International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)

WORKING PAPER

PPRC/5 — WP/22
11/07/19

Fifth Meeting of the Programmes and Projects Review Committee (PPRC/5)
Mexico City, Mexico, 16 to 18 July 2019

Agenda Item 5: **Review of GREPECAS Programmes and Projects and Subsidiary Groups**
5.1 Projects under the PBN Programme (B0-APTA, B0-FRTO, B0-CDO and B0-CCO)

FREE ROUTE AIRSPACE

(Presented by IATA)

EXECUTIVE SUMMARY

This working paper presents a proposal to harmonize the strategy applicable to the optimization of the CAR/SAM airspace, through the application of the Free Route Airspace (FRTO-B1 / 1 Free Route Airspace - FRA), applying as transition strategy the implementation of Direct Routes (FRTO-B0 - Direct routing (DCT), as it has been done by Colombia, the Dominican Republic, Curacao and CENAMER.

Action:	Harmonize the CAR/SAM airspace optimization strategy, through the application of ASBU FRTO-B1, using direct routes (FRTO-B0) as a transition.
Strategic Objectives:	• Air Navigation Capacity and Efficiency • Economic Development of Air Transport • Environmental Protection
References:	• SAM/IG/23 • ATSRO/10 • ANIWG/5

1. Introduction

1.1. During the last years the application of the fixed route network concept was responsible for the complete restructuring of the regional ATS route network, which involved the implementation, realignment and elimination of several routes.

1.2. However, the natural evolution of the optimization of airspace is the use of the Free Route Airspace (FRA), as established in the Global Air Navigation Plan. The use of fixed ATS routes is no longer able to provide the efficiency required for airspace users to obtain fuel savings, flexibility and reduction of greenhouse gas emissions.

2. Free Route Airspace 'Concept of Operations'

2.1 The 37th Session of the International Civil Aviation Organization (ICAO) Assembly (2010) directed member States to increase efforts to meet the global needs for airspace interoperability while maintaining its focus on safety. ICAO therefore introduced the "Aviation System Block Upgrades" (ASBU) initiative as a programmatic framework that:

a) Develops a set of air traffic management (ATM) solutions or upgrades;
b) Takes advantage of current equipage;
c) Establishes a transition plan; and
d) Enables global interoperability.

2.2 As part of the ASBU, four performance improvement areas (PIA) have been set up:

a) Airport Operations
b) Globally Interoperable Systems and Data – through globally interoperable system-wide information management
c) Optimum Capacity and Flexible Flights – through global collaborative ATM
d) Efficient Flight Path – through trajectory-based operations

2.3 Performance Improvement Area (PIA) 3 of the ASBU deals with "Optimum Capacity and Flexible Flights – through Global Collaborative ATM" – here we can find Block B1-FRTO (Free-Route Operations):

Improved Operations through Optimized ATS Routing Introduction of free routing in defined airspace, where the flight plan is not defined as segments of a published route network or track system to facilitate adherence to the user-preferred profile

What is 'Free Route Airspace"?
"A specified airspace within which users may freely plan a route between a defined entry point and a defined exit point, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the fixed ATS route network, subject to airspace availability and consideration of restrictions. Within this airspace, flights remain subject to air traffic control."

Free route airspace allows airspace users to fly an efficient preferred trajectory between a defined entry and exit point (and potentially via intermediate waypoints, if desired), subject to air traffic control, rather than fly existing fixed ATS-Routes with the result to provide operational, environmental and financial benefits for airspace users.

2.4 Free Route Airspace provides an unmatched performance in terms of flight trajectory efficiency through cooperative air traffic management.

2.5 Considerations to analyse before the B1-FRTO implementation:

a) Publication of the 'Free Route Airspace Concept, Requirements and Restrictions' in the State AIP. An example of State AIP is attached as **Appendix A.**
b) Trial period can be considered for evaluation
c) Consider/integrate military requirements from the beginning, but also convince the military to benefit of the use of Free Route Airspace
d) Defining the 'Area of Applicability' and its lateral dimensions
e) Safety is addressed with focus on human aspects

f) Validate that the involved ATM systems can process FPLs with LAT/LONG WPT's in FIRs boundaries not predefined on the databases.
g) Defining the segment length restrictions of Free Route Airspace segments
h) Trajectories shall not be planned closer than xx NM (to be defined) to the Free Route Airspace lateral border
i) Compulsory Connecting Routes for main departure / arrival flows (marginal flows connect via any Arrival / Departure points) within the Free Route Airspace dimension to reduce complexity. High density segregated departure and arrival routes may require PBN capabilities.
j) Generally, flights may not be planned through active Prohibited-, Restricted- and/or Danger-Areas. Intermediate points can be used to avoid the active areas.
k) Where designated, the existing ATS route network within the 'Free Route Airspace Area of Applicability' may remain initially and in parallel during a transition period, but the ultimate goal shall be to remove the fixed ATS-Route network in its entirety in the designated area.
l) Cooperate with neighbouring/adjacent Free Route Airspaces: The larger the Free Route Airspace area – the larger the benefits
m) The use of a SWIM concept to share ATM dynamic information improving the establishment of Free Route Airspace

2.7 Expected benefits:

a) Improved predictability through the "File it – Fly it" concept.
b) Elimination of constrains caused by the fixed ATS-route network structure; congestion points will disappear.
c) No change shall be required to existing ATC procedures
d) Using the entire airspace as a 'resource' – traditional 'unused airspace' is made available to either civil or military users (through flexible and optimal use)
e) Enhanced planning flexibility for operators
f) Reduction in CO2

3. Strategy for introducing the Free Route Airspace

3.1 The SAMIG/23, ATSRO/10 and ANIWG/5 meetings have decided to begin the analysis of the implementation of the Free Route Airspace, through the development of a concept of operations, changing the current strategy of implementation of fixed routes, applying PBN "only" as one of the necessary tools for the optimization of airspace.

3.2 It is important to bear in mind that the current Concepts of PBN Operations for the Airspace of the CAR and SAM Regions, in some way present the need to implement the Free Route Airspace. However, it still addresses the use of fixed routes based on PBN as the main strategy for the optimization of the en-route phase. A complete modification of the PBN CONOPS of both Regions should be made.

3.3 Considering that the implementation of airspace for en-route operations is being carried out by the Performance Based Navigation Task Force (PBN) of the ANI / WG Working Group and by the "new" Subgroup 1 of the SAM Airspace Study and Implementation Group, it is important that both groups establish a harmonization strategy for their work, with a view to reflecting a new method of implementation of en-route optimizations based on different strategies, one of which is Fee Route Airspace, taking into account that free routes must cross CAR and SAM FIR interface.

