出國報告（出國類別：實習）

赴新加坡民航學院參加

「飛航服務安全查核訓練」課程

出國報告書

服務機關：民用航空局民航人員訓練所
姓名/職稱：林昌國/專任教官
派赴國家：新加坡
出國期間：96/12/04 – 96/12/12
報告日期：97/02/29

目　錄

壹、目的

國際民航組織（ICAO）於 2001 年議訂「全球安全監督查核計畫（USOAP, ICAO universal safety oversight audit program）」的範圍涵蓋國際民航公約第 1 號附約「飛航人員證照」、第 6 號附約「航空器作業」、第 8 號附約「航空器適航」、第 11 號附約「飛航服務」及第 14 號附約「機場」。本局爲積極提升本飛航情報區之飛航服務水準，並致力符合第 11 號附約有關飛航服務安全管理之規範，於 2002 年 9 月召開「因應 2004 年 IASA Annex 14 相關事宜」會議，決議成立機場檢核小組(Annex14)、飛航服務安全查核小組(Annex11)及機場保安小組(Annex17)，並頒佈「飛航服務安全管理計畫」，並自 2005 年 1 月起正式對本區各級飛航服務單位實施定期性安全查核。

本次參加新加坡民航學院於 2007 年最新開設之「飛航服務安全查核」課程，希望能更深入瞭解國際間有關飛航服務安全查核之最新趨勢及相關法規、作業之最新資訊，並將所得資訊作爲本飛航情報區執行飛航服務安全查核工作相關作業之參考，藉以提昇查核工作之品質，達成飛航安全之目的。

貳、行程紀要

於 96 年 12 月 4 日搭乘中華航空公司班機啓程前往新加坡，並於當地時間午後抵達。

訓練課程於 12 月 5 日假新加坡民航學院展開，爲期 5 日，至 12 月 11 日結束。參訓學員包括來自香港、澳門、中國、印尼、斯里蘭卡、菲律賓、南韓、新加坡、台灣，東加、薩摩亞、牙買加及歐洲及非洲地區之代表共 39 人。

課程結束後，於 96 年 12 月 12 日搭機返國。

參、課程內容簡介

課程一：ISO9001-2000 品質管理系統

講師：SP 管理顧問公司之資深認證查核員 Tan Kee Huat 及 Lim Poh Seng 擔任（96.12.5～96.12.6）。

品質概念及 ISO9001 概述

一、品質的概念－

了解顧客之需求，符合顧客之需求，業者爲達成上述目標，必須確立生產方向、工作環境、組織潛能極大化、以品質爲導向（有別於傳統以程序/功能爲導向）之管理、制定各類作業間之關係、持續改進之組織目標、依資訊作決策、建立與供給者間之互利關係，作爲 ISO9001-2000 規範要項。

查核－以有系統、獨立性及文件處理以獲取查核之評估及證據，來決定顧客及業者之間的標準是否達成。

一、計畫及準備－

查核的基本要素

- ✓ 獨立性
- ✓ 道德行爲
- ✓ 公正的評斷
- ✓ 相關證據
- ✓ 符合查核需求

二、查核種類－內部查核及外部查核。

計畫及準備之流程如下

1. 查核時程及項目

2. 選定查核人員

3. 聯繫被查核人

4. 查核前討論會議

5. 文件審視

6. 查核方法

7. 查核檢查表

三、查核作業過程注意事項

1. 查核員態度

2. 查核活動

3. 提問技巧

4. 聆聽技巧

5. 事證之蒐集與追蹤

6. 查核員行爲守則

7. 時間之掌控。

四、查核報告之撰寫

1. 查核報告撰寫前討論

2. 提供被查核人發現之問題

3. 被查核人採取之更正行動

4. 查核人審視被查核人採取之更正行動

5. 查核工作之確認及終結

五、品質認證步驟

1. 查核申請

2. 文件審視

3. 實地查核(若未符合標準，需俟改善後再行進行下一步驟)

4. 頒發合格證明

5. 持續觀察

6. 查核項目之有效期限

課程二：飛航服務安全查核

講師:新加坡民航局標準安全部之資深飛航服務安全查核員 Samuel Ko Oon Kok 及 Mohd Ansari 擔任（96.12.7、96.12.10、96.12.11）。課程教材如附件。

本項訓練課程模組－介紹國際民航組織全球飛航服務安全查核計畫（ICAO USOAP）及新加坡飛航服務安全查核（CAAS SMS）之架構、起源、及依據作爲本課程模組之引言，課程綱要如下：

1. 國際民航組織全球計畫之歷史沿革。

2. 國際民航組織全球飛航服務安全查核計畫。

3. 新加坡飛航服務安全查核建置。

4. 新加坡飛航服務安全查核架構。

5. 新加坡飛航服務安全查核流程。

6. 新加坡飛航服務安全查核計畫。

7. 新加坡飛航服務安全查核計畫執行。

8. 新加坡飛航服務安全查核報告撰寫。

新加坡處於東南亞航空交通要衝的地位，國土面積雖然不大，但由於生存的壓力極大，對國際社會的潮流及走向相當在意，自從國際民航組織全球飛航服務安全查核計畫推出之後，新加坡民航當局即積極的參與，經過多年的發展，有關飛航服務安全查核的領域已在亞洲甚至國際間都佔有一席地位。

新加坡的航管單位分爲－樟宜塔台、SELATAR 塔台、新加坡區域管制中心及新加坡近場管制中心四個單位，飛航服務安全查核單位則依下列目標進行：

1. 安全政策

   - 依循國際民航組織之指導原則
   - 採用國際的標準及慣例
   - 安全地提供最高的標準在民航和機場的品質和服務行動

2. 安全管理原則

- 設定安全責任。
- 提供適當的訓練。
- 增加安全察覺。

3. 安全評估

- 所有的系統及運作之安全目標爲以設定且維持。
- 實際作業中，安全目標已確立。

4. 安全目標－以下項目以月爲單位進行查核

- 飛安事件的數量。
- 鳥擊事件的數量。
- 飛航公告的精確度。
- 助導航裝備之可靠度。

5. 責任－所有的資深從業人員及經理均賦予對安全之責任。

- 如何達成安全目標
- 查覺安全服務之趨勢
- 檢視服務項目之缺失

6. 安全稽查－監控飛航作業之表現

- 管制能力之查核
- 監聽無線電通話

- 確認評估
- 安全查核

7. 飛航事件報告

8. 訓練

授課講師高先生在課程進行中講述由於新加坡在本區地小人稠，幾乎沒有任何天然資源，全國上下爲維持新加坡的生存及競爭力，無時無刻不競競業業深恐落人之後；新加坡飛航服務水準領先鄰區各國，爲維持在本區的地位，新加坡民航局對飛航服務安全查核之推展不遺餘力，查核作業水準已在國際民航界名列前茅；。

本項課程與課程一之架構相類似，但授課內容方面，針對飛航服務之作業特性，強調應注意之查核細節，並一一列舉各種查核時可能遭遇之狀況，將學員分組擔任查核員，由授課講師及助教擔任被查核人，以角色扮演之方式，進行查核情境之演練。

由於被查核人均由有經驗之講師及助教扮演，每位學員雖絞盡腦汁扮好查核員的角色，但在演練過程中，窘狀百出，但也使學員印象深刻，學習效果奇佳。

肆、心得

一、課程內容

本次飛航服務安全查核訓練課程屬於查核員初訓課程，課程一的安排從 ISO9001-2000 品質管理系統基本概念及查核基本要素、查核程序之準備、查核技巧注意事項、查核報告撰寫及品質認證步驟流程等技術性內容，在各項課程授課講師詳細講解及輔以查核前之討論，查核演練，查核報告之實際模擬演練，使每一位學員得以模擬演練來驗證授課內容，獲致學習的成效。

依 ISO9001-2000 之分類，查核可分爲以下 3 種：

1. 內部（第一關係人）查核 internal（1st party）audit—由組織內部人員進行之自我查核。

2. 供給者（第二關係人）查核 supplier（2nd party）audit—由需求者/消費者或以其立場角度對供給者/生產者所進行之查核。

3. 認證（第三關係人）查核 certification（3rd party）audit—由供需關係以外之獨立第三者/認證組織，就特定之規範標準進行之認證作業。

例如：本局「飛航服務查核章程」明訂：於民航局提供飛航服務或安全標準之區域，授權飛航管制組執行查核任務。

本區飛航服務之提供者（被查核者）爲飛航服務總臺、飛航管制組（儀航程序設計及飛航指南文件之提供）及本所，而查核團隊屬於局長授權監督之幕僚編組。

就本局飛航服務安全查核而言，一方面，查核者與被查核者皆隸屬於民航局且彼此業務緊密相關，另一方面，查核者亦代表應站在需求者立場持續監督飛航服務是否安全妥適之規管單位，因此，本局飛航服務安全查核同時具有內部（第一關係人）查核及供給者（第二關係人）查核之性質；也正因如此，該查核除應檢視受核者之各項飛航服務作業是否符合既有法規程序之規範外，亦需以更宏觀前瞻或更具敏感度之眼光，有系統地檢視在既有法規程序下進行之作業是否能持續之品質政策。

現行飛航服務安全查核報告中之各項查核發現，除對違反既有法規程序部分標示爲不符合項目外，對於其他有助受核單位提升作業安全、消除潛在危害之觀

察項目，亦可列入建議事項，供其參酌辦理，並納入修訂規範程序之參考。

現行本局飛航服務安全查核選派之查核員，可借重其相關領域之專業及對實際作業面之熟悉度，協調其他飛航服務作業單位人員擔任；惟查核領隊一職，應盡可能在人力條件許可下由飛航管制組人員擔任，以避免角色立場之混淆。現行本局已規劃若受查核單位爲飛航管制組業管之「儀航程序設計」或「飛航指南文件」項目，則由非飛航管制組人員擔任查核領隊，另以飛航服務總臺或本所人員擔任查核領隊。

安全查核有其不可輕忽之高度專業性，查核是協助發現工作環境之潛在危機、降低並防止意外事件發生之利器；有效的查核更是安全管理系統能成功持續運作之關鍵。爲使臨時組成之任務編組能順利有效地運作，每一次查核均需先期之計畫及準備、對篩選之查核項目相關作業文件仔細審閱，及對前次查核之發現列管事項進行追蹤，預先找出於實際查核時適當之切入點，如此才能在有限的查核時間內做有效之查核。

