# Landsat Next
# Mission Alternatives Assessment Team (MAAT)

## Co-Chair's Report

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# Executive Summary

The Landsat Next Mission Alternatives Assessment Team (MAAT) was created for the purpose of considering and assessing architectures for the Landsat program's upcoming mission that would reduce the mission cost in light of reductions spelled out in the President's FY26 budget request. The MAAT, with its diverse array of expertise, carefully considered ten different architectures that included four scaled down versions of the current LandIS mission, two types of Landsat 9 functional clones, one repurposed NASA mission (SBG) and a hybrid LandIS/commercial approach.

The LandIS program is executing well, with reasonable cost and schedule margins that are expected to meet the requirements for which it was intended to be designed. The program is sufficiently mature that any payload redesigns are not likely to save costs. The only option for instrument cost reductions would be reducing the number of payloads. In addition, when considering money spent to date and termination liability, any approach that does not include LandIS will result in a loss of [redacted] to the overall program. This puts alternative options at a significant cost-disadvantage.

Significant and promising progress has been made in commercial Earth observation capabilities within the last decade. Currently, however, no combination of providers meets all Landsat requirements. One reason is that they lack the capability for self-calibration. Absent a LandIS-based LNext, the calibration capabilities would need to be independently developed, either by industry or by the government. Another major hurdle to a commercial-only capability is the importance of simultaneous observations across all channels. The existing and emerging capabilities in the commercial market are such that the observations would likely require multiple platforms from multiple vendors, producing disaggregated sets of observations at different times that would need to be integrated with one another to produce the needed products. Doing so will present challenges that are not yet well understood and would require significant planning and attention from NASA and USGS as well as an unknown level of investment.

**MAAT Assessment**

*The MAAT's assessment identified four options that fit within the President's budget request with low budget risk.* These were:

- A single LandIS instrument with a second in storage (**1+1**),
- A single LandIS instrument to be sold to a commercial provider (**Sell Off**),
- Procurement of satellite(s) from a single commercial vendor [redacted] and
- A combination of a single LandIS instrument with additional investments in commercial capabilities (**Hybrid**).

Of these four, only the 1+1 and the Hybrid options were determined by the team to also meet the schedule and performance requirements for a 2031 launch. The Sell Off option carried questions about feasibility and schedule, and there was significant uncertainty about performance of the [redacted] system.

*Four of the other options could potentially be made to fit within the budget constraints if high-risk postures were taken with the spacecraft and launch vehicle.* We consider the risks associated with these implementations to be prohibitive. These were:

- Two LandIS instruments to be launched at the same time (**2-ball**; [redacted] over the PBR),
- A three-instrument build of LandIS with one launched and the other two stored for future use (**1+1+1**; [redacted] over PBR),
- A Landsat 9 functional clone (**L9**; [redacted] over PBR), and
- An enhanced L9 functional clone with 4-7 additional bands (**L9+**; [redacted] over PBR).

The L9 and L9+ represent lower capability than the 1+1 and the Hybrid approaches but still exceed the allocated budget, because they carry a [redacted] burden of lost funds associated with the termination of the LandIS work.

If additional resources were available to support the implementations assumed by the MAAT, there would be two viable options that would warrant further consideration, as they would be expected to meet the schedule and provide greater performance than any of the other options examined. The 2-ball option would offer the greatest capability during the life of the mission, because of the doubling of the LandIS sampling time, and the 1+1+1 option would offer the potential for single LandIS-level capability well into the future and if each were deployed in a phased manner at five-year intervals.

Finally, *the two options that carry high to moderate risk in multiple categories* are:

- The fully commercial approach (**All In**) and
- The use of a hyperspectral pair of TIR and VSWIR instrumentation sensors (**Repurposed JPL SBG**).

There are several considerations, in addition to cost, that factor into the choice of how to best implement the next Landsat mission. These include the desire to: minimize mission risk, ensure consistent data continuity, and contribute to future commercial capabilities. The contributions of each to these considerations are summarized in the following table. Those colored green fall within the PBR. All options assume a complementary calibration capability.

| Option | Likelihood of Meeting Minimum Mission Criteria | Level of Capability | Continuity | Advancing Commercial |
|---|---|---|---|---|
| 1a: 1+1 | High | High | ✓ | |
| 1b: Sell Off | Medium/High | High | ✓ | ✓ |
| 1c: 2 ball | High | Very High | ✓ | |
| 1d: 1+1+1 | High | Very High | ✓ | |
| 2a: L9 | High | Moderate | ✓ | |
| 2b: L9+ | High | Moderate | ✓ | |
| 3: Repurposed SBG | Low | Unknown: Potentially High | Unknown | |
| 4a: [redacted] | Medium | Moderate/High | | ✓ |
| 4b: All In | Unknown | Unknown | | ✓ |
| 5: Hybrid | High | High | ✓ | ✓ |

In summary, the two options that meet all of the cost, schedule, and performance needs with low risk are the 1+1 and Hybrid. The 1+1 offers a low-cost second payload available for future use, and the availability of spare parts if needed. The Hybrid provides an opportunity to further develop commercial capabilities. If additional resources become available, other options become viable. Those with maximum capability and likely the best value are the 2-ball and the 1+1+1. The L9 and L9+ functional clones would be acceptable, but they would constitute a reduced, decades-old, capability at a higher price when compared to the LandIS-based options.