COWI Group

COWI is a leading international consultancy company founded in 1930 in Denmark. COWI is privately owned and entirely independent of any manufacturer, supplier or contractor.

The COWI Foundation is the majority shareholder. The Foundation supports research and development in various fields of consultancy activities.

The corporate head office of COWI Group is located in Kongens Lyngby 12 km north of Copenhagen, the capital of Denmark.

COWI’s formula for success is simple yet effective. We create value for our customers by thinking 360° around the challenges we meet. The 360° approach leads to more coherent solutions for our customers – and ultimately in the society at large.

COWI employs in the order of 6,100 staff, of which more than 50% are based outside Denmark in subsidiaries, branch offices or projects offices. Most of the employees are professionals with Ph.D., M.Sc. or B.Sc. degrees in civil, structural, geotechnical, mechanical or electrical engineering and other academic areas such as environmental science, geology, hydrology, chemistry, biology, agronomy, sociology, economics and planning.

In 2011 the annual turnover was 631 million EUR (821 million USD). The majority of the turnover of the company is generated outside Denmark in more than 100 countries around the world.

Our 360° approach takes lots of expertise. Fortunately, we have the people to back it up.

With a full set of world-class competences within engineering, economics and environmental management COWI is able to create coherence in the largest and most complex projects in the world.

FULL CIRCLE SOLUTIONS
Even the most effective and well functioning airports are highly dependant on the adjacent infrastructure in the air and on the ground. COWI has more than 75 years experience in transportation consultancy and management covering a wide range of projects in the fields of air and ground transport.

Our comprehensive spectrum of transportation services ranges from transport system planning and management to planning and design of roads, tunnels, bridges, ports, marine structures and intermodal facilities.

Projects in the transport sector are often characterized by a close interrelation between the physical infrastructure, the economics and the environmental impact.

The COWI concept where economics, engineering and environmental science is combined within one organization offers unique added value for the client through cross disciplinary management and optimization.

Major airport projects also involve a broad range of other disciplines including transport planning, environmental management, strategic economic optimization, cost benefit analysis, building, road, railway design and IT & telecommunication design.

“The core business of COWI lies within the spheres of our three service lines ranging from classical engineering through environmental science to modern economic analyses and cross disciplinary management”
COWI has carried out more than 600 airport projects worldwide and employs a large number of specialists in a variety of disciplines within the fields of airport planning, design, operation and transaction advisory services.

**TRANSACTION ADVISORY SERVICES**
The combination of technical specialists and project managers experienced in airport transactions creates a unique platform for providing coherent services to both the and the buying side of an airport transaction.

**AIRPORT PLANNING**
COWI’s vast experience in airport planning is gained from projects spanning from small domestic airports to major international airports with the largest aircraft types.

**PROGRAMME MANAGEMENT**
COWI takes pride in managing time, cost and quality in major development programmes; utilising cross disciplinary optimisation within a dynamic environment to ensure successful project outcomes.

**CIVIL ENGINEERING**
Civil engineering is one of the key elements of our involvement in airport projects. Our pavement engineers have developed unique recycling concepts for both concrete and asphalt.

**BUILDINGS**
COWI uses state-of-the-art engineering to design passenger terminal buildings, air traffic control towers and other airport buildings. Close collaboration with the architect ensures designs with a high degree of functionality, flexibility for future needs and which are cost-efficient and architectural landmarks.

**OPERATION AND MAINTENANCE**
During the process of preparing manuals for operation and maintenance we have often identified potentials for considerable savings in the organisational set-up, in the use of equipment or in operational and maintenance procedures.

**TECHNICAL INSTALLATIONS**
The engineering design of electrical airport installations that meet the demand of a modern airport is a discipline, where we have extensive experience. Other disciplines are fuel supply systems and leak detection.

“COWI is in the top 5 as international airport designers, measured on turnover outside own home market”
Source: Engineering News Record February 2012.
Our services related to airport privatisation and tendering include cross functional optimisation of master plans, CAPEX plans, OPEX, commercial plans and terminal design in close collaboration with disciplines as route development, business planning and financial valuation.

**PPP AND BTO PROJECTS**

COWI staff has a broad experience from airport privatization projects. COWI can offer key staff with many years experience from investor side participation in airport privatisations and tendering in Europe, Middle East, Asia North- and South America.

COWI has experience as technical consultants working for the selling as well as the investor side in airport transactions.

**TECHNICAL SERVICES**

COWI’s in house specialists are in addition to the cross functional optimisation able to deliver detailed support in areas as; airport planning, capacity/demand analysis (airfield, terminals, access systems), design of runway, taxiways and apron, airfield ground lighting (AGL), Navaids, fuelling systems, design of access roads, Curb and parking areas, design of passenger terminals and other buildings (cargo facilities, ATC towers, fire stations, hangars, multi storey car park etc.).
The basis for COWI’s airport planning services is our thorough knowledge of the details and functions of the physical facilities of the airside and landside of an airport.

