AAA AMDAR Software Technical Specification v3.0 D2

AAA AMDAR Software Technical Specification

1. Background

This document, in conjunction with the ASDAR Software Requirements Specification[1], is the Technical Specification for the AAA Software Version 3.0

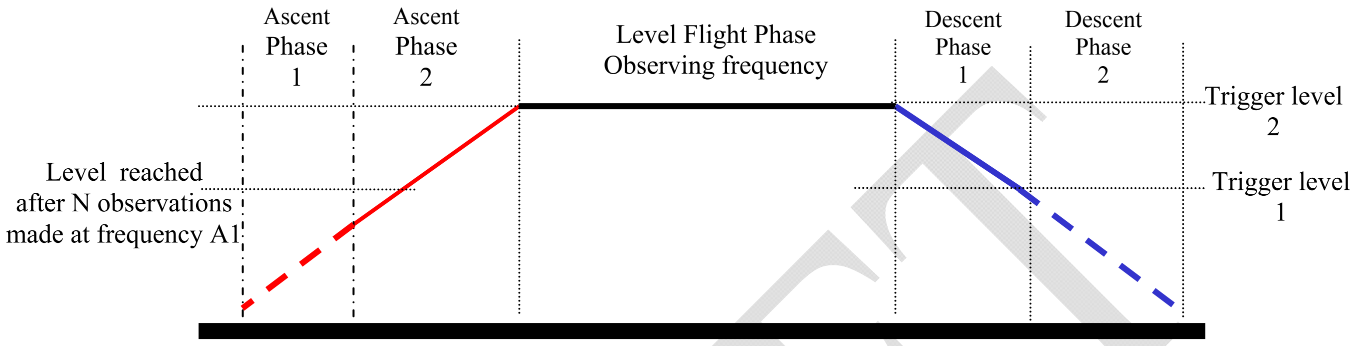
[1] Software Requirements Specification for the ASDAR Project, Issue 3, Matra Marconi Space UK Limited, October 1994. (reference 1163-00016-44-4)

2. AAA AMDAR Specification

2.1. Reporting

2.1.1. Frequency and Definition of Flight Levels

The diagram below illustrates how AAA AMDAR should differentiate between the various flight phases.



2.1.1.1. Configuration

It should also be possible to enable or disable reporting for each flight phase individually. The table below describes each of the required variables and provides details of the default settings which should be applied.

Flight Phase	Variable	Description	Units	Default Setting
Ascent phase	N	The number of observations made at the interval A1 during ascent phase 1.	Integer (1- 99)	N = 10
	Ascent Phase 1 Observing Interval (A1)	Interval between the first N observations made during the first part of the ascent	hPa (1-99 hPa)	A1 = 10hPa Reporting Enabled
	Ascent Phase 2 Observing Interval (A2)	Interval between observations during the second part of the ascent, starting after the first N observations.	hPa (1-99 hPa)	A2 = 50hPa Reporting Enabled
Level Flight	Level Flight Observing Interval (L1)	Interval between observations during the level flight phase, (which commences once the aircraft has reached TL2).	Minutes (1- 99)	L1 = 7 minutes Reporting Enabled
Descent Phase	Descent Phase 1 Observing Interval (D1)	Interval between observations during the first phase of the descent, from TL2 to TL1.	hPa (1- 99 hPa)	D1 = 50hPa Reporting Enabled
	Descent Phase 2 Observing Interval (D2)	Interval between observations during the second phase of the descent, representing the last N observations before touch down.	hPa (1- 99 hPa)	D2 = 10hPa Reporting Enabled
	Trigger Level 1 (TL1)	The pressure level at which the interval between observations changes from D1 to D2.	hPa	TL1 = 700hPa,

	Trigger Level 2 (TL2)	The pressure level at which the interval between observations changes from A2 to L1, or L1 to D1.	hPa *or* feet	For Ascent TL2 = 500hPa or 20,000ft which ever has the higher altitude
				For Descent TL2 = 20,000ft

2.1.1.2. Observing During Descent Phase 2

The Final Transmission after Landing: Although throughout descent phase 2 observations should be observed at the D2 observing interval (default 10 seconds), only the most recent N observations (default 10) should be stored. These will then be transmitted as soon as the aircraft touches down.

