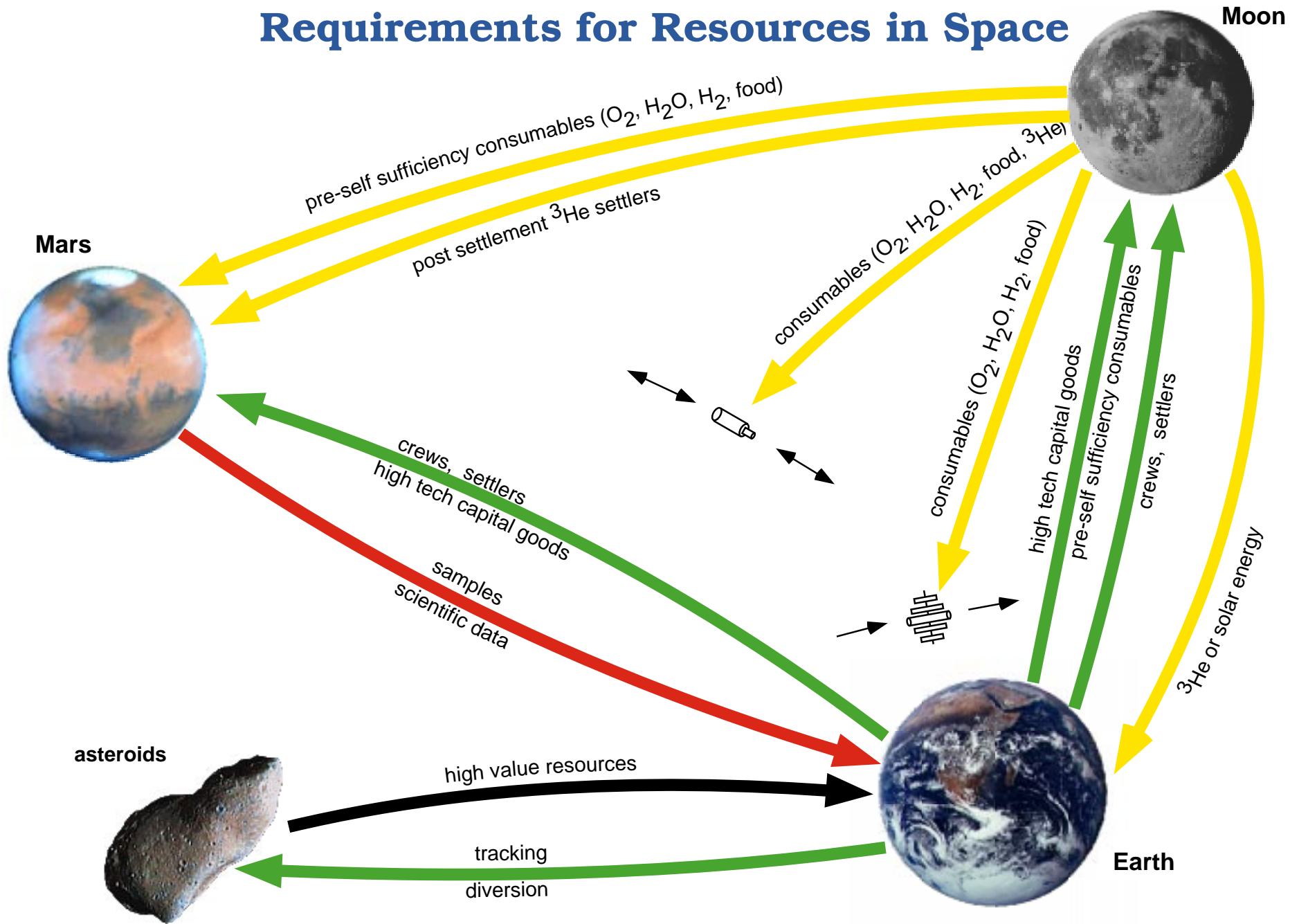
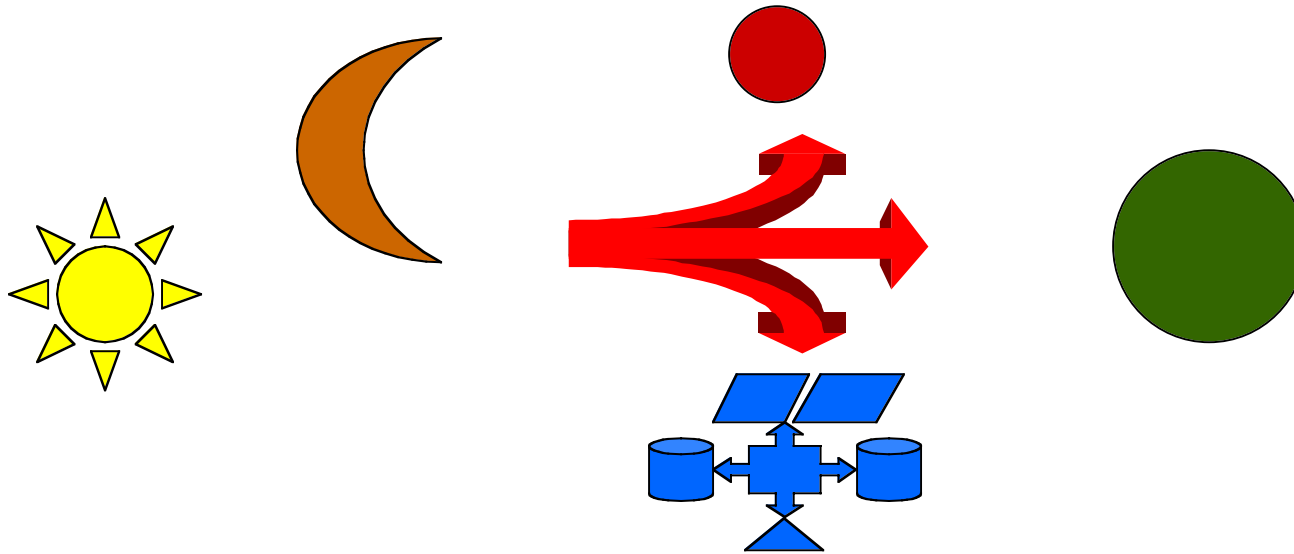