The development of an airport master plan is a complex task. The objective is to ensure that the immediate development is harmonised with the long-term development strategies and that the capacity is, at all times, sufficient but not excessive. This goes for new airports as well as for the extension of existing airports.

**BUSINESS PLANS, TRAFFIC FORECASTS AND FEASIBILITY STUDIES**
COWI analyses the development of airports in terms of passenger and cargo volumes. Combined with the commercial aspects, the results are used in feasibility calculations allowing the airport management to determine their final development strategy.

**PHYSICAL PLANNING**
The master planning covers all elements of an airport, such as the runway/taxiway system including airfield lighting and navigational aids; passenger terminal buildings including apron and landside access facilities, control tower, freight terminal, maintenance and administration buildings, fire rescue facilities and all information and security systems and utilities.

**COSTING**
The master plan work will be concluded with cost estimates of the various alternatives based on COWI’s comprehensive cost databases.

**SERVICES**
- Site selection studies
- Feasibility studies
- Traffic forecasts
- Capacity / demand analyses
- CAPEX and OPEX estimates
- Aircraft movement analyses
- Runways, taxiways and aprons
- Terminals
- Landside access systems
- Cargo
- IT systems
- Environmental assessments
COWI’s ability to tailor programme management to a specific programme is based on our experience in working with public and private clients; in depth knowledge of the consultancy and construction sector in the respective regions combined with experience from a large number of projects in the air transport sector.

PROCUREMENT STRATEGIES
Procurement strategy is a vital element in successful programme management.

Though a procurement strategy finds its basis in the nature of the project, the national legislation and regional market must be taken into consideration at an early stage.

The combination of a strong centralised knowledge base and regional presence gives COWI the ability to design the optimum procurement strategy for the client leading to the right balance between quality, time and cost.

DESIGN MANAGEMENT
Larger modern airports are growing into multimodal airport cities and commercial revenues are getting more and more important for the ability of the airport to deliver a quality product to passengers and business partners.

In this context complexity is constantly growing and visionary design management is becoming increasingly important in order to be able to follow the dynamic changes in a volatile aviation sector.

Design of larger airport projects includes balancing the demands of a variety of stakeholders. COWI is expert in managing stakeholder requirements through open communication and facilitation.

Transforming the design input into world class, efficient and flexible infrastructure is obtained by utilising the combined competences of the three COWI spheres - engineering, economics and environmental science.
CIVIL ENGINEERING

Airport civil engineering comprises design, tendering, contracting and supervision services in connection with runways, taxiways, aprons and landside access facilities.

GEOMETRICAL DESIGN
COWI employs software showing the path of different types of aircraft enabling us to secure that all requirements of ICAO will be met when designing runways, taxiways and aprons. In order to accommodate different aircraft mixes, flexible aircraft stands may be introduced to minimise the length of building facades and thereby reduce initial and future cost.

PAVEMENT DESIGN
COWI employs modern pavement designs using both external and in-house developed software in order to cater for different climatic and loading conditions. We employ new technologies such as the recycling of asphalt and concrete pavements when existing airfield pavements are rehabilitated. These technologies result in savings of 20-40 percent compared to traditional rehabilitation methods.

SERVICES
› Geotechnics
› Drainage
› Pavements/recycling
› Geometrical layout
› Runways and taxiways
› Aprons
› De-icing stands
› Airside/landside roads and parking
› Project and construction management

› Performance-driven specifications, e.g. superpave
› Pavement analysis and modelling
› Utilisation of waste and marginal materials
› Specialised binders
BUILDINGS

COWI's services related to the design and construction of airport buildings include planning, programming, design, tendering and construction supervision of the facilities. We also have extensive experience in project management, both in the design phase and construction phase. Our experience is founded on many years of involvement in airport projects.

AIRPORT BUILDINGS

Airport buildings encompass many specialised buildings such as passenger terminal buildings, control towers, cargo buildings, hangars, airport maintenance buildings and fire and rescue stations.

A number of other buildings also play an important part in many airports. We have design experience with most types of airport buildings and their interfaces with the civil works including car parks, catering and hotels. On all of our projects we create synergies between technology and architecture, and focus on functionality, buildability, construction technology, energy savings and sustainable developments.

COWI has a number of LEED (Leadership in Energy and Environmental Design) certified engineers. LEED is normally used for certifying single buildings, but COWI has developed a method where LEED can also be used to screen sustainability in an entire property portfolio. LEED allows you to assess the sustainability of a property in six categories; the site and its location, water consumption, energy consumption, materials and resources, indoor climate and innovation.

DESIGN OBJECTIVES

Our aim is to ensure that the client’s objectives are always exceeded were possible. Therefore, COWI’s first planning step is to define these objectives in cooperation with the client. Issues for considerations are typically functionality, flexibility, architectural aesthetic and cost.
The basis of airport operation and maintenance services is a detailed understanding of the function of physical facilities and systems, aligned with the appropriate people and processes to create a smooth operation.

COWI has gained intimate knowledge of airport operations and maintenance during many years of airport consultancy and co-operation with partners in airport operations.

