[Lot 4] AIXM-498 Revision of the Approach Type list of values

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version:	**1.0**
last updated:	**24 JUN 2021**
status:	**PROPOSED**

AIXM Aeronautical Information Exchange Model

Change Control Board

Description

The list of values for approachType attribute of the InstrumentApproachProcedure class is updated. Some values (such as GALILEO, DME_DME, etc.) are removed, while other values (such as SRA, GLS, etc.) are added.

Rationale for change

See: https://aixmccb.atlassian.net/browse/AIXM-249, https://aixmccb.atlassian.net/browse/AIXM-250

In the earlier AIXM versions (4.5), the IAP feature has an attribute called CODE_TYPE_RTE defined as "*a code indicating the type of Instrument Approach Procedure. E.g. VOR/DME Approach, Instrument Landing System (ILS), NDB Approach, GPS Approach, etc.*" The list of values was directly derived from the ARINC 424 Route Type for Airport Approach (PF) records and it includes values such as "N (NDB)", "L (Localizer only)*", "E (RNAV, GPS Required)", etc.*

In AIXM 5, this attribute was replaced by the approachType attribute, defined as *"A name describing the type of radio navigational aid/system".* The list of values of the new attribute kept most of the values of the previous model version attribute that referred to a navaid system.

The purpose and the intended use of this attribute needs to be clarified. Although the definition does not say it explicitly, the intention is to identify the navigation equipment/system that is used for the final approach segment and that is normally part of the procedure identifier. This is based on the PANS-OPS rules for ***conventional procedures*** identification (Volume II, Part I, Section 4, 9.5.1.2.1): "*The chart identification for procedures requiring ground-based navaids shall only contain the name describing the type of radio navigation aid providing the final approach lateral guidance. Precision approach systems such as ILS or MLS shall be identified by the system name (ILS, MLS, etc.). If two radio navigation aids are used for final approach lateral guidance, the chart identification shall only include the last radio navigation aid used.*

For example: if an NDB is used as the final approach fix and a VOR is used as the last navaid on the final approach to runway 06, the procedure shall be identified as VOR Rwy 06. If a VOR is used for the initial approach followed by a final approach to Rwy 24 using an NDB, the procedure shall be identified as NDB Rwy 24."

For Performance-based Navigation ***(PBN) approaches***, PANS-OPS, Volume II, Part III, Section 5, indicates that the same requirements for procedure publication as for conventional procedures apply, unless there are specific requirements in Section 5. Item 1.4.2 essentially requires that, after November 2022, the term "RNP" is used to identify such procedures (e.g. "RNP RWY 23") except for the GBAS precision approaches that are identified using the term "GLS". This can be followed by a "parenthetical suffix" in particular conditions, such as "(LPV only)" when the procedure has only an LPV Minima line, "(AR)" for an RNP AR APCH navigation specification. There are also two transitional values specified, applicable until 30 Nov 2022: "RNAV (GNSS)" and "RNAV (RNP)", but the term RNAV is no longer used in the PBN procedures identification after that date. Therefore, the type RNAV needs to be preserved for the moment, but to be used only for non-PBN approaches.

On the other hand, there are many examples of procedure chart identifiers that do not strictly follow the ICAO rules. For example, "NDB/DME", "VOR /DME", etc. - although DME is not providing lateral guidance for the final leg. Therefore, the definition of the approachType attribute correction needs to take into consideration both the ICAO rules and the fact that there are several common deviations from this rule.

The ARINC 424 list of values for Airport Approach (PF) and helicopter Approach (HF) records is also considered in this change proposal.

Thus, the CodeApproachBaseType list of values is updated to contain only the values that correspond to one of the following criteria:

- values that identify the navaid equipment used for lateral guidance on the final approach, such as ILS, VOR, GLS, etc.
- values that identify a combined navaid equipment, although only one of the components is used for lateral guidance on the final approach but which appear frequently in the procedure name, such as VOR/DME, NDB/DME.