# Requirements for Resources in Space





# RESOURCE REQUIREMENTS

SPACE TO EARTH

SPACE TO SPACE

# SPACE RESOURCES

- **MATERIALS**
- **ENERGY**
- **REDUCED GRAVITY**
- **ADVENTURE**
- **STORAGE**

# SPACE RESOURCE APPLICATIONS

- **FOR EARTH**
  - **ECONOMIC/SOCIAL/ENVIRONMENTAL VALUE  
RELATIVE TO ALTERNATIVES**
- **IN SPACE**
  - **ECONOMIC VALUE RELATIVE TO ALTERNATIVES**
- **AT SPACE SETTLEMENT**
  - **ECONOMIC/TIMING/INDEPENDENCE VALUE  
RELATIVE TO ALTERNATIVES**

# ENABLING APPLICATIONS



- **RADIATION SHIELDING**
  - **MOON AND MARS**
- **INITIATION OF MARS SETTLEMENT**
  - **EARLY LUNAR CONSUMABLES**
  - **PROPULSION FUEL (?)**
- **PERMANENT SETTLEMENT**
  - **MOON AND MARS**

# SPACE RESOURCES

## OTHER RATIONALES FOR USE

- **IMPROVED ECONOMICS**
  - **CONSUMABLES**
- **PROFIT**
  - **ENERGY**
  - **CONSUMABLES**
  - **HIGH VALUE METALS**
- **BROADENED HUMAN PARTICIPATION**
  - **PROFIT**
  - **ADVENTURE**
  - **SPACE SETTLEMENT**

# ENERGY and ENVIRONMENT ON EARTH



- **POTENTIAL RESOURCES FROM SPACE**
  - **FUEL FOR FUSION ENERGY (?)**
  - **ENERGY FOR SOLAR POWER (?)**

# **SPACE RESOURCE APPLICATIONS: FOR EARTH**

- **ALSO SUGGESTED TO BE OF POTENTIAL VALUE RELATIVE TO ALTERNATIVES ON EARTH**
  - **TOURIST DESTINATIONS**
  - **WASTE DISPOSAL LOCATIONS**
  - **ASTEROID/COMET THREAT ELIMINATION**
  - **MEDICAL RESEARCH AND MANUFACTURING**
  - **MEDICAL THERAPY**
  - **SCIENCE**
  - **EDUCATION**

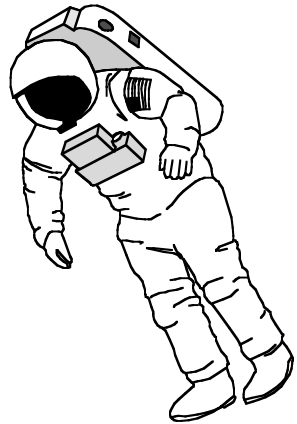


# **SPACE RESOURCE APPLICATIONS: IN SPACE**

- **SUGGESTED TO BE OF POTENTIAL VALUE RELATIVE TO IMPORT FROM EARTH**
  - **CONSUMABLES**
  - **PROPULSION**
  - **ENERGY**
  - **CONSTRUCTION/MANUFACTURING**

# **SPACE RESOURCE APPLICATIONS: AT SPACE SETTLEMENTS**

- **SUGGESTED TO BE OF POTENTIAL  
RELATIVE VALUE**
  - **CONSUMABLES**
  - **PROPULSION FUELS**
  - **IN SITU ENERGY**
  - **CONSTRUCTION/MANUFACTURING**
  - **INDEPENDENCE**



