BASRAH INTERNATIONAL AIRPORT
INITIAL AIRPORT MANAGEMENT ASSESSMENT (CLIN 001)

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EXECUTIVE SUMMARY

OVERVIEW

The Initial Airport Management Assessment was carried out at Basra International Airport between April 24 and April 27, 2003 by a team of four experienced airport professional engineers and a liaison officer.

At the time of the assessment, the airport had already been occupied for the previous four to five weeks by elements of the British forces under the command of RAF Group Captain Lock, who had set up a Deployment Operations Base (DOB). There were more than 1,000 military personnel accommodated at the airport including the RAF, HQ I Division of the British Army, the Royal Engineers and the Joint Helicopter Force.

The airport was accommodating significant helicopter operations and occasional fixed-wing operations under VFR conditions. An Initial Operations Capability had already been achieved, and a Full Operations Capability was then being established together with an IFR capability. On May 1, 2003 the first civil aircraft landed at Basrah—a B747 operated by Virgin Atlantic.

The immediate impression gained by the assessment team was of an airport that had been well designed but poorly maintained since the commissioning in the mid-1980s. Airport buildings and airfield pavements were in remarkably good condition, and exhibited little war damage.

Airport services and utilities, however, were in a serious state of disrepair. There was no mains power to the airport and limited emergency power was provided by one of three emergency generators. There was no running water and the sewage collection system was out of service.

With no power supply to the airfield systems and equipment it was not possible to accurately assess serviceability. The visual inspections over the four-day assessment period, however, revealed that much of the mobile and fixed equipment was either obsolete, looted, vandalized or had been removed for use at other airports. A detailed survey and operational assessment of all airport components is included in the main body of the report.

Indicative capital cost estimates have been prepared to make airport improvements in two phases: an initial phase to accommodate limited civil aviation operations; and a second phase to achieve full CAT II capability. It has been assumed in the estimates that the resources used by the British forces in achieving Full Operating Capability would not be included in the budget.

The capital costs to achieve limited civil aviation operations with a precision approach capability and a basic passenger and cargo handling capability were estimated at $29 million. These improvements would take approximately 6-12 months to implement.

The additional costs to achieve full CAT II capability and to realize the full design capacity of the airport was estimated at an additional $27 million. The full program would take approximately 24 months to implement.

RECOMMENDATIONS

The initial airport management assessment report has been prepared and submitted within two weeks of commencement of the assessments on-site. In the process a large number of assumptions have been made regarding operational capability and the scope of required improvements.

The recommendations below are intended to highlight specific issues that the second assessment team will have to address under Task CLIN 002 – Planning implementation of airport improvements.

It is critical to establish the role of Basrah International Airport in both the short and long term. Certainly in the short term the airport will be operated as a joint military/civil installation, and it is important to ascertain how the future role might evolve. In the next phase of the work under CLIN 002 the following issues need to be addressed:

- The level and type of traffic anticipated in the short and medium term. Among other issues this will have a direct bearing on the scope of the required improvements, as well as the projection of aviation fuel storage requirements.
- The optimum timeframe for handover of civil aviation management functions from the DOB Command to the USAID contractor.
- Organizational structure to permit joint military and civil aviation use of the airport, likely for an extended timeframe;
- The disposition of fixed and mobile equipment installed or to be installed by the DOB command, after handover to the USAID contractor;
- The availability of trained Iraqi nationals who are expected to return to the airport once the environment is suitable

TECHNICAL REPORT

1. INTRODUCTION

1.1. Terms of Reference

The Statement of Work issued by USAID comprises three tasks to be completed for each of five airports to be selected by USAID:

- CLIN 001: Initial Airport Management Assessments
- CLIN 002: Planning Implementation of Airport Improvements
- CLIN 003: Direct Operation of Airports

This report contains the Initial Airport Management Assessment of Basrah International Airport. The material included in the report has been prepared in response to the Statement of Work issued by USAID.

1.2. The Assessment Team Deployment

The assessment team deployed by Skylink Air and Logistic Support (USA) Inc. (Skylink) consisted of four professional engineers experienced in airport planning, design, construction, management and operations, and a Project Liaison Officer.

The team received Accreditation Orders for Training, dated March 19, 2003. Under these orders the team was processed through the CONUS Replacement Centre (CRC) at Fort Benning, Georgia, during the period March 30, 2003 through April 3, 2003, where they received their equipment issue, vaccinations, briefings and training.

The assessment team was subsequently deployed to Kuwait City on April 17, 2003 and then on to Basrah, Iraq on April 24, 2003 when a permissive environment was declared by USAID. The assessment on-site at Basrah International Airport was carried out over four days, after which the team returned to Kuwait City on April 27 returning to North America on April 28, 2003.

1.3. Meetings and Interviews

On arrival at Basrah International Airport the team met Deployment Operations Base (DOB) Commander Group Captain Lock of the Royal Air Force. More than 1,000 British forces personnel from the RAF, Joint Helicopter Force, HQ 1 Division, the Royal Engineers and other elements of the British Army presently occupy the airport.

During the assessment period the team was afforded virtually unrestricted access to all areas of the airport and was in constant consultation with the DOB Commander, his technical and management staff, and with the Royal Engineers. Unclassified information such as initial assessment reports, preliminary organization charts, and a number of drawings in various formats were provided to the team. It must be stated that the assessment work could not have been carried out without the level of cooperation that was provided.

Meetings were also held with three members of a team of approximately 70 Iraqi Nationals who have been employed by the British forces, the three members having been employed at the airport before the British occupation. They included the former Senior Air Traffic Controller, an electronics engineer, and a utilities engineer.

There was no evidence of an Iraq Civil Aviation Organization presently in place at the airport, and consequently the consultations with such an authority, as required by the Statement of Work, could not be held.

It should also be stated that this report contains the findings of the assessment as of the date that it was made. Since that time, the British Forces have been continually making improvements to the airport infrastructure and enhancing its operational readiness. The first commercial aircraft movement was made by a Virgin Atlantic B747-400 aircraft on May 1, carrying 60 tons of humanitarian aid.

