INTEGRATED SPACE PLAN (Preliminary)

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Rockwell International
Space Transportation Systems Division

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UNITED STATES LAUNCH VEHICLE CAPABILITES

VEHICLE	# TO LEO	# TO GEO	GEO-CIRCULAR	FIRST FLIGHT
ALS	200,000			1998
SHUTTLE C	150,000		20,000 (CENTAUR)	1994
SPACE SHUTTLE	55,000		5,500 (IUS) 6,500 (TOS)	1981
TITAN 4	40,000	12,500	10,000 (CENTAUR)	1989
TITAN 3	33,000	8,600	4,200 (IUS)	1965
ATLAS 2	14,400	5,200	2,500	1991
ATLAS 1	12,300			1959
DELTA 2	11,100	3,190	1,350 (PAM-D)	1988
DELTA	7,800			1960
TITAN 2	5,500			1965
SCOUT	475			1961

LAUNCH VEHICLES OF EUROPE AND JAPAN

VEHICLE	# TO LEO	# TO GEO	COUNTRY	FIRST FLIGHT
ARIANE 3		5,690	EUROPE	1984
ARIANE 4		9,260	EUROPE	1988
ARIANE 5	46,000	14,960	EUROPE	1996
H-1		2,300	JAPAN	1986
H-2		9,000	JAPAN	1992

ABUNDANT NEAR-EARTH EXTRATERRESTRIAL RESOURCES

RESOURCE	MOON	PHOBOS/ DEIMOS	ASTEROIDS*	COMETS	ELEMENT NAME
Al	X				ALUMINUM
C		X	C	X	CARBON
Ca	X				CALCIUM
Fe	X		M		IRON
H		X	C	X	HYDROGEN
He3	X				HELIUM 3
Mg	X				MAGNESIUM
N		X	C	X	NITROGEN
Ni	X		M		NICKEL
O		X	C	X	OXYGEN
Si	X				SILICON
Ti					TITANIUM
H2O	?	X	C	X	WATER

* METALLIC=M CARBONACEOUS=C

LEO ET RESOURCE BASE

RESOURCE	LBS/TANK	ELEMENT NAME
Al	56,490	
C	2,760	
Cr	188	CHROMIUM
Cu	3,450	COPPER
Fe	415	
H	466	
Mg	268	
N	246	
Ni	200	
O	1,725	
Si	690	
Ti	220	
Zn	173	ZINC

SOVIET AND CHINESE LAUNCH VEHICLES

VEHICLE	# TO LEO	# TO GEO
ENERGIA	220,000	
SHUTTLE	66,000	
SL-13	43,000	(PROTON)
SL-12	43,000	(PROTON)
SL-16	33,000	
SL-4	16,500	
SL-3	13,900	
SL-14	12,100	
SL-11	8,800	
SL-6	4,600	
SL-8	3,800	
LONG MARCH 3		5,500
LONG MARCH 4		8,800

ABOUT THIS DIAGRAM:

The Rockwell Integrated Space Plan (ISP) is a very long range systematic perspective of America's and the Western World's space program. Its 100-plus-year vision was created from the integration of numerous NASA long-range studies including the project Pathfinder case studies, recommendations from the National Commission on Space's report to the President, the Ride report to the NASA Administrator, and the new National Space Policy Directive. Special initiatives such as the four Pathfinder scenarios or those described in the Ride Report (i.e., Mission To Planet Earth, Exploration of the Solar System, Outpost on the Moon, and Humans to Mars) are integral parts of the ISP. These initiatives as well as the agenda described in the National Commision on Space report, are shown by shading the appropriate boxes involved. These shaded versions are included separately as attachments to the ISP. The ISP is not meant to be a definitive plan for the development of space, but rather a compilation of evolutionary opportunities for our near-term and long-range space activities.

The ISP can be read from top to bottom or left to right. From top to bottom, vertical column elements are phased in chronologically to support centerline milestones. Reading across the columns from left to right will yield the total scope of required activity within a given time period in support of the total "integrated" plan. The centerline of the ISP is the critical path defined by National Space Policy which closely resembles the NASA Office of Exploration case study 4 scenario — Lunar Outpost To Early Mars Evolution. The Space Shuttle and Space Station are essential initial elements; their value increases through the 1990's as infrastructure evolves. Arrowed lines between boxes depict evolutionary, supporting, or synergistic relationships. Double-arrowed lines between boxes are communication / data links. Bold lines are trunk lines with numerous (2 or more) branches stemming from along their length. Boxes with bold outlines are either long-range (centerline) objectives or key "enabling programs" important because their development affects the development of many other programs. Boxes with double lines are in-space transportation nodes. The ISP is chronologically portrayed in five year time intervals because this is a practical segment of time for planning and implementation of program objectives. Obviously, the dates shown have an uncertainty which increases with time, but the chronology is intended to be consistent. Finally, the large bubbles represent the synergistic summation of the individual elements of that period. They are the highest level groups of goals: plateaus of human achievement attainable through a comprehensive execution of the depicted ISP elements.

