



Network Manager
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EUROCONTROL Call Sign Similarity Project

Call Sign Similarity Rules

ICAO MID Region 1st Call Sign Confusion Ad-hoc Working Group

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Similarity Rules - Introduction

- **Terminology**
 - Letter, digit
- **Classification**
 - Single C/S, single AO and multi AO
- **Points of view**
 - Local/General, Customisable, Severity, Relevance
- **Discuss each rule**
 - class by class
 - according these points of view



Terminology (3) – letter, digit, ...

Term	Definition	Examples
Letter	A, B, C, ... Y, Z	D ; Y
Digit ; Figure	0, 1, 2, ... 8, 9	7 ; 0
(Alphanumeric) character	A digit or a letter	7 ; Y
Purely numeric	made of digits only	6 ; 1784
Alphanumeric	made of digits <u>and</u> letters	7A ; 67DE

Similarity Rules - Classification

- **Classification**
- Single C/S (Level Z)
 - 1 flight
 - E.g. ABC 350
- Single AO (Level A)
 - 2 flights, same R/T
 - E.g. ABC 358 & ABC 583
- Multi AO (Level B)
 - 2 flights, different R/T
 - E.g. ABC 358 and DEF 358
 - Not current priority



Similarity Rules – Points of view

- Need to look at each rule from different points of view
- Local vs. General
 - ANSP & APT constraints E.g. ABC 35LL in UK
- AO Customisable
 - AO can choose using the rule or not (e.g. due to AO system limitations)
- Severity (i.e. weight)
 - How far does it create confusion?
 - E.g. ABC 3582 & ABC 5832 vs. ABC 123D & ABC 623D
- Relevance / Usefulness
 - More rules → more complex; More rules → less solutions
 - Detection vs. De-confliction vs. Prevention
 - Check C/S vs. Avoid to propose during de-confliction vs. Publish rules



Similarity Rules - Single C/S (Level Z)

- Acceptable format for a C/S
 - Global Format (whole C/S)
 - Max 7 chars
 - 3 letter ICAO AO code followed by 1 to 4 alphanumeric characters
 - E.g. ABC1; ABC1234; ABC23T
 - Exception!
 - 2 letter AO code followed by 1 to 5 alphanumeric characters
 - Local: Dom flights in France only; E.g. AF123DE
 - Custom: Valid for some AOs only
 - Need to keep that exception?



Similarity Rules - Single C/S (Level Z)

- Acceptable format for a C/S
 - Format (Flight Id)
 - Purely numeric: n, nn, nnn, nnnn
 - 1-final letter: nA, nnA, nnnA
 - 2-final letter: nAA, nnAA

 - No consensus: nAn, nnAn, nAnA, (nAnn)
 - (e.g. ABC 1P9, ABC 5B4E)

 - Points of view
 - Custom: for De-confliction
 - Some AOs: only nA, nnA, nAA; Others: only nnAA
 - Local: De-confliction (DSNA): 2-final letters only for Domestic flights
 - Local (some ANSP/APT): purely numeric only
 - E.g. (Iberia) Russia, Israel, Egypt, Turkey and Algeria do not accept letters



Similarity Rules - Single C/S (Level Z)

- Single C/S similar to ...
 - Similarity to Flight Level
 - For flight id of format nnn
 - Values 040, 050, ..., 390, 400 not allowed (10 increment; limit 410/450?)
 - Q. 40 or 040?
 - Similarity to Heading
 - For flight id of format nnn
 - Values 005, 010, ... 355, 360 not allowed (5 increment)
 - Relevance?
 - Similarity to RWY
 - For flight id of format nn
 - Values 01 to 36 not allowed
 - For flight id of format nnA
 - For letter R, L, C: Values 01R to 36R not allowed
 - Relevance?
 - Local? Only when such a Runway at ADEP or ADES?

