**Dealing with Space Debris**

The Earth is surrounded by a cloud of space debris. This material ranges from dead satellites and upper stages of launchers, to fragments of material and even flecks of paint…and all this junk could do enormous damage to operational spacecraft.

On 18 April (2017), experts from around the world will be meeting at ESA’s European Space Operations Centre (ESOC) at Darmstadt in Germany for the 7th European Conference on Space Debris.

Delegates will discuss the extent of the debris problem and what can be done to ensure that satellites we rely on – providing us with services such as navigation, TV and weather forecasting – can operate in the future without elevated risks.

**A-Roll**

10:00:10

***Satellite launch – flash of rocket, indistinct launch (Gaia 19 December 2013)***

<http://www.esa.int/esatv/Videos/2016/09/First_data_from_ESA_s_Gaia_mission/Launch_of_Gaia_19_December_2013>

For sixty years, we have launched satellites, spacecraft and astronauts into space.

10:00:18

***x/fade into: Debris cloud animation (with Debris not to scale caption)***

As a result, the Earth is surrounded by a cloud of debris – there are more than 18,000 objects being tracked from the ground, at least 750,000 fragments of around a euro in size and millions of pieces that are smaller. Only 1,100 are functional spacecraft.

And at typical impact speeds of 40,000 kilometres per hour, all this material could do serious damage.

10:00:49

***Holger Krag, Head of ESA Space Debris Office***

*It is not comparable to a gunshot, the energy contained in a 1cm particle, hitting a satellite at that sort of velocity roughly corresponds to an exploding grenade. So, the consequences of such a hit mean a satellite failure, for larger objects even satellite destruction and fragment generation, which again has environmental consequences.*

10:01:11

***Spacewalk of Hubble servicing mission 1993***

We rarely get to see the effects of space debris but, in 1993, during the first Hubble servicing mission – a solar array was removed from the space telescope.

10:01:25

***Close-up solar array***

Back on Earth, the panel was found to be peppered with damage.

10:01:29

***Uncontrolled collision animation***

What space debris experts fear most is a chain reaction – where objects break apart in collisions…and fragments go on to smash into other objects, creating more debris.

10:01:42

***Holger Krag, Head of ESA Space Debris Office (with cutaways)***

*These collisions generate more fragments and these fragments are candidates for more collisions to come, so follow-on collisions if you like and our fear is we enter into a cascading effect where one collision triggers the next one and this is not anything that will happen within a microsecond like in the movie gravity, but slowly and unstoppable.*

*Over decades the frequency of collisions might increase without human influence and that’s a scenario that might render some regions of space unusable for spaceflight and that would be a disaster for spaceflight.*

10:02:20

***Set-up shots ESA Space Debris Office, ESOC, Darmstadt Germany (31 March 17)***

Here at ESOC, ESA’s team tracks space surveillance data and plans manoeuvres to keep the agency’s operational satellites out of harm’s way.

10:02:35

***[into animation shots]***

ESA also ensures that when its spacecraft come to the end of their operational lives, they can be taken out of orbit, to burn up in the atmosphere, plunge safely into the ocean or move to so-called ‘graveyard orbits’ – safe from collisions.

10:02:47

***Space debris removal b-roll (from:*** [***http://www.esa.int/esatv/Videos/2013/04/Space\_Debris\_B-Roll/B-roll***](http://www.esa.int/esatv/Videos/2013/04/Space_Debris_B-Roll/B-roll) ***)***

Concepts are also being developed for missions to capture and remove objects from orbit – perhaps using nets or sails.

The top priority, however, is to avoid creating a new generation of space debris.

10:03:01

***Holger Krag, Head of ESA Space Debris Office***

*Use of services from space is in everyone’s interest. Mitigating the problem – space debris – should be in everyone’s interest as well. We have created a global problem that can only be solved on a global scale. It needs a global response****.***

10:03:18

***Space debris cloud animation***

With hundreds of new satellites due for launch in the coming years, ESA is working with its international partners to ensure this orbital pollution doesn’t get any worse.

**B-roll**

**10:03:29:15**

**1. Holger Krag, Head of ESA Space Debris Office soundbites (English)**

**10:05:07:21**

**2. Holger Krag, Head of ESA Space Debris Office soundbites (German)**

**10:08:03:01**

**3. Set-up shots in ESA Space Debris Office at ESOC, Darmstadt, Germany (31.3.17)**

**10:09:05:00**

**4. Space Debris animation (not to scale)**

- Geostationary ring

- Spacecraft explosion

- upper stage rocket

- Zoom into Low Earth Orbit

- Flurry of satellites in Low Earth Orbit

- Collision

- Satellites around the Earth

**10:12:16:06**

**5. 1993 Hubble Space Telescope servicing mission**