

COSAAC/SHAMAN

A tool to assess ASM & ATFM measures and concepts



COSAAC/SHAMAN

- Part I – Introduction
- Part II – Main fonctionnalities
- Part III – Link with FTS
- Part IV – Conclusion

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COSAAC/SHAMAN

- COSAAC/SHAMAN is used to evaluate the effect of ATFM and ASM measures or concepts
- It allows measurement of:
 - Effects of new sectorization
 - Effects of new routes
 - Impact of military activity
 - Detection of bottlenecks (location and time period)
 - ...
- The tool is a TFM simulator, not a Fast Time simulator

A bit of history

- In 1994, SHAMAN is born
 - System to Help Analysis and Monitoring of ACC resources and air route Network
 - R&D version of the COURAGE operational tool
 - Used for studies by CENA and SCTA
 - French data only (from COURAGE)
- In 1998, cooperation started with Eurocontrol Experimental Centre (Brétigny)
 - Renamed to COSAAC/SHAMAN (COmmon Simulator to assess ASM & ATFM Concepts)
 - Extension to European data (flight plans, environment data, traffic volumes, ...)
 - Provided by EEC to CFMU

Examples of studies

- Preparation of Le Bourget airshow
- Global evaluation of re-routings proposed by the 5 french ACCs to increase traffic fluidity
- Emergency plan to evacuate Paris airspace

Input data

- Data :
 - Flight plans (French or ECAC)
 - Beacons and airports data
 - Sectors
 - Opening schemes
 - Military areas activation schemes
 - Traffic volumes
- Different days of traffic can be loaded simultaneously to compare situations

