



Application Form: HS3 Import or Manufacture any Hazardous Substance in Containment

under section 31 of the Hazardous Substances and New Organisms Act 1996

To submit an application, please send by post to: Environmental Protection Authority, Private Bag 63002, Wellington 6140

OR email to: HSApplications@epa.govt.nz

Payment must accompany application: see our fees and charges schedule for details. Please allow 10 working days for processing.

Applicant:

Rocket Lab NZ

Name of substance:

LMP-103S

APPLICANT CHECKLIST

Mandatory sections filled out

Appendices enclosed

Initial fees enclosed

Signed and dated

Electronic copy of application
emailed to EPA

Office use only

Application code:

Date received:

EPA contact:

Initial fees paid: \$

Application version no.:

Important

1. You can talk to an applications advisor at the EPA, who can help you scope and prepare your application. We need all relevant information early on in the application process. Quality information up front will speed up the process.
2. This application form may be used to seek approvals for more than one hazardous substance where the substances are related – for example, a concentrated compound (active ingredient) and its related formulations, or a range of substances for similar purposes to be tested in a field trial.
3. Any extra material that does not fit in the application form must be clearly labelled, cross-referenced, and included in an appendix to the application form.
4. Commercially sensitive information must be collated in a separate appendix.
5. Unless otherwise indicated, all sections of this form must be completed for the application to be progressed.
6. You can get more information at any time by contacting us. One of our staff members will be able to help you.

Environmental Protection Authority
Private Bag 63002
Wellington
New Zealand
Telephone: 64 4 916 2426
Facsimile: 64 4 914 0433
Email: HSApplications@epa.govt.nz
<http://www.epa.govt.nz>

Section 1 – Applicant details

1.1 Name and postal address in New Zealand of the organisation making the application:

Name: **Rocket Lab**

Address: [REDACTED]
[REDACTED]
[REDACTED]

Phone: [REDACTED]

1.2 The applicant’s location address in New Zealand (if different from above):

Address: [REDACTED]
[REDACTED]
[REDACTED]

1.3 Name of the contact person for the application:

This person should have sufficient knowledge to respond to queries and either have the authority to make decisions that relate to processing the application on behalf of the applicant, or have the ability to go to the appropriate authority.

Name: [REDACTED]

Position: [REDACTED]

Address: [REDACTED]
[REDACTED]
[REDACTED]

Phone: [REDACTED]

Email: [REDACTED]

Section 2 – Application type and related approvals required

This form is only for an application to import a hazardous substance into containment, or manufacture a hazardous substance in containment.

2.1 Is this application to manufacture or import a hazardous substance in containment for any of the following purposes?

Containment applications can only be made for a limited range of purposes. In particular, the substance must not be intended for commercial manufacture or sale.

- Small amounts of any hazardous substance for use as an analytical standard, where approval to import or manufacture that substance has been declined? Yes No
- Research on any hazardous substance to acquire information for use in assessing that substance for a HSNO approval? Yes No
- Research and development on any hazardous substance? Yes No
- Use in an emergency? Yes No
- Formulating, relabelling, repackaging, or storing any hazardous substance for export to a destination outside New Zealand? Yes No
- Other purposes? Yes No

2.2 If you answered 'yes' to one of the purposes listed above, please provide some supporting detail. If you answered 'yes' to 'other purpose', describe the purpose and explain why this purpose is appropriate to a containment application.

The purpose for this containment application is importation of a spacecraft fuel to be stored, loaded and launched from a secure Rocket Lab site within New Zealand. The fuel will not be manufactured for sale or otherwise used outside a Rocket Lab facility; the fuel shall be transported for integration with the launch vehicle, from which it shall not be released before entering orbital space.

2.3 Is the information in this application relevant to import, manufacture or both?

Import the substance(s) only? Yes No

Manufacture the substance(s) only? Yes No

Import and manufacture the substance(s)? Yes No

If import only, indicate whether or not manufacture is likely in New Zealand: Yes No

2.4 If the information in the application relates to manufacture of the substance(s) in New Zealand, provide information on the proposed manufacturing process and any alternatives.

