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Manoeuvring area inspection – Part 1

Preface

January 1st, 2019 has been an important date for European sky as another section (paragraph 3) of Article 10 of an European Regulation came into force. We are talking about *COMMISSION IMPLEMENTING REGULATION (EU) 2017/373 of 1 March 2017 (Figure 1), laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/2011*.
As mentioned ***Article 10 - Entry into force*** prescribes what follows:

"This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.
It shall apply from 2 January 2020. However:
(1) Article 9(2) shall apply from the date of entry into force of this Regulation;
(2) in respect of the Agency, Article 4(1), (2), (5), (6) and (8) and Article 5 shall apply from the date of entry into force of this Regulation;
(3) in respect of data services providers, Article 6 shall apply in any case from 1 January 2019 and, where such a provider applies for and is granted a certificate in accordance with Article 6, from the date of entry into force of this Regulation.
This Regulation shall be binding in its entirety and directly applicable in all Member States.
Done at Brussels, 1 March 2017."

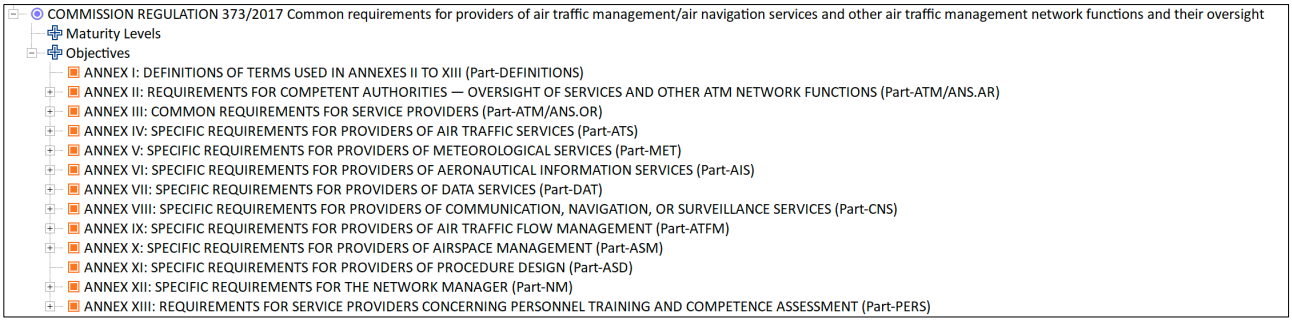

Figure 1: COMMISSION IMPLEMENTING REGULATION (EU) 2017/373 of 1 March 2017

What was for Commission Regulation (EU) No 1178/2011 for ATO, Commission Regulation (EU) No 965/2012 for Air Operators and Commission Regulation (EU) No 139/2014 for Aerodromes, now is for Commission Regulation (EU) No 373/2017.
By January 2020, European sky will finally get fully harmonised on several issues amongst which SMS is one of the most peculiar.
Looking deep into the Regulation the formal implementation of Safety Management System takes place at the following paragraphs:

ANNEX III COMMON REQUIREMENTS FOR SERVICE PROVIDERS (Part-ATM/ANS.OR)
ATM/ANS.OR.B.005 Management system
(a) A service provider shall implement and maintain a management system that includes:
…
(2) a description of the overall philosophies and principles of the service provider with regard to safety, quality, and security of its services, collectively constituting a policy, signed by the accountable manager;
…
(f) Within its management system, the service provider shall establish formal interfaces with the relevant service providers and aviation undertakings in order to:
(1) ensure that the aviation safety hazards entailed by its activities are identified and evaluated, and the associated risks are managed and mitigated as appropriate;

and also at:

ANNEX IV SPECIFIC REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC SERVICES (Part-ATS)
SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC SERVICES (ATS.OR)
SECTION 2 — SAFETY OF SERVICES
ATS.OR.200 Safety management system
…
(2) Safety risk management
(i) A process to identify hazards associated to its services which shall be based on a combination of reactive, proactive and predictive methods of safety data collection.
(ii) A process that ensures analysis, assessment and control of the safety risks associated with identified hazards.
(iii) A process to ensure that its contribution to the risk of aircraft accidents is minimised as far as is reasonably practicable.

As we could learn from above, Risk identification, risk assessment and risk mitigation, in a simple word Risk Management plays therefore an important role in Safety Management System.