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LEGEND

- ISP Program Element
- Key Enabling Program (not on the critical path)
- In-space Transportation Node
- Plateaus or eras of human and technical achievement
- Supporting, evolutionary or synergistic interrelationship
- Communication or data links
- Trunk line (two or more branches)
- Critical Path / Timeline

DEFINITIONS, ABBREVIATIONS AND ACRONYMS

Ad Astra	To the Stars (Latin)
ALS	Advanced Launch System
AMROC	American Rocket Company
ATV	All Terrain Vehicle
AU	Astronomical Unit- 1 AU = 93,000,000 miles
AXAF	Advanced X-ray Astrophysics Facility
CDSF	Commercially Developed Space Facility
CELSS	Controlled Ecological Life Support System
Cislunar	The space between the Earth and Moon
CIT	Circumstellar Imaging Telescope
COMM	Communications
COMSAT	Communication Satellite
CRAF	Comet Rendezvous / Asteroid Flyby
DOD	Department of Defense
ECLSS	Environmental Control and Life Support System
ECO	Ecological
ECV	Electric Cargo Vehicle (OEXP)
EDO	Extended Duration Orbiter
ELV	Expendable Launch Vehicle
EMU	Extravehicular Mobility Units
ERT	Earth Resources Technology
ESA	European Space Agency
ET	External Tank
ET/ACC	External Tank / Aft Cargo Carrier
ETO	Earth-To-Orbit
FTS	Flight Telerobotic Servicer
G	Gravity
Gaia	Earth's self-sustaining biosphere
GEO	Geosynchronous-Earth-Orbit
GPS	Global Positioning Satellite
GRO	Gamma Ray Observatory
HEDM	High Energy-Density Matter
HEO	High-Earth-Orbit
HLC	Heavy Lift Capability
HLV	Heavy Lift Vehicle
HOTOL	Horizontal Take-off and Landing
IDV	Interlibrational Derived Vehicle
ILV	Industrial Launch Vehicle
In-situ	In place (Latin)
IUS	Inertial Upper Stage
IUV	Interlibrational Utility Vehicle
L1	Lagrange Point # 1 35,000 Miles Above Moon
L2	Lagrange Point # 2 40,000 Miles Behind Moon
L4	Lagrange Point # 4 240,000 Mile Earth Orbit
L5	Lagrange Point # 5 240,000 Mile Earth Orbit
LBS	Pounds
LCL	Lunar Cargo Lander (OEXP)
LDF	Large Deployable Reflector
LEO	Low-Earth-Orbit
LLO	Low-Lunar-Orbit
LLOX	Lunar Liquid Oxygen
LOFT	Launch Operations Flight Test
LOSF	Lunar Orbit Staging Facility
LOX	Liquid Oxygen
LPL	Lunar Personnel Lander (OEXP)
LPT	Lunar Propellant Tanker (OEXP)
LPV	Lunar Piloted Vehicle (OEXP)
LRB	Liquid Rocket Booster
MCSV	Mars Crew Sortie Vehicle (OEXP)
MDRE	Mass Driver Reaction Engine
Mir	Peace (Russian)
MLL	Mars Logistics Lander (OEXP)
MLV	Medium Lift Vehicle
MMU	Manned Maneuvering Unit
MMW	Multi-mega Watt
MOMV	Manned Orbital Maneuvering Vehicle
MOTV	Manned Orbital Transfer Vehicle
MPE	Mission To Planet Earth
MPR	Mars Pressurized Rover
MPV	Mars Piloted Vehicle (OEXP)
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NASP	National Aerospace Plane
NDV	NASP Derived Vehicle
NSTS	National Space Transportation System
OEXP	NASA Office of Exploration
OMV	Orbital Maneuvering Vehicle
OSC	Orbital Sciences Corporation
OTV	Orbital Transfer Vehicle
OV	Orbiter Vehicle
PAM	Payload Assist Module
POTV	Personnel Orbit Transfer Vehicle
PTV	Passenger Transport Vehicle
RECON	Reconnaissance
RMS	Remote Manipulator System
SAT	Satellite
SDI	Strategic Defense Initiative
SDV	Shuttle Derived Vehicle
SETI	Search for Extraterrestrial Intelligence
SIRTF	Space Infrared Telescope Facility
Skyhook	Surface to space "elevator" transportation system
SL	Space Launch
SLC	Space Launch Complex
SPS	Solar Power Satellite
SRB	Solid Rocket Booster
SSI	Space Services Incorporated
SSPS	Satellite Solar Power Station
SSTO	Single-Stage-To-Orbit
STV	Space Transfer Vehicle
TAU	Thousand Astronomical Unit
TBD	To Be Determined
TDRS	Tracking Data Relay Satellite
TOS	Transfer Orbit Stage
TSS	Tethered Satellite System
TSTO	Two-Stage-To-Orbit
US	United States
Vivarium	Plant and animal research laboratory
XFER	Transfer
XPORT	Transport

TEN BEST CANDIDATE STARS FOR INTERSTELLAR EXPLORATION

STAR	DISTANCE LIGHT-YEARS	VISUAL MAGNITUDE	LUMINOSITY (SUN=1.0)	SPECTRAL TYPE
Tau Ceti	11.8	3.5	.4	G8
82 Eridani	20.3	4.3	.7	G5
Zeta Tucanae	23.3	4.2	.9	G2
107 Piscium	24.3	5.2	.4	K1
Alpha Mensae	28.3	5.1	.6	G5
54 Piscium	34.0	5.9	.4	K0
Zeta 1 Reticuli	37.0	5.5	.7	G2
Zeta 2 Reticuli	37.0	5.2	.9	G2
Gliese 86	37.0	6.1	.4	K0
Gliese 67	38.0	5.0	1.2	G2

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