

Mode S

**Harmonisation of the Transition Arrangements for State
Aircraft**

**Process and Procedures for the Managing of the Mode S
Compliance Status and the Exemptions Granted to State
Aircraft**



Edition Number	:	1.0
Edition Date	:	14 Jan 05
Status	:	Released Issue
Intended for	:	EATMP Stakeholders

DOCUMENT CHARACTERISTICS

TITLE		
Mode S – Harmonisation of the Transition Arrangements for State Aircraft - Process and Procedures for the Managing of the Mode S Compliance Status and the Exemptions Granted to State Aircraft		
EATMP Infocentre Reference:		
Document Identifier	Edition Number:	1.0
	Edition Date:	14 Jan 05
Abstract		
<p>In July 2004 the regulatory authorities of the Mode S implementing States agreed to extend the transition arrangements for Elementary and Enhanced Surveillance compliance by State Aircraft. During the revised transition period, a coordinated exemption policy will be applied for State Aircraft conditional on the adoption of specific measures supporting the monitoring of the Mode S compliance status of State Aircraft.</p> <p>This document details the new transition arrangements and the process and procedures for managing the Mode S compliance status and the exemptions granted to State Aircraft.</p>		
Keywords		
State Aircraft EHS	Mode S Exemptions	ELS
Contact Person(s)	Tel	Unit
M. DE CAT	02.729.3405	DG/MIL

STATUS, AUDIENCE AND ACCESSIBILITY					
Status		Intended for		Accessible via	
Working Draft	<input type="checkbox"/>	General Public	<input checked="" type="checkbox"/>	Intranet	<input type="checkbox"/>
Draft	<input type="checkbox"/>	EATMP Stakeholders	<input type="checkbox"/>	Extranet	<input checked="" type="checkbox"/>
Proposed Issue	<input type="checkbox"/>	Restricted Audience	<input type="checkbox"/>	Internet (www.eurocontrol.int)	<input checked="" type="checkbox"/>
Released Issue	<input checked="" type="checkbox"/>	<i>Printed & electronic copies of the document can be obtained from the EATMP Infocentre (see page iii)</i>			

ELECTRONIC SOURCE		
Path:	D:	
Host System	Software	Size
Windows_NT	Microsoft Word 2002	512 Mb

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DOCUMENT APPROVAL

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Head of Sector Productivity	 Robert STEWART	18 th Jan 2005

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION NUMBER	EDITION DATE	INFOCENTRE REFERENCE	REASON FOR CHANGE	PAGES AFFECTED
0.1	15/07/04		Initial Draft	All
0.2	26/07/04		Working Draft Comments from Regulatory Authorities and the ACAS & Mode S Programme	4,5,11,12,14,17,24,25
0.3	30/07/04		Working Draft Comments from the mode S Regulators Meeting on 27 Jul 04	All
0.4	06/09/04		Draft Issue Comments at MILT-02 (02 Sep 04) and clarifications	All
0.5	06/11/04		Proposed Issue Clarification Update 'full' DAP capability Updated EHS capability and compliance Editorial	3 4 11,12 4,7,10
1.0	11/01/05		Released Issue MIL BD references replaced with Military Unit (DG/MIL) Editorial	ii-iii 5,7-9 3,4,8,12-14,16,21-22

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EXECUTIVE SUMMARY

In July 2004 the regulatory authorities of the Mode S implementing States agreed to extend the transition arrangements for Elementary and Enhanced Surveillance compliance by State aircraft. During the revised transition period, a coordinated exemption policy will be applied for State Aircraft conditional on the adoption of specific measures supporting the monitoring of the Mode S compliance status of State Aircraft.

This document details the new transition arrangements and the process and procedures for managing the Mode S compliance status and the exemptions granted to State Aircraft.

1. INTRODUCTION

In July 2004 the regulatory authorities of the Mode S implementing States agreed to extend the transition arrangements for Elementary and Enhanced Surveillance during which a coordinated exemption policy will be applied for State Aircraft conditional on the adoption of some specific measures supporting the monitoring of the Mode S compliance status of State Aircraft.

This document details the new transition arrangements and the process and procedures for managing the Mode S compliance status and the exemptions granted to State Aircraft.

An Exemption Coordination Cell (ECC) was established within the Mode S Programme to process Mode S Enhanced Surveillance Compliance Registrations and applications for Exemption for civil aircraft operators. For reasons of confidentiality, State aircraft data will be processed via alternative mechanisms.

2. MODE S REQUIREMENTS

The details pertaining to the carriage of Mode S airborne equipment by State Aircraft within Mode S Elementary Surveillance (ELS) or Mode S Enhanced Surveillance (EHS) airspace are promulgated by the implementing States in Aeronautical Information Circulars (AIC). Subsequently, these will be included within Aeronautical Information Publications (AIP), which are issued by the National Regulatory Authorities and within appropriate National Military Regulations.

Conditions for obtaining Diplomatic Clearances from Mode S implementing States will refer to the relevant Mode S airborne equipment requirements.

