YO-YO AND SHARP-TURN ANGLE FLIGHT PLANS IDENTIFICATION

Guidelines

Edition: 1.0
Edition date: 23-11-2021
Classification: White

DOCUMENT CONTROL

Document Title	YO-YO AND SHARP-TURN ANGLE FLIGHT PLANS IDENTIFICATION
Document Subtitle	Guidelines
Document Reference	This field is automatically updated
Edition Number	1.0
Edition Validity Date	23-11-2021
Classification	White
Status	Released Issue
Author(s)	YYDG
Contact Person(s)	Boris RADOVANOVIĆ (NMD/ACD/PCI)

EDITION HISTORY

Edition No.	Validity Date	Author(s)	Reason
1.0	23/11/2021	All	NMB approval

TABLE OF CONTENT

FIGURES

TABLES

1 SUMMARY

This document is aimed to describe the NM system tool for the detection of the Yo-Yo and sharp-turn angle flight plans (Turn) by aircraft operators (AOs) and flow management position (FMPs) using Network Manager systems. It also contains description of conditions for rejection of critical Yo-Yo and TURN profiles by IFPS.

Yo-Yo flight plans & their operation, key aspects (as agreed by YYDG/1):

1. If a yoyo profile, that was filed to avoid a regulation, is not followed, it will result in 'unanticipated traffic' in the downstream regulated sector. Some ANSPs consider this is impacting safety. Resulting lack of trust in ATFCM reduces network performance.
2. Yoyo profiles are filed for other reasons (RAD requirement, network connectivity, FL orientation, weather, …). Not following these profiles impacts predictability but does not necessarily cause 'unanticipated traffic'.
3. AOs are allowed to avoid a regulation, and as such are allowed to file a yo-yo profile for this reason (assuming the operational intent to fly that profile).
4. Commission Regulation No 1033/2006 (flight plan regulation) Art 3.6 "The operator shall ensure prior to operation of the flight that the content of the initial flight plan correctly reflects the operational intent."
5. Flight plan rules may require AO's to file yoyo-profiles (FL orientation, RAD restrictions).
6. Some AO's instruct their pilots to improve flight efficiency during flight.
7. AO/AOC's generally only manage their flight plans 'by exception', i.e. normally rely on automation and, when acknowledged by IFPS, do not necessarily address flight plan content.
8. Some AO's explain to their AO's the reason for a yoyo profile, eg to avoid a regulation, and expect (instruct?) the pilots to fly that profile.
9. Some AOs have reported that pilots have asked ATC for the yoyo flight, but that ATC denied the descent, probably for workload reasons.
10. Vertical profiles in en-route sectors increase complexity & ATC workload, reducing capacity.
11. ATCOs often do not have visibility of filed FLs due to system design, and as such an ATCO may not be aware of the filed yoyo profile. (actual situation?)
12. ATCOs normally do not have visibility of downstream impact of FPL deviations (eg downstream regulation).
13. Pilots do not have visibility of airspace structures like sectors (apart from changing R/T freq) and ATFCM situation.
14. Some ACCs have implemented, or consider to implement (more) RAD restrictions that prevent AO's to file yoyo profiles (contradicting point 1).
15. An increase in RAD restrictions generally results in less flight plan adherence and less predictability.
16. Some operators have yoyo profiles in company routes, anticipating regulations in specific sectors.
17. Short distance, large vertical deviation yoyo profiles are unlikely to be operated.
    Data indicates that some flights actually operate 2000/3000ft yoyo profiles, which is not the case with 4000/5000ft values or above.
18. Yoyo profiles are not fuel/emission efficient (RP3 will address vertical profiles in flight efficiency targets).
19. Issues associated with yoyo-profiles are most prominent in narrow-band sectorisations, usually designed for airspace with large & complex demand, to meet capacity requirements.

Summer 2019 Exercise conclusions (YYDG report on Summer 2019 exercise):

- Yo-Yos are almost never flown and can deteriorate ATM performance;
- Working closely together with AOs and CFSPs to address Yo-Yo profiles is very effective, resulting in a significant reduction in Yo-Yo profiles files by the AOs concerned; (time-consuming, effort-intensive and not sustainable with the same effort in the long run but as soon as these actions stops, number of Yo-Yo might increase);
- The Yo-Yo detection tool provides an effective means for AO's and FMPs to identify Yo-Yo profiles for follow-up, tactically or post-ops;
- In many cases Yo-Yo profiles are in the Company Routes, often outdated due to lack of AO review;
- Large majority of Yo-Yo's are not intentional, but unintentionally/automatically generated by CFSP (optimisation, automation, database maintenance);
- Only a very small proportion of filed Yo-Yo's are intentionally filed to avoid ATFM regulations;
- Some 'intentional' Yo-Yo profiles are generated for very small economic benefit;

Considering intentional Yo-Yo profiles:

- sometimes ATC can accommodate staying at cruising level, based on full awareness of downstream ATC impact;
- sometimes ATC cannot accommodate the Yo-Yo profile, due to traffic complexity;
- when ATC insists in flying the filed Yo-Yo, in several cases pilots may not agree, resulting in long frequency occupancy, causing safety concerns;
- AO needs a possibility to file Yo-Yo profile in specific circumstances (intentional);
- Longer Yo-Yo profiles are often filed to address wind patterns (AOs remark);
- Yo-Yo profiles might be related to the airspace design/RAD (coordination/cooperation between ANSP and CFSP on pre-validation of changes to be encouraged / best practice);
- After analysis, it appeared that most of the Yo-Yos could have been avoided by AOs' dispatch as a RAD compliant normal routing was always available.

Actions

- CFSPs should (be instructed by their AO's) address shortcomings/limitations (Optimisation software limitation, airspace structures database maintenance and new elements implementations, wind pattern impact) in flight plan generation, to ensure the flight plan is operationally practical and does not contain unintentional elements. This will remove a large majority of filed Yo-Yo profiles;
- CFSPs should investigate a possibility to detect Yo-Yo profiles;
- AOs should regularly review their company routes to ensure they do not cause the generation of unintentional Yo-Yo profiles;
- If Yo-Yo profiles are intentional (i.e. to avoid regulated airspace), pilots must be ready to fly that profile, unless ATC can accommodate staying at cruising level, based on full awareness of downstream ATC impact;

- AO's and FMPs should continue to use the (updated) NM Yo-Yo detection tool on a 'best effort' basis, to support identifying and resolving unintentional Yo-Yo's and to address intentional Yo-Yo's as required;
- Awareness activities to improve pilot and ATCO awareness on Yo-Yo profiles and more generically on the need for flight plan adherence should continue; ANSPs and AOs to actively support this.

INTENTIONALLY LEFT BLANK

2 Introduction

Some ATC flight plans have Yo-Yo profiles, i.e. a descent of 2,000-10,000 feet followed by a climb of similar magnitude. The reasons for including these profiles in flight plans range from wind component optimisation, to software limitations/bugs, to airspace structure issues, to compliance with airspace restrictions, to avoidance of ATFM regulations.

There are various issues with Yo-Yo and sharp-turn angle profiles. The main one is that Yo-Yo and sharp-turn angle profiles are hardly ever flown, which causes downstream predictability issues and unanticipated traffic.

ATC flight plan route and level information are used for Flow Management purposes, to protect ATCOs from a demand more than they can safely handle. If required, the demand is limited through flow measures such as departure delay (ATFM slot). If tactical deviations from filed flight plans put flights in a different ATC sector than assumed by ATFM, then the protection may fail and result in ATFM regulation over-deliveries and/or ATCO overloads. This is particularly the case with Yo-Yo profiles that are not flown.

It is possible that ATC, despite the filed Yo-Yo profile, keeps the flight at the cruising level i.e., deviating from the flight plan. The reason for this may be that ATCO's (currently) often do not have the means to see the filed Yo-Yo descent, nor know the exact downstream impact of such deviation from the flight planned level. Work is ongoing to improve this, and some ANSPs implement system changes that provide ATCO's easier access to filed flight levels.

Pilots may request to stay at the cruising level (e.g. to optimise fuel consumption). Even the ATCO may prefer this, given the (often) higher complexity and workload associated with climbing/descending flights in his sector, without realising the downstream consequence.

Some Yo-Yo profiles are considered as flight planning techniques to overcome specific flight planning issues, not necessarily related to what is expected to be flown. This perception is negative for performance, not realising the use of the filed flight plan such as protecting ATC against over-demand. However, there are different reasons why Yo-Yo flight plans are created, including the RAD restrictions and airspace design issues, CFSP software limitations and to it corresponding database maintenance, AO company routes restrictions, weather (wind) impact and route optimisation based on costs.

