



Bifrost Insurance Facility

Intro and Questionnaire

ASR/SPACE/[TBD]



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1 Objective

In Norse mythology, Bifrost was a rainbow which connected the realm of humans with the realm of the gods.

For us, Bifrost is an insurance facility which seeks to enable and assist NewSpace initiatives to succeed by providing an efficient means of mitigating a broad range of risks which most projects meet.

Bifrost allows premium certainty across a range of risks, as well as an alignment of interests and premium savings linked to actual loss experience and premium volume.

This note provides an overview of the covers provided under Bifrost, details of how the facility operates as well as a questionnaire for potential clients.

The coverage description provided herein does not replace the Policy Wording which, in case of conflict with this description, will take absolute precedence and forms the sole contractual relationship between Aesir Space and the Insured.

1.1 Key Features

- Pre-agreed premiums for a range of risks covering the typical lifecycle of space venture
- A No Claims Bonus on Renewal in case of good performance
- Premium volume discounts in case of portfolio growth
- Premium payments can be arranged as regular fixed payments to ease budgeting

Bifrost is an annual facility accepting any number of declarations, each declaration being for a project across a range of perils, including AIT, pre-launch, Launch and In-Orbit. The Baseline Coverage includes pre-launch plus launch with other coverages being purchased in addition as may be required by the customer.

Bifrost includes predefined rates and automatic acceptance of declarations which fall within pre-agreed limits.

Based on an annual 'Estimated Number of Declarations' as provided by the Insured before inception, premium can be paid as fixed quarterly instalments, and adjusted on an annual basis.

Standardised declaration forms are used for each declaration to the facility.

Declarations are made (in the case of automatic declarations) or agreed (in the case of risks outside the pre-agreed framework) within a predefined timeline before each risk attaches.

Projects which fall outside the agreed limits require prior approval before acceptance.

Claims are settled to the Insured or a Loss Payee.

The facility will be proposed to be renewed with a performance-based profit sharing scheme.

2 Perils covered

The Baseline Coverage to be declared under the facility is Launch cover up to Separation. If required, the following coverage extensions can be purchased in addition to the Baseline Coverage:

- Extension 1: Pre-Launch cover up to Launcher Ignition
- Extension 2: Hot Fire Testing (for the Pre-Launch Phase)
- Extension 3: Assembly, Integration and Testing; at the Insured or prime contractor premises
- Extension 4: Transits; worldwide cover including Final Transit to Launch Site/Launch Operator/Launch Integrator
- Extension 5: Post Separation (to be defined depending on Launch Vehicle configuration and mission profile); cover from Separation to Completion of In Orbit Testing and subsequent In-Orbit cover up to nominal EOL

Up to the moment of Launch, the Satellite is deemed repairable and hence the cover is indemnity based; covering the actual costs to repair or reinstate the Satellite.

After Launch, repair is no longer possible, and cover is provided on a Total Loss Only for Satellite agreed value basis.

Cover for Partial loss during Launch and/or Post Separation may be available depending on mission and equipment.

Market standard coverage extensions and exclusions are applied throughout.

The facility includes predefined rates for Baseline Coverage and Extensions allowing customer to modify overall coverage as and when required during Baseline Policy period and prior to attachment if relevant risk without any further negotiations and by written notification to insurer.

3 Premium calculations and adjustments

At inception the Estimated Premium is calculated based on the Schedule of Expected Risks and satellites expected to be covered under those risks by the Insured in the 12 months of the facility applying rates shown in the Premium Schedule.

The premium is payable in 4 quarterly instalments following inception with the Deposit Premium payable being 85% [TBD] of the Estimated Premium. This represents an upfront discounted NCB.

At each policy anniversary, a comparison is made between the Schedule of Expected Risks agreed at inception and the actual Risks declared, following which the balance premium to be paid taken forward is adjusted for the next policy period.

