International Civil Aviation Organization

The First Meeting of the Ad Hoc Afghanistan Contingency Group Meeting (AHACG/1)

Kuala Lumpur, Malaysia, 11-12 September 2014

Agenda Item 3: Europe- Southeast/South Asia Contingency Planning (scenarios, procedures)

EUROCONTROL INITIAL EVALUATION

(Presented by the Secretariat)

SUMMARY

This paper presents information on an initial impact evaluation that had been prepared by EUROCONTROL, and discusses various planning considerations for contingency ATS route structures.

1. INTRODUCTION

1.1 During recent meetings, increased concerns were raised by aviation stakeholders on the possible unavailability of Afghanistan's airspace or the Air Traffic Services (ATS) disruption in this part of the Region, which might have an impact on major flows (IATA AR-4 Routes) for traffic flying into or out of the ICAO EUR/NAT Region airspace.

1.2 In response to a request from the ICAO EUR/NAT office, the EUROCONTROL Network Manager prepared an initial impact evaluation of the consequences if Afghanistan's airspace would become unavailable or if the provision of Air Traffic Services (ATS) would be impaired.

1.3 The System for Assignment and Analysis at a Macroscopic level (SAAM, an airspace modelling tool designed by EUROCONTROL) was used for this evaluation.

2. DISCUSSION

Initial Impact Evaluation

2.1 The objectives of the evaluation are:

- To present a modelling tool theoretical findings on potential daily distance and environmental savings/losses on traffic flow Europe - Asia and vice-versa, in case of the unavailability of air navigation services within the Kabul FIR;
- To further facilitate proper decisions to be taken by the Organizations and States concerned in order to ensure the least possible disruption of operations affected by such unavailability.

2.2 The evaluation included only those flights which would have a flight segment within the European airspace. In compiling information on the effects of a contingency operation by-passing the Afghanistan airspace, the evaluation assumed the use of currently established and available ATS routes.

2.3 Additionally to the analyses of available existing ATS route options EUROCONTROL in its presentation noted that there are currently other Flight information Regions (FIRs) inside or adjacent to the ICAO EUR/NAT Region airspace, which also affect the re-distribution of traffic flows due to their closure or partial closure, or due the fact that Aircraft Operators (AOs) would avoid flying in the FIR for safety reasons.

2.4 As a major finding of the evaluation, it should be noted that the re-distribution of flights avoiding Afghanistan is directed to Iran on the axis Delhi FIR / Mumbai FIR - Karachi FIR - Tehran FIR and vice-versa, as well as to China on the axis Karachi FIR - Urumqi FIR and Vientiane FIR - Kunming FIR and vice-versa.

2.5 Inside EUR/NAT Region airspace the re-distribution of flights avoiding Afghanistan would shift the flows a little southbound or alternatively further north, with ATS route options available via the Ankara FIR, Yerevan FIR, Baku FIR, Ashgabat FIR and Almaty FIR. It should be further noted that the Central Asian area would not provide a more efficient alternative for flows from/to Europe going to/from Asia.

2.6 In utilizing currently available ATS routes, it should be noted that the shortest ATS route option (G452 and G208 / L124) are merging over ZDN inside Tehran FIR immediately after the FIR boundary. Future discussions should consider that with the predicted traffic increase this might create additional and unexpected ATC workload and will raise the level of complexity in this part of the ATC sector.

2.7 The ATC workload issues in the affected FIRs carrying extra traffic are also mentioned as important considerations, as well as aspects such as: how ATC will deal with the traffic increase at night peak hours, how the shift of traffic flows from one FIR to other FIR inside the same State or to an adjacent FIR will be managed and the situation whereby high traffic flows converge to one waypoint shortly after they have been transferred at the FIR boundary.

2.8 The EUROCONTROL presentation containing the initial evaluation of consequences is appended as **Attachment A**.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss the outcomes and consequences of the EUROCONTROL evaluation; and

c) discuss any relevant matters as appropriate.

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ATS contingency planning

Kabul FIR unavailability - impact on traffic flows Europe - Asia and vice-versa

EUROCONTROL Modelling Tool Evaluations

ICAO EUR / NAT Office - EUROCONTROL NM

Prepared by: Mr. Tihomir Todorov
Head of Section Airspace Design
Operations Planning
Network Operations Management Division
Network Manager Directorate
EUROCONTROL

Air Navigation Services Situation in Kabul FIR

- Currently, the situation in Afghanistan remained fluid, with no certainty regarding the level of ATC services. The ATC contract for provision of services from the Kabul ACC expires in December 2014 and would not be renewed by the military. The Afghanistan government was in negotiations to contract services, but as at July 2014 the contract had yet not been awarded. Besides the uncertainty regarding security and the transition from military to civilian control of the Kabul FIR during the second half of 2014, there were also significant uncertainties regarding the provision of air navigation services in Afghanistan:
  - ✓ the lack of redundancy for the air-ground VHF communication system, which was only capable of covering the Kabul FIR by use of Very Small Aperture Terminal (VSAT) units (there was no High Frequency (HF) or Satellite Communications (SATCOM) backup to this crucial function);
  - ✓ the continued lack of ATS surveillance across all ATS routes supporting international air traffic (the wide area multilateration system was not currently operating and there was a planned reduction of Secondary Surveillance Radar coverage);
  - ✓ the reliance on VSAT to communicate to other ATS units, with no redundant landline capability (all inter-ATS unit communications were conducted by normal telephone, with no direct lines, backup or redundancy); and
  - ✓ the lack of a formal ATM contingency plan.
- The communications remedial plan had not progressed, so the Afghanistan CAA (ACAA) had accepted the need for another coordination meeting with Pakistan and India.
- Within the Kabul FIR, FL300 remained unavailable to civilian traffic because of military operations. Despite the drawdown of international coalition forces at the end of 2014, this would remain the case for the foreseeable future. De-confliction between military activities and aircraft flying at altitudes above FL300 by prior coordination with the Kabul ACC was a priority procedural mechanism for the international coalition, and this involved the ACAA establishing the necessary arrangements with the Afghan Ministry of Defence.

Europe - Asia
Current Airspace Organization

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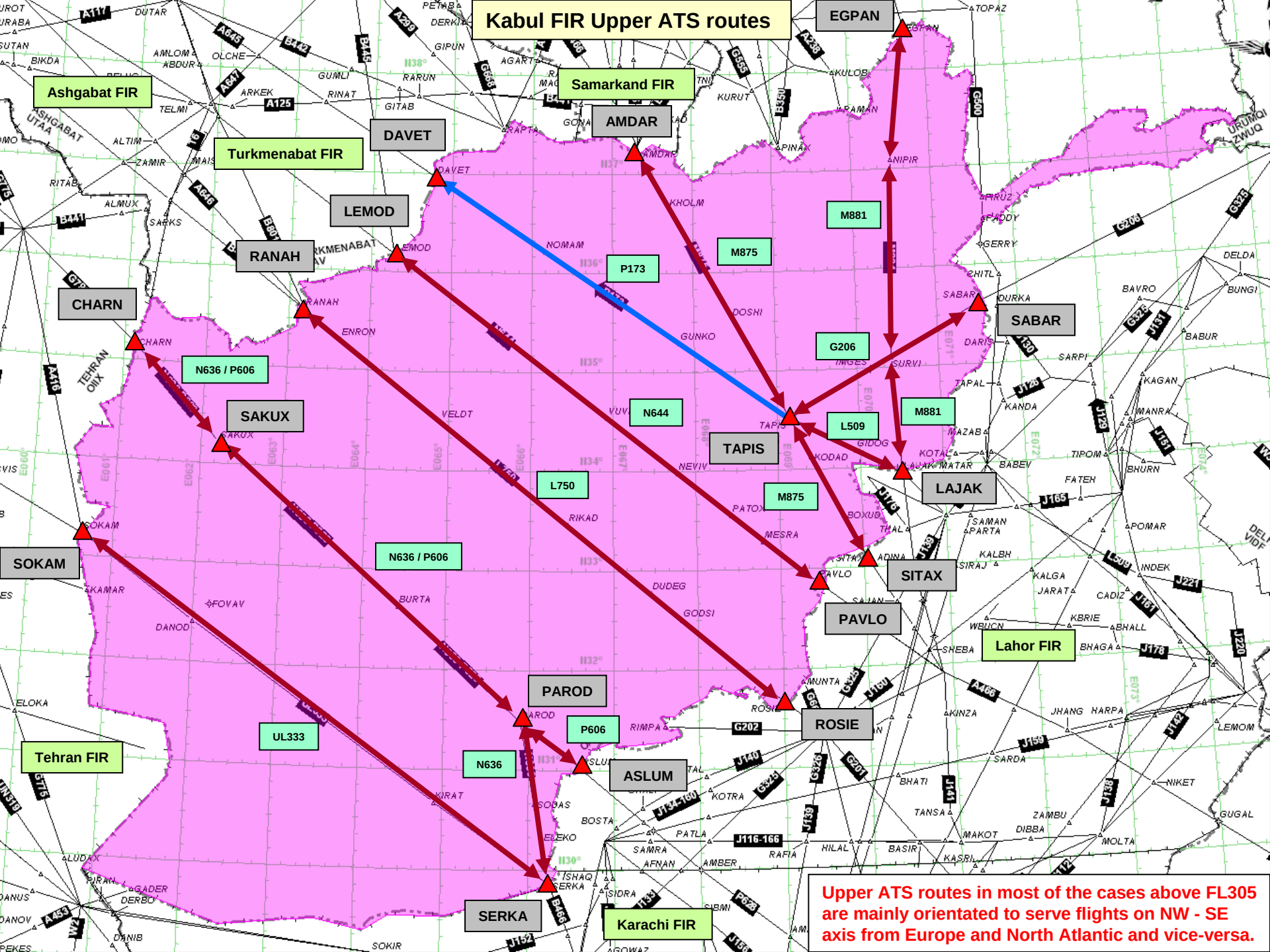
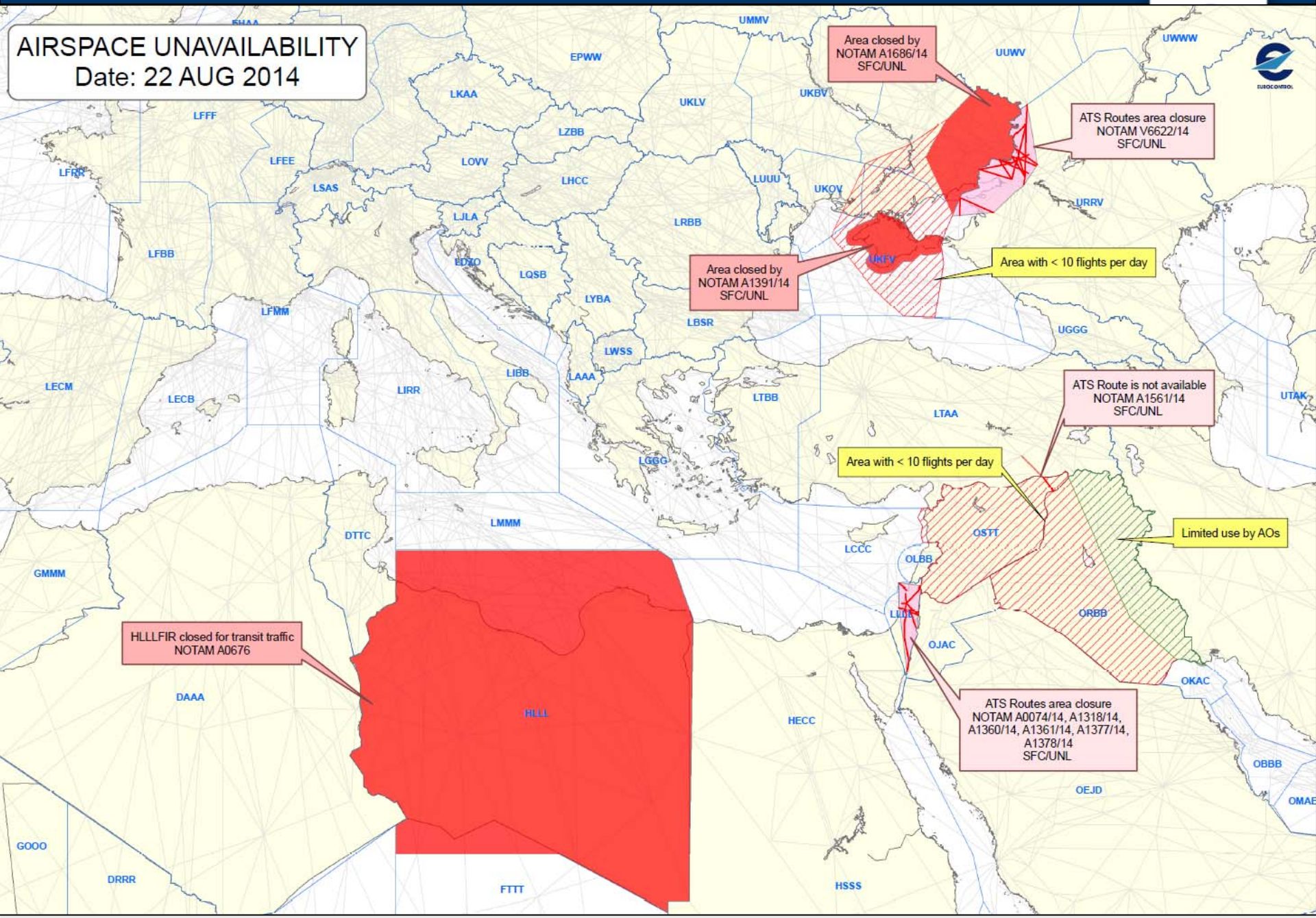
Kabul FIR - ATS route network


Kabul FIR Upper ATS routes
EGPAN
Samarkand FIR
Ashgabat FIR
Turkmenabat FIR
AMDAR
DAVET
LEMOD
RANAH
CHARN
SAKUX
SOKAM
TAPIS
SABAR
LAJAK
SITAX
PAVLO
ROSIE
ASLUM
PAROD
SERKA
Lahor FIR
Tehran FIR
Karachi FIR
M881
M875
P173
G206
L509
N644
L750
N636 / P606
UL333
P606
N636
Upper ATS routes in most of the cases above FL305 are mainly orientated to serve flights on NW - SE axis from Europe and North Atlantic and vice-versa.