2.1 Geographical area – Where will Mode S be implemented?

Civil ATC authorities have commenced their implementation of Mode S Elementary Surveillance in the airspace of **Belgium, France, Germany, Luxembourg, The Netherlands** and **Switzerland**.

Mode S Enhanced Surveillance will be implemented from 2005 onwards, initially in the airspace of **Germany** and the **United Kingdom**. **France** will follow in March 2006.

2.2 Mode S Elementary Surveillance - IFR & VFR airborne implementation

For all State Aircraft flying in Mode S designated airspace, the final date for compliance for the carriage and operation of Mode S Elementary Surveillance airborne equipment is 31 March 2009.

The requirement is also valid for VFR flights conducted in Mode S designated airspace where the carriage and operation of SSR transponders is already mandatory.

The Mode S transponder must comply with the provisions of ICAO Annex 10, SARPs, Amendment 77. The Mode S transponder must be an approved **Level 2**, as a minimum, compliant with JAA Technical Standard Order JTSO-2C112a, or an equivalent standard that is compliant with the relevant ICAO SARPs and which is acceptable to the approval authority. It also includes **Aircraft Identification**. The transponders need to support **Surveillance Identifier** codes.

This rule is equally valid for State Aircraft operating frequently or only occasionally (less than 30 Hrs per airframe per annum) in designated Mode S airspace.

2.3 Mode S Enhanced Surveillance

Mode S Enhanced Surveillance builds upon the benefits of Elementary Surveillance and consists of the extraction of additional airborne data in the form of Downlink Airborne Parameters (DAP). This facilitates an increase in the safety and efficiency of ATM operations.

The carriage and operation of Mode S Enhanced Surveillance functionality applies to “transport type” State aircraft with a maximum take-off mass in excess of 5700 kg or a maximum true cruising airspeed in excess of 250 kts and a “full” DAP capability, conducting IFR flights as GAT in Mode S Enhanced designated airspace for more than 30 hours per annum per airframe.

The final date for compliance for the carriage and operation of Mode S Enhanced Surveillance airborne equipment is 31 March 2009.

- Under “transport type”, State aircraft are understood to be the types of aircraft as mentioned in Annex A with a Mode S category of ‘EHS’.
- Fighter & Training aircraft as well as Rotary-wing aircraft are not covered by the EHS requirements.
- “Full” DAP capability, as defined in Section 5, means that all 8 DAPs are available for downloading. Where the parameter ‘Track Angle Rate’ cannot be provided, ‘True Air Speed’ should be used instead. If these conditions cannot be met the aircraft will not be considered “full” DAP capable.
- Existing / older transport type State aircraft receiving avionics upgrades which then provide them with a full DAP capability are subsequently to be EHS equipped
- All new and future transport type State aircraft are to be EHS compliant on delivery (if they exceed the EHS weight & speed discriminants and therefore fall into the EHS category).
- Transport type State aircraft that are not eligible for Mode S EHS equipage need to be, as a minimum, ELS compliant.

The State Aircraft Operator can contact the Mode S Exemption Coordination Cell (ECC) for any clarification needed (See also Section 4.6).

2.4 Supporting measures

For reasons of confidentiality, data from State Operators will be handled differently from that received from commercial aircraft operators. A number of supporting measures were agreed allowing the regulatory authorities of the implementing States to monitor the Mode S

compliance status and exemptions granted to State Aircraft Operators. The following actions are required:

- By 31 March 2005 – Operators of State Aircraft of EUROCONTROL Member States are to have submitted plans detailing the parts of their fleets subject to Mode S airborne equipage and **Mode S equipage plans for ELS and EHS** for those aircraft (= ELS & EHS applicable fleets). These plans are to be updated yearly for 2006, 2007, 2008 and 2009 respectively.
 - Plans on Mode S airborne equipage will be requested from State Operators through the EUROCONTROL Civil-Military Standing Interface Committee (CMIC).
 - Military Observers Organisations to the CMIC, when representing State Aircraft Operators from non-EUROCONTROL Member States (presently US Department of Defense and NATO), will equally be invited to submit their Mode S equipage plans.
 - The plans are to be provided to the regulatory authorities of the Mode S implementing States via the EUROCONTROL Military Unit (DG/MIL).
 - The NATO ATM Committee (NATMC) with Cooperation Partners will be informed of these proceedings.
 - State Regulators of the Mode S implementing States will inform ICAO EANPG and request non-EUROCONTROL Member States to promulgate the Mode S equipage requirements to their National Military Authorities.
- By 31 March 2009 – 100 % of the applicable fleets are to be ELS or, as appropriate, ELS and EHS equipped.

3. MODE S EXEMPTIONS

3.1 Elementary Surveillance

Fleet based exemption until 31 March 2009 based upon Mode S ELS equipment plans.

Exemptions are permissible beyond the March 2009 date but only in controlled cases and exceptional circumstances – as defined below.

- Aircraft that will be out of operational service by 31 December 2009
- TDM flights (Flight testing, delivery or transit into and out of maintenance bases)

3.2 Enhanced Surveillance

Fleet based exemption until 31 March 2009 based upon Mode S EHS equipment plans.