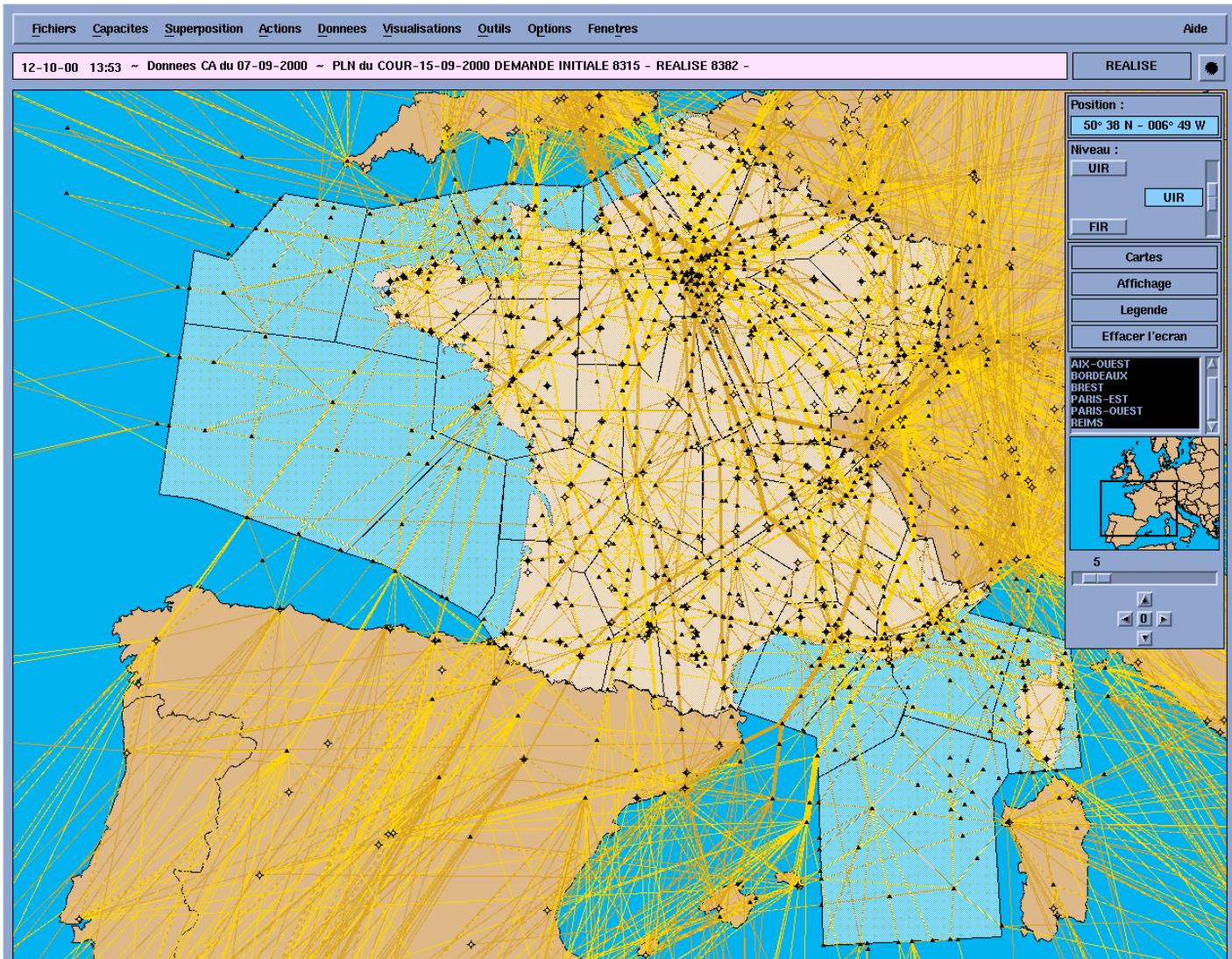
COSAAC/SHAMAN

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Main functionnalities - Display

- User friendly interface to display airspace and traffic:
 - 2D & 3D
 - Vertical profiles
- Flight plans can be represented with different methods:
 - Segments with size proportionnal to number of aircraft
 - Arrows which represent traffic flows
 - ...

Main fonctionnalités – Display



Main functionnalities - Selection

- Traffic selection through multiple criteria, such as:
 - Airports
 - Beacons
 - Sectors
 - Traffic volumes
 - Times
 - Levels
 - Aircraft Id
 - ...