N/A

2.5 If this substance(s) needs an approval under any other legislation, has an application for this approval been made?
(Optional)

Name of approval	Application made
Agricultural Compounds and Veterinary Medicines Act 1997	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Food Act 1981	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Medicines Act 1981	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Chemical Weapons (Prohibition) Act 1996	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Radiation Protection Act 1965	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Biosecurity Act 1993	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Resource Management Act 1991	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA
Other (please specify):	

Section 3 – Information on the substance(s)

Note that all information that is commercially sensitive must be attached as an appendix. The application form should be cross-referenced to the appendix but should be able to be read as a stand-alone document (which will be publicly available).

If approval is being sought for more than one hazardous substance, this section must be completed separately for each hazardous substance.

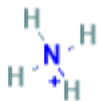
3.1 State the unequivocal identification of the substance(s).

LMP-103S is produced by Eurenco Bofors in Karlskoga, Sweden.

LMP-103S is a homogenous (liquid) blend of ammonium dinitramide (ADN), methanol, ammonia and water. ADN is primarily the oxidizer, which is dissolved in water with methanol and ammonia as fuel components. Ammonia also acts as the stabiliser.

The propellant mixture is considered to be a low-sensitive product.

- **Chemical name (Chemical Abstracts Preferred Index name or IUPAC name):** Azanium; dinitroazanide
- **Common name:** Ammonium dinitramide
Ammonium dinitramide (ADN) 63 %, Methanol 18 %, Ammonia 5 %, Water 14 %
- **Synonyms:** ADN
- **Trade names:** LMP-103S
- **UN number:** 0481
- **UN class:** 1.4S
- **CAS Registry number:**
 - Ammonium dinitramide CAS-no: 140456-78-6
 - Methanol CAS-no: 67-56-1
 - Ammonia CAS-no: 1336-21-6
- **Molecular formula:** H₄N₄O₄ (Ammonium dinitramide only)
- **Structural formula:** (Ammonium dinitramide only)



Existing approvals:

Methanol: HSR001186

Ammonia: HSR001526

3.2 Provide information on the chemical and physical properties of the substance(s).

Provide as much information as possible on the chemical and physical properties of the substance(s) [at 20°C and 1 atmosphere unless otherwise stated] –

- **Appearance (colour, odour, physical state or form):** transparent/yellowish liquid
- **pH:** 9.5
- **Density:** Approx. 1240 kg/m³ at 20 °C
- **Vapour pressure:** 0.1 bar at 20 °C
- **Boiling/melting point:** Since the product is an ionic liquid (a salt dissolved in a liquid solvent) the boiling point increases gradually as the solvent evaporates until decomposition starts at approximately 120 °C . In a closed container, the vapour pressure reaches 1 bar at approximately 73 °C.
- **Solubility in water:** Freely soluble in water, soluble in acetone, methanol, IPA and acetone.
- **Water/octanol partitioning co-efficient:** Log Pow <-2.8

3.3 Provide information on the hazardous properties of the substance(s).

Information should be provided on the hazardous properties of the substance(s) known to the applicant. You should consider each of the six hazardous properties below and provide information on those hazardous properties. This information is needed in order to assess risks and determine whether or not, and how, the substance can be adequately contained.

- **Explosiveness:** Yes
- **Flammability:** No reaction was observed at 5 J energy level (electrostatic) acc. to EN 13631-13:2003. Explosion point 18.5 C acc. to SN EN 15794 (closed vessel).
- **Oxidising properties:** The product contains an oxidizing component (ADN).
- **Toxicity:** GENOTOXICITY
 - Ammonium dinitramide, ADN:
 - Ames reverse mutation (Salmonella typhimurium; in vitro): positive
 - Mammalian cell gene mutation (Mouse lymphoma; in vitro): negative
- **Ecotoxicity:** Bioaccumulation is unlikely
 All components have partition coefficient: n-octanol/water: log Pow <4,5
 Ammonium dinitramide, ADN: log Pow = -2,8
 Methanol: log Pow = -0,71
 Ammonium hydroxide solution, (Ammonia): log Pow = -0,64



3.4 Provide information on what will happen to the substance throughout its whole life, from its introduction into New Zealand, its uses, through to disposal.