課程二的內容則完全著重於飛航作業安全，本次參訓學員以第一線飛航管制人員佔百分之八十爲最多，因此新加坡民航學院針對學員之需求，精心安排一系列的飛航管制作業單位之查核課程，由管制塔台、近場管制單位到區域管制中心，依照 ISO9001-2000 內部查核的精神及流程，從查核前準備、實施查核、查核報告撰寫及查核後討論，每一步驟做詳盡的查核作業演練；學習效果獲得每一位參訓學員的肯定。

二、新加坡合作計畫（Singapore cooperation program）

本次飛航安全服務查核訓練課程，參訓學員除南韓、香港、本人外，其餘學員都是在新加坡合作計畫（Singapore cooperation program）贊助之下得以成行，學員來自歐、亞、非及中南美洲非英語系國家，均有航空背景，且都被賦予在母國建置飛航服務安全查核制度的任務，因此上課期間，專心學習的態度，也得到一致的肯定。

新加坡合作計畫（Singapore cooperation program）係由新加坡外交部主導，結合新加坡民航學院、新加坡旅遊局、新加坡航空公司等單位，主要的目的是提供全世界開發中國家各種技術指導，項目如下：

1. 民航事業

2. 經濟、貿易及旅遊發展

3. 教育

4. 環境發展

5. 健康、疾病及緊急危難救治

6. 資訊及通訊技術

7. 交通管理

8. 公共行政及法令制定

參訓學員的資格在計畫中有詳細的規範，至少在母國有相當的職位，英語能力無礙，所有費用（學費、旅費、食宿費用）均由新加坡政府負擔，因此在學成之後，參訓學員返國均能將所學，運用於其工作領域；而新加坡政府則能提升在國際社會中的地位，形成雙贏的局面。

本項訓練課程，係新加坡民航學院第五次籌辦，世界民航組織雖已在 2001 年實施「全球安全監督查核計畫」，新加坡民航學院每年仍依據該計畫的發展更新授課內容，俾使參訓學員能吸取最新資訊，學成返國之後，做爲訂定飛航安全查核制度的依據。

三、新加坡民航學院模擬機參訪

新加坡民航學院分爲三大部門－飛航管制、機場管理及機場緊急救援服務，在本課程進行中，班務負責人應受訓學員之要求，特別安排參觀學院之塔台模擬機及雷達模擬機：

1. 塔台模擬機－新加坡民航學院之塔台模擬機於 2007 年底建置完成，因原始就規劃爲 360 度之樟宜機場管制塔台，模擬機外部場景與塔台內部配置和實際作業場所近似度接近百分 90，訓練效果不差，但模擬機系統因委託加拿大雷神公司製作，價格相當昂貴約 1000 萬美金，後續維護成本相當高；反觀本所之塔台模擬機完全由國內廠商研發，價格相當低廉，且維護成本低，雖因本所場地限制只有 180 度之場景，但已足敷訓練之用，倘若將來本所經費及場地之困難解決，相信本所塔台模擬機之表現必不遜色。

2. 雷達模擬機－新加坡民航學院所使用之雷達模擬機，係新加坡飛航管制

單位雷達作業系統之模擬訓練系統，所有顯示幕及通信系統均與工作單位完全一樣，訓練效果成效卓著，此套模擬訓練系統亦可作爲航管系統之備份。

伍、建議事項

一、訓練課程比較

在參加新加坡民航學院「飛航服務安全查核訓練」課程之前，本局正舉辦飛航服務安全查核員初訓及複訓課程，比較這兩項訓練課程內容，新加坡民航學院以系統化安排由 ISO 觀念的建立開始，輔以查核各項準備及執行流程，最後以討論及模擬演練來驗證，建立學員正確的查核觀念，完成周延及謹慎的查核作業。

有關查核員訓練之授課方式，本局飛航服務查核員訓練，皆以課堂講授方式進行，輔以實際觀察查核團隊運作。本次新加坡民航學院之安全查核課程在每一分組都指派新加坡航管單位資深從業人員加入各小組，藉以啓發參訓學員腦力激盪，每堂授課結束即加入分組模擬實作，授課講師在過程中並盡可能製造各種不同之情境，藉此加深參訓學員印象，強化學習效果，增加學員對查核過程中臨時突發狀況之應變能力。以上靈活之訓練方式，值得未來開辦相關查核員訓練課程時參考；至於 ISO 基本觀念的建立，在經費許可之下，應延聘相關領域之講師，教授查核工作的真正意義。

二、持續參與國際組織及爭取主辦課程

本次訓練參訓學員大部分是參加新加坡合作計畫（Singapore cooperation program）贊助之下得以成行，由於新加坡政府的大力支持，再加上新加坡各單位的配合，對開發中國家的各項技術協助及各項制度的建立，使得開發中國家對新加坡這個蔓爾小國的協助給予高度的肯定，提升新加坡在國際社會中的地位更加穩固。

在本次訓練課程中，新加坡民航學院爲所有課程的學員安排一場專題演講，由 CANSO(Civil Air Navigation Service Organisation)執行長擔任主講人，暢談該組織的主旨及理念，與會學員受益良多。參予國際組織，有助於提升本國在國際社會的能見度與發言權，並能實質的吸收新知及建立與各國代表間之情誼，是務實外交的一種手段。並能順勢拓展了與各國專家代表間之情誼及諮詢管道，進而成功行銷我們的形象，其所附加的政治、經濟正面影響力，則是難以評估的。該組織介紹詳見其網站(http://www.canso.org/)

Conduct of a Safety Audit

Safety Audit Planning

Concept Model

Shel
Reason
System Process
Etc…

Air Traffic Services

AD
ACC
AIS
APN

Standards

ICAO Annex 11
PANS OPS Doc 4444
Inspection ?

ATS Safety Audit - Control Tower

Personnel

a. Licensing
b. Training / Refresher Training
c. Manning of Control Position

Equipment

a. Telephone links
b. Radio equipments
c. Lightings
d. PAPI / VASIS
e. MDWR
f. RVR

Procedures / Environment

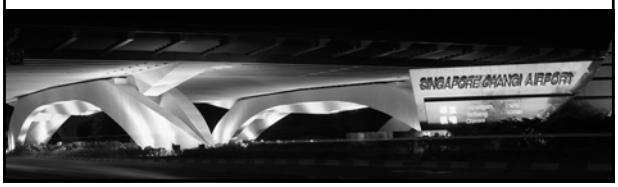
a. Selection of Rwy-in-use
b. Control position – Rwy, GMC, GMP
c. Airfield Inspection
d. Procedures for FOD
e. Animal Hazards
f. Helicopter Ops
g. Joining Procedures
h. Runway Inspections
i. Contingency plans
j. Ship crossings ?
k. Bad Wx Ops
l. Airfield Fam Progm
m. Etc.

Documents

a. ATSM
b. Master Log
c. Log entries
d. Crash Alarm / Fuel cut System Manual
e. Equipment Manual
f. Rwy Friction Tests Results

Checklist

Preparation



Checklists - Preparation

More than simply reviewing reference documents and drafting questions.

Checklist must be prepared to enable the auditor to assess the degree of compliance with the documented system.

Questions should demand a response that the safety system is being complied.

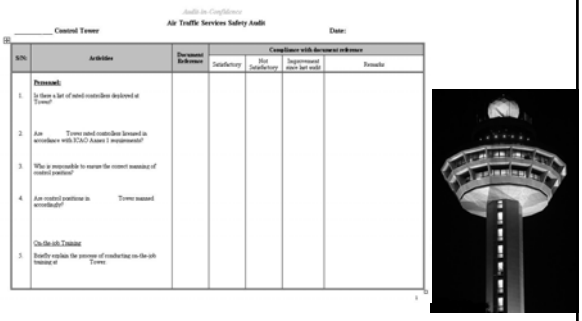
Checklists

Checklists should not be considered as an inflexible procedure.

During the audit, additions can be made or the format restructured as required.

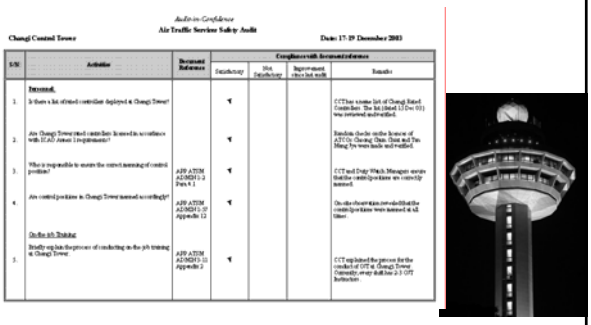
SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

Example of an audit checklist :



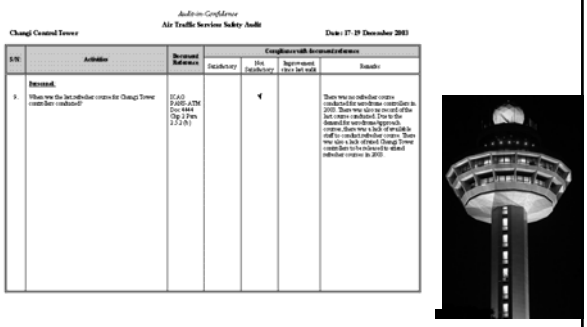
SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

Example of a complete audit checklist :



SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

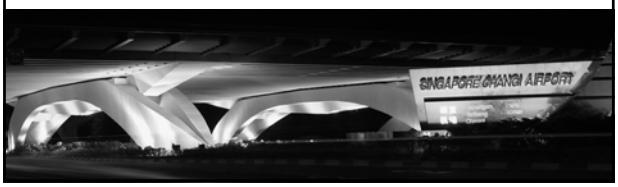
Example of an audit checklist – (with deficiencies):



Safety Audit of ATS – Safety Audit Planning

Conduct of a Safety Audit

Evidence Gathering



Safety Audit of ATS – Safety Audit Planning

Evidence Gathering:

Objective evidence are used to confirm or otherwise that what has been said is actually practised.

Documentary and/or physical evidence must be gathered.

