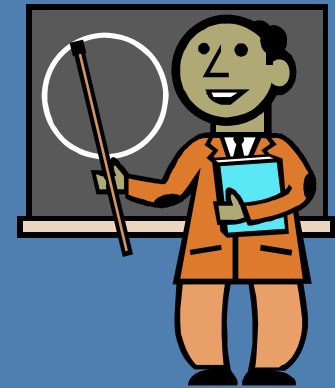


# Our SMS Roadmap

Colonel (Retired) LOOI Han Seng Director  
(Airworthiness/Flight Operations)  
Civil Aviation Authority of Singapore

# Scope

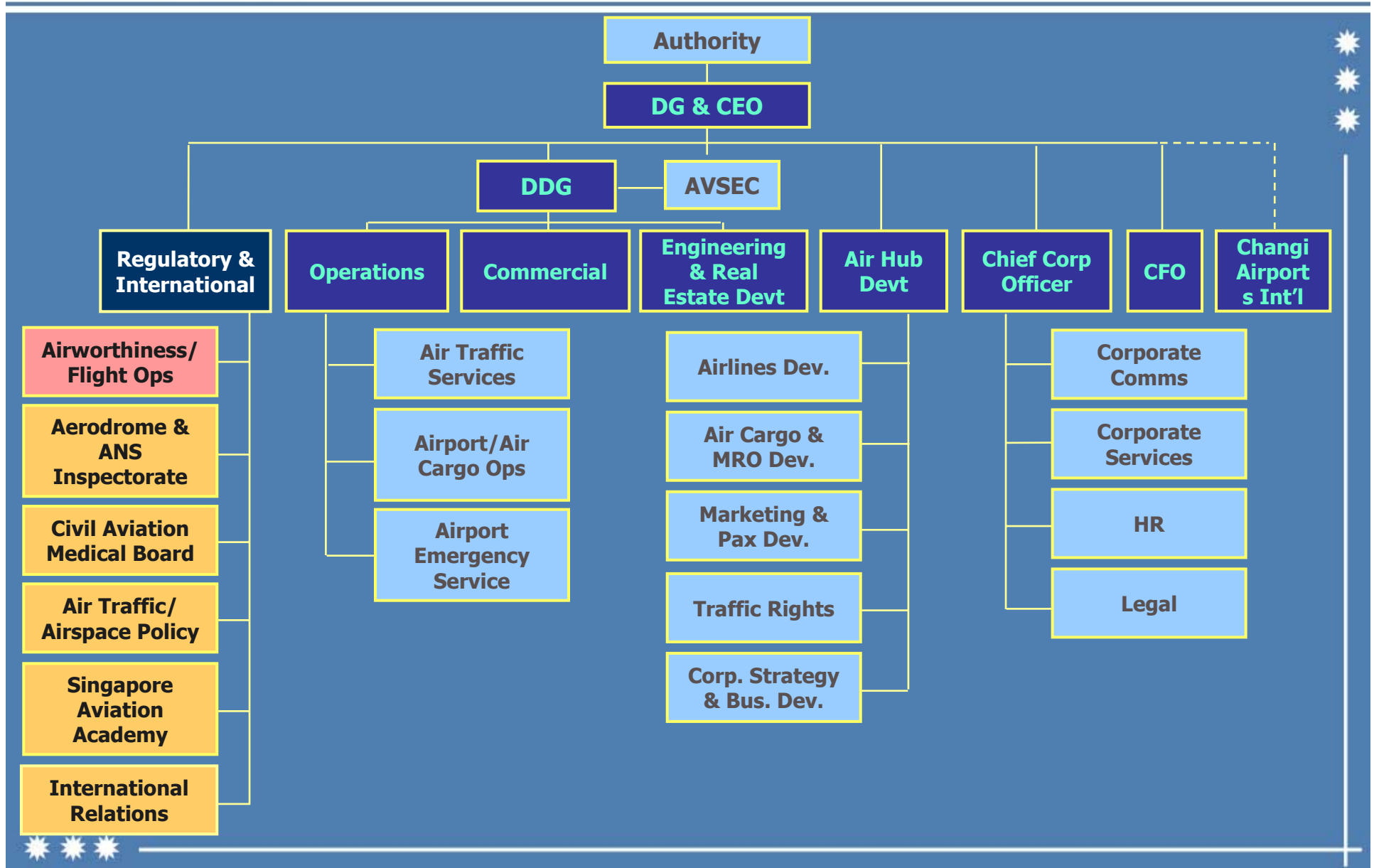
- CAAS and the Singapore aviation industry
- Key Considerations
- Our SMS approach
- Industry education and sharing
- Regulations and guidance
- SMS Assessment Protocol and voluntary assessments



