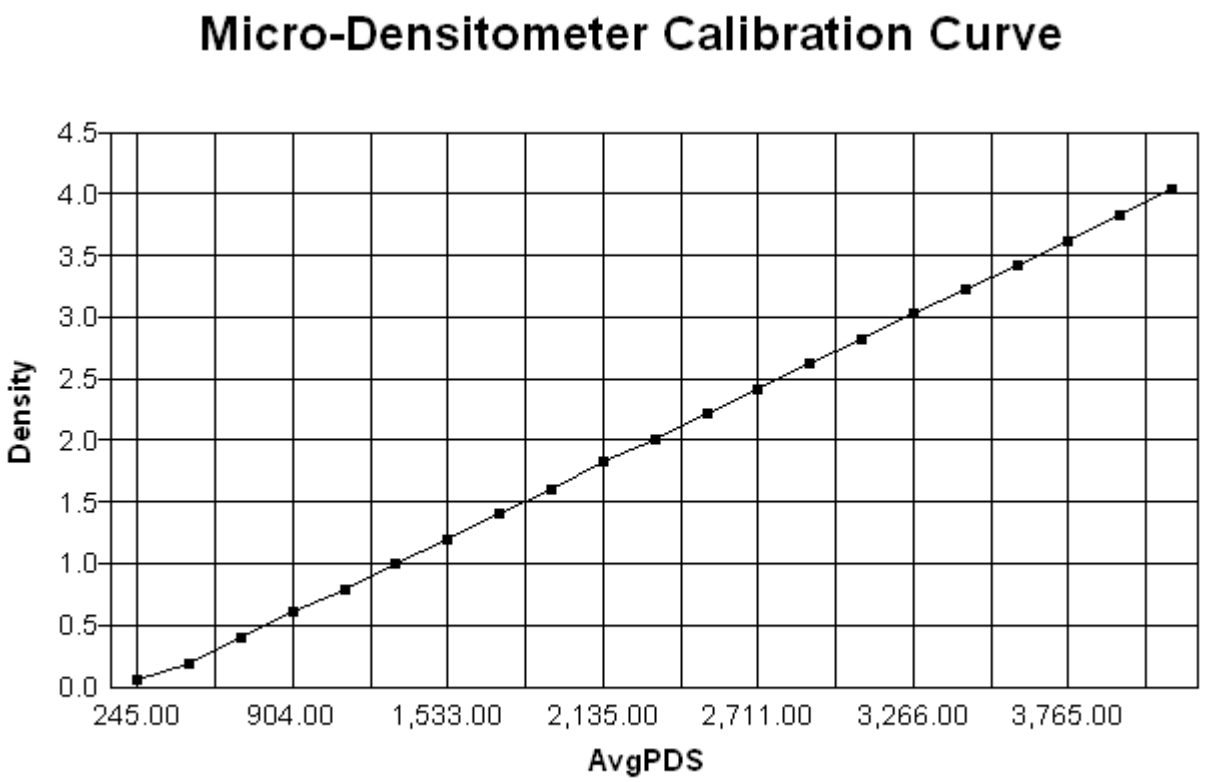
Narrowest Group Number	23
6th Root of 2 Progression	1.1225

Group	1	2	3	4	5	6	7	8	9	10
Width	75.6	67.4	60	53.5	47.6	42.4	37.8	33.7	30	26.7
Group	11	12	13	14	15	16	17	18	19	20
Width	23.8	21.2	18.9	16.8	15	13.4	11.9	10.6	9.5	8.4
Group	21	22	23							
Width	7.5	6.7	6							
Group										
Width										