Safety Audit of ATS – Safety Audit Planning

Evidence Gathering:

Auditors should always verify responses by observing objective evidence.

Objective evidence might be:

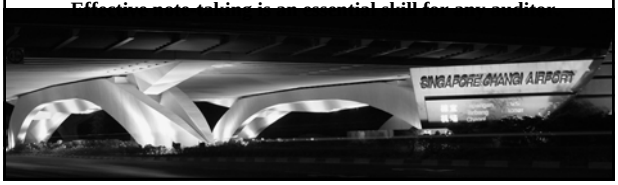
- **positive** - ***that is it exists and can be seen***
- **negative** - ***that is something that should exist does not***

Evidence Gathering:

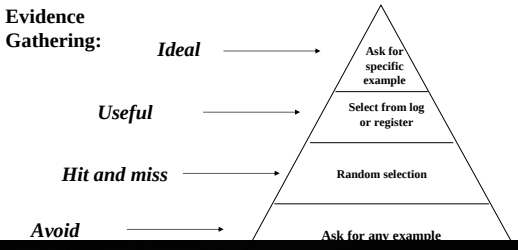
It is also important that documents are not accepted at face value.

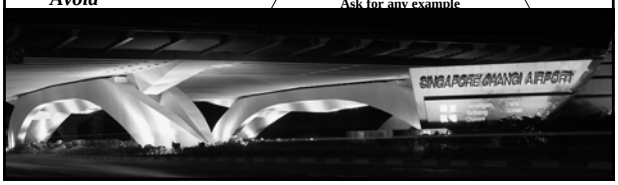
The auditor must thoroughly understand what is being presented, and should always ask for verification of spoken claims.

Effective note-taking is an essential skill for any auditor.



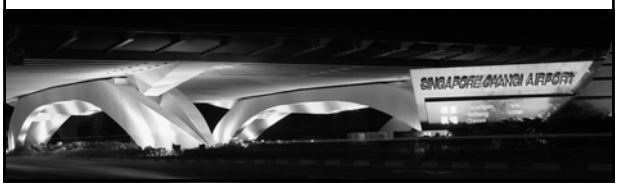
Evidence Gathering:





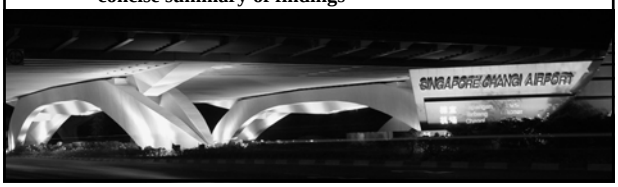
Team Management

The Team Leader for the audit is responsible for the control and direction of his/her team throughout the exercise.



A successful audit contain the following:

- **time management**
- **questioning techniques / listening**
- **sampling**
- **note-taking**
- **audit trail – linking evidence together**
- **use of checklist**
- **concise summary of findings**



Exit Meeting

Exit Meeting:

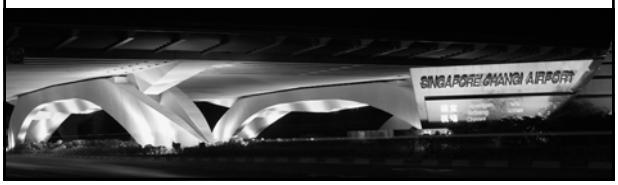
The purpose of the meeting is to present the audit findings to the auditee management team.

It is therefore important that the auditee is represented by managers with *executive responsibility*, able to *formally accept findings* and decide upon *corrective action*.

Exit Meeting:

The meeting should allow findings to be discussed or even challenged.

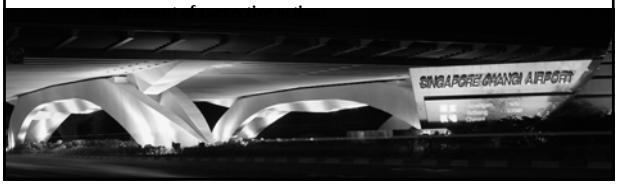
Team Leader should be prepared to modify or even withdraw nonconformities should there be reasonable grounds for such action.



Exit Meeting:

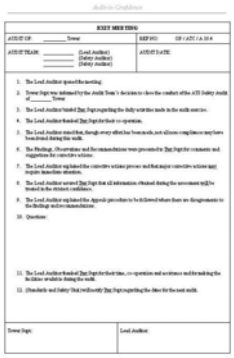
The following points should be included :

- **reiteration of the audit scope and objectives**
- **a disclaimer – audit is only a sampling exercise**
- **recognition of auditee's cooperation**
- **statement of confidentiality**
- **summary of audit findings**
- **presentation of specific nonconformities**
- **resolution of queries**



SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

Example of an exit meeting :



EXIT MEETING

AUDIT OF: _____ Tower	REF NO: SB / ATC / A 10.4
AUDIT TEAM: _____ (Lead Auditor) _____ (Safety Auditor) _____ (Safety Auditor)	AUDIT DATE:

1. The Lead Auditor opened the meeting.
2. Tower Mgr was informed by the Audit Team's decision to close the conduct of the ATS Safety Audit of _____ Tower
3. The Lead Auditor briefed Tower Mgr regarding the daily activities made in the audit exercise.
4. The Lead Auditor thanked Tower Mgr for their co-operation.
5. The Lead Auditor stated that, though every effort has been made, not all non-compliances may have been found during this audit.
6. The Findings, Observations and Recommendations were presented to Tower Mgr for comments and suggestions for corrective actions.
7. The Lead Auditor explained the corrective actions process and that major corrective actions may require immediate attention.
8. The Lead Auditor assured Tower Mgr that all information obtained during the assessment will be treated in the strictest confidence.
9. The Lead Auditor explained the Appeals procedure to be followed when there are disagreements to the findings and recommendations.
10. Questions:

11. The Lead Auditor thanked Tower Mgr for their time, co-operation and assistance and for making the facilities available during the audit.
12. (Standards and Safety Dept) will identify Tower Mgr regarding the dates for the next audit.

Tower Mgr:	Lead Auditor:

SAFETY AUDIT PLANNING

Audit Programme

Planning an Audit Programme

Safety Audits can be of great benefit provided they are carried out professionally and thoroughly.

Careful and comprehensive preparation is essential to the overall success of any audit.

Inadequate preparation can result in:

- ***Devalued audit findings***
- ***A loss of credibility in the audit function overa***
- ***a waste of both auditor's and auditee's time***

A good rule of the thumb

- **40% of the total hrs estimated for the audit in *preparation activities***
- **a further 40% on *conducting the audit***
- **remaining 20% devoted to *reporting and follow-up actions***

An audit programme should always contain provision for:

- ***an opening and a closing meeting with the senior management***
- ***regular (at least twice daily) audit team meeting***
- ***contingency or 'mopping-up' operations***

Example of an audit Time-table

ATS Safety Audit of _____ Tower

Audit Time Table				
Date	Time	Activities	Venue	Offices Involved
Wednesday 6 Apr 2005	0930	Entry Meeting	Briefing Room	Audit Team Tgt Insp Observer – x1
	1030	Document Review – Audit Staging and Review	Briefing Room	Audit Team Tgt Insp TI (Tower)
	1300	Lunch		
	1400	Document Review (cont'd) Review Analysis	Briefing Room	Audit Team Tgt Insp TI (Tower)
	1630	Audit Team Review – Statement of Findings	Meeting Room	Audit Team
Thursday 7 Apr 2005	0830	Audit Preparation	Meeting Room	Audit Team
	0930	Day Observation Visit – Review of Tower Operations	Tower Control Cabin	Audit Team Shift Manager Tower Controller
	1300	Break		
	1400	Day Observation Visit – Review of Tower Operations	Tower Control Cabin	Audit Team Shift Manager Tower Controller
	1600	Audit Team Review – Statement of Findings	Meeting Room	Audit Team
Friday 8 Apr 2005	0830	Overall Summation of Audit Findings – Preparation of Draft Preliminary Report	Meeting Room	Audit Team
	1200	Lunch		
	1400	Preparation for Exit Meeting	Meeting Room	Audit Team
	1500	Exit Meeting	Briefing Room	Audit Team Tgt Insp Observer – x1 X1

Audit Team – Lead Auditor _____	Venue:
Safety Auditor _____	Briefing Room = Controllers' Briefing Room
	Meeting Room = Conference Room
Observer _____	

Questions and Checklists

Prior to conducting an audit, it is important to have a vehicle to enable the auditor:

- *to identify which elements are for audit,*
- *refer to relevant documents in the air traffic system,*
- *record preliminary findings and observations.*

Checklists

Checklists are simply a sequential series of written questions or topics, designed to act as a prompt to the auditor.

- *provide a useful guide or memory aid*
- *form a record of what was checked during the audit*
- *ensure that all major points are covered*
- *help to save time in note taking during an audit*
- *assist in the preparation of the exit meeting*

Checklists

Checklists should not be considered as an inflexible procedure.

During the audit, additions can be made or the format restructured as required.

Example of an audit checklist :

Air Traffic Services Safety Audit

_____ Control Tower Date:

S/N	Activities	Document Reference	Compliance with document reference			
			Satisfactory	Not Satisfactory	Improvement since last audit	Remarks
	Personnel:					
1.	Is there a list of rated controllers deployed at Tower?					
2.	Are Tower rated controllers licensed in accordance with ICAO Annex 1 requirements?					
3.	Who is responsible to ensure the correct manning of control positions?					
4.	Are control positions in Tower manned accordingly?					
	On-the-job Training					
5.	Briefly explain the process of conducting on-the-job training at Tower.					

Entry Meeting

Entry Meeting

All audits should start with a brief meeting with the auditee management.

It provides the opportunity for all attendees to clarify any problems or conditions relating to the audit.

It is the responsibility of the Team Leader to manage the entry meeting.

