

## Trip Report

### Joint Rapid Airfield Construction (JRAC) Australian Airfield Site Surveys

1. **Introduction:** Dr. Gary Anderton, Messrs. Travis Mann and Kelly Miller conducted several airfield site surveys in Australia during 18-22 June 2005 in support of the U.S. Army Engineer Research and Development Center's (ERDC) Joint Rapid Airfield Construction (JRAC) program. The purpose of these site visits was to scout potential sites for the JRAC program's final demonstration project scheduled for 2007, and to gather site data for a 2005 JRAC site selection exercise. The goal of the 2007 JRAC demonstration will be to upgrade an existing airfield to C-17 capable, including adding ramp space and increasing runway geometry, as required. In addition to the site surveys, Mr. Mann gave a briefing on the JRAC team's preliminary survey findings at a 27 June meeting held in Canberra, Australia. The following paragraphs summarize the survey results, meetings, and implications regarding the JRAC program's potential participation in an Australian airfield construction project in 2007.
  
2. **Shoalwater Bay Training Area (SWBTA) Surveys:** (See Fig. 1 map)
  - a. ***The Plains Airfield.*** The Plains Airfield is a moderately rough, grass-surfaced runway (Fig. 2) with an approximate length of 722 m (2369 ft) and width of 38 m (125 ft). There appeared to be sufficient space available for expansion up to C-17 airfield standard requirements. (Geometric requirements for the paved surfaces of a C-17 aircraft for semi-prepared contingency airfield runways are generally 1250-m or 4100-ft long and 27.5-m or 110-ft wide.) No Dynamic Cone Penetrometer (DCP) strength tests or soil samples were taken at this site. The grassy surface with its layer of soft organic material beneath the grass would not be a suitable surfacing for C-17 aircraft operations as the turf would rip apart with each pass. This airfield site would require a significant amount of effort to expand the existing geometry, build the required base and surface layers, and establish sufficient surface drainage for the airfield.
  
  - b. ***The Glen Airfield.*** The Glen Airfield has essentially the same type of grass-surfaced runway (Fig. 3) as the Plains Airfield, but with slightly different surface geometry: 650-m (2134-ft) long and 40-m (130-ft) wide. The same expansion possibilities and conclusions previously stated for the Plains Airfield apply to the Glen airfield. This airfield site is also not a viable candidate for conversion to a C-17 capable airfield.
  
  - c. ***Samuel Hill Airfield.*** At 1200-m (3940-ft) long and 30-m (100-ft) wide, this airfield is currently very close to meeting the C-17 geometric requirements. A coarse-graded (50-mm or 2-in. maximum aggregate size) gravel surface (Fig. 4) was measured to be approximately 375-mm (15-in.) thick, and with a very high strength (80-100 CBR; scale of 1-100). The underlying constructed subbase layer was measured to be at least 500-mm (20-in.) thick, with a substantial strength of 30-50 CBR. This airfield is in close proximity to an existing base camp, which makes this location attractive due to the availability of utilities and short travel distances for personnel during training and construction.

There are three issues that would need to be resolved to make the Samuel Hill airfield C-17 capable. First, approximately 50 m (164 ft) of additional runway length is required. Secondly, there are three side-by-side drainage culverts crossing the runway (Fig. 5), and these culverts along with their headwalls would need to be extended on both sides of the runway approximately 15 m (50 ft). Lastly and most significantly, the entire runway would need to be covered with a 150-mm (6-in.) minimum thickness of fine-graded (10-

mm or 3/8-in. maximum particle size) crushed aggregate surfacing. This smaller top-sized aggregate gradation is a C-17 specific requirement to help prevent foreign object damage (FOD) to the jet engines during operations. These three issues could be easily resolved with current practices, making the Samuel Hill site a good candidate for conversion to C-17 capable, but not necessarily an ideal site for a full-scale JRAC demonstration project as the construction challenges would not require many of the new JRAC technologies.