Airspace penalization / unavailability


AIRSPACE UNAVAILABILITY
Date: 22 AUG 2014
Area closed by NOTAM A1686/14 SFC/UNL
ATS Routes area closure NOTAM V6622/14 SFC/UNL
Area closed by NOTAM A1391/14 SFC/UNL
Area with < 10 flights per day
ATS Route is not available NOTAM A1561/14 SFC/UNL
Area with < 10 flights per day
Limited use by AOs
HLLLFIR closed for transit traffic NOTAM A0676
ATS Routes area closure NOTAM A0074/14, A1318/14, A1360/14, A1361/14, A1377/14, A1378/14 SFC/UNL
UMMV
EPWW
UUWV
UWWW
LKAA
UKLV
UKBV
LFFF
LZBB
LFEE
LOVV
LHCC
LUUU
UKOV
LSAS
URRV
LJLA
LRBB
LFBB
LDZO
LQSB
UKFV
LYBA
LFMM
LBSR
UGGG
LWSS
LECM
LIBB
LAAA
LECB
LIRR
LTBB
UTAK
LTAA
LGGG
LMMM
DTTC
LCCC
OSTT
GMMM
OLBB
LLLL
ORBB
OJAC
OKAC
DAAA
HLLL
HECC
OBBB
OEJD
OMAE
GOOO
DRRR
FTTT
HSSS

EUROCONTROL Evaluation

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Evaluation Objective

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- To present a modelling tool theoretical findings on potential daily distance and environmental savings/losses on traffic flow Europe - Asia and vice-versa, in case of unavailability of air navigation services within the Kabul FIR.

- To further facilitate proper decisions to be taken by the Organizations and States concerned in order to ensure the least possible disruption of operations affected by such unavailability.

Modelling tool used

SAAM - System for Assignment and Analysis at a Macroscopic level

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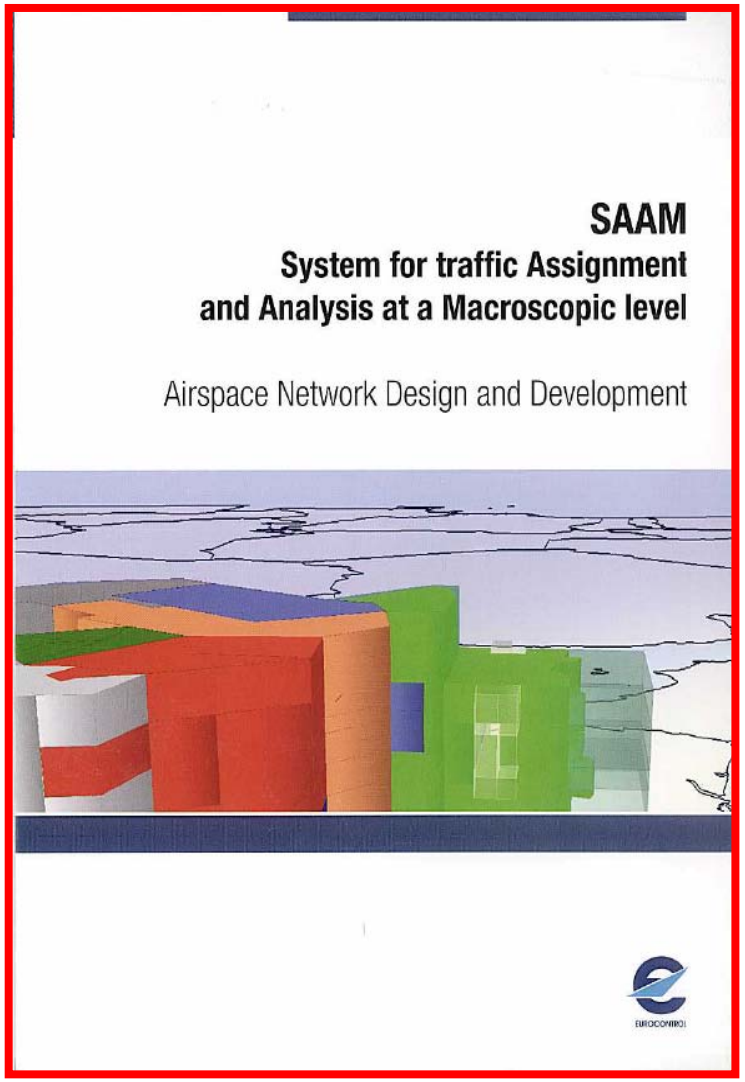
Airspace Design and Development Tool
SAAM



- The System for Assignment and Analysis at a Macroscopic level (SAAM) is an airspace modelling tool designed by EUROCONTROL to assess quantitative information in support of the development of the airspace structure, route network and sectorisation.
- The SAAM tool can assess current and future traffic demand at ECAC, ACC, route segment or sector level. It can evaluate proposals for changes to the route network and sectorisation and support the formulation of new proposals.
- 4D trajectories can be generated (based on traffic demand, route network and aircraft performance) and assessed against traffic volumes. SAAM will by default select the best trajectory option (shortest route, optimum flight profile) but operational rules can be applied such as flight level constraints or restricted route segments.
- In the context of airspace design activities, SAAM is used extensively to perform strategic traffic flow organization, and analyze proposals for route network and airspace optimization.
- Results from SAAM can refine the requirement for fast-time or real-time simulations.

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SAAM - Environmental data

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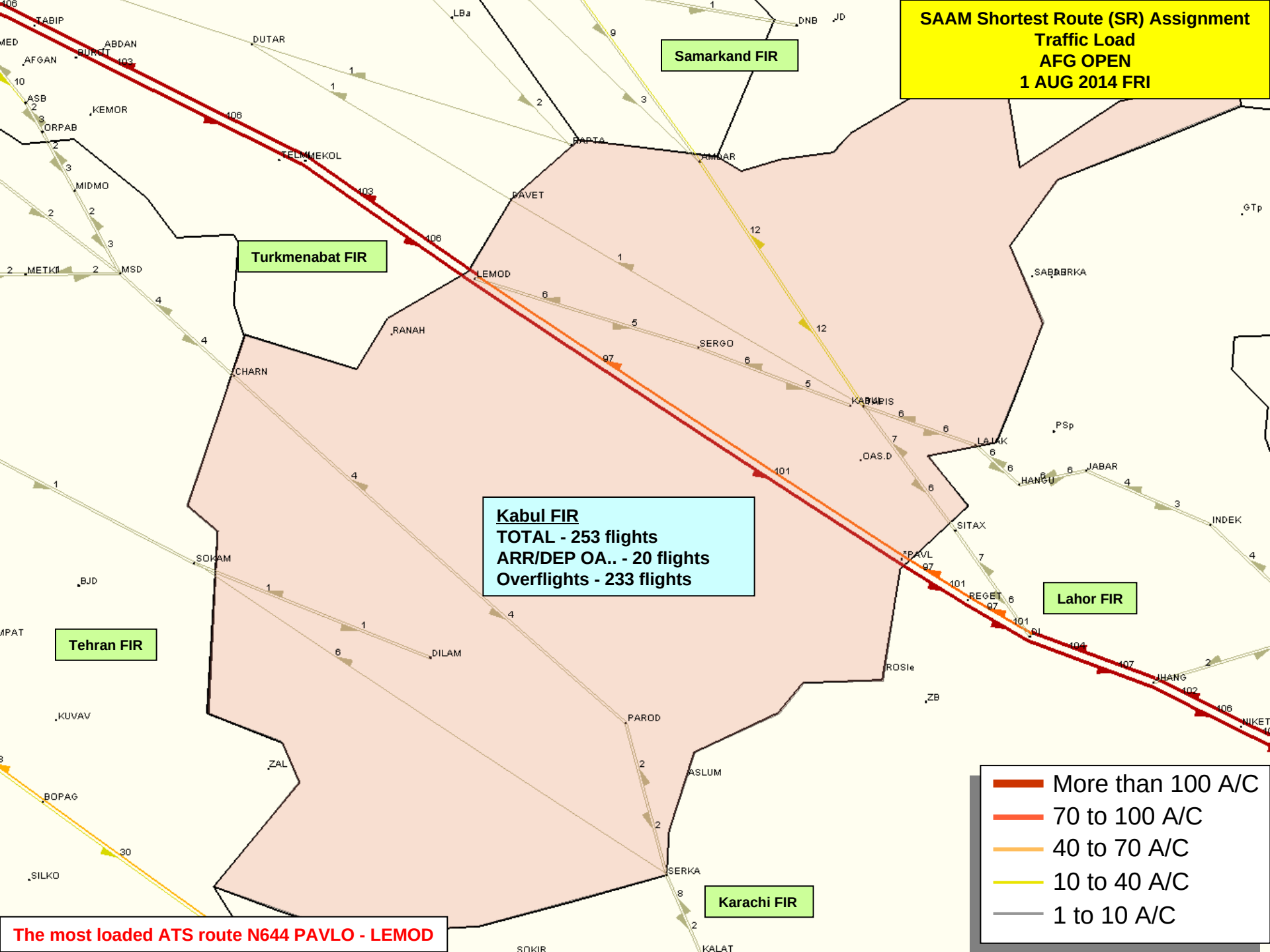
- **Traffic data** - Include all flights through the European airspace for 1 AUG 2014, Friday with total 33577 flights. It is the most loaded day for Europe for August 2014. Evaluation includes only those flights via Afghanistan passing by European airspace.
- **ATS route network** - European ATS route network model VST_1409. The model includes current ATS route network/sectorisation and all airspace changes confirmed for implementation until 21 AUG 2014. The model also includes the majority of ATS route network in Asia.
- **TMA airspace** - Current airspace organisation and changes until 21 AUG 2014 are considered (arrival/departure ATS routes).
- **Airspace penalisation** - Part of the airspace over Eastern Ukraine within Dnipropetrovsk FIR and Simferopol FIR is not available. Reduced use of Baghdad FIR and Damascus FIR has no impact on the evaluation.
- **Assignment method** - Aircraft are assigned on the shortest available ATS routes. The existing strategic and structural traffic rules in Europe contained within the Route Availability Document (RAD) are taken into account. The things such as route charges values, meteorological conditions over Europe and the High Seas areas and others are not taken into account.
- **Flight Economy Indicators** - The FEI values - distance (NM), fuel (kg), time (min), CO_2 (carbon dioxide) emissions (kg) and fuel NO_x (mono-nitrogen oxides NO/NO_2) (kg) are calculated by using EUROCONTROL **Advanced Emission Model**.


SAAM Shortest Route (SR) Assignment
Traffic Load
AFG OPEN
1 AUG 2014 FRI
Samarkand FIR
Turkmenabat FIR
Kabul FIR
TOTAL - 253 flights
ARR/DEP OA.. - 20 flights
Overflights - 233 flights
Tehran FIR
Lahor FIR
Karachi FIR
TABIP
ABDAN
AFGAN
DUTAR
ASB
KEMOR
ORPAB
TELIMMEKOL
MIDMO
METKI
MSD
CHARN
SOKAM
BJD
KUVAV
BOPAG
SILKO
ZAL
DILAM
RANAH
LEMOD
DAVET
RAPTA
AMDAR
SERGO
PAROD
ASLUM
SERKA
SOKIR
KALAT
PAVL
REGET
SITAX
LAMAK
HANGU
JABAR
INDEK
OAS.D
ROSIe
ZB
JHANG
PSp
GTp
More than 100 A/C
70 to 100 A/C
40 to 70 A/C
10 to 40 A/C
1 to 10 A/C
The most loaded ATS route N644 PAVLO - LEMOD

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SAAM SR Assignment
Traffic Load
AFG CLOSE
1 AUG 2014 FRI

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
Zoom around Kabul FIR
1 AUG 2014 FRI