The Assessment Team at Basrah International Airport, April 27, 2003

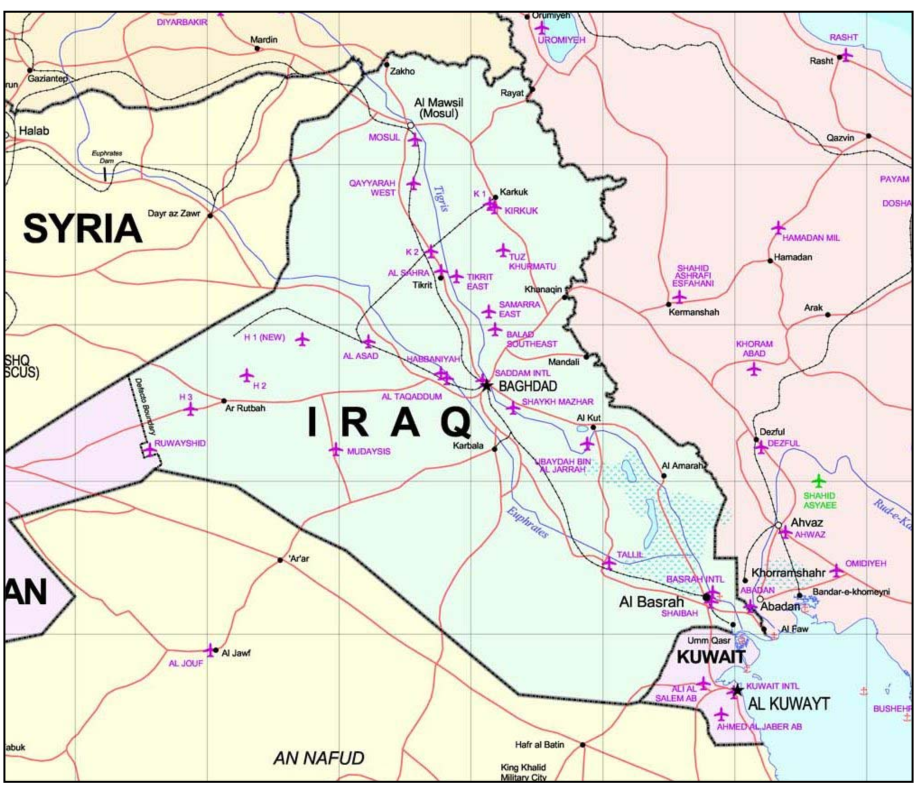
2. RECENT HISTORY OF BASRAH INTERNATIONAL AIRPORT

2.1. First Airport at Shatt al Arab

Basrah is the largest city in southern Iraq, situated on the west bank of Shatt Al-Arab, 55 km from the Arabian Gulf and 545 km from Baghdad. It is connected by rail with Baghdad and the countries of Iran and Kuwait. It is also the terminal point for oil pipelines, and petroleum refining is a major industry. Petroleum products, grains, and dates are the chief exports.

About 70 km north of Basrah is Qurna at the junction of the Tigris and Euphrates rivers, which meet in the Shatt-Al-Arab, running through Basrah and then on to the Arabian Gulf in the south. Due to the build-up of sand in the Shatt-al-Arab only vessels with shallow draft can navigate the section from Basrah to gulf. Good quality highways however link Basra with the main port of Umm Qasr in the south.

Up until the mid-1970s Basrah was an important commercial and cultural centre. It had a thriving economy and a population of around 1.5 million. Although it was not possible to visit the city because of security concerns during the Assessment, information received from Iraqi nationals indicate that the first airport, located very close to the Shatt-al-Arab, was quite busy, handling much of Kuwait's traffic and it accommodated operations by many regional and European carriers. It is likely that the level of traffic through the old airport coupled with its difficult location and short runway length, constrained between two waterways, led to the decision to build the new Basrah International Airport.



2.2. The Design and Construction of Basra International Airport

The Basrah International Airport was designed and constructed during the early 1980's by the German consortium of Straubag Bau AG, Bilfiger Berger and Universale. As will be seen in Section 3 of this report the design of the airport is sound and construction is of a high quality. It appears that no expense was spared in the design and construction program. The installed equipment was likely state-of-the-art when it was specified during the early 1980's, although none of it has been upgraded to take advantage of the newer technologies that have become available.

Although drawings, specifications and construction documents were stored in the Administration Building at the airport these were not readily available to the Assessment Team, because of damage to the building caused by the conflict and the fact that elements of the British forces were in the process of clearing the building to make it suitable for accommodation for more of the units. Many of the drawings have been salvaged however and should be available for the next phase of the work under CLIN 002. Some of the drawings are also being transferred onto CADD files by the Royal Engineers.

2.3. Effect of Wars and the Saddam Regime on the Airport

From the time that the airport was commissioned, it likely never realized the traffic levels for which it was designed. Soon after commissioning, the Iran-Iraq war commenced and the Basra area, being close to the border with Iran suffered the effects. The city's petroleum complex was damaged and the population of the city also declined greatly, as a result of the war, from more than 1.5 million in 1977 to less than 900,000 in the late 1980s.

With Operation Desert Storm in 1991 and subsequent imposition of the no-fly-zone, very few operations occurred at Basra International Airport and it is unlikely that more than two flights a day operated at the airport, those being shuttles to Baghdad.

The Basrah refinery was put out of operation in Operation Desert Fox in 1998 and as a result the airport's role declined even further in terms of its importance. Over the past years, although there has been little or no damage to the airport structurally, the equipment has suffered through neglect and attrition through the effects of the UN sanctions. Much of it has either been looted, vandalized or parts of it removed and shipped to Baghdad. An example of the latter was the VOR/DME originally installed at Basrah being removed and sent up to Baghdad, and replaced by significantly inferior equipment.

2.4. Present Situation under the British DOB Command

During Operation Iraqi Freedom, some additional damage was done to the airport. The Secondary Surveillance Radar (SSR) was destroyed, as were the transmitter and receiver stations. There is also damage to some of the support buildings, although this is mainly superficial. Many of the airfield lighting fixtures have been damaged. At the time of the assessment, the mains power supply was not operating and only one of three emergency generators was in working order. Understandably, power was being supplied only to those sections of the airport deemed essential. There was no running water and the sewage collection and treatment system was also out or order.

The airport is now occupied by elements of the coalition forces, mostly British. There are presently more than 1,000 personnel occupying the airport, and these personnel are accommodated in the northern section of the passenger terminal, the cargo building, administration building, met office, and the fire station. The southern end of the passenger terminal is the HQ 1 Division of the British Army.

At the time of the assessment there were already significant helicopter operations and limited fixed wing operations under VFR conditions.

Since occupying the airport, the immediate priorities of the DOB command have been to:

- Set up a secure airport perimeter
- Remove destroyed Iraqi military equipment from the airfield, and clear all areas of unexploded ordinance, booby traps, and land mines;
- Clear the airfield of significant amounts of FOD;
- Restore the power supply;
- Restore the water supply and sewage collection and disposal;
- Restore an IFR capability at the airport by installing communications equipment and a portable ATC facility, a TACAN facility to be located near the site of the destroyed SSR, a portable Tactical Watchman Radar system, and a portable airfield ground lighting system.

3. THE AIRPORT SITE

3.1. Location

The airport is located approximately 10.5 kilometres (6.5 miles) from the Basrah city centre at the point the main two-lane access road enters the airport property boundary.

The overall airport property encompasses approximately 2300 hectares (5687 acres) and is full enclosed by a chain link security fence topped with three strands of barbed wire. (All the concrete posts are deteriorating at the ground line due to chemical attack by the salt-laden soils.)

The aerodrome reference elevation is 3.353 m (11.0 ft) and the entire airport is situated on former marshlands. Elevations range from about 3 m to 8 m above mean sea level throughout the site and natural drainage is poor in the unpaved areas.

3.2. Ground access and service roads

The main access road is four-lane divided highway (two lanes in each direction) connecting to a major four-way highway interchange leading to Basrah and Kuwait. All site roads are asphalt-surfaced and are generally 1.5 to 2 metres above the surrounding terrain. The main access road is in excellent condition, is landscaped and has a road lighting system on its full length from the main gate to the terminal complex, and along the access from the main highway interchange. The departure/arrival roadway in front of the terminal consists of a one-way five-lane system with generous drop off curbs for the terminal.

