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重飛(復飛)決策

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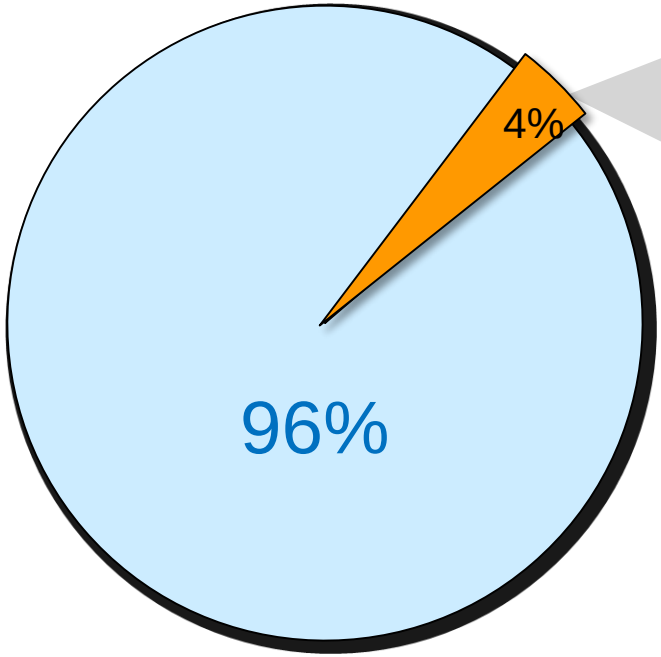
簡報大綱

1. 簡述世界飛安基金會相關報告
2. 重飛時機
3. 風險管理
4. 訓練上的挑戰

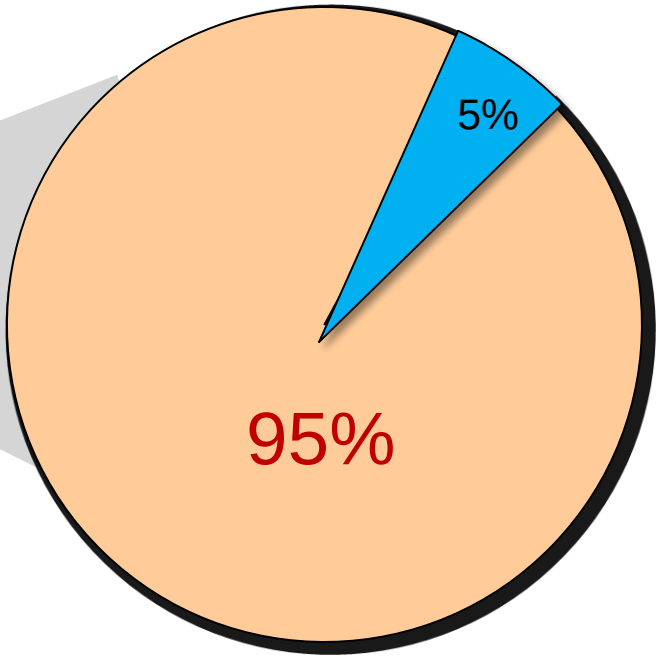
過去的研究...

其中**4%**的進場(approach)
呈現不穩定(unstable)