Cloud Cover	0	percent	0	percent	0	percent	0	percent	0	percent
Modulation (K2)	0.759		0.756		0.751		0.752		0.749	
Aircraft Pass	1		2		3		4		5	
Target Zone	1		6		7		6		6	
Target Location	0	mm	0	mm	0	mm	0	mm	0	mm
Time	1530	gmt	1536	gmt	1541	gmt	1547	gmt	1554	gmt
Altitude (AGL)	6625	meters	6641	meters	6629	meters	6633	meters	6645	meters
Ground Speed	629	km/hr	620 KM	km/hr	631 KM	km/hr	623 KM	km/hr	617 KM	km/hr
Drift	6.6 L	degrees	6.7 L	degrees	7.78 L	degrees	6.94 L	degrees	6.37 L	degrees
Roll	0.8 L	degrees	0.08 L	degrees	0.58 L	degrees	0.38 L	degrees	1.4 L	degrees
Pitch	1.3 U	degrees	1.31 U	degrees	1.03 U	degrees	1.17 U	degrees	1.41 U	degrees
Field of View	93	degrees	93	degrees	93	degrees	93	degrees	93	degrees
Frame Number	98		118		137		154		169	
Kp	0		0		0		0		0	
Lp/mm	31.69	37.21	26.39	32.28	28.26	37.22	31.33	35.66	24.56	31.85
Observers	AL Width (cm	AC Width (cm	AL Width (cm	AC Width (cm	AL Width (cm	AC Width (cm	AL Width (cm	AC Width (cm	AL Width (cm	AC Width (cm
Andrianov, Oleg	18.9	18.9	26.7	21.2	26.7	18.9	18.9	18.9	30	21.2
Breuer	21.2	18.9	26.7	21.2	26.7	21.2	23.8	21.2	30	23.8
Goerling, Philip	21.2	18.9	26.7	21.2	23.8	18.9	21.2	18.9	26.7	21.2
HONNAY	23.8	18.9	30	23.8	26.7	18.9	23.8	21.2	30	23.8
Lane, Bruce A.	26.7	21.2	26.7	23.8	26.7	21.2	23.8	21.2	30	23.8
Lipchenko	23.8	18.9	26.7	21.2	26.7	18.9	23.8	18.9	30	21.2
Marzeda, Pawel	21.2	18.9	26.7	21.2	21.2	18.9	21.2	18.9	26.7	21.2
Millotti, Pier	21.2	18.9	26.7	23.8	21.2	16.8	23.8	21.2	30	23.8
Molnar, Emilia	23.8	21.2	30	23.8	26.7	18.9	23.8	21.2	30	23.8
Simonsen, Kjell	26.7	21.2	30	26.7	26.7	23.8	23.8	23.8	33.7	26.7
Trimmean (cm)	22.86	19.47	27.52	22.5	25.65	19.48	23.15	20.34	29.59	22.82
L2	19.47	cm	22.5	cm	19.48	cm	20.34	cm	22.82	cm
Crab Angle	11	degrees	11	degrees	8	degrees	11	degrees	12.5	degrees

Part IV: Micro-Densitometer Calibration

File	Step	# Pts	Avg PDS	Std Dev	Density
NBS01.IMG	1	1681	245	23.47	0.06
NBS02.IMG	2	1681	471	28.19	0.19
NBS03.IMG	3	1681	698	32.58	0.40
NBS04.IMG	4	1681	904	36.37	0.60
NBS05.IMG	5	1681	1116	39.36	0.80
NBS06.IMG	6	1681	1329	44.23	1.00
NBS07.IMG	7	1681	1533	48.09	1.20
NBS08.IMG	8	1681	1739	51.06	1.40
NBS09.IMG	9	1681	1952	55.63	1.60
NBS10.IMG	10	1681	2135	59.61	1.83
NBS11.IMG	11	1681	2332	58.53	2.01
NBS12.IMG	12	1681	2521	58.17	2.22
NBS13.IMG	13	1681	2711	56.02	2.42
NBS14.IMG	14	1681	2893	51.68	2.62
NBS15.IMG	15	1681	3092	43.35	2.82
NBS16.IMG	16	1681	3266	35.55	3.03
NBS17.IMG	17	1681	3427	30.83	3.23
NBS18.IMG	18	1681	3589	25.55	3.42
NBS19.IMG	19	1681	3765	20.17	3.61
NBS20.IMG	20	1681	3950	18.90	3.82
NBS21.IMG	21	1681	4095	2.67	4.04



