GUIDANCE MATERIAL

ON

SACCAN FANS 1/A

OPERATIONAL EVALUATION TRIALS

IN

CANARIAS AIRSPACE

(SECOND PHASE)

VERSION 2.0

SEPTEMBER 2003

TABLE OF CONTENTS

PREFACE

This Document details the SACCAN system, and the procedures and requirements applicable to the second phase of the SACCAN FANS 1/A operational evaluation trials in Canarias airspace. Information to be widely spread relating to the CANARIAS Operational Evaluation Trials is contained in a State AIC which should be read in conjunction with this Document.

In this second phase CPDLC messages will be used to satisfy real operational needs, although controller instructions via CPDLC and any other messages that may affect safety will require to be confirmed via voice communications.

To assist with the editing of this Document and to ensure the currency and accuracy of future editions, comments/suggestions for possible amendments should be sent to the editor at the following EMAIL address or facsimile number:

- e-mail: ddiez@aena.es
- fax: + 34 913213181 (Attn: David Diez)

LIST OF ACRONYMS

ACC	Area Control Centre
ACID	Aircraft Identification
ADS	Automatic Dependent Surveillance
ADS-C	ADS Contract
AENA	Spanish Airports and Air Navigation
AFN	Air Traffic Services Facilities Notification
AIP	Aeronautical Information Publication
AIC	Aeronautical Information Circular
AMP	Aircraft Messages Processing
ARINC	Aeronautical Radio INC.
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
CAA	Civil Aviation Authority
CNS	Communications, Navigation and Surveillance
COM	Communications Processing
CPDLC	Controller Pilot Data Link Communications
DL	Data Link
DLT	Data Link Terminal
ECA	ADS-SSR Control Station
EMG	Emergency Message
FANS	Future Air Navigation Systems
FANS 1	Boeing implementation of FANS
FANS A	Airbus implementation of FANS
FANS 1/A	Boeing & Airbus implementations of FANS
FDP	Flight Plan Data Processor
FDPS	Flight Data Processing System
FIR	Flight Information Region
FMC	Flight Management Computer
FMS	Flight Management System
GPS	Global Positioning System
HF	High Frequency
ICAO	International Civil Aviation Organization
ISPACG	Informal South Pacific ATS Coordinating Group
LAN	Local Area Network
LRNS	Long Range Navigation System
MET	Meteorological
MSAW	Minimum Safe Altitude Warning
MTCA	Medium Term Conflict Alert
NIM	Navigation Integrity Monitoring
NOTAM	Notice to Airmen
POS	ICAO Position Report Message
PSR	Primary Surveillance Radar
RNP	Required Navigation Performance
RRU	Radar Data Reception Unit
SACCAN	CANARIAS ADS/CPDLC System
SACTA	Air Traffic Control Automated System
SARPS	Standards and Recommended Practices
SATMA	South Atlantic Monitoring Agency
SDP	Surveillance Data Processing
SITA	Societe Internationale de Telecomunications Aeronautiques
SSR	Secondary Surveillance Radar

STCA	Short Term Conflict Alert
SVT	Supervision Terminal
TDT	Traffic Display Terminal
UTC	Universal Time Coordinated
VHF	Very High Frequency
WP	Waypoint Position
WPR	Waypoint Position Reporting

PART 1 – SACCAN FANS 1/A OPERATIONAL EVALUATION TRIALS

1.1 SACCAN General Description and Current Status

1.1.1 SACCAN is a ground ADS/CPDLC system of Aena currently sited at the operations room of CANARIAS ACC. The main purpose of SACCAN, after proper operational evaluation and validation, is to provide air traffic control services to FANS 1/A aircraft operating in the CANARIAS airspace. ICAO compliant aircraft (CNS/ATM package 1) will be accommodated later when they start operating.

1.1.2 FANS 1/A aircraft equipage normally includes VHF&SATCOM Data Link, ADS, CPDLC, FMS, and a Navigation Package.

1.1.3 The FANS-1/A Navigation Package normally consists of three Inertial Reference Systems providing position and velocity information to two Long Range Navigation Systems (LRNS) contained in individual Flight Management Systems each of which also references its own Global Positioning System (GPS) receiver and VOR/DME/ILS signals. These sensor inputs are resolved into a single aircraft position solution within each LRNS. This navigation package is capable of being approved for RNP 4. The actual navigation performance is constantly monitored; if it exceeds the required navigation performance (RNP), the flight crew is alerted.

1.1.4 The technical specification for CPDLC is provided in *RTCA DO-219*. The technical specification for the bit to character conversion and the ATS Facilities Notification (AFN) application is provided in *AEEC 622-2*. Deviations from the aforementioned standards in specific airframe implementations are provided in the manufacturers interoperability documents, the Boeing *Air Traffic Services System Requirements and Objectives* document (ATS/SR&O) and the Airbus *AIM FANS System Objectives and Requirements* document (FANS-A SO&R).

1.1.5 The technical specification for ADS is provided in *AEEC 745-2* and *RTCA DO-212*. The technical specification for the bit to character conversion and the ATS Facilities Notification (AFN) application is provided in *AEEC 622-2*. Deviations from the aforementioned standards in specific airframe implementations are provided in the manufacturers interoperability documents, the *Boeing ATS/SR&O* and the *Airbus FANS-A SO&R*.

1.1.6 FANS 1/A equipped aircraft use the SITA and ARINC networks and can communicate with SACCAN by means of the Aeronautical Mobile Satellite Service (AMSS) provided by INMARSAT, or by VHF when within the range of any of the multiple SITA or ARINC VHF data link stations, like the two of SITA located in the Canary Islands.

1.1.7 A most outstanding characteristic of SACCAN is its capability to establish, change and cancel ADS contracts automatically. This is done in order to minimize the air-traffic controller workload required to operate ADS.

1.1.8 All SACCAN technical acceptance tests have carried out successfully and therefore next phase is operational evaluation with both real and simulated traffic.

1.1.9 Inter-operability tests have been carried out successfully with both the FANS 1 Boeing 747&777 simulator in Seattle and with the FANS A Airbus A340 simulator in Toulouse.

1.1.10 An ADS/CPDLC simulator capable of simulating data from up to forty aircraft has been developed and is ready to be used in the operational evaluation of SACCAN with simulated traffic.

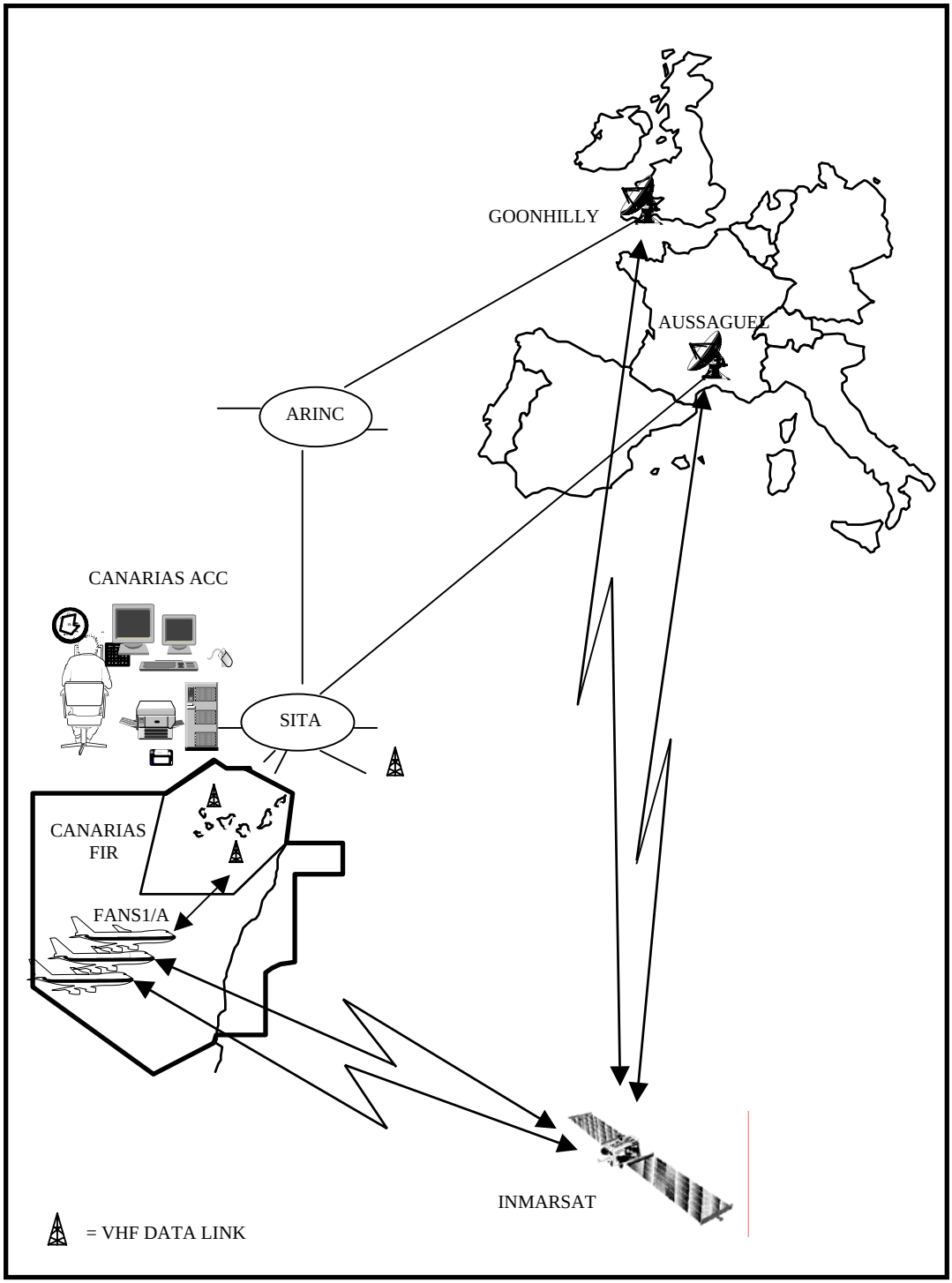

FIGURE 1: SACCAN FANS 1/A SYSTEM DESCRIPTION

1.2 SACCAN Background

1.2.1 The SACCAN *system installed in the control/operations room of CANARIAS ACC is in* fact a reduced replica of a larger system called ECA, used by *Aena (Spanish Airports and Air Navigation)* for trials, experimentation, evaluation and validation of ADS, CPDLC, and other advanced data link applications and functions. *Aena* made use of ECA during February and March 1998 to participate in *ADS Europe* trials using the Aeronautical Telecommunication Network (ATN).