**OPERATION AND SAFETY MANUALS**
We have assisted airport authorities in establishing specific manuals and local regulations such as general operation and safety manuals, manuals for runway use, emergency planning and security, as well as the development of software for gate selection and simulation of aircraft movements, baggage and passenger flows.

**OPERATIONAL ANALYSIS**
COWI has carried out studies of various operational aspects such as tractor towing of aircraft and evaluation of de-icing procedures. In close cooperation with our partners, we have established operational frameworks and procurement philosophies and a strategy for operations and maintenance procurement, concentrating on economies of scale and adaptability to individual airport operation.

**PAVEMENT MAINTENANCE AND REHABILITATION**
Pavement maintenance and rehabilitation are planned and co-ordinated with other activities to ensure that the total work programme can be implemented with a minimum of operational restrictions.
A modern airport is totally dependent on efficient technical installations, ranging from traditional high voltage and low voltage, electrical installations, navigational and communication aids and IT systems to mechanical installations and fuel supply systems. This complexity demands a multitude of specialised staff, to deliver superior planning, design and construction management and supervision.

**AIRFIELD GROUND LIGHTING**
Depending on the airport category the airfield ground lighting comprises all installations on the airfield, including centre line and edge lights, threshold and end lights, approach and touch-down zone lights, PAPI and intensity control systems.

**NAVIGATIONAL AND COMMUNICATION AIDS**
Depending on the airport category the navigational and communication aids may comprise instrument landing systems (ILS), GPS systems, guidance systems, air traffic control (ATC), precision approach and ground radar, radio- and data communication.

**METEOROLOGICAL EQUIPMENT**
Meteorological equipment comprises systems for measuring and data processing for example wind and visibility data, cloud heights.

**TERMINAL EQUIPMENT AND INFORMATION TECHNOLOGY (IT)**
Modern airport terminal equipment and associated information technology comprises ever growing system and network capability requirements. COWI offers highly skilled IT professionals with knowledge and expertise in the very latest IT airport design technology, supporting business visions by utilising state-of-the-art technology solutions.

The processes for check-in, baggage drop and boarding control operate in close interaction with information display screens (IDS), baggage transport systems, screening and sorting as well as stand allocation, passenger boarding bridges and aircraft docking facilities. Simplified and automated processes through the use of NFC, RFID, biometric and 2D barcodes on paper or a cellular phone allow for a wide use of self-service products and streamlining processes.

Focus on security and safety leads to ever more advanced screening of passengers and hand baggage, CCTV, public address systems and fire fighting systems.

COWI has expertise in Airline Ground Handling, Airline/Airport IT systems and Airport processes with focus on airline trends in automation and simplifying the passenger travel process through the airport, together with impact assessment of airlines automation requirements on landside/airside operations. COWI has a leading role in the technical standards development of operational data exchange between Airlines and Airport through IATA and ACI.

**FUEL AND POWER SUPPLY SYSTEMS**
Fuel supply systems may comprise storage tank farm and pumps and filter separators for jet fuel, hydrant distribution line system including hydrant pits, and leak detection systems. Power supply systems may comprise high voltage primary supply and secondary, on-site generated power supply to all airport functions.
**SUSTAINABILITY, ENVIRONMENT, HEALTH AND SAFETY**

Modern infrastructure projects must consider sustainability, environmental impacts and health and safety to be fully successful. A solid vision and policy with a high standard for environment, health and safety provides a more sustainable airport. COWI offers high quality consultancy services covering all phases of an airport project from planning and design to construction, operation, maintenance and decommissioning.

**ENVIRONMENTAL IMPACT ASSESSMENT**

Both authorities and other stakeholders demand minimisation of the possible environmental impacts of an airport development project during construction and in subsequent operations. Therefore, the possible impacts of a project should be considered in the early planning stage and include both negative and positive aspects. COWI has many years of experience in carrying out environmental impact assessments (EIAs) of airport and other large infrastructure projects in compliance with national or international guidelines. EIAs can include assessment of impacts on public health, working environment, social and socio-economic issues, public hearings and handling of other stakeholder issues, as requested. We also assist project developers already in site selection phase by performing environmental and social due diligence (ESDD) evaluations.

**SUSTAINABLE DESIGN**

Sustainability considerations are implemented from the beginning of design development thus enabling full integration of this approach in the design process and optimising the possibilities of achieving a result that will reduce future operational costs (often up to 50%) through careful use of natural resources and minimisation of the carbon (CO₂) footprint of the project. Examples of specific measures in sustainable building design are:

- Life cycle cost perspective in the design phase
- Use of sustainable materials for the construction
- Use of standardized systems in the design phase (DGNB, LEED or BREEAM)
- Orientation of buildings
- District cooling / heating plants
  - Absorption cooling in combination with district heating and/or geothermal storage
  - Sea water cooling in combination with heat pumps
- Natural / hybrid ventilation / free-cooling
- Recycling of grey wastewater
- Thermo-active constructions
- Mega heat pumps in connection with geothermal heating and/or solar cells/panels
- Low energy lighting concept and low energy passenger lifts
- Renewable energy by wind turbines
- Renewable energy by solar cells / solar panels.

