Agenda

- What is a Large Height Deviation (LHD)?
- Why is it important to report LHDs?
- Understanding LHDs
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What is a Large Height Deviation (LHD)?

- Formal definition (ref. RASMAG/7):

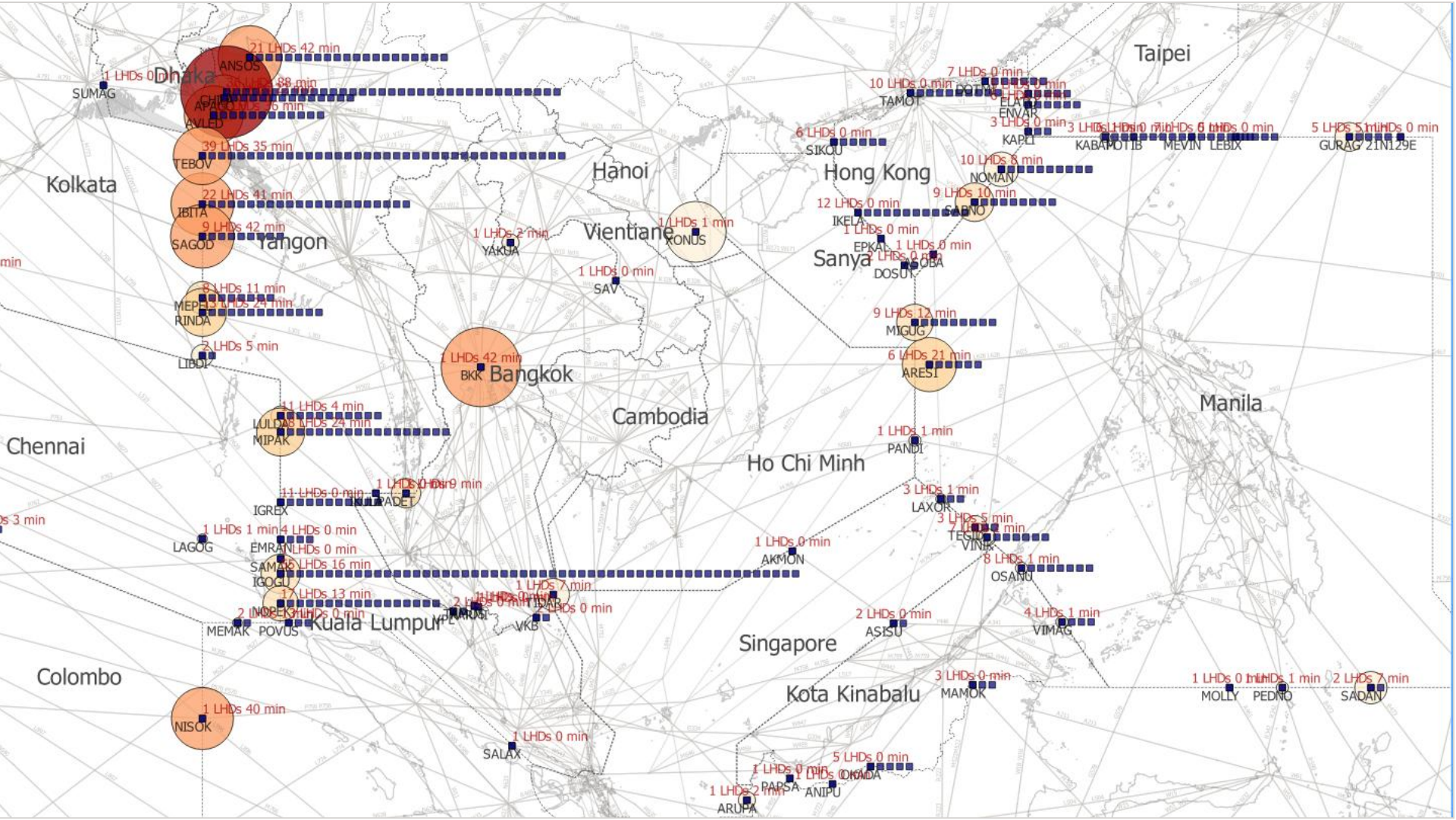
"A RVSM large height deviation (LHD) is defined as any vertical deviation of 90 metres/300 feet or more from the flight level expected to be occupied by the flight"

- Essentially, a LHD happens when an aircraft occupies space unexpected by a controller. Not knowing that the space is occupied, the controller may clear another aircraft to that location, which may cause a mid-air collision.
- **An LHD contributes to the risk regardless of whether a loss of separation occurred or not.**
- ATC authority is responsible for reporting LHD to the responsible RMA.

Why is it important to report LHDs?

