

rocket science blog

news from the edge of gravity



27 Feb 2018 at 00:00 48 Comments

Posted on 12 January 2018 by [Daniel](#)

→ TIANGONG-1 REENTRY UPDATES

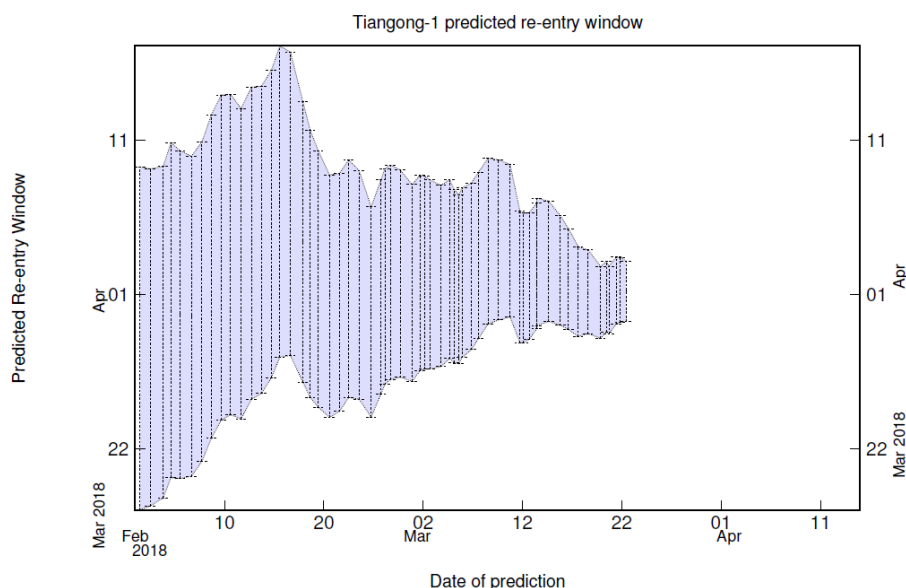
Latest reentry forecast provided by ESA's [Space Debris Office, ESOC](#), Darmstadt, Germany.

Update 22 March 2018

The current estimated window is ~30 March to ~3 April; this is highly variable.

Note:
[Read our updated FAQ in English](#)
[Hier lesen Sie dieses FAQ in deutscher Sprache](#)
[Preguntas frecuentes sobre la reentrada de Tiangong-1](#)

Reentry will take place anywhere between 43°N and 43°S (see [map here](#)). Areas above or below these latitudes can be excluded. At no time will a precise time/location prediction from ESA be possible. This forecast was updated approximately weekly through to mid-March, and is now being updated every 1~2 days.



Tiangong-1 reentry window forecast as of 22 March Credit: ESA

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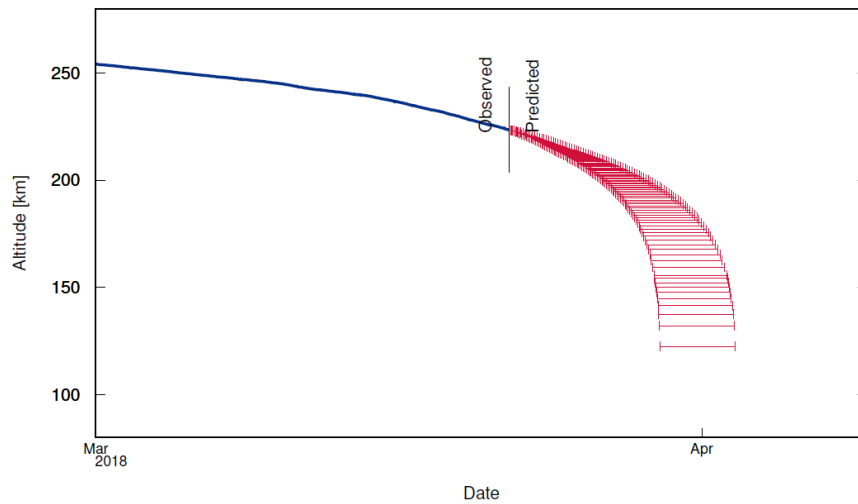
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Tiangong-1 Altitude Evolution



Tiangong-1 altitude decay forecast as of 22 March Credit: ESA

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COMMENTS



T Zevo says:

The parenthesis referring to Spain, Portugal, Greece seems irrelevant to re-entry of Tiangong between 43° north and 43° south!
It seems that the scientific community is rather casual about the potential consequences of this uncontrolled re-entry situation.
Little press on this for fear of embarrassing China?

