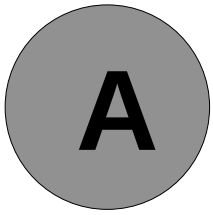


APPENDIX A:

EXAMPLES OF FUNCTIONAL HAZARD ASSESSMENT

1 INTRODUCTION

The purpose of this chapter is to provide several examples of application of the Hazard Assessment part (Chapter 3 sub-steps 1 to 3) of the FHA process.

In the following sections, the results of the application of the process are given for:

- Ground-ground data communication function: On-Line Data Interchange (OLDI);
- Air-Ground data communication function: Controller/Pilot Data Link Communications (CPDLC);
- Surface Movements Guidance and Control System (SMGCS).

2 ON-LINE DATA INTERCHANGE (OLDI) FUNCTIONAL HAZARD ASSESSMENT

This section describes the high level Functional Hazard Assessment of a Ground-Ground Data Communication function OLDI, defined in the Operational Concept Document for the EATCHIP Phase III System Generation. The OLDI function is specified in the EUROCONTROL Standard DPS.ET1.ST06-STD-01-00.

2.1 Operational Environment and System Description

2.1.1 Operational Environment

To perform the assessment, a generic working unit and a generic environment are selected.

The sector suite is selected as the generic unit. This means that all activities taking place within the unit (communications, actions, co-ordinations, tasks, etc.) will be considered as workload for the unit and not split up into planning controller, executive controller and assistant workloads.

Similarly all external communications (voice and data) will be regarded as external communications of the unit and not of its constituent parts.

The traffic, physical and procedural environment of the generic sector suite will be considered to be ECAC core area without reference to specific traffic loads and/or equipment and/or procedures.

2.1.2 System Description

Definition of the OLDI function:

Co-ordination and transfer of communications between air traffic control units by the use of electronic data transfer between Flight Data Processing Systems (FDPS).

Operational description:

Before every transfer between two adjacent units: the transferring unit (A) and the receiving unit (B), several messages are exchanged. Some of the messages from the Basic Procedure are introduced here after:

Exchange data way	Message identification	Time until COP	Remarks
A ➢ B	Advanced Boundary Information Message (ABI)	≈ 30mn	Notification
A ➢ B	Activate Message (ACT)	≈ 10mn	Co-ordination message. Include new or updated data from ABI
B ➢ A	Logical Acknowledgement Message (LAM)		Means by which the receipt and safeguarding of a transmitted message is indicated to the sending unit by the receiving unit.
A ➢ B	Revision (REV): optional		An amendment to co-ordination message sent previously by the transferring ATC unit to the receiving unit.

Table I-8. Mandatory exchanged messages

Every message is exchanged between Flight Data Processing Systems from the transferring to the receiving units (ABI, ACT ...) or sent back from the receiving to the transferring units (RJC ...), processed and stored in Flight Data Base.

Validity checks are performed on all data items.

Depending of the message, received operational data are displayed to the controller.

“ACT” will not normally be displayed to the controller, but only the pertinent flight data in accordance with the updated lifecycle state.

2.2 Hazard Assessment

Few examples of potential OLDI hazards are given hereafter.

Note that the worst credible case has been assumed in order to allocate the severity class.