所有的進場與落地
All Approaches and Landings

當中，少於**5%**重飛



所有的不穩定進場
All Unstable Approaches

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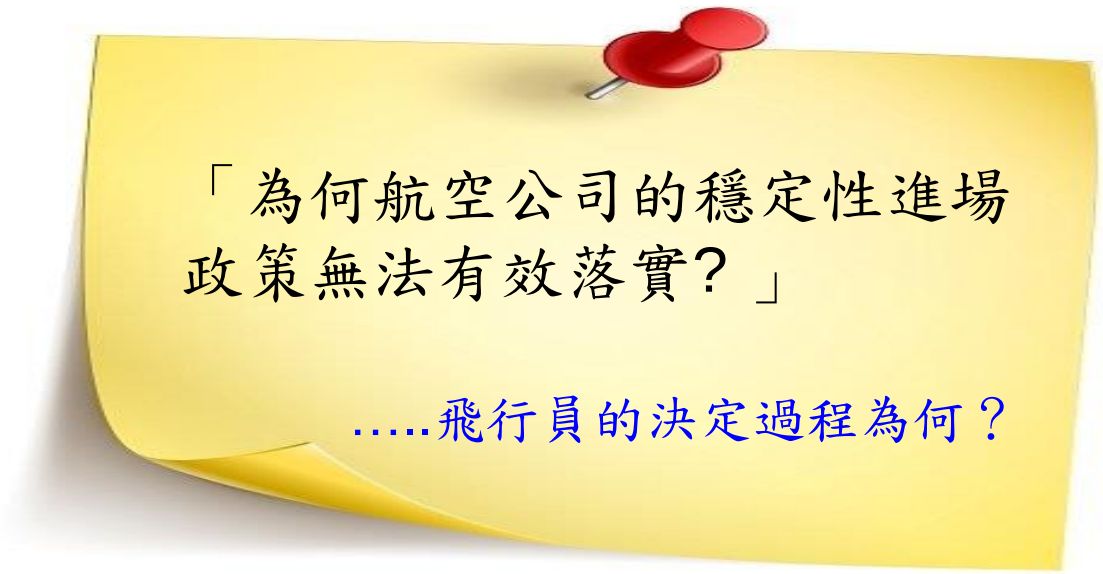
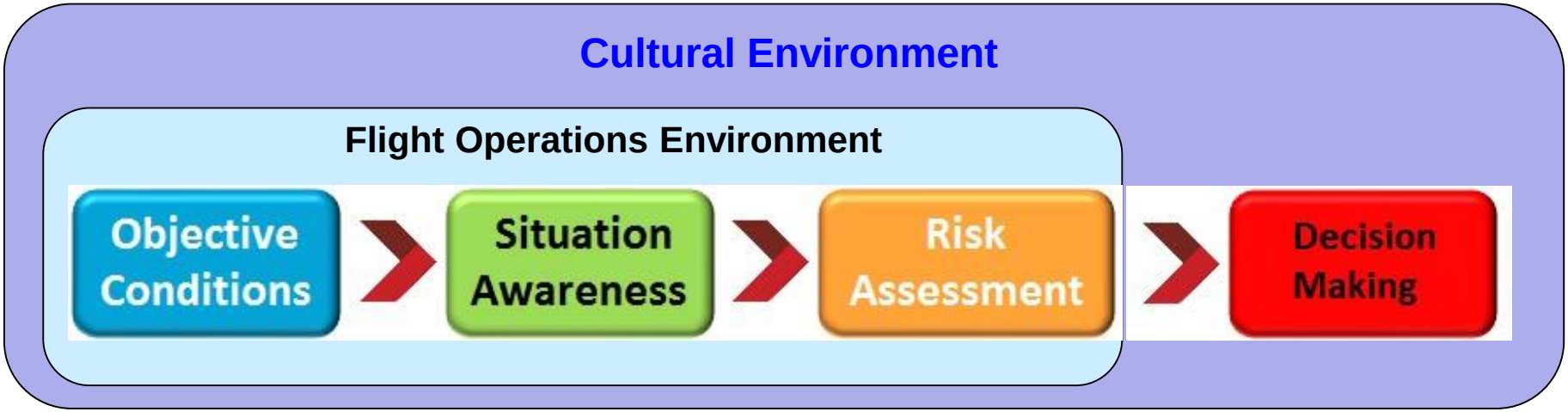
航空公司的穩定性進場政策(Stable Approach)



- 過去十多年來，各航空公司在組員資源管理(CRM)的訓練上獲得長足的進展。以華航來說，CRM訓練不僅符合民航法規最低要求，進一步地特別讓航務、空服、機務、ATC以及地勤等線上作業人員參與Joint CRM，模擬最真實的工作環境提升CRM訓練成效。
- 如今，絕大多數的飛行員對於Aeronautical Decision Making可謂已耳熟能詳。知道是知道了，但運用在真實環境時，又會遇到甚麼困難呢？

Aeronautical Decision Making過程



- **Objective Condition**：建立認知，我們「看到」或「知道」
- **Situation Awareness**：對於面臨的狀況有正確的解讀
- **Risk Assessment**：則需要藉助於程序、經驗、團隊合作與領導將所認知化為因應措施，也就是最後的結果－Decision Making。

- 由於訓練的普及，對於成熟的飛行員來說，前三項都是已具備「硬知識」，也可以說是飛行員本職學能的一部分。然而，在做出最後的決策前，不能避免地受到公司政策、駕駛艙團隊氣氛、個人心理狀態等文化因素的干擾。