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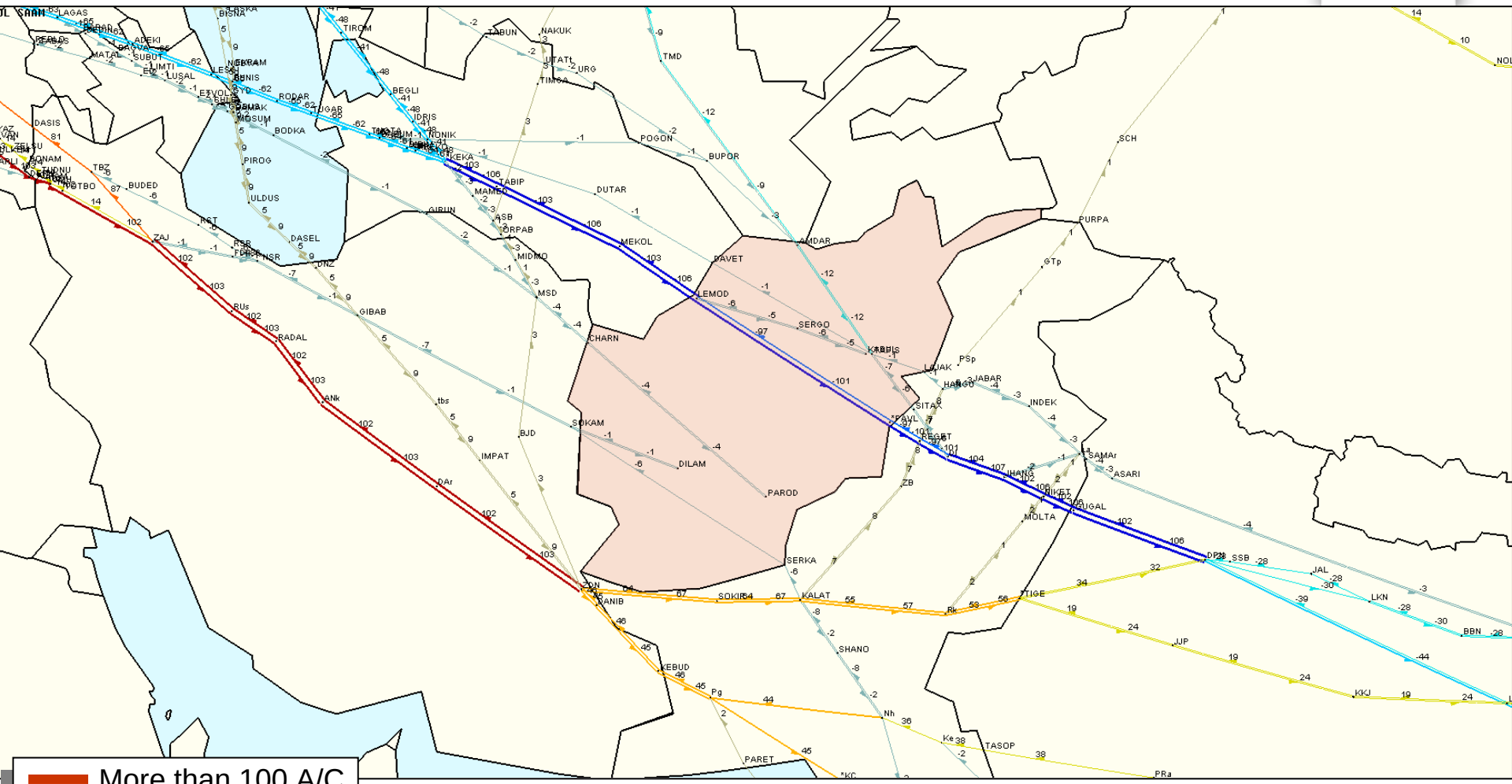

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
Europe - Asia wide zoom
1 AUG 2014 FRI

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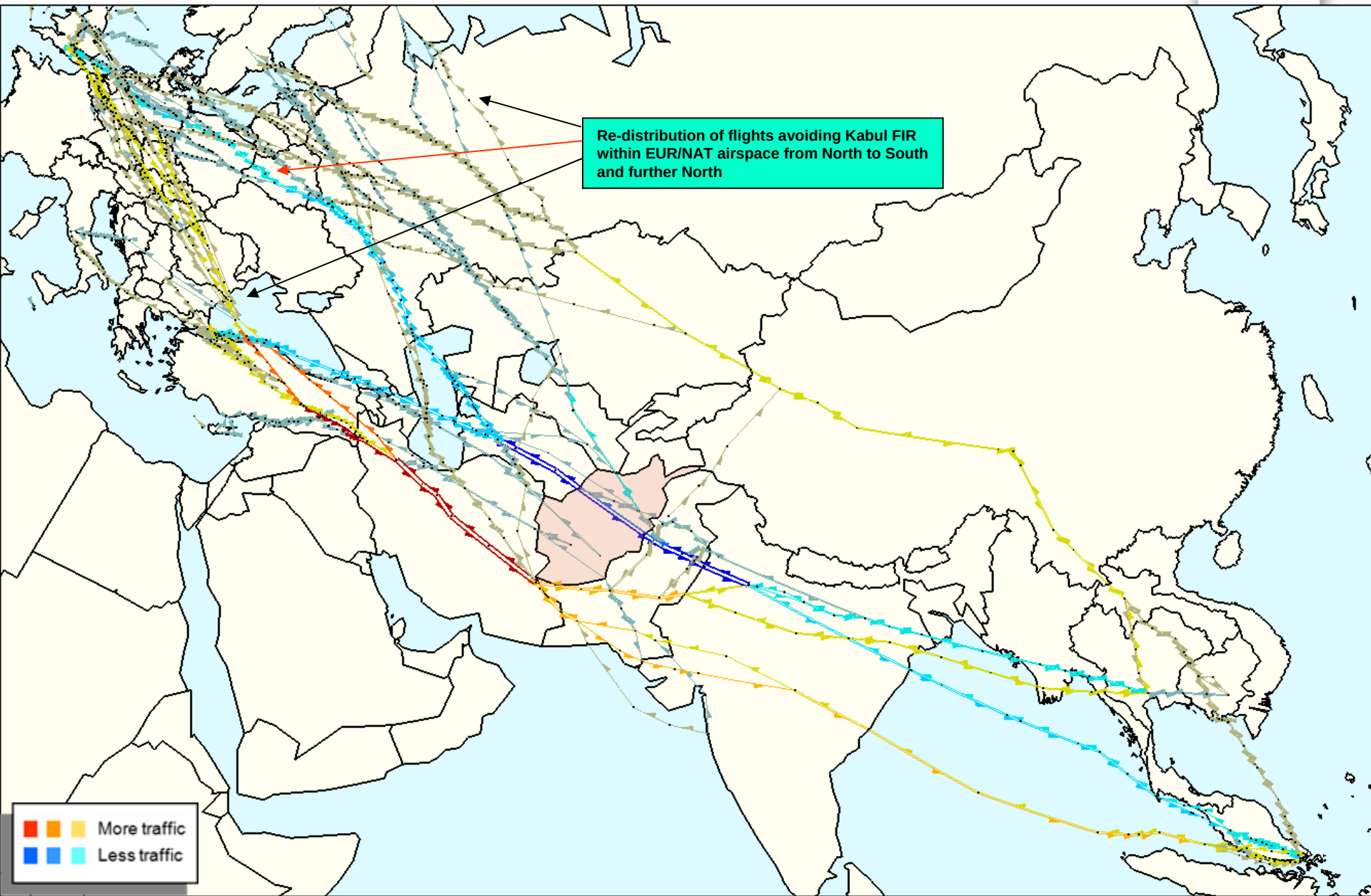

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Flight Economy Indicators calculation

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Potential flights:	SAAM shortest ATS route assignment (1 AUG 2014)	**248**

Potential losses: *(compare to Kabul FIR open)*		SAVINGS	LOSSES	AVERAGE P / F
	Daily distance (NM)		**33622.830**	**+ 135.58**
	Daily time (min)		**4280.122**	**+ 17.26**
	Daily fuel (kg)		**463988.580**	**+ 1870.92**
	Daily CO_2 (kg)		**1466184.300**	**+ 5912.03**
	Daily NOx (kg)		**7955.387**	**+ 32.07**

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Flight Economy Indicators calculation

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10 most penalized city pairs							
ADEP	**ADES**	**Acft Type**	**Length (NM)**	**Time (min)**	**Fuel (kg)**	**CO2 (kg)**	**NOx (kg)**
VIDP	KEWR	B772	591.640	73.659	7126.900	22521.000	152.350
OPRN	CYYZ	B77L	515.840	64.222	7828.000	24738.000	149.440
EGCC	OPRN	B77W	433.510	53.882	7006.300	22140.000	135.350
VIDP	EFHK	A333	376.740	47.993	3825.700	12088.900	50.746
EGCC	OPLA	B772	337.720	41.955	4049.100	12795.000	85.650
KJFK	VIDP	B77W	334.290	41.619	5438.000	17185.000	105.080
OPRN	LIMC	B77W	330.350	41.128	5394.000	17045.000	104.010
OPLA	EGCC	B772	319.170	39.431	3709.800	11723.000	79.400
VIDP	ESSA	GLF4	317.480	43.683	337.830	1067.600	23.903
LFPG	OPRN	B77W	310.250	38.758	5073.800	16034.000	98.370

10 less penalized city pairs							
ADEP	**ADES**	**Acft Type**	**Length (NM)**	**Time (min)**	**Fuel (kg)**	**CO2 (kg)**	**NOx (kg)**
LSZH	WSSS	A343	40.540	5.298	556.800	1759.000	9.510
VABB	KEWR	B77W	39.280	4.891	622.000	1964.000	12.200
LIMC	WSSS	B77W	38.270	4.765	621.300	1963.000	12.010
WSSS	LSZH	A388	26.420	3.250	693.000	2188.000	12.920
LTBA	WSSS	A333	20.230	2.583	204.100	645.000	2.685
EDDF	WMKK	A343	15.350	2.006	210.800	666.000	3.600
WSSS	LIRF	B772	14.470	1.802	173.300	547.000	3.730
LIRF	WSSS	B772	11.690	1.456	141.600	447.000	3.000
WMKK	EDDF	A343	5.780	0.756	80.000	253.000	1.350
WSSS	LTBA	B772	5.300	0.660	63.500	200.000	1.370

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
1 AUG 2014 FRI

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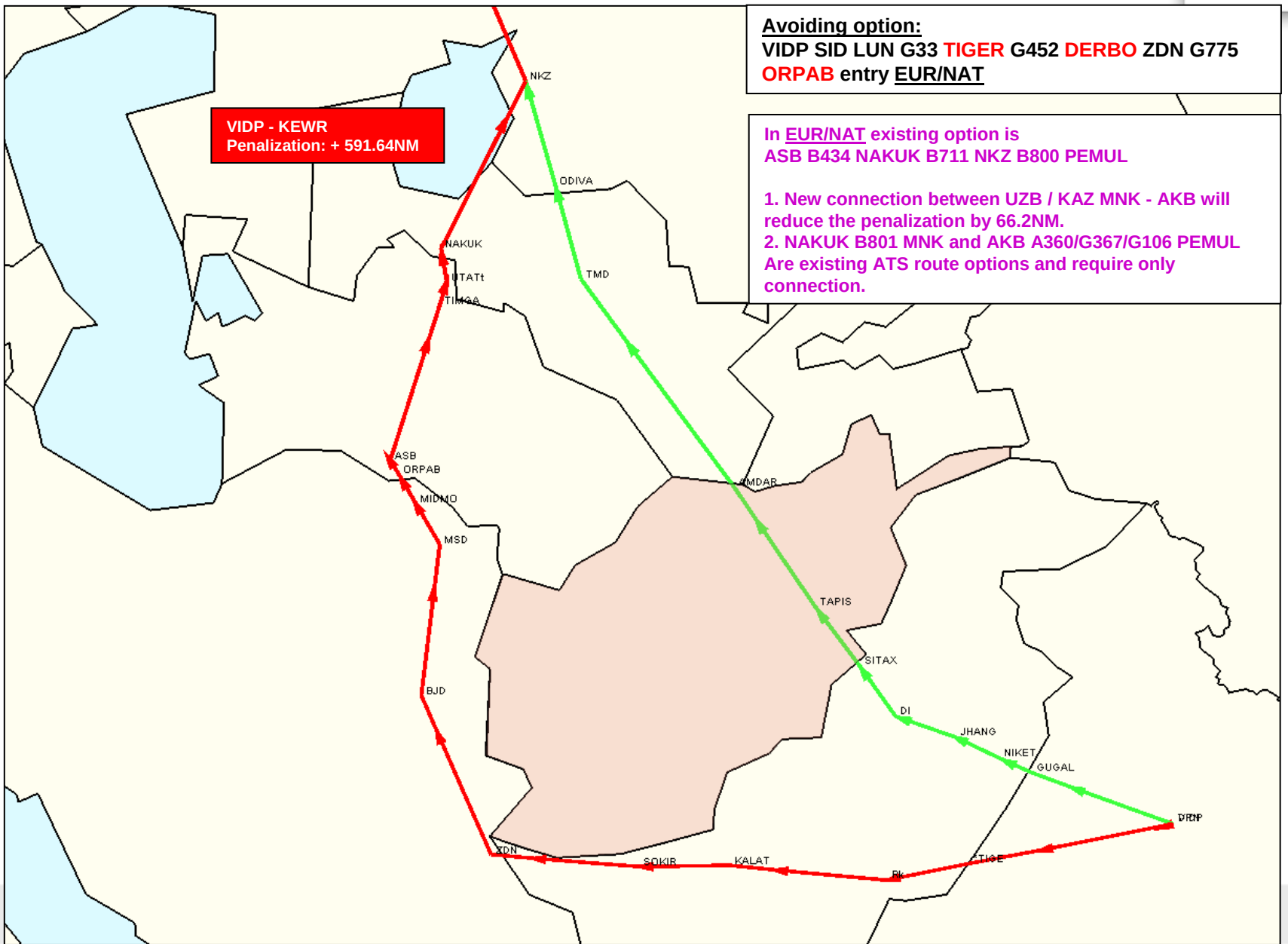

Avoiding option:
VIDP SID LUN G33 TIGER G452 DERBO ZDN G775 ORPAB entry EUR/NAT

In EUR/NAT existing option is
ASB B434 NAKUK B711 NKZ B800 PEMUL

1. New connection between UZB / KAZ MNK - AKB will reduce the penalization by 66.2NM.
2. NAKUK B801 MNK and AKB A360/G367/G106 PEMUL Are existing ATS route options and require only connection.