1.2.2 SACCAN as well as ECA incorporates the philosophy, tracking algorithms, and functions of the *ADS-SSR Integration Study* carried out by *Aena* in 1994. The experience gained during the *PRODAT/PROSAT programme* of the *European Space Agency (ESA)* in which Spain participated was also taken on-board during system specification.

1.3 CANARIAS Current Limitations and Need for Improvement

1.3.1 Canarias has an airspace only partially covered by radar where a lot of over-flights and departing/arriving aircraft from/to the islands operate.

1.3.2 There are large parts of airspace out of coverage of the ground-based systems sited in the islands, where no radar surveillance is available, and where HF is the only means for voice position reporting and other controller-pilot communications; As a consequence large separations and complex operational procedures, such as the Mach number technique, has to be applied in many cases.

1.3.3 Of course, in the area covered by radar more efficient separations are applied to arriving and departing aircraft, although large longitudinal separation must anyhow be established before leaving radar coverage outbound.

1.3.4 Is evident that there is an operational need, to improve the current situation that does not allow for a flexible and efficient use of the airspace, and get rid of complex operational procedures which generate a lot of extra workload to both air-traffic controllers and pilots.

1.4 SACCAN Operational Concepts and Functions

The following main new concepts and functions are available within SACCAN:

a) ADS & ADS-SSR tracking;
b) STCA and MSAW based on ADS & ADS-SSR tracking;
c) Navigation Integrity Monitoring (NIM);
d) Detection of Incorrect Waypoint Insertion;
e) Conformance monitoring & Automatic update of flight plan by the tracker;
f) Automatic activation of ADS contracts;
g) Automatic cancellation of ADS contracts;
h) Central Management of ADS contracts;
i) Manual management and visualization of ADS contracts;
j) Generation and display of flight plan tracks;
k) Controller-Pilot Data Link Communications (CPDLC); and
l) GPS availability visualization.

1.4.1 *ADS &ADS-SSR tracking*

1.4.1.1 An *adaptable tracking algorithm* which integrates into one common track ADS-C data and SSR data from up to eight radars is available within SACCAN. This algorithm can also work with only ADS-C or radar only data.

1.4.1.2 The most outstanding feature of this *adaptable tracking algorithm* is its capability to adapt, in real time, the reporting rate of ADS-C periodic contracts to the tracking accuracy and redundancy required. When ADS data is not required the reporting rate is set to a minimum value, just to keep the periodic contract alive and running with a minimum cost. When ADS becomes necessary, because the number of radars is not enough to meet the redundancy requirement or the radar data is not accurate enough to meet the accuracy requirement, the reporting rate is increased accordingly. This can be very cost-effective since the reporting rate can be kept to the minimum necessary to fulfil the requirements.

1.4.1.3 The accuracy and redundancy requirements can be specified by the SACCAN system operator either for each of the boxes of an *airspace requirements mosaic*, for one particular aircraft, or for one or various aircraft group/s. The accuracy has to be specified in meters and the redundancy must reflect the number of surveillance sources required to track the aircraft.

1.4.1.4 A *non-adaptable ADS-SSR tracking algorithm* is also available within SACCAN.

1.4.1.5 Both the adaptable and non-adaptable tracking algorithms have the capability to estimate the uncertainty/accuracy of the aircraft position being displayed to the controller. This is a most important feature in order to assess the minima separation that could be applied each moment to aircraft. In the case of ADS tracking, position uncertainty, which can be represented by a circle, is a function of the figure of merit, time elapsed from the time stamp of last ADS report received, and aircraft speed. Is evident that the maximum size that the circle can take, assuming no losses, is also a function of the ADS periodic contract-reporting rate.

1.4.1.6 The main purpose of the tracking function is to improve the accuracy and availability of the positional data (ADS and/or SSR data) being received from aircraft. It minimizes the noise of the position received by means of track smoothing, compensates for positional data losses by using position extrapolations instead, and calculates the speed of aircraft when not provided.

1.4.2 *STCA and MSAW based on ADS & ADS-SSR tracking*

1.4.2.1 Short Term Conflict Alert and Minimum Safe Altitude Warning based on ADS tracking and/or ADS-SSR tracking are also available. The STCA and MSAW modules themselves are capable of adapting in real time the reporting rate and content of ADS-C periodic contracts to its own requirements which will be more demanding as aircraft come more and more closer to each other or to an specified area. This is an enhancement of the classic STCA and MSAW based only on radar since the number of false alerts will be minimized because of the availability, on request, of accurate attitude data as provided by the *earth reference group (true track, ground speed and vertical rate) of ADS.*

1.4.3 *Navigation Integrity Monitoring (NIM)*

1.4.3.1 A function is available to crosscheck ADS positional data [derived from the aircraft navigation system (GPS, VOR, etc.)] with SSR positional data of the same aircraft. This enables the ATC to detect errors of the navigation system being used by the aircraft and therefore control its integrity. An alert is displayed when ADS and SSR positional data from

the same aircraft do not match each other within a margin that can be set by the system operator. The operator can also set the time between crosschecks.

1.4.4 *Detection of Incorrect Waypoint Insertion*

1.4.4.1 The availability of the next two waypoints *(predicted route group)*, as provided by ADS-C, permits the ground system (ATC) to crosscheck this data with the flight plan route data stored in the ground Flight Plan Data Processor (FDP) in order to detect possible incorrect waypoint data insertion before a dangerous situation may arise. The ground system operator can set the time between crosschecks.

1.4.5 *Conformance monitoring & Automatic update of flight plan by the tracker*

1.4.5.1 When differences (lateral deviations) between tracking data (ADS, ADS-SSR, or SSR) and the route data of the flight plan data stored in the flight plan data processing system exceed a pre-defined tolerance limit (currently set to 5NM for lateral deviations) an out-of-conformance indication (a change in the color of the track) is displayed to the controller

1.4.5.2 Based on tracking data (ADS, ADS-SSR or SSR) the SACCAN system automatically updates the passing times and estimates over the route fixes of the flight plan data processing system.

1.4.6 *Automatic activation of ADS contracts*

1.4.6.1 Immediately after an aircraft *logs on* to SACCAN, an initial ADS-C periodic contract with a low reporting rate is automatically established with that aircraft by the ground system. Once a track (ADS or ADS-SSR) has been created, the tracker takes control, adapting if required the reporting rate of the initial contract to its own needs (requirements) as explained before

1.4.7 *Automatic cancellation of ADS contracts*

1.4.7.1 An adaptable parameter of time after an aircraft has left or landed at Canarias FIR, cancellation of all ADS contracts established with that aircraft is done automatically by SACCAN. Manually cancellation can also be done by controller at any time.

1.4.8 *Central Management of ADS contracts*

1.4.8.1 This function implemented in SACCAN centralizes all system needs for ADS-C data. It takes from all system modules the requests for ADS data (ADS & ADS-SSR Tracker, STCA, MSAW, NIM, FDP, Operator, etc.), and based on that builds and establishes only one periodic and one event contract per aircraft to satisfy all needs. Contracts are changed when necessary by the system.

1.4.8.2 As explained above ADS contracts management (activation, cancellation, change, etc.) is handle automatically by the system itself in order to minimize the air traffic controller workload required for operating ADS. Nevertheless a manual function is available for the operator to make his own ADS data requests, supervise, change and cancel contracts in place.

1.4.9 Manual management and visualization of ADS contracts

1.4.9.1 This manual function allows the controller to establish, modify, cancel and visualize: periodic, event, and demand contracts, as supported by FANS 1/A equipped aircraft.

1.4.10 *Generation and display of flight plan tracks*

1.4.10.1 When this function is enabled, synthetic tracks based on flight plan data stored in the flight plan data processor are created, maintained, and displayed to the controller. This is only done for aircraft for which no real tracks (ADS, ADS-SSR, SSR, or PR) exist. Of course, any manual update of estimates done by the controller as consequence of a voice position report received, is immediately reflected on the track. Synthetic tracks are displayed using a specific position symbol and color so as to differentiate them from real tracks. The availability of synthetic tracks will eliminate the workload required by the controller to built an image of aircraft positions in his mind based only on flight plan data and voice position reports.

1.4.11 *Controller Pilot Data Link Communications (CPDLC)*

1.4.11.1 Both SATCOM and VHF data links within its respective areas of coverage can support controller-pilot data link messages exchange. A mouse and a keyboard permit air-traffic controllers to easily and quickly compose CPDLC messages using canned-coded messages. A free text editing function is also available.

1.4.12 *GPS availability visualization*

1.4.12.1This function calculates and displays the theoretical number of expected GPS satellites in sight at any position of the CANARIAS FIR selected by means of mouse. Its purpose is to give air traffic controllers an idea of what would be the availability and continuity of the ADS function, when based on GPS, in a particular area of airspace before aircraft come in. In future is expected that this function will be connected to EGNOS to provide real time data.

1.5 SACCAN General Objectives

1.5.1 The SACCAN general objectives are:

a) Familiarize air traffic controllers and technicians of CANARIAS ACC with the ADS and CPDLC applications;
b) Evaluate and validate the new functions and operational procedures that will be required for efficient ADS/CPDLC use;
c) Asses, based on real data, the safety, efficiency and economical benefits to be derived from the application of ADS and CPDLC in the Canary Islands; and
d) Provide ADS and CPDLC services to FANS 1/A and ICAO compliant aircraft operating in the CANARIAS FIR/UIR

1.6 SACCAN Expected Benefits

1.6.1 The implementation of FANS1/A services in the Canary Islands FIR is expected to bring a series of benefits deriving from a more accurate navigation using GPS/RNAV, a more efficient communications system (CPDLC), and ADS.

