AIRWAYS CORPORATION OF NEW ZEALAND

AUCKLAND ATC TOWER REPLACEMENT

September 2022

Contents

1. Executive summary

1.1. The current Auckland Airport air traffic control (**ATC**) tower construction and commissioning dates to the mid-1960s. The tower is due for replacement as it is reaching its end of lease with Auckland Airport. It is currently situated in an area where Auckland Airport has alternative plans for the site. In addition, the current contingency has access and availability constraints; requires a minimum of two-hours to setup, has limited visibility of the control zone and domestic apron, and is not capable of low visibility operations.

1.2. Three replacement options have been considered. These are:

- **Replacement conventional tower**: a new tower structure, around 70m high, which would enable conventional service for both the existing runway and the proposed northern runway. Contingency would be a remote digital tower. This conventional tower would be centrally located between the two runways, as shown in the Auckland Airport masterplan documents.
- **Hybrid tower:** this is an approximate 35m high conventional tower for controlling the current runway, with future digital capability for controlling a northern runway should the AIAL proposal for a northern runway be progressed. Contingency would be a remote digital tower.
- **Remote digital tower**: digital camera masts at the airport with controllers working positions remotely. This will provide service for the southern runway initially, with the capability and size capacity for expansion for the northern runway when that is built and commissioned.

1.3. At the time of the 2022-2025 pricing consultation, Airways had not completed an investigation and evaluation of the Auckland tower replacement options and so sufficient information was not available to enable an update to the capital plan assumptions.

1.4. Airways did however indicate in the 2022-2025 pricing consultation that options for the replacement were under consideration and that we would further engage with stakeholders on the evaluation of these options.

1.5. Following this consultation, a decision will be made in November 2022, once feedback has been received and considered.

1.6. The current preferred option is to proceed with a hybrid tower, supported by digital contingency. This option still requires confirmation of key information such as agreed location for the 35m conventional tower, geotechnical investigations, and approved business case. This will be addressed in the following phase of the project.

1.7. The purpose of this paper is to describe the context of the current consultation, to outline the options and Airways' current preferred option, and to seek feedback to inform Airways' decision.

2. Context

2.1. The current Auckland air traffic control (ATC) tower construction and commissioning dates to the mid-1960s. Regular maintenance is now required to keep the tower in a usable state, with further significant work likely to be required if extending the life of the tower past the agreed lease expiry date. Due to the Auckland International Airport master planning for terminal works, a further extension of the lease for Airways may not be a favorable option.

2.2. Digital technologies are a core enabler driving positive change in the aviation industry, with the potential to allow improvements to our services that boost resilience, improve safety outcomes, and support greater sustainability. Airways has been investigating digital air traffic control tower technologies for a number of years and watched closely as airports internationally have developed their digital capabilities. We see digital tower technology as key to achieving our strategy of creating a modern and progressive airspace environment.

2.3. When looking into the selection of which option and implementation approach to use for the replacement, Airways has taken a number of factors into account. These include the need to:

- maintain, and improve where possible, safety performance
- maintain, and improve where possible, operational performance
- consider Auckland Airport traffic growth, and plans for a northern runway
- consider the Auckland Airport service delivery requirements
- consider industry technology trends and the uptake of modern technology platforms to support effective and efficient service delivery, and specifically in this case the industry growing acceptance of digital towers as a viable alternative to traditional physical control towers.
- consider expenditure implications.
- evaluate suitable sites for locating facilities that would adequately support service delivery.
- complete works and commission the new service delivery facility prior to the agreed lease expiry date.
- engage and consult with stakeholders to seek their input so we can take their viewpoints into consideration prior to making a final recommendation and decision.
- assess the project and business risks and take this assessment and associated mitigation initiatives into consideration.

2.4. Three replacement options have been considered:

- Conventional tower – capable of providing service to the current southern runway and potential future northern runway.
- Hybrid option – a combination of a conventional tower for the southern runway and a digital based service extension for the potential future northern runway.
- Digital tower option – digital based service provision for the southern runway with the capability to be expanded for the northern runway.

2.5. Airways also considered the status of the Auckland Airport ATC contingency facility, currently situated in the Auckland Airport apron management room atop the international terminal building. It has access and availability constraints; requires a minimum of two-hours

to setup, has limited visibility of the control zone and domestic apron, and is not capable of low visibility operations. Traffic capacity is estimated at 65%. A digital contingency tower is expected to address many of the constraints and enhance capacity.