Although only a few percent of flights every day have Yo-Yo profiles (200-300 out of daily ~30.000, reference summer 2018), they do have a big impact where they occur. Particularly in busy airspace, where regulations are often needed and where capacity is needed most, unanticipated (uncounted) additional flights in already busy sectors reduces the ATC trust in ATFM protection. This usually results in lower planned capacity, requiring more ATFM regulations, i.e. more ATFM delay.

Following Operations and Development Sub-Group (ODSG) 41 conclusions Yo-Yo drafting group (YYDG) was formed in order to find a tangible solution for operational issues associated with filing and (non) execution of Yo-Yo flight profiles. The scope of YYDG actions is defined taking into account "Yo-Yo key aspects" (see Summary) agreed at the first YYDG meeting.

Main YYDG activities are:

- Focused actions for the reduction of filed Yo-Yo and sharp-turn angle profiles (identifying Yo-Yo and sharp-turn angle profiles associated with airspace design together with ANSPs, AOs and CFSPs);
- Awareness activities with ATCOs and pilots;
- System change development (definition, preparation, planning and operational implementation of change);

3 NMOC system Yo-Yo and sharp turn tool

All flight plans where a change of cruising flight level is done in a way that flight will have to initially descend and after that climb for a certain amount of feet (ITEM 15), and over a specified distance, are considered to be Yo-Yo flight plans.

Similarly, all flight plans where the angle between two consecutive ATS routes/DCTs (based on ITEM 15) is greater than a specified value, are considered to be Sharp turn angle flight plans.

NM is committed to supporting the reduction of flight plans with Yo-Yo and sharp turn angle profiles, in order to carry out predictability enhancements defined in the Flight Plan Predictability Action Plan approved by NDOP, with the goal to increase the level of predictability in tactical operations.

Some ANSPs consider the lack of information about unanticipated traffic causing sector over-delivery and overload of ATCOs a safety-related issue. It is expected that the provision of additional details to ANSP about such flights will decrease unanticipated traffic entering regulated sectors, leading to a reduction in the number of related incidents. Increased awareness on flight plans containing Yo-Yo and sharp turn angle profile will allow FMPs to evaluate traffic demand with more accuracy.

Also, AOs expressed their interest to reduce the number of flight plans submitted with Yo-Yo and sharp turn angle profiles that are not intended to be flown.

Based on YYGD agreement on directions, NM enabled functionality for detection and sharing of information about Yo-Yo and sharp turn angle flight plans with AOs and FMPs concerned.

Using predefined filtering criteria, NMOC systems detect Yo-Yo / Turn flight plans, based on the FPL/CHG messages. When identified, information about that specific flight plan that contains Yo-Yo / Turn profile within the en-route portion of its trajectory is communicated to the AO concerned through the NMOC system interfaces flight list (YY and Turn columns). Similarly, details about these flight plans are made available to FMPs when at least one portion of Yo-Yo profile / Turn point is within their area of responsibility.

With NM release 25.0 a “critical” category of Yo-Yo and Turn profiles is rejected by IFPS.

3.1 Yo-Yo profiles identification

Identification of the Yo-Yo profile is a two-stage process.

After FPL or CHG message is submitted, NMOC system will analyse the vertical profile of a flight to identify Yo-Yo characteristics:

- *descent of at least 2000ft is followed by a climb of at least 3000ft, or*
- *descent of at least 3000ft is followed by a climb of at least 2000ft*.

(values represent total vertical change achieved in descent/climb)

If these characteristics are present in the profile, the flight will become a *Yo-Yo candidate*, with a known Start and End of Yo-Yo sequence.

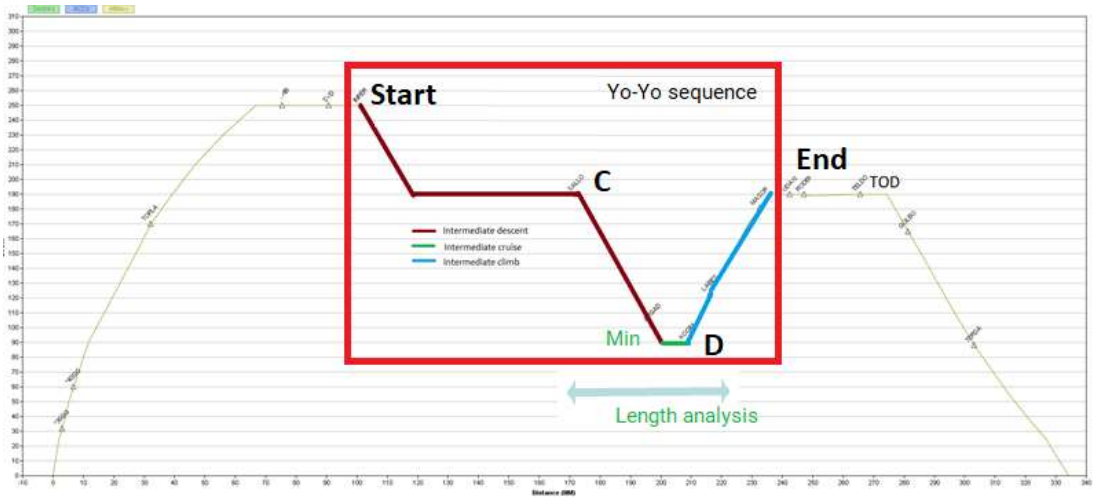


Figure 1: Yo-Yo

Then, in order to mark a flight as a Yo-Yo, the NMOC system will analyse if over the defined length, centred around the lowest part (min level) of the Yo-Yo sequence, there is a vertical profile change that fulfils one of the criteria defined as below:

Vertical change	Length
Not candidate for REJ Category 2000/3000ft to 4000/5000ft	0 – 300 NM
Candidate for REJ Category 4000/5000ft and above	0 – 300 NM
Other – not visible / identified	N/A

Table 1: Yo-Yo vertical/length criteria

NOTE: Vertical change parameter represents the cumulative value of climb/descend considered over the defined length. Parameter e.g. 4000/5000 means that the flight needs to descent at least 4000ft and then climb at least 5000 ft or descend 5000ft and then climb at least 4000 ft, over 300NM to become a candidate for a REJ by NMOC system. For the practical reason, it will be written as 4000/5000 (=5000/4000) or 40/50 (=50/40). Climb/Descend might be continuous or in steps, interrupted with opposite vertical change less than 2000ft, which is ignored when Yo-Yo candidate is defined.

NOTE: Length criteria is measured from a point where a descent commences to a point where climb commences (Picture 1, C and D) – point where step in descent/climb commences to meet vertical criteria.

NOTE: Parameters can be changed through the NM Patch control board process, after agreement with operational stakeholders.

A portion of the trajectory where vertical change and length conditions are fulfilled is considered to be “intermediate Yo-Yo interval”.

Yo-Yo flight plan will not be rejected by IFPS when vertical/length criteria is satisfied if:

- Flight type is M, X
- Type of aircraft is a helicopter
- Intermediate Yo-Yo interval is not completely within IFPZ and not completely *visible* (not completely IFR, STAY indicated, OAT…)
- Flight is *round-robin* (ADEP=ADES).

Flight is exempted from rejection by using in ITEM18 RMK/PROFYYINT (NM will monitor this code utilisation in post-ops and AU may be contacted when non-adherence to the profile is detected).

