

# 美 軍 空 降 場 風 險 評 估 之 研 析

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## 提要

- 一、介紹美軍現行引張帶跳傘空降場風險評估之方法，評估的項目計有水域、電線及樹木障礙等三項，依照障礙物距離空降場遠近區分為高、中、低風險等三個等級，並依風險等級派遣勤務小組以維跳傘人員安全。
- 二、律定任務指揮官、空降場安全官或空降場支援組長及跳傘長等重要人員在具有不同障礙物之空降場執行任務時，其所負責之職掌及執行事項，藉由分層負責降低空降場之危安因素，以利跳傘人員任務安全。
- 三、列舉遇不同障礙物時，各回收勤務小組可攜帶裝備範例，供我軍空降場勤務人員參考，所需裝備可依單位任務需求實施調整，不必拘泥於表列清單，以能成功救援受困之跳傘人員為主。

關鍵詞： 空降場、風險評估、美軍準則

## 前言

### 一、研究動機

空降作戰是一項高風險的任務，而空降場的選定則與任務成功與否習習相關，選定要項需考量任務、敵情、天候、地形、機型、航線、航高、空降作業方式及空降場幅員<sup>1</sup>，其中空降場內的地形地貌對人員的傷損率有較大的影響，綜觀近年各國發生的傘安案例，有不少人員的傷損都是因為人員溢出場外後，與空降場附近的障礙物碰撞而導致傷損。因此在選定空降場時應優先考量風險等級較低之空降場，若無法避免選擇高風險之空降場，則應配置回收勤務人員，以利及時救援受困之跳傘人員。

### 二、目的

藉由轉譯美軍引張帶跳傘技術與訓練（Static Line Parachuting Techniques and Training(2018), TC 3-21.220）附錄 D-空降場風險評估（Drop Zone Risk Assessment Analysis）之內文，提供國內傘訓教官及特戰部隊，未來執行空降作戰時，對空降場實施風險評估之參考。

### 三、範圍

本文節錄自美軍引張帶跳傘技術與訓練附錄 D 空降場風險評估，內文提供空降場風險評估要項，以水域、電纜（線）及樹林等主要評估項目，可供國內部隊參考使用。

<sup>1</sup>陸軍總司令部，《空降導航及地面導引訓練教範（第一版）》（民國 97 年 12 月），頁 2-5

## **壹、空降場風險評估分析(Drop Zone Risk Assessment Analysis)**

Conducting an Airborne operation is an inherently high risk mission. When water, wire, or tree hazards are on or in close proximity to the intended drop zone, the probability and severity of injuries is increased, the possibility of fatalities during airborne operations is also present.

執行空降作戰是一項具有高風險的任務。當水域、電線或樹木座落於預定空降場內或附近時，受傷的可能性和嚴重程度增加，也使空降作戰存在死亡的可能性。

This appendix provides planning considerations for water, wire and tree emergency landings. It also aids the commander in conducting drop zone deliberate risk assessments and analysis, and provides the commander, DZSO or DZSTL, and JM personnel with operational and logistical planning control measures to assist in mitigation the inherent risks jumpers might encounter during Airborne operations.

本篇提供水域、電線和樹木緊急著陸的注意事項。並協助指揮官執行空降場風險評估和分析，且提供指揮官、空降場安全官或空降場支援組長和跳傘長提供作戰和後勤規劃管控措施，以降低跳傘者在空降作戰期間可能面臨的風險。

Individual service components may modify these requirements based on the availability of training aids and equipment. They will also follow their service risk assessment procedures and regulations.

各單位依照可使用的輔助訓練與裝備調整需求。同時遵守單位內的風險評估程序與規範。

## **貳、考量事項與水域障礙(Considerations and Water Obstacles)**

一、Initial risk levels reflect a combination of the probability of occurrence and the severity of the adverse impact prior to any mitigation control measures being implemented. Probability and severity are independent measures of hazards. In other words, estimating probability has no direct relationship to estimating severity. When assessing hazards on a drop zone, commanders should—

初始風險等級是在引進任何降低風險的管控措施之前，反映發生的可能性與不良影響的嚴重性。可能性與嚴重性是獨立的危安指標。換句話說，可能性評估並不直接影響嚴重性的評估。在評估空降場上的危險時，指揮官應考量下列事項：

(一) Estimate the probability of a harmful event or occurrence from a hazard.

估算傷害事件或危險發生的可能性。

(二) Estimate the expected severity of an event or occurrence.

估算事件或危險發生的預期嚴重性。

(三) Determine the level of risk for the estimated probability and severity.  
為估算的可能性與嚴重性決定風險等級。

(四) Remember that all established risk criteria are initial risk and do not reflect mitigating factors and residual risk levels.

謹記所有已建立的風險指標皆為初始風險，不得反映降低風險因子與剩餘風險等級。

二、A water hazard is any body of water such as a lake, pond, river, stream, or canal that has a depth of four feet or more, is 40 feet wide or wider, and is located within 1000 meters of any edge of the surveyed or tactically assessed DZ.

水域危險是指任何水域，如湖泊、池塘、河川、溪流或運河，其深度達 4 英尺以上、寬度達 40 英尺以上、且位於經勘查或野戰評估之空降場的任一邊界 1000 公尺範圍之內。

三、When conducting an Airborne operation deliberate risk assessment, the commander should consider the proximity of the water hazard to the DZ, depth of the water hazard, and the width of the water hazard. Additionally, the following factors may enter into the water hazard risk assessment: the condition of the water hazard bottom, the current of a free flowing water hazard, water temperature, the number of water hazards present, recovery equipment available to retrieve a jumper, jumper experience levels, jump time (day or night and percent of illumination), and whether or not the selected DZ is critical to mission success. The following are the minimum initial risk categories assigned to DZs with water obstacles:

指揮官在執行空降作戰風險評估應考量水域與空降場之距離、水域深度與水域寬度。另外，下列因素亦可列為水域危險評估項目：水域底部狀況、流動性水域之水流、水溫、水域數量、可使用於回收跳傘人員之裝備、跳傘人員經驗、任務時間（日間或夜間以及亮度）以及選定之空降場是否對任務成功至關重要。下列事項為具有水域障礙之空降場的初始風險類別：

(一) High risk conditions exist if a water hazard is within 1000 meters of any edge of the DZ, water depth is four feet or more, and water is

40 feet wide or wider. If a high risk condition exists, it is necessary to use a boat detail and have jumpers use approved life preservers. If the water is four feet deep or more, but not over 40 feet wide, a boat detail is not required. However, approved life preservers are still required for the jumpers.

如果有水域存在於空降場任一邊界 1000 公尺以內，且深度達 4 英尺以上、寬度達 40 英尺以上，則屬高風險條件。若具備高風險條件，則必需要有舟艇勤務且跳傘人員需穿著核准的救生衣。若水深達 4 英尺以上，但寬度不足 40 英尺，則可不需有舟艇勤務人員。然而，跳傘人員仍需穿著核准的救生衣。

- (二) Medium risk conditions exist if a water hazard is more than 1000 meters but less than 1500 meters from any edge of the DZ, water depth is four feet or more, and water is 40 feet wide or wider. Boat detail may be used, but not required.

