

Small But on the Radar

The Regulatory Evolution of Small Satellites in the Netherlands

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Abstract

In 2012 the authors presented a paper that explained the regulatory situation with respect to nano-satellites, in selected national laws of European states (IAC-12-E7.5.8, 'Orbiting under the Radar: Nano-Satellites, International Obligations and National Space Laws'). The examples showed a practice which excluded nano-satellites activities from the scope of certain national laws, leaving these satellites to orbit 'under the regulatory radar'.

Since then, the nano-satellite market, and more generally the market for small satellites has grown rapidly with hundreds of small satellites already launched, and many planned missions in the near future. Further, more and more entities are aiming to launch small satellite networks or constellations, which indicates that these satellites will be around to stay.

One state that excluded small satellite activities from being licensed under its national space law was The Netherlands. With time, and as small satellite activities became a Dutch reality, the Government had to consider a solution to enable it to authorize and supervise these space activities, in line with Article VI of the Outer Space Treaty.

In this paper the authors, whose background allows them to provide both industry and academic viewpoints, will present the regulatory evolution that started with the mentioned exclusion, progressed towards an ad hoc authorization process in 2013, and finally, resulted in a recent Decree extending the scope of the Dutch Space Activities Act (2007) to 'unguided satellites' as of 1 July 2015.

The paper will present and analyze the Decree and its Explanatory Note and will discuss its implications for the key stakeholders. It will conclude with some indications regarding the expected consequences of this new regulatory situation.

I. Introduction

In 2012 the authors presented a paper elaborating on the lack of regulatory instruments related to small satellites activities in The Netherlands.¹ Since

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then, small satellites activities increased in The Netherlands, which gave reason for the legislator to seek further regulation of these activities. This paper describes and analyses the regulatory evolution, which recently took shape in a new regulatory measure.

Both authors were involved in the regulatory process, one representing the industry, and the other advising the Dutch government. Therefore, this paper includes two different and informed perspectives relating to the mentioned recent developments.

This paper aims to provide information and background about this process to the international community, because other states may face the challenge of a fast-growing private space industry operating in their jurisdiction that must be authorized and supervised in order to comply with the state's obligations under Article VI of the 1967 Outer Space Treaty.² Sharing experience and know-how is useful on the one hand to avoid 'reinventing the wheel' at considerable effort and cost, and on the other hand it may help promote harmony in regulation across states. This may help establish legal certainty for 'new space' entrepreneurs, although the authors of course recognise that different circumstances may require different solutions. Likewise, the efforts of UNCOPUOS, which led to the adoption of the 2013 UN resolution on recommendations on national space legislation³ were inspired by 'the need for consistency and predictability with regard to the authorization and supervision of space activities', while it was also recognized that different approaches may be taken by states in dealing with various aspects of national space activities.

II. Recent Market Developments

In the early years, small satellites were mostly used by educational institutions such as universities and research centres. The satellites were launched individually, meaning each operator launched mostly one satellite per mission, and the mission itself was not commercial *per se*.⁴

1 Neta Palkovitz and Tanja Masson-Zwaan, 'Orbiting under the Radar: Nano-Satellites, International Obligations and National Space Laws' in *IISL Proceedings of the 55th Colloquium on the Law of Outer Space* (Eleven International Publishing 2013) 566.

2 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, done 27 January 1967, entered into force 10 October 1967, 610 UNTS 205, 6 ILM 386 (1967), (hereinafter: Outer Space Treaty).

3 A/RES/68/74 of 11 Dec. 2013, 'Recommendations on national legislation relevant to the peaceful exploration and use of outer space'.

4 Some missions would have a commercial potential such as in the case of technology demonstrations of a certain system, using a small satellite as the platform.

Nowadays, there are several commercial operators that operate a constellation of small satellites, in order to maximize the platform's potential uses.

For example, Planet Labs is a U.S. based private company, which provides image data using a constellation of over 100 small satellites.⁵ This is the largest satellites imagery constellation ever launched into orbit, and according to its vision, by 2016 the company will have enough small satellites in orbit to cover the entire Earth every day.⁶ In this case the use of small satellites technology allows for better imagery coverage of Earth, since the cost per satellite is lower than of traditional satellites.