NOTE: More details about Yo-Yo flight plan rejection is available in IFPS Users manual (PROF325)

3.1.1 Yo-Yo profiles examples

Example 1:

(FPL-FB107CB-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS DCT NIVAS DCT PEVAL DCT NERRA DCT PETAK/N0460F310 DCT DIMIS UL604 YNN UL604 TRL/N0460F330 UL604 PLH/N0460F330 UL604 SALUN/N0460F330 UL604 DBA/N0460F330 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200706 REG/123413234)

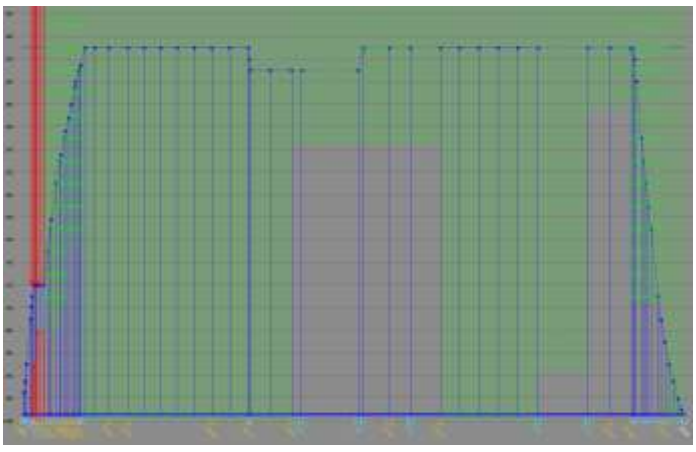


Figure 2: Yo-Yo example 1

Yo-Yo sequence Start/End: PETAK / after TRL

Yo-Yo sequence min level: after PETAK - TRL

Vertical change: 20/20

Length < 300 NM

Vertical/length test conditions not met to be indentified as YY (vertical criteria)

Result: Yo-Yo candidate not presented in YY column

Example 2:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS DCT NIVAS DCT PEVAL DCT NERRA DCT PETAK/N0460F300 DCT DIMIS UL604 TRL/N0460F330 UL604 PLH/N0460F330 UL604 SALUN/N0460F330 UL604 DBA/N0460F330 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200708 REG/1234)

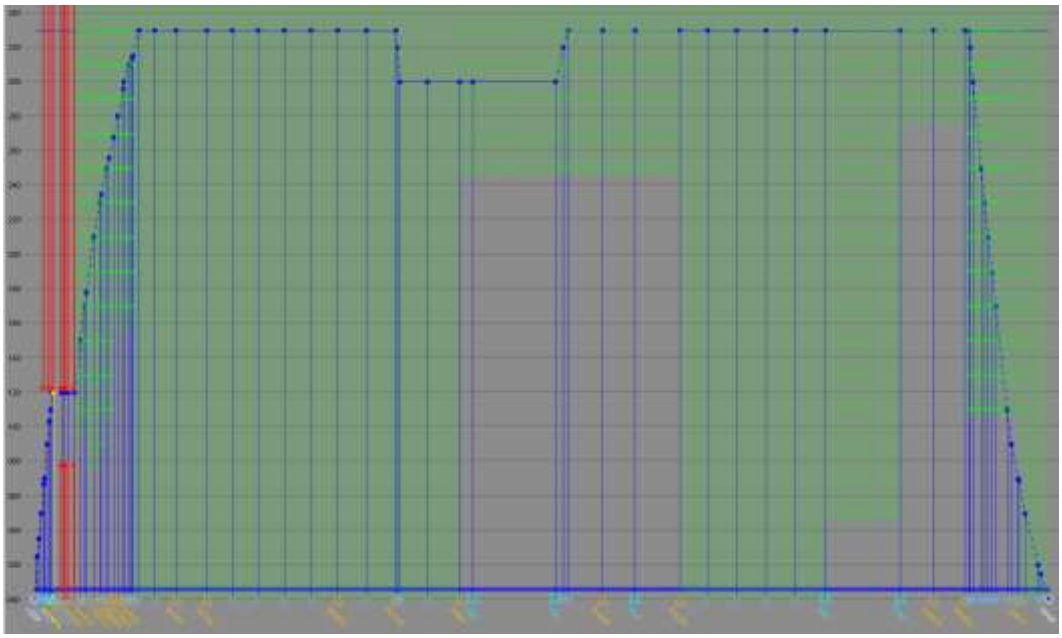


Figure 3: Yo-Yo example 2

Yo-Yo sequence Start/End: PETAK/after TRL

Yo-Yo sequence min level: after PETAK - TRL

Vertical change: 30/30

Length Start to End < 300 NM

Criticality test conditions met between PETAK and TRL (30/30, distance <300 NM, non-critical)

Result: Yo-Yo is not candidate for REJ by IFPS

Example 3:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS DCT NIVAS DCT PEVAL DCT NERRA DCT PETAK/N0460F280 DCT DIMIS UL604 TRL/N0460F330 UL604 PLH/N0460F330 UL604 SALUN/N0460F330 UL604 DBA/N0460F330 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200708 REG/1234)

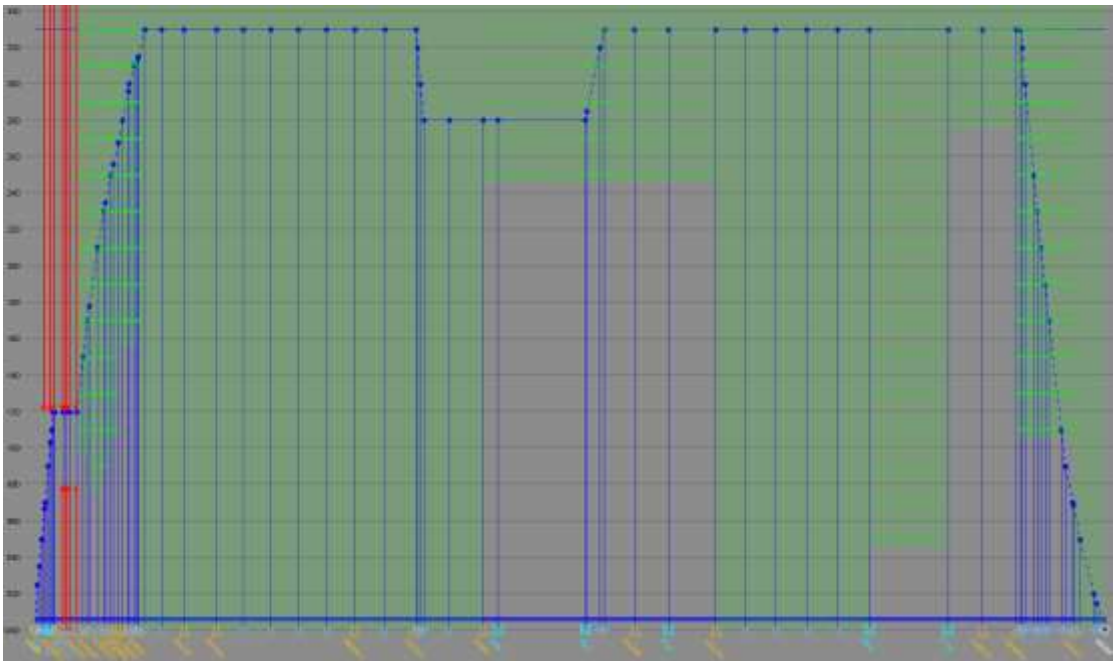


Figure 4: Yo-Yo example 3

Yo-Yo sequence Start/End: PETAK/after TRL

Yo-Yo sequence min level: after PETAK - TRL

Vertical change: 50/50

Length < 300 NM

Vertical test/length conditions met between PETAK and TRL (50/50, distance <300 NM, critical)

Result: Yo-Yo is candidate for REJ by IFPS

Example 4:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL/N0452F270 DCT NERRA DCT PETAK DCT DIMIS UL604 TRL/N0460F350 UL604 SALUN UL604 DBA/N0460F350 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200708 REG/1234)

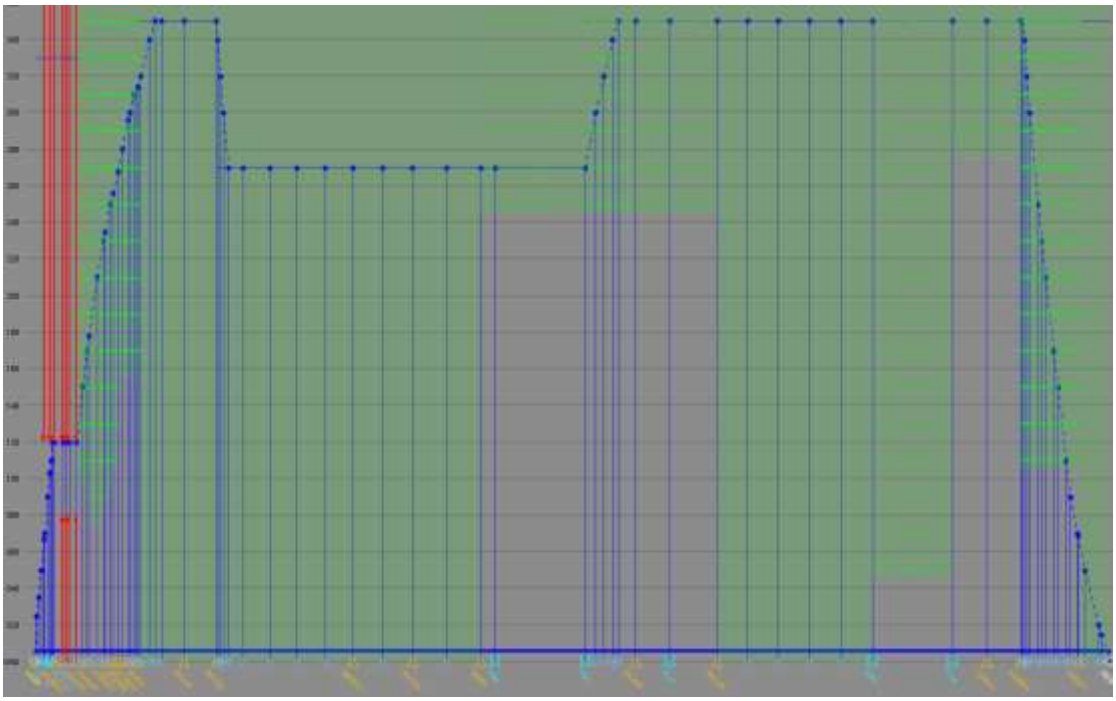


Figure 5: Yo-Yo example 4

Yo-Yo sequence Start/End: PEVAL/after TRL

Yo-Yo sequence min level: after PEVAL - TRL

Vertical change: 80/80

Length > 300 NM

Vertical/length test conditions not met (length criteria)

