

**UNITED STATES LAUNCH VEHICLE CAPABILITIES**

VEHICLE	# TO LEO	# TO GEO	GEO CIRCULAR	FIRST FLIGHT
ATLAS	200,000	150,000	20,000 (CELESTIAL)	1958
SHUTTLE	55,000	5,500 (US)		1981
SHUTTLE II	40,000	12,500	10,000 (CELESTIAL)	1989
TITAN 3	33,000	8,600	4,300 (US)	1959
ATLAS 5	14,000	5,200	3,500	1991
ATLAS 5	13,000			1959
DELTA 2	7,000	3,100	1,500 (PAM-D)	1968
DELTA 2	2,000			1969
DELTA 2	5,500			1985
SCOUT	475			1961

**LAUNCH VEHICLES OF EUROPE AND JAPAN**

VEHICLE	# TO LEO	# TO GEO	COUNTRY	FIRST FLIGHT
ARIANE 3	5,600		EUROPE	1984
ARIANE 4	9,500		EUROPE	1988
ARIANE 5	46,000	14,900	EUROPE	1996
HL-1	2,500		JAPAN	1986
HL-2	2,500		JAPAN	1992

**ABUNDANT NEAR-EARTH EXTRATERRESTRIAL RESOURCES**

RESOURCE	MOON	PHOENIX/DEIMOS	ASTEROIDS	COMETS	ELEMENT
Al	X	X	X	X	ALUMINUM
Ca	X	X	X	X	CARBON
Fe	X	X	X	X	IRON
He	X	X	X	X	HELIUM-3
Ni	X	X	X	X	NICKEL
O	X	X	X	X	OXYGEN
S	X	X	X	X	SULFUR
Ti	X	X	X	X	TITANIUM
Zn	X	X	X	X	ZINC

**LEO ET RESOURCE BASE**

RESOURCE	LIST NAME	ELEMENT
Al	56,490	ALUMINUM
Ca	2,760	CARBON
Fe	188	IRON
Cu	3,450	COPPER
Co	415	COBALT
Cr	466	CHROMIUM
Mg	268	MAGNESIUM
Ni	250	NICKEL
O	1,725	OXYGEN
Sr	600	STRONTIUM
Zn	220	ZINC
HEO	173	ZINC

**SOVIET AND CHINESE LAUNCH VEHICLES**

VEHICLE	# TO LEO	# TO GEO
ENERGIA	220,000	
SL-12	43,000	(PROTON)
SL-13	33,000	(PROTON)
SL-4	16,500	
SL-3	13,900	
SL-11	12,100	
SL-10	8,000	
SL-6	4,600	
SL-9	3,800	
LONG MARCH 3	5,500	
LONG MARCH 4	8,800	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-22	12,100	
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-23	12,100	
SL-22	12,100	
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-24	12,100	
SL-23	12,100	
SL-22	12,100	
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-25	12,100	
SL-24	12,100	
SL-23	12,100	
SL-22	12,100	
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	
SL-11	12,100	
SL-10	8,000	
SL-9	3,800	
SL-8	2,500	
SL-7	2,000	
SL-6	1,500	
SL-5	1,000	
SL-4	500	
SL-3	250	
SL-2	125	
SL-1	62.5	

**SOVIET AND CHINESE LAUNCH VEHICLES (CONTINUED)**

VEHICLE	# TO LEO	# TO GEO
SL-26	12,100	
SL-25	12,100	
SL-24	12,100	
SL-23	12,100	
SL-22	12,100	
SL-21	12,100	
SL-20	12,100	
SL-19	12,100	
SL-18	12,100	
SL-17	12,100	
SL-16	12,100	
SL-15	12,100	
SL-14	12,100	
SL-13	33,000	
SL-12	43,000	