



THE X-37B SPACE PLANE: SPACE MILITARISATION, WEAPONISATION OR PLAIN EXPERIMENTATION

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The Secrecy, Speculation and Reaction to the X-37B

The U.S. Air Force certainly knows how to keep a secret. What is known of its air and spacecraft covers tons of literature, it evokes adoration and envy in equal measure and what remains unknown sparks speculation in no small measure. Take, for example, the US Air force's X-37B unmanned Aerospace craft that goes out to outer space on a launch rocket and glides back to earth like an aircraft. The U.S. Air Force has the distinction of orbiting three X-37Bs since 22 April 2010 as given in the table below, and yet nobody knows what it's been doing up there.

Earth¹. The U.S. Air Force on its fact sheet states the X-37's mission as "...an experimental test program to demonstrate technologies for a reliable, reusable, unmanned space test platform for the U.S. Air Force. The primary objectives of the X-37B are twofold: reusable spacecraft technologies for America's future in space and operating experiments which can be returned to, and examined, on Earth".² The mission statement is just as helpful as that; it states the obvious and incubates the substance. Evidently, apart from the U.S. Air Force, the rest of America knows little about its purpose. The balance of the world knows even lesser and hence speculation

Table-1: Mission Profiles of X-37B Orbital Transfer Vehicle (OTV)

Nomenclature	Date of launch	Date of landing	Time in orbit
X-37B OTV-1	22 April 2010	Dec 2010	225 Days
X-37B OTV=2	05 Mar 2011	Jun 2012	470 Days
X-37B OTV-3	03 Dec 2012	Oct 2014	670 days

It's been over four years since the first X-37B went into orbit and the world is none the more wiser on its purpose and mission. Amongst the Americans, even the highly revered Union of Concerned Scientists appears befuddled; it finds the mission unclear and actually summarises that the X-37 B makes no sense in terms of missions that require space craft to stay in orbit and also those that require space craft to return back to

abounds. Suspicions are rife and reactions across the world vary. For instance, the Chinese Press believes that "the spacecraft (X-37B) could be a precursor to an orbiting weapon, capable of dropping bombs or disabling foreign satellites as it circles the globe"³ An equally alarmed Russia watches it closely believing that the X-37B threatens first China and then Russia, since it is capable of multiple missions including destroying

communication, observation satellites and elements of Ballistic Missile Defence (BMD).⁴ Russia's response has been a rejuvenation its own space plane programmes and also reorganisation and consolidation of all of its Air Defence, Ballistic Missile Defence, Space Defence and military satellite operation units into a single entity called Aerospace defence forces in December 2011. It now pumps in generous amounts of money into either project. For instance, up to \$ 55.6 bn have been allotted in 2014 for upgradation of Russia's Aerospace Defence forces.⁵ On the other hand, Chinese reactions range from diplomatic initiatives like advancing legal treaties to bind the US to projects aimed at creating its own space planes like the Shenlong. Across the world space planes are making a comeback with United Kingdom launching its Skylon project for its space plane by 2020,⁶ Japan plans its HOPE space plane by 2022,⁷ India attempts its AVATAR and so on. The comeback, plans, attempts, proof of concepts etc are the easier part, getting the space plane off the drawing board to the launch pad and then into outer space and back to Earth is the difficult part. As of now the success of the U.S. Air Force is unmatched. In simple terms, the X-37 demonstrates how far ahead it is as compared to every other nation on Earth.

X-37B: A Brief Description

Descriptively speaking, the X-37B is as given in Figure 1:

Additionally, the following information on the X-37B is available from open sources;

X-37B is an experimental reusable spaceplane, very similar to the Shuttle but much smaller and completely robotic and using more advanced technologies.

X-37B is designed to be launched into

space on top of a standard space launch vehicle, stay on orbit for up to 270 days, and then re-enter and land like the Shuttle.

