	Rapid II Summary	Units	Astrium Flexbus*	Ball Aerospace BCP 600	Ball Aerospace BCP 2000	Lockheed Martin LM 900	Orbital LeoStar-2*	Orbital MicroStar	Orbital MidStar	Orbital MiniStar	Orbital PicoStar	Orbital StarBus
Compatibilty	**Payload Power (OAV) (EOL)**	**W (EOL)**		125 W with solar array normal to sun except for 15 min/day	730 W with S/C yaw steering of solar array	344, 35% Duty Cycle (based on reference mission)		50	327.4	25	10	550
	Payload Mass Limit of Bus	**kg**		90	380	470		68	780.1	25	20	200
	Bus Dry mass (w/o Payload)	**kg**		203	608	492		58.6	580	100	52.7	566.3
	Science Data Downlink capacity	**kbps**		17,000 (two channels)	320000	Mission Specific		2000	1024	115.2	2 to 100	1000
	Science Data Storage capability	**Mbit**		2000	134000	Mission Specific		3	2000	32	3.9	n/a
	Pointing Knowledge	**arcsec**		12 (3); 16 for yaw	3 (3)	10		2880	10	540	3600	390
	Pointing Control	**arcsec**		13 (3); 17 for yaw	5 (3)	12		2160	10	720	3600	900
	Pointing Stability (Jitter)	**arcsec/sec**		< 4.2 (3)	0.045	0.8		36	0.055	N/A	720	3.6
	Slewrate	**deg/min**		~ 60	~ 240	n/a		60	6	N/A	(mission dependent)	15
	Mission Design Life	**yrs**		6	5	6		3	3	5	1	10
	Compatible LVs	**(names)**		Pegasus XL, Taurus Multiple Manifest	Titan II, Delta II, Athena 2, Taurus, COSMOS SL-8, Long March D	Athena II, Taurus, Delta II		Pegasus, Taurus	Delta II	Pegasus, Taurus	Shuttle, Delta, Pegasus,Taurus, Ariane	Delta II,Ariane
	Nominal Orbit			600 km 60° inclination	600 km 60° inclination	680 km, 90.5° sun synch		580 km 97.75 deg	768 km 25 deg	685 km; 98.13 deg sun synch	370 km 51.7 deg	GEO
	Types of Orbits availible			450 to 900 km; 0 deg to sun sync inclinations	450 to 900 km; 0 deg to sun sync inclinations	LEO from 28.5 to 90.5 deg, up to 80 km		LEO All Inclinations 580-1000km	All LEO Orbits	500 to 1000 km; all inclinations	LEO from 28.5 to 51.6 deg up to 900 km	GEO
	External Volume availible for Payload			111 cm dia tapering to 70 cm dia at height of 101 cm	1m dia x 1.5 m h	2200mm x 1270mm		1.5 m dia x 1m h	2.75 m dia x 4.4 m h	Taurus APC 75D x 20H Pegasus 76D x 90H (dimensions in cm)	n/a	1 m x 1.8 m x 1.2 m (l x w x h)
	Internal Volume Availible for Payload			71 cm x 71 cm x 55 cm high	0.91 cm x 120 cm x 101 cm high	780mm x 1010mm in central cylinder. Some volume available in equipment bay		Special (additional payload rings added as needed)	n/a	25 cm square on +/- Z sides of payload panel	0.35 m x 0.19 m footprint, 0.18 m high	Two 1.4 m^2 side panels plus one 1.8 m^2 nadir panel
Description	**ACS**	**type**		3 axis, Zero-net Momentum	3 axis stabilized	Zero Momentum, 3 axis stablilized		3 Axis Zero Momentum	3 Axis Zero Momentum	spinner	spinner	3 Axis Pitch Bias nadir oriented
	GPS	**# recievers**		0	2	2		1	0	0	0	0
	Batteries	**type/Ah**		NiH2 CPV / 20 Ah	NiH2 CPV / 40 Ah	NiH2 / 50 Ah		NiH2/10 Ah	NiCd/80 Ah	NiCd / 8 Ah	NiCd/4 Ah	NiH2/104 Ah
