

出國報告(出國類別：實習)

參加「國家民用航空安全計畫實施」  
訓練課程  
出國報告書

服務機關：交通部民用航空局

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## 一、課程目的

國際民航組織（International Civil Aviation Organization，ICAO）於第 19 號附約(Annex 19)中要求各會員國應制定國家民用航空安全計畫(State safety programme，SSP)，該計畫之內容涵蓋人員檢定給證、航空器作業、航空器適航、飛航管制服務、航空器事故及意外調查、機場等各項民航相關業務。

我國囿於政治因素非 ICAO 之締約國，然民航事業為全球化之事業，為達成我國民用航空法「符合國際民用航空標準法則」之目的，我國已依 Annex 19 之要求訂定國家民用航空安全計畫，該計畫為 ICAO 近年甫推動之計畫，相關參考資料與指導文件仍持續建置與發布，為了解 ICAO 對該計畫最新之推動狀況與建議，遂派員參加本次訓練，以較深入瞭解 ICAO 國家民用航空安全計畫之推行現況及實務做法。

本次訓練課程係由新加坡民航學院（Singapore Aviation Academy, SAA）主辦。新加坡民航學院為新加坡民航局直屬之人員培訓機構，每年均提供 ICAO 相關標準及規範之課程，以滿足全球民用航空從業人員之培訓需求。本課程旨在使參訓學員瞭解 ICAO 標準及建議措施中對 SSP 之相關要求與實施方法，課程內容除介紹安全管理基本架構、SSP 相關標準與建議措施、SSP 推行實務說明，並提供危害識別與風險評估相關工具，鼓勵參訓學員依組織之實務需求進行修改及運用。

## 二、過程

### (一) 課程內容摘要

#### 1.1 課程單元

本訓練課程內容包含五大章節(Module)：

- 安全管理基本原理
- 安全管理標準與建議措施 (Annex 19)
- 國家民用航空安全計畫(SSP)的實施
- 危害識別與風險降低工作表格介紹
- 安全績效指標(SPI)與可接受安全績效水準(ALoSP)的建立

各章節下均再分為數個小節介紹，全部內容詳附件 1，本報告將擇要說明。

#### 1.2 授課講師及參與學員

本課程主要授課講師為 Mr. Gim Thong Teo，講師有完整的資歷，於 1971 年進入新加坡航空服務，再到法國的 STAero 公司、SLK 公司等，最後進入 CAAS，並參與 ICAO 相關事務，而現在則為新加坡民航學院的首席培訓講師，主要教授安全管理方面的課程。

參與學員共 25 人，其中 10 人來自新加坡，國際學生則有來自香港、泰國、帛琉、葉門、辛巴威及我國，大多來自民航監理單位。

## **(二) Module 1：安全管理基本原理**

### **1.1 安全的概念**

1. 要求航空器零失事或無重大意外事件、操作過程中不會產生任何危害、人員完全遵守規範或不應有失誤之安全觀念，實際上是不可能的。任何人為活動或人造系統，都無法保證危害或操作錯誤不會發生。
2. 依據 ICAO Annex 19 第二版，安全的定義為：「與航空器運作有關、或直接支持航空器運作的飛航活動，將其風險降低並控制在可接受水準的狀態。」

### **1.2 安全思想發展**

自 1950 年至 1970 年間，航空界著重於提升航空技術，以降低航空器失事及重大意外事件；1970 年後期，技術不再是維護安全之主要考量因素，而開始研究持續發生之人為操作與人為因素。1980 年後之研究發現，影響人為操作與人為因素之要因，不單是個人行為，更重要的是組織因素。組織因素會造成技術、人為因素之發生。

### **1.3 失事肇因的概念**

1. 失事發生的肇因係結合防範措施的不足（法規、訓練、技術等）、人為因素（失誤或違規）、工作環境（危害、威脅、不安全的狀況）、及組織性潛在狀況在等。

## The concept of accident causation

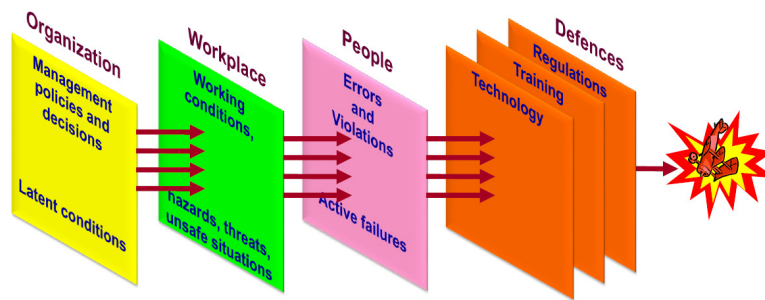


圖 2-1 失事肇因的概念

2. 本課程介紹以 Bow-Tie 工具探討失事的肇因。該工具係以不安全狀況為探討核心，左側列出造成不安全狀況所有可能的危害 (Hazard)，右側列出不安全狀況可能造成的後果(Consequence, 例如：失事)，藉以探討預防各項危害造成不安全狀況的手段，及防止不安全狀況進一步造成實質後果的措施。

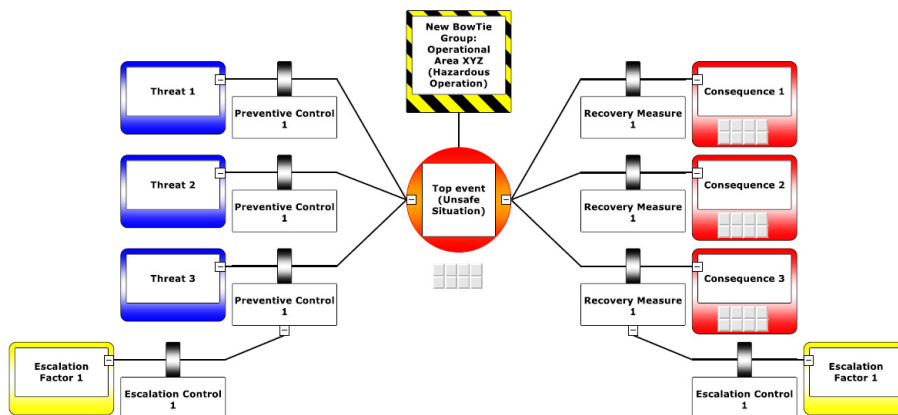


圖 2-2 Bow-Tie Accident Causation Model

### 1.4 人、環境與安全 (SHELL Model 介紹)

1. 操作背景與人員之間可能的相互關係可以用一個簡單、易懂的方式說明：SHELL Model，其中各要件說明如下：

Software (S) - 軟體，指程序、訓練、支援等。

Hardware (H) - 硬體，指機具或裝備等。

Environment (E) - 環境，指運作環境。

Liveware (L) - 人員，指工作環境中的人員。

2. 圖 2-3 即為 SHELLModel。中央的 L 意指第一線的作業人員，雖然人類被認為可以適應不同的環境，但由於人類的行為無法如電腦、機械等硬體設施般可被標準化為統一規格，因此人員與工作環境中的其他要素間並非完美無缺地結合，為了避免其他要素與作業人員間因發生緊張關係以致危害人員的作業，必須了解 SHELL 四個方格與中央 L 方格之間的交互關係，這些交互關係必須儘可能地彼此密合。

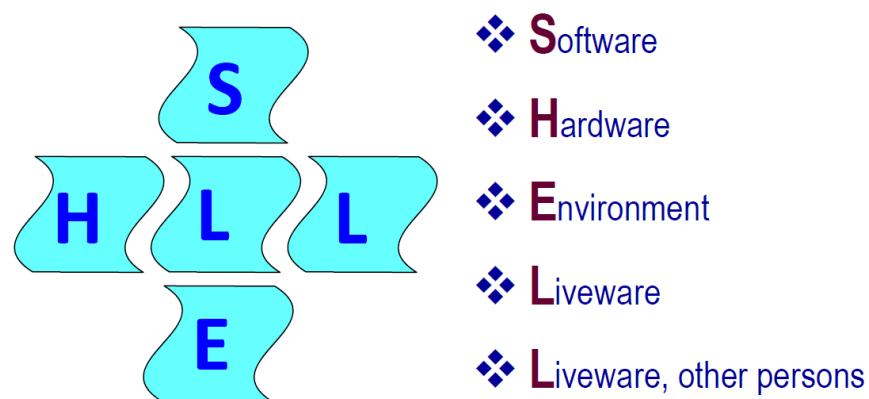


圖 2-3 SHELL Model

## 1.5 失誤與違規

### 1. 定義—

- 失誤 (Error)：操作人員作為或不作為，導致與組織或操作人員本身的意向或預期產生偏差。(非故意)



- 違規 (Violation)：故意違反既定程序、協議、規範或慣例的行為或不作為。(故意)
2. 在現今「公正文化」的環境下，執法的決策與行動應將失誤與違規予以區分。
  3. 為了控制失誤所造成的風險，可採取以下三種策略：
    - a. 降低策略—從失誤發生的源頭即予介入，降低或消除失誤發生的因子，例如：導入人因設計、人體工學設計等。
    - b. 攔截策略—一旦發生失誤，在進一步造成意外前予以攔截，例如：檢核表 (checklists)、任務卡 (task cards)、飛航條 (flight strips) 等。
    - c. 容忍策略—增加系統容許能力，不致於因失誤發生即導致嚴重的意外，例如：備用系統、雙飛行員等。
  4. 下列三種違規可能不被視為有意的作為或不作為：
    - a. 情況性違規 (Situational violations)：為反應特定情況因素而犯的違規，例如時間壓力或高工作量。
    - b. 日常違規 (Routine violations)：已成為工作團隊中辦理業務的正常方式。此類違規是針對遵守既定程序完成任務有困難的情況下發生的，可能是由於實務性或可操作性的問題，人員與技術間的界面設計有缺陷，及其他導致人們採用「變通程序」的問題，使這些違規行為成為日常工作。
    - c. 組織引起的違規 (Organizationally induced violations)：可視為日常違規的延伸，當組織試圖藉無視或越過其安全防護措施，以滿足產能增加的需求時，往往會發生這種違規行為。

## 1.6 安全文化

1. 安全文化是組織成員藉共通的安全相關信念、價值觀、偏見，及由此產生行為所形成的組織表徵。
2. 安全文化會受到組織文化、專業文化、及國家文化的影響，組織的安全文化可藉由組織風險輪廓（**Organization Risk Profile**）及通報文化（**Reporting culture**）來了解。
3. 通報文化屬於員工對通報系統所帶來的益處及潛在損害所秉持的信念與態度，可透過對組織自願通報系統的有效性進行評估。對組織通報文化良好與否可採下列語詞描述：
  - **Pathological** — 忽視或隱藏資訊。
  - **Bureaucratic** — 限制或封鎖資訊。
  - **Generative** — 客觀分析並分享資訊
4. 組織的安全文化與員工及組織對安全及品質相關事務的信念與態度有關，會影響組織 **SMS/QMS** 與通報系統的有效性，也影響組織的安全風險輪廓。健全的安全文化可見於下述表徵：
  - 有效的（**Generative**）通報文化。
  - 積極的危害識別與風險緩解活動。
  - 高階管理階層對安全責任的承諾。
  - 對持續提升的追求。
  - 正向的組織風險輪廓。

5. 健康的安全文化及組織風險輪廓無法被「執行」，可以透過自願評估和獎勵計劃進行提升。本課程提供了對航空公司組織風險輪廓評估表供參訓學員參考運用。

### 1.7 管理的兩難：在產能與安全之間取得平衡。

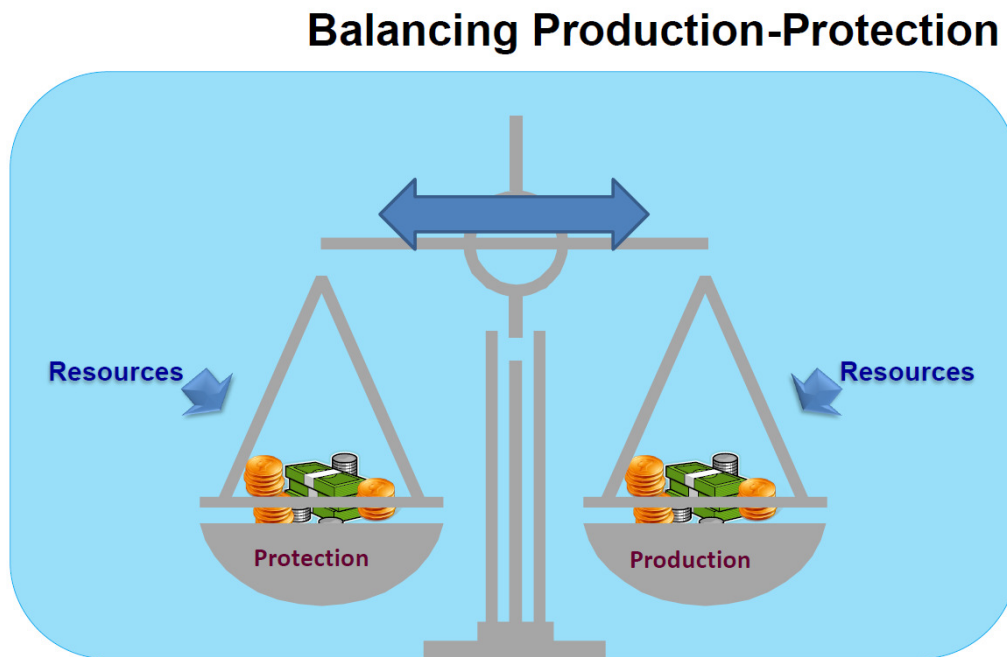


圖 2-4 管理的兩難

### 1.8 改變管理（Change Management）

1. 依據 ICAO Doc 9859 的定義，改變管理為組織以系統化方式對改變進行管理的正式過程，在實施改變前，應就已識別的危害及風險降低策略進行評估。
2. 改變管理過程所進行的危害識別與風險評估與檢視應予文件化。

### 1.9 管理系統的整合

1. 組織運作包含了各類管理系統，例如品質管理系統(QMS)、環境

管理系統(EMS)、職業健康與安全管理系統(OHSMS)、安全管理系統(SMS)等，予以整合有以下益處：

- 減少重複並因而降低成本。
  - 減少組織整體風險及增加效益。
  - 平衡潛在的目標衝突。
  - 移除潛在責任與關係的衝突。
2. 從安全管理角度，組織了解安全管理系統與其他管理系統(例如 QMS)間的相關性是很重要的，更重要的是如何適當整合 SMS 與 QMS。

## 1.10 安全通報系統

1. 安全通報系統包括：
  - 失事通報。(Accident reporting)
  - 強制性意外事件通報。(Mandatory incident reporting )
  - 自願（危害、意外、主動揭露）通報。
2. 失事通報：當發生失事時，必須通報民航局、獨立調查權責單位及 ICAO，相關規範訂於 ICAO Annex 13。
3. 強制性意外事件通報：除前述失事案件外的重大意外事件，係由民航局定義，強制航空服務提供者向民航局通報。
4. 自願（危害、意外、主動揭露）通報：非強制性的通報系統，係為取得危害、威脅、不安全的狀況、主動揭露失誤或違規等資訊。

## 1.11 安全資料收集與分析

### 1. 安全資料的類型包括：

- 失事調查資料
- 強制意外事件調查資料
- 自願通報資料
- 持續適航報告資料
- 運作績效監控資料
- 查核發現及報告
- 安全研究及檢視
- 從其他國家或區域組織取得的安全資料

### 2. 安全資料分析可用以：

- 監控與衡量安全趨勢或績效
- 找出潛在安全不足的條件
- 協助決定需要哪些額外的資訊
- 協助取得有效的結論

### 3. 資料分析的方法及工具包括：

- 統計分析
- 趨勢分析
- 規範性比較（Normative comparisons）

- 模擬與測試
  - 專家平臺或小組
  - 成本效益分析
4. 安全資訊系統宜符合下列需求：
- 包含友善的介面供資料輸入及查詢
  - 可將大量安全數據轉換為支援決策的可用資訊
  - 可降低管理者及安全員工的工作量
  - 運作於相對低廉的成本下
5. 數據庫系統的特色：
- 記錄各種類別的安全事件
  - 編寫分析、圖表和報告
  - 可檢查個別報告
  - 允許與其他組織共享安全數據
  - 監控個別報告的狀態或結束
6. 安全績效指標（Safety performance indicators, SPIs）：用以追蹤管控安全趨勢，詳細內容於 Module 3 及 Module 5 說明。
7. 安全數據庫的重要目的為支援安全績效指標的建立，以衡量並監控航空服務提供者或整體航空系統的安全績效。

## **1.12 危害識別與風險降低（Hazard identification & risk**

## mitigation)

1. 危害的定義：可能造成或導致發生航空器意外或失事的狀況或物體。
2. 危害可能導致不安全的事件，不安全的事件可能導致最終後果 (Consequence)，如圖 2-5 所示，依此概念下，本課程介紹以 Bow-Tie 工具進行危害識別與風險分析，如圖 2-2 所示。



圖 2-5 危害演變示意圖

3. 危害識別的方法分為被動式及主動式，被動式方法係藉由分析過去的事件或結果找出危害，例如失事或意外事件調查報告；主動式方法係來自現有或即時的運作狀況，例如查核或調查報告、自願危害及意外通報、運作資料監控系統等。
4. Bow-Tie 工具可以有下列三種使用模式（如圖 2-6）：
  - 從單一危害識別不安全事件及其後果。
  - 從不安全事件識別危害及後果。
  - 從後果識別不安全事件及危害。