Result: Yo-Yo is not identified

Example 5:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL/N0452F310 DCT NERRA/N0460F330 DCT PETAK DCT DIMIS/N0460F270 UL604 TRL/N0460F350 UL604 SALUN UL604 DBA/N0460F350 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200708 REG/1234)

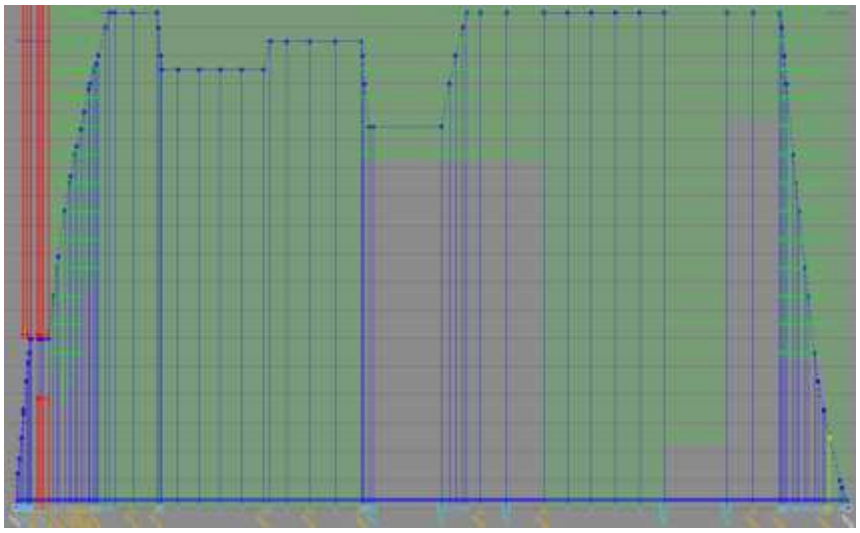


Figure 6: Yo-Yo example 5

Two Yo-Yo candidates are identified:

YY1:

Yo-Yo sequence Start/End: PEVAL/after NERRA

Yo-Yo sequence min level: after PEVAL - NERRA

Vertical change: 40/20

Length < 300 NM

Vertical/length test conditions met between PEVAL and NERRA (40/20, distance <300 NM, non-critical)

YY2

Yo-Yo sequence Start/End: DIMIS / after TRL

Yo-Yo sequence min level: after DIMIS - TRL

Vertical change: 60/80

Length < 300 NM

Vertical/length test conditions met between DIMIS and TRL (60/80, distance <300 NM, critical)

Result: Yo-Yo is candidate for REJ by IFPS

Example 6:

(FPL-FB107CA-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL/N0452F310 DCT NERRA/N0460F320 DCT PETAK/N0460F280 DCT DIMIS UL604 YNN UL604 TRL/N0460F310 UL604 PLH/N0460F330 UL604 SALUN/N0460F350 UL604 DBA/N0460F350 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200706 REG/12341234)

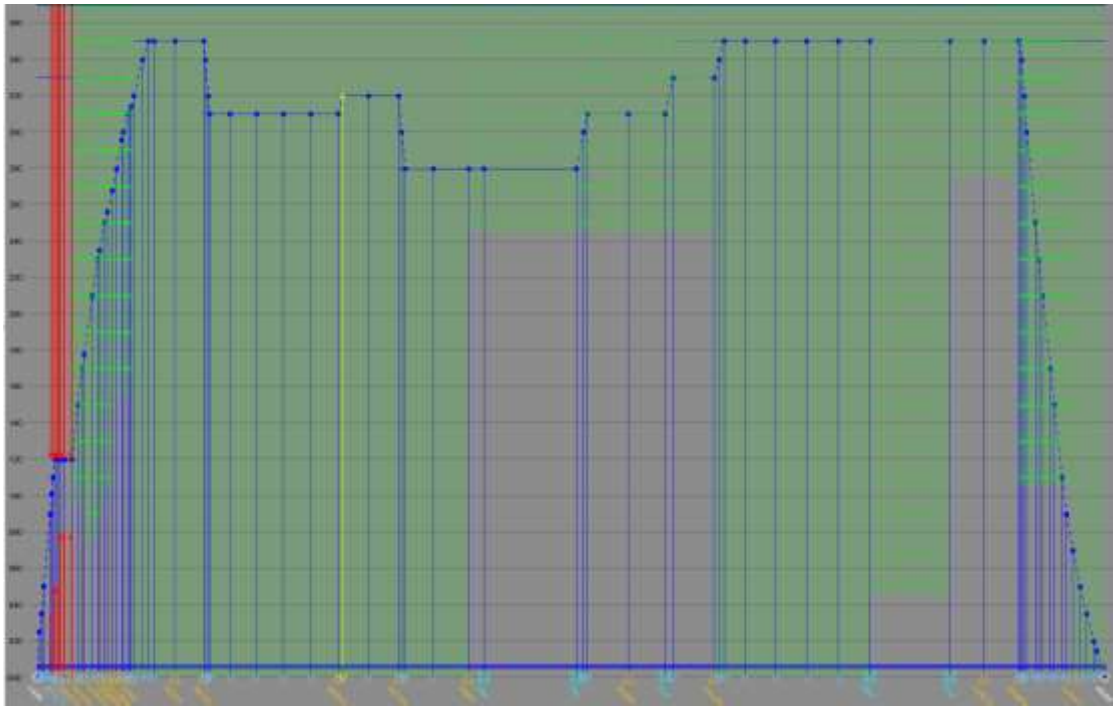


Figure 7: Yo-Yo example 6

Yo-Yo sequence Start/End: PEVAL / after SALUN

Yo-Yo sequence min level: after PETAK - TRL

Vertical change: 70/70

Length > 300 NM

Vertical/length test conditions met between PETAK and TRL (40/30, distance <300 NM, non-critical)

Result: Yo-Yo is not candidate for REJ by IFPS

NOTE: Climb of 1000ft at NERRA is ignored when Yo-Yo candidate is identified

Example 7:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL/N0452F310 DCT NERRA/N0460F320 DCT PETAK/N0460F260 DCT DIMIS/N0460F270 UL604 YNN/N0460F260 UL604 TRL/N0460F310 UL604 PLH/N0460F330 UL604 SALUN/N0460F350 UL604 DBA/N0460F350 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200706 REG/1234)

