

Space cargo: the next frontier in global logistics

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Opinion

Historically, it has been observed that every major moving platform discovered by humanity like ships, railways, or aircraft has played a transformative role in human and cargo transportation. The discovery of the steam engine marked a revolutionary turning point in human history. It opened the door for largescale human and cargo transportation, changing land and sea mobility. Steam powered ships and trains connected distant regions by making movement of goods and people faster. Later, the Wright brother's invention of the aircraft took this transformation to a new dimension and today aviation has emerged as important and faster option for human and cargo movement. All these platforms are making an important contribution towards maintaining global supply chains.

In the space domain, humanity has already achieved the capability of traveling from Earth to space and back. Using space systems for cargo delivery is not a new idea. For years space systems are delivering cargo in space mainly in three different ways. Basically, putting satellite into an orbit/putting probe in space itself could be view as an act of cargo delivery to space. The most famous activity of cargo delivery is about providing supplies to international space station (ISS) essentially for huma survival and maintaining the operational space station. This form of delivery is a two-way activity that is delivering supplies to and from space stations. The third form of delivery is more theoretical in nature and yet to become a reality. This is about using systems like near-hypersonic point-to-point transport vehicles, with an aim to radically cut down global travel times. All these systems are launched and, in some case, retrieved back by using traditional rockets, reusable capsules, and advanced space planes.

For years, international space agencies, like the European Space Agency (ESA) with its Automated Transfer Vehicle (ATV) and the Japan Aerospace Exploration Agency (JAXA) with its H-II Transfer Vehicle (HTV), are used space systems to deliver cargo to the ISS. As per available information following are some important space systems used for delivering supplies to ISS that include equipment, food, clothing, and scientific experiments.

SpaceX dragon: NASA has major dependence on these systems for some time now. These are reusable capsules launched by Falcon 9 rockets. They are used for ferrying both pressurized and unpressurized cargo to and from the ISS. This a very successful system.

Northrop grumman cygnus: This spacecraft is designed for one-way resupply missions. After delivering cargo to the ISS, it gets loaded with unserviceable items and several thousand pounds of waste is not brought back to earth. The craft ensures that it gets burnt while entering the earth's atmosphere during re-entry since the unit sans any protective thermal gear, which can withstand very high temperatures (say around 2000 deg Celsius) during re-entry.

Sierra space dream chaser: This reusable, winged spaceplane is under development to transport cargo to and from the space. This system is getting designed to land on commercial runways, which

exposes sensitive payloads to less gravitational forces upon return. The launch date for the Dream Chaser spaceplane is presently planned for late 2026. It will be launched by a United Launch Alliance (ULA) Vulcan Centaur rocket to deliver cargo to the ISS.

China has unveiled the design of a new reusable shuttle to take cargo to and from the country's space station. This Haolong space shuttle is being developed by the Chengdu Aircraft Design and Research Institute under the state-owned Aviation Industry Corporation of China (AVIC). This could be ready by end 2025 or later. China currently uses its robotic Tianzhou spacecraft to send cargo to the Tiangong space station. This automated cargo spacecraft was first launched during 2017. This system has also demonstrated autonomous propellant transfer showcasing Chinese ability in the arena of space refuelling.

Today, the time (and technology) has become ripe to expand on the concept that envisions spacecraft or suborbital vehicles to can carry cargo or passengers from one location on Earth to another through space, drastically reducing travel time. This would allow the humans to cover the distances in minutes, which even a modern aircraft takes hours to travel. For all these years, the steam engine and aircrafts have revolutionized the regional and global transportation systems. Now the time has come for space-enabled terrestrial transportation to bring in the next revolution in transportation sector. It could redefine global mobility, logistics, and even the structure of international trade and defence operations. The concept of 'connectivity' to take a quantum leap. Some important research, development and innovation is happening in this area under the direction of the US defence agencies.

On October 1, 2025 a California-based company Inversion has unveiled its reusable spacecraft, Arc, designed to serve as an orbital storehouse for rapid, global cargo delivery and hypersonic testing. This vehicle is being developed for the US military to deliver critical supplies anywhere on Earth in under an hour. Arc is a self-guided re-entry vehicle that can carry up to 227 kg of payload. It can be deployed on demand from orbit and can deliver its cargo within 60 minutes to any point on the globe. The design feature is such that after delivering its cargo, the craft descends to Earth and lands using a parachute system. This is a reusable system. The idea behind this project is to have a constellation of Arc vehicles into low Earth orbit. These vehicles will function as an orbital logistics network or 'warehouse in space,' offering rapid and strong supply chain capabilities.

As per reports in media the spacecraft is also designed to serve as a hypersonic testbed, capable of reaching speeds over Mach 20 and

withstanding extreme conditions during re-entry. The overall design of Arc system is such that it allows the vehicle to glide and manoeuvre over large distances during re-entry. It is expected have an AI-enabled guidance and a steerable parafoil system. This would assure high precision, autonomous landings within 50 feet of a designated target. The first global flight of this system is expected to take place around 2026.¹

The US Air Force has awarded contracts to Blue Origin and Anduril Industries to study the feasibility of rocket based point-to-point cargo transportation. The understanding is to have a system in place for delivering materials anywhere on earth within an hour. Under the Rocket Experimentation for Global Agile Logistics (REGAL) program, Blue Origin received \$1.3 million to explore modifying its launch vehicles for such missions. Whereas Anduril received \$1 million to design and analyse rocket cargo containers for multiple government payloads. Here the idea is to leverage advancements in reusable rockets and commercial launch capabilities for fast global logistics.

REGAL envisages using rockets for ultra-fast delivery of defence and humanitarian cargo. Presently, the same job has been carried out

under the commercial contracts with private airlines. The system could support missions such as emergency resupply, disaster relief, and restoration of critical operations. All this indicates that there is a growing military interest in space enabled logistics.² It may take some more time to have space systems in place for transporting humans from one part of the earth to another part of the earth. However, all trends indicate that this is going to happen soon. All these developments are going to augment the growth of the Space Cargo Delivery Market in a big way. All in all, it could be said that having operational space-based systems for delivery of cargo on the earth would immensely help the defence forces and simultaneously there could be significant commercial benefits too.

References

1. Jamie Whitney. Inversion unveils Arc spacecraft for rapid space-based delivery and hypersonic testing. 2025.
2. Elizabeth Howell. US Air Force selects Blue Origin and Anduril for rocket cargo delivery project: report. 2025.