

SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems (1)

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TECHNICAL ASPECTS OF SEMICONDUCTOR STRUCTURES MANUFACTURING IN SPACE
ENVIRONMENT**Abstract**

Manufacturing of modern semiconductor structures on the base of epitaxial technologies requires ultra vacuum conditions and high purity inside operational environment. It is very complicated and expensive to satisfy these requirements in terrestrial conditions. Therefore, near-earth orbital space conditions for many years explored as natural environment for the development of high-tech production processes. For creation of high vacuum on American research vehicle WSF an idea was used to displace operational equipment inside of aerodynamic wake behind the round shield oriented perpendicular to flight direction. The practical measurements show that vacuum behind the shield of WSF was several orders of magnitude worse than expected. Nevertheless it may be expected to achieve essentially higher vacuum results using more optimal technical solutions for design of devices with similar purposes. The molecular shield also used here to provide high vacuum in its wake zone. But overall vehicle design is arranged to eliminate most destructive factors. The orientation of the front shield in the direction of orbital flight is carried out without the use of jet engines. The extended form of the vehicle provides a gravitational orientation of its supporting structure toward the centre of Earth. Rotation of the shield surface perpendicular to the direction of flight is performed by power gyroscope, installed in the lower part of the power structure. Molecular shield and other parts of the manufacturing equipment should be made of materials with minimal own gas emission. Therefore, polymer composites should be excluded, and most preferable are pure metals with minimal rate of gas absorptivity. It is necessary to create a completely unmanned automatic orbital manufacturing complex. Rocket control systems for docking the vehicles must provide a minimum of pollutant impact on the orbital complex. The main task for successful realization economically profitable space production is to reduce the cost of transportation operations between Earth and near earth orbit. This problem could be successfully achieved only through setting up effective and reusable space transportation systems. In comparison with Space Shuttle new transportation system should reduce in dozens of times the cost of delivery of payload into orbit and return to earth. As prototypes of efficient space transportation systems may be considered projects with air launch – the Russian project MAKS, American aircraft-carriers Space Ship Two, Stratolaunch. Booster stage should be reusable-the Russian “Baykal”, American Falcon-9. The prototype of unmanned orbital vehicle could be American X-37B, MAKS etc.