2.6. The Auckland digital contingency tower initiative to replace the current contingency was detailed in the 2019-2022 pricing consultation and was broadly accepted by airlines and NZAA as a worthwhile initiative.

2.7. Airways had commenced work for a digital contingency tower but halted this initiative due to the COVID-19 pandemic situation, and in the 2022-2025 pricing consultation this project was removed.

2.8. Airways has now completed its initial internal evaluation of the three options and is proposing a preferred replacement implementation approach as detailed in section three of this consultation paper. As stated in the pricing consultation response, we will now engage and consult with industry on the replacement before making a final decision.

3. Options evaluation

3.1. Process

- There were four key steps which enabled Airways to evaluate the options and put forward a proposal and its implementation approach.

- Risk workshops and assessment were conducted covering all three options.
- Any final replacement approach would also be subject to confirmation by satisfactory completion of the full operational and technical design, and development of safety and business cases, where assumptions are to be addressed and resolved. Current key assumptions include;
    - Physical locations, suitable for installations and operational delivery
    - Geotechnical investigations and suitability
    - Regulatory compliance and support
    - Permits and approvals
    - Buildability and construction restrictions / constraints
    - Technology capability for operational delivery
    - Suppliers and vendors capacity and capability
    - Resource availability, both internal and external
    - Continued stakeholder support

3.2. In summary the results of the evaluation for each option are detailed below.

Option 1: conventional physical tower, approximately 70m in height to service current and proposed northern parallel runways.

- This option was evaluated to have the longest implementation schedule, due to the amount of preconstruction and then construction activities that would be involved.
- This option was also evaluated to be the most expensive in terms of construction and commissioning.
- Evaluation against the requirements produced no clear leader in terms of the overall result. The conventional physical tower scoring higher in some categories - People and Human Factors, Risk and Regulatory, and Service Delivery - and lower in Financial and Business Strategy.
- The highest evaluated risks for the conventional tall physical tower were potential customer resistance to funding, and potential for construction timetable impacts and build cost escalations. Other risks related to future flexibility and adaptability to changes in the aviation operational environment and alignment with Airways strategic imperatives.

Option 2: hybrid physical tower, approximately 35m in height to service the current south runway via conventional means and able to accommodate the future provision of digital based services for the northern runway.

The construction and commissioning schedule duration was evaluated to be similar to a digital tower implementation.

- The project expenditure for the hybrid physical tower was evaluated to be less than that of the taller conventional tower option, but more expensive to build and commission than the implementation of a digital tower.
- The hybrid option was evaluated against service requirements as fitting in between the conventional and digital options.
- Likewise, for the risk assessment, the hybrid option generally fit between the other two options in terms of risk profile. The highest evaluated risks were to confirm a suitable design and location, the project schedule, and for resourcing pressures and cost escalations.

Option 3: digital tower, the provision of a digital based service for both the southern and proposed northern runways.

- The schedule for implementation and commissioning of a digital solution schedule duration was evaluated to be similar to that of the hybrid physical tower option.
- The implementation of a digital solution was evaluated to have the lowest project expenditure.
- In terms of evaluation against the requirements, although it was rated highest in the business strategy alignment category, it was evaluated lower in a number of the other evaluation categories. This can be partly attributed to having little knowledge and experience implementing digital technology into a New Zealand operational environment. This position can be further evidenced in the risk assessment of the options.
- The highest evaluated risks for a digital tower approach, given that Airways currently has minimum exposure to implementing a digital solution in the New Zealand environment, would be:
    - potential to have insufficiently scoped the full extent of the works and activities required to undertake such an implementation. This could lead to an increased risk of scope creep resulting in additional funding required and placing additional pressure on the overall project schedule and resources.
    - being a modern technology platform, in New Zealand, the system and service validation activities will place additional pressure on Airways resources, which will require proactive management to protect the business-as-usual activities.
    - suitability of technology to operate in the Auckland Airport environment to the same, or improved, service performance levels that we currently provide is unproven therefore this risk needs to be further evaluated through system validation, and trials.
    - gaining regulatory approval to utilise a digital service platform in New Zealand.
- The main avenues to be explored for mitigating associated risks with the introduction of modern technology platform would be to look to developments and implementations in other parts of the world, leverage from those experiences, and undertake an implementation in New Zealand with extensive stakeholder (internal and external) involvement throughout the implementation.