	Arrays	**cell type/Area**		GaAs/Ge dual junction / 2.35 m2	GaInP2/GeAs/Ge triple junction / 7.26 m2	GaAs / 2.31 m^2		Single Junction GaAs 1.57m^2	Single Junction GaAs 7.73m^2	Silicon / 0.71 m^2	Single Junction GaAS 0.39m^2	Silicon 13.1m^2
	Nominal Voltage	**V**		28	28	28		14, 5, 28	28	28	28	35/28 (sun/eclipse)
	C&DH Bus Architecture	**description**		HLDC, LLDC, 1553, serial digital	HLDC, LLDC, 1553, serial digital	1553		RS-422 Distributed	1553	RS-422	RS-422 Central	1553 Distributed
	Downlink Formats			CCSDS STDN	CCSDS STDN	STDN		STDN,CCSDS	CCSDS,DSN,TDRSS,STDN,LEO-T	NRZ-S	STDN, DSN	STDN,DSN
	Downlink Band			S-band	S-band and X-band	S-Band		S-band	S-band	S-band	S-band	S-band
	Structure	**description**		Rectangular; graphite facesheets bonded to Al honeycomb core	Rectangular; aluminium honeycomb	Al Honeycomb hexagon		AlBeMet/Al Honeycomb Dual Faced Cyl	Al Honeycomb Trapezoidal	Al and Al Honeycomb Octagon	Al Honeycomb Composite Hexagon	Al/Composite Rectangular
	Propulsion	**type**		none	Monopropellent, Blowdown N2H4	N2H4 blowdown		none	none	none	none	Monopropellant Blowdown EHTs/REA
	Propellant Capacity	**kg**		none	33	38.4		none	none	none	none	254
	Max delta V	**m/s**		none	72			none	none	none	none	800
Programmatic	**heritage mission(s)**	**name(s)**		GEOSAT Follow-On	QuikSCAT	CRSS		BATSAT, ORBCOMM	FUSE	ACRIMSAT	MightySat 1	IndoStar
	nominal schedule	**mths**		32	24	36		22	27	24	19	30
	Contract Options	**1**		Battery By-Pass	Battery By-Pass			Custom Structal Ring Configartion for Flexible P/L Acc.	Add SSR (128Mb) and X-band XMTs (Up to 400 Mbps)	Mission Operations for 2 years	ELV Launch Modifications	Change to 3 Axis Zero Momentum System
		2		Monopropellent, Blowdown N2H4 Propellant System	Larger Propellant Tank			Increase Power Up To 270W	Add GPS Receivers	Deletion of SDMS	Mission Operations	Add R6000 P/L Computer
		3						Add 1553/1773 P/L Data Interface	Add Propulsion System			Change to X-band XTM (50Mps)
		4						Enchanced Data Storage 256Mb	Enchanched Structure For Large P/L			Higher Power Array(2000w) and Batteries(52Ah)
		5						Reduced Pointing Accuracy	Operations for 3 years			Add 32 Gbit SSR P/L Data Unit
		6						Add Propulsion Module				
		7						Operations for 2 years				
		8										

*** TO BE PROVIDED**

	Rapid II Summary	Units	Spectrum Astro SA-200B	Spectrum Astro SA-200HP	Spectrum Astro SA-200S	Surrey MicroSat-70	Surrey Minisat-400	Surrey SNAP	SWALES EO-SB	TRW T100	TRW T200A	TRW T200B	TRW T310*
Compatibilty	Payload Power (OAV) (EOL)	W (EOL)	86	650	66	1.5 - 18	100	2.5	256	25	94	175	
	Payload Mass Limit of Bus	kg	40 ref, 100 Max	666	200	23.8	200	3	150 + 86	36	75	95	
	Bus Dry mass (w/o Payload)	kg	90	354	129	44.7	206.7	6.5	332	184.1	242.4	278	
	Science Data Downlink capacity	kbps	2500	80,000 (X-band) 2500 (backup)	2500	2048	2048	38.4 + 76.8	up to 4000	200	1400	2048	