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
1 AUG 2014 FRI

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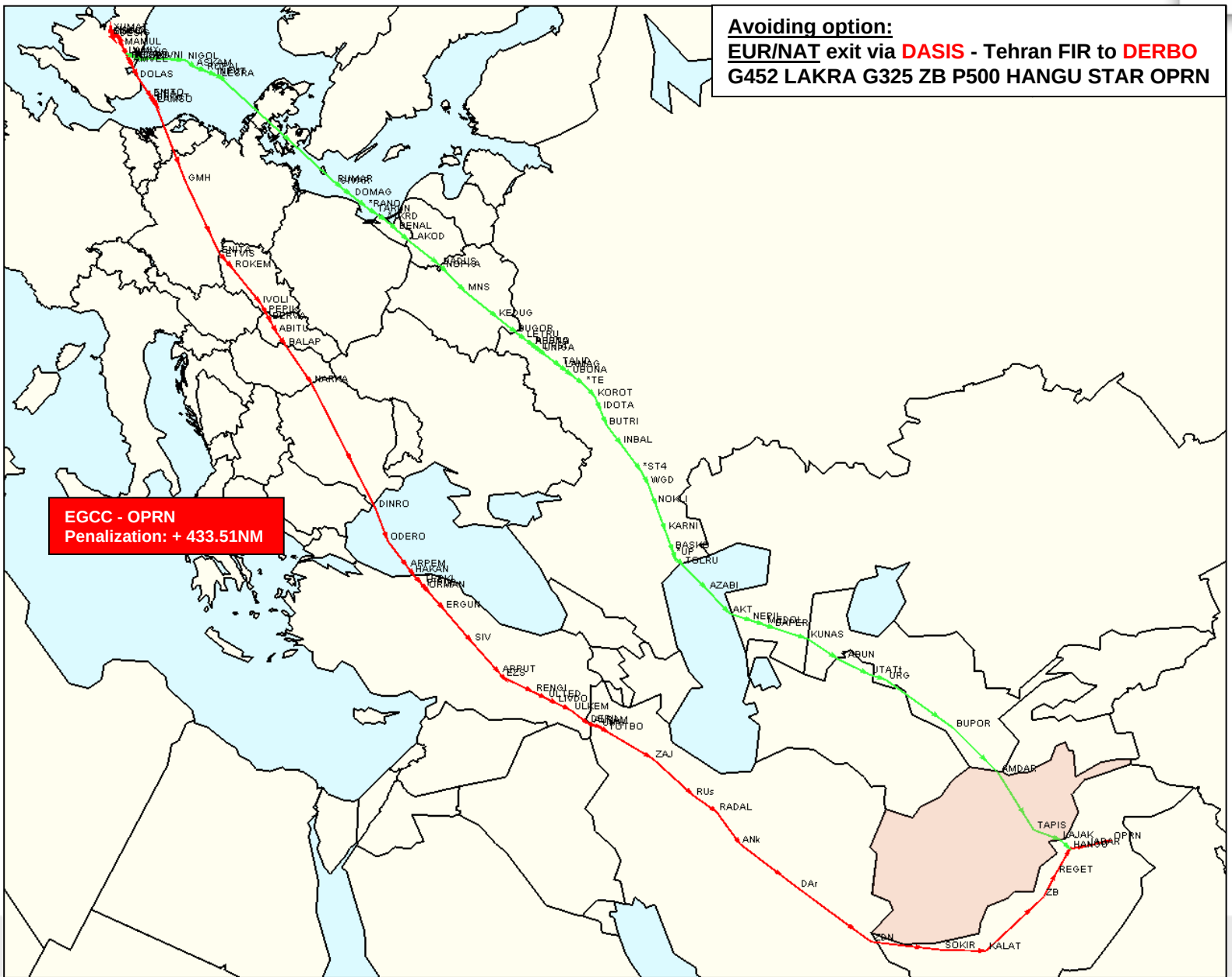

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
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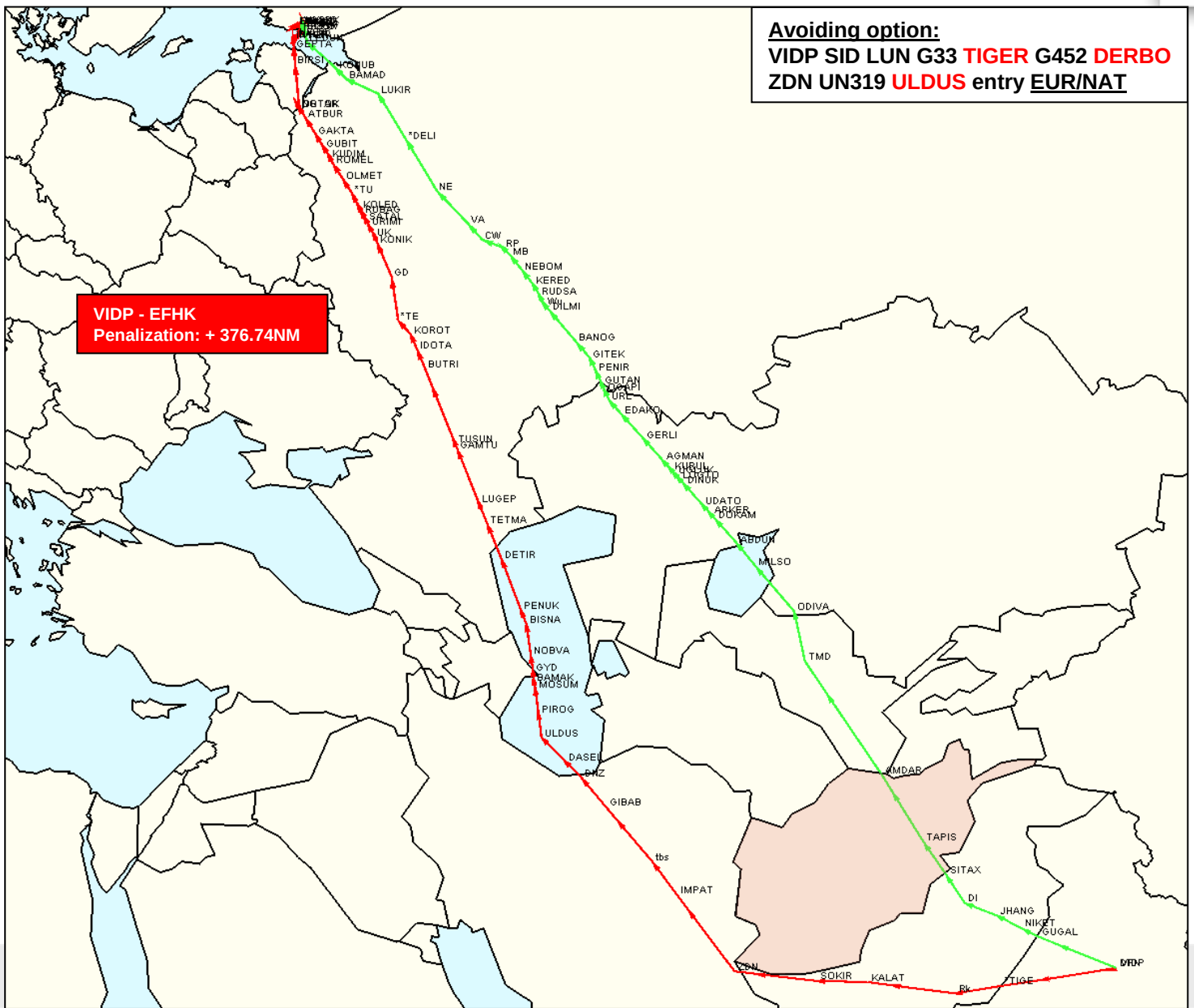

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
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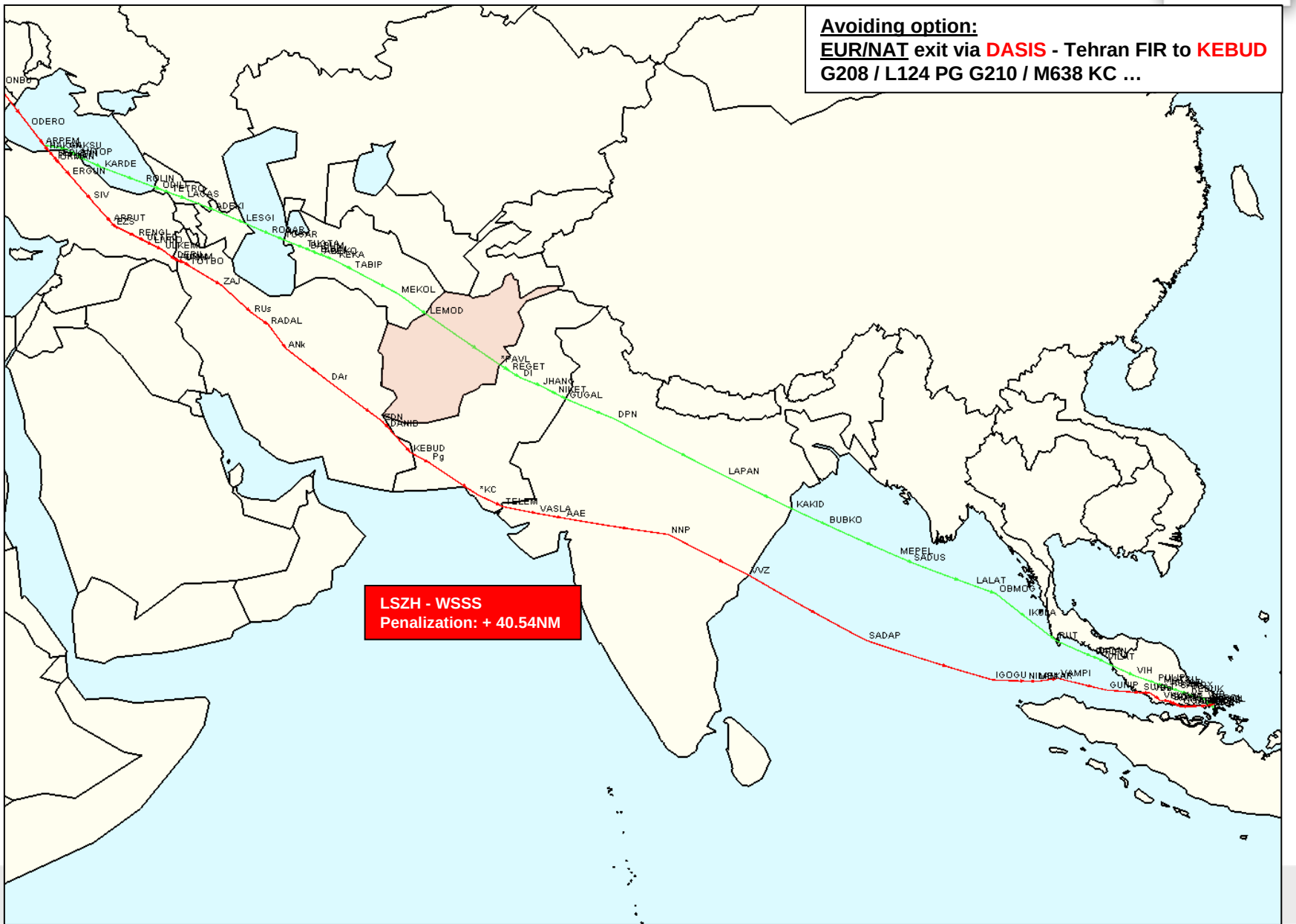

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
1 AUG 2014 FRI

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
1 AUG 2014 FRI

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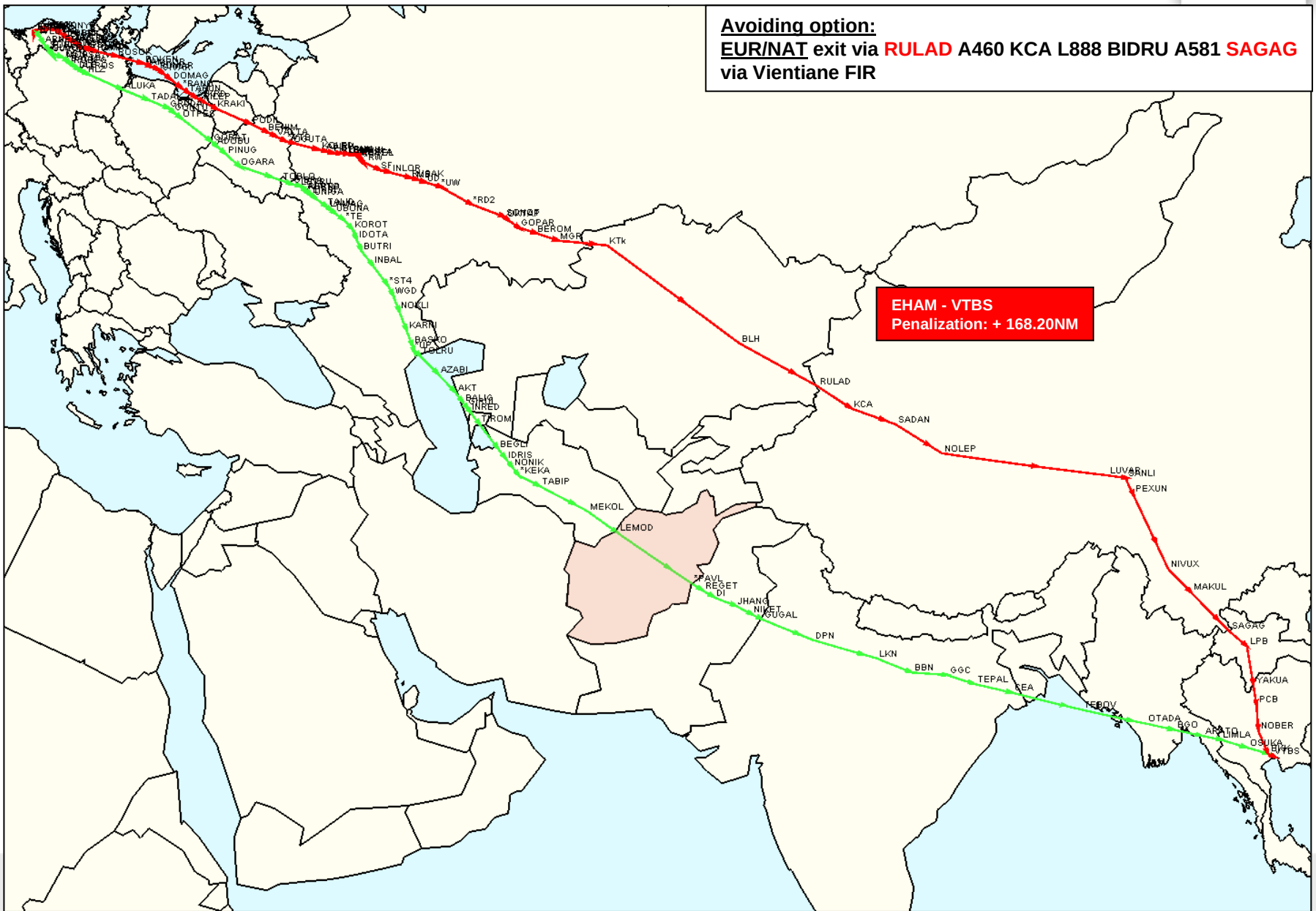