3.3. In summary,

- A full digital tower solution would be new to New Zealand. In implementing any new system, we would want to ensure that change is made as safely as possible and at the right pace. We are facing constraints at Auckland Airport, including the tight timeframe available to replace the existing tower. At this point, we do not yet have the confidence to know we can safely and successfully roll out a digital solution at our biggest international airport.
- Airways' assessment of replacement options and our implementation approach must take current operations and future airport growth into consideration.
- Full digital tower solutions are not currently in operation at large and complex international airports and so Airways is unable to utilise this experience to determine suitability for the Auckland environment. A digital tower may be a feasible primary service solution, however thorough investigation would be required to confirm this.

- To mitigate risk, the preferred replacement approach being considered by Airways is to implement a ***digital contingency*** solution in parallel with works required for a ***hybrid physical tower*** solution.
- Airways have carefully considered many factors and would now appreciate your views and feedback on the tower replacement in relation to the three options we have evaluated.

Question 1: Do you have any feedback on the Auckland ATC Tower replacement *options* outlined?

4. Preferred option and implementation approach

4.1. Having taken the following into consideration:

- Airways gained general industry support for its digital strategy, and specifically for our Auckland digital contingency tower initiative in the 2019 pricing round.
- Due to COVID-19 pandemic impacts, Airways cancelled the Auckland digital contingency tower project.
- As indicated in the 2019 pricing round, Airways' plan was to build our knowledge base, experience, and confidence in the ability of a digital platform to deliver air traffic services safely and efficiently, through the implementation of a digital contingency tower. Had that occurred and proven successful, Airways may have had the confidence to replace the primary Auckland Airport facility with a digital tower.
- Not having implemented a digital contingency tower, Airways needed to revise its approach to the primary Auckland Tower replacement.

4.2. We have now completed a comprehensive evaluation and risk profiling of the replacement options. This work concluded that, even though a digital platform could provide benefits, there are a number of important considerations that need to be considered, including:

- The importance of the Auckland Airport as a New Zealand gateway port
- The need to ensure continuity of service
- The lack of operational digital tower technologies implemented offshore in a similar operating environment to that of Auckland Airport
- Recognition of the need to complete the project prior to the current lease expiry date
- The options and implementation approaches that would reduce and / or defer capital and operating expenditure
- The level of in-house experience and expertise needed to implement and support the primary service replacement.
- Confidence that the solution design and implementation will be able to operate to at least the same capacity, capability, and efficiency levels in the Auckland environment as the current service and cater for future growth in traffic.

4.3. After taking these factors into consideration the preferred replacement approach is to:

- Deliver a hybrid physical tower, which will provide a conventional service delivery platform for the southern runway, and begin planning for its construction
- Deliver a digital contingency tower, which will be developed as a parallel activity to the hybrid tower planning and design work, and use this to validate the technical and operational merits of a digital tower in the Auckland environment

Airways considers that the above parallel works will provide the best approach to ensure continuity of service at Auckland, recognising the lease expiry deadline.

As our confidence and experience builds with the undertaking of the digital contingency tower validation there will be a review carried out prior to construction commencing on the hybrid tower. This review will provide an opportunity to consider whether (1) to proceed with the current plan to construct the physical hybrid tower and digital contingency facility, or (2) go with a full digital primary tower facility (along with the digital contingency facility).

4.4. Benefits of taking this replacement approach in terms of the digital contingency tower works:

Technical evaluation

Having a digital system on site in New Zealand will facilitate effective technical evaluation of the solution. Specifically, the following aspects can be thoroughly assessed:

- Limitations of the technology components and how to resolve/mitigate these
- Network bandwidth requirements via both fibre and microwave links
- Camera mounting and positioning requirements
- Impact of the environment including climatic conditions and proximity to salt water
- Ongoing maintenance requirements
- Technical training processes
- Compatibility with other ATM systems operated by Airways

Operational evaluation

Air traffic control staff will be able to analyse the system, compare it with current conventional aerodrome control practices and evaluate the pros and cons. Staff will be able to assessment human factor and human machine interface requirements and needs and develop, test, and implement a change management programme. Staff will be able to assess requirements for a change in service delivery methodology, test if these requirements work and develop an implementation strategy well ahead of any transition to live operations.

