

Reusable rockets essay



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Most rockets today can be used only once. Partially they are destroyed while entering the atmosphere; partially they remain to fly in low Earth orbit, creating major space debris mass. Multiple stages can significantly increase the ratio of the mass output payload to the initial mass of the rocket. Multi-stage rockets also demand for exclusion areas for falling of intermediate stages.

From the beginning of rocket building, it was important to create reusable space ships, which would reduce the economic cost of space flights. Ideally, the rocket should return to Earth, and after refueling fly back to space. Because of the need to use highly sophisticated technologies (first of all, in the field of propulsion and heat protection), fully reusable rockets still do not exist. However, this technology is permanently in interest of many researches. Nowadays projects on the development of reusable launch vehicles are constantly opening.

Research articles on reusable rockets

Previous Attempts

For the period from the 1990s to the present day, there have been many various projects on the development of reusable launch vehicles, such as ROTON, developed by Rotary Rocket Company, Kistler K-1 that is in commercial development by Rocketplane Kistler and VentureStar , which was proposed to replace Space Shuttle.

The reusable launch system (RLS) Space Shuttle (the program was started in 1981) was only partially reusable. However, Space Shuttle was unable to ensure the reduction of the cost of cargo delivery into orbit. Moreover, manned RLS was characterized by a complex and time-consuming step of prelaunch (due to increased requirements for the crew safety and security).

Space Shuttle program was closed in 2011 because it was uneconomical and also because of accidents with shuttles Challenger and Columbia (Howell, 2013).

Reusable rocketseconomic effects

In November 2015, Blue Origin successfully landed suborbital rocket New Shepard (“ Blue Origin”, 2015). On December 22, 2015, SpaceX Company landed the first stage of the rocket Falcon 9 after it had been sent into space (Weaver, 2015). Until that time, all rockets that went into space, either crashed or not used after takeoff. The inability to reuse rockets makes space flights so expensive: every launch requires a new spacecraft. Many private companies have tried to develop a reusable rocket that would make space transportation cheaper and Blue Origin and SpaceX have succeeded.

Therefore, the idea about reusable rockets no longer seems fantastic as it might have seemed before. The ability to reuse rockets would contribute to a significant reduction in cost of space launches. In theory, we will only need to refill rockets to use them again.

Discussion

The cost of repairs was one of the main reasons why the space shuttle program flight was closed in 2011. Space Shuttle was considered as a

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perspective variant of reusable spacecraft. The cost of the program was extremely high. It should be noticed that the shuttle was launched with launch vehicle (which is essentially a giant fuel tank) with two jet engines for solid fuels. After the space mission the shuttle, like an airplane, lands back on the ground.

Initially, the shuttle's design was developed taking into account the savings on space missions. All of it, except for the external launch vehicle, could be reused.

Engines must be changed after several launches of the shuttle. Moreover, each time required to carry out innumerable checks and repairs between missions. In addition, rocket boosters for solid fuels require timely updates, and external fuel tanks must be changed every time. All this increased the cost of launches of space shuttles. Each flight costs from 450 million to 1.5 billion dollars .

Companies working on reusable rockets

In few last years two private companies successfully carried out landing of the first stage of the launch vehicle.

Blue Origin.; Rockets from private company Blue Origin are already in development.

Since November 2015, the company has already launched and landed New Shepard rocket for four times (Grush, 2016).

On September 12, 2016 Jeffrey Bezos, the entrepreneur and founder of Blue Origin private space company officially announced the development of a new

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reusable launch vehicle New Glenn. Currently two models of the rocket are already in development. This is a two-stage and three-stage versions of the launcher New Glenn. The height of the first rocket is 82 meters, while the second is 95 meters. These rockets will be used to launch manned and unmanned spacecraft in Earth orbit.

Both rockets are much higher than famous SpaceX's Falcon Heavy. Three-stage New Glenn is close in size to the world's largest launch vehicle Saturn V (NASA).

New Blue Origin's rockets were named in honor of John Glenn, the first American to orbit the Earth. Jeffrey Bezos believes that development of such rockets is important, because in the future almost one million people would work in space. This requires rockets to deliver crews and equipment into orbit.

SpaceX. Space Exploration Technologies Corporation;(SpaceX) is a US company, a manufacturer of space technology. The founder of PayPal and Tesla Motors, Elon Musk, founded it in 2002 to reduce costs of flights into space, opening the way for Mars colonization (Rosen, 2016).

Company has already developed launch vehicles Falcon 1 and Falcon 9 and spacecraft Dragon, which is designed to resupply the International Space Station (ISS). Falcons were assumed to be reusable from the very beginning. The passenger version of Dragon V2 which is to transport astronauts to the ISS is in the final phase of development. Since 2015 SpaceX has been also involved in the vacuum train project Hyperloop.

On December 22, 2015 SpaceX successfully launched and returned to Earth new version of Falcon 9, landing it in upright position at Cape Canaveral.

According to representatives of SpaceX, through economies of scale and reuse of returned stages, in the future the company will reduce price for the take off to \$ 5-7 million. Musk also promised that the company will be able to reduce the price of payload delivered into orbit to $\text{CONTENT}\text{nbsp}; 1, 100$ per kilogram.

Conclusion

From the beginning of rocket building, humanity has been interested in creation of reusable rockets, which could reduce the economic cost of space flights. All the previous projects suggested only partially reusable rockets. Today all of the most successful projects dealing with the development of reusable rockets are owned by private companies Blue Origin and SpaceX. In last few years they successfully launched and landed multistage reusable launch vehicles. The ability to reuse rockets would contribute to a significant reduction in cost of space launches.

References

Blue Origin Makes Historic Rocket Landing. (2015). In ; *Blue Origin*. ; Retrieved from [https://www. blueorigin. com/news/news/blue-origin-makes-historic-rocket-landing](https://www.blueorigin.com/news/news/blue-origin-makes-historic-rocket-landing)

Grush, L. (2016). Blue Origin safely launches and lands the New Shepard rocket for a fourth time. In *The verge*. ; Retrieved from [http://www. theverge. com/2016/6/19/11972450/blue-origin-new-shepard-fourth-test-flight-success](http://www.theverge.com/2016/6/19/11972450/blue-origin-new-shepard-fourth-test-flight-success)

<https://assignbuster.com/reusable-rockets-essay/>

Howell, E. (2013). Columbia Disaster: What Happened, What NASA Learned. In *Space.com*. ; Retrieved from <http://www.space.com/19436-columbia-disaster>

Rosen, L. (2016). SpaceX Launch Vehicle Program. *The Space Congress Proceedings. (44th) The Journey: Further Exploration for Universal Opportunities*.

Weaver, M. (2015). “‘ Welcome back, baby’: Elon Musk celebrates SpaceX rocket launch – and landing”. In *the Guardian*. ; Retrieved from <https://www.theguardian.com/science/2015/dec/22/welcome-back-baby-elon-musk-celebrates-spacex-rocket-launch-and-landing>