Shaping the AAT in the 2030-2040 Era workshop: outcomes and paths forward for the AAT

Prof. Karl Glazebrook (Swinburne), Chair of AAT Council — 25th August 2026
kglazebrook@swin.edu.au.

Background and context

The Australian Government's essential contribution to the funding support for the AAT is due to run out in mid-2027. Combined with the decision by the Australian Government not to proceed to full ESO membership after the conclusion of the ESO Strategic Partnership, this leaves Australian optical astronomy facing a critical juncture. The AAT Council convened the AAT2030+ workshop at Macquarie University on 23–24 July 2026 to assemble the evidence: the scientific and commercial uses the community envisages for our national 4m telescope, and its requirements. A fuller record is informing the Council's advice to Government; this note summarises the outcomes for the wider community.

The workshop

One hundred and twenty-four people registered — fifty-three in person and seventy-one online — for twenty-five talks over two days, drawn from every major Australian astronomy institution together with colleagues from Berkeley, Caltech, USQ, UWA, CSIRO and elsewhere. The level of engagement was high, with multiple carefully thought-through proposals setting out indicative costs, timelines and named leads. There was discussion of future operating modes, potential new instruments, mixed scientific and commercial use and even the prospects of deploying adaptive optics systems and replacing the AAT with a new large telescope at Siding Spring.

I would note two commercial demonstrations implemented in advance of the workshop: queue-scheduled satellite observing has already been run remotely on the AAT using off-the-shelf software, and a deep-space optical laser communications receiver has already operated on the telescope. It was also notable that the principal commercial cases — space domain awareness and optical communications — were argued from within the astronomy community, and are being developed by astronomers working in partnership with the industry players who know these markets.

Points of consensus

- The clearest convergence of the two days was on time-domain astronomy as the AAT's compelling new role. The new Vera Rubin Observatory alert stream, target-of-opportunity follow-up, and the transient discoveries expected from SKA-Low and the ATNF facilities all demand rapid optical spectroscopy that the discovery machines cannot deliver themselves. Australia's longitude leaves the AAT alone in a window of 18 hours between Chile and southern Africa as the night travels, and it watches the same sky as SKA-Low at the same time. The niche is clear and specific: not surveying but responding — the optical spectroscopic node of an Australian multi-wavelength time-domain capability.
- A 4-metre telescope does not substitute for 8-metre access. The AAT and negotiated access to larger aperture facilities are seen as complementary elements of a single portfolio, consistent with the conclusions of the NCA–AAL community consultation. In particular, the AAT was seen as an accessible testbed for new instrumentation technologies (following the 2dF/SAMI/Hector/Veloce model) allowing them to be more rapidly brought up to the technology readiness level required for larger observatories.
- Wide-field survey spectroscopic multiplex is no longer the arena where the AAT is competitive. That race cannot be won against the likes of DESI, 4MOST and Subaru/PFS, while Rubin yields of order just one high-value target per AAT field. The strongest new science cases presented — exoplanet radial velocities, stellar and Galactic programmes, transient spectroscopy — are single-object and cadence-driven. The telescope's future lies in agile follow-up, and there was high demand for this science.
- The most powerful operational mode beyond 2030 emerges from this science — a permanent Cassegrain instrument suite, queue scheduling, rapid response and possibly automation to streamline operations. These are the same changes that commercial applications require. This convergence was perhaps the most significant outcome of the meeting.
- Each major investment discussed should be preceded by a small feasibility study, so that no large commitment is sought before the key unknowns are resolved.

- The site retains two advantages that cannot be obtained from elsewhere: longitude — the AAT is the only spectroscopic telescope of its class between Chile and southern Africa; and a genuinely dark sky in an accessible location that facilitates fast turnaround research and the deployment of new technologies.

The roads forward

A strong consensus emerged on future scenarios. The fixed near-term requirement is continuity: certainty of funding for operations to 2030, completing the committed surveys (Hector, the Veloce exoplanet survey, GALAH-2 and OzArch). It is critical for the staff at the facility, and for the astronomy community as a whole, that this certainty be provided soon — and that it come with the direction beyond 2030 signalled, since funding to 2030 alone would simply recreate today's uncertainty at the next horizon.