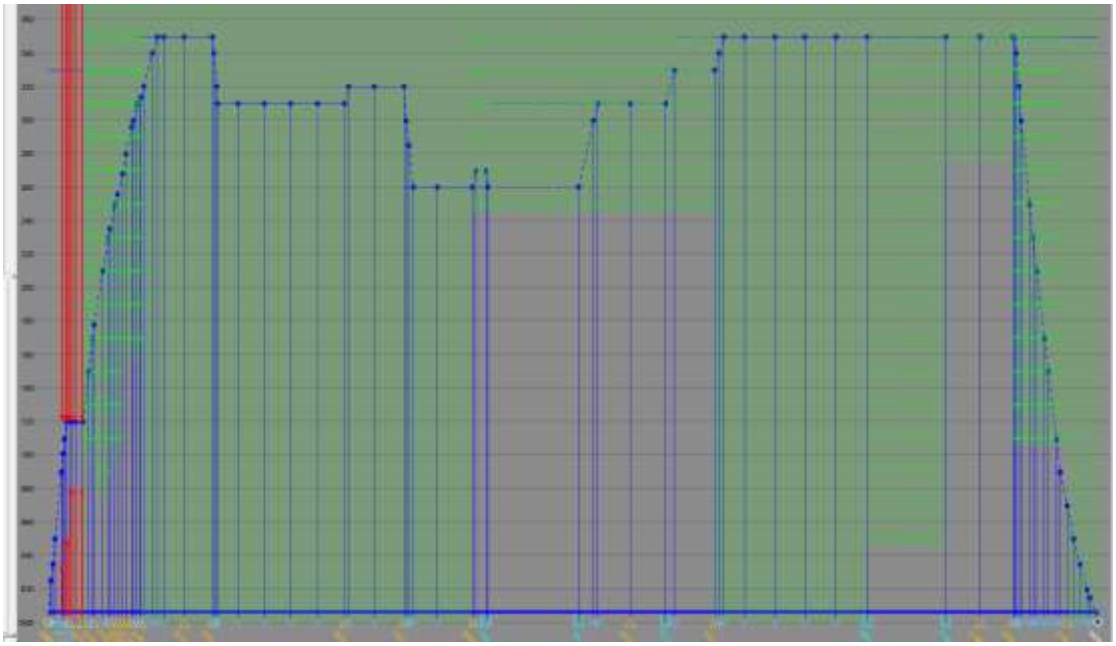


Figure 8: Yo-Yo example 7

Yo-Yo sequence Start/End: PEVAL / after SALUN

Yo-Yo sequence min level: after PETAK - TRL

Vertical change: 90/90

Length > 300 NM

Vertical/length test conditions met between PETAK and TRL (90/90, distance <300 NM, critical)

Result: Yo-Yo is candidate for REJ by IFPS

NOTE: Climb of 1000ft at NERRA, and later DIMIS and descent at YNN are ignored when Yo-Yo candidate is identified

Example 8:

(FPL-FB1072C-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL DCT NERRA DCT PETAK/N0460F260 DCT DIMIS/N0460F280 UL604 YNN/N0460F260 UL604 TRL/N0460F350 UL604 PLH UL604 SALUN UL604 DBA M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/200706 REG/1234)

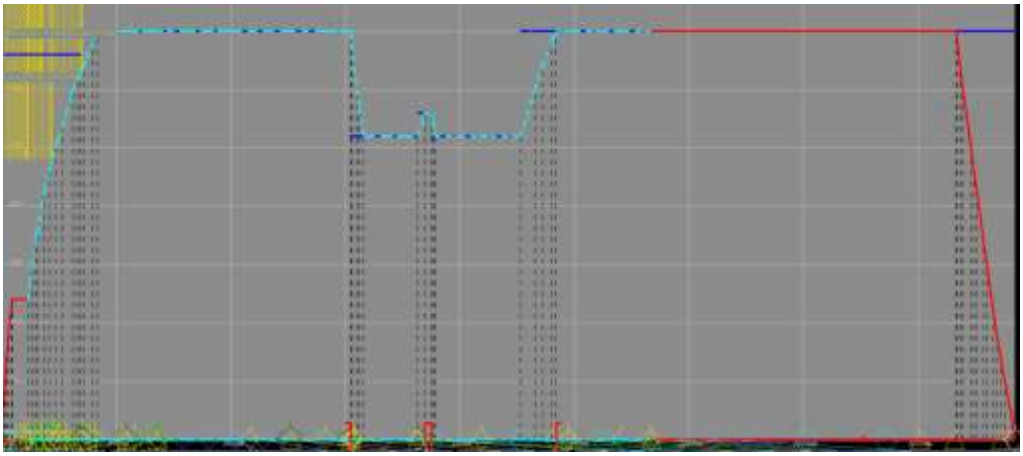


Figure 9: Yo-Yo example 8

Two Yo-Yo candidates are identified:

YY1:

Yo-Yo sequence Start/End: PETAK / after DIMIS

Yo-Yo sequence min level: after PETAK - DIMIS

Vertical change: 90/20

Length < 300 NM

Vertical/length test conditions met between PEVAL and TRL (90/90, distance <300 NM, critical)

YY2:

Yo-Yo sequence Start/End: YNN / after TRL

Yo-Yo sequence min level: after YNN - TRL

Vertical change: 20/90

Length < 300 NM

Vertical/length test conditions met between PEVAL and TRL (90/90, distance <300 NM, critical)

Result: Yo-Yo is candidate for REJ by IFPS

Example 9:

(FPL-FB107CA-IS

-A320/M-SDE2E3FGHIJ1RWXY/L

-LSZH1415

-N0443F330 DEGES Z2 XEBIX L607 ELMEM N606 GIRIS/N0452F350 DCT NIVAS DCT PEVAL/N0452F310 DCT NERRA/N0460F320 DCT PETAK/N0460F280 DCT DIMIS UL604 YNN/N0460F310UL604 TRL/N0460F330 UL604 PLH UL604 SALUN/N0460F350 UL604 DBA/N0460F350 M872 LUGAT

-HEGN0403 HEMA

-PBN/A1B1D1O1S2 DOF/210420 REG/12341234)

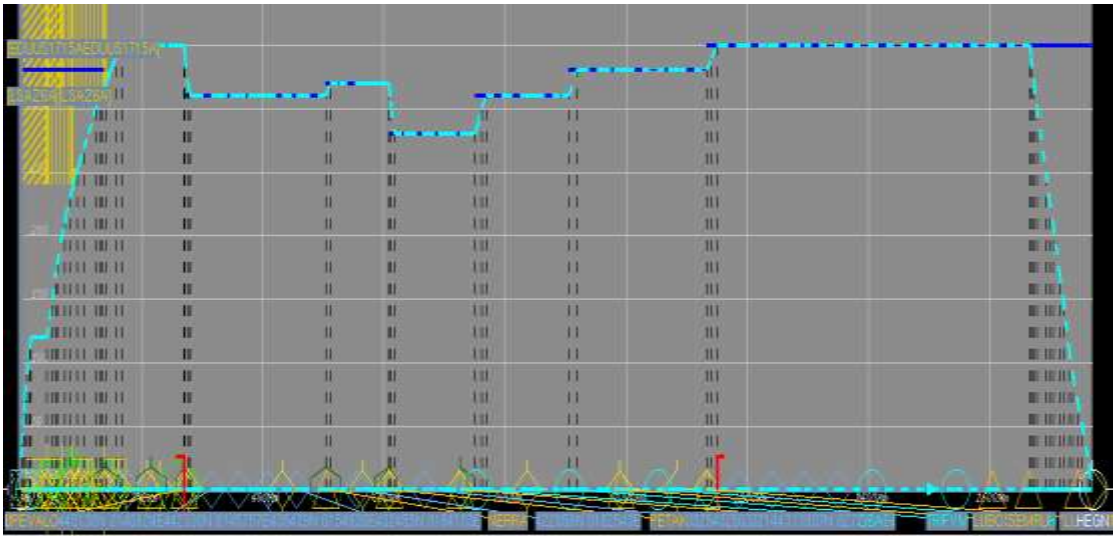


Figure 10: Yo-Yo example 9

Yo-Yo sequence Start/End: PEVAL / after SALUN

Yo-Yo sequence min level: after PETAK - NERRA

Vertical change: 70/50

Length > 300 NM

Vertical/length test conditions met between PETAK and TRL (70/50, distance <300 NM, critical)

Result: Yo-Yo is candidate for REJ by IFPS

NOTE: Climb of 1000ft at NERRA is ignored when Yo-Yo candidate is identified

3.2 Turn profiles identification

After FPL or CHG message is submitted, NMOC system will analyse horizontal profile of a flight to identify (sharp) TURN, based on the value of an angle between two consecutive segments of the trajectory:

Turn angle value
Not candidate for REJ 90 – 120 degrees
Candidate for REJ Above 120 degrees
Other – not visible / identified

Table 2: Turn angle value

TURN flight plan will not be rejected by IFPS when angle criteria is satisfied if:

- Flight type is M, X
- Type of aircraft is a helicopter
- Turn segments are not completely within IFPZ and not completely *visible* (not completely IFR, STAY indicated, OAT…)
- Flight is *round-robin* (ADEP=ADES)
- Turn is at the enroute connecting point
- Turn is within a radius of 60NM around the ADEP/ADES
- Turn point is below FL200.

Flight is exempted from rejection by using in ITEM18 RMK/ PROFTURNINT (NM will monitor this code utilisation in post-ops and AU may be contacted when non-adherence to the profile is detected).

NOTE: More details about TURN flight plan rejection is available in IFPS Users manual (PROF340)

Note: When identify TURN rejected by IFPS that has to be filed by AU in cases when no other routing option is possible, an Error Management restriction (EMR) rule will be used to allow automatic processing / acknowledgement of the flight plans containing that TURN. For each case threaded by EMR, there will be adequate follow-up with ANSP(s) concerned.

