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## Technical Paper Session I-A - Time to Rethink Space Access?

Andrew W. Clark  
*Space Frontier Operations, Inc.*

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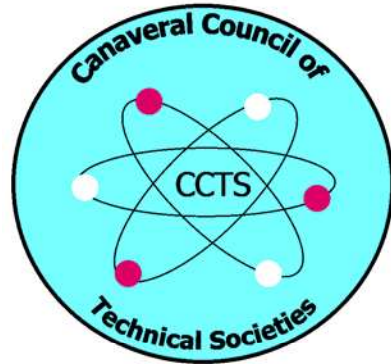
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**SPACE VISIONS CONGRESS 2007**

**TECHNICAL PAPER**  
**SESSION IA**

**“TIME TO RETHINK SPACE ACCESS?”**  
**ANDREW W. V. CLARK**  
**(ABSTRACT PRESENTATION ONLY)**



## **Time to Re-think Space Access?**

Andrew W. V. Clark  
Chairman and CEO  
Space Frontier Operations, Inc.  
P.O. Box 445  
Cape Canaveral, FL 32920

### **Abstract**

Construction of space vehicles on the surface of the Earth is inhibiting the development of spacecraft and therefore the overall exploration of space.

No one in their right mind would dream of constructing an Aircraft Carrier in the middle of Oklahoma or Kansas and then transporting it to the ocean. The whole idea is illogical and preposterous. Why then do we construct spacecraft on the surface and transport them to orbit before their mission can begin?

This paper will explore the reasons behind the current philosophy and examine the limitations placed on spacecraft design and operation as a result.

Finally, a new regime will be posited, along with an examination of the implications of these proposed changes.

# Time to Re-think Space Access?

Andrew W. V. Clark  
Chairman and CEO  
Space Frontier Operations, Inc.  
P.O. Box 445  
Cape Canaveral, FL 32920

Space Frontier Operations, Inc

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## Time to Re-think Space Access?

- ***Construction of space vehicles on the surface of the Earth is inhibiting the development of spacecraft and therefore the overall exploration of space.***
- ***No one in their right mind would dream of constructing an Aircraft Carrier in the middle of Oklahoma or Kansas and then transporting it to the ocean. The whole idea is illogical and preposterous. Why then do we construct spacecraft on the surface and transport them to orbit before their mission can begin?***
- ***This paper will explore the reasons behind the current philosophy and examine the limitations placed on spacecraft design and operation as a result.***

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## The Big League of Launchers

<b>Vehicle</b>	<b>Maximum Payload to LEO (Kg)</b>
Atlas V	20,520
Delta IV Heavy	22,560
Space Shuttle	24,900
Ariane V	17,250
Proton M	21,000
Proton K	19,760

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## Problems with Designing Spacecraft to Survive Launch

- Volume, mass and dimensions are constrained by the Launch Vehicle.
- Added mechanical complexity as a result of folding components.
- Launch Shock and Vibro-acoustic loads impact the design.

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## Benefits of not Designing for the Launch Vehicle

- Mechanical complexity could be reduced – no longer have to fold antennae or solar panels etc.
- Spacecraft could grow dimensionally and accommodate somewhat larger equipment.
- Mass constraints could be relaxed, and total mass need not be constrained by the launch vehicle.
- Spacecraft will be designed for the loads they will see in space.
- Reduction in complexity should result in higher reliability.

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## Potential Impacts of not Designing for the Launch Vehicle

- Boost Motors will be larger in order to accommodate the larger spacecraft.
- Spacecraft power requirements will probably rise significantly.
- Mass Properties will change and may be more difficult to measure.

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## Infrastructure Changes that will be Necessary

- Provision of a large manned space base.
- Provision of a reliable quick reaction manned vehicle.
- Provision of a really Heavy Lift launch Vehicle.
- Both vehicles will be optimized for their respective roles.

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## Discussion

- Economic Drivers
- Emergence of these tools and systems predicated on a future requirement that must be firm.
- System reliability issues – hopefully improved.
- SFO has the Manned Vehicle, the HLV and the Space Base designs now.
- Hopefully the development of these systems will be driven by commercial and not government requirements.

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# Contact

Space Frontier Operations, Inc.

P.O. Box 445

Cape Canaveral, FL 32920

[a.clark@sfo.org](mailto:a.clark@sfo.org)

(407) 462 0922

Space Frontier Operations, Inc

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