1.6.2 The following improvements are expected:

a) More direct flight paths;
b) More optimal climb and descend profiles;

c) Increased access to cruise altitudes closer to optimal;
d) Reduced air-traffic controllers and pilots workload; and
e) Increased level of safety.

1.6.3 For aircraft operators, the above improvements will generate savings in fuel and other operating costs, such as crew costs. For passengers, will reduce travel time.

1.6.4 The above improvements will be based on the following:

a) A much more accurate navigation using GPS that will permit to establish a much more efficient route structure characterized by the extensive use of direct routes and more closely spaced airways. The elimination of two-opposite-directions airways will allow optimum climbing and descending profiles which will not be staggered since aircraft will not be restricted by traffic in the opposite direction, and will also increase safety and reduce pilot and controller workload;

b) A reduction in controllers workload per aircraft which will be the result of the elimination of voice position reporting and complex operational procedures, a less problematic route structure, implementation of new automated functions, and the extensive use of CPDLC. This reduction in workload will make possible for the controller to increasingly authorize more direct trajectories and attend a larger number of aircraft when so required;

c) Improved surveillance based on ADS and on its integration with radar, which will make possible to the controller apply more reduced separation minima and smaller longitudinal separation, since greater levels of accuracy, availability, integrity and continuity of serviced will be ensured. The reduction in longitudinal separation will require in most cases an equivalent implementation in the other FIRs of the Region; and

d) Detection of incorrect waypoint insertion, navigation integrity monitoring, and STCA/MSAW based on ADS.

1.6.5 Although the above benefits will not be very significant until a high proportion of aircraft will be equipped, those equipped will enjoy since the very beginning a reduction in pilot communications workload, and a higher level of safety. Some direct routing approvals will be also possible from the beginning since its negotiation (by CPDLC) and surveillance (by ADS) will not impose a significant workload to the controller.

1.6.6 The early safety benefits will come from the “detection of incorrect waypoint insertion”, the “conformance monitoring”, and the “navigation integrity monitoring” functions of the SACCAN system. CPDLC will also contribute to these benefits by minimizing current voice communications misunderstandings and language difficulties.

1.6.7 A way to maximize the early benefits might be traffic segregation. Specific routes and/or levels could be dedicated to traffic properly equipped.

1.7 SACCAN System Architecture and Blocks Description

1.7.1 SACCAN system architecture and mayor logical blocks description can be found in Appendix1

1.8 Conduct of the Second Phase of SACCAN FANS 1/A Operational Evaluation Trials

1.8.1 The Spanish Air Navigation Service Provider, Aena, is ready to start the second phase of the SACCAN FANS 1/A ADS&CPDLC operational evaluation trials with the interested aircraft operators in the Canarias FIR/UIR. First phase, in which Lufthansa, LanChile, TAM, and Air France are participating, started August 15th 2002 and will continue until the initiation of the second phase .

1.8.2 **The second phase of the operational evaluation trials will start November 10th 2003 and will last for six months. ADS trials and CPDLC trials will be carried out from 22:30 to 03:30 UTC. Changeovers or altered circumstances will be published by NOTAM.**

1.8.3 In order to participate in the Trials, operators must be in possession of the appropriate approval(s) issued by the State of Registry or the State of the Operator.

1.8.4 Interested aircraft operators may opt between participating in "ADS only" operational evaluation trials, or in both ADS and CPDLC trials. This is to take into account that crews are not all trained for CPDLC procedures, and that some airlines may have a limited operational approval for "ADS only".

1.8.5 The SACCAN FANS 1/A operational evaluation trials will be monitored and coordinated by the already existing **South Atlantic Monitoring Agency (SATMA)** of Spain.

1.8.6 All airline operators with FANS 1/A equipped aircraft interested in participating in the operational evaluation trials are kindly requested to provide to **SATMA** the following information:

a) operator name;
b) operator contact person;
c) aircraft type(s) and associated registration(s);
d) whether the option of updating the FMC time using the GPS time has been installed for the particular aircraft involved;
e) whether the option of participation is for "ADS trials only" or also for CPDLC but subject to CPDLC trained crew on board;
f) anticipated start date of participation; and
g) indication whether the approval(s) referred above in 1.8.3 cover(s) both ADS and CPDLC, or ADS only.

Additionally, for aircraft participating in CPDLC trials, the following is required to be provided:

h) assurance that operational approval has been obtained in accordance with FAA AC 120-70 and associated Operational Approval Information Package, or, if it exists, equivalent material;

1.8.7 A registration form used to file the required data to participate in the trials is attached in Appendix 5 of the present document. Registration forms and any other required documentation should be submitted to the following **SATMA** address:

Agencia de Monitorización SATMA
Centro de Control de Tránsito Aéreo de Canarias
Apartado 69
E35219 Telde (Las Palmas de Gran Canaria) – ESPAÑA
Phone: + 34-928577057
Fax: + 34-928577052
E-mail: : satma@aena.es

A copy should also be sent to the following **Aena** headquarters address:

Departamento de Requisitos Operativos
Dirección de Tránsito Aéreo
Aena
C/ Juan Ignacio Luca de Tena, 14 – 28027 Madrid
ESPAÑA
Phone: + 34-913213326
Fax: + 34-913213181
E-mail: : ddiez@aena.es

1.8.8 To avoid logons being rejected and to ensure FANS 1/A downlinks are properly routed, each participating airline must co-ordinate with its Data Link Service Provider (or providers if applicable) to initiate FANS 1/A ground system configuration for its aircraft.

1.8.9 Participation in CPDLC operational evaluation trials is subject to CPDLC trained crews on board. It is the responsibility of the Operator to ensure that only trained crews manage CPDLC.

1.8.10 For a particular flight of an airline that has complied with the specified in 1.8.6 for CPDLC , the intention of participating in a CPDLC trials session will be communicated in real time to air traffic control just before entering CANARIAS FIR/UIR by means of the appropriate voice phraseology described within this document in 2.5.

1.9 Area of Applicability

1.9.1 Second phase of SACCAN FANS 1/A operational evaluation trials will take place in the Canarias FIR/UIR.

1.10 Contacts

1.10.1 Aena-Canarias operates **SATMA**. Contact points for the SACCAN FANS 1/A operational evaluation trials within **Aena-Canarias** are as follows:

Canarias Trials Coordinator -
Name: Santiago Gubern
Head of the Operational Support Department
Canarias ACC
Phone : + 34 928577057
Mobil : + 34 679979573
Fax : + 34 928577052
Email : SGubern@aena.es

Canarias ACC Operations -
Name: Patricia Ruiz
Head of the Operations Management Department
Canarias ACC
Phone : + 34 928577060
Fax : + 34 928577052
Email - PRMartino@aena.es

1.10.2 Contact point for the SACCAN FANS 1/A operational evaluation trials within **Aena-Headquarters** is as follows:

Headquarters Trials Coordinator - Name: David Diez
ADS&CPDLC Programme Manager
Air Traffic Services Directorate
Aena - Madrid
Phone: + 34-913213326
Fax: + 34-913213181
E-mail: : ddiez@aena.es

1.10.3 Operators using **ARINC** as their Data Link Service provider, contact:

Name: Terry Anton
Phone: 410 266-4027
Fax: 410 573-3515
Email: txa@arinc.com

T1.10.4 Operators using **SITA** as their Data Link Service provider, contact:

Name: Eduard Blasi
Phone : + 33 1 4641 2473
Fax : + 33 1 4641 1978
Email:eduard.blasi@sita.int

PART 2 – SYSTEM OPERATION - MANAGING ADS AND CPDLC

2.1 Log-on/Connection

2.1.1 Aircraft participating in the SACCAN FANS 1/A operational evaluation trials are kindly requested to manually log-on the Canary Islands SACCAN system by sending an *ATS Facilities Notification (AFN) Contact* message, containing the 4 character ICAO code of the CANARIAS ATS unit "GCCC" between 15 and 30 minutes prior to entering the CANARIAS FIR/UIR.

2.1.2 If a log-on attempt is not successful, wait at least 5 minutes before making a second attempt

2.1.3 For flights departing from airports adjacent to, or within CANARIAS FIR/UIR, the pilot should log-on prior to departure.

2.1.4 SACCAN will accept the *ATS Facilities Notification (AFN) Contact* message from the aircraft and generate an *AFN Acknowledgement*. The AFN Acknowledgement will indicate that both ADS and CPDLC applications are supported.

2.1.5 The AFN log-on is a prerequisite to any CPDLC or ADS connection.

2.1.6 The AFN log-on serves the following purposes:

a) To provide the ground system with the data link application context of the aircraft, namely: the data link applications supported on board (ADS, CPDLC), their version numbers, and the associated addresses (in the FANS-1/A context, these are the ACARS addresses unique to each aircraft).

b) To provide the ground system with information such as the flight identification (ATS personnel usually use flight identifications to identify flights) and aircraft registration number (the registration number is used by the FANS network as the destination address for data link messages to aircraft). This information will allow the correlation of the flight attempting to log-on with the corresponding flight data held by the ATS system (SACCAN). The aircraft logging-on will then be positively identified by the ATS system.

c) To allow the SACCAN system to establish both ADS and CPDLC connections where applicable; Some aircraft may decide to participate only in ADS operational evaluation trials, and therefore the only connection to be activated will be ADS.

2.1.7 The AFN log-on will be rejected if:

a) the aircraft registration/flight identification pairing does not match the pairing contained in the flight plan;

b) there is no aircraft registration included in the flight plan; or

c) there is no flight plan in the ATS system (SACCAN) for that flight.

2.1.8 **The flight identification used for log-on must be exactly the same as the filed in the ATS flight plan.**

2.2 Establishing and Terminating an ADS Connection

2.2.1 Immediately after log-on has been completed successfully SACCAN will automatically activate the ADS connection and set an initial 15 minutes (adaptable value) periodic reporting rate contract with the aircraft.

2.2.2 During the aircraft transit through CANARIAS FIR/UIR airspace different periodic contract reporting rates and data contents will be exercised in order to operationally evaluate the *SACCAN automatic ADS contracts management feature* which adapts the initial periodic contract to meet surveillance operational requirements (accuracy and redundancy operational parameters) previously set by the operator for the cells of an airspace mosaic.

