



**Norman
Disney &
Young**
A TETRA TECH COMPANY

Aviation

Capability Statement



Table of contents

Introduction	03
Our values, purpose & vision	04
What we do	05
Our aviation capabilities	06
Aviation & security	07
The flight path to sustainable aviation	08
NDY aviation experience	10

**NDY by
numbers**

 established
1959

 **600+**
people

 **9**
key markets

12 
offices

 **5**
countries

Introduction



Our track record in aviation projects started over 30 years ago. During that time, we have been involved in the successful delivery of aviation projects in Australia and internationally.



Established in 1959, Norman Disney & Young (NDY) has a long and proud history of offering an extensive range of engineering services and delivering world class projects. Our consulting engineering advice has brought considerable value for many aviation clients around the world.

We are pleased to present this capability statement detailing the benefits we provide for airport operators and aviation carriers.

Our consulting provides real benefit from inception through to design, construction and commissioning. We also assist our clients to manage, upgrade and adapt facilities during their lifecycle, so that each asset provides triple bottom line sustainable outcomes.

This document demonstrates the depth of expertise offered by NDY in the delivery of consultancy services and our ability to professionally service the engineering needs of airport operators and aviation carriers.

The success of the airport is based on the passenger experience

from Road to Runway.



The heart of the airport is a resilient facility



that provides a level of system redundancy equal to a mission critical environment.

The face of the airport is a modern building that serves its customers and provides

a positive travel experience.



The evolution of the facility will require a staged delivery



that will allow progressive integration of systems against defined minimum performance requirements

The cost of this growth will require assessment of total cost and value engineering assessment

to deliver the best outcomes.



Future Proofing

the Asset for Expansion



Our **values**

Excellence

Do it once, do it well

Leadership

**Lead in our profession, industry
and the community**

Integrity

Treat others as we wish to be treated

Collaboration

Listen, share and contribute

Accountability & Ownership

**Understand the impact of our actions
and own the outcomes**

Innovation

Inspired creativity to challenge the norm

“
Our purpose
is making
spaces work
”

Our **vision**

To enhance the lives of others,
by engineering outstanding projects,
mindful that every project matters.

To sustain deep and trusting
relationships with our clients,
through solving their problems and
serving them with utmost reliability,

and

To engage our people with
meaningful, rewarding and
inspiring opportunities.

Our ethical statement

NDY has a proud tradition of upholding the highest ethical standards in the manner by which we conduct ourselves as a company. Read our ethical statement at www.ndy.com/about-us/our-ethical-statement



What **we** do

As consulting engineers, our purpose is making spaces work. We listen to the unique requirements of each client, and tailor our services accordingly to every project.

Our collaborative approach to excellence and innovation are core values at NDY. We consistently deliver best practice sustainable solutions to achieve our clients' objectives.

Clients come to NDY because they want quality. We take ownership and provide clear recommendations while consulting with the utmost integrity.

Most of all, clients come to us because we listen. We look forward to better understanding your business and collaborating with you to achieve successful outcomes.

Our markets

- › Civic
- › Education
- › Health
- › Industrial
- › Mission Critical
- › Offices
- › Residential & Hotels
- › Retail
- › Transport

Our services

- › Acoustics
- › Asset Performance
- › Audio Visual
- › BIM (Building Information Modelling)
- › Communications
- › Controls & Integration
- › Electrical
- › Fire Engineering
- › Fire Protection
- › Hydraulics
- › ICT Consultancy
- › Interiors
- › Mechanical
- › NDYLIGHT (Lighting Design)
- › Property Consultancy
- › Security (including SCEC services)
- › Sustainability
- › Vertical Transportation

Our aviation capabilities

NDY's track record in aviation projects dates back over 30 years, with involvement across Australia and overseas. Our capabilities extend beyond core engineering services to cover the specific needs of airside and landside facilities.

NDY understand that the services within the **airside** area of an airport are direct, practical and efficient. They are intense and rarely seen in other industries, such as:

- ▶ 400 hertz electrical systems
- ▶ Mass flow air systems and
- ▶ Pre-conditioned air systems.

These systems must be designed to suit many different types of aircraft and require flexibility in their application. Prior to placing pen to paper, detailed discussions and briefs need to be implemented to ensure correct application.