	Science Data Storage capability	Mbit	2048	100,000	2048	2048	3072	24	1800	16.7	2000	2000	
	Pointing Knowledge	arcsec	317	0.5	2.8	1800	72	3600	36	694	360 - R/P, 324 - Y	6 - R, 2 - P/Y	
	Pointing Control	arcsec	360	16	32	1800	360	< 18,000	30	833 - R/P, 2777 Y	1080 - R/P, 1440 - Y	72	
	Pointing Stability (Jitter)	arcsec/sec	360 (18)	0.1	0.1	20	20	18	0.3	unknown	18 arcsecs per 0.1sec above 3 Hz	Roll 3.6 arcsec/sec; Pitch/Yaw 7.2 arcsec/sec	
	Slewrate	deg/min	240	120	390	300	300	12	15 - 60	300	120	20	
	Mission Design Life	yrs	1 @ .76	4	2	3 @ .85	1	1 @ .8	1.5 @ .88	3	4	3	
	Compatible LVs	(names)	Minotaur, Pegasus, Taurus, Athena, Delta, Titan-II, Atlas	Taurus, Athena I, Athena II, Delta II series, Titan II, Atlas	Pegasus XL, Taurus, Athena, Delta, Titan II, Atlas	Cosmos-3M,Ariane-4, Delta, Athena, OSP Minataur, Taurus, Zenit, Dnepr, Tsyklon		Cosmos-3M, Ariane-4, Athena, Cyclone, Delta II, Delta III, EELV, Zenit, Dnepr	Delta	Standard Pegasus	Athena 1	Athena 1, Athena 2, Taurus, Delta 7320	
	Nominal Orbit		55 km, 28.5 deg	600 km circular at 28.5 deg	425 km 97.1 deg Sun Synch	700 km, sun synch	650km, 65deg	700 km, 98 deg	400-900km, 98.8 deg	750 Circular Sun Sync.	600 circular	600 +/- 50 km circular sun sinc.	
	Types of Orbits availible		All sun synch, all LEOs @ modified PL duty cycle	LEO circular (nominal); many other orbits available	Sun-Synchronous (twilight); other available	400-1400km, all inclinations	400-1400km, all inclinations	400-1400km, all inclinations	0-99 deg inclinations	N/A	Any LEO 250 to 1000 km, any inclination	Any LEO (250 to 1000 km) any inclination	
	External Volume availible for Payload		.71 x .38 x 1.20 m	2.06 m wide x 1.12 m deep x 2.40 m tall (Taurus XL)	1.12 m wide x 0.95 m deep x 1.25 m tall (baseline Pegasus XL fairing)	.3 x .3 x .2	250mm x 1000mm diameter	Mission Dependent	1.000 x .75 x 1.50 m	6.114 cubic feet on the top of the spacecraft structure	80" diameter to LV fairing, 12.7 ft^3	11.81 sq.ft x 80.9 in	
	Internal Volume Availible for Payload		Slots for up to 7 6U VME cards	100 cm dia x 75 cm tall	Slots available for up to four (4) 6U VME Cards	.11 x .28 x .28 m Earth observation compartment and .078 x .35 x .35 for 3 payload module trays	8bays, 0.18m², 0.03m ², 6x 0.01m²	3 module boxes, central bay	280 x 232 x 180	N/A	N/A	3 bays, 2.43 sq.ft.each	
Description	ACS	type	3-Axis zero momentum bias, wheels, mag tqs	3-Axis zero momentum bias/thruster-based management	3-Axis zero momentum bias/magnetic management	3 axis zero bias, 3 wheels, mag tqs	3-axis /ZM	3-axis momentum bias, 1 wheel, mag tqs	3-axis zero momentum bias, 3 wheels, mag tqs	Pitch-momentum bias	Pitch momentum biased three axis control	Zero Momentum, 3-axis control, stellar inertial	
	GPS	# recievers	Option #3	0	1	1	12 channel, 2 antennas	1	1	0	1 (internally redundant)	2 (1 redundant)	
