Contributing to Europe's sovereignty and security

Position paper by the Dutch industry on the possibilities of space communications for defence

In this position paper, we as the Dutch satcom industry address the challenges faced by Europe and the Netherlands with regard to secure space communications and pose actions to help overcome them.

Challenges:
An overdependence on non-EU infrastructure, a threatened supplier base losing competitiveness and disruptions in cybersecurity standards and governmental intelligence need addressing today.

Dutch strengths:
Our strong heritage in semiconductors, radar, ultraprecision optics manufacturing and space instrumentation, as well as recent investments in quantum technology and (optical) satellite communication technology, help us position the reliable and trustworthy Dutch solutions for these challenges.

Call to action:
We propose three key actions to position the Dutch industry and enable relevant interoperable capabilities for Dutch and European governments: building a constellation interoperable with IRIS^2 and SDA, focusing on user terminals and enabling a QKD ground station for the space segment of EuroQCI.

To get started:
We advocate for a public-private collaboration to unlock the real-world applications and to co-develop further ambitions in line with the Defence Space Agenda and Long-Term Space Agenda to reach a secure future for Europe and the Netherlands.

The challenge for Europe

At the border of the NATO treaty area, Europe is engaged in war. Threats are posed by both governmental and non-governmental actors, potentially leading to conventional or hybrid warfare. In this context, secure space communications are crucial for timely decision-making, allowing for a resilience, flexibility and global coverage that terrestrial communications cannot offer.

Like many European Union member states, the Netherlands' military has access to foreign space communications infrastructure including the Advanced Extremely High Frequency (AEHF) and Wideband Global Satcom (WGS) systems, which provide state-of-the-art communication capabilities worldwide.

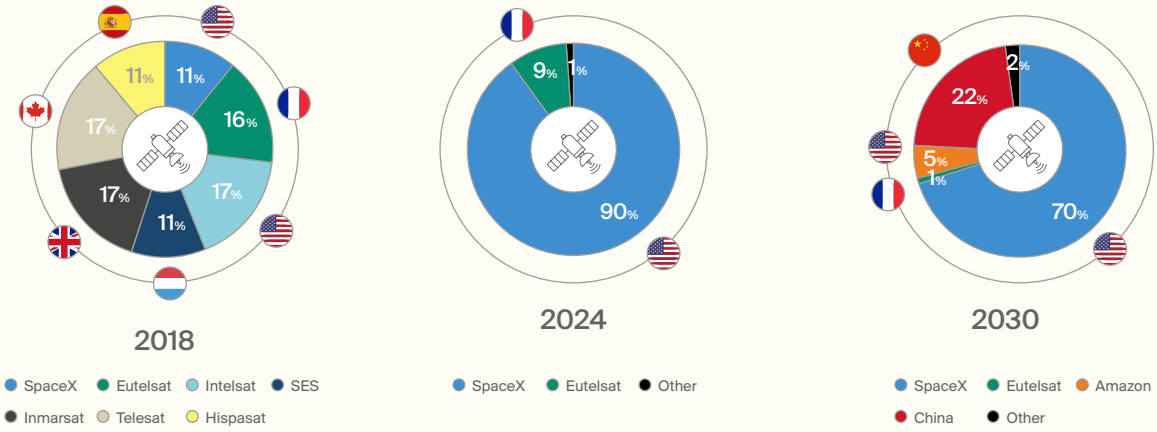
To ensure that Europe and its member states retain adequate access to secure space communications end-to-end in the future, the following challenges should be addressed.

- **Overdependence on non-EU infrastructure.**
  Most European countries, including the Netherlands, can rely on excellent NATO military communications infrastructure as well as access to European national capabilities through bilateral agreements. Alongside that, European-led sovereign communications infrastructure is needed to ensure availability in times of geopolitical fragility and conflict, to avoid priority denial on bandwidth and to gain better control of resources. This is in line with the Netherlands Defence Space Agenda (2022), which alongside strengthening NATO co-operation calls for more European and national resources. It is also in line with the Long-Term Space Agenda (2024), which calls for adequate sovereign access to information facilitated by (optical) satellite communications, sensors, supporting technologies and distribution of satellite data.