What is a Bow-Tie

A Bow-Tie is a diagram that visualises the risk you are dealing with in just one, easy to understand picture. The diagram is shaped like a bow-tie, creating a clear differentiation between proactive and reactive risk management. The power of a bowtie is that it shows you a summary of scenarios in a single picture. In short, it provides a simple, visual explanation of risk that would be much more difficult to explain otherwise.
It is interesting to verify how BowTieXP can be actually used in different sectors, reason being its safety related approach methodology common to every industry fields, regardless the intimate nature of hazards and associated risks.

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Structure your thinking

New insights often emerge from bowtie workshops that were not identified by other methods. The highly visual and interactive nature of bowtie building ensures maximum involvement from all levels of the organisation.

Make risk based decisions

Analyse and distill weak points in how you manage risk and create risk based improvement plans.

Communicate risk

BowTieXP diagrams have been designed from the ground up to be easily communicable and provide you with many options to tailor the diagram for your audience.

In previous articles (check in the related section of this Linkedin profile) we have shown how BowTieXP has great potential in managing risk assessment in Flight Operations and Aerodrome environment.
This time our focus is the area of Air Traffic Control/Air Navigation Services[1].

[1] This article has been written in strict cooperation with an Air Traffic Control Operator, whom my warm regards are directed for his great contribution to the case. Without him I could have probably only grasped some concept. It has been a great chance to work with him and a proved case that pilots and air traffic controllers should share their knowledge and experience amongst one another even more.

Manoeuvring area inspection: the case

We are going to consider a case occurring in every airport, every day, more times a day: the "Manoeuvring area inspection", that is a dedicated procedure by which a taxiway or a runway are closed, to any aerodrome traffic, because of the inspection required regularly by law or randomly by other sudden need (e.g. wild life impact, occurrence on manoeuvring area, etc.).
Amongst the numbers of procedure, belonging to ATM/ANS area, this type of procedure is quite of interest, because of the apparent simplicity and the several threats involved.
The approach we follow is the usual one. Starting from all the ATCOs Operations/Procedures:

- Evaluate all the ***Operations/Procedures*** dealt with;
- Classify them into ***Group/Class***;
- For each ***Operation*** identify one or more hazards;
- For each ***Hazard*** evaluate one or more Top Events;
- For each ***Top Event*** draw related Risk analysis.

Moving directly to third step, the procedure could be embraced within those regarding "Manoeuvring area traffic movement".
One of the hazard is well soon identified as "Manoeuvring area inspection".
Top events associated with this hazard could be more than one, as it usually happens:

1. ATCO's awareness or control loss of inspecting device position (ATCO's point of view);
2. Loss of control of inspecting device (inspecting device driver/pilot's point of view).
3. …

We will concentrate on the first one, being directly linked to ATM/ANS environment, which is the focus of this risk assessment (Figure 2).

*Manoeuvring area traffic movement – MATM (**Operation**)*
*Manoeuvring area inspection – AV-H.04 (**Hazard**)*
*ATCO's awareness (or control) loss of inspecting device position – (**Top Event**)*

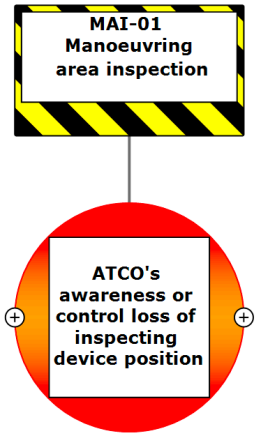

Figure 2: Hazard & Top Event

The scenario takes place in a medium traffic size airport, with two Air Traffic Control Operators (ATCOs): Ground ATCO (GMC/GMS) and Tower ATCO (TWR/RAD) working alongside. The area of interest is the full Manoeuvring area (Taxiways and Runways). The inspecting device used to perform the operation can be either a vehicle or a drone managed respectively by a qualified driver or a qualified pilot.

A possible associated visual Risk assessment (Figure 3) could be the following:

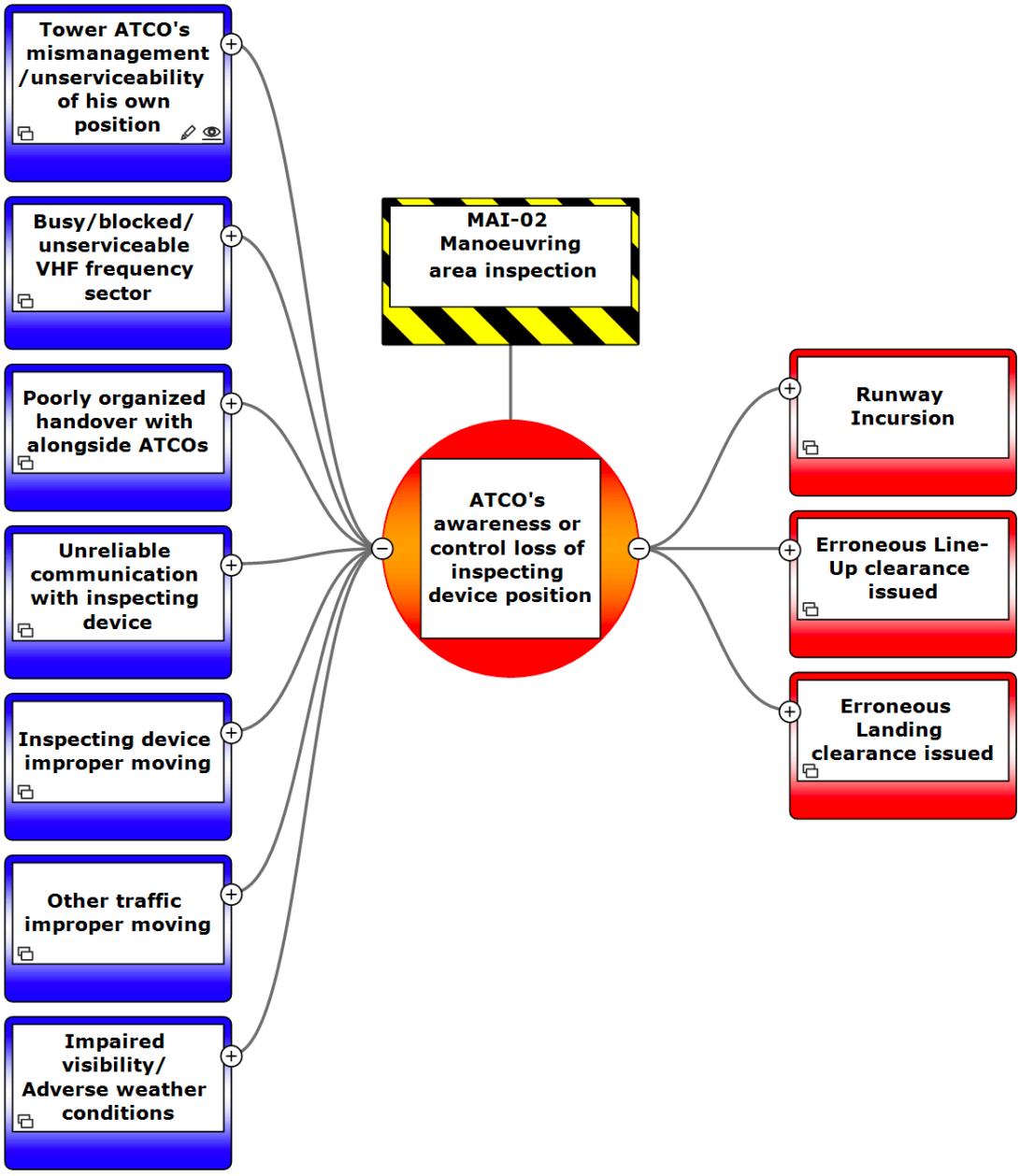

Figure 3: Visual Risk assessment

Seven possible THREATS have been found which have the potential to let the ATCO loose his awareness or control over the inspecting device in the manoeuvring area.
Three possible CONSEQUENCES have been supposed to occur, the first probably not of immediate understanding. However, as a matter of fact, ATCO's awareness or control loss of inspecting device position, can cause the inspecting device, unexpectedly (inspecting on a Taxiway, for instance) to perform a RUNWAY INCURSION on the active Runway. The last two consequences are quite obvious.

Let's now disclose the Risk assessment and show all the possible barriers (Figure 4 and 6).