- d. Williamson Airfield.* This site is virtually C-17 capable in its current condition (Fig. 6). The runway is 1800 m (5900 ft) long, 30 m (100 ft) wide, and has a 20-mm (3/4-in.) thick bitumen chip sealed surfacing over a strong crushed aggregate base foundation. There is a large apron, which would appear to be large enough to accommodate two or three C-17 aircraft.

The major issue at this airfield for C-17 capability is the gravel surfacing on the apron. Similar to the Samuel Hill runway, this apron area would need to be covered with a 150-mm (6-in.) minimum thickness of fine-graded (10-mm or 3/8-in. maximum particle size) crushed aggregate surfacing. Also, the two connector taxiways linking this apron with the runway will need to be widened along with their respective clear zones. Once again, with only minor improvements required to make this airfield C-17 capable, this site is not a suitable challenge for the 2007 JRAC demonstration project.

### 3. **Bradshaw Field Training Area (BFTA) Surveys:** (See Fig. 7 map)

The JRAC team visited four sites at BFTA. Several sites (including Angalarri, Ikymbon, and others) were indicated as potential C130 airfield sites in a study that was conducted in 1996 by the AS Defence Force. Two of these potential sites (Ikymbon or TFMA and Koolendong) were selected for construction in the BFTA range development plan. The JRAC team was unable to visit the Koolendong site, which is located in a very remote portion of BFTA, due to limited access by ground vehicles.

- a. Timber Creek.* Timber Creek is a fine-graded aggregate surfaced airfield located just outside of the BFTA. Serious operational hazards (noise and flight safety) restrict this site from C-17 aircraft considerations. The Victoria River runs parallel on the north side of the runway at approximately 100-m distance and the Victoria Highway runs parallel on the side at approximately 50-m distance. The town of Timber Creek is also within close proximity to the east end of the runway. All of these issues remove this airfield site from consideration of the JRAC demonstration. It is important to note, however, that the aggregate surfacing at Timber Creek Airfield (Fig. 8) did appear to be close to the required gradation for the C-17 aircraft, which indicates that producing the required surface gradation in this area would be achievable using locally available materials.

- b. Homestead Airfield.* The runway at the Homestead site was grass-surfaced, and had an approximate geometry of 1553-m (5100-ft) long and 30-m (100-ft) wide. Besides the grassy and organic layers at the surface, the runway soil strengths down to 625 mm (25 in.) varied from 30 to 80 CBR. This is a sufficient foundation strength, but requires a fine-graded crushed aggregate surfacing for C-17 operations.

The main issue at this airfield, which eliminates it from further consideration, is the close proximity of a large escarpment to the northwest end of the runway (Fig. 9). C-17 contingency airfield operations require an approach departure clearance surface (ADCS), which extends (10,500 ft) from each runway end, at a glide slope of 20:1. C-130 aircraft requires the same (ADCS) with a 35:1 glide slope. With these flight operation restrictions, the Homestead Airfield would not qualify for either C-130 or C-17 operations.