Function	Hazard	Hazard Effect	Severity Class	Remarks
Achieve co-ordination between Air Traffic Control Units Timely Correct flight data, Right destination.	Total loss of transmit sub-function (failure to transmit the message -with or without warning)	If the failure comes from the transferring unit, no message will be addressed to the next ATSU, and no acknowledgement from the receiving unit will be sent. The aircraft will go through exit sector of the transferring unit and enter in the receiving sector without prior co-ordination. No automatic co-ordination between transferring and receiving units.	3	• Increase of workload of the next sector receiving the aircraft • Potential conflict.
	Partial loss of transmit sub-function (partial failure to transmit the message-with or without warning)	If the failure comes from the receiving unit, no acknowledgement will be addressed to the transferring ATSU. The aircraft will go through exit sector of the transferring unit and enter in the receiving sector without prior co-ordination. No co-ordination between transferring and receiving units.	3	• Increase of workload of the next sector receiving the aircraft • Potential conflict.
	Message corrupted – undetected corruption	In the worst case, the output flight data including the corrupted data will be considered as **credible**. The aircraft will go through exit sector of the transferring unit without detection of the failure/corruption and enter in the receiving sector without prior co-ordination.	2	• Invalid co-ordination / confusion • Conflicts
	Message corrupted – detected corruption	If the message is **obviously** corrupted: No LAM will be sent from the receiving unit. The controller from the transferring unit will	4	• Slight increase of workload

Function	Hazard	Hazard Effect	Severity Class	Remarks
		initiate telephone co-ordination.		

Function	Hazard	Hazard Effect	Severity Class	Remarks
	Mis-direction of the message	In the worst case, the message will be addressed to the wrong ATSU. If the wrong receiving unit sends an erroneous acknowledgement to the transferring unit then the aircraft will go through exit sector of the transferring unit and enter in the receiving sector without the correct co-ordination	3	• Increase of workload of the next sector receiving the aircraft. • Potential conflict
		In the normal case, even if the message is not addressed to the right unit, the transferring unit will not receive an acknowledgement and will co-ordinate the flight by telephone.	4	• Increase of workload of both sectors
	Delay of the message - too late	If the message is sent too late, the result is the same as “message lost”: The aircraft will go through exit sector of the transferring unit and enter in the receiving sector without prior co-ordination. No co-ordination between transferring and receiving sectors. No acknowledgement indicated to the transferring unit.	3	• Increase of workload of both sectors • Potential conflict.
	Delay of the message - late	If the message is delayed in transmission, a LAM time-out will be initiated, then a manual co-ordination will take place.	4	• Increase of workload of both sectors

3 CONTROLLER/PILOT DATA LINK COMMUNICATIONS (CPDLC) FUNCTIONAL HAZARD ASSESSMENT

See EUROCAE ED120.

4 SURFACE MOVEMENTS GUIDANCE AND CONTROL SYSTEM

This section describes a part of the high level Functional Hazard Assessment of A-SMGCS Ground Assistance Tools for EUROPE (AGATE). The complete Functional Hazard Assessment can be found in Annex 3 of AGATE Business Case.

The purpose of AGATE system is to assist aircraft and authorised vehicles to manoeuvre safely and efficiently in the movement area, in relation to all weather conditions, traffic density and aerodrome layout.

4.1 Operational Environment and System Description

4.1.1 Operational Environment

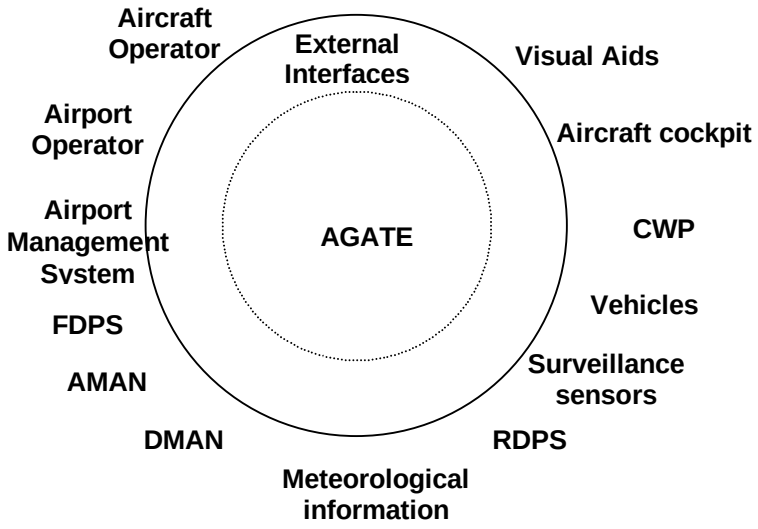
The FHA is based on the following airport characteristics:

- Traffic Density (Movements per runway/aerodrome measured from the mean busy hour independent of visibility conditions): High (26 or more take-offs and landings per runway or typically more than 35 total aerodrome movements);
- Visibility Conditions (Visibility conditions are measured in terms of visibility necessary for visual taxiing and surveillance): Poor (the visibility is insufficient for the pilot to taxi by visual guidance only, or visibility sufficient for the pilot to taxi but insufficient for the pilot to avoid collision with other traffic, and insufficient for personnel of control units to exercise control over all traffic on basis of visual surveillance;
- Aerodrome Complexity Level (ACL). Two ACLs are considered:
  - Low: An aerodrome with one runway, having more than one taxiway to one or more apron areas;
  - High: an aerodrome with more than one runway, having many taxiways to one or more apron areas.
- Airport Saturation Level (the saturation level corresponds to the ratio between the average utilisation level of the airport and the capacity in terms of runway and taxiway capacity as well as some ATC capacity (e.g.

workload, system pressure): High (airports which are (or are expected to be in the very short term) capacity constrained / saturated.

4.1.2 System Boundaries

The boundaries of the system are described in Figure I-. The external systems are described in the Agate Operational Concept Document.



4.1.3 Functional Description

AGATE comprises 4 functions:

- AWARE. Surveillance function: Provision of positional information on all movements within the movement area, provision of identification and labelling of authorised movements including moving and static aircraft and vehicles, and immunity to operationally significant adverse effects (weather, topographical conditions);

- ALERT. Conflict detection and alert function: Conflict prediction, detection and resolution including incursions to runways or other critical or sensitive areas;

- GUIDE. Guidance function: Provision of the guidance necessary for any authorised movement, provision of a clear indication to pilots and vehicle drivers to allow them to follow their assigned route, enable all pilots and vehicle drivers to maintain situational awareness of their position in relation to the assigned route, and flexibility in case of any changes;

- SMAN. Planning / routing function: designation and assignment of routes while minimising / optimising taxi distances / time consumption as well as interaction with the control function to minimise conflicts.

As described in the AGATE Business Case, each AGATE function may be implemented at different levels of functional sophistication (low, medium, high). The FHA presented in section corresponds to the combination of the lower sophistication level. The other assessment can be found in the AGATE Business Case.

4.2 Hazard Assessment

Note that the worst credible case has been assumed in order to derive the severity class.

Function	Hazard	Hazard effect	Severity Class	Remarks
AWARE (Surveillance) Tracks data fusion	Loss of Track data fusion.	Loss of localisation information of all targets on the CWP situation display. Loss of key events notification provided to controllers. Loss of runway incursion alerts provided to controllers. Impossibility to use certain transferable data from other systems: the RDPS data. Loss of automatic updating of key events prediction (in function of key events notification and current position of targets). High increase in controller workload until traffic is reduced or service restored. Frequency congestion which is likely to occur (surveillance relying on pilots reports) may worsen the situation. The "safety net" provided by the runway incursion alerts being lost, the controller ability to provide guidance while ensuring separation and avoiding runway incursions is severely compromised. Many losses of separation are likely to occur and probability of collision increases on complex airports.	**ACL Low: 3** **ACL High: 2**	As visibility is assumed low, controllers must rely on pilot's RTF reports (reporting should be performed at each crossing point) and on a mental representation of the traffic situation. This is more difficult on complex airports. Traffic is reduced to a level allowing the provision of continuous safe service (priority is given to arrivals).
		Localisation information displayed to controller becomes obsolete, especially for fast targets (manoeuvring area). Key events notification is delayed. Runway incursion alerts are delayed and		Unlike the loss of function, the delay (as far as it isn't too long) may not be immediately detected. If it's the case, users will rely in good faith on obsolete localisation

Function	Hazard	Hazard effect	Severity Class	Remarks
		thus risk to become ineffective. The "safety net" provided by the runway incursion alerts is less effective (delayed alerts), the controller ability to provide guidance while ensuring separation and avoiding runway incursions is severely compromised. Many losses of separation are likely to occur.	2	information.