Exemptions are permissible beyond the March 2009 date but only in controlled cases and exceptional circumstances – as defined below.

- Aircraft that will be out of operational service by 31 December 2009
- TDM flights (Flight testing, delivery or transit into and out of maintenance bases)

4. PROCESS FOR REGISTERING COMPLIANCE OR REQUESTING EXEMPTION AGAINST THE MODE S REQUIREMENTS.

4.1 Process and Procedure

For confidentiality reasons, State Aircraft Operators will not be required to record each of their aircraft in the Exemption Co-ordination Cell (ECC) database. The compliance recording and exemption management process will be performed by the State Regulators of the Mode S implementing States through EUROCONTROL civil-military working arrangements i.e. the Civil-Military Standing Interface Committee (CMIC) and facilitated by the Military Unit (DG/MIL).

The regulatory authorities will not award exemptions to individual aircraft but grant applicable fleet based exemptions through the endorsement/acceptance of the equipage plans submitted by an operator.

These plans shall provide proof of intent and will show that the defined rates of percentage of fleet equipage are achievable and that viable plans to achieve 100% compliance by 31st March 2009 are established.

These plans will cover both ELS and EHS airborne implementation.

The procedure to be established is set out below.

1. The EUROCONTROL Civil-Military Standing Interface Committee (CMIC) will request EUROCONTROL Member States and Military Observers Organisations, when representing State Aircraft Operators from non-EUROCONTROL Member States (presently US Department of Defense and NATO), to provide equipage plans for those parts of their fleets subject to Mode S airborne equipage. Annex A can be used to determine aircraft subject to Mode S EHS equipage.
2. State authorities will be requested to provide the information listed in Annex B to the EUROCONTROL Agency Military Unit (DG/MIL) for consolidation. A contact person and email address will be communicated.
3. The initial information, required by 31 March 2005, will be consolidated by DG/MIL and passed to the Regulatory Authorities of the Mode S implementing States for their assessment.
4. The Regulatory Authorities of the Mode S implementing States will review the information package assembled by DG/MIL and reach a consensus on the endorsements. Agreement entitles the aircraft identified in the submission to be exempted against Mode S requirements across the Mode S implementing States.
5. Fleet based exemptions will then be granted by the Regulatory Authorities of the Mode S implementing States and copied to the DG/MIL. DG/MIL will inform the Member States accordingly.

6. The Regulatory Authorities of the Mode S implementing States may request, on a bilateral basis, adaptations to the plans or request further information if it is believed that sufficient progress is not being achieved.
7. The information package shall be updated annually (for 31 March 2006, 2007, 2008 and 2009) by the State authorities and sent to DG/MIL for consolidation and subsequent review by the Regulatory Authorities of the Mode S implementing States.
8. A final review will be performed in April 2009 to ensure that 100% Mode S compliance of the applicable fleets has been achieved.
9. Long term monitoring of aircraft Mode S capability may be performed by National Regulatory Authorities and possible non-compliance will be subject to subsequent investigation.
10. Post 31st March 2009: [Existence of ECC post 2009 is still to be confirmed]
 - After 31 March 2009, requests for special Mode S exemptions (see section 3) will be handled through the ECC.
 - The ECC would distribute these requests to the Regulatory Authorities of the Mode S implementing States and similarly, pass the Regulators assessments back to the State Operator.
 - The intention is that the role of the ECC will be minimal in these matters (limited to posting of information and distributing correspondence to appropriate parties).

4.2 Role of the EUROCONTROL Military Unit (DG/MIL)

DG/MIL will perform a facilitator's role to support the Regulators of the Mode S implementing States in endorsing the plans submitted by the State Aircraft Operators. In performing this role they will undertake the following tasks:

- DG/MIL will request fleet plans via CMIC.
- DG/MIL will consolidate the information packages received from the State Aircraft Authorities and distribute the consolidated information to the Regulators of the Mode S implementing States.
- DG/MIL will coordinate an annual update process whereby the take-up rate of Mode S airborne equipment in State Aircraft would be monitored.
- DG/MIL will publish and maintain the list of applicable aircraft (see Annex A).

4.3 Role of the Regulatory Authorities of the Mode S implementing States

The Regulatory Authorities retain control over authorization of flights within their sovereign airspace. They will grant exemptions to their own national, and foreign, State Aircraft through the endorsement/acceptance of the plans submitted by the State Aircraft Operators.

The Regulatory Authorities of the Mode S implementing States will permit foreign aircraft, identified in the information plans, to operate within their Mode S designated airspace without full compliance to ELS or EHS requirements.

The Regulatory Authorities of the Mode S implementing States may monitor the adherence to the occasional access rules and to the upgrade plans through corroboration of air traffic movements and flight plan information. Corrective actions will be coordinated with State Aircraft Operators as required.

The Regulatory Authorities of the Mode S implementing States would also ensure that as well as military aircraft, police and customs aircraft of their State were appropriately documented.

4.4 Role of State Aircraft Operators

The State Aircraft Operators of EUROCONTROL Member States and of Military Observers Organisations to CMIC, when representing State Aircraft Operators from non-EUROCONTROL Member States, will be required to notify their plans to DG/MIL on how they plan to equip applicable fleets of aircraft for ELS and EHS.

