



FDA Seminar – Miami  
25-27 October 2016

## FDA Limits

Capt Paul DUBOIS  
Manager SMS & FDA Assistance  
AIRBUS

# FDA Limits - Content

**1** How Data is recorded?

**2** Which parameters to record?

**3** What does recorded Data look like?

**4** How to make it readable in an FDA software?

# FDA Limits - Content

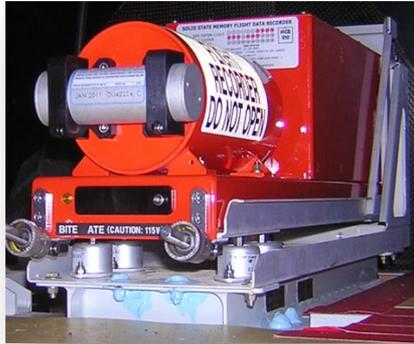
**1** How Data is recorded?

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# FDA Limits – How Data is recorded ?

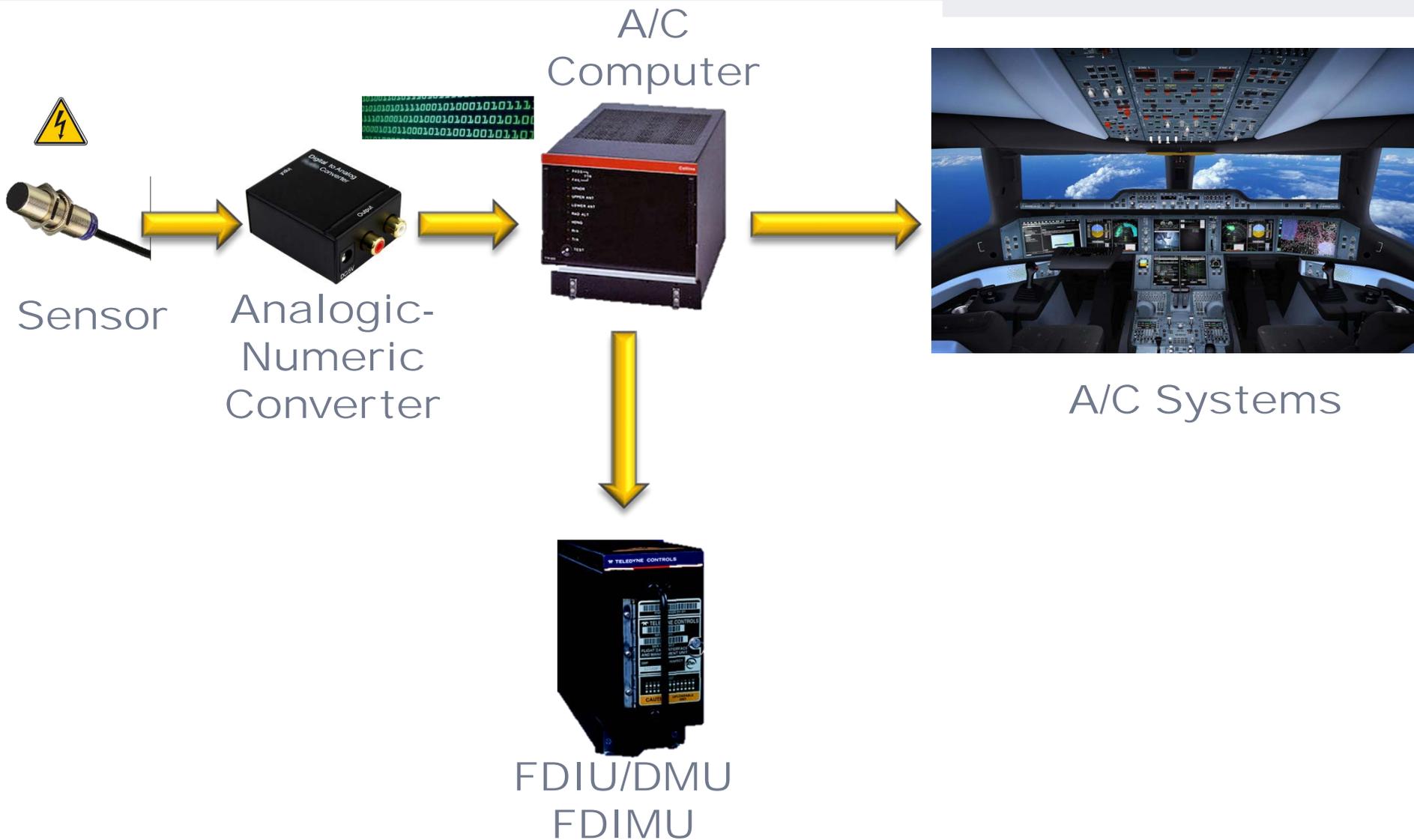


Flight Data Recorders (FDR) or Digital Flight Data Recorders (DFDR) are dedicated to accident investigation.

Flight Data Analysis programs extract data from easily accessible Quick Access Recorders (QAR).

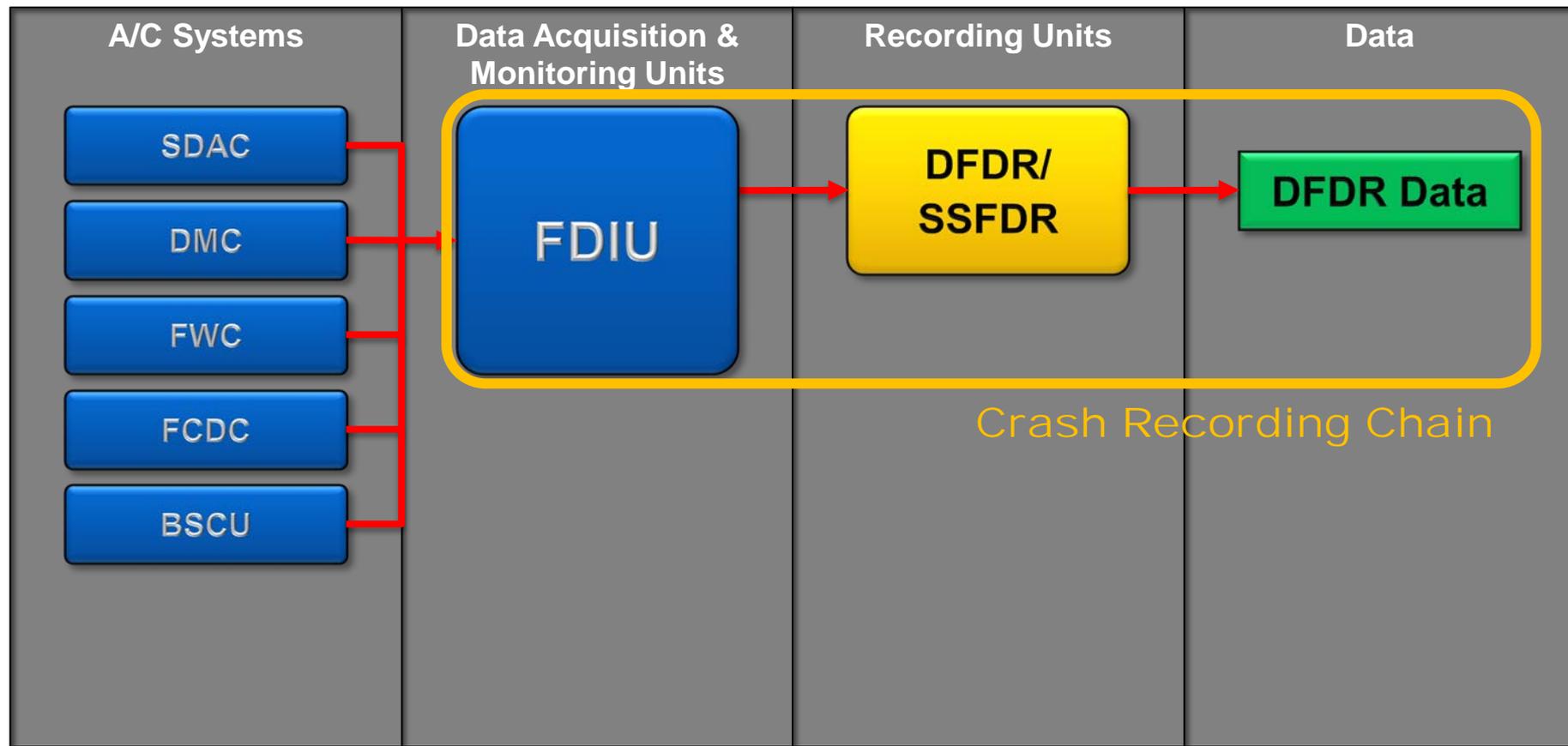


# FDA Limits – How Data is recorded ?



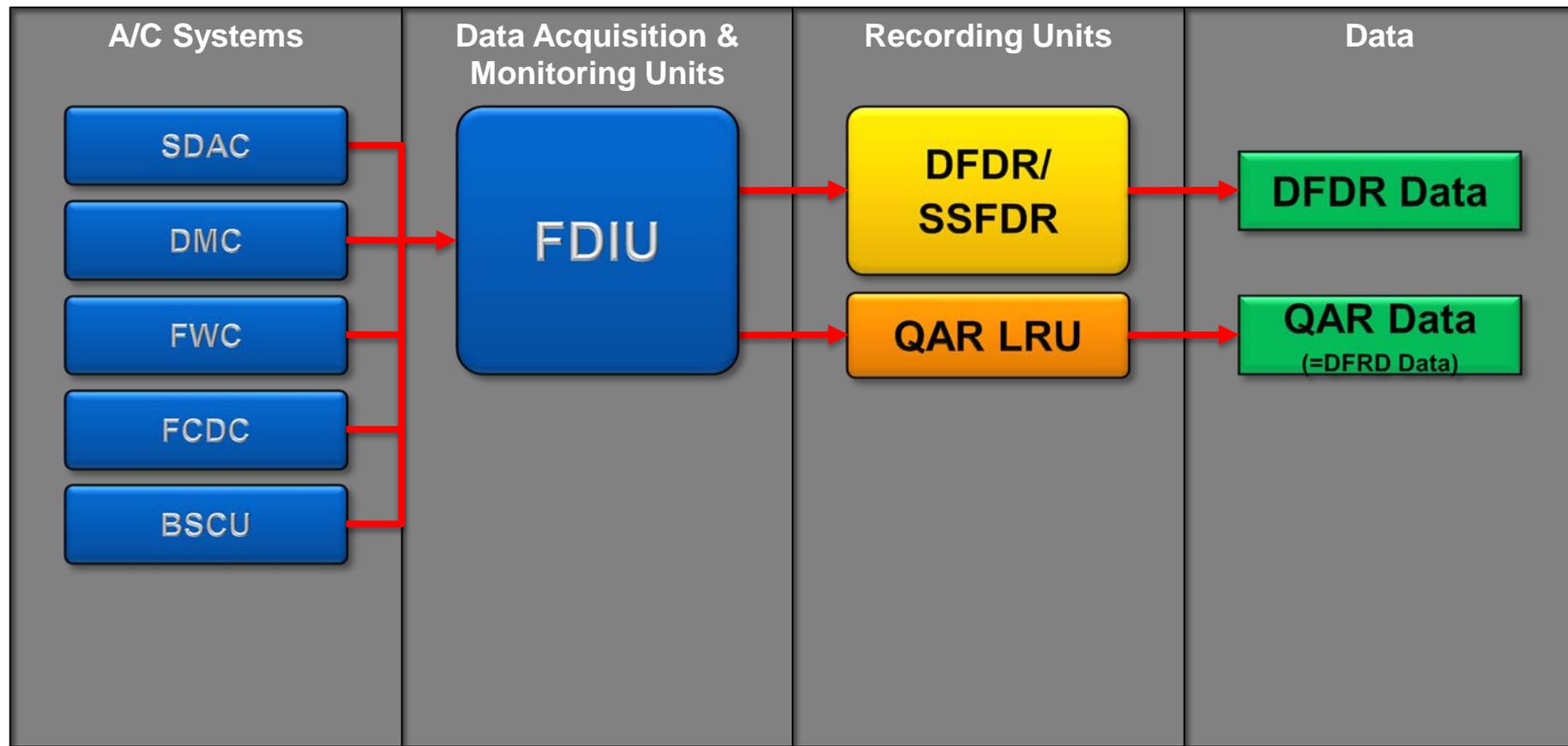
## FDA Limits – How Data is recorded ?

The FDIU (Flight Data Interface Unit) is in charge of picking parameters on the A/C ARINC network.



