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Submission to Department of Industry Science & Resources on the proposed Flight Safety Code and Maximum Probable Loss Methodology Guidelines under the Space Activities Regulations 2001

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1 GENERAL COMMENTS

ASICC is pleased to provide this submission in response to the proposed Flight Safety Code and Maximum Probable Loss Methodology Guideline documents that were recently distributed for industry consultation.

ASICC has consistently argued that any regulatory framework for Australian space activities must:

- Establish a constructive and supportive environment to attract and foster investment in Australian space activities
- Ensure that any obligations imposed on business entities attempting space activities from Australia are clear, unambiguous, workable and free from arbitrary determinations
- Be no more onerous for participants than is the case in other space-faring nations.

The Australian commercial space launch industry is at a critical stage of development. Important investment decisions have yet to be made and the detailed obligations of launch providers set out in the Regulations, Flight Safety Code and MPL Methodology will have a major impact on the commercial viability of the projects.

We acknowledge the Government's obligation to protect the public against the risk of injury and property damage. We urge the Government to balance this with the importance of not stifling the establishment of new commercial activity that will earn export income for Australia, create jobs for Australians, showcase our expertise in project management and restore Australia's standing in the international space community.

We are gravely concerned that some of the provisions of the Flight Safety Code and Maximum Probable Loss Methodology will be more onerous for Australian launch providers to achieve than for their counterparts in other countries, and specifically in the United States.

The imposition of more stringent measures than are imposed elsewhere leads to costs for Australian launch providers that their competitors overseas do not incur. This has an impact on the competitiveness of Australian projects compared with their established competitors overseas which ultimately reduces the ability of Australian launch providers to attract the investment necessary to fund their projects.

We are very seriously concerned about the Maximum Probable Loss Methodology proposed. Under one interpretation of the proposed MPL Methodology it is conceivable that no launch will ever take place from Australia, as the insurance cover required will exceed the available capacity of the global insurance market. It is imperative that the Government revisit the MPL document and devise a workable solution that does not effectively prohibit launches from Australia.

The Flight Safety Code and MPL Methodology as they stand make it much more difficult to obtain the required space licences and launch permits in Australia than in other countries. This makes Australia a more difficult place to conduct launch operations than any other country. Under the proposed Guidelines Australia will require a standard of safety above the norm that has been established in other countries. This is despite an extremely low level of casualties historically and no significant third party property claims involving personal injury in 40 years of space launch activities overseas.

ASICC submits that the Government has not achieved an appropriate balance between public safety and the encouragement of this new industry and suggests that Australia would be better served by adopting standards more in line with those overseas which adequately protect public safety yet enable a robust launch industry.

2 SPECIFIC COMMENTS ON THE PROPOSED FLIGHT SAFETY CODE

2.1 Drop Zone and Landing Zone Definitions (Section 2)

The definitions for drop zone and landing zone specify a four standard deviation dispersion footprint around the nominal impact point. Normal space industry practice in other countries requires only a three standard deviation dispersion footprint. The more stringent measure proposed in Australia imposes additional costs on Australian launch providers by potentially limiting certain flight paths and increasing insurance costs. The three standard deviation dispersion footprint has been used effectively overseas since the start of the space age, is universally recognised and should be a more than adequate limit for Australia.

ASICC submits that the three standard deviation dispersion footprint be adopted here and throughout the document.

2.2 Maximum third party individual casualty annual risk (Section 3.1)

Section 3.1 specifies a maximum third party individual risk on a per launch basis as 10E-7 per launch and the maximum third party individual casualty risk on a per year basis as 10E-6. This effectively places a cap of 10 launches per year for a specific flight path. This standard does not support robust growth of the Australian launch industry.

ASICC submits that the maximum third party individual casualty risk on a per year basis should be relaxed slightly to enable 50 launches per year and proposes a maximum third party individual casualty risk on a per year basis of 5 x 10E-6. This still comprises a standard which would be acceptable to the Australian public.

2.3 Asset Safety Standards (Section 3.2)

ASICC notes that Asset Safety Standards are not imposed in any other launching state and hence this is an imposition on Australian launch providers that their competitors do not have.

The Asset Safety Standards proposed also impose an effective cap of 10 launches per year. ASICC submits that these standards should be relaxed to allow up to 50 launches per year. ASICC proposes the maximum probability of debris impact on a Designated Asset per year be reduced to 5 x 10E-4 and that the standard for trigger debris impact per year be amended to 5 x 10E-6.