The Remaining Part of the Descent: As it is unlikely that these N observations will cover the entire descent from TL1 (700hPa) to the ground. Before sending the final transmission it will be necessary to also transmit observations with an interval of D1 (50hPa) to cover that part of the descent from TL1 (700hPa) to the altitude of the highest of the final N observations.

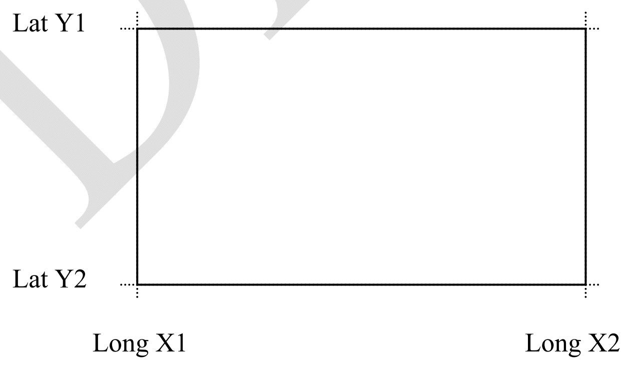
2.1.1.3. Continuous 7 Minute Observations

In addition to the observing frequencies specified for the ascent and descent phases above, observations should continue to be made every 7 minutes during all flight phases, excluding the descent below TL1 (700hPa) to ensure that this minimum observing interval is continued should the aircraft temporarily revert to level flight.

2.1.2. Geographical and Time Limiting Function

2.1.2.1. Geographical Data Control Boxes

Two values for latitude and two values for longitude in degrees and minutes should be used to describe each box, as shown below:



The area will always be defined as that between X1 to X2 in an easterly direction, and Y1 to Y2 in a southerly direction, thus enabling a box to be wrapped around the globe (20E-20W, 20N-80S for example). The order of priority for these boxes should be from 1 to 4 (or more if implemented), thus allowing a large area to be enabled for reporting using box 4 and a smaller region to be disabled within this area using box 3 for example.

It should be possible to define these boxes by remote uplink command. Default settings will be as follows:

Box	Lat Y1	Lat Y2	Long X1	Long X2	Status
1	90°00'N	90°00'N	180°00'W	180°00'E	Disable Reporting
2	90°00'N	90°00'N	180°00'W	180°00'E	Disable Reporting
3	90°00'N	90°00'N	180°00'W	180°00'E	Disable Reporting
4	90°00'S	90°00'N	180°00'W	180°00'E	Disable Reporting

This will ensure that should the aircraft revert to default settings no further observations will be received until it has been re-configured.

2.1.2.2. The Time Limiting Function

It should be possible to programme a single time window during which observations will be generated and outside which, observing will be disabled.

This should allow the specified period to cross 00Z (i.e. 22Z to 05Z). Two time values in hours and minutes should specify the time window. The default setting should be 00:00 - 23:59.

2.1.3. Airport Specific Reporting

The software should include the facility to list 50 airports around which profile reporting (ascent and descent phases) can either be enabled or disabled. The settings applied to these 50 specific locations should take priority over the geographical box configurations.

Each airport will be described by a four letter ICAO airport designator, configurable manually within the software or by uplink command. When programming each location, a flag should also be set to control whether observing during ascent and descent from this location should be activated or deactivated.

2.2. AMDAR Data

2.2.1. Parameter Ranges

The following out of range checks, based on those defined for ASDAR, are recommended. If no valid sample is achieved then the data should be invalidated as specified in section 2.2.3.

Parameter	Range
Latitude	90°S to 90°N
Longitude	180°E to 180°W
Indicated Height (Pressure altitude)	-1,000 to 50,000 feet
Time in HHMMss (GMT)	00:00:00 – 23:59:59
Static Air Temperature	-99°C to +99°C
Roll angle	-180° to 180°
Normal Acceleration	-3g to +6g
Wind speed	0 to 800 knots
Wind Direction (True)	0° to 360°

2.2.2. Smoothing Function

The smoothing function applied by the ASDAR software results in the following parameters having the averaging periods indicated below, which should be compliant with the AAA AMDAR software output.