3.4 With a view to more adequately reflecting the need for a more holistic optimization of the airspace of the CAR and SAM regions, as well as establishing a framework in which the PBN becomes

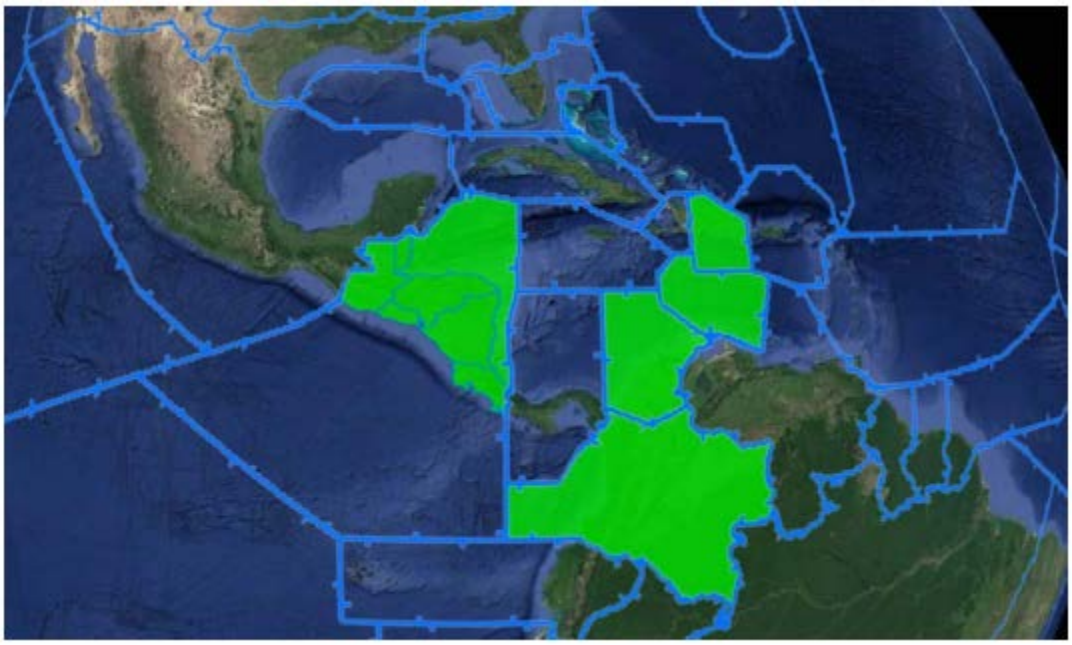
"only" one of the necessary tools for such optimization, It would be convenient to change the name of the PBN Program (B0-APTA, B0-FRTO, B0-CDO and B0-CCO) for the Airspace Optimization Program (B0-APTA, B0-FRTO, B0-CDO and B0-CCO).

4. Implementation of Direct Routing (FRTO-B0/1 Direct routing - DCT), in Colombia

4.1 Since 2018, Direct Routing is being applicable in Colombia. This concept is based on use of the any published waypoints to flight plan and operations in Bogotá and Barranquilla FIRs and could be used as a transition to the Free Route Airspace implementation.

4.2 Just for one airline (KLM) and one city pair (Guayaquil – GYE to Amsterdam-AMS), the use of Direct Routing in Colombia resulted in the 269 ton of fuel savings and 851 tons of reduction in greenhouse gas emissions.

4.3 Besides Colombia, Dominican Republic, Curazao and CENAMAER have agreed in implementing Direct Routing and trials will be initiated soon. Most of SAM States would be in position to initiate similar trials in large portions of their airspaces, which count on good Communication (VHF) and Surveillance coverages.



4.4 A full analysis of Direct Routing use in Colombian Airspace is provided by KLM in the **Appendix B** to this working paper.

4.5 An example of potential benefits that could be achieved by LATAM in the flights SPJC/MDPC/SPJC, involving Lima, Bogotá, Barranquilla, Curazao and Santo Domingo FIRs is shown in the **Appendix C**.

5. Suggested Actions

5.1 The meeting is invited to:

a) Take note of the information provided in this working paper;

b) Discuss and agree on the harmonization strategy between the Performance Based Navigation Task Force (PBN) of the ANI/WG Working Group and the "new" Subgroup 1 of the SAM Airspace Study and Implementation Group, for the implementation of Free Route Airspace, based on the procedures already established in the FIRs of Bogotá and Barranquilla;

c) Change the name of the PBN Program name (B0-APTA, B0-FRTO, B0-CDO and B0-CCO) for the Airspace Optimization Program (B0-APTA, B0-FRTO, B0-CDO and B0-CCO)).

d) Establish this strategy as a high Regional priority, with a view to improving operational efficiency.

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APENDIX A

ENR 1.3 INSTRUMENT FLIGHT RULES

1. RULES APPLICABLE TO ALL IFR FLIGHTS

1.1 Aircraft equipment

Commercial air transport aircraft operating in the airspace of Hungary have to adhere to the provisions of ICAO Annex 6 - Operation of Aircraft - Part 1, Chapter 6 - Aeroplane Instruments, Equipment and Flight Documents - and Chapter 7 - Aeroplane Communication and Navigation Equipment, and Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.

Aircraft, other than State aircraft, operating within the Budapest FIR under IFR shall be equipped with, as a minimum, RNAV equipment meeting RNAV 5 (B-RNAV) in accordance with the requirements set out in of ICAO Doc 7030/5 Regional Supplementary Procedures (EUR).

Acceptable means of compliance are set out in the JAA Technical Guidance Leaflet No. 2 rev. 1 and EASA AMC 20-4, Airworthiness Approval and Operational Criteria for the Use of Navigation Systems in European Airspace Designated for Basic RNAV Operations.

Requirements for VFR flights related to VHF 8.33 KHZ channel spacing radio equipage are stated in *GEN 1.5*.

1.2 Minimum flight altitudes

The AMAs depicted on chart *ENR 6-LHCC-ERC* have been determined so as to ensure at least 1 000 FT vertical clearance above the highest obstacle.

Except when necessary for take-off or landing an IFR flight shall not be flown lower than:

a. over high terrain or in mountainous areas at a level which is at least 2 000 FT (600 M)

b. elsewhere (over a flat terrain) at a level which is at least 1 000 FT (300 M)

above the highest obstacle located within 8 KM of the estimated position of the aircraft or at the MSA established for the area concerned.

When determining the flight altitude, the navigational accuracy which can be achieved on the relevant route segment shall be taken into account, having due regard to the navigational facilities available on the ground and on board of the aircraft.

The minimum flight altitude for IFR flights in uncontrolled airspace is 4 000 FT (1 200 M) AMSL.