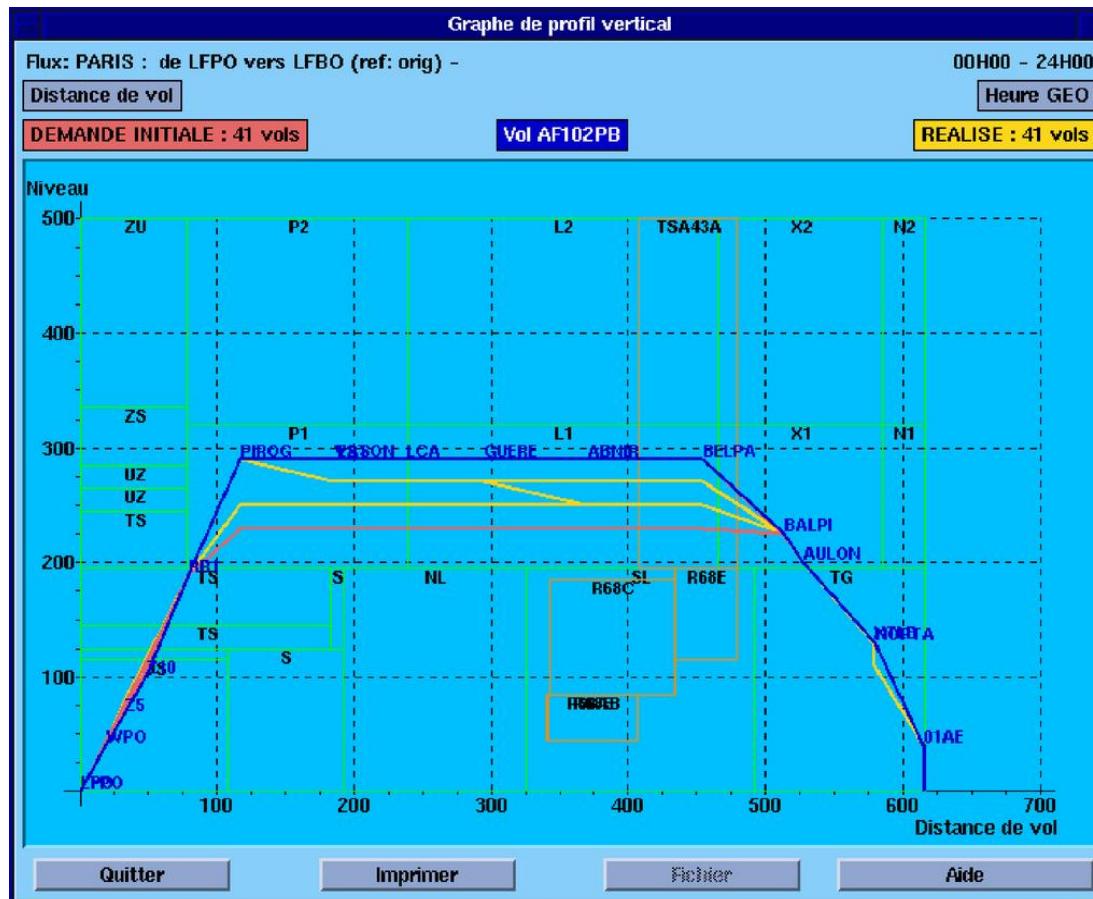
Definition d'un flux

Identification	LFO
Origine	LF
Via secteurs	DS TS NS
Via balises	
Destination	LF
Trafic - volume	
Critere de reference : via secteurs	
Heure de reference	de 05H00 a 09H00
Niveau de reference	min max