**HSE MANAGEMENT**

It is vital that environmental, health and safety (HSE) issues are addressed and managed adequately by careful planning starting in the design phase and continued in the construction and subsequent operation of an airport. COWI has a long track record of successful HSE-related assignments around the world. Taking a holistic approach, we assist in developing and establishing a management system and action plan, including auditing and monitoring, adapted to the specific needs of a project, covering environment, occupational health and safety in construction phase as well as in the operation.
In a joint venture with Larsen Architects, COWI is the responsible designer and supervising engineer on this prestigious project to develop Oman’s largest airport, Muscat International Airport and Salalah airport in the south of the country, resulting in two of the world’s most advanced airports.

On completion of the first phase of development Muscat will have a capacity of 12 million passengers a year and Salalah will reach 2 million passengers a year.

**MUSCAT INTERNATIONAL AIRPORT**

Muscat International Airport is the largest project to be undertaken in the history of Oman and has been designed with a modern approach and strong locally influenced aesthetics. It will become one of the largest landmarks in the nation and will be among the world’s leading and most prevailing airports. Muscat International Airport will be a national symbol of growth, development and pride.

The new airport will include:

- Brand new passenger terminal building with a 6-lane access road, interchanges and parking for 8,000 cars
- New 4,000 m second runway and taxiways for CAT II operation, serving all aircraft types including the A380, the world’s largest passenger aircraft
- Apron areas with 59 aircraft stands, of which 29 are connected to the terminal by passenger Boarding Bridges
- New control tower and area control centre
- More than 100 ancillary and utility buildings.

The north runway system is planned to open by the end of 2013 and the full airport is to be completed by the end of 2014.
In order to meet the growing demand until opening of the new facilities COWI has prepared a redesign of the existing apron. By updating the aircraft parking concept from power-in/power-out to a power-in/push-back the apron capacity has been enhanced by around 25% within the existing area.

SALALAH AIRPORT
Salalah is the second largest city in the Sultanate of Oman, located in the Dhofar region. Its environment is distinctive to the region, as it experiences an unusual monsoon season, making it an extremely lush green and cooler destination. This unique natural environment attracts many tourists to the area.

COWI-Larsen JV has used the beauty of this region to influence the design of the brand new passenger terminal building. With palm-like pillars in the check-in area, the 65,000 sqm area of the structure is an iconic symbol for the nation.

- Brand new passenger terminal building with parking facilities for 2,000 cars
- Apron area with 12 aircraft stands of which 8 are connected to the terminal by passenger boarding bridges
- New taxiways and a 4,000 m runway to CAT II
- More than 50 ancillary and utility buildings.

The first phase of airport development is to be completed by the end of 2013.
In February 2009 a team including COWI A/S, Narud Stokke Wiig, architects and Plannes and Norconsult won the tender for a major expansion of the airport. The project includes primarily a large extension of the passenger terminal building, a new pier with contact stands, new taxiway system and a redesign of the forecourt areas.

Since the inauguration of the new Oslo International Airport at Gardermoen in October 1998 passenger figures have risen from 14.1 million passengers in 1999 to 21.1 million passengers in 2011 and the airport has now reached a milestone where a major expansion of the passenger terminal capacity is required.

The planned expansion of the terminal building and 17 new aircraft stands will take the capacity of the airport to 28 million passengers in the first phase and to 35 million passengers in a later stage.

COWI proposed a continuation of the single terminal concept rather than a second terminal. The presented single terminal concept allows for premium flexibility, simplifies passenger way finding and optimizes staff resources by minimizing split operation. The single terminal concept is estimated to have more than 20% higher capacity compared with a dual terminal concept of the same size. The construction of stands and taxiways started in 2011 and completion of the several billion NOK expansion project is now scheduled for 2017.

**ORIGINAL AIRPORT DEVELOPMENT PROGRAMME**

In 1991, Aviaplan, a group of Norwegian and Danish architects and engineers including COWI, completed a master plan project for the new Oslo International airport at Gardermoen, approximately 50 km north of Oslo.

Located on a site of an existing military airport, the project included the planning and conceptual design of new runways, taxiways, aprons, terminals, pier buildings, maintenance facilities and passenger approach facilities such as motorway and railway station. Gardermoen Airport, with two runways and 40 gates, had a capacity of 12 million passengers in the opening year 1998 and 17 million passengers in year 2010. The airport occupies an area of 13 km². The approximated cost for this project amounted to 11 billion NOK. The two runways, 3,600 m and 2,950 m long, respectively, were placed as staggered parallel lanes with 2,200 m between them.