1.3 Change from IFR flight to VFR flight

An aircraft electing to change the conduct of its flight from compliance with IFR to compliance with VFR shall notify the appropriate ATS unit that the IFR flight plan is cancelled by including the statement „CANCELLING MY IFR FLIGHT" within the radio message and communicate thereto the changes to be made to its flight plan.

When an aircraft operating under IFR is flown in or encounters visual meteorological conditions it shall not cancel its IFR flight unless it is anticipated, and intended, that the flight will be continued for a reasonable period of time in uninterrupted visual meteorological conditions.

1.4 RVSM operation

As specified in the ICAO EUR Regional Supplementary Procedures (Doc 7030/5 - EUR), Chapter 1, paragraph 1.2.1.2, flights shall be conducted in accordance with IFR when operated within or above the EUR RVSM airspace. RVSM shall be applicable in the volume of airspace between FL 290 and FL 410 (ICAO EUR Supplementary Procedures (Doc 7030/5 – EUR), Chapter 4, paragraph 4.2.1).

Therefore, flights operating as GAT within the Budapest FIR at or above FL 290, as described in *ENR 2.1*, shall be conducted in accordance with the IFR. (*See also ENR 1.4.1.*)

In case the route of a non-RVSM approved aircraft is planned within the lateral limits of RVSM airspace the flight shall be cleared to a flight level below FL 290.

Formation flights shall not be performed by civil aircraft in RVSM airspace. Operators of formation flights with either State aircraft operating as GAT, or non-RVSM approved aircraft, shall acquire ATS clearance for special operations in case the requested flight level is FL 290 or above.

Aircraft in EUR RVSM airspace shall report to ATC as soon as possible:

- the inability to maintain altitude prescribed for EUR RVSM airspace and acquire a modified ATC clearance possibly before altering from the previously cleared route or altitude.
- if the aircraft no longer qualifies for the prescribed RVSM MASPS, which then is no longer considered RVSM approved aircraft.
- the return of proper functioning of the RVSM MASPS equipment.
- encountered turbulence caused by weather or other aircraft which will presumably affect altitude maintaining ability.

1.5 B-RNAV Contingency Procedures

Prior to and during RNAV or Free Route flights operators shall verify the correct functioning of the aircraft RNAV systems. This includes:

a. the flight route complies with ATC clearance, and

b. the aircraft navigation capability complies with at least B-RNAV standards.

Subsequent ATC action in respect of that aircraft will be dependent upon the nature of the reported failure and the overall traffic situation. Continued operation in accordance with the current ATC clearance may be possible in many situations. When this cannot be achieved, a revised clearance may be required to revert to VOR/DME navigation. ATC may also provide the aircraft with radar vectors until the aircraft is capable of resuming its own navigation.

In case of a failure or degradation of the RNAV system below RNAV 5, which is detected before departure from an aerodrome, and where it is not practicable to effect a repair, the aircraft concerned should be permitted to proceed, as directly as possible, to the nearest suitable aerodrome where the repair can be made. When granting clearance to such aircraft, ATC should take into consideration the existing or anticipated traffic situation and may have to modify the time of departure, flight level or route of the intended flight. Subsequent adjustments may become necessary during the course of flight. Operators of such aircraft, where a failure or degradation is detected before departure, shall not insert designators „S" or „R" in Item 10 of the flight plan. Since such flights require special ATC handling, Item 10 shall contain the designator „Z" and Item 18 of the flight plan shall contain „NAV/RNAVINOP".

For such aircraft experiencing a failure or degradation of the RNAV system below RNAV 5, the phrase "UNABLE RNAV DUE EQUIPMENT" shall be included by the pilot immediately following the aircraft call sign, whenever initial contact on the ATC frequency is established.

2. RULES APPLICABLE TO IFR FLIGHTS WITHIN CONTROLLED AIRSPACE

- IFR flights shall comply with the provisions of Commission Implementing Regulation (EU) No. 923/2012 (SERA), point SERA.5020 when operating in controlled airspace.
- An IFR flight operating in controlled airspace shall be flown at a cruising level selected from the tables of cruising levels shown in *ENR 1.7.3.* according to its planned track, except as otherwise instructed by ATC.

3. RULES APPLICABLE TO IFR FLIGHTS OUTSIDE CONTROLLED AIRSPACE

3.1 Cruising levels

During the en route portion of the flight, the cruising levels selected as prescribed in point 2 above, shall be maintained.

3.2 Communications

All IFR flights leaving the CTR or TIZ shall maintain a continuous listening watch and establish two-way radio communications on the appropriate radio frequency of the FIC.

3.3 Position reports

Aircraft shall make position reports at designated reporting point (if any) and at other occasions, as instructed by FIC, but at least every 15 minutes.

Irrespective of the applicable rules, the FIC shall be notified:

- if an aircraft is compelled to divert from its flight plan route by more than 5 KM;
- if an estimated time over the FIR boundary is different by + 5 minutes from the one communicated to the FIC earlier;
- if it intends to change from IFR to VFR or vice versa;
- if departing from a non-AFIS aerodrome;
- of an approach to land outside an aerodrome.

4. FREE ROUTE AIRSPACE GENERAL PROCEDURES

4.1 Area of application

4.1.1 FRA is available within Budapest CTA from 9 500 FT AMSL to FL 660 H24.
Parts of this FRA are the:

- HUFRA within the time period 0500-2300 (0400-2200); and
- SEENFRA (South-East Europe Night FRA) within the time period 2300-0500 (2200-0400).

The SEENFRA encompasses the FRAs within Budapest CTA, București CTA, Sofia CTA and Bratislava CTA. For cross-border operations planning within SEENFRA see *ENR 1.3 section 4.4 Flight Planning (Item 15)*.

4.2 Flight Procedures

4.2.1 General

4.2.1.1 Within HUFRA and SEENFRA, aircraft other than State aircraft, shall comply with the aircraft equipment requirements published in *GEN 1.5*.

4.2.1.2 Within HUFRA and SEENFRA airspace, users will be able to plan user-preferred trajectories using significant points - five-letter name-codes, and/or en-route radio navigation aids in *ENR 4.4.1* and *ENR 4.1.1*, respectively published in AIP Bulgaria, AIP Hungary and AIP Romania. Segments between the significant points shall be defined by means of DCT (Direct) instructions.

4.2.1.3 Within HUFRA and SEENFRA airspace the use of an unpublished point defined by geographical coordinates or by bearing and distance is not allowed.

4.2.1.4 Within HUFRA and SEENFRA, significant points are considered as FRA Horizontal entry, FRA Horizontal exit, FRA intermediate, FRA Arrival Connecting and FRA Departure Connecting points, as described in AIP Bulgaria, AIP Hungary and AIP Romania *ENR 4.4.1*. All en-route radio navigation aids published in AIP Hungary *ENR 4.1.1* are considered as FRA intermediate points.