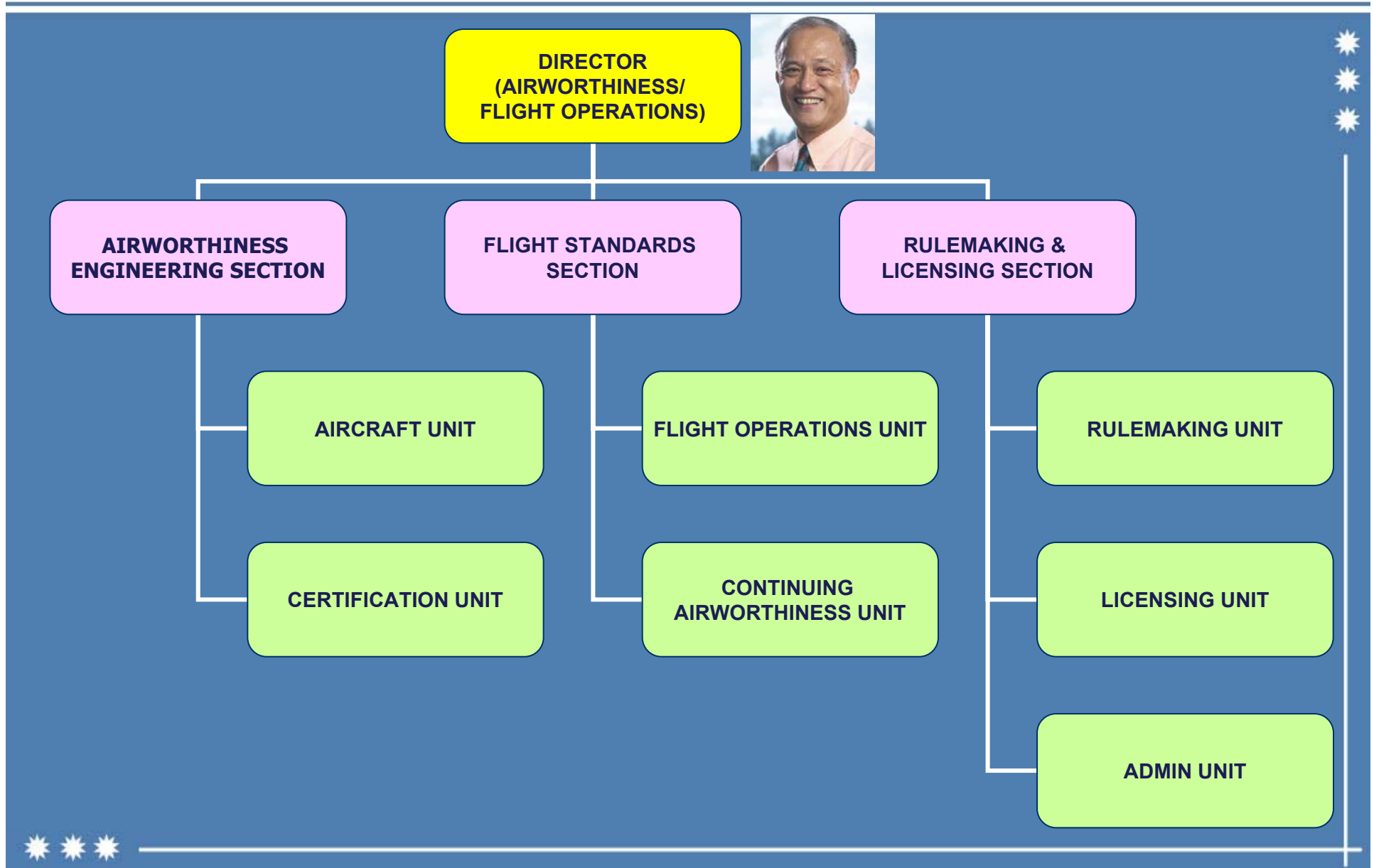


Civil Aviation Authority of Singapore

# CAAS Organisation Chart



# A/FO Division





Civil Aviation Authority of Singapore

# Singapore Aviation Industry



**Singapore Technologies  
Aerospace**  
A company of Singapore Technologies Engineering



**8 AOC Holders**



**95 MROs (29 overseas)**



**3,600 flight  
crew licenses**



**1,900 AME  
licenses**



# Singapore Aviation Industry



***162 Singapore registered aircraft***



***Other approved organisations:***

***13 Design & production***

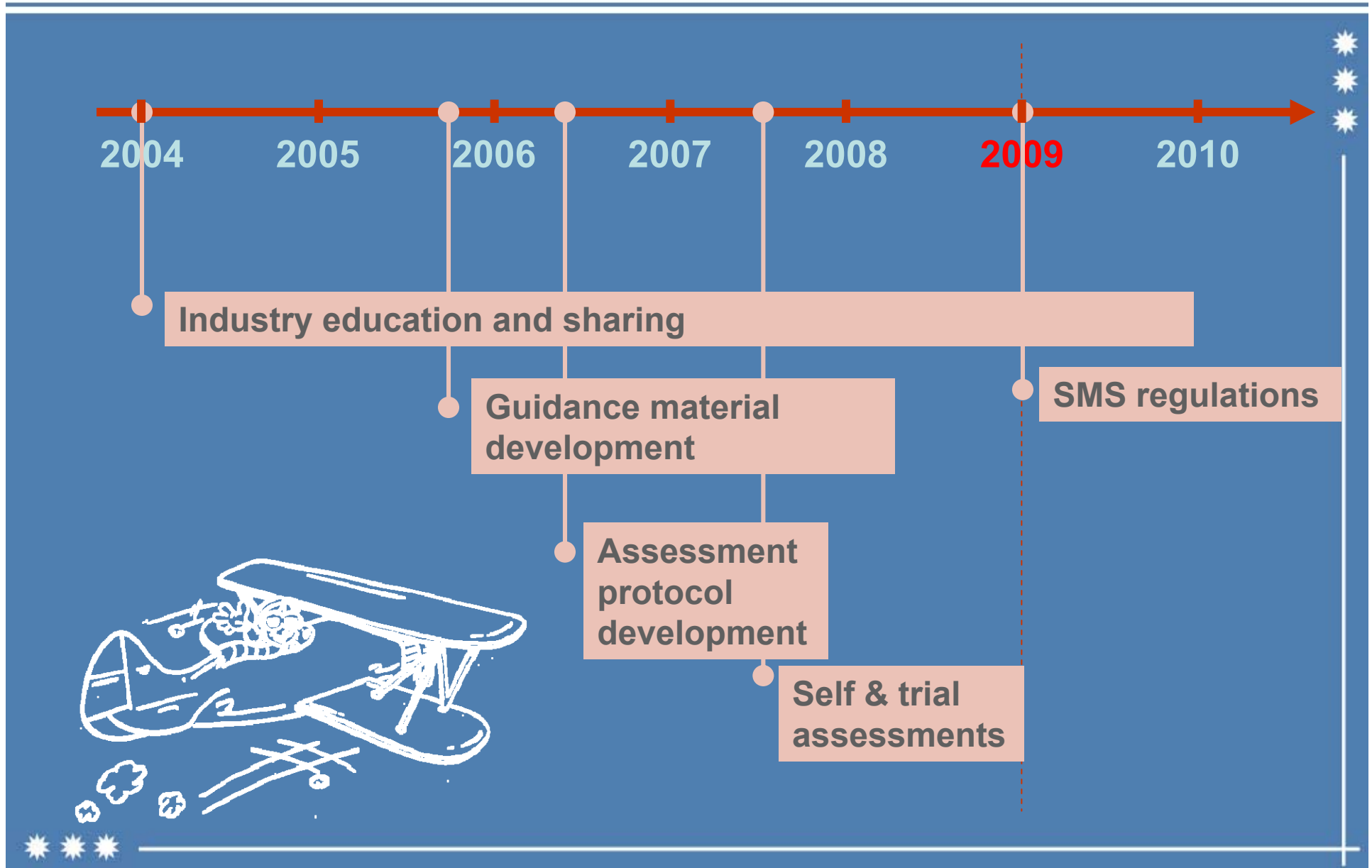
***6 Maintenance training***

***3 Flight training***

# Key Considerations

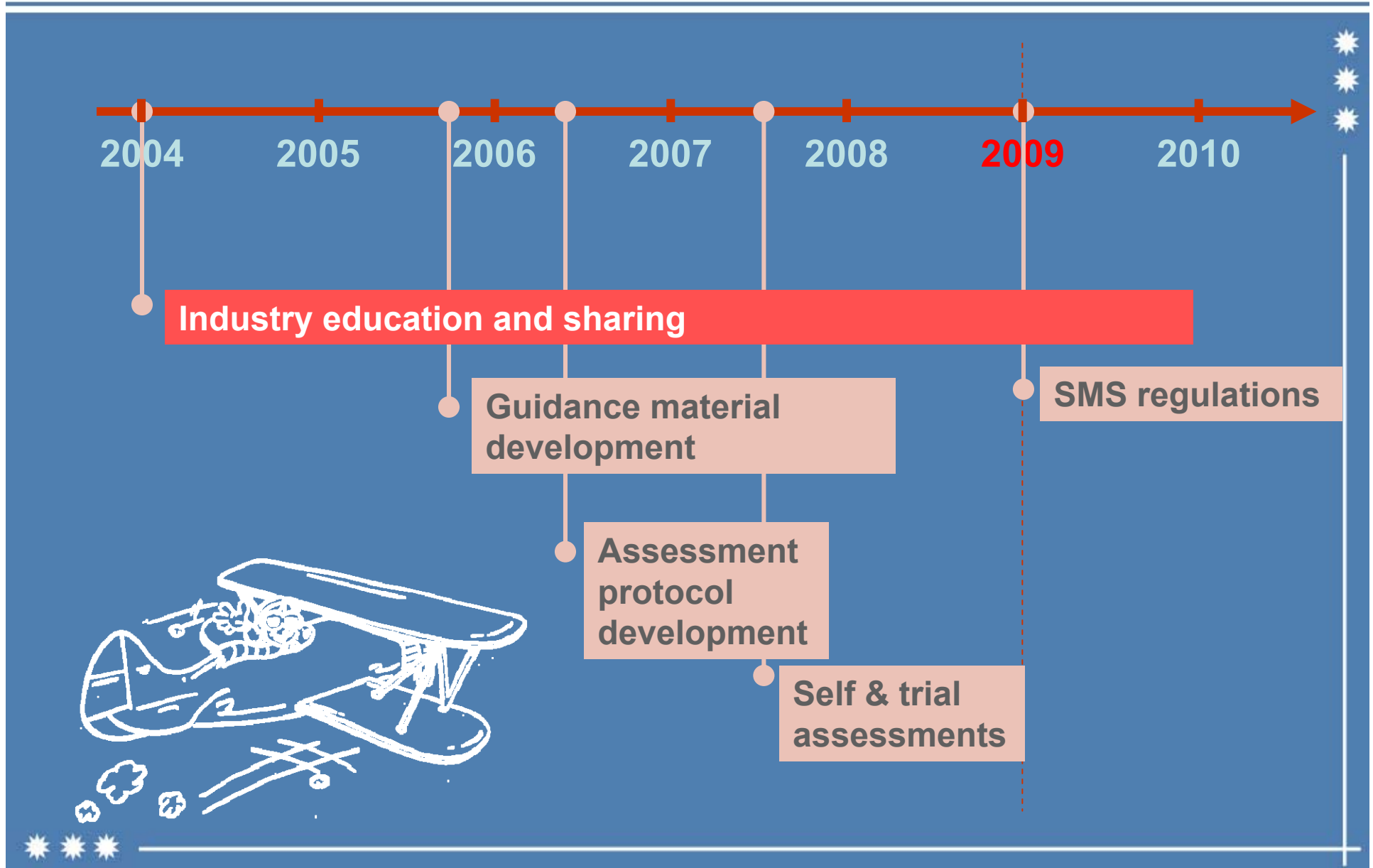
