A bold new plan to address Sydney's airport woes

The current thinking behind expanding Sydney's airport capacity is to provide a second airport either in Sydney's west at Badgerys Creek or in the south near Holsworthy. However, a quite radical proposal has just been launched by the Pacific Airport Group (PAG), to replace Kingsford Smith Airport with a higher capacity airport platform located on piers close to the shore just north of the entrance to Botany Bay. Bob Jackson reports on the main engineering and planning aspects of PAG's proposal.

For years Sydneysiders have argued and anguished over where to build a second airport. Since the 1970s suggested sites have included Galston, Richmond, Badgerys Creek and Holsworthy.

About six years ago the previous federal government decided to expand the capacity of the existing Kingsford Smith Airport by building a third runway.

Since the third runway came into service it has proved unpopular, with many previously unaffected residents complaining about aircraft noise. And because capacity has been increased at Kingsford Smith, a second Sydney airport now has to wait till early next century before it would be commercially viable.

A totally new concept, which promises to overcome all the problems associated with the other sites is now being proposed. It is an airport built offshore just north of Botany Bay heads and half a kilometre out from the shoreline.

The proposal, called Sydney Offshore, has been put forward by the Pacific Airport Group (PAG), a design consortium representing consulting engineer Tierney & Partners, architect and planner Hassell and geotechnical engineer Douglas Partners. The preliminary design for the airport has been undertaken over the past 15 months and PAG is now in a position where it is confident in going public.

The proposal is for an airport located offshore on a concrete platform supported by piers, adjacent to the golf courses of Little Bay and the La Perouse peninsula, east of the existing facility at Mascot.

"Using the latest construction methods, the proposal involves the construction of runways, terminals and all the necessary support facilities for an international airport, founded in rock on the sea floor and linked by a bridge to the mainland," says the preamble to the 50-page proposal.

The new airport would reduce noise, pollution and other negative environmental effects over the city, enable 24-hour operation and cater for the growing volume of air traffic, the preamble says.

It would also bring benefits in improved land use and value across the suburbs that are currently affected by aircraft noise and allow the transformation of the present airport site in a way that would significantly enhance Sydney's urban planning, it says.

According to David Tierney of Tierney & Partners, the piled structure would be straightforward because of the solid sandstone base and the reasonable depth which would vary between 20m at the shallowest part of the platform to 60m at the deepest.

"In view of the fact that 150m deep piled offshore structures are now being undertaken, established construction methods could be used with confidence," he said.

"The scale of the project

David Tierney (l) and Ross Speers of Tierney & Partners discuss the Sydney Offshore Airport proposal.

would also mean that once part of the platform is completed, construction could proceed from a rig operating off the already completed parts of the deck."

The airport would provide taxiways, runways, passenger terminals and necessary maintenance facilities. However, some support services such as air catering and airline administration functions could remain at the present site at Mascot.

A wide arterial road corridor, Anzac Parade, already exists connecting the city to the area. The divided road also has an old tram easement down much of its length and this could be made use of to provide modern light rail access to the airport. A multilane bridge with provision made for both road and rail transport would connect the airport to the mainland. Provisions could also be made for extending to Sydney Offshore the New Southern Railway, a BOOT project presently under construction to service South Sydney, Mascot and Kingsford Smith Airport.

"Once we started studying the noise contours we realised we could get within 0.5km of the shore ..."

Fuel storage would be on land and pumped through pipelines across the bridge.

There would be two runways – one 4km long and the other 3km long – aligned 20° east of true north making them approximately parallel to the coast. The design also allows for the inclusion of a third cross runway for smaller aircraft if further study found this to be necessary. The international and domestic terminals would be on the shore side of the runways and taxiways, together with hotels and shops. However, a satellite building for embarking and arriving passengers would be located between the runways and would serve 72 aircraft gates. Passengers would move between the terminals and satellite in a shuttle link beneath the platform level of the airport.

Alternative configurations have also been considered including:

- locating support facilities on the present Prince Henry Hospital site (subject to closing of the hospital and purchase of the site from the state government)
- locating the terminals between the runways and integrating them with the satellite and gates
- separating the international and domestic terminals by carparking structures
- locating part of the terminals on the Prince Henry Hospital site and limiting traffic access to the platform
- locating the terminals under the deck level in a deep truss superstructure.

The surface of the offshore platform for the airport would be 17m above high water ordinary spring tide (HWOST) with superstructure clearance of 10m HWOST to allow for the predicted 100-year maximum extreme wave of 15m (measured between trough and crest).

Tierney said he had originally considered a floating airport but after discussions with Douglas Partners could see that founding it on the sea bed was a better option.

"Once we started studying the noise contours we also realised we could get within 0.5km of the shore (within the 70dBA limit).

"It then became one of those serendipity situations when we found out that the area we were looking at was bounded by golf courses and open space without surf beaches, thus providing an even better noise buffer."

However, at 0.5km from the shore, about 69ha of privately owned medium density houses between Malabar and Little Bay could fall just inside the 70dBa contour, as would an area of national park and golf course.

The proposal concedes that many Sydneysiders might baulk at the visual impact of a large offshore structure and would oppose it on these grounds. However, it notes that the visual impact would be primarily local.