Function	Hazard	Hazard Effect	Severity Class	Remarks
	Detected loss of a target	The particular target is neither visualised by the controller nor addressed by the runway incursion detection mechanism. No key event associated to it will be identified. Controller/pilots are aware about the degradation and they use pilot/vehicle driver radio position reports to continue control.	**4**	A certain discomfort is experienced by controller, when visibility is poor and traffic is heavy. His ability to maintain a safe air traffic service is slightly impaired. Capacity might slightly decrease.
	Undetected loss of a target	As above, but surveillance users (controller, pilots and vehicle drivers) are not aware about the absence of that target.	2	The situation may last several minutes. No mean to avoid collision remains to controllers, pilots and vehicle drivers when visibility is poor. Significant risk of loss of separation or even of collision.
	Undetected corruption	One or several targets are neither visualised by the controller nor addressed by the runway incursion detection mechanism. Some targets may not correspond to the right position of the traffic component.	2	As above. Additionally, controller might miss interpret the situation and erroneously instruct aircraft.
	Detected false target	A false target, key event notification or runway incursion alert are or may be presented to controller.	5	No effect
	Undetected false target	As above, but controllers/pilots are not aware that target is false.	5	A certain discomfort is experienced by users, when visibility is poor and traffic is heavy. Capacity may slightly decrease, as false target involve useless precaution.

Function	Hazard	Hazard Effect	Severity Class	Remarks
AWARE (Surveillance) Velocity assessment	Loss of velocity assessment: Loss of distinction between moving and static traffic components and of information about moving direction on the controller situation display. Slight degradation of key events time estimation.	Runway incursion alerts are no more provided to controllers in due time. Many losses of separation are likely to occur when visibility is poor, until traffic is reduced to acceptable levels or service is restored.	**3**	Traffic is reduced to a level allowing the provision of continuous safe service (priority is given to arrivals). Contingency Separation Measures should be applied.
	Detected loss of velocity assessment for a target	Same effects as for "Loss", but concerning an unique target (and alerts related to possible conflicts involving that target).	5	A slight discomfort might be experienced by controller, as he pays particular attention to that target.
	Undetected loss of velocity assessment for a target	As above, but alerts related to conflicts involving that particular target are no more provided in due time.	2	CONTROLLER IS NOT AWARE ABOUT THE FACT THAT VELOCITY OF THAT TARGET IS NO MORE AVAILABLE.
	Undetected corruption	Moving direction and velocity of some or all targets on the controller situation display might be erroneous. The runway incursion detection mechanism is subject to errors (false alerts, delayed alerts). Slight degradation of key events time estimation.	2	Controller might take wrong decisions as displayed velocity is significantly different from the real one. Runway incursion alerts are no more provided in due time, controller is not aware about. Many losses of separation and even near collisions are likely to occur when visibility is poor.

Function	Hazard	Hazard Effect	Severity Class	Remarks
AWARE (Surveillance) Association	Loss of association with loss of history.	Loss of aircraft identification and of classification of non co-operative targets (manoeuvring area), on the CWP situation display. Differentiation between arriving and departing traffic on the manoeuvring area is no more provided to controllers. Impossibility to use certain transferable data from other systems: the ID of RDPS data, the FDPS data. Major degradation of key events notification. Loss of key events prediction. Traffic is reduced to a level allowing the provision of continuous safe service (priority is given to arrivals). Position of traffic components and alerts are still provided to users (controllers and pilots, vehicle drivers if need be). Contingency Separation Measures should be applied.	**3**	Controller's workload increases significantly, as he must issue instructions to traffic components that he must identify from memory or by asking for report. Additionally, there is a significantly increased risk for controllers to interchange instructions prepared for different aircraft, that might result in loss of separation. Some losses of separation may occur.
	Loss of association without loss of history	For new incoming aircraft only: same effects as above. Traffic is reduced until service is fully recovered.	4	Controller's workload increases, as he must issue instructions to new entrant traffic components that he must identify from memory or by asking for report.