The information provided needs to reflect the containment character of the application. It will be used in the development of exposure scenarios and the assessment of risks, and hence the specification of the containment conditions.

LMP-103S (in UN class 1.4S 5 litre containers) will be imported in Auckland and then driven to Mahia, Gisborne.

The substance will be imported from an international vendor in Sweden in UN approved DOT or ADR vessels and stored in UN approved DOT / ADR vessels in a dangerous good container, prior to being transferred to a secure Rocket Lab facility.

Product waste will be handled and treated as explosive waste, handled/stored at dedicated locations and by trained personnel. Disposal is expected to be through incineration; it will be handled by a contracted third-party disposal company capable and certified to dispose of ammonia-based substances, adhering to their certification and regulations they comply with.

Unused samples, disposed containers, and absorbent spill material, and any other contaminated waste will be disposed of by the same accredited contracted hazardous waste vendor in every case.

Following spacecraft integration at a Rocket Lab launch site in NZ, the substance will be launched to a specified orbit where it is released from a thruster in the space environment.

Dependent on the determination of the hazard classification, Rocket Lab will assess the need for a hazardous substance location (HSL) at the launch site. If a HSL is required, Rocket Lab will arrange inspection by a HSW (HS) 2017 certifier for the quantity of the substance to be stored at site.

If a HSL is not required, Rocket Lab as the person conducting a business of undertaking (PCBU), will apply over-conservative safety measures for the storage and handling of the substance, including utilisation of a dedicated store equipped with bunding, temperature control, and airborne contamination monitoring. Movement of the substance will also be tracked and recorded.

Oxidisers, open flames, sparks, and static electricity will not be tolerated near the storage areas and will be segregated accordingly.

The storage of the substance will be surrounded by a containment area capable of holding 110% of the total capacity of all the storage tank/containers.

The storage facility to be repurposed for its storage is fire resistant, electrically grounded with approved protection against lightning, and provided with safety showers and eye baths.

Ambient monitoring will be in place with an appropriate alert and evacuation system. Additionally, the handling area is also equipped with a direct camera surveillance system and fire detection system (flame detector).

Rocket Lab understands and recognises the thresholds and designations for storage of hazardous substances under the Health and Safety at Work (Major Hazard Facilities) Regulations 2016, but does not expect to trigger them given the small volumes to be imported.

Approval of LMP-103S would enable the development and launch of high performing spacecraft engines (for operation in space).

3.5 Provide information on the quantity of the substance proposed to be imported or manufactured.

This information is used in the development of exposure scenarios and the assessment of risks.

31 kilograms of LMP-103S (in 5 litre containers) will be imported in Auckland for the specific upcoming mission in Q2/Q3 of 2023.

Further requirements to use this substances is anticipated for future missions; therefore, Rocket Lab requests a total of 200 kg be permitted for import over a three-year approval period. Should the cumulative imported quantity of the substance risk exceeding 200 kg during the approval period, Rocket Lab will approach the EPA for reapproval/assessment before the threshold is exceeded.

The substance will be imported from an international vendor in Sweden in UN approved DOT / ADR vessels and stored in UN approved DOT / ADR vessels in a dangerous good containers, prior to being transferred to a secure Rocket Lab facility.

Section 4 – Information on the proposed containment system

4.1 Provide information on the proposed containment system .

It is essential that good information is provided on the containment system because the adequacy of containment, in conjunction with the hazardous properties of the substance, will have a major impact on whether or not approval is given.

You will need to provide a description of the containment proposed AND information on how you intend to address the following issues (proposed controls):

- Methods for preventing the escape of the contained hazardous substance and preventing the contamination of the facility
- Methods for excluding unwanted organisms from the facility or to control organisms within the facility
- Methods for excluding unauthorised people from the facility
- Methods for preventing unintended release of the substance by experimenters

- Methods for controlling the effects of any accidental release of the substance
- Inspection and monitoring requirements of the containment facility.

A management plan may be attached as an appendix. This plan should specify the procedures for implementing the above methods for containing the substance(s), and provide details of the qualifications of the person responsible for implementing those controls.

