NT EPA reference: EP2023/031

Tue 20 August 2024

Dr Paul Vogel AM – Chairperson
Northern Territory Environment Protection Authority (NT EPA)

Dear Dr Vogel,

Subject: Review of proposed action Phase 2 Expansion of the Arnhem Space Centre

Preamble

I commend your decision of Supplementary Environmental Reporting (SER) for proposed Phase 2 Expansion of the Arnhem Space Centre (ASC). That indicates trust and confidence in Equatorial Launch Australia (ELA) and their Yolŋu partners with ASC's long term management, mitigation, monitoring and remediation of the environmental and social impacts.

I too want ASC to succeed and flourish, especially for the futures of the region, the nation, and the commercial space industry. Educating the public and regulatory authorities about the history, challenges, and impacts of the industry is important to realising those futures; particularly where regulations and policies lag potential impacts.

ASC was founded with the intent to implement lessons learnt from past attempts to establish space launch facilities in Australia. And similarly, lessons learnt from more established launch and test facilities in Europe and the Americas. Those aspirations are all the more challenging for an Australian private commercial startup enterprise.

So I write with concern in the apparent lack of sufficient public evidence available so far to address the potential impacts from the increased scale as only outlined in the proposed Phase 2 Expansion of ASC. I reviewed the available Referral documents and ancillary documents uploaded to the public register available as of Sunday 18 August 2024. I note the decision referenced documents dependence upon the ASC Phase 01 Notice of Intent (NOI). I include the following review notes for your consideration. Alas, they are less than exhaustive to address apparent deficiencies as I was only recently aware of the public consultation.

Overview

The original strategy for ASC sustainable expansion can be defined along three capability dimensions of increasing complexity and risk:

x. propellant infrastructure;
y. payload lift and recovery;
z. and commercial ecosystems support.

Propellant infrastructure (that includes fuel, oxidisers, pressurisers, and power systems) for space launch vehicles and spacecraft generally phased incrementally as:

1. solid,
2. liquid (including hybrids of solid and liquid),
3. then cryogenics (including pressure vessels).

Payload lift and recovery generally phased incrementally as launch and recovery facilities to Low Earth Orbit (LEO, that is, 180km to 2000km altitude, while there is a commercial sweet zone below the International Space Station, subISS, <400km,) with:

1. micro to small space launch vehicles (SLV respectively <=500kg, <=2000kg payloads);
2. medium space launch vehicles (MLV <=20000kg);
3. then heavy space launch vehicles (HLV <=50000kg).

Commercial ecosystems support, generally phased incrementally across increasing independent self sustaining enterprises (including materiel, research and development, advanced manufacturing, testing, and education outreach) as:

1. Local;
2. Regional;
3. International.

Phase 01 of ASC, with the successful launch and recovery of solid propellant sounding rockets, largely scoped level 1 capabilities along all three dimensions. Where the proposed outline of Phase 2 Expansion can be situated in any frame of complexity and risk is unapparent. And, relative to Phase 01, appears ambiguously open ended.

Brief Review

1. Measurement and monitoring of regulated and unregulated pollutants across soil and groundwater profiles enable long term risk management and short term environmental loading capabilities. Monitoring environmental loading capabilities determine operational areas like safe and sustainable periods of rocket motor firing during testing and viable launch cadence from each pad. They can also assist in monitoring structural integrity of launch pads, aprons, storage, and bunding. Originally planned management of baseline measurement (prior to site construction and prior to each firing of a rocket motor) with post rocket motor firing and regular monitoring of soil and groundwater profiles for regulated and unregulated pollutants appears undefined.

2. Selection of site construction materials to avoid ongoing false positive and skewed results in soil and groundwater target pollutants monitoring (caused by leaching) appears undefined.

3. “Greener” and lower hazard propellants were originally planned for use to sustain competitiveness and avoid costly mitigation, monitoring and potential remediation. Propellants excluded from acceptable use appear undefined.

4. Bunding and storage parameters for each specific propellant appear undefined.

5. Movement, storage, pre-launch/ firing and post launch/ firing hazard zones across all Phase 2 sites appear undefined.

6. Mitigation of migratory birds, insects, larger animals and other impacted and impacting vectors with exposed water storage appears undefined.

7. Comprehensive modeling of exhaust plumes for all types and configurations of LV intended for testing and launch appears undefined. That includes multiple scenarios and catastrophe with various radiosonde wind profiles across near and far fields. You might recall the argument we had, during ASC Phase 01 NOI assessment, about the invalidity of AERMOD and CALPUFF models for a space launch and testing facility. A static model based on a factory smoke stack cannot scope the dynamic nature of rocket exhaust plumes with various different propellants and vehicle configurations through layers of atmosphere. Recall the exhaust plume models of the Black Brant IX sounding rocket motors you accepted with Phase 01.

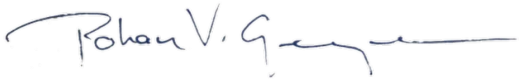
8. Management of recovery and disposal of LV stages beyond first and booster stages, especially for failures to reach target altitudes or orbits and far drop zones, appears undefined.

9. Management of injured or entangled large animals, especially in far marine drop zones, appears undefined.

10. Management of recovery and disposal of unspent propellants dispersed across land or marine environments (launch failure or catastrophic scenarios) is undefined. Note also exhaust plumes from solid and hybrid rocket motors, in nominal scenarios, can also disperse unburnt propellants which can have a cumulative environmental impact (see soil and ground water monitoring above).

11. Chain of custody of full life cycle material reuse and licensed waste disposal appears undefined. Chain of custody not only allows pricing of practices like client “camper” rules (incentives for clients to recycle, reuse, and leave with responsibility for their waste) but is also useful for post incident investigations.

In appreciation,



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