To gain access to European Mode S Enhanced designated airspace for less than 30 hours per annum, non-EUROCONTROL Member States would be expected to review the AIPs and to process requests via normal diplomatic clearance channels.

4.5 Role of NATO

In certain circumstances, such as managing specific aircraft or managing the ICAO 24-bit aircraft addresses allocated to NATO, NATO can be regarded as a State Aircraft operator. NATO will be required to adhere to the rules for State Aircraft Operators and may submit the appropriate information package directly to DG/MIL (copy to or via the National Regulatory Authorities of the Grand Duchy of Luxembourg).

4.6 Role of the ECC

The ECC will ensure that appropriate information is published on the Mode S website (www.eurocontrol.int/mode_s).

The ECC will act as a focal point for enquiries and requests for information will be processed via the most suitable channels. Contact information is as follows:

Mode S Enhanced Surveillance Exemption Co-ordination Cell
EUROCONTROL Agency (Room 51.237)
Rue de la Fusee 96
Brussels B-1130
Belgium

Or, via email to: Ecc.modes@eurocontrol.int

In the longer term, post 31 March 2009, the processing of Mode S exceptional exemptions for State Aircraft will be determined by the national civil and military regulatory authorities of the Mode S implementing States.

5. DEFINITIONS

The following definitions are proposed (not in strict alphabetical order):

- Aircraft Operator Fleet:

An Aircraft Operator's fleet could be composed of several types and numbers of aircraft. Such a fleet could comprise:

- non Mode S applicable aircraft (e.g. due to expected area of operation, size or weight)
- ELS Applicable Aircraft
- EHS Applicable Aircraft

- ELS Applicable Fleet:

ELS Applicable fleet is composed of aircraft types and numbers for aircraft subject to ELS equipage requirements.

It is recognized that a State Aircraft Operator is responsible for a diverse range of aircraft stationed at multiple locations, some of which may be expected to operate in notified Mode S airspace. It is therefore also recognized that not all aircraft in the State Aircraft Operator's fleet will belong to the ELS applicable fleet.

- EHS Applicable Fleet:

EHS Applicable fleet is composed of aircraft types and numbers for aircraft subject to EHS equipage requirements.

The aircraft types to be considered are in Annex A. "Transport type" aircraft incapable of providing the required DAP information do not belong to the EHS capable fleet. They should be listed under the ELS Applicable Fleet.

It is recognized that a State Aircraft Operator is responsible for a diverse range of aircraft stationed at multiple locations, some of which may be expected to operate in notified Mode S airspace. It is therefore also recognized that not all aircraft in the State Aircraft Operator's fleet will belong to the EHS applicable fleet.

- ELS Capable:

An aircraft currently required to carry and operate an IFF/SSR transponder is considered ELS capable.

- ELS Compliant:

An aircraft that is ELS compliant meets the following functionalities:

Mode S Elementary Surveillance functionality shall constitute the following transponder parameters and data formats for Ground Initiated Comm.-B (GICB) protocols as defined in ICAO Annex 10 volume III (Amendment 77 or later), Appendix 1:

- 24 bit aircraft address,
- SSR Mode 3/A
- Altitude reporting in 25ft increments (or at least 100 ft increments – subject to airframe capability, ICAO Annex 10, Vol IV 2.1.3)
- Flight Status (airborne/on the ground) (ICAO Annex 10, Vol IV 23.1.2.8.6.7)
- Data Link Capability Report (BDS 10 hex)
- Common Usage GICB Capability Report (BDS 17 hex)
- Aircraft identification (BDS 20 hex)
- ACAS Active Resolution Advisory (BDS 30 hex) if ACAS equipped
- The aircraft operator has to ensure that the aircraft reports a unique 24 bit aircraft address as assigned by the appropriate State Authorities and as managed by the appropriate military domain (if applicable)

The functionality of Mode S airborne equipment shall comply, as a minimum, with the provision of ICAO annex 10, in particular Vol. III and IV as standardized in amendment 77 and with the appropriate technical standards.

The installed equipment must be an approved level 2, as a minimum, Mode S transponder compliant with JAA Technical Standing Order JTSO-2C112a, or an equivalent standard that is acceptable to the certifying authority.

Mode S equipped aircraft with gross mass in excess of 5700 kg or a maximum cruising true airspeed in excess of 250 knots shall be operated with antenna diversity as prescribed in ICAO Annex 10 Vol IV, 3.1.2.10.4 (Note, where it is impracticable to provide antenna diversity on a particular airframe, a derogation may be considered).

To be ELS compliant the installation and equipment should meet JAA TGL 13 Revision 1.

- EHS Capable:

An ELS capable aircraft that is also capable of transmitting the specified 8 Downlink Aircraft Parameters (DAPs)^{See Note 1}. Where the parameter 'Track Angle Rate' cannot be provided, 'True Air Speed' should be used instead. If these conditions cannot be met the aircraft will not be considered "full" DAP capable.