Entry Meeting

The following points should be covered as a minimum :

- ***introduction of audit team***
- ***reiteration of the audit, scope and objectives***
- ***statement of confidentiality***
- ***review of programme & resolve queries***
- ***confirmation of administrative arrangements***
- ***coverage of how audit findings will be raised***
- ***confirm format of the exit meeting (time,who will attend, where…. etc)***

SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

Example of an entry meeting checklist:

ENTRY MEETING CHECKLIST		
AUDIT OF: _____ TOWER		
AUDIT DATE:		
1.	Introduce the audit team members to the auditee.	
2.	Circulate Entry/Exit Meetings Attendance Record for signing.	
3.	Review the scope of the audit with the auditee. Scope:	
4.	Check for any revisions to documentations since the Document Review.	
5.	Explain the audit methodology: · Review process and their control · Observe operations · Ask questions of operational controllers · Random testing of systems · etc	
6.	Confidentiality confirmed.	
7.	Explain Corrective Actions process.	
8.	Explain Major Corrective Actions may require immediate attention.	
9.	Review the Audit Timetable.	
10.	Confirm Unit representative has been allocated to each auditor. Names:	
11.	Confirm times for daily start and finish, and time for the exit meeting.	
12.	Confirm availability of facilities needed by the audit team.	
Notes:		

SAFETY AUDITS OF AIR TRAFFIC SERVICES
5 – 11 December 2007

Example of an entry meeting form:

ENTRY MEETING

AUDIT OF: [illegible] Tower — REF NO: OP / ATC / A 10 4

AUDIT TEAM: _____ (Lead Auditor), _____ (Safety Auditor), _____ (Safety Auditor) — AUDIT DATE: 4 Apr 01 – 5 Apr 01

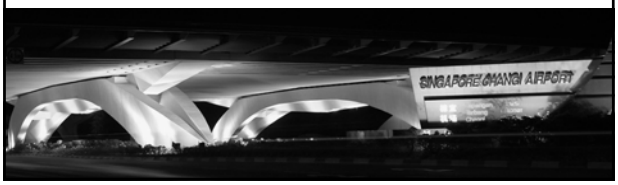
1. The Lead Auditor opened the meeting.
2. The Audit Team was introduced to CIT.
3. The Lead Auditor outlined the objectives and scope of the Safety Audit.
4.

Chief Station Tower: — Lead Auditor:

What is Safety Auditing?

"…a measure of an organisation safety performance."

Roger Saunders, The Safety Audit – Designing Effective Strategies *(1992)*

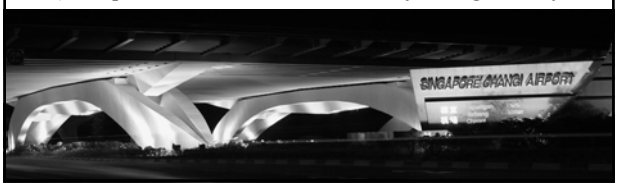


A Safety Audit –

a) Is usually regarded as a measure of performance in terms of accident reduction / prevention; and

b) Examines safety policies, practices, procedures and programmes.

c) Is a pro-active instrument in the Safety Management System



ATS Safety Management

"to ensure that the level of air traffic services (ATS) …. are appropriate and adequate for maintaining an acceptable level of safety in the provision of ATS"

OBJECTIVES

- **Ensure established level of safety is met**
  - Monitoring Safety Levels
    - *Collection and evaluation of safety-related data*
    - *Review of incident and other safety-related reports*
  - Safety Reviews
    - *Safety and Standards specialist group review*
    - SAFETY AUDITS
      - Units to Audit
      - Audit Contents – *a) Regulatory issues; b) Opnl and technl issues; c) Licensing & training issues*
  - Safety Assessment – *Required in the proposal for: a) Airspace re-organisation; b) Provision of ATS procedures; c) New equipment, systems or facilities*
  - Safety Enhancement Measures
    - *Hazard management*
    - *Safety Awareness Programme* – *a) Publicity; b) Training; c) Education / Safety Seminars*
- **Safety related enhancements are implemented**
  - Follow-up Actions

Safety Audit Planning

In Safety Audit Planning, concept models are used as tools to provide a systematic approach to safety review.

These models also serve as a structure to integrate standard requirements and audit reviews.

Safety Audit Planning

3 basic concept models in Safety Audit planning :

1. SHEL model (Frank Hawkins)

2. Swiss Cheese model (James Reason)

3. System process model

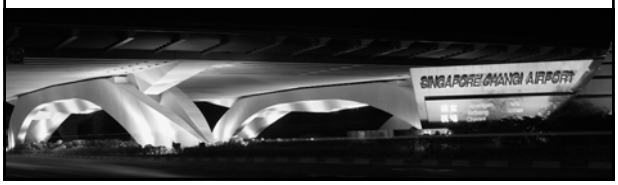
The SHEL model provides a conceptual framework to illustrate the interfaces and interaction between categories:

Liveware – Software

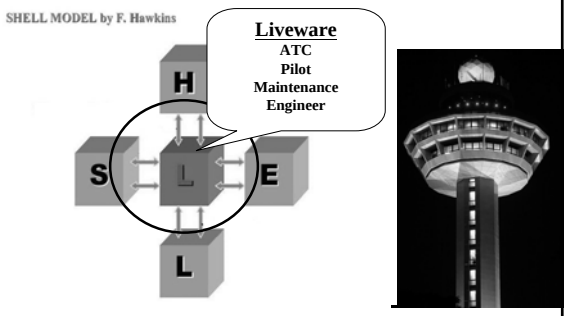
Liveware – Hardware

Liveware – Environment

Liveware - Liveware



Frank Hawkins SHEL Model Concept



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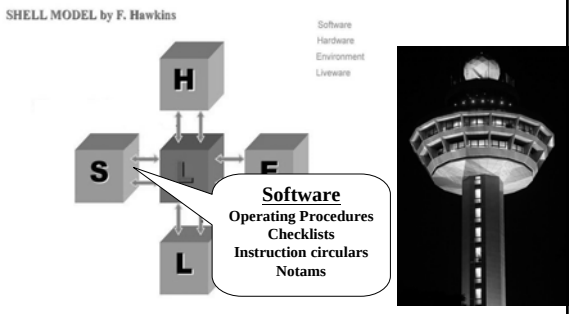

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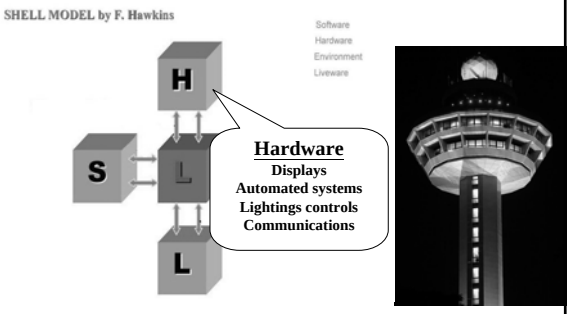

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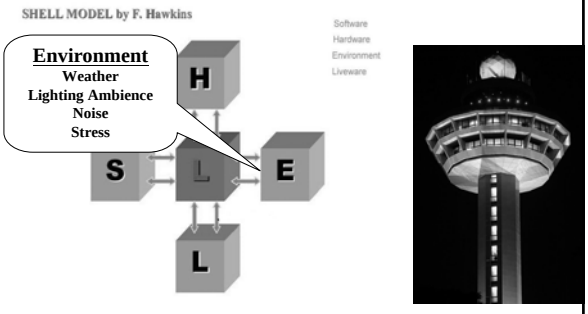

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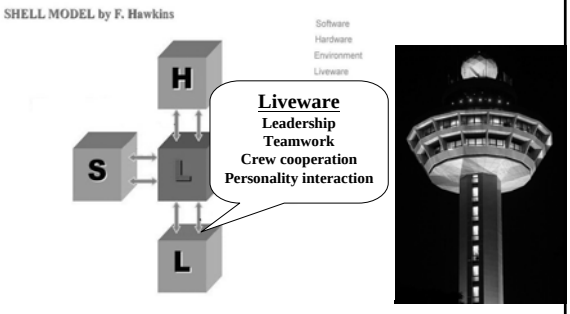
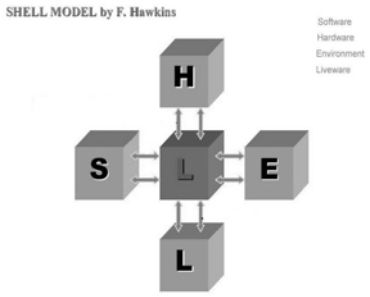


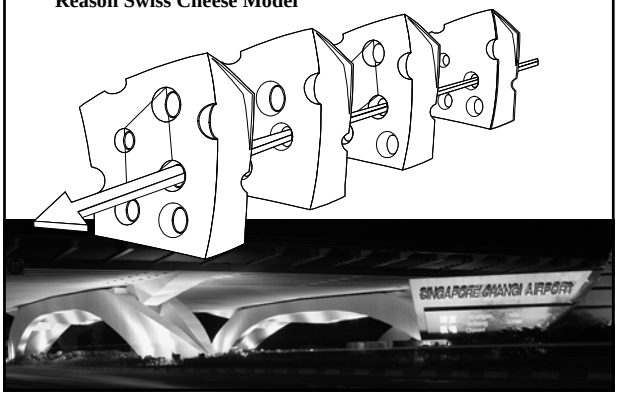
SAFETY AUDITS OF AIR TRAFFIC SERVICES

Frank Hawkins SHEL Model Concept



Safety Audit of ATS – Safety Audit Planning

Reason Swiss Cheese Model

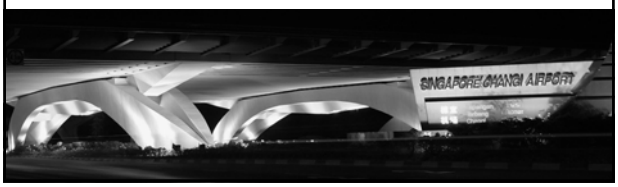


Safety Audit of ATS – Safety Audit Planning

Reason Swiss Cheese Model

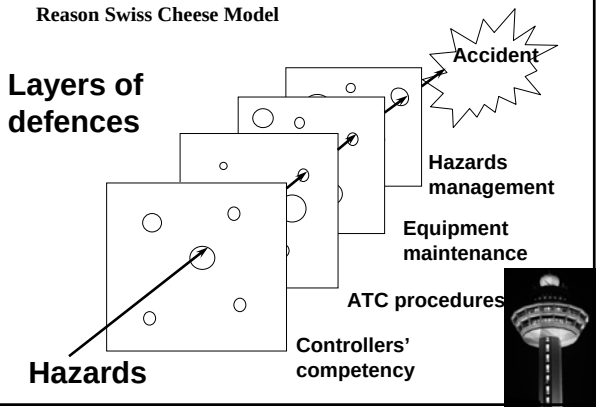
Prof James Reason views the aviation industry as a complex productive system.