- RMAs use LHD data to estimate airspace risk. The most important parameter is LHD duration. Roughly speaking, the longer the duration, the higher the risk.
- The resulting risk estimates act as a trigger for States to initiate collaboration to solve safety issues, especially when the risk exceeds the Target Level of Safety (TLS) of 5.0 x 10-9 Fatal Accidents per Flight Hour (FAPFH).
- RMAs provide annual reports to the Regional Airspace Safety Monitoring Group (RASMAG), which reports to APANPIRG. States can also use information provided in the report to help identify their safety issues.

Risk by Location



LHD Taxonomy

Operational Errors	
A	Flight crew failing to climb/descend the aircraft as cleared
B	Flight crew climbing/descending without ATC clearance
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearances etc);
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late/non-existent coordination, or time estimate, flight level, or ATS route information not in accordance with agreed parameters)
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues

LHD Taxonomy

Aircraft Contingency Events	
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure)
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors)
Deviation due to Meteorological Condition	
I	Turbulence or other weather related causes

LHD Taxonomy

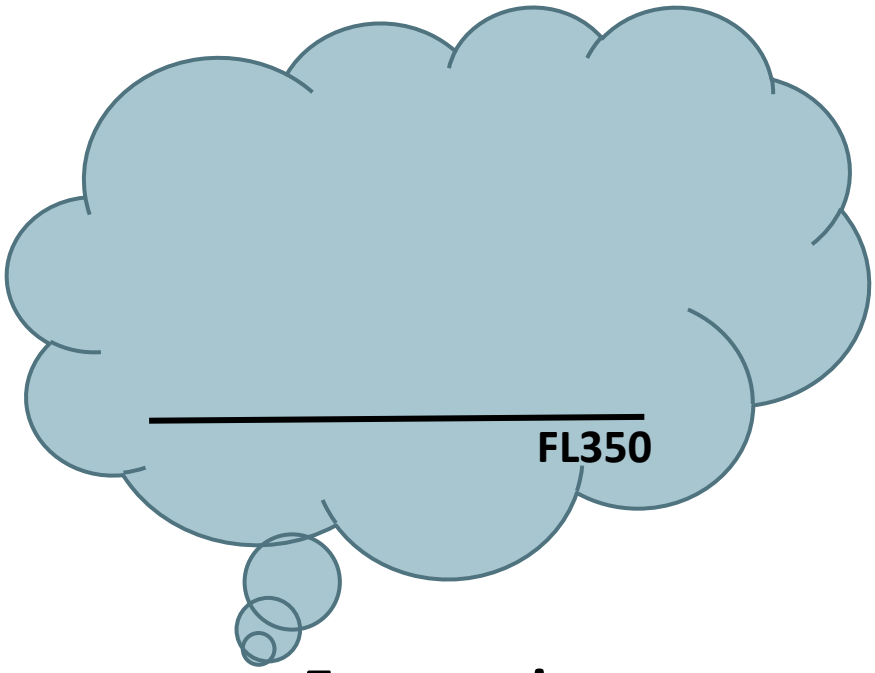
Deviation due to TCAS advisories	
J	TCAS resolution advisory; flight crew correctly following the resolution Advisory Note: LHD resulting from actions complying with a TCAS RA would not reflect risk in the RVSM airspace since it is a proper remedial action of flight crew. Nonetheless, it is strongly recommended that all LHD occurrences related to TCAS resolution advisory be reported to the responsible RMA detailed airspace safety analysis
K	TCAS resolution advisory; flight crew incorrectly following the resolution advisory
Others	
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RSVM approval but aircraft not approved, ATC misinterpretation of flight plan)
M	Other

LHD Taxonomy

- These codes are mainly for the use of RMAs. However, reporters may use this taxonomy in order to understand what types of events are considered LHDs.
- **Detailed description** of large height deviation occurrences is **crucial** for the RMA to assess the risk of the LHD and its duration.
- Available at: http://www.aerothai.co.th/maar/safetylhdcategories.php