The terminal including two traverse piers is situated between the runways. The entire system of taxiways and runways created a high level of efficiency based on a minimal distance between aprons and runways. Markings on taxiways, aprons and internal roads were designed the year prior to the opening, and in close co-operation with the airport administration. Approximately 60,000 m² of markings have been applied on the surfaces. Based on the experience from the first year of operation the expected quantities of de-icing chemicals to be used on pavements in “normal” winter seasons were evaluated. The results formed the basis for negotiations with the environmental authorities.
BERGEN AIRPORT FLESLAND, NORWAY

SERVICES
- Project Management
- Geometrical design of taxiways
- Design of civil works and pavements
- Drainage design
- Construction supervision

PROJECT PERIOD
2009 - 2012

CLIENT
The Norwegian Civil Aviation Administration (AVINOR) and Bergen Airport

REALLOCATION OF TAXIWAYS
COWI was contracted by Bergen Airport, Flesland to carry out a major redesign of taxiways due to non-compliance with ICAO rules.

The work consisted of relocation of Taxiway Y for a distance of 3,000 m and Taxiway W for a distance of 1,000 m and also relocation of cross taxiways for a total length of 1,500 m.

In connection with the taxiway relocation a new primary and secondary cable duct system was designed and constructed along with a new surface drainage system with separators for collection of contaminated substances. An important design feature was an underground channel from the ocean to a nearby lake to secure water flow and allow for passage for sea trout and eel.
NEW TERMINAL DEVELOPMENT

In September 2011 an engineering team with COWI as one of the partners won the tender for the engineering services for a major expansion of the airport. The project includes a new passenger terminal building (Terminal 3), redesign of the existing terminal for use as a future satellite terminal, and a major redesign of airside, forecourt areas and access roads.

The existing terminal was built more than 20 years ago with a design capacity of 3 mppa. Passenger figures have grown steadily reaching 5.5 mppa in 2011.

The new terminal will be connected to the existing terminal through a skyline passenger walkway and a culvert for goods transportation. The new terminal will facilitate an integrated light rail station for swift and environmentally friendly access between the airport and the downtown of Bergen.

Several solutions have been developed to make the terminal energy efficient and as environmental friendly as possible. The use of seawater for building cooling/heating and a high degree of recycling of warm air for heating purposes are some of the concepts adopted for minimising the energy consumption.

The planned expansion will take the capacity of the airport to 7.5 mppa in the first phase and to 10 mppa in a later stage. The preliminary design was completed in March 2012 and the completion of the expansion project is scheduled for 2016.
RAJIV GANDHI INTERNATIONAL AIRPORT HYDERABAD INDIA

The new airport in Hyderabad commenced operations on 23 March 2008. In a hassle-free start up period the greenfield airport has been handling 250+ ATM’s per day.

COWI in association with Aviaplan of Norway and STUP of India provided consulting services in the preparation of the master plan, engineering/architectural design and tender documents for the new Hyderabad airport.

The new airport is located at a greenfield site near the village of Shamshabad, approximately 20 km southwest of Hyderabad. Hyderabad International Airport Limited is a public private partnership which includes GMR Group, India, MAHB of Malaysia, State Government of Andhra Pradesh and Airport Authority of India.

The vision has been to build an airport of international standards with emphasis on:
- Cost efficiency
- High standards of safety and security
- Functionality and flexibility
- High level of service for passengers
- Modern architecture
- Efficient operation and maintenance
- Environmental considerations.

The new airport in Hyderabad handled 6.5 million passengers in its opening year. In February 2010 and again in 2011 the airport has been awarded as the best airport among 5-15 MPPA airports in the world by ACI (Airport Council International).

The capacity of the first construction phase is around 12 million passengers a year and the maximum passenger capacity is estimated at 40 million passengers a year.

The master plan addresses the following facilities related to air traffic operations in the initial phase:
- Runway, taxiways and aprons
- Passenger terminal building
- Cargo terminal facility
- Control tower/technical building
- Maintenance workshop
- Fuel farm
- Airport crash, fire and rescue service
- Aircraft hangar and maintenance
- Airside/landside fencing and security
- Road access
- Car parking
- Airport hotel
- Administration building.

“Best in class 2010 and 2011”
Source: ACI, ASQ Survey

SERVICES
- Master plan
- Engineering design
- Tender documents and assistance

PROJECT PERIOD
2003 - 2008

CLIENT & FINANCING
Hyderabad International Airport Limited, India
In a joint venture with KEO (Kuwait Engineer’s Office) and STROL 1000 (Bulgaria) COWI was awarded the contract for construction supervision of a new runway system within the Sofia Airport reconstruction, development and extension project.

The consultants’ main services were project management and supervision during construction of the runway system and related works. COWI provided the resident consulting engineer, the supervisor of civil works, the tendering expert and the contracting expert. The total scope of specialist services was 305 man-months, of which 95 man-months were provided by COWI.

The project to upgrade Sofia Airport was initiated back in 1995 - 1996 with the issuance of a master plan. The main elements of the master plan were the construction of a new parallel runway and a new passenger terminal building. Accordingly, the project was divided into two main packages:

- Lot B1 – new passenger terminal building and related infrastructure
- Lot B2 – new runway system and related works - construction of a new runway system, a bridge across the Iskar River, existing runway extension, construction of taxiways to connect the new runway with the existing one, a de-icing platform, a fire and rescue substation, additional crash roads, a new fence around the new territory for the international airport in Sofia. Other works include a new circular road, a road for inspecting the fence and related infrastructure. The construction included the provision of runway power supply, a lighting system and two navigational systems. The construction works were carried out whilst ensuring that the airport remained fully operational during the construction period.