The proposed changes are discussed in detail in the following table:

Coded value	***Definition***	***Reason to change***
[new] SRA	Surveillance Radar	PANS-OPS provides procedure design guidelines for surveillance radar.
ASR	Airport surveillance radar (ASR)	No change
ARA	Airborne radar approach (ARA)	No change

ARSR	Air Route Surveillance Radar	No change
PAR	Precision Approach Radar	No change
ILS	Instrument landing system (ILS)	No change
~~ILS_DME~~	~~Instrument landing system with Direction measuring equipment~~	DME is a not a type of lateral guidance system for final approach. From the PANS-OPS point of view, it is an ILS approach. It is also not in the ARINC 424 list of values.
~~ILS_PRM~~	~~Instrument landing system using a Precision runway monitor~~	“Precision runway monitor” is not a type of lateral guidance system. A separate change proposal will deal with PRM and parallel approaches.
LDA	Localizer Type Directional Aid	No change
LDA_DME	Localizer Type Directional Aid with Distance Measuring Equipment.	No change. It’s a combined equipment used as such in the procedure names.
LOC	Localizer only	No change.
LOC_BC	Localizer Back course	No change.
~~LOC_DME~~	~~Localizer with Distance Measuring Equipment~~	The final lateral guidance is provided by the Localizer. It is not a combined equipment and it does not appear in the ARINC 424 list of values.
~~LOC_DME_BC~~	~~Localizer with Distance Measuring Equipment back course~~	The final lateral guidance is provided by the Localizer back course. It is not a combined equipment and it does not appear in the ARINC 424 list of values.
MLS	Microwave Landing System	No change.
(new) MLS_AZM	Microwave Landing System - Azimuth Only	Non-precision approach type in PANS-OPS
~~MLS_DME~~	~~Microwave Landing System with Distance Measuring Equipment.~~	The lateral guidance is provided by the MLS system. It is not a combined equipment and it does not appear in the ARINC 424 list of values.
NDB	Non-Directional Beacon.	No change.
NDB_DME	Non-Directional Beacon with Distance Measuring Equipment.	The final lateral guidance is provided by the NDB. However, it is a combined equipment and it also appears in the ARINC 424 list of values.
(new) DF	High frequency direction-finding (VDF) station	There exist real world procedures with this type.
SDF	Simplified Directional Facility.	There exist real world procedures with this type.
TLS	Transponder Landing System.	There exist real world procedures with this type.
VOR	VHF Omnidirectional Radio	No change.
VOR_DME	VHF Omnidirectional Radio with Distance Measuring Equipment.	The final lateral guidance is provided by the VOR. However, it is a combined equipment and it also appears in the ARINC 424 list of values.
TACAN	UHF Tactical Air Navigation beacon	No change
VORTAC	VHF Omnidirectional Radio with UHF Tactical Air Navigation beacon	The final lateral guidance is provided by the VOR. However, it is a combined equipment and it also appears in the ARINC 424 list of values.
~~DME~~	~~Distance Measuring Equipment~~	DME does provide lateral guidance. It is not a combined equipment and it does not appear in the ARINC 424 list of values.
~~DME_DME~~	~~Distance Measuring Equipment with Distance Measuring Equipment.~~	This is probably an RNP approach for which DME/DME navigation is authorised. But it remains an RNP approach.
RNP	Required Navigation Performance.	No change.
GPS	Global Positioning System	This will be kept for the moment because these are not PBN procedures. They are legacy procedures based on GPS only.
~~GLONASS~~	~~GLONASS~~	This is an RNP approach type. The GNSS system used will be coded through a direct association, see the new GNSS model proposal.
~~GALILEO~~	~~GALILEO~~	This is an RNP approach type. The GNSS system used will be coded through a direct association, see the new GNSS model proposal.
RNAV	Area Navigation (not PBN)	Transitional term, used only until DEC 2022.
IGS	Instrument Guidance System	No change.
(new) GLS	GBAS Landing System	Approach type listed in PANS-OPS and in the real-world.