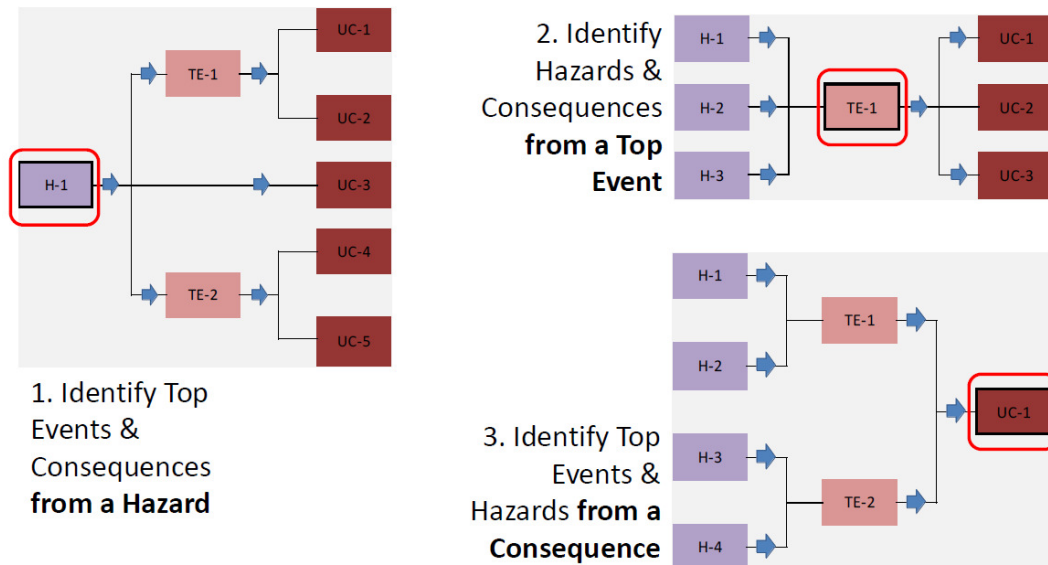


圖 2-6 識別危害、事件及後果的三種方法

5. 對於參與特定風險分析項目的人員，須注意單一風險分析所定義的危害、不安全狀況和後果，通常僅在特定營運區域或組織的範圍內。最終後果如超出了營運範圍，可能肇因於緩解措施或提升因素超出本身之權限或控制範圍。風險管理任務是確保在所在的區域或組織內設置適當的屏障，可防止危害、威脅及不安全情況。如組織所產生的不安全情況或後果增加，將成為內、外部其他組織的危害或不安全情況。
6. 安全風險的定義：對某特定危害所造成的後果，評估其發生可能性與嚴重性，即稱為風險。
7. 本課程將安全風險的可能性、嚴重程度及容忍度分為五級，相關圖表如圖 2-6~圖 2-10 所示。



<i>Likelihood</i>	<i>Meaning</i>	<i>Value</i>
Certain/ Frequent	Likely to occur many times (has occurred frequently)	E
Likely/ Occasional	Likely to occur sometimes (has occurred infrequently)	D
Possible/ Remote	Unlikely to occur, but possible (has occurred rarely)	C
Unlikely/ Improbable	Very unlikely to occur (not known to have occurred)	B
Exceptional/ Impossible	Almost inconceivable that the event will occur	A

圖 2-6 風險可能性

<b>Level</b>	<b>Descriptor</b>	<b>Severity description</b>
<b>1</b>	Insignificant	No significance to aircraft-related operational safety
<b>2</b>	Minor	Degrades or affects normal aircraft operational procedures or performance
<b>3</b>	Moderate	Partial loss of significant/major aircraft systems or results in abnormal application of flight operations procedures
<b>4</b>	Major	Complete failure of significant/major aircraft systems or results in emergency application of flight operations procedures
<b>5</b>	Catastrophic	Loss of aircraft or lives

圖 2-7 風險嚴重程度

## Safety risk index

Likelihood	Severity				
	1. Insignificant	2. Minor	3. Moderate	4. Major	5. Catastrophic
A. (exceptional/ impossible)	Negligible (1A)	Negligible (2A)	Low (3A)	Low (4A)	Moderate (5A)
B. (unlikely/ improbable)	Negligible (1B)	Low (2B)	Low (3B)	Moderate (4B)	Moderate (5B)
C. (possible/ occasional)	Low (1C)	Low (2C)	Moderate (3C)	Moderate (4C)	High (5C)
D. (likely/ occasional)	Low (1D)	Moderate (2D)	Moderate (3D)	High (4D)	Extreme (5D)
E. (certain/)	Moderate (1E)	Moderate (2E)	High (3E)	Extreme (4E)	Extreme (5E)

圖 2-8 風險值矩陣

## Safety risk tolerability

Risk Index	Risk Tolerability
<b>5D, 5E, 4E - Extreme Risk</b>	<b>STOP OPERATION OR PROCESS IMMEDIATELY...</b>
<b>5C, 4D, 3E - High Risk</b>	<b>WARNING.</b> Ensure that risk assessment has been satisfactorily completed and declared preventive controls are in place.
<b>5A, 5B, 4B, 4C, 3C, 3D, 2D, 2E, 1E - Moderate Risk</b>	<b>CAUTION.</b> Perform or review risk mitigation as necessary. Departmental approval of risk assessment required.
<b>4A, 3A, 3B, 2B, 2C, 1C, 1D - Low Risk</b>	<b>REVIEW.</b> Risk mitigation or review is optional.
<b>2A, 1A, 1B - Negligible Risk</b>	<b>NO ACTION REQUIRED.</b> Acceptable as is. No formal risk mitigation required.

圖 2-9 各風險值的容忍程度

## Safety risk mitigation (SRM)

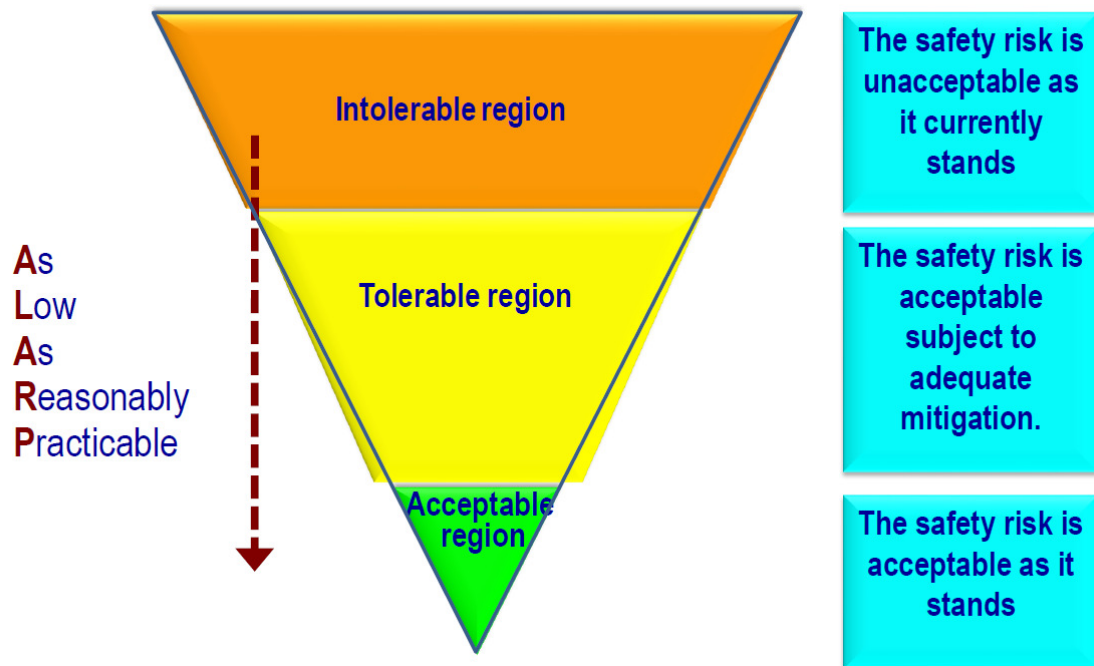


圖 2-10 風險降低策略

8. 本課程將 Bow-Tie 理論以 EXCEL 表格化設計供實務上運用，相關內容於 Module 4 中介紹。
9. 風險評估過程可能涉及人為因素（Human factors）的分析，如需進行複雜的人因與系統介面間的評估，可考慮以 SHELL 模式進行。
10. 高衝擊性的風險降低策略可能需要成本效益分析，風險評估管理過程中，如有需成本效益分析的狀況應予敘明；涉及主要組織性改變或高財務衝擊的緩解措施，即應考量成本效益分析。

### (三) Module 2：安全管理標準與建議措施 (Annex 19)

本章係列出 ICAO Annex 19 各項標準與建議，課程內容均取自 Annex 19，本報告不再臚列。

## (四) Module 3：國家民用航空安全計畫(SSP)的實施

本章是講述 SSP 的實現與實際作業，相較於前 2 章課程，本章進行了實務方面更詳細的解釋。

### 3.1 SSP 基石

1. 推行 SSP 首先需有立法規定來賦予各國家航空監管機關（例如：民航局或事故調查機構）履行其職責的權力。實施國家安全計畫通常屬民航局職責。
2. SSP 的實施與運作執行的首要工作，則應先確定 SSP 的權責主管、組織架構、負責的執行人員與相對應的法令規章，所有有關的角色和責任都應予以確定並明文記載於 SSP 中；SSP 權責主管通常為民航局局長並負有下列權責：
  - 對整體民航系統 SSP 負有最終權責。
  - 對 SSP 相關權責組織有人力與財務資源的決定權。
  - 對所有航空服務提供者的認證與監督有決定權。

課程提供常見的法規監理架構組織圖如圖 4-1 所示。

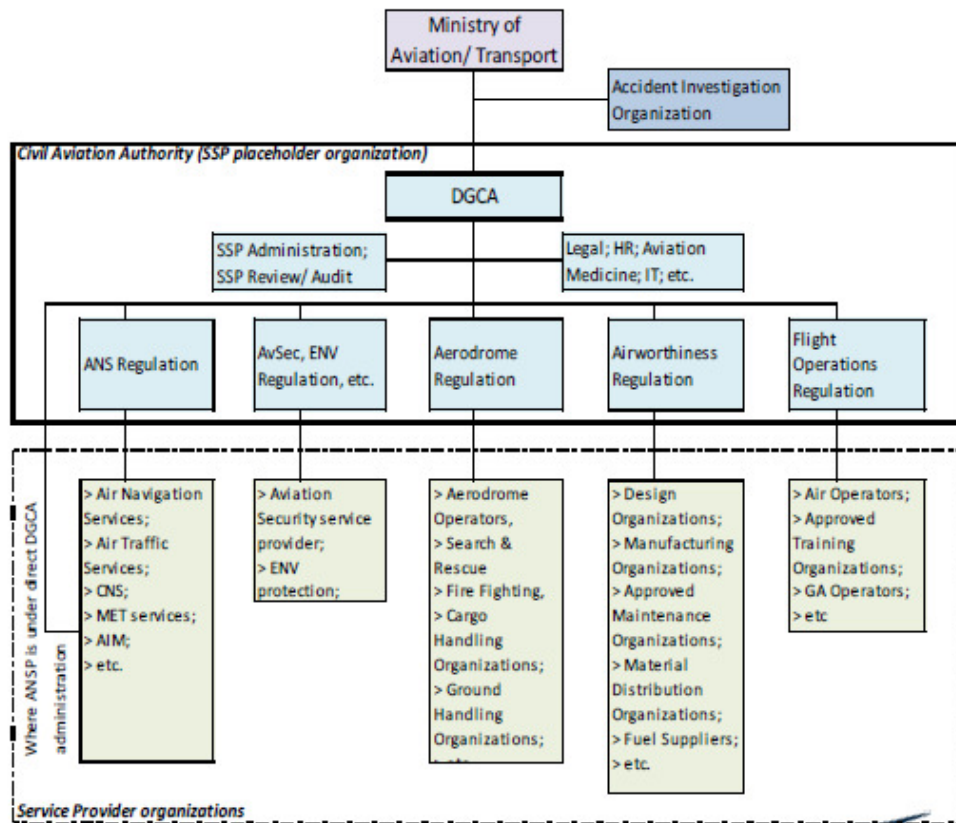
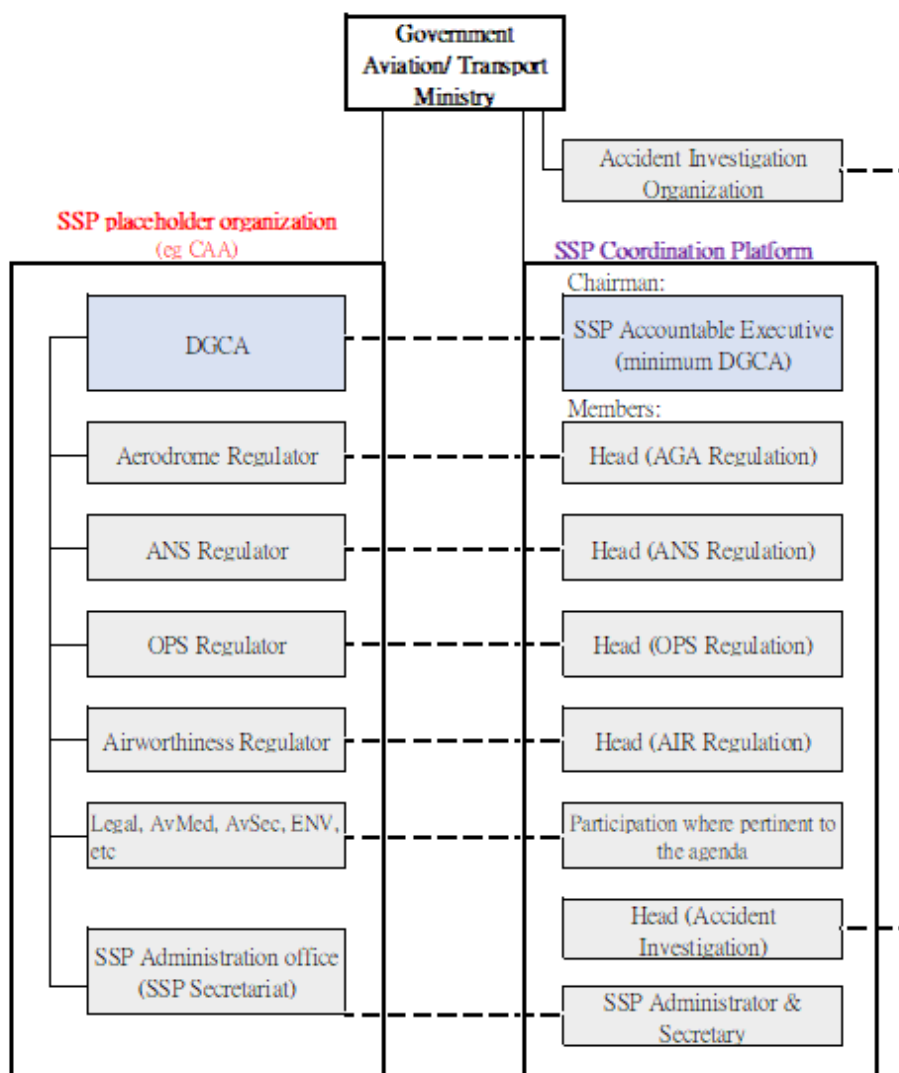


圖 4-1 常見民航監理架構

3. 應確保所有相關人員對於國家安全計畫理解一致：SSP應包括其結構和相關安全計畫方案，各個組成部分如何共同發揮作用與所扮演角色與責任。並廣泛描述各種國家安全方案如何共同發揮作用以提高安全。不管採用何種溝通管道，其目的都是促進所有相關人員對國家安全計畫的共同理解。
4. 國家應擬訂人員和組織架構，以根據 Annex 19 對航空服務提供者進行監理和督導；國家安全計畫的實施、作法、義務和職能應明文確立。
5. 當國家同時負責服務提供角色時，應清楚界定監管者與航空服務提供者 SMS 的功能。
6. 國家應建立一個負責實施和維護國家安全計畫的航空主管機關代

表，組成的適當的協調小組（SSP Coordination Committee，如圖 4-2），該小組是委員會形式，由民航局局長主持，成員包括 SSP 專責辦公室及執行秘書、飛航事故調查單位主管、各（機場、飛航服務、航空器運作與適航）監理單位主管、及其他視議程需要之民航局內部單位。



Note:  
SSP Coordination Committee should consist of State regulatory and administrative organizations representation only.