Given that certainty, there are three immediately feasible options available: 1) completion of the surveys and orderly closure; 2) conversion to an agile mixed-use facility operating for the next decade; or 3) transformation of the facility, through flagship instrumentation, to at least 2040.

A possible fourth path — hosting the southern telescope (on the AAT pier) of the US DOE Stage-5 dark-energy experiment (Spec-S5) as a 6-metre, 2° FoV ~13,000-fibre facility — proceeds on the US project's timeline. This cannot begin before the early 2030s, would use the telescope exclusively, and should be assessed separately. It is a step away from general-purpose astronomy, but for the Australian survey community it would be a continuation of the 2dF lineage — wide-field spectroscopy at 100 times 2dF's reach.

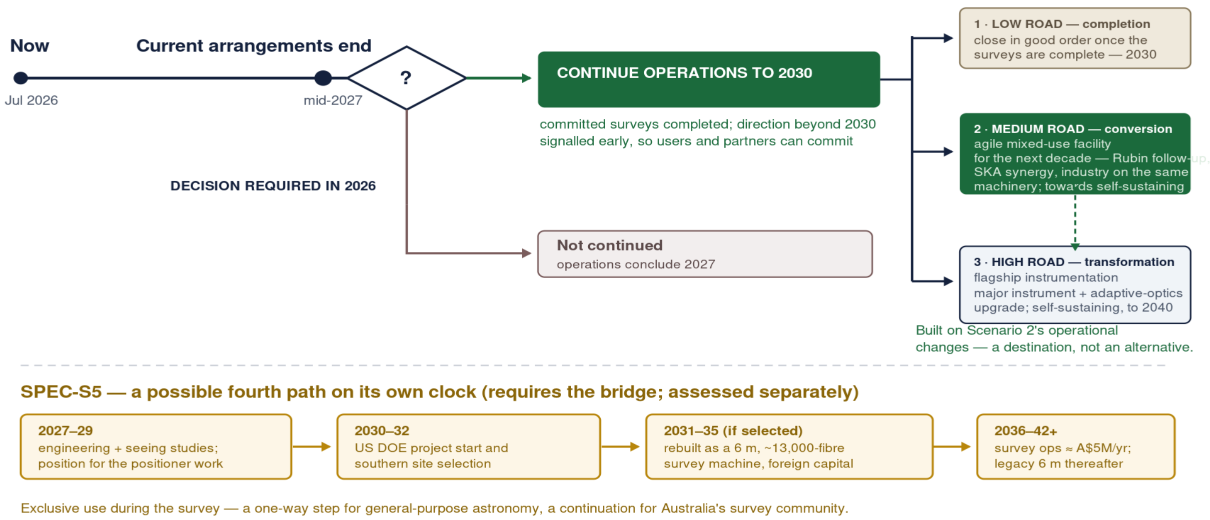

Figure 1. Future possible timelines with a key decision this year followed by three roads forward.

The consistent theme from the workshop was that the 'medium road' — an agile, queue-driven follow-up facility whose automation also serves industry — would be a feasible and exciting option, one that can be built out for not much more than a continuation of the current operations budget. It is staged so that each stage delivers science in its own right: should capital investment cease at any point, the capability already delivered keeps operating, provided operations funding continues. The move to this observing mode is primarily driven by the science enabled and more straightforward operations, rather than by long-term cost-saving alone.