4.2.1.5 Within HUFRA and SEENFRA, there is no restriction on the maximum DCT distance.

4.2.2 Overflying traffic

4.2.2.1 Overflight traffic within HUFRA and SEENFRA shall be planned directly between FRA entry, FRA exit and FRA intermediate points.

4.2.2.2 Exceptions to this rule are exist when the DCT segments which are not available are announced in accordance with paragraph *4.5* below.

4.2.2.3 Traffic within HUFRA and SEENFRA proceeding inbound or outbound airports located in close vicinity of LHCC FIR shall be planned in accordance with *4.2.2.1* above and paragraph *4.4* below also using the relevant FRA Arrival Connecting and FRA Departure Connecting points. Airports in close vicinity of LHCC FIR are considered to be: LOWW and LZIB.

4.2.3 Access to/from airports and terminal airspace

4.2.3.1 Flights arriving at or departing from airports located within Budapest FIR are eligible for free route operations and shall be planned in accordance with the paragraphs below.

4.2.3.2 In case of departing flight from an airport where standard instrument departures procedures (SIDs) are published, RNAV-capable departing flights shall be planned directly from the SID final waypoint to the HUFRA Horizontal exit point.

4.2.3.3 In case of arriving flight to an airport where standard instrument arrival procedures (STARs), or transition procedures are published, RNAV-capable arriving flights shall be planned directly from the HUFRA

Horizontal entry point to the STAR initial waypoint or transition procedure.

4.2.3.4 The SID/STAR or transition procedures shall not be indicated in the filed route of the FPLs.

4.2.3.5 Where SIDs are not published, the flights shall be planned DCT to the HUFRA Horizontal exit point.

4.2.3.6 Where STARs are not published, the flights shall be planned DCT from the HUFRA Horizontal entry point to the airport.

4.2.4 Cross-Border Applications

4.2.4.1 The planning of DCT segments across the HUFRA borders (cross border DCT) is allowed only within SEENFRA. See *ENR-2.2*.

4.2.4.2 The planning of DCT segments that are partially outside the lateral limits of HUFRA and SEENFRA (multiple re-entry segments) is not allowed.

4.3 Airspace Reservation - Special Areas

4.3.1 Re-routing Special Areas

4.3.1.1 Flights may be planned through active TRAs or danger areas.

4.3.2 Promulgation of route extension

4.3.2.1 In the case where there is no availability to cross the active reserved area, occasionally:

a. a flight may be instructed to proceed to one of the five significant points which are published in *ENR 4.4.1* as an intermediate point, with the remark "in case TRA 32/33 active";

b. tactical radar vectoring may be applied in order to ensure an additional safety margin between active TRA boundaries and flight trajectories. It is expected that the average extension to be considered by aircraft operators will be approximately 5 NM and in exceptional circumstances, not more than 10 NM.

4.3.2.2 Restrictions on the maximum DCT distance inserted in the flight plan will not be enforced.

4.4 Flight Planning (Item 15)

4.4.1 General

4.4.1.1 In case of more than 30 minutes of flying time or 200 NM (370 KM), an intermediate point may be inserted at which a change of speed, flight level, track, or flight rules are planned. Flights within SEENFRA planning of DCT (cross border DCTs) require at least one published FRA significant point within București CTA and Budapest CTA. There is no restriction on the number of FRA intermediate points that may be used.

4.4.1.2 The use of an unpublished point defined by geographical coordinates or by bearing and distance is not allowed.

4.4.1.3 The planning of DCT segments closer than 3 NM to the HUFRA or SEENFRA border is not allowed.

4.4.2 ATS Route Network

4.4.2.1 The ATS route network within Budapest FIR will be withdrawn.

4.4.2.2 Within HUFRA no reference shall be made in the flight plan to ATS routes.

4.4.3 Flight Level Orientation Scheme

4.4.3.1 Cruising levels must be planned in accordance with AIP Hungary *ENR 1.7* and the information provided in the column "Remarks/Usage" in *ENR 4.4.1*. The direction of cruising levels (EVEN or ODD) must be chosen depending on the direction of the flight level required over the FRA Horizontal entry and FRA Horizontal exit points as described in the following table:

Direction of Cruising levels within **HUFRA / SEENFRA**		
FLs over FRA entry point	FLs over FRA exit point	FLs inside HUFRA / SEENFRA
EVEN	EVEN	FLs for all DCT segments
ODD	ODD	FLs for all DCT segments
EVEN	ODD	A change from EVEN to ODD FLs must be planned inside HUFRA / SEENFRA
ODD	EVEN	A change from ODD to EVEN FLs must be planned inside HUFRA / SEENFRA

Note: ODD is the direction of *IFR* cruising levels with a magnetic track between 000° and 179° while EVEN is the direction of *IFR cruising levels with a magnetic track between 180° and 359°, as described in the table of cruising levels in ENR 1.7.*

4.4.3.2 Cruising levels must also be planned in accordance with the adjacent ATS route network and/or FRA Flight Level Orientation Scheme.

4.4.4 Flight Planning procedures for departing and arriving flights from/to significant airports

4.4.4.1 Flight Planning of any departing flights shall comply with the following procedures:

Airport	Working time	Mandatory Segment / Point	Mandatory Exit point (X)	Flight Plan examples (Item 15)	Remark
LHBP	0500-2300 (0400-2200)	NALAG - RIGSA	KEKED, LONLA, GEMTO, KARIL, BADOR	NALAG DCT RIGSA DCT BADOR	
LHBP	2300-0500 (2200-0400)	NALAG - RIGSA			See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
LHBP	0500-2300 (0400-2200)	NORAH	NARKA, BUDOP	NORAH DCT BUDOP	
LHBP	2300-0500 (2200-0400)	NORAH			See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
LHBP	0500-2300 (0400-2200)	ERLOS - MAVIR	TEGRI, INVED	ERLOS DCT MAVIR DCT INVED	Above FL 135
LHBP	2300-0500 (2200-0400)	ERLOS - MAVIR			Above FL 135 See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
LHBP	0500-2300 (0400-2200)	PUSTA	KEROP, VEBAL, KOPRY, DIMLO, GOTAR	PUSTA DCT GOTAR	
LHBP	0500-2300 (0400-2200)	GILEP	SUNIS, ARSIN, ABETI, BEGLA	GILEP DCT BEGLA	
LHBP	0500-2300 (0400-2200)	TORNO	NATEX	TORNO DCT NATEX	Only for city pair LHBP - LOWW
LHBP	0500-2300 (0400-2200)	TORNO	XOMBA	TORNO DCT XOMBA	Only for city pair LHBP - LZIB
LOWW	0500-2300 (0400-2200)	ALAMU - EPARI	KEKED, LONLA, GEMTO	ALAMU DCT EPARI DCT KEKED	
LOWW	0500-2300 (0400-2200)	ALAMU - EPARI	KARIL, BADOR, NARKA, BUDOP, TEGRI, GEMTO, LONLA, KENIN, KEKED	ALAMU DCT EPARI DCT KEKED	
LOWW	H24	ARSIN - SIRDU	TEGRI, INVED	ARSIN DCT SIRDU DCT INVED	
LOWW	H24	STEIN	VEBAL, KOPRY, DIMLO	STEIN DCT DIMLO	
LOWW	H24	ARSIN	BABIT, BAREB	ARSIN DCT BABIT	
LZIB	0500-2300 (0400-2200)	VAMOG - SIRDU	VEBAL, KOPRY, DIMLO, GOTAR	VAMOG DCT SIRDU DCT KOPRY	
LZIB	0500-2300 (0400-2200)	VAMOG - GITAS	KEKED, LONLA, GEMTO, KEROP, BABIT	VAMOG DCT GITAS DCT BABIT	
LZIB	0500-2300 (0400-2200)	VAMOG - GITAS	KARIL, BADOR, NARKA, BUDOP, TEGRI, MOPUG, INVED	VAMOG DCT GITAS DCT TEGRI	