Part V: PDS Sensitometric Strip Measurements

PDS Head Measurements

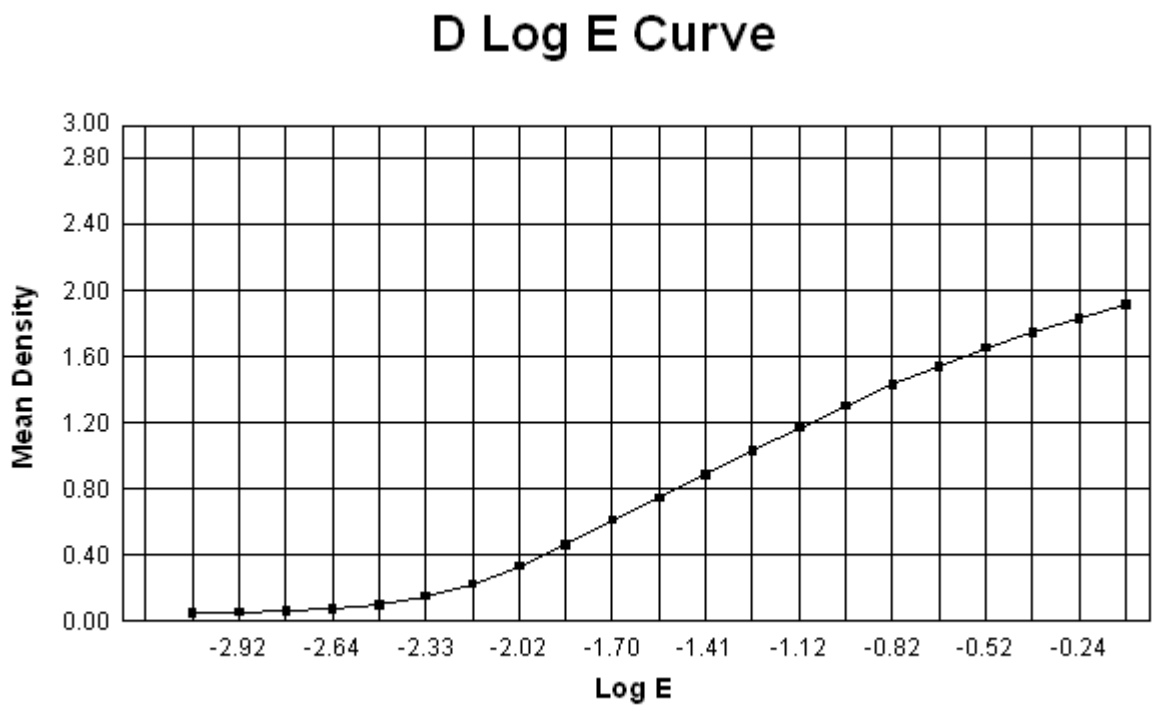
File	Step	NumPts	AvgPDS	StdDev	Density
HEAD00.IMG	1.00	1681	86	16.05	0.05
HEAD01.IMG	2.00	1681	87	16.03	0.06
HEAD02.IMG	3.00	1681	93	16.48	0.06
HEAD03.IMG	4.00	1681	106	17.41	0.07
HEAD04.IMG	5.00	1681	136	19.80	0.10
HEAD05.IMG	6.00	1681	194	22.19	0.15
HEAD06.IMG	7.00	1681	280	26.88	0.22
HEAD07.IMG	8.00	1681	407	29.87	0.34
HEAD08.IMG	9.00	1681	555	30.96	0.47
HEAD09.IMG	10.00	1681	725	33.82	0.63
HEAD10.IMG	11.00	1681	871	37.20	0.76
HEAD11.IMG	12.00	1681	1025	37.02	0.91
HEAD12.IMG	13.00	1681	1176	40.81	1.05
HEAD13.IMG	14.00	1681	1318	41.80	1.19
HEAD14.IMG	15.00	1681	1458	44.19	1.33
HEAD15.IMG	16.00	1681	1587	46.85	1.45
HEAD16.IMG	17.00	1681	1696	47.88	1.56
HEAD17.IMG	18.00	1681	1808	50.72	1.67
HEAD18.IMG	19.00	1681	1902	50.54	1.77
HEAD19.IMG	20.00	1681	1981	49.94	1.85
HEAD20.IMG	21.00	1681	2060	49.16	1.93
HEAD21.IMG	B+F	1681	94	16.26	0.06

