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Preventing a Cold War in Space Using European Research and Innovation Programs

José-Miguel Bello y Villarino

The Coming Cold War in Space

In 2018, the United States President proposed a Space Force[1] as a sixth branch of the US military.[2] In 2019, the President of India announced that his country had shot down a low-orbit satellite,[3] becoming the fourth country to test an anti-satellite (ASAT) technology in a span of twelve years. These events should come as no surprise. There is a space cold war in the making. Russia, China, and the United States are leading the way, racing to ensure that their space-related assets, which play an increasingly essential role in modern warfare, can match, surpass, or counterbalance the capabilities of others. These developments present a greater threat of military confrontation than the 1983 launch of the U.S. Strategic Defense Initiative, better known as "Star Wars".[4]

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Since 1983, there had been an unspoken *Pax Americana* in outer space. An informal global moratorium on the testing of anti-satellite weapons had been initiated by Russia[5] and generally supported by the international community. There was a global understanding of the benefits of avoiding a weapons escalation in, and towards, space.[6] Each year, the General Assembly of the United Nations (UNGA) passed nearly unanimous[7] resolutions on the "Prevention of an Arms Race in Outer Space" (PAROS) (Res. 36/97C). There were even attempts to give these efforts legal force. In 2008, Russia and China submitted a draft Treaty on the Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT) to the Conference on Disarmament. Article II is clear about the treaty's objective: "The States Parties undertake not to place in orbit around the Earth any objects carrying any kinds of weapons, not to install such weapons on celestial bodies and not to place such weapons in outer space in any other manner, [and] not to resort to the threat or use of force against outer space objects".[8] These declarations reflected a desire to keep space peaceful, meaning either "not militarised"[9] or "non aggressive".[10]

Ironically, this proposal was tabled shortly after China's confirmation in 2007 that it had destroyed one of its own satellites with a guided missile, as a test.[11] In addition to the resulting space debris problem that was generated, this action forced global powers to rethink the challenges of space security.[12] The United States quickly followed, demonstrating in 2008 its own anti-satellite system (Aegis Ballistic Missile Defense System) by shooting down its own errant spy satellite as it was falling out of orbit.[13,14] The United States has since acknowledged having an anti-satellite system, the Counter Communications Satellite System, and it has several latent capabilities, notably its ground-based missile defense interceptors.[15] Russia has also repeatedly tested the PL-19 Nudol ballistic missile,[16] which can strike objects in orbit.[17] There is also clear evidence that other capabilities are being developed to cripple space assets and make space infrastructure useless, including cyberattacks on satellites,[18] lasers capable of knocking down space objects,[19] and methods to jam signals from space.[20]

As a result of this dynamic, we have today a militarized space, where a quarter of the active satellites have some military use.[21] Space is today a theatre in war plans. From a legal point of view, this militarization was made possible through a particular interpretation of article IV of the 1967 Outer Space Treaty.[22] This interpretation distinguishes between "peaceful purposes" – applicable to space in general – and "exclusively peaceful purposes" – restricted to certain celestial bodies. Military uses of the moon and other celestial bodies are then outrightly prohibited, but the "empty space" between celestial bodies can be militarized. This line of reasoning could also justify weaponization of that empty space, for example, placing weapons in a satellite. The only legal limit would be the ban on weapons

of mass destruction in space established by the same article IV. To prevent it, the UN Assembly General passed in December 2014 UN Resolution 69/32 calling for "[n]o first placement of weapons in outer space". This attempt to collectively agree on the non-weaponization of space received more limited support than previous PAROS resolutions. Four states voted against it and another forty-two abstained.[23,24] It cannot even be excluded that militarization may have already happened.[25]