Parameter	Averaging Period Ascent & Descent Phases	Averaging Period Level flight Phase	Sampling Frequency
Wind speed	10 seconds	30 seconds	1 Hertz
Wind direction	10 seconds	30 seconds	1 Hertz
Static air temperature	10 seconds	30 seconds	1 Hertz
Flight level	10 seconds	30 seconds	1 Hertz
Turbulence *	10 seconds	10 seconds	1 Hertz
Horizontal position	No averaging	No averaging	1 Hertz

* See section 2.2.4

2.2.3. Missing or Invalid Data

All missing or invalid data will be coded as solidi in accordance with the table below (the term 'solidi' refers to the '/' character.):

Parameter	If Missing / Invalid
Latitude	Code Latitude as solidi
Longitude	Code Longitude as solidi
Indicated Height (Pressure altitude)	Code pressure altitude as solidi
Time in HHMMss (GMT)	Code time as solidi
Static Air Temperature	Code air temperature as solidi
Roll angle	Code wind data as solidi if Roll angle missing or > 5 deg
Normal Acceleration	Code turbulence as solidi
Wind speed	Code wind data (speed & direction) as solidi
Wind Direction (True)	Code wind data (speed & direction) as solidi

2.2.4. DEVG Algorithm

The information below is an extract from the Australian Department of Defence, Structures Report 418, "The Australian Implementation of AMDAR/ACARS and the use of Derived Equivalent Gust Velocity as a Turbulence Indicator", Douglas J. Sherman, 1985.

The velocity of the derived equivalent vertical gust, U_{de}, (in tenths of metres per second) may be calculated by the formula:

$$U_{de} = \frac{10Am|\Delta n|}{V}$$

where $|\Delta n| =$ peak modulus value of deviation of aircraft normal acceleration from 1g in units of g.
m = total aircraft mass in (metric) tonnes
V = calibrated airspeed at the time of occurrence of the acceleration peak, in knots.
A = An aircraft specific parameter which varies with flight conditions, and may be approximated by the following formulae:

$$A = \overline{A} + c_4(\overline{A} - c_5)\left(\frac{m}{\overline{m}} - 1\right)$$

$$\overline{A} = c_1 + \frac{c_2}{c_3 + H(kft)}$$

= Value of A when mass of aircraft equals reference mass

H = altitude in thousands of feet

$\overline{m}$ = Reference mass of aircraft in (metric) tonnes

2.2.4.1. Computation of Derived Equivalent Gust Velocity

The parameters $c_1, c_2, \ldots, c_5$ depend on the aircraft's typical flight profile which may be expressed in the form: *take off at speed V_1, accelerate to calibrated air speed V_c by height h_1 and maintain the lesser of V_c or mach M_c to cruise altitude h_c. (Reverse the procedure during descent.)*

For various aircraft, the appropriate constants, based on the flight profiles indicated, are shown in the table below:

Aircraft	V_1	V_c	M_c	h_1	h_c	$\overline{m}$	c_1	c_2	c_3	c_4	c_5
	knot	knot	Mach	ft	ft	Tonne			kft		
A300B4	130	300	0.78	5000	30000	120	0.971	2690	79	0.49	19.6
A310	130	300	0.78	5000	35000	120	19.6	574	32	0.52	23.5
A318	120	300	0.78	5000	35000	40	34.7	878	28	0.52	40.3
A319	120	300	0.78	5000	35000	50	33.9	846	29	0.45	39.6
A320-200	120	300	0.78	5000	35000	55	35.9	771	27	0.44	40.7
A321	120	300	0.78	5000	35000	60	34.8	716	28	0.41	39.3
A330-200	120	300	0.82	5000	35000	170	5.88	1010	55	0.44	13.7
A330-300	120	300	0.82	5000	35000	170	5.89	1010	54	0.44	13.6
A340-200	120	300	0.82	5000	35000	190	6.36	949	54	0.41	13.7
A340-300	120	300	0.82	5000	35000	190	6.34	948	54	0.41	13.6
B727	120	300	0.84	5000	30000	50	6.45	4580	83	0.54	37.3
B737-200	120	300	0.73	3000	35000	30	62.0	351	14	0.64	59.4
B737-300	120	300	0.73	3000	35000	40	56.4	328	15	0.56	54.7
B737-400	120	300	0.73	3000	35000	40	56.3	329	15	0.56	54.5
B737-500	120	300	0.75	3000	35000	40	56.4	303	14	0.57	54.3
B737-600	120	300	0.78	3000	35000	40	45.4	420	18	0.57	45.3
B737-700	120	300	0.78	3000	35000	50	42.4	374	19	0.54	42.4
B737-800	120	300	0.78	3000	35000	50	42.2	350	18	0.57	41.9
B747-200	140	300	0.85	5000	40000	250	-2.41	2230	97	0.65	11.5
B747-300	140	300	0.85	5000	40000	200	2.27	1630	81	0.69	13.3
B747-400	140	300	0.85	5000	40000	250	-7.78	3260	120	0.62	10.2
B747SP	140	300	0.85	5000	40000	250	7.44	644	48	0.74	12.4
B757-200	140	300	0.8	3000	40000	100	29.2	298	22	0.55	30
B757-300	140	300	0.8	3000	40000	100	28.9	292	21	0.55	29.7
B767-200	140	300	0.8	3000	40000	110	12.8	918	46	0.65	19.8
B767-300	140	300	0.8	3000	40000	100	13.1	821	42	0.69	19.4
B767-400	140	300	0.8	3000	40000	150	12.9	701	45	0.54	18.3
B777-200	140	300	0.82	3000	40000	170	12.6	198	21	0.72	13.0
B777-300	140	300	0.82	3000	40000	210	13.1	147	19	0.65	12.9
BAC111-200	120	280	0.7	3000	30000	30	55.8	924	27	0.54	60.1
BAC111-475	120	280	0.7	3000	30000	30	50.6	930	28	0.54	55.3
DC10-30	150	300	0.82	5000	30000	200	-6.45	4080	130	0.56	15.0
Electra	100	350	0.7	5000	30000	30	48.9	220	9.1	0.57	41.2
Fokker-100	130	280	0.7	3000	30000	35	52.9	917	27	0.52	57.2
KingAir 100	110	200	0.6	9000	25000	3	70.6	2280	89	0.74	223.
L1011-500	120	300	0.83	5000	35000	150	11.7	712	47	0.59	17.1

2.2.4.2. Measurement of deviation of aircraft normal acceleration Δn

AMDAR must sample the aircraft normal acceleration frequently enough to accurately detect a maximum value. Based on the method employed by the Australian Bureau of Meteorology the following is recommended:

Parameter	Averaging Period Ascent & Descent Phases	Averaging Period Level flight Phase	Sampling Frequency
Aircraft normal acceleration	No averaging	No averaging	8 Hertz

The figure should represent calculated value of U_{de} based on peak modulus value of deviation of aircraft normal acceleration from the calibration value of the aircraft's sensor (close to 1.0g) since the time of the last observation. The value of Δn recorded at the time of touch down must be ignored.

2.3. AMDAR Reports

2.3.1. Version Control

Each variation of the AMDAR format generated by the different versions will be clearly labelled at the beginning of the AMDAR transmission in the following manner:

Label	Software Version
AMDAR	AAA AMDAR Software version 1, written to ASDAR Engineering Requirements Specification, Issue 9, October 1994.
AMDAR1	AAA AMDAR Software version 1.1 (Modified version of the AAA AMDAR Software for British Airways aircraft only. Generates a compressed message)
AMDAR2	AAA AMDAR Software Version 2
AMDAR3	AAA AMDAR Software Version 3 (this specification)

2.3.2. Transmission of the AMDAR Reports

AMDAR bulletins should be generated as independent ACARS transmissions, separate from other types of messages generated by the aircraft. As each AMDAR transmission from the aircraft must be of a fixed length, once the first observation has been made the report should be completed by making the next 7 observations before checking the geographical position or time to determine whether observing should continue. In the event of the aircraft landing before a complete set of observations have been made the report will be padded out with the "/" character.