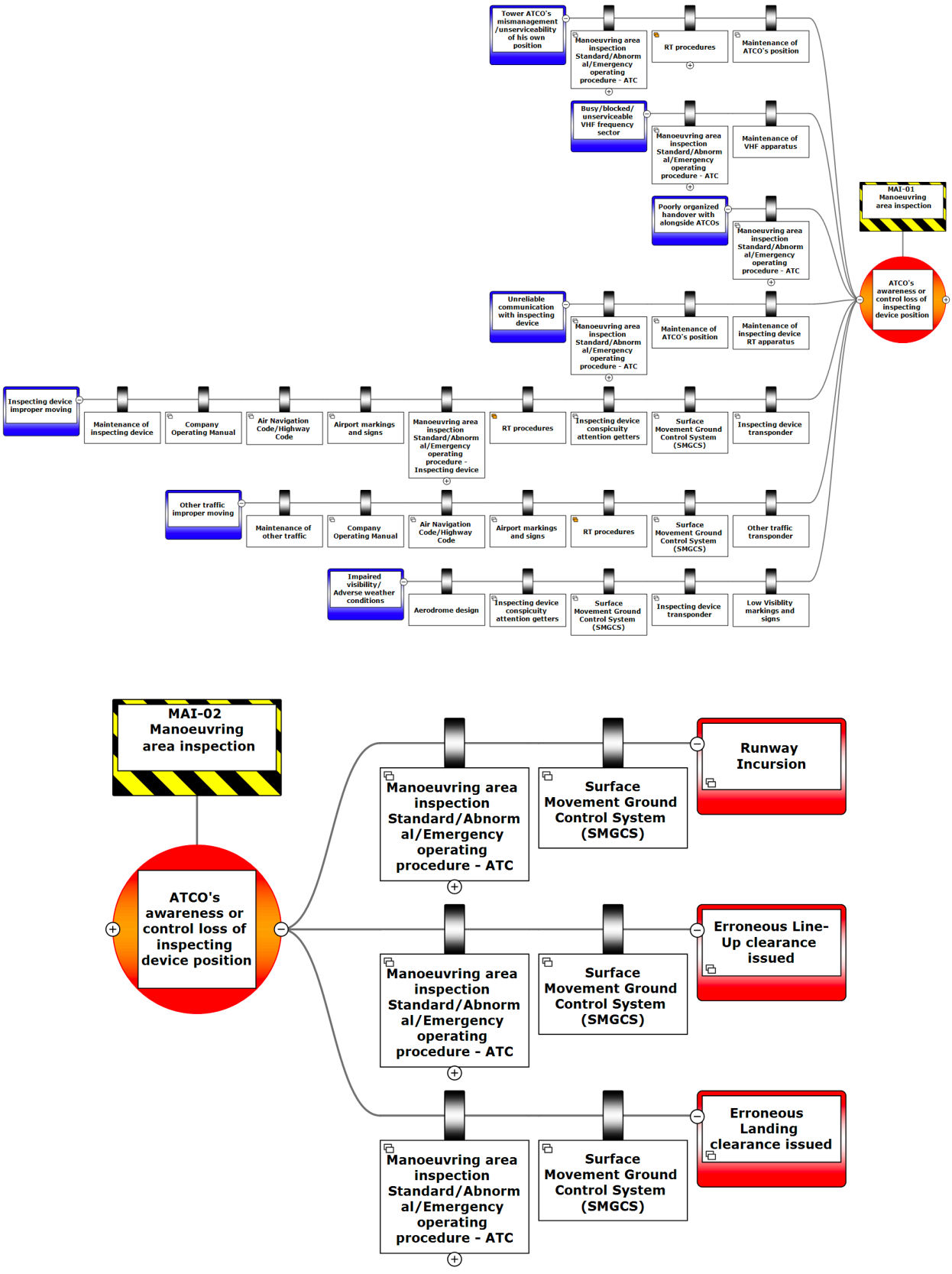

Figure 4: Preventive and Recovery Barriers cut-out

Let's highlight some areas:

1. Barrier – *"Manoeuvring area inspection Standard/Abnormal/Emergency operating procedure – ATC"*.
   This recurrent barrier is placed in several preventive and recovery limbs and is definitely the most important barrier of the whole analysis. It is not simple to uniquely define which "Type" of barrier it can be (Physical, Functional, Symbolic or Incorporeal), because in accordance with the limb it is placed in, it can behave in several fashions. Some examples will explain:
   - Threat 1 *"Tower ATCO's mismanagement/unserviceability of his own position"*; it represents those procedures (as by Operation Manual) by which the ATCO can handle his position in a proper and safe manner during the execution of a Manoeuvring area inspection (how to start, monitor and end up the procedure) together with all those symbolic and functional devices (activation of warning lights or other symbolic means) related to the purpose.
   - Threat 2 *"Busy/blocked/unserviceable VHF frequency sector"*; it represents those alternate procedures to be put in place, such as the usage of 121.5, or a back-up TWR frequency or again the coordination with APP sector to organize arriving traffic in holding in order to relieve ATCO's workload.
   - Threat 3 *"Poorly organized handover with alongside ATCOs"*; it prescribes procedures, made up of either incorporeal (what to do) and symbolic (what to handover), put in place to ease a safe handover from Ground to Tower ATCO or vice versa during the responsibility changeover.
   - Threat 4 *"Unreliable communication with inspecting device"*; it prescribes alternate contact procedure with driver/pilot of inspecting device in case of primary channel failure.
   - In all Consequences this barrier mainly addresses the usage of functional/symbolic devices (therefore more powerful than incorporeal/symbolic on left part of the diagram) to help the ATCO and regain the proper awareness before ending up in an unpleasant consequence.
2. Threat 5 *"Inspecting device improper moving"* is definitely the one with a consistent numbers of barriers. The line of responsibility rests mainly in the vehicle/drone with the exception of barrier SMGCS (see below), which is the only barrier in the ATCO's hands to monitor vehicle/drone actual position, especially in adverse weather conditions (see Threat 7).
3. Threat 6 *"Other traffic improper moving"* is a distractive factor for the ATCO deriving from an improper moving of whatever traffic in proximity of the areas affected by inspection.
4. The Surface Movement Ground Control System (SMGCS) is a powerful symbolic barrier, moreover if working together with a transponder equipped inspecting device, giving instantly our vehicle/drone position.
5. Last consideration is on degradation factor affecting barriers. We consider here only the main ones related to barrier *"Manoeuvring area inspection Standard/Abnormal/Emergency operating procedure – ATC"* and barrier *"RT Manual"* (Figure 5). In synthesis the failure of a procedure or of a communication might be due to *"ATCO's Psychological Physiological status"*, *"Lack of currency"* and/or *"Poor ergonomics"*, negative effect of those can be counteracted by the usage of the illustrated degradation factors barriers.

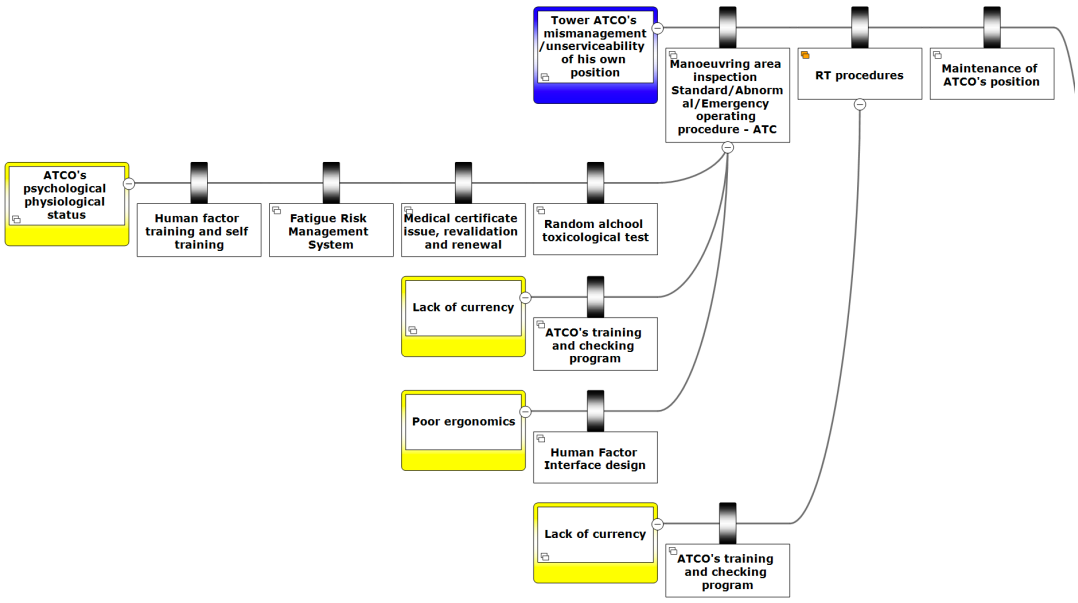

Figure 5: Degradation factors and associated barriers for Threat 1

Conclusion

In this brief analysis we tried to point out the most interesting aspects related to a risk assessment settled in an ATM/ANS environment. An apparent simple procedure with a very limited numbers of functional and physical barriers, if not any (of these) at all. A procedure, therefore, which must be able to withstand on mainly the weakest symbolic and incorporeal barriers.
We have skipped all those other interesting aspects like Barrier Management task (the most demanding but also the most important) and Degradation factors for the whole diagram, but the scope of this article was to briefly highlight the big potentialities BowTieXP can have when managing a risk analysis.