All of this is leading military actors to consider the Earth's orbit a new "warfighting domain".[26] The U.S. Air Force's "Transformation Flight Plan" of 2003 acknowledged that future adversaries could attack space assets, mainly from the ground, and that weapons in orbit may eventually be required to protect those assets.[27] The current U.S. National Security Space Strategy refers to systems to "deny and defeat an adversary's ability" to successfully carry out "attacks targeted at the U.S. space systems".[28] The most recent threat assessment of the U.S. intelligence community notes that both Russia and China "aim to have nondestructive and destructive counterspace weapons" to "reduce US and allied military effectiveness" and points to a military trend in China and Russia "designed to integrate attacks against space systems and services with military operations in other domains".[29] Some believed that the weaponization of space,[30] the establishment of a space force,[31] and other non-peaceful space-related activities were inevitable steps in the decades-long development of space warfare capabilities by the United States, China, and Russia. For these authors, this is not a race "to dominate space" but an incremental development of "a range of options to control or deny outer space in a time of open conflict".[32] Regardless of the view, space assets will doubtless play a role in future non-peaceful relations between space-faring nations and are already playing a deterrence role. However, a continued and escalating space-based cold war need not occur if more trust can be established among the key players.

The European Union as a Broker of Trust

The mistrust that exists among China, Russia, and the United States regarding space-related activities is a logical consequence of the role of space in modern warfare described above. The inability of the participants in these weapons races to adequately assess one another's capabilities and intentions is driving them to develop even greater capabilities to pre-empt potential adversaries. Yet it is possible to restore a certain degree of trust by allowing space powers to better assess risks, capabilities, and intentions, and break the cycle of escalation. This article contends that cooperation on space-related global challenges can build that trust. Unfortunately, leadership in the domain of space by any one of these three actors is unlikely to be accepted by the others, even if the potential results are beneficial for all. These countries too often present themselves using adversarial language, with media supporting such views.[33]

The European Union (EU) is the only global actor that has all of the tools necessary to assist in the establishment of confidence-building measures between China, Russia, and the US in the domain of space. The EU is a key actor in space[34,35] despite lacking a space agency as such. Other international organization, the European Space Agency (ESA), provides technical support for the flagship EU programs.[36] The EU has asserted its presence in international space-related policy-making and acted as a diplomatic hinge, for example, in the development of guidelines for an International Code of Conduct for Outer Space from 2008 onwards.[37] Even though other global actors could offer similar or superior combinations of space-related technology, a skilled workforce, and budgetary capacity, only the EU has the appropriate institutional framework – a multi-country, compromise-driven system of governance – combined with a civilian-only research and innovation program.[38] Other non-state entities, such as the ESA or the United Nations, are unable to undertake cooperative efforts to build trust among the three nations because they lack either the budgetary capacity or an

The EU in particular can offer a civilian, research-driven, diplomatic tool. Such a tool is already within its current legal and policy framework and would build upon previous EU-sponsored actions in space research and innovation. It would not require significant legislative change or a critical rise in expenditure. The main requirement is a clear commitment to its objectives and the political willingness to engage with international actors that may be seen as more inclined to hostile discourse or behavior than is normally promoted by the EU. An EU-driven approach would offer the image of a peace-loving, supranational entity reluctant to or incapable of acting militarily. Its decision-making process already builds in the different sensitivities among its members in relation to the other three actors. Among the EU countries some are closer to China,[39] some to the United States,[40] and some to Russia.[41] While the EU might be expected to cooperate closely with the United States opposite China and Russia, the EU has in the past "recast problems the US interprets as solvable solely with the hammer of military intervention as problems of trade or diplomacy […] forging its own path in service of its ambition to be considered a global player".[42]

Along with the ability to lead, the EU has every reason to act. Against the backdrop of escalating tensions in space, the EU and its member states appear to be peaceful bystanders. However, as one of the leaders in outer space activities, especially commercial satellite activities, the EU and its members have much to lose from an outright conflict. By bringing the three space powers together, the EU could achieve better security and reliability of space assets, which would benefit its population as well as the whole planet. Additionally, it could project its economic and research power as a powerful diplomatic tool, casting itself as a key international player and global broker in space affairs. The "smart" strategy[43] envi-

sioned here would combine both hard and soft power under a humble leadership that only the EU seems able to exercise. Europe would not be a resolute leader in the usual sense. Confrontation is beyond its power and not in its DNA. Instead, "[i]n a dangerous world, Europe is the holder of the balance".[44] In the context of space, the EU "represents a natural bridge between space competitors and possesses the track record and credibility to serve as the principal 'middle diplomat' of the global space community".[45]

