

What are LHDs, LLEs, and LLDs?

A Large Height Deviation (LHD) means a vertical deviation of 300 ft or more from ATC assigned or coordinated flight level. The deviation may be due to an ATC or pilot error, an equipment malfunction or other environmental factors such as turbulence, causing the aircraft to be at a vertical position that is unexpected by the ATC.

In the Asia/ Pacific Region, the majority of LHDs are reported at Flight Information Region (FIR) boundaries. Almost 80% of all cases are breakdowns in ATC to ATC coordination while transferring control of an aircraft.

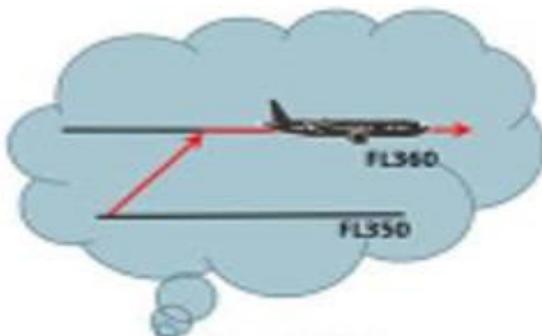
A Large Longitudinal Error (LLE) means a difference between the expected longitudinal position of an aircraft and the actual position, if the difference is greater than an agreed parameter.

A Large Lateral Deviation (LLD) means a lateral deviation of 10 NM or more from the current flight plan track, as agreed for the Asia/ Pacific Region.

LHD Examples

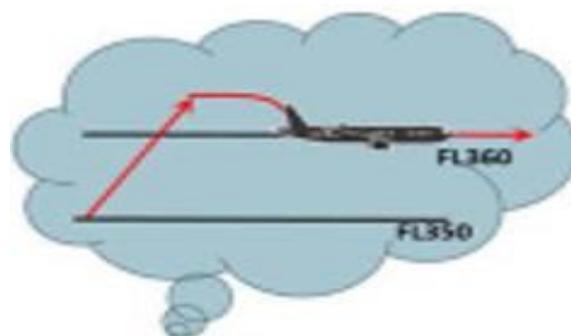
Typical scenarios for LHD occurrence are:

- **Overshoot or under shoot with deviation ≥ 300 feet**



Expectation

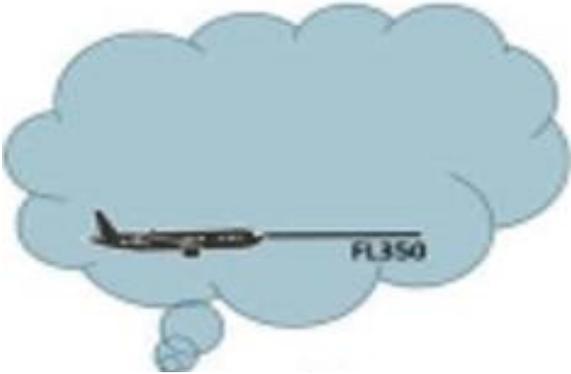
An aircraft climbs to FL 360



Reality

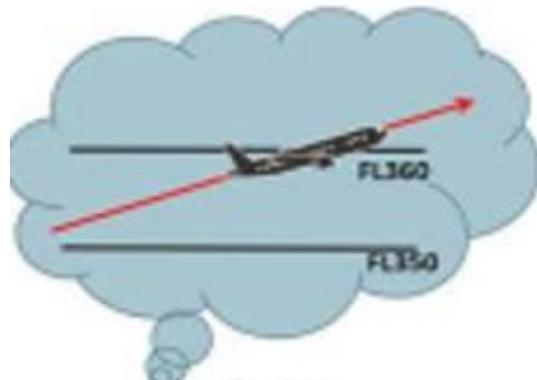
Overshoot with deviation from the expected FL greater than or equal to 300 feet

- **Climb/ descend without clearance**



Expectation

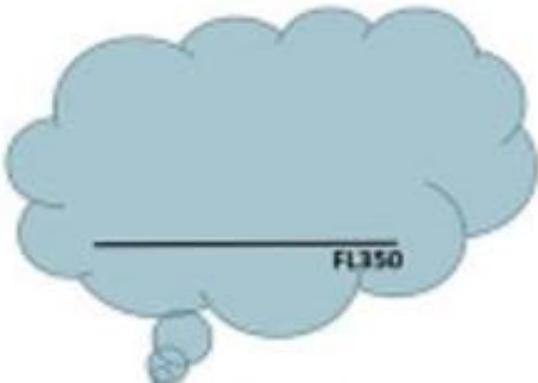
An aircraft cruises at FL 350



Reality

The aircraft climbs without an ATC Clearance, due to the flight crew misunderstanding an ATC instruction

- **Non-existent Coordination (Negative transfer)**



Expectation

No coordination received. ATC does not expect any aircraft at FL 350



Reality

An aircraft appears at FL350 without ATC's knowledge

Factors that contribute to these occurrences include equipment failure, inappropriate procedures, lack of surveillance, errors from controller – pilot loop, etc. However, the vast majority of incidents are caused by human performance limitations such as a controller forgetting to send a transfer message or a controller/ pilot slip an incorrect read back.