圖 4-2 SSP 協調小組成員

### 3.2 SSP 運作與實施

1. **有效實施國家安全計畫需要國家高階管理層級的承諾和各級人員的支持。**國家安全政策和國家安全目標是國家航空主管機關核可的高階聲明，同時也為安全活動和資源配置之指導。應定期審查國家安全政策和目標，以確保其相關性和適當性。安全政策應述及安全管理所必需的關鍵作法及如何履行安全責任，並國家航空主管機關核可，以表明其安全意圖，並作為程序或規則予以實施。
2. **SSP 的實施與差異分析：**可透過檢視 ICAO SSP 差異分析表及 USOAP PQs 確認 SSP 建置與實施狀態，本課程除提供了 ICAO 差異分析表，並自 USOAP PQs 挑出 SSP 相關項目共 299 項，供參訓學員作為對現行 SSP 進行差異分析之工具，經檢視未達成或部分達成的項目，納入後續實施計畫中。
3. **建置 SSP 手冊。**SSP 手冊內容架構如圖 4-3 所示；SSP 手冊應確認國家民航系統各監理部門之安全管理架構與政策，及必要的協調與整合。SSP 手冊內容係說明國家實際執行 SSP 的項目與程序，而非敘述對 SSP 的未來與期望。該手冊應由 SSP 權責主管簽署。
4. **SSP 協調小組（SSP Coordination Committee）：**
  - SSP 協調小組如圖 4-2 由 SSP 權責主管主持，SSP 相關監管部門及調查單位主管組成，為國家 SSP 運作的協調平台。
  - 本課程提供 SSP 協調小組議程與開會頻率供參訓學員參考如下：
    - a、SSP 初始建置階段：每 3 個月一次，建議議程如下：

- (a) 檢視 SSP 實施計畫進度。
- (b) 檢視 SSP 手冊建置狀況。
- (c) 檢視國家安全政策內容。
- (d) 檢視國家安全目標與相關 SPI 目標（如已適用）。
- (e) 檢視各領域 SSP 安全績效指標(SPI)的範疇與種類。
- (f) 檢視 SSP 整體 SPI 與航空服務提供者 SMS-SPI 間的關聯（如已適用）。
- (g) 檢視 SSP SPI 個別目標與警示值設定準則（如已適用）。
- (h) 建立與現行或下一監控期間整體 SSP 相關之國家預計或期望的可接受安全績效（ALoSP）。
- (i) 檢視各領域對航空服務提供者 SMS 要求的狀況與協調情形。
- (j) 檢視各領域航空服務提供者 SMS 實施狀況。

b、SSP 實施階段：每半年一次，建議議程如下：

- (a) 檢視 SSP SPI 績效與趨勢，及相對的警示值與目標（如適用）。
- (b) 檢視監控期間 SSP 整體績效，及其與國家 ALoPS 之相關性。
- (c) 檢視各領域航空服務提供者 SMS 實施狀況與監管認可情形。



- (d) 檢視 SMS 查核結果及是否有重大查核發現。
- (e) 檢視基於風險考量的安全監督（監管）計畫狀況。
- (f) 檢視航空服務提供者組織安全文化（風險輪廓）評估策略，以支持基於風險的安全監督（監管）計畫。
- (g) 檢視國家自願或保密通報系統的有效性。
- (h) 檢視國家 SSP 內部查核或檢視機制。
- (i) 檢視國家 SSP 相關 SAAQs(State Aviation Activity Questionnaires)、PQs(Protocol Questions)或符合性檢查表的符合情形。
- (j) 檢視 ICAO GASP、Annex 19 及 Doc9859 最新狀況。

#### 5. 安全政策與安全目標：

- 國家安全政策聲明實質上是向航空系統中所有相關利益相關人(Relevant Stake Holder)聲明其安全管理承諾。應由 SSP 權責主管簽署並於 SSP 手冊明確敘明。
- 制定安全目標首先要清楚地瞭解航空系統中的最高安全風險。安全目標代表國家安全管理的優先事項，並為分配和組織國家的資源提供了一個藍圖。
- 安全目標宜避免過於籠統或無法被衡量，例如「未來五年降低強制通報意外發生率」，宜訂為「在 2023 年以前，每 10,000 飛時強制通報意外發生率至少降低 5%」。

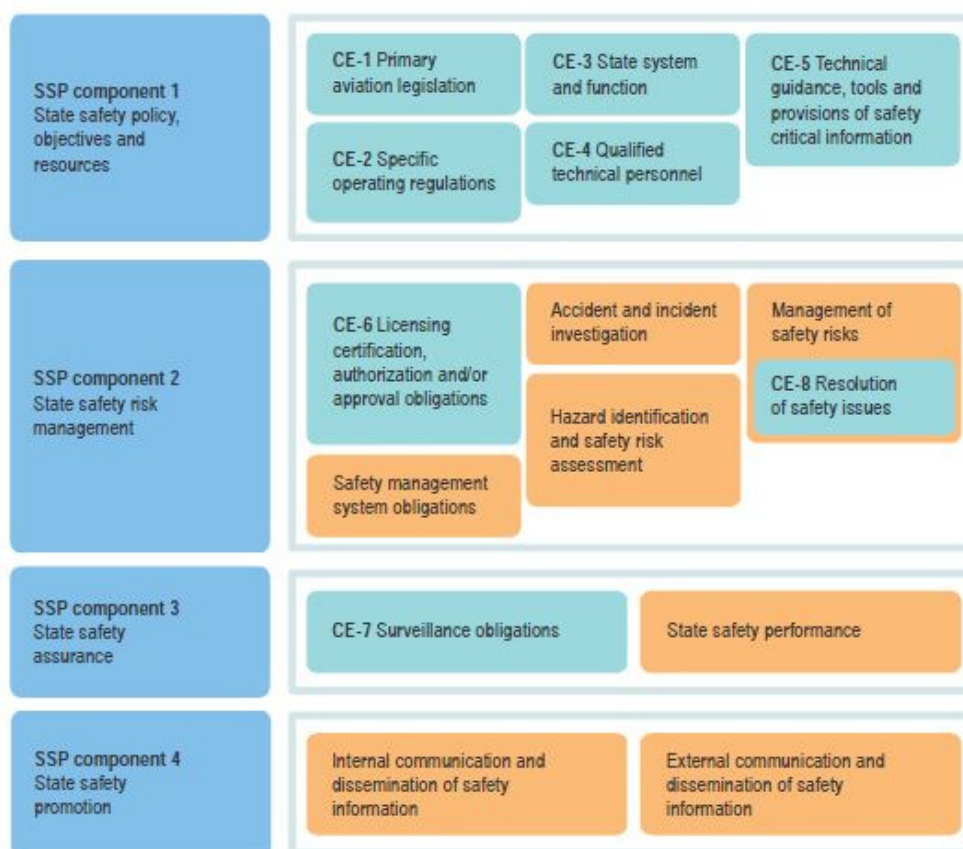


圖 4-3 國家安全計畫架構與內容

COMPONENT	ELEMENT
1. Safety policy and objectives	1.1 Management commitment
	1.2 Safety accountability and responsibilities
	1.3 Appointment of key safety personnel
	1.4 Coordination of emergency response planning
	1.5 SMS documentation
2. Safety risk management	2.1 Hazard identification
	2.2 Safety risk assessment and mitigation
3. Safety assurance	3.1 Safety performance monitoring and measurement
	3.2 The management of change
	3.3 Continuous improvement of the SMS
4. Safety promotion	4.1 Training and education
	4.2 Safety communication

圖 4-4 安全管理系統要項和要素

### 3.3 國家安全風險管理

1. **國家應要求航空服務提供者建立並實施安全管理系統。**依據 ICAO Annex 19，航空訓練機構、航空器使用人、航空器維修機構、航空器及發動機設計或製造者、飛航管制單位及認證機場應建置並實施安全管理系統，目的是向航空服務提供者提供一種系統性的安全管理做法，通過危害識別、收集和分析安全資料和安全資訊，以及持續評估安全風險，於事故徵候之前採取主動措施來降低這些風險，有效地管理其活動安全績效和資源。基本安全管理系統架構如圖 4-4。國家應建立確保航空服務提供者安全風險管理是否可接受的方法，審查航空服務提供者的安全管理系統，確保其持續識別航空系統的潛在安全風險。
2. **國家需要識別對航空系統的潛在安全風險。**國家安全風險管理組成要項需包括要求航空服務提供者實施安全管理系統，對危害識別過程和對相關安全風險加以管理。國家可透過以下系統收集對航空系統的潛在安全風險：
  - 失事及重大意外：規範於 ICAO Annex 13，由國家專責調查單位負責調查。
  - 除失事及重大意外，國家應建立強制性意外通報系統，以收集重要的安全資訊；強制性意外通報是後續進行 SSP SPI 目標與警示值得監控與追蹤的重要機制。強制意外事件的類別係由民航局訂定，本課程提供了數項可列為強制意外事件的範例供參。
  - 自願報告系統：

a、國家應建立國家層級自願報告系統，提供整個民航產業，甚至一般大眾通報安全危害或意外事件；自願報告系統可以由國家調查單位或民航局管理。

b、國家應要求航空服務提供者建置自願報告通報系統。

3. **危害識別與風險評估（HIRM）：**國家應要求航空服務提供者建立系統化機制，透過 HIRM 檢視飛航安全相關設備與程序。本課程所介紹 HIRM 相關工具的使用，後續於 Module 4 說明。

4. **航空主管機關最重要的工作之一是識別整個航空系統的危害和新出現的趨勢。**通常需透過分析從多個來源彙集的安全資料實現。

5. **安全風險管理的主要目標是利用可用的安全資料識別危險和控制危險的潛在後果。**安全風險管理的原則對於國家和航空服務提供者是相同的。航空系統可從各種面向取得安全資訊，包括：事故調查、航空服務提供者安全調查、持續適航報告、醫療評估結果、安全風險評估、查核結果和查核報告，以及安全研究和監督。航空系統所有層面都存在著危害，故應在危害導致事故、意外或其他安全相關事件發生之前識別出來。方法可包括在查核或檢查期間，或從強制性報告中識別出危害，也能從日常的系統可靠性監測中注意到安全績效下降的早期跡象。

6. **安全風險管理的目標是確保安全風險得到控制並實現可接受的安全績效水準。**國家主管機關制定、記錄和建議適當的安全風險降低或安全風險控制策略，而許多安全風險控制措施需要航空服務提供者採取行動，國家則應督導航空服務提供者有效實施。

### 3.4 國家安全績效

1. **國家安全績效的制定為對其安全管理最為重要的部分。有效的實施國家安全計畫是安全績效管理的一種決策工具**，其中應當包括：航空服務提供者的安全績效；國家的監督能力；以及通過制定指導方針向航空服務提供者提供支援。對於航空服務提供者來說，安全績效管理的主要功能是監測和衡量其管理安全風險的成效。安全管理是否成功取決於國家與其航空服務提供者之間的協定。國家確定合適的安全績效指標，航空服務提供者對指標進行監測，並與國家分享監測結果，以確立達成可接受的安全績效水準。
2. **安全得到有效管理**。建立可接受的安全績效水準，實施和達成安全績效指標和安全績效目標。建立可接受的安全績效水準的責任在於國家主管機關，航空服務提供者需要達到和維持的安全相關目標，國家對航空服務提供者的安全績效指標和目標進行認可，並在必要時採取行動。有意義的安全績效指標應反映實際的運作環境，並能突顯可用於確定安全風險控制情況的措施。
3. **國家安全績效指標經確立後須定期檢視**。定期檢視並更新和完備國家安全目標，從而更新和完備安全績效指標和安全績效目標。未達到的目標應了解其原因，並需確定即使未達到目標，安全的提升水準是否仍足夠，以及需要採取的進一步行動。這也許需要更多的分析，以查明未予以解決的風險因素，或者發掘一些可能是無效的風險降低策略。
4. **設定適宜之安全警示**，定期審查可接受的安全績效水準，以確定可接受的安全績效水準的適當性。而審視安全績效指標是否已達

到必需要採取行動的時機，則應設定安全警示，以進行修正或修補行動，實現既定的可接受的安全績效水準。

5. 設置安全警示的方法是使用總體標準差（STDEVP）原理。根據給定安全指標的過去歷史資料，得出標準差（SD）值。該標準差值加上歷史資料集的平均（中）值，形成下一個監測期的基本安全警示值。警示值可以提供早期預警，使決策者能夠作出明智的安全決策，從而提高安全績效。也能防止安全績效再惡化，並且根據資料作出決策以採取進一步行動，以將安全績效帶回可接受的區域，以期實現預期之安全目標。
6. 安全績效指標、目標值及警示設定，詳 Module 5。
7. **國家主管機關應審查並認可、及定期審查航空服務提供者提出的安全績效指標。**航空服務提供者的安全管理系統（SMS）必須得到國家主管機關的認可，安全管理系統手冊可視為安全資訊交流工具。國家主管機關在審查時，應考慮到每個安全績效指標和安全績效目標的執行情況和有效性。
8. **安全績效指標如有包括各類型指標，可更加完整和真實地反映航空服務提供者的安全績效。**安全績效指標應包括：低機率/高嚴重性事件（如事故和重大意外）、高機率/低嚴重性事件（如虛驚之運作事件、不符合規定報告、偏差等）、及實施績效（如培訓、系統改進和報告處理）。航空服務提供者訂定安全績效指標應考慮：對正確的事物進行衡量、數據的可獲性與資料的可靠性、同業共同的安全績效指標。監測和衡量安全績效主要係一種檢核安全風險控制措施有效性的手段，還可衡量安全管理系統各種過程和活動的完整性和有效性。

9. 國家主管機關藉監督航空服務提供者之安全保證程序及發展的成熟度，特別是透過監督其安全績效的管理情況，獲得經驗並熟知每個航空服務提供者之作為及表現。後續可採基於安全風險的監理（Risk-based surveillance）做法，依航空服務提供者的安全風險概況，調整對其進行的監理活動。

### 3.5 國家監督責任

1. 國家民航主管機關應確認對各航空服務提供者均有基本安全監督系統，國家安全監督系統的 8 項關鍵要素（詳述於 ICAO Annex 19 第二版 Appendix 1）構成 SSP 的基礎架構。國家對航空服務提供者的監督系統包含監理及查核活動，確保各航空服務提供者符合民航局法令規範要求，這包括許可航空服務提供者的 SMS，及定期評估其績效。
2. 國家民航主管機關通過監督過程，瞭解航空服務提供者安全管理發展的成熟度，安全管理系統的有效性不應僅以安全績效指標為唯一依據。航空服務提供者應致力於採取各種方法來確定其有效性、衡量過程的輸出和結果，以及評估通過這些活動所收集的資訊。此類方法可包括：查核、評估、事件監測、安全調查、管理階層審查、評估安全績效指標和安全績效目標及相關經驗。對安全績效和內部審計過程進行監測，有助於增強航空服務提供者不斷提升其安全績效的能力。
3. 國家民航主管機關應確保 SMS 的督導與查核為各部門對各個航空服務提供者的例行查核計畫的一部分。因 SMS 的實施結果有績效上的差異，傳統的符合性檢查難以反應航空服務提供者的 SMS 實施成效，本課程建議對 SMS 的查核以 Present（建置）、Suitable

(合適)、Operative (運作中)、Effective (有效) 等分項，針對各 SMS 查核項目給予評量，並提供如圖 4-5 所示之 SMS 查核表供參訓學員運用。該表列出 SMS 各主要查核要項，依所得實施狀況給予評分，並以百分比方式呈現航空服務提供者 SMS 的整體實施表現。

ROUTINE SMS AUDIT CHECKLIST

/ Routine SMS audit checklist\_PSOE

4/5/16

SMS element		Assessment Question	Maturity Assessment*				Remarks
			P	S	O	E	
Management commitment and responsibilities [1.1]	1	The safety policy is relevant to the scope and complexity of the organization's operations.					
	2	There is evidence that the safety policy is communicated to all employees with the intent that they are made aware of their individual safety obligations.					
	3	There is a periodic review of the safety policy by senior management or the safety committee.					
	4	The accountable manager's terms of reference indicate his overall responsibility for all safety issues.					
Safety accountabilities [1.2]	1	There is a safety committee (or equivalent mechanism) that reviews the SMS and its safety performance.					
	2	The accountable manager's final authority over all operations conducted under his organization's certificate(s) is indicated in his terms of reference.					
Appointment of key safety personnel [1.3]	1	The manager performing the SMS role has relevant SMS functions included in his terms of reference.					
	2	The manager responsible for administering the SMS does not hold other responsibilities that may conflict or impair his role as SMS manager.					
	3	The SMS manager has direct access or reporting to the accountable manager concerning the implementation and operation of the SMS.					
	4	The SMS manager is a senior management position not lower than or subservient to other operational or production positions.					
Emergency response planning [1.4]	1	The ERP addresses possible or likely emergency/crisis scenarios relating to the organization's aviation service/ product deliveries.					
	2	The ERP includes procedures for the continuing safe production, delivery or support of its aviation products or services during emergencies or contingencies.					
	3	ERP drills or exercises are carried out according to plan and the results of drills carried out are documented.					

SMS element		Assessment Question	Maturity Assessment*				Remarks
			P	S	O	E	
Safety performance monitoring and measurement [3.1]	1	The organization's SMS safety performance indicators have been agreed with the relevant national aviation authority.					
	2	There are high-consequence data-based safety performance indicators (e.g. accident and serious incident rates).					
	3	There are lower-consequence safety performance indicators (e.g. non-compliance, deviation events).					
	4	There are alert and/or target level settings within the safety performance indicators where appropriate.					
	5	There is periodic review of the organization's package of SMS-SPIs by its management or safety committee as applicable.					
	6	There is evidence of corrective or follow-up action taken when targets are not achieved and/or alert levels are breached.					
The management of change [3.2]	1	There is a procedure to ensure that changes to the organization's aviation safety-related processes and operations do include an evaluation of the hazard identification and risk assessment status of the affected processes or operations.					
	2	Management of change documentation pertaining to aviation safety-related processes and operations are maintained, including their hazard identification and risk assessment evaluation outcomes.					
Continuous improvement of the SMS [3.3]	1	There is evidence that an internal SMS audit/assessment has been planned and carried out.					
Training, education and communication [4.1, 4.2]	1	There is evidence that all personnel involved in SMS operations have undergone appropriate SMS training or familiarization.					
	2	Personnel involved in conducting risk evaluation are provided with appropriate risk management training or familiarization.					
	3	There is evidence of a safety (SMS) publication, circular or channel for communicating safety and SMS matters to employees.					
Sub-Total							
Total (max 160)							

圖 4-5 SMS 例行性查核檢查表

- 基於安全風險的監理( Safety risk-based surveillance)適合於具有成熟安全管理系統的組織機構，也可適用於尚未實施安全管理系統



的組織機構。有效的基於安全風險的監理，其基礎是具有足夠可靠和有意義的資料。

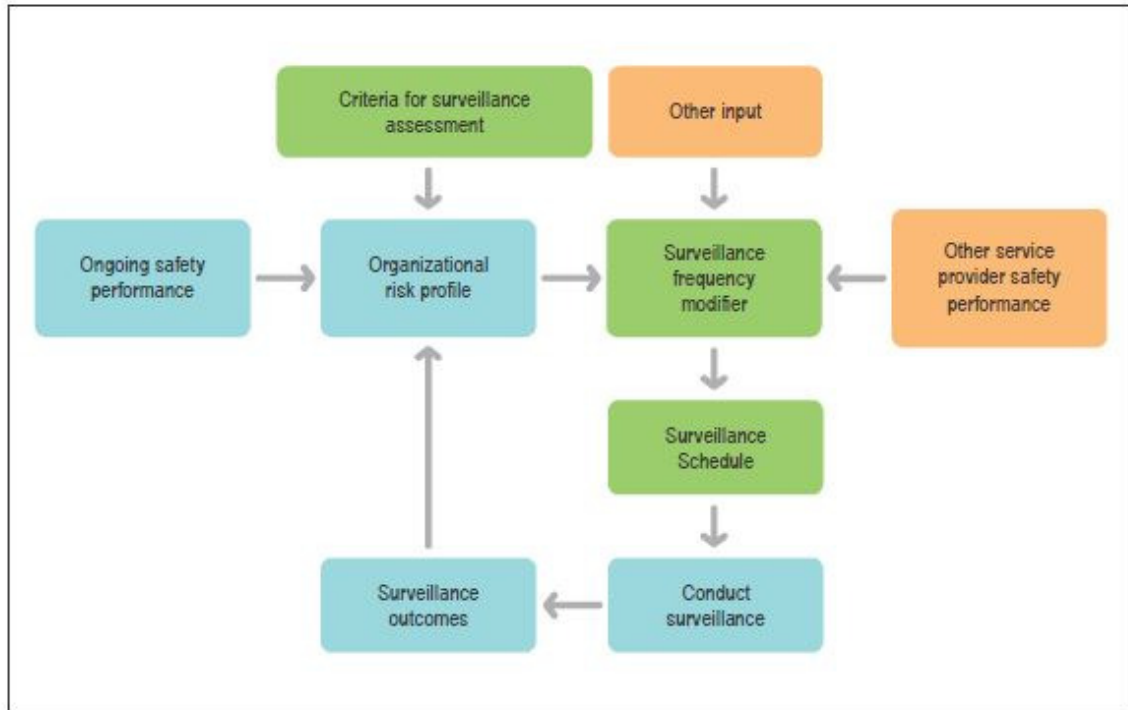


圖 4-5 Safety risk-based surveillance concept

5. 基於安全風險的監理，實施方式說明如下：
- a. 將傳統符合性檢查表予以量化，例如圖 4-6 所示方法，將各檢查項目以評分方式評比，以百分比型式對檢查結果整體評分。
  - b. 建立航空服務提供者風險輪廓（ORP, Organization Risk Profile），本課程以航空公司為例提供組織風險參數共計 40 項，形式如圖 4-7 所示，並依總分列等組織風險層級（由 A~E）。
  - c. 綜合前述兩項評分結果，可如圖 4-8 所示，做為對該航空服務提供者查核頻率調整的依據。