Function	Hazard	Hazard Effect	Severity Class	Remarks
	Undetected corruption	Identification of one or several aircraft is erroneous or interchanged. Errors may occur in the classification of non co-operative targets and in the differentiation between arriving and departing traffic on the manoeuvring area, provided to controllers. Certain transferable data from other systems (the ID of RDPS data) is inappropriately used. Errors in the key events notification may occur. Errors in the key events prediction may occur. Position of traffic components and alerts are still correctly provided to users (controllers and pilots, vehicle drivers if need be). Nevertheless, it is assumed that in certain cases (e.g. aircraft is cleared to cross a runway on which another aircraft is landing) reaction time following an alert is too short and pilot might choose to trust controller instruction rather than alert.	**2**	Controller is not aware about the failure and uses the identification information in good faith. As identification is erroneous for some traffic components, wrong instructions are likely to be given to them by the controller. (e.g. in case of runway incursion or short-term conflict alert raised, resulting instructions may be given to the wrong aircraft). Multiple losses of separation may occur and a real risk of collision exists.

Function	Hazard	Hazard Effect	Severity Class	Remarks
Key events detection	Loss of key events detection	No more key events notification to controllers. Degradation of the key events prediction. Slight degradation of the runway incursion detection. Controller rely on pilot's RTF reports to obtain the key events.	**5**	No significant impact on safety.
	Undetected corruption	Key events notification to controllers may be erroneous in certain cases (false event, no notification, erroneous content). Degradation of the key events prediction. Slight degradation of the runway incursion detection. All means to recover an eventual erroneous instruction are in place (surveillance, alert, RTF pilot reports).	**4**	As controller is unaware about the failure, he might issue some wrong instructions but all means to recover the initial error are in place. Capacity might slightly decrease and safety margins might be eroded.
Surveillance information distribution	Loss of surveillance information distribution.	Same as for "Loss of tracks data fusion", and additionally: Information on dynamic status of operational parts of the aerodrome is no more displayed to controller nor provided to the concerned tools (ALERT, SMAN)	**ACL Low: 3** **ACL High: 2**	Same as for "Loss of tracks data fusion". Restricted area alerts are no more available
	Delay of surveillance information distribution.	Same as for "Delay of tracks data fusion".	2	Same as for "Delay of tracks data fusion".
	Undetected corruption	Same as for "Undetected corruption of tracks data fusion", and additionally display to controller erroneous information on dynamic	2	Same as for "Undetected corruption of tracks data fusion".

		status of operational parts of the aerodrome		

Function	Hazard	Hazard Effect	Severity Class	Remarks
External input interface with CWP	Loss of external input interface with CWP	Loss of controller capability to manually associate ID to a target. Loss of controller capability to select information to be displayed on the situation display and to set options on the tool use. Traffic might be slightly reduced until service is fully recovered.	**4**	Discomfort is experienced by controller and its ability to maintain a safe air traffic service is slightly impaired.
External output interface with CWP	Loss of enriched tracks	Loss of information on localisation, identification, moving direction and speed of all targets on the CWP situation display. Loss of key events notification provided to controllers. Loss of runway incursion alerts provided to controllers.	**ACL Low: 3** **ACL High: 2**	Same as for "Loss of tracks data fusion".
	Loss of key events notification	Loss of key events notification provided to controllers. Controller rely on pilot's RTF reports of key events.	5	
	Loss of aerodrome information	No more display to controller of information on dynamic status of operational parts of the aerodrome Pilots RTF reporting.	5	This loss may create a discomfort for the controller, who might forget the state of a taxiway on a complex airport (but the forgetting of the runways status is not credible). Moreover, restricted area alerts are available This event may penalise the capacity but not the safety.