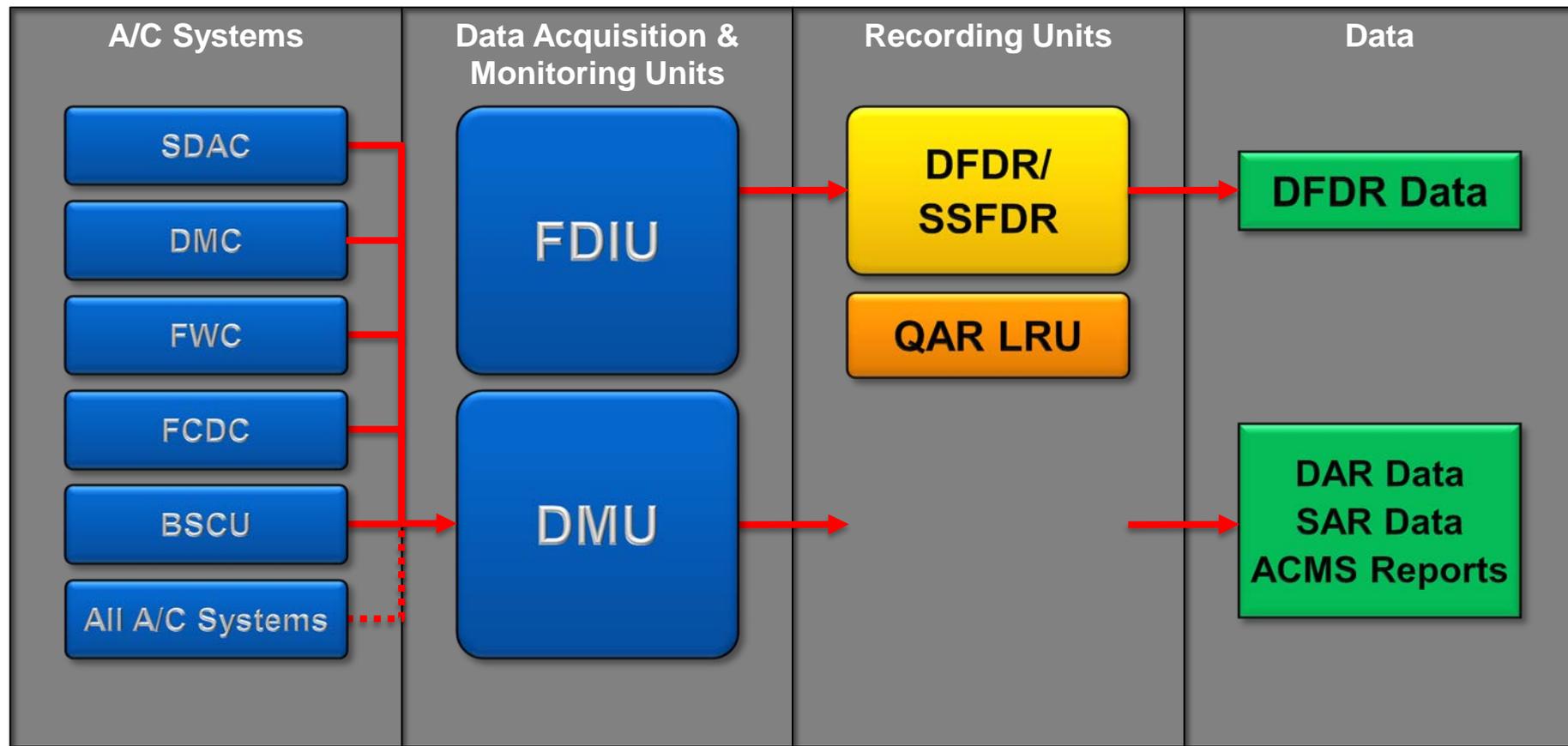
# FDA Limits – How Data is recorded ?

The FDIU provides the same Data to the DFDR and to a QAR LRU.



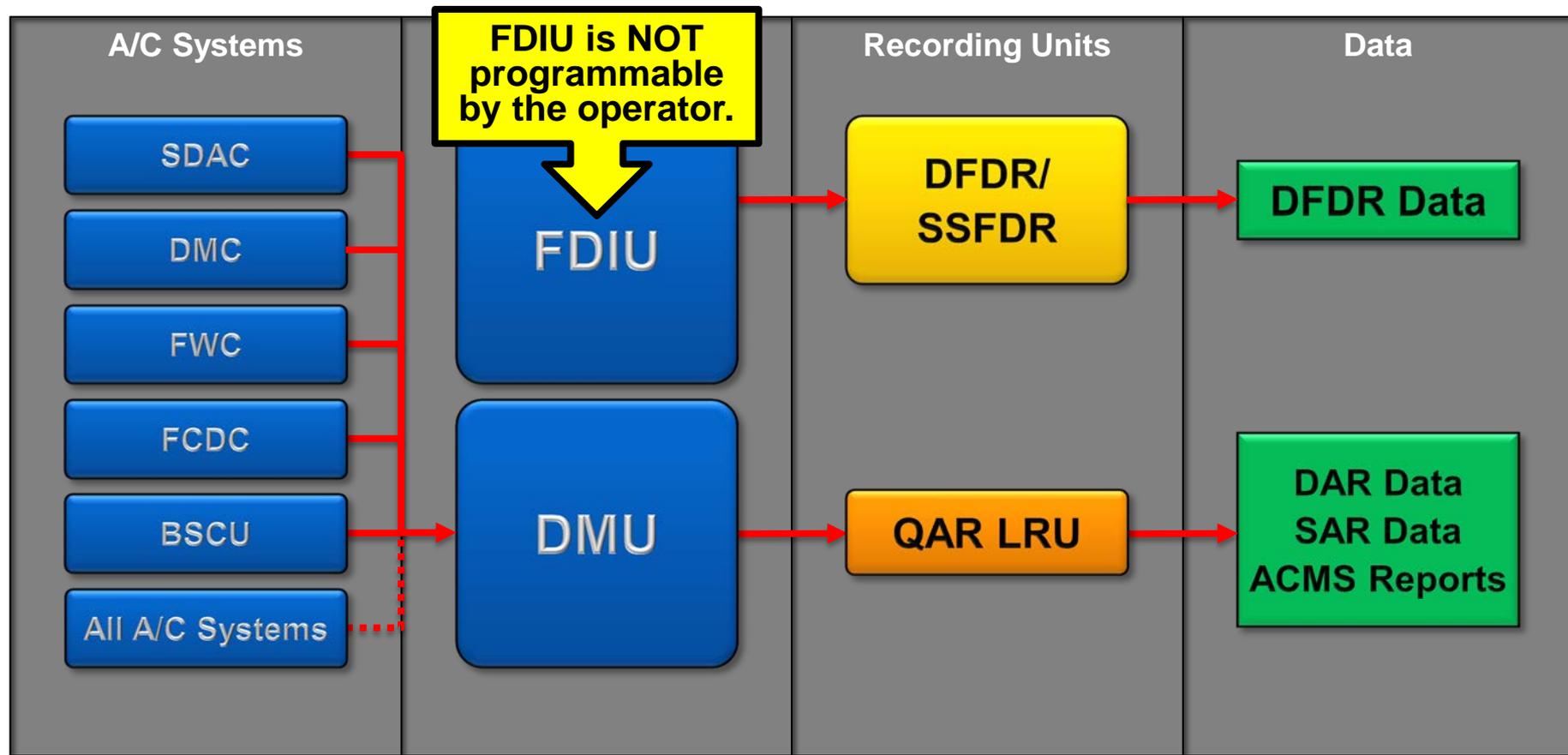
# FDA Limits – How Data is recorded ?

DAR Data stands for Digital ACMS Recorder Data  
DAR Data and QAR Data are used for FDA program.



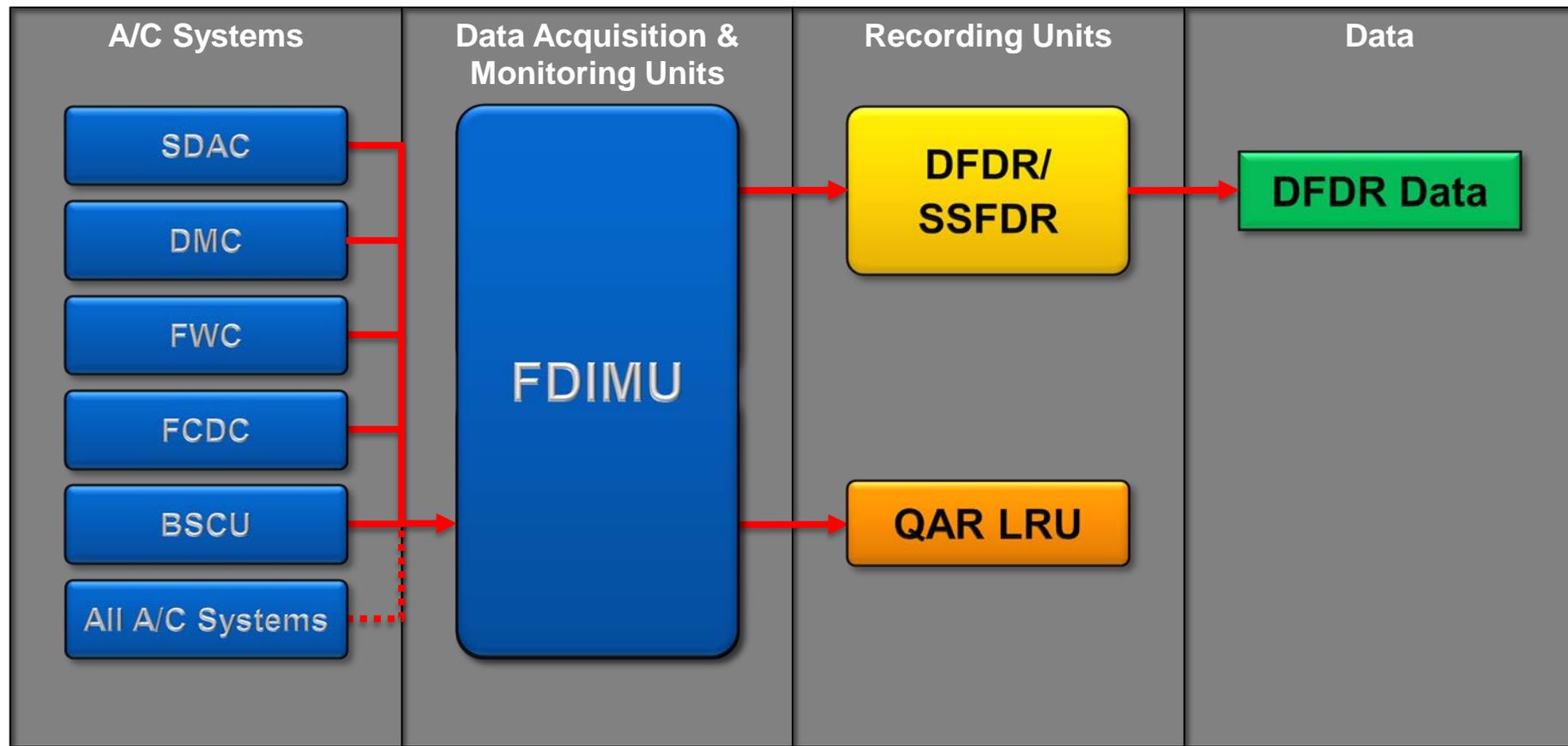
# FDA Limits – How Data is recorded ?

DMU can be programmed by an operator to record any convenient parameters provided available on the ARINC network.



# FDA Limits – How Data is recorded ?

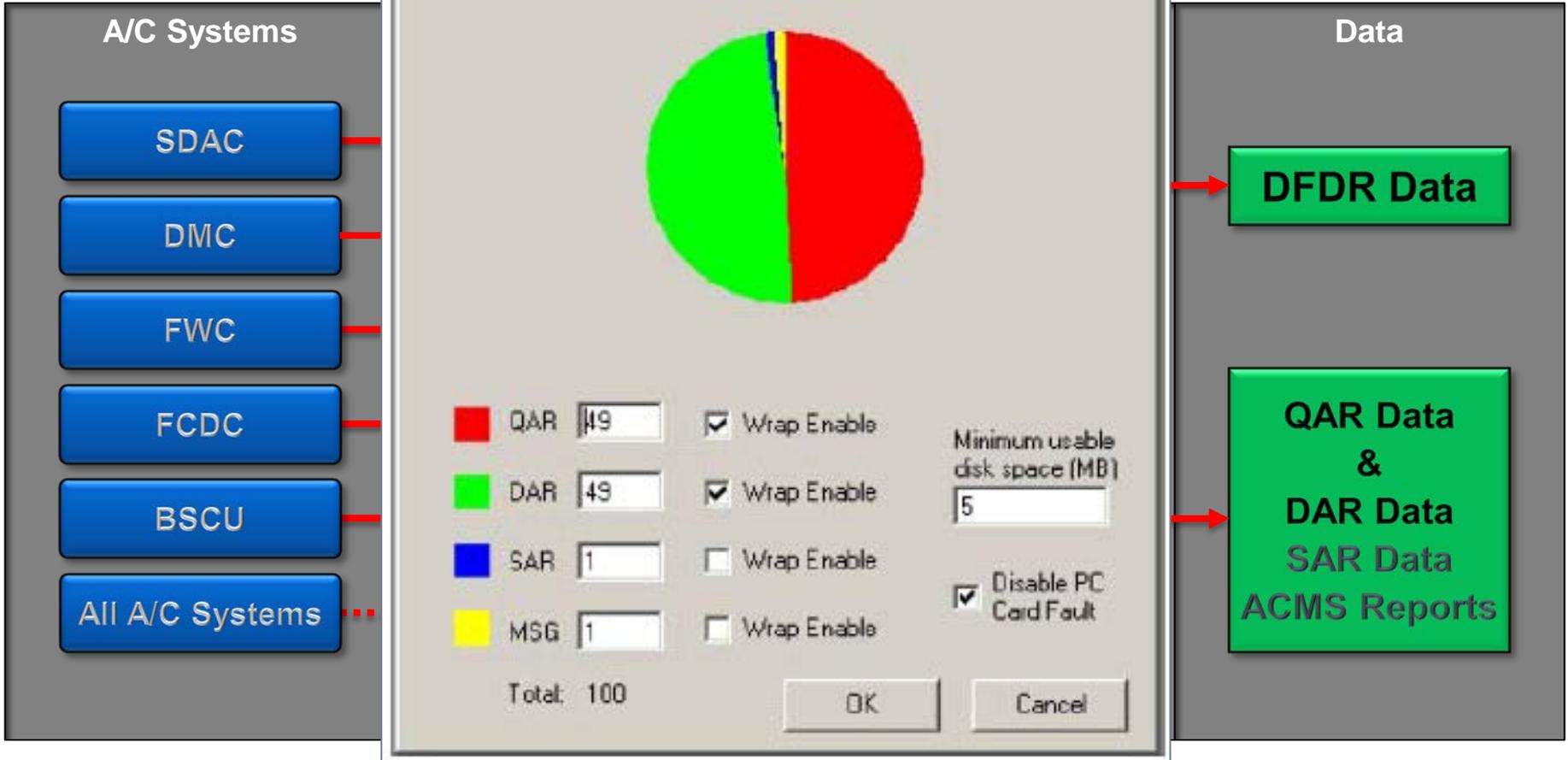
FDIU and DMU are often combined into a single equipment:  
FDIMU