OTHER	Other	

Note: *the InstrumentApproachProcedure.**name** attribute can be used to provide the final approach identifier, such as "ILS RWY 08", "GLS RWY 26", "RNP RWY 23 (LNAV/VNAV only)", etc. This can also accommodate approach procedures that apply a non-standard or transitional naming, such as "LOC/DME Procedure West", "IGS-Z RWY 34", "RNAV (GNSS) RWY 23", etc.*

Impact assessment

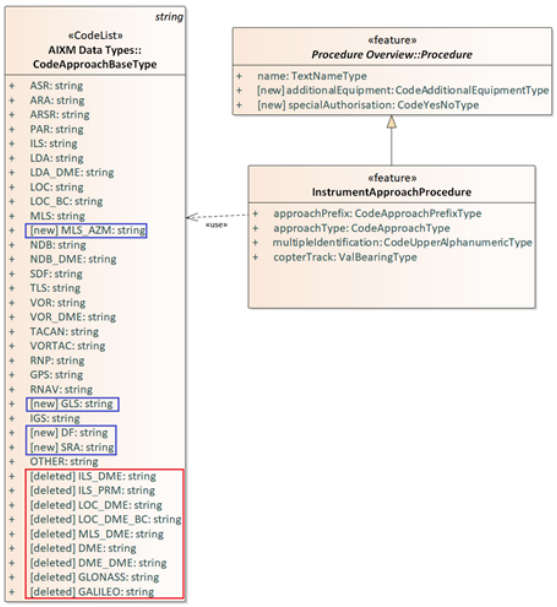
When receiving data from AIXM 5.1(.1) implementations, AIXM 5.2 systems will have to be able to map forward the values that were removed into OTHER:... values, as described in the mapping rules further in this document.

When receiving data from AIXM 5.2 implementations, current AIXM 5.1(.1) systems will have to be able to map back the new values into OTHER:... values, as described in the mapping rules further in this document.

Change Proposal details

In the UML model:

- In the **InstrumentApproachProcedure** class update the definition of the **approachType** to read "*The component of the procedure identifier that indicates either the ground-based navigation system used for the final approach segment (usually limited to the system used for lateral guidance), or an indication that it is an RNP or (legacy) RNAV approach.*"
- In the ***CodeApproachBaseType*** list of values make the following changes:
  - add SRA = Surveillance Radar
  - add MLS_AZM = Microwave Landing System - Azimuth Only
  - add DF = High frequency direction-finding (VDF) station
  - add GLS = GBAS Landing System
  - modify LOC = Localizer *only*
  - modify RNAV = Area Navigation *(not PBN)*
  - remove ILS_DME
  - remove ILS_PRM
  - remove LOC_DME
  - remove LOC_DME_BC
  - remove MLS_DME
  - remove DME
  - remove DME_DME
  - remove GLONASS
  - remove GALILEO



The UML class diagram to the right shows the modified list of values:

Mapping AIXM 5.1.1 to AIXM 5.2 (forward)

[MAPC-01] The following algorithm shall be applied:

- For each **InstrumentApproachProcedure** that has the following **approachType** values:
  - Replace "ILS_DME" with "ILS"
  - Replace "ILS_PRM" with "ILS"
  - Replace "LOC_DME" with "LOC"
  - Replace "LOC_DME_BC" with "LOC_BC"
  - Replace "MLS_DME" with "MLS"
  - Replace "DME" with "OTHER:DME"
  - Replace "DME_DME" with "OTHER:DME_DME"
  - Replace "GLONASS" with "OTHER:GLONASS"
  - Replace "GALILEO" with "OTHER:GALILEO"
  - Replace 'OTHER:SRA" with "SRA"
  - Replace 'OTHER:MLS_AZM" with "MLS_AZM"
  - Replace 'OTHER:DF" with "DF"
  - Replace 'OTHER:GLS" with "GLS"

Mapping AIXM 5.2 to AIXM 5.1.1 (backward)

[MAPC-01] The following algorithm shall be applied:

- For each **InstrumentApproachProcedure** that has the following **approachType** values:
  - Replace 'SRA" with "OTHER:SRA"
  - Replace 'MLS_AZM" with "OTHER:MLS_AZM"
  - Replace 'DF" with "OTHER:DF"

- Replace ‘GLS” with “OTHER:GLS”

Mapping example

(Note: for mapping test data see: https://github.com/aixm/mapping_52_511/tree/master/AIXM-xxx)

AIXM 5.2	AIXM 5.1(.1)
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