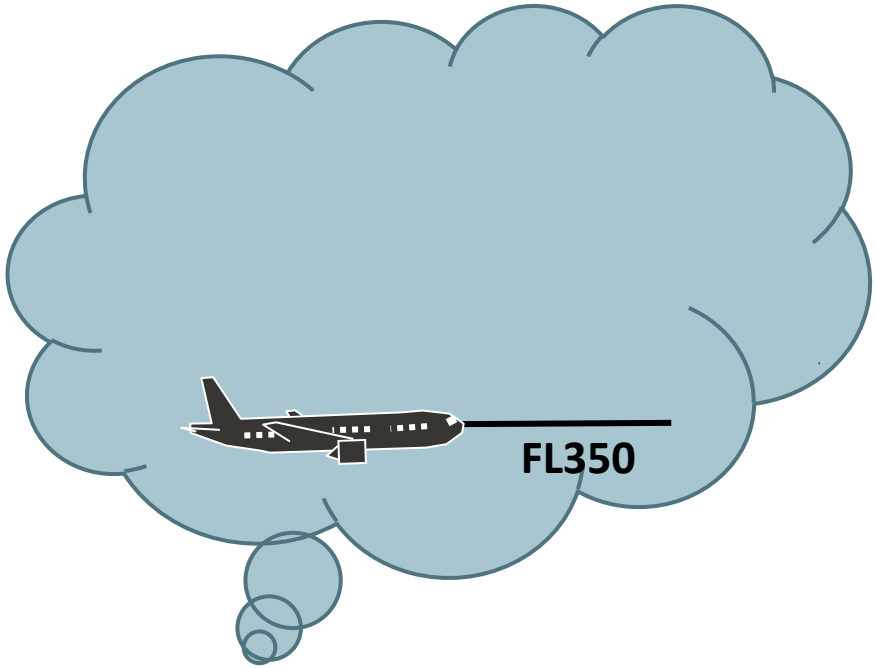
LHD Examples

Non-existent Coordination (Negative Transfer)



Expectation

No coordination received. ATC does not expect any aircraft at FL350.

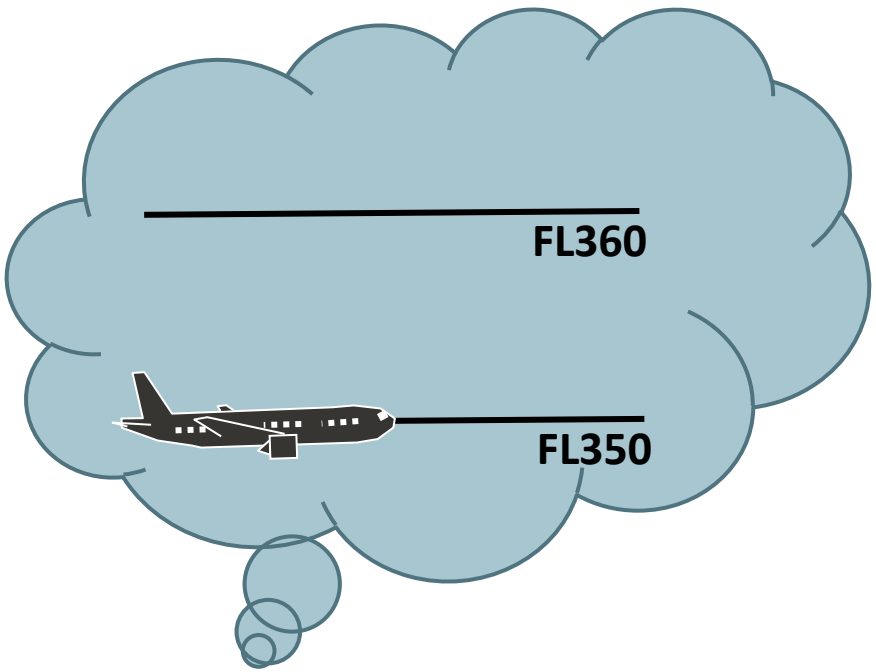


Reality

An aircraft shows up at FL350 without the ATC's knowledge.