tardes select 1	
Regulation	
Delai ATC	min 5 max
Indicatif	-AF
Avion	
Niveau depose	min 110 max

Quitter Mise à jour Effacer tout Aide

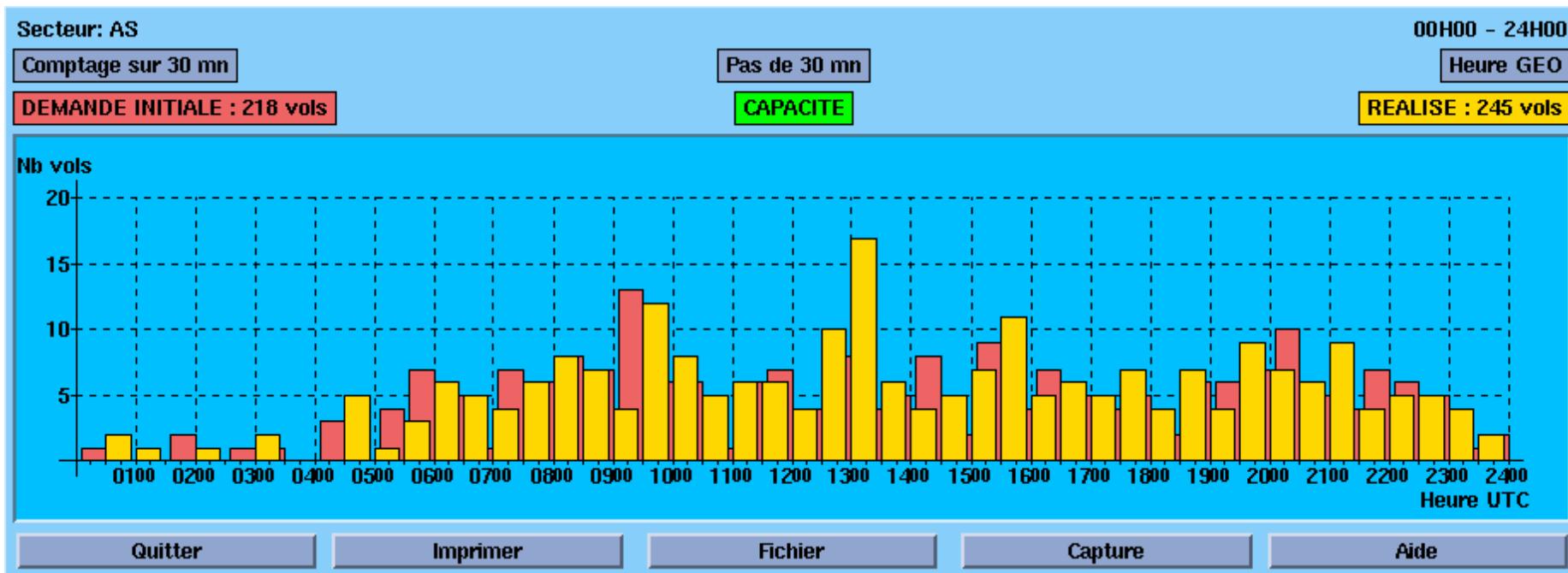
Main functionnalities - Analysis

- Vertical profiles:



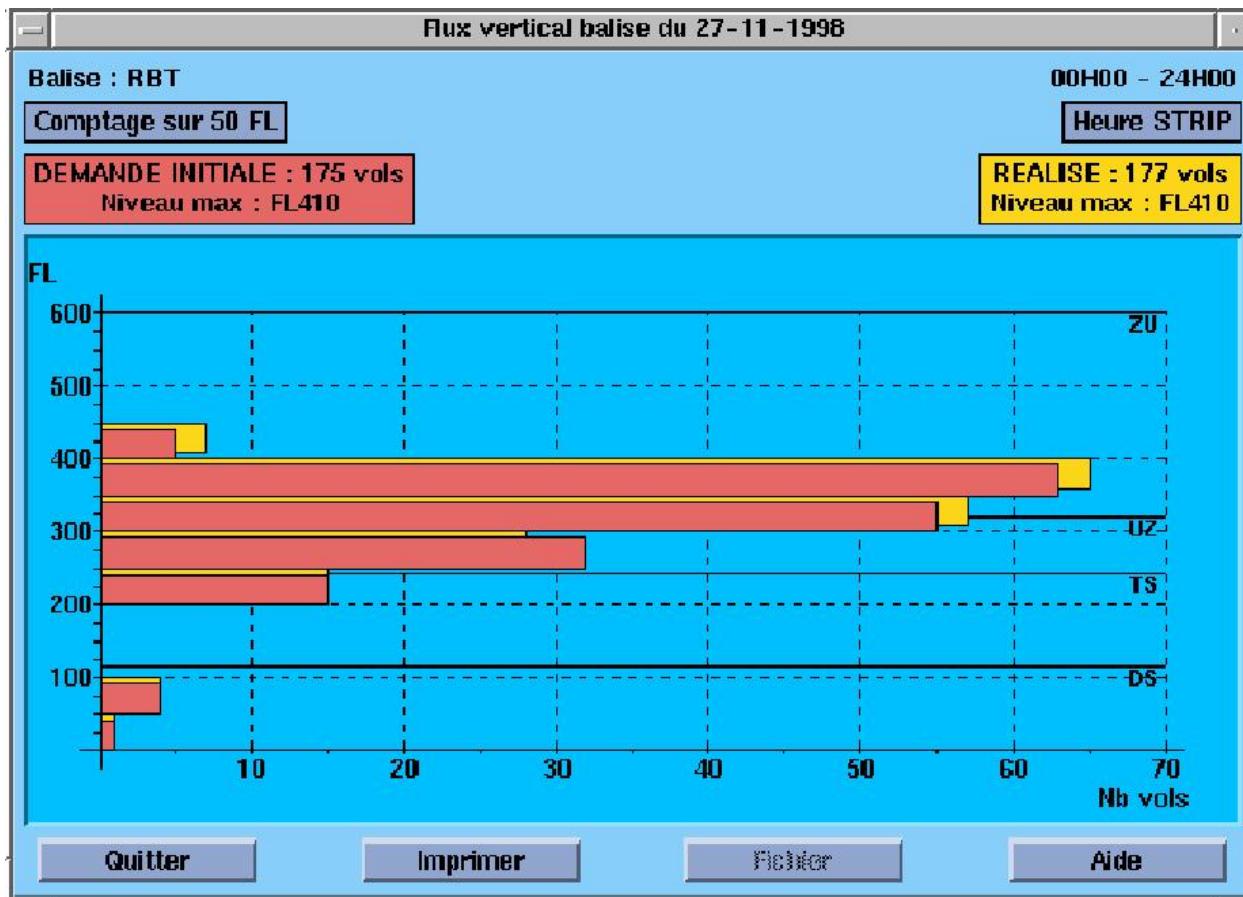
Main functionnalities - Analysis

- Sector throughput and instantaneous load
- Throughput can be compared with sector capacity = local detection of overloads