Airport	Working time	Mandatory Segment / Point	Mandatory Exit point (X)	Flight Plan examples (Item 15)	Remark
LZIB	0500-2300 (0400-2200)	ERGOM	LONLA, GEMTO	ERGOM DCT GEMTO	
LZIB	0500-2300 (0400-2200)	ERGOM	KARIL, BADOR, NARKA, BUDOP, TEGRI	ERGOM DCT BADOR	

4.4.4.2 Flight Planning of any arriving flights shall comply with the following procedures

Working time	Mandatory Entry point (E)	Mandatory Segment / Point	Airport	Flight Plan examples (Item 15)	Remark
H24	KARIL	RIGSA - GELKA - JBR	LHBP	KARIL DCT RIGSA DCT GELKA DCT JBR	
H24	PITOK	GELKA - JBR	LHBP	PITOK DCT GELKA DCT JBR	
0500-2300 (0400-2200)	KEKED, LONLA, KARIL	RIGSA - GELKA - JBR	LHBP	KEKED DCT RIGSA DCT GELKA DCT JBR	
2300-0500 (2200-0400)		RIGSA - GELKA - JBR	LHBP		See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
H24	DEMOP	JBR	LHBP	DEMOP DCT JBR	
H24	NARKA, MEGIK, BUDOP, DEGET, MOPUG,	ABONY	LHBP	NARKA DCT ABONY	
2300-0500 (2200-0400)		ABONY	LHBP		See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
H24	PARAK	ABONY	LHBP	PARAK DCT ABONY	
H24	VEBAL, KOPRY, DIMLO, GOTAR	VEBOS	LHBP	KOPRY DCT VEBOS	
H24	KEKED (and for DEP LHBP via TORNO SID)	TORNO - NATEX	LOWW	KEKED DCT TORNO DCT NATEX	
H24	KARIL, NARKA, MEGIK, BUDOP, DEGET, MOPUG	BALUX - TORNO - NATEX	LOWW	KARIL DCT BALUX DCT TORNO DCT NATEX	
0500-2300 (0400-2200)	LONLA, PARAK	BALUX - TORNO - NATEX	LOWW	LONLA DCT BALUX DCT TORNO DCT NATEX	
2300-0500 (2200-0400)		BALUX - TORNO - NATEX	LOWW		See *ENR 1.3 section 4.4 Flight Planning (Item 15)*
H24	LONLA, PARAK	BALUX - XOMBA	LZIB	LONLA DCT BALUX DCT XOMBA	
H24	TONDO, VEBAL, KOPRY, DIMLO	XOMBA	LZIB	VEBAL DCT XOMBA	
0500-2300 (0400-2200)	KEKED, KARIL, BADOR, NARKA, MEGIK, BUDOP, DEGET, MOPUG	BALUX - XOMBA	LZIB	NARKA DCT BALUX DCT XOMBA	
2300-0500 (2200-0400)		BALUX - XOMBA	LZIB		See *ENR 1.3 section 4.4 Flight Planning (Item 15)*

4.4.4.3 The other flights arriving at or departing from other airports located in close vicinity of Budapest FIR are considered as overflying traffic (see para *4.2.2.3* above).

4.5 Route Availability Document

4.5.1 All HUFRA and SEENFRA constrains, exceptions and restrictions, if any will be published via the RAD and promulgated in accordance with *ENR 1.10*

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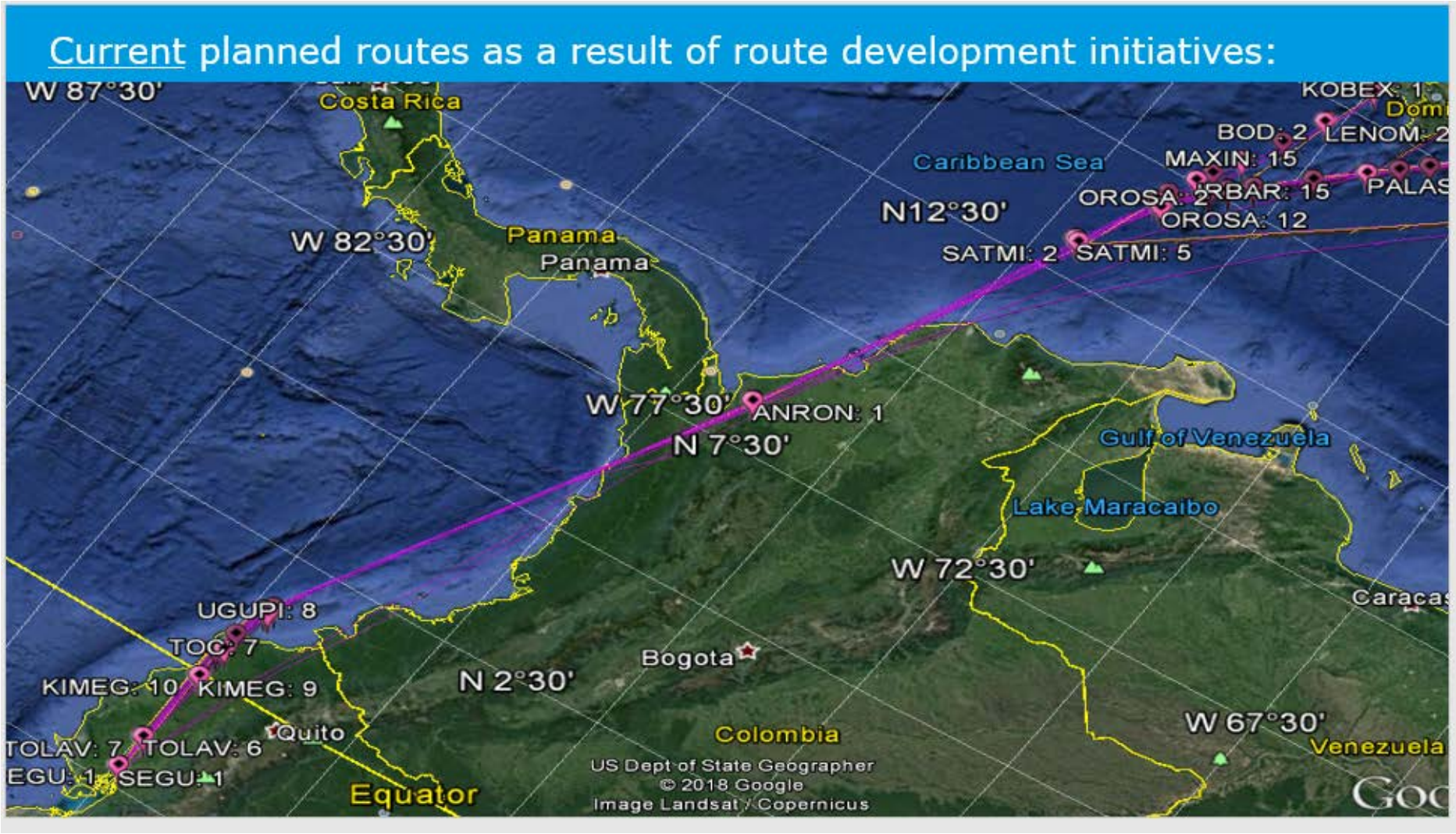
APPENDIX B