Similarity Rules - Single C/S (Level Z)

- Single C/S similar to ...
 - Similarity to Aerodrome
 - For C/S with 2-final letters
 - E.g. EZY25LL
 - Local to UK?
 - Similarity to QNH / QFE
 - Values 950 to 1050
 - Relevance? Local?
 - Similarity to Squawk
 - Values 0001 - 7777
 - Relevance?
 - Similarity to VHF frequencies
 - For flight id of format nnnn
 - Values 1180 to 1369 (118.0 MHz to 136.9 MHz)
 - ...



Similarity Rules - Single C/S (Level Z)

- Other similarity in single C/S
- Letter visually similar to Digit
 - E.g. ABC 7OM vs. ABC 70M
 - Not use such a letter where a digit can be expected
 - Do not use it as first letter! e.g. ABC 53I or ABC 53IE
 - Use it as second letter? e.g. ABC 53EI or ABC 53EO
 - Relevance: Which letters?
 - DSNA excludes only I, O, and S
 - Iberia excludes C, F, I, O and X (some for pronunciation reasons)
 - DFS/DLH agreement to excludes the 8 letters (Local fonts?)
 - Local?
 - Custom?

Letter	Digit
B	8
D	0
G	6
I	1
O	0
Q	0
S	5
Z	2

Similarity Rules - Single C/S (Level Z)

- More rules and potential issues in single C/S
 - Special purpose final letter
 - E.g. V at end for ferry flights → not to be proposed in de-confliction
 - D for Delayed flight; A for Additional. ...
 - How far is this important? AO customisable?
 - Too many repetition
 - Four times same figure E.g. ABC 7777
 - What about three times same digit.
 - Relevance?
 - Pronunciation problems
 - see DLH presentation;; Use of 3-syllable letters (e.g. J, N)
 - E.g. NN too long, WX difficult
 - Identified?
 - Relevance? Detection vs. De-confliction
- Nice C/S ?



Similarity Rules - Single C/S - Summary

Rule	Relevant	weight	Local	AO Custom.
Global Format	Y	High	Y (France)	Y
Format Flight Id	Y (which)	High	Y	Y
FL	Y	High	N	N
Heading	Y	Med?	N	N
RWY	N	-	-	-
AD	Y	Med	Y	N
QNH / QFE	N	-	N	-
Squawk	N	-	N	-
VHF freq	N	-	?	-
Letter – digit	Y (which)	High	?	?
4 same digit	?	Med?	N	?
Pronunciation	(which)	Low	?	?

Similarity Rules - Single AO (Level A)

- Identical final figures
 - Numerical, also mixed length
 - 38 & 638 & 438 & 2538
- Anagram
 - Pure anagrams (→ same length)
 - 6813 & 1863 & 6318
 - Same set of letters
 - 6118 and 681
- Identical Block
 - Same length or length 2&3 or length 3&4
 - 3422 & 422 & 4221
 - 50 & 508 & 50E & 50T & 250
- Parallel figures
 - Numerical, same length only
 - 638 & 658; @@with length 4??
- Identical root
 - Numerical. Same length or length 2&3 or length 3&4
 - 23 & 237 & 239;
341 & 3417 & 3419
- Identical bigram (identical 2-final letters)
 - 7PC & 9PC & 25PC
- Identical final letter
 - Also mixed 1 & 2 final letter
 - 104D & 298D & 25AD

Similarity Rules - Single AO (Level A)

- More rules
 - Partial anagrams.
 - E.g. ABC 5TX vs. ABC 4XT ; ABC 56T vs. ABC 65P
- Weighting
 - Should indicate how likely this would create confusion
 - Does not only depend on the similarity rule(s) that apply
 - 52PC is more similar to 25PC than to 7PC
 - Actually: comparison between 2 strings
 - Identify differences
 - Difficulty:
 - last positions should have higher weight
 - Letters should have a higher weight (more syllables)



Similarity Rules - Single AO - Summary

Rule	Relevant	Weight	Local	AO Custom.
Identical Final Figures	Y	High	N	N
Anagram	Y	High	N	N
Identical Block	Y	Med	N	N
Parallel Figures	Y	Low	N	N
Identical Root	Y	Med	N	N
Identical 2-final letter	Y	High	N	N
Identical final letter	Y	Med	N	?