Parking capacity directly in front of the terminal is estimate at more than 400 vehicles with remote parking adjacent to the administration building.

The internal service roads are generally two-lane asphalt surfaced pavements without shoulders laid out in a grid system that serves all the main facilities and connects to the perimeter road system on the inside of the security fence.

3.3. Airfield layout

The airfield is laid out in an orthogonal grid and in accordance with accepted international planning standards. The layout provides sufficient space for expansion of all facilities as and when required.

The airfield components consist of:

- Runway 14-32 of rigid pavement construction (PCN 80), 4,000 m in length, 45 m width with 7.5 m asphalt paved shoulders.

- Full parallel taxiway of rigid pavement construction, (PCN 80), 23 m width with 11 m asphalt paved shoulders.

- Four right angle taxiway links to the runway and two rapid exit taxiway links positioned to provide direct access to the main commercial apron

- A main commercial apron of rigid pavement construction, 800 metres long and 160 metres wide, with 11 m shoulders, accommodating 12 aircraft parking stands, 5 of which are connected to the passenger terminal building by loading bridges. The main commercial apron is connected to the parallel taxiway by three taxiway links.

- A general aviation apron, with taxiway links to the parallel taxiway and to the main commercial apron.

- An apron located on the south side of the field used for the handling of dangerous cargo.

- An apron to the south west of the main commercial apron, of undetermined use (possibly hardstand for a future aircraft maintenance hangar).

Airfield dimensional criteria as noted in the Airport Information Data Sheet conform to ICAO Aerodrome reference code 4E, capable of handling aircraft with wingspans up to 65 metres and outer gear wheel span of up to 14 metres. This category includes all commercial aircraft presently operating. Runway to taxiway, and taxiway to apron separations are sufficient to accommodate new larger size aircraft such as the A380, however runway and taxiway widths are not sufficient to permit a Code 4F airport classification.

3.4. Terminal complex

The passenger terminal is constructed on four levels and is located approximately equidistant to the runway ends. The terminal floor plan is virtually symmetrical with international passenger processing on the south side and domestic passenger processing on the north side.

Passenger processing utilizes the one-and-one-half level concept, with processing of departing and arriving passengers at ground level, served by a single level roadway and curb, and passenger waiting and hold rooms on the level above. An airside corridor contains five hold rooms accessing five contact gates. Total floor area for passenger processing is approximately 32,000 m^2.

- Level 1 contains a basement and emergency (air raid) shelter and service rooms.
- Level 2 at ground level contains passenger processing including a large double-volume public concourse, centralized check-in counter arrangement, and domestic departures and arrivals to the north and international to the south together with a well-appointed VIP lounge.
- Level 3 contains the departure lounges, restaurant facilities, and an airside corridor containing hold rooms and five contact gates.
- Level 4 contains mechanical rooms.

The structure is reinforced concrete on concrete piles driven into the former salt marsh.

Architectural features include: exposed, coloured aggregate, exterior pre-cast concrete panels; dual high efficiency gold bronze reflective glass in thermally broken aluminum framing; polished granite flooring in all main public areas, with carpet in 2nd.floor lounges; terrazzo or vinyl flooring in maintenance areas, epoxy in service and cargo areas. All control rooms have raised floors. Marble walls in all main floor public areas, Book-marked wooden paneling in all second floor lounges. Glass fabric walls in heavily traveled service corridors and stairs, and sprayed vinyl paint on remainder.

The passenger loading bridges are Thyssen Henschel telescopic bridges installed in 1982. Because there was no power to the bridges at the time of the assessment, it was not possible to make an assessment of their serviceability. A visual inspection indicated that they were in good condition. Apron markings indicate that the bridges were to accommodate aircraft ranging in size from DC9 to B747.

Security equipment includes X-ray machines for both checked baggage located at the entrance to the public concourse, and X-ray machines for hand baggage. Serviceability could not be checked because they were not energized. This equipment does not meet current security standards for explosives detection.

Because of the unavailability of power it was not possible to make an assessment of building mechanical equipment such as escalators and elevators, although all are expected to be serviceable after routine maintenance and certification.

Baggage handling devices and conveyors for both inbound and outbound baggage were assessed by the British forces to be in working order. Outbound baggage is manually sorted, and installation of a bar-code sortation system may be required when traffic levels increase.

Air cargo and the passenger terminal viewed from the control tower

3.5. Air cargo

The air cargo building is structural steel framed with a ground floor area of approximately 2,300 m^2. The high-bay cargo handling areas are air conditioned and located at either side of a two-level central core. The central core contains bonded storage, refrigerated storage and electrical and mechanical rooms on the ground floor and administration offices on the second floor. Each of the two bays has only one landside and two airside doors. Cargo handling equipment is very limited and appears to be unserviceable.

With minimal mechanization the annual capacity of the cargo terminal would not be expected to exceed 10,000 metric tonnes.

3.6. Control tower

The control tower facility consists of a circular structure approximately 45 m high, with a 16-sided visual control cab at the top and an approach control room immediately below together with staff facilities. The visual control room has consoles for three positions and offers a view of all aircraft manoeuvring surfaces. One of the few design faults is the size and location of structural steel mullions supporting the roof structure, which interferes with line-of-site between the console positions and the runway thresholds. Repositioning the new consoles may rectify this deficiency.

At the base of the tower is an integrated 2 level administration building containing offices and equipment rooms.

The elevator from the base of the tower to the approach control room is unserviceable and at the moment access to the cab is via a staircase of 220 steps.

Although the structure and the accommodation is in good condition, virtually all equipment is either missing, unserviceable, or obsolete.

Control tower

3.7. Fire station

The Crash, Fire and Rescue Station is centrally located and is served by access roads to all manoeuvring surfaces of the airport. Minimum response time is less than the 3 minutes minimum specified by ICAO.

The station has 5 vehicle bays and a two level facility containing equipment rooms, staff facilities, and an observation cab above. Although the fire station is in good physical condition, much of the equipment and communications facilities are unserviceable. Some of the equipment also appears to have been vandalized e.g. fire hoses with the nozzles cut off. There appeared to be no foam or chemical-extinguishing agents at the site, although there are supplies stored at the aviation fuel compound.

Three fire fighting and rescue vehicles were located on site and a fourth vehicle was believed to have been removed from the site. The vehicles were manufactured by the Austrian company Rosenbauer in 1983 and each has a payload capacity of 10,500 litres. All vehicles are presently unserviceable.

3.8. Meteorological station

The airport had a complete meteorological station located near the SSR including an upper air facility within its own radar system and balloon launching building.

Anemometers, rain gauges, barometer and full flight planning and weather monitoring/recording facilities were available at the MET station. The MET facility includes a single storey building with eight rooms, observation tower and outdoor fenced equipment area.

3.9. Visual aids

The airfield ground lighting (AGL) system consists of the following components:

- ICAO CAT II approach lighting system for Runways 14 and 32 with inter-leaved circuits.
- High –intensity elevated edge lighting system for Runway 14-32 with interleaved circuits.
- ICAO CAT II runway centreline and touchdown zone inset lighting system for Runways 14 and 32.
- ICAO CAT II centreline inset lighting system for all taxiways.
- Medium-intensity edge lighting system on all taxiway curves and fillets.
- ICAO CAT II inset lighting for taxiway hold bars at all runway/taxiway intersections.
- PAPI units for Runways 14 and 32.