Route Development
(Colombia)
Results 2018
Rocco Heesters
Flight Support Manager Americas
Royal Dutch Airlines
KLM
AIRFRANCE KLM


Planned routes before route development initiatives:
Port-au-Prince
KOBEX
BOD
LENOM
IKMAG
MAXIN
IRBAR
ERIKO
OROSA
SIPOK
NESMO
AGUJA
Caribbean Sea
Santo Do
San Jose
Costa Rica
W 87°30'
Panama
W 82°30'
TOC
TBG
TOC
TORIL
W 77°30'
N 7°30'
BUXOS
Gulf of Venezuela
Lake Maracaibo
W 72°30'
Caracas
UGUPI
TOC
TOC
N 2°30'
Bogota
Quito
DALUD
SEGU
Equator
Ecuador
Colombia
W 67°30'
Venezuela
US Dept of State Geographer
© 2018 Google
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google

Planned vs Actual GYE-AMS

- 30% of the flights a DCT was given between UGUPI-OROSA.
  45% of the flights a DCT was given between BUXOS-AGUJA
  25% of the flights the actual filed route had to be used.
- Initial calculations showed a significant fuel and CO2 saving if we could plan what we tactically get.
- A visit with IATA was made to the authorities where our route proposal was presented.


Current planned routes as a result of route development initiatives:
W 87°30'
Costa Rica
KOBEX: 1
BOD: 2
LENOM: 2
Caribbean Sea
MAXIN: 15
OROSA: 2
RBAR: 15
PALAS
N12°30'
OROSA: 12
W 82°30'
Panama
Panama
SATMI: 2
SATMI: 5
W 77°30'
ANRON: 1
N 7°30'
Gulf of Venezuela
Lake Maracaibo
W 72°30'
Caracas
UGUPI: 8
TOC: 7
Bogota
KIMEG: 10
KIMEG: 9
N 2°30'
Quito
TOLAV: 7
TOLAV: 6
EGU: 1
SEGU: 1
Colombia
W 67°30'
Venezuela
Equator
US Dept of State Geographer
© 2018 Google
Image Landsat / Copernicus

Actual Savings Colombian DCT`s 2018

	Fuel savings in Kilograms	CO2 savings in Kilograms
Yearly savings	269.524	851.000