- **Threatened EU and NL supplier base (industrial and service).**
  Europe's supplier base, which serves both commercial and governmental needs, is being dramatically challenged at all stages of the value chain by the emergence of a US and privately-led monopoly: Starlink today, reinforced by Kuiper tomorrow. For both sovereignty and economic prosperity, the European supplier base needs reinvigoration. This is in line with the recent European Defence Industrial Strategy (EDIS) and European Defence Industrial Programme (EDIP) initiatives, which aim to strengthen the European Defence Technological and Industrial Base (EDTIB) and to achieve defence-industry readiness for the space domain, amongst others. It is also in line with the latest Dutch Defence White Paper (2024), which identifies "space technology" as one of five areas for more focused investments. It should be noted that in Europe, major space programmes are generally entrusted to the ESA, where the Dutch budget is relatively small compared with those of other countries, thus disabling our industry from positioning itself favourably with regard to these major opportunities.

SatCom satellites

Graph shows the distribution of optical in-orbit satellite counts by country, based on information available from public sources, verified where possible. Especially for China, verifying the information has been challenging. The percentages should be regarded as indicative. While this graph only shows hardware, it is important also to appreciate the market for services (payloads, data processing, etc.) correlating with it.



- **Disruption of cybersecurity standards and governmental intelligence.** It is anticipated that quantum computers will become able to break conventional cryptography within the foreseeable future. New encryption methods will therefore be required. Currently, countries like China and Russia are leading the technological race in space-based quantum secure communications, which offer systematic and reliable detection of signal interception.

Acknowledging the need for sovereignty in satellite communications and cybersecurity, Europe has initiated several major space initiatives through, for example, the European Defence Agency and the European Commission (IRIS^2 and EuroQCI).

- IRIS^2 aims to serve the military and governmental secure communication needs of European governments. It will begin as soon as 2025 with a pooling and sharing of member states' national assets (GOVSATCOM) and will expand shortly thereafter to become a multi-orbital, European-owned constellation. The ambition, besides serving military and other governmental applications, is to enable mass-market civil applications and broadband internet services throughout Europe.

- EuroQCI will be a secure quantum communication infrastructure spanning the entire EU. It will reinforce the protection of Europe's sensitive data by integrating quantum-based systems into existing communications infrastructures. EuroQCI is set to become a key pillar of the EU's Cybersecurity Strategy for the coming decades. It aims to be an integral part of IRIS^2 and is one of the main selling points of the future EU satellite constellations.

Dutch engagement in IRIS^2, either directly or through supporting projects like the European Protected Waveform, as well as the space component of EuroQCI, remains limited to date, but we as the Dutch satcom industry do see a short-term opportunity to join and align our national efforts with European initiatives.

The Dutch ambition

Leveraging our heritage in semiconductors, radar, ultraprecise optics manufacturing and space instrumentation, our (ASPI-rated) world-class position in quantum communications (QuTech's entanglement networks, Eindhoven's steps towards a multi-user QKD network) and recent public-private investments in ESA's optical satellite communication programs, the National Growth Fund investments (QDNL & NXTGEN Hightech) and the developments of constellation enabling abilities in the PAMI project, the Netherlands satcom industry aspires to:

- first, position itself as a trustworthy partner for the Dutch government by solving its challenges with respect to secure space communications; and,
- second, in doing so, position itself as a reliable partner for upscaling solutions to European projects, such as the IRIS^2 and EuroQCI programmes.

The above can be realised through three main actions linked to the challenges we have identified.

1. Creating independence of non-EU infrastructure through Dutch engagement in Europe via a sovereign integrated constellation.

- Building upon its experience of Brik-II and MilSpace2, the Dutch Ministry of Defence has expressed interest in a sovereign integrated satellite constellation. Such a constellation can combine intelligence, surveillance and reconnaissance (ISR) capabilities with secondary payloads, specifically for communications. Integrating (optical) communications capabilities in an ISR constellation would:
  a) enable safe and secure transmission of ISR information;
  b) enable entirely sovereign access to secure and resilient satcom for the Netherlands in the event of a crisis; and,
  c) contribute towards the European satellite pooling of GOVSATCOM.
  The communications payload of the ISR satellites could feature optical intersatellite links and hybrid downlinks to user terminals, with RF for guaranteed continuity of operations. This can be seen as an upscaling of recent work by the Optical Alliance initiative's space segment to develop a mobile, secure and resilient communications infrastructure for hostile environments and the public-private collaboration through platform NLRL. This constellation should be interoperable with the IRIS^2 and SDA constellations as it aims to bring secure European communications one step closer.