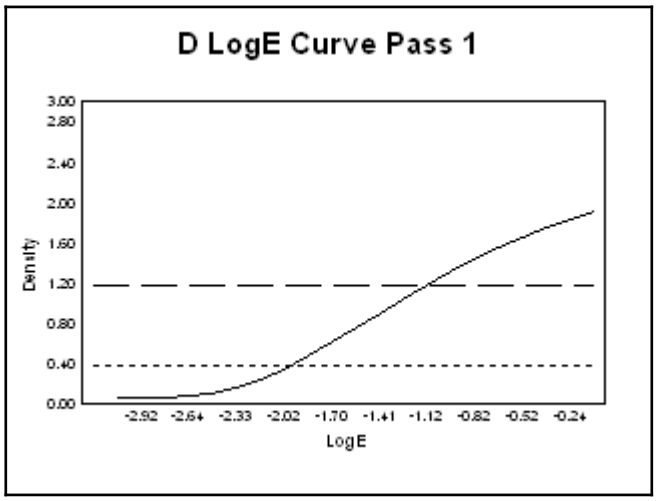
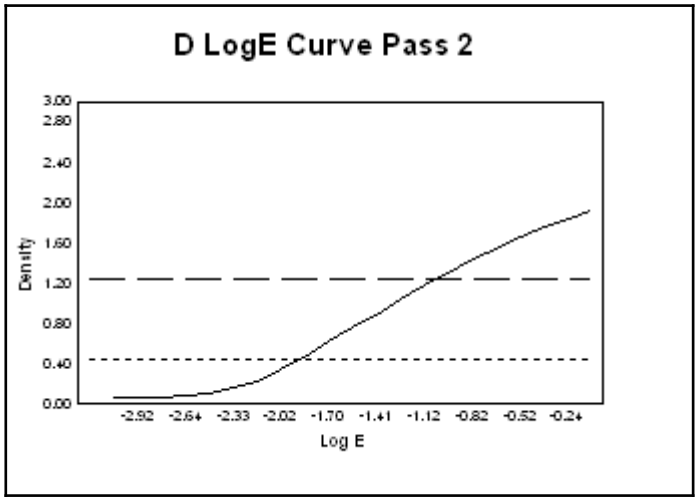
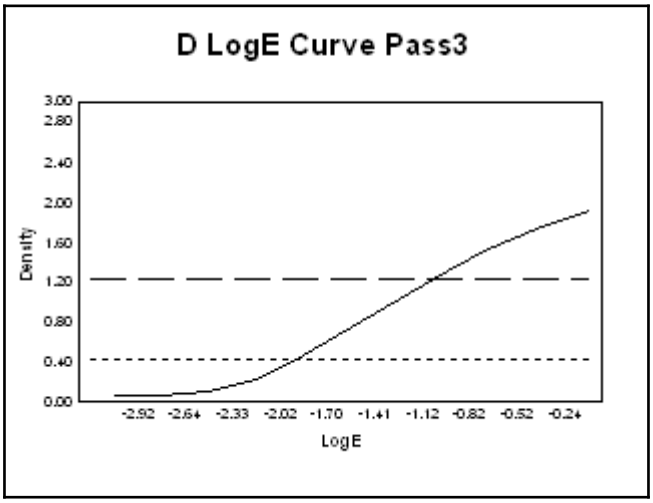
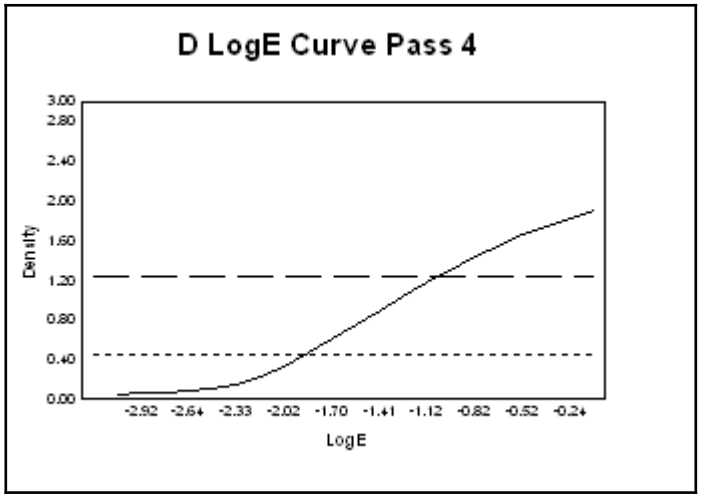
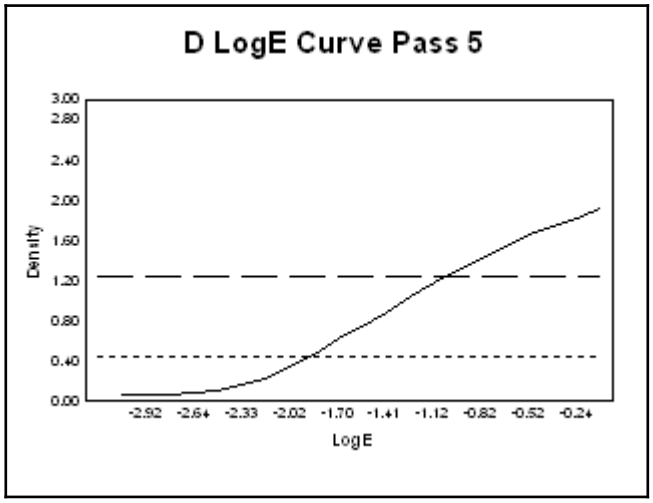
PDS Tail Measurements