# FDA Limits – How Data is recorded ?

In that case bo

be recorded



# FDA Limits – How Data is recorded ?

## Different Recording Systems

- Different Data Files
- Different decoding programs

## Different Parameter Sources

- Different raw parameter gross values

Homogeneity Issue

# FDA Limits - Content

1

How Data is recorded?

2

Which parameters to record?

3

What does recorded Data look like?

4

How to make it readable in an FDA software?

Table A8-1. Parameter Guidance for Crash Protected Flight Data Recorders

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GPS time sync)	24 hours	4	±0.125% per hour	1 second
2	Pressure-altitude	-300 m (-1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed	95 km/h (50 kt) to max $V_{So}$ (Note 1) $V_{So}$ to 1.2 $V_{D}$ (Note 2)	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)	360°	1	±2°	0.5°
5	Normal acceleration (Note 3)	-3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%	0.004 g
6	Pitch attitude	±75° or usable range whichever is greater	0.25	±2°	0.5°
7	Roll attitude	±180°	0.25	±2°	0.5°
8	Radio transmission keying	On-off (one discrete)	1		
9	Power on each engine (Note 4)	Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft
10*	Trailing edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
11*	Leading edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
12*	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)		
13*	Ground spoiler/speed brake selection (selection and position)	Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature	Sensor range	2	±2°C	0.3°C
15*	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretely	1		
16	Longitudinal acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
<i>Note.— The preceding 16 parameters satisfy the requirements for a Type II FDR.</i>					
17	Lateral acceleration (Note 3)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g

FDA Limits —

Regulation

➤ ICAO —

the DFDR

# FDA Limits – Which parameters to record ?

Regulations on parameters only concern the DFDR

➤ IC  
➤ E  
A

**Table 1: FDR**

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
1a or 1b	Time	24 hours	4	± 0.125 % per hour	1 second	(a) UTC time preferred where available.
<p><b>AMC2 CAT.IDE.A.190 Flight data recorder</b></p> <p>OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 APRIL 1998 AND BEFORE 1 JANUARY 2016</p> <p>(a) The operational performance requirements for FDRs should be those laid down in <u>EUROCAE Document ED-55</u> (Minimum Operational Performance Requirements For Flight Data Recorder Systems) dated May 1990, or <u>EUROCAE Document ED-112</u> (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including amendments n°1 and n°2, or any later equivalent standard produced by EUROCAE.</p>						
5	Normal acceleration	-3 g to +6 g	0.125	1 % of maximum range excluding a datum error of 5 %	0.004 g	The recording resolution may be rounded from 0.004 g to 0.01 g provided that one sample is recorded at full resolution at least every 4 seconds.
6	Pitch attitude	±75 degrees	0.25	±2 degrees	0.5 degrees	
7	Roll attitude	±180 degrees	0.5	±2 degrees	0.5 degrees	
8	Manual radio transmission keying	Discrete	1	-	-	Preferably each crew member but one discrete acceptable for all transmissions provided that the replay of a recording made by any required recorder can be synchronised in time with any other required recording to within 1 second.
9a	Propulsive thrust / power on each engine	Full range	Each engine each second	±2 %	0.2 % of full range	Sufficient parameters e.g. EPR/N, or Torque/NP as appropriate to the particular engine must be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
9b	Flight crew compartment thrust / power lever position	Full range	Each lever each second	±2 % or sufficient to determine any gated position	2 % of full range	Parameter 9b must be recorded for aeroplanes with non-mechanically linked cockpit-engine controls, otherwise recommended.

1391 CAT

AIR OPS CAT.IDE.A

AMC3 CAT.IDE.A.190 Flight data recorder

PERFORMANCE SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 APRIL 1998 AND BEFORE 1 JANUARY 2016

AIR OPS CAT.IDE.A.190 - May 2013

Amex V Part-CAT

port

# FDA Limits – Which parameters to record ?

**TABLE II-A.1: PARAMETERS TO BE RECORDED - AEROPLANES**

N°	Parameter	Minimum Recording Range (refer to para II-A.7)	Maximum recording interval in seconds (refer to para II-A.8)	Recording Accuracy (refer to para II-A.9)	Recording Resolution (refer to para II-A.11)	Remarks
1a or 1b 1c	Time Relative Time Count GPS Time Sync	24 hours 0 to 4095 Discrete	4 4 4	± 0.125% per hour ± 0.125% per hour	1 second	(a) UTC time preferred where available.  (b) Counter increments each 4 seconds of system operation.  (c) To establish whether the aircraft clocks are synchronised to GPS time
2	Pressure Altitude	- 1 000 ft to maximum certificated altitude of aircraft + 5 000 ft	1	±100 ft to ±700 ft Refer to Table II-A.3	5 ft	Refer to paragraph II-A.6.1
3	Indicated Airspeed or Calibrated Airspeed	50 kt or minimum value from installed pitot static system to Max V <sub>SO</sub>  Max V <sub>SO</sub> to 1.2 V <sub>D</sub>	1	± 5%  ± 3%	1 kt (0.5 kt recommended)	Refer to paragraph II-A.6.1
4	Heading (Primary flight crew reference)	0 - 360 degrees and discrete 'true' or 'mag'	1	± 2 degrees	0.5 degrees	When true or magnetic heading can be selected, the primary heading reference, a discrete indicating selection shall be recorded.
5	Normal Acceleration	- 3 g to + 6 g	0.125	± 0.09 g excluding a datum error of ±0.45 g	0.004 g	
6	Pitch Attitude	± 90 degrees	0.25	± 2 degrees	0.5 degree	Accuracy will be apply only within ± 75° range
7	Roll Attitude	± 180 degrees	0.5	± 2 degrees	0.5 degree	For a new aircraft type, an analysis should be performed by the aircraft manufacturer in order to assess if a shorter sampling interval is necessary to capture quick attitude variations in a dynamic sequence.
8	Manual Radio Transmission Keying and CVR/FDR synchronization reference	Discrete(s)	1	-	-	Preferably each crew member but one discrete acceptable for all transmissions provided the CVR/FDR system complies with paragraph 2-1.11 of Section 2 (including ATC/SATCOM communications)

# FDA Limits – Which parameters to record ?

Regulations on parameters only concern the DFDR

- ICAO - Annex 6 Part I – Aeroplanes  
Chapter 6 Para 6.3 - Appendix 8
- EASA - AIR OPERATIONS - Commercial Air Transport  
AMC CAT.IDE.A.190 Flight Data Recorder
- EUROCAE - ED-55 / ED-112 / ED-112 A  
MOPS for Crash Protected Airborne Recorder Systems
- FAR 121.334 Digital Flight Data Recorders

Appendix M to Part 121 - Airplane Flight Recorder Specifications

## FDA Limits – Which parameters to record ?

Airbus adds to these lists, parameters also required by Airbus Flight Safety and Airbus Handling Quality. All these parameters are mandatory parameters identified by an M.

M06a = Pitch Attitude

On the DFDR data frame there are also parameters recorded on request of Airbus internal stakeholders. They are called documentary parameters identified by a D.

D09 = Vertical Speed

## FDA Limits – Which parameters to record ?

For the DAR Data Frame there is no regulatory requirement but most of the previous parameters (Mandatory and Documentary) are recorded.

Standard DAR Data Frames exist but they are fully customizable by the operator.

These modifications will obviously affect the final picture of a flight into an FDA software.

# FDA Limits – Which parameters to record ?

More than 100 standards exist (QAR & DAR)

Homogeneity Issue

# FDA Limits - Content

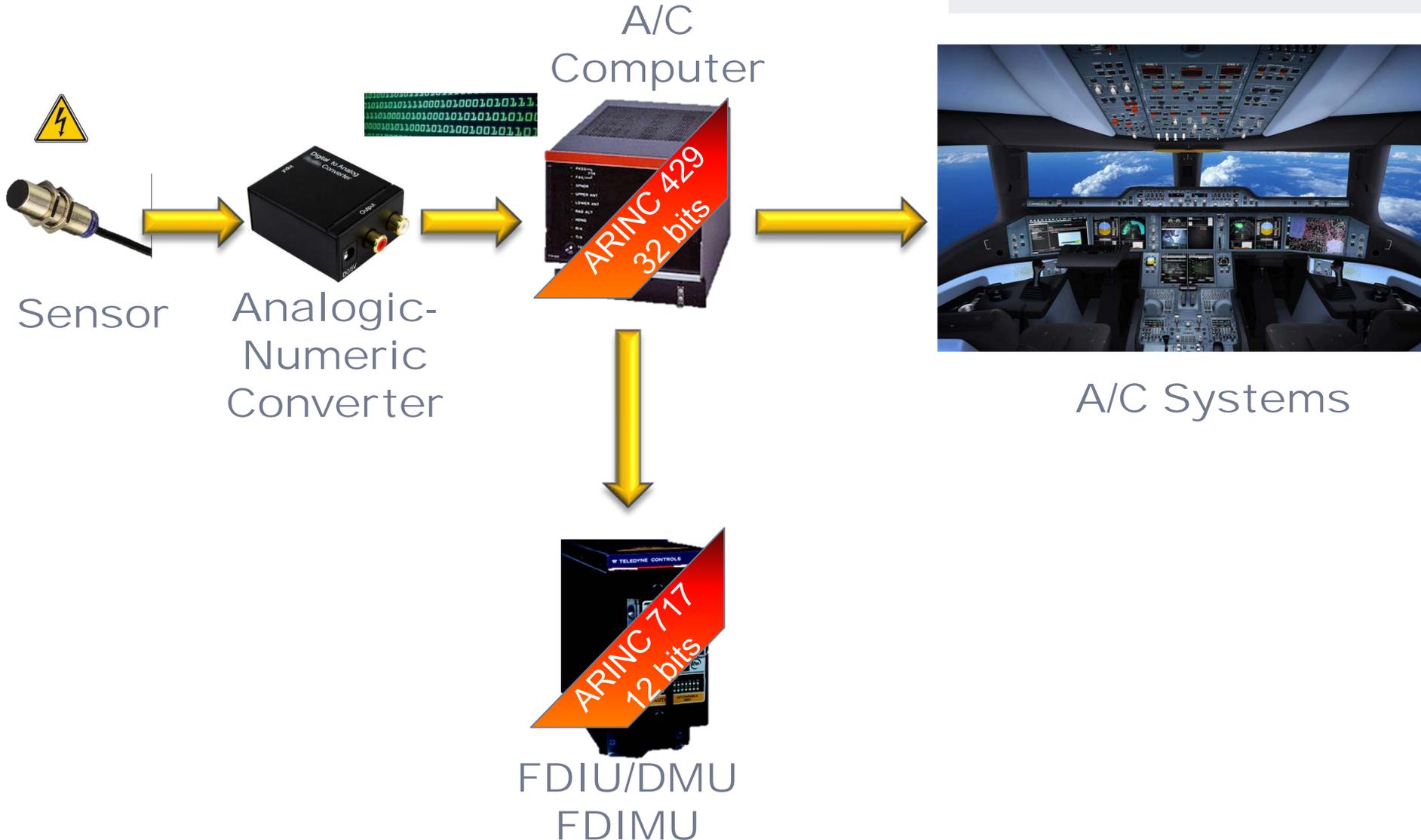
**1** How Data is recorded?