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決策過程例子

- 舉個例子來說，一組on seat駕駛員原已決定重飛的判斷，可能因為「雖然不會受到處分，也得寫好多報告、開好多會」而做出不同的決定；可能僅因為「急著回家」、或「工作時間限制」，做出不同的決定；也可能因為「等一下可以挽救的回來」的過度自信，做出不同的決定。也就是這種「做出不同的決定」的原因廣泛，且普遍涉及個人心理與社會心理層面而難以全面掌握，讓Stable Approach政策無法更加有效。
- 解決之道依然在於程序的制定與訓練的執行。特別是飛行員的訓練，已由「We train PROFESSIONAL pilots」、變為「We train PROFICIENT pilots」、再變為「We train RESILIENT pilots」，正如黑天鵝理論(Black Swan)，面對這樣難以全面掌握的難題，訓練目標必須是針對飛行員的核心能力，也就是根本原因，而不是在訓練過程中塞入曾經遇過的狀況。訓練方法必須是使之成為習慣，而不是內心的掙扎還做不了決定。近年來華航極力推動的Evidence-based Training便是為此而來。

世界飛安基金會相關報告

FLIGHT SAFETY FOUNDATION

世界飛安基金會

Go-Around Decision-Making and Execution Project

Study 1

對於風險的評估受限於飛行員對於風險的察覺與認知

Presage Situational Awareness Model

Study 2

各種情況下飛行員重飛最低高度的「容忍度」

Pilot Go-Around Thresholds

GOAL

以改善重飛政策的符合程度、降低 approach & landing accidents (ALAs) 為目的

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Presage Situational Awareness Model

Presage Group將分飛行員的察覺與認知分為九個面向，成為Presage Situational Awareness Model。

飛行員重飛「容忍度」

影響飛行員重飛最低高度「容忍度」的各種情況：

Aircraft Instability

- Flight Path Deviation (Laterally and Vertically)
- Airspeed Deviation (Speed Increment and Decrement to VREF)
- Sink Rate Deviation
- Landing Configuration

Environmental Factors

- Turbulence (Low Altitude Turbulence and Windshear)
- Runway Condition (Braking Action)
- Runway Length

Figure 4

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)

	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
You are laterally slightly more than 1 dot away from centerline approach course	11%	33%	23%	14%	14%	4%
You are vertically slightly more than 1 dot above desired glide path	9%	27%	22%	12%	24%	6%
You are vertically slightly more than 1 dot below desired glide path	15%	34%	23%	15%	10%	4%
Your airspeed is V_{REF} plus 20–25 kt	13%	30%	19%	10%	21%	7%
Your airspeed is V_{REF} minus 0–5 kt	5%	22%	22%	18%	27%	7%
Your vertical rate of descent is slightly greater than 1,000 fpm	12%	39%	26%	11%	9%	3%
Thrust is at idle	11%	32%	21%	10%	16%	10%
The aircraft is not fully configured for landing (gear/flaps)	38%	43%	7%	3%	6%	2%
The aircraft is unstable by parameter(s) you feel are most critical and the landing distance available is the required distance plus 10%	22%	39%	15%	8%	11%	4%
The aircraft is unstable by parameter(s) you feel are most critical and the landing distance available is the required distance plus 100%	18%	31%	18%	9%	16%	8%
The aircraft is unstable by parameter(s) you feel are most critical and the runway braking action is poor	31%	34%	12%	7%	10%	6%
The aircraft is unstable by parameter(s) you feel are most critical and the crosswind is slightly more than 30 kt	21%	37%	17%	9%	12%	4%
The aircraft is unstable by parameter(s) you feel are most critical and the tail wind is slightly more than 10 kt	22%	33%	18%	9%	13%	5%
You are stable and all environmental conditions are good	3%	15%	13%	11%	37%	21%

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Stable Approach Criteria

Stable Approach Criteria
(for Precision Approach)

By 1,000 ft AAL

Less than **1 dot deviation** from LOC and GS

Vref < **Airspeed** < target speed +15 kts

Max sink rate **1200 fpm**

In **landing configuration**

Engine "**spooled up**"

Aircraft Instability

Flight Path Deviation
Laterally and Vertically

Airspeed Deviation
Reference Landing Speed

Sink Rate Deviation

Landing Configuration

Environmental

Turbulence
Low Altitude Turbulence and Windshear

Runway Condition
Braking Action

Runway Length

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Flight Path Deviation

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)

	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
You are laterally slightly more than 1 dot away from centerline approach course	11%	33%	23%	14%	14%	4%
You are vertically slightly more than 1 dot above desired glide path	9%	27%	22%	12%	24%	6%
You are vertically slightly more than 1 dot below desired glide path	15%	34%	23%	15%	10%	4%