The area that the public sees is **landside**, where their journeys begin. Comfort, lighting and enticement are some of the key requirements of this area, adding to the airport experience and allowing patrons to relax. Creating inviting retail spaces involves:

- ▶ Speciality lighting
- ▶ Comfortable air conditioning and
- ▶ Flexible services design.

NDY's design experience in this area is backed up by our involvement in many retail centre projects worldwide.



NDY has been involved in many airport projects, and has experience in both landside and airside designs. Our ability to blend this experience into one facility will add to the overall space, satisfying the objectives of airport operators, airline carriers, retailers and the general public.



Aviation & security

Among consulting engineers, NDY's security expertise is unique. Our qualified security risk analysts provide advice on security requirements including:

Personnel security

Only known trusted persons with a proven business need for entry and access can enter restricted areas and gain access to valuable assets such as, airframes, tarmac, freight warehouses, sensitive information, or other attractive mission critical equipment.

Physical security

Technology such as fences, building fabric, lighting, intruder alarms, CCTV, access control systems, locking systems, passenger and cargo screening systems, and containers (such as safes), extending to effective access control over public, semi public (airside sterile zone), and restricted areas (back office staff only zones, server rooms, bond stores, and sheds).

Information security

Data classification, storage, destruction, distribution, access only to those with a "need to know".

Administrative security

Policies and procedures, standing instructions, codes of conduct and professional responsibility, incident reporting and analysis, threat and risk assessment, compliance with International and Australian Government standards and legislation for aviation security.

Security education and awareness

Staff training, expected standards of conduct, responsibility for security and custody of assets such as passwords, keys, vehicles, equipment spares, fuel, aircraft stores, and other organisational property.



At NDY, sustainability is in our DNA. It's not an 'add-on' but an intrinsic part of everything we do.

The flight path to sustainable aviation

We're committed to delivering buildings, facilities and infrastructure that contribute to a sustainable future – because we know that sustainability is not only better for cities and communities but also our clients.

At NDY, we practice what we preach. We have attained global ISO14001 accreditation, we report annually on our own corporate sustainability initiatives through the Global Reporting Initiative (GRI) framework, and our Australian offices are either certified or registered for Green Star and NABERS ratings.

Our team has extensive experience delivering projects in the aviation industry, and has worked with airport operators and airline carriers to achieve sustainable solutions that reduce operating costs, improve building asset values, boost workplace productivity and minimise environmental footprints.

With almost two thirds of non-flight revenue generated through property and retail at airports, we understand why the aviation industry is focused on improving operational efficiencies.

We also understand how to identify and capture these operational efficiencies. We work with our clients to:

- Identify the key areas of opportunity
- Test and agree on the alternatives and
- Develop a strategy for implementation.

We've helped our clients achieve significant financial savings by addressing building operations issues – from energy and emissions minimisation to water conservation, and from waste management to noise reduction.

And we continue to develop efficient, cost-effective solutions that deliver on the 'triple bottom line' of environmental, economic and social sustainability.

“

For over 60 years, we have been at the forefront of innovation. We recognise that both clients and projects are unique, and we are adept at tailoring our services and designs to suit project requirements.



Stuart Fowler

CEO
Norman Disney & Young

”



Flug nr.	Flug ziel	planmäßige Abflugzeit	geplannte Ankunft	Terminal	Flughafen	Flughafen Code	Flugzeug	Flugplatz
26	HYDERABAD-MUMBAI	10**	11**	1	B	677-881	B42	
52	VILNIUS	11**	12**	1	A	050-481	A22	
H								
07	NEW YORK-J.F.KENNEDY	11**	12**	2	D	841-856	05	
88	ISTANBUL F	11**	12**	1	B	661-663	024	
89	LONDON CITY AIRPORT	11**	12**	2	E	701-909	07	
13	LJUBLJANA	11**	12**	1	A	051-461	011	
12	BUKAREST	11**	12**	1	U	474-481	033	
10	KATTUNIJZ	11**	12**	1	A	050-461	05	
14	LAGOS	11**	12**	1	A	050-461	026	
12	MADRID	11**	12**	1	A	050-461	038	
13	ROM-FIUMICINO	11**	12**	2	D	805-808	024	
15	KUALA LUMPUR	12**	13**	2	D	886-891	01	
14	ATLANTA	12**	13**	1	A	050-461	056	
16	PARIS-CH. DE GAULLE	12**	13**	1	A	050-461	026	
12	MANCHESTER	12**	13**	1	A	050-461	031	
15	SINGAPUR	12**	13**	1	B	493-493	048	
12	BERLIN-TEGEL	12**	13**	1	A	050-461	017	
12	KOELN-MBF	12**	13**	1	A	050-461	016	
12	BRNO	12**	13**	1	A	050-461	056	
12	MÜNCHEN	12**	13**	1	A	050-461	018	
Terminal 1 ABC Terminal 2 DE								