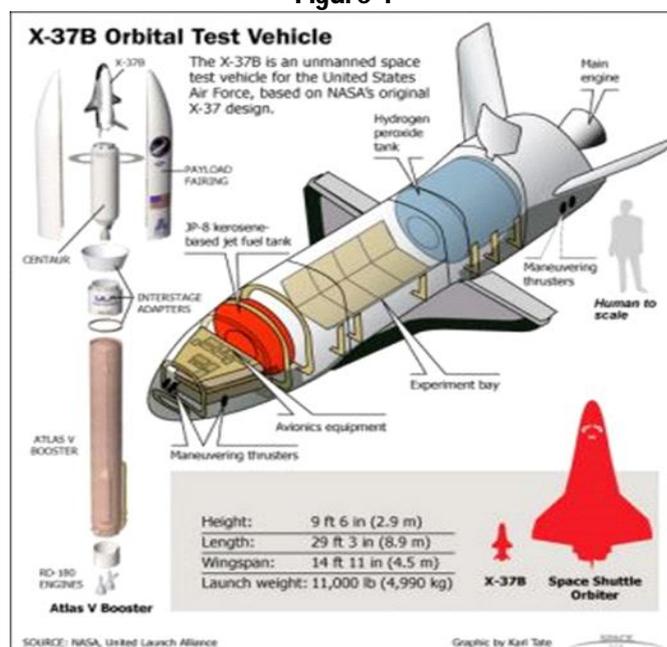
- X-37B uses its own solar array and lithium ion batteries to generate power, instead of Shuttle's fuel cells, a major reason why it can stay on orbit for much longer.

- X-37B has thrusters for on-orbit manoeuvring and de-orbit, but no engines for powered flight in the air—it is a glider in the atmosphere.

- Total program costs and budget line are classified.⁸

While the above descriptions are well known and repeated across mounds of literature on the subject, the descriptions of the most important component of the X-37B, the payload bay are delightfully vague—the standard description found on all the fact sheets parrot the usual line of its size being about the size of a pick-up truck. Pick-up truck dimensions vary from quarter of a ton to 40 tons and hence the revelation is not of much help. The closest worthwhile revelation of its payload is found in a NASA fact sheet of year 2003, and another of the manufacturer Boeing that states a payload size of 7 feet length and 4 feet diameter. The fact that the X-37B is highly manoeuvrable is well known, but to what extent is not known. This coupled with its potential multirole capability makes it one of the most formidable technological marvels of the new millennium.

Figure-1



Making Sense of the X-37B

It would be naïve to expect that such technology has been demonstrated without purpose or without a clear mission. It may be borne in mind that the US is a democracy run by well-informed tax payers with rigorous systems of checks and balances in place. The X-37 B is technologically complex, costly and a

drain on resources. Without purpose or mission, it would have never taken off from the drawing board. Hence, it would be in order to hazard reasonable conjectures on the issue.

The first step to the guess-estimate would be to look into the genesis of space planes. Space planes precede even the World War-2 Ballistic Missiles or Vergeltung-2 (V-2) rockets of Van Braun. During WW-2, competition within the German military forces, particularly the German Air Force (*Luftwaffe*) and German Army was intense. By end of 1941, the *Luftwaffe* was on

enables greater exploitation making military tasks easier. It has only increased the levels of flexibility and versatility possible. The same platform now can be used for multiple missions. To understand the multirole capabilities that may be possible on the X-37B, it would be essential to have a brief overview of the U.S. Air Force's perception of the military uses of outer space.¹⁰ These doctrinal perceptions provide the underpinnings of the likely uses and hence they are examined against the possible missions of the X-37B to make sense of its purpose and mission in Table 2:

Table-2

Military Uses of Space			
Role	Air Mission	Space Mission	What it translates into
Control of environment	Air Control Ops (Fight for Air dominance etc)	Space Control Ops (Fight for dominance)/Space Control	Hard kill by Kinetic Energy ASATs (KE ASATs), Soft kill by Lasers etc
Enhancing Combat Capabilities	Combat Support Operations	Force Enhancement	Satellites for communication, navigation, spying or observation.
Sustaining Combat Capabilities	Air Support Operations	Space Support (Launch, Orbit support etc)	Operationally responsive launch, rapid replenishment of capability gaps etc
Applying Combat Power	Air based force application (Strike, bombers, etc)	Space based force application	Dropping weapons from space, e.g. tungsten rods- "Rods from Gods project" etc

the back foot having lost the Battle of Britain whereas the German Army triumphantly marched across Russia. The *Luftwaffe* was desperate to redeem its image and an attack on the US would enable that. The problem lay with the slow, short range piston-powered that made it impossible to hit the US over 7000 miles away. A major technological innovation was required and the solution lay in a maverick Austrian engineer, Eugen Saenger's paper that proposed a winged, reusable, rocket-propelled space-plane that could hit anywhere on Earth. Thus was born the first space plane called Silver bird that envisaged bombing New York from Berlin using the lower fringes of space.⁹

The point being made is, the conceptual underpinnings of a space plane were always military, six decades hence, there is little to indicate any change. Modern technology only enables greater exploitation making military tasks easier.

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Based on the above, the X-37B applies in the following manner;

Applicability to Space Control Missions

Space Control missions are possible. The known size of the cargo bay allows use of microsats/ other objects to interfere with other space objects. However, despite its manoeuvrability, the complications of co-orbiting, targeting etc are huge. Application of directed energy like LASERS makes more sense in view of a variety of factors ranging from smaller size of laser equipment to lack of atmospheric distortions of laser in outer space etc. The mission can be expected to be presently confined to the relevant Low Earth Orbits¹¹ from 400-1000 kms, where space objects like observation satellites and ballistic missiles abound and not communication satellites that are placed much higher in the Geostationary Earth Orbit (GEO) of

35,786 kms. The X-37 B typically operates in altitudes of 400-500 kms and most military observation satellites including Imagery Intelligence (IMINT), Electronic Intelligence (ELINT) and Communication Intelligence (COMINT) satellites are typically in these LEO altitude belts of 400-1000 kms.

Applicability to Force Enhancement Missions

The X-37 B is eminently suited to the above mission. However, these would largely be confined to gap-filling capabilities related to lack of IMINT, ELINT, COMINT in particular sectors. Expecting a highly manoeuvrable platform like the X-37B to be employed to undertake an isolated task of IMINT or ELINT would amount to sub-optimal utilisation and hence in most cases, it would plug gaps in coverage of existing US constellations. The above is subject to the right kind of Electro-Optic cameras, radar or ELINT payloads being on board, which is eminently doable with present levels of miniaturisation. It could also be as LEO SATCOM repeaters or relay stations to augment tactical communications. However, not much use is expected in case of position, navigation and timing.

Applicability to Space Support Missions

Space support missions in terms of conventional launch and space support may not be the forte of the X-37B, however as an operationally responsive system that can bring space capabilities to the precise area of operations without the usual issues of launch windows, logistics etc is particularly useful to the war-fighter. Rapid replenishment of space capabilities and operational responsiveness may be inferred to be its prime tasks, in view of the missions possible as also the fact that the Rapid Capabilities Office of the U.S. Air Force is Boeing's customer for the X-37B Orbital Test Vehicle.¹²

Applicability to Space Based force Application Missions

The possibility of X-37 B being used to drop munitions or other objects from outer space at present doesn't appear plausible in view of the complexities involved. Apart from the real-estate issues on the cargo-bay of X-37 is the aspect that controlled re-entry of space objects into Earth's

atmosphere continues to be a challenging proposition even for the US. Hence, targeting from space is neither operationally, technologically feasible nor does it make much sense in economic terms. With regards to rapid transport of combatants across the globe, another space plane the XS-1 is making dedicated advances and hence the possibility of the unmanned and constricted X-37B being used for hypersonic troop transportation is presently remote.