2.3.3. Observation Report Format

2.3.3.1. Aircraft and Flight Header Information

The first 2 lines of a report will be of the format

```
AAAABBBB
AMDAR3ZZZZZZ
```

	Definition	Length (chars)
AAAA	ICAO code for departure airport	4
BBBB	ICAO code for arrival airport	4
AMDAR3	Identifies version of AMDAR used	6
ZZZZZZ	Aircraft Designator	6

2.3.3.2. Observation Data

Below is shown the observation encoding format, both the first and the subsequent observations. The valid value range for each field, and the number of characters required to encode the value are also presented. Note, that most values (with the exception of single character values) are base40 encoded (refer section 3), hence in the example report which follows the values are unintelligible.

Note also that fields having erroneous values are filled with forward slash ("/") characters (see section 2.2.3), and leading <space> characters to pad portions of the value which are unused.

```
PYYYXXXTTTTTaaaeeddssvvwwwqPyyxxtttaaaeeddssvvwwwq
PyyxxtttaaaeeddssvvwwwqPyyxxtttaaaeeddssvvwwwq
PyyxxtttaaaeeddssvvwwwqPyyxxtttaaaeeddssvvwwwq
PyyxxtttaaaeeddssvvwwwqPyyxxtttaaaeeddssvvwwwq
```

Line 1: Contains the first (having the absolute values) and the second observations. Total line length is 50 (27+23) characters.

Lines 2,3 and 4: Each have two observations. Total line length is 46 (23+23) characters.

	Definition	Units	Range	Length (chars)
P	Observation profile type		A=Ascent D=Descent R=Level Flight W=Highest Wind[2] U=Unstable[3] E=Error in previous obs.	1
YYY	Reference Latitude	Minutes	-5400 to +5400	3
XXX	Reference Longitude	Minutes	-10800 to + 10800	3
TTTTT	Seconds into the Month	Seconds	0 to 2,678,399	5
aaa	Altitude	10 feet	-100 to 6,000	3
ee	Temperature	0.1 Degrees C	-800 to +799	2
dd	Wind Direction	Degrees	0 to 360	2
ss	Wind Speed	Knots	-799 to +800	2
vv	Maximum Derived Equivalent Vertical Gust (DEVG)	0.1m/s	0 to 800	2
www	Water Vapour	0.001g/kg		3

[2] Observations of wind speed maxima will only be reported when all of the following apply
a) The ambient pressure is lower than 600 hPa,
b) The aircraft is in level flight,
c) The wind speed exceeds 60 knots absolute,
d) The wind speed exceeds by 10 knots or more the value observed at the previous routine observation,
e) The wind speed exceeds by 10 knots or more the value observed at the subsequent routine observation.

[3] Unstable flight shall be defined as any period when:
a). The roll angle is in error or exceeds +/- 5 deg,
or
b). If the flight level data is lost.

q	Water Vapour Quality		0 to 9, or /	1
yy	Relative Latitude (to the previous observation)	Minutes	-800 to +799	2
xx	Relative Longitude (to the previous observation)	Minutes	-800 to + 799	2
ttt	Relative Time (to the previous observation)	Seconds	0 to 31,999	3

<u>Example</u>

```
- YMMLYPAD
AMDAR3AU0137
RINZPF: YZ9FLAED5RT U L///9R .IM UKM335UQEKQ M///9
R -IN UKM9.5PQJLB K///9R -IO UKMA05-QFLC K///9
RKPIT UKMA067QHLI K///9RKTI: UKLH3BXRAKL K///9
D S 7 NFL64EGS5 . K///9D P F LXL0AF:R-KM K///9
```

Type	Characters	Value
Departure Airport	YMML	ICAO Code for Melbourne, Australia
Arrival Airport	YPAD	ICAO Code for Adelaide, Australia
AMDAR Version	AMDAR3	AMDAR version 3 (i.e. This version)
Aircraft Designator	AU0137	Aircraft from the Australian AMDAR “fleet”

Type	Characters	Value
Observation Profile Type	R	Level Flight
Reference Latitude	INZ	-2245 Minutes = -34.4167 degrees
Reference Longitude	PF:	8636 Minutes = 143.9333 degrees
Seconds into the Month	(space)YZ9F	952375 seconds The message was received in August, so this corresponds to 00:32:55 on 12th August
Altitude	LAE	2014 x 10 feet = 20140ft
Temperature	D5	-275 x 0.1 degrees = -27.5C
Wind Direction	RT	309 degrees
Wind Speed	(space)U	10 knots
Max DEVG	(space)L	1 x 0.1 m/s = 0.1m/s
Water Vapour	///	Not installed
Water Vapour Quality	9	