LANDSCAPING PROJECT

In 2005-06 COWI carried out a landscaping project at Sofia Airport. The project included a review of the existing preliminary design to ascertain its suitability and applicability to the requirements for landscaping at an airport as well as schedule changes and cost estimates. COWI’s scope included the following elements:

- Review of the preliminary design
- Tender documents for Design Build Contract (FIDIC based)
- Tender documents for the contract for supervision of the design.

SERVICES
- Project management
- Design review
- Construction supervision

PROJECT PERIOD
2001 - 2009

CLIENT
Sofia Airport EAD, Bulgaria
COWI in a joint venture with NACO (Netherlands Airport Consultants) carried out the rehabilitation and upgrading of 6 regional airports in the southern part of the Philippines. The project included services from three sub-consultants: TransAsia, Basic Team and COWI Philippines.

The project included a review of the original scope of works, master plan, preliminary and detailed design, and assistance to the client during bidding and contract negotiations.

The scope of works included rehabilitation of airport facilities in order to meet ICAO safety and security standards. This included pavement rehabilitation of runways, runway widening and lengthening, grading of safety areas adjacent to the runway, improvements of taxiways and aprons, construction of proper fencing between airside and landside areas and installation of X-ray equipment.

COWI designed an upgrade to the facilities to increase the service level and to handle expected demands for year 2010. This included expansion of terminals, construction of new terminals, cargo buildings, installation of airfield lighting to secure night flights, expansion of utility facilities such as water supply and sewage treatment and improvements to landside parking facilities.
RIga International Airport Latvia

COWI has been involved in a number of projects in Riga International Airport.

REHABILITATION AND EXTENSION

Riga International Airport is changing to become a modern international airport.

The number of passengers served by the airport has grown significantly in recent years and a continued growth is expected the next 10-20 years. It was, therefore, decided to extend the existing terminal building with a new pier, to renovate the shopping areas in the existing terminal building and to renovate the existing apron areas.

In 1999, Riga International Airport tendered a design for the related building and civil works. The Latvian architectural firm Arhis in co-operation with COWI won this competition.

The airport served approximately 500,000 passengers a year in 1999 and had about 20,000 aircraft operations annually. The planned expansion enabled the airport to serve 1,300,000 passengers a year.

The building and civil works comprised:
- A new two-storey pier building (150 by 18 m) with a total floor area of 5,200 m²
- Refurbishment of shopping and waiting areas in the existing terminal building, an area of approximately 3,100 m²
- New west facade of the existing terminal building constructed as a glazed curtain walling
- New freshwater treatment system for the entire Riga Airport complex
- New apron and taxiway pavement including drainage and oil separators
- Two new de-icing platforms at each end of the runway
- New apron lighting.

The new pier was connected with five passenger boarding bridges serving various types of aircraft. The pier and the areas in the existing terminal building were equipped with modern communication systems comprising access control, fire alarm system, data installations, telephone installations, check-in facilities, etc. All mechanical and electrical installations were connected to a building management system for control of the installations.

FEASIBILITY STUDY AND COHESION FUND APPLICATION

COWI, in a joint venture with Integra carried out a feasibility study and Cohesion Fund application for improvement of Riga Airport (RIX) starting 2009 and concluding with final approval from EU in 2011.

The feasibility study comprised of an analysis of RIX position in the transportation market of the Baltic region; identification of potential infrastructure elements to include in feasibility study; technical and financial feasibility study of selected infrastructure elements; analysis of socio economic benefits of the project elements; preparation of sketch design and construction cost estimates for selected infrastructure elements. The study was concluded in a feasibility study report for Cohesion Fund application use.

The analysed infrastructure elements included in the feasibility study included:
- Strengthening of the runway strip
- Runway surface repairs
- CAT II lighting
- Additional runway entries and exits
- De-icing platforms with de-icing fluid re-collection
- Storm water system and subsurface drainage system
- Reconstruction of aprons
- Improved surface drainage including oil separators
- Fuel hydrant systems for aprons
- Dedicated solid waste handling area
- Vehicle washing facility
- Improved power supply.
NEW ATC TOWER STOCKHOLM ARLandA AIRPORT, SWEDEN

In the late 1990’s Arlanda International Airport – the main airport for Stockholm the capital of Sweden – underwent major expansion. Included in this expansion was a new third runway and a plan for a fourth runway.

In order to continue to perform air traffic control for the expanded airport a new 83 m high ATC tower was constructed, providing the ability to have a direct line of sight from the tower cab to all runway ends.

The cab included areas for approach and departure controllers as well as area for ground movement controllers.

COWI AB was responsible for the structural design of the ATC tower and the surrounding new utility and administration building. The tower was a prestressed concrete tower structure with a concrete foundation directly on bedrock. The air traffic controllers were situated in the control room (cab) at the top. The control room was built from a steel structure (space frame) at the top of the tower.