- Two AGL field substations at each end of the runway housing the constant current regulators (CCRs), control panels and 500 kW standby generators for the airfield lighting system at the electronic navigation at 14 and 32 ends of the runway.

- Aerodrome beacon on top of the control tower.

- Apron-floodlighting system and obstruction lights on the main terminal parking apron, the general aviation parking apron and the isolated aircraft parking apron.

- Obstruction lighting on the control tower, apron floodlighting masts and various buildings.

All AGL fixtures were originally sourced from AEG (Germany) during the construction of the airport.

There is an extensive underground electrical and communications duct bank system throughout the airside and apron areas that carries the primary (5 kV) and secondary wiring to the AGL and associated systems.

3.10. Radio navigational aids and communications facilities

The principal electronic aids to air navigation that complement the CAT II visual aids include the following:

- ICAO CAT II ILS system for Runways 14 and 32 consisting of a localizer, Glidepath co-located with DME, transmissometer, middle marker (NDB) and ceilometer.

- VOR/DME located on the extended centreline for the Runway 32 approach and provides both enroute and direct precision approaches to Runway 32 (and 14 on backcourse).

- Remote transmitter and receiver sites for VHF and UHF tower frequencies.

- VHF and UHF radio transmitter/receivers located in tower and equipment roof. (The Iraqi Senior Air Traffic Controller (SATCO) advised that there were 5 VHF and 4 UHF frequencies used at one point.)

- Tape machines for ATC tower radio recordings.

All facilities electronic radio aids and associated equipment have direct paved road access to the sites and paved walkways to individual antenna elements. The cabling is all housed in duct banks to the building sites.

All ILS equipment including transmitters and receivers are sourced from SEL (Standard Electrik Lorenz), which is no longer an independent manufacturer.

The Secondary Surveillance Radar (SSR) was originally destroyed in 1998 as part of the air strikes associated with the no fly zone. It was rebuilt and was again destroyed as part of Operation Iraqi Freedom. No information on the radar site was available as part of the visit. The site also included a separate standby generator, which was also destroyed, and control building.

3.11. Aviation fuelling facilities

The aviation fuel dispensing and storage system comprises three-600 cubic metre tanks with crossovers feeding twelve hydrants located on the main parking apron. The tanks are located within a high berm storage enclosure and localized delivery is provided through tankers. A pipeline to the site from the Basrah refinery was not completed.

The hydrant system was last used in 1991 and the fuel has not been removed from the system since that time. The hydrant system is cathodically protected although it is not known whether the system has been checked or anodes replaced since that time.

Fuelling is presently carried out by tanker truck (bowsers) and the two hydrant carts, which are located on site, are visually unserviceable.

3.12. Power supply and distribution

Main electrical power supply to the site is from two independent 33 KV feeders from separate substations. There is a complete 9 MVA standby generating plant with three B&W generators. Three 11KV ring mains connect to three Field Electrical Centres two of which have 500 KW SAB generators and one has 1000 KW SAB generators all with MTU diesels.

3.13. Water supply, treatment and distribution

All supply water is pumped from the canal to an above-ground storage tank, then treated in a flocculation-settlement-sand filter-settlement plant then polished through an reverse osmosis system to a storage tank connected to the fire main.

Water for fire protection is provided by dual electric pump pressurized ring main with dual electric jockey pumps and standby diesel fire pump supplying treated water to hydrants and standpipes. Sprinklers are provided in high hazard areas. Halon or CO^2 systems used on all communications and electric areas.

3.14. Sewage collection and treatment

There are 5 sewage lift stations that pump all sewage to a central sewage treatment plant. Sewage treatment plant uses aeration of primary influent with an aerated sludge digester. Treated effluent is used for irrigation.

4. CONDITION SURVEY AND OPERATIONAL ASSESSMENT

4.1. Theoretical airport design capacity

There were no master plan documents available to the assessment team. The assessment of the design capacity of the airport as indicated below is imputed from the information available to the assessment team.

- Calculation of runway length requirements for the B747-400 aircraft indicate that at 40^0 Celsius reference temperature and at Basrah elevation at 3.4 m, zero wind, zero runway gradient at maximum takeoff weight of 877,000 lbs (maximum) the runway length required is 4,062 metres. This indicates that the existing runway length is sufficient to permit non-stop service to destinations as far away as London, UK with only very minor load restrictions. At higher reference temperatures, payload restrictions may apply.

- IFR capacity of the existing airfield configuration could be conservatively estimated at 40 aircraft movements per hour, and depending on the mix of aircraft, an annual capacity of up to 60,000 aircraft movements.

- The passenger terminal complex appears to be designed to have a balanced capacity to handle upwards of 3 million annual passengers through 10 active aircraft parking stands.

- The airport category for rescue and fire fighting, assuming that the design level of services and equipment was provided is estimated at ICAO Aerodrome Category 9, indicating that the airport has sufficient rescue and fire-fighting capability to handle up to 700 movements of B747 aircraft in the three busiest months.

- Air cargo design capacity is estimated at 10,000 annual metric tonnes, although this throughput could be increased with future introduction of mechanized handling systems.

4.2. Present operational capability

The ability of the airport to handle its design capacity is presently severely limited principally because of airside constraints. In particular, the airport at the time of the assessment had no IFR capability, and the rescue and fire fighting services were not up to ICAO standards.

In this section of the report, the shortfall is expressed in terms of the physical condition of the airport. An equally serious concern arises in terms of a shortfall in management and operations aspects including the availability of trained personnel, management capability and mobile equipment. These issues are addressed in Section 7.

A survey of some of the critical physical components of the airport as they existed during the assessment is described in the following sections.

4.3. Pavements

Runway 14-32

The runway is in excellent condition. There is no evidence of war damage and the rigid pavement does not exhibit distress due to traffic. The surface condition is virtually “as new” with little or no rubber deposits on the Runway 14 and 32 touchdown zones.

There is no cracking of the slabs and the joint sealant is in excellent condition. The British forces identified the Pavement Classification Number (PCN) as 80/R/C/W/T based on the civil engineering records in their possession and this would allow unrestricted use by B747 types, A340-200, AN 124 and other large civilian and military transports such as the C-17. (Some ACNs for aircraft such as the B777-300 and other new generation aircraft exceed the PCN value noted above, but intermittent use could still be allowed and the pavement monitored for any distress). In any case there is no existing pavement distress, and no upgrades or repairs are required for commercial or military airport operations.

The 7.5 metre wide asphalt shoulders are in excellent condition with no evidence of cracking or stripping.

All paint markings have deteriorated (washed out) and need to be repainted. It is recommended that the white markings be outlined in black for better visibility.

Taxiways and Aprons

All taxiways and aprons are also in excellent condition based the visual condition survey undertaken at the airport. The pavement structures also appear to be the same and there is no evidence of any distress or settlement on the soft subgrade. The condition of the taxiways and aprons is the same as the runway.

The 11.5 metre wide asphalt shoulders are in excellent condition with no evidence of cracking or stripping.

