CHAPTER 5 Runway/Taxiway Alternatives

5.1 INTRODUCTION

This chapter presents the development and analysis of different layouts and configurations of both Runway 10-28 and its related taxiways. A primary objective in these analyses is to enhance safety margins at the Block Island Airport. Given that Block Island is a well-known and attractive environment, it is extremely popular with aviation day-trippers from the New York and Coastal New England areas. As noted by the pilot members and airport management members of the Technical Advisory Committee, these day-trippers exhibit a wide range of pilot skill levels. Accordingly, it is desirable that the physical configuration and dimensions of the airport infrastructure, i.e., runway, taxiways, apron, taxilanes, striping, markings, the surrounding navigable airspace and so on, be designed and built to FAA design standards to the greatest extant practicable.

In the analyses presented herein, RIAC attempts to maximize the limited BID airfield areas while providing acceptable levels of safety, economy and durability. In several instances, these attempts yield solutions that fall short of FAA design standards. In these cases, RIAC managers will work closely with FAA staff to arrive at solutions acceptable to all.

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5.2 WORKING ASSUMPTIONS

The following assumptions form the bases of the various concepts and scenarios presented in this chapter:

- **Runway length.** The present Runway 10-28 length of 2, 501 feet will remain for the duration of the study period.
- Runway width. Although the present runway width of 100 feet exceeds the FAA design standards by 25 feet, it is assumed that the 100-foot width will remain for the duration of the study period. Arguments for the 100-foot width include the following:
 - i) Runway 10-28 is the only runway at BID and thus must be used in all weather and wind conditions and directions;
 - ii) The airport is popular with operators and pilots of smaller GA aircraft and the skill levels of these pilots range from beginner to highly skilled;
 - iii) The island and the airport are enveloped frequently by sea mist and fog, making a centerline landing very difficult at best; and

- iv) Such a scenario (maintaining a width wider than required by FAA design standards for various reasons) has precedent in the FAA New England Region, i.e., Pittsfield (ME), Danbury (CT) [Runways 8-26 and 17-35], to name two.
- Britten-Norman Islander. The (STOL) B-N Islander 10-seat aircraft is still in production with the final assembly done on the Isle of Wight off the southern coast of England. While the financial underpinnings of the Britten-Norman company have been hit-or-miss in the recent past, the B-N Group (BNG), a company owned by members of the Zawawi family from the Sultanate of Oman, now exercises ownership. The Islander aircraft and its derivatives remain very popular: more than 1,250 aircraft have been delivered to customers in some 120 countries.

Accordingly, it is assumed that the Islander will remain in commercial service and will serve as the design aircraft throughout the planning period.

 ARC of A-II. The existing Airport Reference Code (ARC) of BID – A-II – will remain through the planning period. The ARC is based, presumably, on the Britten-Norman Islander aircraft in commercial passenger service at BID. The Islander is listed as having a wingspan of 49 feet 0 inches, just making it into the Airplane Design Group (ADG) II category.^{1,2} The airport surfaces and dimensions associated with BID and an ARC of A-II are tabulated in Table 2-6.

The existing ARC of A-II is based on the number of operations in the B-N Islander, an A-II aircraft. In 2001, the last year for which these data exists, airline operations accounted for 8,081 of the total operations of 17,755, or 46 percent of the total. While New England Airlines does downsize to a smaller single-engine aircraft when passenger loads are low, the overwhelming majority of airline operations occur in the B-N Islander aircraft.

5.3 RUNWAY SAFETY AREA SCENARIOS

The present runway asphalt surface and its underlying structural base are at the end of their engineering useful life. Accordingly, a full-scale rehabilitation of the runway is envisioned within the next two years. While BID is not a Part 139 airport and thus is not *required* by FAA regulations to enhance its present runway safety areas, RIAC management is taking such a step voluntarily. Safety is of primary importance both to FAA and RIAC.