- The sovereign integrated satellite constellation would serve as a demonstrator for Dutch industrial capability in respect of secure communications via space. Such a demonstrator would work as a springboard to prove our heritage and could enable a full partnership between the Netherlands and IRIS^2 by:
  a) proposing and promoting Dutch participation in European satellite manufacturing and its communications capability to users on ground, in the air and at sea;
  b) enabling new bilateral collaborations to combine funding and to fast-track the building of satellites;
  c) contributing actively towards the definition of IRIS$^{2\prime}$s next generation (QKD, optical end-to-end, etc.).

2. Reinvigorating the EU supplier base by focusing on user terminals. A user terminal is the device used by an end user to connect to the backbone network. Optical user terminals are not yet available on a commercial scale and only a few companies with proven flight heritage are working on this technology. Consequently, there exists an inherent supply-chain risk and hence a good opportunity for Dutch industry to step in. User terminals are critical to enable links from military aircraft, naval ships and third-party satellites to the space optical backbone network. Having optical user terminals enables inherently safer and more secure optical links. Optical and hybrid optical/RF relay links are also considered as high-capacity backup routes in the event of the disruption of undersea optical-fibre cables.

On the industry side, the Netherlands can build not only on its strong heritage in maritime and aircraft manufacturing and part-manufacturing, but also on its continued innovations on phased array system for the RF industry therewith answering the full-scope of satcom needs, and on more recent investments such as PIC (photonic integrated circuit) technology. PICs enable far-reaching miniaturisation and integration of discrete optical components, leading to much lower energy consumption, size and weight.

3. Preparing to face the new cybersecurity and intelligence challenges by engaging in the space segment of EuroQCI, enabled through a first QKD ground station in the Netherlands and through increased Dutch participation in the ESA's Eagle 1 and SAGA programmes.

The efforts of the Netherlands National Communications Security Agency (NLNCSA) and Dutch Ministry of Defence to address the cybersecurity challenges posed by quantum computing prioritize Post-Quantum Cryptography (PQC). Meanwhile, the European Commission has chosen a hybrid PQC/QKD approach and is working on a continent-wide QKD infrastructure with both ground and space segments to reinforce the protection of Europe's governmental communications. Alongside the current PQC investments, we therefore recommend:

- using the QKD ground station as a lab to help guide a community of early adopters to mature usage, to objectively assess the benefits and limitations of the technology for cybersecurity, to clarify the conditions for secure implementation of space QKD and to investigate its connection to ground quantum networks;