- c. Angalarri Site.* This proposed airfield site was indicated as a potential site of interest in the previous study of potential BFTA airfield locations. Additionally, it is considered an area of interest for the JRAC Site Selection Exercise. It is located in the very remote northeastern portion of BFTA, however the site does appear to be suitable for locating a C-17 capable airfield. Soil strengths at this site were quite good, consistently ranging from 30 to 60 CBR. It appears as if only minor vegetation would need to be cleared in order to start construction, likely making use of local borrow materials for the required new surfacing (Fig. 10). The main issue with this potential airfield site is its current remoteness from any of the developed areas in the southern regions of BFTA.
  - d. Ikymbon (TFMA) Site.* This proposed airfield site is located just off of Ikymbon Road in close proximity to the Range Control complex and the Training Force Maintenance Area (TFMA). There appears to be sufficient geometry to locate an airfield capable of supporting C-17 aircraft. Since the area is generally flat with small vegetation, earthwork requirements are anticipated to be relatively low in order to achieve proper grade for an airfield. The native soil is composed of a relatively loose silty sand material near the surface and an increasing amount of large rocks with depth down to the 250- to 350-mm (10- to 14-in.) range (Fig. 11). Below this depth, there appears to be a rather solid layer of sandstone bedrock. This site is located within 10-20 km of the Victoria River, which would supply a valuable source of construction water. It is also very close to utilities, which are being installed on the range to support the training infrastructure. The location of this airfield appears to be very suitable for JRAC purposes, however it is desirable to have some portion of an airfield present before the JRAC demonstration begins.
4. **Summary of Airfield Site Surveys:** Of the eight airfield sites surveyed, two of the existing airfields (Samuel Hill and Williamson) and the two undeveloped sites (Angalarri and Ikymbon) were identified as candidate sites for development into C-17 capable airfields. However, the two existing airfields at SWBTA were deemed so close to C-17 capable in their current conditions that they would not provide enough opportunity for JRAC technologies to be demonstrated in a full-scale demonstration project. Of the two undeveloped sites at the BFTA, the Ikymbon site is the most desirable as it is much nearer to current areas and facilities under development, and it is closer to water and developed borrow sites needed for construction.
5. **ERDC-JRAC Brief to Joint Combined Training Center (JCTC) and Infrastructure Group at Canberra:** On 27 June 2005, Mr. Travis Mann briefed various representatives of the Australia military at JCTC Headquarters, Canberra, on the JRAC team's preliminary survey results. Much discussion on the airfield sites followed, and the most important points from these discussions are summarized below:
- a.* While the logistics and support requirements are much easier at SWBTA, it appears that a C-17 capable airfield is not a priority at SWBTA due to the adequacy of the existing airfields at Samuel Hill and Williamson.
  - b.* The Ikymbon airfield was originally incorporated as a project in the range development work currently ongoing at BFTA. The airfield project was cut from the currently funded project list due to budget constraints and the escalating cost of construction in the BFTA. There are a number of significant challenges associated with this alternative; however, most agree that it is the most suitable site with enormous potential for payoff as both the U.S. and Australia desire to have a C-17/C-130 airfield located within BFTA and within close proximity to the range control and TFMA complexes. Because this project was previously included in the scope of work, it has already received some significant approvals (indigenous land use agreement and environmental assessment).
  - c.* There is a significant concern for troop safety and medical evacuation as BFTA begins to operate as a functional training range. All agreed that a significant risk was being undertaken without an airfield at BFTA.

6. **Recommendations:** As a result of the June 2005 airfield site surveys and the subsequent 27 June meeting discussions in Canberra, it is recommended that all concerned parties pursue the BFTA Ikymbon site as the location for the JRAC demonstration project in 2007. Since the JRAC program has limited staff and budgeting for this demonstration effort, a number of important steps must be taken by others for such a large project to succeed. These steps are listed below:
- a. Commitment from United States military (USARPAC and PACOM) and Australian military to support the 2007 airfield project with sufficient troop labor, engineering equipment, and funding for both. Some significant level of commitment, detailed in a joint memorandum of agreement, would be required by 30 December 2005.
  - b. Construction of a C-130 capable runway (minimum 914-m or 3600-ft (with overruns) and 18.5-m or 60-ft wide) at Ikymbon site by the end of the 2006 construction season. This construction effort will be independent of the JRAC project; however, JRAC engineers will assist with design and possibly construction planning, if required. The anticipated tasks associated with this construction are as follows:
    - i. Clearing and grubbing of approximately 26,675 square meters (1067m X 25m) to a depth of 150mm to 200mm.
    - ii. Grading of the runway profile to achieve the design elevation.
    - iii. Placement of a 150mm to 200mm surface layer consisting of a material that meets the gradation requirements of the C17 aircraft (Table 1).
    - iv. Compaction and finishing of the surface course to achieve the required density.
7. **Summary:** The JRAC program is prepared to commit to participate in the construction of a C-17 capable semi-prepared airfield at the Bradshaw Field Training Area's Ikymbon site during the dry season of 2007. The JRAC program will participate by offering its design and construction expertise throughout the project period, providing all JRAC specific materials such as soil stabilizers and matting systems, tools such as GPS survey equipment and rapid quality control test kits, and specialized equipment such as a soil pulvermixer and GPS-based instrumentation for earthmoving equipment. In addition, JRAC team members will provide the required training sessions for military engineering and construction personnel at one or two sites before project construction commences. The details of these and other commitments from the JRAC program, as well as those listed in paragraph 6 above for other participating agencies will be placed in a Memorandum of Agreement and approved by all participating agencies as soon as possible.