Another example of the new generation of small satellites commercial uses is OneWeb.⁷ This company plans to build and operate a constellation of approximately 700 satellites of less than 200 kg in LEO, to provide global internet broadband service to hundreds of millions of users in remote areas as from 2019. Arianespace and Virgin Galactic have been contracted to launch several satellites, while Airbus Defense and Space will build some of the satellites.⁸

These two examples show that the recent developments in the small satellites market is twofold, the satellites missions and applications are increasingly more commercial than in past years, and accordingly this implies in many cases that more than one satellite will be used in order to provide a certain service to customers.

III. Small Satellites in the Netherlands

III.1. Small Satellites Activities in the Netherlands

The first Dutch small satellite that was launched to outer space was Delfi-C3, a 3U CubeSat. It was launched in 2008 as part of a student project at the Delft University of Technology (hereinafter: 'TU Delft').⁹ The students who worked on the project founded a private company as a spin-off, ISIS – Innovative Solutions In Space B.V. (hereinafter: 'ISIS'). ISIS' small satellite activities are presented below.

In 2013 TU Delft launched another 3U CubeSat named Delfi-n3Xt, which was built by a new group of students.¹⁰

5 See <https://www.planet.com/data/>.

6 Ibid.

7 <http://oneweb.world>.

8 See for instance <http://spacenews.com/airbus-wins-oneweb-contract/>. Interestingly, OneWeb wishes to reassure the public about the company's trustworthiness: 'We intend to be a very good steward of space. Deorbiting the satellites was a big driver in our design considerations. We do not intend to create a lot of junk', Brian Holz, OneWeb space systems director, *ibid*.

9 www.tudelft.nl/en/current/dossiers/archive/delfi-c3/ See also for more details: www.delfispace.nl/delfi-c3 and: www.lr.tudelft.nl/en/organisation/departments/space-engineering/space-systems-engineering/projects/delfi-c3-project-page/.

10 www.delfispace.nl/delfi-n3xt.

TU Delft plans to launch the DelFFi mission,¹¹ as part of the QB50 mission.¹² This means that The Netherlands will be represented in this international project, which aims to launch about 50 CubeSats, by participating with two 3U CubeSats.

In addition to the Delfi small satellite program, TU Delft participates in the ambitious OLFAR mission, which aims to create a constellation of small satellites in orbit around the Moon for astronomy research.¹³ In summary, the TU Delft small satellites missions are educational and scientific.

The second Dutch entity to launch a small satellite is ISIS, a private company specializing in small satellites systems, launches and applications. ISIS' first satellite, a 3U CubeSat named Triton-1, was launched in 2013 together with the Delfi-n3Xt and FUNcube-1 (see below). Triton-1 is the first element of a planned small satellite constellation, which will monitor vessels' traffic using AIS technology.¹⁴ This mission aims to demonstrate the mentioned technology, and has a commercial potential.

The third Dutch entity that launched a small satellite is AMSAT-NL, a non-profit organization linked to the international AMSAT network of radio amateurs.¹⁵ It launched FUNcube-1, a 1U CubeSat. The satellite's mission is to 'educate young people about radio, space, physics and electronics'.¹⁶

Other Dutch Universities and research organizations are taking their first steps in experimenting with small satellites technology, although no firm launches are planned so far. However, this indicates that the volume of small satellites activities in The Netherlands will increase in the years to come.

III.2. Regulatory Framework and Gap

The Netherlands Space Activities Act, in force since 1 January 2008, establishes a licensing system for private space operators, including necessary requirements such as insurance and regulation of liability issues.¹⁷ The Dutch Act applies to the 'launch' of objects from The Netherlands or from a Dutch ship or plane, and to 'flight operation' and 'guidance of space objects in outer space'.¹⁸ This implies that space objects that are launched from abroad and

11 www.delfispace.nl/delffi.

12 <https://www.qb50.eu/>.

13 www.delfispace.nl/advanced-concepts/olfar-mission.

14 www.isispace.nl/cms/index.php/projects/triton-missions.

15 www.amsat-nl.org/.

16 <http://funcube.org.uk/>.

17 Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects, 24 January 2007, 80 *Staatsblad* (2007), Space Activities Act. An English translation is available at: www.oosa.unvienna.org/oosa/en/SpaceLaw/national/state-index.html.