All paint markings have deteriorated (washed out) and need to be repainted. It is recommended that the white markings be outlined in black for better visibility.

Main Access Roads

The main airport access roads are in excellent condition and no cracking or other distress was visible on the pavement surfaces. There was no differential settlement or pavement undulations noticed in the surface rideability of the pavement.

The terminal approach roads, apron head-of-stand road and other roads, which were or will be heavily trafficked are in excellent condition as well. No maintenance or repairs are required in the short term.

The damage that was noticed in many isolated locations was broken precast curbs, which had been overridden by tanks, or other tracked vehicles and has been broken. These can be removed and replaced in sections in order to maintain the proper drainage flows.

Service Roads and Parking

Virtually all the secondary and service roads are in good condition with no war damage or any significant wear and tear. The two exceptions are:

- Sections of two-lane service road around the existing radar site that was destroyed during the war. There are short sections of the road that has to be rebuilt because of bombing damage.

- Sections of perimeter security road inside the fence line and a section of the service road north of the parking apron near the fuel storage facility. Both these roads exhibit longitudinal cracking near centreline and along the edge, and have been previously sealed. It appears that the embankment structure is weak or the subsurface fills have shrunk. These roads are low traffic routes and will just require regular maintenance.

Other Operations and Maintenance Issues

The lack of adequate vegetation cover and windy conditions creates problems with sand accumulation on the runways and taxiway system. The airport requires a vacuum sweeper truck and standby unit to keep the pavement surfaces clean for aircraft operations. A simple sweeper truck only tends to move the fine-grained sands and silts from place to place rather than removing them. The vacuum-sweeper previously used at the airport is unserviceable.

4.4. Drainage and erosion control

The airport property is generally flat with no effective gradient for storm water discharge by gravity to areas outside the airport property. Once all stormwater is collected from this reclaimed salt marsh it is pumped to the Qanat Shall Al Basrah canal from a large storm water lift station through a 42" diameter piping power by four – 150HP pumps. All the equipment appears in excellent condition and needs only minor maintenance and cleanup. The lift station sump, screens and trash racks require removal of accumulated sediment and debris.

The stormwater collection system is in good working order, although it is likely that that all sumps and piping will need to be flushed since there has been significant sediment accumulated in the catch basins and other inlets.

The main slotted drain in the main apron collects surface drainage and is in excellent condition. The outfall from the lead to infield "ponds" situated between the apron and parallel taxiway. The outfalls to the ponds go through oil-water separators (OWSs) before being discharged into these areas where the stormwater both infiltrates and evaporates. The OWSs required thorough cleaning of all the plate/filter media since this has not likely been carried out for some time.

There is little or no grass or vegetation cover on the airport, runway strip or any other area. Erosion of the compacted silty clays and clayey sands is evident on all sloped surfaces with some eroded channels more than 0.5 m deep. These areas, especially adjacent to aircraft manoeuvring surfaces need to be levelled and compacted to ensure that there are no hazards to aircraft leaving the paved surfaces. One important measure to develop a vegetation cover on many parts of the airport is to rapidly reinstate the function of the sewage treatment plant in order that the clarified effluent can be sprayed in various graded areas to promote vegetation growth. This was the original design intent in 1986 and the various reinstated Iraqi maintenance staff have pictures of vegetation cover, flowers etc. when the sewage treatment plant was functioning.

4.5. Visual aids

The main deficiencies in the condition of the airfield ground lighting system were as follows:

Damaged approach light fixtures

- The CAT II approach lighting fixtures and short elevated masts were damaged as a result of tanks and other tracked vehicles running over the fixtures when the Coalition forces entered Basrah International Airport. There are not enough AEG spares in the stores to restore the system and AEG (original manufacturer) no longer exists. The CAT II approach should be replaced at both the 14 and 32 ends.

- The runway edge lights appear in fair condition with some sand scouring on the lenses. The units may be functional but without an energized system, this could not be confirmed. It sis recommended that the fixtures be replaced within the existing cans with new units from a supplier that is currently in the business.

- The existing mandatory information signage on the runways and taxiways does not meet current standards and have been sand-scoured to the point that many signs are unreadable. It is recommended that all mandatory signage on the airside system be replaced.

- The Precision Approach Path Indicators (PAPI) should be replaced for both runway approaches. The four PAPI units for Runway 14 are missing.

- Approximately 70% of the elevated blue edge lights delineating the curve and fillets on the taxiway system have been damaged or removed. All the edge light units should be replaced with new units from a proven manufacturer.

- New lighted windsocks are require at both the 14 and 32 ends of the near the holding bays.

Damaged generator set at Field Electrical Centre

- The Field Electrical Centres (FECs) at end runway end have been damaged with the lighting control cabinets, switchgear, standby generators and regulators (CCRs) all vandalized. We understand that the CCRs that originally were supplied for the AEG lighting system were removed and sent to Baghdad a few years ago. The existing units are over 30 years old and their coils have been removed for copper content. The FEC buildings are in good condition with only minor door and air-conditioning units requiring replacement. However all other internal electrical components will require replacement.

- A new touch screen airfield lighting control panel must be installed in the control tower visual control room to replace the existing system. This will be installed in the new ATC consoles which are required as part of the tower refurbishment (see Section 4.7).

- The above recommendations assume that the duct bank system is undamaged and there is no indication to assume otherwise based on the surface condition of duct manhole covers and duct runs. At the time of the inspection the airfield lighting system could not be energized because of the FEC damage noted above. Thus some additional repairs and replacement of bulbs and fixture may be required. The maintenance garage stores contain some spares for the AEG system including bulbs, inset lights and over 100 encapsulated transformers. However, there are not enough spares to restore the system and the parts are no longer manufactured, so a replacement is recommended for safe international operations.

4.6. Airfield equipment and navigational aids

Damaged transmitter building

The transmitter and receiver buildings have been completely stripped of equipment, and in the case of the transmitter building the antennae have been destroyed. The transmitters and receivers need to be replaced, although the buildings themselves appear to be reusable.

The Secondary Surveillance Radar (SSR) has been completely destroyed, along with its associated building infrastructure.

Destroyed SSR facility

The ILS equipment was supplied by SEL, a German supplier, which is no longer an independent manufacturer. There was no power to these installations and it was not possible to check their serviceability. A visible check of the equipment showed that parts of it have been damaged and parts of the cabling and panels have been removed. The Senior Air Traffic Controller could not indicate when the equipment was last serviceable, although he did indicate that even when it was last energized, the equipment was not properly calibrated because of the unavailability of flight checks. Localizer and glidepath buildings and their surrounding infrastructure however are in good shape. Given the age of the equipment and the potential lack of spares, it is recommended that the equipment be replaced. Without any records of the incidence of CAT II IFR weather conditions, it is not possible to accurately determine whether ILS is required on both Runway 14 and Runway 32.

The VOR/DME installed as part of the original construction program was removed some years ago and replaced by inferior equipment. No information is available on the replacement equipment, and it is assumed to be unserviceable.

4.7. Air traffic services

The air traffic control tower remains relatively undamaged by the conflict and there is only superficial damage to the building and facilities, such as damage to doors and locks caused during the initial occupation by the British forces. Many of the administration and equipment rooms are yet to be cleaned of human waste and garbage. The approach room in particular was in a state of considerable disrepair.