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
1 AUG 2014 FRI

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Possible Avoiding Options for Europe - Asia Axis

South of the Himalayas

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Avoidance via Iran

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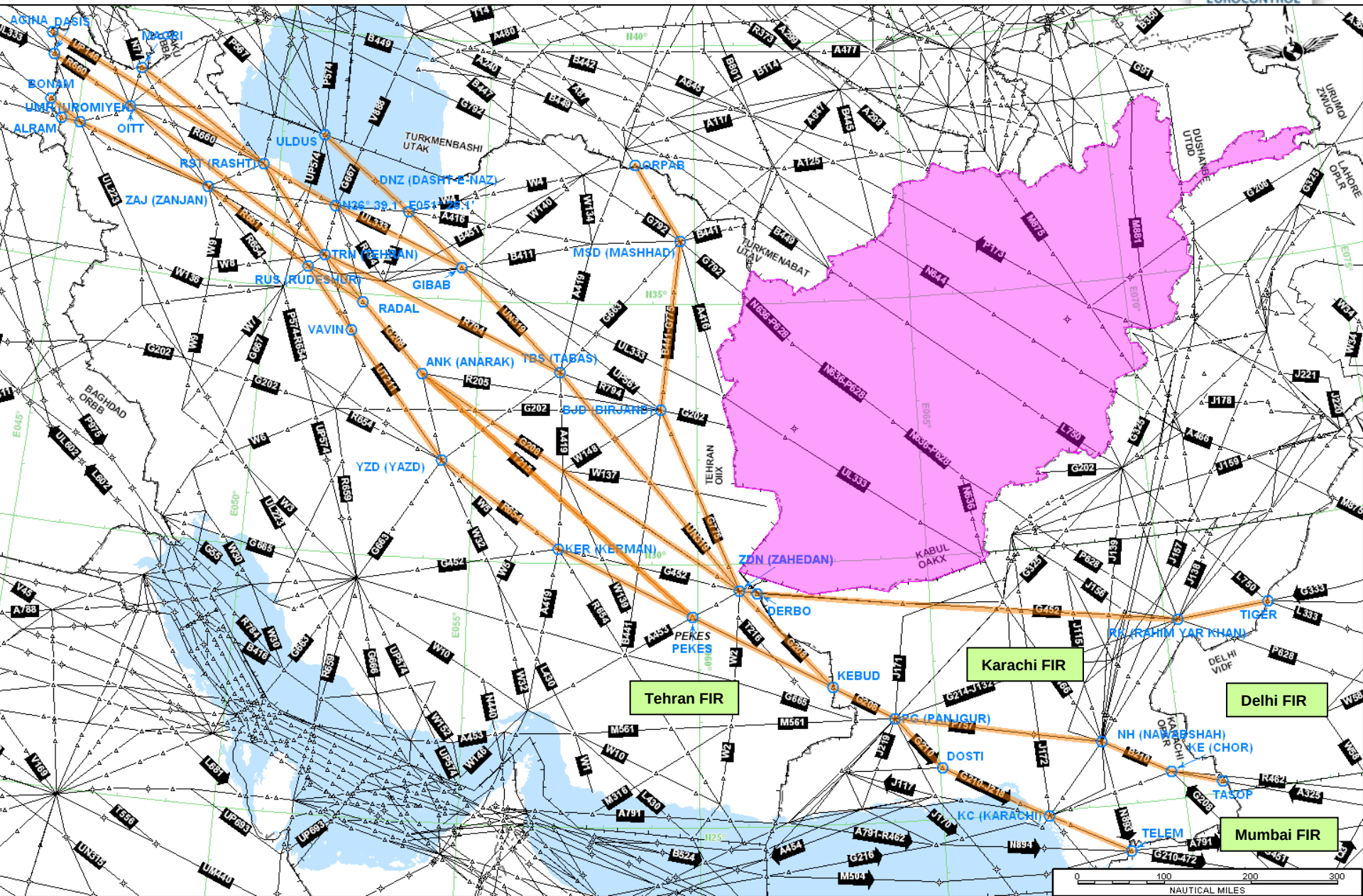

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Avoidance via Iran

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- ATS route options avoiding Kabul FIR are available on axis Delhi FIR / Mumbai FIR - Karachi FIR - Tehran FIR and vice-versa.

- To / From EUR/NAT Region airspace via Tehran FIR ATS route options are available via Ankara FIR, Yerevan FIR, Baku FIR and Ashgabat FIR.

- The most loaded TCPs are as follows:
  - ✓ TELEM / TASOP between Mumbai FIR and Karachi FIR;
  - ✓ TIGER between Delhi FIR and Karachi FIR;
  - ✓ DERBO / KEBUD between Karachi FIR and Tehran FIR;
  - ✓ ALRAM / DASIS between Tehran FIR and Ankara FIR.

- The general traffic distribution via the TCPs is as follows:
  - ✓ “V” area - TELEM, TIGER and KABIM;
  - ✓ “W” area - TELEM and TASOP;
  - ✓ “OP” area - DERBO and KEBUD.

- Possible shortest option ATS routes at interface Karachi FIR / Tehran FIR to accommodate re-routed traffic flows are:
  - ✓ G208, G452, G775;
  - ✓ L/UL124, UL125, UN319, UT215, UT211.

  It shall be noted that the shortest option ATS routes (G452 and G208 / L124) are merging over ZDN inside Tehran FIR immediately after the FIR boundary 20NM from DEBRO which might create additional ATC workload.

North of the Himalayas

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Avoidance via China

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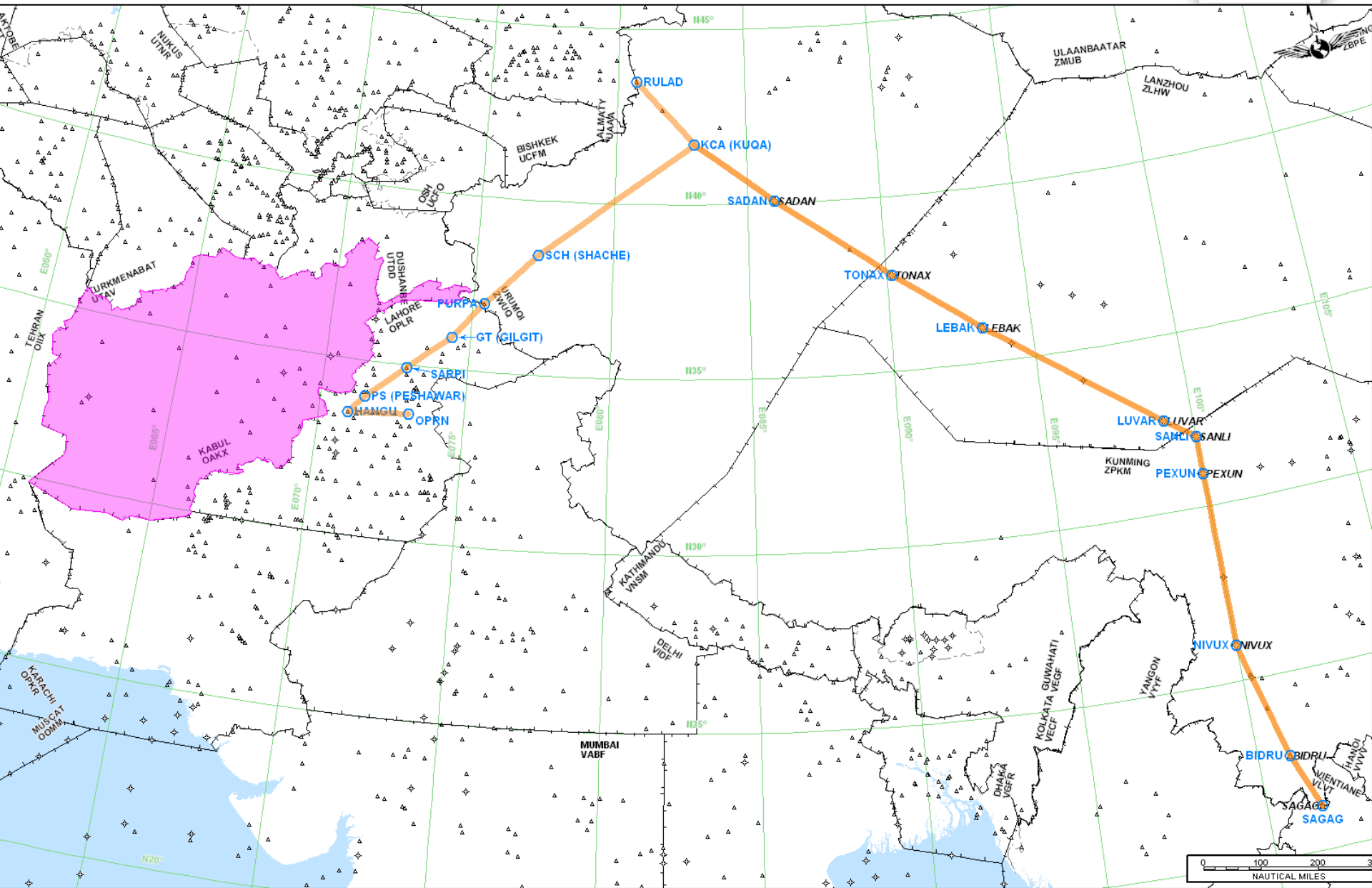

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Avoidance via China

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- ATS route options avoiding Kabul FIR are available on axis Karachi FIR - Urumqi FIR and Vientiane FIR - Kunming FIR and vice-versa.

- To / From EUR/NAT Region airspace via China the shortest ATS route option is available via Almaty FIR.

- The most loaded TCPs are as follows :
  - ✓ PURPA between Karachi FIR - Urumqi FIR:
    - Mainly for DEP OP to North Atlantic Area (“C” and “K” areas);
  - ✓ SAGAG between Vientiane FIR / Kunming FIR:
    - Mainly for flights between VTBS, VVTS, WSSS and Europe (EF, ES, EN, ED, LF…) and vice-versa.

- Possible shortest option ATS routes via China to accommodate re-routed traffic flows are:
  - ✓ B215;
  - ✓ A581 / L888.

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Avoidance via South

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- Upper ATS routes inside Kabul FIR in most of the cases available above FL305 are mainly orientated to serve flights on NW - SE axis from Europe and North Atlantic to Asia and vice-versa.

- Flights to Africa and Gulf area and beyond normally are not routed via Kabul FIR.

- In case of such flights re-routing is possible either via Tehran FIR for North African States or Tehran FIR / Muscat FIR for the rest of African States and beyond.

- In all cases unavailability of the airspace of Tripoli FIR shall be considered.

Impact on States

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SAAM SR Assignment
Comparison AFG OPEN / CLOSE
Interface Iran / Pakistan
1 AUG 2014 FRI