Main functionnalities - Analysis

- Statistics on flights over a beacon



Main functionnalities - Analysis

- Comparison with capacity:
 - Compares number of aircraft in a sector/in a traffic volume with capacity during each time period
 - Takes military activity into account
 - Used to easily detect overloads (bottlenecks)
 - Can be used to determine which sectors to group or not during a given period (best sector opening scheme in an ACC)
- Same color coding as in operations

Main fonctionnalités - Analysis

FRANCE : 7 centres

En route

AIX-EST
AIX-OUEST
BORDEAUX
BREST
PARIS-EST
PARIS-OUEST

Trafic DEMANDE INITIALE du 07-07-2000

Superposition standard Periode : 00H00 24H00

Comptage sur 1 h Default

DEMANDE INITIALE **Schema DEPOSE** **Heure GEO**

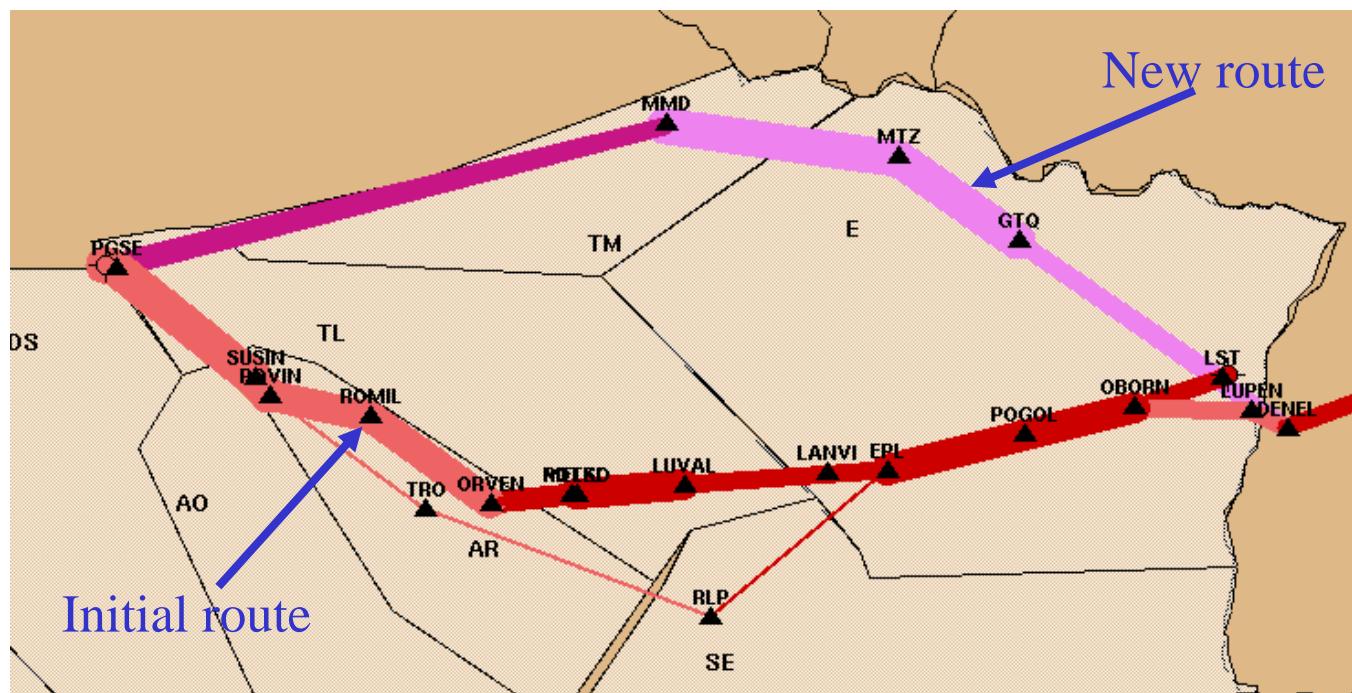
REALISE	6	3	6	10	10	14	14	14	14	14	14	14	14	12	15:00	16:00	17:00	18:00				
	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00							
A					19/35	25/35	30/40	23/40	25/42	15/44	26/44	28/44	28/44	21/44								
FBRT					37~35	23/35	22/35	39>31	25/31	24/31	14/31	20/31	21/31	25/31	32~31	34~35	30/35	39~35	25/35			
FX																						
FZX	6/24	11/24	10/24	20/24		18/33	16/33	25/30	23/30	15/32	36~33	28/33	30~33	22/33	24/33							
G																						
GA	11/28		12/36	24/36												56~55	34/55	31/55	40/55			
J			23~25	19/35	28/35	26/35	30/45	32/45	53>47	42/48	53~48	40/48	43~48	44~48	31~48	30/48	23/48	21/48				
N	8/39		14/28	28/39	35~38	30/38	42/49	41/49	49~52	36/55	55~55	46/55	52~55	43/55	52~55	38/55	47/55	37/55				
NGA		11/30	15/30																			
OQ			25~26	22/48	28/48	25/48	33/44	38/44	52>46	33/48	43~48	38/48	24/48	40/48	37~35	26/35	14/35	18/35				
OQJ	14/35	8/26	9/26			37~35	25/35															
X																						
XS									4/32	19/35	26/35	23/35	22/35	10/35	20/35	20/35	19/35	13/35	13/35	16/35		
XU									13/26	14/28	19/28	20/28	23/28	22/28	14/28	14/28	27~28	13/28	16/28	13/28		
Z									18/32	26/32	19/32	39~35	43>35	35~35	42~35	30/35	34~35	23/35	36~35	27/35	31/35	32~35
ZS									22/26	29>26	23~26	22/28	21/28	27~28	39~28	27~28	19/28	20/28	26~28	21/28	25~28	18/28
ZU									22/26													
ZXS									16/26													
ZXU																						
TOTAL	21	21	21	53	88	114	115	128	134	144	137	157	127	131	132	152	108	121	122			