Procedure development

Many of the air traffic management procedures currently used in a conventional control tower may need modification or redevelopment. Implementing a digital system at Auckland will enable subject matter experts (SMEs) and key stakeholders to determine how the airspace will be managed in a digital environment and then develop and test new procedures to ensure the ongoing safety and efficiency of the operation.

Training development

All operational and technical staff will need training on the operation of a digital control tower. A digital solution at Auckland will facilitate the development of training requirements, training material and assessment criteria. This will ensure the training is fit for purpose, meets Airways standards, and satisfies regulatory requirements.

Regulatory assessment

Regulatory approval to utilise a digital tower to provide aerodrome control services is the responsibility of the Civil Aviation Authority (CAA). The CAA in New Zealand currently have had little exposure to the technology or the concept of digital tower services. Being able to see and assess a digital solution as it is acquired, installed, tested, and trialled will enable regulatory staff to understand the operation, determine their expectations, assess suitability, and provide approval. They will be part of the process rather than being introduced to a newly installed system and being expected to certify its operation with minimal exposure.

Lifecycle assessment

Familiarity with the total package of equipment and support facilities will enable Airways to determine ongoing costs of operation and lifecycle management aspects of a digital tower

system. This will assist with strategic asset management, time-based replacement, upgrade programmes and service improvement options.

Stakeholder engagement and education

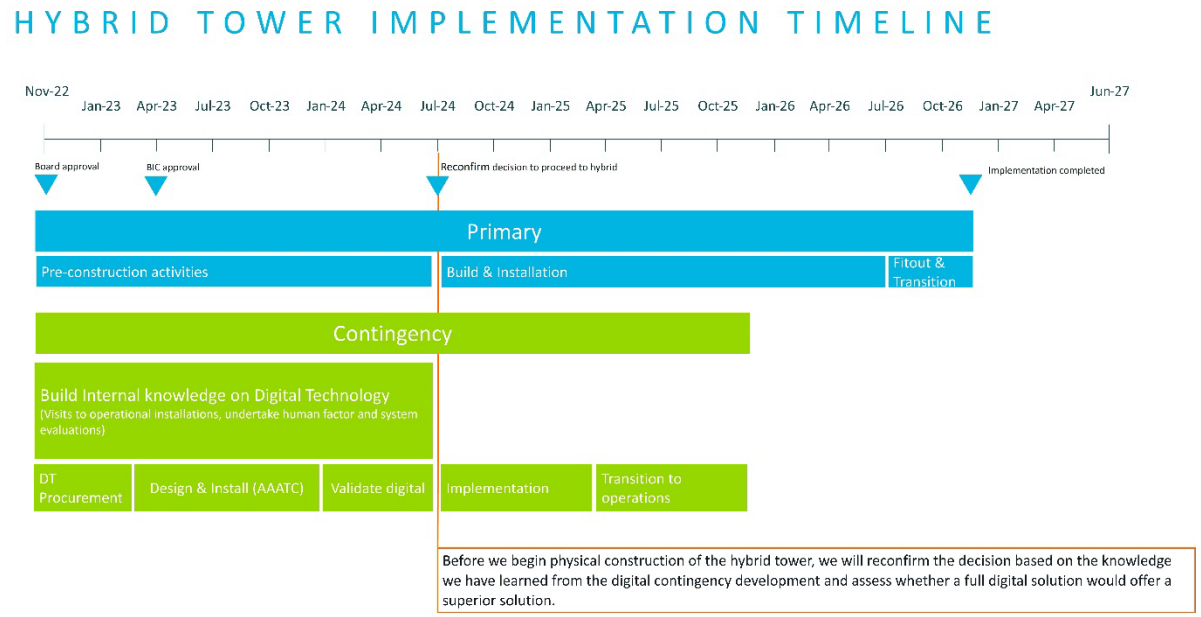
Being able to physically demonstrate to key stakeholders a digital tower system in operation while remaining independent of the current system will provide significant benefits. It will give them confidence and understanding and allow them to assess how the needs of their operations will be met. Key stakeholders such as MOT, BARNZ/Airlines, Treasury, Auckland Airport, Airways staff, Union partners, and CAA can see the system working, ask questions, suggest improvements or changes, and identify risks and issues. This will assist Airways to develop the safest and most efficient and effective digital service possible.