18 The latter two terms are defined as follows in the Explanatory Note: The term '*flight operation*' is understood to mean the navigation, tracking and control of a space object during the flight phase, i.e. the phase between the launch of the space object and

are neither operated nor guided from The Netherlands do not fall under the law, and hence do not require a license.

So far, small satellites are generally not ‘manoeuvrable’. The narrow interpretation of the Dutch Space Activities Act, defining space activities restrictively as covering only a ‘launch’ from The Netherlands or a Dutch ship or plane, ‘flight operation’ and ‘guidance of space objects in outer space’, did not cover small satellites that are not manoeuvrable. This turned out to be a too restrictive interpretation of the UN space treaties, which do not restrain themselves according to whether objects are manoeuvrable or not, or whether they are large or small.

As this narrow interpretation was upheld by the Dutch authorities in the first years, small non-manoeuvrable satellites of Dutch private entities were not registered, either in the national part of the Dutch registry or in its UN part. They were not registered in the UN part of the national registry because The Netherlands does not consider itself the launching state of satellites launched by a private entity – whether they are small or large, because it holds the view that space activities can only reasonably be regarded as national activities if it is actually possible to exercise jurisdiction and control over them.¹⁹ The satellites could not be entered into the national part of the registry, because they were not ‘launched’, ‘guided’ or ‘operated’ from The Netherlands.²⁰

This situation subsequently changed for two reasons. On the one hand, the technological capabilities of small satellites are developing at a very fast pace, and in the future they will be manoeuvrable and thus will be ‘guided’ and/or ‘operated’ from The Netherlands. That means they will fall under the definition

the time at which it takes up a position in outer space. Such activities can be performed from facilities, bases, earth stations or other control centres established on Dutch territory. This likewise applies with regard to the *guidance* of space objects in outer space (outer-space activities in the broad sense). This includes all command and control activities in relation to a space object (usually a satellite) – e.g. the execution of major and minor manoeuvres designed to keep a satellite in its position in outer space or to adjust its position/orbit, checking that there is no space debris in the vicinity that might cause problems, and monitoring the fuel level of geostationary satellites, etc., so as to ensure that satellites can be decommissioned when they are no longer in use (by placing them into a ‘decommissioning orbit’ around 200 km higher than the geostationary orbit).

19 See ‘Note Verbale dated 29 July 2003 from the Permanent Mission of the Netherlands to the United Nations (Vienna) addressed to the Secretary-General’, A/AC.105/806 of 22 August 2003; available at: www.unoosa.org/pdf/reports/ac105/AC105_806E.pdf.

20 See for more details on registration of small satellites, Tanja Masson-Zwaan, ‘Registration of small satellites and the case of the Netherlands’, to be published in 2016 as part of a book following up on the conference ‘Small Satellites: Chances and Challenges’, held at the University of Vienna in March 2014, See: http://kalender.univie.ac.at/einzelansicht/?tx_univieevents_pi1%5Bid%5D=9196.

of space activities and The Netherlands will require them to be licensed to comply with its obligations under Article VI of the Outer Space Treaty.

On the other hand, the government decided to prepare an administrative measure, clarifying that in the future, ‘unguided’ satellites will fall under the scope of the law and need to apply for a license. However, in the interim, some adjustments were made to comply with the requirements of launch providers.

III.3. *Ad hoc* Adjustments

As mentioned in the previous section, three Dutch small satellites were launched in November 2013. At the time, the Dutch Space Activities Act did not apply to these satellites, which means that the three operators were not required to apply for a license under the Act.

This situation was somewhat problematic for the following reasons: first, while the domestic Act did not include small satellites activities under its scope, the UN treaties would nonetheless apply since small satellites activities are a ‘space activity’ in the meaning of Article VI of the Outer Space Treaty, and are ‘space objects’ in the meaning of Articles VII and VIII and consequently the Liability and Registration Conventions.²¹ This means that although The Netherlands did not accept its status as a ‘launching state’ as mentioned above, it was still internationally responsible for these activities.

