Beyond the International Space Station

European Astronauts' Vision for Future Space Exploration

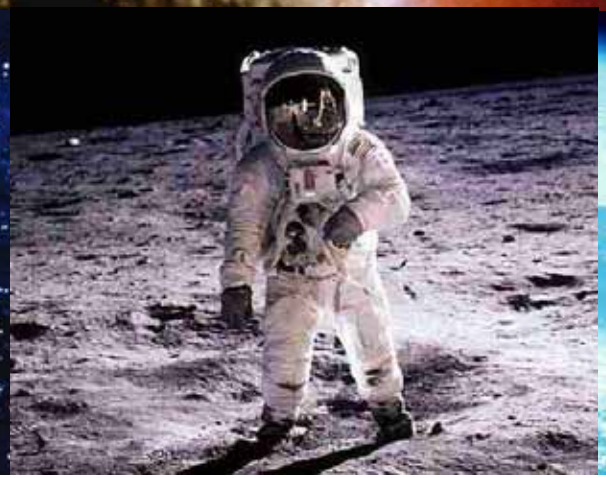
June 2008

Background to Vision

- Provide the basis and prerequisite for forming public opinion and political action
- Foster and direct European Exploration efforts

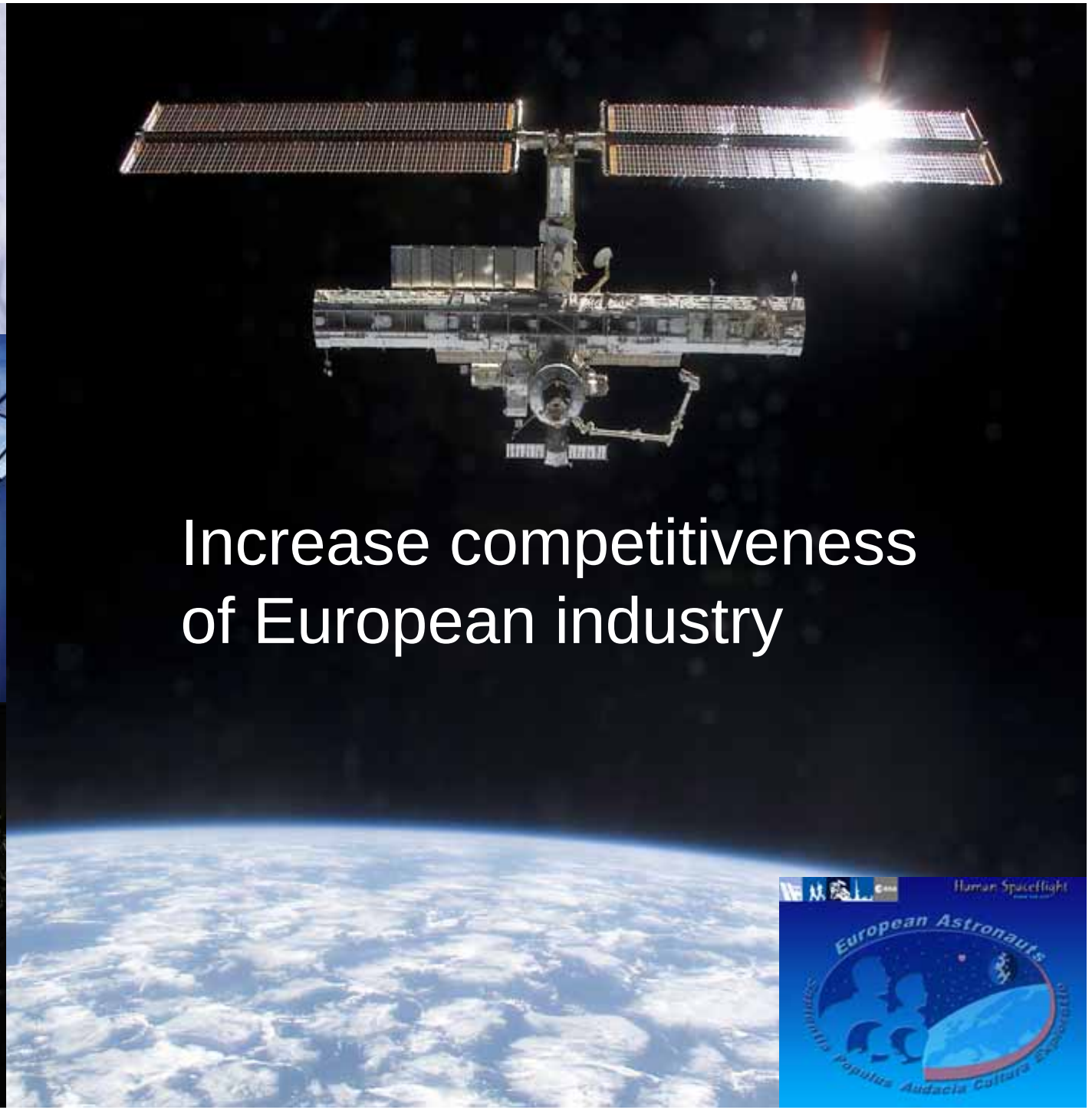
Why Europeans in Space?