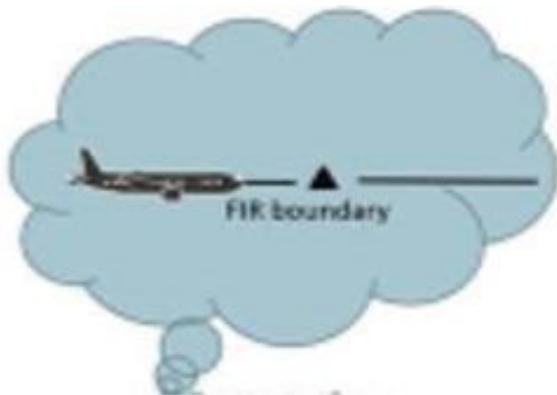
Though automated systems – such as digital data for ATC-to-ATC or ATC-to-pilot communications – are alleviating this problem, sometimes automation introduces other issues. An example of this is when an aircraft logged on CPDLC with the wrong aircraft ID, resulting in the aircraft following instructions and clearances intended for another aircraft.

LHD events in the working area, ATC must make a report. LHD events are events that must be reported as mandatory reporting. Reporting can be done through web-based reporting on the *Effort Safety Integrated* application. The web-based address is www.effort.airnavindonesia.co.id

LLE/ LLD Examples

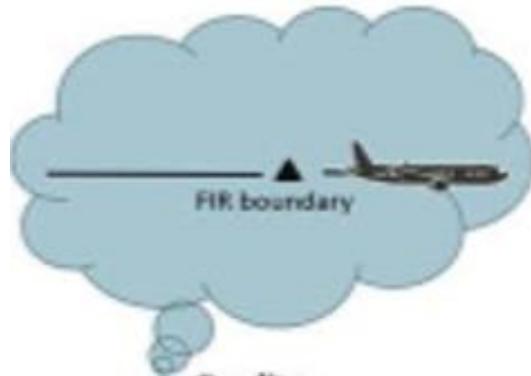
The top contributors to LLE are ATC coordination errors and the flight crew providing incorrect time estimates. The most common LLE scenario is an individual aircraft time estimate varying by three minutes or more.

Most common LLE – Individual aircraft time estimate varying three minutes or more



Expectation

ATC received the coordination that aircraft would cross FIR boundary at 01:03



Reality

Aircraft crossed the FIR boundary at 01:00 which is 3 minutes earlier than expected

What's the risk?

If an Air Traffic Controller is unaware of the location of an aircraft or relies on incorrect aircraft position information, there is a possibility that aircraft comes into conflict with other aircraft. In the past, there have been reports of incidents where an absence of a transfer message resulted in an aircraft traversing the whole FIR without the controller's knowledge. In most of these cases, the pilots were not aware of the failure to transfer, and may not have even been on the correct frequency.

On another case where the South China Sea parallel routes are spaced 60 NM apart, any unknown Large Lateral Deviation (LLD) would pose a risk to other aircraft on the adjacent route travelling in the opposite direction.

Prevention and Mitigation

- **[Pilot, ATC] Adhere to readback-hearback procedures** – Stress the need for active listening of the Air Traffic Control instructions/ clearances/ pilot's readbacks. If unsure, ask for the information to be repeated. Anticipate problems such as callsign confusion, incorrect FL information or any clearance misunderstanding that may lead to an LHD, LLD or LLE. This can be done in training, as part of routine safety promotion activities, and/ or in the operational environment.
- **[Pilot] Adhere to the local procedure, if it exists, to contact ATC before TCPs** – In areas where surveillance and air-ground communication are poor such as in oceanic airspace, a local procedure is put in place for flight crew to report to an ATC before a transfer-of-control point (TCP). The procedure is to ensure that controllers of the accepting transfer of control between ATC units was missing. A negative transfer could lead to a long duration occurrence if an ATC fails to send a transfer message to another ATS unit.
- **[Pilot] Contact ATC if there is a need to deviate from the last ATC clearance** – Pilots should notify the responsible ATS unit as soon as possible if there is a deviation due to weather or any other causes.
- **[Pilot] Maintain air-ground communication with ATC** – Many reports identify loss of air-ground communication as one of LHD's contributing factors. While radio communication failure alone does not constitute a vertical or lateral deviation, it may increase the chance of or contribute to such an event if the ATC was not aware of the aircraft's accurate position. Investigation revealed several causal factors which included flight crew tuning to a wrong frequency as a result of readback-hearback errors. In some cases of radio communication failures, ATC attempted to contact flight crew via the emergency frequency published in the AIP, but the flight crew did not respond.