Secondly, there was a need to register the satellites at least in a national registry. Small satellites are launched as auxiliary payloads and usually when launched on board of a foreign launch vehicle, the launch service provider will require that the operator will register its satellite in its state of nationality, even if this practice does not necessarily correspond to the concepts in the Liability and Registration Conventions.²² This meant that in order to execute their launch, the satellites would have to be registered in the Dutch national registry of space objects, even if the Dutch Space Act did not apply.

For these reasons it was crucial to find a legal arrangement to solve the described discrepancies. As there was not enough time to issue a Decree before the launch, an *ad hoc* solution was found. The three operators obtained a blanket third party liability insurance policy for their small satellites, covering

21 Convention on International Liability for Damage Caused by Space Objects, done 29 March 1972, entered into force 1 September 1972, 961 UNTS 187, 10 ILM 965 (1971), (hereinafter: Liability Convention); Convention on Registration of Objects Launched into Outer Space, done 14 January 1975, entered into force 15 September 1976, 1023 UNTS 15, 14 ILM 43 (1975), (hereinafter: Registration Convention).

22 This is a recommended practice expressed in: A/RES/62/101 of 17 Dec. 2007, ‘Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects’ See recommendation 3(d): ‘States should encourage launch service providers under their jurisdiction to advise the owner and/or operator of the space object to address the appropriate States on the registration of that space object’.

them for € 20 million. The Kingdom of The Netherlands was named as an additional insured party.

With the insurance in place, the Dutch Government approved the launch of the three satellites and agreed to enter them into the national part of the registry, once the new Decree (see below) would be in force and a license obtained.

IV. Regulatory Changes

IV.1. The 'Unguided Satellites' Decree

The Decree extending the application of the Space Activities Act to managing unguided satellites (Decree unguided satellites) was signed by the King on 19 January 2015 and entered into force on 1 July 2015.²³ It makes the Dutch Space Act explicitly applicable also to unguided satellite missions. By a broader definition of the concepts of 'operation' and 'guidance', non-maneuvrable or 'unguided' small satellites henceforth fall under the scope of application of the Dutch Space Act.

The Decree consists of four articles. Article 1 provides that the Space Activities Act also applies to managing an unguided space object in outer space from The Netherlands by means of a communication connection. Article 2 provides that the Decree will not apply for activities that are already taking place and hitherto did not fall under the Act during *three* months after its entry to force. On top of that, it provides that the Decree will not apply for such activities during *nine* months after its entry into force if an application for a license is submitted within three months after entry into force of the Decree. Article 3 gives the short title of the instrument, and Article 4 determines that the Decree enters into force on July 1, 2015.

IV.2. The Explanatory Note

A four-page explanatory note is attached to the Decree, the highlights of which are summarized below.

In the first section, the purpose and rationale are explained by referring to the growing importance of 'unguided' satellites (i.e. whose orbital position cannot be influenced after launch) in The Netherlands. The Decree aims to extend the scope of the Space Activities Act to these satellites. ISIS is recognised as a prominent market player, and educational activities of TU Delft in developing and building unguided satellites are also acknowledged. The government expects these activities to further increase, and cooperation between

23 'Besluit ongeleide satellieten', 18 *Staatsblad* (2015), <https://zoek.officielebekendmakingen.nl/stb-2015-18.html>. The term used is 'unguided' satellites, to remain within the terminology of the law; the term 'small' is not used even though that seems to have become the term of art internationally. The Decree still has to be notified to the UN for inclusion in its National Space Law Collection, www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html.

companies and research institutions to intensify. The space sector is seen as ‘enabler’ for other ‘top-sectors’ identified in the policy of the Ministry of Economic Affairs. The government’s space policy 2014-2020 stresses the importance of space to solve social problems, create space infrastructure, and to provide opportunities for Dutch companies and knowledge institutes to export products and services.²⁴

The development of unguided space objects was not foreseen in 2007 when the Dutch Act was adopted, although it does provide the general possibility of extending the scope by means of a Decree.²⁵ Since unguided satellites do not necessarily pose a lower risk than guided satellites, extension was considered necessary; unguided satellites must comply with the same technical requirements as guided ones, and insurance requirements must also apply. The Netherlands bears international responsibility under Article VI of the Outer Space Treaty and must authorise and supervise national activities by non-governmental entities. Since a communication link with these satellites is maintained from Dutch territory, unguided satellites must be authorised and supervised, just like guided satellites.

