ICAO | GOLD MANUAL (DOC 10037) | PANS-ATM (DOC 4444)

ADS-C and CPDLC

Data link in practice

Periodic, event and demand contracts, reporting parameters, operational use, surveillance applications, monitoring and contingency arrangements



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Data link brings surveillance and dialogue to airspace beyond radar and VHF

The two applications

CPDLC Text-based dialogue between controller and pilot: clearances, requests, reports and emergency messages.

ADS-C The aircraft reports position and intent automatically, under contracts set by the ground system.

Together They enable procedural surveillance and reduced separation in oceanic and remote airspace.

Contract types

Periodic, event and demand

Reporting parameters

Report groups and contents

Operational use

Contract lifecycle and CPDLC pairing

Surveillance

Separation, conflict and SAR support

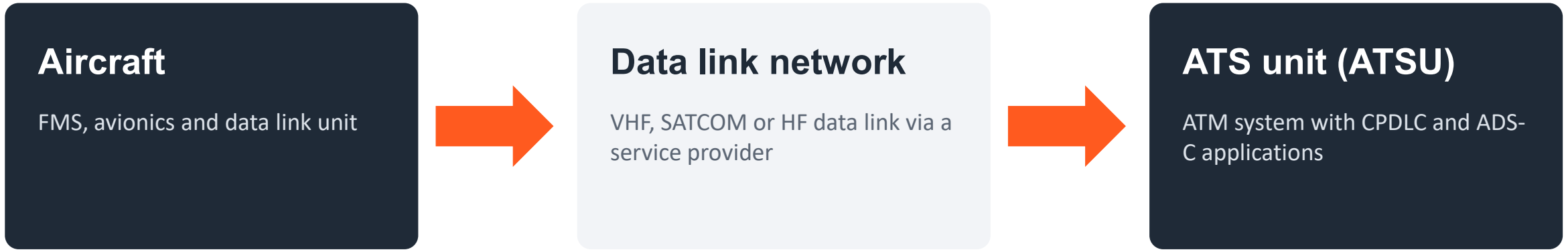
Monitoring

Performance and controller checks

Contingency

Failures and fallback procedures

Aircraft and ATSU exchange data through a ground-air data link network



DLIC

Data link initiation capability. The aircraft logs on, so the ATSU learns its identity and which applications it supports.

ADS-C

Automatic position and intent reports sent under contract. Delivered through FANS 1/A.

CPDLC

Standard message sets for clearances and requests. Delivered through FANS 1/A or ATN B1.

Three contract types define when the aircraft reports

Periodic

TRIGGER

A fixed reporting interval set by the ATSU.

TYPICAL USE

Continuous tracking of progress along the route.

Event

TRIGGER

A defined condition is met: a waypoint change, or a level, lateral or vertical-rate threshold.

TYPICAL USE

Detecting deviations from the cleared profile.

Demand

TRIGGER

A single report sent when the ATSU asks for it.

TYPICAL USE

Checking position now, for example when a periodic report is overdue.

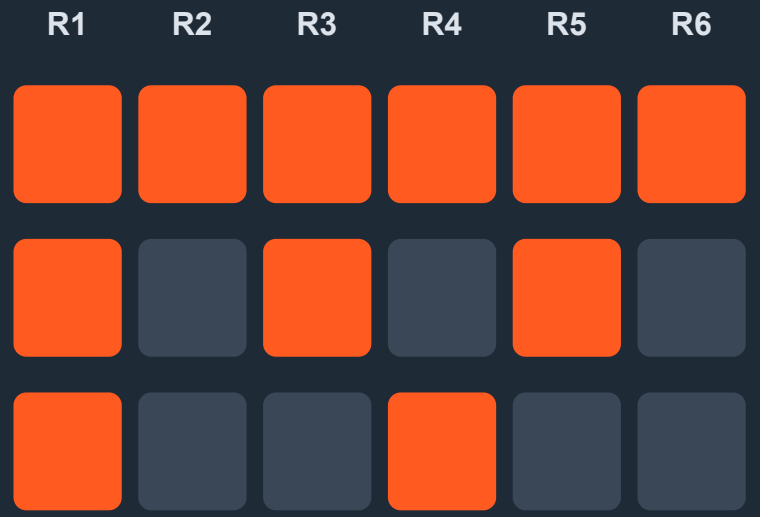
Emergency mode Activated by the flight crew, it marks reports with an emergency indication so the ATSU is alerted.

Periodic contract: the aircraft reports at a fixed interval

How it works

- The ATSU sends one request with a reporting interval.
- The aircraft reports every interval until the contract is cancelled or replaced.
- Optional groups can be added at a modulus of the interval.
- A new periodic request from the same ATSU replaces the previous one.
- The interval is chosen to suit the separation minima and monitoring needs of the airspace.

Example: which groups ride in each report



R1 to R6 are successive periodic reports. The basic group is always present; other groups appear only at their modulus.

Event contract: the aircraft reports only when a condition is met

Key points

- Stays silent until a trigger occurs.
- One event contract per ATSU can combine several event types.
- Guards against deviations between periodic reports.
- ATC chooses thresholds to match the separation in use.

Waypoint change

Reports when the next or next-plus-one waypoint changes, for example after a waypoint is sequenced.

Level range deviation

Reports when the aircraft leaves a defined floor and ceiling altitude range.