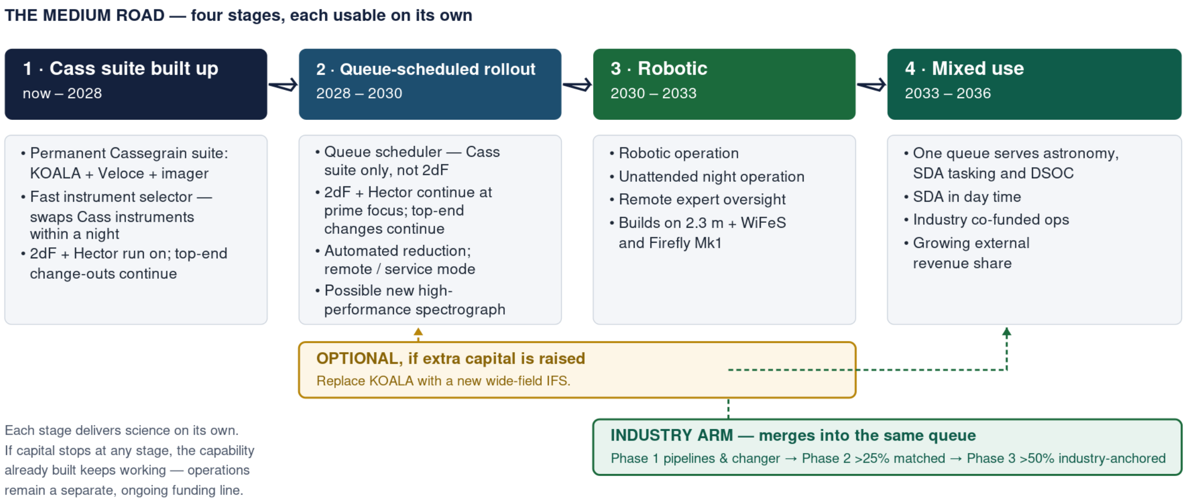

Figure 2. The staged conversion: the industry arm develops in parallel from the outset, merging fully into the same observing queue.

The key science for AAT's future

Rubin follow-up. Rubin issues approximately seven million alerts per night, and worldwide spectroscopic follow-up capacity falls well short of demand. When Rubin identifies a target late in the Chilean night it can be observed from Australia within hours; Chile itself must wait a further day. Australian alert brokers have supplied Siding Spring since February 2026 and the AAT made its first Rubin Target-of-Opportunity follow-up observation in July. ARC LIEF funding already supports Rubin data rights for forty Australian astronomers.

The SKA's optical arm. ATNF presented its concept for an Australian multi-wavelength transient facility. SKA-Low will discover transients at a rate its own resources cannot follow up, and agile facilities remain essential through the 2030s. The AAT is the natural optical spectroscopic node of that architecture, alongside ATCA, Murriyang, ASKAP and the Siding Spring 2.3-metre.

Exoplanets and stellar astrophysics. Veloce's precision radial-velocity programme continues. Veloce-Plus, an upgrade of order $0.6M, would add the Southern Hemisphere's only routinely accessible spectropolarimetric capability, in service of SKA-Low stellar science and PLATO follow-up.

Galactic archaeology. Gaia, Rubin, Euclid and Roman will identify stellar streams and substructure faster than the instruments implementing large, fixed surveys can pursue them. Enabling simultaneous AAOmega and HERMES observation (of order $0.5–1M) would make the AAT the agile follow-up instrument for this science. Its value lies in the years to 2030, while 2dF remains in service at prime focus, and the case for it has to be made on that basis.

New spectrographs. A rapid-response high-throughput longslit optical spectrograph of the NGPS (Next Generation Palomar Spectrograph) class — a design now in service at Palomar, under $10M, approximately doubling the telescope's efficiency — could be built in partnership with Caltech. The Palomar team have offered a partnership and a joint concept study, which could report within about a year of starting; a build would follow over roughly three years, putting an instrument on the telescope early in the 2030s.

Wide-field integral-field spectroscopy — MANTIS. A monolithic wide-field (~3 arcmin) high-spectral resolution IFS based on replicated Spector-class spectrographs, with an indicative cost of $25–35M (a first estimate; formal costing would be a deliverable of the design study) and operation in 2032–2035 (depending on design re-use). It would make the AAT the premier facility for studying the detailed astrophysics of large nearby galaxies. There is a strong Australian synergy with upcoming SKA HI science. MANTIS could be deployed in a staged way and would also cover the needs of transient follow-up science.