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# FDA Limits – What does recorded Data look like ?

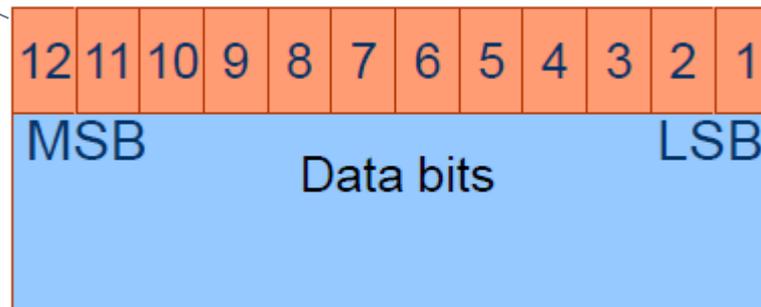


# FDA Limits – What does recorded Data look like ?

## ARINC 429

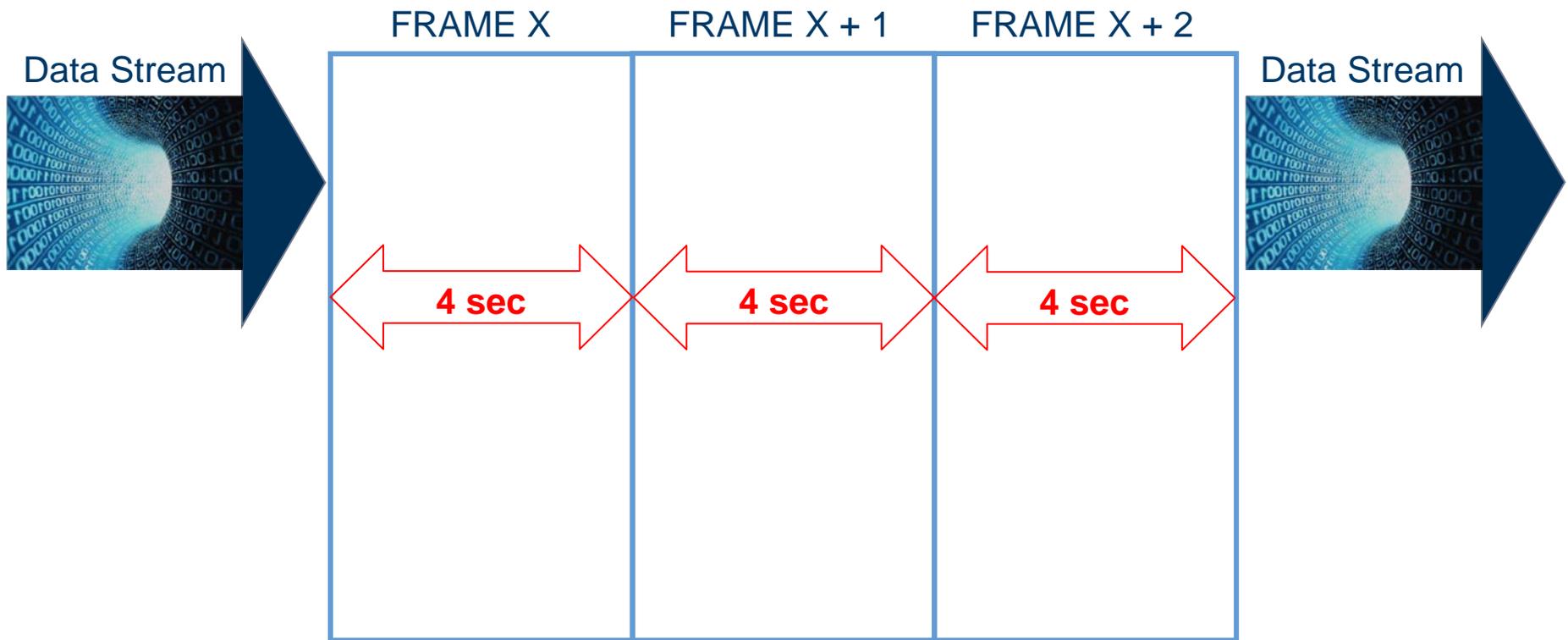


## ARINC 717



# FDA Limits – What does recorded Data look like ?

Either the FDIU or the DMU sends continuous Data Blocks containing 4 seconds of flight Parameters.  
One block is called a frame.



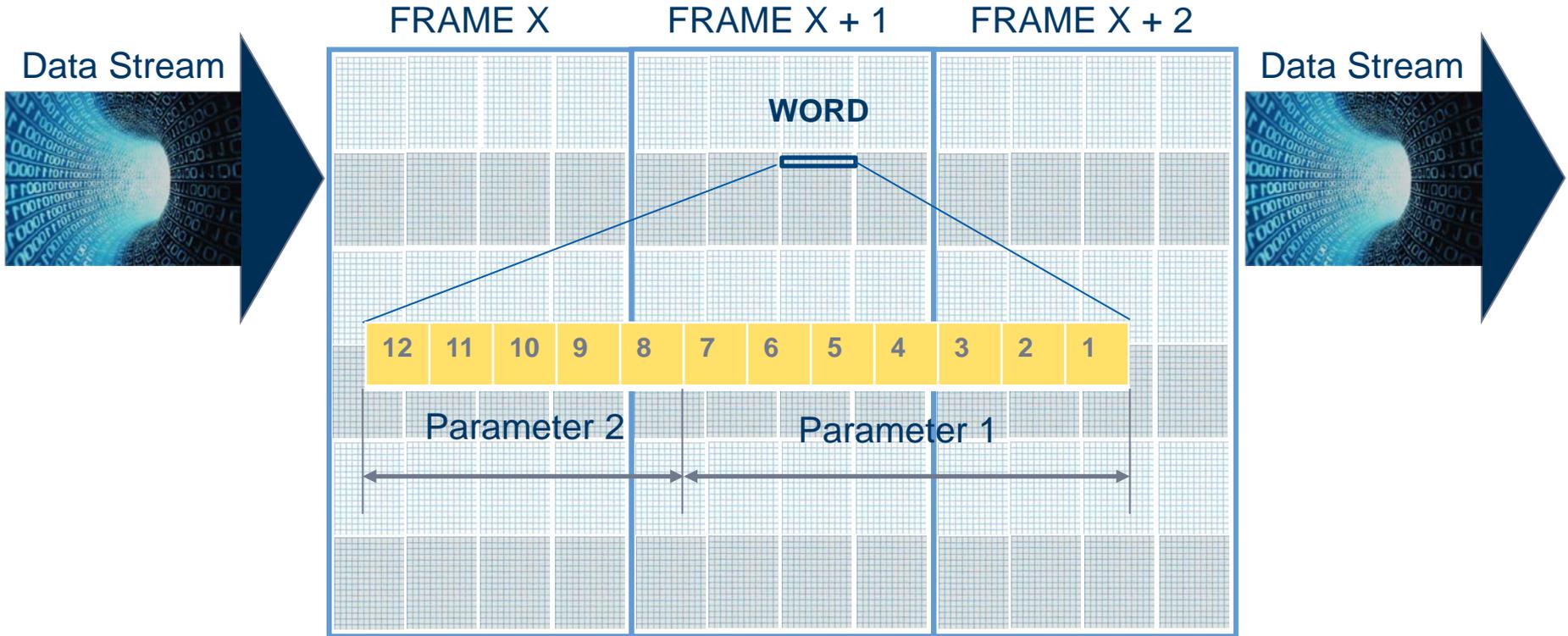


# FDA Limits – What does recorded Data look like ?

Each word is made of 12 bits.

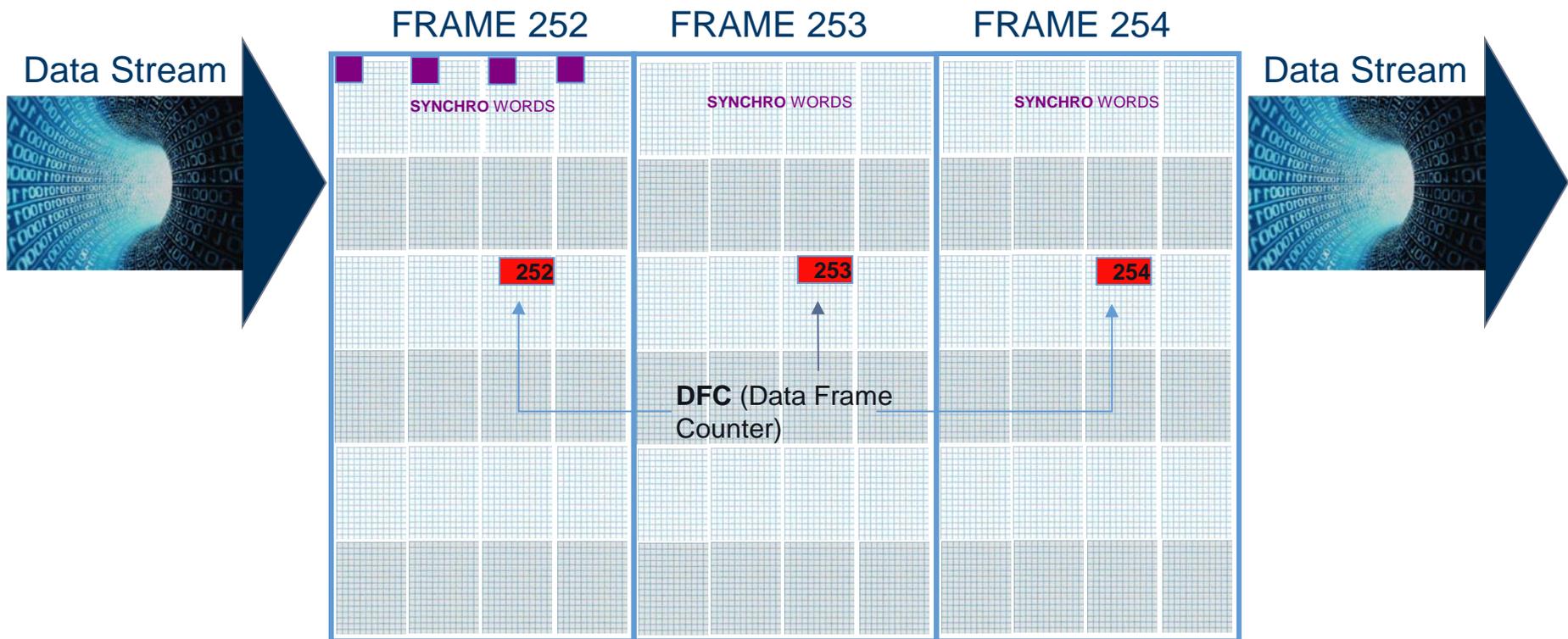
These bits contain the active parameter data

One word can contain several parameters



# FDA Limits – What does recorded Data look like ?

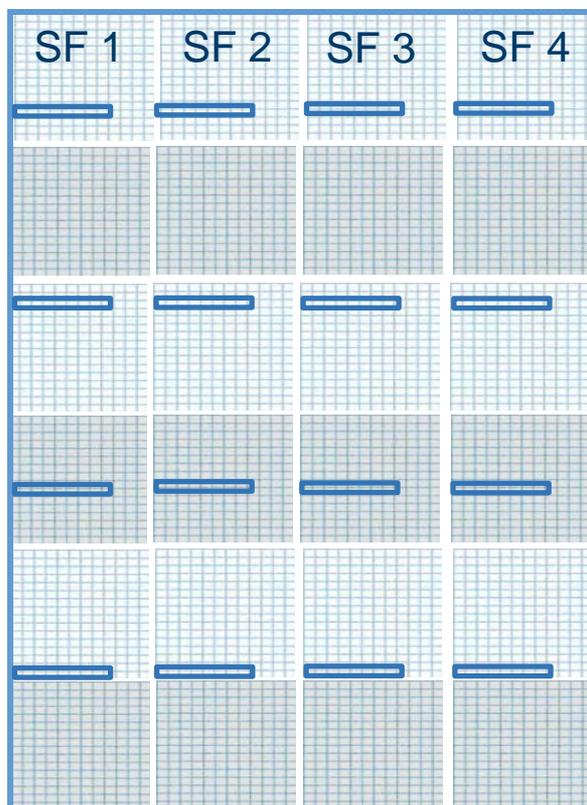
The stream is managed by synchronisation words and a data frame counter which provide the continuous assessment capability on the stream.



# FDA Limits – What does recorded Data look like ?

According to its refreshing rate parameter can be stored several times in one frame. Done at a constant pace.