Type	Characters	Value
Observation Profile Type	R	Level Flight
Relative Latitude	(space).	+19 Minutes = 0.3167 degrees. New Latitude = Old Latitude + Relative Latitude Change = -34.4167 + 0.3167 = -34.1000 Degrees

Relative Longitude	IM	-58 Minutes = - 0.9667 degrees New Longitude = Old Longitude + Relative Longitude Change = 143.9333 – 0.9667 = 142.9667 Degrees
Relative Time	(space)UK	420 seconds New Time = Old Time + Relative Time Change = 952375 + 420 seconds = 00:39:55 12th August
Altitude	M33	3323 x 10 feet = 33230 ft
Temperature	5U	-570 x 0.1 degrees = -57.0C
Wind Direction	QE	254 degrees
Wind Speed	KQ	26 knots
Max DEVG	(space)M	2 x 0.1 m/s = 0.2 m/s
Water Vapour	///	Not installed
Water Vapour Quality	9	

2.3.4. Status Report Format

The first 14 characters of the message's free text portion are `-<space>AMDARSTATUS3`.

The Status message format is presented below. Note, that unlike the Observation Report message there is no base40 encoding and so the values of the example message are human readable.

- AMDARSTATUS3 $I_A I_A I_A I_A I_A I_A I_A I_A$
A$S_A Int_{A1}$/Int_{A2} **R**$S_R Int_R$ **D**$S_D Int_{D1}$/Int_{D2}
T1T_{L1} **T2**T_{L2} N
SInt_S **SP**Int_{TP} **SC**Int_{TC} **SD**Int_{TD} **I**Int_I
B0 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B1 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B2 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B3 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B4 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B5 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B6 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B7 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B8 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
B9 Lat_1/$Long_1$ Lat_2/$Long_2$ S_B
A1 $ICAO_N$/S_A **A11**$ICAO_N$/S_A **A21**$ICAO_N$/S_A **A31**$ICAO_N$/S_A **A41**$ICAO_N$/S_A
A2 $ICAO_N$/S_A **A12**$ICAO_N$/S_A **A22**$ICAO_N$/S_A **A32**$ICAO_N$/S_A **A42**$ICAO_N$/S_A
A3 $ICAO_N$/S_A **A13**$ICAO_N$/S_A **A23**$ICAO_N$/S_A **A33**$ICAO_N$/S_A **A43**$ICAO_N$/S_A
A4 $ICAO_N$/S_A **A14**$ICAO_N$/S_A **A24**$ICAO_N$/S_A **A34**$ICAO_N$/S_A **A44**$ICAO_N$/S_A
A5 $ICAO_N$/S_A **A15**$ICAO_N$/S_A **A25**$ICAO_N$/S_A **A35**$ICAO_N$/S_A **A45**$ICAO_N$/S_A
A6 $ICAO_N$/S_A **A16**$ICAO_N$/S_A **A26**$ICAO_N$/S_A **A36**$ICAO_N$/S_A **A46**$ICAO_N$/S_A
A7 $ICAO_N$/S_A **A17**$ICAO_N$/S_A **A27**$ICAO_N$/S_A **A37**$ICAO_N$/S_A **A47**$ICAO_N$/S_A
A8 $ICAO_N$/S_A **A18**$ICAO_N$/S_A **A28**$ICAO_N$/S_A **A38**$ICAO_N$/S_A **A48**$ICAO_N$/S_A

A9 ICAO$_N$/S$_A$ **A19**ICAO$_N$/S$_A$ **A29**ICAO$_N$/S$_A$ **A39**ICAO$_N$/S$_A$ **A49**ICAO$_N$/S$_A$
A10ICAO$_N$/S$_A$ **A20**ICAO$_N$/S$_A$ **A30**ICAO$_N$/S$_A$ **A40**ICAO$_N$/S$_A$ **A50**ICAO$_N$/S$_A$