Adaptive optics. Ground-layer adaptive optics at Siding Spring could be equivalent, in delivered image quality, to raising the telescope by roughly a thousand metres — and because a low site carries a larger fraction of its turbulence in the ground layer, the proportional gain is greater than at a premium site. The cost is unresolved: likely above $10–20M, depending strongly on whether an adaptive secondary mirror is required, and a dedicated design study is a prerequisite. A systematic turbulence-profiling campaign begins at Siding Spring in late 2026 and will establish how much of the seeing is in fact correctable.

Commercial opportunities

Space domain awareness and deep-space optical communications are growing markets well matched to the AAT's aperture and unique location, and pilot observations of both kinds have been made with the telescope. The short-term revenue potential of these proposals is not yet clear, and mixed use may not completely substitute for the need to support operations. The operational upgrades it requires are, on the other hand, the same as those the science requires, so investment in that machinery serves both.

Studies required

The logic runs in two steps. First, position the facility for longer-term certainty: secure funding to 2030, settled by the end of this year. Then, over the following twelve months, run a set of low-cost feasibility studies to establish reliable costs for the more ambitious options, so that the choice of path is made on evidence. Six comparatively modest studies would retire most of the cost and feasibility uncertainty in those options. None is large, and each is a precondition for a decision rather than a commitment to one.

- **An operations model study.** Queue-scheduled simple imaging operations have already been demonstrated; however, there would be non-trivial software-engineering costs associated with a rollout to all Cassegrain instruments. For full robotic operations, where the mixed-use potential is greatest, what is needed is validation of the hardware costs and staffing assumptions; robotic operation may not prove cost-effective compared with a simple queue. Very rough workshop estimates for the costs of complete automation ranged all the way up to $15M of capital; while that is likely the ceiling, a proper study is needed before any figure is relied on. This is the most consequential of the six studies, and the one the workshop was least able to settle from the material presented.
- **Site turbulence profiling.** Measurements of how the atmospheric blurring is distributed with height above the site. A systematic campaign of measurements with a new system begins at Siding Spring in late 2026 and will establish what fraction of the blur arises near the ground — the fraction that adaptive optics can correct.
- **A GLAO design and costing study.** Dependent on the turbulence results. The range of costs presented at the workshop was wide, and turns principally on whether an adaptive secondary mirror is required; the option cannot responsibly be offered until this is resolved.
- **A joint AAT–Palomar concept study for an NGPS-class spectrograph.** Offered by the Palomar team: instrument requirements, two architecture options, mass and envelope within the Cassegrain limit, a throughput model, interface and software plan, cost and risks.
- **A MANTIS feasibility and preliminary design phase.** Scoped to select the operating point on the capability–cost curve — field of view, spatial sampling, wavelength coverage and spectrograph count — rather than to validate a single fixed design, and to produce a more robust costing.
- **An updated facility condition report.** On the normal cycle, due around 2028–2029. The 2021 report found the facility in excellent condition and many of the items it flagged were addressed; an equivalent survey underpins any costing of modernisation or conversion.

Spec-S5 requires studies of a different kind. The proposal is major: that everything above the AAT centre section is replaced — a 6-metre segmented primary, new truss, secondary, corrector and focal plane — while the existing mount, pier, building and site are retained. While an initial mechanical engineering assessment has been made, a more detailed finite-element analysis is needed to refine questions of deflection, stress and balance of a new telescope structure on the existing mount. Further, the present dome aperture is set by the arch-girder spacing at 5.6 m, so a 6-metre primary would require a new dome rather than a modified one. No costing for this exists, and on present evidence it is the larger of the two unknowns and would likely dominate any Australian contribution. A key down-select in the early 2030s for the DOE project would be whether to choose the AAT or the Blanco 4m in Chile for their southern site. Either option would require similar mechanical studies and there are many commonalities between the AAT and the Blanco in this work.

Next steps

The Council's advice to Government is being finalised and draws on the full workshop record. I thank Matt Owers and Macquarie University for hosting the meeting, AAL, and all speakers and participants.