NDY aviation experience

For more than sixty years NDY has provided consulting engineering services on strategic projects throughout Asia, Australia, Canada, Europe, New Zealand and the UK.

These award-winning projects are testament to the quality of our innovation, expertise and personnel. The following examples of our experience are a snapshot of our ability to deliver world's best practice for master planning projects of all sizes.

To view a comprehensive outline of our project experience visit our website www.ndy.com





Perth International Airport T1 Arrivals Expansion, Perth, Australia

Services:

- ▶ Electrical
- ▶ Fire Protection
- ▶ Hydraulics
- ▶ ICT
- ▶ Mechanical
- ▶ Security
- ▶ Sustainability
- ▶ Vertical Transportation

About the project:

The Terminal 1 shell at Perth Airport remained largely unaltered since the opening of the facility in October 1986. Since then international passenger movements have doubled with forecasts indicating 4 million passengers per annum by 2019. An upgrade to the facility was required to address this increase in passengers.

The brief was to deliver a 12,000 sq m cost-effective quality design that could be readily altered at minimal cost and operational disruption to accommodate the planned post consolidation changes to the terminal building. Optimising income from retail & advertising opportunities, group transport initiatives and commercial leasing agreements was also part of the project brief.

Features and Innovations:

- ▶ Design documentation provided in REVIT.
- ▶ Construction works were undertaken in a “live/operating” terminal with design recognising staged construction to minimise disruption.
- ▶ The Immigration area, twice the size of the old area, is now located on level 1 next to a greatly expanded new arrivals JR/Duty Free store.
- ▶ Changes on the ground floor include expanded baggage reclaim area, doubling the size of the secondary examination (Quarantine) area, and new toilet facilities and car rental counters.
- ▶ By separating Immigration and Biosecurity (Quarantine), and significantly increasing the size of these areas, passenger queuing and waiting have been minimised.
- ▶ Significant Stakeholder engagement was required, including: Perth Airport (multiple departments); Airlines, AQIS, Customs, DIAC, WA Police, and Federal Police.
- ▶ Incorporating sustainable design and “whole of life” principles where proven benefits can be achieved to demonstrate visibly Perth Airport’s commitment sustainability and energy use targets.



Terminals Australia

Gold Coast Airport Low Cost Carrier Terminal, Coolangatta, Queensland

Services:

- Communications
- Electrical
- Fire Protection
- Hydraulics
- Mechanical

About the project:

A \$100 million extension and upgrade was undertaken in 2009 to cater for the ongoing growth in passenger numbers (to approximately 500,000 per month). The redeveloped terminal was doubled in size to 28,000 sq m with exciting new retail stores, revamped duty free and a host of new food and beverage outlets.

The expansion more than doubled the original terminal. The main terminal building had a floor area of approx 12,000 sq m before the refurbishment, and was divided into two terminal areas (T1 and T2), now combined and expanded as one Common User Terminal. The area of the new terminal building is approx 30,000 sq m.

The works included the redevelopment of the existing terminal areas, the airside extension, the outward baggage extension, new terminal operations and central control room. It also included the redevelopment of the ACS, AQIS, DIAC and airline areas.

Our design has allowed to cater for the airport's 2017 busy hour forecast.