Example : FRAME 256 WPS



Word 12

+ 64

Word 76

+ 64

Word 140

+ 64

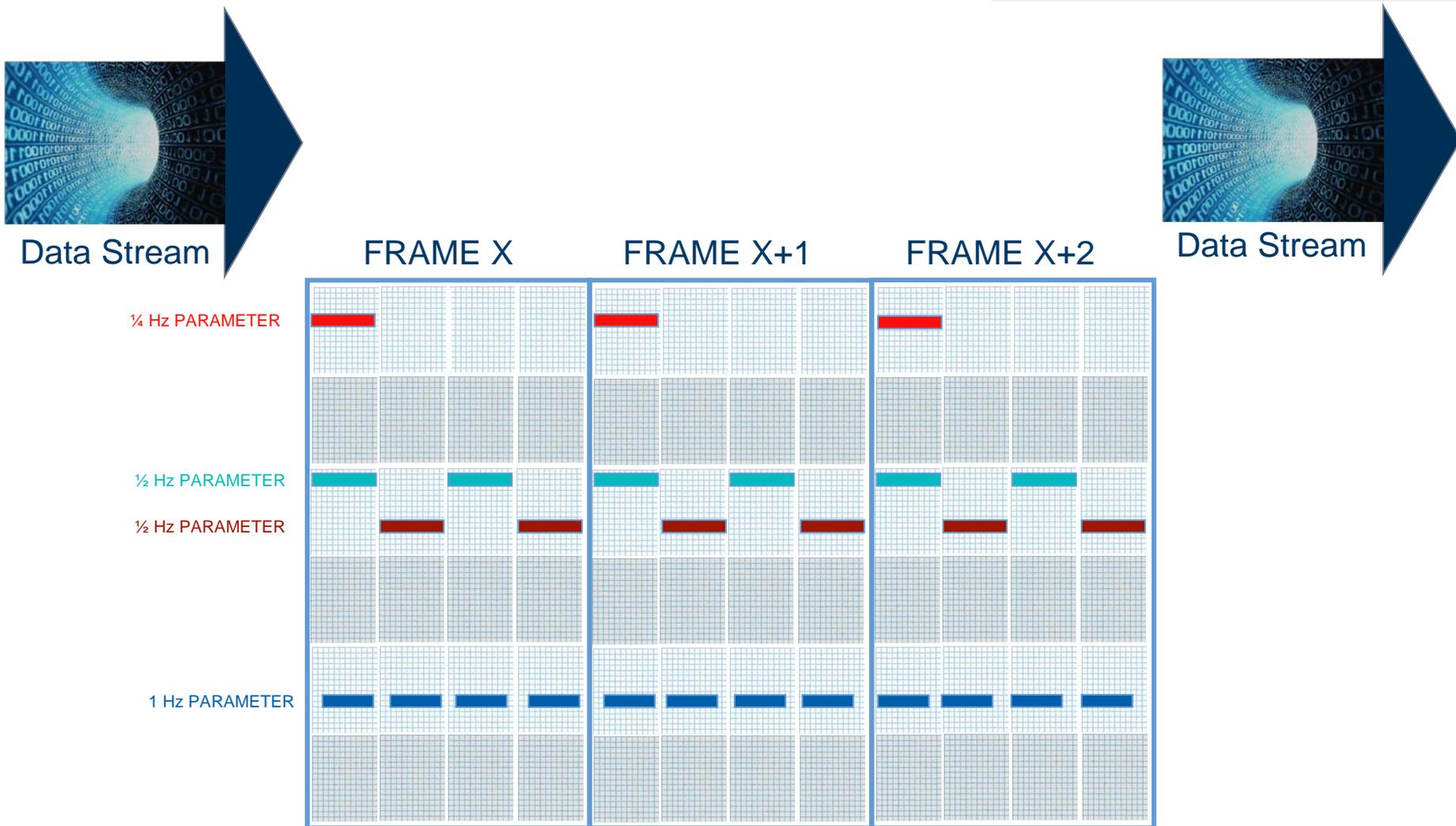
Word 204

+ 64

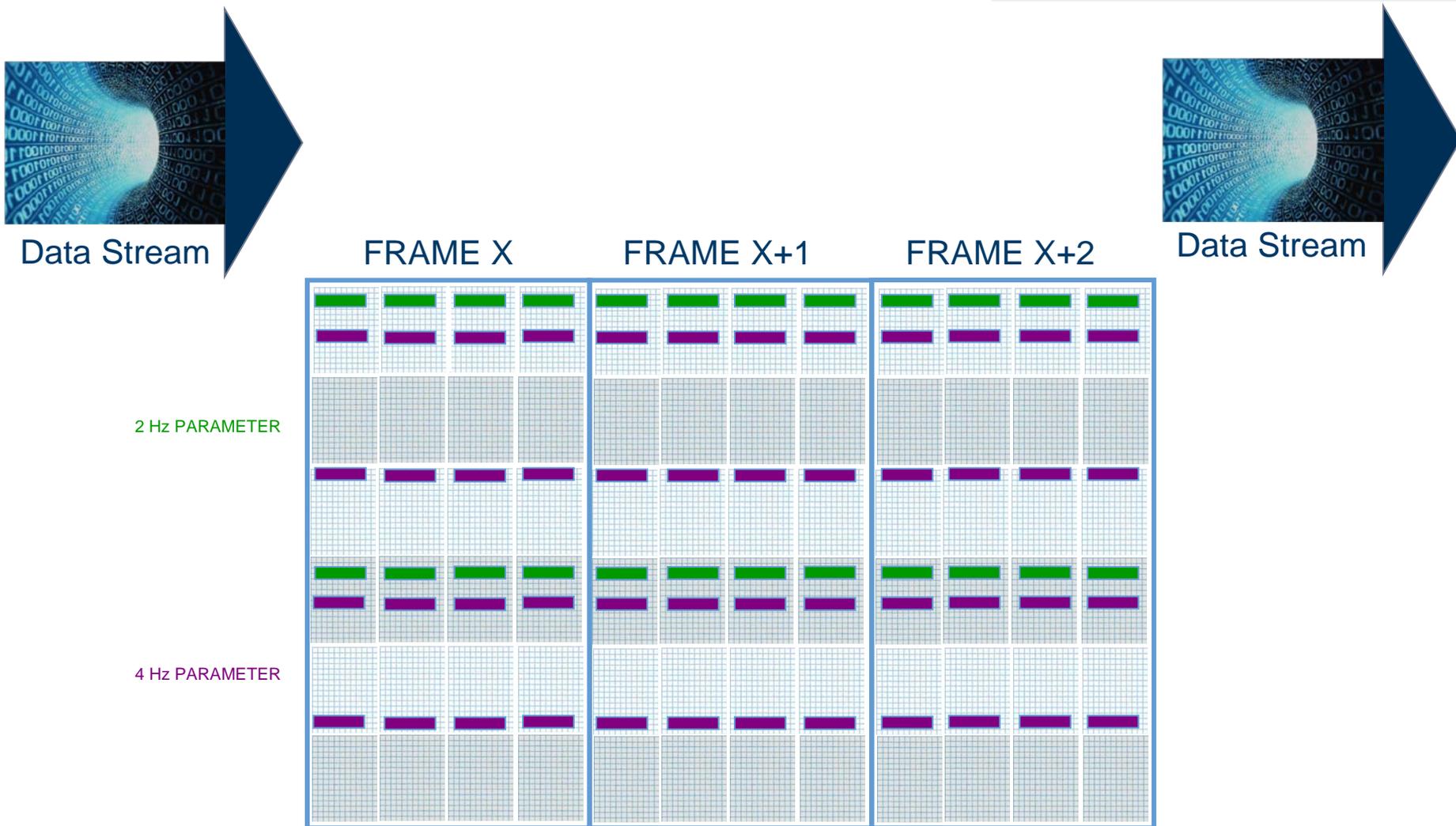


**4 Hz**

# FDA Limits – What does recorded Data look like ?

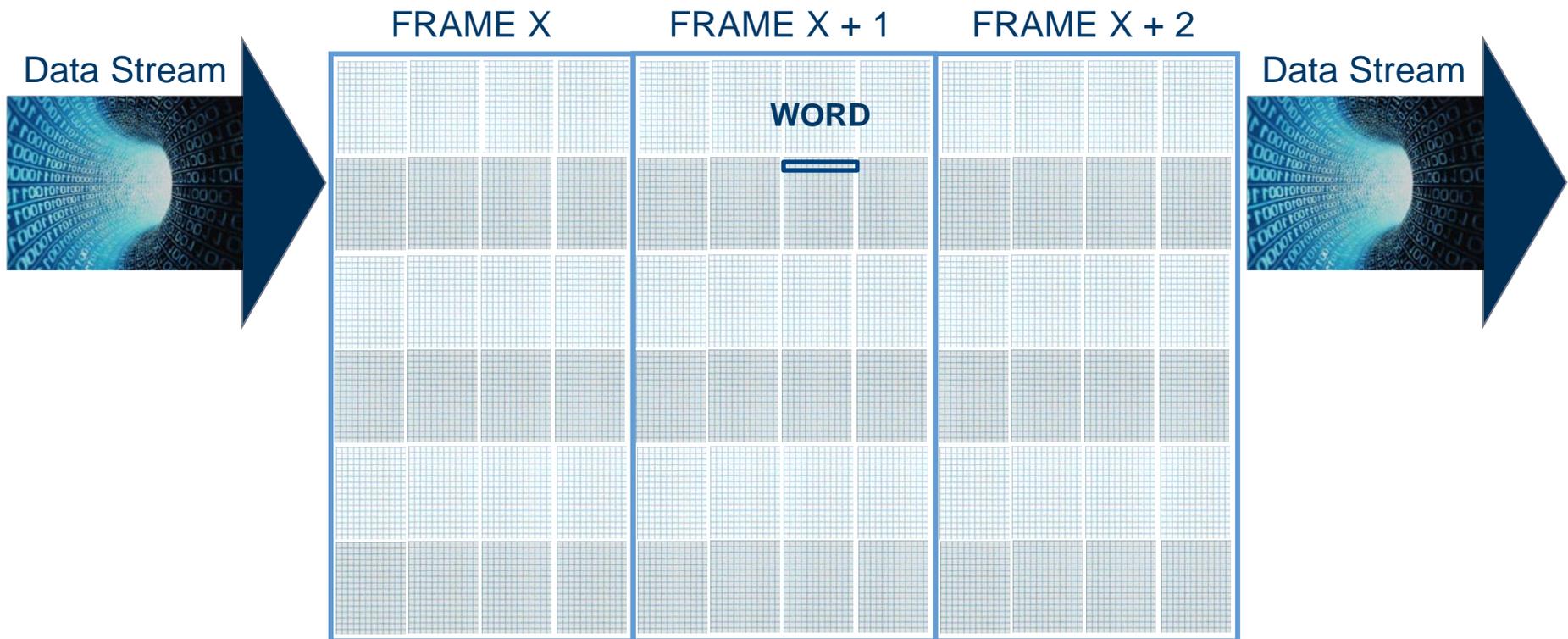


# FDA Limits – What does recorded Data look like ?



# FDA Limits – What does recorded Data look like ?

Some words do not need to be recorded on each Frame.  
They are therefore recorded every Superframe.



# FDA Limits – What does recorded Data look like ?

**AIRBUS** Flight Data Recording  
Parameter Library

Select the aircraft family:

**A300/A310 FAMILY**  
Rev. 9

**A320 FAMILY**  
Rev. 17

**A330/A340 FAMILY**  
Rev. 11

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

**Aircraft:**   
A318 / 100  
A319 / 100  
A320 / 100  
A320 / 200  
A321 / 100  
A321 / 200

**Engine:**

**LRU:**  FDIMU | Vend: SAGEM | PN: ED48A100 | SPN: 360-04027-010

**Words:**

Highlights 

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

**Aircraft:**  >

- A318 / 100
- A319 / 100
- A320 / 100
- A320 / 200**
- A321 / 100
- A321 / 200

**Engine:**

**LRU:**

**Words:**

Highlights 

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

Select your Aircraft, Engine, LRU and Frame:

<b>Aircraft:</b>	▼	1800 L-200
<b>Engine:</b>	▼	CFMI CFM56-5A1 CFMI CFM56-5A3 <b>CFMI CFM56-5B4/P</b> CFMI CFM56-5B4/2P (DAC)
<b>LRU:</b>	▼	IAE V2500-A1 IAE V2527-A5 IAE V2527E-A5
<b>Words:</b>	•	128

Highlights  Go

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

Select your Aircraft, Engine, LRU and Frame:

**Aircraft:** A320 / 200

**Engine:** CFMI CFM56-5B4/P

**LRU:** ▼ FDIMU | Vend: SAGEM | PN: ED48A100 | SPN: 360-04027-010

**Words:**

**Highlights:**

FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-020
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-030
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-040
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-050
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-210
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-010
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-020
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-030
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-040
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-050
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-210
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-0001
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8801
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8802
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8803
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8804
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-002-0001
FDIU	Vend: SAGEM	PN: ED43A1	SPN: D4
FDIU	Vend: SAGEM	PN: ED43A1	SPN: D6

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

Select your Aircraft, Engine, LRU and Frame:

**Aircraft:** A320 / 200

**Engine:** CFMI CFM56-5B4/P

**LRU:** FDIMU | Vend: SAGEM | PN: ED48A100 | SPN: 360-04027-010

**Words:** 128

Highlights 

# FDA Limits – What does recorded Data look like ?

The screenshot displays a web-based interface for searching aircraft parts. On the left, there are filter buttons for 'Aircraft:', 'Engine:', 'LRU:', 'Words:', and 'Highlights'. The 'Words:' filter is currently active, indicated by a red dot. The main area shows a list of parts with columns for part number, vendor, and serial part number (SPN). One entry is highlighted with a red box: 'FDIMU | Vend: TDY | PN: 2234320-01-01 | SPN: F320-002-0001'. A 'Go' button is located at the bottom right of the list area.

FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-010
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-020
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-030
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-040
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-050
FDIMU	Vend: SAGEM	PN: ED48A100	SPN: 360-04027-210
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-010
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-020
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-030
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-040
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-050
FDIMU	Vend: SAGEM	PN: ED48A200	SPN: 360-04027-210
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-0001
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8801
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8802
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8803
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-001-8804
FDIMU	Vend: TDY	PN: 2234320-01-01	SPN: F320-002-0001
FDIU	Vend: SAGEM	PN: ED43A1	SPN: D4
FDIU	Vend: SAGEM	PN: ED43A1	SPN: D6

# FDA Limits – What does recorded Data look like ?

  
**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

Select your Aircraft, Engine, LRU and Frame:

**Aircraft:**

**Engine:**

**LRU:**

**Words:**

Highlights 

**Consistency Issue**

# FDA Limits – What does recorded Data look like ?

**AIRBUS**  
Flight Data Recording Parameter Library Rev. 17

Select your Aircraft, Engine, LRU and Frame:

**Aircraft:** A320 / 200

**Engine:** CFMI CFM56-5B4/P

**LRU:** FDIMU | Vend: TDY | PN: 2234320-01-01 | SPN: F320-002-0001

**Words:** 1024

Highlights  **Go**

# FDA Limits – What does recorded Data look like ?

Rev. 17

**AIRBUS** Flight Data Recording Parameter Library

Aircraft: A320 / 200  
Engine: CFMI CFM56-5B4.P  
Words: 1024  
LRU: FDIMU  
Vendor: TDY  
PN: 2234320-01-01  
SPN: F320-002-0001

Param Ident

Select Bus

Label + SDI

Select Alpha

Show all parameters

Search

Subframe-No  Word-No

# FDA Limits – What does recorded Data look like ?

Rev. 17

**AIRBUS** Flight Data Recording Parameter Library

Aircraft: A320 / 200  
Engine: CFMI CFM56-5B4/P  
Words: 1024  
LRU: FDIMU  
Vendor: TDY  
PN: 2234320-01-01  
SPN: F320-002-0001

Param Ident

Select Bus

Label + SDI

Select Alpha

Show all parameters

Search

Subframe-No  Word-No

### All Parameters

Ident	Bus	Label/SDI	Description
M01a01	Clock	150 / 00	- Hours
M01a02	Clock	150 / 00	- Minutes
M01a03	Clock	150 / 00	- Seconds
M01a04	Clock	150 / 00	- Clock synchronized by GPS
M01b01			- Frame Counter
M02a01	DMC	203 / XX	- Pressure altitude (fine)
M02a02	DMC	203 / XX	- Pressure altitude (coarse)
M02a03	DMC	350 / 01	- Metric altitude
M02b01	FWC	124 / 01	- Warning "Alti baro Discrepancy"
M02b02	FVC	124 / 01	- Warning "Alti Std Discrepancy"
M02c01	DMC	020 / DD	- Baro-Temp corrected altitude Capt (fine)
M02c02	DMC	020 / DD	- Baro-Temp corrected altitude Capt (coarse)
M02c03	DMC	020 / DD	- Baro-Temp corrected altitude F/O (fine)
M02c04	DMC	020 / DD	- Baro-Temp corrected altitude F/O (coarse)
M02d01	DMC	076 / DD	- GPS altitude emitted by IRS selected by the DMC (fine)
M02d02	DMC	076 / DD	- GPS altitude emitted by IRS selected by the DMC (coarse)
M03a01	DMC	206 / XX	- Computed airspeed
M04a01	DMC	320 / XX	- Heading (true or magnetic value)
M04b01	DMC	271 / 01	- Heading selection
M04c01	FVC	126 / 10	- Warnig "Heading Discrepancy"
M05a01	SDAC	333 / 01	- Normal acceleration
M06a01	DMC	324 / XX	- Pitch attitude
M06b01	FVC	124 / 01	- Warning "Pitch discrepancy"
M07a01	DMC	325 / XX	- Roll attitude
M07b01	FWC	124 / 01	- Warning "Roll discrepancy"
M08a01	SDAC	002 / 01	- VHF 1
M08a02	SDAC	002 / 10	- VHF 2
M08a03	SDAC	002 / 11	- VHF 3
M08a04	SDAC	002 / 01	- HF 1
M08a05	SDAC	002 / 10	- HF 2
M09a01	DMC	346 / 01	- N1 actual Eng 1
M09a02	DMC	346 / 10	- N1 actual Eng 2

# FDA Limits – What does recorded Data look like ?

The screenshot shows the Airbus Flight Data Recording Parameter Library interface. The top left corner features the Airbus logo and the text "Flight Data Recording Parameter Library" with "Rev. 17" next to it. Below this, a metadata box lists: Aircraft: A320 / 200, Engine: CFMI CFM56-5B4.P, Words: 1024, LRU: FDIMU, Vendor: TDY, PN: 2234320-01-01, and SPN: F320-002-0001. The left sidebar contains several search filters: "Param Ident" with an empty input and a "Go" button; "Select Bus" with a dropdown menu showing "--"; "Label + SDI" with two empty input fields and a "Go" button; "Select Alpha" with a dropdown menu showing "--"; "Show all parameters" with a "Go" button; "Search" with an input field containing "pitch" and a "Go" button (both circled in red); and "Subframe-No" and "Word-No" with empty input fields and a "Go" button. The main content area on the right is a large empty white space. The top right of the interface has icons for a list, bar chart, information, and grid, along with a help icon and a globe.

# FDA Limits – What does recorded Data look like ?

The screenshot displays the Airbus Flight Data Recording Parameter Library interface. On the left, there is a sidebar with aircraft information and search filters. The main area shows a search for 'pitch' with 12 results. The result for 'M06a01 DMC 324 / XX - Pitch attitude' is highlighted with a red box.

**Search for pitch**

Ident	Bus	Label/SDI	Description
<b>12 results shown in list.</b>			
D29a06	ISIS Inertial	324 / 00	- Pitch angle
D31a01	DMC	137 / 01	- Capt pitch pitch value
D31a02	DMC	137 / 10	- F/O pitch pitch value
<b>M06a01</b>	<b>DMC</b>	<b>324 / XX</b>	<b>- Pitch attitude</b>
M06b01	FWC	124 / 01	- Warning "Pitch discrepancy"
M12b01	FCDC	305 / 01	- Capt pitch command position
M12b02	FCDC	306 / 01	- F/O pitch command position
M12b05	FCDC	040 / 01	- Pitch normal law
M12b06	FCDC	040 / 01	- Pitch alternate law
M12b07	FCDC	040 / 01	- Pitch direct law
M79a01	FCDC	040 / 01	- ELAC 1 pitch fault
M79a03	FCDC	040 / 01	- ELAC 2 pitch fault

# FDA Limits – What does recorded Data look like ?

Rev. 17

**Flight Data Recording**

Parameter

**M06a01 - Pitch attitude**

Aircraft: A320 / 200

Engine: CFMI CFM56-5B4/P

Words: 1024

LRU: FDIMU

Vendor: TDY

PN: 2234320-01-01

SPN: F320-002-0001

Description	Pitch attitude
DFDR Parameter Ident	M06a01
Primary Source / Refresh Interval	DMC 025.1.324.XX / 50 (0 - 0) ms
Alternative Source / Refresh Interval	DMC 025.2.324.XX / 50 (0 - 0) ms
<b>Source Parameter</b>	
Type	BNR
Name	Pitch attitude
LSB Position	14
Number of Bits	15+sign
Resolution	0.0054931640625
Word Range	-180 deg to 180 deg
Operational Range	-75 deg to 75 deg

Type	BNR
Number of Bits	9+sign
Resolution	0.17578125
Word Range	-90 deg to 90 deg
Operational Range	-75 deg to 75 deg

**DFDR Frame Assignment**

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	SDI	Lab
B10	-	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-	-	-	-	-	-	-	XX	324

W	Cyc	SF1	SF2	SF3	SF4	12	11	10	9	8	7	6	5	4	3	2	1
16	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
144	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
272	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
400	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-

# FDA Limits – What does recorded Data look like ?



**Flight Data Recording  
Parameter Library**

Rev. 17

**M06a01 - Pitch attitude**

**Aircraft:** A320 / 200  
**Engine:** CFMI CFM56-5B4/P  
**Words:** 1024  
**LRL:** FDIMU  
**Vendor:** TDY  
**PN:** 2234320-01-01  
**SPN:** F320-002-0001

Param Ident:

Select Bus:

Label + SDI:

Select Alpha:

Show all parameters:

Search:

Subframe:

**Detail**

Description: Pitch attitude  
 DFDR Parameter Ident: M06a01

Primary Source / Refresh Interval: DMC 025.1.324.XX / 50 (0 - 0) ms  
 Alternative Source / Refresh Interval: DMC 025.2.324.XX / 50 (0 - 0) ms

**Source Parameter**

Type: BNR  
 Name: Pitch attitude  
 LSB Position: 14  
 Number of Bits: 15+sign

**Destination Parameter**

Refresh Interval: 125 ms

Type: BNR

Number of Bits: 9+sign

Resolution: 0.17578125

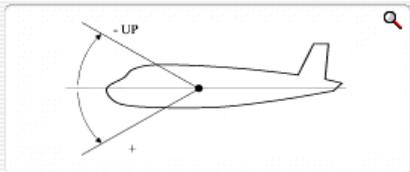
Word Range: -90 deg to 90 deg

Operational Range: -75 deg to 75 deg

**DFDR Frame Assignment**

W	Cyc	SF1	SF2	SF3	SF4	12	11	10	9	8	7	6	5	4	3	2	1
16	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
144	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
272	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-
400	No	X	X	X	X	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	-	-

Reproducing Issue



# FDA Limits - Content

1 How Data is recorded?

2 Which parameters to record?

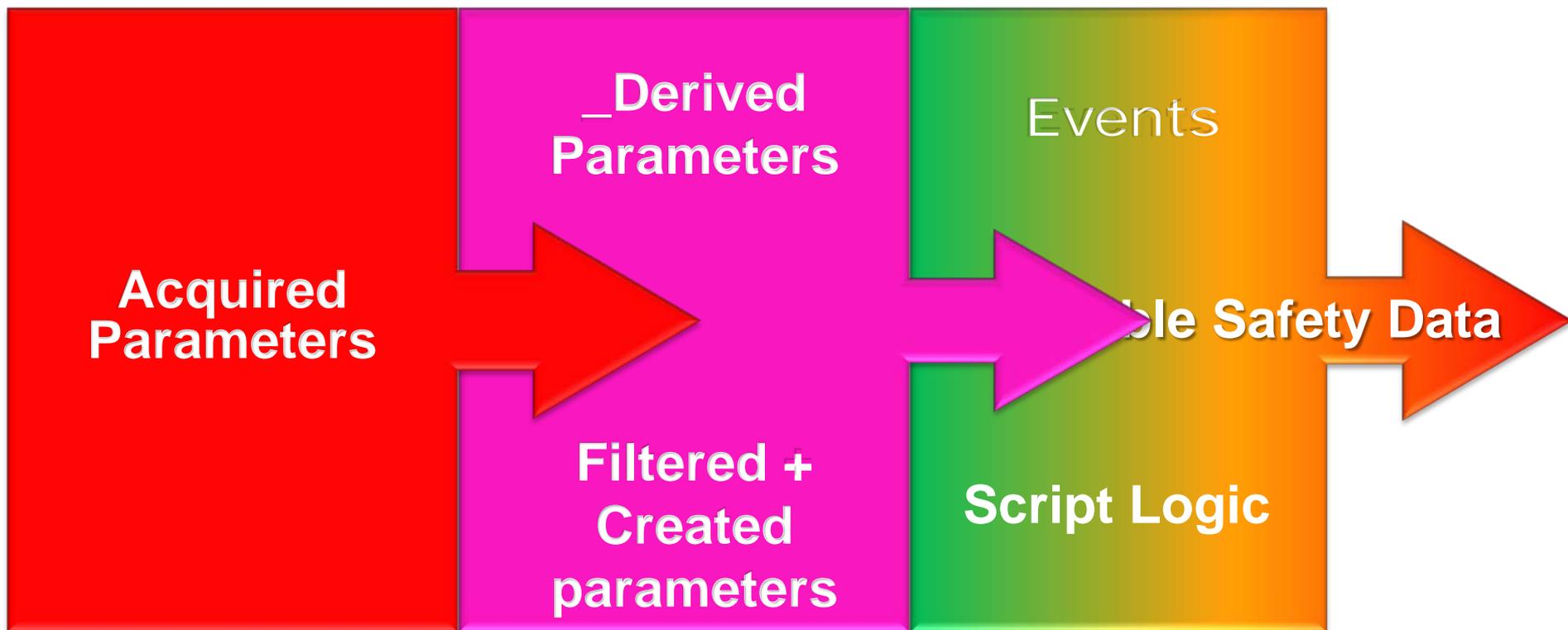
3 What does the recorded Data look like?