2.2.3 Only one periodic contract will be established between the ATC unit and a particular aircraft at any one time. Whenever a new periodic contract is established, the previous periodic contract is replaced. The periodic contract will remain in effect until it is modified or cancelled.

2.2.4 Although several types of event contracts will be operationally evaluated , the most commonly used will be:

a) ADS Way Point Change Event;

b) Altitude Range Event that will be mostly triggered when the aircraft altitude is 200 feet either less than or greater than the *maintaining cleared altitude* in a RVSM environment airspace; and

c) Lateral Deviation Change Event (LDCE) that will be mostly triggered when the aircraft's actual position exceeds a lateral distance of 5 NM in a RNP-10 airways network, from the aircraft's expected position on the active flight plan.

2.2.5 Demand contracts could also be established as "one-off" request from the ground system to provide just one ADS report containing specific data as defined in the request. A demand contract can be set by the ground system at any time.

2.2.6 The ADS MET Data contract request (i.e. a contract for periodic reporting of the Meteorological Group data with a typical reporting period of 30 minutes) will also be evaluated.

2.2.7 In order to minimize the cost of data communications the use of high periodic reporting rates (the highest possible is 64 seconds for FANS 1/A avionics) and in general the amount of ADS data exchanged will be kept to the minimum required.

2.2.8 FANS 1/A equipped aircraft can have up to four (or five, depending on the avionics) ADS connections established, each with a different ground facility. All ADS connections have equal status within the avionics.

2.2.9 ADS contracts and connection will be terminated during the trials by the ground system :

a) Automatically when the aircraft has crossed outbound the Canaries FIR /UIR boundary;

b) Automatically when the aircraft's flight plan has been cancelled or has finished; or

c) Manually by the controller at any time considered appropriate (The aircraft has landed within the Canaries FIR, operational evolution is discontinued, etc.)

2.2.10 During the operational evaluation trials phase it is not expected to execute any transfer since no adjacent ATS unit FANS 1/A equipped is yet available

2.2.11 The termination of ADS contracts with an aircraft, whether performed automatically or manually, will be strictly monitored to avoid the unnecessary exchange of ADS data .

2.3 ADS Emergency Mode Operation

2.3.1 When SACCAN receives an emergency-mode ADS report (triggered by pilot action) , it will alert the Controller. If a periodic contract is active, the emergency reports will be transmitted at the existing periodic rate. Otherwise, the rate will default to 304 seconds for Boeing aircraft or 64 seconds for Airbus aircraft. Only the pilot can cancel the emergency mode.

2.3.2 During the ADS operational evaluation trials the ADS Emergency Mode Operation will be occasionally evaluated with aircraft. Pilot triggering of the emergency mode for testing purposes will be done only on controller request via voice communications, or via data link free text in case the aircraft is also participating in CPDLC trials.

2.4 Surveillance Safety Considerations

2.4.1 **During this second phase of ADS operational evaluation trials ADS data will never be used for operational purposes such as application of *ADS separations* between aircraft, aircraft and the terrain, or any kind of *ADS service*.**

2.4.2 Only after proper evaluation, system modification if required, and validation, SACCAN will be used in a first operational phase for *"ADS monitoring"*

2.4.3 As for *radar* is defined in ICAO Doc. 4444, *ADS monitoring* has to be understood as the use of ADS for the purpose of providing aircraft with information and advice relative to significant deviations from nominal flight path, including deviations from the terms of their air traffic control clearances. *ADS service* indicates a service provided directly by means of ADS, and *ADS separation*, a separation used when aircraft position information is derived from ADS sources.

2.4.4 The application of *ADS separations*, foreseen for a second operational phase, will require extensive evaluation to be done with simulated traffic, development of appropriate *operational procedures*, and *safety analysis*.

2.4.5 For safety reasons STCA and MSAW tests will take place out of these trials, within a completely separated evaluation to be carried out exclusively with simulated traffic.

2.5 Establishing, Executing, and Terminating a CPDLC Connection

2.5.1 Properly approved for CPDLC trials aircraft [see 1.8.6 h) and 1.8.9] wanting to participate on top of ADS trials also in a CPDLC operational evaluation trials session, **once entered Canarias airspace** and ready to start a trials session, should inform Canarias ACC by means of the following voice phraseology:

"READY FOR CPDLC TRIALS"

2.5.2 If when receiving the aircraft message the controller is ready for CPDLC trials, he/she will answer " ROGER, INITIATING CPDLC" while he/she manually triggers (a mouse click) the CPDLC initiation in the SACCAN system.

2.5.3 If when receiving the aircraft request the controller is not ready for CPDLC trials with that aircraft, and expects he/she will never be before the aircraft leaves the Canarias airspace, the answer will be "UNABLE TO PERFORM CPDLC TRIALS".

2.5.4 If when receiving the aircraft request the controller is not ready for CPDLC trials, but he/she expects to be ready for it later before the aircraft leaves the Canarias airspace, he/she will answer "ROGER, I WILL CALL YOU BACK FOR CPDLC TRIALS", or "EXPECT CPDLC CONECTION FOR TRIALS AT TIME __ __".

2.5.5 Once the controller is ready for CPDLC trials he/she will indicate it to the pilot by the voice message " CONFIRM READY FOR CPDLC TRIALS", and if the pilot response is "AFFIRMATIVE" he/she will answer "ROGER" and trigger the CPDLC initiation in the SACCAN system.

2.5.6 A CPDLC exchange can only occur after the AFN logon has been completed, the CPDLC initiated by means of a CONNECTION REQUEST message triggered manually by the controller and sent by the SACCAN system to the aircraft, and a CONNECTION CONFIRM message received from the aircraft.

2.5.7 When so requested by ATC by means of the free text message **"START CPDLC WAYPOINT POSITION REPORTING"** pilots shall ensure that a CPDLC message will be issued whenever an ATC waypoint is passed over **(Waypoint Change Events (WCE)**). ATC expects position reports based on downlink message **POSITION REPORT** [position report] (Message 48 of the DOWNLINK MESSAGE ELEMENT TABLE defined in RTCA DO-219 that also can be seen in Appendix 4). **Pilots should not expect a controller response to these position reports**. Free text message **"STOP CPDLC WAYPOINT POSITION REPORTING"** will be used by ATC to advice pilot to stop this reporting.

2.5.8 A set of CPDLC messages to be used during the second phase of the operational evaluation is in Appendix 2. This set is made of a limited number of the messages contained in the "FANS-1/A CPDLC Message Set defined in RTCA DO-219, MOPS for ATC Communications Application".

2.5.9 Appendix 4 contains a complete listing with the message intent (interpretation) for all FANS-1/A CPDLC messages (RTCA DO-219) as was defined by the ADS Panel. This is most useful in order to have a clear understanding of the intent (meaning) of the CPDLC messages.

2.5.10 **Participation in CPDLC trials does not release pilots from the obligation of establishing, maintaining, and monitoring HF or VHF voice communications. CPDLC trials require both data link and R/T voice to be used in parallel**.

2.5.11 Pilots participating in the CPDLC trials must have available the CPDLC Set contained in Appendix 2 of this Guidance Material Document. Only those messages held at Appendix 2

should be used for CPDLC. For messages out of Appendix 2 ICAO R/T voice phraseology procedures will continue to be used.

2.5.12 The CPDLC set in Appendix 2 is divided into two subsets. The first subset contains the "pilot messages, and the second subset the "controller messages".

2.5.13 CPDLC messages exchanged during this second phase of operational evaluation trials will be only used to satisfy real "operational needs", and not simply for the sake of testing and familiarisation. Therefore a pilot participating in a CPDLC trials session will never make any request via CPDLC unless he has a real need . For example, he will never send the CPDLC message "request climb to FL", unless he really wants to climb.

2.5.14 Pilots should not expect controller voice read-backs to pilot CPDLC requests, but direct CPDLC responses. If a response to a request is not received within a reasonable time pilot should revert to R/T to repeat the request via voice.
NOTE: See Example 1 and Example 2 in Appendix 3

2.5.15 **Controller instructions via CPDLC are not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process must be completed before the sending of the data link message "WILCO" and before carrying out the instruction.**

2.5.16 If voice confirmation to controller instruction has not been received within a reasonable time (1 minute approximately after having requested the confirmation) or the ATC voice response to the confirmation is to disregard the instruction, the data link message "UNABLE" should be sent by pilot instead of "WILCO".

2.5.17 The voice confirmation process to controller instructions should normally be initiated by pilot by reading back the instruction received, and closed by ATC by confirming or not confirming it. The following phraseology should be used:

A) CONTROLLER INSTRUCTION CONFIRMED (it is assumed that the pilot voice read back does match the up-linked data link instruction)

Pilot: " [Callsing] Confirm datalink instruction to ……. "
Controller: " [Callsing] Affirmative, data link instruction confirmed "

Then the pilot should send the data link message "WILCO" to close the CPDLC dialog.
NOTE: See Example 1 in Appendix 3

B) CONTROLLER INSTRUCTION NOT CONFIRMED (it is assumed that the pilot voice read back does not match the up-linked data link instruction, or another reason arises that makes controller to tell pilot to disregard)

Pilot: " [Callsing] Confirm datalink instruction to ……. "
Controller: " [Callsing] Negative, disregard data link instruction"

Then the pilot should send the data link message "UNABLE" to close the CPDLC dialog.
NOTE: See Example 2 in Appendix 3

NOTE: The readback should be in full and conform to ICAO R/T phraseology procedures.

2.5.18 The UNABLE and STANDBY responses to a pilot request do not require voice confirmation.

2.5.19 **Pilot or FMS-to-Controller CPDLC messages that may affect safety are not to be considered operationally valid by controller until/unless confirmed via voice communications. Controller will initiate the voice confirmation process if he/she considers it required.**
NOTE: See Example 6 and Example 7 in Appendix 3

2.5.20 At any moment during a CPDLC trials session pilot and controller will be free to use R/T voice instead of a particular CPDLC message of Appendix 2 if they consider it more appropriate at that moment, because of work overload, urgency, or any other reason. This does not imply that the CPDLC trials session has to be terminated unless a decision has been taken not to use CPDLC any longer during the flight.