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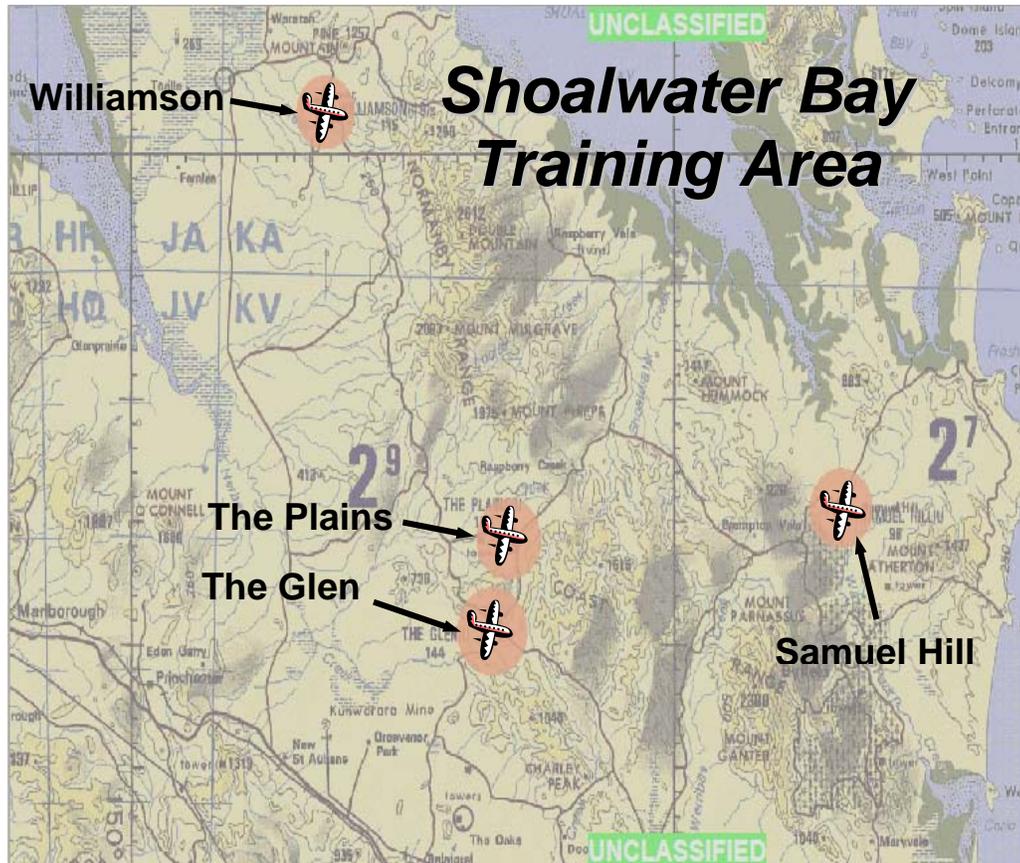


Figure 1. Airfield sites surveyed at Shoalwater Bay Training Area (SWBTA)