Note 1: List of DAPs for EHS Capability

BDS Register	Basic DAP Set (if Track Angle Rate is available)	Alternative DAP Set (if Track Angle Rate is not available)
BDS 4,0	Selected Altitude	Selected Altitude
BDS 5,0	Roll Angle	Roll Angle
	Track Angle Rate	
	True Track Angle	True Track Angle
	Ground Speed	Ground Speed
BDS 6,0	Magnetic Heading	Magnetic Heading
	Indicated Airspeed (IAS) / Mach no. (Note: IAS and Mach no. are considered as 1 DAP (even if technically they are 2 separate ARINC labels). If the aircraft can provide both, it must do so).	Indicated Airspeed (IAS) / Mach no. (Note: IAS and Mach no. are considered as 1 DAP (even if technically they are 2 separate ARINC labels). If the aircraft can provide both, it must do so).
	Vertical Rate (Barometric rate of climb/descend or baro-inertial)	Vertical Rate (Barometric rate of climb/descend or baro-inertial)
		True Airspeed (provided if Track Angle Rate is not available)

The two columns reflect which DAPs are to be provided if Track Angle Rate is or is not available.

Further details are contained in JAA NPA 20-12a.

- **EHS Compliant:**

Full ELS compliance and the broadcast of 8 DAPs.

To be EHS compliant the installation and equipment should meet JAA NPA 20-12a.

- **Out of Operational Service:**

In this context, Out of Operational Service means that the aircraft is scheduled to be either:

- scrapped,
- returned to a leaser
- sold from that fleet
- re-routed to non-ECAC airspace

6. REFERENCE AND RELATED DOCUMENTS

6.1 ICAO

- (a) Annex 10, Amd. 77, *Aeronautical Communications (Digital Data Communication Systems)*, Volume III, July 2002.
- (b) Annex 10, Amd. 77, *Aeronautical Communications (Surveillance Radar and Collision Avoidance Systems)*, Volume IV, July 2002.
- (c) *Manual of the Secondary Surveillance Radar System*, Doc 9684, Second Edition 1998.
- (d) *EUR Regional Supplementary Procedures*, ICAO Doc 7030/4, as amended.
- (e) ICAO Annex 6
- (f) ICAO Doc 8168 PANS-OPS Vol 1
- (g) ICAO Doc 4444

6.2 JAA/EASA

- (a) EASA ETSO 2C112B, *Minimum Operational Performance Specification for SSR Mode S Transponders*. (Adopts EUROCAE ED-73B).
- (b) JAA TGL 13, Revision 1, - *Certification of Mode S Transponder Systems for Elementary Surveillance*.
- (c) JAR-OPS 1:Amendment 6: 1.845 and 1.866 and associated AMCs.
- (d) JAR-OPS 3: Amendment 2: 3.845, 3.860, 3.865, and associated AMCs.
- (e) JAR-OPS 1/3: MEL Policy Document.
- (f) EASA *Certification Specifications* CS-23, CS-25, CS-27, and CS-29, as applicable.
- (g) JAA Technical Standing Order JTSO-2C112a
- (h) NPA 20-12a (dated 11th February 2004) ACJ 20X11 certification of Mode S transponder systems for Enhanced Surveillance

6.3 FAA

- (a) FAR 121.345, Radio equipment.
- (b) TSO C112, 1986, (Based on RTCA DO-181). This standard of transponder does not provide the full functionality required for the European Region. However, the RTCA document has been updated to DO-181C that defines an acceptable standard. It is expected that the FAA TSO will be updated to reflect this standard.

6.4 EUROCONTROL

- (a) Document SUR.ET2.ST02.1000-CNP-01-00, Edition 2, Nov 1996 *The Concept of Operations - Mode S in Europe*.
- (b) EUROCONTROL Agency document 'Guidance for the Operational Introduction of SSR Mode S Volume 1 Elementary Surveillance' version 1.0 Dated 17th December 2003
- (c) Document SUR/Mode S/ES 3SP MP, Edition 1.0, 30 August 2002, *Mode S Three States Project Master Plan*.
- (d) Document SUR-EHS/02-001, Edition 2.0, July 2003, *Common Framework for the Regulation of Mode S Enhanced Surveillance*.
- (e) Definition of State Aircraft – Decision of the Provisional Council Session 11 on 12/07/01.

6.5 EUROCAE

- (a) *Minimum Operational Performance Specification for SSR Mode S Transponders*, ED-73B, January 2003.
- (b) *Minimum Operational Performance Specification for Aircraft Data Link Processors*, ED-82A, November 1999.
- (c) *Minimum Operational Performance Specification for Mode S Specific Service Applications*, ED-101, September 2000.
- (d) *Minimum Operational Performance Specification for Light Aviation SSR Transponder*, ED-115, August 2002

6.6 RTCA

- (a) *Minimum Operational Performance Specification for Air Traffic Control Radar Beacon System/ Mode Select (ATCRBS/Mode S) Airborne Equipment*, RTCA DO-181C: June 2001.
- (b) *Minimum Operational Performance Specification for the Mode S Airborne Data Link Processor*, RTCA DO-218B: June 2001

6.7 States AICs

- (a) Belgium AIC – 17/2003 (includes G.D. of Luxembourg)
- (b) France AIC – A26/02
- (c) Germany AIC – 6/03 – 7/03
- (d) Switzerland AIC – 01/04
- (e) The Netherlands AIC-B – 10/03
- (f) United Kingdom AIC – 88/2001

List of annexes:

ANNEX A: MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

**ANNEX B: MILITARY AIRCRAFT DATA – DATA TO BE PROVIDED BY STATE
AIRCRAFT OPERATORS**

7. ANNEX A

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Appendix 1 to this Annex contains a non-exhaustive list of aircraft which are potentially subject to **Mode S EHS** equipage requirements.