如果有水域存在於空降場任一邊界 1000 至 1500 公尺以內，且深度達 4 英尺以上、寬度達 40 英尺以上，則屬中風險條件。可安排舟艇勤務人員，但並非必要。

- (三) Low risk conditions exist if a water hazard is more than 1500 meters from any edge of the DZ, water depth is four feet or more, and water is 40 feet wide or wider.

如果有水域存在於空降場任一邊界 1500 公尺以外，且深度達 4 英尺以上、寬度達 40 英尺以上，則屬低風險條件。

四、The commander, DZSO or DZSTL and JM personnel perform the actions described below to reduce the risks associated with water obstacles. The commanders must—

指揮官、空降場安全官或空降場支援組長與跳傘長執行下列動作以降低水域障礙風險。指揮官必須執行下列事項—

- (一) Ensure a risk assessment analysis has been conducted to determine the unintentional water landing risk level for jumpers. If a high risk exists, select (if possible) an alternate DZ that allows mission conduct at a lower risk level.

確保已執行風險評估分析，以決定跳傘人員意外於水上降落之風險等級。如果存在高風險條件，如果可以選擇可使任務於較低風險條件下執行之備用空降場。

- (二) Ensure a deliberate risk assessment worksheet is completed to document the hazards, initial risk, control measures, and residual risk remaining in order to determine appropriate risk approval level.  
確保完成詳細的風險評估表，記錄危安因素、初始風險、管控措施與剩餘風險，以利決定適當之風險核准等級。
- (三) Ensure that key leaders, JM personnel, and jumpers have been informed of the water obstacle risks and the risk level (high, medium, or low).  
確保重要領導幹部、跳傘長與跳傘人員已被告知水域障礙風險與風險等級（高、中或低）。
- (四) Ensure AF Form 3823, is current and available. Ensure the DZSO or DZSTL and JM personnel have read it and completely understand the unintentional water landing risk level and the safety measures that are to be used.  
確保 AF 3823 表是現行可用的版本。確保空降場安全官或空降場支援組長與跳傘長已閱讀表單並完全了解意外於水上降落之風險等級與使用的安全措施。
- (五) Ensure that if a boat detail is used, the DZSO or DZSTL and the unit providing the detail have properly conducted initial or refresher training. Ensure the OIC or NCOIC of the boat detail knows where and when the detail begins its duties and how to contact the DZSO or DZSTL.  
如有安排舟艇勤務人員，確保空降場安全官或空降場支援組長與勤務支援單位有正確執行事前訓練。確認舟艇勤務支援單位帶隊官知道於何地何時開始執行勤務，與如何聯繫空降場安全官或空降場支援組長。
- (六) Ensure that approved life preservers are coordinated for, if needed.  
如有需要，確保已協調核准之救生衣以供使用。
- (七) Ensure the DZSO or DZSTL, JM personnel, and jumpers are informed of all water obstacle risks and that the DZSO or DZSTL and JM complete their duties.  
確保空降場安全官或空降場支援組長、跳傘長與跳傘人員皆被告知所有水域障礙風險，並且確定空降場安全官或空降場支援組長與跳傘長完成他們的職掌。

## 五、The DZSO and DZSTL must—

空降場安全官與空降場支援組長必需完成下列事項—

- (一) Determine if a follow on assessment of the DZ has been conducted to confirm the current status.

確認是否有執行空降場再評估以確定現在狀態。

- (二) Ensure the OIC or NCOIC is fully briefed on the plan if the deliberate risk assessment worksheet indicated high risk and a boat detail is necessary. Ensure all boat detail personnel have been trained and have all necessary equipment available to conduct the mission.

如果詳細的風險評估表顯示為高風險並有必要使用舟艇勤務，確認舟艇勤務帶隊官已接受完整任務簡報。確保所有舟艇勤務人員已完成事前訓練並攜帶執行任務之必要裝備。

- (三) Read all applicable regulations, FMs, and SOPs. Ensure copies are present throughout the mission.

閱讀所有適用法規、教範與標準作業程序。確保於任務全程將資料影本陳列。

## 六、The jumpmaster must—

跳傘長必需完成下列事項—

- (一) Ensure that if approved life preservers are to be used, they are serviceable and have been inspected within the last 180 days. Ensure that all jumpers have been trained on life preserver wear, fit, and use (to include manual inflation).

確認核准的救生衣是否有被使用過，並確定他們是妥善的並於 180 天內完成檢查。確保所有跳傘人員已接受救生衣著裝、調整與使用訓練（包含人工充氣）。

- (二) Ensure all personnel have received pre-jump training no earlier than 24 hours prior to take-off, with special emphasis on unintentional water landing. If pre-jump is over 24 hours, an O-6 must give approval.

確保所有人員於起飛前 24 小時內完成複訓，並強調意外於水上降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。

## 七、Each water hazard may require a different type of coverage. The following list is an example composition of a boat detail. Equipment should be altered to best accomplish the mission. Two qualified boat operators must

be present on each boat recovery detail. (One primary and one assistant for each boat.) Each recovery boat team may need the following equipment:

不同水域危險會需要不同型態的項目。下列清單為舟艇勤務的組成範例。裝備應適當調整以符合任務。每艘回收艇必需要有兩名合格的操舟手。(每艘艇一名主操舟手與一名副操舟手。)每個回收艇小組可能需要下列裝備：

(一) Boat (combat rubber raiding craft or solid bodied boat of comparable size) with operable outboard motor.

裝備操舟機的船艇(戰鬥橡皮艇或類似大小的硬殼船)。

(二) Fuel and oil sufficient to complete the mission.

足以完成任務的燃油與機油。

(三) Life vest or floatation device for each boat detail member and additional floatation devices for jumpers.

每位舟艇勤務人員一件救生衣或浮力裝置，與提供跳傘人員額外的浮力裝置。

(四) One life ring with attached rope.

一個附有繩索的救生圈。

(五) One radio with spare battery.

一具無線電與備用電池。

(六) One shepherd's crook.

一個救生勾。

(七) One grappling hook.

一條鉤繩。

(八) One long backboard to facilitate cardiopulmonary respiration.

一個長背板以實施心肺復甦術。

(九) One aid bag with resuscitation equipment.

一個裝有復甦設備的急救包。

(十) One rope, 120 feet long.

一條 120 英尺長的繩索。

(十一) Optional training, as required.

依需求實施選擇性訓練。

八、For night recovery operations, each recovery boat must have operational night vision devices with spare batteries: two for each boat.

執行夜間回收任務，每艘回收艇必需具有夜視器材與備用電池：每艘艇兩具。

九、The following optional training is suggested:

建議實施下列選擇性訓練：

- (一) Suspended harness training on second through fifth points of performance may be given. Step-by-step training on the procedures jumpers will take for an unintentional water landing may be conducted.

可以實施空中操傘至著陸過程之吊架訓練。並使跳傘人員一步一步操作意外於水上降落之處置程序。

- (二) An optional dunk tank training device may be constructed to allow the lowering of jumpers (wearing parachute harness and B-7, LPU-10, and TFSS life preservers) into the water. This training familiarizes the jumpers with the proper emergency water landing procedures.

選擇性的使用水中棄艙求生訓練器可使跳傘人員浸於水中（穿著傘具套帶與 B-7、LPU-10 與 TFSS 救生衣）。此項訓練可使跳傘人員熟悉正確的緊急水上降落程序。

### 參、電線障礙(Wire Obstacles)

- 一、A wire obstacle is a wire or set of wires (regardless of height or type) located within 1000 meters of any edge of the surveyed or tactically assessed DZ. The types of wire obstacles that could pose a risk to jumpers are electric, telephone, or cable television wires. Wire fence can be regarded as an obstacle if it poses a hazard to jumpers. Power line capacity (voltage or amperage) is not a factor when determining the risk to jumpers who may come in contact with a wire obstacle on or near the DZ.