ASICC also notes that the requirement for the launch provider to fund expert engineering analysis on trigger debris on Designated or Protected Assets is not imposed in any other launching state and hence is an imposition on the Australian launch providers that their competitors do not have. ASICC submits that there should be limits on the requirements for this type of analysis. ASICC submits that this analysis should only be required when the probability of debris impact on a Designated Asset is between 10E-5 and 10E-7. ASICC further submits that a two tiered analysis approach should be used when the debris impact probability is between 10E-5 and 10E-7. The first step would be a general analysis of the size and nature of the debris fragments that fall within the above mentioned threshold and an assessment as to whether any of these constitute trigger debris. The more detailed engineering analysis should only be conducted once the first analysis gives an indication that this more in depth analysis is warranted.

2.4 Protected Assets (Section 3.2)

There are no safeguards in the proposed Regulations or the Draft Flight Safety Code that guarantee the launch providers, having met all the safety requirements at the time of issuance of a space licence, will be able to continue to use their chosen flight paths. The overall construction of the Flight Safety Code document, and in particular the requirement that a protected asset be at least 10km outside the 10E-7 impact probability isopleth, creates the possibility that the creation of new protected assets under an existing flight path would render this flight path unusable. The potential that major revenue earning flight paths, and potentially the entire launch site, will be rendered unusable through actions outside the control of the launch provider has a major impact on a launch provider's ability to raise commercial funding for these activities, given that several years of successful operation to recoup the investment funds would be required. This approach is unlikely to attract the investment funding needed to ensure a viable commercial launch industry in Australia.

It is a fact of nature that there are only certain useful corridors for placement of satellites into useful orbits from a specific place on the earth's surface. These will be specified as part of the space licence application. ASICC submits that once these flight corridors are approved as part of the licensing process they should remain accessible to the launch provider for the duration of the space licence. In practice this would mean that parties who wish to build high value assets under an approved flight path must do so at their own (minimal) risk. It should not be possible to halt the flight activities of the launch provider by the construction of such facilities under a known flight and these new assets should not capable of being deemed protected assets.

2.5 Unproven Launch Vehicle Safety Standards (Section 3.3)

ASICC accepts that SLASO might wish to ensure that the launch of unproven vehicles does not compromise public safety. ASICC can accept this principle as long as the merits of any additional restrictions are determined on a case by case basis. This discretionary authority must be flexible to cater for different circumstances. ASICC is concerned that a uniformly imposed restriction may disadvantage commercially necessary flight paths and preclude the launch provider from certain types of business until the vehicle is proven. An unproven vehicle with three or four consecutive successful launches should generally be more favourably reviewed with regard to restrictions, than a vehicle on its first flight.

ASICC submits that that the wording of the Guidelines be amended to ensure that SLASO is able to exercise this additional flexibility when appropriate and suggests the following words:

“Subject to the discretion of SLASO, an unproven vehicle may be subject to restrictions regarding flying in the vicinity of significantly populated areas.’’

2.6 New Space Licence Safety Standards (Section 3.4)

ASICC understands that the intent of this section is to provide additional protection to Designated Assets during the first flights from a launch facility. ASICC submits that the existing wording does not adequately address this and suggests the following wording:

‘’Launches from a licensed space facility may be subject to restrictions until after three consecutive successful launches. Designated Assets which are petroleum facilities may be treated as Protected Assets until three consecutive successful launches are achieved.’’

2.7 Monitoring Drop Zones (Section 3.5)

The requirement to monitor and record the location of all drops near a Designated Asset involves significant engineering difficulties. At best it is a major cost requiring additional hardware and potential impact on the reliability of the launch vehicle (particularly for existing vehicles) and at worst it may not be achievable. No other flight code worldwide requires this. ASICC submits that this requirement should be deleted.

The requirement that the launch not proceed unless the drop zone area is monitored and an all clear signal is given from the drop zone would appear to be unattainable for marine drop zones or drop zones which cover large areas. One interpretation of this would exclude aerial surveillance as an effective means of monitoring. ASICC submits that the wording of this phrase be amended so that real time monitoring and an all clear signal simultaneously across a large area is not required.

2.8 Expected Casualty Equation Probability of Failure (Section 4.2)

The same term Pf is used in the Expected Casualty Equation at the bottom of page 12 and at the top of page 17 however these terms appear to have completely different meanings in the two places. ASICC submits that this discrepancy be amended by revisiting what is meant by Pf on page 12 and clearly differentiating this from the Pf on page 17.