Table items indicate “Role” of the aircraft, the Manufacturer, the aircraft designation and popular name, the gross weight (kg), the aircraft’s typical speed (kts/Mach number) for its primary mission and the Mode S Category (ELS or EHS).

State Regulators and State Aircraft Operators can use these lists in order to determine the aircraft types of the State Aircraft fleet requiring Mode S EHS equipage.

This Annex is a living document and may be updated as required (comments may be addressed to the ECC – see Par. 4.6). The lists are accepted by the National Regulators of the MODE S implementing States.

Appendix 2 to this Annex contains State aircraft “roles” which are potentially only subject to **Mode S ELS** equipage requirements. For some of these roles some typical aircraft types are added as an example.

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Appendix 1 - “Military transport type” aircraft

This Appendix lists “military transport type” aircraft potentially subject to the **Mode S EHS** equipage requirements.

“Commercial transport” aircraft (i.e. Narrow & Wide Body Turbofans and Turboprops) belonging to military fleets are by default subject to the Mode S EHS equipage requirements and are not included here.

Legend

Name¹: popular name

Gross Weight²: in kg (> 5700Kg)

Typical speed³: typical speed for primary mission in kts/Mach number (> 250 Knots)

MODE S⁴: Mode S category (ELS or EHS equipment as required)

Role	Manufacturer	Designation	Name ¹	Gross Weight ²	Typical speed ³	MODE S ⁴
CARGO/TRANSPORT/REFUELING				> 5700 kg	> 250 kts	EHS
	Antonov Aeronautical Scientific	An-12	Cub	61.008	320 kts	EHS
		An-22	Cock	226.796	305 kts	EHS
		An-24RW	Coke	21.772	245 kts	EHS
		An-26	Curl	24.004	225 kts	EHS
		An-28	Cash	6.509	190 kts	EHS
		An-30	Clank	22.997	230 kts	EHS
		An-32	Cline	27.000	270 kts	EHS
		An-70	-	131.882	430 kts	EHS
		An-70T	-	131.882	415 kts	EHS
		An-72/74	Coaler/B/C	36.514	380 kts	EHS
		An-124	Condor	391.450	430 kts	EHS
		An-225	Cossack	598.742	430 kts	EHS
	The Boeing CO.	C-9A	Nightingale	48.988	570 kts	EHS
		C-9B	Skytrain 2	49.895	570 kts	EHS
		C-17A	Globemaster 3	265.352	496 kts /M 0.77	EHS

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Role	Manufacturer	Designation	Name ¹	Gross Weight ²	Typical speed ³	MODE S ⁴
		KC-10A	Extender	267.619	529 kts /M 0.82	EHS
		VC-9C	-	49.895	495 kts	EHS
		C-32A	-	115.666		EHS
		C-40A	Clipper	77.791		EHS
		C-40B/C	-	77.791		EHS
		VC-25A	-	379.203	484 kts	EHS
		KC-135A/KC-135E	Stratotanker	134.717	461 kts	EHS
		KC-135R	-	146.284	461 kts	EHS
	Bombardier Aerospace	Bombardier Q200	Dash 8	16.465		EHS
		Bombardier Q300	Dash 8	19.504		EHS
		C-21A	-	8.345	360 kts	EHS
		C-23A	Sherpa	10.387	201 kts	EHS
		C-23B	Sherpa	11.612	194 kts	EHS
	EADS (CASA)	C212-400	Aviocar	8.100	169 kts	EHS
		C-295	-	23.201	226 kts	EHS
		CN-235-300	-	16.500	214 kts	EHS
	EADS SOGERMA Services	C160 NG	Transall NG	51.000	277 kts	EHS
	EMBRAER	ERJ 135	-	20.000	490 kts /M 0.76	EHS
		ERJ 145	-	22.000	490 kts /M 0.76	EHS
	Fairchild Aircraft	C-26A	-	7.257	239 kts	EHS
	Finmeccanica, Alenia Aeronautica	C-27A	Spartan	25.800	250 kts	EHS
		G.222	-	28.000	250 kts	EHS
	General Dynamics	C-20A/B/D/E	Gulfstream 3	31.842	516 kts/M 0.80	EHS
		C-20F/G/H	Gulfstream 4	34.019	516 kts/M 0.80	EHS
		C-37A	Gulfstream 5	41.232	516 kts/M 0.80	EHS
		C-38A	G100	11.181	516 kts/M 0.80	EHS
	Ilyushin Aviation Complex	Il-76MD	Candid	189.996	516 kts/M 0.80	EHS
		Il-76MF	-	209.998	516 kts/M 0.80	EHS