Reason's Swiss Cheese model is used primarily as an accident causation model to investigate the breeches in the aviation layer of defense.

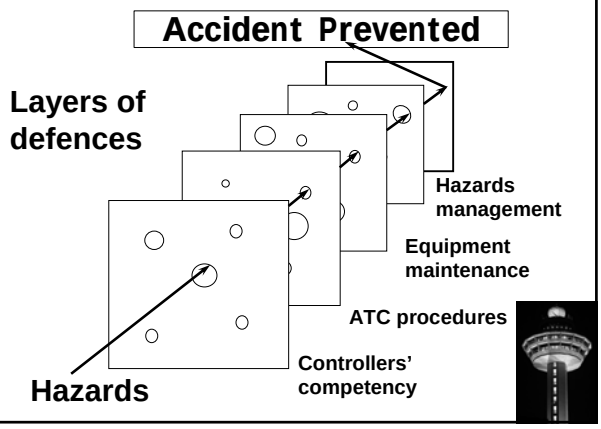


SAFETY AUDITS OF AIR TRAFFIC SERVICES

Reason Swiss Cheese Model



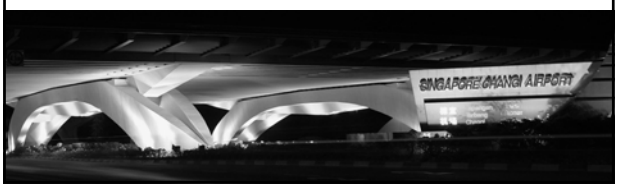
SAFETY AUDITS OF AIR TRAFFIC SERVICES



Safety Audit of ATS – Safety Audit Planning

Shel and Reason's Model

In addition to Reason's model, the conceptual SHEL model will facilitate the data collection task by providing a systematic approach to identifying problems.



System Process Model

System Process examination is a model use in aerodrome certification audit.

System Process identifies 5 key elements within a system :

1. Personnel
2. Equipment
3. Environment
4. Material
5. Information

System Process Model – Aerodrome Control Service

Personnel

Competency?

Trainined?

Licence?

Equipment

COMMS?

Airfield Lightings?

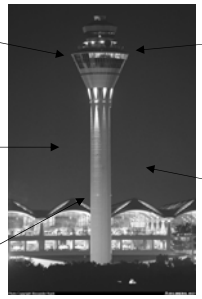
ASDE?

Material

Headset - Compatible?

Binoculars?

Stationeries; pens/pencil ?



Environment

View Obstructed?

Noise/Distractions?

Drinks - hazards?

Information

Procedures- clearly understood? updated? relevant?

Operating manuals- easily accessed?

New info – how disseminated?

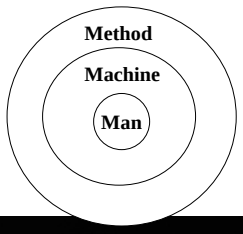
Other Models include :

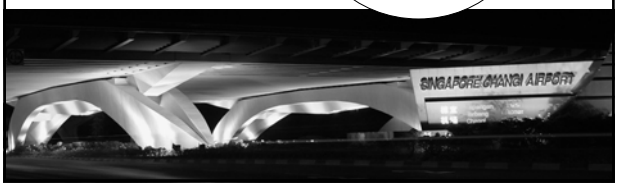
3 M Approach:

Man

Machine

Method





Other Models include :

Critical Elements Approach:

CE 1 – Primary Aviation Legislation

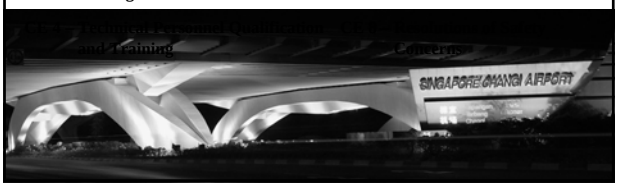
CE 2 – Specific Operating Regulations

CE 3 – Civil Aviation Systems and Oversight Functions

CE 5 – Tech Guidance, Tools and Provn of Safety-Critical Info

CE 6 – Licensing, Certification, etc

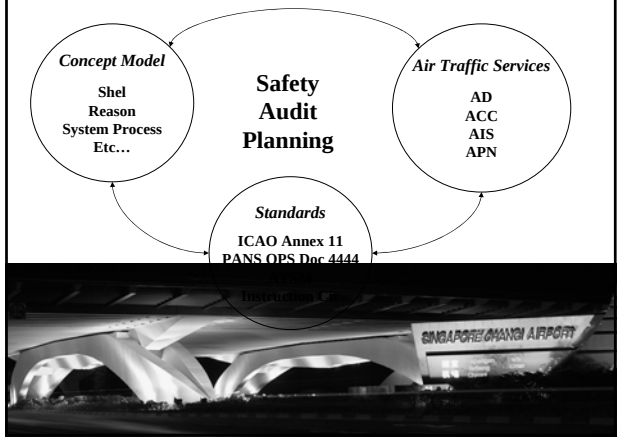
CE 7 – Surveillance Obligations



Tools used in the Comprehensive Systems Approach audit

Audit Protocols – an example

ICAO reference	Aspects to be audited or questions to be answered	Status	Example of evidence to be reviewed	Implementation as applicable	Comments	CE
OPS 4.000 – Legislation and regulations for aircraft operations						
GM Doc 8335 1.2.1 & 2.1.2 Doc 9734 Part A 3.3	OPS 4.001 Has the State developed and promulgated specific operating regulations applicable to aircraft operations to enable the State to implement the provisions of annex 6?	❑ Yes ❑ No	Title and date of applicability of all regulations related to operation of aircrafts. Review the compliance checklist.	❑ Satisfactory ❑ Not satisfactory ❑ Not applicable		2
GM Doc 8335 1.2.1 & 2.1.2 Doc 9734 Part A 3.3	OPS 4.002 Has the State developed and promulgated specific operating regulations applicable to aircraft operations to enable the State to implement the provisions of annex 18?	❑ yes ❑ No	Title and date of applicability of all regulations related to operation of aircrafts. Review the compliance checklist.	❑ Satisfactory ❑ Not satisfactory ❑ Not applicable		2
OPS 4.060 – Availability of qualified technical personnel and training						
GM Doc 8335 9.3.1 & 9.4 Doc 9734 Part A 3.6	OPS 4.062 Has the CAA established minimum flight and work experience to become operations inspectors?	❑ Yes ❑ No	Review recruitment requirements. This can include: 1. Five or more years in air transport 2. 5.000 flight hours, 3. Training experience, etc.	❑ Satisfactory ❑ Not satisfactory ❑ Not applicable	**Applicable Critical Element**	4



Lessons Learnt

ATS Safety Audit Process

- October 2001-ICAO set a new standard for state to:
- Establish safety management programmes to ensure:

1)Air traffic services

2)Comms/nav/surveillance systems

maintained at safe level.

Audit Objectives

- To ascertain compliance with ICAO Standards and Recommended Practices.
- To ensure adherence with prescribed standards and procedures in the provision of air traffic services.
- To determine the effectiveness of safety planning in ATC operations.
- To highlight commendable findings (where appropriate)

SCOPE OF AUDIT

- Licensing and Training Issues
- Regulatory Issues
- Operational and Technical Issues

criteria & requirements as specified in:

1. Air Traffic Service Manuals
2. ICAO Annex 11
3. PANS ATM Doc 4444
4. ATS Instruction Circulars

Authority For Audit Programme

- Head (Standards Unit) is the convening authority for safety audits as approved by the Division Head (ATS), and;
  - is accountable to the Division Head (ATS) for matters relating to safety management system and safety oversight of air traffic services.
  - is authorised to plan the conduct of safety audits and the selection of audit team members.

Audit Team

- The audit team usually consists of two members (lead auditor and safety auditor)
- This number may be augmented, depending on the size and complexity of the unit to be audited.

Audit Team Qualifications

- An audit team member must be at least an ATCO Grade IV (supervisory appointment)
- Must hold two valid ATC ratings.
- Has completed and obtained a pass in an approved audit training

AUDIT NOTIFICATION

- 3 months prior to audit
- 2 months prior to proposed dates:
- Unit Head to concur or propose alternate dates.

Audit Time Table

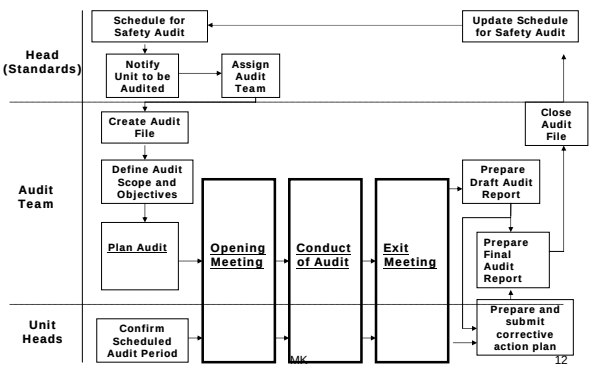
Dates	Time	Activities	Venue	Officers Involved
Tuesday 27 March 2007	0900	Entry Meeting	Seletar Briefing Room	Audit Team CST Observer – PCC
	1000	Document Review - Audit Sampling and Review	Seletar Briefing Room	Audit Team CST CO (Seletar Tower)
	1300	Lunch Break		
	1400	Document Review (cont'd) Process Analysis	Seletar Briefing Room	Audit Team CST CO (Seletar Tower)
	1630	Audit Team Review – Summary of Findings	Seletar Briefing Room	Audit Team
Wednesday 28 March 2007	0830	Audit Preparation	Seletar Briefing Room	Audit Team
	0930	Day Observation Visit – Review of Tower Operations	Seletar Tower Control Cabin	Audit Team Watch Managers Tower Controllers
	1300	Break		
	2000	Night Observation Visit – Review of Tower Operations	Seletar Tower Control Cabin	Audit Team Watch Manager Tower Controllers
	2300	Audit Team Review – Summary of Findings	Seletar Briefing Room	Audit Team
Thursday 29 March 2007	0830	Overall Summation of Audit Findings – Preparation of Draft Preliminary Report	Seletar Briefing Room	Audit Team
	1300	Lunch Break		
	1400	Preparation for Exit Meeting	Seletar Briefing Room	Audit Team
	1500	Exit Meeting	Seletar Briefing Room	Audit Team CST Observer – SATCM (SSU)

Audit Process

- Upon confirmation of audit schedule:
- Lead Auditor to prepare checklist on the 4 elements:
  1) Personnel & Training
  2) Documentation
  3) Procedures & Environment
  4) Equipment

Safety Audit Process

Audit Flow Chart



Audit Procedures

Audit Day 1: Entry Meeting:

- Lead Auditor will conduct entry meeting.
- Audit Team introduced to Auditee.
- Objectives / scope of Safety Audit outlined
- Audit standards confirmed.
- Audit methodology explained.