[Reply](#)



Modest Zlatolobov says:

They are casual about it because they understand the probability of

someone being hit by part of the station. Read the FAQ.

[Reply](#)



Ours says:

Actually it has been extremely difficult to calculate the reentry. China discussed this and began working on the problem with all global space partners and agencies in November..... What do you expect?

[Reply](#)



Space Lover says:

It's actually been Virtually Impossible. Tiangong-1 suffered from an unpredictable and unpreventable Malfunction. It's out of Control, because they CANNOT Communicate with it! Hence, they have NO CONTROL of it. Any expected Re-Entry Points are ONLY Assumptions, calculated on Fluctuations in Altitude and Rate Of Descent. Tiangong-1 is NOT Travelling in a Stable Orbit. It is Rolling and Spinning.

[Reply](#)



Space Lover says:

I think they have mentioned the stated locations because they are referring to the associated Land Mass in Europe (seeing that it the ESA).

[Reply](#)



Johnny Gleen says:

This debate is very unusual. Highly questioned not only time and space of re-entry but whether anything will reach the ground. Some data is very hard to obtain, especially radioactive data and the full mass of that Gyroscope, which is like a massive flywheel made of stainless steel, it's shape and materials are quite likely to survive re-entry if it is massive enough.

[Reply](#)



John Kinahan says:

People (e.g. Fox News) interprets your examples for 43 degrees N to 43 degrees S to mean Europe, and the continental US is not in its path... You should clarify this...

[Reply](#)



Modest Zlatolobov says:

Here is the reentry map from ESA's FAQ http://blogs.esa.int/rocketscience/files/2018/01/esa_esoc_tiangong1_risk_map_jan2018-1024x375.png

[Reply](#)



Seamus McDermott says:

Interesting. I hadn't considered that the vehicle spends more time at its extremes of latitude than it does anywhere else, and hence the probability of crashing in those areas is much higher.

[Reply](#)



Viktor says:

The positive side of that potential tragedy is more positions at space debris science.

[Reply](#)



CH says:

Its amazing that these space stations are coming down and there is no back up system to blow them up..OR guide them ..
I thought we all learned a lesson when sky lab came down about 30+ years ago..
Its all well and good that there is more land and water, than populated areas. BUT , its going to come down somewhere and land on ONE grain of sand.. And what was the calculations on being that one grain of sand?
it could as easily be the middle of a city.. A building full of thousands of people.
If they put them up. There should be some way to deal with a re entry..
Simpe ..Right?

[Reply](#)



Daniel says:

Hi CH: We passed your comment to Holger Krag, Head of ESA's Space Debris Office here at ESOC in Darmstadt, Germany. He replied as follows:

Indeed, if it is shown that the on-ground casualty risk would be unacceptably high, most national guidelines recommend designing missions so as to enable a controlled reentry. A controlled reentry entails ensuring that the spacecraft or satellite has on board systems to lower its orbit by propulsive means, typically comprising a thruster and fuel, such that a specific geographical area on ground can be targeted. Most operators use a largely uninhabited area on the South Pacific Ocean.

However, even if this is implemented in the design, in-flight failures could prevent such a controlled reentry and, hence, spaceflight will never be

100% risk free.

When it comes to the actual risk associated with reentries, we have to say that from the about 30 000 tonnes of hardware that have re-entered so far, no casualty on ground has ever been confirmed.

In fact, the amount of mass re-entering each year is, today, much lower than it was in the age of the Space Race in the 1970s and 1980s. In general terms, the likelihood of a person being hit by a piece of space debris is lower than the likelihood of being hit by lightning twice in the same year.

Note that atmospheric break up will cause reentering objects, like satellites, to disintegrate into their constituent parts or components, small portions of which may survive to reach the surface. These will not all fall on the same spot, but rather will be dragged apart and will land with significant separations, typically on the order of over 100 km.

Hence, the components of a complete spacecraft will never fall together into a city.

Note also that the velocity with which these fall is much slower (typically < 300 km/hr) than, for example, a meteoroid. As a consequence, no crater is ever generated by falling space debris.

[Reply](#)



Aaron Schuman says:

The odds are vanishingly small. But yet on 1/22/1997, Ms. Lottie Williams, of Tulsa, Oklahoma, was hit by a piece of a Delta II rocket that fell out of orbit.