The next section of the Explanatory Note deals more specifically with unguided satellites. It argues that legal clarity will contribute to a favourable and stable climate for private parties, and will help promote innovation; thus, extending the scope of the Act will provide assurance to stakeholders. No manoeuvres can be performed to keep unguided satellites in their orbital position or to manoeuvre them. Their limited communication capabilities imply that the current generation of unguided satellites operates mainly independently. An increase in the number of unguided satellite applications from The Netherlands is expected; currently about ten market players are active in this field. In the short-term, three licence applications are expected, and two more in the medium term.

There is also a section that addresses the regulatory and administrative burden imposed on private entities by the Decree. As explained earlier, unguided satellites must in principle comply with the same requirements as other space objects. The licensing process was standardized by the Dutch Telecom Agency, and the license application form has been updated to accommodate also unguided satellites. The authorization process for unguided satellites contains no additional information requirements, so the administrative burden is kept to a minimum. The following information must be provided when applying for a license:

- Information about the space activities;
- Financial and technical data;

24 ‘Nota Ruimtevaartbeleid 2014-2020’, in Dutch, See: <https://www.rijksoverheid.nl/documenten/beleidsnotas/2014/09/11/samenvatting-nota-over-ruimtevaartbeleid-2014-2020>.

25 See Article 2.2.b.

- Proof of third party liability insurance;
- A statement by the International Telecommunication Union (ITU) about the use of frequency rights; and
- A statement about expertise and experience with space activities.

The application form must be completed only once, because a license is given for the duration of the activity and does not require a new application for each new satellite. The Explanatory Note states that it is estimated that about four hours are needed to fill out the application form. At an hourly rate for a ‘highly skilled knowledge worker’ (€ 60), this means that the estimated administrative burden is € 240.

The Decree also brings substantive obligations for the operation of unguided satellites, viz., the obligation to take out liability insurance. The annual premium for liability insurance of \$ 20 million is estimated at around 0.1% of the coverage, so will cost around \$ 20,000.²⁶ This, the Explanatory Note states, can be considered as ‘operational cost’ because the applicants would also purchase such insurance if this was not a condition to obtain a license.

Finally, the Note provides a brief article-by-article explanation. With regard to Article 1, the rationale for the Decree is again explained. Unguided satellites cannot perform manoeuvres to maintain or change their orbital position. As small satellites are mostly launched to LEO, operators of small-unguided satellites do not have to file for orbital slot allocation with the ITU, however, there is a need to coordinate the use of certain radio frequencies (filing rights). In order to obtain those rights, the ITU Radio Regulations require that the transmitter of an unguided satellite can be switched on and off via telecommand, to prevent interference or detect and solve other problems. For this purpose it is necessary to establish a communication link, and if that is managed from The Netherlands, the operation of unguided satellites will from now on fall under the scope of the Dutch Space Activities Act.

For Article 2, the rationale for a transition period is explained, as the Act will also apply to unguided satellites that are already in space. Conditions could be imposed on those activities, pursuant to Article 3.3 of the Act. Without transitory provisions, they would become illegal after the entry into force of the Decree because they are not licensed. The first paragraph provides time to prepare and submit an application, while the second paragraph provides additional time for the Telecom Agency to assess the license applications for ongoing activities.

Articles 3 and 4, which deal with the short name and entry into force of the Decree, are not addressed in the Explanatory Note.

In addition to the Decree, the government also decided to modify the license application form. The form is the same for all applicants, so the modification

²⁶ Although the space insurance market is dynamic and thus policy prices may change.

was not done specifically for ‘unguided’ satellites; rather, the update was considered necessary to clarify certain requirements, for instance in terms of documents to be submitted at the time of application.²⁷ The aim of the government is to facilitate the application process, to assist applicants as much as possible in complying with the requirements, and to limit the requirements to what is realistic and manageable.

V. Assessment, Effects and Consequences

V.1. Assessment

The passing of this Decree is a good example of flexible regulation. It shows that regulations can and should be adapted to changed circumstances. Although the operation of small or unguided satellites was not foreseen when the Dutch Act was drafted, subsequent practice has shown the large growth of this activity and expected further development of this market, with important market activity taking place in The Netherlands. In order to comply with its Treaty obligations, it became necessary to expand the scope of the national legal framework. The Act itself provides for the possibility to do this by means of an administrative Decree, which is less cumbersome than amending the Act itself. The Decree is brief and clear in content, and was developed in close consultation with the market players. However, certain critical notes can be made.