As depicted in Figures 5-1 and 5-2, seven (7) scenarios are considered in this master plan. Several alternatives or scenarios address the issue of the substandard runway safety area (RSA) off the approach end to Runway 10. At approximately 158 feet in the length, the existing RSA is 142 feet short of the FAA standard of 300 feet for an ARC of A-II (for runways with not lower than ³/₄-statute mile approach visibility minimums). The RSA off the approach end to Runway 28, built in the early 1990's, meets FAA standards for a 150-foot-wide-by-300-foot-long RSA.

¹ Airplanes are grouped based on wingspan. Group I: wingspans up to but not including 49 feet. Group II: wingspans 49 feet up to but not including 79 feet.

² The Britten-Norman Group was contacted and confirmed the listed wingspan of the Islander aircraft.





Given the present airport boundaries and the location of Center Road west of Runway 10-28, the maximum runway safety area that can be obtained off the Runway 10 approach end is 235-240+/- feet. This assumes a 50-foot-wide public right-of-way for Center Road and a vertical structural wall to support the RSA located on a 10-foot offset from the ROW. The wall is estimated at 10 feet in height and is intended to retain the additional fill required off the end of Runway 10 to construct an RSA to FAA-specified grades.

A **Build to Standard option** is presented in Figure 5-1 as **Scenario 1**. This scenario depicts a standard 300-foot-long RSA built off the Runway 10 end, which requires a realignment of Center Road well to the west of its existing location. This realignment would be very difficult due to the fact that the topography drops off sharply in this area, requiring considerable fill. In addition, construction of the RSA itself would require considerable fill given the grade change beyond approximately 158 feet from the existing Runway 10 threshold. A series of detailed engineering plans compiled in Appendix F gives additional detail on the grading and fill requirements for this scenario.

A **runway shift to the east** is depicted in **Scenario 2** (Figure 5-1). This scenario maintains the existing alignment of the runway but shifts both runway thresholds 105 feet to the east. **The runway length remains at 2,501 feet.** While this scenario avoids impacts to the airport maintained as habitat for the Northern Blazing Star (south of the runway at the Runway 28 approach end), the RSA still would intrude into wetlands located east of the airport, if fill were to be used.

Alternatively, a 28-30-foot vertical structural wall could be constructed 300 feet from the runway threshold. In this instance, a structural wall referred to as a "reinforced earth" wall is proposed. Unlike a "standard" retaining wall which utilizes the bulk and strength of the wall itself to retain the earth mass behind it, a reinforced earth wall utilizes concrete panels tied to strips buried in the retained earth mass for its strength and rigidity (see illustration below). The advantages of such a wall include relatively easy on-site assembly of precast concrete panels constructed off-site and the ability to weave a variety of textures and colors into the precast concrete panels, among others.



Cross-section of a Typical Reinforced Earth Wall

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Scenario 3 presents a runway alignment showing two shifts – one a shift of 130 feet to the east and a second shift of 100 feet to the south. The runway length remains at 2,501 feet. This scenario:

- Avoids disrupting Center Road by utilizing airport property to the east of Runway 28;
- Expands the width of aircraft parking on the terminal side by 100 feet; and
- Decreases somewhat the difficulty in constructing a full parallel taxiway to the Runway 28 end.

There are a number of serious drawbacks to this scenario, however.:

- 1. At the Runway 10 end, the realigned runway intrudes into an area that is currently managed for Northern Blazing Star, a state endangered plant species. If fill alone was to be used at the 28 end to construct the RSA, the resultant grades required to maintain a stable slope would shift the toe of slope into wetlands to the east and south of the Runway 28 approach end.
- 2. Significant quantities of fill would be required to construct this scenario.
- 3. The wind cone and VOR now fall within the Runway Object Free Area (ROFA) and would have to be relocated outside the ROFA. The VOR is an FAA facility and given RIAC's interest in reconstructing Runway 10-28 in the near future, it is unlikely that the VOR could be relocated in the near term, assuming FAA would be interested in moving the VOR at all.
- 4. The RIAC-owned MALSF would have to be realigned to match the realigned runway centerline. Such a shift could be accommodated within the present airport boundaries. RIAC managers note that the present MALSF is prone to problems and breakdowns and is nearing its useful life; a replacement system is planned for the near future. Such planning would have to be accelerated to coincide with the runway realignment.