4 How to make it readable in an FDA software?



## The Purpose of FDA Tool is to

Identify Non-Desired flight conditions

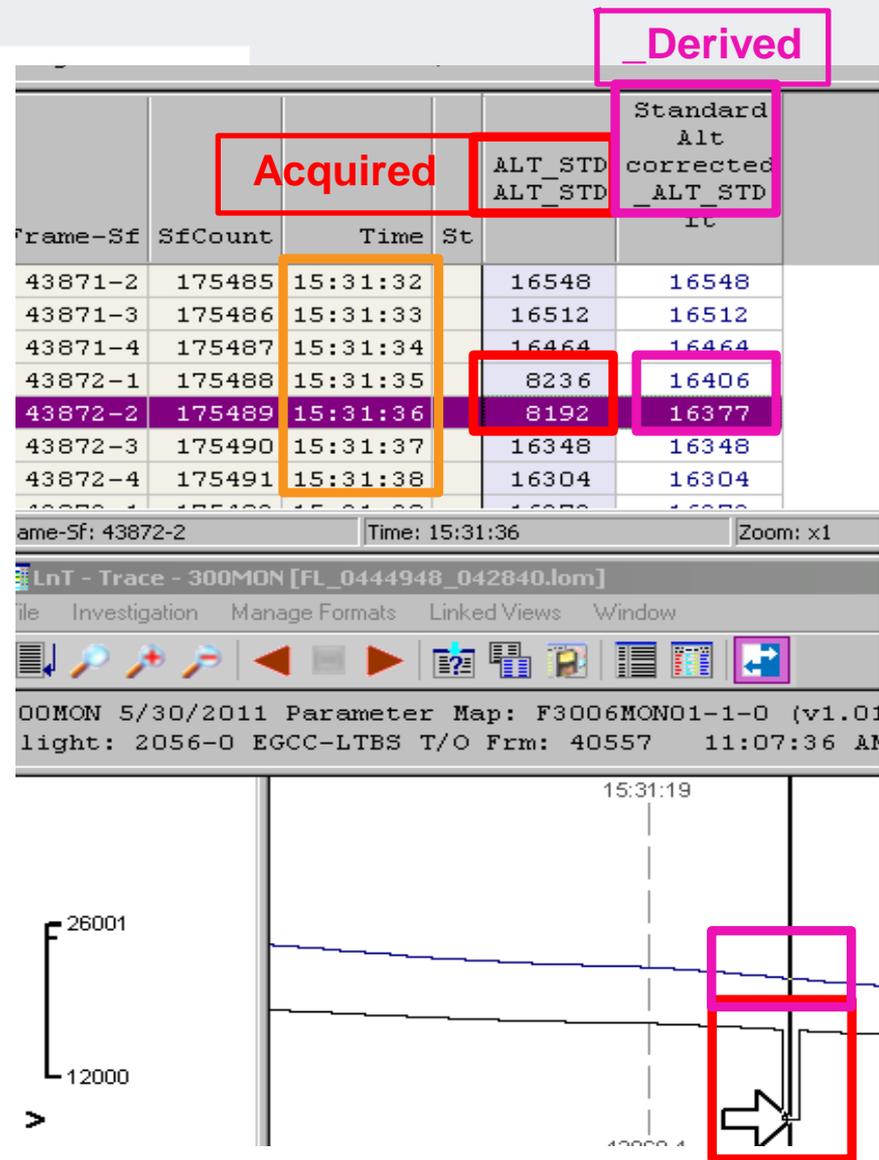


# FDA Limits - How to make it readable?

Acquired Parameters must be Derived to become exploitable

This derivation allows:

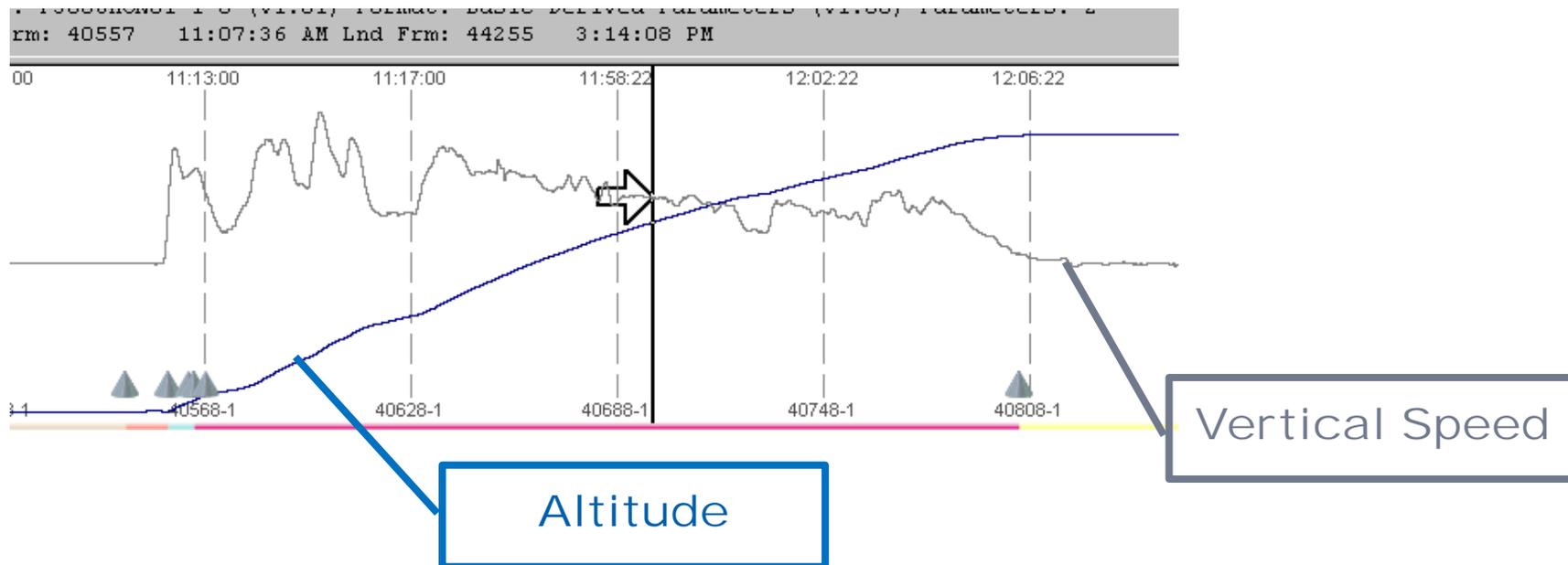
- Automatic wrong parameter filtering



# FDA Limits - How to make it readable?

Derivation also allows new parameter development

example: vertical speed derived from altitude



# FDA Limits - How to make it readable?

Parameters can be derived rather simply

## Boolean Example



0 = FALSE



1 = TRUE

**\_Derived Parameter = Acquired Parameter**

# FDA Limits - How to make it readable?

Parameters can be more complex

## Binary Example



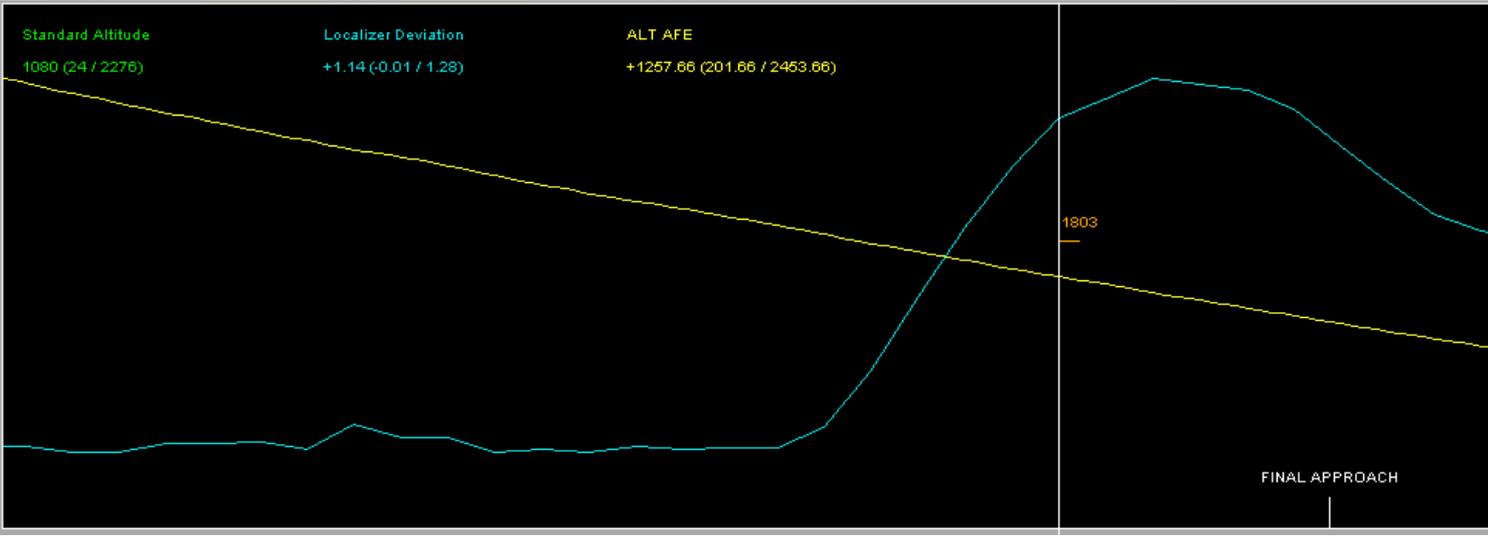
$$\begin{aligned} & \text{\_Derived Parameter} \\ & = \\ & \text{Acquired Parameter} \times \text{Coefficient} \\ & + \\ & \text{Offset} \end{aligned}$$

# FDA Limits - How to make it readable?



## Ex: Deviation from Localizer

LOCC  >: TOL >= 3s			
A/C Type	LOW	MEDIUM	HIGH
A300-600	0.5 dot	1.0 dot	1.5 dot
A310	0.5 dot	1.0 dot	1.5 dot
A319	0.5 dot	1.0 dot	1.5 dot



# FDA Limits - How to make it readable?



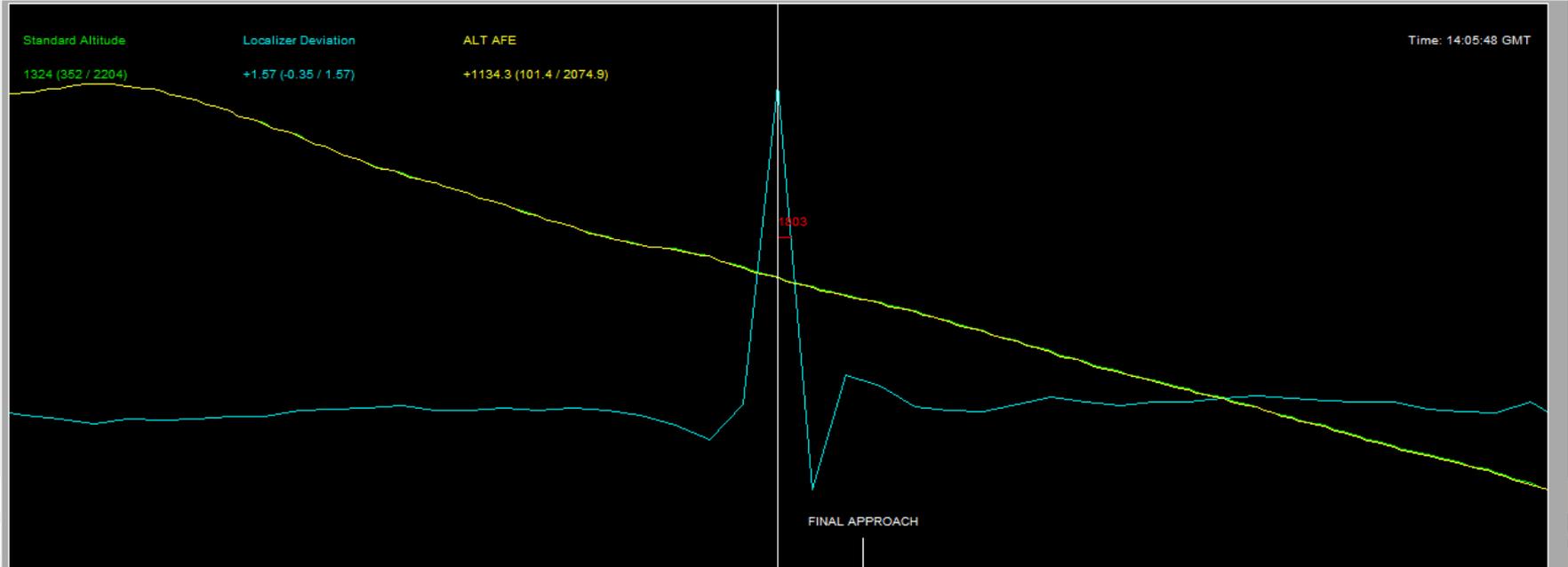
Events Flight Phases 3D Configuration Airport