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Role	Manufacturer	Designation	Name ¹	Gross Weight ²	Typical speed ³	MODE S ⁴
		II-78M	Midas	209.998	516 kts/M 0.80	EHS
	Indonesian Airspace	CN-235M	-	16.500		EHS
	Kawasaki Heavy Industries	C-A	-	38.700	439 kts	EHS
	Lockheed Martin Aeronautics CO.	C-5A/C	Galaxy	379.657	489 kts	EHS
		C-5B	Galaxy	379.657	489 kts	EHS
		C-130H	Hercules	70.307	325 KTAS	EHS
		C-130H-30	Hercules	74.843	315 kts	EHS
		C-130J	Super Hercules	74.843	417 kts	EHS
		C-130J-30	Super Hercules	79.379	355 kts	EHS
		C-141B/C	StarLifter	146.556	489 kts	EHS
		KC-130F/R/T	Hercules	70.307	305 kts	EHS
		KC-130J	Super Hercules	74.843	480 kts	EHS
		MC-130E	Combat Talon	70.307	345 kts	EHS
		MC-130H	Combat Talon 2	70.307	345 kts	EHS
		MC-130P	Combat Shadow	70.307	332 kts	EHS
		C-27J	Spartan	31.800	315 kts	EHS
	Northrop Grumman Integrated Systems	C-2A	Greyhound	24.201	260 kts	EHS
	Raytheon Aircraft CO. (Beech)	C-12A/B/C/D/F/R	Huron	5700	298 kts	EHS
		C-12J/J2	-	7.738	278 kts	EHS
Future deliveries						
	Airbus	A-400 M	-	129.727	384 kts	EHS
EARLY WARNING / COMMAND&CONTROL / SPECIAL MISSIONS				> 5700 kg	> 250 kts	EHS
	The Boeing CO.	E-3A/B/C	AWACS	151.953		EHS
		E-4A/B	NEACP	362.874		EHS
		E-6A	TACAMO	155.129		EHS
	EMBRAER	ERJ 145 AEW&C	-	24.100	400 kts	EHS
	Ilyushin Aviation Complex	A-50	Mainstay	189.996		EHS

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Role	Manufacturer	Designation	Name¹	Gross Weight²	Typical speed³	MODE S⁴
	Lockheed Martin Aeronautics CO.	EC-130E	ABCCC	70.307	344 kts	EHS
		EC-130E	Command Solo	-		EHS
		EC-130H	Compass Call	70.307	399 kts	EHS
		EC-130J	Command Solo 2	70.307		EHS
		HC-130N/P	King	70.307	332 kts	EHS
	Northrop Grumman Integrated Systems	E-2C	Hawkeye	24.687		EHS
	Saab Aircraft AB	Saab 340 AEW&C	Argus	13.154	285 kts	EHS

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)**Appendix 2 - Other than “Military transport type” aircraft**

This Appendix lists State aircraft “roles” which are potentially only subject to **Mode S ELS** equipage requirements.

For some of these roles some typical aircraft types are added as an example.

Legend

Name¹: popular name

Gross Weight²: in kg (> 5700Kg)

Typical speed³: typical speed for primary mission in kts/Mach number (> 250 Knots)

MODE S⁴: Mode S category (ELS or EHS equipment as required)

Role	Manufacturer	Designation	Name¹	Gross Weight²	Typical speed³	MODE S⁴
ATTACK				> 5700 kg	> 250 kts	ELS
	Fairchild Aircraft	A-10A	Thunderbolt 2	22.026	400 kts	ELS
	The Boeing CO.	AC-130U	Specter	70.307	325 kts	ELS
BOMBER				> 5700 kg	> 250 kts	ELS
	The Boeing CO.	B-1B	Lancer	216.364	774 kts/M 1.2	ELS
		B-52H	Stratofortress	221.353	565 kts	ELS
	Northrop Grumman Integrated Systems	B-2A	Spirit/Stealth Bomber	152.634		ELS
ELECTRONIC WARFARE				> 5700 kg	> 250 kts	ELS
	Panavia Aircraft	Tornado ECR	-	27.941	1289+ kts/M 2+	ELS
FIGHTERS	(pro memore)			> 5700 kg	> 250 kts	ELS
PATROL ASW				> 5700 kg	> 250 kts	ELS
	BAE Systems, Air Systems	Nimrod MRA 4	- (Nimrod 2000)	105.376	-	ELS
	BAE Systems, Customer Solutions & Support	-	Nimrod MR Mk.2	80.513	-	ELS
		HS-801	Nimrod MR Mk 1	80.513	-	ELS
	Dassault Aviation	BR-1150	Atlantic/ATL2	42.266	380 kts	ELS