Function	Hazard	Hazard Effect	Severity Class	Remarks
External input interface with non co-op. and co-op surveillance sensors	Loss of external input interface with non co-op. and co-op surveillance sensors	If all sensors are concerned, same effects as for "Loss of tracks data fusion" If one sensor is affected only, no more tracks will be provided to the "Tracks data fusion" for the related coverage area.	In **case of simple surveillance coverage:** **ACL Low:** **3** **ACL High:** **2**	If that coverage is simple, the effects from "Loss of tracks data fusion" will affect a subset of traffic components
External input interface with RDPS	Loss of external input interface with RDPS	Identified tracks for arriving traffic are no more provided by RDPS to the "Tracks data fusion", thus automatic association of arriving aircraft is lost. Traffic is reduced until service is fully recovered.	**4**	Arriving traffic will have to be manual associated by controller, which workload increases. This may slightly impair the ability to maintain a safe air traffic service.
External input interface with FDPS	**Loss of** external input interface with FDPS	Flight plans are no more provided by FDPS to the "Association" function, thus automatic association of departing aircraft is lost. Flight plans are no more provided by FDPS to the "Key events prediction" function. The latter is significantly degraded. Traffic is significantly reduced until service is fully recovered.	**4**	Departing traffic will have to be manual associated by controller, which workload increases. This may slightly impair the ability to maintain a safe air traffic service. Capacity decreases.
External output interface with FDPS	**Loss of** external output interface with FDPS	No more key events notifications are provided to the FDPS. Traffic is significantly reduced until service is fully recovered.	4	Flight plan co-ordination with en-route ATC is impaired (receiving controller may have to manually activate the flight plans of aircraft having took-off). This might result in increased workload and diminished ability to maintain a safe air traffic service for

				en-route controller.

Function	Hazard	Hazard Effect	Severity Class	Remarks
External input interface with Airport operator	Loss of aerodrome information	Information on dynamic status of operational parts of the aerodrome is no more displayed to controller nor provided to the concerned tools (ALERT, SMAN), or it is no more updated. Thus, restricted area alerts are no more available. Pilots RTF reporting.	**ACL Low: 4** **ACL High: 4**	This loss may create a discomfort for the controller, who might forget the state of a taxiway on a complex airport (but the forgetting of the runways status is not credible). Meanwhile, restricted area alerts are no more available, thus a risk to instruct aircraft on a closed taxiway exists.
External output interface with Airport Management System	Loss of key events notifications	No more key events notifications are provided to the Airport Management System.	5	Capacity significantly decreases, but safety is not affected.

Function	Hazard	Hazard Effect	Severity class	Remark
ALERT (Control/Monitoring) Runway incursion detection	Detected loss of Runway incursion detection.	Runway incursion situations are no more detected and associated alerts not provided to controller. Surveillance capabilities are still available. Traffic must be reduced to a level allowing the provision of continuous safe service.	**4**	Being aware about the failure, controller and pilots will increase their vigilance. The ability to maintain a safe air traffic service is slightly impaired.
	Undetected loss or corruption of Runway incursion detection.	As above, but users are not aware about the failure. Surveillance capabilities are still available.	3	Controllers and pilots have no more assistance means to detect runway incursions, but contingency separation measures and traffic limitation are not applied. Losses of separation and even a collision may occur.
	Undetected runway incursion	As above, but concerning a runway incursion which occur. Surveillance capabilities and RTF are still available.	2	Collision is highly probable, as controllers and pilots have not much time to react.
	False runway incursion alarm	False alarms.	5	Increased controller and/or pilot workload. Capacity is affected, but not safety.
External input interface with CWP	Loss of alerts activation/deactivation and setting criteria capabilities	Degradation or even loss of runway incursion alerts provided to controller. Surveillance capabilities are still available. Traffic must be reduced to a level allowing the provision of continuous safe service.	4	Being aware about the failure, controller and pilots will increase their vigilance. The ability to maintain a safe air traffic service is slightly impaired.
External output interface with	Loss of alerts	No more runway incursion alerts provided to controller.		Being aware about the failure, controllers will increase their