- Collaborative & Handholding approach
- Top-management commitment
- Phased regulatory expectations
- Early SMS education & Preparation
- Objective SMS assessment protocol
- Promote buy-in rather than a compliance mindset

# Our SMS Roadmap

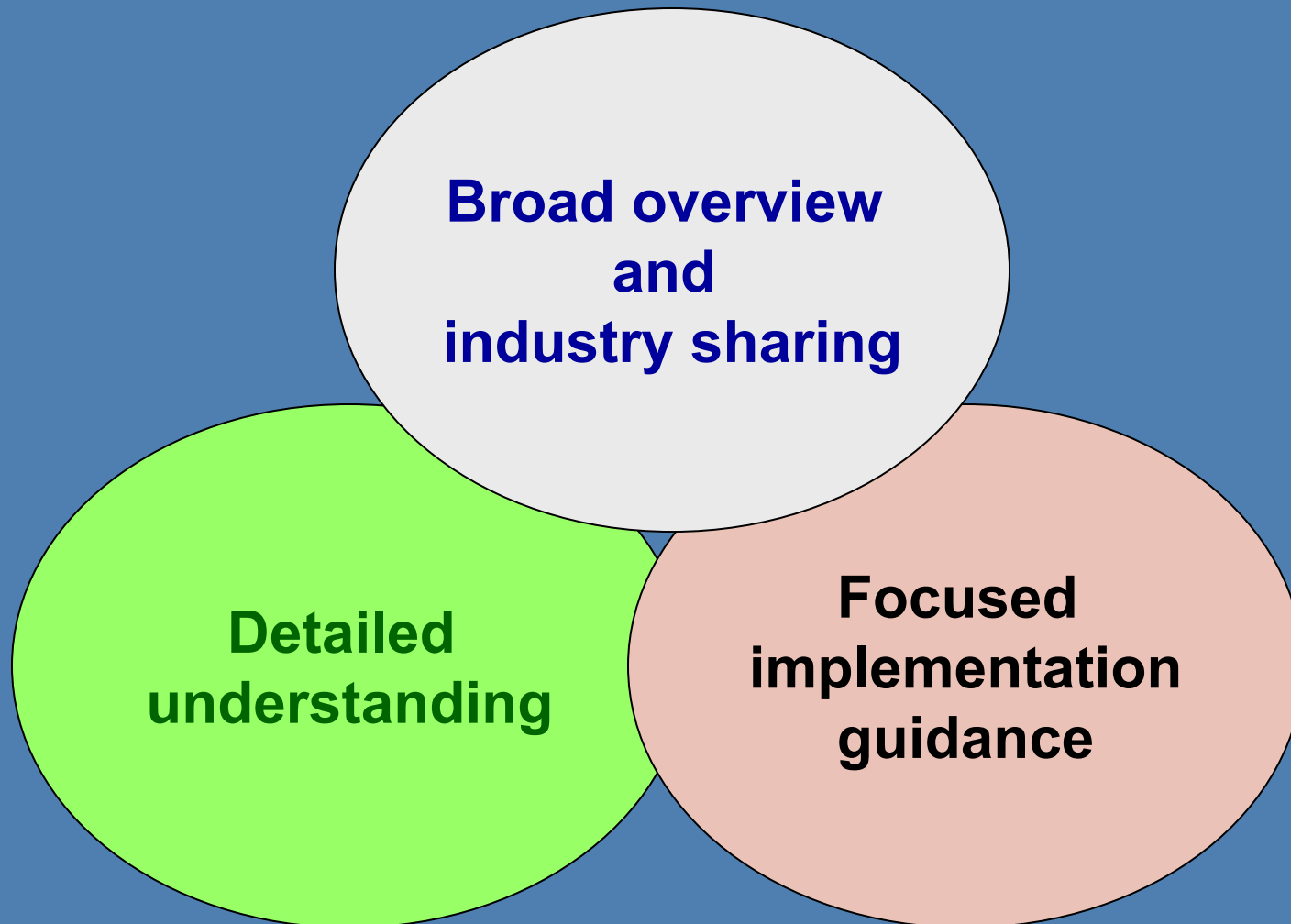




# Our SMS Roadmap



# Industry Education & Sharing



# Industry Education & Sharing



# Industry Education & Sharing



# Industry Education & Sharing



# Aviation Safety Forums

Year	Theme	Participants
2005	Introduction to SMS	120
2006	SMS Hazard & Risk Management	300
2007	SMS Implementation Review	450