As appropriate, the insured will receive discount if there have been no claims made;

The premium review is performed as follows:

1. Actual Earned premium calculation, Earned NCB calculation:
Actual Risks declared are used to calculate Actual Earned premium. In case of no loss, a No Claims Bonus is deducted from the Actual Premium, calculated as [TBD]% of the Actual premium. This offset to the [TBD]% NCB already pre-earned and deducted from the Estimated Premium.
2. Rate adjustment based on Loss History and Volume:
Loss history: Rates are adjusted upwards by [TBD]% in case of claims having been made or downwards by [TBD]% in case of no claims made.
3. New Estimated/Deposit Premiums calculation:
A new Schedule of Expected Risks for the subsequent year is agreed and the Estimated and Deposit premiums for the new year are calculated.
4. New Deposit adjustment:
The Deposit Premium for the subsequent year is adjusted up/down based on any surplus or shortfall of premium between the Actual Earned and Deposit Premiums from the year prior.
5. Quarterly premium calculation:
Quarterly premium payments continue based on 1/4th of [TBD]% of the (adjusted) Deposit premium.
6. Premium in case of claim:
In case of a claim, the difference between Actual Earned and Deposit premium (if positive) becomes due and payable including all premium instalments due.

Please ask us for worked examples to demonstrate this.

4 Practical aspects of the facility

4.1 Risks Declared

Risks Declared are used to confirm / correct the Schedule of Expected Risks under the facility.

Declarations which are in line with the Schedule of Expected Risks are by definition accepted and cover will automatically attach.

New declarations outside the Schedule of Expected Risks will be automatically accepted if they fall within the defined acceptance framework, otherwise they will require agreement by the insurer prior to attachment of risk.

The intention is to have a wide acceptance framework defined, making the majority if not all new declarations automatic.

Where the risk falls outside the predefined product framework, the Insurer will review the submitted declaration and revert with a proposed premium rating and agreement or requests for further information.

4.2 Limits

- Baseline: Launch:
Agreed value limit: USD [TBD] per satellite, subject to
Aggregate limit: USD [TBD] per Launch
- Extensions 1-4: Assembly, Integration, Test, Transit, Pre-Launch, Hot Fire Test:
Indemnity limit: USD [TBD] per satellite/equipment, subject to
An aggregate limit: USD [TBD] in any one location
- Extension 5: Post-separation, In-Orbit:
Agreed value limit: USD [TBD] per satellite

One satellite/project should give rise to one Declaration.

Subject to the aggregate limits above, several satellites up to a potential accumulation of 10 (e.g. in the same factory, on the same transit shipment or on the same launch) can be declared as a single Declaration where suitable. Accumulations of more than 10 satellites on a single declaration would probably benefit from separate underwriting and will be subject to insurer's agreement.

The sum insured should typically be based on the replacement value of the flight hardware.

For transit and pre-launch, this can also include non-flight hardware used for the transit and prelaunch activities which is returned to the Insured (value to be declared prior to attachment to risk), as well as extra expenses cover (not exceeding 20% of the Sum Insured).

Furthermore, for the launch phase, where the launch has been procured by the Insured, the sum insured can include the value of launch contract, to enable a re-flight.

4.3 Material Change provisions

Market standard Material Change provisions apply to the cover; once a declaration has attached, Insurers should be notified as soon as practicable in case of a Material Change. A Material Change would typically include the change of Launch Vehicle or the in-orbit failure of the same equipment as the equipment on the declared satellite.

Where the Material Change leads to a risk which is still within the agreed product framework (e.g. change to another Launch Vehicle already part of the standard rate list), this will be automatically agreed and in practice only serve to update the Declaration.

Where the Material Change falls outside the agreed product framework, coverage will be subject to Insurers providing agreement.

4.4 Claims

In case of an event which may give rise to a claim, the Insured is required to give a Notice of Event within 30 days of the date of the event.

A final Proof of Loss needs to be submitted within 180 days of the Notice of Event.

Insurers will either agree the Proof of Loss or raise any questions to the Proof of Loss within 30 working days.

An agreed Proof of Loss will be settled within 30 days of agreement, subject to signature of a Release Agreement.

Standard forms will be used for the claims process.