Containment is assured in the following ways -

- In case of a liquid leak/spill, there is bunding to waste tanks sized for 110% of volume held onsite. This is applicable to both storage and handling areas. All chemical waste shall be disposed of by a contracted vendor, and not released to drains or other municipal waterways.
- Transportation by road between facilities is in accordance with road transport regulations - New Zealand Standard 5433:2012 Transport of dangerous goods on land (NZS 5433:2012) - with oversight by a Rocket Lab official. The substance will be transported between Rocket Lab facilities and from the airport using a van labelled as carrying dangerous goods, driven by a dangerous goods licenced driver. The initial volume of 31 litres in 5 cases will be put in a plastic pallet bund to follow over-conservative safety measures when dealing with a substance for the first time. Compatible spill kits will be carried in the van. The driver will also be provided with an ammonia portable detector to support emergency services in the case of any off-nominal events, if the need arises.
- Rocket Lab is required to meet the stringent security requirements of the International Traffic in Arms Regulations as well as the NZ Government's Protective Security requirements (at Managed level). In order to prevent unauthorised access at any Rocket Lab site, we implement a fully integrated, defence in depth approach to security. We achieve this through a mix of technological, physical, procedural, and culture-based measures. All our sites have perimeter security comprising of robust fences, anti-climb toppings and gates, covered by CCTV and, in the majority of sites, guard patrols. Access through the perimeter is based on zoned access privileges granted to staff and implemented through use of the Gallagher Control Centre automated access control system used in collaboration with separate ID credentials.
- Unintended release by experimenters is mitigated by use of compatible hardware and approved procedures. All waste will be collected and disposed of by a contracted hazardous substances disposal vendor.
- Accidental release is limited to the following:
 - Rocket Lab handling facilities: integration facilities. Bunding and spill kits shall be provided at all locations to prevent release into the environment.
 - Transportation: spill or loss in transit. Mitigated by approved vessels and security oversight.
- Inspection of Rocket Lab facilities is coordinated by respective Site Managers. Various bodies (WorkSafe, EPA, NZ Space Agency, District and Regional Council and independent inspectors) conducted inspections as required.
- Continuous monitoring of all storage and use areas is implemented where possible using gas sensors. All storage and handling areas are separated from incompatible substances (oxidizers, water) by design.

- All handling of LMP-103S and associated equipment will be done in accordance with procedures reviewed by Rocket Lab SMEs and safety representatives. Anyone handling LMP-103S must be suitably qualified and experienced, with records managed in the Rocket Lab Learning Management System.

Section 5 – Identification and assessment of risks

In completing this section, it is important that you take account of the proposed containment system you described in Section 4. We are particularly interested in knowing about risks that may still remain with the containment system in place. You will need to consider the effects on the environment and public health, including any social effects. You should also take account of the quantity of material involved and the number of different locations that may be involved.

Complete this section as far as you can.

5.1 Identify all of the risks of the substance(s).

Include information on potentially significant, possible risks of the substance and whether or not these risks are *likely* to be significant. It is important to think about the source of the risk – ie, the way in which the risk is created (the exposure pathway) and then the consequences of exposure. Risks should be considered in relationship to:

- the sustainability of native and valued introduced flora and fauna
- the intrinsic value of ecosystems
- public health (including occupational exposure)
- the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga
- the economic and related benefits to be derived from the use of the hazardous substance
- New Zealand's international obligations.

LMP-103S has a low toxicity and is an environmentally benign propellant.

Toxicity: GENOTOXICITY

- Ammonium dinitramide, ADN:
- Ames reverse mutation (*Salmonella typhimurium*; in vitro): positive
- Mammalian cell gene mutation (Mouse lymphoma; in vitro): negative

Ecotoxicity: Bioaccumulation is unlikely

All components have partition coefficient: n-octanol/water: log Pow <4,5

Ammonium dinitramide, ADN: log Pow = -2,8

Methanol: log Pow = -0,71

Ammonium hydroxide solution, (Ammonia): log Pow = -0,64

Non-monetary benefits:

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- Recognition of New Zealand as a major player in interplanetary exploration enabled by high-specific impulse (Isp) propellant and design
- Primary use case is in space where people and the human-environment are not at risk of exposure

Benefits for satellite missions:

- Increased performance
- Simplified handling and transportation
- Reduced mission costs