MK 13

Audit Procedures

Audit Entry Meeting: (continued)

- - including reviewing process, random sampling of documents, on-site observations and interviewing operational controllers
- Explain the corrective action process
- Check for availability of facilities and resources as required by the audit team.
- Confirm the date/time for an exit meeting.

MK 14

Audit Procedures

Audit Day: Conduct of audit:

- Should be conducted in accordance with audit plan.
- Interview auditee to gather objective information to determine effectiveness of safety planning and practices.
- Use questions checklist based on four main elements, namely Personnel and Training, Equipment, Procedures and Documentation.

MK 15

Audit Procedures

Audit Day : (Documentation review)

- Ensure operating manuals are available, updated and accessible.
- Examine watch logbooks and records for reports on:
  (a) equipment unserviceability
  (b) abnormal reports
  (c) animal hazards

MK 16

Audit Procedures

- **Conduct of audit: Day 2**
- On-site observation:
  - work practices
  - manning level
  - control room discipline

Gather information through interview of watch manager and controllers

MK 17

Audit Procedures

Conduct of audit: (continued)

- Deficiencies when identified, should be recorded as observations or findings.
- All audit findings for non-compliance or non-adherence must be verified.
- Ensure that findings are supported by evidence and documented in a clear and concise manner.

MK 18

Audit Procedures

Evidence Gathering:

- Audit team must always verify auditee's response during interview by gathering documentary and physical evidence.
- Objective evidence is used to confirm or refute what has been said by auditee or actually practiced by operational staff.
- It is important not to accept what is said at face value.
- Always ask for verification of spoken claims.

MK 19

Audit Procedures

Summary Of Findings:

- Review and validate findings of safety audit prior to exit meeting.
- A summary of findings must be completed and presented to Unit Head at exit meeting.

MK 20

Audit Procedures

Definitions Of Audit Findings:

- **Non-Compliance:**
  - An audit finding that identifies areas where ICAO SARPs and provisions in ICAO PANS ATM Doc 4444 are not implemented.
- **Non-Adherence:**
  - An audit finding that identifies areas where standards and procedures as specified in ATSM and related documents are not applied or not applied correctly.

MK 21

Audit Procedures

Definitions Of Audit Findings:

- **Observations:**
  - An area which, in the audit team's view, could improve efficiency and/or generate an improved safety outcome and which the auditee should note and address.

MK 22

Audit Procedures

Exit Meeting:

- Lead auditor convenes exit meeting with auditee (Unit Head) at the end of audit.
- Brief the auditee on the audit findings of the unit's safety oversight activities.
- Provide information on the findings and recommendations that would be included in the final audit report.
- Allow audit findings to be discussed or even challenged.

MK 23

Audit Procedures

Exit Meeting: (continued)

- Be prepared to modify or even withdraw certain audit findings should there be reasonable grounds to do so.
- When the auditee agrees with the audit team's findings, corrective actions must be taken to address the issues.
- Agree on a time-frame for the unit to come up with a corrective action plan to resolve the findings.

MK 24

Audit Procedures

Dispute Resolution:

- In the event of a failure to resolve issues associated with a safety audit, the matter would be referred to Division Head (ATS) through CATCO and Head (Standards Unit).

SAFETY AUDIT PROTOCOL

Security of Audit Documentation
All documentation relating to the safety audit should be treated as " Audit-in-Confidence" and marked accordingly.

Documentation including draft reports, evidence, summary of findings and recommendations should be secured at all times.

Safety Audit Process

Draft Audit Report
Findings and Recommendations

Operational Unit: **Audit Period:**	**Reference Number:**
Document Reference:	**Audit Protocol Reference:**
Type Of Findings: ☐ **Non-compliance of Standards and Procedures** ☐ **Non-adherence of Standards and Procedures**	
Findings:	
Recommendations:	
Lead Auditor:	**Date:**
Team Member/s:	

Audit Report

- The audit report is an objective reflection of the results of safety audit.
- It provides information on the status of implementation of ICAO SARPs, ATSM standards and procedures and practices.
- The report would also serve to identify the need to initiate corrective action on deficiencies in the ATS system.

Final Audit Report

- The final audit report represents the official report of the safety audit.
- Lead Auditor prepares the report in consultation with audit team members.
- It should be made available within 28 days after the end of safety audit.
- Primary objective of distributing the report is to enhance safety in air traffic services.

Post Audit Follow-up

- Purpose is to validate the effective implementation of the corrective action plan submitted by Unit Head.
- Audit follow-up reporting forms and checklists should be completed for each finding.
- A report should be submitted on the implementation status of the unit corrective action plan.

Closing Of Safety Audit

- The safety audit would be completed when;
  - the final report has been published and accepted
  - an action plan to address deficiencies and/or non-standard practices has been completed
  - the deficiencies and non-standard practices have been closed by Lead Auditor

MK 31

SAFETY AUDIT PROTOCOL

Audit Process Timeline

a. 3 months prior to Audit Day – notify Unit Head (Auditee)

b. 2 months prior to Audit Day – Unit Head to concur with schedule of audit

c. **Audit Day** - conduct audit of ATC Unit (2 to 3 days depending on size of audit)

MK 32

Audit Process Timeline

d. Exit Meeting - Audit Team to inform Unit of findings & recommendations

e. 7 days after end of audit - Audit Team to submit draft report to Unit Head

f. 14 days after end of audit - Unit Head to submit unit's - corrective action plan

g. 21 days after end of audit - submit draft final report to Unit Head

MK 33

Audit Process Timeline

h. 24 days after end of audit - Unit Head to provide comments on DFR

i. 28 days after end of audit - Audit Team to publish Final Report

j. Completion of corrective action plan - close audit file

MK 34

Safety Audits of Air Traffic Services

1

Overview of

ICAO USOAP

Comprehensive Safety Approach

ATS Safety Management Programme in Singapore

2

Outline of Presentation

- History
- Comprehensive System Approach
- CAAS Safety Management Structure
- ATS Safety Management Programme
- Conclusion

3

ATS Safety Management

History

- **1995**
  - On 7 June 1995, ICAO Council approved the ICAO voluntary Safety Oversight Assessment Programme (SOAP)
- **1996**
  - The 31st Session of the Assembly endorsed and launched first stage of program (voluntary)
    - **88 requests, 67 assessments made**
    - **Annex-by-Annex approach**

4

ATS Safety Management

History

- **1997**
  - **DGCA Conference addressed the need for increased attention to global aviation safety as identified through the SOAP**
  - **Conference made 38 recommendations, the most significant being:**
    - **Regular, mandatory safety audits to be carried out by ICAO**
    - **Greater transparency and increased disclosure**
    - **Programme to be extended**
    - **ICAO Council ensure allocation of adequate resources for the implementation of the audit programme**

5

ATS Safety Management

History

- **1998**
  - **The 32nd Session of the ICAO Assembly established the Universal Safety Oversight Audit Program (USOAP)**

    Emphasis on:
    - **Annex 1 – Personnel Licensing**
    - **Annex 6 – Operation of Aircraft**
    - **Annex 8 – Airworthiness of Aircraft**
  - **181 Audits conducted, 162 Follow-ups, Annex-by-annex approach**

6

ATS Safety Management

History

- **2001**
  - **33rd Session of ICAO Assembly adopted resolution to expand the USOAP to include:**

    Requirements contained in
    - **Annex 11 (ATS) and**
    - **Annex 14 (Aerodromes)**
    - **And other safety-related fields e.g. Annex 13**
  - **Provisions and guidance available in ICAO PANS-ATM DOC 4444 and ICAO PANS-ATM DOC 9735**

7

ATS Safety Management

History

- **2005**
  - **35th Session of ICAO Assembly adopted Assembly resolution A35-6, that:**
    - **USOAP further expand to include safety-related provisions in all safety-related Annexes (except Annex 9 and 17)**
    - **USOAP restructured to implement the comprehensive system approach to reflect the critical elements of a safety oversight system**

8

ATS Safety Management

History

ICAO USOAP has enjoyed a high degree of acceptance on the parts of the States

The success of the Programme had led to demands to cover all safety-related areas of aviation

Audit Findings now classified under the critical elements

Greater transparency – audit information to be made public

9

ICAO SAFETY OVERSIGHT AUDIT

Comprehensive Systems Approach Audit

10

Comprehensive systems approach audit

- **A comprehensive systems approach (CSA) refers to:**

  "the implementation of a structured process and methodology for the planning, preparation, conduct, reporting, follow-up and evaluation of ICAO safety oversight audits."