Similarity Rules - Multi AO (Level B)

- (Out of current scope, except “Sanity Check”)
- Identical Flight Id
 - ABC 123 vs. DEF 123
 - ABC 357D vs. DEF 357D
- Identical 2-final letters
 - DLH 7PC vs. AFR 456PC
 - Local?
- More to take into account?



Similarity Rules - Multi AO - Summary

Rule	Relevant	Weight	Local	AO Custom.
Identical Flight Id	Y	High	N	N
Identical 2-final letter	Y	Med	N	N

Publication of General Similarity Rules -



Call Sign Similarity Rules

General Similarity Rules (Applicable to flights within a single AO schedule, i.e. AO ICAO designator remains the same)

The following similarity rules are recommended by the CSS User Group. The order within the following table is significant with the most critical rules at the top.

Legend
Acceptable Format
Single AO Similarity Rule
Single Call Sign Similarity Rule

Name	Individual Rule Description	Special considerations for this rule	Examples		Rule ID
			Not acceptable	Acceptable	
C/S Format	Call Signs need to comply with the allowed formats (see ICAO Doc.4444 Field 7 (a), Aircraft Identification). Normal format: 3 letter ICAO AO designator followed by 1 to 4 alphanumeric characters (Flight Id).	The CSSUG have agreed that the following formats for the Flight Id should be adhered to: Pure numeric: n, nn, nnn, nnnn 1-final letter: nA, nNA, nnnA 2-final letters: nAA, nnAA	ABC 4B63, ABC F27	ABC 1, ABC 1234, ABC 23T, ABC 34TD	ZG00
Identical Final Digits	Checks for 2 Identical final digits in the Flight Ids		ABC 234 vs ABC 534		AG02
Identical Bi-grams	Checks for blocks of contiguous characters which form a bi-gram.		ABC 224 KF vs ABC 36 KF ABC 36 KF vs ABC 528 KF		AG07
Letters To Avoid	Some single letters may be easily confused with digits and are therefore best avoided.	Single letters, eg. "O" vs "0", "I" vs "1"	ABC 841I, ABC 460O		ZG08
Anagrams	Checks for anagrams occurring within the Flight Ids		ABC 1368 vs ABC 1386 vs ABC 1638 vs ABC 1683 vs ABC 1836 vs ABD 1863 etc.		AG03
Identical Block Digits	Checks for Calls Signs which form blocks of contiguous identical characters which are: <ul style="list-style-type: none"> the same length, or 2 versus 3 characters, or 3 versus 4 characters 		ABC 52 vs ABC 352 vs ABC 524 vs ABC 52L		AG04
Parallel Characters	Checks if characters composing the Call Signs form parallel alignment of identical characters.		ABC 41 vs ABC 401 vs ABC 4351		AG05
Identical Digit Roots	Checks for prefix blocks (roots) of identical digits.		ABC 57 vs ABC 573 vs ABC 5746		AG06
Identical Final Letter	Checks for Call Signs with identical final letter.		ABC 23L vs ABC 257L ABC 54L vs ABC 637L		AG08

Rules Set

- Balance to capture conflicts whilst retaining solution space and tool performance.
- Emphasis on reported occurrences using analysis of EVAIR and ANSP reports and looking at patterns rather than rules.
- Experience with DSNA Ajaccio Tool.
- Single AO random de-confliction reduces 75% of detected multi AO conflicts.

Trials Rules Set

- FL Values (Avoid use of 200-480 at end)
- Triple Repetition
- Acceptable ATC Flight ID Formats
- Combinations to avoid: O, I and S at end
- Identical Flight ID
- 2 Identical Final Digits
- Anagrams
- Parallel Characters 2
- Identical Bi-grammes

Exaggerated Conflicts

- 1322 versus 1354
- 126 versus 1298 ?
- EVAIR (4/396: 66P versus 66LJ)

Improve 2 Parallel Characters Rule

- Flight ID pair 3 or more characters in length with similar characters only at position 1 and 2 will not be taken into account as a conflict.
- **1322 1354** no conflict
- **1322 1352** conflict
- **132AA 133BB** no conflict