SURVEILLANCE CHECKLIST INSPECTION OF AIRCRAFT AT RAMP			
Name of Operator: Aircraft Type: Regn. No.: Flight No.: Location/ Bay No.: Date of Inspection: Name & Designation of Inspecting Officer:			
S/N	ITEMS OF INSPECTION	Score (1 to 10)	Remarks
1.	Proper procedure of fuelling/ defuelling of aircraft and observance of Safety Precautions during fuelling/ defuelling operation.	8	
2.	Condition of refueller/ dispenser/ hydrant pit.	7	
3.	Observance of proper Marshalling procedures.	9	
4.	Catering, cleaning, toilet and water servicing - procedure & effectiveness.	9	
5.	Proper loading of Cargo/ Baggage.	8	
6.	Proper communication between cockpit and ground crew.	9	
7.	Condition of surface of the tarmac.	7	
8.	Foreign object debris cleanliness around aircraft.	2*	Item 8: Found a nail in front of LH main wheels
9.	Proper positioning of ground support equipment/ vehicles.	8	
10.	Condition of markings on the tarmac.	8	
11.	Serviceability of Aero bridge (if applicable).	10	
Total Score - %		85	77.2%

圖 4-6 檢查表數值化示意圖

ORGANISATION RISK PROFILING (ORP) - Air Operator [Safety Culture Assessment Concept]				/ AOC ORP Jan17	
Organisation Name:		Assessment Period:		Assessed By / Date:	
	Organisation Risk Parameter	RISK LEVEL / PROFILE			Score
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
1	General public reputation.	Perceived as an undesirable organization - from customer or employee perspective.	Perceived as an average organization - from customer or employee perspective.	Perceived as a desirable organization - from customer or employee perspective.	3
2	Financial health of the Organisation	More losses than profits	Break-even most of the time	Consistently profitable	3
3	Company experience (years of operation)	< 5 years	5 to 10 years	> 10 years	3
4	Organization safety culture	Individual employees and organization at large do manifest disinterest or a negative attitude or behaviour concerning safety and quality matters.	Individual employees or organization at large does not manifest any consistent positive or negative attitude or behaviour concerning safety and quality matters.	Individual employees and organization at large do manifest a positive and healthy attitude and behaviour concerning safety and quality matters.	3
5	Experience & qualification of Accountable Executive (as of assessment date)	Has <3 years aviation experience AND no technical qualification	Has > 3years aviation experience OR technical qualification.	Has > 3 years aviation experience AND aviation technical qualification	3
6	Accountable Executive - ownership of safety/ quality functions.	Safety/ quality functions non existent in Accountable Manager TOR.	Accountable Manager TOR has negligible or indistinct mention of safety/ quality functions	Final accountability for safety & quality matters clearly addressed in Accountable Manager TOR.	3
		Has < 5 years civil aviation	Has >5 years civil aviation safety/	Has >15 years civil aviation	

	SUB - TOTAL
Level 3 (Least desirable)	8
Level 2 (Average)	17
Level 1 (Most desirable)	15
NA	0
Total No of Questions scored	40

ASSESSMENT RESULT	
Total Pts	OPERATOR RISK PROFILE CATEGORY
73	D

Total Score	ORP Category
40-49	A (Most Desirable)
50-59	B
60-69	C
70-84	D
85-120	E (Least Desirable)

Note: The green shaded items can be deemed to be generic ORP parameters, whereas the unshaded ones are more sector specific (in this case, air operators)

Note: See Sheet 2 for ORP input to Surveillance frequency/ scope calibration

<b>Notes:</b>	
1	Risk level criteria descriptions/ figures are illustrative only, subject to customization and validation of actual figures to be used.
2	Checklist will need to be separately customized for AMOs, Aerodrome & ATS SPs.
3	Points to be allocated for each parameter assessed - namely 1, 2 or 3 for Level 1, 2 and 3 respectively.
4	This Checklist assessment may be completed by assigned Inspector/ Surveyor on scheduled basis (such as during organisation audit). He may need to liaise with the service provider to obtain some of the data required.
5	This ORP assessment process may not be mandatory in view of those parameters which are outside of normal regulatory purview eg staff turnover rate, etc. It may be administered as a supplementary/ voluntary participation basis.
6	Total points achieved and its corresponding ORP Category (Cat A to E) to be annotated. Results should be provided to the organization assessed.
7	Results of this ORP assessment may be correlated with other regulatory inspection/ audit program findings to identify areas (organisations) with greater concern or need as per SSP element 3.3 requirements. Otherwise, notification of ORP results to each organization alone may suffice as a mechanism to encourage organizational behavior (safety culture) towards the desirable category where applicable.

圖 4-7 組織風險輪廓評估表

Table A

Current ORP Score (%)		Current Surveillance Result (%)				
		90-100	80-90	70-80	60-70	50-60
		1	2	3	4	5
90-100	A	1A	2A	3A	4A	5A
80-90	B	1B	2B	3B	4B	5B
70-80	C	1C	2C	3C	4C	5C
60-70	D	1D	2D	3D	4D	5D
50-60	E	1E	2E	3E	4E	5E

Table B

Surveillance Index	Next surveillance interval
1A	36 mths
1B, 2A	30 mths
1C, 2B, 3A	24 mths
1D, 1E, 2C, 2D, 3B, 3C, 4A, 4B	18 mths
2E, 3D, 3E, 4C, 4D, 5B, 5C	12 mths
4E, 5D, 5E	6 mths

圖 4-8 基於安全風險的查核應用

#### 6. 強制執行政策與程序：

- a、國家法律規章應授權國家民航主管機關對於航空服務提供者或持證人員有違規行為時，具有罰款或行政處分的權力。
- b、國家應建立程序，允許航空服務提供者在其 SMS 或 QMS 範圍內，在監管單位允許的情況下，內部處理和解決安全或品質問題。該程序應包括向民航局提交安全或品質調查報告，特別針對民航局所訂定的強制性報告事件。
- c、國家應建立強制執行政程序處理安全違規的準則，可包括：
  - 涉及重大過失，故意或蓄意侵犯或犯罪活動的特定事件。
  - 航空服務提供者的調查報告、所採取或建議的改正措施有嚴重偏見或不足。
  - 航空服務提供者的安全或品質調查和處理過程不足或無效。

- 航空服務提供者未能完全向民航局提供所需的安全資訊。
- SMS 或 QMS 績效不令人滿意，並始終未能達到所預期的安全績效水準。
- 航空服務提供者屢次違規。

d、國家應將決策輔助工具納入法規強制執行政程序中，公平之評斷航空服務提供者或人員對安全或品質相關違規的責任；在 SSP 及 SMS 環境中，強制執行政策和程序應適度納入強制執行或處分行動之規定，這是為了確保所有相關條件和情況皆已納入考量，尤其是針對潛在的組織因素。本課程提供決策輔助工具如圖 4-9。

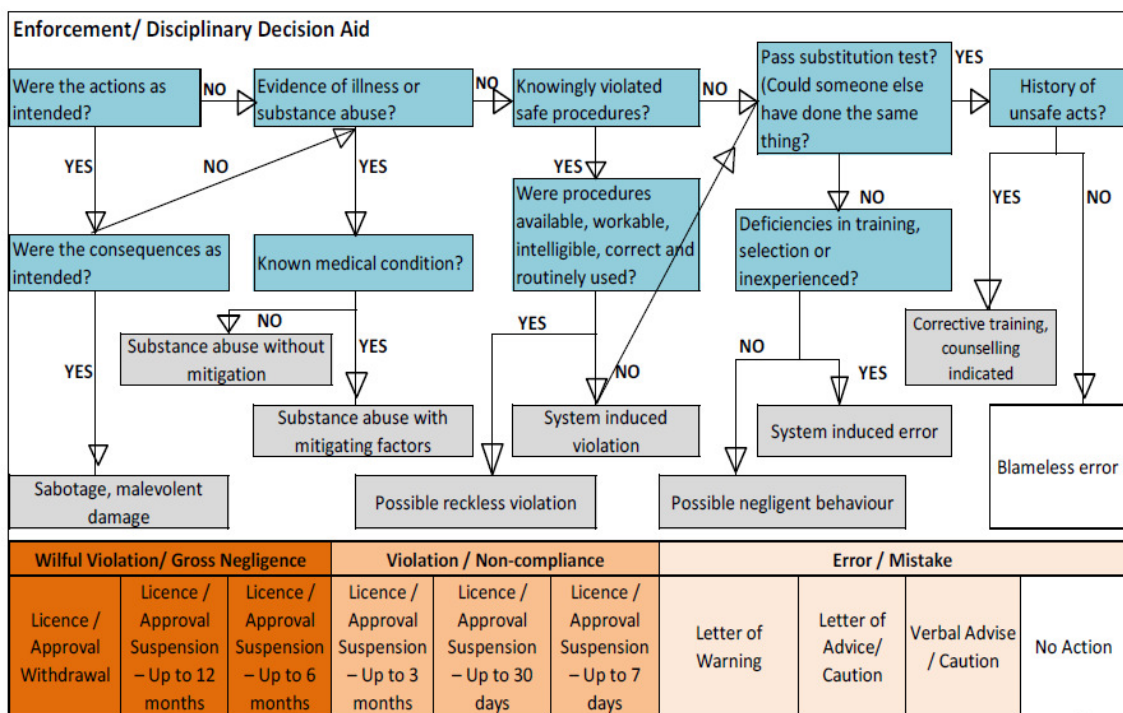


圖 4-9 強制執行決策輔助工具

### 3.6 國家安全提升

1. **國家安全計畫應支持和鼓勵積極的安全文化**；確保對安全資料和安全資訊及相關來源的保護，具有安全管理系統的航空服務提供者可在某種條件和情況下在其安全管理系統範圍內處理和解決涉及某些內部安全問題的事件。通過使用安全管理原則，國家與其航空服務提供者之間的關係應超越遵守和強制執行，發展為旨在維護或持續提高安全績效的夥伴關係。
2. **保護安全資料、安全資訊及其相關來源：其目的在於確保它們可持續獲得**，以使用於維護或提高航空安全，同時鼓勵個人和組織機構報告安全資料和安全資訊。保護原則適用於安全資料、安全資訊和相關來源，除非主管當局確定適用三項例外原則中的某一項。在每一特定情況下，主管當局的任務將是決定是否適用特定的例外原則。強制性和自願性安全報告系統所捕獲的安全資料和安全資訊應受到不同程度的保護，以鼓勵人們自願地提供安全資料或安全資訊。
3. 國家應確定對組織(機構)內擔任不同角色和責任的人員最適當之培訓，包含：國家安全計畫、安全管理系統、安全政策與目標、可接受之安全績效水準，以及對航空服務提供者監督等相關的訓練。
4. 安全宣傳活動和出版物也可以改善國內參與安全監督的不同組織機構之間的協調與合作。在其內部溝通和傳播中應當處理的資訊包括：國家安全計畫文件、政策和程序；安全績效指標、部門安全績效資訊；部門組織安全風險概況、系統安全責任的溝通、從事故和事故徵候中吸取的經驗教訓、和安全管理概念和最佳做法。內部傳達安全資訊之方式，包含：簡報、公告、傳單、出版物、研討會、會議、培訓、網站、郵寄清單、在社交媒體上發佈

資訊、協作小組開展討論等多種管道。國家應建立適當的溝通平臺或媒體，以促進安全管理系統的實施，並改善全系統的安全文化。

## （五）Module 4：危害識別與風險降低工作表格介紹

### 4.1 工具使用概述

1. 本章係介紹課程推薦的安全風險評估工具的使用方法（已編輯為 EXCEL 檔供餐訓學員直接運用，以下簡稱 HIRM 工作表），該工具是從 Bow-Tie 的概念轉化而來，本報告就該工具的特色及須考慮參數簡要說明。
2. 承本報告 2.12 及圖 2-6 之說明，Boe-Tie 工具的使用可分別以單一危害、不安全事件或單一後果為核心，分為三種不同使用模式，無論採何者模式，在使用 HIRM 工作表時，僅考慮「單項危害」對應「單項事件」，再對應「單項後果」來分析；因此 HIRM 工作表首先係就各單項內容於以陳述，如圖 5-1 所示。

A	
1. AREA/ OPERATION/ EQUIPMENT:	<i>OPS: Aircraft Take-Off/Climb Operations</i>
2. HAZARD / THREAT [H/T]:	<i>H-1: Inclement weather during climb-out</i>
3. UNSAFE EVENT [UE]:	<i>TE-1: Inadvertent flight into inclement weather/storm during departure</i>
4. ULTIMATE CONSEQUENCE [UC]:	<i>UC-1: LOCI - due to inclement weather (windshear/ down draft)</i>

圖 5-1 HIRM 工作表 1

3. 就危害發展為不安全事件，及不安全事件發展為後果，討論相關現有風險緩解策略，依相對應類別填列於表格，如現有在現有風險緩解策略下，風險值未在可接受範圍，進一步討論新增風險降



低策略。完成後的表格型式如圖 5-2 至圖 5-4 所示。

4. 有關風險值的決定，HIRM 工具針對可能性及嚴重程度均有相關細部考慮因素，後續將進一步說明。

B		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
H-1: Inclement weather during climb-out	Hazard / Threat	Unsafe Event Mitigation (as applicable)																													
		Existing Preventive Controls [E-PC]												ERI & T		New Preventive Controls [N-PC]												RRI & T			
		1. Emergency/ Backup system [EB]													3C	Existing Risk Index	1. Emergency/ Backup system [EB]														
		2. Equipment/ Tooling [ET]															2. Equipment/ Tooling [ET]														
3. Regulation/ Requirement [RR]														3. Regulation/ Requirement [RR]																	
4. Std Operating Procedure [SP]														4. Std Operating Procedure [SP]																	

圖 5-2 HIRM 工作表 2

Description of Existing Preventive Controls [E-PC]
<b>E-PC1: Pilot review weather Report before departure [BSV - 3]</b>
EF>E-PC1: <i>Nil</i>
EC>EF>E-PC1: <i>NA</i>
<b>E-PC2: Pilot use of airborne weather radar [BSV - 4]</b>
EF>E-PC2:
EC>EF>E-PC2:
<b>E-PC3: Pilot request for deviation due to weather [BSV - 4]</b>
EF>E-PC3:
EC>EF>E-PC3:
<b>E-PC4:</b>
EF>E-PC4:
EC>EF>E-PC4:

圖 5-3 HIRM 工作表 3-風險降低策略描述

5-1. Existing Risk Index [Hazard > Unsafe-Event]	
1 Existing Severity level of UE [Sht 4C] >	3
2 UE's Optimum No of Barriers (ONB) [Sht 4A, Table3] >	4
3 Applicable CBSV-Likelihood Table [Sht 4A, Table 3] >	4 (iii)
4 BSV of Existing-PCs [Sht 4A, Table 1 & Sht 4B] >	
E-PC1	3
E-PC2	4
E-PC3	4
E-PC4	
E-PC5	
E-PC6	
E-PC7	
E-PC8	
5 Therefore, CBSV (SUM) of all E-PCs >	11
6 CBSV of ONB ( <u>Applicable if E-PCs is &gt; ONBs</u> ) > (SUM of barriers with best BSVs)	NA
7 CBSV of UE (item 5 or 6, whichever is applicable) >	11
8 Existing Likelihood of the UE (Table of item 3) >	C
9 Existing Risk Index of UE [Sht 8] >	3C
10 Existing Tolerability of UE >	Moderate Risk

圖 5-4 HIRM 工作表 4-風險值評估



## 4.2 決定風險降低策略的考慮因素

1. 危害通常具屬永久性或重複發生的性質，無法僅以單一傳統的矯正措施有效地處置或移除。
2. 避免將不合法令規範的議題視為危害。
3. 風險降低策略研擬的行動應在風險降低評估團隊或組織的領域或專業知識範圍內。
4. 成本、效益及資源都須納入考量。

## 4.3 三種主要的風險降低措施

1. 危害消除：將危害直接消除或移除，只有在以傳統矯正措施可確實完全消除或移除危害的情形下適用，例如維修、更換、矯正或處置；這類危害通常為暫時性、短暫或單一的，通常沒有必要透過系統化的安全風險降低措施解決。例如：滑行道指示牌不清楚或損壞。
2. 危害避免：藉由中止或取消運作活動或運作的相關部分，以完全避免危害（及因而產生的後果）。這可能是儘管考慮了所有可能的（或在經濟上可行的）降低策略，但最終的風險指數仍然是高度不可容忍的。例如：當火山活動時，取消火山活動相關空域。
3. 風險降低：藉由將風險指數（嚴重程度）降低到可接受或可容忍的水準，減輕危害造成的後果。這可透過合併新的防禦措施或加強現有的防禦措施來達成，適用於具有永久性或重複性且無法通過傳統矯正措施移除的危害。例如：機場的鳥類活動。