The European Framework for Enhancing Cooperation

The framework needed to foster cooperation in space between China, Russia, and the United States (as well as other nations) is already in place in the EU. The EU's official position regarding the international projection of its research and innovation is formalized in Horizon 2020 (H2020), the Framework Programme for Research and Innovation (2014-2020).[46] The H2020 Regulation envisions large-scale projects, carried out with international cooperation.[47] It anticipates working with partners in third countries to address many of its objectives, particularly those relating to the Union's external and development policies and international commitments.[48] It further establishes that space activities should "support the European research and innovation contribution to long term international space partnerships," acknowledging that "space undertakings have a fundamentally global character".[49]

This was built on international cooperation under the previous framework program (FP7), which recorded a significant participation of entities from those three countries:[50]

- United States: 517 instances of participation, in 410 projects, with a total contribution of €80 million,
- Russia: Participation in 545 projects, with a total contribution of €73 million; and
- China: 383 instances of participation, with a total contribution of €35 million.

Concerning space in particular, a search in the European Commission database on participation in previous EU research and innovation (R&I) programs[51] shows that the European Union has contributed to several projects with Russian, Chinese and U.S. participation. In total, there have been around twenty projects with at least one participant from one of those countries. A small but significant number of these projects received technical or advisory input from individuals from those countries on a personal basis.[52] Some of those individuals were working for government agencies within those countries.

Based on H2020 and its predecessor, it is clear that international scientific cooperation is desired by the EU, it is legal, and that there is precedent. By aligning space-related diplomatic policy with parts of space-related R&I policy, the EU can continue to catalyze efforts to solve global problems with the participation of the most active space-faring nations. By specifically targeting China, Russia, and the United States, the EU can help establish confidence and de-escalate tensions.

Establishing TCBMs around Global Challenges

Several authors have recently proposed the establishment of Transparency and Confidence-Building Measures (TCBMs) for enhanced space security. Space TBCMs are designed to mitigate "the risk of misperception and erroneous assessment of the activities of States in outer space," analogous to their terrestrial role during the Cold War.[53,54] In this context, Europe was described as "uniquely qualified to negotiate a twenty-first-century TCBM architecture thanks to its history of diplomacy and ability to identify common ground among disparate parties".[55] However, for the EU to act as an effective diplomat of the global space community in the development of TCBMs, its actions should go beyond developing legal approaches and codes of conduct. These are useful tools, but not sufficient to de-escalate conflicts. A more hands-on and personal approach can better open the necessary channels to understand the other countries' approaches and priorities.

The human factor of TCBMs in research and innovation is the key to success. The scientists collaborating in such initiatives would be the same scientists – or sufficiently close to – the scientists and industrial groups developing military technologies. Following Rotenberg's[56] interpretation of Charles Osgood's research on Cold War psychology,[57] these "structured reciprocally cooperative interactions" would create the necessary middle channels in a context in which the preferred political option seems to be to close the door to cooperation.[58] By bringing together space-related personnel from China, Russia, and the United States to address one or more global challenges, the EU can mitigate the building mistrust.

Appropriate global challenges that should be considered for this purpose should:

- Have a global character that justifies cooperation in a way that overcomes political resistance;
- Be sufficiently removed from military uses to avoid suspicion; in the cases of dual (civil-military) use,[59] the military use should not be the focus of the research;
- Be significant enough that success could be acknowledged with minimal achievements; and

- Address areas where the EU has already supported academic or technical work, but where international cooperation has not been fully developed.

Based on these requirements, areas in which the EU has no previous experience in cooperation are not included. Neither are areas with previous intensive international cooperation, such as the International Space Station.[60] Challenges such as space weather and extreme events are further omitted because they are less likely to deliver success with minimal achievements. Space weather prediction through Earth-based preparation and satellite technologies will not deliver "showcase" results, even if successful.[61] Extreme events such as gamma rays that could destroy the ozone layer[62] are too abstract and rare, as they are estimated to happen once every million years.[63] Taken all this into account, the most promising fields are space debris and near-Earth objects (NEOs). Furthermore, in these areas the work of scientific communities is often coordinated with research for military activities.