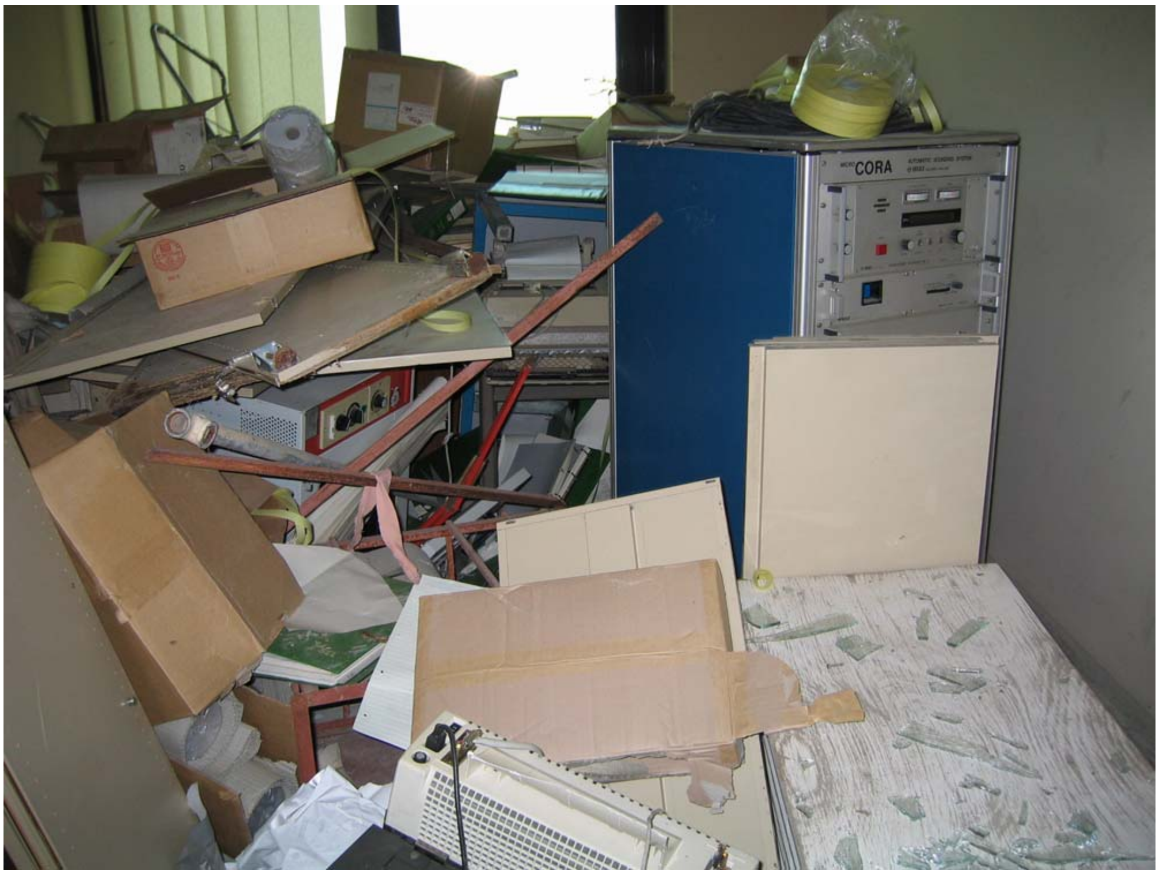
Building systems such as air conditioning, fire protection and the main elevator could not be tested because of the unavailability of power, although it could be reasonably expected that these could be commissioned after routine maintenance.

The equipment, including consoles, switches and recorders was assessed as extremely antiquated and all was unserviceable. The Iraqi SATCO who was interviewed during the assessment explained that due to the imposition of sanctions, the majority of the equipment had not been maintained due to an inability to obtain spares.

Control tower - consoles

4.8. Meteorological station

The meteorological building complex located west of the radar site is in relatively good structural condition. The rooms have been looted and equipment has been damaged or removed, but there is no major damage to the MET building envelope, observation room or the upper level balloon launching building.



Evidence of looting at the Met Office

The MET equipment enclosure with the Stevenson screens, temperature gauges, rain gauges, anemometers, barometers etc. have been poorly maintained and the equipment must be replaced. There were no local readouts of the instruments in the MET building and it was assumed that the processors and recording data was looted. In general all the electronic MET equipment was removed and must be replaced, including the remote feeds to the ATC control tower and other charts etc. for flight planning and terminal area weather forecasting.

The radar, which tracks upper level wind balloons, is not serviceable, although the small antenna on top of the observation room is intact. The radar electronic equipment in the MET building has been removed or damaged and must be replaced.

4.9. Rescue and fire fighting

The 5-bay airside firehall located central to all aircraft manoeuvring areas is in excellent structural condition, and all major electrical and mechanical components can be restored to service fairly quickly in terms of the building envelope. The current facilities are being used as dormitories for the British forces, but there is still a significant amount of firefighting apparel located within the building including masks, high-temperature suits, hydrant connections etc. The equipment was scattered in the building and requires a detailed assessment of individual sizes and serviceability. There was no aqueous foam located within the building and this will need to be restocked.

Unserviceable fire trucks and ground handling equipment

Fire hoses were also located within the building but looters cut off all the brass connections, so they must all be replaced. The main observation "watch tower" is in good condition with no broken windows. The condition of the main annunciation alarm panel appears to be good, but as in all other locations was currently unserviceable. All control cabling requires a detailed continuity check since the vandals and looters were invariably removed wiring for its salvage value.

The main doors bays for the building are intact and all but one appears to be serviceable, however, the fire fighting vehicles need a major overhaul. Three of Rosenbauer (Austrian) foam units (each with a payload of 10,500 kg water/foam) were originally manufactured in 1983. The units have been vandalized and require a complete overhaul. The assessment team understands that there was a fourth unit but it was removed from the airport, and may be located within the town of Basrah. There was no sign of the Rapid Intervention Vehicle (RIV) on the airport, and looters also could have removed it from the airport. In general, a restoration of firefighting vehicles to full operational condition, a new RIV and a trained firefighting force are required for full compliance with ICAO standards for commercial aircraft operations.

To repair the three Rosenbauer foam units to a reliable condition, we suggested to the British that they return them on a empty return AN 124, C 17, etc. flight to the manufacturer and after repair, upgrading and certification, ship the units back by any economical means for return to service. The two British units could then be moved to another facility.

4.10. Passenger terminal complex

The airport buildings have been constructed on pile foundations and there are settlements in excess of 4 inches in the adjacent unsupported pavements. While it is expected this settlement has passed the 90% point on the exponential curve, it should be monitored to confirm future settlement projections. The pavements have hung up on the piled foundation caps and the differential settlements have resulted in cracking or steps in adjacent pavement slabs. These steps should be sloped at a maximum of 1 to 10 by concrete grinding and future settlements monitored.

Inside the building on the international arrivals level slab on grade, the settlements have resulted in the break-up and the removal of the granite flooring from the international baggage hall. This repair work was commenced by the previous administration and should now be completed with a pea gravel concrete overlay with a steel towelled smooth concrete stained and waxed finish to cheaply imitate marble, for immediate use. The cost of reinstating the granite slabs cannot be justified by the expected traffic, and possible future settlements can easily be repaired by local feathering prior to the placement of a rubber of vinyl surface.