In addition to the above, it could also be fulfilling its stated objectives of being a test bed for space based sensors, experiments, on-orbit inspections and a host of other tasks that allows us to infer that the X-37B is a platform created to not just fulfil a single mission but a host of missions. It fits into the US's global missions by enhancing both global observation and global strike. The levels of enhancement, as also promptness are not known. However, as technology strides ahead, the US would most certainly use it to fulfil its needs.

Conclusion:

The X-37 B is due to land back and perhaps the world would become wiser thereafter, or perhaps it would not. Either way nothing can draw attention away from the fact that perhaps the era of MultiRole Combat Aircraft is slowly but surely giving way to the era of Multirole Combat Space Craft. It makes sense to put things in order and prepare when the opportunities present themselves, rather than waiting for a crisis to hit home. It is time to take on the present and be prepared for the future lest we continue to prepare for yesterday's war.

Notes:

¹ Ref Union of Concerned Scientists, "The X-37B 'Space Plane': Still no Clear Mission, at a High Price", www.ucsusa.org/sites/default/files/legacy/assets/.../X-37B-fact-sheet.pdf, accessed on 14 Oct 14.

² Ref U.S. Air Force, "X-37B Orbital Test Vehicle" at factsheets on site of U.S. Air Force, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104539/x-37b-orbital-test-vehicle.aspx>, accessed on 14 Oct 14.

³ Ref Deng Shasha, "US Secret Space Plane X-37B May End Mission Soon", *Xinhua News Agency*, 14-06-2014 http://news.xinhuanet.com/english/sci/2012-06/14/c_131653372.htm, accessed on 15 Oct 14.

⁴ Ref AP, "US Space Plane Watched", *The Moscow Times*, 28 Jan 2011 and Sergei Balamov, "USA Concerned about Russia's response to X-37B", *Pravda.Ru*, http://english.pravda.ru/world/americas/07-02-2011/116803-russia_usa_space-0/, accessed on 14 Oct 14.

⁵ Ref Jaroslaw Adamowski, "Russia to invest \$ 55.6 Bn to boost Aerospace Defence Forces", *Defense News*, 14 Mar 2014, at <http://www.defensenews.com/article/20140304/DEFREG01/303040028/Russia-Invest-55-6B-Boost-Aerospace-Defense-Forces>, accessed on 14 Oct 14.

⁶ Ref Jonathan Ames, "Skylon Space Plane Economics Stack up", *BBC News*, 29 May 2014, <http://www.bbc.com/news/science-environment-27591432>, accessed on 13 Oct 14.

⁷ Ref Rob Coppinger, "Japan wants Space Plane or Capsule by 2022", *Space. Com* 24 Oct 2012 <http://www.space.com/18198-japan-plans-manned-capsule-space-plane.html>, accessed on 10 Oct 14.

⁸ For additional details, see Brian Weeden, "X-37B Orbital Test Vehicle fact Sheet", Secure World Foundation at <http://www.swfound.org/about-us/staff-publications/publications-by-brian-weeden/>, accessed on 14 Oct 14.

⁹ Ref David Robinson, "Adolf Hitler's plot to Bomb New York", *DailyExpress*, 04 Jan 2013, <http://www.express.co.uk/news/world/368490/Adolf-Hitler-s-plot-to-bomb-New-York>, accessed on 14 Oct 14

¹⁰ It may be noted that these perceptions are followed by most militaries across the globe with minor modifications.

¹¹ LEO or Low Earth Orbit ranges from 400-1000kms and most military observation satellites including Imagery Intelligence (IMINT), Electronic Intelligence (ELINT) and Communication Intelligence (COMINT) satellites are typically in these altitude belts. Medium Earth Orbits (MEO) typically range from 10000-28000 kms.

¹² Ref Site of Boeing, "X-37B Orbital Test Vehicle", http://www.boeing.com/boeing/defense-space/ic/sis/x37b_otv/x37b_otv.page, accessed on 14 Oct 14



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