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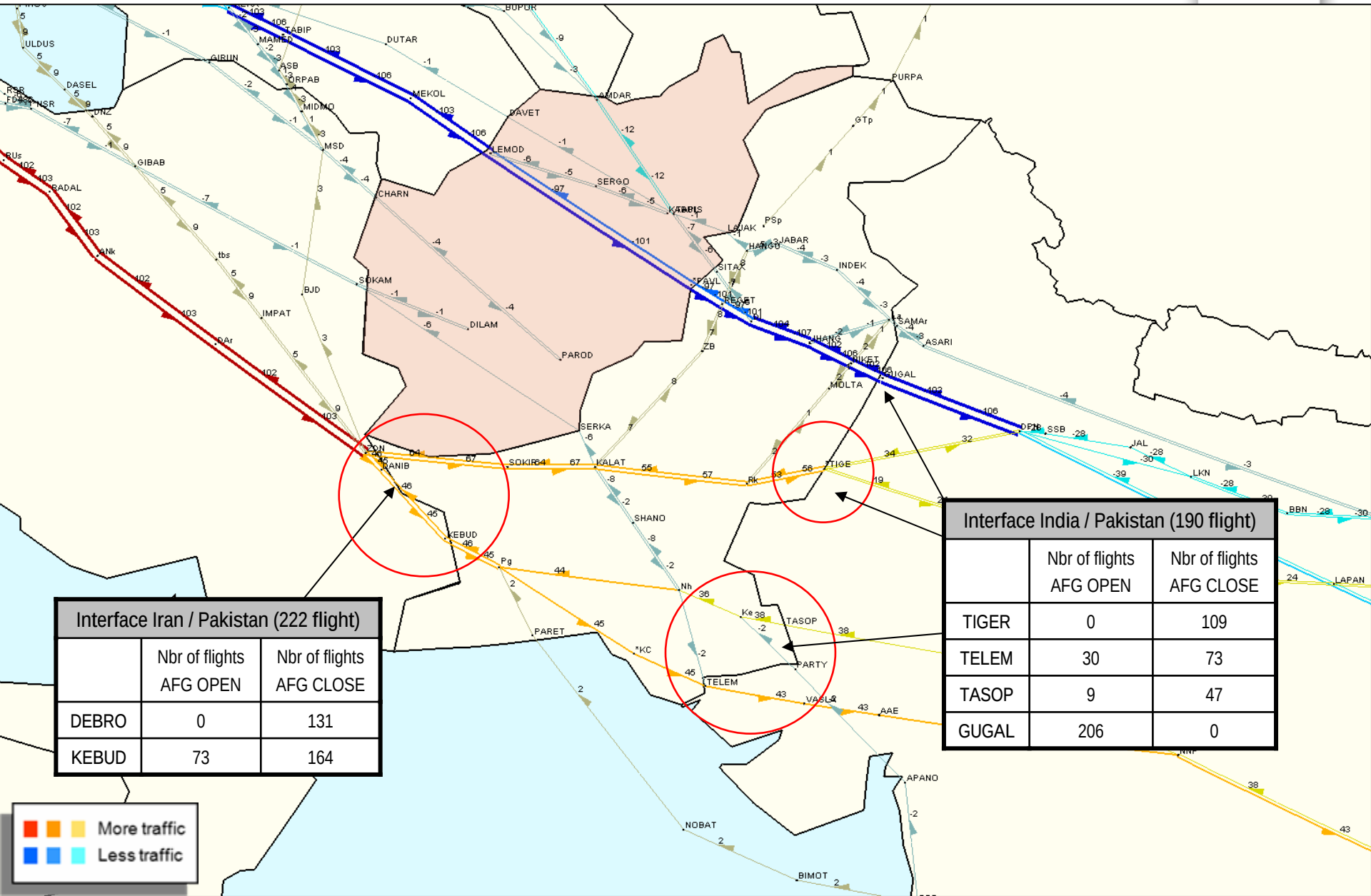
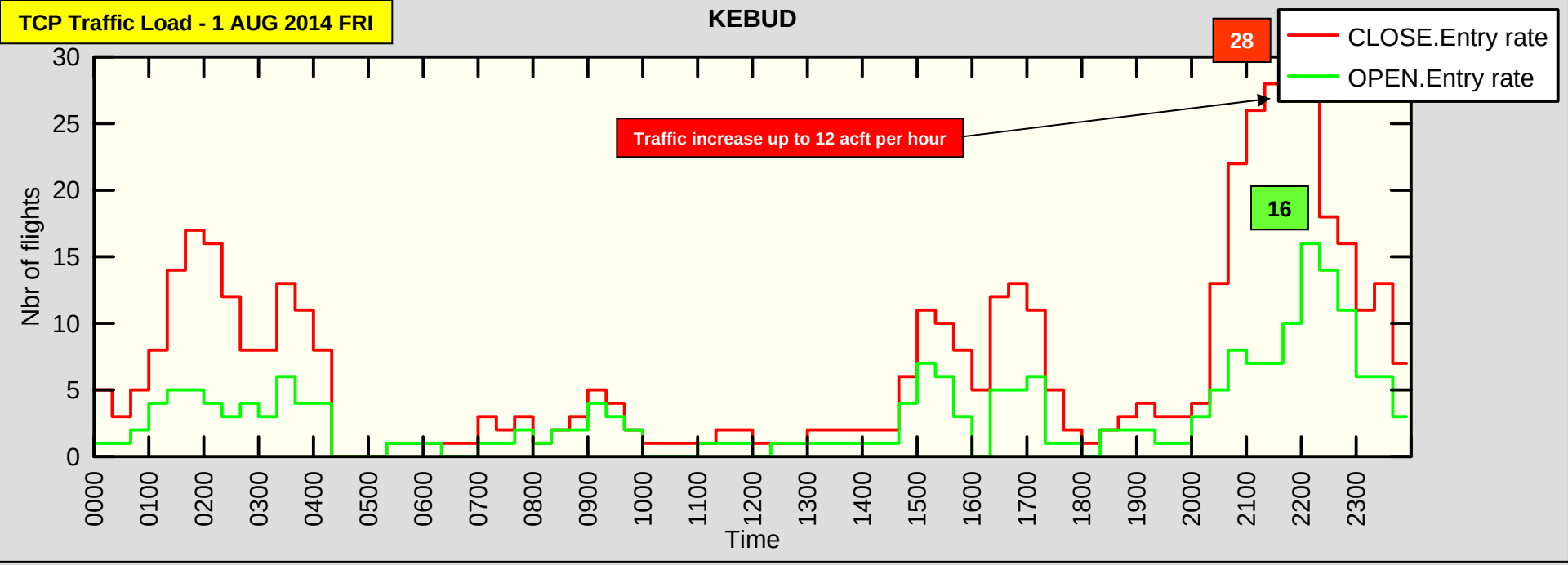


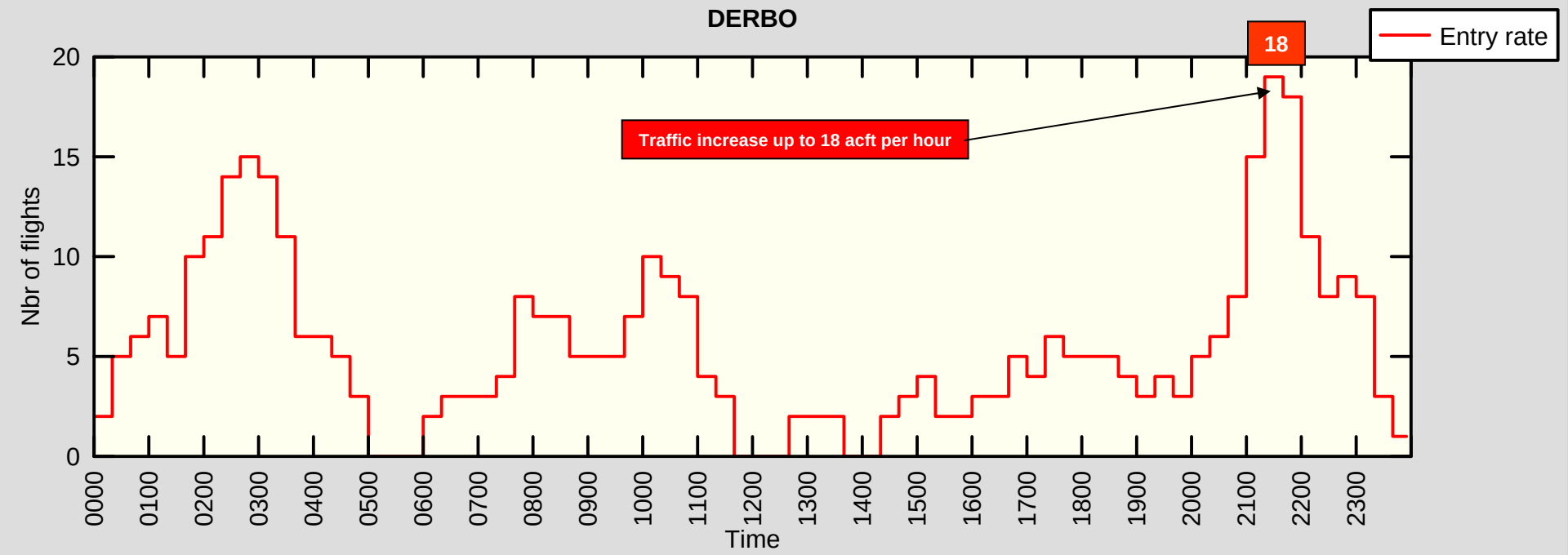
Interface Iran / Pakistan (222 flight)		
	Nbr of flights AFG OPEN	Nbr of flights AFG CLOSE
DEBRO	0	131
KEBUD	73	164

Interface India / Pakistan (190 flight)		
	Nbr of flights AFG OPEN	Nbr of flights AFG CLOSE
TIGER	0	109
TELEM	30	73
TASOP	9	47
GUGAL	206	0

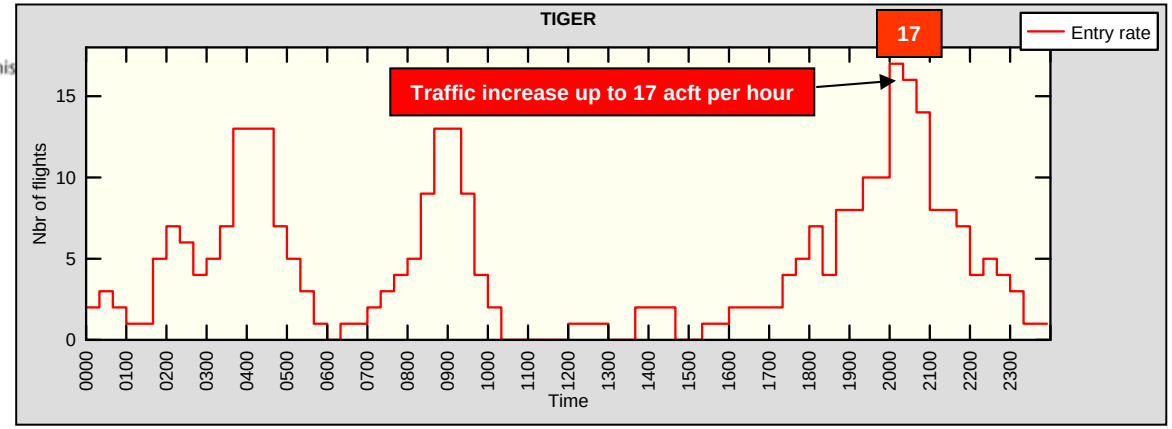
More traffic
Less traffic

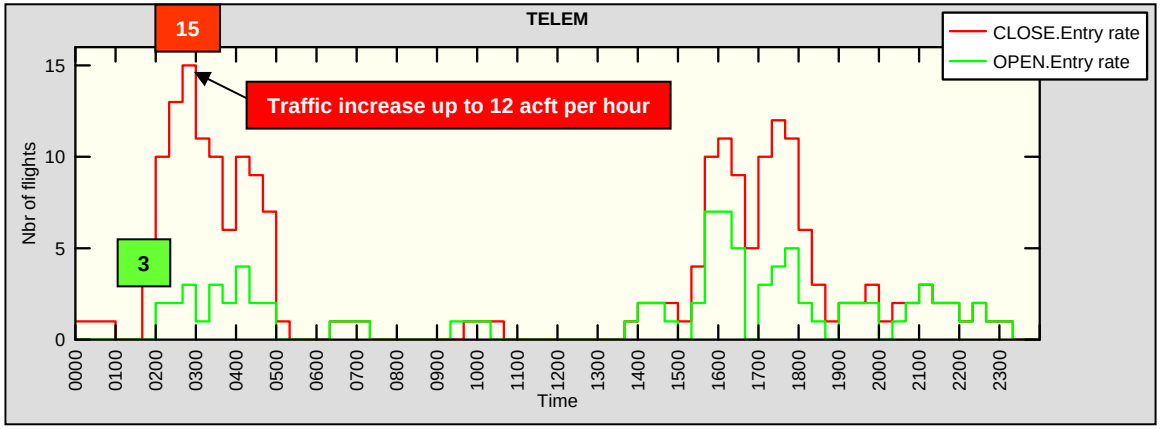
TCP Traffic Load - 1 AUG 2014 FRI

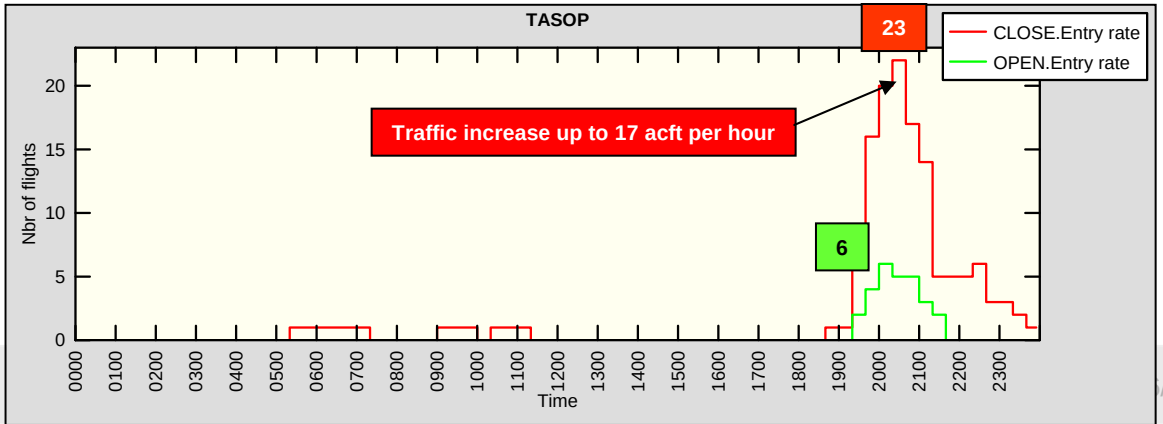




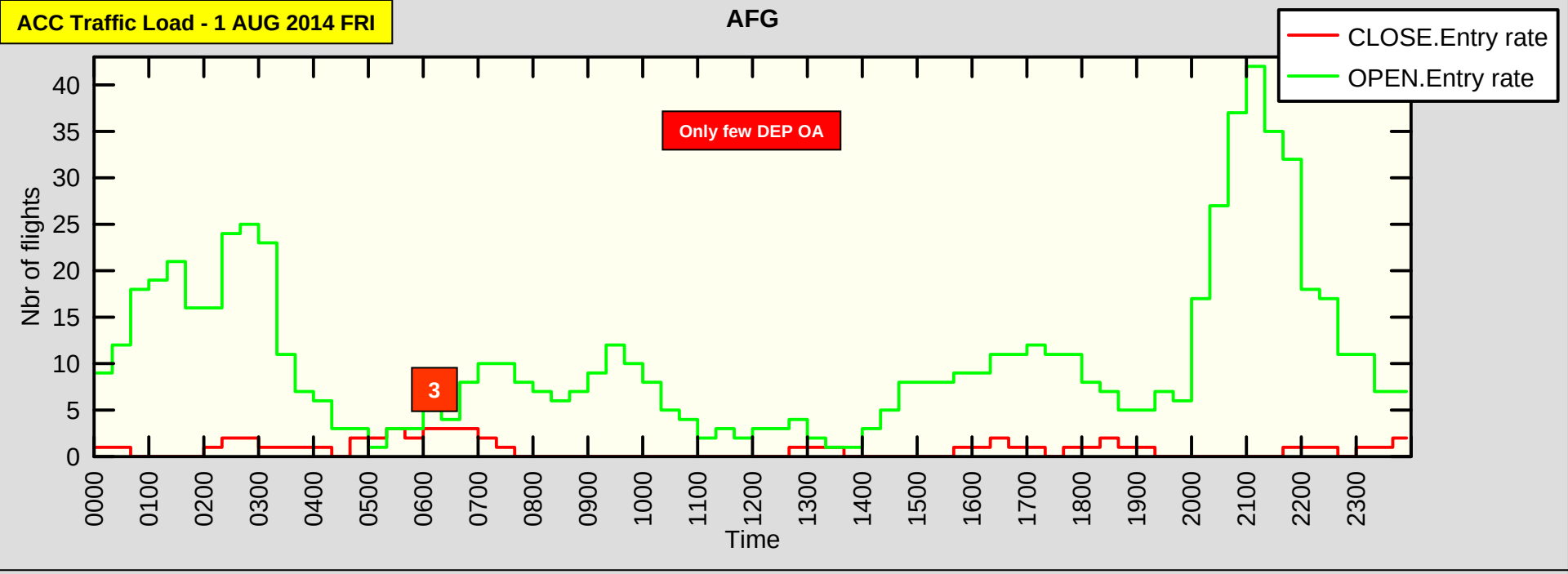
Entry Rate: The sum of entries for the next periods making one hour (cyclic). If a flight enters a sector more than once, it is only the first entry that counts. Calculation as done in OPS and NEVAC.