電線障礙是指位於經勘查或野戰評估之空降場的任一邊界 1000 公尺範圍之內的電線或電纜（不論高度或類型）。可能對跳傘人員造成風險的電線障礙類型有電線、電話線或電視線。如果鐵絲圍籬會對跳傘人員造成危害，亦可視作為障礙物。在決定位於空降場內或附近可能造成與跳傘人員接觸的電線障礙風險時，電線負荷能力（電壓或安培數）並非考量因素。

**CAUTION:** Regardless of voltage or current carrying capacity, if a power line is located within 1000 meters of any edge of the surveyed or tactically assessed DZ, the power should be cut off before using the DZ, if possible.



**注意：**無論電壓或電流負荷為多少，如果有電線位於經勘查或野戰評估之空降場的任一邊界 1000 公尺範圍之內，如果可以在使用空降場前應完成斷電。

二、When conducting an Airborne operation risk assessment, the commander should consider the following:

指揮官在執行空降作戰風險評估應量下列事項：

- (一) Proximity of the wire obstacle to the DZ.  
空降場附近的電線障礙。
- (二) Ability to de-energize the wire hazard or not.  
是否有能力將電線斷電。
- (三) Height of the wire hazard.  
電線高度。
- (四) Number of wire hazards present.  
電線數量。
- (五) Recovery equipment available to retrieve the jumper.  
可用於協助跳傘人員脫離的裝備。
- (六) Jumper experience levels.  
跳傘人員經驗。
- (七) Drop time (day or night and percent of illumination).  
任務時間（日間或夜間以及亮度）。
- (八) Whether or not the selected DZ is critical to mission success.  
選定之空降場是否對任務成功至關重要。

三、The following are the minimum initial risk categories that are assigned to DZs with wire obstacles:

下列事項為具有電線障礙之空降場的初始風險類別：

- (一) High risk: a high risk condition exists if a wire hazard is taller than 35 feet within 1000 meters of any edge of the surveyed DZ. If a high risk condition exists, it may be necessary to have a recovery detail at the DZ. Regardless of height, any wire hazard remains high risk if it is still energized during the Airborne operation and is within 1000 meters of any edge of the surveyed drop zone.  
高風險：如果在空降場任一邊界 1000 公尺以內有高於 35 英尺的電線，則屬於高風險條件。若具備高風險條件，空降場必須要有回收勤務人員。如果在執行空降任務中，空降場任一邊界 1000 公尺以內有未斷電的電線，無論高度為何皆屬高風險。

- (二) Medium risk: a medium risk condition exists if a wire hazard is taller 35 feet and more than 1000 meters but less than 1500 meters from any edge of the surveyed DZ. Regardless of height, any wire hazard remains high risk if it is still energized during the Airborne operation and is within 1000 meters of any edge of the surveyed drop zone.

中風險：如果在空降場任一邊界 1000 至 1500 公尺以內有高於 35 英尺的電線，則屬於中風險條件。如果在執行空降任務中，空降場任一邊界 1000 公尺以內有未斷電的電線，無論高度為何皆屬高風險。

- (三) Low risk: a low risk condition exists if a wire hazard is taller than 35 feet and more than 1500 meters from any edge of the surveyed DZ. Regardless of height, any wire hazard remains high risk if it is still energized during the Airborne operation and is within 1000 meters of any edge of the surveyed drop zone.

低風險：如果在空降場任一邊界 1500 公尺以外有高於 35 英尺的電線，則屬於低風險條件。如果在執行空降任務中，空降場任一邊界 1000 公尺以內有未斷電的電線，無論高度為何皆屬高風險。

四、The commander, DZSO or DZSTL, and JM perform the actions described below to reduce the risks associated with wire obstacles. Commanders must—

指揮官、空降場安全官或空降場支援組長與跳傘長執行下列動作以降低電線障礙風險。指揮官必須執行下列事項—

- (一) Ensure a risk assessment analysis has been conducted to determine the unintentional wire landing risk level for jumpers. If a high risk exists, select (if possible) an alternate DZ which allows the mission to be conducted at a lower risk level.

確保已執行風險評估分析，以決定跳傘人員意外於電線降落之風險等級。如果存在高風險條件，如果可以選擇可使任務於較低風險條件下執行之備用空降場。

- (二) Ensure a deliberate risk assessment worksheet is completed to document the hazards, initial risk, control measures, and residual risk remaining in order to determine appropriate risk approval level.

確保完成詳細的風險評估表，記錄危安因素、初始風險、管控措施與剩餘風險，以利決定適當之風險核准等級。

- (三) Ensure that key leaders, JM personnel, and jumpers have been informed of the wire obstacle risks and the risk level (high, medium, or low).

確保重要領導幹部、跳傘長與跳傘人員已被告知電線障礙風險與風險等級（高、中或低）。

- (四) Ensure AF Form 3823 is current and available.

確保 AF 3823 表是現行可用的版本。

- (五) Ensure the DZSO or DZSTL and JM personnel have read the AF Form 3823 and completely understand the wire landing risk level and the safety measures to be used.

確保空降場安全官或空降場支援組長與跳傘長已閱讀 AF 3823 表並完全了解意外於電線降落之風險等級與使用的安全措施。

- (六) Ensure the DZSO or DZSTL and the unit providing the detail have properly conducted initial or refresher training if a recovery detail is used. Ensure the OIC or NCOIC of the recovery detail knows where and when the detail begins its duties and how to contact the DZSO or DZSTL.

如果有安排回收勤務，確保空降場安全官或空降場支援組長與勤務支援單位有正確執行事前訓練。確認勤務支援單位帶隊官知道於何地何時開始執行勤務，與如何聯繫空降場安全官或空降場支援組長。

- (七) Ensure the DZSO or DZSTL, JM personnel, and jumpers have been informed of all wire obstacle risks. Ensure the DZSO or DZSTL and JM complete their duties.

確保空降場安全官或空降場支援組長、跳傘長與跳傘人員皆被告知所有電線障礙風險，並且確定空降場安全官或空降場支援組長與跳傘長完成他們的職掌。

#### 五、DZSO or DZSTL must—

空降場安全官或空降場支援組長必需完成下列事項—

- (一) Determine if a follow on assessment of the DZ has been conducted to confirm the current status.

確認是否有執行空降場再評估以確定現在狀態。

- (二) Ensure that the OIC or NCOIC is fully briefed on the plan if the risk assessment indicates high risk and a recovery detail is utilized. Ensure all recovery personnel have been trained and have all necessary equipment available to them to conduct the mission.

如果詳細的風險評估表顯示為高風險並有必要使用回收勤務，確認勤務帶隊官已接受完整任務簡報。確保所有勤務人員已完成事前訓練並攜帶執行任務之必要裝備。

- (三) Ensure that coordination with the electric company has been made to cut off the power not later than one hour prior to drop time, if possible. DZSTL must have direct contact with whoever will turn off the power if a jumper is drifting towards the wires or becomes entangled. There must also be a plan to recover parachutists from wires. Ensure all recovery personnel have been trained and have all necessary equipment available to conduct the mission.