3.3 YY and Turn flight list column - AOs

In the NMP Flight / NOP / CHMI flight list, the NMOC system will mark Yo-Yo and sharp-turn angle flights not fulfilling rejection criteria or flights that are exempted from the NMOC system rejection (e.g. because of the use of a dedicated RMK code).

A flight is marked through YY (in case of a Yo-Yo) and TURN (in case of a sharp turn) columns of the flight list, where:

- The first character indicates if there is a Yo-Yo / Turn in the FTFM model (always) – it provides indication based on the FPL/CHG message
- The second character indicates if there is a Yo-Yo / Turn in the highest available model:
    - In the Traffic Demand type / view: FTFM
    - In the Traffic Regulated type / view: RTFM, FTFM
    - In the Traffic Load type / view: CTFM, RTFM, FTFM

(before departure, the First and the Second are the same in all flight list "view" selections).

YY column my take following values (AO flight list query)

YY column	View	Letter 1	Letter 2
yy	Demand/Regulated/Load	Non-critical YY identified in the FTFM	Non-critical YY identified in the highest model
YY	Demand/Regulated/Load	Critical YY identified in the FTFM	Critical YY identified in the highest model
yY	Load	Non-critical YY identified in the FTFM	Critical YY identified in the CTFM
Yy	Load	Critical YY identified in the FTFM	Non-critical YY identified in the CTFM
ny	Load	No YY in the FTFM	Non-critical YY identified in the CTFM
nY	Load	No YY in the FTFM	Critical YY identified in the CTFM
yn	Load	Non-critical YY identified in the FTFM	No YY in the CTFM
Yn	Load	Critical YY identified in the FTFM	No YY in the CTFM
blank	Demand/Regulated/Load	No YY in the FTFM	No YY in in the highest model

TURN column my take following values (AO flight list query)

TURN column	View	Letter 1	Letter 2
tt	Demand/Regulated/Load	Non-critical TURN identified in the FTFM	Non-critical TURN identified in the highest model
TT	Demand/Regulated/Load	Critical TURN identified in the FTFM	Critical TURN identified in the highest model
tT	Load	Non-critical TURN identified in the FTFM	Critical TURN identified in the CTFM
Tt	Load	Critical TURN identified in the FTFM	Non-critical TURN identified in the CTFM
nt	Load	No TURN in the FTFM	Non-critical TURN identified in the CTFM
nT	Load	No TURN in the FTFM	Critical TURN identified in the CTFM
tn	Load	Non-critical TURN identified in the FTFM	No TURN in the CTFM
Tn	Load	Critical TURN identified in the FTFM	No TURN in the CTFM
blank	Demand/Regulated/Load	No TURN in the FTFM	No TURN in in the highest model

Note:

Yo-Yo / Turn flight will always be marked with the first lowercase letter if:

- Flight type is M, X
- Type of aircraft is a helicopter
- Flight is round-robin (ADEP=ADES)
- Intermediate Yo-Yo interval is partially outside the IFPZ and/or is partially visible (not completely IFR, STAY indicated, OAT…)
- Turn point is the enroute connection point
- Turn point is within a radius of 60NM around the ADEP/ADES or else (exclusive) is the turn point is below FL200
- one or both segments to/from the turn point are partially (not completely IFR, STAY indicated, OAT…)
- one or both segments to/from the turn point are partially outside the IFPZ.

Yo-Yo / Turn flight will be marked with the first uppercase letter if the flight is exempted from NMOC system rejection by code in ITEM18: RMK/PROFYYINT or RMK/PROFTURNINT, or exempted by Error management Restriction (EMR).

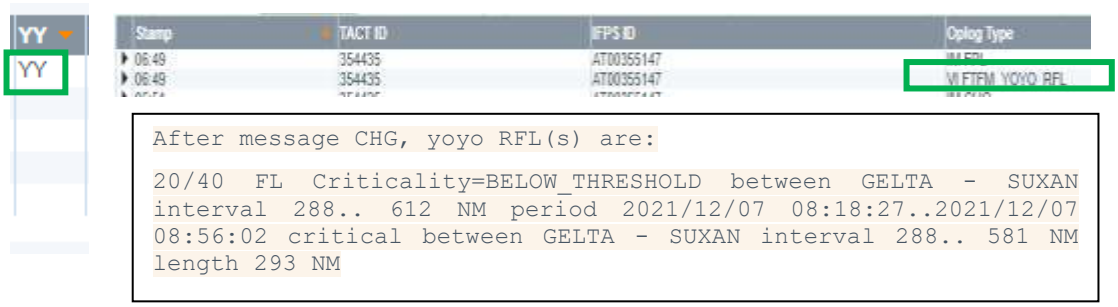
Yo-Yo / Turn flight will not be marked if:

- Intermediate Yo-Yo interval is completely outside the IFPZ and/or is not IFR
- both segments to/from the turn point are not visible or are outside the IFPZ

In other cases, when Yo-Yo/ TURN is not rejected by the NMOC system, they will be marked with lowercase letter.

After departure, the uppercase second letter indicates there is a critical Yo-Yo / Turn in the CTFM.

YY Oplog text example VI-xTFM_YOYO_RFL



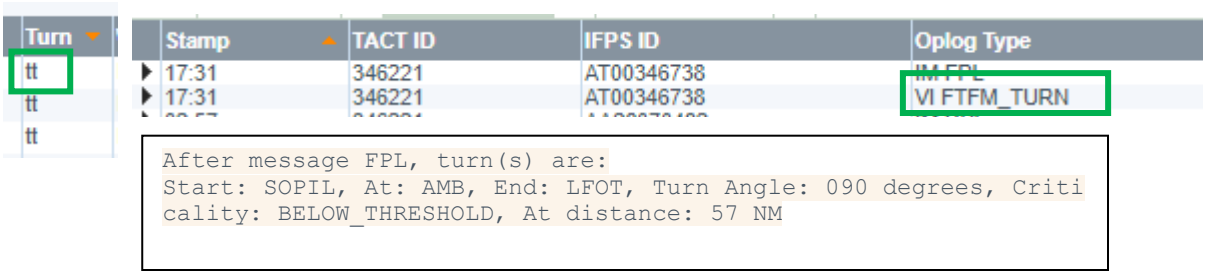
Explanation:

FL Criticality=BELOW_THRESHOLD - Non-critical Yo-Yo

GELTA - SUXAN, Yo-Yo sequence START/END is PEVAL/NERRA

critical between GELTA - SUXAN interval 288.. 581 NM length 293 NM < 300NM

TURN Oplog text example VI-xTFM_TURN



Explanation: Turn at point AMB, with angle 90deg, not critical

In CHMI Archive, irrespectively of the model (TFC type) selected:

- The first character always indicates if there is a Yo-Yo / Turn in the FTFM trajectory
- The second character always indicates if there is a Yo-Yo / Turn in the CTFM trajectory

NOTE: To detect Yo-Yo / Turn flight plans consider only information provided within "Traffic Demand" (FTFM profile based), or "Traffic Regulated" RTFM (RTFM profile based). *The CTFM trajectory may have glitches that may rarely cause wrong identification of the Yo-Yo profile (CTFM due to its sensitivity may have so-called "rabbit ears" that usually appear in the aerodrome vicinity - and this looks like Yo-Yo, but are actually caused by the way how FPL data is interpreted with received CPR coming from the radar). CTFM will be used carefully only in post-ops for analysis of actually flown Yo-Yo profiles. This NOTE will remain valid until described issues are resolved.*

Disclaimer: It is AO and FMP responsibility to validate information received before taking any further actions.

3.4 YY and Turn flight list column - FMPs

(Airspace and TV based on airspace query)

In the NMP Flight / NOP / CHMI flight list, the NMOC system will mark Yo-Yo and sharp-turn angle flights not fulfilling rejection criteria or flights that are exempted from the NMOC system rejection (e.g. because of the use of a dedicated RMK code).

A flight is marked through YY (in case of a Yo-Yo) and TURN (in case of a sharp turn) columns of the flight list, where:

- The first character indicates if there is a Yo-Yo / Turn in the FTFM model (always) – it provides indication based on the FPL/CHG message
- The second character indicates if there is a Yo-Yo / Turn in the highest available model:
    - In the Traffic Demand type / view: FTFM
    - In the Traffic Regulated type / view: RTFM, FTFM
    - In the Traffic Load type / view: CTFM, RTFM, FTFM

(before departure, the First and the Second are the same in all flight list "view" selections).