Features and Innovations:

- High efficiency Turbocor air-cooled chiller plant
- CO₂ control of outside air, zoning to suit area occupancy, hours of operation and building loads
- 1 million litre rain vault and dual water reticulation system
- Common integrated cabling system that accommodates Common Use Terminal Equipment (CUTE), airport services, airlines and tenants.



ADAT Hangar 6 - Maintenance and Repair Facility Abu Dhabi International Airport, United Arab Emirates

Services:

- ▶ Communications
- ▶ Electrical
- ▶ Fire protection
- ▶ Hydraulics
- ▶ Mechanical

About the project:

Abu Dhabi Aircraft Technologies (ADAT) is an established Maintenance, Repair and Operations (MRO) provider to the Middle East region, the fastest growing aviation sector in the world.

ADAT developed this new three bay Heavy Maintenance facility to alleviate the pressures on their existing three bay hangar, ancillary facilities and to advance their goal to become the pre-eminent MRO within the Middle East.

The hangar comprises 32,000 sq m of hangar space, 12,000 sq m of office and workshop space, and a central building services compound for centralised systems. The hangar complex is capable of housing 3 x A380 Airbus aircraft together with 6 mid sized (B767-300, A330-300) aircraft in an L shaped configuration.

The services within the hangar have been designed to allow for the construction of an additional bay attached to the hangar plus an additional two bay hangar.

NDY, as part of a design and build team headed by Aircraft Support Industries, was responsible for the design, documentation and construction phase for all building services for the hangar, ancillary offices and workshops.

The incorporation of the initiatives of the NDY design will ensure a cost effective and practical facility.

Features and Innovations:

- ▶ Compressed air to the hangar and workshops
- ▶ HV reticulation and substations
- ▶ Centralized 400Hz generation and reticulation
- ▶ Hangar air conditioning utilizing a semi displacement type system
- ▶ Hazardous area electrical services where required to the hangar and workshops
- ▶ High volume fire suppression system to the hangars, utilising leading edge discharge systems
- ▶ High grade lighting systems.



Sydney Airport Qantas Domestic Terminal, Sydney, New South Wales

Services:

- ▶ Electrical
- ▶ Specialist Lighting
- ▶ Mechanical
- ▶ Modelling
- ▶ Vertical transportation

About the project:

The Qantas domestic terminal at Sydney Airport has a gross area of approximately 100,000 sq m and provides over fifteen domestic gates. The terminal was totally rebuilt in place of the previously existing terminal. This presented the project team with the challenge of staging and coordinating the construction while maintaining an operational terminal facility.

The maximum four hour daily shutdown window for out of hours work is an indication of the significant logistical problems that were faced during the course of the project. NDY have been involved in numerous upgrades and refurbishments since the terminal opened.

Specialist lighting upgrades were incorporated in the \$250 million renovation/expansion of the Sydney Domestic Terminal. The Departures Hall has an expansive roof with five rooflights running the width of the building.

Initial studies for this project included an intensive daylighting study using interactive 3-D lighting software. Calculations were made for clear and cloudy sky conditions at various times of the day, and for the middle of summer and winter.

Features and Innovations:

- ▶ The checked baggage screening and baggage handling upgrades were an early demonstration of the value of 3D modelling to coordinate design with the existing congested spaces below the passenger area.
- ▶ NDY's calculations were invaluable during the design stage to assess the levels of sunlight entering the space during the day and to control daylight levels by the treatment applied to the skylights and provision of screening devices to work areas to eliminate discomfort from directly radiated light and heat.
- ▶ The roof lights in the Satellite area provided a challenge in terms of the artificial lighting. As this building is under the flight path, care had to be taken in the design of the artificial illumination to be used at night with regard to spill light.



Perth Airport Qantas Regionals and Qantas Lounge fitout, Perth Airport, Perth, Western Australia

Services:

- Acoustics
- Electrical
- Fire Protection
- Hydraulics
- ICT Consultancy
- Mechanical
- Security
- Vertical Transportation

About the project:

The Qantas Regionals project in Perth involved the refurbishment of the Perth Domestic Terminal 3, including the fit-out of the new Qantas transit lounge for passengers flying direct from London to Perth.

At 14,498 kilometres, this direct flight service is one of the longest commercial routes in the world, taking advantage of the efficiency and comfort of the new 787-9 Dreamliner. Providing comfort and relaxation for passengers embarking or arriving from such a long flight greatly enhances the passenger experience.