確認與電力公司完成協調，如果可以最晚在任務前 1 小時完成斷電。如果有跳傘人員飄向電線或與電線纏繞，空降場支援組長必須直接與斷電負責人連絡。必需要有將協助跳傘人員從電線脫離的計畫。確保所有勤務人員已完成事前訓練並攜帶執行任務之必要裝備。

- (四) Ensure all necessary personnel have read all applicable regulations, FMs, and SOPs. Ensure copies are present throughout mission.

確保所有必要人員皆完成閱讀所有適用法規、教範與標準作業程序。確保於任務全程將資料影本陳列。

## 六、Jumpmaster must—

跳傘長必需完成下列事項—

- (一) Ensure all personnel have been briefed on the wire obstacles.

確保所有人員已接受電線障礙物簡報。

- (二) Ensure all personnel have received pre-jump training no earlier than 24 hours prior to take-off, with special emphasis on unintentional wire landings. If the pre-jump is over 24 hours, an O-6 must give approval.

確保所有人員於起飛前 24 小時內完成複訓，並強調意外於電線降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。

## 七、Each wire obstacle may require different types of coverage. Equipment should be altered to best accomplish the mission. The following is an example composition of a recovery detail:

不同電線障礙會需要不同型態的項目。裝備應適當調整以符合任務。下列清單為回收勤務的組成範例。

(一) OIC or NCOIC and assistant.

帶隊官與副隊長。

(二) Enough personnel to recover jumpers who may become entangled in the wire obstacles.

足夠的人員以救援卡在電線上的跳傘人員。

(三) A recovery team may need the following equipment:

回收小組可能會需下列裝備：

1. Two radios with spare batteries—2 (one for OIC or NCOIC and one for the recovery team).

兩具無線電與備用電池——一具給帶隊官、一具給回收小組。

2. One grappling hook.

一條鉤繩。

3. One tree climbing kit.

一組爬樹工具。

4. One long backboard to facilitate cardiopulmonary respiration.

一個長背板以實施心肺復甦術。

5. One aid bag with resuscitation equipment.

一個裝有復甦設備的急救包。

6. Two ropes, 120 feet long.

兩條 120 英尺長的繩索。

7. Two wood poles 15 feet long.

兩根 15 英尺長的木桿。

8. One extension ladder, 20 feet long.

一個 20 英尺長的伸縮梯。

9. Four snap links.

四個扣環。

(四) For night recovery operations, the following equipment should be added:

執行夜間回收任務，需增加下列裝備：

1. Night vision devices (with spare batteries) for each team.

每個小組需有夜視器材（與備用電池）。

2. Operational flashlights (with spare batteries) for each team.

每個小組需有手電筒（與備用電池）。

3. Optional training, as required.

依需求實施選擇性訓練。

八、Optional training includes suspended harness training on the second through fifth points of performance. Step-by-step training on the procedures jumpers take for unintentional wire landings may be conducted.

選擇性訓練包含空中操傘至著陸過程之吊架訓練。並使跳傘人員一步一步操作意外於電線降落之處置程序。

#### **肆、樹木障礙(Tree Obstacles)**

一、A tree obstacle is any tree or group of trees that are on, around, or within 1000 meters of any edge of the drop zone. When conducting an Airborne operation risk assessment, the commander should consider the proximity of the tree hazard to the DZ, the number of hazards, recovery equipment available to safely retrieve a jumper from the hazard, jumper experience level, drop time (day or night and percent of illumination), and whether or not the selected DZ is critical to mission success. The following risk categories are the minimum initial risk categories assigned to DZs with tree obstacles:

樹木障礙是指位於經勘查或野戰評估之空降場內、周圍或任一邊界 1000 公尺範圍之內的樹木或樹林。指揮官在執行空降作戰風險評估應考量空降場附近的樹木障礙、樹木數量、可用於協助跳傘人員安全脫離的裝備、跳傘人員經驗、任務時間（日間或夜間以及亮度）以及選定之空降場是否對任務成功至關重要。下列事項為具有樹木障礙之空降場的初始風險類別：

（一）High risk: a high risk condition exists if a tree obstacle with a height of 35 feet or more are within 1000 meters of the DZ or are on any edge of the DZ. If a high risk condition exists, it may be necessary to have a recovery detail present at the DZ.

高風險：如果在空降場任一邊界 1000 公尺以內有高度高於 35 英尺的樹木，則屬於高風險條件。若具備高風險條件，空降場必須要有回收勤務人員。

（二）Medium risk: a medium risk condition exists if a tree obstacle with a height of 20 to 35 feet is on or within 1000 meters of any edge of the DZ.

中風險：如果在空降場任一邊界 1000 公尺以內有高度介於 25 至 35 英尺的樹木，則屬於中風險條件。

- (三) Low risk: a low risk condition exists if a tree obstacle with a height of less than 20 feet is on or within 1000 meters of any edge of the drop zone.

低風險：如果在空降場任一邊界 1000 公尺以內有高度低於 25 英尺的樹木，則屬於低風險條件。

二、The commander, DZSO or DZSTL, and JM personnel perform the following actions to reduce the risks associated with tree obstacles. Commanders must—

指揮官、空降場安全官或空降場支援組長與跳傘長執行下列動作以降低樹木障礙風險。指揮官必須執行下列事項—

- (一) Ensure a risk assessment analysis has been established to determine the tree landing risk level for jumpers. If a high risk exists, select (if possible) and alternate DZ that allows the mission to be conducted at a lower risk level.

確保已執行風險評估分析，以決定跳傘人員於樹上降落之風險等級。如果存在高風險條件，如果可以選擇可使任務於較低風險條件下執行之備用空降場。

- (二) Ensure a deliberate risk assessment worksheet is completed to document the hazards, initial risk, control measures, and residual risk remaining to determine appropriate risk approval level.

確保完成詳細的風險評估表，記錄危害因素、初始風險、管控措施與剩餘風險，以利決定適當之風險核准等級。

- (三) Ensure that key leaders, JMs, and jumpers have been informed of the tree obstacle risks and the risk level (high, medium, or low).

確保重要領導幹部、跳傘長與跳傘人員已被告知樹木障礙風險與風險等級（高、中或低）。

- (四) Ensure AF Form 3823 is current and available. Ensure the DZSO or DZSTL and JM have read it and completely understand the tree landing risk level and the recovery measures to be used.

確保 AF 3823 表是現行可用的版本。確保空降場安全官或空降場支援組長與跳傘長已閱讀表單並完全了解意外於樹木降落之風險等級與使用的安全措施。

- (五) Ensure DZSO or DZSTL and the unit providing the detail have properly conducted initial or refresher training if a recovery detail is used. Ensure the OIC and NCOIC of the recovery detail knows

where and when the detail begins its duties and how to contact the DZSO or DZSTL.

如果有安排回收勤務，確保空降場安全官或空降場支援組長與勤務支援單位有正確執行事前訓練。確認勤務支援單位帶隊官知道於何地何時開始執行勤務，與如何聯繫空降場安全官或空降場支援組長。

- (六) Ensure that the DZSO and DZSTL, JM and AJM, and jumpers have been informed of all tree obstacle risks and that the DZSO or DZSTL and JM complete their duties.