Stable Approach Criteria

- By 1,000 ft AAL
- Less than **1 dot deviation** from LOC and GS
- Vref < Airspeed < target speed +15
- Max sink rate 1200 fpm
- In landing configuration
- Engine “spooled up”

對照於現行大多數航空公司的Stable Approach Criteria，從這個結果看起來，飛行員重飛最低高度的容忍度似乎都比公司的政策低得多。

例如，上表中的「Lateral Deviation 1 dot」、「Vertical Deviation 1 dot Above」、「Vertical Deviation 1 dot Below」等幾項，佔比最多飛行員選擇500英尺。

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Airspeed Deviation

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)

	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
Your airspeed is V_{REF} plus 20–25 kt	13%	30%	19%	10%	21%	7%
Your airspeed is V_{REF} minus 0–5 kt	5%	22%	22%	18%	27%	7%
Your vertical rate of descent is slightly greater than 1,000 fpm	12%	39%	26%	11%	9%	3%
Thrust is at idle	11%	32%	21%	10%	16%	10%

Stable Approach Criteria

- By 1,000 ft AAL
- Less than 1 dot deviation from LOC and GS
- Vref < **Airspeed** < target speed +15
- Max sink rate **1200 fpm**
- In landing configuration
- Engine “spooled up”

對照於現行大多數航空公司的Stable Approach Criteria，從這個結果看起來，飛行員重飛最低高度的容忍度似乎都比公司的政策低得多。

例如，上表中的「VREF minus 0-5 kts」，佔比最多飛行員選擇50英尺。

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Landing Configuration

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)

	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
The aircraft is not fully configured for landing (gear/ flaps)	38%	43%	7%	3%	6%	2%

Stable Approach Criteria

- By 1,000 ft AAL
- Less than 1 dot deviation from LOC and GS
- Vref < Airspeed < target speed +15
- Max sink rate 1200 fpm
- In **landing configuration**
- Engine “spooled up”

對照於現行大多數航空公司的Stable Approach Criteria，從這個結果看起來，飛行員重飛最低高度的容忍度似乎都比公司的政策低得多。

比較起來，「Landing Configuration」、「Runway Length」、「Braking Action Poor」等幾項，選擇1000英尺或500英尺飛行員的佔比都很多。

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Runway Length and Condition

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)

	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
The aircraft is unstable by parameter(s) you feel are most critical and the landing distance available is the required distance plus 10%	22%	39%	15%	8%	11%	4%
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The aircraft is unstable by parameter(s) you feel are most critical and the tail wind is slightly more than 10 kt	22%	33%	18%	9%	13%	5%

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All Conditions Are Good

Pilot Response Scores to Question: What is the lowest altitude you believe a safe go-around could be executed from? (With variable conditions. Segmented values.)						
	1,000 ft	500 ft	200 ft	100 ft	Threshold Crossing	Just Prior to Reverser Thrust Deployment
You are stable and all environmental conditions are good	3%	15%	13%	11%	37%	21%

這個結果可以反映出飛行員真正的想法與容忍度(跨50英尺~1000英尺的範圍)。

雖說如此，但現行Stable Approach Criteria的訂定主要還是站在總體航務管理的立場去訂定，必須適合於整個團體，而非個別；必須適合於各種可能操作環境變化，而非個案。所以面對這樣兩難的局面，現行Stable Approach Criteria的適用高度(例如1000英尺AAL)是目前在沒有更好的方案被提出前的可行方法。可以進一步提升的飛航組員的訓練，特別特別是Risk Assessment與Decision Making的完整做法。就如同前面所言，這絕對需要公司政策支持。