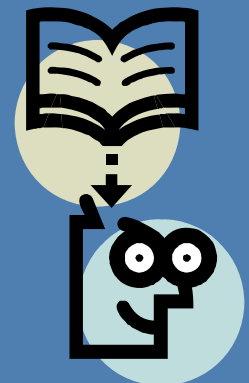
# Aviation Safety Forums

- Fronted by CAAS A/FO Division
- Key lectures by international SMS experts
- Platform for industry to share experience



# SMS Courses

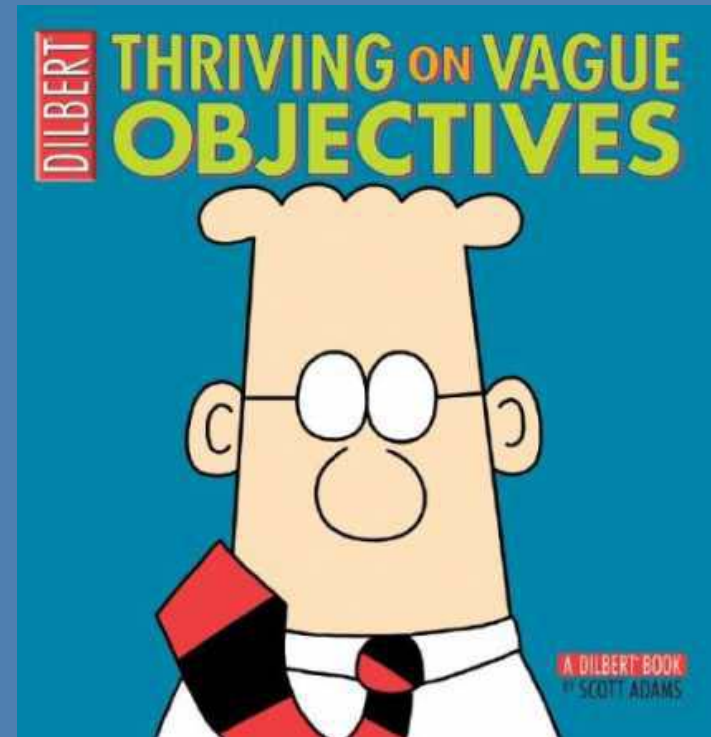
- Conducted at the Singapore Aviation Academy
  - ICAO 5-day course
  - CAAS 2-week course
- In-depth knowledge on SMS principles and concepts, with relevant case studies
- Participants from all over the world



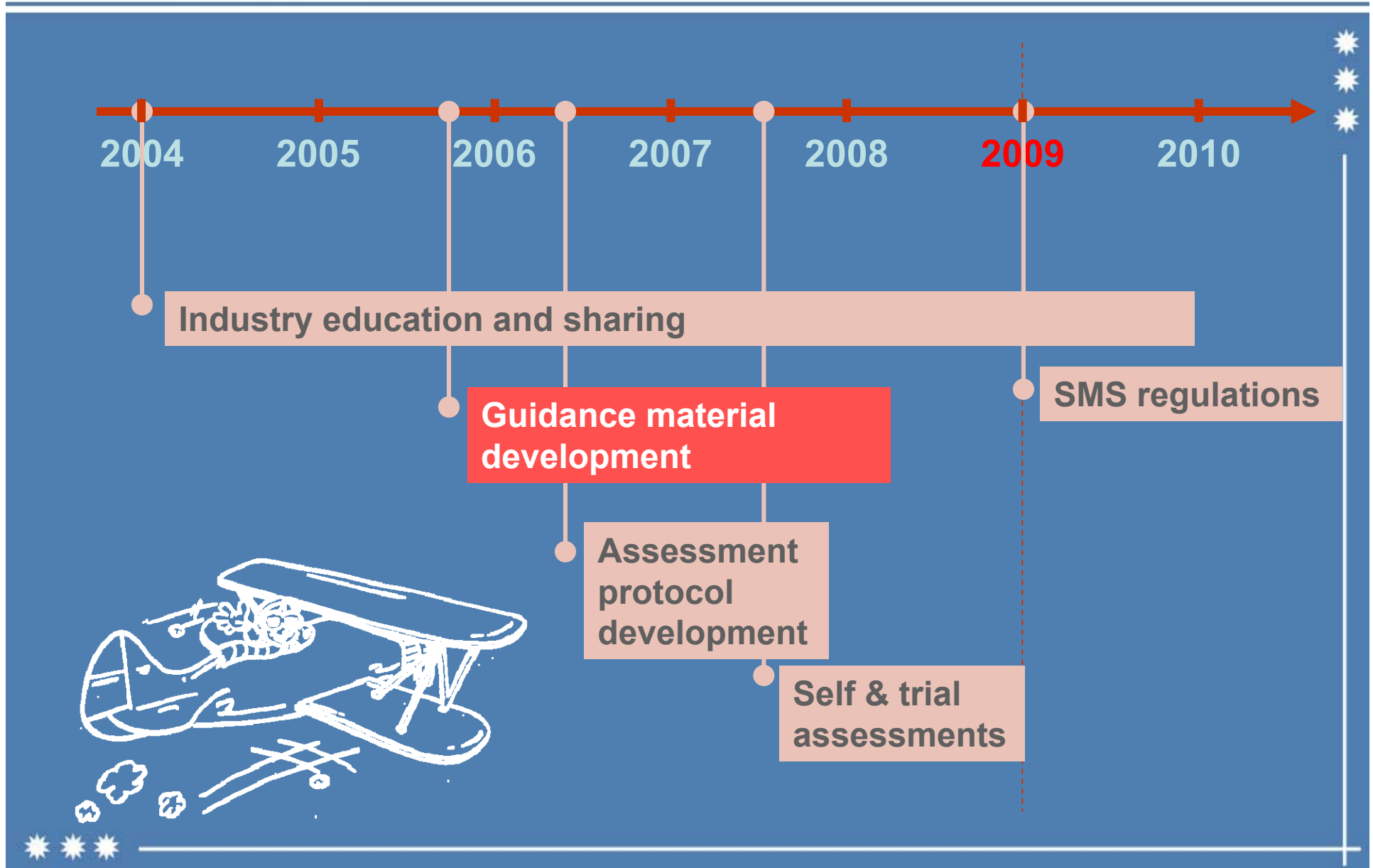


# SMS Workshops

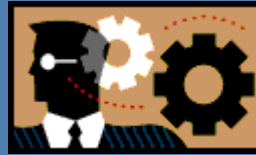
- Early 2008
- Targeted at component workshops
- Handholding, partnership approach
- Focus on individual companies' implementation issues