Humans will continue to explore Space, with or without Europeans




European Astronauts
Scientia Populus Audacia Cultura Exploratio
Europeans to carry on our heritage
of exploration


European Astronauts
Reinforce the European Identity



Increase competitiveness of European industry

Inspire future European generations

Goals

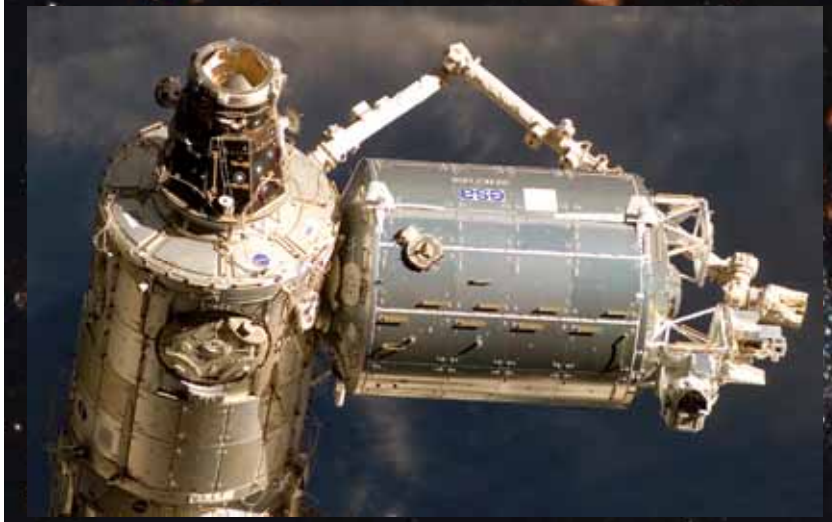
Europeans on Moon, and later on Mars

through acquiring

Independent Human Access to Space

Major Milestones

Feb 2008: Columbus



April 2008: ATV

- 2008 Decision to initiate ‘European Human Spacecraft Programme’
- 2009 Start development of European Crew Spacecraft
- 2016 First flight, to ISS
  Start development of Moon capacity
- 2021 End of ISS utilization
  First flight to the Moon
  Participate in building International Moon Base

