

“Gravity”: The Real Story on Russian ASATs and China’s Space Station

Presentation to Secure World Foundation

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Russian ASATs

- Premise: Russia launches a direct ascent antisatellite (ASAT) device that creates massive space debris
- Real World:
 - Three countries have developed and launched ASAT systems
 - Soviet Union/Russia
 - United States
 - China
 - Two countries have launched direct ascent ASATs
 - United States
 - China
 - Russia developed and launched co-orbital, not direct ascent ASATs
 - The film makers chose the one ASAT-capable country that HAS NOT launched a direct ascent ASAT to blame for the movie's catastrophe

Debris from ASAT Tests

Country	Satellite(s)	Year	Total Debris (pieces)	Total Debris Still in Orbit (pieces)
USSR	K 248 (T); K 249/252 (I)	1968	251	85
USSR	K 373 (T); K 374/375 (I)	1970	145	36
USSR	K 394 (T); K 397 (I)	1971	116	48
USSR	K 459 (T); K 462 (I)	1971	27	0
USSR	K 880 (T); K 886 (I)	1976	127	60
USSR	K 967 (T); K 970 (I)	1977	70	65
USSR	K 1171 (T); K 1174 (I)	1980	46	5
US	Solwind	1985	285	0
US	USA 193*	2008	174	0
China	Fengyun 1C	2007	3280	3028

Source: Data from Brian Weeden, Secure World Foundation, 2013

T=target, I = Interceptor

* US does not describe this as an ASAT test, but removal of dangerous satellite

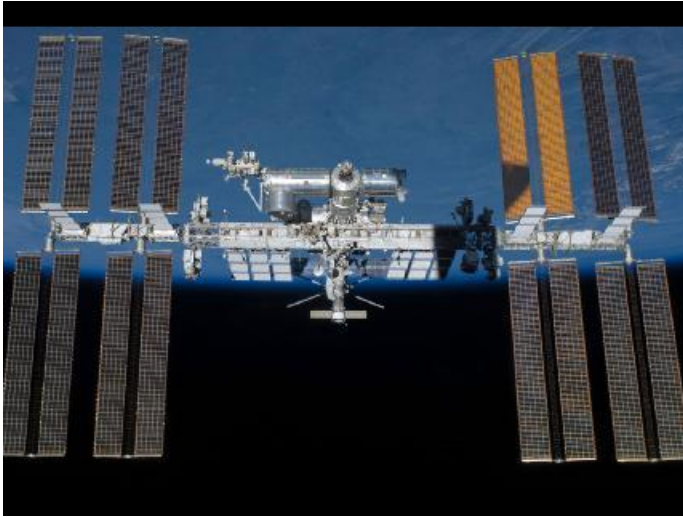
China's Space Station

- Premise: China has a space station in an orbit similar to the International Space Station (ISS) as well as Hubble and the space shuttle
- Real World:
 - China has launched only one space station, Tiangong-1
 - Tiangong-1 and shuttle were never in orbit at the same time
 - Tiangong-1 was launched in September 2011, two months after the final space shuttle flight
 - The orbits are very different
 - Tiangong-1: 42.8 degrees inclination at about 360 kilometers
 - ISS: 51.6 degrees, about 330 km
 - Hubble: 28.5 degrees, about 570 km

China's Space Station (cont)

- Premise: It's a BIG space station, almost as big as ISS
- Real World: Tiangong-1 is a tiny space station, smaller than the first space stations launched by the Soviet Union (Salyut) and the United States (Skylab) never mind in comparison to the ISS

ISS v. Tiangong-1 Comparison



International Space Station

Overall Length: 109 meters

Overall Width: 73 meters

Overall Mass: 419 metric tons

Habitable volume: 388 cubic meters

Typical Crew Size: 6

Partners: US, Russia, Japan, Canada, Europe



Tiangong-1

Overall Length: 8.3 meters

Max Diameter: 3.35 meters

Overall Mass: 8.6 metric tons

Habitable volume: 14.4 cubic meters

Typical Crew Size: 3

Partners: None

The first Soviet space station, Salyut 1 (1971), was 18.6 metric tons.

The first U.S. space station, Skylab (1973), was 77 metric tons.

Extremely Rough Size Comparison of Footprint

International Space Station



Tiangong-1



China's Space Station (cont)

- Premise: Tiangong-1 has a spacecraft, Shenzhou, docked to it that is similar enough to Soyuz that our heroine can operate it and return to Earth
- Real World:
 - Typically a Shenzhou is there only if a crew is aboard and the crew would have used it to get home themselves
 - Tiangong-1 has only one docking port so there could not have been an extra Shenzhou conveniently docked
 - Shenzhou is based on Soyuz in some respects, but China insists it is mostly China's own design so it's not clear that the control panels would be THAT similar
 - HOWEVER, China did dock an unoccupied Shenzhou to Tiangong-1 as a test before docking a crew, and our heroine did have to do some guesswork with the controls, so we'll give the movie a pass on this one