Parameter	LMP-103S
Stability	Stable > 20 yrs (STANAG 4582)
Toxicity	Low Toxicity (due to methanol)
Carcinogenic	No
Corrosive	No
Flammable Vapours	No
Environmental Hazard	No
Sensitive to Air & Humidity	No
SCAPE Required for Handling	No
Storable	Yes (> 6.5 yrs, end-to-end test is ongoing)
Freezing Point	-90°C (-7°C saturation)
Boiling Point	120°C
Operating Temp Range Capability	-5°C to 60°C
Typical Blow-Down Ratio	4:1
Exhaust Gases	H2O (50%), N2 (23%), H2 (16%), CO (6%), CO2 (5%)
Radiation Tolerance	Insensitive up to 100 kRad (Cobalt 60)
Shipping	UN / DOT 1.4S (Permitted on commercial passenger aircraft)

5.2 Provide an assessment of the potential risks identified in Section 5.1.

An explicit risk assessment only needs to be provided for those risks which might be significant. The assessment should consider whether the identified risks can be adequately managed by the proposed containment system, and the substance(s) itself adequately contained.

The assessment should include the nature, probability of occurrence, and magnitude of each adverse effect. The uncertainty bounds of the information contained in the assessment should also be discussed.

(Optional)

N/A

Section 6 – International considerations

6.1 The EPA is interested in whether this substance (or any of its components) has been considered by any other regulatory authority in New Zealand, or by any other country. If you are aware of this, please provide details of the results of such consideration.

(Optional)

N/A

Section 7 – Miscellaneous

7.1 Provide a glossary of scientific and technical terms used in the application.

ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	"Accord européen relatif au transport international des marchandises dangereuses par route", which translates as "The European Agreement concerning the International Carriage of Dangerous Goods by Road."
DOT	Department of Transportation

7.2 Provide here any other information you consider relevant to this application that is not already included.

N/A

Section 8 – Summary of public information

The information provided in this section may be used in the EPA's public register of substances, required under Section 20 of the HSNO Act.

This summary information will be used to provide information for the people and agencies (eg, Ministry for the Environment, Department of Conservation, Regional Councils etc) that will be notified of the application, and for potential submitters who request information. This information will also be used to prepare the public notice of the application.

For these reasons, applicants should ensure that this summary information does not contain any commercially sensitive material.

8.1 Name of the substance(s) for the public register:

Please use a maximum of 80 characters.

LMP-103S

8.2 Purpose of the application for the public register:

This should include an abstract (in a maximum of 255 characters) giving information on the intended use of the substance and why an application is needed, based on its hazardous properties.

LMP-103S is a monopropellant (liquid) blend of Ammonium dinitramide (ADN), Methanol, Ammonia and water. ADN is primarily the oxidizer which is dissolved in water with methanol and ammonia as fuel components. Ammonia also acts as the stabiliser.

The propellant mixture is considered to be a low-sensitive product. Use is to generate thrust in Space only.

8.3 Use categories of the substance(s):

The EPA has adopted the system of use categories developed by the European Union, which identify various functional uses of substances. This information is pertinent to the assessment of exposure scenarios and the determination of risk, and is also useful for building up a profile of the substance. There are three sets of use categories. Within each of these, applicants should state which use categories are relevant to all intended uses of the substance(s).

1. Main category: There are four main categories.
2. Industry category: There are 16 industry categories.
3. Function/Use category: There are 55 function/use categories.

(Optional)

8.4 Executive summary:

In this section, the applicant should provide a summary of information contained in this application, including:

- the identification of the substance, its hazardous properties, intended uses and disposal
- an assessment of the adverse effects of the substance
- information on the proposed containment.

LMP-103S is a monopropellant (liquid) blend of Ammonium dinitramide (ADN), Methanol, Ammonia and water. ADN is primarily the oxidizer which is dissolved in water with methanol and ammonia as fuel components. Ammonia also acts as the stabiliser.

Rocket Lab respectively seeks containment approval of LMP-103S, under section 30 of the HSNO Act for the purposes described within and in accord with the demonstrated benefits and acceptable risks.

21/02/2023

Signature

Date

Appendix 1 – Commercially sensitive information

N/A