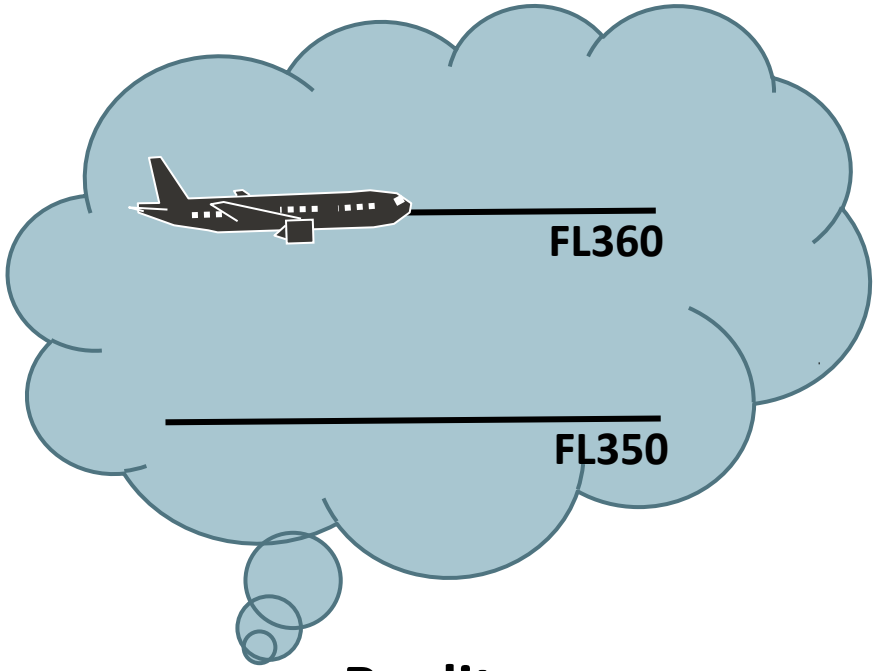
LHD Examples

Incorrect FL



Expectation

ATC receives the coordination for an aircraft to show up at FL350

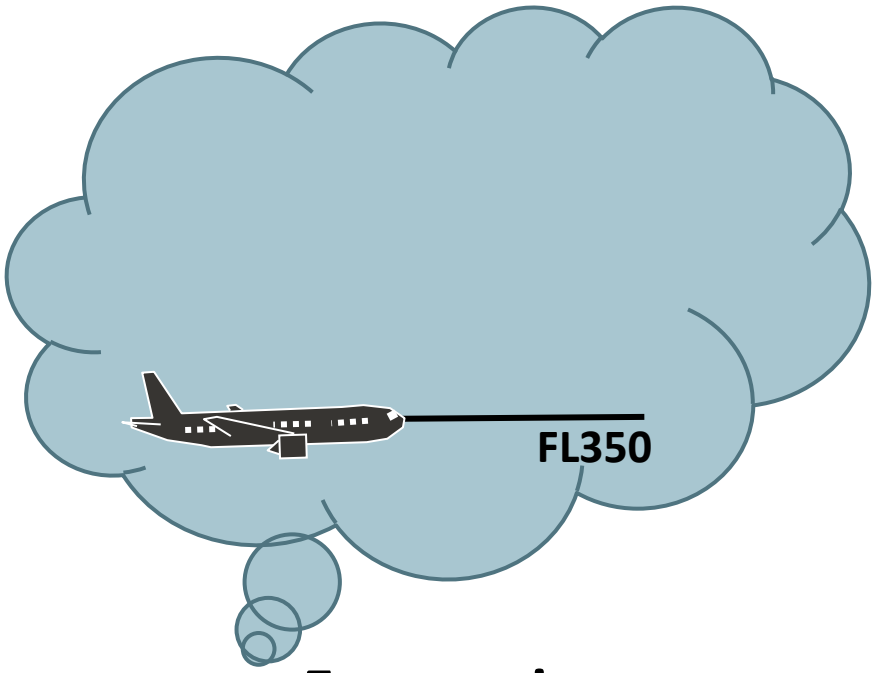


Reality

The coordinated FL is incorrect or outdated and the aircraft shows up at FL360 instead

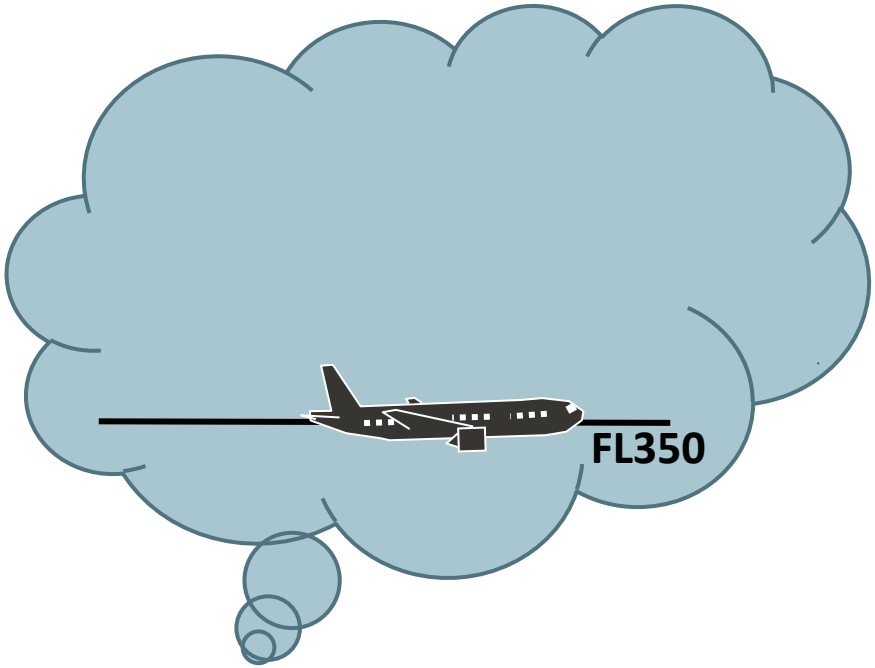
LHD Examples

Incorrect time estimate



Expectation

ATC receives the coordination for an aircraft to show up at a particular time.