Scenario 4 in Figure 5-1 introduces the concept of **declared distances** at BID. The net effect of this scenario is to reduce the Landing Distance Available (LDA) for landings on both runway ends. Given that the runway is considered short by many pilots now, it is not recommended that any scenario that shortens the runway further be pursued.

Scenarios 5-7 in Figure 5-2 illustrate a series of alternatives that **keep the runway along its** present bearing but shift the runway to one end or the other. These shifts fall within a "corridor" approximately 3,041 feet long, formed by the available land between the existing Runway 10 threshold and the Center Road ROW (240 feet), the length of the runway (2,501 feet) and the graded runway safety area off the approach end of Runway 28 (300 feet). Scenario 5 maintains the standard RSA on the 26 end, Scenario 6 places the standard RSA on the Runway 10 approach end and Scenario 7 essentially "splits the difference", assigning 270 feet of RSA off both runway ends.

Several pilot members of the Technical Advisory Committee and the BID airport manager provided valuable insight to BID operations at TAC Meeting #4 held October 21, 2004. Both favored Scenario 6 for the following reasons:

- 1. Runway 28 has a much higher runway end use than Runway 10, particularly in the summer months.
- 2. Anecdotal evidence indicates that overshoots rather than the undershoots are the more prevalent of the two.

3. Transient operations occur primarily in the summer when a Runway 28 landing is the preferred approach to BID.

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Subject to further discussion with FAA representatives, RIAC managers have selected Scenario 6 as the preferred runway alternative, given that it balances the need to enhance safety margins with an avoidance of impacts to the wetlands located off the Runway 28 approach end. Figures 5-3 through 5-5 provide additional details on the preferred runway alternative.

5.4 TAXIWAY SCENARIOS

5.4.1 Runway 10

Figure 5-6 indicates Build to Standard taxiway configurations to the Runway 10 end with holding bays in both scenarios. Option 1 in Figure 5-6 depicts the holding bay with a taxiway-to-taxilane separation distance of 105 feet (FAA AC 150/5300-13 *Airport Design*, Table 2-3). Option 2 in Figure 5-6 uses the equations in the notes below Table 2-3 in AC 150/5300-13 *Airport Design* to modify standard dimension listed in Table 2-3 (which is based on a maximum wingspan in ADG II: 79 feet). Given that i) BID is an A-II airport operating at the lower extremes of ADG II (49-foot wingspans vs. 79-foot wingspans), and that ii) minimizing the size of the holding bay maximizes the area available for aircraft parking to the north of the holding, Option 2 is the preferred alternative. RIAC managers will work with FAA staff to ensure this options meets all FAA safety requirements for holding bays.

5.4.2 Runway 28

Figure 5-7 depicts a Build to Standard taxiway to the Runway 28 end at the required runway-totaxiway clearance standard of 240 feet. The close contour lines in the figure indicate the steepness of the grades in this area and the rapid drop off from the runway. This configuration would require large amounts of fill or a lengthy, costly retaining wall. Impacts to wetlands are inherent in this configuration.

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While preferred from an operations standpoint, both RIAC and FAA managers and technical staff felt compelled to move off this configuration at an early stage in the master plan. Accordingly, the Build to Standard taxiway option to the Runway 28 will be dropped from further consideration.

Figures 5-8 through 5-11 represent a series of taxiway alternatives intended to provide some operational flexibility to pilots taxiing to/from Runway 28. The pilot representatives at TAC Meeting #4 noted the desirability of some means to bypass an airplane along Taxiway Charlie. The pilots noted a specific instance where a pilot flying an IFR route may be required to hold along the taxiway, thus delaying all other aircraft behind, even those who could take-off under VFR conditions. A bypass taxiway, a holding bay or some such means offering an alternative path to the Runway 28 end.