Figure 2. The Plains Airfield at SWBTA



Figure 3. The Glen Airfield at SWBTA



Figure 4. Coarse-graded aggregate surface on Samuel Hill Airfield runway



Figure 5. Drainage culvert and headwall at runway edge – Samuel Hill Airfield



Figure 6. Bitumen chip sealed runway surfacing at Williamson Airfield

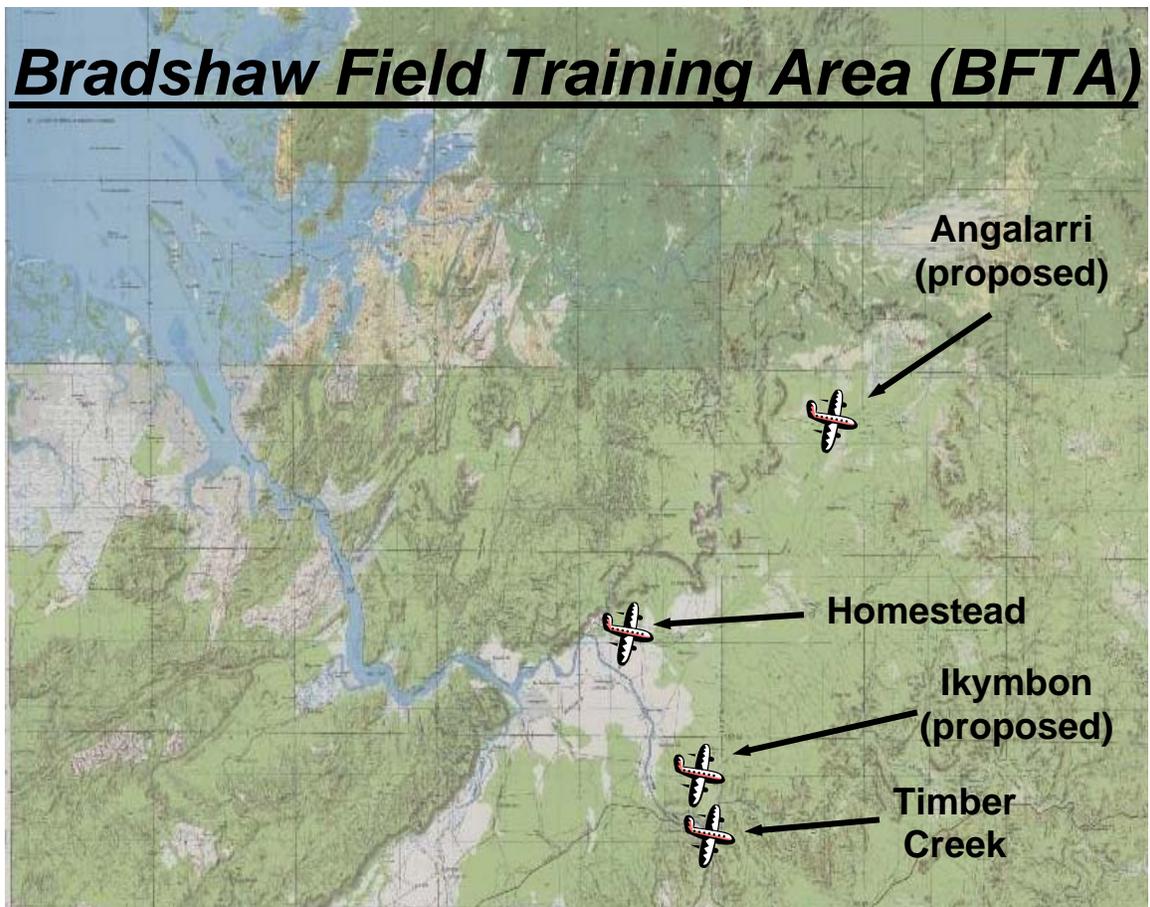


Figure 7. Airfield sites surveyed at Bradshaw Field Training Area (BFTA)



Figure 8. Fine-graded aggregate surfacing at Timber Creek Airfield



Figure 9. Large escarpment at northwest end of Bradshaw Homestead Airfield



Figure 10. Flat terrain and limited vegetation at Angalarri site



Figure 11. Testing soil strength with Dynamic Cone Penetrometer (DCP) at Ikymbon site

**TABLE 1. Required Gradation of Aggregate Surface Course for C-17 Airfield**

Sieve Size – metric (U.S. standard)	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	60-80
4.75 mm (No. 4)	50-85
2.00 mm (No. 10)	40-70
425 um (No. 40)	24-45
75 um (No. 200)	8-15