# Our SMS Roadmap



# Regulations and Guidance

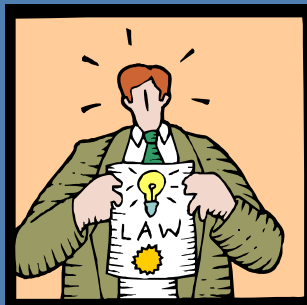


## Principal consideration

- ***Performance-based requirement***

### Mandatory Requirements

- Only core SMS components
- Failure to demonstrate compliance will affect approval



### Implementation Guidance

- Provides suggested methods of compliance
- Organisations can scope their own means of compliance



# Regulations and Guidance

Mandatory requirement for **safety objectives**



Organisation proposes objectives to be set, method of monitoring, triggering level, response mechanism



Submitted to CAAS for acceptance



# Mandatory Requirements

## CAAS

- a **safety policy** on which the system is based;
- clearly defined **lines of safety accountability** throughout the organisation, including a direct accountability for safety on the part of the Accountable Manager
- setting of **safety objectives**, goals and **performance indicators**;
- **documentation** of all SMS components, procedures and activities including their relevant integration;
- an **emergency response plan**

## ICAO

- Safety policy and objectives

# Mandatory Requirements

## CAAS

- **identification of hazards to aviation safety and the evaluation and management of their associated risks;**
- **periodic review or audit of the safety management system;**
- **personnel SMS training to ensure their competency to perform their duties;**

## ICAO

- **Safety risk management**
- **Safety assurance**
- **Safety training & communication**

# Guidance Material

AC 1-3(0)  
20 Dec 2006

## Advisory Circular



### SAFETY MANAGEMENT SYSTEMS (AOC HOLDERS & SAR-145 AMOs)

General .....	1
Purpose .....	1
Applicability .....	1
Cancellation .....	1
Effective date .....	1
References .....	1
Introduction .....	2
Integrated Safety Management System (SMS) .....	2
Benefits of an Integrated SMS .....	3
SMS Implementation Schedule .....	3
SMS Requirements .....	3
Senior Management's Accountability for Safety .....	4
Implementing a Safety Management System .....	4
a) Safety Policy .....	4
b) Roles and Responsibilities .....	5
c) Safety Targets and Performance Indicators .....	7
d) Hazard and Risk Management .....	8
e) Safety Training and Promotion .....	12
f) SMS Documentation and Records .....	13
g) Safety Assurance .....	13
h) Emergency Response Plan .....	14
Integrating SMS with Existing Systems .....	15
Gap Analysis and Project Plan .....	15
Definitions .....	15
Appendix 1: Sample Hazard Management Flowchart .....	17
Appendix 2: Sample Risk Management Process Flowchart .....	18
Appendix 3: Example of a Risk Mitigation Process .....	19
Appendix 4: Guidance for the Development of a SMS Manual .....	20
Appendix 5: Frequently Asked Questions .....	28

- GENERAL.** Advisory Circulars (ACs) are issued by the Civil Aviation Authority of Singapore (CAAS) and contain information about standards, practices and recommendations acceptable to the Authority. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.
- PURPOSE.** This AC is issued to provide general guidance and principles to implement an Integrated Safety Management System (SMS).
- APPLICABILITY.** This AC applies to all Singapore Air Operator Certificate (AOC) Holders and SAR-145 Approved Maintenance Organisations.
- CANCELLATION.** This is the first Advisory Circular issued on this subject.
- EFFECTIVE DATE.** This Advisory Circular is effective on 20 December 2006.
- REFERENCES.** ICAO Safety Management Manual (Doc 9859)

## 7. INTRODUCTION.

Safety has always been the overriding consideration in the conduct of all aviation activities. Safety is the state in which the risk of harm to persons or property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management.

Due to the nature of the aviation industry, the total elimination of accidents or serious incidents is unachievable. No human endeavour or human-made system can be free from risk and error, and failures will be expected to occur in spite of the most accomplished prevention efforts. The system must, however, seek to understand and control such risks and errors.

Traditional approaches to accident prevention have focused primarily on outcomes (probable cause) and unsafe acts by operational personnel. Safety improvement measures introduced usually address the identified safety concern exclusively. The 'what', 'who', 'when' and 'how' were often identified but not the 'why'. As such, the organisational, human factor and environmental contexts in which errors were made were often neglected, and measures adopted therefore often addressed only symptoms.

In the 1950s, accident prevention concentrated primarily on technical factors. Recognition that human performance issues (human factor) played a part gained momentum in the 1970s. In the 1990s, safety thinking has evolved to the point of widespread acknowledgement that organisational factors play a significant role in the performance of human beings and therefore is an important issue in risk and error management. The study of accident causation today focuses on organisational processes, latent conditions, workplace conditions, human factors, adequacy of defenses as well as active failures.

Today, Safety Management Systems seek to enhance the organisational approach to managing a safe and successful aviation operation.

This AC is intended to address SMS implementation with respect to an approved organisation's service, product or processes which have an impact on aviation safety.

## 8. INTEGRATED SAFETY MANAGEMENT SYSTEM (SMS)

Safety cannot be achieved by simply introducing rules or directives concerning the procedures to be followed by operational employees; it encompasses most of the activities of the organisation. For this reason, safety management must start from senior management, and the effects on safety must be examined at all levels of the organisation.

An Integrated Safety Management System (SMS) is a systematic, explicit and proactive process for managing safety that integrates operations and technical systems with financial and human resource management to achieve safe operations with as low as reasonably practicable risk.

An SMS is systematic in that safety management activities are carried out in accordance with a pre-determined plan, and applied in a consistent manner throughout the organisation. It is proactive by taking an approach that emphasizes prevention, through hazards identification and risk control and mitigation measures, before events that affect safety occur. It is also explicit, in that all safety management activities are documented, visible and performed as an essential component of management activities.

It is an integrated system which includes the people, procedures, practices and technology needed to monitor and improve the safety of the aviation transportation system.