Where the claim is made under an indemnity based cover (i.e. up to but not including Launch), the Insured will need to demonstrate the actual expenses incurred to replace/repair the damaged equipment. It is strongly suggested that the Insured accounts for all such costs separate from other costs to facilitate a correct loss adjustment.

4.5 Premium Rates

Premium is calculated as a rate applied to the sums insured.

4.6 Declaration and Claim Templates

These will be detailed as a result of future discussions as we learn more about products and risks required by the Insured. Templates will be kept as simple as possible to facilitate the submission process.

5 Questionnaire

This questionnaire is not a comprehensive consideration of every detail, however the greater level of information that can be provided at this stage will result in a better understanding of the coverage required and in turn a better premium. Further questions may be posed to assess specific proposals. By nature, the insurance of Space ventures is technically complex and detailed.

For information specific to each coverage required, please see the questions listed below. To avoid duplication, it is not necessary to repeat answers where they have been addressed within the background information or where already answered for another coverage.

5.1 Background Information

The following questions are aimed at getting a better understanding of the company and the projects which are required covered under the facility.

5.1.1 Company

- (1) Name and address of party(ies) to be insured.

- (2) Please attach a company presentation to the response of this questionnaire

- (3) Description of activities performed by the insured party(ies).

- (4) What standards\design standards (if any) do you as a company typically follow e.g. ESA ECSS, MIL-STD, ISO 9001 etc

- (5) What is the previous claims history of the Insured and other organisations involved in the insured activities?

5.1.2 Expected Risks

Please list the expected projects/satellites for which cover is required and type of cover required

5.2 Schedule of Expected Risks – Sums Insured

Satellite/Project	Baseline Coverage Launch	Extension 1 Pre-launch	Extension 2 Static Fire Test	Extension 3 AIT	Extension 4 Transit	Extension 5 Post Separation	Extension 6 In Orbit

5.3 Project Information

For each project, please provide:

1. a summary of satellite(s) and/ or launch vehicle(s) and/ or launch site and/ or other subject to be insured.
2. Outline of major project milestones and key dates.
3. Indication of the sum(s) insured and its basis of evaluation. For asset cover, this would be the construction costs or book value of assets to be insured
4. High level summary of project structure:
 - a. manufacturers, major sub-contractors and suppliers
 - b. contractual framework and principal allocation of risks
 - c. financing structure
 - d. legal and regulatory environment and licenses obtained or sought.

5.4 Launch - Baseline Coverage

The following questions are aimed at getting a better understanding of cover required for the launch phase of insurance Coverage for loss, damage, or failure of the satellite during launch

Please complete this section if any of the projects listed above require this cover. If any of these points differ by project, please provide additional details.

- a) Which launch vehicle will perform the launch and how will it be configured?
- b) What is the mission profile and satellite(s) to be launched?
- c) What deployer being used?
- d) Single payload or Co-payload, Co-passengers if known
- e) If shared ride, please provide separation sequence
- f) Are you aware of if it is a qualification flight or are there any first flight items?
- g) What is the scheduled launch date?

5.5 Extension 1: Pre-Launch

The following questions are aimed at getting a better understanding of pre-launch phase of insurance providing cover against physical loss or damage of the satellite at the launch site and the integration of the satellite to the launch vehicle. Typically coverage will terminate at "lift off" or "intentional ignition".

Please complete this section if any of the projects listed above require this cover. If any of these points differ by project, please provide additional details.

- 1) Launch Site:
 - a) Geographical Location
 - b) Launch Vehicle
- 2) What are the main events of the pre-launch preparation process?

- 3) Please provide list of planned activities at launch site (tests, fuelling, battery charging, any movements around launch site?)
- 4) Will any component parts be assembled at the launch site?
- 5) Will there be any storage at Launch Site? If so, please advise the estimated period and conditions?
- 6) Who is responsible for the satellite at the launch site during the pre-launch campaign? Is there supervision representative from the Insured?
- 7) Is cover required for satellite support equipment to make up the Insured Interest? If yes, please provide:
 - a) Basis of Valuation of this equipment
 - b) Sum Insured

5.6 Extension 2: Hot Fire Engine Testing

Is Hot Fire Test performed whilst satellite mated to the launch vehicle?