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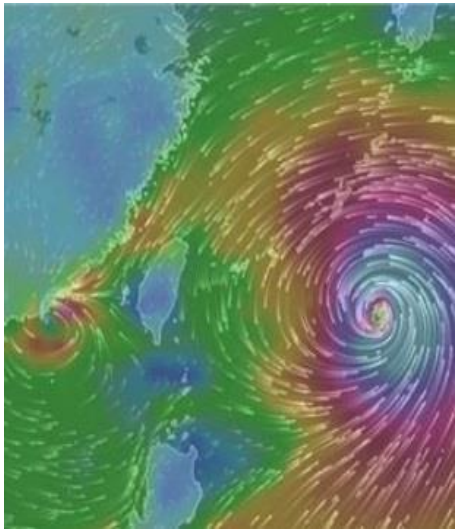
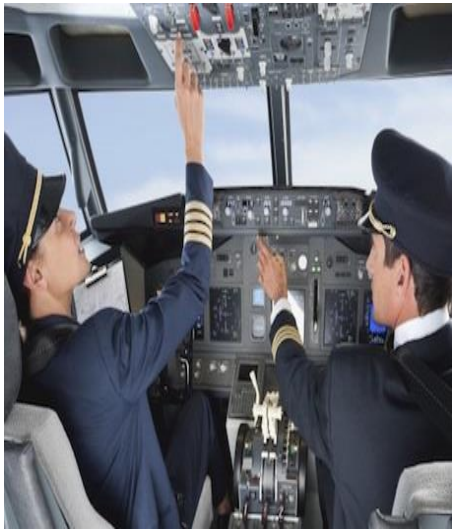
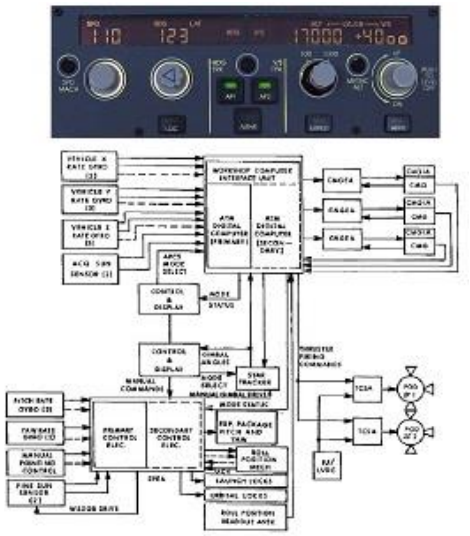
重飛之原因