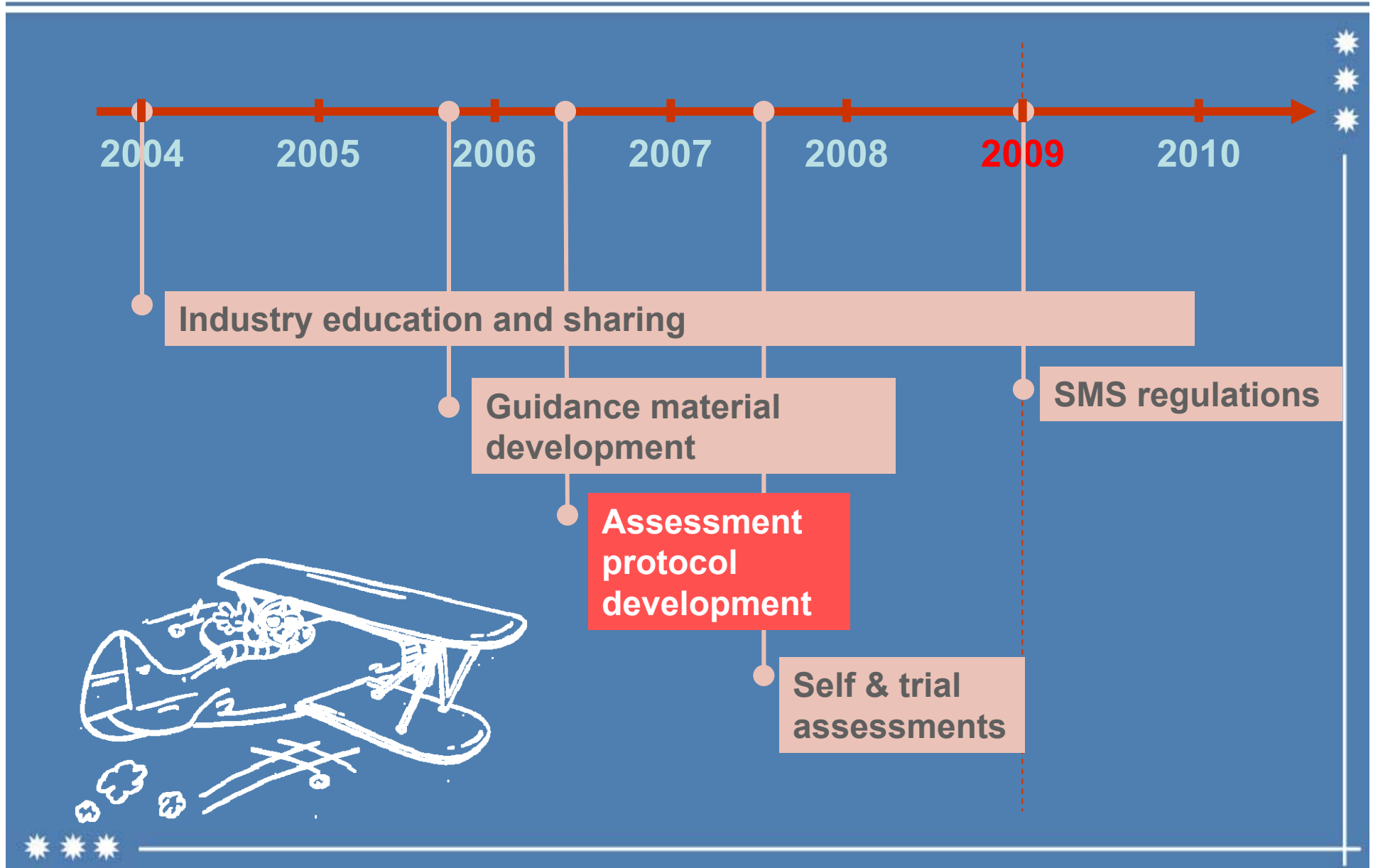
Safety management may be also described as the systematic application of specific technical and managerial skills to identify and control hazards and related risks. By identifying, assessing and eliminating or controlling safety-related hazards and risks, acceptable levels of safety will be achieved.

# Guidance Material

- Advisory Circular AC 1-3(0) [Dec 2006]
  - General
    - What is an SMS
    - Benefits of an SMS
    - Senior Management Accountability
  - SMS Implementation Schedule
  - ***Implementing an SMS***
  - Integrating SMS with existing systems
  - Gap Analysis and Project Plan
  - Frequently Asked Questions
  - ***Guidance for the Development of a SMS Manual***
  - Examples of :
    - Hazard Management Flowchart
    - Risk Management Process Flowchart
    - Risk Mitigation Process