Space Debris

The ESA estimates that there are more than 170 million pieces of space debris in low orbit (i.e., posing a risk to satellites) as a result of human activity in space. Approximately 29,000 of those are larger than 10 cm across and capable of causing chain reactions which would destroy large numbers of satellites. The 2007 explosion created by the Chinese anti-satellite demonstration is thought to have caused 25% of existing space debris,[64] although the majority of total space debris mass, especially in low Earth orbits, has been created by the United States and Russia/USSR.[65] To date, international cooperation on space debris, through the Inter-Agency Space Debris Coordination Committee (IADC), has mainly focused on mitigation, or avoiding the creation of new debris.[66] A need exists for a collective approach to prepare and execute a massive clean-up if a chain reaction happens, particularly in orbits important for certain types of satellites.

An EU-funded project, with the participation of the IADC, could work on the development of prototypes and demonstration projects within a medium-term time frame (4-7 years). This kind of cooperation between Russia, the United States, and perhaps China has been suggested by others,[67] but would only be possible if a third party, such as the EU, catalyzes and funds the initial steps. The broadcasting of an in-space demonstration of such a cooperative technology would be a significant public-diplomacy achievement for all parties involved.

Near-Earth Objects

The most obvious example of a near-Earth object (NEO) is the risk of an as-

teroid hitting the planet, in line with the 1998 film "Armageddon." More realistic is the experience over Tunguska, Russia, when, in 1908, an object between 50 and 100 meters in diameter exploded, leveling over 2,000 square kilometers of forest, with a power equivalent of 5-10 megatons of TNT (hundreds of times greater than the first atomic bombs). According to the U.S. National Science and Technology Council, "[i]f a similar event occurred over a major metropolitan area, it could cause millions of casualties".[68] NASA estimates there are over 300,000 objects larger than 40 meters across that could pose an impact hazard and would be very challenging to detect more than a few days in advance.[69]

European states, the ESA, China, the United States, and Russia already collaborate on NEOs through the International Asteroid Warning Network (IAWN) and the Space Mission Planning Advisory Group (SMPAG). The former is tasked with developing strategies and protocols to assist governments in analyzing the consequences of asteroid impacts.[70] The latter was created on the basis of a recommendation by the Working Group on Near-Earth Objects of the Scientific and Technical Subcommittee of the UN Committee on the Peaceful Uses of Outer Space in February 2013 and endorsed by the UN General Assembly at the end of that year. In February of 2016 the SMPAG recommended an "actual demonstration of the kinetic impactor technique with a space mission" – essentially hitting the NEO with something to change its path – as the most promising technique.[71]

As with space debris, the technologies required for orbiting an asteroid, landing on it, and/or deflecting it, is the kind of cooperative work that may enhance confidence between space-faring nations. The know-how for these activities is not military in nature but has a close relation to non-pacific uses. The European Union could lead these efforts through funding and supporting the development of the roadmap for an international demonstration. It could also provide essential budgetary support and the political push to complete that demonstration in a ten-year horizon. This could be done on the basis of voluntary participation, but stirring enough publicity that non-participation could reach the level of a domestic political issue. These activities should be developed in close cooperation with the existing multilateral institutions and initiatives, but the EU should not hesitate to advance even if not all parties are on board at a given time – part of a gradual approach – and should keep the institutional architecture of these other international entities from obstructing progress.

H2020 and Beyond

By establishing transparency and confidence-building measures centered around space debris and NEOs, the EU can help build trust between China, Russia,

and the United States. Although the R&I framework of the EU can be used to establish space R&D-based TCBMs, maintaining or developing existing initiatives within H2020 will not suffice. Those initiatives have relied on open calls for project proposals, and the submission and funding of any proposals with one or more members from China, Russia or the United States has been by chance rather than by design. The new "Horizon Europe" program is an opportunity to exploit and deepen the existing international cooperation in space and serve as a diplomatic tool.

This €100 billion program is being developed as a new iteration of the EU's flagship R&I plan, to support activities with a transnational component in 2021-2027. Through "Horizon Europe," the European Union should welcome calls aimed at essential international cooperation in space. Where possible, it could consider funding joint programs with agencies from China, Russia, and the United States, and perhaps Japan and India as well.

Finally, after testing the waters, the EU should set the relevant framework to draft, with the United States, Russia and China, a roadmap for practical cooperation in these areas. This roadmap could receive, at the relevant time, the highest political support. Until then, promoting personal and professional relations among scientists, engineers, and other space-related practitioners from those countries is a first good step. **SD**

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