"The extent of the visual impact will depend on the finished height of the structure in relation to the cliffs along the coast and the ultimate distance from the coastline, although the visual impact of planes taking off and landing is likely to be significant along most of the immediate coast," it said.

Doubts regarding the project are also echoed to some extent by the chairman of the Maritime Panel of IEAust's Sydney Division, Ray Rice, who agrees that, while the project is technically feasible, its environmental impacts and economic viability would have to be very closely examined.

Although a full environmental impact statement (EIS) would be prepared if the proposal were taken up, the principal environmental impacts have already been

anticipated. None of those yet appear serious enough to challenge the viability of the project.

Apart from the environmental considerations dealing with the construction phase of the proposed airport a permanent structure could have impacts on:

- littoral drift from the impact of the piers
- waves and surf
- shading of the sea floor

- sediment drift and scour
- polluted run-off from aircraft operations
- aviation accidents
- the marine ecology
- recreational and commercial fishing and shipping movements to and from Port Botany.

Whatever the final form of the structure, it would be expensive and would have to be justified financially.

The proposal points to the opportunity to redevelop the 8km² area of the present airport, which could generate significant revenue from the sale of land. The redevelopment would also substantially enhance property values in Sydney's inner west and southern suburbs and open up more areas for redevelopment and urban consolidation, areas that are already well provided with infrastructure support.

However, the cost of the most expensive elements – the piers, the deck and the bridge – using conventional construction methods is estimated at this stage at several billion dollars, much more than the cost of establishing a conventional airport. However, the gap would be reduced if the extensive infrastructure required to service a second airport in Sydney's west were taken into account.

"The next important task is to refine and confirm the cost of founding the structure," said Tierney.

"For example, piling rigs as used in the oil industry can cost $200,000 a day, but you would only use a piling rig to found a small part of the structure. Then you could cantilever out using methods similar to those for bridgebuilding."

The structure would also be cantilevered around its edge so that the piles would be between 5m and 10m in from the perimeter to protect them from ship collision.

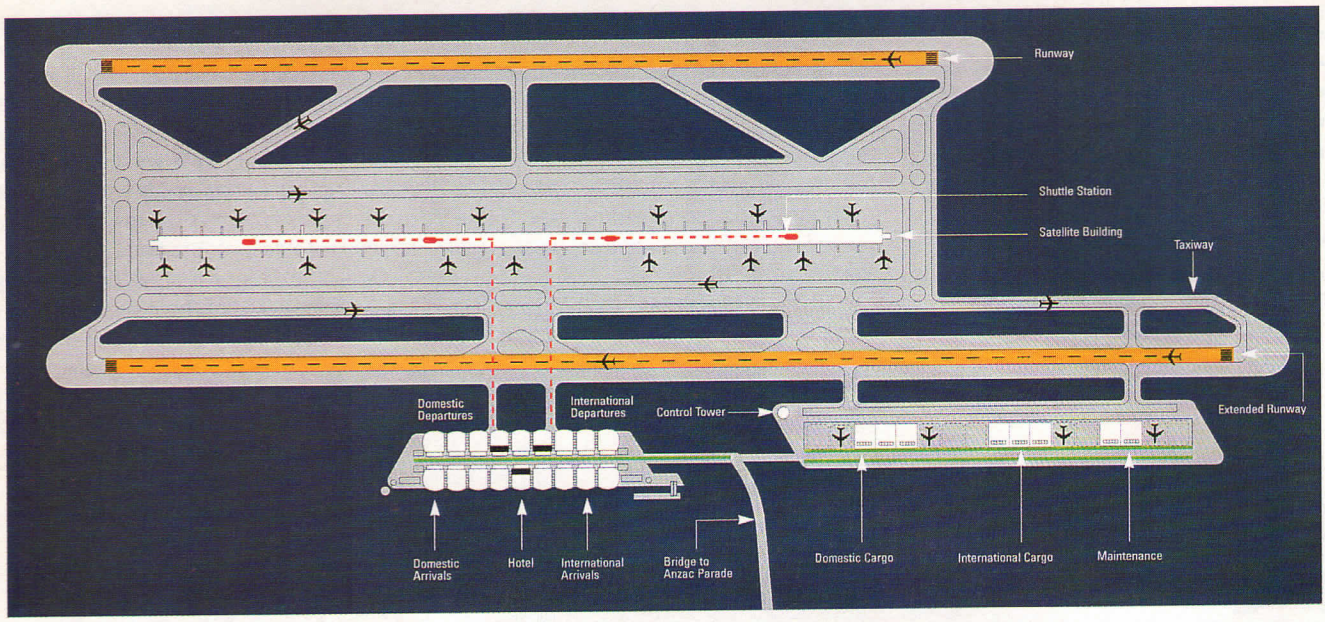
Tierney said a lot of work still needs to be done on such questions as the expected durability and life of the structure. But he is confident that with the appropriate concrete mixes and cathodic protection systems a very durable structure could be obtained.

One of the biggest challenges would be the sheer size of the civil works.