The locks or drywall walls beside the locks should be repaired and made serviceable to secure the building.

The rest of the building is in surprisingly good shape, but the wear and tear resulting from the accommodation of the British forces will have to be assessed and acted upon.

4.11. Security fencing

A chain link fence with 3-barbed wire top strands, all supported by reinforced concrete posts provided the airport security. The concrete post reinforcing steel, where buried, has deteriorated from the salts of the original salt marsh to the extent that whole fence runs have collapsed or are in danger of collapsing. To maintain security, the concrete posts will have to be replaced by new posts reinforced by epoxy coated or galvanized reinforcing steel or just galvanized steel pipe posts. The later would be preferable from timing prospective. The top barbed strands could also be supplemented with coiled razor wire to provide better security protection.

Security fence posts damaged by salt attack

4.12. Utilities corridor

Utilities including fire and water mains, chilled water loop, power, communications, control cables, etc. delivered from central power and chiller plant via a reinforced concrete tunnel to all major buildings. Main terminal has a large basement with the utilities on an airside corridor that has severe salty water intrusion that is causing corrosion of cable tray and pipe supports and steel doors. This corrosion must be dealt with as soon as possible.

4.13. Power supply

Two independent 33 KV feeders from separate substations supply the airport with a complete 9 MVA standby generating plant with three B&W generators. This is split into three 11KV ring mains around the runway providing a very secure airfield supply that also has two-500Kw and one-1000Kw SAB generators with MTU diesels as backup. The main power supply was in the process of being reconnected and a proper assessment of the supply was not possible. However it would appear that with the replacement or repair of the diesel generators and associated transfer switches, a very secure power supply can be restored.

4.14. Sewage system

Five sewage lift stations pump all sewage to a central sewage treatment plant that consisted of aeration of the primary influent with an aerated sludge digester. These facilities have been non-operative for a considerable period with untreated sewage pumped directly into the waterways. A concerted effort to reinstate the system must be commenced immediately to accommodate the expanding military population. The treated effluent was used for irrigation and this also must be reinstated to maintain the landscape of irrigated flowering trees or palm trees and ground cover to all airside access roads.

The incinerator building housing a diesel fired incinerator for sludge and waste appeared in working order, but it is not required as a priority.

4.15. Storm water system

A slotted central drain across the whole 800-meter apron drained via concrete pipes to infield storm water ponds. Oily water separators are used on all outfalls from fuelling surfaces, and a large central electric storm water lift station pumps all runoff from the former reclaimed salt marsh areas to the canal via 42 inch main. The whole system appears in good order apart from accumulated silts, which must be cleaned and flushed out.

4.16. Fire protection system

This system is in need of repair, testing and certification. The leaks waste expensively produced water and compromise safety. Some hydrants have been plugged as an interim measure, and it is imperative that the cathodic protection be checked and certified as soon as possible in these corrosive soils.

4.17. Water supply

All supply water is pumped from the canal to an above-ground storage tank, then treated in a flocculation-settlement-sand filter- settlement water treatment plant with a polishing reverse osmosis (RO) system to a storage tank connected to the fire main. The domestic supply is taped off the fireman with dual electric pressure pumps. The plant was operational except for the RO that requires replacement membranes, which have been ordered from the German supplier. Bottled water only is being used for human consumption, and once the RO is operational the whole system should be swabbed, flushed, disinfected and certified for human consumption and put back into service.

4.18. Aviation fuel system

Three large aboveground jet fuel tanks, avgas storage, diesel and petrol storage tanks are available for supply by tanker truck or dispensed at pump bowsers. This system has been made serviceable and is being used by the British. However the complete pressurized under wing apron hydrant pipeline system from the fuel farm will not be repaired. This system should be cleaned, the cathodic protection certified, and the two unserviceable pumper trucks repaired or replaced, to ensure no further deterioration of a very expensive asset. For safety the complete fire fighting foam storage and dispensing system with above ground water storage tanks to a pumped system must also be made serviceable. When traffic warrants, connection of the jet fuel pipeline to the Basrah refinery can be made.

4.19. Airport maintenance facilities and equipment

The 5 building airport maintenance facility is in good condition. The facilities are currently being utilized as a maintenance yard for the British forces. All buildings appear to be in excellent structural condition with no signs of damage to the mechanical and electrical services. All overhead doors appear to be operational and the internal stores racks all appear to be sound structurally. The maintenance facility access road and parking pavement system is in good condition with little sign of damage.

The airport maintenance equipment, however, is in very poor condition. The equipment that remains is non operational and likely non repairable. It is probable that the remaining equipment was stripped to keep other equipment operational as the post Gulf War trade embargo limited access to parts. The airport maintenance equipment that was still operational had been looted during Operation Iraqi Freedom. Some of this equipment may still be recoverable as previous airport maintenance staff is hired back on who will likely know the whereabouts of the various equipment.

Our ability to completely examine the airport spares was limited due to the British forces utilizing the maintenance facility. It is likely that spares are limited due to the post Gulf War trade embargo and thus the spares will likely need to be replenished. We were able to look at the spares for the airside electrical works, which had an extensive inventory in tack and likely in working condition. The spares include items such as approach light fixtures, taxiway inset light fixtures, isolating transformers, miscellaneous electrical works, etc. Many of the spares will be obsolete if the existing fixtures have to be completely replaced, such as the approach light fixtures and elevated edge light fixtures. However, fixtures such as taxiway inset lights likely will not require replacement and possibly enough spare fixtures remain to replace the few damaged installed fixtures.

5. AIRPORT MANAGEMENT AND OPERATIONS

5.1. Occupation of airport facilities

Basrah International Airport is presently occupied by various elements of the British forces including the RAF, HQ 1 Division, the Joint Helicopter Force and the Royal Engineers comprising more than 1,000 personnel in total.

At the time of the assessment the facilities occupied included the passenger terminal building, the administration building, fire station, met office, airport maintenance compound, and aviation fuel compound.

The Deployment Operations Base (DOB) command is presently occupying the northern part of the passenger terminal building and provision is now being made to relocate to the Air cargo building as soon as suitable power, communications and office facilities can be installed. The southern part of the terminal would then be used to process passengers.

It was not clear during the assessment as to how long the British forces would remain at the airport and in what numbers. Indications are that the DOB Command will endeavour to vacate critical facilities and to restore the airport to accommodate civil aviation operations in the northern or international section of the terminal building within the shortest possible time frame.

5.2. Initial Management and Operations Structure (DOB Command)

DOB command has proposed organizational structures for a sequenced transition to operational capability of the airport.

- Initial Operations Capability (IOC), which entails operations of the helicopter and limited fixed wing military aircraft under VFR conditions; and,

- Full Operational Capability (FOC), which will entail joint military and civil aviation air traffic capability under limited IFR conditions.

The IOC phase is expected to transition to FOC within a period of 30 to 60 days, a condition that may have already been achieved at the time of writing this assessment report with the news that on May 1, 2003 a Virgin Atlantic B747 aircraft had landed at Basrah.