2.5.21 The termination of a CPDLC trials session may be decided at any moment by either pilot or controller and will be communicated to each other by means of the following free text message:

"REQUEST CPDLC TRIALS TERMINATION"

The response to this message should be the message "ROGER".

In the event of work overload or urgency, voice could be used instead.

2.5.22 In order to terminate CPDLC the controller will trigger the initiation of the CPDLC connection termination sequence which will cause SACCAN to send an **END SERVICE** uplink message. In response to this message:

a) The avionics will downlink a **DISCONNECT** message, and the avionics will consider the aircraft to be disconnected as soon as the **DISCONNECT** message is sent.
b) The active CPDLC connection will be terminated by the activation of a non-active connection if existing.

2.5.23 The controller shall ensure that no open uplink CPDLC messages exist prior to the up-linking of an END SERVICE message.

2.5.24 Although it is an abnormal case, if the controller is aware that the sending of the END SERVICE message did not occur or has been unsuccessful, the pilot will be instructed by voice to terminate the connection.

2.5.25 If the CPDLC connection does not terminate automatically at the appropriate time (normally 5 minutes after leaving CANARIAS FIR/UIR), then the pilot shall manually disconnect.

2.6 Communications Safety Considerations

2.6.1 **During this second phase of the operational evaluation trials the integrity of the ATC service still remains wholly dependent on establishing and maintaining HF or VHF voice communications.**

2.6.2 **Participation in CPDLC trials does not release pilots from the obligation of establishing, maintaining, and monitoring HF or VHF voice communications. CPDLC trials require both data link and R/T voice to be used in parallel**.

2.6.3 **Controller instructions via CPDLC and any other CPDLC messages that may affect safety are not to be considered valid either by pilots or controllers unless confirmed via voice communications.**

PART 3 – RIGHTS AND RESPONSIBILITIES

3.1 ATS Provider Rights and Responsibilities

3.1.1 The ATS provider may suspend temporarily the operational evaluation trials at any time due to technical or operational reasons.

3.1.2 The ATS provider will notify users of the current Phase of operational evaluation trials and version number of the Guidance Material applicable via NOTAM or AIC.

3.1.3 For scheduled and/or extended suspension of the operational evaluation trials, a NOTAM shall be issued.

3.1.4 The ATS provider will issue NOTAMS for planned or predicted system outages.

3.1.5 In the event of an unexpected SACCAN system outage, ATS shall:

a) inform all affected aircraft and their operators, providing the outage expected duration; and

b) issue a NOTAM for long expected durations.

3.1.6 The ATS provider will provide participating airlines with latest version of Guidance Material, and will inform them of the publication of related AICS and NOTAMS. Latest version of " GUIDANCE MATERIAL ON SACCAN FANS 1/A OPERATIONAL EVALUATION TRIALS IN CANARIAS AIRSPACE (SECOND PHASE) " may be downloaded from the SATMA web site :

www.satmasat.com

3.2 Operator Rights and Responsibilities

3.2.1 Operators, and pilots may suspend their participation in the operational evaluation trials anytime due to technical or operational reasons.

3.2.2 Operators should ensure they have current information related to the operational evaluation trials, such as Aeronautical Information Circulars, Guidance Material, and NOTAMS.

3.2.3 Operators should ensure that the proper information is included in the ICAO Flight Plan.

3.2.4 Advisory information distributed within the flight operations department of an airline should ensure that all personnel concerned are aware of FANS 1/A concepts and procedures and any other necessary information for participating in the operational evaluation trials.

3.2.5 For scheduled and/or extended suspension of participation in the operational evaluation trials operators should inform SATMA.

3.2.6 Pilots should inform CANARIAS ACC via voice communications if system outages are noted on route.

3.2.7 Operators should inform SATMA of any pilot reported problems or anomalies associated with the FANS 1/A operational evaluation trials.

3.2.8 To facilitate dissemination of outage information all operators should provide SATMA with contacts for the receipt of outage or trials suspension information. Contact numbers should be sent to SATMA either via fax or e-mail.

3.3 Communications Service Provider Responsibilities

3.3.1 Data link service providers will inform SATMA and airline operators if a system outage is noted or of planned outages of the network.

PART 4 – OPERATIONAL EVALUATION TRIALS PROCEDURES

4.1 Flight Planning Procedures

4.1.1 To facilitate the eventual migration to a standardized CNS-ATM system, and in keeping with the flight planning provisions as specified in the ICAO Doc. 4444 (PANS-ATM), operators should complete the ICAO flight plan form as follows for FANS 1/A equipped aircraft:

a) Item 10 – The letter "J" to indicate data link available and serviceable;

b) Item 10 – The letter "G" to indicate GNSS available and serviceable;

c) Item 10 – The letter "D" in the Surveillance field to indicate ADS serviceable;

d) Item 18 – DAT/ followed by one or more letters as appropriate to indicate the type of data link capability when "J" is entered in Item 10.

e) Item 18 – RMK/ followed by CANARIAS FANS 1 or CANARIAS FANS A (specifically requested by Canarias ACC to FANS 1/A participating aircraft)

Example:

ICAO Item 10: **….J….. / …D**
ICAO Item 18: **DAT/SV..RMK/CANARIAS FANS 1** (for a satellite and VHF data link equipped aircraft, and FANS 1 aircraft participating in the *Canarias FANS 1/A operational evaluation trials*)

Letter following DAT/	Type of data link
S	Satellite data link
H	HF data link
V	VHF data link
M	SSR mode S data link

NOTE 1: The above requirements are for an end-state system. If an operator's flight planning system does not have the capability to enter any of the data as indicated; this will not restrict participation in the SACCAN FANS 1/A Operational Evaluation Trials.

4.1.2 The operator is responsible for ensuring that the correct aircraft registration is filed in Field 18 of the ICAO flight plan. The ATS system (SACCAN) compares the registration number of the aircraft contained in Field 18 (Other Information) of the ICAO flight plan with the registration

contained in the ATS Facilities Notification (AFN) logon in order to establish (if equal) or deny (if different) the connection with the aircraft.

4.2 Air Traffic Control Procedures

4.2.1 See "Log-on/Connection" procedures in 2.1.

4.2.2 See "Establishing and Terminating an ADS Connection" procedures in 2.2.

4.2.3 See "ADS Emergency Mode Operation" procedures in 2.3.2

4.2.4 See "Establishing, Executing and Terminating a CPDLC Connection" procedures in 2.5

4.2.5 Whenever an ADS-WPR is overdue by more than an interval, as determined by ATC, the controller will take action to advise the aircraft concerned in order to investigate or try to correct the situation.

4.2.6 A controller who becomes aware of corrupt or incorrect data, will take action to advise the aircraft concerned in order to investigate or try to correct the situation.

4.2.7 In order to perform the operational evaluation the controller will follow the internal evaluation procedures and protocols established to this respect.

4.2.8 If the controller is advised, or becomes aware of a data link communications failure, aircraft concerned will be advised.

4.2.9 When an unexpected /not programmed ADS emergency message is received, the controller with control responsibility for the aircraft shall request confirmation of the emergency through voice communications with the aircraft.

4.2.10 When a controller not having control responsibility for the aircraft receives an ADS emergency report, he/she shall co-ordinate with the controlling authority to ensure that the emergency report has been received and is investigated.

4.3 Flight Crew Procedures

4.3.1 **When initialising the FMC, it is essential to ensure that the flight identification matches the one displayed in the filed ATC flight plan (FPL Message). If a flight crew becomes aware that they have provided incorrect flight identification data for logon to ATC, they shall immediately terminate ADS and re-logon with a correct identification.**

4.3.2 Pilots must be aware that appropriate clocks synchronisation to UTC (hours/minutes/seconds) is essential for FANS operations and specially for ADS. Although the time stamp source for ADS is GPS time referenced to UTC, some aircraft use the manually set flight deck clock as a back up source when GPS time is unavailable.

4.3.3 Pilots might be asked by the controller to provide a "time check for ADS" by means of the following voice message: "REQUEST TIME CHECK FOR ADS"; if that is the case, pilot response should be : "TIME (minutes, seconds)".

4.3.4 Pilots are requested to log-on between 15 and 30 minutes prior to entering the CANARIAS FIR/UIR. See “Log-on/Connection” procedures in 2.1

4.3.5 On initial voice contact with CANARIAS ACC the pilot will use the term “FANS ADS” after the call-sign.

4.3.6 If unable to log-on after several attempts , on initial voice contact with CANARIAS ACC the pilot should inform ATS using the following terminology:

“UNABLE TO FANS LOG-ON”

4.3.7 ADS, with the exception of the “ADS Emergency Mode Operation” will normally be initiated, managed, and terminated by the ground system, without pilot intervention.

4.3.8 See “ADS Emergency Mode Operation” procedures in 2.3.2

4.3.9 For CPDLC trials, see “Establishing, Executing and Terminating a CPDLC Connection” procedures in 2.5

4.3.10 If problems are experienced with the CPDLC connection , pilot should inform ATS via HF or VHF voice using the following terminology:

“PROBLEMS WITH CPDLC CONNECTION”

4.3.11 Log-off should normally take place 5 minutes after leaving CANARIAS FIR/UIR unless something different is agreed in real time via pilot-controller voice communications.

4.3.12 Pilots of participating aircraft, 5 minutes after having left Canarias FIR/UIR or after 0330 UTC, are requested either to:

a) Log-off (Disconnect / Select off ATC COMM) the Canarias SACCAN system
Or
b) Select off / Set off ADS

This is to make sure that ADS reporting is terminated in due time in case that due to a malfunction some ADS contracts may not be cancelled automatically by the SACCAN system as they normally should be.

4.3.13 Flight crews that encounter problems with FANS 1/A data link will inform controller and advise their Company Operations Department in accordance with their established problem reporting procedures.

