**Progress Spacecraft**

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| Progress spacecraft |
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| **Description** |
| **Role:** | Used to supply the International Space Station, originally used to supply Soviet and Russian space stations (see Mir) |
| **Crew:** | 0 |
| **Dimensions** |
| **Height:** | 7.23 m (23.72 ft) |
| **Diameter:** | 2.72 m (8.92 ft) |
| **Volume:** | 7.6 m3 (268 ft3) |
| **Payload:** | 2,350 kg (5,200 lb) |
| **Return Payload:** | None |
| **Performance** |
| **Endurance:** | 6 months docked to station |

The **Progress** (Russian: **Прогресс**) is a Russian expendable cargo spacecraft. Its purpose is to deliver supplies needed to sustain human presence in orbit. While it doesn't carry a crew it can be boarded by astronauts when docked with a space station, hence it being classified as *manned* by its manufacturer. Progress is derived from the manned Soyuz spacecraft and launches on the same vehicle, a Soyuz rocket.

Progress has supported space stations as early as Salyut 6 and as recently as the International Space Station. Each year there are between three and four Progress flights to the ISS. A Progress remains docked until shortly before being replaced with a new one or a Soyuz (which will use the same docking port). Then it is filled with waste, disconnected, and de-orbited, at which point it burns up in the atmosphere. Due to the variation in Progress vehicles flown to the ISS, NASA uses its own nomenclature where "**ISS 1P**" means the first Progress spacecraft to ISS.

Progress was developed because of the need for a constant source of supplies to make long duration space missions possible. It was determined that cosmonauts needed an inflow of consumables (food, water, air, etc.), plus there was a need for maintenance items and scientific payloads that necessitated a dedicated cargo carrier. Such payloads were impractical to launch with passengers in the restricted space of a Soyuz.

**Design**

Progress is of much the same size and shape as Soyuz. It consists of three modules:

* A pressurized forward module. This carries the supplies for the crew such as scientific equipment, clothes, prepackaged and fresh food, and letters from home. The docking drogue is similar to that of the Soyuz but features ducting for the UDMH fuel and N2O4 oxidizer.
* A fuel compartment. The reentry module of the Soyuz was replaced with an unpressurized propellant and refueling compartment with ducting along the outside of the spacecraft. This meant that if a leak occurred, the poisonous gas would not enter the station's atmosphere. The fuel is carried in two tanks.
* A propulsion module. The propulsion module, at the rear of the spacecraft, remained unchanged and contains the orientation engines used for the automatic docking. It may be used to boost the orbit of the station once docked.

Reduction in mass was possible because the Progress was designed to be unmanned and disposable. This means that there is no need for bulky life support systems and heat shields. Small weight savings achieved due to the lack of automatic rescue crews system and lack of parachutes. The spacecraft also has no ability to split into separate modules. After undocking, the spacecraft performs a retrofiring and burns up in the atmosphere.

**Versions**

There were many small variations between the different flights, but the major upgrades are reflected in the change of name.

**Progress (1978–1990)**

Main article: Progress 7K-TG

Progress logistics resupply spacecraft. It consists of the dry cargo module (left); the tanker compartment (center); and a stretched service module (right).

There were 42 spacecraft built using the initial **Progress** design, the last one being launched in May 1990.

The bureau in charge of designing the freighter was TsKBEM (now RKK Energia). They began work on the design in mid-1973, assigning Progress the GRAU index 11F615A15. The design was complete by February 1974, and the first production model was ready for launch in November 1977. Progress 1 launched on 20 January 1978 aboard the same rocket used to launch the Soyuz. It still featured the same launch shroud as the Soyuz, though this was purely for aerodynamic purposes as the launch escape system had been deactivated.

This first version of Progress had a mass of 7,020 kg and carried 2,300 kg of cargo, or 30% of its launch mass. It had the same diameter as the Soyuz at 2.2 meters, but was 8 meters in length—slightly longer. The autonomous flight time was 3 days, the same time as that of the Soyuz ferry. It could spend one month docked. Progress always docked to the aft port of the station it was resupplying.

* Launch mass: 7,020–7,249 kg
* Mass of cargo:
	+ ~2,300 kg (before Progress-24)
	+ ~2,500 kg (from Progress-24)
* Length: 7.94 m
* Diameter of cargo modules: 2.2 m
* Maximum diameter: 2.72 m
* Volume of cargo compartment: 6.6 m³

**Progress-M 11F615A55 (1989-2009)**

Main article: Progress-M

Progress-M logistics resupply spacecraft.

The upgraded **Progress M** (GRAU: 11F615A55, manufacturer's designation: 7K-TGM) was first launched in August 1989. The first 43 flights all went to Mir; following Mir's re-entry, Progress was used as the resupply vehicle for the International Space Station. As of August 2014, there have been 56 flights to the ISS and more are scheduled.

The Progress M is essentially the same spacecraft as the Progress, but it features improvements based on the Soyuz T and TM designs. It can spend up to 30 days in autonomous flight and is able to carry 100 kg more. Also, unlike the old Progress crafts, it can return items to Earth. This is accomplished by using the Raduga capsule, which can carry up to 150 kg of cargo. It is 1.5 m long and 60 cm in diameter and has a "dry mass" of 350 kg. Progress M can also dock to the forward port of the station and still transfer fuel. It uses the same rendezvous system as the Soyuz, and it features solar panels for the first time.