5.7 Extension 3: Assembly, Integration and Test

The following questions are aimed at getting a better understanding of cover required for the assembly integration and test phase of insurance providing cover against physical loss or damage of the satellite during test or transit from the manufacturer's facilities to third party locations.

- 1) Please complete this section if any of the projects listed above require this cover. If any of these points differ by project, please provide additional details.
- 2) Location of Assembly facilities
- 3) Location of Test facilities if different from above
- 4) What are security arrangements and fire fighting systems in the facility.
- 5) Will any component be tested in the laboratory standalone prior to integration onto the spacecraft?
- 6) Are ESD precautions taken whilst testing components
- 7) Will calibrated test equipment be used to test components and spacecraft
- 8) How are components transported from laboratory to AIT facilities?
- 9) Are the test facilities clean room grade and if so which classification to they fall?
- 10) Who will be carrying out tests on the spacecraft?
 - a. What is their experience in this process?
 - b. What is the expected time line for this phase of the project?
- 11) Is insurance required whilst the insured property is tested at third party locations e.g. external vibration facilities, external thermal vacuum chambers, external anechoic or acoustic test facilities? If yes, please provide:
 - a. Location details
 - b. Tests to be undertaken e.g. Thermal testing, vacuum testing, EMC testing
 - c. Who will have responsibility/control of the Insured Interest at this time
- 12) How are components/spacecraft transported to third party test facilities and who is responsible for packaging.
 - (1) Will any component parts be assembled at the launch site?

5.8 Extension 4: Transit

The following questions are aimed at getting a better understanding of cover required for the transit insurance against physical loss or damage of the satellite during transit from the manufacturer's facilities to the launch site. Typically coverage will terminate at acceptance at the launch site.

Please complete this section if any of the projects listed above require this cover. If any of these points differ by project, please provide additional details.

Please provide an overview of the planned transits. Exact dates are not required but approximate dates should be provided.

Project	Sum Insured	Start	From	End	To	Method
<i>e.g. Newsat</i>	<i>USD 1,125,000</i>	<i>2 Mar 2019</i>	<i>Harwell, UK</i>	<i>5 Mar 2019</i>	<i>Cape Canaveral Air Force base, FL, USA</i>	<i>Road and air</i>

If available, please provide additional information relating to the transits as follows:

- 1) Start point for transportation, facility location?
- 2) Any interim storage before final delivery to the Launch Site (if yes, please provide location, security arrangements, duration and storage conditions)
- 3) Please provide the full route structure with re-loading points if any.
- 4) Means of Transportation, if various means are used, please advise for each leg. Who is responsible for the satellite during each leg?
- 5) What security arrangements are in place and will guards accompany the satellite/ launch vehicle?
- 6) Who will be loading and unloading the satellite/ equipment/ launch vehicle? What is their experience in this process?
- 7) Satellite packaging (container, life support equipment, shock shields)
- 8) Is cover required for inbound transit to the manufacturing plant of equipment to make up the Insured Interest? If yes, please provide:
 - a) Basis of Valuation of this equipment
 - b) Sum Insured
- 9) Launch Site Geographical Location

5.9 Extension 5: Post-Separation In Orbit Coverage

The following questions are aimed at getting a better understanding of cover required for the post separation phase of insurance Coverage for loss, damage or failure of the satellite during the "in-orbit phase".

Please complete this section if any of the projects listed above require this cover. If any of these points differ by project, please provide additional details.

1. What is the desired period of insurance?
2. What type of coverage is required? e.g. Total Loss only or Partial and Total Loss coverage.
3. What is the designated orbital pattern and location of the satellite?
4. What is the satellite platform? Please provide a top-level block diagram describing the main systems and listing installed redundancies.
5. What is the payload? Please provide a top-level block diagram describing the main systems and listing installed redundancies.
6. Please provide a list of previously un flown equipment.
7. What is the design life and current projected lifetime of the satellite? What is the main life limiting factor?
8. Please provide system level budgets including power, fuel, RF link as appropriate
9. If full technical description of the satellite is available, the copy will be much appreciated. Declarations

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