2.9 Initial Probability of Failure for New Vehicles (Section 4.4)

ASICC cannot find evidence to support the statement on page 17 that “from actual launch history about 25% or the new vehicles have failed” which is the basis of assigning 25% as the initial failure rate for new vehicles. An ASICC analysis using the definition of new vehicle in the Flight Safety Code (first five flights) based on flight history data contained in the major space insurance database, Airclaims Spacetrak, reveals that new vehicles have a failure rate of 10.53%. If the analysis is confined to only the first launch of any vehicle the failure rate is 15.49%. ASICC submits that the initial failure rate for new vehicles in the Guidelines should be amended to between 11% to 15% based on these historical statistics.

The detailed ASICC analysis is contained in Appendix A.

2.10 Status of Guidelines

The Flight Safety Code is somewhat ambiguous as to which elements in the methodology described are mandated and which are preferred but open to alternate methodology to be proposed by the launch proponent.

ASICC recognises that endless different methodologies cannot be accommodated however given that the practicalities of this methodology have not yet been tested. ASICC submits that the language of the document should be amended to enable alternate methodologies which achieve the same effect to be used by the launch providers.

3 MAXIMUM PROBABLE LOSS METHODOLOGY

ASICC is very concerned about the Maximum Probable Loss Methodology document as it currently stands. We find the document confusing and even contradictory in some respects. ASICC submits that this document needs a complete review to ensure that the methodology proposed is clear and easily understood. ASICC further submits that the methodology be tested to determine whether the likely MPL figures derived by the methodology exceed the available third party launch insurance on the global market and hence prohibit launches from Australia.

ASICC notes that the proposed methodology requires the launch proponent to include terms for property loss for high value assets, loss of use and environmental clean-up including consequential losses. These factors do not exist in the MPL calculations of other countries. In addition to making the calculations much more complicated, the addition of these terms significantly increases the amount of insurance needed placing additional costs on Australian launch providers that their competitors do not have.

The inclusion of high value assets, loss of use and consequential damages has the potential to raise the level of MPL required to such a degree that it exceeds the US$2 billion of available capacity in the worldwide third party launch insurance market. Under this scenario launch providers would be unable to obtain sufficient insurance and hence launches could not proceed from Australia.

This result is very likely since the proposed methodology requires the assumption that rocket fails at every instant in flight (i.e. the probability of failure is 1). This varies significantly from the Casualty Expectation calculations where the reliability of the rocket is taken into account (i.e. the probability of failure is much less than 1).

ASICC submits that it is imperative that a solution be found to this contradictory situation. ASICC proposes that either:

1) the newly added terms of high value asset loss, loss of use and consequential damages for environmental clean-up be removed from the MPL calculations or,
2) the method for calculating the probability threshold area be revised to allow the reliability of the rocket to be used or,
3) the Australian government follow the lead of other governments and limit the maximum liability of the launch provider at a specific figure. ASICC proposes a limit of US$500 million as used in the United States.

The importance of this matter cannot be over emphasised. Unless a solution to this dilemma is found there is a very real chance that launch providers will be unable to obtain sufficient insurance for launches from Australia and hence no launches will proceed.

The MPL insurance proposals set an arbitrary maximum dollar value on casualties at A$5 million per casualty. ASICC is also concerned that the establishment of the maximum dollar value on casualties at this value seems to be an arbitrary following of the US standard of US$3 million per casualty, rather than a evaluation of the likely scenario under Australian conditions. ASICC raised this point previously in its submission to DISR on the MPL methodology of 13 October 2000.

As pointed out previously, the two sources of claims for compensation arising from launch accidents will be intergovernmental claims pursuant to the Liability Convention and claims under Australian law, either pursuant the Space Activities Act or at common law.

While there are no precedents in relation to the calculation of claims under the Liability Convention or the Space Activities Act, the selection of a similar value to that used in the US (US$3 million per casualty) assumes that the very high level of damages awarded by juries for personal injuries in the US courts is likely to apply in Australia as well. We do not believe that this is a correct assumption. Australian courts are more conservative in the levels of compensation awarded for personal injuries and we do not believe that a Claims Commission established pursuant to the Liability Convention would necessarily follow the US courts in quantifying compensation. It is more likely to base compensation at average levels from a number of countries.

ASICC submits that the Casualty value used in the MPL calculation should be set no higher than A$3 million per casualty.

4 APPENDIX A

Summary of Launch History for New Launch Vehicles

Source: Spacetrak (March 2001 release)

This table summarises the flight history (successes and failures) of each new launch vehicle. A new launch vehicle is defined by DISR as one that has not yet achieved 5 flights.