## 4.4 風險值的評估-「可能性」相關參數

1. 風險降低策略的效果：每項風險降低策略或防禦機制均就下述各方面參數給予相對應評分，綜合評分高者代表對降低風險可能性的效果佳：
  - a. 效果(Effectiveness)：對降低風險嚴重性及可能性的有效程度。
  - b. 費用與效益(Cost/benefit)：緩解措施所帶來的效益超越其成本。
  - c. 實用性(Practicality)：緩解措施可行程度。
  - d. 可接受性(Acceptability)：緩解措施可被相關利害關係人接受。
  - e. 執行性(Enforceability)：對新法令、規範或操作程序的符合性之可監控性。
  - f. 耐久性(Durability)：緩解措施可持續並有效。
  - g. 非預期後果(Unintended consequences)：新的緩解措施是否導致其他非預期的危害。
2. 風險降低策略的數量：足夠數量的風險降低策略或防禦機制對降低風險可能性的效果佳；依據風險值嚴重程度，風險降低策略或防禦機制的數量建議最小值如下：
  - a. 可忽略(Negligible, 嚴重程度 1)：2 項
  - b. 輕微(Minor, 嚴重程度 2)：3 項
  - c. 中等(Moderate, 嚴重程度 3)：4 項
  - d. 重大(Major, 嚴重程度 4)：6 項

- e. 災難 (Catastrophic, 嚴重程度 5) : 8 項
3. 前述兩項參數經確認後均予加權平均，確認最終響風險值的可能性，本課程所提供 EXCEL 檔工具已設定相關參數與計算過程供參訓學員直接運用。

#### 4.5 風險值的評估-「嚴重性」相關參數

1. 依所要評估的「不安全狀況 (Unsafe Event)」或「後果 (Ultimate Consequence)」，就下列參數給予相對應評分，綜合評分高者代表風險嚴重性高：
  - a. 大眾或旅客 (Public/ Pax [Safety]) : 對大眾或旅客安全的影響程度。本項加計 4 倍加權。
  - b. 員工或雇員 (Worker/ Employee [Safety]) : 對員工或雇員安全的影響程度。本項加計 3 倍加權。
  - c. 服務或產能 (Service/ Product [Quality]) : 對所提供的服務品質、產品或系統效能的影響程度。本項加計 2 倍加權。
  - d. 資產或財務 (Asset/ Financial [Loss]) : 財務或有形資產損失的程度。
  - e. 聲譽 (Reputation [Loss]) : 對組織或國家聲譽的損失。
  - f. 保安 (Security [Compromise]) : 危及航空或組織保安的程度。
  - g. 環境 (Environmental [Damage]) : 對環境損害程度。
2. 完成各項評分並給予加權可得到「不安全狀況 (Unsafe Event)」或「後果 (Ultimate Consequence)」的風險嚴重值。

## 4.6 書面紀錄

風險評估完成後應予書面紀錄，圖 5-5 為課程提供的風險評估成果報告範例，依安全管理系統手冊內容由權責主管或適當授權人員簽署。

### SAFETY RISK MITIGATION REPORT

Organization Name	<i>Flight Standards Div, SRG</i>		SRM Report No: <i>BT/LOC/01/2019</i>
Operation / Process / Area	<i>Aircraft Take-Off/Climb Operations (Changi)</i>		Date:
Hazard >	<i>H-1: Inclement weather during climb-out</i>		Department: <i>F/Ops</i>
Top Event >	<i>TE-1: Inadvertent flight into inclement weather/storm</i>		Section:
Consequence >	<i>UC-1: LOCI due to inclement weather (wind shear/ down draft)</i>		Reserved
Hazard ID Code >	<i>LOCI Risk, Row 6, SRG HRM dB</i>		Reserved
Project start date: <i>18/3/19</i>	Project completion date: <i>4/4/19</i>	Next Review date: <i>TBC</i>	
Existing Risk Index & Tolerability: Top Event > <i>2B, Low Risk</i> Consequence > <i>3C, Moderate Risk</i>		Resultant Risk Index & Tolerability: Top Event > <i>NA</i> Consequence >	
Documents Attached (as indicated below):			
Item	Document		Remarks
1	Schematic output of the completed SRM project - completed BTPX Diagram / HIRM <i>Wshd</i>		<i>See Attachment A &amp; B</i>
2	Summary of SRM methodology/ outcomes/ recommendations.		<i>See Attachment C</i>
3	Other attachments (documents, drawings, references, standards, exceptions, etc.), if any		<i>Nil</i>
SRM Project Team Leader:			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div><i>Capt. Cheong Kah Seng</i></div> <div><i>FOI (Flight Standards)</i></div> </div> <div style="display: flex; justify-content: space-between;"> <div>Sign-Date</div> <div>Name</div> <div>Designation</div> </div>			
SRM Project Team Members:			
Reviewed by SPL/ SMA/ Others :			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Sign-Date</div> <div>Name</div> <div>Designation</div> </div>			
Approved by (DDG/ SD/ Division/ Section Head):			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Date</div> <div>Name/ Designation</div> <div>Signature</div> </div>			
Note: Upon approval, forward copy to HIRM database Office for SRM Action update/ closure			

圖 5-5 安全風險評估報告格式

## (六) Module 5：安全績效指標與可接受安全績效水準的建立

### 5.1 安全績效指標的建立

1. 承前述 Module 3 對 SSP 安全績效指標（Safety Performance Indicator, SPI）的說明，SPI 依其嚴重程度分為高後果指標（High Consequence Indicator）及低後果指標（Lower Consequence Indicator）。
2. 本課程針對 HIGH Consequence SSP SPI 舉例如下：
  - a. 航空器操作：
    - 航空器失事率
    - 航空器重大意外發生率
    - 航空器強制報告意外發生率
    - 航空器引擎空中關車發生率
  - b. 航空站運作：
    - 航空器於航空站地面失事率
    - 航空器於航空站地面重大意外發生率
    - 航空器於航空站地面強制報告意外發生率
    - 航空站跑道入侵意外發生率
    - 航空站設施嚴重故障（例如：跑道燈光系統）
  - c. 飛航服務運作：

- 飛航情報區範圍內與飛航服務相關航空器失事率
- 飛航情報區範圍內空中接近意外發生率
- ANS/ATC/CNS 系統設施嚴重故障（例如：雷達系統）

3. 本課程針對 LOW Consequence SSP SPI 舉例如下：

a. 航空器操作：

- 航空器意外發生率（非強制通報意外）
- 危險物品意外發生率
- 航空器操作違規減免申請的核發
- 航空器定期檢查違規減免申請的核發
- 民航局對航空公司檢查（LEI%或 findings）
- 民航局對航空公司外站檢查（LEI%或 findings）
- 民航局對外籍航空公司機坪檢查（LEI%或 findings）

b. 航空站運作：

- 航空器於航空站地面意外發生率（例如放棄起飛、滑行道入侵、鳥擊、因 FOD 受損等）
- 航空站地面車輛事故發生率（未涉及航空器）
- 民航局對航空公司檢查（LEI%或 findings）

c. 航空管制飛航服務運作：

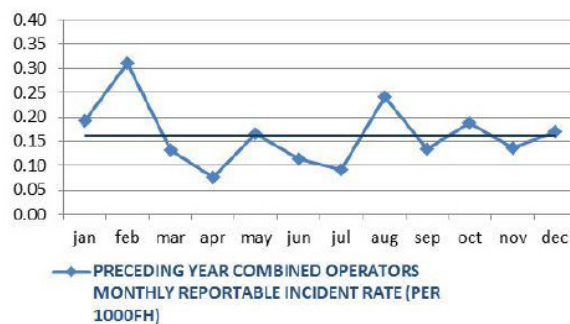
- 飛航情報區範圍內 TCAS 意外

- 飛航情報區範圍內 level bust 意外
- 飛航情報區範圍內隔離不足意外
- 民航局對航管單位檢查（LEI%或 findings）

## 5.2 SPI 目標值及警示設定

1. 進行 SPI 目標值及警示設定，應先取得該指標前一年度的運作資料，並依月份營運量換算為標稱值（nominal values），如圖 6-1；該圖範例係以每飛行小時發生意外的次數為例，是 SPI 的性質決定適當基數，例如可採起降架次、管制架次等。

Preceding Year				
Mth	All Operators Total FH	All Operators Mandatory Incidents	Incident Rate*	Ave (line)
jan	51,837	10.00	0.19	0.16
feb	48,406	15.00	0.31	0.16
mar	53,354	7.00	0.13	0.16
apr	52,513	4.00	0.08	0.16
may	54,037	9.00	0.17	0.16
jun	52,673	6.00	0.11	0.16
jul	54,086	5.00	0.09	0.16
aug	54,043	13.00	0.24	0.16
sep	52,383	7.00	0.13	0.16
oct	53,042	10.00	0.19	0.16
nov	51,353	7.00	0.14	0.16
dec	53,006	9.00	0.17	0.16
			Ave	0.16
			SD	0.06
Ave+1SD		Ave+2SD	Ave+3SD	
0.23		0.29	0.35	



**圖 6-1 前一年度安全指標實際情形**

2. 目標值的訂定：本年度目標的訂定，係以前年度平均值，降低特定百分比為本年度目標值，例如圖 6-1 範例，前年度全年發生率為 0.16，本年度目標訂為降低 5%，計算本年度安全目標為 0.15。
3. 警示設定：
  - a. 警示設定的目的，係監控系統是否有短期間指標事件大量發生的情形，當發生此類情形，即有必要全面檢視系統是否有相關疏漏。
  - b. 警示設定係計算前一年度各月份指標事件發生率之標準差（簡稱 SD），以平均值加計 1~3 倍 SD 得來（詳圖 6-1 紅框處）。標準差 SD 的定義，係各述值與平均值的分散程度，其計算公式如下：

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{N}}$$

其中  $x$  為數據集中的每個數值， $\mu$  為數據集所有數值的平均值， $N$  為數據即的數值數量。



- c. 完成 SD 計算後，整合目標值與 1~3 倍標準差值，以監控本年度指標事件趨勢如圖 6-2 右圖；參考機場手冊，執行空側場面檢查。

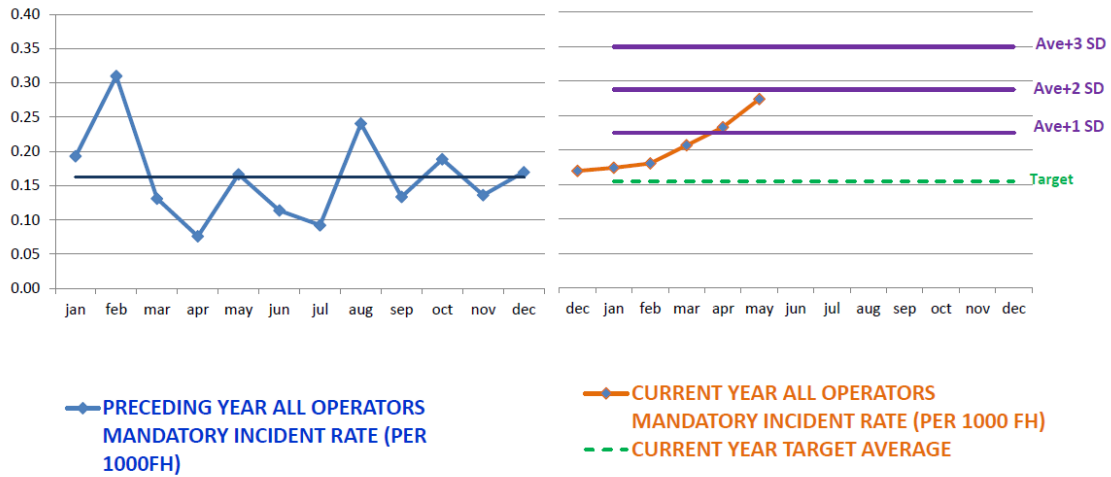


圖 6-2 整合目標值與警示設定

- d. 警示設定：當指標事件發生率達到以下條件時（圖 6-3），可能代表外在風險提高，或內部控制機制異常，須即時啟動警示機制進行檢討：

- 單月值超過 3SD
- 連續兩個月超過 2SD
- 連續三個月超過 1SD



圖 6-3 警示設定啟動條件

### 5.3 SPI 目標值與警示監控

1. 如前節所述，警示設定的目的，係監控短期是否有外在風險提高，或內部控制機制異常的情形，監控過程如發生率有達到警示設定的情形，應立即啟動檢討機制。
2. SPI 目標值的設定，係冀望本年度安全績效可以優於過去表現，著眼於全年度數值，因此係在年度結束時，檢討是否完成目標，無須逐月檢討。
3. 綜合以上，警示設定的監控，在確認系統有無發生異常情形；年度目標值的檢視，在確認系統安全等級是否逐年提升。

### 5.4 SSP ALoPS 績效量化評量

年度結束後，可彙整各項 SPI 指標執行情形如圖 6-4，依據全年度各

SPI 是否有超出警示設定，及是否達到目標給予評分，經加權計算後得到整體 ALoPS 績效評分（以百分比表示）

High Consequence Safety Indicators				
Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes (4), No (0)]	SI Target level/ criteria (for 2010)	Target Achieved [Yes (3), No (0)]
1 High Consequence SPI No 1	Preceding Period Ave Rate + 1/2/3 SD	4	5 % improvement of Current Period Ave rate over Preceding Period Ave	0
2 High Consequence SPI No 2	Preceding Period Ave Rate + 1/2/3 SD	0	6 % improvement of Current Period Ave rate over Preceding Period Ave	0
3 High Consequence SPI No 3	Preceding Yr Ave Rate + 1/2/3 SD	4	3 % improvement of Current Period Ave rate over Preceding Period Ave	3
4 Etc				
Sub-total		8	Sub-total	3
Max		12	Max	9

Lower Consequence & Supplementary Safety Indicators				
Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes (2), No (0)]	SI Target level/ criteria (for 2010)	Target Achieved [Yes (1), No (0)]
1 Lower Consequence No 1	Preceding Period Ave Rate + 1/2/3 SD	2	3 % improvement of Current Period Ave rate over Preceding Period Ave rate	1
2 Lower Consequence No 2	Preceding Period Ave Rate + 1/2/3 SD	2	4 % improvement of Current Period Ave rate over Preceding Period Ave rate	0
3 Lower Consequence No 3	Preceding Period Ave Rate + 1/2/3 SD	0	2 % improvement of Current Period Ave rate over Preceding Period Ave rate	0
4 Lower Consequence No 4	Preceding Period Ave Rate + 1/2/3 SD	2	6 % improvement of Current Period Ave rate over Preceding Period Ave rate	0
5 Lower Consequence No 5	Preceding Period Ave Rate + 1/2/3 SD	2	3 % improvement of Current Period Ave rate over Preceding Period Ave rate	1
6 Etc				
Sub-total		8	Sub-total	2
Max		10	Max	5
No Alert %		72.7%	Target Achieved %	35.7%
Overall SSP/ SMS ALoS Performance			58.3%	

圖 6-4 SSP/SMS ALoPS 績效量化評量

### 三、心得與建議事項

茲就參訓成員參加本次訓練後之心得與看法分述如下：

#### (一) 國家民用航空安全計畫之執行組織及其運作

在本次訓練課程中，針對推行 SSP 之組織有明確之律定，包含航空站、飛航服務、飛航作業、適航、法務等主管部門或組織，並將飛航事故調查機關納入協調平台(或機制)中。

其中，較為特別的是，在課程中建議成立一專責之 SSP 管理辦公室(或秘書處)作為推行整體 SSP 之主要窗口，其主要之職責包含：

1. 國際民航公約第 19 號附約及第 9859 號文件「Safety Management Manual」修正後之符合性評估及差異分析。
2. 行動計畫之擬定。
3. 建立跨部門/組織之聯繫及協調平台。
4. 組成 SSP 監督委員會並安排定期會議。
5. 執行內、外部安全稽核。
6. 檢視及管控行動計畫執行情況。
7. 評估 SSP 達成績效及差異分析。
8. 安全資料管理等。

以專責單位統合各部門、跨組織之整體運作，避免各部門/組織各行其事，或遭遇跨部門/領域之行動計畫無法順利推行之窘境，以期達

成 SSP 及既訂之可接受安全水準。例如：目前於香港民航處 Air Service and Safety Management Division，及新加坡民航局 Safety Policy and Licensing Division 均為專責推動 SSP 相關事務單位。

## （二）國家民用航空安全計畫執行成效評估

依據國際民航組織所訂全球航空安全計畫(GASP, Global Aviation Safety Plan)，SSP 之擬訂及執行係依據各國民航主管機關對於國際民航組織第 9734 號文件「安全監理手冊」所述之八大關鍵要項(CE, Critical Element)為基礎，在各項作業(包含：法制體系、監理組織、人員證照管理、飛航作業管理、適航管理、失事調查、飛航服務管理、航空站管理等)中之有效達成率(EI, Effective Implement)達 60%者(依據 GASP Chapter 2 §2.2.5 規範)應推行 SSP。

然在本次課程中，授課教師別強調此一作法在 SSP 推展至今已有所調整，即目前國際民航組織在全球安全監督評估計畫下，針對 SSP 依前述八大關鍵要項發展出 299 項之協議問題(PQ, Protocol Questions，如附件 2)。各國應依據該協議問題執行監理系統之自我評量作業，並就差異之處擬定行動計畫進行 SSP 之建置作業。

我國目前尚未成為國際民航組織之締約國，惟在 SSP 之推行及作法上，仍能持續與國際作法接軌。在本次課程中，授課講師已提供前述之協議問題供各國參訓人員參考，除可對現況進行符合性檢視並做差異分析外，亦可作為我國持續推行 SSP 時作為評估整體執行績效之重要依據。

此外，在前述之協議問題外，授課講師亦提供一份 SSP 差異分析檢查表(SSP Gap Analysis Checklist)，除供填列目前之執行情況外，在

評估後確認未能符合或部分符合時，應將差異之處具體描述，並將所採取之行動做成計畫，包含執行之組織及人員、SSP 之參考依據、計畫期程及執行狀態(例如：進行中、未執行、已完成)等，將所有差異部分予以文件化、具體化，確保所有行動皆於妥適之監督及管制下完成。經檢視該表內容，其與本局 105 年辦理 SSP 差異分析所採用的表格內容相同。

### (三) 安全資料蒐集與分析

本次參訓主要目的之一，係為了解國際上有關安全資料分析與運用的相關做法與工具。經詢授課講師各國之作法時，表示目前於市面上雖有販售安全資料分析之套裝軟體，惟其仍需予以客製化後方能供主管機關使用，產出所需之結果(包含數值及圖表等)，惟其價格相當昂貴，且最終結果仍需由主管人員進行判讀，故尚未通用於各國主管機關。