確保空降場安全官與空降場支援組長、跳傘長與副跳傘長及跳傘人員皆被告知所有樹木障礙風險，並且空降場安全官或空降場支援組長與跳傘長完成他們的職掌。

### 三、DZSO and DZSTL must—

空降場安全官與空降場支援組長必需完成下列事項—

- (一) Determine if a follow on assessment of the DZ has been conducted to confirm the current status.

確認是否有執行空降場再評估以確定現在狀態。

- (二) Ensure that the OIC or NCOIC is fully briefed on the plan if the risk assessment indicates high risk and a recovery detail is used. Ensure all recovery personnel have been trained and have all necessary equipment available to conduct the mission.

如果詳細的風險評估表顯示為高風險並有必要使用回收勤務，確認勤務帶隊官已接受完整任務簡報。確保所有勤務人員已完成事前訓練並攜帶執行任務之必要裝備。

- (三) Ensure all necessary personnel read all applicable regulations, FMs, and SOPs. Ensure copies are present throughout mission.

確保所有必要人員皆完成閱讀所有適用法規、教範與標準作業程序。確保於任務全程將資料影本陳列。

### 四、Jumpmasters must—

- (一) Ensure all personnel have been briefed on the tree obstacles.

確保所有人員已接受樹木障礙簡報。

- (二) Ensure all personnel have received pre-jump training no earlier than 24 hours prior to take-off; with special emphasis on unintentional tree landing. If the pre-jump is over 24 hours, an O-6 must give approval.



確保所有人員於起飛前 24 小時內完成複訓，並強調意外於樹上降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。

五、Each tree obstacle may require a different type of coverage. Equipment should be altered to best accomplish the mission. The following is an example composition of a recovery detail:

不同樹木障礙會需要不同型態的項目。裝備應適當調整以符合任務。下列清單為回收勤務的組成範例。

(一) OIC, NCOIC, and assistant.

帶隊官與副隊長。

(二) Sufficient personnel sufficient to recover jumpers who may become entangled in the tree obstacles.

足夠的人員以救援卡在樹木上的跳傘人員。

(三) A recovery team may need the following equipment:

回收小組可能會需下列裝備：

1. Two radios with spare batteries—2 (one for OIC or NCOIC and one for recovery team).

兩具無線電與備用電池——一具給帶隊官、一具給回收小組。

2. One grappling hook.

一條鉤繩。

3. One tree climbing kit.

一組爬樹工具。

4. One long backboard to facilitate cardiopulmonary respiration.

一個長背板以實施心肺復甦術。

5. One aid bag with resuscitation equipment.

一個裝有復甦設備的急救包。

6. Two ropes, 120 feet long.

兩條 120 英尺長的繩索。

7. Two wood poles 15 feet long.

兩根 15 英尺長的木桿。

8. One extension ladder 20 feet long.

一個 20 英尺長的伸縮梯。

9. Four nap links.

四個扣環。

(四) During night recovery operations, the following equipment should be added:

執行夜間回收任務，需增加下列裝備：

1.Night vision devices (with spare batteries) for each team.

每個小組需有夜視器材（與備用電池）。

2.Operational flashlights (with spare batteries) for each team.

每個小組需有手電筒（與備用電池）。

3.Optional training as required.

依需求實施選擇性訓練。

六、Optional training includes suspended harness training on the second through fifth points of performance. Step by step training on the procedures jumpers will take for unintentional tree landings may be conducted.

選擇性訓練包含空中操傘至著陸過程之吊架訓練。並使跳傘人員一步一步操作意外於樹上降落之處置程序。

#### **伍、決心要項表與檢查表(Decision Matrix and Checklists for Leaders)**

一、This section provides four tables to aid the leader in assessing risk. Table 1 shows the DZ risk assessment decision matrix.

本段提供四個表格協助領導幹部評估風險。次頁表 1 為空降場風險評估決心要項表。

表 1、空降場風險評估決心要項表

|                                                         | <b>HIGH RISK</b><br>高風險                                                                                                                      | <b>MEDIUM RISK</b><br>中風險                                                                                                                                                        | <b>LOW RISK</b><br>低風險                                                                                                                          |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Water</b><br>水域                                      | Within 1000 meters of any edge of a DZ, more than four feet deep, and more than 40 feet wide.<br>於空降場任一邊界 1000 公尺以內，且深度達 4 英尺以上、寬度達 40 英尺以上。 | More than 1000 meters but less than 1500 meters from any edge of DZ, more than four feet deep, and more than 40 feet wide.<br>於空降場任一邊界 1000 至 1500 公尺以內，且深度達 4 英尺以上、寬度達 40 英尺以上。 | More than 1500 meters from any edge of DZ, more than four feet deep, and more than 40 feet wide.<br>於空降場任一邊界 1500 公尺以外，且深度達 4 英尺以上、寬度達 40 英尺以上。 |
| <b>Wire</b><br>電線                                       | Within 1000 meters of any edge of DZ.<br>在空降場任一邊界 1000 公尺以內。                                                                                 | More than 1000 meters but less than 1500 meters from any edge of DZ.<br>在空降場任一邊界 1000 至 1500 公尺以內。                                                                               | More than 1500 meters from any edge of DZ.<br>在空降場任一邊界 1500 公尺以外。                                                                               |
| <b>Tree(s)</b><br>樹木                                    | Within 1000 meters of any edge of DZ and 35 feet tall or taller.<br>在空降場任一邊界 1000 公尺以內，高度高於 35 英尺。                                           | Within 1000 meters of any edge of DZ and 20 to 35 feet.<br>在空降場任一邊界 1000 公尺以內，高度介於 20 至 35 英尺。                                                                                   | Within 1000 meters of any edge of DZ, but less than 20 feet tall.<br>在空降場任一邊界 1000 公尺以內，高度低於 20 英尺。                                             |
| <b>Obstacle Training and Equipment</b><br>障礙處置<br>訓練與裝備 | Required.<br>需要                                                                                                                              | Not required.<br>不需要                                                                                                                                                             | Not required.<br>不需要                                                                                                                            |
| <b>Legend 說明</b><br>DZ-drop zone 空降場                    |                                                                                                                                              |                                                                                                                                                                                  |                                                                                                                                                 |

二、Table 2 outlines a checklist for water landings. Table 3 is a checklist for wire landing, and table 4 is a checklist for tree landings.

表 2 列出水上降落檢查表。表 3 為電線降落檢查表、表 4 為樹上降落檢查表。

表 2、水上降落檢查表

| <b>COMMANDER</b><br><b>指揮官</b>                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deliberate risk assessment and follow-on assessment have been conducted and approved at the appropriate level.<br>完成詳細地風險評估與再評估並經權責長官核准。                                                                                                                                |
| Key leaders, jumpmaster personnel, and jumpers have been informed of water obstacle risks and the risk level (high, medium, or low).<br>重要領導幹部、跳傘長與跳傘人員已被告知水域障礙風險與風險等級（高、中或低）。                                                                                          |
| AF Form 3823 is current and available. The DZSO or DZSTL and JM have read it and completely understand the unintentional water landing risk level and the safety measures that are to be used.<br>AF 3823 表是現行可用的版本。確保空降場安全官或空降場支援組長與跳傘長已閱讀表單並完全了解意外於水上降落之風險等級與使用的安全措施。 |
| The DZSO or DZSTL and OIC and NCOIC of the boat detail have been briefed and understand their mission.<br>空降場安全官或空降場支援組長與舟艇勤務帶隊官已接受任務簡報並了解任務。                                                                                                                           |
| Life preservers are coordinated for if needed.<br>如有需要協調核准之救生衣以供使用。                                                                                                                                                                                                     |
| The DZSO or DZSTL, JM personnel, and jumpers have been informed of all water obstacle risks.<br>空降場安全官或空降場支援組長、跳傘長與跳傘人員皆被告知所有水域障礙風險。                                                                                                                                    |
| The DZSTL or DZSO and JM personnel have completed their duties.<br>空降場安全官或空降場支援組長與跳傘長完成他們的職掌。                                                                                                                                                                           |
| <b>DZSO or DZSTL</b><br><b>空降場安全官或空降場支援組長</b>                                                                                                                                                                                                                           |