When querying on Airspace and TV based on airspace, the second line will provide more details on Yo-Yos intersection with queried airspace:

- C : Complete, Yo-Yo completely overlaps with the airspace.
- S : Start, there is a Yo-Yo that starts within the airspace.
- E : End, there is a Yo-Yo that ends within the airspace.
- A : Airspace, Yo-Yo cross with the airspace, but not the start or end.
- O: Outside, there is no Yo-Yo overlapping with the airspace

but there is at least one outside this airspace.

Furthermore

- Blank: There is no Yo-Yo at all or detection has never been performed.
- N: no Yo-Yo in one of the columns when detected in another

YY column my take following values

(x/X values - when querying an airspace/TV based on airspace)

YY column	View	Letter 1	Letter 2
yy	Demand/Regulated/Load	Non-critical YY identified in the FTFM	Non-critical YY identified in the highest model
YY	Demand/Regulated/Load	Critical YY identified in the FTFM	Critical YY identified in the highest model
yY	Load	Non-critical YY identified in the FTFM	Critical YY identified in the CTFM
Yy	Load	Critical YY identified in the FTFM	Non-critical YY identified in the CTFM
ny	Load	No YY in the FTFM	Non-critical YY identified in the CTFM
nY	Load	No YY in the FTFM	Critical YY identified in the CTFM
yn	Load	Non-critical YY identified in the FTFM	No YY in the CTFM
Yn	Load	Critical YY identified in the FTFM	No YY in the CTFM
yx	Demand/Regulated/Load	Non-critical YY identified in the FTFM	x - Non-critical YY identified in the highest model
Yx	Demand/Regulated/Load	Critical YY identified in the FTFM	x - Non-critical YY identified in the highest model
yX	Demand/Regulated/Load	Non-critical YY identified in the FTFM	X - Critical YY identified in the highest model
YX	Demand/Regulated/Load	Critical YY identified in the FTFM	X - Critical YY identified in the highest model
nx	Load	No YY in the FTFM	x - Non-critical YY identified in the CTFM
nX	Load	No YY in the FTFM	X - Critical YY identified in the CTFM
blank	Demand/Regulated/Load	No YY in the FTFM	No YY in in the highest model
x/X Values			
c/C	Yo-Yo completely overlaps with the airspace		
s/S	Yo-Yo that starts within the airspace		
e/E	Yo-Yo that ends within the airspace		
a/A	Yo-Yo crossing the airspace, but not the start or end		
o/O	there is no Yo-Yo overlapping with the airspace but there is at least one outside this airspace		

Table 3: YY column values – flight list

When querying on Airspace and TV based on airspace, the second letter will provide more details on Turn intersection with queried airspace:

- I: Turn is inside, or on the boundary, of the airspace
- O: Turn is outside the airspace

Furthermore,

- Blank: There is no Turn at all or detection has never been performed.
- N: no Turn in one of the columns when detected in another

TURN column my take following values

(x/X values - when querying an airspace/TV based on airspace)

TURN column	View	Letter 1	Letter 2
tt	Demand/Regulated/Load	Non-critical TURN identified in the FTFM	Non-critical TURN identified in the highest model
TT	Demand/Regulated/Load	Critical TURN identified in the FTFM	Critical TURN identified in the highest model
tT	Load	Non-critical TURN identified in the FTFM	Critical TURN identified in the CTFM
Tt	Load	Critical TURN identified in the FTFM	Non-critical TURN identified in the CTFM
nt	Load	No TURN in the FTFM	Non-critical TURN identified in the CTFM
nT	Load	No TURN in the FTFM	Critical TURN identified in the CTFM
tn	Load	Non-critical TURN identified in the FTFM	No TURN in the CTFM
Tn	Load	Critical TURN identified in the FTFM	No TURN in the CTFM
tx	Demand/Regulated/Load	Non-critical TURN identified in the FTFM	x - Non-critical TURN identified in the highest model
Tx	Demand/Regulated/Load	Critical TURN identified in the FTFM	X - Critical YY identified in the highest model
tX	Demand/Regulated/Load	Non-critical TURN identified in the FTFM	x - Non-critical TURN identified in the highest model
TX	Demand/Regulated/Load	Critical TURN identified in the FTFM	X - Critical YY identified in the highest model
nx	Load	No YY in the FTFM	x - Non-critical YY identified in the CTFM
nX	Load	No YY in the FTFM	X - Critical YY identified in the CTFM
blank	Demand/Regulated/Load	No TURN in the FTFM	No TURN in in the highest model
x/X Values			
i/I	Turn is inside, or on the boundary, of the airspace		
o/O	Turn is outside airspace		

Table 4: TURN column values – flight list

Remarks - Focus on:

S, C: Yo-Yos to adhere to the Yo-Yo flight plan

E, A: flight may come on different FL if Yo-Yo not instructed from previous ATC units

Note:

Yo-Yo / Turn flight will always be marked with the first lowercase letter (will not be rejected by NMOC system) if:

- Flight type is M, X
- Type of aircraft is a helicopter
- Flight is round-robin (ADEP=ADES)
- Intermediate Yo-Yo interval is partially outside the IFPZ and/or is partially visible (not completely IFR, STAY indicated, OAT…)
- Turn point is the enroute connection point
- Turn point is within a radius of 60NM around the ADEP/ADES or else (exclusive) is the turn point is below FL200
- one or both segments to/from the turn point are partially (not completely IFR, STAY indicated, OAT…)
- one or both segments to/from the turn point are partially outside the IFPZ.

Yo-Yo / Turn flight will be marked with the first uppercase letter if flight is exempted from NMOC system rejection by code in ITEM18: RMK/PROFYYINT or RMK/PROFTURNINT

Yo-Yo / Turn flight will not be marked if:

- Intermediate Yo-Yo interval is completely outside the IFPZ and/or is *invisible*
- both segments to/from the turn point are *invisible* or are outside the IFPZ

In other cases, when Yo-Yo/ TURN is not rejected by NMOC system, they will be marked with lowercase letter.

After departure, the uppercase second letter indicates there is a critical Yo-Yo / Turn in the CTFM.

NMOC system looks at the sequence of the RFL from the FPL/CHG message but is using NMOC systems calculated trajectory to generate the position of the Yo-Yo in relations to the airspace.

NOTE: To query ANSP AoR use “CC” airspaces (eg LFCC) in the flight list.

Example Yo-Yo:

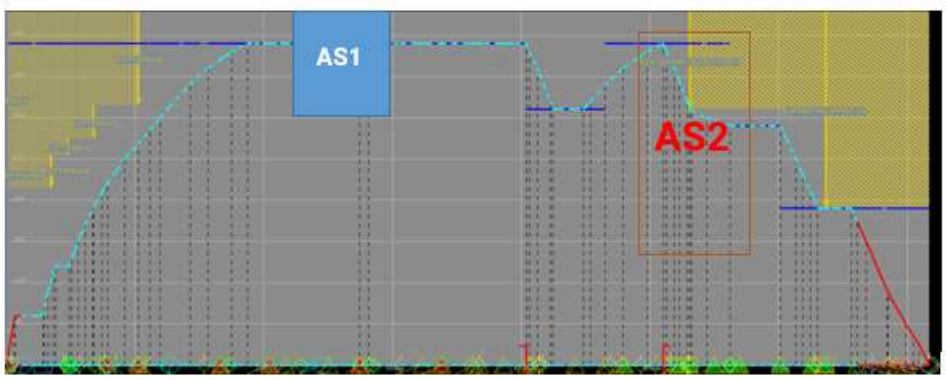


Figure 11: Example of Yo-Yo in relation to an airspace

Airspace AS1 queried (Traffic demand): YO

- There is a Yo-Yo in a trajectory crossing AS1, but Yo-Yo is outside queried airspace

Airspace AS2 queried (Traffic demand): YE

- There is a Yo-Yo in atrajectory crossing AS2, and Yo-Yo exit is in queried airspace

In CHMI Archive, irrespectively of the model (TFC type) selected:

- The first character always indicates if there is a Yo-Yo in the FTFM trajectory
- The second character always indicates if there is a Yo-Yo in the CTFM trajectory
- Detailed intersection is possible only on the AUA airspace category (e.g. EDYYUTA)

When querying in archive airspace not AUA:

- y/Y: there is a Yo-Yo in the FTFM (first character) or CTFM (second character)

NOTE: To detect Yo-Yo /Turn flight plans consider only information provided within "Traffic Demand" (FTFM profile based), or "Traffic Regulated" RTFM (RTFM profile based). *The CTFM trajectory may have glitches that may rarely cause wrong identification of the Yo-Yo profile (CTFM due to its sensitivity may have so-called "rabbit ears" that usually appear in the aerodrome vicinity - and this looks like Yo-Yo, but are actually caused by the way how FPL data is interpreted with received CPR coming from the radar). CTFM will be used carefully only in post-ops for analysis of actually flown Yo-Yo profiles. This NOTE will remain valid until described issues are resolved.*

As Yo-Yo detection is done based on the RFL sequence from the flight plan, while sector/TV intersection calculation based on the trajectory model, in a limited number of cases, when the RFL just after the departure / before arrival is extremely high, Yo-Yo might be detected because of the RFL sequence but not visible in the calculated trajectory - in that case, intersection with the TV would have value 0.