以新加坡民航局為例，目前該局仍以 Microsoft Excel 軟體為主要之安全資料蒐集、統計及分析之工具。因此，授課講師建議我國能依監理之需求，規劃安全資料分析前所需之資料項目、內容、格式、產出之報表形式等，由具備航空專業領域知識及資料分析能力之人員進行資料之核實、審查、建檔及分析作業，妥善運用所蒐集之安全資料，以利建置以績效為基礎之飛安監理系統，妥善運用有限之監理資源。另所分析的來源資料，包括強制性報告案件與自願報告案件，惟考量兩者性質並不相同，所代表的意義亦有所分別，因此係採個別分析方式處理。

#### (四) 安全目標及可接受之安全水準

本次課程中，對於國家安全目標之訂定應有明確的準則，除了必須符合國家整體航空安全政策外，必須依據航空環境之複雜度、航空事業之樣態及發展程度，以及地理環境、作業環境可能之風險等，依據其優先等級予以訂定。對於可接受之安全水準，則直接反映於安全績效指標及安全績效目標中。

目前我國已於 SSP 中訂定安全指標，包含：國籍民用航空運輸業飛機失事發生率、國籍民用航空運輸業之重大意外事件發生率、飛航管制案件發生率、車輛或其他地面設備造成跑道入侵導致航空器重飛/放棄起飛事件發生率、因地面作業不當或裝備失效，導致航空器受損須停機檢修事件發生率等，並設有各指標之目標值，據以定期檢視及檢討未達成情況。

在本課程中對於安全目標之達成情況，提供更為縝密及細緻之作法。例如，目前我國未針對各指標訂定警戒值(如本報告第 45 頁)，以致於在單一事件發生且造成逾越目標值時，僅對個案進行檢討，然對個案的討論實屬業務單位應辦事項，非 SSP 安全保證小組層級所應探討的，對於整體之風險趨勢無法具體呈現。如果再因案件肇因單純，則其分析檢討對整體而言尚難有具體效益。爰此，在安全績效目標設定後，應再計算其標準差以設定不同層次之警戒值。在事件發生率達到不同層次之警戒值時，即應採取不同之矯正行動。

舉例而言，如果發生率逾越目標值但未逾越目標值加一個標準差，則暫不採取行動並持續觀察，如連續兩個月皆逾越目標值加一個標準差時，則有負向趨勢之徵兆，應採取適當之矯正行動。再如單月發生率逾越目標值加二個標準差或以上時，即應採取強制措施，甚

至停止作業等，於釐清事件肇因並擬定改善或緩解措施據以實施後，始可恢復正常作業。

綜上，對於現行之安全指標及目標檢視及管控作業，我國可審酌前述作法，除可有效掌握各指標之表現趨勢外，並可避免對單一個案所做之無效分析，使安全保證小組發揮檢視整合性安全議題功能，真正達到持續提升安全績效的目的。

### **（五）本局安全保證小組之運作**

目前我國 SSP 下，依據交通部民用航空局安全保證小組設置要點之規定，設有跨組室之常態性安全保證小組，除有召集人、副召集人及委員外，並設有執行秘書及幹事等人員，以作為推行計畫之幕僚編組。依據該要點之規定，安全保證小組應每季召開會議，以檢討國家民用航空安全計畫、可接受之安全水準、航空服務提供者安全管理系統相關之規定及其執行成果，以及檢視安全資訊、識別安全議題、提出改善計畫並進行風險管理等事項。

在本次訓練課程中，對於安全保證小組之會議功能、討論事項及辦理會議之頻率(如本報告第 21、22 頁)等進行研討。其中，在會議頻率部分，課程建議在 SSP 建置初期應每季召開一次會議，以擬定及追蹤各應辦事項(計畫)之辦理進度；在建置完成後，修正為每半年召開一次，其考量在於過度頻繁之會議頻率，在安全資料不足或變異情況不大的狀況下，無法確切掌握整體安全風險趨勢，耗費作業人力及時間。

另外，對於安全保證小組之會議議程，亦有極為具體之建議，包含安全指標及目標之整體趨勢、航空服務提供者之 SMS 實施情況、SMS



查核結果及發現、檢視組織風險輪廓、以績效導向之安全監理結果、強制、主動及自願報告系統有效性、SSP 內部查核結果、國際民航組織 SSP 相關文件以及協議問題/符合性檢查表之符合情況等，皆可以做為本局未來辦理安全保證小組會議之參考。

## **(六) 導入基於安全風險的安全監理系統**

目前本局所執行之飛安監理作業中，仍以法規符合性為檢查重點，在航空產業急速發展狀況下，機隊及航空人員急速成長，航空站作業複雜度及作業需求及人力增加，空中航行管制需求亦隨之成長，爰此，監理及管理機關必須持續擴增監理能量，包含聘用更多專業人力、增加財務資源等，始能應付與日俱增之監理需求。爰此，在資源及人力有限的情況下，本局應逐步導入基於安全風險的安全監理系統，儘早因應持續成長之航空產業發展需求。

為能配合國際監理趨勢，導入此一新式之安全監理系統，除以現有之法規符合為基礎外，必須加強安全資料蒐集及分析能力，以期識別安全風險並調整監理資源，投注於風險較高之作業中執行妥適之監理行動，以降低危害之發生機率。另外，對於目前之符合性檢查方式，亦應有所改變，意即將現有之符合/不符合式檢查表，轉換為量化之評分表(如本報告第 31、32 頁)，藉以評定特定作業項目之符合程度，輔以檢查結果彙整及分析後，決定未來之檢查頻率。例如：某特定作業經數次檢查後，綜合檢查評分皆達一定水準者，調降其檢查頻率，反之，則增加其檢查頻率。如此之做法，對於各航空服務提供者之監理強度會隨其整體表現而有所不同，意即自我管理強度越強之公司，本局無須投注過度之監理資源，但如公司自我管理績效不彰者，本局即可投入較多監理資源以令其改正並提升作業嚴

謹度及績效。

另外，對於航空服務提供者之安全績效表現，本局目前僅就各提供者之績效表現進行檢視，並對逾越指標之處要求其進行檢討及改善，然對於整體之表現未建立一衡量機制。在訓練課程中，授課講師亦提供一量化之工具(如本報告第 48、49 頁)，對各個航空服務提供者之績效表現進行量化之評分，除了可以具體呈現其績效外，並可作為同一類型之航空服務提供者間相互之評比。此外，此一評比亦可作為調整監理計畫之具體依據，相當值得本局參考運用。

### **(七) 危害識別與風險降低 (HIRM) 工具的應用**

依據國際民航組織第 9859 號文件之要求，所有風險管理作為皆應予以文件化，並保留對於各式作業風險之處理歷程，妥為建檔保存，以作為日後處理類似案件之參考。

在本次訓練課程中，提供一份危害識別與風險降低工具(如本報告第 36 頁)，以供參訓人員學習如何將所識別之危害以及可能造成之不安全狀況予以具體、明確地在工具表內描述，其中，在擬定排除或緩解策略上，應考慮的層面包含緊急(或備援)系統、裝備/工具、法規、標準作業程序、檢查/維修計畫、建議通告、程序檢定及核准、人員授權/證照、訓練/教育，以及其他可能之措施等。皆可依據所見之危害樣態就各個層面進行研討、陳述。該項工具並有一套完整的邏輯協助判定該項危害現在所屬之風險值，此較一般以風險評估作業人員或組織之判斷較具客觀性。同時，在檢討完現有之防禦機制後，可就不足之處再進行進一步排除或緩解措施之擬定及實施作業，並登載於工具表內，如此，該工具表會協助呈現出經此排除或緩解措

施後其風險值之變動情況。

相較於現行航空服務提供者所進行之危害識別與風險降低作業所採用的工具，本課程所提供的工具更為完整且具客觀性，記載了整體危害識別與風險緩解過程，雖使用上較為繁雜，仍值得透過教育訓練推廣至各服務者納入自身之作業程序中廣泛應用，特別運用於較為複雜或爭議性較大的風險評估案，除了可將處理歷程完整的紀載於工具表外，並對風險值之判定有一客觀之衡量標準，避免因個人或組織之經驗或其他人為因素影響判斷之準確性，以致無法確實將風險因素有效緩解或排除。

## 報告附件

## 附件 1 課程大綱

Mod 1: SM Fundamentals		Mod 2: SM SARPs - Annex 19		Mod 3: SSP Implementation		Mod 4: HIRM Worksheet	
No	Section Title	No	Section Title	No	Section Title	No	Section Title
1	Concept of safety	1	State safety management responsibilities (A19-2, C3, App 1)	1	SSP organization & accountable executive	1	SRM Task Preparation
2	Evolution of safety			2	Regulatory system and responsibilities	2	Purpose of HIRM Worksheet
3	Accident causation	2	Safety Management System (A19-2, C4, App 2)	3	Legislative provision for regulation & safety management	3	HIRM Terminology & Definitions
4	People, context and safety			4	SSP gap analysis & implementation plan	4	Customize HIRM Tool & SOP
5	Error & violation	3	Safety data and safety information collection, analysis, protection, sharing and exchange (A19-2, C5, App 3)	5	SSP manual	5	Create Master Hazards Register
6	Safety culture	4	GASP objectives (2017)	6	SSP administration & records	6	Prioritize Hazards for Risk Mitigation
7	The management dilemma			7	SSP coordination committee	7	Activate Risk Mitigation for selected Hazards
8	Change management			8	State safety policy & objectives	8	Risk Mitigation: Hazard to Unsafe Event
9	Integration of management systems			9	SMS requirements for service providers	9	Risk Mitigation: Unsafe Event to Consequence
10	Safety reporting & investigation			10	Mandatory reporting system	10	CBSV Methodology to derive Likelihood Value
11	Safety data collection, analysis & SPIs			11	Hazard identification & risk management*	11	SRM Report
12	Hazard identification & risk mitigation			12	SSP safety performance indicators	12	Safety Case
				13	Acceptable level of safety performance (ALoSP)	13	BTXP SRM Tool Awareness
				14	Initial SMS assessment and acceptance		
				15	Agreement on SMS-SPIs	Mod 5: SPI & ALoSP Development	
				16	Agreement on service provider safety performance	No	Section Title
				17	Safety oversight	1	Collate potential SPIs
				18	Routine SMS audit (PSOE)	2	Select SPIs package
				19	Risk based surveillance	3	Develop SPI charts
				20	Enforcement policy & procedures	4	Incorporate SPI Alert & Target settings
				21	Independent accident investigation	5	Monitor individual SPIs' performance
				22	Safety information protection	6	Quantify package SPIs' performance
				23	SSP Training and Communication	7	Establish and achieve ALoSP
				24	SSP internal review mechanism		
				25	USOAP SSP Audit Information		

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## 附件 2 SSP 協議問題 (PQ, Protocol Questions)

### USOAP SSP Foundation Protocol Questions List

Dated: October 2019

PQ	Subject	Question
1.001	Primary aviation legislation	Has the State promulgated primary aviation legislation to enable it to address its obligations as a signatory to the Chicago Convention?
1.009	Specific operating regulations	Has the State established a process for determining the need to amend its specific operating regulations or, if necessary, its primary aviation legislation, taking into consideration ICAO provisions and their amendments?
1.015	State Authorities	Does the primary aviation legislation clearly delegate authority to each Director General (DG)/Chief Executive Officer (CEO) who has a safety oversight responsibility?
1.027	Exemptions	Does the legislation provide for the granting of exemptions?
1.028	Exemptions	Has the State established a policy and associated procedures for the granting of exemptions?
1.051	Enforcement	Does the primary aviation legislation provide for the enforcement of applicable legislation?
1.055	Enforcement	Has the CAA established an enforcement policy and associated procedures?
1.107	Enforcement	Does the legislation provide for a clear delegation of sufficient legal authority to civil aviation inspectors?
2.01	State Organizational Structure	Has an organizational structure been established at the State level depicting the authorities with functions related to safety oversight or aircraft accident and incident investigation in the State and their reporting lines?
2.011	State functions	Are the functions and responsibilities of each authority with functions related to safety oversight or aircraft accident and incident investigation clearly defined?
2.013	State functions	If Regional Offices (ROs) have been established for authorities which perform functions related to safety oversight or aircraft accident and incident investigation, are their roles and responsibilities clearly defined?

2.017	Delegation	If the State has delegated or transferred safety oversight-related tasks to a regional or supranational entity, have procedures been established to ensure that the State's obligation for safety oversight in the delegated areas is being met?
2.019	State Authorities	When there is more than one authority (organization) with functions related to safety oversight or aircraft accident and incident investigation, have procedures been established to ensure that all areas are covered and that there is no overlap of responsibilities?
2.021	State Authorities	Do the State's legislation and/or structure in place provide for a distinct separation of functions and responsibilities between all safety oversight entities in the State and the aviation industry/service providers, particularly when industry/service provider functions are carried out by the State?
2.051	Resources	Has the State established and implemented a mechanism to ensure that each safety oversight authority has sufficient financial resources to meet its national and international obligations?
2.053	Resources	Has the State established a mechanism to ensure that each safety oversight authority has sufficient personnel to meet its respective national and international obligations?
2.101	Qualified technical personnel	Does each safety oversight entity/investigation authority have an active role in the selection and recruitment of sufficiently qualified/experienced technical personnel?
2.103	Resources	Is each safety oversight entity/investigation authority able to attract, recruit and retain sufficiently qualified/experienced technical personnel?
2.105	Qualified technical personnel	Has each safety oversight entity/investigation authority established a training policy for the technical personnel?
3.001	Specific operating regulations	Has the State promulgated personnel licensing regulations to enable it to transpose the provisions of Annex 1?
3.005	Specific operating regulations	Has the State implemented procedures for the amendment of its specific PEL regulations taking into consideration ICAO provisions, and their amendments?
3.015	Exemptions	Has the State implemented procedures for the granting of exemptions in the area of personnel licensing?
3.101	State Organizational Structure	Has the State established an organizational structure for personnel licensing?



3.103	State functions	Are the functions and responsibilities of the personnel licensing office clearly defined?
3.109	Resources	Does the personnel licensing office have sufficient human resources to carry out its functions and mandate?
3.111	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for its personnel licensing staff?
3.112	Qualified technical personnel	Does the State ensure that all personnel licensing staff meet the established minimum qualification and experience requirements?
3.113	Qualified technical personnel	Is a formal training programme established that details the type of training that should be provided to personnel licensing inspectorate staff and other technical personnel?
3.115	Qualified technical personnel	Has a periodic training plan been established detailing and prioritizing the type of training that will be provided to personnel licensing inspectorate staff and other technical personnel during the established period?
3.117	Qualified technical personnel	Is the training programme appropriately implemented for personnel licensing inspectorate staff and other technical personnel?
3.119	Qualified technical personnel	Has a system been established to maintain the training records of personnel licensing staff?
3.153	Technical guidance, tools and provision of safety-critical information	Are the relevant ICAO documents and other technical publications readily available to the personnel licensing inspectorate staff and other technical personnel?
3.154	Technical guidance, tools and provision of safety-critical information	Is there a technical library available for the staff of the personnel licensing office or another method to ensure receipt, control and distribution of the necessary technical documentation?
3.155	Technical guidance, tools and provision of safety-critical information	Are personnel licensing staff provided with comprehensive guidance material and procedures that are sufficiently detailed to enable them to carry out their functions and responsibilities effectively?
3.203	Licensing, certification,	Does the State implement a process for the systematic review and evaluation of submitted application forms for

	authorization and approval obligations	the issuance of licenses and ratings and for examinations?
3.256	Licensing, certification, authorization and approval obligations	Has the State established a system to re-establish or reinstate the privileges of expired licenses and ratings?
3.257	Licensing, certification, authorization and approval obligations	Has the State implemented a system to re-establish or reinstate the privileges of expired licenses and ratings?
3.263	Management of safety risks	What action does the CAA take in the event that sufficient evidence exists to demonstrate that a pilot license holder has not performed his/her duties in accordance with the prescribed procedures and privileges of his/her license?
3.307	Licensing, certification, authorization and approval obligations	Does the licensing authority contact the foreign license issuing State systematically to ensure the validity of the license to be converted or validated?
3.423	Licensing, certification, authorization and approval obligations	If the State has not established any system for assessing the medical fitness of license applicants and license holders, has the State implemented practices and procedures to ensure the medical fitness of an applicant (e.g. the validation of a foreign medical assessment)?
3.751	Technical guidance, tools and provision of safety-critical information	Has the State implemented procedures for the approval of aviation training organizations (TOs)?
3.753	Licensing, certification, authorization and approval obligations	Has the State implemented a system to ensure the qualification and competency of the instructors of domestic approved training organizations (TOs)?