Firstly, in practical terms, the statement measuring the time and effort needed to handle a license application in four hours/€ 240 seems highly unrealistic in practice. Even though the government does its utmost to assist applicants, considerable effort is required to assemble all documents and provide all the required information. The limitation seems to be motivated by a politically driven desire to show restraint in administrative burden, however lacks any realistic justification.

Likewise, the Explanatory Note seems to assume that a third party liability insurance coverage of \$ 20 million will generally be an acceptable level of insurance for the operation of unguided satellites. However, there is no guarantee that the Minister will indeed uphold this assumption, as the Act entitles him to require what he considers to be the maximum possible cover.²⁸ If the usual coverage imposed on operators of Geostationary satellites (general € 60 million) would be required, operators such as TU Delft, AMSAT-NL and ISIS would not be able to realise their mission as the insurance cost would simply be too high. The further assumption in the Explanatory Note that third party liability insurance would be purchased even without a legal obligation to do

²⁷ The new form (in Dutch) can be found at: www.agentschaptelecom.nl/sites/default/files/207_aanvraag_ruimtevaartactiviteiten.pdf. Like the Decree, it has not yet been included in the UN National Space Law Collection.

²⁸ Article 3(4) of the Act.

so is, to say the least, doubtful. There seems to be confusion between third party liability insurance on the one hand, and asset insurance on the other. Operators of small satellites will not be internationally liable in case of damage, as this liability falls upon to states. Therefore it seems unrealistic to argue that they would take insurance to cover such liability of their own will, hence justifying the expenses for such insurance as normal business expenses. The Decree makes the Dutch Space Act applicable to unguided or small satellites without considering their different characteristics as compared to traditional satellites. This is problematic especially when trying to incorporate space debris mitigation standards²⁹ since many of them do not apply to small satellites as they are launched into LEO, while others are simply not technically feasible, such as making orbital manoeuvres in order to speed-up the satellites' re-entry process, in line with the '25 year rule'.

Finally, when aiming to accommodate a new space activity, i.e. small satellites, defining the activity by only one technical characteristic may not be future proof. The choice to define these activities by their lack of manoeuvring abilities is sensible for now, however, small satellites are different from other satellites for many other reasons, and once they will be able to perform orbital manoeuvres, they will be treated exactly the same under the Dutch Space Act. This may raise the need to adjust the Act once more.

V.2. Effects and Consequences

Since the Decree went into force on 1 July 2015, license applications for unguided satellites currently being operated were due by 1 October 2015. Three applications were submitted, viz. by ISIS, TU Delft and AMSAT-NL. In order to facilitate the process, the Telecom Agency had put together an information document to assist the applicants as much as possible. The approach of the Agency is to gather as much information as possible, and to clarify as many issues as possible before the actual submission of the application, so that the actual 'audit' can then be carried out smoothly and efficiently and with all required information available. Close and intense interaction with the applicants will be maintained during the coming months, and within six months, i.e. at the latest on 1 March 2016, a decision will be taken on these three applications.

VI. Conclusions

While Dutch small satellites activities began during 2008, they were properly regulated only in 2015, and the first licenses will be issued in 2016.

The regulatory evolution of small satellites in The Netherlands is generally a positive one, however, it illustrates the legal 'tragedy' expressed in the need to

²⁹ See: Inter-Agency Space Debris Coordination Committee, 'IADC Space Debris Mitigation Guidelines' (IADC-02-01, Revision 1, 2007).

stay on top of technological advancement and new practices in space activities carried out by, not only, but mostly, private companies.

As this problem is a part of the reality of space law, legislators should be in contact with the industry and academia in order to bridge the regulatory gap effectively. In the case at hand, an open dialog was created between the legislator and the operators, which made the regulative process a better one, and gave those who would be subject to the Decree a deeper understanding of the upcoming change, and reminding all the parties involved that the most important motivation behind this new Decree is – promoting small satellites activities in The Netherlands.