CWP		Surveillance capabilities are still available.	4	vigilance. Their ability to maintain a safe air traffic service is slightly impaired.
External input interface with Airport operator	Loss of airport constraints	Unpredictable degradation of runway incursion alerts provided to controller. Surveillance capabilities are still available. Traffic must be reduced.	4	Being aware about the failure, controller and pilots will increase their vigilance. The ability to maintain a safe air traffic service is slightly impaired.

Function	Hazard	Hazard Effect	Severity Class	Remarks
GUIDE (Guidance) Guidance command & distribution	Loss of Guidance command & distribution	The commands for the visual aids are no more automatically provided from the basic route assigned by the controller in input. Controllers have to manually guide aircraft (decide which sequence of visual aids commands should be activated for each aircraft and in which timing, then command visual aids by classical means). Controllers might issue more RTF instructions to complement the guidance. Traffic must be reduced to a level allowing the provision of continuous safe service.	**5**	The controllers' workload is expected to increase, leading to a decrease in capacity, but safety is not affected.
	Undetected corruption (spurious or erroneous command)	Erroneous command for the visual aids is automatically provided from the basic route assigned by the controller in input. Alerts are still available.	**2**	Although alerts are still available, some situations may involve a high risk of loss of separation and even of collision, giving the short time available to controllers, pilots and vehicle drivers to react (e.g. aircraft inadvertently guided by automatic stop bar command to cross a runway).
External input interface with CWP	Loss of assigned basic route	Same as "Loss of guidance command & distribution"	**5**	Same as "Loss of guidance command & distribution"
External output interface with CWP	Loss of information on guidance status	Degradation or even loss of the automatic guidance capabilities, as controller will not be able to assign basic route. Same as "Loss of guidance command & distribution".	5	Same as "Loss of guidance command & distribution".
External input interface with	Loss of real-time guidance status of visual aids	Same as "Loss of information on guidance status"	5	Same as "Loss of information on guidance status"

Visual aids				
External output interface with	Loss of visual aids commands	Same as "Loss of information on guidance status"	5	Same as "Loss of information on guidance status"

Function	Hazard	Hazard Effect	Severity Class	Remarks
SMAN (Routing/Planning/ Conformance monitoring) Key events prediction	Loss of key events prediction	Time estimates of key events (in relation with the planning of ground traffic flow and coping with DMAN and AMAN constraints) are no more delivered to controller and pilots, nor provided to FDPS and Airport Management System. Flight constraints are no more provided to DMAN. Controllers might try build a mentally image of the traffic to come (short term). A reduction of traffic level should be envisaged.	**5**	Controller workload increases, capacity diminishes, as controllers loose information essential for the optimisation of traffic management. Meanwhile, safety is not affected.
	Undetected corruption	Time estimates of key events delivered to controller and pilots, and provided to FDPS and Airport Management System, are erroneous. Flight constraints provided to DMAN are erroneous as well. Surveillance information and alerts are still available	**ACL Low: 5** **ACL High: 4**	Controller workload increases, capacity diminishes, as controllers use in good faith erroneous information for the optimisation of ground traffic management. The safety margin may be diminished on complex airports, as traffic reduction measures risk not to be taken early enough (undetected failure).
External input interface with CWP	Loss of controller input	Controller generated messages (change of planning results and operational conditions), or messages issued by controller following pilots requests (e.g. for alternative routing or for a remote hold after RDY message has been sent to CFMU) are no more provided to SMAN. SMAN capabilities are degraded.	5	The degradation of SMAN capabilities might affect controller workload. Capacity diminishes, as controllers are left less accurate information for the optimisation of traffic management. Meanwhile, safety is not affected.

