SPACE MINING using Nano-micro satellites

Discussion Group 3
MOTIVATION

• To live in space, to send colonies to explore the space, and to maintain space vehicle with its subsystems’, the main requirement is energy.

• For economic purposes the efficient way is to produce the energy/equipment needed at space instead of sending those equipment from Earth.

• Compared to the cost of having the resources in space rather than transporting from earth is much more feasible and cost efficient.
A Near-Earth Asteroid Census

Each image represents 100 objects

- Known Asteroids
- New Predicted Total (WISE)
- Old Predicted Total (pre-WISE)

- > 1000 m
- 500–1000 m
- 300–500 m
- 100–300 m
- < 100 m
THE SPACE ECONOMY: A MODERN DAY GOLD RUSH
Asteroid Mining Will Create A Trillion-Dollar Industry

As our population grows we need to find a sustainable supply of natural resources to fuel exploration in space and prosperity on Earth.

MORE ASTEROIDS DISCOVERED NEAR EARTH EVERYDAY
- 1,500 easier to reach than Moon
- 8,000 discovered to date
- NEARLY 1,000 found every year

NEAR-INFINITE SUPPLY OF PRECIOUS RESOURCES

PLATINUM-RICH ASTEROID
Could contain more Platinum Group Metals than what's been mined on Earth in all of history

USES OF PLATINUM GROUP METALS ON EARTH
- REDUCE COST OF ELECTRONICS
- ELECTRIFY TRANSPORTATION
- DRIVE INNOVATION, AND CREATE A GREENER EARTH

ONE SINGLE 500M PLATINUM-RICH ASTEROID
At current market prices, one ounce of platinum is valued over $1,500

WATER-RICH ASTEROID
One water-rich asteroid could produce enough fuel for every rocket launched in history.

USES OF WATER IN SPACE
- ROCKET FUEL
- BREATHABLE AIR
- DRINKABLE WATER

ONE SINGLE 500M WATER-RICH ASTEROID
It currently costs $20,000 to send a liter of water from Earth to Deep Space

ONE SINGLE 500M WATER-RICH ASTEROID
At current market prices, one ounce of water is valued over $1.5 trillion

Uses of Platinum Group Metals
- More than the yearly world output of platinum
- Worth $2.9 trillion
- 1.5 times more than the known world-reserves of PGMs

Asteroid mining will open a trillion-dollar industry and provide a near-infinite supply of Platinum Group Metals and water to support our growth both on this planet and off.
State of the ART

- HAYABUSHI, 2005, Japan
- ROSETTA, 2014, ESA
- Other planned projects, USA, others
SPACE MINING using Nano-micro satellites

• MAIN QUESTIONS TO DISCUSS

• What capabilities/technologies should they develop/have to space mining (power, onboard propulsion, adcs, thermal,...)

• How they can help space mining activities (can be primary or always secondary, e.g. just observation, just remote or onsite examination)