Qantas enlisted the expertise of Norman Disney & Young, A Tetra Tech Company (NDY), to ensure the fitout of the Perth Qantas Lounge, and the Terminal 3 extension were technically best in class and customer focused.

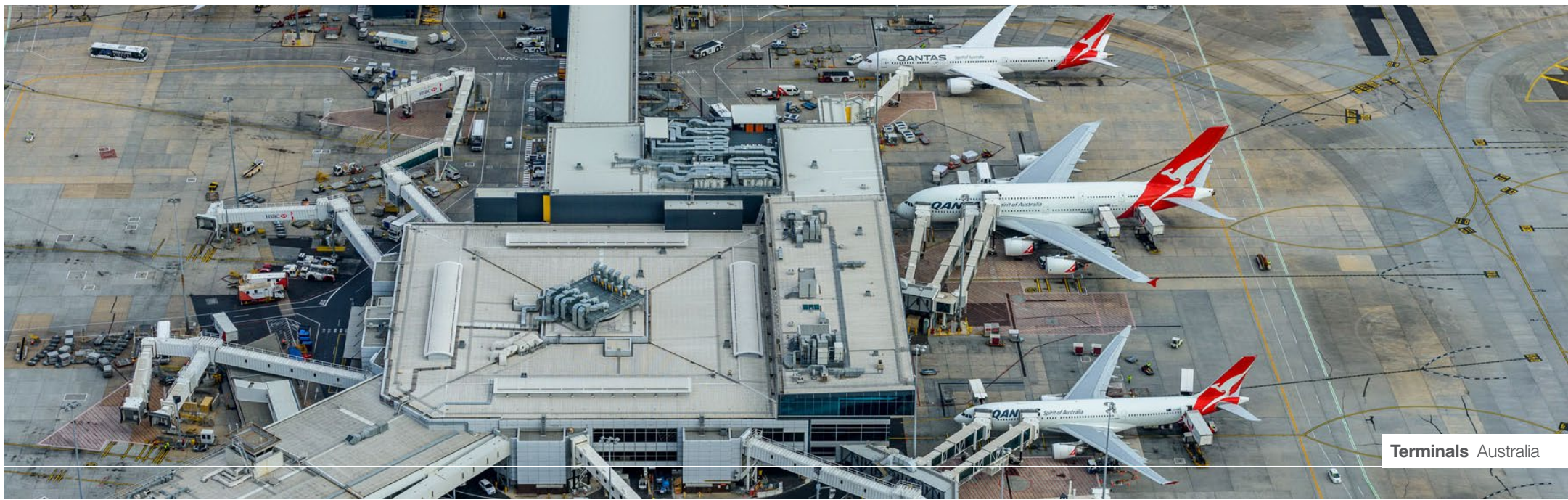
The world class transit lounge features the first outdoor patio at an airport in Australia, with a barbecue grill and a Neil Perry-designed barbecue menu.

The project consists of a reconfigured Ground and First Floor and a modest building expansion at the southern end of Terminal 3. The scope of this works is to be able to process incoming and departing wide bodied aircraft for long haul international flights and domestic transfers/ stopovers within Australia.

This involves the flexible use of the available space and the use of “swing gates” for both domestic and international/transferring passengers and controlled passenger flows that are able to support the various immigration and border protection requirements.

Features and Innovations:

- 15 Shower suites including bright LED lighting which can be run in 15 minute sessions to help re-adjust your body clock to the local time zone
- A Wellness studio that offers stretching and breathing classes held every 15 minutes. This helps relax passengers before a flight, while also assisting them to adjust to a new time zone and work out any kinks once they arrive in Perth
- Two outdoor decks providing sunshine and fresh air and an authentic Perth experience after the long flight.
- Outdoor BBQ with meals provided by on-site chefs
- Business facilities, including Free WiFi, USB charging ports, wireless printing, personal messaging, and national Newspapers.