|                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Risk assessment analysis has been conducted and approved at the appropriate level.</p> <p>已完成風險評估分析並經權責長官核准。</p>                                                                                                                                                                                                                                 |
| <p>If a boat detail is used, the OIC or NCOIC of the boat detail is fully briefed on the plan.</p> <p>如果有使用舟艇勤務，帶隊官已接受完整任務簡報。</p>                                                                                                                                                                                                                   |
| <p>All boat detail personnel have been trained and have all necessary equipment available to conduct the mission.</p> <p>所有舟艇勤務人員已完成事前訓練並攜帶執行任務之必要裝備。</p>                                                                                                                                                                                           |
| <p>All applicable regulations, FMs, and SOPs have been read.</p> <p>已閱讀所有適用法規、教範與標準作業程序。</p>                                                                                                                                                                                                                                                        |
| <p>The boat detail maintains communications throughout the mission. Communications are established one hour prior to drop time and checked 15 minutes prior to drop time.</p> <p>舟艇勤務於任務中保持通聯。於任務前 1 小時完成通訊建立並於任務前 15 分鐘完成確認。</p>                                                                                                                   |
| <p style="text-align: center;"><b>JUMPMASTER</b><br/><b>跳傘長</b></p>                                                                                                                                                                                                                                                                                 |
| <p>All personnel have been briefed on the water hazards.</p> <p>所有人員已接受水域危險簡報。</p>                                                                                                                                                                                                                                                                  |
| <p>All jumpers have been trained on wear, fit, and use (to include manual inflation) of life preservers.</p> <p>所有跳傘人員已接受救生衣著裝、調整與使用訓練（包含人工充氣）。</p>                                                                                                                                                                                                 |
| <p>All personnel receive pre-jump training no earlier than 24 hours prior to take-off, with special emphasis on unintentional water landings. If the pre-jump is over 24 hours, an O-6 must give approval.</p> <p>所有人員於起飛前 24 小時內完成複訓，並強調意外於水上降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。</p>                                                                   |
| <p><b>LEGEND 說明</b></p> <p>O-6 – colonel or U.S. Navy captain; DZSO – drop zone safety officer; DZSTL – drop zone support team leader; FM – Field Manual; OIC – officer in charge; NCOIC – noncommissioned officer in charge; SOP – standard operating procedure</p> <p>O-6—上校；DZSO—空降場官全官；DZSTL—空降場支援組長；FM—教範；OIC—軍官帶隊官；NCOIC—士官帶隊官；SOP—標準作業程序</p> |

表 3、電線降落檢查表

| <p style="text-align: center;"><b>COMMANDER</b><br/><b>指揮官</b></p>                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Deliberate risk assessment and follow-on assessment have been conducted and approved at the appropriate level.<br/>完成詳細地風險評估與再評估並經權責長官核准。</p>                                                                                                                               |
| <p>Key leaders, jumpmaster personnel, and jumpers have been informed of wire obstacle risks and the risk level (high, medium, or low).<br/>重要領導幹部、跳傘長與跳傘人員已被告知電線障礙風險與風險等級（高、中或低）。</p>                                                                                          |
| <p>AF Form 3823 is current and available. The DZSO or DZSTL and JM have read it and completely understand the unintentional wire landing risk level and the safety measures that are to be used.<br/>AF 3823 表是現行可用的版本。確保空降場安全官或空降場支援組長與跳傘長已閱讀表單並完全了解意外於電線降落之風險等級與使用的安全措施。</p> |
| <p>The DZSO or DZSTL and OIC and NCOIC of the recovery detail have been briefed and understand their mission.<br/>空降場安全官或空降場支援組長與回收勤務帶隊官已接受任務簡報並了解任務。</p>                                                                                                                      |
| <p>The DZSO or DZSTL, JM personnel, and jumpers have been informed of all wire obstacle risks.<br/>空降場安全官或空降場支援組長、跳傘長與跳傘人員皆被告知所有水域障礙風險。</p>                                                                                                                                    |
| <p>The DZSTL or DZSO and JM personnel have completed their duties.<br/>空降場安全官或空降場支援組長與跳傘長完成他們的職掌。</p>                                                                                                                                                                          |
| <p style="text-align: center;"><b>DZSO or DZSTL</b><br/><b>空降場安全官或空降場支援組長</b></p>                                                                                                                                                                                              |
| <p>Risk assessment analysis has been conducted and approved at the appropriate level.<br/>已完成風險評估分析並經權責長官核准。</p>                                                                                                                                                               |
| <p>If a recovery detail is used, the OIC and NCOIC of the recovery detail is fully briefed on the plan.<br/>如果有使用回收勤務，帶隊官已接受完整任務簡報。</p>                                                                                                                                        |

|                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>All detail personnel have been trained and have all necessary equipment available to conduct the mission.</p> <p>所有勤務人員已完成事前訓練並攜帶執行任務之必要裝備。</p>                                                                                                                                                                                                  |
| <p>All applicable regulations, FMs, and SOPs have been read.</p> <p>已閱讀所有適用法規、教範與標準作業程序。</p>                                                                                                                                                                                                                                                        |
| <p>The recovery detail maintains communications throughout the mission. Communications are established one hour prior to drop time and checked 15 minutes prior to drop time.</p> <p>回收勤務於任務中保持通聯。於任務前 1 小時完成通訊建立並於任務前 15 分鐘完成確認。</p>                                                                                                               |
| <p>The DZSO or DZSTL has direct contact with who will turn off the power in the event a jumper is drifting towards or becomes entangled in energized electrical lines.</p> <p>若有跳傘人員飄向電線或與未斷電的電線纏繞，空降場安全官或空降場支援組長必須直接與斷電負責人連絡。</p>                                                                                                                  |
| <p style="text-align: center;"><b>JUMPMaster</b></p> <p style="text-align: center;"><b>跳傘長</b></p>                                                                                                                                                                                                                                                  |
| <p>All personnel have been briefed on the wire obstacles.</p> <p>確保所有人員已接受電線障礙物簡報。</p>                                                                                                                                                                                                                                                              |
| <p>All personnel receive pre-jump training no earlier than 24 hours prior to take-off, with special emphasis on unintentional wire landings. If the pre-jump is over 24 hours, an O-6 must give approval.</p> <p>所有人員於起飛前 24 小時內完成複訓，並強調意外於電線降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。</p>                                                                    |
| <p><b>LEGEND 說明</b></p> <p>O-6 – colonel or U.S. Navy captain; DZSO – drop zone safety officer; DZSTL – drop zone support team leader; FM – Field Manual; OIC – officer in charge; NCOIC – noncommissioned officer in charge; SOP – standard operating procedure</p> <p>O-6—上校；DZSO—空降場安全官；DZSTL—空降場支援組長；FM—教範；OIC—軍官帶隊官；NCOIC—士官帶隊官；SOP—標準作業程序</p> |