<https://www.wired.com/2009/01/jan-22-1997-heads-up-lottie-its-space-junk/>

[Reply](#)



Bill Michaels says:

Even though she was struck....

Williams was not injured. She was struck a glancing blow, and the debris was relatively light and probably traveling at a low velocity. It was also subject to wind currents, which mitigated the impact even further.

[Reply](#)



J. says:

According with my vision will crash in Thailand – Philippines area, ~ 18 march.

[Reply](#)



G. says:

What is the altitude lower limit for satellite TIANGONG 1, I see its at 150 miles 2/27/18, at what height will it start to burn up??

[Reply](#)



Dan says:

Once it hits 100-110 miles altitude, atmospheric drag will slow the station down until it deorbits on its own. I expect that ESA or NASA will then be able to give a better prediction of the impact zone and if it is over land, those areas will be alerted to the impending impacts.

Once it gets to about 75 miles up, the craft will begin to break up with the solar panels breaking off as well as antennas and other external features. As it plunges into the deeper/thicker atmosphere under 50 miles will see peak burn up and breakup of the station. then, under 150,000 feet, the surviving pieces will slow to under mach 2 and start to cool down, meaning no more fireworks. the pieces that survive will then further slow as their terminal velocity drops, meaning pieces will impact the planet's surface at probably 250 to 300 MPH with the smaller survivors slowed to 100 MPH or so.

[Reply](#)



G. says:

Thank you! I'm under its orbit in southern Oregon
And you just never know!

[Reply](#)



Daniel says:

Hi G.: We passed your query to Holger Krag, Head of ESA's Space Debris Office. He replied:

100 km is normally the lowest altitude at which a spacecraft can still complete one full orbit (one full revolution) around Earth. Atmospheric break-up then starts, typically, below that, with most severe heating between 80 and 70 km.

Destruction then ends at around 30 km altitude, when the break-up remnants have been completely decelerated and start to fall vertically.

[Reply](#)



G. says:

thanks I'll be wearing a hard hat for the rest of my life!

[Reply](#)

Andrew Jones says:

Will there be any further updates, beyond the February 21 post? Thanks!

[Reply](#)

Space Lover says:

Yep! .. That means ANYWHERE between 43 Degrees North and 43 Degrees South. Those Curved Lines are the ORBIT. No, it doesn't travel in a curvature: It circles Earth in a Set Orbit, but with the Rotation of the Earth, it appears to be a Curvy Orbit. When it's travelling upwards, it appears to travel SW to NE. When it's travelling downwards, it appears to travel NW to SE.: Depending what time of day/night it is, and where it is traversing.

[Reply](#)

MiGWind says:

How long before that roadster re-enters?

[Reply](#)

Daniel says:

Hi MIGWind:

The answer to your question can be found here:

<https://arxiv.org/abs/1802.04718>

This has not yet been peer-reviewed, so we can't confirm. But it makes for interesting reading.

[Reply](#)

M says:

What about airplanes flying between these altitude between those days? Any chance the airplane get hit by debries ?

[Reply](#)

Daniel says:



Hi M: We passed this question to the Space Debris Office team. One of our analysts, Stijn Lemmens, replied:

In essence, the risk to an air plane or to air traffic routes is not much different from the risk to any congested place on Earth's surface. Note that aircraft are built so as to be at least somewhat impact resistant, as they frequently have to deal with the risk of bird strikes.

[Reply](#)

RE says:

I am always thinking about items floating in space that could eventually fall on the surface of our planet. I believe the last two questions posted by MiGWind, and M are very valid. Elon's roadster may take much more time, but the risk of an aircraft of being hit by debris seems to be real and much sooner.

[Reply](#)

K817 says:

Considering Elon's roadster is on the way to Mars, I would think the chance of it ever reentering Earth's atmosphere is highly unlikely.....

[Reply](#)

David says:

"Spain, France, Portugal, Greece"...

Funny: they do not mention Italy (any location South of Tuscany may be impacted), while France is almost completely excluded being above 43°N

[Reply](#)

Richard Karash says:

Lede paragraph here and through the news implies the probability is evenly spread between 43° N and S. Check the re-entry map. Highest likelihood impact is AT 43N or 43S. A sinusoid spends more time at the boundary than at any point in the middle.