### Single Events

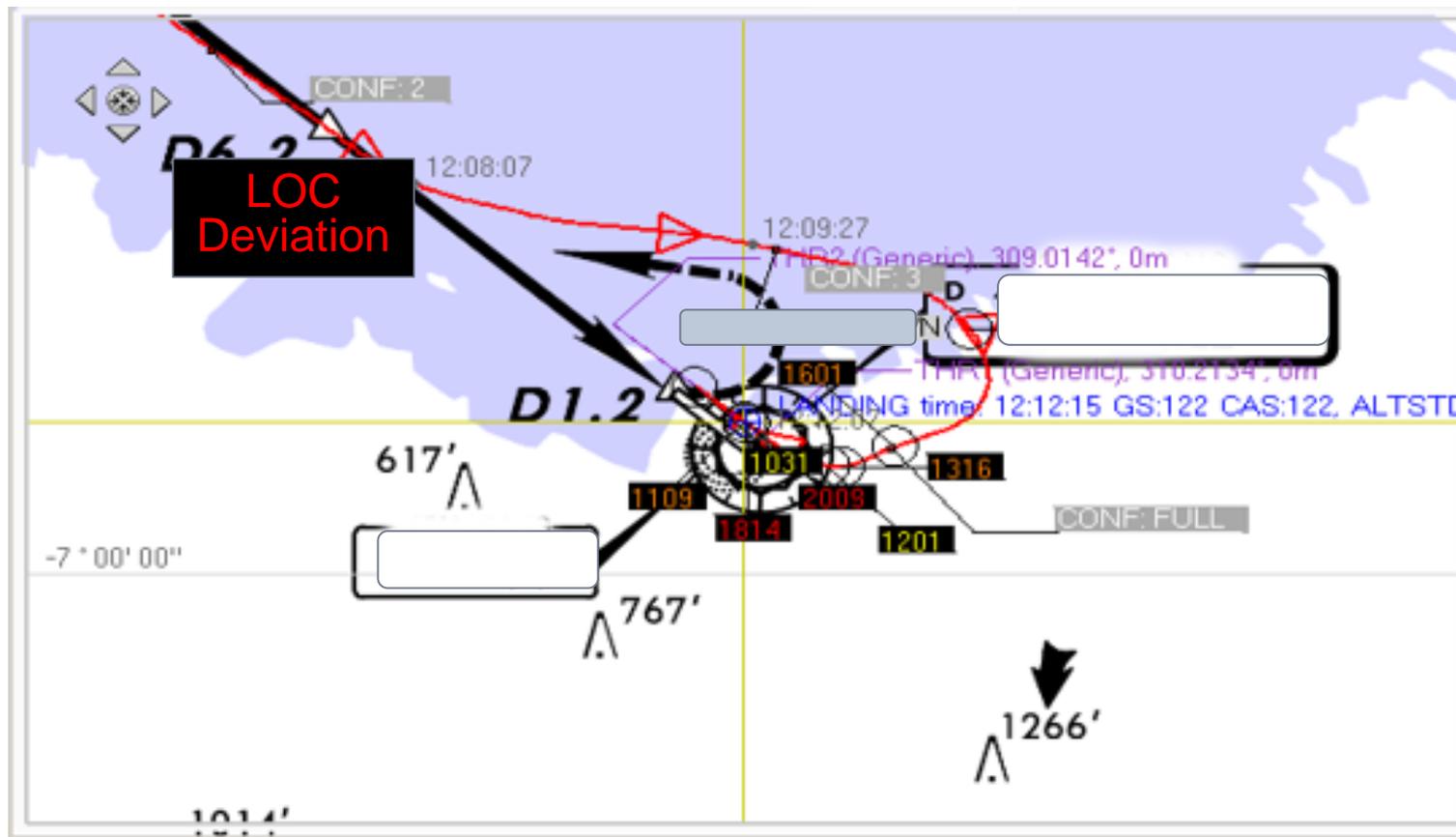
Event	Time /	Description	Unit	Low	Medium	High
1030	01/05/2008 10:22:09 GMT	Taxi Speed Exceedance	GS	> 32 Kts	> = 35 Kts	> = 40 Kts
1053	01/05/2008 10:23:53 GMT	Rolling take-off				
1803	01/05/2008 14:05:48 GMT	Deviation from Localizer	(LOCC) >: TOL >= 3s	0.5 dot	1 dot	1.5 dot
1023	01/05/2008 14:07:36 GMT	Low Speed at Landing	CAS <:	VLS -5 Kts	VLS -8 Kts	VLS -10 Kts
1818	01/05/2008 14:07:36 GMT	Long Touchdown	DIST_TO_THR (at TD)	750 m	900 m	1050 m
1619	01/05/2008 14:07:53 GMT	Reversers Abusive Use	Full reverse applied with CAS <	65 kts	55 kts	45 kts

### Trend Events

Event	Time	Description



# FDA Limits - How to make it readable?



# FDA Limits - How to make it readable?



## Limitation

- Parameter reliability
- Script logic relevancy

## Solution

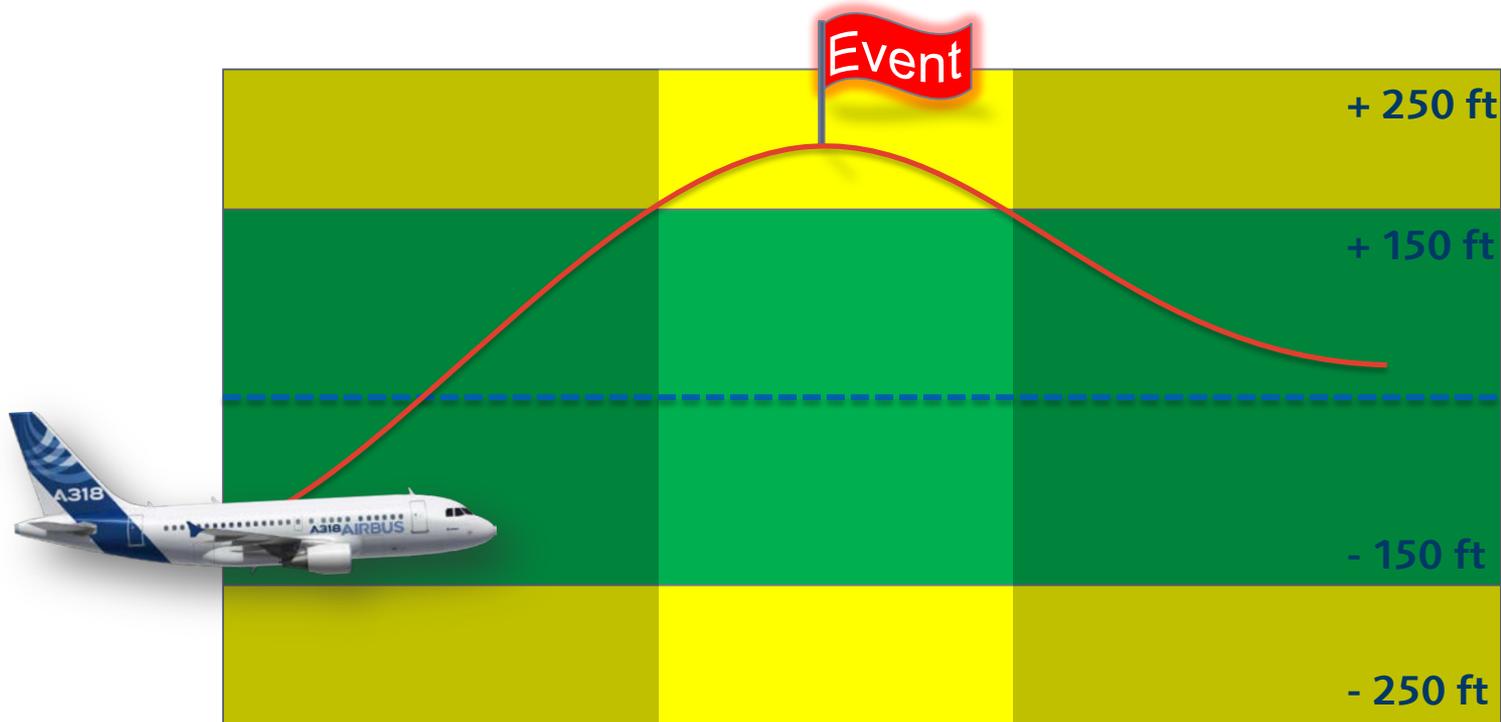
- Engineering cleaning
- Operational cleaning

An FDA software is partially DUMB

# FDA Limits - How to make it readable?

## Ex: Level Bust

Event raised when entering and escaping the zone





## Limitation

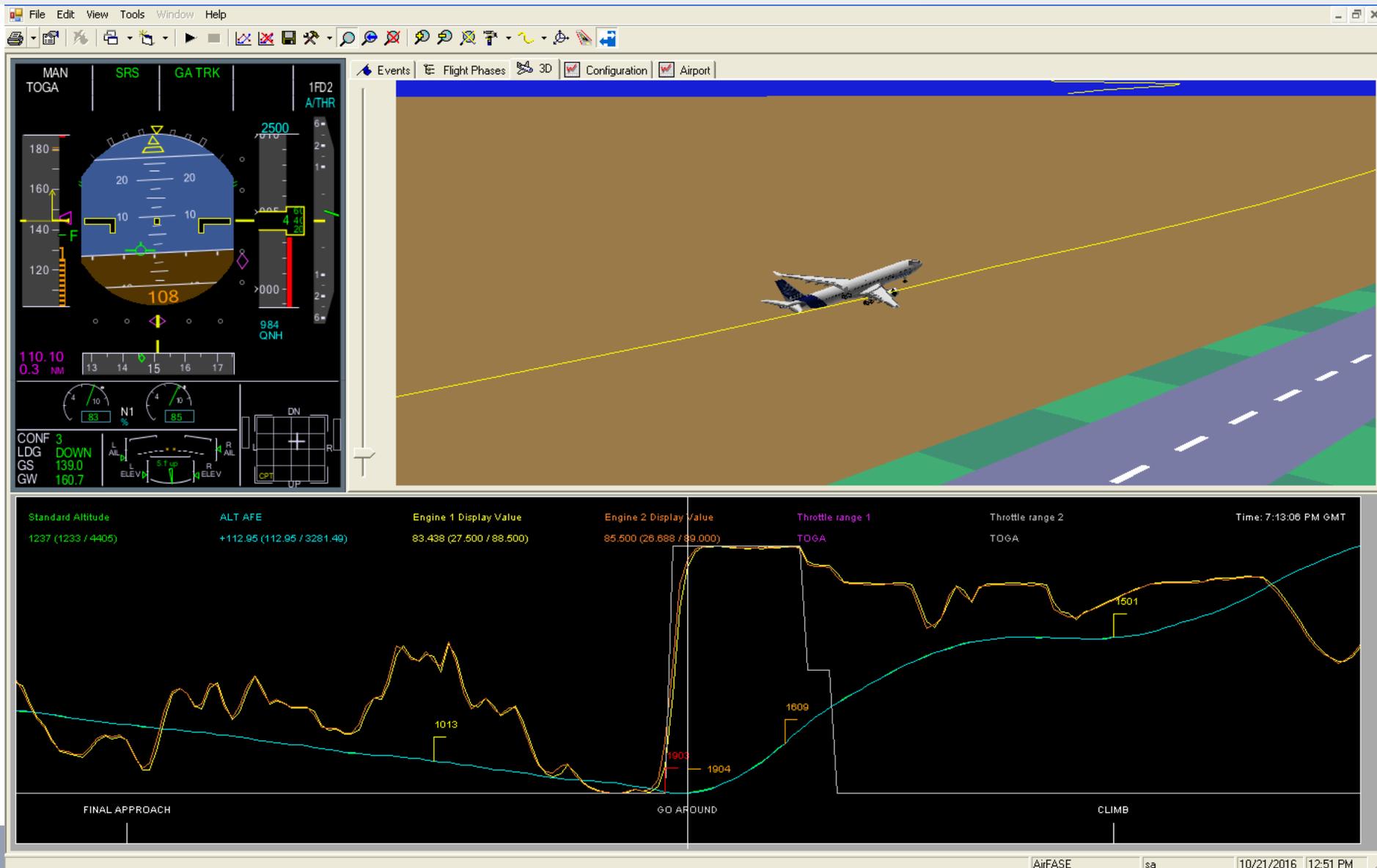
- Inside and Outside Voice messages not available

## Solution

- To create a close Link with the reporting system

An FDA software is partially DEAF

# FDA Limits - How to make it readable?





## Limitation

- No Environmental/Situational Information

## Solution

- To use any available data, including the reporting system

An FDA software is partially BLIND

## FDA Limits - Conclusion

The FDA tool is very powerful,  
Even if it has some limits  
It will tell you

WHAT happened,

but not WHY it happened...

An FDA tool needs Human Expertise

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