The table below lists the flight history of new vehicles through the fifth flight for each vehicle. If vehicles have not yet achieved 5 flights all flights to date are included.

Flights where the satellite reached orbit but not the correct orbit are included as a success in the table below since there was no risk to public safety. Similarly, flights which were considered a mission success but where there was debris fallout which presented a threat to public safety are listed as failures in the table below.

The failure rate of new vehicles based on this data is 10.53%

Note that this data is taken from the Airclaims Spacetrak Database which is widely used by the space insurance industry and considered the most comprehensive database on launch history.

Vehicle	Flights	Successes	Failures	1st Launch	Failure
Ariane 1	5	3	2	1	0
Ariane 2	5	4	1	1	1
Ariane 3	5	4	1	1	0
Ariane 4-0	5	5	0	1	0
Ariane 4-2L	5	5	0	1	0
Ariane 4-2P	5	5	0	1	0
Ariane 4-4L	5	4	1	1	0
Ariane 4-4LP	5	5	0	1	0
Ariane 4-4P	5	5	0	1	0
Ariane 5	5	3	2	1	1

	Flights	Successes	Failures	1st Launch	Failure
Athena 1	3	2	1	1	0
Athena 2	3	2	1	1	0
Atlas 1	5	2	3	1	0
Atlas 2	5	5	0	1	0
Atlas 2A	5	5	0	1	0
Atlas 2AS	4	4	0	1	0
Atlas 3	1	1	0	1	0
Atlas Agena D	5	5	0	1	0
Atlas LV-3C	5	5	0	1	0
Atlas SLV-3C	5	5	0	1	0
Atlas SLV-3D	5	5	0	1	0
Atlas SLV-3G/Centaur D-1A	5	4	1	1	1
Brazilian VLS	1	0	1	1	1
Conestoga	1	0	1	1	1
Cosmos 3M	5	5	0	1	0
Cosmos B1 (SL-07)	5	3	2	1	1
Delta 1410	1	1	0	1	0
Delta 1604	2	2	0	1	0
Delta 1900	1	1	0	1	0

Vehicle	Flights	Successes	Failures	1^{st} Launch	Failure
Delta 1910	1	1	0	1	0
Delta 1913	1	1	0	1	0
Delta 1914	2	2	0	1	0
Delta 2310	3	3	0	1	0
Delta 2313	3	3	0	1	0
Delta 2910	5	5	0	1	0
Delta 2913	2	2	0	1	0
Delta 2914	5	5	0	1	0
Delta 300	3	2	1	1	0
Delta 3910	3	3	0	1	0
Delta 3910/PAM D	5	5	0	1	0
Delta 3913	1	1	0	1	0
Delta 3914	5	4	1	1	0
Delta 3920	4	4	0	1	0
Delta 3920/PAM D	5	5	0	1	0
Delta 3924	5	5	0	1	0
Delta 4925	2	2	0	1	0
Delta 5920	1	1	0	1	0

Delta 6920 (Delta II)

Flights	Successes	Failures	1st Launch	Failure
3	3	0	1	0

Delta 6925 (Delta II)

Flights	Successes	Failures	1st Launch	Failure
5	5	0	1	0

Delta 7320 (Delta II Medlite)

Flights	Successes	Failures	1st Launch	Failure
2	2	0	1	0

Delta 7326 (Delta II Medlite)

Flights	Successes	Failures	1st Launch	Failure
2	2	0	1	0

Delta 7420 (Delta II Medlite)

Flights	Successes	Failures	1st Launch	Failure
5	5	0	1	0

Delta 7425 (Delta II Medlite)

Flights	Successes	Failures	1st Launch	Failure
2	2	0	1	0

Delta 7426 (Delta II Medlite)

Flights	Successes	Failures	1st Launch	Failure
1	1	0	1	0

Delta 7920 (Delta II)

Flights	Successes	Failures	1st Launch	Failure
5	5	0	1	0

Delta 7925 (Delta II)

Flights	Successes	Failures	1st Launch	Failure
5	5	0	1	0

Delta 8930 (Delta III)