"The deck would be about 3.3km² in area and would use about three million cubic metres of concrete which is about one years concrete production in NSW," he said.

The federal Ministry for Transport and Regional Development, in response to the proposal, said it is in favor of a second

▲ An artist's impression of what a redeveloped Kingsford Smith site and the Sydney Offshore Airport would look like.



A plan view of the proposed airport design and configuration.

airport rather than a replacement option. It said two second-airport proposals are being considered – Badgerys Creek and Holsworthy.

Of these Badgerys Creek is the preferred option and a draft environmental impact study (EIS) relating to both Badgerys Creek and Holsworthy will be released for public comment in May. Consulting engineer Rust PPK is carrying out the EIS for the ministry.

Three federal government back-benchers from the Sydney area – Paul Zammit, the member for Lowe; Danna Vale, the member for Hughes; and Jackie Kelly, the member for Lindsay – have publicly endorsed Sydney Offshore.

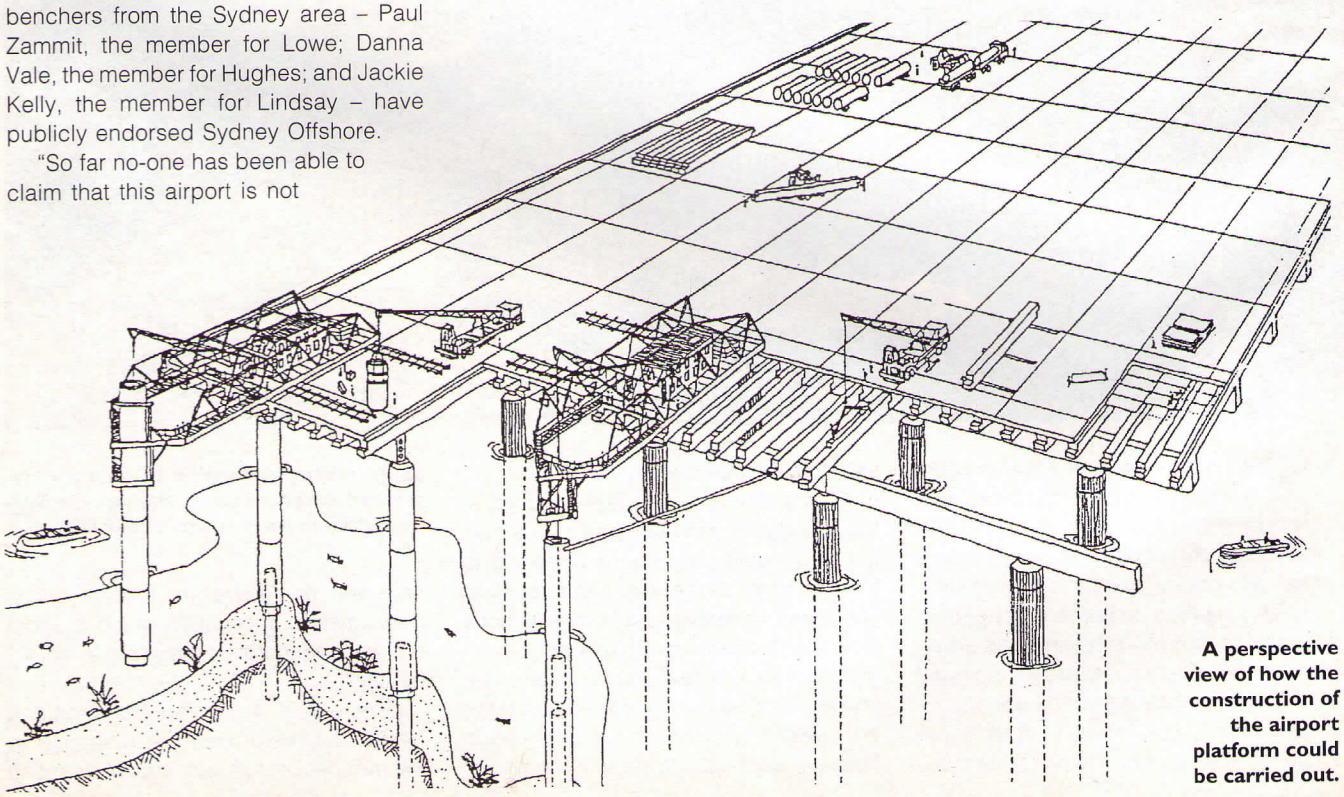
"So far no-one has been able to claim that this airport is not feasible either from an engineering or an economic perspective," Zammit told *Engineers Australia*.

"Kingsford Smith has a reputation as an inefficient airport to the extent that it is costing the airlines which use it up to half a billion dollars a year.

"The new airport would cost about $8 billion, a figure similar to that for Hong Kong's new Chep Lak Kok Airport. This is not an impossible amount of money, which would largely be recouped after a decade of operation.

"I come from an ethnic background and admit to being greatly impressed with the engineering vision and the hard work of the multiethnic workforce who built the Snowy Mountains Hydro-Electric Scheme.

"I see the Sydney Offshore proposal in a similar way – to those who wish to knock the idea my answer is why not?" ●



A perspective view of how the construction of the airport platform could be carried out.