Lateral deviation

Reports when the aircraft departs from the cleared route by more than a set distance.

Vertical rate change

Reports when the climb or descent rate goes above or below a set threshold.

Demand contract: a single report whenever the controller asks

1 ATSU requests

The ATSU asks for one report and selects the groups it needs.

2 Aircraft reports

The aircraft sends a single report as soon as it can.

3 Contract ends

Periodic and event contracts continue unaffected.

Typical uses

Overdue report

Confirm position when an expected periodic report has not arrived.

Intent check

Request the predicted route before issuing a clearance.

Conformance check

Verify the aircraft is following a clearance just issued.

Handover

Obtain a current report around transfer of control.

Reports are built from groups of parameters, with the basic group always included

Group	Main contents	Inclusion
Basic	Latitude, longitude, altitude, time stamp and figure of merit	**Every report**
Flight identification	Flight identity of the aircraft	When requested
Earth reference	True track, ground speed and vertical rate	When requested
Air reference	True heading, Mach and vertical rate	When requested
Airframe identification	24-bit aircraft address	When requested
Meteorological	Wind speed and direction, and temperature	When requested
Predicted route	Next waypoint and ETA, and next-plus-one waypoint and ETA	When requested
Projected intent	Near-term intended path (intermediate and fixed projection)	When requested

Figure of merit tells the ATSU how accurate the reported position is. Which groups are available depends on aircraft avionics.

Operational use: from log-on to transfer of control

1

Log on

The crew logs on to the ATSU through DLIC. The ATSU matches aircraft identity and address to the flight plan.

2

Set contracts

The ATSU sends periodic, event and demand requests. The aircraft accepts them automatically.

3

Receive reports

The ATM system displays position, checks conformance and alerts on deviations or overdue reports.

4

Use CPDLC

Clearances, level and route changes and requests are exchanged by text. ADS-C reports confirm the outcome.

5

Transfer

CPDLC passes to the next ATSU, which sets up its own ADS-C contracts. An aircraft can hold contracts with up to four ATSUs.

Flight crew keep ADS-C enabled unless instructed otherwise or an abnormal procedure requires it off.

CPDLC and ADS-C work as a pair in oceanic and remote airspace

CPDLC: the dialogue

- Clearances and instructions from ATC
- Requests and reports from the crew
- Responses such as WILCO or UNABLE close the loop

ADS-C: the picture

- Position and intent with no crew action
- Deviation and overdue-report alerts
- Conformance monitoring against the clearance

Example: a level change request

1 Pilot request

The crew sends REQUEST CLIMB TO [level] by CPDLC.

2 Controller check

ATC checks traffic using ADS-C position and intent.

3 Clearance

The controller uplinks CLIMB TO [level] and the crew replies WILCO.

4 Confirmation

The new level appears in ADS-C reports and is monitored.

ADS-C extends surveillance to airspace without radar coverage

Reduced separation

Supports reduced lateral and longitudinal minima where the required navigation and communication performance is met.

Conflict and conformance checks

Ground automation compares reports with the cleared route and level, and alerts on deviations.

Position reporting

Replaces routine voice position reports on HF, which lowers workload and read-back errors.

Search and rescue

The last reported position and emergency-mode reports help rescue coordination centres.

Weather data

Wind and temperature in the meteorological group can feed forecasts along the route.

Advanced services

Dynamic re-routes and tailored arrivals build on data link communication and reporting.

Monitoring keeps data link performance and reports under control

Controller

Watches for overdue reports, deviation alerts and any mismatch between ADS-C position and the clearance.

ATSU system

Logs message times and flags exchanges that exceed latency timers.

Operators

Operators and ANSPs report data link problems to the responsible reporting agency for investigation.

Regional monitoring

Performance data are reviewed against the required specifications.

Performance specifications

RCP 240

RSP 180

RCP 400 | RSP 400

Required communication performance (RCP) and required surveillance performance (RSP), set out in the Performance-based Communication and Surveillance Manual (Doc 9869).

Contingency arrangements: know the fallback before data link degrades

ADS-C report overdue	Request a demand report. If none arrives, confirm position by CPDLC or voice and apply alternative separation.
CPDLC failure or lost connection	Revert to voice on HF, VHF or SATVOICE, advise adjacent units and re-establish with a new log-on.
Failed transfer to next ATSU	The crew logs on to the next ATSU manually. If that fails, transfer by voice.
Aircraft emergency	Acknowledge the emergency-mode reports or CPDLC emergency message and alert search and rescue services.
Ground system or network outage	Notify adjacent ATSUs and crews, and revert to non-data-link procedures with suitable separation.

Always apply the State AIP, regional supplementary procedures (Doc 7030) and the current editions of Doc 4444 and Doc 10037.

1

Contracts

Periodic answers how often, event answers what changed, and demand answers what now.

2

Parameters

Report groups let ATC take only the data it needs. The basic group is always sent.

3

Operations

CPDLC and ADS-C together support reduced separation where required performance is met.

4

Resilience

Monitoring and rehearsed fallback procedures keep operations safe when data link degrades.

Reference documents

- Annex 10, Volume III: aeronautical telecommunications
- Annex 11: air traffic services
- PANS-ATM (Doc 4444)
- Global Operational Data Link (GOLD) Manual (Doc 10037)
- Performance-based Communication and Surveillance Manual (Doc 9869)
- Regional Supplementary Procedures (Doc 7030)