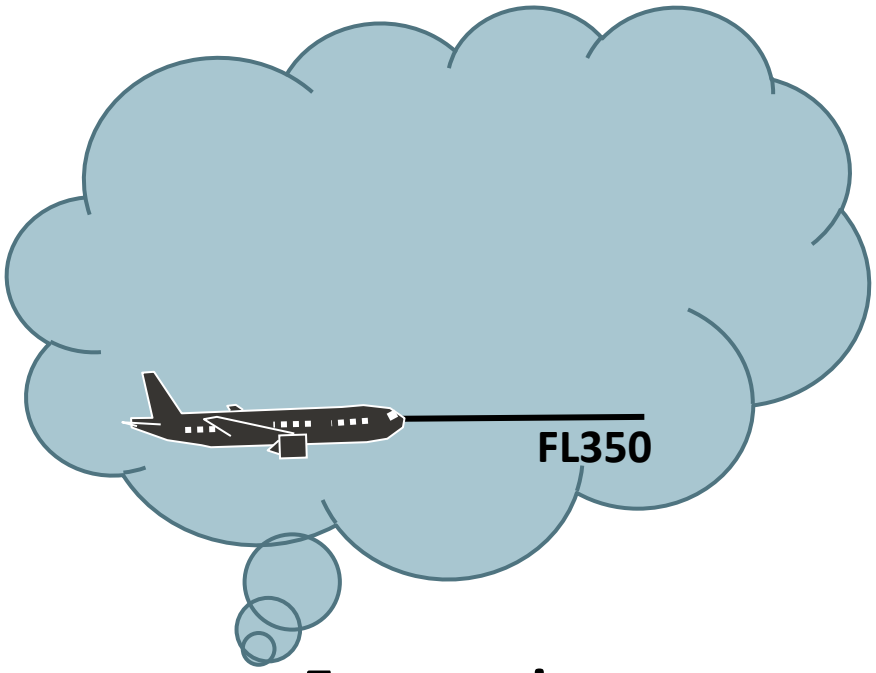


Reality

An aircraft shows up earlier/later than expected

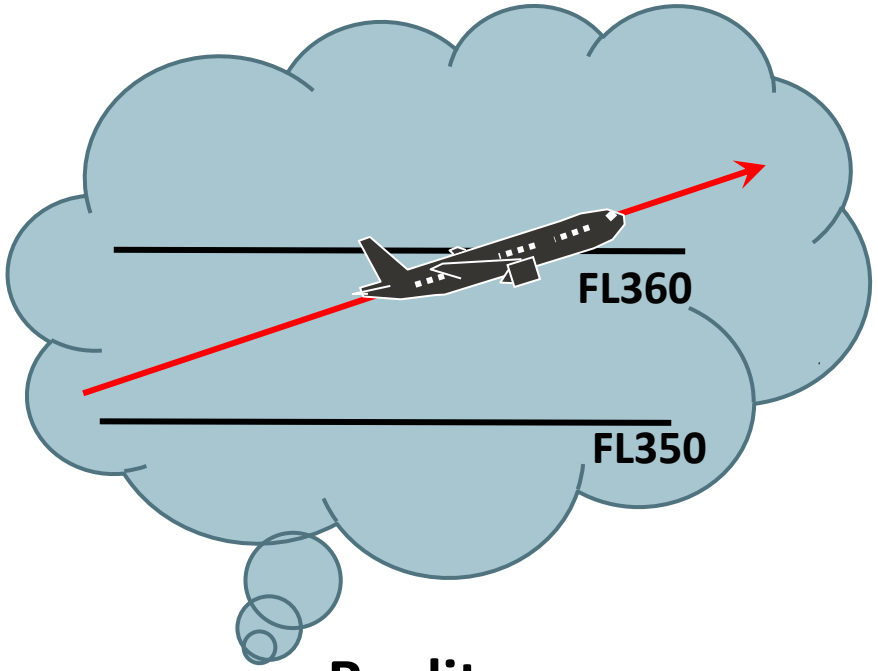
LHD Examples

Climb/descend without clearance



Expectation

An aircraft cruises at FL350

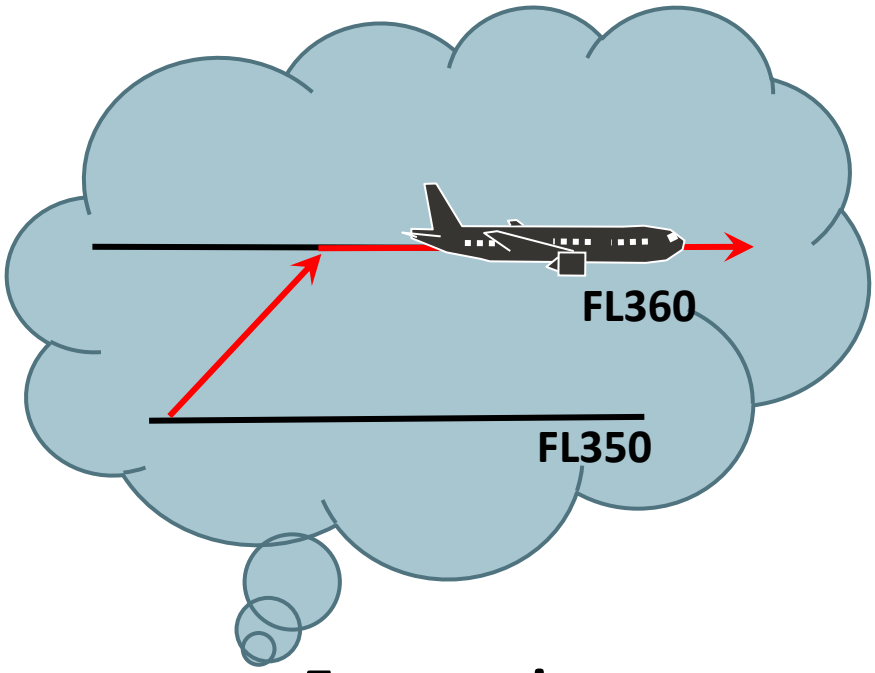


Reality

The aircraft climbs without the correct clearance since the flight crew misunderstand ATC's instruction.