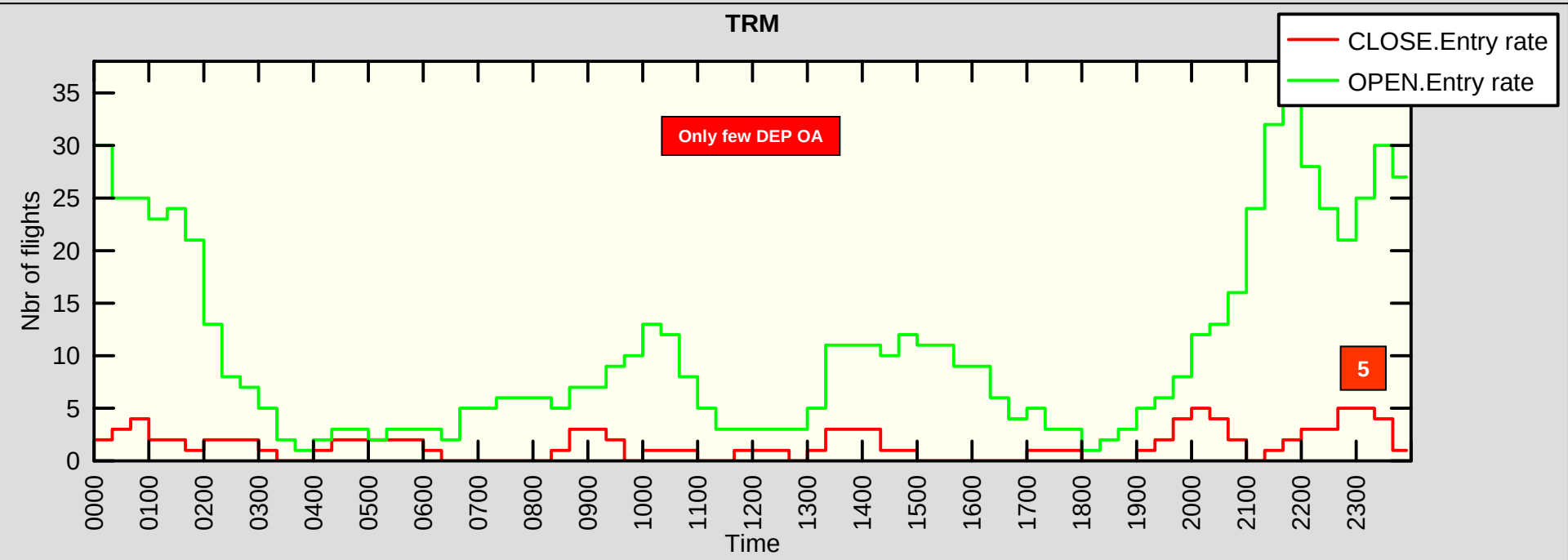

TIGER
17
Entry rate
Traffic increase up to 17 acft per hour
Nbr of flights
Time


TELEM
15
CLOSE.Entry rate
OPEN.Entry rate
Traffic increase up to 12 acft per hour
3
Nbr of flights
Time


TASOP
23
CLOSE.Entry rate
OPEN.Entry rate
Traffic increase up to 17 acft per hour
6
Nbr of flights
Time

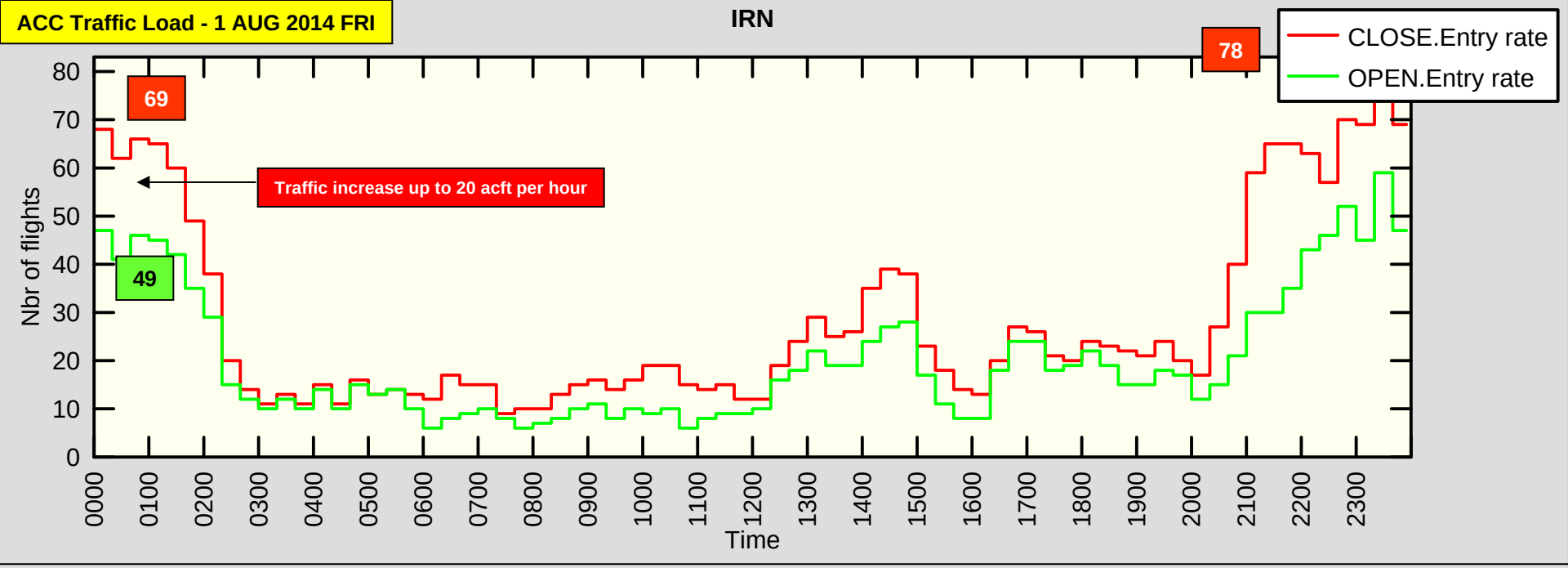
ACC Traffic Load - 1 AUG 2014 FRI

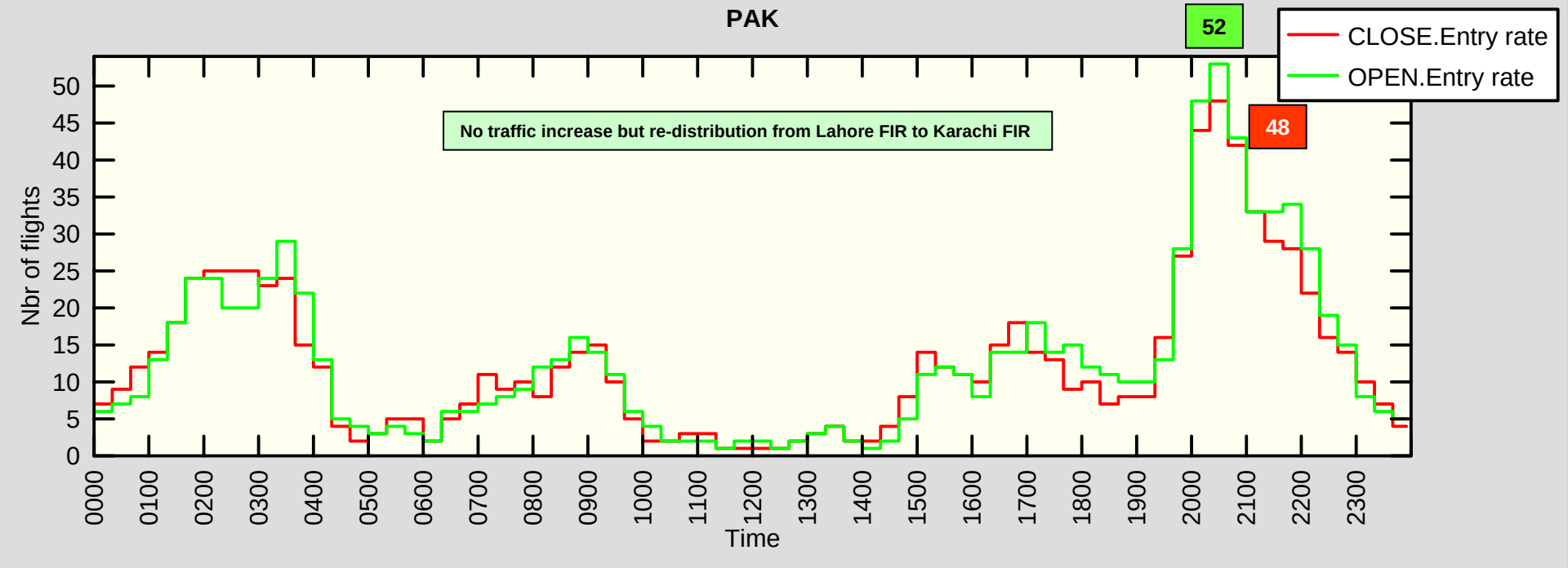




Entry Rate: The sum of entries for the next periods making one hour (cyclic). If a flight enters a sector more than once, it is only the first entry that counts. Calculation as done in OPS and NEVAC.