4.3.14 **Controller instructions via CPDLC and any other CPDLC messages that may affect safety are not to be considered valid either by pilots or controllers unless confirmed via voice communications.**

4.3.15 **Participation in CPDLC trials does not release pilots from the obligation of establishing, maintaining, and monitoring HF or VHF voice communications. CPDLC trials require both data link and R/T voice to be used in parallel**.

4.3.16 **During this second phase of the operational evaluation trials the integrity of the ATC service still remains wholly dependent on establishing and maintaining HF or VHF voice communications.**

APPENDIX 1

SACCAN SYSTEM ARCHITECTURE AND BLOCKS DESCRIPTION

1.1 The major logical blocks of the SACCAN system are as follows:

a) Communications Processing (COM);
b) Surveillance Data Processing (SDP);
c) Flight Plan Data Processing (FDP);
d) Aircraft Messages Processing (AMP);
e) Radar Data Reception Unit (RRU);
f) Supervision Terminal (SVT);
g) GPS clock;
h) Local Area Network (LAN);
i) Tape unit;
j) Color printer; and
k) 1 Air Traffic Control Working Position made of :
- 1 Traffic Display Terminal (TDT); and
- 1 Data Link Terminal (DLT).

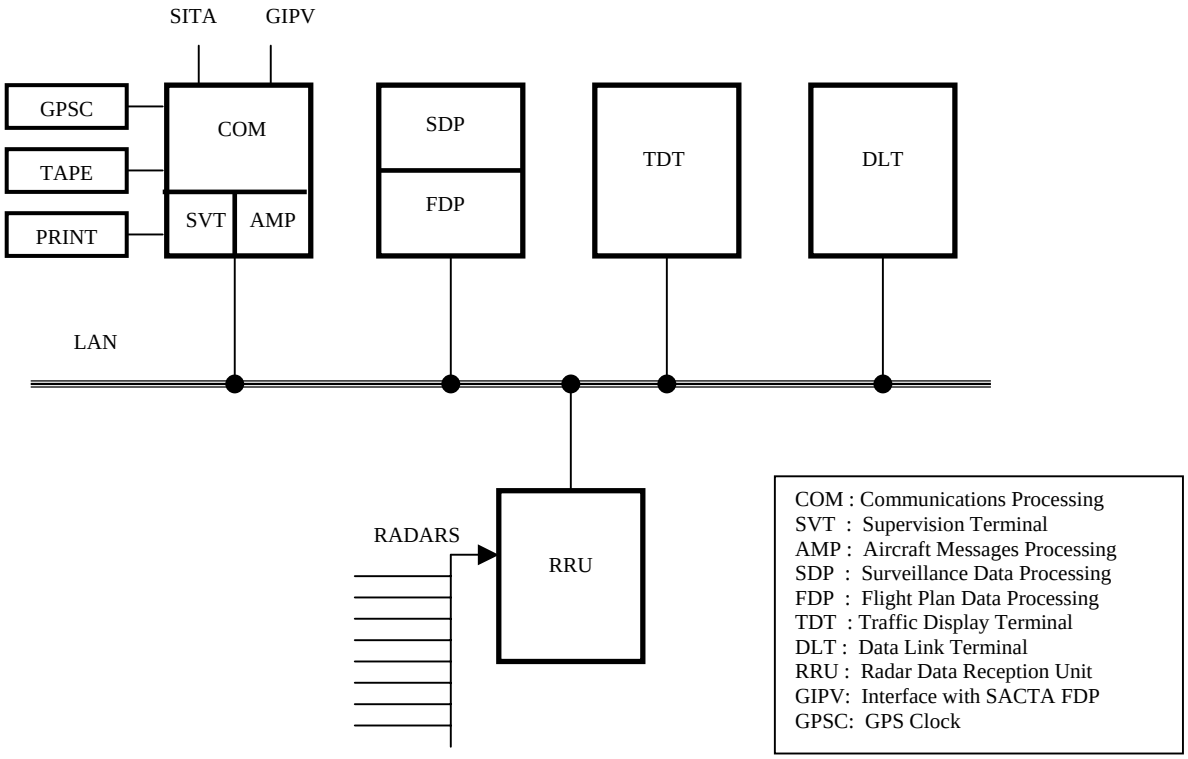

FIGURE 2 : SACCAN LOGICAL BLOCKS

1.2 *Communications Processing (COM)*

1.2.1 It deals with the external interfaces [SITA network, and GIPV (interface with the SACTA flight plan data processing system)], with the tape unit used for recording and playback, and with the GPS clock.

1.2.2 It shares a *Sun Processor ULTRA 2* / 21" colour raster scan display (1280x1024 pixels) with the AMP and SVT logical blocks.

1.3 *Surveillance Data Processing (SDP)*

1.3.1 It deals with ADS and SSR data processing, tracks generation, STCA, and other surveillance related functions.

1.3.2 It shares a *Sun Processor ULTRA 1* / 21" colour raster scan display (1280x1024 pixels) with the FDP logical block.

1.4 *Flight Plan Data Processing (FDP)*

1.4.1 It deals with all flight plan related functions such as creation, modification, and cancellation of flight plans. It takes pre-processed flight plans from the SACTA (current operational system) via the GIPV interface.

1.4.2 It shares a *Sun Processor ULTRA 1 /* 21" colour raster scan display (1280x1024 pixels) with the SDP logical block.

1.5 *Aircraft Messages Processing (AMP)*

1.5.1 It is the logical block where ADS, CPDLC and AFN (ATS Facilities Notification) messages are processed.

1.5.2 It shares a Sun Processor ULTRA 2 / 21" colour raster scan display (1280 x 1024 pixels) with the COM and SVT logical blocks.

1.6 *Radar Data Reception Unit (RRU)*

1.6.1 It pre-processes radar data from up to eight SSR radar stations. Currently only four are connected.

1.7 *Supervision Terminal (SVT)*

1.7.1 It deals with all supervision functions of the SACCAN system.

1.7.2 It shares a *Sun Processor ULTRA 2 /* 21" colour raster scan display (1280 x 1024 pixels) with the COM and AMP logical blocks.

1.8 *GPS Clock*

1.8.1 It is a *Trimble GPS receiver* plus a *time and frequency processor*. This is mainly used to accurately time stamp incoming ADS messages so as to allow the Surveillance Data Processing (SDP) to measure the transit delay of ADS messages.

1.9 *Local Area Network (LAN)*

1.9.1 A LAN is used to interconnect the different subsystems of SACCAN.

1.10 *Tape Unit*

1.10.1 A tape unit is used for recording and play back.

1.11 *Printer*

1.11.1 A high-resolution colour printer Tektronix Phaser 560 is available. It is used to print any image being displayed at the Traffic Display Terminal, Data Link Terminal or Supervisor Terminal.

1.12 *Traffic Display Terminal (TDT)*

1.12.1 Consists of the same hardware as the new SACTA control position "FOCUCS". This is so in order to facilitate the future integration of the SACCAN new functions into the SACTA system. The Traffic Display Terminal consist in a colour *Sony 2k x 2 k (2048x2048 pixels) 28" raster scan display*, a *Barco graphic processing card*, and a *Sun Processor Ultra 30*.

1.12.2 Aircraft positions are displayed by means of appropriate symbols. Different symbols are used to differentiate between the different type of plots (PSR, SSR, SSR+PSR, ADS, ADS+SSR, ADS+SSR+PSR, extrapolations, and of synthetic tracks.).

1.12.3 The aircraft label, structured in four lines, in addition to the typical information (call-sign or SSR code, cleared flight level, current flight level, ground speed, vertical speed, etc.) contains:

a) Type of alarm/alert, if any (EMG, COM FAILURE, HIJACK / STCA, MTCA, NIM);
b) ADS on/off indicator;
c) CPDLC on/off indicator;
d) Predicted route on/off indicator;
e) Conformance monitoring-flight plan update on/off indicator;
f) Event indicator (Altitude range, vertical rate, lateral deviation, or waypoint change);
g) Data loss (positional periodic data) indication;
h) Estimated maximum uncertainty (accuracy) of the displayed position (in metres) / Required accuracy (maximum uncertainty) of the displayed position (in metres);
i) Time elapsed since last reception of positional data (in seconds) / Reporting rate of the ADS periodic contract in place (in seconds);
j) Number of radars being used by the tracker (0 = only ADS); and
k) Uncertainty of the displayed position (rounded to miles).

1.12.4 Also, on request of the controller, an *uncertainty circle* can be displayed around the aircraft position symbol, being its radius an indication of the correctness (uncertainty) of the aircraft displayed position [as in k)].

1.12.5 Most of the above information, which will be used mainly to assess the performance of the tracking algorithms during trials and evaluations, can be disable.

1.12.6 By pinching with the mouse the ADS on/off indicator, a window is opened for ADS contracts visualization and modification. By pinching the CPDLC on/off indicator, a window is opened to view the CPDLC messages exchange with the selected aircraft.

1.12.7 Tabulars do exist for:

a) Short Term Conflict Alert (STCA) and Minimum Safe Altitude Warning (MSAW) based both on ADS and SSR data;
b) Medium Term Conflict Alert (MTCA);
c) Navigation Integrity Monitoring (NIM) Alert which is displayed when ADS and SSR positional data from the same aircraft do not match each other;
d) Incorrect Waypoint Insertion Alert, which is displayed when "ADS next way-points" do not mach the flight plan;
e) CPDLC messages display; and
f) Flight Plans Display;

1.12.8 By pinching a specific call sign of the Flight Plans Tabular, an editing window is opened for flight plan visualization and modification.

1.12.9 From this terminal, also the *airspace requirements mosaic* can be visualized, and edited box by box if wanting to change the accuracy and redundancy requirements. Fast editing by areas is possible through the Supervision Terminal (SVT).

1.13 *Data Link Terminal (DLT)*

1.13.1 It is a *Sun Processor ULTRA 1* with a 21" raster scan color display (1280x1024 pixels) which is mainly used for CPDLC messages exchange and for full manual management and visualization of ADS contracts. A mouse and a keyboard are available for messages input.

1.13.2 This terminal also shows the list of FANS 1/A equipped aircraft logged on to SACCAN, indicating if the ADS and CPDLC applications are active or not.