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Role	Manufacturer	Designation	Name ¹	Gross Weight ²	Typical speed ³	MODE S ⁴
		F50-M	Falcon SURMAR	18.497	-	ELS
		HU-25	Falcon Guardian	15.195	554 kts/M 0.86	ELS
	EADS (CASA)	C-212	Patrullero	8.100	-	ELS
		C-295- MPA/ASW	Persuader	23.201	-	ELS
		CN-235- MSA/MPA	Persuader	16.500	-	ELS
	Finmeccanica, Alenia Aeronautica	ATR42MP	Surveyor	18.600	-	ELS
	Lockheed Martin Aeronautics CO.	P-3C	Orion	63.394	-	ELS
		S-3B	Viking	23.831	370 kts	ELS
RECONNAISSANCE/SURVEILLANCE				> 5700 kg	> 250 kts	ELS
	The Boeing CO.	RC-135S	Cobra Ball	135.624	434 kts	ELS
		RC-135U	Combat Sent.	135.624	434 kts	ELS
		RC-135V/W	Rivet Joint	135.624	434 kts	ELS
	Dassault Aviation	Mirage 4P	-	34.246	1289+ kts/M 2+	ELS
		Mirage F1CR	-	16.193	1289+ kts/M 2+	ELS
	Lockheed Martin Aeronautics CO.	U-2S	-	18.144	-	ELS
	Northrop Grumman Integrated Systems	E-8C	Joint STARS	152.407	<541 kts/M 0.84	ELS
TRAINING	(pro memore)			> 5700 kg	> 250 kts	ELS
UTILITY	(pro memore)			> 5700 kg	> 250 kts	ELS
UAV				> 5700 kg	> 250 kts	ELS
	Northrop Grumman Integrated Systems	RQ-4A	Global Hawk	11.612 (launch wt – booster)	395 kts	
ROTARY-WING	(pro memore)			> 5700 kg	> 250 kts	ELS

Remark

To ease determination of the Mode S category for aircraft types in “Training” or “Utility” role some typical examples are given below:

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

- **TRAINING** : (Name) e.g. Super Albatros, Albatros 2 ; Hawk 60, Hawk 100 ; Harrier T4, Harrier T10 ; Mirage (3B, 2000B, 2000-5B, F1B, Rafale B) ; Alpha Jet ; Aviojet ; Viggen (Sk 37)
- **UTILITY** : (Name) e.g. SAAB 340 SAR, SAAB 2000 Flight Inspection

MILITARY AIRCRAFT DATA – DATA TO BE PROVIDED BY STATE AIRCRAFT OPERATORS

8. ANNEX B**DATA TO BE PROVIDED BY STATE AIRCRAFT OPERATORS**

ANNEX B contains a template detailing the data to be provided by State Aircraft Operators on their ELS/EHS applicable fleet equipage.

Initially, data is required by 31st March 2005. Then yearly updates will be requested by 31st March of the years 2006, 2007, 2008 and 2009.

Requested Data:

1. STATE AIRCRAFT OPERATOR: *(to be completed)*
2. STATE OF REGISTRY: *(to be completed)*
3. Point of contact and contact details: *(to be completed)*
4. Table containing following data items: *(example below)*

1	2	3	4	5	6	7	8	9	10
Type of aircraft	Total number	Transponder details	Mode S category	% Mode S certified aircraft by	% aircraft to be Mode S equipped by	% aircraft to be Mode S equipped by	% aircraft to be Mode S equipped by	% aircraft to be Mode S equipped by	Remark
				31 Mar 05	31 Mar 06	31 Mar 07	31 Mar 08	31 Mar 09	
TypeA	100	...	ELS	20 %	30 %	50 %	75%	100 %	
Type A	50	...	EHS	10 %	45 %	80 %	90 %	100 %	
Type B					
Type C							

MILITARY AIRCRAFT DATA – MODE S CATEGORY (ELS/EHS)

Legend:

- Column 1: Type of aircraft - aircraft designation and popular name (if available)
- Column 2: Total number - total number of this aircraft type in the Mode S category indicated (column 4) eligible for Mode S equipage
- Column 3: Transponder details - make, manufacturer and type of transponder to be operated
- Column 4: Mode S category - subject to ELS or EHS equipage requirements as appropriate (the same aircraft type can appear in both ELS and EHS category)
- Column 5: % Mode S certified aircraft by 31 Mar 05 - percentage of the total number (column 2) of Mode S (ELS or EHS as appropriate) certified aircraft
- Column 6: % aircraft to be Mode S equipped by 31 Mar 06 – cumulative percentage of the total number (column 2) of aircraft to be equipped by 31st March 2006
- Column 7: % aircraft to be Mode S equipped by 31 Mar 07 – cumulative percentage of the total number (column 2) of aircraft to be equipped by 31st March 2007
- Column 8: % aircraft to be Mode S equipped by 31 Mar 08 – cumulative percentage of the total number (column 2) of aircraft to be equipped by 31st March 2008
- Column 9: % aircraft to be Mode S equipped by 31 Mar 09 – cumulative percentage of the total number (column 2) of aircraft to be equipped by 31st March 2009
- Column 10: Remarks – free remarks related to the data items of aircraft type mentioned in column 1. This item should include details on any technical issues that are to be resolved in order to achieve compliance.