3.763	Licensing, certification, authorization and approval obligations	Does the State ensure that the domestic approved training organization (TOs) develops and publishes a training and procedures manual for the use of personnel concerned, the content of which conforms to Annex 1, Appendix 2?
3.765	Licensing, certification, authorization and approval obligations	Does the process of issuing an approval to a domestic training organization (TO) take into account pertinent aspects related to facilities, equipment, key personnel and organization as contained in Annex 1 Appendix 2?
3.767	Surveillance obligations	Does the State implement an effective surveillance programme of the approved training organizations (TOs) to ensure continuing compliance with the approval regulations and document?
3.769	Management of safety risks	What action does the CAA take in the event that sufficient evidence exists to demonstrate that a training organization has not performed its function according to its procedures manual?
3.771	Licensing, certification, authorization and approval obligations	If the State authorizes foreign training organizations (TOs) to provide approved training to its license holders for the issuance of a related license and/or ratings, does it implement a system for the approval of foreign TOs?
3.811	Surveillance obligations	Has the authority implemented a surveillance system of the aircraft maintenance technician/engineer/mechanic licenses issued?
3.813	Management of safety risks	What action does the CAA take in the event that sufficient evidence exists to demonstrate that an aircraft maintenance technician/engineer/mechanic has not performed his/her duties in accordance with the prescribed procedures and privileges of his/her license?
3.855	Licensing, certification, authorization and approval obligations	Has the State implemented a process for the systematic review and validation of applications from air traffic controllers for the issuance, renewal, validation and extension of licenses and ratings?
3.857	Surveillance obligations	Has the authority implemented a surveillance system of air traffic controller licenses issued?
3.859	Management of safety risks	Does the CAA take action in the event that sufficient evidence exists to demonstrate that an air traffic controller

		has not performed his/her duties in accordance with the prescribed procedures and privileges of his/her license?
4.001	Specific operating regulations	Has the State promulgated aircraft operations regulations which transpose the provisions of Annex 6 Parts I, II and III?
4.003	Specific operating regulations	Has the State implemented procedures for amending its enabling aircraft operations regulations?
4.021	State Organizational Structure	Has the State established an organizational structure for aircraft operations, such as a directorate/department/division/section/office for the certification of commercial air transport operations?
4.023	Licensing, certification, authorization and approval obligations	Has the State implemented documented procedures for coordination with other relevant areas, including personnel licensing, airworthiness, legal, financial etc., on the air operator certification processes and surveillance activities?
4.025	Resources	Does the flight operations inspection organization have sufficient human resources to carry out its functions and mandate?
4.027	State functions	Are all the functions and responsibilities of the flight operations inspection organization clearly defined?
4.033	Qualified technical personnel	Has the flight operations inspection organization established appropriate minimum qualifications for: \r\na) flight operations inspectors; \r\nb) other operations inspectors; and \r\nc) dangerous goods inspectors?
4.039	Qualified technical personnel	If the flight operations inspection organization delegates its duties to other divisions, other State bodies, regional organizations, private agencies or individuals (e.g. designated examiners for flight and cabin crew checks), have requirements for competency been established?
4.041	Delegation	If the flight operations inspection organization delegates its duties to other entities, i.e. CAA divisions, State bodies, Contracting States, regional organizations, private agencies or individuals (e.g. designated examiners for flight and cabin crew checks), are the delegated tasks clearly defined?
4.051	Qualified technical personnel	Has the flight operations inspection organization established a formal training programme for operations inspectors and dangerous goods inspectors which describes the type of training to be provided?
4.053	Qualified technical personnel	Does the flight operations inspection organization establish a periodic training plan detailing and prioritizing the

		type of training to be provided during a specified timeframe?
4.055	Qualified technical personnel	Is training implemented appropriately?
4.059	Qualified technical personnel	Do the flight operations inspection organization and the entities responsible for the transport of dangerous goods by air have a system for maintaining training records of its technical staff?
4.071	Technical guidance, tools and provision of safety-critical information	Do operations and dangerous goods inspectors have access to up-to-date operational documentation and information to support the certificates/approvals issued?
4.073	Technical guidance, tools and provision of safety-critical information	Are ICAO documents and other technical publications readily available to the technical and administrative staff of the flight operations inspection organization ?
4.074	Technical guidance, tools and provision of safety-critical information	Is there a technical library available for the technical staff of the flight operations inspection organization or another method to ensure receipt, control and distribution of the necessary technical documentation?
4.075	Technical guidance, tools and provision of safety-critical information	Are operations inspectors provided with comprehensive procedures and checklists to assist them in carrying out their functions in a standardized and effective manner?
4.107	Exemptions	Has the State effectively implemented procedures to grant exemptions from the regulations for an AOC to air operators, using formal procedures that take into consideration the impact to safety?
4.109	Licensing, certification, authorization and approval obligations	Has the flight operations inspection organization implemented a documented process for the certification of air operators that includes thorough technical evaluations that lead to approval/acceptance of required procedures, documents and operations?
4.137	Licensing, certification, authorization and approval	Does the flight operations inspection organization ensure that an air operator has implemented procedures for the retention of flight recorder records and flight recorders in safe custody pending their disposition as

	obligations	determined in accordance with Annex 13?
4.145	Specific operating regulations	Has the State promulgated regulations for flight time, flight duty period, duty period and rest period limitations based on scientific principles, knowledge and operational experience?
4.147	Specific operating regulations	Does the flight operations inspection organization ensure that the air operator has requirements, in its operations manual, to establish flight time, flight duty period, duty and rest period limitations for flight and cabin crews, in accordance with State regulations?
4.205	Licensing, certification, authorization and approval obligations	Does the flight operations inspection organization ensure that the flight data analysis programme is non-punitive and contains safeguards to protect the source(s) of the data?
4.247	Surveillance obligations	Has the flight operations inspection organization established a surveillance programme to ensure that the appointed instructors and examiners for cabin crew maintain their competency with respect to their delegated tasks?
4.253	Specific operating regulations	Does the flight operations inspection organization ensure that the air operator maintains current records of flight time, flight duty periods, duty periods and rest periods of flight and cabin crew members for the period of time specified by the State?
4.254	Specific operating regulations	If State approves variations to the prescriptive fatigue management regulations, does it do so according to an established process?
4.285	Licensing, certification, authorization and approval obligations	Does the flight operations inspection organization ensure that the air operator has procedures for the preparation and dissemination of the information contained in the AIP, the Aeronautical Information Circular (AIC), and the Aeronautical Information Regulation and Control (AIRAC) to flight crew and operations personnel?
4.321	Licensing, certification, authorization and approval obligations	Does the flight operations inspection organization ensure that the air operator has established an organizational structure which includes the responsibilities and authority for the management of all ground handling functions prior to the issuance of an AOC?

4.323	Licensing, certification, authorization and approval obligations	Does the flight operations inspection organization ensure that the air operator has established aircraft ground handling training requirements, subcontracting policies, handling processes, procedures and practices for all ground handling operations?
4.325	Surveillance obligations	Does the flight operations inspection organization ensure that the air operator maintains permanently its ground handling responsibility, when all or part of the functions and tasks related to ground handling services have been contracted to a service provider?
4.331	Specific operating regulations	Has the State promulgated regulation on the transport of dangerous goods by air to transpose the provisions of Annex 18?
4.333	Specific operating regulations	Has the State implemented procedures to amend its enabling regulations in the area of dangerous goods subsequent to an Annex 18 amendment?
4.337	State functions	Are all the functions and responsibilities of the entities/individuals responsible for dangerous goods clearly defined?
4.355	Technical guidance, tools and provision of safety-critical information	Does the organization/individual responsible for the transport of dangerous goods by air ensure that the air operator authorized to transport dangerous goods has established in-flight procedures for emergency response for aircraft incidents involving dangerous goods?
4.357	Surveillance obligations	Has the State established procedures for the surveillance of all the air operators related to the transport of dangerous goods by air?
4.359	Surveillance obligations	Does the organization/individual responsible for the transport of dangerous goods by air carry out regular and random inspections of all entities, except air operators, involved in the transport of dangerous goods by air to confirm compliance with Annex 18 and the Technical Instructions (TI or Doc 9284)?
4.36	Surveillance obligations	Has the State developed procedures related to the oversight of entities, other than air operators, established in the State and involved in the transport of dangerous goods by air to confirm compliance with dangerous goods regulations?

4.371	Management of safety risks	Has the organization/individual responsible of the transport of dangerous goods by air established and implemented: â€¢ Procedures to take appropriate actions in case of violation (e.g. enforcement and penalties), and â€¢ A system to track identified deficiencies and to ensure timely resolution?
4.373	Hazard identification and safety risk assessment	Has the State established and implemented a process for reporting dangerous goods incidents and accidents, with procedures for investigating and compiling information concerning accidents or incidents involving dangerous goods, which occur in its territory, and which involve the transport of dangerous goods originating in or destined for another State?
4.384	Licensing, certification, authorization and approval obligations	Has the State implemented a process for the acceptance or approval of aircraft leasing arrangements, including coordination on airworthiness-related aspects?
4.445	Surveillance obligations	Does the established surveillance programme monitor the AOC holders' financial condition and any negative trends?
4.392	Exemptions	Has the State implemented a process to grant exemptions from the provisions of the Technical Instructions for the safe transport of dangerous goods by air, when the State is the State of Origin, Operator, Transit, Overflight and Destination?
4.435	Licensing, certification, authorization and approval obligations	Does the flight operations inspection organization ensure that the air operator has taken into account, reviewed and implemented all regulations before operations specifications are granted?
4.443	Surveillance obligations	Is a formal surveillance programme implemented to verify that all AOC holders in the State comply, on a continuing basis, with national regulations, international standards, AOCs and corresponding operations specifications?
4.447	Surveillance obligations	Does the surveillance policy and programme of the CAA include necessary processes and procedures for coordination among its different departments or directorates (i.e. transportation, finances, legal, operations,



		personnel licensing, airworthiness, etc.)?
4.448	Surveillance obligations	Is a formal surveillance programme implemented to verify that foreign air operators comply, on a continuing basis, with international standards, AOCs and corresponding operations specifications?
4.449	Management of safety risks	What actions are taken by the CAA if the deficiencies identified during the conduct of inspections are not rectified in a timely manner?
4.451	Management of safety risks	Has the flight operations inspection organization implemented a documented process or a system to track the deficiencies identified and to accept/validate the corrective actions taken by the air operators?
4.453	Management of safety risks	Does the flight operations inspection organization maintain a system which monitors and records progress, including actions taken by the air operator in resolving identified safety issues, to make it possible to track past deficiencies and regulatory non-compliance?
5.001	Specific operating regulations	Has the State promulgated airworthiness regulations to transpose the airworthiness-related provisions of Annexes 6, 7, 8, 16 and 19?
5.005	Specific operating regulations	Has the State implemented procedures for the amendment of its enabling regulations and national standards?
5.013	Exemptions	Has the State implemented procedures for the granting of exemptions?
5.023	State functions	Are all the functions and responsibilities of the AID clearly defined?
5.029	State Authorities	If the State is involved in the provision of aircraft operations or maintenance of aircraft, is there a clear separation of authority between the State operating agency and the State regulatory authority?
5.031	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for airworthiness inspectors?
5.033	Resources	Does the AID have sufficient human resources to carry out its functions and mandate?
5.047	Qualified technical personnel	Has the AID developed a formal training programme detailing the type of training to be provided to airworthiness inspectors?
5.049	Qualified technical personnel	Does the AID develop a periodic training plan detailing and prioritizing the type of training to be provided during

		the established period?
5.051	Qualified technical personnel	Is the training programme appropriately implemented for airworthiness inspectors?
5.055	Qualified technical personnel	Does the AID have a system for the maintenance of training records for its technical staff?
5.101	Technical guidance, tools and provision of safety-critical information	Are the relevant ICAO documents and other technical and regulatory publications readily available to the technical and administrative staff of the AID?
5.103	Technical guidance, tools and provision of safety-critical information	Is there a technical library available for airworthiness inspectors or another method to ensure receipt, control and distribution of the necessary technical documentation?
5.105	Technical guidance, tools and provision of safety-critical information	Do airworthiness inspectors have access to up-to-date design organization documentation and continuing airworthiness information to support the certificates/approvals issued for the aircraft on the State's register?
5.107	Technical guidance, tools and provision of safety-critical information	Are airworthiness inspectors provided with comprehensive procedures and checklists to assist them in carrying out their functions in a standardized and efficient manner?
5.125	Licensing, certification, authorization and approval obligations	Have procedures been developed for the issuance of certificate of registration and for the maintenance of the aircraft register?
5.127	Licensing, certification, authorization and approval obligations	Does the State maintain a current register showing for each aircraft registered the information recorded on the certificate of registration?
5.149	Licensing, certification, authorization and approval	Has the AID developed procedures for the issuance of a first certificate of airworthiness for an aircraft type?

	obligations	
5.151	Licensing, certification, authorization and approval obligations	Has the AID implemented the procedures for the issuance of a first certificate of airworthiness for an aircraft type?
5.183	Licensing, certification, authorization and approval obligations	Has the State developed procedures and checklists for the initial issuance/renewal of a certificate of airworthiness?
5.189	Licensing, certification, authorization and approval obligations	Does the CAA keep records for every aircraft registered in the State?
5.216	Hazard identification and safety risk assessment	Has the State established and implemented a system for appropriate actions upon receipt of mandatory continuing airworthiness information and/or issuance of additional mandatory continuing airworthiness information?
5.371	Specific operating regulations	Has the State promulgated regulations for obtaining a maintenance organization approval?
5.377	Licensing, certification, authorization and approval obligations	Has the AID issued AMO certificates in accordance with the promulgated regulations and established procedures?
5.429	Licensing, certification, authorization and approval obligations	Has the AID established and implemented a mechanism to ensure that AMO employees receive initial and recurrent training appropriate to their assigned tasks and responsibilities?
5.441	Surveillance obligations	Has the AID developed a formal surveillance policy/procedure to be used by airworthiness inspectors for conducting surveillance activities of AOC holders, foreign air operators and domestic and foreign AMOs?
5.443	Surveillance obligations	Is a formal surveillance programme implemented to verify that all AOC holders comply on a continuing basis with

		airworthiness-related national regulations, international standards, AOCs and corresponding operations specifications?
5.444	Surveillance obligations	Is a formal surveillance programme implemented to verify that all AMOs comply on a continuing basis with national regulations, international standards and AMO certificates?
5.445	Management of safety risks	Has the AID implemented a documented process and/or a method to track identified deficiencies, to evaluate corrective actions presented by air operators and/or AMOs and to take appropriate actions, up to and including enforcement measures, to resolve identified deficiencies and safety issues in a timely manner?
5.447	Surveillance obligations	Does the surveillance programme include ramp inspections of aircraft operated by AOC holders and foreign air operators?
5.449	Management of safety risks	If deficiencies are identified during the conduct of ramp inspections and indicate serious safety deficiencies/concerns, does the regulatory authority take appropriate action when necessary to preserve safety?
5.451	Surveillance obligations	Does the AID conduct ongoing surveillance of reliability programmes?
5.453	Management of safety risks	Does the AID initiate a special evaluation or impose special operational restrictions if information obtained from reliability monitoring indicates degraded level of safety?
5.473	Resources	Does the AED have sufficient human resources to carry out its functions and mandate?
5.485	Licensing, certification, authorization and approval obligations	Has the AED developed a formal training programme detailing the type of training to be provided to airworthiness engineers?
5.489	Licensing, certification, authorization and approval obligations	Is the training programme for airworthiness engineers appropriately implemented?
5.561	Technical guidance, tools and provision of safety-critical	Has the State established procedures for the issuance of an STC?

	information	
5.683	Surveillance obligations	Does the AED establish a formal surveillance programme for the continuing supervision of all production organizations?
6.001	Accident and incident investigation	Has the State promulgated legislation or regulations instituting an investigation into the circumstances of aircraft accidents and serious incidents in compliance with the provisions of Annex 13?\r\n
6.003	State Authorities	Has the State promulgated primary legislation to enable it to formally designate a specific agency/commission/board or other specific body to conduct aircraft accident and serious incident investigations?\r\n
6.004	State Authorities	Does the State's primary legislation clearly delegate authority to the Director/Chief Investigator/Chairman of the specific agency, commission or board designated to conduct aircraft accident and serious incident investigations?\r\n
6.007	Accident and incident investigation	Has the State promulgated regulations requiring immediate notification of aircraft accidents and serious incidents within the State to the accident investigation authority?
6.029	Primary aviation legislation	Does the primary legislation contain provisions to ensure the non-disclosure of CVR recordings and airborne image recordings to the public or for purposes other than accident or incident investigation?\r\n
6.031	Primary aviation legislation	Does the primary legislation contain provisions to ensure the non-disclosure of investigation records (other than CVR and CVR recordings and airborne image recorders and airborne image recordings) for purposes other than aircraft accident or incident investigation?
6.101	State Organizational Structure	Has the State established an investigation authority with a clear and documented structure and in a manner that ensures independence from State aviation authorities and other entities that could interfere with the conduct or objectivity of an investigation?\r\n
6.105	Resources	Has the State established and implemented a process to ensure that the accident investigation authority have sufficient financial resources to investigate accidents and serious incidents?

6.107	Resources	Has the State established and implemented a process for supplementary funding of accident investigations when required (major accidents)?
6.111	Resources	Does the State have its own appropriately qualified personnel identified and charged with aircraft accident and serious incident investigation duties?
6.113	Resources	Has the State implemented a mechanism to ensure that the accident investigation authority has sufficient personnel to meet its national and international obligations related to aircraft accident investigations?
6.115	Qualified technical personnel	If the State does not have its own appropriately qualified personnel, or not in sufficient number, does the State have arrangements (i.e. Memoranda of Understanding (MoUs)) with other States or with regional organizations to obtain the necessary personnel in an expeditious manner in the event of an accident or serious incident?\r\n
6.119	Qualified technical personnel	Has the State/investigation authority established appropriate minimum qualifications and experience requirements for aircraft accident investigators?\r\n
6.12	Qualified technical personnel	Has the State/investigation authority established minimum qualifications and experience requirements for aircraft accident investigators?
6.123	Qualified technical personnel	Has the State/investigation authority developed a formal training programme detailing the type of training to be provided to its investigators?
6.125	Qualified technical personnel	Does the investigation authority develop a periodic training plan detailing and prioritizing the type of training to be provided during the established period?
6.127	Qualified technical personnel	Is the training programme appropriately implemented?
6.129	Qualified technical personnel	Has investigation authority established and implemented a system for the maintenance of training records for its technical personnel, including records on the OJT received?
6.21	Accident and incident investigation	Has the investigation authority established and implemented means to ensure the proper maintenance of aircraft accident and serious incident investigation files?\r\n
6.347	Management of safety risks	Has the investigation authority established and implemented procedures to ensure that it informs the aviation

		security authorities immediately if an act of unlawful interference was involved or is suspected?
6.357	Accident and incident investigation	Has the State established and implemented procedures to ensure that in the event of an accident or serious incident, all air traffic services (ATS) communication recordings and documents associated with the flight are secured and placed in safe keeping as soon as possible?\r\n
6.413	State safety promotion	Has the State, as the State conducting the investigation, established and implemented procedures to ensure that it sends the final report to all States involved, including any State having suffered fatalities or serious injuries to its citizens and any State which provided relevant information, significant facilities or experts?
6.421	State safety promotion	Has the State, as the State conducting the investigation, established and implemented guidelines regarding the development and issuance of safety recommendations to the appropriate authorities, including those in other States, at any stage of an accident or incident investigation?
6.423	Management of safety risks	Has the State, as the State conducting the investigation, established and implemented procedures to ensure that it addresses, when appropriate, any safety recommendations arising from its investigations to accident investigation authorities in other State(s) concerned and, when ICAO documents are involved, to ICAO?
6.425	Management of safety risks	Has the State, as the State receiving safety recommendations from other States, established and implemented procedures: a) to monitor the progress of any action taken in response to these safety recommendations, and b) to ensure that it informs the proposing State within 90 days of the preventive action taken or under consideration or the reasons why no action will be taken?
6.429	State safety promotion	Has the State developed and implemented procedures to record responses to the safety recommendations it has issued?
6.501	Hazard identification and safety risk assessment	Has the State established and implemented (through the necessary legislation, procedures and guidance to the industry) a mandatory incident reporting system to facilitate the collection of information on actual or potential safety deficiencies?
6.507	Hazard identification and safety	Has the State established an accident and incident database to facilitate the effective analysis of information on

	risk assessment	actual or potential safety deficiencies and to determine any preventive actions required?
6.509	State safety promotion	Is the database created in a standardized format to facilitate data exchange?
7.009	Specific operating regulations	Has the State promulgated ANS specific operating regulations to transpose the provisions of the ANS-related Annexes into its own legislation?
7.011	Specific operating regulations	Has the State implemented procedures for amending its ANS specific regulations as well as for identifying and notifying differences, taking into consideration ICAO provisions and their amendments?
7.017	Technical guidance, tools and provision of safety-critical information	Has the State established procedures for the development and distribution of guidance material on the implementation of ANS specific operating regulations to all relevant service providers?
7.019	Technical guidance, tools and provision of safety-critical information	Does the State ensure that safety-critical information is disseminated in an effective and efficient manner?
7.031	State Organizational Structure	Has the State established an organizational structure for the safety oversight of air navigation service providers?
7.037	Technical guidance, tools and provision of safety-critical information	Has the State developed procedures to assist air navigation services (ANS) inspectors in effectively carrying out their safety oversight duties and responsibilities?
7.039	Technical guidance, tools and provision of safety-critical information	Are the relevant ICAO documents and other technical and regulatory publications readily available to all ANS technical staff?
7.045	Management of safety risks	Has the State established and implemented a mechanism for the review and elimination of deficiencies identified within the framework of Planning and Implementation Regional Groups (PIRGs)?
7.051	State functions	Is there a distinct separation between the regulatory and the service provision functions for all fields in ANS?
7.059	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for air traffic service