Terminals Australia

Melbourne Airport, Victoria

Services:

- ▶ BMS Controls
- ▶ Building Fabric, Structure
- ▶ Catering Equipment
- ▶ Civil Systems
- ▶ Electrical
- ▶ Hydraulics
- ▶ Mechanical Systems
- ▶ Fire Engineering
- ▶ Fire Protection
- ▶ Fuel System
- ▶ ICT
- ▶ Security
- ▶ Vertical Transportation

About the project:

NDY have had an ongoing relationship with Melbourne Airport completing a range of projects including retail, plant upgrades, hanger conversions, capital planning and asset management assessments. This has provided us a broad exposure to the airport and its operational challenges and a detailed appreciation for the engineering design considerations. Over this period our involvements has had to consider system redundancy levels, plantroom locations, airside vs landside and associated security, and compliance with NFPA requirements.

NDY has recently been involved in completing an upgrade of the services infrastructure tunnels addressing compliance, converting a hanger to a usable office space and assisting Melbourne airport to identify and define the landside/airside demarcations.

For one recent project NDY were engaged to carry out a condition assessment and a 20 year lifecycle analysis of all maintainable critical assets located in Melbourne Airport's Terminals 2 & 3. APAM required the information to be provided in a format that was compatible with their Maximo asset management software and for capital planning. Using hand held devices preloaded with the asset database and the NDY developed data collection tool, each asset was visually assessed for the following information:

- ▶ Quantity of asset type
- ▶ Asset condition rating
- ▶ Asset type details
- ▶ Location

NDY used this information for the establishment of prioritized forward maintenance budgets and schedules including programmed capital replacement works for the life of the asset. The lifecycle maintenance capex and renewal program was developed in conjunction with the APAM asset hierarchy format. This information provided the empirical basis for APAM to determine the asset's baseline performance and plan future asset replacement or renewal in line with the Asset Management Strategy of Terminals 2 & 3 and broader critical assets.



Brisbane Domestic Terminal Access Project, Brisbane Airport, Queensland

Services:

- Communications
- Fire
- Electrical
- Hydraulics
- Vertical Transportation

About the project:

Work on the Domestic Terminal Access Project (DTAP) began in November 2010.

DTAP consists of a bridge link between a new multi-level car park and the domestic terminal, plus the construction of a new public drop-off road, to further improve traffic movements around the terminal.

Features and Innovations:

- High levels of vertical transportation including five lifts, nine travelators and four escalators
- A new substation and services to the existing airtrain station
- Designed-in capability to accommodate future major terminal expansion including future retail and central energy plant services
- Architectural fabric roof provides a dramatic visual effect and required a specialist lighting solution with high levels of consultation.

“

DTAP consists of a bridge link between a new multi-level car park and the domestic terminal, plus the construction of a new public drop-off road.

”



Ballarat Airport Infrastructure Upgrade, **Ballarat, Victoria**

Services:

- Communications
- Electrical
- Hydraulics

About the project:

NDY was engaged by the City of Ballarat to provide Project Management and engineering services design for the expansion of capability at Ballarat Airport. On behalf of our client, NDY engaged Airbiz aviation planners and Bonacci Group civil engineers to provide a complete design solution for this project.

The project involved expanding the aviation operation area to accommodate flight school facilities and training aircraft, additional aircraft parking, services for new hangar facilities, road extensions, and a civil drainage strategy based on extensive modelling undertaken of the airport. NDY worked closely with the City of Ballarat and our design team to develop cost effective designs to satisfy the project requirements.