# Our SMS Roadmap

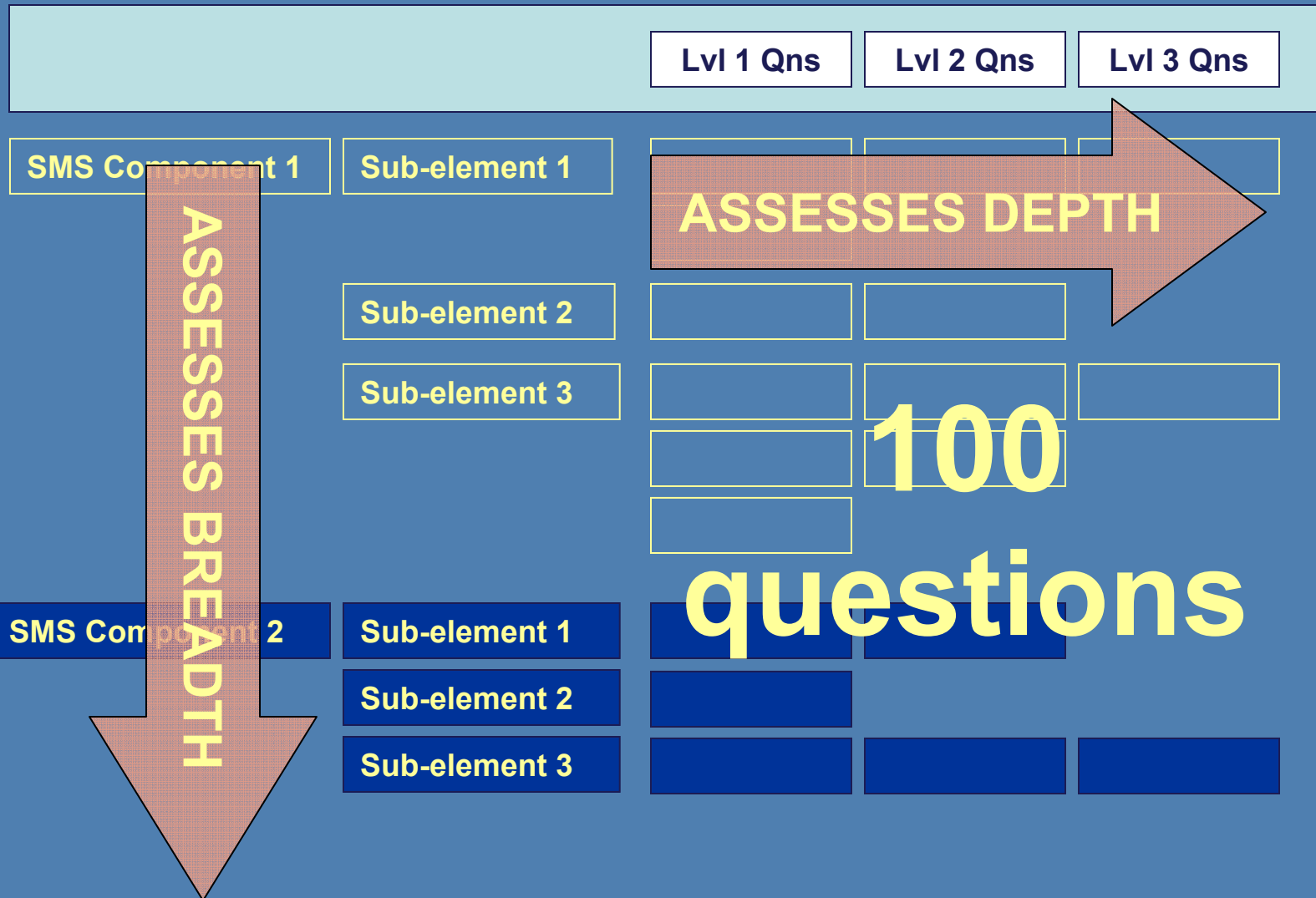


# SMS Assessment Protocol

- Conceptual Framework:
  - Objective and transparent tool
  - *Assessment* instead of *audit*
    - *Depth & maturity* - beyond compliance
- ICAO SMM, SMS experts (e.g. TC & CASA), Industry
- Pilot tested with some MROs and air operators



# SMS Assessment Protocol



# Breadth

SMS Component	Sub-element
Safety Policy	-
Safety Roles and Responsibilities	Accountable Manager
	Safety Manager
	Safety Committee
Safety Targets and Performance Indicators	Safety Objectives and Goals
	Safety Performance Indicators
Hazard and Risk Management	Hazard identification
	Risk management

# Depth

	Level 1	Level 2	Level 3
<b>Safety Policy</b>	Organisation has a formal written Safety Policy statement.	The Safety Policy is readily visible or accessible to all personnel.	There is evidence that the Safety Policy is communicated to all employees with intent that they are made aware of their individual safety obligations.
<b>Hazard and Risk Management</b>	There is a documented risk evaluation procedure.	There is a process for the prioritisation and scheduling of identified hazards for risk assessments.	There is a procedure for periodic review of existing risk analysis records.
<b>Safety Manager</b>	There is a safety manager that administers the SMS programme.	The Safety Manager does not hold another post that may impair with his role as a Safety Manager	The Safety Manager is a senior position independent of operations or production.



Civil Aviation Authority of Singapore

# Assessment Protocol

## CAAS SMS ASSESSMENT PROTOCOL (DRAFT)

SAC 100Q Draft 27 Jul 07

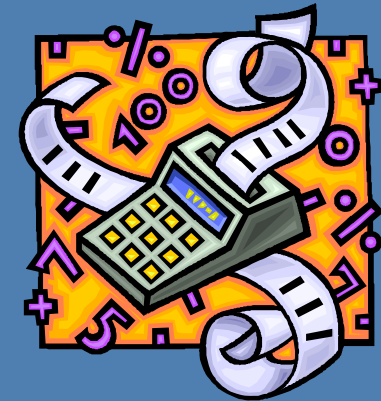
SMS Component {AC 1-3(0)}	SMS Assessment Checklist [annotate "1" in either "Y" (Yes), "N" (No) or "NA" column]									
	Elements	Category-1 Questions (C1)	Y (1)	N (1)	NA (1)	Category-2 Questions (C2)	Y (1)	N (1)	NA (1)	C
Safety Policy 13(a)	NIL	Q13 (a) / C1-1 Does the organisation have a formal written Safety Policy statement?	1			Q13 (a) / C2-1 The Safety Policy is readily visible or accessible to all personnel.	1			Q1
		Q13 (a) / C1-2 The Safety Policy is appropriate to the size, nature and complexity of the organisation.	1			Q13 (a) / C2-2 The Safety Policy Statement do cover or include aviation safety.	1			Q1
		Q13 (a) / C1-3 The Safety Policy is endorsed by the Accountable Manager.	1			Q13 (a) / C2-3 The safety policy do address the provision of necessary human and financial resources for its implementation.		1		
Safety Rules & Responsibilities 13 (b)	Accountable Manager 13 (b) (i)	Q13 (b) (i) / C1-1 Does the organisation have a documented safety (SMS) accountability within the organisation that begins with the Accountable Manager?	1			Q13 (b) (i) / C2-1 Does the Accountable Manager's terms of reference indicate his ultimate responsibility for the implementation and maintenance of the SMS?		1		Q1
		Q13 (b) (i) / C1-2 Does the Accountable Manager's terms of reference indicate his full control over financial and human resources associated with his Air Operator Cert/ Cert of Approval ?	1			Q13 (b) (i) / C2-2 Does the Accountable Manager's terms of reference indicate his final authority over all operations conducted under his Air Operator Cert/ Cert of Approval ?		1		
		Q13 (b) (ii) / C1-1 Does the organisation have a Manager/ Officer who performs the role of administering the SMS?	1			Q13 (b) (ii) / C2-1 The Manager responsible for administering the SMS does not hold other responsibilities that		1		Q1
	Safety (SMS)									Ac