11

Comprehensive systems approach audit

- **A systems approach audit :**
  - **Looks at States' safety oversight systems from a process perspective;**
  - **Provides a timely picture of the overall health of a State's safety oversight system;**
  - **Focuses attention on critical safety areas;**
  - **Allows for flexibility depending on the size and complexity of the aviation system established in a State.**

12

Comprehensive systems approach audit

- **Benefits of a systems approach audit:**
  - **Assesses a State's overall capability for safety oversight;**
  - **Assesses the effective implementation of the critical elements of a safety oversight system;**
  - **Avoids a piecemeal approach of evaluating aviation Safety Standards.**

13

Comprehensive systems approach audit

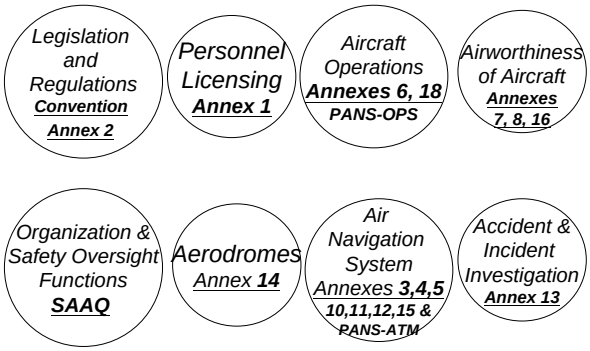
- **Benefits of a systems approach audit:**
  - **Promotes uniform implementation of international safety Standards;**
  - **Provides the safety oversight capability of the State;**
  - **Contributes to the safety and efficiency of international air transport system.**

14

Scope of the Comprehensive System Approach audit

15

Scope of the Comprehensive System Approach audit



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ICAO SAFETY OVERSIGHT AUDIT

Critical Elements of an effective safety oversight system

17

Critical Elements of an effective safety oversight system

Effective safety oversight system

- **What is meant by an effective safety oversight system?**
- **What are the elements that you would consider essential for a State to establish and maintain an effective safety oversight system?**

18

Critical elements of a State's safety oversight system

19

Critical elements of an effective safety oversight system

- **Enables the effective implementation of safety-related policies and associated procedures.**
- **Encompasses the whole spectrum of civil aviation activities.**
- **Serve as safety defence tools of a State's safety oversight system.**

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ICAO SAFETY OVERSIGHT AUDIT

Tools used in the Comprehensive Systems Approach audit

21

Tools used in the Comprehensive Systems Approach audit

Audit tools:

- **Compliance Checklist (CC);**
- **State Aviation Activities Questionnaire (SAAQ); and**
- **Audit Protocols**

22

Tools used in the Comprehensive Systems Approach audit

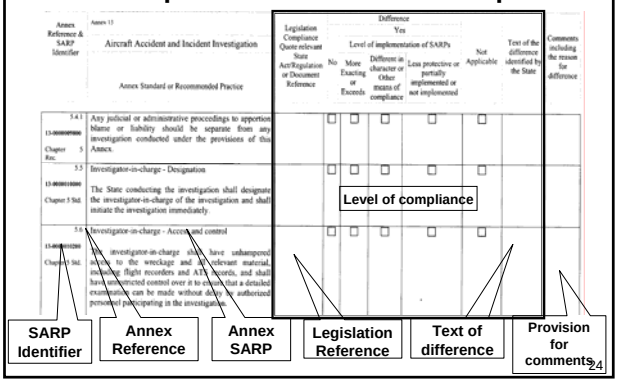
Compliance Checklist:

- **Provides ICAO with information on a State's level of implementation of international SARPs;**
- **Identifies differences in a State and those established by international standards (Article 38 of the Chicago Convention)**

23

Tools used in the Comprehensive Systems Approach audit

Compliance Checklist – an example



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Tools used in the Comprehensive Systems Approach audit

State Aviation Activities Questionnaire (SAAQ)

- Provides information on the organization and system established by a State to meet its safety-related obligations as a signatory to the Convention on International Civil Aviation.

25

Tools used in the Comprehensive Systems Approach audit

Contents of the State Aviation Activity Questionnaire (SAAQ):

- Part I – General administrative information
- Part II – Legislation
- Part III – Organization
- Part IV – Operational activities
- Part V – Air navigation services
- Part VI – Aerodromes
- Part VII – Aircraft accident and incident investigation

26

Tools used in the Comprehensive Systems Approach audit

Audit Protocols (PQ):

- **Used for the conduct of the on-site audit;**
- **Auditing against the critical elements of a safety oversight system;**
- **Provide guidelines on what evidence should be reviewed;**

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Tools used in the Comprehensive Systems Approach audit

Audit Protocols (PQ):

- **The primary tool for on-site audit to ensure transparency, consistency and standardization;**
- **Enhances confidence and reliability in the conduct of audits;**
- **Reflect the core areas of the audit Programme.**

28

Tools used in the Comprehensive Systems Approach audit

Areas covered by the Audit Protocols:

- Primary Aviation legislation and civil aviation regulations (LEG)
- State aviation system and safety oversight functions (ORG)
- Personnel licensing system (PEL)
- Operation of aircraft (OPS)
- Airworthiness of aircraft (AIR)
- Aircraft accident and incident investigations (AIG)
- Air navigation services (ANS)
- Aerodromes (AGA)

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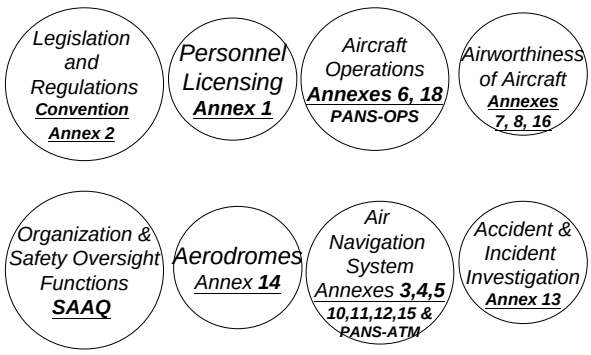
Scope of the Comprehensive System Approach audit



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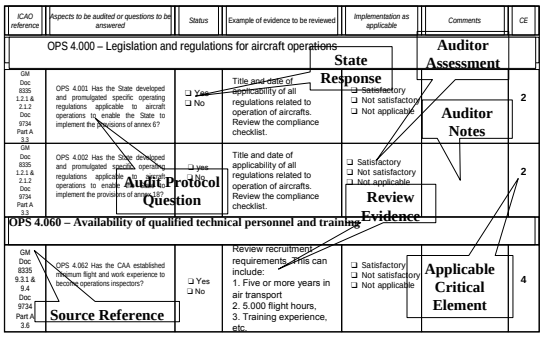
Tools used in the Comprehensive Systems Approach audit

Audit Protocols – an example



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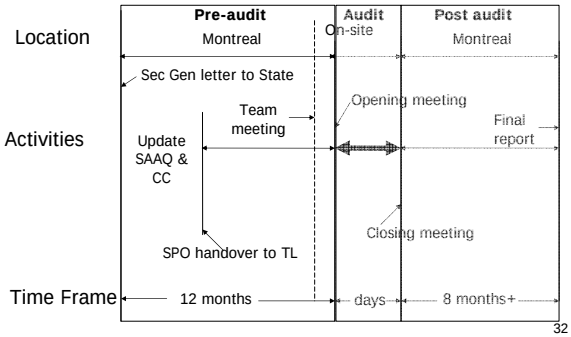
Tools used in the Comprehensive Systems Approach audit

- **Safety oversight audit process:**



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Review

- **History of ICAO USOAP**
- **Comprehensive Approach**

CAAS Approach

- **CAAS Safety Management Structure**
- **ATS Safety Management Programme**

33

Adopting the Standards...

- **Two main components in a safety management system:**
  - **Safety regulatory and oversight function**
  - **Active safety management system of the ATS provider**

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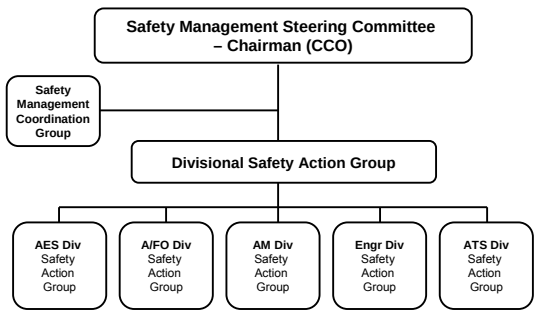
Adopting the Standards...

- **CAAS started to formalise safety management system to achieve:**
  - **More systematic, proactive and integrated approach to managing safety**
  - **Means to control hazards within the ATS system**

35

SMS Structure in CAAS...



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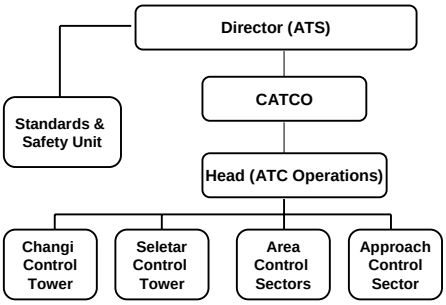
SMS in ATS...



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SMS in ATS...

- **Safety Policy**
- **Safety Management Principles**
- **Safety Assessments**
- **Safety Targets**
- **Accountabilities**
- **Safety Audits**
- **Incident Reporting**
- **Training**

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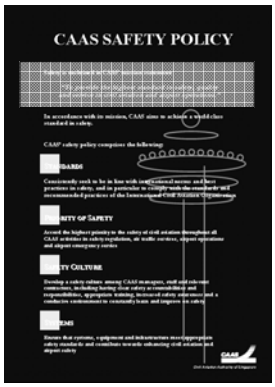
SMS in ATS...



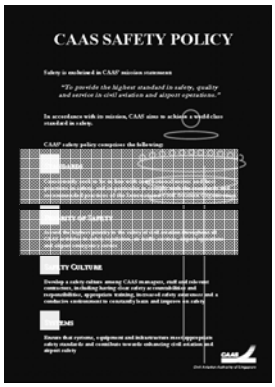
Safety Policy

Enshrined in CAAS mission statement :

'To provide the highest standard in safety, quality and service in civil aviation and airport operations'

39

SMS in ATS...



Standards

- Comply with ICAO SARPs
- Adopt international norms and best practices in safety

• Priority

- Accord highest priority to safety of civil aviation

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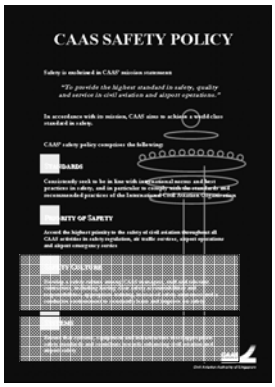
SMS in ATS...



Safety Culture

- Set clear safety accountabilities
- Provide appropriate training
- Increase safety awareness

• Systems

- Meet appropriate safety standards

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SMS in ATS...

Safety Management Principles

STAFF

❑ Competency Principle

Staff are adequately trained to be competent for the job they are required to do, in addition to being properly licensed if so required.