Organization structures for both IOC and FOC utilize military personnel, principally RAF officers supported by the Royal Engineers. The structures for both phases are similar in that each is headed by the DOB Commander. Two broad functions report to the DOB Commander:

- Flight Operations including air traffic services, crash fire and rescue, and airport security; and,

- Logistics and administration functions including ground handling, cargo, fuelling and crash/medical emergency.

In the transition from IOC to FOC there is an anticipated change in the DOB Commander from Group Captain Lock who would hand over to Wing Commander Bessell once FOC has been achieved.

5.3. Immediate improvements to achieve FOC

The DOB Command has developed an accelerated program to achieve full operational capability at Basrah. Many of the measures have already been implemented while the remaining items are in process. These include the following:

- Securing the airport perimeter and critical strategic facilities;
- Clearing all areas of the site of damaged equipment, unexploded ordinance, and FOD
- Cleaning and preparing many of the buildings for either accommodation or temporary/permanent operational use
- Preparing the northern end of the passenger terminal for the processing of civilian passengers.
- Restoring the mains power supply and repairing the emergency generators. At the time of the assessment, the Royal Engineers were in the process of connecting the mains power supply.
- Restoring power to critical facilities such as the control tower, fire station, cargo building and the passenger terminal
- Restoring the water supply and distribution system. The water supply system was to be connected as soon as a satisfactory method of handling wastewater could be achieved.
- Providing a crash fire and rescue capability. During the assessment period, fire fighting military personnel had arrived on site, along with two fire fighting vehicles.
- Providing an IFR capability for flight operations.

In terms of providing an IFR capability, the following facilities and equipment were in the process of being installed.

- Initial installation of communications capability in the visual control room of the tower using desktop Drake and Parkair transceiver equipment. Investigations were also being undertaken to provide a site for a portable control cab (PAVCR) as an intermediate measure, to permit the refurbishment of the permanent visual control room in the control tower cab.
- Installation of a second communications package in the existing transmitter building, and will be available for the use of the Approach Controllers.

- Installation of an initial Tactical Watchman Radar (TWR) facility at a site located between the existing transmitter building and the glideslope building at the 14 end of the runway. There are also plans to site a second TWR with enhanced capability, likely adjacent to the site of the destroyed SSR. A new display cabin containing the Drake switch and Raster displays will be sited at the foot of the control tower.

- Installation of a TACAN facility to replace the existing VOR/DME.

- Supply and installation of portable airfield ground lighting system.

5.4. Transition to an eventual Iraqi civil aviation administration

The organization required to effect the transition to an Iraqi civil aviation administration is one of the essential tasks of CLIN 002. Some of the more important issues to be addressed in the phase will be:

- The level of traffic anticipated in the short and medium term

- The optimum timeframe for handover of civil aviation management functions from the DOB Command to the USAID contractor.

- Organizational structure to permit joint military and civil aviation use of the airport, likely for an extended timeframe;

- The disposition of fixed and mobile equipment installed or to be installed by the DOB command;

- The availability of trained Iraqi nationals who are expected to return to the airport once the environment is suitable

6. IMMEDIATE ENVIRONMENTAL CONCERNS

The most immediate concern is the lack of sewage treatment and to a lesser extent the need to repair the water treatment plant. The sewage treatment plant needs to be reinstated as designed or as recommended for improvement by the original supplier to prevent discharge of untreated sewage into the waterways. The irrigation water by-product from the sewage plant will also help control the dust, reduce runoff erosion and enhance the airport landscaping.

The repair of the reverse osmosis water treatment plant will eliminate or substantially reduce the use of bottled water, which is contributing substantially to the FOD problem on the airfield from discarded plastic bottles. The clean water is a necessity for the health and well being of the local workforce and future traveling public, as well as for slowing the deterioration of the fire protection water, domestic water and process pipe work.

The oily water separators should be cleaned, made operational and scrupulously maintained to minimize the discharge of oily water to the local waterways. The storm water discharge pumping station should be cleaned and an oil boom used to soak up the existing oils floating on the surface and present in the pipe work.

All of the Carrier chillers have Refrigerant 11 as their operating gas. This should be purged and saved, and replaced by Refrigerant 123 gas, or other gas, as recommended by the manufacturer. The manufacturer's representative should service all chillers to ensure maximum efficiency and to set up a maintenance program for long term economy, life and efficiency.

In fact, all equipment in the airport should be serviced by each of the manufacturers representatives to bring them up to specification, ensure safe and efficient operation and to establish a baseline for performance and maintenance.

There is a concern that the anode protection of the underground pipe work has not been maintained. In addition there has not been chemical treatment of the water for various cooling, fire and water mains and process loops and some local leakages have occurred. These should be corrected as soon as possible and the anode protection and chemical treatment also scrupulously maintained to avoid a simple pipe break with resulting fuel spill, which would introduce substantial pollution into the environment.

There was no evidence of asbestos, lead paint or moulds on the first assessment. A closer examination is required together with possible communication with the original design and construction companies. There was also no evidence of PCBs leaking from damaged transformers, but again this should be more closely checked.

The incinerator plant should be examined by the manufacturers representative to ascertain the costs that would be incurred to reduce the quantity of emitted pollutants. It may be more beneficial to construct a dual-lined waste landfill that is correctly constructed and could be monitored and expanded as required to accommodate the actual waste inflows. The sewage sludge could be tested and dried for reuse as compost.

7. INDICATIVE CAPITAL COST ESTIMATES FOR MEDIUM TERM IMPROVEMENTS

7.1. Accuracy of the estimates

The estimating technique used to derive the cost estimates, also known as parametric estimating, is generally used for the purposes of pre-feasibility studies. Its purpose is to determine the value of proceeding to the preproject stage of preparatory studies and basic plans and specifications for the project under consideration. The estimate is based on assumptions regarding scope of work, together with historical data obtained from comparable projects already completed, with costs adjusted to take into account factors such as construction date, production capacity in the case of plant, dimensions and other similar general information. It is very brief and based on a minimum of information, and as a result, it has a large margin of error in the range of +/- 20% to 30%.

The costs are exclusive of taxes and duties, and are based on year 2003 dollars.

7.2. Improvements required for limited civil aviation capability

From the forgoing description it is assumed that once the British forces attain Full Operational Capability the airport will be capable of handling humanitarian flights with an IFR capability. It is expected that this condition will be attained within the next 30 to 60 days. For the purpose of budget estimates it is also assumed that the resources utilized in achieving this goal will be to the account of the British forces.

The cost estimate contained in Figure 7.1 for a limited civil aviation capability includes those improvements suggested in Section 4 of this report, that could be made within a timeframe of 6-12 months, in order for the airport to achieve a Precision Approach capability using new VOR/DME and SSR equipment. The airport improvement program involves a repair-and-replace-as-required approach.

Total estimated capital costs for this program are in the order of US $29 million.

7.3. Improvements required for full Category II operations

To achieve full CAT II operations and control of Basra airspace, the program adds to that contained above by including CAT II ILS for both Runway 14 and 32, as well as a Primary Radar. The airport improvement program includes a complete repair and replacement program.

Total capital costs for this program, which would take place over a two-year period, is an additional US $27 million, for a total all-up cost of US $56 million.