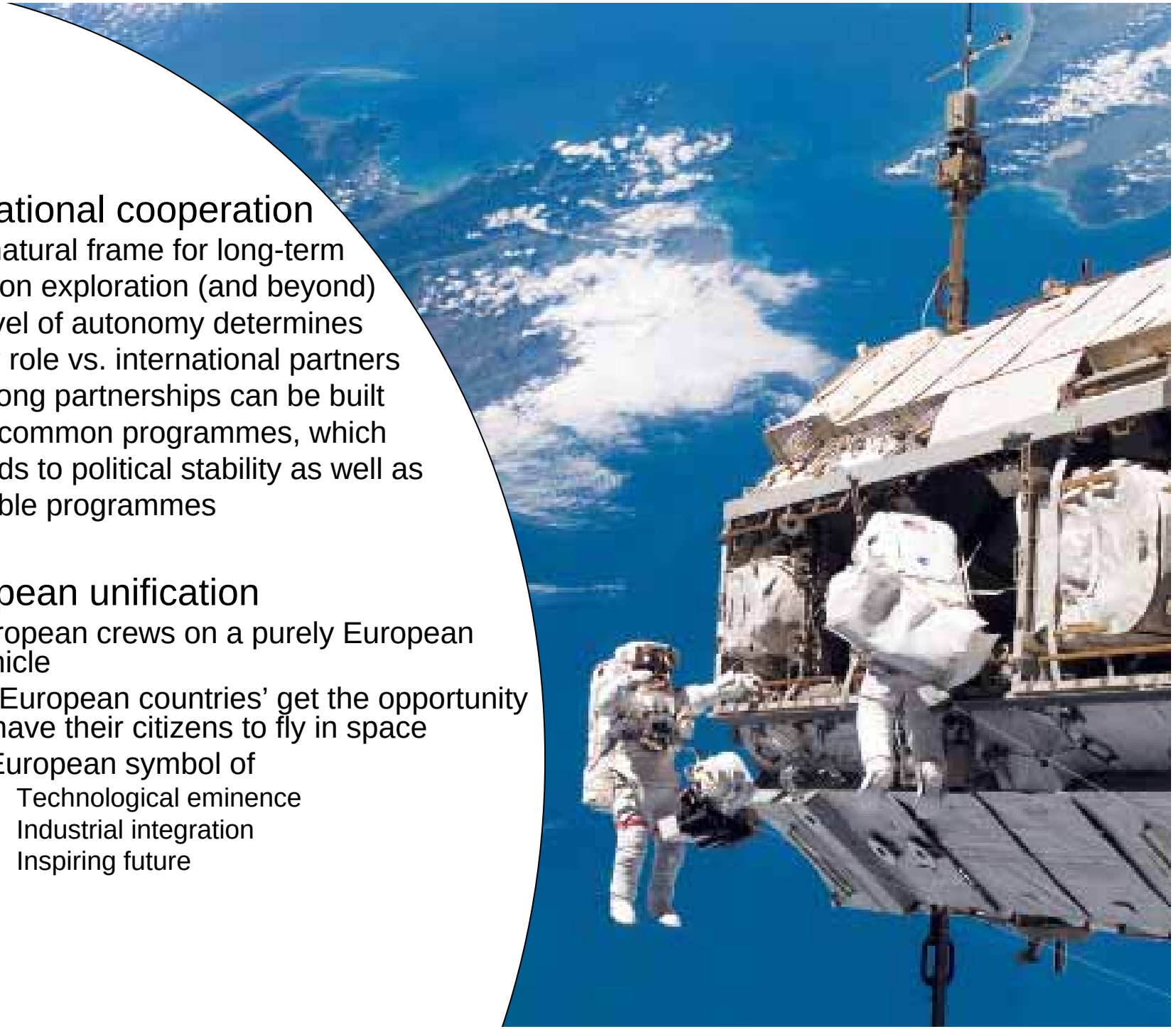
Key Factors

International cooperation

- A natural frame for long-term Moon exploration (and beyond)
- Level of autonomy determines our role vs. international partners
- Strong partnerships can be built by common programmes, which leads to political stability as well as stable programmes

European unification

- European crews on a purely European vehicle
- All European countries' get the opportunity to have their citizens to fly in space
- A European symbol of
  - Technological eminence
  - Industrial integration
  - Inspiring future



Technological development

- Inspire Universities and Engage Industry by new developments
- Build on existing elements where possible (Ariane V, ATV, Columbus) and experience (ARD,…)
- Utilize ISS to test key technologies