Risk management

As the digital system is installed and developed there will be risks identified that were not previously considered. These can be assessed by the SMEs on the programme, mitigated appropriately and then re-tested. This will ensure that a digital solution has been through a robust analysis and assessment process with all issues addressed before it is considered for live operations.

Airways welcomes stakeholders to get in touch if they require more information about the analysis that Airways has conducted to inform their submission.

4.5. The project timeline for the preferred option and implementation approach.



4.6. The impacts on the Capital Plan that we provided in the last pricing round will be detailed in section five of this consultation document.

Question 2: Do you have any feedback on Airways preferred approach for the replacement of the Auckland ATC Tower?

5. Impact to Airways' capital plan

5.1 Airways is proposing to invest $29.3 million during the 2022-2025 pricing period and $26.7 million during the 2025-2028 pricing period. This investment will fund the preferred approach of a physical ~35m tower and a digital contingency tower.

Over this timeframe, $34.3 million was included in the current capital plan, resulting in an additional investment of $21.6 million.

The transition and operating costs of $2.5 million will also be incurred in relation to these projects.

These figures are estimates only and will be updated and refined as the project proceeds to the next stage.

As set out in the Pricing Decision, the Auckland Tower replacement project is not forecast to complete until FY27 and therefore does not enter our pricing asset base until then.

$m	FY23	FY24	FY25	Total 2022-2025 pricing period	Total 2025-2028 pricing period	Total project
Auckland replacement primary tower	2.8	4.5	16.1	23.4	22.4	45.8
Auckland digital contingency tower	-	2.1	3.8	5.9	4.3	10.2
Total capital investment	**2.8**	**6.6**	**19.9**	**29.3**	**26.7**	**55.9**
Currently in capital plan	**7.2**	**10.0**	**10.0**	**27.2**	**7.1**	**34.3**
Additional investment needed	**(4.4)**	**(3.4)**	**9.9**	**2.1**	**19.6**	**21.6**
Transition & operating costs	-	0.3	0.4	0.7	1.8	2.5

5.2 For comparison purposes, the above table has been replicated below to show the estimated impact for the two other options considered.

Option 1: conventional physical tower

$m	FY23	FY24	FY25	Total 2022-2025 pricing period	Total 2025-2028 pricing period	Total project
Auckland replacement primary tower	3.0	4.7	24.8	32.5	36.7	69.2
Auckland digital contingency tower	-	2.1	3.8	5.9	4.3	10.2
Total capital investment	**3.0**	**6.8**	**28.5**	**38.4**	**41.0**	**79.4**
Currently in capital plan	**7.2**	**10.0**	**10.0**	**27.2**	**7.1**	**34.3**
Additional investment needed	**(4.2)**	**(3.2)**	**18.5**	**11.2**	**33.9**	**45.1**
Transition & operating costs	-	0.3	0.4	0.7	1.8	2.5

Option 3: digital tower

$m	FY23	FY24	FY25	Total 2022-2025 pricing period	Total 2025-2028 pricing period	Total project
Auckland replacement primary tower	8.0	10.4	2.0	20.3	14.2	34.6
Auckland digital contingency tower	-	1.2	0.6	1.8	3.7	5.5
Total capital investment	**8.0**	**11.6**	**2.6**	**22.1**	**17.9**	**40.0**
Currently in capital plan	**7.2**	**10.0**	**10.0**	**27.2**	**7.1**	**34.3**
Additional investment needed	**0.8**	**1.6**	**(7.4)**	**(5.1)**	**10.8**	**5.7**
Transition & operating costs	0.2	2.1	0.4	2.7	2.1	4.8

Whilst the initial investment is lower for the digital tower option, the ongoing operating costs are higher and requires more frequent lifecycle replacements.

Question 3: Do you have any feedback on the changes highlighted to the Capital Plan in 5.1?

6. Consultation process – how to make a submission

6.1. We invite submissions in response to this consultation paper per the following timetable:

- Submissions are to be received by 21 October 2022. Submissions will be posted on Airways' website for customers, stakeholders, and the industry to view.
- All submissions will be carefully considered by Airways and will inform the final decision on an Auckland Tower replacement and implementation approach.
- A paper outlining Airways' decision will then be published. We will keep you updated with our progress.

6.2. Please send submissions by email to submissions@airways.co.nz. As submissions will be made available to the public, they should not contain any commercially sensitive or confidential information.