Schema DEPOSE du 07-07-2000

Fermer **Imprimer** **Sauver** **Aide**

Main functionnalities – Traffic mods.

- Traffic modifications:
 - Increase (all traffic or selected flows)
 - Random modification of take-off times
 - Re-routing



Main fonctionnalities – slot allocation

- COSAAC/SHAMAN – slot allocation module:
 - Departure delays given to some aircraft in order to respect capacities
 - Capacities are either:
 - Sectors declared capacities (with opening schemes and taking military activity into account)
 - Regulations on traffic volumes
 - Several algorithms are available to delay departing aircraft (one is similar to the one used by CFMU)
 - Can be performed on all traffic or on a selection of flight plans

Main functionnalities - slot allocation

- Output of slot allocation algorithms is delays:
 - Delays show where the bottlenecks are located (most penalizing regulations)
 - Delays are used as performance indicators to evaluate and compare different ATFM measures
 - Those measures give indications on the global performance of the system since slot allocation takes the network effect into account

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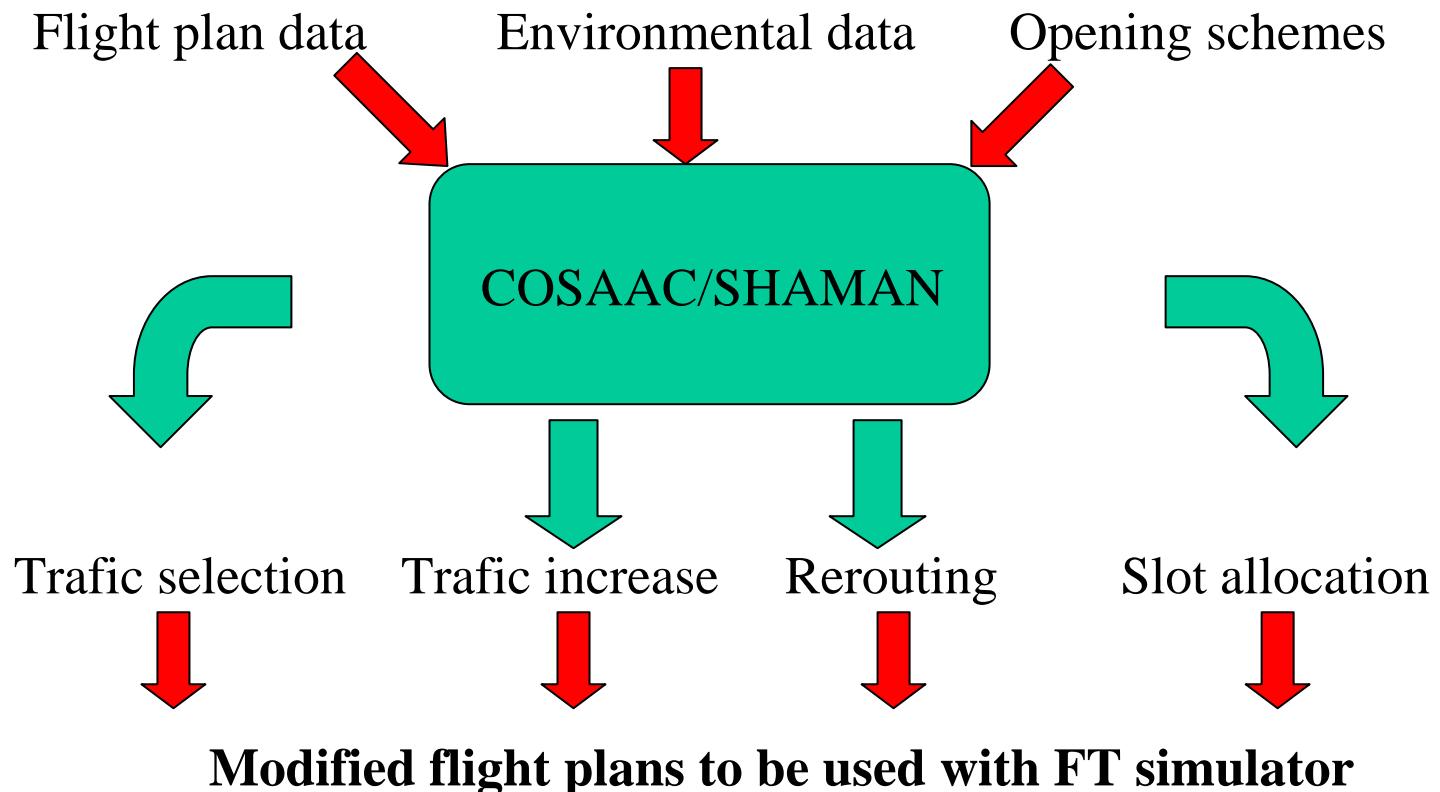
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Links with FTS

- COSAAC/SHAMAN can be used as a pre-processor for Fast Time simulations :
 - To prepare traffic (selection, re-routing, slot allocation, traffic increase)
 - Identify possible areas of interest
- The tool can also be used to analyse results from Fast Time simulations

Links with FTS - Data pre-processing

- Traffic preparation:



Links with FTS – results analysis

- FT simulators can generate new flight plans which include:
 - time and level over beacons
 - list of crossed sectors and entry/exit times
 - arrival times
- Generally two scenarios are compared:
 - Reference scenario reflecting current situation
 - Alternative scenario including new concepts such as Free-Route with automatic military areas avoidance

Links with FTS – results analysis

- COSAAC/SHAMAN allows traffic display
 - ⇒ both reference and alternative traffic on the same figure
- The analysis capabilities of the tool also include:
 - Sector throughput with load graphs comparing reference and alternative situation
 - Comparison of delays generated with a slot allocation on both scenarios

Links with FTS – results analysis

Flight plans generated by FTS



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Load graphs

Display

Analysis of delays
with slot allocation

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Conclusion

- COSAAC/SHAMAN is a traffic simulator (not FTS) that offers many possibilities to analyse effects of TFM measures/concepts
- User friendly interface is similar to operational tool COURAGE, so french operational experts can easily get acquainted with it
- Can be used:
 - For studies
 - By Flow Management Positions during operations to evaluate local and global impact of TFM measures