Flights	Successes	Failures	1st Launch	Failure
3	2	1	1	1

	Flights	Successes	Failures	1st Launch	Failure
Delta 900	2	2	0	1	0

	Flights	Successes	Failures	1st Launch	Failure
Delta DM-19	5	4	1	1	1

	Flights	Successes	Failures	1st Launch	Failure
Delta DSV-3A	2	2	0	1	0

	Flights	Successes	Failures	1st Launch	Failure
Delta DSV-3B	3	3	0	1	0

	Flights	Successes	Failures	1st Launch	Failure
Delta DSV-3C	5	5	0	1	0

	Flights	Successes	Failures	1st Launch	Failure
Delta DSV-3C1	3	3	0	1	0

Vehicle	Flights	Successes	Failures	1st Launch	Failure
Delta DSV-3D	2	2	0	1	0
Delta DSV-3E	5	5	0	1	0
Delta DSV-3E1	5	5	0	1	0
Delta DSV-3G	2	2	0	1	0
Delta DSV-3J	1	1	0	1	0
Delta L	2	1	1	1	1
Delta M	5	5	0	1	0
Delta M-59	1	0	1	1	1
Delta M-63	1	1	0	1	0
Delta M-66	1	1	0	1	0
Delta M-68	1	1	0	1	0
Delta M-71	1	0	1	1	1
Delta M-75	1	1	0	1	0
Delta M-78	1	1	0	1	0
Delta M-79	1	1	0	1	0
Delta N	5	5	0	1	0
Delta N6	3	2	1	1	0
Dnepr 1	2	2	0	1	0
Japanese H-1	5	5	0	1	0
Japanese H-2	5	5	0	1	0

Vehicle	Flights	Successes	Failures	1st Launch	Failure
Japanese M	3	2	1	1	0
Japanese N-1	5	5	0	1	0
Japanese N-2	5	5	0	1	0
Indian PSLV-C	2	2	0	1	0
Indian PSLV-D	3	2	1	1	1
North Korean Taipo Dong 1	1	0	1	1	1
Long March 1	2	2	0	1	0
Long March 2A	1	0	1	1	1
Long March 2C-Solo	5	5	0	1	0
Long March 2C-SD	5	5	0	1	0
Long March 2D	3	3	0	1	0
Long March 2E-PKM/EKPM	3	3	0	1	0
Long March 2E-Star 63F	4	2	2	1	0
Long March 2F	2	2	0	1	0
Long March 3	5	5	0	1	0
Long March 3A	5	5	0	1	0
Long March 3B	5	3	2	1	1
Long March 4A	2	2	0	1	0

Vehicle	Flights	Successes	Failures	1st Launch	Failure
Long March 4B	3	2	1	1	1
Minotaur	2	2	0	1	0
Molniya (8K78)	5	3	2	1	1
Molniya M	5	5	0	1	0
Pegasus	5	5	0	1	0
Pegasus XL	5	3	2	1	1
Proton D	4	3	1	1	0
Proton K (Breeze M)	2	1	1	1	0
Proton K (D-1)	5	4	1	1	0
Proton K (D-1-e)	5	2	3	1	0
Rockot	2	2	0	1	0
Shavit 1/LK-A	5	3	2	1	0
Shtil 1	1	1	0	1	0
Soyuz-Fregat	4	4	0	1	0
Soyuz-Ikar	5	5	0	1	0
Soyuz-U	5	5	0	1	0
Soyuz-U2	5	5	0	1	0
START 1	5	5	0	1	0
Taurus	5	5	0	1	0

Vehicle	Flights	Successes	Failures	1st Launch	Failure
Titan 34D	5	3	2	1	0
Titan 34D/IUS	3	3	0	1	0
Titan 34D/Transtage	5	5	0	1	0
Titan 3A	4	3	1	1	1
Titan 3B	5	4	1	1	0
Titan 3C	5	5	0	1	0
Titan 3D	5	5	0	1	0
Titan 3E Centaur	5	4	1	1	1
Titan 3 Commercial + TOS	4	4	0	1	0
Titan 2	5	5	0	1	0
Titan 2G	5	5	0	1	0
Titan 4A	5	5	0	1	0
Titan 4A/Centaur	5	5	0	1	0
Titan 4A/IUS	3	3	0	1	0
Titan 4B	2	2	0	1	0
Titan 4B/Centaur	4	4	0	1	0
Titan 4B/IUS	3	3	0	1	0
Tsyklon 2 (M) (SL11)	5	5	0	1	0
Tsyklon 3 (SL14)	5	5	0	1	0

Vostok (SL-3)	Flights	Successes	Failures	1st Launch	Failure
	5	4	1	1	1

Zenit 2	Flights	Successes	Failures	1st Launch	Failure
	5	4	1	1	1

Zenit 3 Sea Launch

	Flights	Successes	Failures	1st Launch	Failure
	5	4	1	1	0

TOTALS	Flights	Successes	Failures	1st Launch	Failure
	513	459	54	142	22

New Vehicle Failure Ratio **10.53%**

1st Launch Failure Ratio **15.49%**