The four options depicted in Figures 5-8 through 5-11 fall into three groupings as follows:

Group [Scenarios]	Notes	_
Taxiway south of Rwy 10-28 [Scenario 5E]	This option entails a rwy crossing to move aircraft to a new twy south of the rwy. The angled twy to the Rwy 28 end is intended to lessen the need for a retaining wall, given the steep drop-off immediately south of the Rwy 28 threshold. Once Aircraft 'A' is on the new twy, aircraft "behind" Aircraft 'A' would be able to move onto the rwy and backtaxi to the rwy end for takeoff. Hold lines are positioned at 125 feet from the rwy centerline.	
Taxiway/holding bay south of Rwy 10-28 [Scenario 5F]	This option, which also entails a rwy crossing, would eliminate backtaxiing to the Rwy 28 end by constructing a partial parallel twy south of the rwy. The twy would be configured with a holding bay allowing for bypass taxi movements.	Airport Master Plan
Taxiway or holding bay north of Rwy 10-28 [Scenarios 5D-1, 5G-1]	The simplest solution, constructing a stub taxiway (5G-1), would allow aircraft to move onto the runway west of the existing intersection of Twy Charlie and the rwy. However, backtaxiing distances would increase, from 560 feet at present to 842 feet, an increase of 50 percent. Scenario 5D-1 presents an "in-line" holding bay between the parallel twy and the rwy. The holding bay centerline is located approx. 171 feet from the rwy centerline.	-

There are several other considerations worth noting with these four scenarios:

1. **Proximity to PAPI system.** As configured at present, Scenario 5F passes in close proximity to the existing PAPI's south of Rwy 10-28. FAA AC 150/5345-28D Precision Approach Path Indicator (PAPI) Systems states that the "inboard light unit shall be no closer than 50 feet, +10, -0 from the runway edge or to other runways or taxiways." Along with considerations of Taxiway Safety Areas and the like, either the new taxiway would have to be realigned and reconfigured or the PAPI's themselves relocated, which triggers its own set of issues, i.e., aiming along the designated visual glide path and so on.

2. **Proximity to VOR.** Some options pass closer to the VOR than others. While the scenarios do not propose parking aircraft in the VOR vicinity, several do call for aircraft to hold there. FAA technical staff will be consulted as to whether any of the scenarios trigger concerns about the operational reliability of the VOR.

3. **Grade south of Runway 28 threshold.** The grade drops off steeply just south of the Runway 28 threshold. Study team designers attempted to place the taxiway at an angle in some scenarios to avoid/minimize the need for a retaining wall. Final design on the selected scenario can explore this in further detail but when the Taxiway Safety Area is figured in as well, it's likely that some length of retaining wall will be necessary if the preferred alternative comes from certain designs.

The preferred alternative is Scenario 5D-1 (Figure 5-10). This scenario does not entail a runway crossing and thus reduces the risk of runway incursions. It does, however, provide a holding area for run-ups and for aircraft awaiting IFR clearance. RIAC managers will work closely with FAA staff to ensure this option conforms to FAA safety requirements for holding bays.











FILE:	Hoyle, Tanner & Associates, Inc.					TWEED – NEW HAVEN AIRPORT SAFETY IMPROVEMENTS	FIGURE
003 003	150 (603)	DOW STREET, M 869–5555, W	MANCHESTER, NH EB: HOYLETANN	H 03101 ER.COM	TAXIWAY HOLDING BAY	5-6	
FIG	снкр. вү JBD	dr. by DDS	des. вү RKD	date: 01/18/05	scale: NTS	OPTIONS RUNWAY 10	

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BLOCK ISLAND AIRPORT 5.5 EMERGENCY ACCESS

Given the space constraints of the airport, obstruction clearance requirements and distances from surrounding features required by non-precision and precision approaches to an on-airport heliport, it was determined, in consultation with RIAC and FAA representatives, that the existing RNAV approaches (see Appendix C) to both runways and the approach lighting system to Runway 10 allowed reasonably good access to the airport in periods of inclement weather. Therefore, no additional measures to improve emergency access to the airport via helicopter are proposed.

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