表 4、樹上降落檢查表

| <p style="text-align: center;"><b>COMMANDER</b><br/><b>指揮官</b></p>                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Deliberate risk assessment and follow-on assessment have been conducted and approved at the appropriate level.<br/>完成詳細地風險評估與再評估並經權責長官核准。</p>                                                                                                                               |
| <p>Key leaders, jumpmaster personnel, and jumpers have been informed of tree obstacle risks and the risk level (high, medium, or low).<br/>重要領導幹部、跳傘長與跳傘人員已被告知樹木障礙風險與風險等級（高、中或低）。</p>                                                                                          |
| <p>AF Form 3823 is current and available. The DZSO or DZSTL and JM have read it and completely understand the unintentional tree landing risk level and the safety measures that are to be used.<br/>AF 3823 表是現行可用的版本。確保空降場安全官或空降場支援組長與跳傘長已閱讀表單並完全了解意外於樹上降落之風險等級與使用的安全措施。</p> |
| <p>The DZSO or DZSTL and OIC and NCOIC of the recovery detail have been briefed and understand their mission.<br/>空降場安全官或空降場支援組長與回收勤務帶隊官已接受任務簡報並了解任務。</p>                                                                                                                      |
| <p>The DZSO or DZSTL, JM personnel, and jumpers have been informed of all tree obstacle risks.<br/>空降場安全官或空降場支援組長、跳傘長與跳傘人員皆被告知所有樹木障礙風險。</p>                                                                                                                                    |
| <p>The DZSTL or DZSO and JM personnel have completed their duties.<br/>空降場安全官或空降場支援組長與跳傘長完成他們的職掌。</p>                                                                                                                                                                          |
| <p style="text-align: center;"><b>DZSO or DZSTL</b><br/><b>空降場安全官或空降場支援組長</b></p>                                                                                                                                                                                              |
| <p>Risk assessment analysis has been conducted and approved at the appropriate level.<br/>已完成風險評估分析並經權責長官核准。</p>                                                                                                                                                               |
| <p>If a recovery detail is used, the OIC and NCOIC of the recovery detail is fully briefed on the plan.<br/>如果有使用回收勤務，帶隊官已接受完整任務簡報。</p>                                                                                                                                        |



|                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>All detail personnel have been trained and have all necessary equipment available to conduct the mission.</p> <p>所有勤務人員已完成事前訓練並攜帶執行任務之必要裝備。</p>                                                                                                                                                                                                  |
| <p>All applicable regulations, FMs, and SOPs have been read.</p> <p>已閱讀所有適用法規、教範與標準作業程序。</p>                                                                                                                                                                                                                                                        |
| <p>The recovery detail maintains communications throughout the mission. Communications are established one hour prior to drop time and checked 15 minutes prior to drop time.</p> <p>回收勤務於任務中保持通聯。於任務前 1 小時完成通訊建立並於任務前 15 分鐘完成確認。</p>                                                                                                               |
| <p style="text-align: center;"><b>JUMPMaster</b><br/><b>跳傘長</b></p>                                                                                                                                                                                                                                                                                 |
| <p>All personnel have been briefed on the tree obstacles.</p> <p>所有人員已接受樹木障礙簡報。</p>                                                                                                                                                                                                                                                                 |
| <p>All personnel receive pre-jump training no earlier than 24 hours prior to take-off, with special emphasis on unintentional tree landings. If the pre-jump is over 24 hours, an O-6 must give approval.</p> <p>所有人員於起飛前 24 小時內完成複訓，並強調意外於樹上降落之處置。如果完成複訓超過 24 小時，必需要奉上校階核定。</p>                                                                    |
| <p><b>LEGEND 說明</b></p> <p>O-6 – colonel or U.S. Navy captain; DZSO – drop zone safety officer; DZSTL – drop zone support team leader; FM – Field Manual; OIC – officer in charge; NCOIC – noncommissioned officer in charge; SOP – standard operating procedure</p> <p>O-6—上校；DZSO—空降場官全官；DZSTL—空降場支援組長；FM—教範；OIC—軍官帶隊官；NCOIC—士官帶隊官；SOP—標準作業程序</p> |

### 陸、我軍空降場風險評估分析

參照我國「跳傘訓練教範（第二版）」-第四章第四節第三款 04024 空降場選定之因素<sup>2</sup>及「空降導航及地面導引訓練教範（第一版）」-第二章第三節 02005 選擇空降場應考慮之因素<sup>3</sup>，我國選擇空降場應考慮之因素可區分為下列九點：

<sup>2</sup>陸軍總司令部，《跳傘訓練教範（第二版）》（民國 97 年 11 月），頁 4-37

<sup>3</sup>陸軍總司令部，《空降導航及地面導引訓練教範（第一版）》（民國 97 年 12 月），頁 2-4

### 一、任務

首先依據任務目標之位置，選定對達成任務最有利之地區為空降場。

### 二、敵情狀況

依據敵情狀況、分析、判斷、選定最有利的狀況、犧牲最小、成功公算最大之空降場為著眼。

### 三、天候

空降場附近地區，空中、地面之風向、風速、能見度、雲幕高，天氣情況、特殊氣象足以妨礙信號、標誌之作業，必須列入考慮。

### 四、地形

遠離湖泊、河川，並避免使用地面障礙物過多之地區。

### 五、機型

執行空降作戰任務之飛機類型、性能與限制。

### 六、航線

通常進航須有 5 分鐘之直線距離，以便能通視目標及利於導航修正。脫離方向亦須有 30 秒平直飛行之空域，30 秒以後轉彎脫航亦須考慮不得與後續梯隊交叉。

### 七、航高

航高計算，為空降絕對高度及目標區障礙物標高之總和。

### 八、空降作業方式

單機門或雙機門作業。

### 九、空降場幅員

空降場之長寬，與機型、航速、編隊、機數等均有密切關係。

依照我國「陸軍航空特戰指揮部跳傘訓練現行作業程序」規定，執行跳傘任務，由空降場指揮官依照「晝（夜）間跳傘風險評估表」（次頁，表 5）<sup>4</sup>完成天候、任務整備及導航設施等共計 26 項評估，始可執行跳傘任務。

表 5、晝（夜）間跳傘風險評估表

| 陸軍空降訓練中心空降場基本傘訓跳傘訓練晝（夜）間跳傘風險評估表 |                      |       |       |       |     |
|---------------------------------|----------------------|-------|-------|-------|-----|
| 傘訓梯次<br>(班隊)                    |                      | 日 期   | 年 月 日 | 時 間   | 時 分 |
| 跳傘人數                            | 試風：員<br>基本：員<br>高空：員 | 機 型   |       | 架 次   | 機 批 |
| 能 見 度                           | 公 尺                  | 風（向）速 |       | 填 表 人 |     |