<http://blogs.esa.int/rocketscience/2018/01/12/tiangong-1-reentry-updates/>

[Reply](#)

anon says:

The orbit is not a sinusoid. That is an effect of producing a flat map of the earth with the orbit overlaid.

[Reply](#)



Marty Sizemore says:

What about Sicily?

[Reply](#)



Tom Moxley says:

Porchigal—forgive me I know that's not spelled right

[Reply](#)



Ken says:

Here is the issue with the data presented and the way it is being portrayed; ESA claims that the likeliest area of impact is between 43 degrees north and 43 degrees south, good, I agree. The issue though is that you cannot accurately predict a date, much less a time for re-entry. This means you don't know at which point in its orbit the re-entry will occur. Therefore, you cannot say with ANY certainty that the likeliest area of impact is Europe. In truth, it could be almost anywhere in North, Central, or South America just as easily. Please be more careful with the data you present to the press and public.

[Reply](#)



Sam says:

Is there any way for me to be notified (like via text or email) when it begins to burn up? I'm apparently within the falling latitude at 41.65 degrees North. I'd really like to see the fireball if possible.

[Reply](#)



G. says:

<https://www.n2yo.com/?s=37820>

You can receive text messages before it fly's over your location, follow the instructions under alerting tools

[Reply](#)



Larry Hoffman says:

With all the advances in space equipment, why can't they land a person on the broken satellite and fix it?

[Reply](#)



Walfy says:

Despite all the advances in space equipment, it is still extremely expensive and complicated to fly up there. And dangerous, as a lot of spacewalking would be required to find out why it stopped communicating.

[Reply](#)



rdp says:

Might the de-orbit and breakup be visible from earth's surface? And if so, how far in advance will we know when and where to watch?

[Reply](#)



Walfy says:

Yes, reentry burn up will be visible, probably even during the day. There will be no advance notice of exactly where the burn will take place, as that is too unpredictable. Your best bet to see it would be to track it within the range of dates stated at top of this page and look up whenever it passes over. Cross your fingers that it comes down above you, but not on you.

[Reply](#)



stella says:

London has a tiny threat of being hit.

That's London, Ontario.

[Reply](#)



J says:

Actually, the odds of a catastrophe from this station or any man made spacecraft uncontrolled re-entry is purely statistical. That said, the danger from this craft is somewhat numerically equal to the chance of an Earthquake causing damage to any populated area on Earth. Over time the over-all odds increase not unlike the odds of a devastating earthquake, as when we say "A Big One is overdue". So eventually we will have a terrible event, not unlike an aircraft hitting a nuclear power-plant, something will eventually happen! But for each event the odds are very very tiny.

[Reply](#)



Kylie Smart says:

Hi there,
Can someone please let me know if there is a risk to planes? I am flying on an 11 hour flight on the 30th of March in the high risk area and am concerned

[Reply](#)

LaurieAG says:

It looks like it is a curving attenuating wave with another due to the cross spin. Try basic linear algebra with a high average granularity, 1 km drop per day and scale the drop up to get a better view of the wave(s). Create a series of plots on the same chart with the drop on the lh side, keep the days on the bottom constant for now and find the best match. Then, when you have the best match, scale down from one day, on the same chart, using multiples of 2, 2^2 , 2^3 and finally 2^4 . Somewhere in amongst all of this you will find the pattern you are looking for. Regards.

[Reply](#)

LaurieAG says:

Just to clarify, anchor the top left corner of your plot at 252km altitude and rescale from that point down each time. Anchor the date at March 1 2018 and don't change the scale just plot for averages of 1, 0.5, 0.25, 0.125 and 0.0625 days (or 16, 8, 4, 2 and 1 orbit(s)) across all the first plots. The fall is just a parabola which the incoming object bounces above and below although a bit of a fudge factor may be required to get the best match. Adjust for new data and compare with the projections and repeat. This should give a better projection and more lead time so once the best match stabilises prepare. It would help if you could get someone who had a good idea about the ANB. Regards.

[Reply](#)

PeterZ says:

CMS has updated the on-orbit Status Update for Tiangong-1 every day since March 14.(Before this they updated weekly.)China notified the United Nations Office for Outer Space Affairs of the upcoming re-entry and committed to enhanced monitoring and forecasting of the orbital decay, including requesting an international joint monitoring and information dissemination campaign under the framework of the Inter-Agency Space Debris Coordination Committee .And said will be in the last minute through the media timely release of information.

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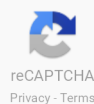
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