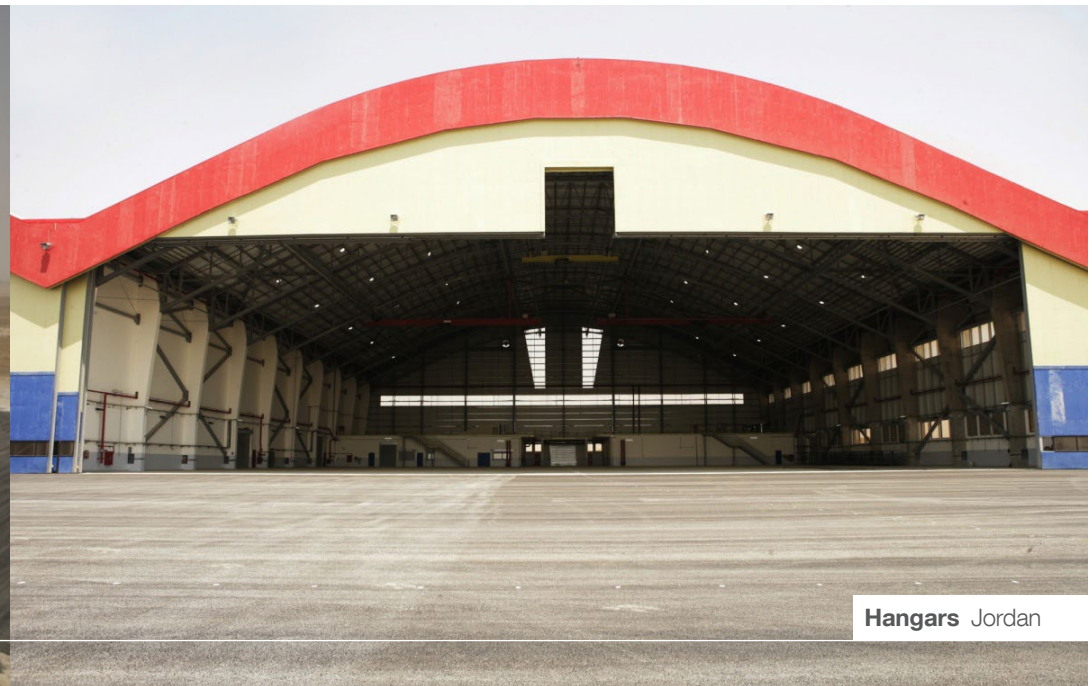
Features and Innovations:

- Apron and taxiway lighting
- Power infrastructure to service new hangar sites
- Communications infrastructure
- Water and sewer extensions for the expanded airport
- Road lighting.

“

NDY worked closely with the City of Ballarat and our design team to develop cost effective designs to satisfy the project requirements.

”



Hangars Jordan

JorAMCo Aircraft Maintenance and Repair Facility Queen Alia International Airport, Amman, Jordan

Services:

- Electrical
- Fire protection
- Mechanical

About the project:

The advent of new generation aircraft and rapid growth in aircraft passenger numbers has resulted in a surge in demand for commercial aircraft. This has resulted in a need for new, and more efficient, maintenance facilities.

The Jordan Aircraft Maintenance Company (JorAMCo) provides services to the Middle East region – the fastest growing aviation sector in the world. JorAMCo developed this new two-bay heavy maintenance facility to extend their existing hangar and ancillary facilities.

NDY was responsible for the design, documentation and construction phase services for the mechanical, electrical and fire requirements, as part of a design and build team headed by Aircraft Support Industries.

Features and Innovations:

- High volume fire suppression system to the hangars (utilising leading edge discharge systems which are integrated into the site-wide fire water supply and reticulation system)
- Power supply to specialised aircraft systems incorporating of 400Hz power
- High grade lighting systems
- Compressed and respiratory air to the hangar, workshops and sanding booth
- Critical temperature and humidity controlled air conditioning to the composite workshop
- Hazardous area electrical services where required to the hangar and workshops
- NDY's design, particularly the integration of the site-wide water supply, ensured that the facility is both cost effective and practical.



NDY's design, particularly the integration of the site-wide water supply, ensured that the facility is both cost effective and practical.





Darwin International Airport Master Plan Review, Darwin, Northern Territory

Services:

- Electrical
- Hydraulics

About the project:

NDY completed a detailed master plan review of the electrical, lighting and hydraulics systems of Darwin International Airport.

Subsequently, Darwin International Airport engaged NDY to facilitate detailed studies from the recommendations made in the initial report. The first projects consist of lighting compliance to CASA and Australian standards and back-up generator coordination with load transfer switches.

Features and Innovations:

This review looked at all aspects of the existing infrastructure including:

- Ongoing maintenance
- Compliance with CASA
- Future requirements
- Rationalisation of plant
- Sustainability and carbon reduction
- Metering
- Back up generation
- Zone substation planning
- Network planning.



Darwin International Airport engaged NDY to facilitate detailed studies from the recommendations made in the initial report.



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