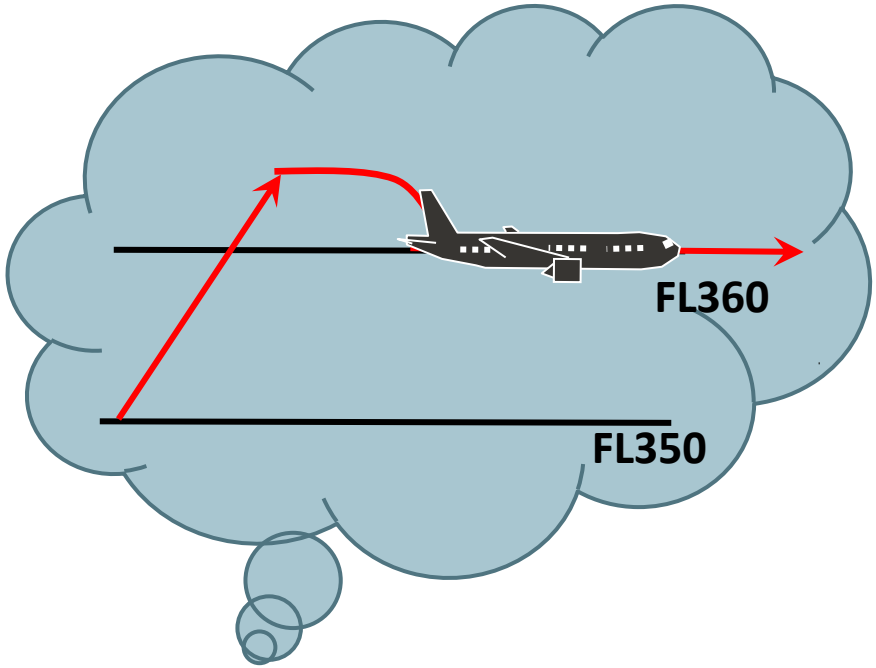
LHD Examples

Overshoot or undershoot with deviation > 300 feet



Expectation

An aircraft climbs to FL360

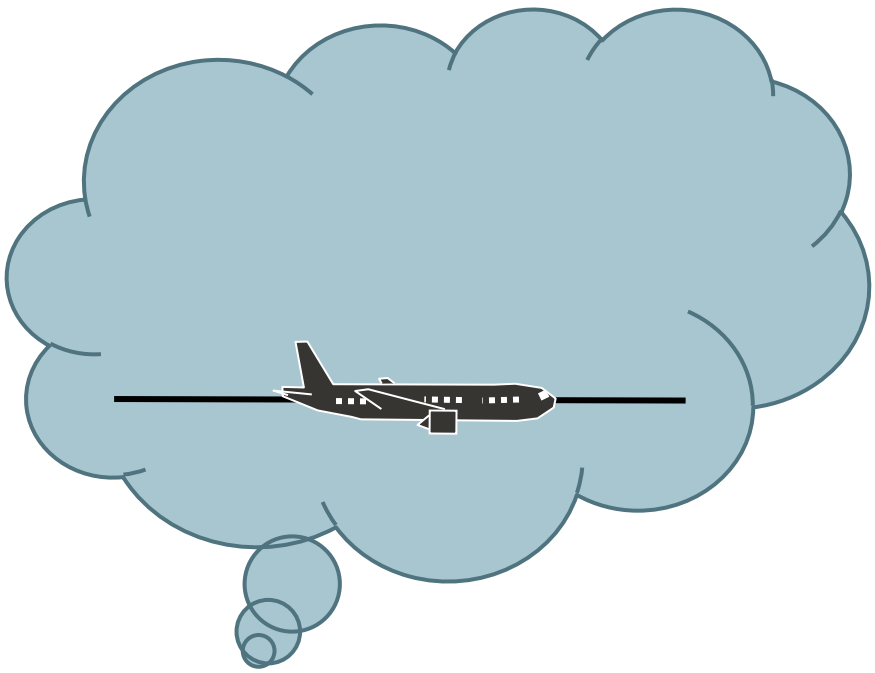


Reality

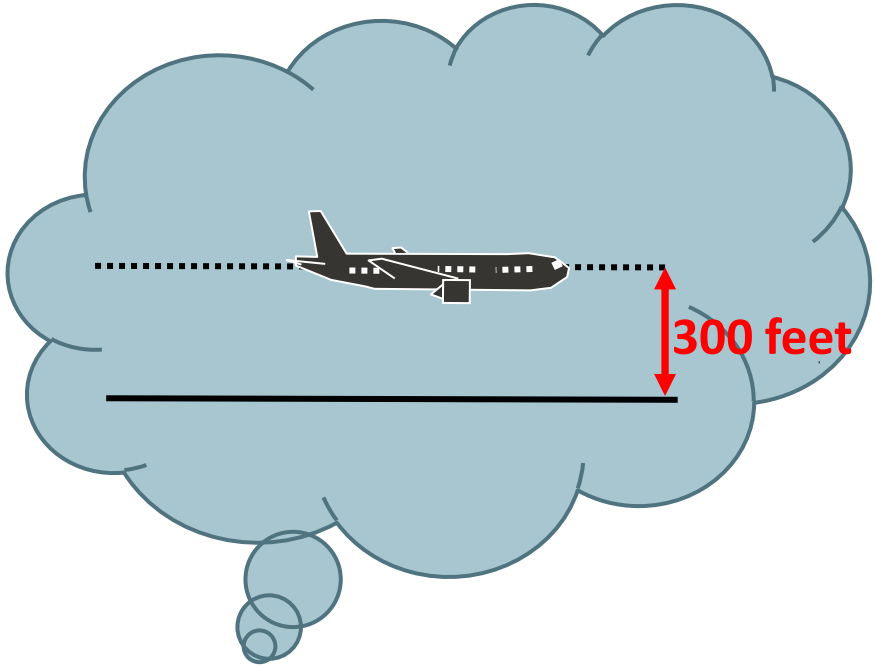
Overshoot with deviation from the expected FL greater than 300 feet

LHD Examples : Summary

Roughly speaking, LHDs occurs when vertical deviation from an expected location is greater than 300 feet.



Expectation



Reality

LHD FAQs

Q: Some states impose flow restrictions by issuing NOTAMs or AFTN service message. If the incoming traffic violates the flow restriction but complies with separation agreed in the LOA, should this incident be reported as an LHD?

A: No. This operational error may be reported internally, but does not need to be reported as an LHD to the RMA.

LHD FAQs

Q: The transferred SSR code does not match the incoming traffic. The controller sees the incoming traffic, but cannot identify it. Should this be reported?

A: Yes. The RMA will analyze this type of occurrence case by case.

When in doubt, report it or ask maar@aerothai.co.th

More FAQs can be found at:

http://www.aerothai.co.th/maar/safetylhdfaqs.php

LHD Reporting

- Typically, POC person collects LHDs during each month and sends the reports to the respective RMA.
  - New LHD report form can be found under: http://www.aerothai.co.th/maar/documents.php
  - MAAR is working on a prototype system to enable online submission & automatic notification.
- Each ANSP should have an internal safety management system that defines an internal reporting process and the treatment of each report. The system should take into account the LHD reporting requirement.

Current LHD Report Form

Name of FIR: Enter the name of your FIR.

Date of Occurrence (UTC Date): Enter the date of occurrence based on UTC.

Call Sign: Enter the call sign.

Departure Aerodrome: ICAO Designator. **Destination Aerodrome:** ICAO Designator.