CLIENT
Luftfartsverket (Civil Aviation Authority of Sweden)

COMPLETION
2000

SERVICES BY COWI
Structural design. The scope included static and dynamic loads including comfort criteria for the personnel in the control room. Concept design, preliminary design, detailed design and construction supervision.

NEW TERMINAL AT VAGAR AIRPORT, FAROE ISLANDS

Vagar Airport is changing to become a modern international airport. The number of passengers served by the airport has grown significantly in recent years and a continued growth is expected the next many years.

COWI has supported team FAERPORT winning the design contest for the new airport passenger terminal and service buildings.

The new passenger terminal will be a modern terminal which incorporates the Faroe Islands heritage, and getting its shape and form from the buildings built by the British engineers during World War II.

The terminal will be approx 3500 m² with 4 (5) aircraft stands. The apron and access area to the airport will also be a part of the new design together with new service building for the airport.

CLIENT
Vága Flughavn

PROJECT PERIOD
2011 - 2013

SERVICES BY COWI
Project Management support, ainside design, passenger and baggage flow consulting, IT infrastructure design, PA/Acoustic, security and fire engineering concepts and quality assurance.
CHEDDI JAGAN INTERNATIONAL AIRPORT, GUYANA
Design and supervision for rehabilitation of the main runway in the only international gateway to Guyana. Comprehensive topographical surveys, FWD measurements and soils and materials investigations were carried out on the 2,300 m composite pavement runway in order to evaluate the condition and bearing capacity. To improve the present condition and to raise the PCN-value, asphaltic overlays were designed. Further design of a new lighting system including both runway edge, runway threshold/end lights, upgrading of the remote control supply system.

CLIENT
Inter-American Development Bank
COMPLETION
2004
SERVICES BY COWI
Pavement evaluations, preliminary and detailed design, tender documents and supervision of civil works and lighting installations.

MADINAH AIRPORT PPP, KINGDOM OF SAUDI ARABIA
COWI with SH&E as sub consultant was in 2009 appointed as lead technical advisor for the first full airport PPP in Saudi Arabia.
COWI and SH&E has provided technical due diligence, market analysis for passengers and cargo traffic, demand trends and associated revenue sources. The technical advisor assisted in developing a financial model for the transaction including providing a set of minimum technical requirement, CAPEX, OPEX and revenue estimates.
COWI and SH&E provided assistance in defining prequalification criteria for potential bidders and in the evaluation of interested private side consortiums.
For the bidding process the assistance included defining requirement to the content of the technical proposal and setting up a detailed bid evaluation model as well as evaluation of the technical bids.
COWI provided assistance in procurement and review of deliverables regarding land surveyor performing a LiDAR survey of the airport site.
COWI has performed an EISA screening of the airport. The ESIA program addressed all relevant environmental and social issues and proposes relevant mitigation actions.

CLIENT
International Finance Corporation (IFC)
PROJECT PERIOD
2009 - 2012
SERVICES BY COWI
Technical due diligence, preparation of minimum technical requirements, CAPEX planning, assistance in the prequalification and bidding process and assistance in the bid evaluation and implementation of the transaction.
THE ECONOMIC CONDITIONS FOR CIVIL AVIATION IN SCANDINAVIA
The analysis consisted of updating and evaluating data for the economic conditions of civil aviation on selected routes in Sweden. The project was based on an evaluation from 2000 that also covered Denmark and Norway. The analysis focused on competition between air transport, railways, cars, buses and ferries. The impact of the different modes of transport was assessed in terms of both economic and environmental effects to identify the relative performance.

CLIENT
Scandinavian Airlines (SAS)

COMPLETION
2005

SERVICES BY COWI
All services in the study.

REHABILITATION OF TAXIWAY NO. 2, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK
The airport’s main taxiway was rehabilitated using the same extensive recycling techniques as used for the main runway. All old concrete and asphalt pavement materials were reused. The new asphalt concrete base and binder course contained more than 50% of recycled old asphalt concrete, while the wearing course contained Trinidad Lake Asphalt and steelslag from electric furnaces. The rehabilitating works also included new lightings systems and all electrical works. The savings compared to traditional rehabilitation were 25-40 percent.

CLIENT
Copenhagen Airports Authority

COMPLETION
1989

SERVICES BY COWI
Programme, pavement investigations, preliminary and detailed design, tender documents and construction supervision.

EXIT TAXIWAY 2L, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK
Design of a rapid exit taxiway and 730 m taxiway, parallel to runway 04L-22R. The taxiways will mainly be used for landings on runway 22R when dependent parallel approaches occur on 22R/L. More than half of the taxiway system was constructed on a ramp, as the parallel taxiway had to cross a highway at a later development stage. The taxiways are designed for B777 and B747.

CLIENT
Copenhagen Airports A/S

COMPLETION
1991

SERVICES BY COWI
Programme, geotechnical investigations, preliminary and detailed design and tender documents.