		(ATS) inspectors?
7.061	Resources	Does the State employ a sufficient number of qualified air traffic service (ATS) technical staff to carry out its safety oversight tasks and regulatory functions?
7.063	Surveillance obligations	Has the State established and implemented a formal surveillance programme for the continuing supervision of the service provider responsible for air traffic service (ATS)?
7.065	Qualified technical personnel	Has the State established a formal training programme detailing the type of training to be provided to its air traffic service (ATS) inspectors?
7.067	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of training to be provided to air traffic service (ATS) inspectors during a specified period?
7.069	Qualified technical personnel	Is the training programme appropriately implemented for the air traffic service (ATS) inspectors?
7.073	Qualified technical personnel	Does the ATS inspectorate have a system for the maintenance of training records for its technical staff?
7.081	Licensing, certification, authorization and approval obligations	Does the State ensure that the service provider responsible for the air traffic service (ATS) has developed policies and procedures for determining the capacity of the ATS system, including the number of staff required to ensure the provision of an adequate ATS system?
7.083	Licensing, certification, authorization and approval obligations	Does the State ensure that the service provider responsible for the air traffic service (ATS) has developed job descriptions for its ATS staff?
7.085	Licensing, certification, authorization and approval obligations	Does the State ensure that the service provider responsible for the air traffic service (ATS) has developed and implemented policies and procedures to enable recruitment and retention of appropriately qualified and experienced ATS staff?
7.087	Licensing, certification, authorization and approval obligations	Does the State ensure that the service provider responsible for air traffic service (ATS) has developed and implemented a training programme for its ATS staff?

7.101	Licensing, certification, authorization and approval obligations	Does the State ensure that a system has been established and implemented for the recording and retention of the air traffic service (ATS) data?
7.131	Licensing, certification, authorization and approval obligations	Does the State ensure that policies and procedures are established and implemented for coordination between air traffic service (ATS) and other entities?
7.135	Licensing, certification, authorization and approval obligations	Does the State ensure that MET information is supplied promptly to flight information centres, area control centres, approach control units, aerodrome control towers, and communication stations?
7.139	Licensing, certification, authorization and approval obligations	Does the State ensure that information on the operational status of navigation aids is promptly forwarded to appropriate air traffic service (ATS) units?
7.16	Specific operating regulations	If data link services are provided, has the State promulgated requirements for the provision of these services?
7.162	Specific operating regulations	If data link services are provided, does the State ensure that relevant procedures are established and implemented?
7.177	Hazard identification and safety risk assessment	Does the State ensure that the service provider carries out safety assessments with respect to significant airspace reorganizations, a) for significant changes in the provision of ATS procedures applicable to an airspace or an aerodrome, and b) for the introduction of new equipment, systems or facilities,?
7.183	Surveillance obligations	Does the State ensure that safety reviews are being regularly conducted by the ATS service provider?
7.185	Surveillance obligations	Does the State ensure that the ATS provider has appropriately qualified personnel to conduct safety reviews?
7.187	Accident and incident investigation	Has the State established and implemented a system for reporting and following up air traffic incidents?
7.189	Management of safety risks	Has the State promulgated a regulation requiring the establishment of a runway safety programme and has such a

		programme been implemented?
7.201	Specific operating regulations	Has the State promulgated regulations as a bases for procedure design in accordance with ICAO PANS-OPS provisions?
7.207	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for PANS-OPS inspectors?
7.209	Resources	Does the State employ a sufficient number of qualified PANS-OPS technical staff to carry out its safety oversight tasks and regulatory functions over the service providers?
7.211	Qualified technical personnel	Has the State developed a formal training programme detailing the type of training to be provided to its PANS-OPS inspectors?
7.213	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of PANS-OPS training to be provided to its inspectors during the specified period?
7.215	Qualified technical personnel	Is the training programme appropriately implemented for PANS-OPS inspectors?
7.219	Qualified technical personnel	Does the PANS-OPS inspectorate have a system for the maintenance of training records for its technical staff?
7.221	State functions	Has the State established an office or entity to oversee the process of development and maintenance of visual and instrument flight procedures?
7.229	Licensing, certification, authorization and approval obligations	Does the State ensure that established minimum qualification requirements for procedures are met by specialists and/or service providers who are responsible for the design of flight procedures?
7.231	Surveillance obligations	Does the State effectively conduct surveillance over its procedures specialists or service providers?
7.233	Management of safety risks	Has the State established a mechanism/system with timeframe for elimination of deficiencies identified by PANS-OPS inspectors?
7.241	Licensing, certification, authorization and approval	Does the State ensure that PANS-OPS service provider has developed job description for its PANS-OPS technical staff?

	obligations	
7.243	Licensing, certification, authorization and approval obligations	Does the State ensure that PANS-OPS service providers develop a training programme for PANS-OPS technical staff?
7.247	Surveillance obligations	Does the State ensure that flight inspections of instrument flight procedures, including obstacle checks, are carried out?
7.261	State functions	Has the State established an AIS office or entity?
7.267	Licensing, certification, authorization and approval obligations	Does the State ensure that a properly organized quality management system in the AIS has been established?
7.269	Resources	Does the State employ sufficient qualified technical staff to carry out its oversight tasks over the entity providing the AIS?
7.275	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for AIS inspectors?
7.277	Qualified technical personnel	Has the State developed a formal training programme detailing the type of training that should be provided to its AIS inspectors?
7.279	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of AIS training to be provided to its inspectors during a specified period?
7.281	Qualified technical personnel	Is the training programme appropriately implemented for AIS inspectors?
7.285	Qualified technical personnel	Does the AIS inspectorate have a system for the maintenance of training records for its technical staff?
7.287	Surveillance obligations	Does the State effectively conduct surveillance over the entity providing the AIS?
7.289	Management of safety risks	Has the State established a mechanism/system with time frame for the elimination of deficiencies identified by AIS inspectors?
7.301	Licensing, certification,	Does the State ensure that AIS provider has developed job descriptions for its AIS technical staff?

	authorization and approval obligations	
7.303	Licensing, certification, authorization and approval obligations	Does the State ensure that AIS service providers develop a training programme for AIS technical staff?
7.309	Licensing, certification, authorization and approval obligations	Does the State ensure that the Aeronautical Information Regulation and Control (AIRAC) system is used to notify the establishment, withdrawal and premeditated significant changes of circumstances listed in accordance with Chapter 6 and Appendix 4 Part 2 of Annex 15?
7.331	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for cartographic inspectors?
7.333	Qualified technical personnel	Has the State developed a training programme detailing what type of training should be provided to its cartographic inspectors?
7.335	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of training to be provided during a specified period to its cartographic inspectors?
7.337	Qualified technical personnel	Is the training programme appropriately implemented for cartographic inspectors?
7.373	Resources	Does the State employ sufficient qualified technical staff to carry out its safety oversight tasks over the entity operating CNS systems and facilities?
7.379	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for CNS inspectors?
7.381	Qualified technical personnel	Has the State developed a formal training programme detailing what type of training should be provided to its CNS inspectors?
7.383	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of training that will be provided to its CNS inspectors during the established period?
7.385	Qualified technical personnel	Is the training programme appropriately implemented for CNS inspectors?

7.389	Qualified technical personnel	Does the CNS inspectorate have a system for the maintenance of training records for its technical staff?
7.391	Surveillance obligations	Does the State effectively conduct surveillance over the entity responsible for the maintenance and operation of CNS systems and facilities?
7.393	Surveillance obligations	Does the State ensure that requirements for flight inspection are established and periodical flight inspections are provided for radio navigation aids?
7.395	Management of safety risks	Has the State established a mechanism/system with time frame for the elimination of deficiencies identified by CNS inspectors?
7.401	Licensing, certification, authorization and approval obligations	Does the State ensure that the entity operating CNS systems and facilities has developed job descriptions for its technical staff?
7.403	Licensing, certification, authorization and approval obligations	Does the State ensure that the entity operating CNS systems and facilities has developed a training programme for its technical staff?
7.412	State Authorities	Has the State designated a meteorological authority to provide or made arrangements for the provision of MET services by a non-governmental agency or another State ?
7.415	State Authorities	Does the State ensure that an agreement or procedure/arrangement has been established between air traffic service (ATS) authorities and MET authorities for the provision of MET services?
7.417	Resources	Does the State ensure that the MET authority employs a sufficient number of qualified MET staff in the inspectorate?
7.423	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for MET inspectors?
7.425	Qualified technical personnel	Has the State developed a formal training programme detailing the type of training to be provided to its MET inspectors?
7.427	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of training to be provided to its

		MET inspectors during a specified period?
7.429	Qualified technical personnel	Is the training programme appropriately implemented for MET inspectors?
7.433	Qualified technical personnel	Does the MET inspectorate have a system for the maintenance of training records for its technical staff?
7.435	Surveillance obligations	Does the State effectively conduct surveillance over the entity providing the MET service?
7.437	Management of safety risks	Has the State established a mechanism/system with time frame for elimination of deficiencies identified by MET inspectors?
7.451	Licensing, certification, authorization and approval obligations	Does the State ensure that the entity providing the MET service has established a properly organized quality system?
7.453	Licensing, certification, authorization and approval obligations	Does the State ensure that the entity providing the MET service has developed job descriptions for its technical staff?
7.455	Licensing, certification, authorization and approval obligations	Does the State ensure that the entity providing the MET service has established a training programme for its technical staff?
7.487	Resources	Does the State employ a sufficient number of qualified technical staff to carry out its safety oversight tasks over the rescue coordination centre (RCC) and, as appropriate, rescue sub-centre (RSC)?
7.493	Qualified technical personnel	Has the State established appropriate minimum qualifications and experience requirements for SAR inspectors?
7.495	Qualified technical personnel	Has the State developed a formal training programme detailing the type of training to be provided to its SAR inspectorate staff?
7.497	Qualified technical personnel	Does the State develop a periodic training plan detailing and prioritizing the type of SAR training to be provided to its inspectors during a specified period?
7.499	Qualified technical personnel	Is the training programme appropriately implemented for SAR inspectorate staff?

7.503	Qualified technical personnel	Does the SAR inspectorate have a system for the maintenance of training records for its technical staff?
7.507	Management of safety risks	Has the State established a mechanism/system with time frame for elimination of deficiencies identified by SAR inspectorate staff?
7.531	Licensing, certification, authorization and approval obligations	Does the State ensure that each rescue coordination centre (RCC) and, if appropriate, rescue sub-centre (RSC), develops written job descriptions for each of their technical staff?
8.001	Specific operating regulations	Has the State promulgated aerodrome regulations to enable the State to implement the provisions of Annex 14?
8.003	Specific operating regulations	Has the State implemented procedures for the amendment of its specific regulations taking into consideration ICAO provisions, and their amendments?
8.011	State Authorities	If the State is involved in the provision of aerodrome facilities and services, is there a clear separation of authority between the State operators and the State regulatory authority?
8.013	Enforcement	Has the State promulgated legislative provisions enabling the aerodrome regulatory authority to impose operating restrictions and/or sanctions at a certified aerodrome, in the event of non-compliance with the certification requirements or an unresolved safety deficiency/concern?
8.031	State Organizational Structure	Has the State established an organizational structure, for example a Directorate of Aerodromes Safety and Standards (DASS) for airport certification and surveillance activities?
8.033	State functions	Are all the functions and responsibilities of the aerodrome regulatory authority clearly defined?
8.039	Resources	Does the aerodrome regulatory authority have sufficient human resources (including an appropriate mix of technical disciplines given the size and scope of all the aerodrome operations in the State) to carry out its functions and mandate?
8.04	Qualified technical personnel	Has the State established appropriate minimum qualification and experience requirements for the technical staff and key management personnel of the aerodrome regulatory authority?
8.042	Qualified technical personnel	Does the State ensure that the established minimum qualification and experience requirements are met by all



		technical staff and key management personnel of the aerodrome regulatory authority?
8.047	Delegation	If the aerodrome regulatory authority delegates its duties to other entities (e.g. CAA divisions, State bodies, Contracting States, regional organizations or private agencies), are the delegated tasks clearly defined?
8.049	Qualified technical personnel	If the duties of the aerodrome regulatory authority have been delegated to other entities or individuals, have the requirements for competency been established?
8.053	Qualified technical personnel	Does the aerodrome regulatory authority develop a periodic training plans detailing and prioritizing the type of training to be provided during the established period?
8.055	Qualified technical personnel	Is the training programme appropriately implemented?
8.057	Qualified technical personnel	Does the aerodrome regulatory authority have a system for the maintenance of training records for its technical staff?
8.063	Technical guidance, tools and provision of safety-critical information	Does the State issue and maintain up-to- date publications, including guidance material, to ensure that aerodrome operators are aware of the State regulations and supporting requirements which have to be met for the granting and retention of an aerodrome certificate?
8.065	Technical guidance, tools and provision of safety-critical information	Are the relevant ICAO documents and other technical publications up-to-date and readily available to aerodrome regulatory and inspectorate staff?
8.069	Technical guidance, tools and provision of safety-critical information	Has the aerodrome regulatory authority developed guidance material and procedures for aerodrome inspectorate staff, covering each technical specialist area?
8.083	Technical guidance, tools and provision of safety-critical information	Has the State established a process for the certification of aerodromes?
8.086	Licensing, certification,	Does the aerodrome regulatory authority fully implement the certification requirements?

	authorization and approval obligations	
8.099	Exemptions	As part of the State's aerodrome certification process, does the State implement procedures for accepting a non-compliance with the established requirements, including a risk assessment mechanism and notification procedure?
8.133	Hazard identification and safety risk assessment	Has the State established coordination between aerodromes/heliports and AIS to ensure up-to-date information of aerodrome safety-related conditions?
8.171	Hazard identification and safety risk assessment	Whenever a change to the aerodrome physical characteristics, facilities or equipment is proposed, does the aerodrome regulatory authority ensure that the aerodrome operator has a procedure for evaluating the impact of this change on the safety of the existing operation?
8.181	Licensing, certification, authorization and approval obligations	Has the State established and implemented coordinated arrangements among its aviation agencies, aerodrome regulatory authority and aerodrome operators in order to optimize civil aviation security measures in the State and ensure that international civil aviation security measures are integrated into the design and construction of aerodrome facilities?
8.285	Management of safety risks	In the event of conflicting interests between land use and aviation authorities, what process is followed to ensure that aircraft safety is not compromised?
8.291	Management of safety risks	Does the State ensure that aerodrome operators/competent State authority develop emergency plans, including appropriate cooperation and coordination with other entities involved in the provision of emergency services and the development of the plans?
8.326	Management of safety risks	With regard to maintenance, construction works or contaminants removal operations, does the State ensure that aerodrome operators develop and implement procedures for the safe return of a runway to operational status?
8.331	Management of safety risks	Does the State ensure that aerodrome operators take appropriate action to decrease the hazard of wildlife strikes?

8.335	Management of safety risks	Has the State established and implemented a process to mitigate against an increase or potential increase in the wildlife strike hazard due to land use development likely to attract wildlife around an aerodrome?
8.367	Exemptions	Has the State promulgated a regulation which defines the circumstances and rationale for the conduct of aeronautical studies/risk assessments?
8.369	Technical guidance, tools and provision of safety-critical information	Has the State developed and issued guidance for aerodrome operators and regulatory staff on the use of aeronautical studies/risk assessments and their evaluation?
8.373	Exemptions	Has the State established a process to review the validity of using an aeronautical study or risk assessment to justify an application for an exemption or exception as well as the continuing need?
8.375	Management of safety risks	Has the State established and implemented a mechanism to assess the outcomes of the conduct of risk assessments or aeronautical studies?
8.377	State safety promotion	Does the State ensure that the outcomes of risk assessments or aeronautical studies, in the form of exceptions, are published in a document which is publicly accessible, such as the State AIP?
8.401	Surveillance obligations	Has the aerodrome regulatory authority developed and implemented procedures for the continuing surveillance of aerodrome certificate holders?
8.409	State safety promotion	Does the State enable the exchange of safety information across the aerodrome industry?
8.411	Management of safety risks	Has the aerodrome regulatory authority developed and implemented procedures to deal with deficiencies found during aerodrome surveillance activities?
8.413	Management of safety risks	Has the aerodrome regulatory authority developed and implemented a process to take actions, including enforcement, if deficiencies found during surveillance activities are not rectified within a reasonable time by the aerodrome operator?