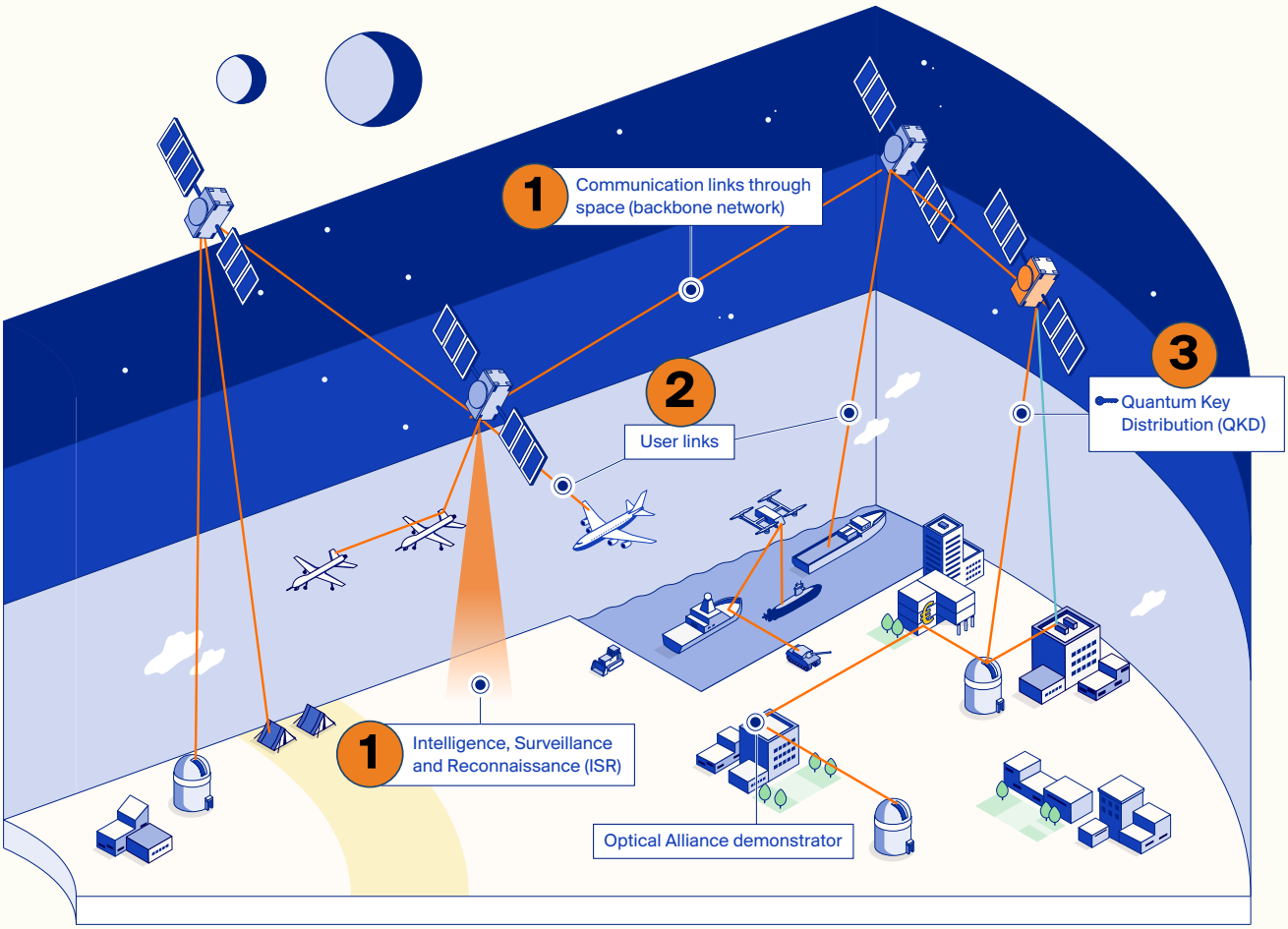
- capitalising on this knowledge to participate in and influence the development of EuroQCI;

- promoting and positioning the Dutch supply chain as the main actor in the European ground segment through an increased national contribution to ESA's Eagle 1 and SAGA programmes and systematic response to relevant development tenders;

- as a nation, taking and owning innovation dominance with regard to this critical technology by acquiring intelligence on (space-enabled) QKD developments and by investing in a sovereign Dutch knowledge base so that we are able to adequately and independently assess the capabilities of other countries; and,

- beyond the cybersecurity potential, secure and grow Dutch leadership on the second generation of quantum communication, the quantum internet.

Visualisation of the application fields of the three proposed actions



Our call to action

To have a strong European position for communication via space enabled by the Dutch and to help shape the future of QKD, our three actions are concrete steps to make Europe and the Netherlands independent of non-EU infrastructure, to better prepare for the upcoming disruption of cybersecurity standards and to reinvigorate the threatened EU supplier base. These actions now need to be translated into concrete plans with the relevant stakeholders from European and Dutch government and industry.

We therefore propose:

- creating a high-level stakeholder group to guide this collaboration and to turn our dream of a Dutch contribution towards European sovereignty and security into reality;

- including the Ministry of Defence and other governmental stakeholders in this group, so as to better articulate their wishes in line with the Defence Space Agenda and Long-Term Space Agenda (LTR);

- making a firm first commitment, in both time and money, to kick-start the ambitions and actions described above, with an estimated financial cost of €4 million being covered through industry and public co-funding.

Empowered by NXTGEN Hightech, this document has been drafted by the following partners in the Dutch satcom industry:

AAC Clyde Space
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ISISPACE Group
LioniX International
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Royal NLR
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