APPENDIX 2

Appendix 2: Downlink and Uplink Messages

The following provides an overview of the downlink and uplink messages that can be used during the phase 2 of SACCAN FANS 1/A Operational Evaluation Trials.

1. Messages

A limited number of messages are available during this second phase of the trials (see below). See Appendix 4 for a clear understanding of their meaning (intent).

1.1 Downlink Messages

It should be appreciated that whilst the airborne HMI will indicate that a message has been sent, there is no guarantee that it has been received at the SACCAN controller position in CANARIAS ACC. Only one message at a time should be transmitted and on no account should free text be used.

Downlink messages are grouped in 2 categories, as follows:

Aircrew Requests
Aircrew Responses

1.2 Uplink Messages

Uplink messages are grouped in 8 categories, as follows:

Level Messages
Route Messages
Speed Messages
Time Messages
Voice Communication Instruction Messages
General Instruction Messages
Confirm Messages
Report Messages

2. Downlink Messages

2.1 Requests

Aircrew Request
REQUEST CLIMB TO [altitude]
REQUEST DESCENT TO [altitude]
REQUEST [altitude]
REQUEST DIRECT TO [position]
REQUEST WEATHER DEVIATION UP TO [direction][distance offset] OF ROUTE
REQUEST OFFSET [direction][distance offset] OF ROUTE
REQUEST [route clearance]

Note: Pilots should not expect controller voice read-backs to these pilot CPDLC requests, but a direct data link response. If the response to the request is not received within a reasonable time, pilot should revert to R/T to repeat the request via voice.

See Examples 1 and 2 in Appendix 3

2.2 Responses

Of course, responses to ATC instructions, like WILCO, UNABLE, STANDBY, and ROGER, and reports responding to the ATC confirm/request messages described bellow (in 3.7) will be downlinked when appropriate.

3. Uplink Messages

The following CPDLC messages can be expected from CANARIAS ACC:

3.1 Level Messages

ATC Instruction
MAINTAIN [altitude]
CLIMB TO AND MAINTAIN [altitude]
DESCEND TO AND MAINTAIN [altitude]
CROSS [position] AT AND MAINTAIN [altitude]
CROSS [position] AT OR ABOVE [altitude]
CROSS [position] AT OR BELOW [altitude]

Warning: These controller instructions via CPDLC are not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process, to be initiated by the pilot, must be completed before the sending of the data link response "WILCO", and of course before carrying out the instruction.

See Example 3 in Appendix 3

3.2 Route Messages

ATC Instruction
PROCEED DIRECT TO [position]
CLEARED [route clearance]
OFFSET [direction][distance offset] OF ROUTE
CLEARED TO DEVIATE UP TO [direction][distance offset] OF ROUTE
WHEN ABLE PROCEED DIRECT TO [position]
TURN [direction] HEADING [degrees]
PROCEED BACK ON ROUTE

Warning: These controller instructions via CPDLC are not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process, to be initiated by the pilot, must be completed before the sending of the data link response "WILCO", and of course before carrying out the instruction.

3.3 Speed Messages

ATC Instruction	
MAINTAIN [speed]	(mach number)
MAINTAIN [speed] OR GREATER	(mach number)
MAINTAIN [speed] OR LESS	(mach number)
RESUME NORMAL SPEED	

Warning: These controller instructions via CPDLC are not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process, to be initiated by the pilot, must be completed before the sending of the data link message "WILCO" and before carrying out the instruction.

3.4 Time Messages

ATC Instruction
CROSS [position] AT OR AFTER [time]
CROSS [position] AT OR BEFORE [time]

Warning: These controller instructions via CPDLC are not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process, to be initiated by the pilot, must be completed before the sending of the data link message "WILCO" and before carrying out the instruction.

3.5 Voice Communication Instruction (VCI) Messages

ATC Instruction
CONTACT [icao unit name] [frequency]

Warning: This controller instruction via CPDLC is not to be complied with, either by pilot or FMS, unless/until confirmed via voice communications (R/T). The voice confirmation process, to be initiated by the pilot, must be completed before the sending of the data link message "WILCO" and before carrying out the instruction.

3.6 General Instruction Messages

ATC Instruction
SQUAWK [beacon code]
CHECK STUCK MICROPHONE [frequency]

Note: These controller instructions via CPDLC do not need to be confirmed via voice communications (R/T).

3.7 Confirm Messages

ATC Instruction
CONFIRM NEXT WAYPOINT
CONFIRM NEXT WAYPOINT ETA
CONFIRM ASSIGNED ALTITUDE
CONFIRM ASSIGNED ROUTE

Note1: Controllers should not expect pilot voice read-backs to these controller CPDLC requests (confirms), but a direct data link response from aircraft. If the response to the request is not received within a reasonable time, controller should revert to R/T to repeat the request via voice.
Note2: Responses to these confirm messages are not to be considered operationally valid by controller until/unless confirmed via voice communications. Controller is the one to initiate the voice confirmation process if considers it required.

See Example 4 and Example 5 in Appendix 3

3.8 Report Messages

ATC Instruction
REPORT LEAVING [altitude]
REPORT LEVEL [altitude]
REPORT REACHING [altitude]
REPORT BACK ON ROUTE

Note3: Controllers should not expect pilot voice read-backs to these controller CPDLC messages.
Note4: Reports received in response to these messages are not to be considered operationally valid by controller until/unless confirmed via voice communications. Controller is the one to initiate the voice confirmation process if considers it required.

See Example 6 and Example 7 in Appendix 3

APPENDIX 3

Appendix 3: Dialogues Examples

The following provides typical examples of pilot initiated and controller initiated dialogs that can occur during the phase 2 of SACCAN FANS 1/A Operational Evaluation Trials. The main purpose is to clarify the voice confirmation process to CPDLC controller instructions.

PILOT INITIATED DIALOGUES

Example 1

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
REQUEST CLIMB TO 310			
		CLIMB TO AND MAINTAIN 310	
	" [Callsing] Confirm data link instruction to CLIMB TO AND MAINTAIN 310 "		
			" [Callsing] Affirmative, data link instruction confirmed "
WILCO {at this time, and not before, the aircraft executes the instruction}			

Note: In this example it has been assumed that the pilot voice read back does match the data link instruction sent by the controller.

Example 2

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
REQUEST CLIMB TO 310			
		CLIMB TO AND MAINTAIN 310	
	" [Callsing] Confirm data link instruction to CLIMB TO AND MAINTAIN 350 "		
			" [Callsing] Negative, disregard data link instruction"
UNABLE { the aircraft **must not execute** the CLIMB instruction}			

Note: In this example it has been assumed that the pilot voice read back does not match the data link instruction sent by the controller, and therefore controller tells pilot to disregard.

CONTROLLER INITIATED DIALOGUES

Example 3

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
		CLIMB TO AND MAINTAIN 350	
	" [Callsing] Confirm data link instruction to CLIMB TO AND MAINTAIN 350 "		
			" [Callsing] Affirmative, data link instruction confirmed "
WILCO {at this time, and not before, the aircraft executes the instruction}			

Note: In this example it has been assumed that the pilot voice read back does match the data link instruction sent by the controller.

Example 4

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
		CONFIRM ASSIGNED ALTITUDE	
ASSIGNED ALTITUDE 310			
			" [Callsing] Confirm data link message ASSIGNED ALTITUDE 310 "
	" [Callsing] Affirmative, data link message confirmed "		

Example 5

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
		CONFIRM ASSIGNED ROUTE	
ASSIGNED ROUTE [routeclearance]			
			" [Callsing] Confirm data link message ASSIGNED ROUTE [routeclearance] "
	" [Callsing] Affirmative, data link message confirmed "		

Example 6

Downlink CPDLC messages that may affect safety are not to be considered operationally valid by controller until/unless confirmed via voice communications. Controller will initiate the voice confirmation process if he/she considers it required.

In this example, the controller requests confirmation via voice because the information provided (leaving 310) will be the base to ensure vertical separation with another traffic, and therefore affects safety.

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
		REPORT LEAVING 310	
ROGER			
Some minutes later: **LEAVING 310**			
			" [Callsing] Confirm data link message LEAVING 310 "
	" [Callsing] Affirmative, data link message confirmed "		

Example 7

In this example, the controller considers that voice confirmation is not required because the information provided is not relevant for traffic separation anymore and therefore does not affect safety.

Aircraft transmits		Ground transmits	
Via Data Link	**Via Voice R/T**	**Via Data Link**	**Via Voice R/T**
		REPORT LEAVING 310	
ROGER			
Some minutes later: **LEAVING 310**			

APPENDIX 4 – FANS-1/A CPDLC MESSAGE SET AND INTENT

This Appendix contains a complete listing of the message intent for all FANS-1/A CPDLC messages as defined by the ADS Panel. Additional comments provided by the ISPACG forum are displayed in Italics.

Response Requirements Key:

TYPE	CLOSURE RESPONSES
W/U	WILCO, UNABLE, will close the uplink message.
A/N	AFFIRM, NEGATIVE, will close the uplink message.
R	ROGER, will close the uplink message.
NE	Most messages with an NE attribute require an operational response. Only the correct operational response is presented to the pilot. The uplink message is considered to be closed on sending and does not require a response to close the dialogue. The WILCO, UNABLE, AFFIRM, NEGATIVE, ROGER, and STANDBY responses are not enabled for pilot selection.
Y	Response required.
N	Response not required

Note: Under some circumstances, an ERROR message will also close an uplink message.