# COST REDUCTION OR PROFIT

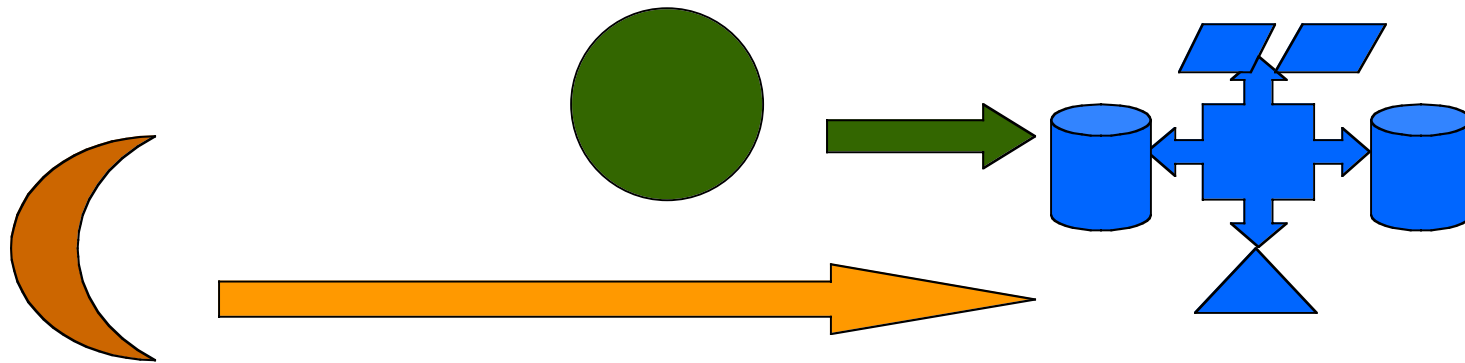


- **SPACE STATION CONSUMABLES**
  - $\text{H}_2\text{O}$ ,  $\text{O}_2$ ,  $\text{H}_2$ ,  $^4\text{He}$ , FOOD, MATERIALS
- **TRANS-MARS SPACECRAFT**
  - $\text{H}_2\text{O}$ ,  $\text{O}_2$ ,  $\text{H}_2$ ,  $^4\text{He}$ , FOOD, MATERIALS
  - $^3\text{He}$  FUSION FUEL
- **INTERPLANETARY SPACECRAFT**
  - $\text{H}_2\text{O}$ ,  $\text{O}_2$ ,  $\text{H}_2$ ,  $^4\text{He}$ , FOOD, MATERIALS
  - $^3\text{He}$  FUSION FUEL

# IMPORT NODES IN SPACE

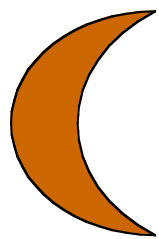
- **EARTH AND MOON SUPPLIED**
  - LOW EARTH ORBIT STATIONS
- **MOON SUPPLIED**
  - LUNAR SURFACE BASES/SETTLEMENTS
  - MARS SURFACE EXPLORATION
- **MOON AND MARS SUPPLIED**
  - MARS SURFACE BASES/SETTLEMENTS
- **MARS SUPPLIED**
  - MARS SETTLEMENTS/PROPULSION
- **MARS OR MOON SUPPLIED**
  - SOLAR SYSTEM SPACECRAFT
  - INTERSTELLAR SPACECRAFT

# IMPORT NODES IN SPACE



- **EARTH AND MOON RESOURCES**
  - SPACE STATIONS
  - TRANS-MARS SPACECRAFT

# IMPORT NODES IN SPACE



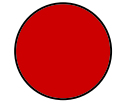
- **MOON SUPPLIED RESOURCES**
  - **LUNAR SURFACE BASES/SETTLEMENTS**
    - LIBRATION POINT STATIONS
    - LUNAR ORBIT STATIONS
    - MOON INITIATED CHEMICAL PROPULSION
  - **MARS SURFACE EXPLORATION**
  - **MARS SETTLEMENT START-UP**
  - **INTERPLANETARY SPACECRAFT**



# IMPORT NODES IN SPACE

- **MOON & MARS SUPPLIED RESOURCES**
  - **MARS SURFACE BASES**
    - **MARS ORBIT STATIONS**
  - **INTERPLANETARY EXPLORATION**
  - **INTERSTELLAR TRAVEL**

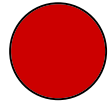
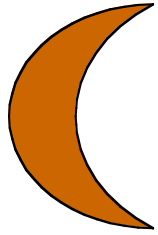
# IMPORT NODES IN SPACE



- **MARS SUPPLIED RESOURCES**
  - **MARS SURFACE SETTLEMENTS**
  - **MARS INITIATED CHEMICAL PROPULSION**



# IMPORT NODES IN SPACE



- **MOON OR MARS SUPPLIED RESOURCES**
  - SOLAR SYSTEM EXPLORATION
  - SOLAR SYSTEM CONVEYORS
  - OUTER PLANET ORBIT STATIONS
  - OUTER PLANET SURFACE BASES
  - **INTERSTELLAR** EXPLORATION