	Definition	Units	Range
$I_AI_AI_AI_AI_AI_A$	AMDAR Aircraft Identifier		
S_A	Ascent Phase Reporting Status		R = Active D = Disabled
Int_{A1}	Observing pressure interval during Ascent Phase A1*	hPa	Integer (1-99)
Int_{A2}	Observing pressure interval during Ascent Phase A2*	hPa	Integer (1-99)
S_R	Level Flight Phase Reporting Status		R = Active D = Disabled
Int_R	Observing time interval during level flight	seconds	Integer
S_D	Descent Phase Reporting Status		R = Active D = Disabled
Int_{D1}	Observing pressure interval during Descent Phase D1*	hPa	Integer (1-99)
Int_{D2}	Observing pressure interval during Descent Phase D2*	hPa	Integer (1-99)
T_{L1}	Trigger Level 1 (TL1)*	hPa	Integer
T_{L2}	Trigger Level 2 (TL2)*	hPa	Integer
N	Number of observations made during intervals A1 and A2		Integer
Int_s	Smoothing Method		0 = None 1 = ASDAR 2 = Arithmetic Mean
Int_{TP}	Profile time constant for smoothing		Integer
Int_{TC}	Cruise time constant for smoothing		Integer
Int_{TD}	Time constant for DEVG		Integer
Int_I	Instantaneous time constant		Integer
Bi	Lat/Long Box Number i		Integer
Lat_1	Latitude Value Y1 for box i (see 2.1.2.1)	Minutes	-5400 minutes=90 S
$Long_1$	Longitude Value X1 for box i (see 2.1.2.1)	Minutes	9600 minutes = 160E
Lat_2	Latitude Value Y2 for box i (see 2.1.2.1)	Minutes	
$Long_2$	Longitude Value X2 for box i (see 2.1.2.1)	Minutes	
S_B	Status of reporting box		1 = Active 0 = Disabled
ICAO	Airport ICAO Identifier		4 Characters
S_A	Status at Airport		1 = Active 0 = Disabled

* See definitions in 2.1.1

<u>Example</u>

```
- AMDARSTATUS3 AU0115
AD10/50 RR421 DR50/10
T1 690 T2 500
S2 SP1 SC5 SD5 I1
B0 0/ 5400 -5399/ 9600 1
B1 0/ 9600 -3000/ -9600 1
B2 0/ 0 0/ 0 0
B3 0/ 0 0/ 0 0
B4 0/ 0 0/ 0 0
B5 0/ 0 0/ 0 0
B6 0/ 0 0/ 0 0
B7 0/ 0 0/ 0 0
B8 0/ 0 0/ 0 0
B9 0/ 0 0/ 0 0
A1 YPDN/0 A110000/0 A210000/0 A310000/0 A410000/0
A2 WSSS/1 A120000/0 A220000/0 A320000/0 A420000/0
A3 0000/0 A130000/0 A230000/0 A330000/0 A430000/0
A4 0000/0 A140000/0 A240000/0 A340000/0 A440000/0
A5 0000/0 A150000/0 A250000/0 A350000/0 A450000/0
A6 0000/0 A160000/0 A260000/0 A360000/0 A460000/0
A7 0000/0 A170000/0 A270000/0 A370000/0 A470000/0
A8 0000/0 A180000/0 A280000/0 A380000/0 A480000/0
A9 0000/0 A190000/0 A290000/0 A390000/0 A490000/0
A100000/0 A200000/0 A300000/0 A400000/0 A500000/0
```

	Definition	Value
AU0115	AMDAR Aircraft Identifier	
D	Ascent Phase Reporting Status	Disabled
10	Observing pressure interval during Ascent Phase A1	(when ascent reporting is enabled) observations will be made at 10hPa pressure intervals during Ascent Phase A1
50	Observing pressure interval during Ascent Phase A2	(when ascent reporting is enabled) observations will be made at 50hPa pressure intervals during Ascent Phase A2
R	Level Flight Phase Reporting Status	Enabled
421	Observing time interval during level flight	An observation will be made very 421 seconds during level flight
R	Descent Phase Reporting Status	Enabled
50	Observing pressure interval during Descent Phase D1	observations will be made at 50hPa pressure intervals during Descent Phase D1
10	Observing pressure interval during Descent Phase D2	observations will be made at 10hPa pressure intervals during Descent Phase D2
690	Trigger Level 1	Trigger Level 1 (TL1) is at 690hPa
500	Trigger Level 2	Trigger Level 2 (TL2) is at 500hPa
	Number of observations made during intervals A1 and A2	0
2	Smoothing Method	Arithmetic Mean Smoothing in use.
1	Profile time constant for smoothing	