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Safety Management Principles

STAFF

- Safety Improvement Principle

  All staff are actively encouraged to propose solutions to identified hazards and changes should be made to improve safety where they appear needed.

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Safety Management Principles

Preventive and Reactive Remedial Action

- Safety Occurrences Principle

  Any incident which has safety implications is investigated and necessary corrective action taken. Where remedial action cannot be taken, reasons are recorded.

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Safety Management Principles

Preventive and Reactive Remedial Action

- Safety Improvement Principle

  All staff are actively encouraged to propose solutions to identified hazards and changes should be made to improve safety where they appear needed.

45

Safety Management Principles

Preventive and Reactive Remedial Action

- Safety Surveys Principle

  Safety surveys are carried out to recommend improvements where needed, to provide assurance to managers of the safety of activities within their areas and to confirm conformance with applicable parts of the safety management system.

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Safety Management Principles

Preventive and Reactive Remedial Action

- Safety Monitoring Principle

  Procedures are in place to detect changes in systems or operations which may suggest any element is approaching a point at which acceptable standards of safety can no longer be met and corrective action should be taken.

47

Safety Management Principles

Safety Culture and Safety Awareness

- Lesson Dissemination Principle

  Lessons arising from safety occurrence investigations are disseminated within units and passed up the management chain and relevant authorities, if appropriate.

48

SMS in ATS...

Safety Management Principles

Safety Culture and Safety Awareness

- Organisational Change Principle

  Major organisational changes are accompanied by a formal analysis and evaluation of safety management implications.

49

SMS in ATS...

Safety Management Principles

Safety Culture and Safety Awareness

- Safety Awareness Principle

  Staff are kept aware of the safety management initiatives in the organisation and reminded of the emphasis placed on safety.

50

SMS in ATS...

Safety Management Principles

Safety Assessment

- Safety Targets
  - Quantitative safety targets are set and maintained for all systems and operations
  - At the operational level, safety targets have been established

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SMS in ATS...

Safety Management Principles

Safety Assessment

- Safety Targets

  Targets include:
  - Number of ATC incidents
  - Number of birdstrikes
  - Accuracy in NOTAMs
  - Availability of critical systems such as ATS system, Navaids, Radar, ILS and Communications

52

SMS in ATS...

Safety Management Principles

Safety Assessment

- Safety Targets

  Targets monitored and reviewed on a monthly basis.

53

SMS in ATS...

Safety Management Principles

Safety Assessment

- Qualitative Safety Assessment

  Any significant safety-related change to the ATC system implemented only after a safety assessment has demonstrated that an acceptable level of safety will be maintained.

  Safety assessment are formally conducted and documented to ensure that due consideration is given to all operational and technical aspects.

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Safety Management Principles

Safety Assessment

- Qualitative Safety Assessment
  - Formal, proactive and systematic process of identifying potential hazards
  - Find ways to control risk associated
  - Take action to pre-empt problems

55

Safety Accountabilities

All senior officers and managers have safety accountabilities and responsibilities.

Example:

Head of Standards and Safety Unit is accountable to Director (ATS) for the effective implementation and maintenance of the Safety Management System for air traffic services and the safety oversight of air traffic services.

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Performance Monitoring

- Means to verify that safety targets are met
- Detect trends
- Detect weakness in system defences

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Performance Monitoring

Achieved through:

1. Proficiency Checks
2. RTF Monitoring
3. Validation Assessments
4. Safety Audits

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Performance Monitoring

Achieved through monitoring of:

- Number of ATC incidents
- Number of birdstrikes
- Accuracy in NOTAMs
- Availability of critical systems such as ATS system, Navaids, Radar, ILS and Communications
- Obstacle and wildlife hazard control

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Monitoring of Performance and Standards of Controllers

60

SMS in ATS...

Safety Audit

- Detailed review of operations, procedures and practices
- Provides vital information
  - Safety of current operations
  - Areas where corrective action may be required

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SMS in ATS...

Safety Audit

- Ascertain compliance with ICAO SARPs and prescribed procedures
- Ensure adherence with standards and procedures
- Determine effectiveness of safety planning in ATC operations
- Highlight commendable findings

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SMS in ATS...

Safety Audit

- Protocol for safety audit of ATC units was finalised in September 2003.
- First audit was conducted in December 2003.
- Each ATC unit will be audited at least once annually.

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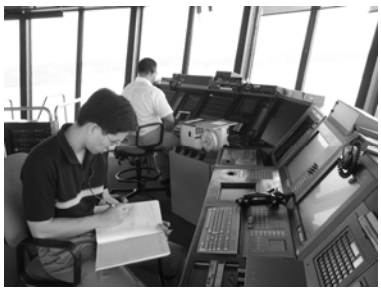
SMS in ATS...

Safety Audit of operational units commenced in December 2003.



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SMS in ATS...

The scope of ATS unit safety reviews should include:

- Regulatory Issues
- Operational and Technical Issues
- Licensing and Rating Issues

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SMS in ATS...

Regulatory Issues

- ATS manuals, instructions, coordination procedures are complete, concise and up-to-date
- ATS route structure provides
  - Adequate spacing
  - Location of crossing points reduce need for controller intervention
- Separation minima used are appropriate
- Procedures and measures in place to minimise runway incursion threats

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SMS in ATS...

Regulatory Issues

- Procedures for Low Visibility Aerodrome Operations
- Traffic volumes and controller workload do not exceed defined safe levels
- Procedures for Equipment failures provide acceptable level of safety
- Procedures for Reporting of Incidents are implemented

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SMS in ATS...

Operational and Technical Issues

- Environmental working conditions
- Automation systems
- Equipment designed ergonomically

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SMS in ATS...

Operational and Technical Issues

- CNS and other safety significant systems and equipment are:
  - Tested routinely
  - Reliable and valid
  - Equipped to provide timely failure warning
  - Equipped with documents of failure consequences
  - Equipped with measures to control failures
  - Equipped with back-up facilities and/or procedures
- Detailed records of systems and equipment serviceability kept and periodically reviewed

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SMS in ATS...

Licensing and Training Issues

- Controllers are trained and licensed
- Refresher training including emergencies
- Training to ensure teamwork
- Training provided prior to introducing new procedures or equipment
- Competency in English language
- Use of standard phraseology

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SMS in ATS...

Incident Reporting

- **In line with ICAO Annex 13:**
  - Investigate to determine facts, conditions and circumstances;
  - Establish cause(s) so that appropriate remedial and preventive measures can be implemented;
  - Disseminate lessons learnt.

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SMS in ATS...

CONCLUSION

- **CAAS has:**
  - Set up a Safety Management System for ATS in line with ICAO requirements;
  - Addressed SMS elements in the CAAS SMS Manual;
  - Provided SMS training through the Singapore Aviation Academy.

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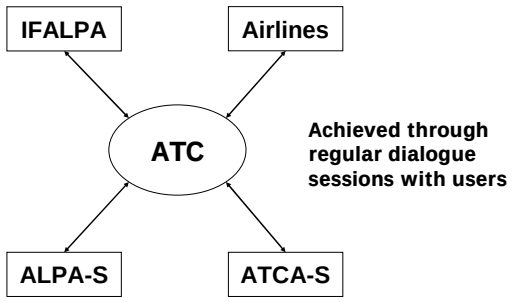
CONCLUSION

- **The next step:**
  - Continue to improve ATS safety management programme and fine-tune procedures e.g. safety assessment, safety audit, incident reporting

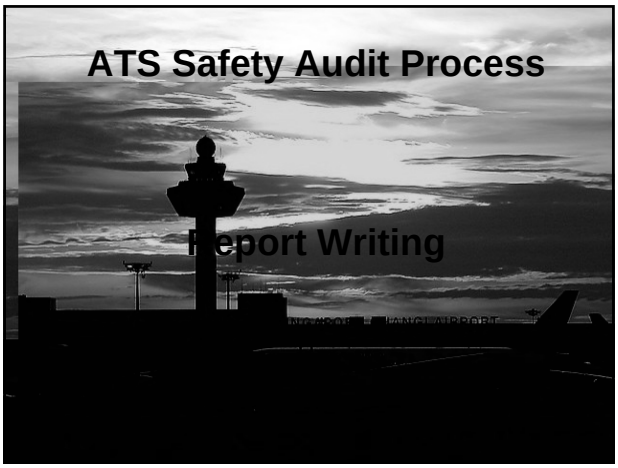


Achieved through regular dialogue sessions with users

CONCLUSION

- ✓ Safety management in ATS is a skill;
- ✓ Skills have to be acquired and kept up;
- ✓ Need for continuous improvement.

It's not enough to succeed just once.



Safety Audit of ATS

- **Written Report**

Audit findings must be formalised by the issue of a written report as soon as possible after the audit.

The report should contain only facts or judgements that were presented at the final meeting.

MK 2

Safety Audit of ATS

- **Written Report**

Your report should include or at least refer to the following:

a) Audit objectives
b) Identification of audited unit/audit team
c) Audit scope, criteria, process and time period
d) Audit findings and recommendations
e) Corrective action plan

MK 3

Safety Audit of ATS

- **Written Report**

The Report should not contain:

a) Subjective opinions
b) Confidential information
c) Criticism
d) Trivia
e) Observations not discussed at the exit meeting

MK 4

Safety Audit of ATS

- **DRAFT AUDIT REPORT**

Purpose:

a) Verify findings/observations and recommendations made during the exit meeting.

b) Points of disagreement, if any, can be referred to third party arbitration.

MK 5

Safety Audit of ATS

Corrective Action

Unit Head would be required to develop a CAR to address the findings and recommendations.

Plan should include:

a) Detailed information of actions to be taken
b) Time frame for the commencement and completion of each safety action.

MK 6

Safety Audit of ATS

Post-Audit Follow-up and Action Plan validation

The purpose of a post-audit follow-up is to validate the effective implementation of the corrective action plan.

If, incident to the follow-up, the audit team has concerns on safety issues, the team would record these as observations requiring further corrective action by the Unit Head concerned.

MK 7

Safety Audit of ATS

Close Audit

The safety audit would be completed when:

a) The final audit report to address deficiencies and/or non-standard practices has been completed.

b) An action plan to address deficiencies and/or non-standard practices has been completed.

c) Deficiencies and/or non-standard practices have been closed by the Team Leader.

MK 8