File	Step	NumPts	AvgPDS	StdDev	Density
TAIL00.IMG	1.00	1681	88	16.63	0.06
TAIL01.IMG	2.00	1681	94	16.11	0.06
TAIL02.IMG	3.00	1681	101	17.17	0.07
TAIL03.IMG	4.00	1681	117	17.64	0.08
TAIL04.IMG	5.00	1681	146	19.26	0.11
TAIL05.IMG	6.00	1681	205	22.96	0.16
TAIL06.IMG	7.00	1681	285	24.25	0.23
TAIL07.IMG	8.00	1681	405	27.80	0.34
TAIL08.IMG	9.00	1681	544	30.60	0.46
TAIL09.IMG	10.00	1681	700	33.51	0.60
TAIL10.IMG	11.00	1681	844	35.83	0.74
TAIL11.IMG	12.00	1681	988	37.24	0.87
TAIL12.IMG	13.00	1681	1141	39.86	1.02
TAIL13.IMG	14.00	1681	1284	41.29	1.16
TAIL14.IMG	15.00	1681	1421	41.39	1.29
TAIL15.IMG	16.00	1681	1547	45.56	1.41
TAIL16.IMG	17.00	1681	1664	46.78	1.53
TAIL17.IMG	18.00	1681	1773	53.47	1.64
TAIL18.IMG	19.00	1681	1868	49.44	1.74
TAIL19.IMG	20.00	1681	1945	48.94	1.81
TAIL20.IMG	21.00	1681	2028	47.06	1.90
TAIL21.IMG	B+F	1681	95	15.92	0.06

Part VI: D log E Plot

Step	LogE	Head Density	Tail Density	Mean Density
1.00	-3.07	0.05	0.06	0.06
2.00	-2.92	0.06	0.06	0.06
3.00	-2.78	0.06	0.07	0.06
4.00	-2.64	0.07	0.08	0.08
5.00	-2.48	0.10	0.11	0.10
6.00	-2.33	0.15	0.16	0.15
7.00	-2.17	0.22	0.23	0.23
8.00	-2.02	0.34	0.34	0.34
9.00	-1.86	0.47	0.46	0.47
10.00	-1.70	0.63	0.60	0.62
11.00	-1.56	0.76	0.74	0.75
12.00	-1.41	0.91	0.87	0.89
13.00	-1.26	1.05	1.02	1.03
14.00	-1.12	1.19	1.16	1.17
15.00	-0.96	1.33	1.29	1.31
16.00	-0.82	1.45	1.41	1.43
17.00	-0.67	1.56	1.53	1.55
18.00	-0.52	1.67	1.64	1.66
19.00	-0.38	1.77	1.74	1.75
20.00	-0.24	1.85	1.81	1.83
21.00	-0.10	1.93	1.90	1.92
B+F		0.06	0.06	0.06



Part VII: Average Density of Bar and Space & Effective Modulation K2

Frame	Pass	Black				White				*Delta*= (LogE $_{Black}$ -LogE $_{White}$)	C=10^{Delta} Contrast	K2= $\frac{C-1}{C+1}$ K2
		Samples	Density	StdDev	LogE	Samples	Density	StdDev	LogE			
98	1	252	1.17	0.04	-1.38	252	0.37	0.03	-2.24	0.86	7.30	0.76
118	2	252	1.24	0.04	-1.30	252	0.43	0.03	-2.16	0.86	7.21	0.76
137	3	252	1.23	0.04	-1.31	252	0.43	0.03	-2.16	0.85	7.02	0.75
154	4	252	1.25	0.04	-1.29	252	0.45	0.03	-2.14	0.85	7.08	0.75
169	5	252	1.24	0.04	-1.30	252	0.45	0.03	-2.14	0.84	6.99	0.75