The more is this risk analysis complete and well defined with all threats, barriers, degradation factors and consequences, the greater the chance to predict first and to fit on it, later, a generic occurrence developing around the chosen Top event. It will provide a fast baseline where to start for an occurrence analysis.

In fact, what can be done (to reinforce, validate and strengthen the analysis itself), especially after an occurrence, is to proceed with a deeper Barrier Failure Analysis, with IncidentXP module, to produce the required recommended actions and related follow-up after having presumably understood, if possible, the cause(s) of each barrier failure and/or the reason for each degradation factor, using, where appropriate, those adequate tools belongings to Human Factor competencies.
Next part 2…

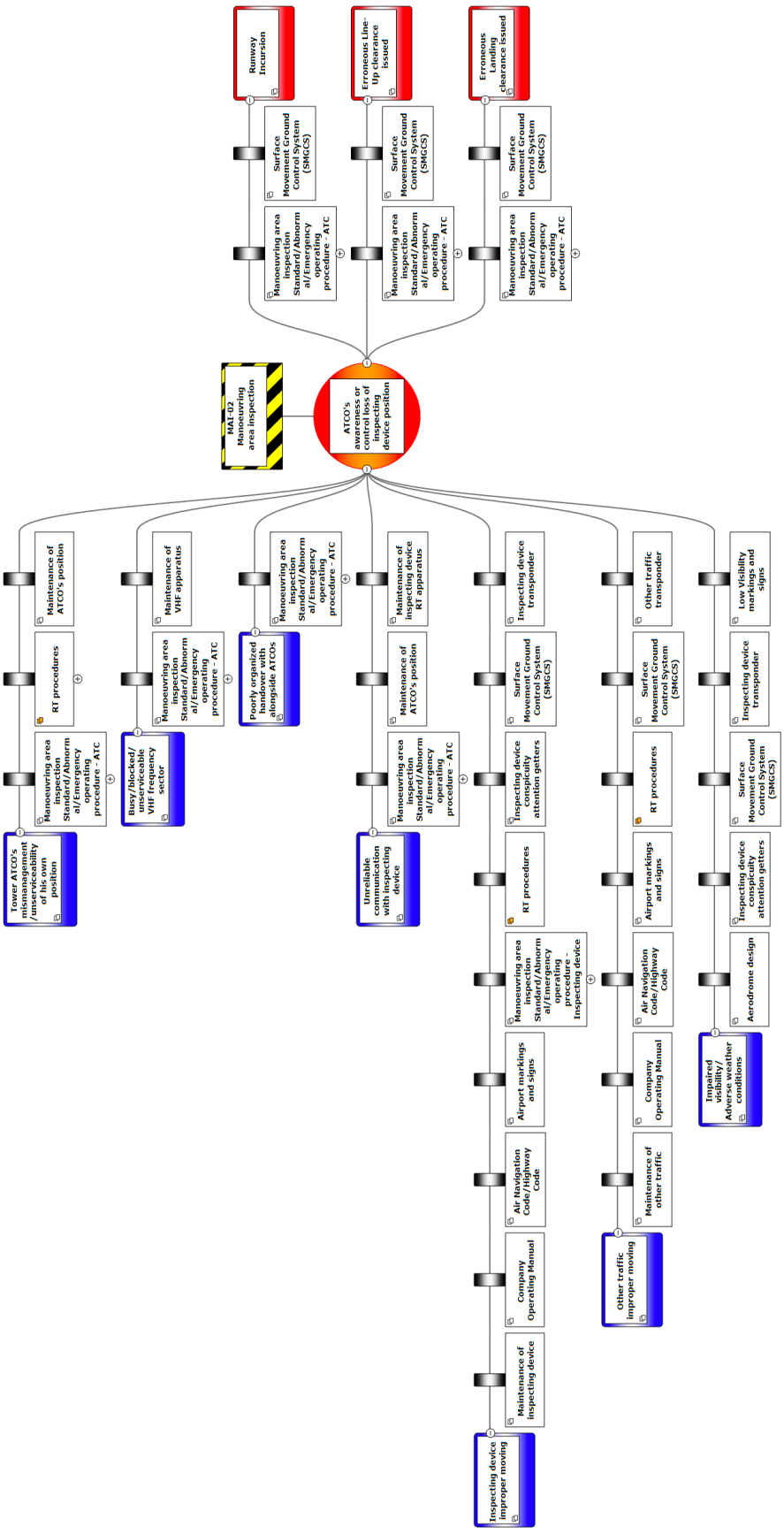

Figure 6: Preventive and Recovery Barriers – Full diagram