* Launch mass 7,130 kg
* Cargo mass 2,600 kg
* Dry cargo mass 1,500 kg
* Liquid cargo mass 1,540 kg
* Length 7.23 m
* Diameter of cargo modules 2.2 m
* Maximum diameter 2.72 m
* Dry cargo compartment volume 7.6 m³
* Solar array span 10.6 m

**Progress-М 11F615A60 (2008-present)**

Main article: Progress-M

A new modification of the Progress spacecraft, with new TsVM-101 digital flight computer and MBITS digital telemetry system, was first launched on 26 November 2008, at 12:38 UTC from the Kazakhstan's Baikonur Cosmodrome spaceport aboard a Russian Soyuz rocket. The first spacecraft of this series was Progress M-01M.

The spacecraft belongs to the so-called 400 series (GRAU: 11F615A60), and all modifications applied to it were subsequently used in the production of new Soyuz-TMA-M manned spacecraft.

**Progress M1 (2000-2004)**

Main article: Progress-M1

**Progress M1** is another variant, capable of carrying more propellant (but less total cargo) to the space stations. There have been 11 of these flights.

* Mass: 7,150 kg
* Capacity cargo: 2,230 kg
* Capacity dry cargo: 1,800 kg
* Capacity propellant: 1,950 kg

**Progress M2**

**Progress M2** was a planned variant, which was a proposed design for the proposed Mir-2 space station, but was dropped due to financial issues. The M2 variant would have a larger service module for larger cargo or space station modules and would have been launched on a Zenit launch vehicle.

**Progress MS**

**Progress MS** is a planned variant which should fly in 2014.

**Current status**

Launch of Progress M-11M

Progress M1-3 seen docked at the bottom of the *Zvezda* module of the ISS during STS-106.

Progress spacecraft are currently used to resupply the International Space Station (ISS). Between 1 February 2003 and 26 July 2005, they were the only spacecraft available to transport large quantities of supplies to the station, as the Space Shuttle fleet was grounded after the breakup of *Columbia* at the end of STS-107. For ISS missions, the Progress M1 variant is used, which moves the water tanks from the propellant and refueling module to the pressurized section, and as a result is able to carry more propellant. Progress M-67, the final flight of a Progress-M spacecraft, was launched 24 July 2009 on a Soyuz-U.

The European Space Agency (ESA) operates its own type of supply freighter, the Automated Transfer Vehicle (ATV). The first of these, named *Jules Verne*, was launched at 04:03 GMT on 9 March 2008. ATVs can carry up to 8 tons of cargo into space, roughly three times as much as the Progress, and will be launched every 12–18 months by Ariane 5 rockets.

NASA's Orion spacecraft, which was to replace the Space Shuttle after 2015, was initially designed to have an unmanned variant similar to Progress, however this capability has since been removed. SpaceX's commercial (private owned) Dragon spacecraft and Orbital Sciences' Cygnus spacecraft also handle American logistics to the International Space Station.

RKK Energia has proposed the Parom (*ferry*) spacecraft as a replacement for Progress. This new spacecraft would retrieve either the proposed Kliper spacecraft or any cargo container with a Russian airlock and weighing up to 15 short tons (14 t) back to the ISS.

**See also**

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|  | [***Spaceflight portal***](http://en.wikipedia.org/wiki/Portal%3ASpaceflight) |

* [List of Progress flights](http://en.wikipedia.org/wiki/List_of_Progress_flights)
* [List of unmanned spaceflights to the ISS](http://en.wikipedia.org/wiki/List_of_unmanned_spaceflights_to_the_ISS)
* [Comparison of orbital spacecraft](http://en.wikipedia.org/wiki/Comparison_of_orbital_spacecraft)
* [Unmanned resupply spacecraft](http://en.wikipedia.org/wiki/Unmanned_resupply_spacecraft) - descriptions of other similar vehicles:
	+ [Automated Transfer Vehicle](http://en.wikipedia.org/wiki/Automated_Transfer_Vehicle) - a similar cargo vehicle developed by the [European Space Agency](http://en.wikipedia.org/wiki/European_Space_Agency)
	+ [Cygnus spacecraft](http://en.wikipedia.org/wiki/Cygnus_spacecraft) - a similar cargo vehicle developed by [Orbital Sciences Corporation](http://en.wikipedia.org/wiki/Orbital_Sciences_Corporation)
	+ [Dragon Cargo spacecraft](http://en.wikipedia.org/wiki/SpaceX_Dragon) - a similar cargo vehicle, also capable of returning 3000 kg of cargo to Earth, NASA Spaceflight developed by [Space Exploration Technologies](http://en.wikipedia.org/wiki/SpaceX)
	+ [H-II Transfer Vehicle](http://en.wikipedia.org/wiki/H-II_Transfer_Vehicle) - a similar cargo vehicle developed by [Japan Aerospace Exploration Agency](http://en.wikipedia.org/wiki/Japan_Aerospace_Exploration_Agency)
* [Orbital Technologies Commercial Space Station](http://en.wikipedia.org/wiki/Orbital_Technologies_Commercial_Space_Station)

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