Aircraft Type: Enter the ICAO aircraft type.

Location of Occurrence (Point): Enter a point or coordinate. **FLOS Transition Area?:** Yes/No

Location of Occurrence (Route): Enter the route name. **Route Type:** Enter or choose the route type.

- Fixed bi-directional route
- Fixed uni-directional route
- Flexible track
- User-preferred route

Flight Level Expected by the Controller: (e.g. last assigned or last coo

Actual Flight Level: Enter the actual FL. **Detected via:** Enter or choos

Duration at the Incorrect FL: Enter or choose time duration at incorr

next section instead for Category E occurrence.

Other Traffic (if any): Enter the identification and description of conflicting traffic, if any.

If this occurrence is a breakdown in ATC-to-ATC coordination (Category E or F), please fill in the following additional information:

Reporter's Role: *Choose the role.* ***The Other ATS Unit:*** *Enter the name of involving ATS unit.*

Was there any collaboration between the watch supervisors of both ATS units to uncover the cause of the error? *Yes/No*

Check all that describe the nature of the occurrence:

☐ *Late/non-existent coordination* ☐ *Miscommunicated transfer conditions*

☐ *Late/non-existent FL/time/route information* ☐ *Aircraft did not transfer at the coordinated FL*

☐ *Other (please, describe below)*

Time aircraft expected to arrive at the TOC Point (UTC): *Enter the last coordinated arrival time.*

Actual time aircraft arrived at the TOC point (UTC): *Enter the actual arrival time.*

Time the Controller detected the actual position of the aircraft (UTC): *Enter the time of detection. If there was a conflict, enter the time the conflict was resolved.*

Additional Description of the Occurrence (please attach a copy of your internal occurrence report, if available): Enter textual description of the occurrence, including crew comments, if available.