		A slight reduction of traffic level could be necessary.		

Function	Hazard	Hazard Effect	Severity Class	Remarks
External output interface with CWP	Loss of external output interface with CWP.	Time estimates of key events (in relation with the planning of ground traffic flow and coping with DMAN and AMAN constraints) are no more delivered to controllers. Controller has to assign basic routes himself. Pilots still dispose of SMAN information (time estimates of key events, proposed routes and associated moving map) but it is of little use as not validated by controller. Traffic must be reduced to a level allowing the provision of continuous safe service.	5	Controller workload increases, capacity diminishes, as controllers loose information essential for the optimisation of traffic management. Meanwhile, safety is not affected.
External input interface with Airport operator	Loss of airport constraints	Degradation of time estimates of key events delivered to controller and pilots, and provided to FDPS and Airport Management System. Degradation of flight constraints elaboration aimed for DMAN. External information support on airport constraints might be available to controllers (e.g. paper).	5	Controller workload increases, capacity diminishes, as controllers use degraded information for the optimisation of ground traffic management. Safety is not affected.
External input interface with Airport Management System	Loss of stand allocation and slots	The required stand allocations and occupancy slots provided by the Airport Management System are no more input to SMAN. Same effects as above.	5	As above
External output interface with Airport Management System	Loss of time estimates of key events	The Airport Management System is no more provided with the required off-block time for each departing aircraft nor with the estimated on-block time for each arriving aircraft.	5	Optimisation of ground traffic management is seriously degraded. Capacity decreases but safety is not affected.

Function	Hazard	Hazard Effect	Severity Class	Remarks
External input interface with Aircraft operators	Loss of flight constraints	No flight constraint (e.g. delays caused by technical problems) is input to SMAN. Same effects as for " Loss of external input interface with Airport operator" Same as for " Loss of external input interface with Airport operator"	5	Same as for " Loss of external input interface with Airport operator"
External input interface with Meteorological information	Loss of local weather conditions	Data concerning local weather conditions is no more provided to SMAN, resulting in a degradation of its capabilities. As above	5	As above
EXTERNAL INPUT INTERFACE WITH AMAN	Loss of arrival times	Estimated times of arrivals are no more input to SMAN. Conservatively, effects are judged similar to "Loss of key events prediction"	5	Same as "Loss of key events prediction"
External input interface with DMAN	Loss of departure times	Estimated times of departures are no more input to SMAN. Conservatively, effects are judged similar to "Loss of key events prediction"	5	Same as "Loss of key events prediction"
External output interface with DMAN	Loss of flight constraints	Flight constraints involved in SMAN estimations (e.g. unforeseen delay at gates, strongly time-consuming de-icing activities, etc) are no more provided to DMAN. Effects are similar to "Loss of external input interface with Aircraft operators"	5	Same as for "Loss of external input interface with Aircraft operators"
External output interface with Cockpit	Loss of external output interface with Cockpit	Time estimates of key events are no more delivered to pilots. Controllers continue to be provided with all SMAN capabilities. Moreover, automatic guidance is available, as	5	Pilots' work is slightly impaired, as they don't have enough visibility on the situation to come. Safety is not affected.

		GUIDE is provided with all needed SMAN information.		
External output interface with FDPS	Loss of external output interface with FDPS	Time estimates of key events (departing aircraft) are no more provided to FDPS.	5	FDPS data is slightly degraded (because not updated with the key events estimates), but safety is not affected.

5. EATM PROGRAMMES

See:

- GBAS FHA;
- 8.33 kHz VEX.