<sup>4</sup>陸軍航空特戰指揮部，《陸軍航空特戰指揮部跳傘訓練現行作業程序》（民國 111 年），頁 102

| 區分   | 項次                                                                                                                                    | 評估項目                                  | 是        | 否 | 備考 |
|------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------|---|----|
| 天氣概況 | 1                                                                                                                                     | 目標區能見度是否達 4800 公尺（3 哩）以上。             |          |   |    |
|      | 2                                                                                                                                     | 雲幕高煩高於航高 1000（含）英尺以上。                 |          |   |    |
|      | 3                                                                                                                                     | 距人員跳出前 6 分鐘地面風速是否低於 13 哩。             |          |   |    |
|      | 4                                                                                                                                     | 目標區是否降雨，若有是否影響張傘（由地面指揮官判定）。           |          |   |    |
| 任務整備 | 5                                                                                                                                     | 跳出任務前需由空降場指揮官完成勤前教育及任務提示。             |          |   |    |
|      | 6                                                                                                                                     | 救護車輛是否作用正常（醫務所準備）。                    |          |   |    |
|      | 7                                                                                                                                     | 攝影器材是否作用正常（傘整連準備）。                    |          |   |    |
|      | 8                                                                                                                                     | 週邊各魚池救生器材是否備齊（竹竿、救生圈、救生鉤）。            |          |   |    |
|      | 9                                                                                                                                     | 各地勤小組 HR-93 及民用無線電機是否暢通。              |          |   |    |
|      | 10                                                                                                                                    | 勤務人員飲用水是否足夠（水壺裝滿水、備用水桶充足）。            |          |   |    |
|      | 11                                                                                                                                    | 勤務人員交管衣、交管棒是否充足（路口人員）。                |          |   |    |
|      | 12                                                                                                                                    | 煙霧攜行數量是否滿足跳傘架次需求（一機需三罐 M1）。           |          |   |    |
|      | 13                                                                                                                                    | 空降場內是否有民人、大型廢棄物及車輛進入。                 |          |   |    |
|      | 14                                                                                                                                    | 目視空域範圍內是否有航空器影響任務執行。                  |          |   |    |
|      | 15                                                                                                                                    | 各魚池抽水馬都遷是否派人管制（絕緣手套、長竿、反光衣及救生圈等是否備齊）。 |          |   |    |
|      | 16                                                                                                                                    | 空降場周邊鐵網（告示牌）是否執行重點覆蓋及人員警戒。            |          |   |    |
|      | 17                                                                                                                                    | 周邊建築物是否指定地勤人員就位警戒。                    |          |   |    |
|      | 18                                                                                                                                    | 傘勤人員是否於空降場周邊待命。                       |          |   |    |
|      | 19                                                                                                                                    | 南、北路口管制人員「停」字旗或管制看板是否攜行。              |          |   |    |
|      | 20                                                                                                                                    | 空降場擴音設備作用是否正常。                        |          |   |    |
| 導航設施 | 21                                                                                                                                    | ACT 空管組人員是否完成適切編組。                    |          |   |    |
|      | 22                                                                                                                                    | AN/GRC-406 對空無線電機作用是否正常。              |          |   |    |
|      | 23                                                                                                                                    | 煙霧組人員是否完成勤前教育。                        |          |   |    |
|      | 24                                                                                                                                    | 各導航管制小組無線電機通聯是否正常。                    |          |   |    |
|      | 25                                                                                                                                    | 高空目標區風筒、布板是否備齊（執行高空跳傘任務時填）。           |          |   |    |
|      | 26                                                                                                                                    | 高空目標海綿墊是否鋪設（執行高空跳傘定點時）。               |          |   |    |
| 總評   | <input type="checkbox"/> 可依空中跳傘計畫時間執行任務。<br><input type="checkbox"/> 尚有部分未達標準，需於狀況解除後才可執行任務。<br><input type="checkbox"/> 危安顧慮較大，取消任務。 |                                       | 空降場指揮官簽章 |   |    |

### 柒、美軍空降場風險評估分析與我軍之差異比較

我軍因長年於潮州空降場及昌隆農場執行跳傘訓練，因此風險評估置重點於天候概況、任務整備及導航設施，其中首重任務整備與周邊安全部署。於平時訓練，依此方式可以大幅降低我軍訓練危安。然而，此風險評估分析並不適用於作戰時評估任務空降場，戰時僅能藉由圖上偵查方式評估空降場周邊地形地貌對作戰之影響。

美軍在執行空降場風險評估時，首要考量事件發生機率與發生後的嚴重性，以決定空降場之初始風險等級。其中本文針對空降場內或附近之障礙物，例如：水域、電線、樹木作討論，依照障礙物對空降場造成的危安影響將風險等級區分高風險、中風險與低風險等三個等級，並藉由數值化及矩陣表等方法快速分析風險。並針對高風險的空降場配置勤務小組，以協助不慎受困的跳傘人員。

相較於美軍，我軍準則內文針對空降場評估條文，著眼點為大範圍的要項，依照任務、敵情、天候、地形、機型、航線、航高、空降作業方式及空降場幅員等九項論述，缺少對空降場內或附近之障礙物風險評估相關內文，未來可參考美軍準則內文，作為我軍後續準則修訂之參考。

依照美軍風險評估分析方法評估我國常使用之空降場—潮州空降場（如次頁，圖 1）及昌隆空降場（如次頁，圖 2）為例（第 31 頁，表 6）：

圖 1、潮州空降場周邊地形圖



資料來源：筆者自製

圖 2、昌隆空降場周邊地形圖



資料來源：筆者自製

表 6、使用美軍風險評估分析評估我國空降場風險矩陣表

| 使用美軍風險評估分析評估我國空降場風險矩陣表 |                                               |                                              |
|------------------------|-----------------------------------------------|----------------------------------------------|
| 區分                     | 潮州空降場                                         | 昌隆空降場                                        |
| 水域障礙                   | 1,000 公尺範圍內有多處漁塭，深度達 4 英呎、寬度達 40 英呎以上，屬「高風險」。 | 1,000 公尺範圍內有林邊溪，深度達 4 英呎、寬度達 40 英呎以上，屬「高風險」。 |
| 電線障礙                   | 附近電線位於 1,000 公尺至 1,500 公尺範圍間，屬「中風險」。          | 附近電線位於 1,000 公尺至 1,500 公尺範圍間，屬「中風險」。         |
| 樹木障礙                   | 1,000 公尺範圍內有檳榔樹園，樹高介於 12-15 公尺屬「高風險」。         | 1,000 公尺範圍內有檳榔樹園，樹高介於 12-15 公尺屬「高風險」。        |
| 總評                     | 潮州空降場屬「高風險」空降場，執行任務時，周圍需配置勤務人員，以降低跳傘人員風險。     | 昌隆空降場屬「高風險」空降場，執行任務時，周圍需配置勤務人員，以降低跳傘人員風險。    |

資料來源：筆者自製

## 捌、結論

美軍因其國土廣大可於本土可開設多個訓練用空降場，亦時常於海外協同盟友執行聯合空降作戰，因此對於空降場的風險評估已建立一套標準作業模式，供其空降部隊使用。相較於我國空降部隊長年於潮州空降場執行訓練任務，演訓任務則假昌隆農場、空軍機場執行，多為經常使用之空降場，因此對於上述空降場的風險早已完成評估。不過即使是經常使用之空降場，我們仍應時常保有風險意識，以維護跳傘人員執行任務之安全。

本篇節錄美軍空降場風險評估分析之條文，建議可援引美軍對於風險評估概念與數值化的分析方法，結合我軍近年風險管控作為，以此做為修訂「空降導航及地面導引訓練教範」之依據，充實我軍準則內容，供國內空降部隊參考使用。

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