NEW TAXIWAY NO. 7, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK
The project included a realignment of the taxiway in the very complicated northeast corner of the airport. The construction work was planned in stages lasting a very short time in order to maintain the airport in full operation.

CLIENT
Copenhagen Airports Authority

COMPLETION
1991

SERVICES BY COWI
Preliminary and detailed design and supervision of civil works.
NEW PIER A, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK
Re-arrangement of ten aircraft stands along the renovated and new pier A. The stands were equipped with apron drive air bridges and allowed for nose-in parking combinations with different aircraft types. The aircraft stand and service areas close to the pier were rehabilitated with new concrete and asphalt pavements, and one stand was strengthened with a special top layer “Densit Ferrotop 2000”.
CLIENT
Copenhagen Airports A/S
COMPLETION
1995
SERVICES BY COWI
Preliminary and detailed design including tender documents.

ENTEBBE INTERNATIONAL AIRPORT, UGANDA
Pavement strength evaluation study comprising condition surveys, bearing capacity measurements, recommendations for required strengthening to accommodate for wide-body aircraft.
CLIENT
ICAO, Montreal
COMPLETION
1992
SERVICES BY COWI
Pavement studies.

KARUP AIRPORT, DENMARK
Design for a 12,000 m² extension of the civil apron, raising the number of aircraft stands from 2 to 5. The design included survey, pavement dimensioning, surface water run-off system, power distribution for lighting, markings and application for approvals from different authorities.
CLIENT
The Danish Defence Construction Service
COMPLETION
1998
SERVICES BY COWI
Preliminary and detailed design.

NICE CÔTE D’AZUR INTERNATIONAL AIRPORT, FRANCE
Feasibility study for expansion of Nice International Airport. A number of scenarios were identified and the technical and economic consequences covering the period 1992-2010 were analysed. The services included comprehensive simulation of the aircraft movements in the manoeuvering area.
CLIENT
Chambre de Commerce et d’Industrie, Nice Côte d’Azur
COMPLETION
1994
SERVICES BY COWI
Traffic prognoses and studies, simulation of aircraft movements and proposals for airside extensions.
COMMUTER APRONS, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK

Construction of new stands for aircrafts F50, BAe-146. All 9 aircraft stands were paved by interlocking concrete blocks and have lead in/out markings, docking guidance systems, electrical power supply from boxes embedded in pavement and huts which contain power distribution facilities and printing equipment.

CLIENT
Copenhagen Airports Authority

COMPLETION
1991

SERVICES BY COWI
Preparation of programme, preliminary and detailed design and supervision of construction.

RENOVATION OF RUNWAY 22R AND TAXIWAY NO. 1, COPENHAGEN INTERNATIONAL AIRPORT, DENMARK

Pavement renovation using extensive recycling techniques which allowed the base and binder courses to contain up to 30% recycled asphalt. In addition, both the wearing and binder courses contain natural Trinidad Lake Asphalt, and antiskid surface treatment was applied to the wearing course on the runway. Renovation work also included the installation of a new drainage system, lighting system and all electrical works.

CLIENT
Copenhagen Airports Authority

COMPLETION
1992

SERVICES BY COWI
Pavement investigations, preliminary and detailed design, tender documents and construction supervision.

STOL AIRPORTS, GREENLAND

Pavement consultancy and supervision on 7 new STOL airports including development of arctic asphalt using Superpave binder investigations and Superpave mix design for extreme cold climates. Two of the airports opened for operations in 1998, one in 1999 and one in 2000.

CLIENT
Greenland Airport Authority

COMPLETION
2000

SERVICES BY COWI
Pavement consultancy and supervision.

AIRCRAFT SHELTERS, AIR BASES IN DENMARK

Planning, design and supervision of 3rd generation aircraft shelters and pool truck shelters at various military airfields. The project included the pavements adjacent to the shelters and a registration of all pipelines in the project areas.

CLIENT
The Danish Defence Construction Service

COMPLETION
1992

SERVICES BY COWI
Detailed planning, design and supervision.
The Transport Commission for Greenland was appointed by the government of Greenland in 2009 to analyze the main challenges of the transport system in Greenland, to identify development opportunities and to provide recommendations on how to arrange and organize the future air, sea and land transport system. COWI had a central role as part of the secretariat function for the commission and in addition prepared comprehensive technical background studies in air, sea and land transport planning, economics, finance, organization and regulation.

One outcome was a plan for the future transport system in the country including airports, seaports and roads.

CLIENT
Government of Greenland

COMPLETION
2011

SERVICES BY COWI
All services in the study
COWI A/S is a leading Northern European consulting group. We provide state-of-the-art services within the fields of engineering, environmental science and economics with due consideration to the environment and society. COWI is a leader within its fields because COWI’s 6,100 employees are leaders within theirs.

ADDRESS Parallelvej 2
DK-2800 Kongens Lyngby
Denmark

TEL +45 56 40 00 00
FAX +45 56 40 99 99
EMAIL cowi@cowi.com
WWW cowi.com