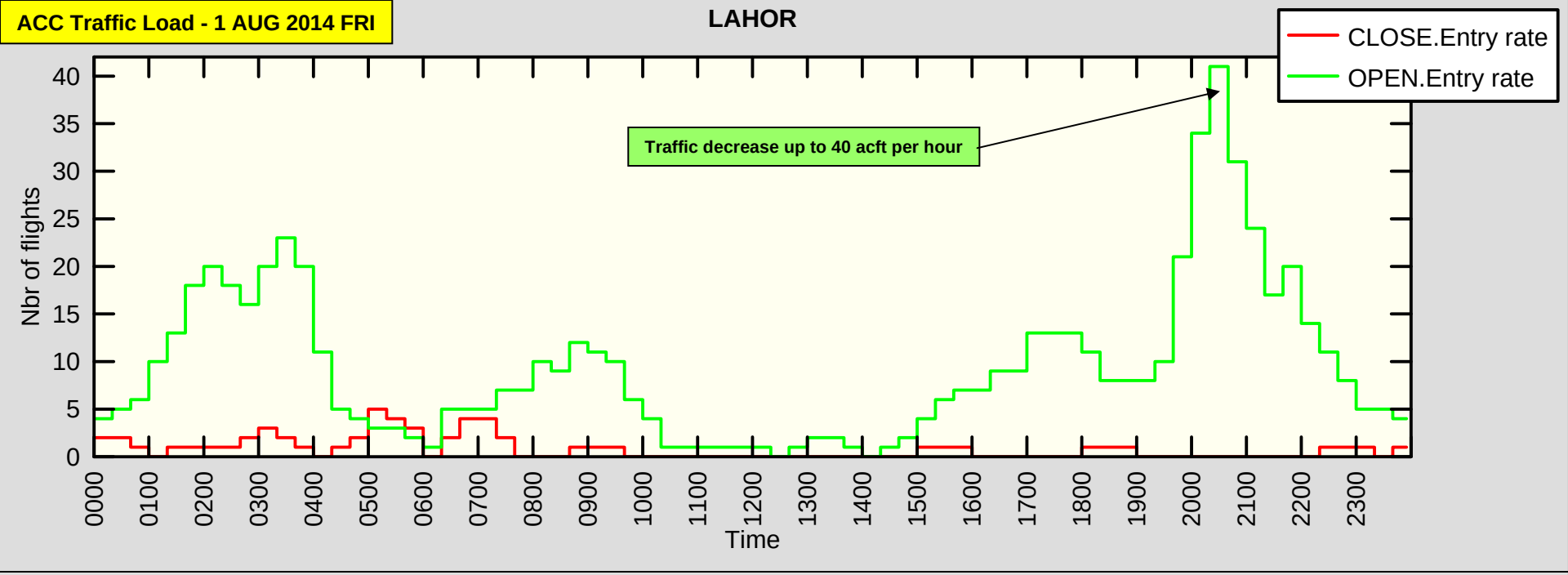
ACC Traffic Load - 1 AUG 2014 FRI

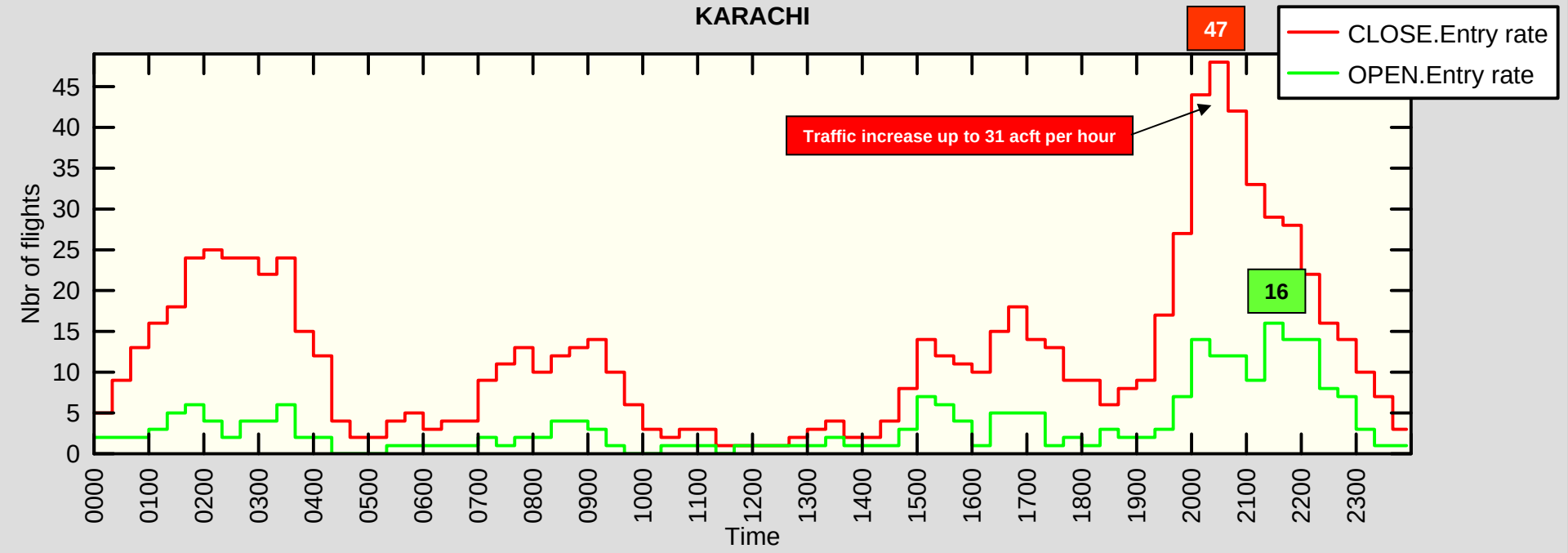




Entry Rate: The sum of entries for the next periods making one hour (cyclic). If a flight enters a sector more than once, it is only the first entry that counts. Calculation as done in OPS and NEVAC.

ACC Traffic Load - 1 AUG 2014 FRI





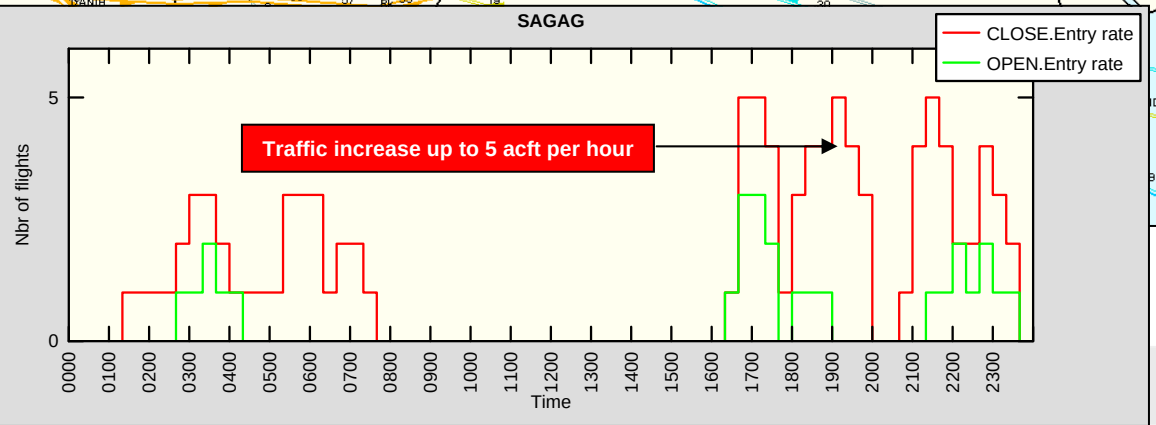
Entry Rate: The sum of entries for the next periods making one hour (cyclic). If a flight enters a sector more than once, it is only the first entry that counts. Calculation as done in OPS and NEVAC.

Network Manager
nominated by
the European Commission

SAAM SR Assignment
Comparison AFG OPEN / CLOSE
Interface with China
1 AUG 2014 FRI

EUROCONTROL

Interface China / Laos (24 flight)		
	Nbr of flights AFG OPEN	Nbr of flights AFG CLOSE
SAGAG	9	33



More traffic
Less traffic

Impact on on-loading areas - Findings

Findings are based on EUROCONTROL Evaluation including ONLY flights operating via European (ECAC) Airspace. Other local area flights shall be also considered in final conclusions and decisions.

- Interface Karachi FIR - Tehran FIR: Significant increase of additional 222 flights compare to normal situation. TCPs are loaded instantaneously during the night period, after 20:00UTC till 05:00UTC, with more than 45 flights per hour. Up to 18 flights per hour increase is also encountered. Mentioned shortest option ATS routes (G452 and G208 / L124) merge over ZDN inside Tehran FIR immediately after the FIR boundary 20NM from DIBRO shall be seriously considered as with such increased traffic this might create additional and unexpected ATC workload.

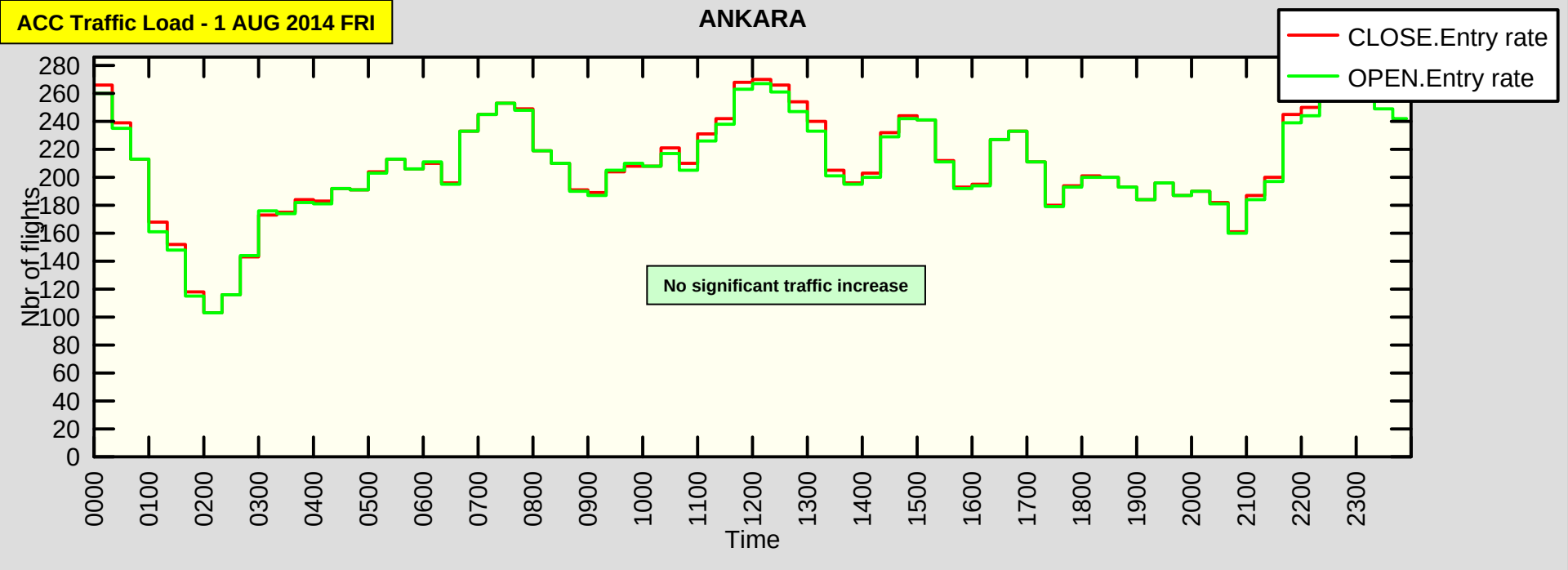
- Interface Delhi FIR / Mumbai FIR - Karachi FIR / Lahor FIR: Similar number of flights but re-distribution from Lahor FIR to Karachi FIR is evident. Re-distribution inside Indian FIRs is not significant except the swap of VIDP flights from GUGAL to TIGER. TCPs TIGER and TASOP are loaded instantaneously shortly after 20:00UTC with more than 40 flights per hour, while TCPs TIGER and TELEM are loaded instantaneously shortly after 03:00UTC with more than 20 flights per hour.

- Interface Vientiane FIR - Kunming FIR: Increase of 24 flight per day encountered with increase of around 5 flights per hour concentrated during night period, after 16:00UTC till 06:00UTC.

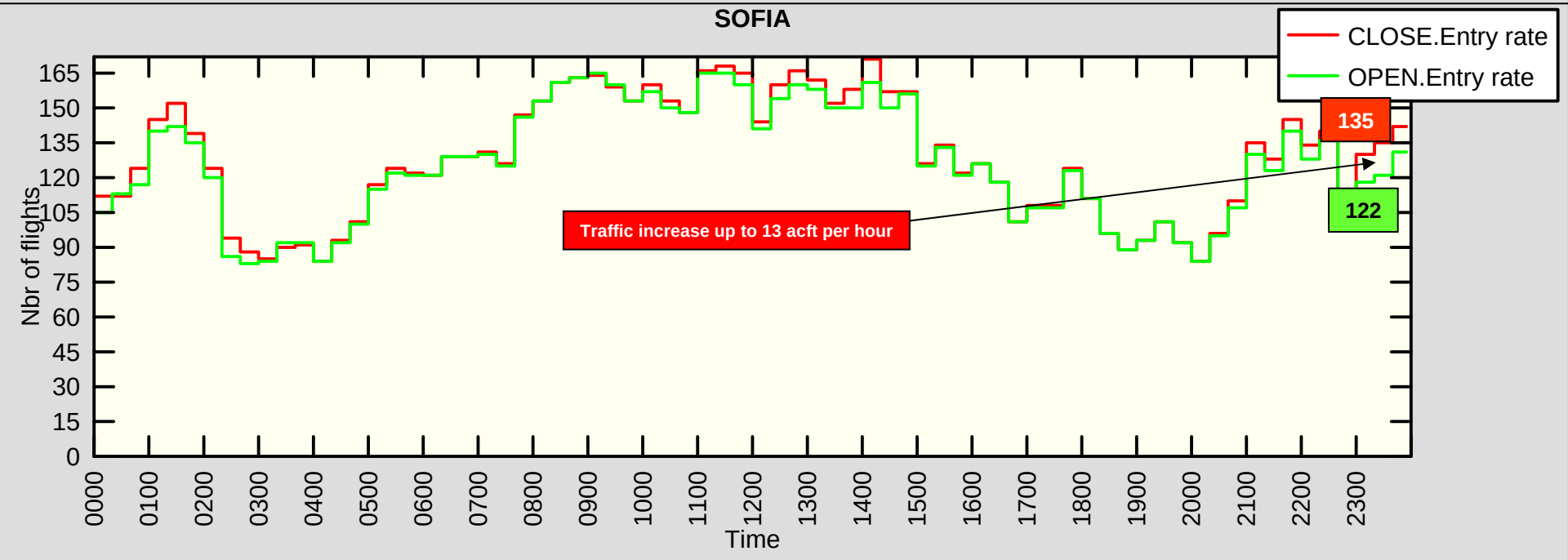
- ACCs:
  - ✓ Turkmenistan - tremendous traffic decrease;
  - ✓ Iran - heavily loaded night period, after 21:00UTC till 02:00UTC, with picks of more than 75 flights per hour;
  - ✓ Pakistan - load swap between Lahor and Karachi.

ACC Traffic Load - 1 AUG 2014 FRI

ANKARA



SOFIA



Entry Rate: The sum of entries for the next periods making one hour (cyclic). If a flight enters a sector more than once, it is only the first entry that counts. Calculation as done in OPS and NEVAC.

Impact on EUR/NAT Region - Findings

- In general no traffic increase inside EUR/NAT Region airspace except encountered re-distribution of more than 200 flights from North to South and further North.

- The main traffic concentration is on axis Ankara FIR - Sofia FIR - Bucuresti FIR and beyond where for all FIRs except Ankara FIR traffic increase might be expected.

- Reduction of flights via Yerevan FIR and Baku FIR.

- The most loaded TCPs are ALRAM / DASIS and ODERO / UDROS between Ankara FIR and respectively Tehran FIR and Sofia FIR.

- Prior information in case of unavailability of air navigation services within the Kabul FIR and traffic re-distribution inside EUR/NAT Region shall be properly communicated in order to assure necessary coordination inside the Region.

END