5	Cruise time constant for smoothing	
5	Time constant for DEVG	
1	Instantaneous time constant	
`B0 0/5400 -5399/9600 1`		Reporting is enabled in Lat/Lng Box 0, which lies between latitudes 0 and 89°59'S, and between longitudes 90W and 160W
`B1 0/9600 -3000/-9600 1`		Reporting is enabled in Lat/Lng Box 1, which lies between latitudes 0 and 50S, and between longitudes 160W and 160E
`A1 YPDN/0`		All reporting at YPDN (Darwin Australia) is disabled.
`A2 WSSS/1`		All reporting at WSSS (Changi Airport, Singapore) is enabled.

2.4. AMDAR Uplink Formats

2.4.1. Modify Profile Reporting

- **`XCM 99 METONOFU`** `y`

Where field values are:

y	Ascent Reporting	Level Flight Reporting	Descent Reporting
0	No	No	No
1	No	No	Yes
2	No	Yes	No
3	No	Yes	Yes
4	Yes	No	No
5	Yes	No	Yes
6	Yes	Yes	No
7	Yes	Yes	Yes

2.4.2. Amend Airport List

- **`XCM 99 AIRP`**`n`**`U`** `oooo` **`AP`**`n`**`FLAG`** `s`

n	Airport list number
oooo	Airport ICAO identifier
s	Reporting Status 1 = On 0 = Off

2.4.3. Amend Region List

- **XCM 99 X1BOX**n**U** *aa* **X2BOX**n**U** *bb* **Y1BOX***n***U** *cc* **Y2BOX**n**U** *dd*

n	Region list number
aa	First longitude boundary: -10799 to 10899 minutes
bb	Second longitude boundary: -10799 to 10899 minutes
cc	First latitude boundary: -5399 to 5399 minutes
dd	Second latitude boundary: -5399 to 5399 minutes

Note: This command defines the geographic box. A separate uplink (see section 2.4.4) is required to activate/deactivate the box.

2.4.4. Activation/Deactivation of a Geographic Box

- **XCM 99 BOX**n**USU** s

n	Region list number
s	Reporting Status 1 = On 0 = Off

2.4.5. Set Time Period

- **XCM 99 MTIMEONU** xxxx **MTIMEOFU** yyyy

xxxx	Start Time: eg. 2357 = 23:57 = 11:57pm
yyyy	Stop Time:

2.4.6. Status Request

- **XRP 626 0**

No parameters – use as above.

2.4.7. Set Smoothing Function

- **XCM 99 METSMTHU** m

m	Smoothing Method: 0 = None 1 = ASDAR 2 = Arithmetic Mean.

2.4.8. Set Profile Time Constant for Smoothing

- **XCM 99 METSPU** t

t	Profile Time Constant t = 0 to 15

2.4.9. Set Cruise Time Constant for Smoothing

- **XCM 99 METSCU** t

t	Cruise Time Constant t = 0 to 15

2.4.10. Set DEVG Time Constant for Smoothing

- **XCM 99 METSDU** t

t	DEVG Time Constant t = 0 to 15

2.4.11. Water Vapour Sensor Selection

- **XCM 99 METWVCFU** t

t	Sensor Selection: 0 = None (default) 1 = WVSSII 2 = Not Defined 3 = Not Defined

3. Appendix A: Base40

3.1. Character set

Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character
0	0	10	A	20	K	30	U
1	1	11	B	21	L	31	V
2	3	12	C	22	M	32	W
3	3	13	D	23	N	33	X
4	4	14	E	24	O	34	Y

Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character	Decimal value	Base40 ASCII character
5	5	15	F	25	P	35	Z
6	6	16	G	26	Q	36	:
7	7	17	H	27	R	37	,
8	8	18	I	28	S	38	-
9	9	19	J	29	T	39	.

3.2. Value range

Number of Base40 character	Minimum value	Maximum value
1	-20	19
2	-800	799
3	-32,000	31,999
4	-1,280,000	1,279,999
5	-51,200,000	51,199,999