Operational knowledge

– With ISS Europe is acquiring considerable expertise in Human Spaceflight

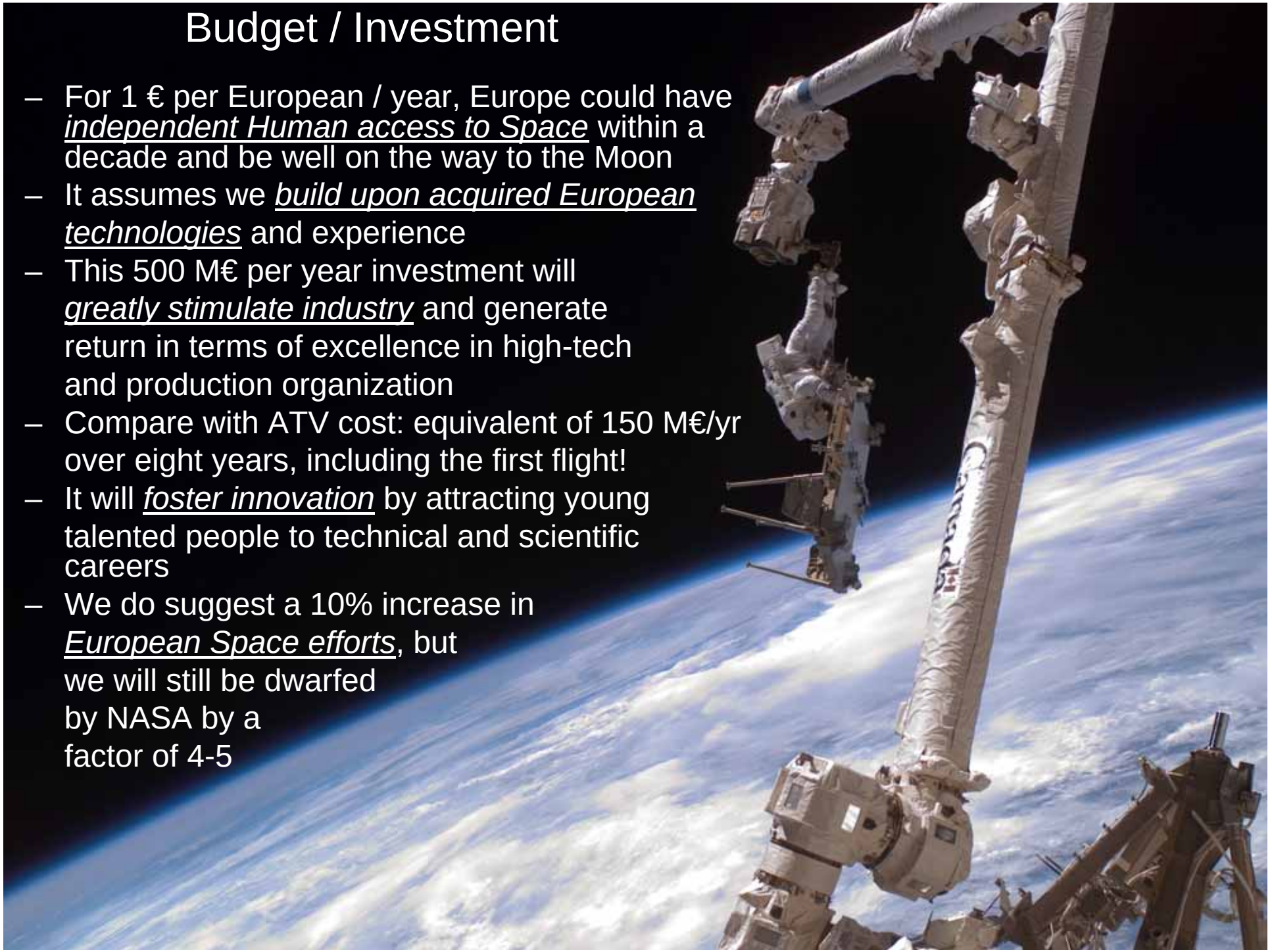
– Obtain frequent European astronaut presence on ISS, at least one flight per year

– Ultimately master end to end operations

– Extend the knowledge to the even more challenging tasks required by planetary missions

Budget / Investment

- For 1 € per European / year, Europe could have *independent Human access to Space* within a decade and be well on the way to the Moon
- It assumes we *build upon acquired European technologies* and experience
- This 500 M€ per year investment will *greatly stimulate industry* and generate return in terms of excellence in high-tech and production organization
- Compare with ATV cost: equivalent of 150 M€/yr over eight years, including the first flight!
- It will *foster innovation* by attracting young talented people to technical and scientific careers
- We do suggest a 10% increase in *European Space efforts*, but we will still be dwarfed by NASA by a factor of 4-5



Ground Rules

Safe & Simple

by using

Experience and Proven Technology

as much as possible

Proven technology and simple:

=> Reliable schedule

=> Economical

- Start with a simple conical capsule
- First flight well in ISS timeframe – a valuable complement to Orion
- Separate crew and cargo transportation

Safety:

- Robust escape system for all ascent
- Ballistic back-up entry

Develop and evolve step by step

- Maintain growth potential in the initial design
- A docking mechanism compatible with international partner’s
- Sub-systems built on proven concepts
- First flight as ATV-like as possible
- Ultimately an additional mean of transportation for international human space exploration

Summary

- It is of utmost importance for Europe to participate in the ongoing human exploration of space
- Europeans must be present when humans build the very first permanent base on another heavenly body: the Moon around 2020
- Europe should develop a human space craft in parallel to utilizing ISS optimally during the next 8-10 years
- Europe has many building blocks to start from: hardware, operational expertise as well as excellent industry
- The guiding principles must be to keep it safe and simple, to give us a robust vehicle in a foreseeable time at an affordable price
- The investment of about 500 M€ per year will inspire and engage a full young generation, enhance European technological competitiveness, increase Europe's global strategic importance and be a factor of pride and unification for all of Europe
- We will create a strong basis for a robust participation in emerging international partnerships of human space exploration