5

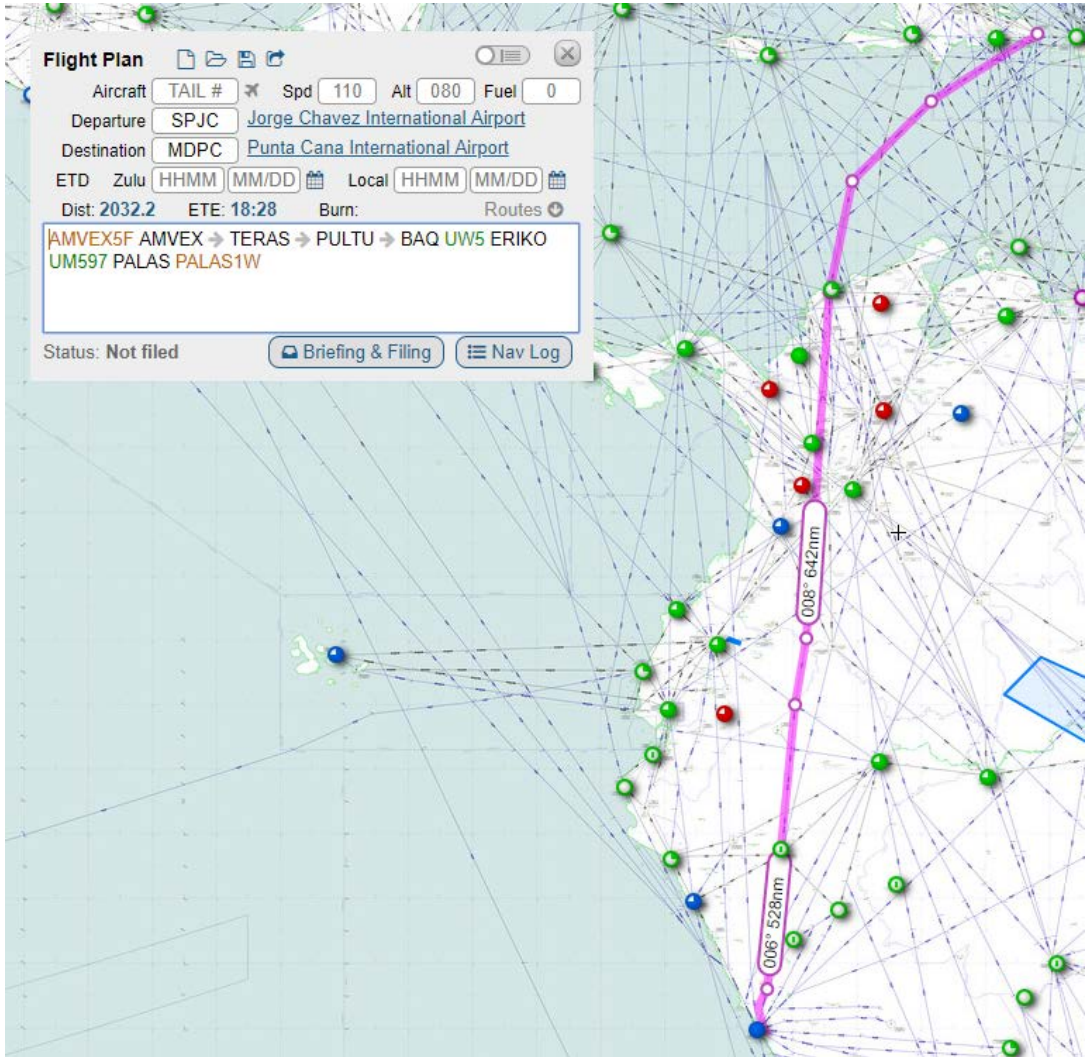
KLM Royal Dutch Airlines

LATAM DIRECT ROUTING – SPJC/MDPC/SPJC

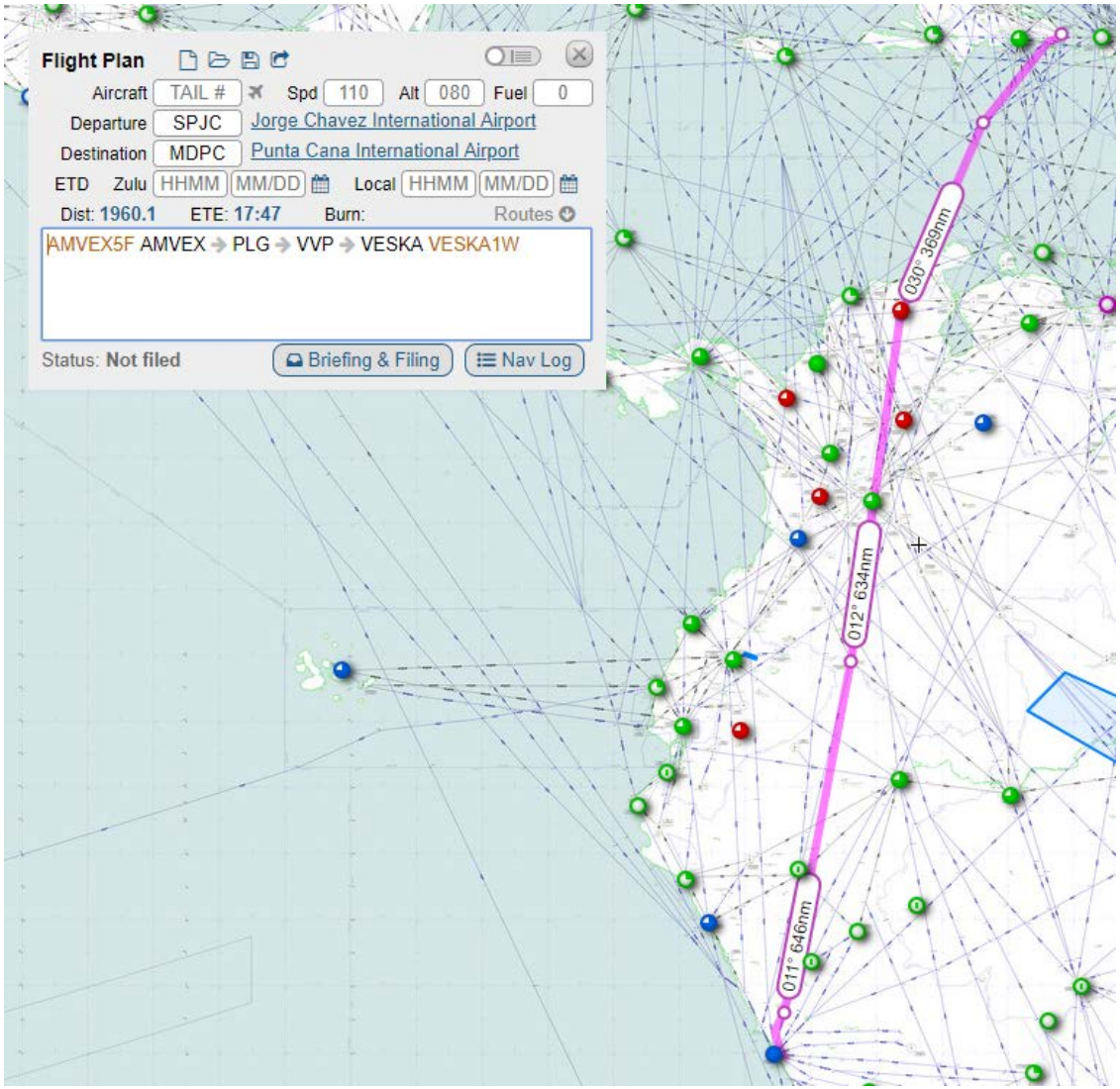
Par de Ciudades		RUTA	TV	Combustible a bordo	GND DIST
SPJC - MDPC	ACTUAL	SPJCR15 AMVEX5F AMVEX UL305 TERAS DCT PULTU UL305 BAQ UW5 ERIKO UM597 PALAS PALAS2B MDPCR09	04:53	15406	2091
	DIRECT ROUTING	SPJC RWY15 AMVEX5F AMVEX DCT PLG DCT VVP DCT VESKA VESKA1W MDPC	04:38	14712	1972
	Beneficios		- 15	- 694	- 119
MDPC - SPJC	ACTUAL	MDPCR08 PALAS2W PALAS UM597 ERIKO UW5 BAQ UL305 TOKAN UP776 ILROL ILROL4 SPJCR15	04:53	15698	2052
	DIRECT ROUTING	MDPC RWY08 VESKA2W VESKA DCT VVP DCT PLG DCT ILROL ILROL4 SPJC	04:40	15133	1960
	Beneficios		- 13	- 565	- 92