	Batteries	type/Ah	NiCd / 4 Ah (3)	Two NiH_2/50 Ah each	One NiH_2/15 Ah	NiCd / 7 Ah	NiCd/20 Ah	NiCd / 1.4 Ah	NiCd / 50 Ah	NiCad / 9	Super NiCad / 21	Nickel-Hydrogen / 23	
	Arrays	cell type/Area	Si, 2.54 m^2	Triple Junction $GaInP_2$/GaAs/Ge 10.32 m^2	Dual Junction $GaInP_2$/GaAs/Ge 1.62 m^2	Ga As, 0.7 m^2	Single Junction GaAs, .5m^2	Ga As, 0.16 m^2	Hi ETA Si, 1860 & Ga As, 5.25 m^2	5796 N-on-P Silicon Cells / 3.75 sq. m.	Silicon 1710 x 2 / 2 wings -Total area = 5.71 meters	Silicon / 7.06 Sq.meters	
	Nominal Voltage	V	28	28	28	5V regulated and 14V unregulated	28	8	28	28	28	28	
	C&DH Bus Architecture	description	RS422, 1553	VME-based 32-bit RISC processor	VME-based 32-bit RISC processor	RS232, RS422, RS485	RS422/485 and CAN	CAN, RS232, RS422	1773 / RS422	80C86 bus Central Processor	1553 and a 80C86 bus, Central Processor	1553 and a 80C86 bus, Central Processor	
	Downlink Formats		CCSDS	CCSDS: STDN/DSN	CCSDS: STDN/DSN	CCSDS	CCSDS	Custom	CCSDS-701	STDN	NASA/STDN & ESA	GSTDN / DSN	
	Downlink Band		S-Band	X-band and S-Band	S-Band	S-Band	S-band	S-Band	S-Band	S-band	S-band	S-band	
	Structure	description	Rectangular. Al Honeycomb	Octagonal, Al space frame construction with honeycomb	Al half-frames forming a honeycomb configuration	Rectangular. Al honeycb stacked trays.	Al Honeycomb Nine sided prism	3 side prism. Al + Al/Al honeycomb	Hexagon, Milled Al	Hexagon / Aluminium	Hexagon/ aluminum	Hexagonal Composite vertical and Aluminum horizontal panels	
	Propulsion	type	None	Blowdown hydrazine system	Blowdown hydrazine system	None	N2, 10 thrusters @ 0.1N	Liq. Butane, self press.	None	monopropellant hydrazine blowdown system	Monopropellant blowdown hydrazine system	Monopropellant blowdown hydrazine system	
	Propellant Capacity	kg	None	67 kg	21.3 kg	None	5.3	0.033	None	73	73	Nominal 45, max 80	
	Max delta V	m/s	None	131	192	None	15	3	None	548	352		
Programmatic	heritage mission(s)	name(s)	MightySat II.1	New Millennium Deep Space 1	MSTI-1, MSTI-2, MSTI-3	Tsinghua-1	UoSAT-12	SNAP-1	EO-1	TOMS-EP	ROCSAT	SSTI Lewis	
	nominal schedule	mths	37	36	36	19	18	12	37	18	21	24	
	Contract Options	1	Full redundancy	Full Redundancy	Deployed Gimbaled Arrays	None	Enhanced Power	Cameras & Machine Vision System	High data: 105 Mbps, 50Gb, Xband	Remove Propulsion	Fine Pointing	Increase PL Mass and Power	
		2	High data: 80 M down, 32 G storage	Deep Space Configuration	Full Redundancy		Resistojet propulsion sub system	UHF receiver	N2H4 60 m/s delta-V & RCS			GEO Modifications	
		3	GPS (1)	Electric Ion Propulsion	Full Redundancy & Deployed Gimbaled Arrays				Change 1773 bus to 1553				
		4	Ground segment integration support	Electric Ion Propulsion and Deep Space Configuration	High Rate Data								
		5		Grond Segment Integration Support	Ground Segment Integration Support								
		6		GPS and Magnetics									
		7											
		8											

*** TO BE PROVIDED**