Uplink - Responses and Acknowledgements

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
0	UNABLE	Indicates that ATS cannot comply with the request.	NE
1	STANDBY	Indicates that ATS has received the message and will respond. *The pilot is informed that the request is being assessed and there will be a short-term delay (within 10 minutes). The exchange is not closed and the request will be responded to when conditions allow.*	NE
2	REQUEST DEFERRED	Indicates that ATS has received the request but it has been deferred until later. *The pilot is informed that the request is being assessed and a long-term delay can be expected. The exchange is not closed and the request will be responded to when conditions allow.*	NE
3	ROGER	Indicates that ATS has received and understood the message..	NE
4	AFFIRM	Yes	NE
5	NEGATIVE	No	NE

Uplink - Vertical Clearances

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
6	EXPECT [altitude]	Notification that a level change instruction should be expected.	R
7	EXPECT CLIMB AT [time]	Notification that an instruction should be expected for the aircraft to commence climb at the specified time.	R
8	EXPECT CLIMB AT [position]	Notification that an instruction should be expected for the aircraft to commence climb at the specified position.	R
9	EXPECT DESCENT AT [time]	Notification that an instruction should be expected for the aircraft to commence descent at the specified time.	R
10	EXPECT DESCENT AT [position]	Notification that an instruction should be expected for the aircraft to commence descent at the specified position.	R
11	EXPECT CRUISE CLIMB AT [time]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified time. *Due to different interpretations between the various ATS units this element should be avoided.*	R
12	EXPECT CRUISE CLIMB AT [position]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified position. *Due to different interpretations between the various ATS units this element should be avoided*	R
13	AT [time] EXPECT CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence climb at the specified time to the specified level.	R
14	AT [position] EXPECT CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence climb at the specified position to the specified level.	R
15	AT [time] EXPECT DESCENT TO [altitude]	Notification that an instruction should be expected for the aircraft to commence descent at the specified time to the specified level.	R
16	AT [position] EXPECT DESCENT TO [altitude]	Notification that an instruction should be expected for the aircraft to commence descent at the specified position to the specified level.	R
17	AT [time] EXPECT CRUISE CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified time to the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	R

Uplink - Vertical Clearances Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
18	AT [position] EXPECT CRUISE CLIMB TO [altitude]	Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified position to the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	R
19	MAINTAIN [altitude]	Instruction to maintain the specified level.	W/U
20	CLIMB TO AND MAINTAIN [altitude]	Instruction that a climb to the specified level is to commence and the level is to be maintained when reached.	W/U
21	AT [time] CLIMB TO AND MAINTAIN [altitude]	Instruction that at the specified time, a climb to the specified level is to commence and once reached the specified level is to be maintained.	W/U
22	AT [position] CLIMB TO AND MAINTAIN [altitude]	Instruction that at the specified position, a climb to the specified level is to commence and once reached the specified level is to be maintained.	W/U
23	DESCEND TO AND MAINTAIN [altitude]	Instruction that a descent to the specified level is to commence and the level is to be maintained when reached.	W/U
24	AT [time] DESCEND TO AND MAINTAIN [altitude]	Instruction that at the specified time a decent to the specified level is to commence and once reached the specified level is to be maintained.	W/U
25	AT [position] DESCEND TO AND MAINTAIN [altitude]	Instruction that at the specified position a descent to the specified level is to commence and when the specified level is reached it is to be maintained.	W/U
26	CLIMB TO REACH [altitude] BY [time]	Instruction that a climb is to commence at a rate such that the specified level is reached at or before the specified time.	W/U
27	CLIMB TO REACH [altitude] BY [position]	Instruction that a climb is to commence at a rate such that the specified level is reached at or before the specified position.	W/U
28	DESCEND TO REACH [altitude] BY [time]	Instruction that a descent is to commence at a rate such that the specified level is reached at or before the specified time.	W/U
29	DESCEND TO REACH [altitude] BY [position]	Instruction that a descent is to commence at a rate such that the specified level is reached at or before the specified position.	W/U
30	MAINTAIN BLOCK [altitude] TO [altitude]	A level within the specified vertical range is to be maintained.	W/U
31	CLIMB TO AND MAINTAIN BLOCK [altitude] TO [altitude]	Instruction that a climb to a level within the specified vertical range is to commence.	W/U
32	DESCEND TO AND MAINTAIN BLOCK [altitude] TO [altitude]	Instruction that a descent to a level within the specified vertical range is to commence.	W/U

Uplink - Vertical Clearances Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
33	CRUISE [altitude]	Instruction that authorizes a pilot to conduct flight at any altitude from the minimum altitude up to and including the altitude specified in the clearance. further, it is approval for the pilot to proceed to and make an approach at the destination airport. *Due to different interpretations between the various ATS units, this element should be avoided.*	
34	CRUISE CLIMB TO [altitude]	A cruise climb is to commence and continue until the specified level is reached. *Due to different interpretations between the various ATS units, this element should be avoided.*	W/U
35	CRUISE CLIMB ABOVE [altitude]	A cruise climb can commence once above the specified level. *Due to different interpretations between the various ATS units, this element should be avoided.*	W/U
36	EXPEDITE CLIMB TO [altitude]	The climb to the specified level should be made at the aircraft's best rate.	W/U
37	EXPEDITE DESCENT TO [altitude]	The descent to the specified level should be made at the aircraft's best rate.	W/U
38	IMMEDIATELY CLIMB TO [altitude]	Urgent instruction to immediately climb to the specified level.	W/U
39	IMMEDIATELY DESCEND TO [altitude]	Urgent instruction to immediately descend to the specified level.	W/U
40	IMMEDIATELY STOP CLIMB AT [altitude]	Urgent instruction to immediately stop a climb once the specified level is reached.	W/U
41	IMMEDIATELY STOP DESCENT AT [altitude]	Urgent instruction to immediately stop a descent once the specified level is reached.	W/U
171	CLIMB AT [vertical rate] MINIMUM	Instruction to climb at not less than the specified rate.	W/U
172	CLIMB AT [vertical rate] MAXIMUM	Instruction to climb at not above the specified rate.	W/U
173	DESCEND AT [vertical rate] MINIMUM	Instruction to descend at not less than the specified rate.	W/U
174	DESCEND AT [vertical rate] MAXIMUM	Instruction to descend at not above the specified rate.	W/U

Uplink - Crossing Constraints

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
42	EXPECT TO CROSS [position] AT [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at the specified level.	R
43	EXPECT TO CROSS [position] AT OR ABOVE [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at or above the specified level.	R

Uplink - Crossing Constraints Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
44	EXPECT TO CROSS [position] AT OR BELOW [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at or below the specified level.	R
45	EXPECT TO CROSS [position] AT AND MAINTAIN [altitude]	Notification that a level change instruction should be expected which will require the specified position to be crossed at the specified level which is to be maintained subsequently.	R
46	CROSS [position] AT [altitude]	The specified position is to be crossed at the specified level. This may require the aircraft to modify its climb or descent profile.	W/U
47	CROSS [position] AT OR ABOVE [altitude]	The specified position is to be crossed at or above the specified level.	W/U
48	CROSS [position] AT OR BELOW [altitude]	The specified position is to be crossed at or below the specified level.	W/U
49	CROSS [position] AT AND MAINTAIN [altitude]	Instruction that the specified position is to be crossed at the specified level and that level is to be maintained when reached.	W/U
50	CROSS [position] BETWEEN [altitude] AND [altitude]	The specified position is to be crossed at a level between the specified levels.	W/U
51	CROSS [position] AT [time]	The specified position is to be crossed at the specified time.	W/U
52	CROSS [position] AT OR BEFORE [time]	The specified position is to be crossed at or before the specified time.	W/U
53	CROSS [position] AT OR AFTER [time]	The specified position is to be crossed at or after the specified time.	W/U
54	CROSS [position] BETWEEN [time] AND [time]	The specified position is to be crossed at a time between the specified times.	W/U
55	CROSS [position] AT [speed]	The specified position is to be crossed at the specified speed and the specified speed is to be maintained until further advised.	W/U
56	CROSS [position] AT OR LESS THAN [speed]	The specified position is to be crossed at a speed equal to or less than the specified speed and the specified speed or less is to be maintained until further advised.	W/U
57	CROSS [position] AT OR GREATER THAN [speed]	The specified position is to be crossed at a speed equal to or greater than the specified speed and the specified speed or greater is to be maintained until further advised.	W/U
58	CROSS [position] AT [time] AT [altitude]	The specified position is to be crossed at the specified time and the specified level.	W/U
59	CROSS [position] AT OR BEFORE [time] AT [altitude]	The specified position is to be crossed at or before the specified time and at the specified level.	W/U
60	CROSS [position] AT OR AFTER [time] AT [altitude]	The specified position is to be crossed at or after the specified time and at the specified level.	W/U
61	CROSS [position] AT AND MAINTAIN [altitude] AT [speed]	Instruction that the specified position is to be crossed at the specified level and speed and the level and speed are to be maintained.	W/U

Uplink - Crossing Constraints Continued

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
62	AT [time] CROSS [position] AT AND MAINTAIN [altitude]	Instruction that at the specified time the specified position is to be crossed at the specified level and the level is to be maintained.	W/U
63	AT [time] CROSS [position] AT AND MAINTAIN [altitude] AT [speed]	Instruction that at the specified time the specified position is to be crossed at the specified level and speed and the level and speed are to be maintained.	W/U

Uplink - Lateral Offsets

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
64	OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction.	W/U
65	AT [position] OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified position.	W/U
66	AT [time] OFFSET [direction] [distance offset] OF ROUTE	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified time.	W/U
67	PROCEED BACK ON ROUTE	The cleared flight route is to be rejoined.	W/U
68	REJOIN ROUTE BY [position]	The cleared flight route is to be rejoined at or before the specified position.	W/U
69	REJOIN ROUTE BY [time]	The cleared flight route is to be rejoined at or before the specified time.	W/U
70	EXPECT BACK ON ROUTE BY [position]	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route at or before the specified position.	R
71	EXPECT BACK ON ROUTE BY [time]	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route at or before the specified time.	R
72	RESUME OWN NAVIGATION	Instruction to resume own navigation following a period of tracking or heading clearances. May be used in conjunction with an instruction on how or where to rejoin the cleared route.	W/U

Uplink - Route Modifications

UL	MESSAGE ELEMENT	MESSAGE INTENT	RESPONSE
73	[predepartureclearance]	Notification to the aircraft of the instructions to be followed from departure until the specified clearance limit.	W/U
74	PROCEED DIRECT TO [position]	Instruction to proceed directly from the present position to the specified position.	W/U
75	WHEN ABLE PROCEED DIRECT TO [position]	Instruction to proceed, when able, directly to the specified position.	W/U