APPÉNDIX C

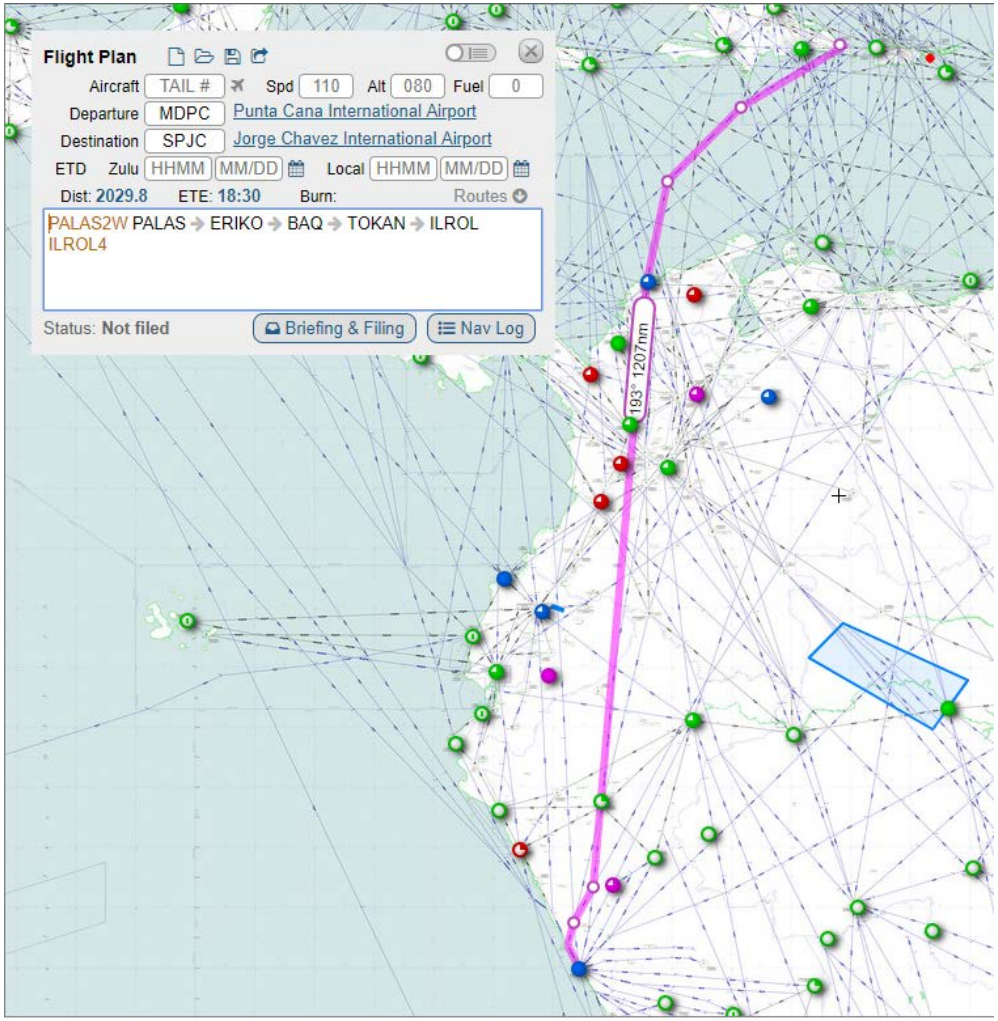
Ruta Actual: SPJC-MDPC



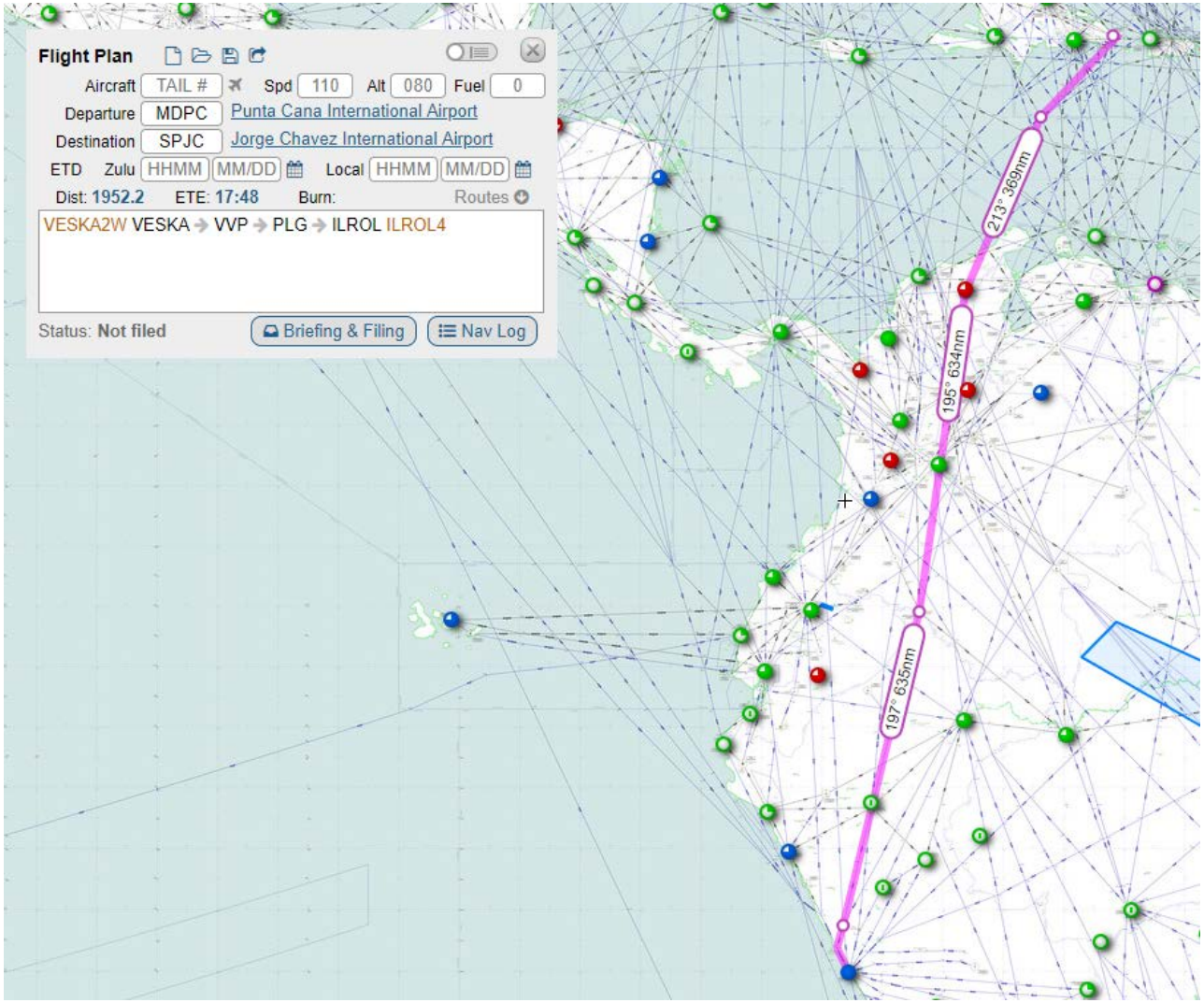
DIRECT ROUTING: SPJC-MDPC



Ruta Actual: MDPC – SPJC



DIRECT ROUTING: MDPC – SPJC



— FIN —