Disclaimer: It is AO and FMP responsibility to validate information received before taking any further actions.

Example Turn:

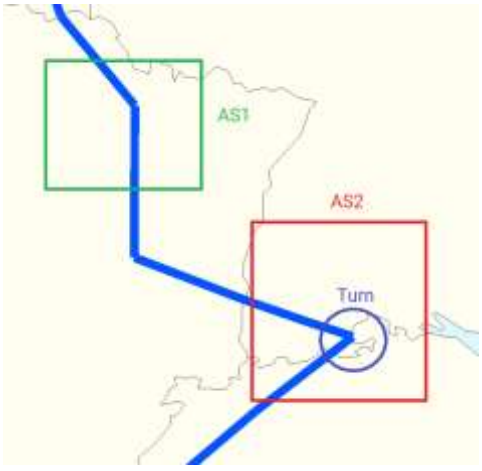


Figure 12: Example of Turn in relation to an airspace

Airspace AS1 queried (Traffic demand): to

- There is a Turn in trajectory crossing AS1, but Turn is outside the queried airspace

Airspace AS2 queried (Traffic demand): ti

- There is a Yo-Yo trajectory crossing AS2, and Turn is in the queried airspace

In CHMI Archive, irrespectively of the model (TFC type) selected:

- The first character always indicates if there is a Turn in the FTFM trajectory
- The second character always indicates if there is a Turn in the CTFM trajectory
- Detailed intersection is possible only on the AUA airspace category (e.g. EDYYUTA)

When querying in archive airspace not AUA:

- t/T: there is a Turn in the FTFM (first character) or CTFM (second character

When a flight plan is received, a **Filed TFM** (FTFM) is created. All known information on the flight is part of it. The FTFM will remain available until the flight is archived. The FTFM shows the request from the AO. Any modification on the flight made by the AO (DLA, CHG...) or some DPI messages will update the FTFM. If the flight is subject to a regulation or to a rerouteing, the ETFMS creates a **Regulated TFM**. If the ETFMS receives a CPR / FSA, DEP or some DPI messages for a flight, a **Current TFM (CTFM)** is created. The CTFM indicates the real situation of the flight. The flight is in a status ATC activated. When the system time reaches the CTOT for a flight, the CTFM is also created. The flight is in a status TACT activated (Expecting an activation message).

INTENTIONALLY LEFT BLANK

4 Recommendations for addressing YY/TURN flight plans

The purpose of this chapter is to provide recommendations to operational stakeholders for addressing YY and TURN flight plans, as proposed by YYDG, based on summer 2019 exercise.

As a general principle, when Yo-Yo/Sharp-turn angle is detected and whenever it is possible, FMP may try contacting AO to agree on one of the actions:

- to refile flight plan without Yo-Yo/Sharp-Turn angle profile
- to adhere to the flight plan with Yo-Yo/Sharp-Turn angle profile.

Note: “To adhere” in context of this instruction means special attention that planned Yo-Yo/Sharp-Turn angle profile will be operated.

4.1 ANSP

FMP

- coordinate when possible with AOs to refile flight plan if possible or adhere to the flight plan
- inform ATCO about that flight plan Yo-Yo/Sharp-Turn angle status if Yo-Yo/Sharp-Turn angle is not suppressed after CDM
- choose to enforce FPL adherence without any precedence, in coordination with ATCO, even if AO was not contacted
- keep records on this agreed actions/reasons for the purposes of the post-ops analysis
- coordinate with adjacent FMP further actions
- be mindful that contacting AOs to update/ refile 3 hours before EOBT might make them late updater (2h before EOBT) or late filers (3h before EOBT)
- before applying regulation, if Yo-Yos/Sharp-Turn angles are contributing to it, contact relevant AO

ATCOs

- when informed by FMP adhere to the Yo-Yo/Sharp-Turn angle flight profile, if the traffic situation allows
- avoid requesting FL on the first contact with a pilot
- avoid offering FL not in the Flight Plan
- common and international agreed phraseology required, which doesn’t allow any space for misunderstanding and sticks to FL according to FPL

Other

- do not use data obtained by YY/TURN tool to implement new RAD restrictions
- address RAD restrictions contributing to YY profiles
- identify RAD restrictions (preventing YY/TURN profiles) to be relaxed/suppressed

4.2 AOs

- ensure that the flight plan contains the operational intentions of the flight
- refile Yo-Yo/Sharp-Turn angle flight plans not intended to be operated, even if not requested by FMP
- update/review company routes and highlight (to be addressed) flight planning system shortcomings/limitations
- ensure pilots are aware of the Yo-Yo/Sharp-Turn angle if not suppressed after CDM
- advice pilots to adhere to the Yo-Yo/Sharp-Turn angle flight plan if intended to be operated
- keep records on about taken actions for the purposes of the post-ops analysis
- highlight to NM Yo-Yo/Sharp-Turn angle flight plans that could not be refiled without Yo-Yo profile (e.g. due to RAD restriction, ATS route availability etc.), keep records
- consider that refiling may cause late update/filer effect
- report to NM Incident (via CCMS or email at NM.incident@eurocontrol.int) any yo-yo/turn profiles that are forced to be filed due to airspace design issues

Pilots

- identify Yo-Yo/Sharp-Turn angle profiles in your ATC flight plan
- report identified Yo-Yo/Sharp-Turn angle profiles to flight planning office
- adhere to the flight plan
- request ATC to adhere to the flight plan - > it would be more precise for a vertical profile to request FLs according to FPL (“request descent to FL xxx”)
- report if ATCO ignore Yo-Yo/Sharp-Turn angle profile

The more general principle of Adherence to Flight Plans stems from ICAO Doc Annex 2 to the Convention on International Civil/Aviation/Rules of the Air. In accordance with Chapter 3, article 3.6.2 “an aircraft shall adhere to the current flight plan or the applicable portion of a current flight plan submitted for a controlled flight unless a request for a change has been made and clearance obtained from the appropriate air traffic control unit, or unless an emergency situation arises which necessitates immediate action by the aircraft, in which event as soon as circumstances permit, after such emergency authority is exercised, the appropriate air traffic services unit shall be notified of the action taken and that this action has been taken under the emergency authority.

Note: (EC) No 1033/2006 laying down the requirements on procedures for flight plans in the pre-flight phase for the single European sky applies as from 1st January 2009: “The operator shall ensure that the conditions of acceptance of a flight plan and any necessary changes thereto as notified by IFPS to the originator are incorporated into the planned flight operation and communicated to the pilot.” and “The operator shall ensure prior to operation of the flight that the content of the initial flight plan correctly reflects the operational intentions.”

Acronyms

Term	Definition
ACC	Area Control Centre
ADEP	Aerodrome of Departure
ADES	Aerodrome of Destination
ANSP	Air Navigation Service Provider
AO	Aircraft Operator
AOC	Aircraft Operating Company
AoR	Area of Responsibility
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
AU	Airspace User
CDM	Cooperative Decision-Making
CFSP	Computer Flight Plan Service Providers
CHG	Change Message
CHMI	Collaboration Human Machine Interface
CPR	Correlated Position Report
CTFM	Current Tactical Flight Model
EMR	Error Management Restriction
EOBT	Estimated Off-Block Time
FL	Flight Level
FMP	Flow Management Position
FPL	Flight plan message
FTFM	Filed Tactical Flight Model
IFPS	Integrated Initial Flight Plan Processing System
IFPZ	IFPS Zone
IFR	Instrument Flight Rules
NDOP	Network Directors of Operations
NM	Network Manager
NMOC	Network Manager Operations Centre
NOP	Network Operations Portal

OAT	Operational Air Traffic
ODSG	Operations and Development Sub-Group
R/T	Radio/Telephony
RAD	Route Availability Document
REJ	Reject (IFPS)
RP3	Reference period 3
RTFM	Regulated Tactical Flight Model
TV	Traffic Volume
YYDG	Yo-Yo Drafting group

EUROCONTROL

SUPPORTING EUROPEAN AVIATION

www.eurocontrol.int