To prevent such occurrences, pilots and ATC are advised to monitor the emergency frequency and pay attention to frequency readback. In the case where flight crews change frequency

and cannot contact the next sector, it is suggested to contact the previous ATS unit/ sector using the previous frequency.

Similarly, datalink systems such as Automatic Dependent Surveillance-Contract/ Controller Pilot Datalink Communications (ADS-C/ CPDLC) can help controllers detect potential aircraft deviations. Where voice communication is unavailable or unreliable, an early ADS-C/ CPDLC logon will help reduce the risk.

- **[ANSP, ATC] Use a checklist that includes pending actions as part of position/ shift change briefing** – Coordination information can be lost during a shift/ position change. Using a comprehensive checklist can serve as memory aid to controllers to pass on important information to the next controllers, including information such as transfers or revisions.
- **[ANSP, ATC] Improve coordination process** – Since most LHDs in the region are categorized as coordination breakdowns, any preventive measure that will decrease the probability of coordination errors would help reduce the risk triggered by the LHDs. These preventive measures may include automation systems such as ATS Inter-facility Datalink Communication (AIDC) and procedures to minimize readback-hearback errors.
Since AIDC is not yet established in all parts of the Asia/ Pacific Region, controllers can reduce error by limiting the exchange of information to about three flights per call between ATC units when using voice communication.
- **[ANSP, ATC] Increase controller's ability to detect errors** – When coordination errors occur, the earlier the controller detects an error and recovers the situation, the more risk is reduced. For example, an increase in surveillance capability will enable air traffic controllers to determine the actual position of an incoming aircraft, in spite of deviation from the ATC clearance or a transfer message error.
- **[ANSP, ATC, Pilot] Report incidents** – Incident statistics are regularly collected and analyzed, but appropriate action to improve and prevent recurrence depends on the quality of reporting. Annex 19, the Asia/ Pacific Seamless ATM Plan and past APANPIRG Conclusions are quite clear that open, non-punitive reporting is a prerequisite for safe and efficient flight operations. Therefore, if States or organizations do not provide a "safe" reporting environment for pilots and controllers, then this should be brought to the attention of the region.

Each FIR has an appointed Point-of-Contact responsible for collecting LHD, LLE and LLD reports from air traffic controllers. Air traffic controllers should note that a reportable deviation occurs even if the event did not lead to loss of separation on that occasion. Below is a guideline for reporting.

Category of Error	Criterion for Reporting
Individual-aircraft	Vertical deviation of 300 ft. or more from an ATC assigned/ coordinated flight level.
Individual-aircraft	Any lateral deviation from the current flight plan track that is greater than a regionally agreed value pertinent to the applied separation minimum.
Individual-aircraft (Time-based separation applied)	Pilot estimate varies by three minutes or more from that advised in a routine position report.
Aircraft-pair (Time-based separation applied)	Infringement of longitudinal separation standard based on routine position reports.
Aircraft-pair (Time-based separation applied)	Expected time between two aircraft varies by three minutes or more based on routine position reports.
Aircraft-pair (Distance-based separation applied)	Infringement of longitudinal separation standard, based on ADS, radar measurement or special request for RNAV position report.
Aircraft-pair (Distance-based separation applied)	Expected distance between an aircraft pair varies by 10NM or more, even if separation standard is not infringed, based on ADS, radar measurement or special request for RNAV position report.

[Pilot] Adherence to ANNEX 2 Rules of the Air 3.6.2.2c – Notification of estimate time error for the next compulsory reporting point in excess of three minutes.

[ANSP, ATC, Pilot] Be aware of Airspace Safety Hot Spots – Airlines and ANSPs are recommended to sensitize and raise awareness of the LHD/ LLD/ LLE hot spots in the Asia/ Pacific region, to have increased vigilance in these areas.

For information on the current hot spots, please visit

<https://www.icao.int/APAC/Meetings/Pages/APANPIRG.aspx>

Then, select the latest APANPIRG meeting. Explanation regarding current Asia Pacific hot spots will be summarized in “RASMAG Outcomes” working paper.

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