The form should come with many pre-defined drop-down lists.

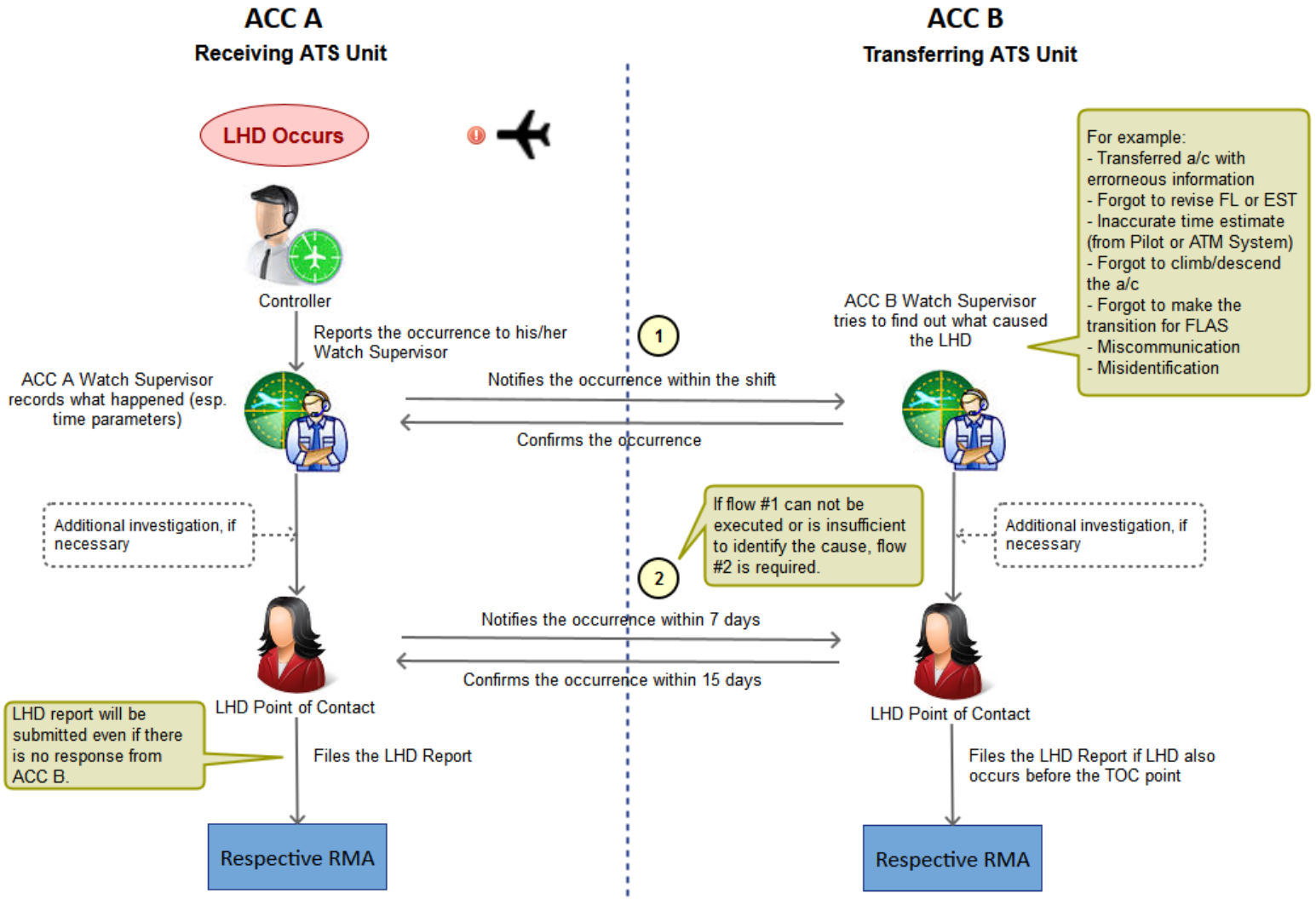
Time parameters are extremely important as they're the main driver of the estimation of the risk.

The more detailed description of the occurrence, the better the RMA can analyze the LHD.

Category E: ATC-to-ATC Coordination Errors

- Cat E LHDs constitute about 90% of all LHD occurrences and usually most of the risk in RVSM.
- Cat E LHDs refer “coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues.” Therefore, LHDs in cat E usually involve another ATS unit.
- To ensure that there is coordination between the two involving ATS units to uncover the cause and prevent future occurrences, additional coordination procedure is recommended for every LHD occurrence that involves another ATS unit.

Recommended Procedure for Cat E LHDs



Q&A