AC Reference

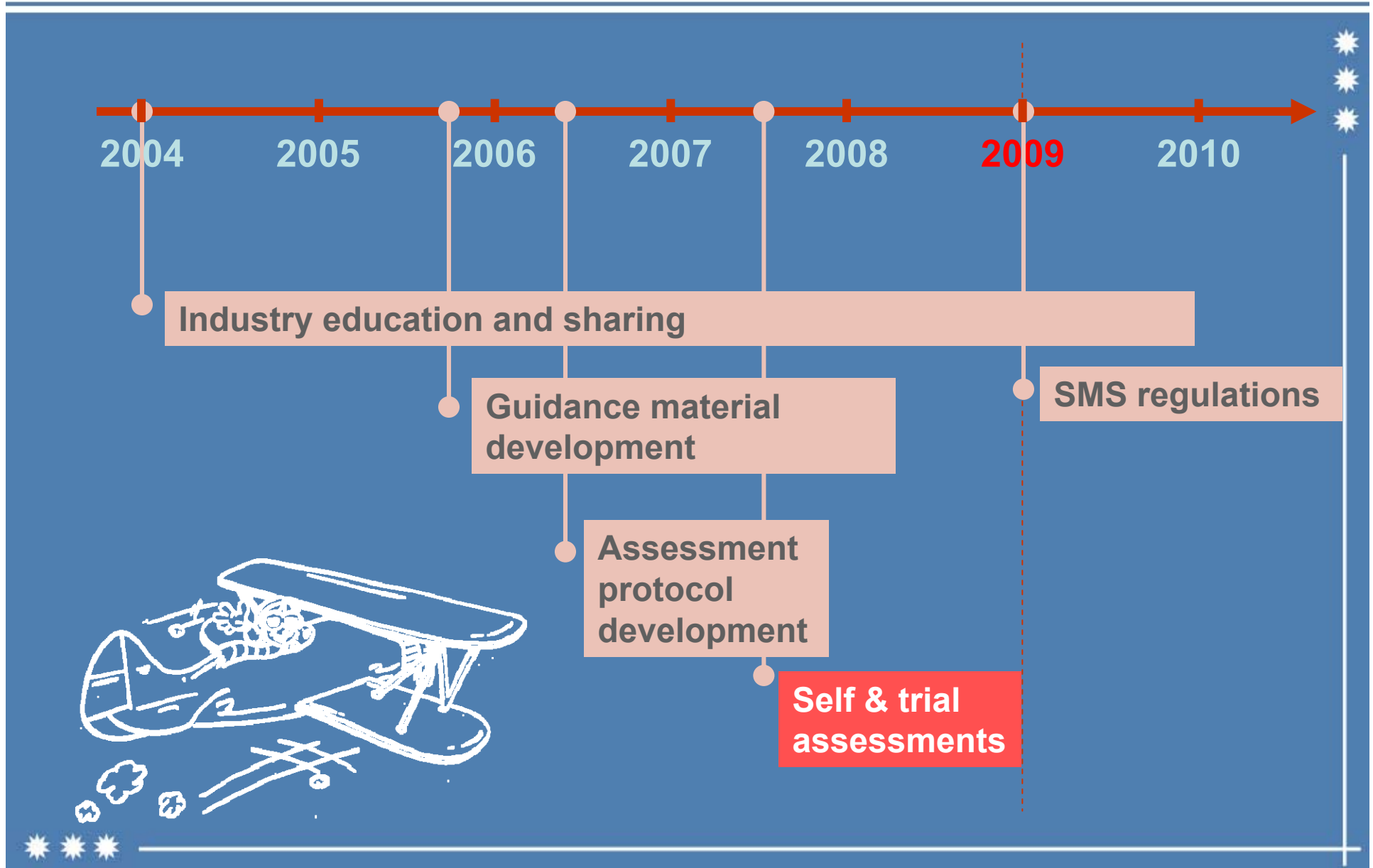
# Assessment Score

$$\text{Score} = \frac{\sum \text{YES}}{\sum (\text{YES} + \text{NO})}$$

- Phased expectations
  - Minimum acceptable score will be increased
  - Corrective Action Notice



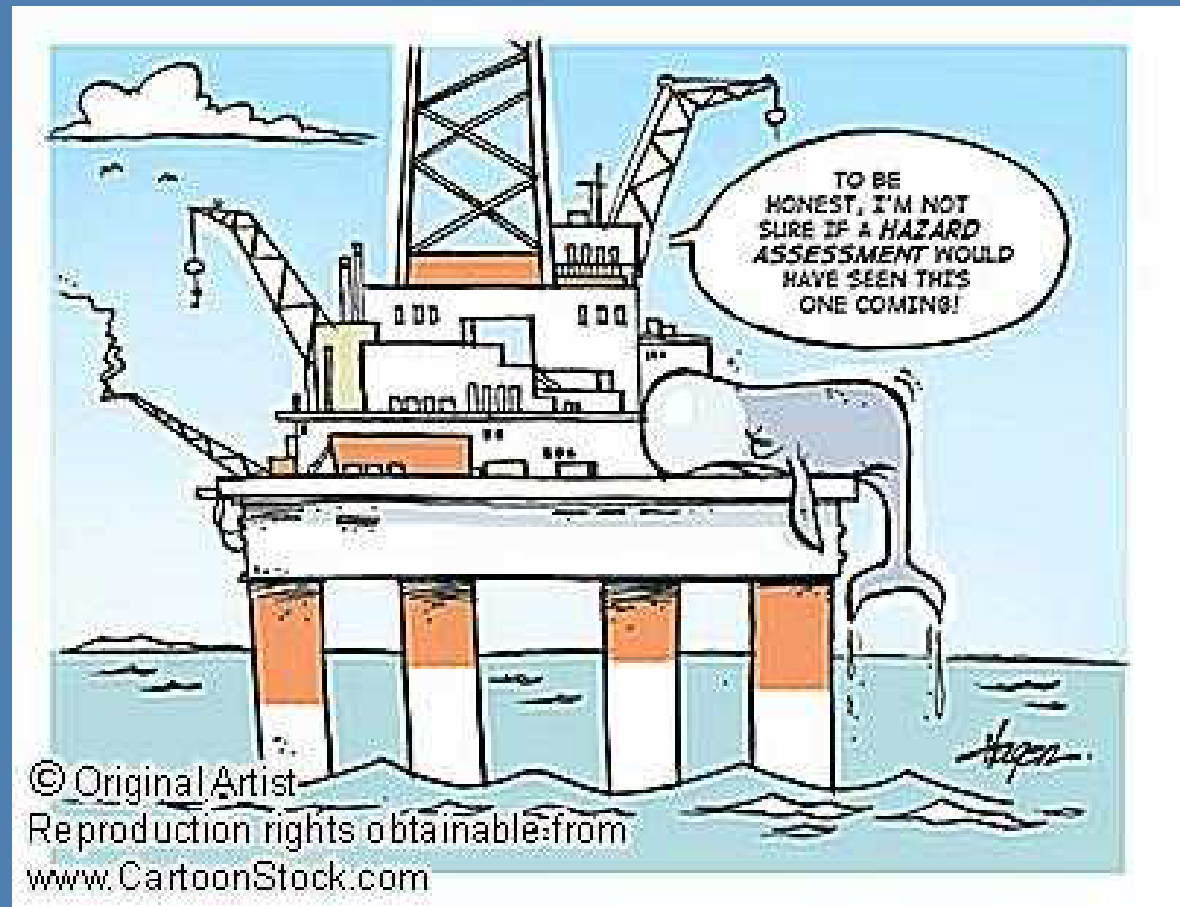
# Our SMS Roadmap





# Voluntary Self-assessments

- Encourage buy-in
- Self-critique



# Voluntary Self-assessments

No of Submissions	Range of Overall % Score	Weakest area
18 MROs	12% to 96%	Scope of Hazard Identification and Risk Assessment (HIRA) completion
3 AOCs	62% & 98%	



# Trial Assessments

- 2008 (CAAS)
- Objectives
  - Experience building for our inspectors
  - Verify results of self assessments
  - Prepare industry for ICAO compliance deadline





Civil Aviation Authority of Singapore

# Recap of CAAS Approach

- Collaborative & Handholding approach
- Top-management commitment
- Phased regulatory expectations
- Early SMS education & Preparation
- Objective SMS assessment protocol
- Promote buy-in rather than a compliance mindset



# What Next ?

- SMS Assessment Data & Regulatory Compliance Audits
  - Risk management approach
    - Calibrate frequency and scope of audits
- How to motivate SMS maturity over time?
- Organisation Risk Profiling?



***Thank you !***

<http://www.caas.gov.sg>