Weather	ATC	Flight Crew	Aircraft Systems







Others

重飛決策阻礙

個人與社會心理因素

Report & Review Board

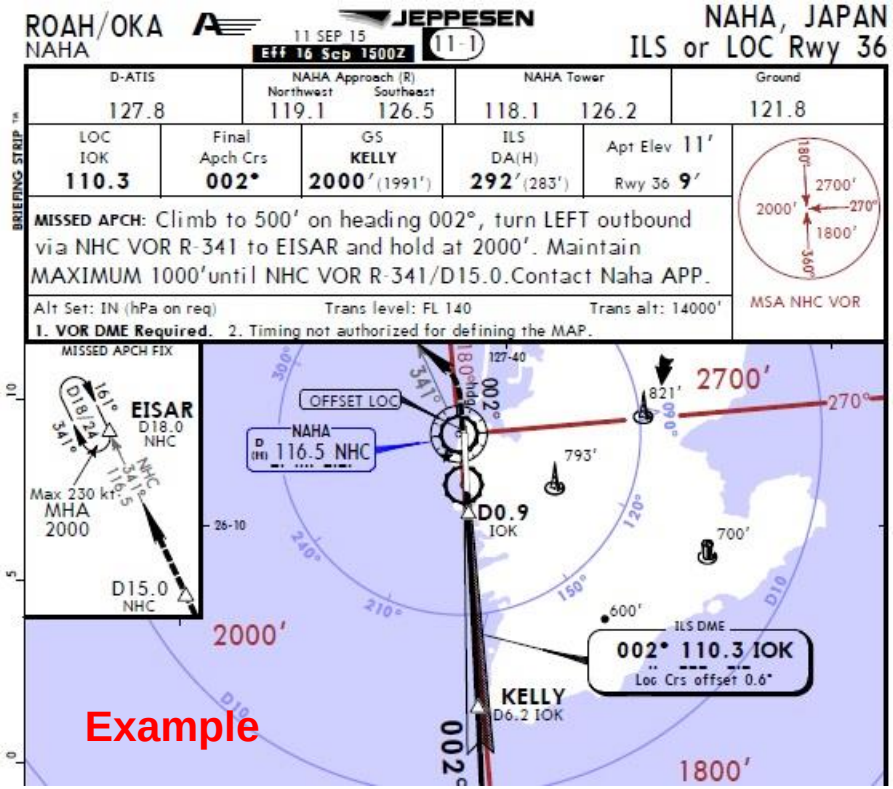
Time & Operational Schedule

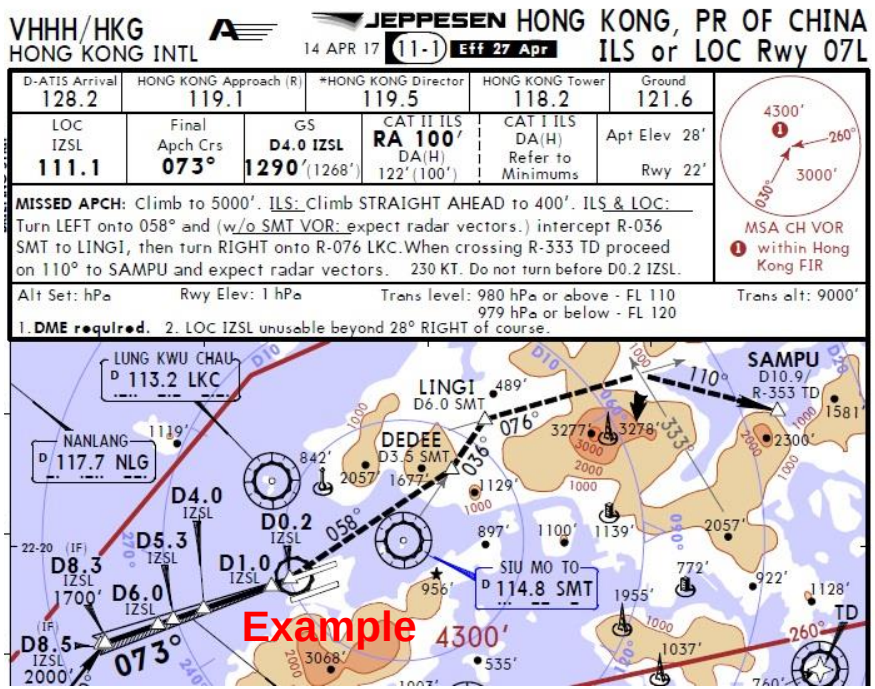
Fuel Quantity

Others

程序因素

某些儀器進場的重飛程序比較複雜，如因地障或ATC空域限制，重飛路線比較複雜、高度速度都有限制。並不意圖說明因為這些複雜因素而避免重飛，而是必須要在非critical的時間點儘早準備，否則將大幅增加重飛的風險。





Complicated Profile

Others

Low Altitude Level-off

決策風險

重飛亦有重飛的風險。在某些情況下重飛的風險還大於繼續進場落地。例如，近兩三年來一直是個熱烈討論的議題－鋰離子電池帶來的風險。進場落地優先？還是重飛做完程序再觀察情況是否可控制得住？偏偏有某些情況下，火災的變化太快，飛行員就須慎重考量重飛的風險是否大於落地的風險。

SMOKE/FIRE FROM LITHIUM BATTERY

If necessary, transfer control to the flight crew member seated on the opposite side of the fire

– CKPT/CAB COM ..... ESTABLISH
– STORAGE AFTER Li BAT FIRE cabin procedure ..... REQUEST INITIATION

- If there are flames:
  – CREW OXY MASK (PF) ..... USE
  – SMOKE HOOD (PM) ..... USE
  – HALON EXTINGUISHER ..... USE
- If there are no flames or when flames are extinguished:
  - If not possible to remove device from the cockpit:
    – WATER or NON-ALCOHOLIC LIQUID ..... POUR ON DEVICE
    – DEVICE ..... MONITOR
  - If possible to remove device from the cockpit:
    – DEVICE ..... TRANSFER TO CABIN

- AT ANY TIME of the procedure, if SMOKE becomes the GREATEST THREAT:
  –REMOVAL OF SMOKE/FUMES procedure ..... CONSIDER

- AT ANY TIME of the procedure, if situation becomes UNMANAGEABLE:
  – IMMEDIATE LANDING ..... CONSIDER

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案例影片

VIDEO CLIPS

訓練上的挑戰

- 教育飛行員重飛是安全的：
  - 不穩定進場後繼續完成落地，雖然不一定會導致飛安事件，但重飛是更安全的選項。
- 強調重飛的重要性：
  - 在初訓與複訓時強調重飛的重要性，並確認組員重飛程序的正確性。
- 提高飛行員的Situational Awareness：
  - 藉由訓練與日常飛行的Briefing，提高飛行員的Situational Awareness，落實穩定性進場與重飛政策。

結論

- 落實穩定性進場政策
- 提高飛行員的Situational Awareness，並能夠正確地執行重飛程序
- 公司支持組員重飛決定的政策

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謝謝!