

Non-adherence to ATC procedures

The most fruitful input to safety management

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1 Non-adherence: it happens

Procedures in an Air Traffic Control manual for a medium or large airport are quite numerous. Moreover, they constitute a rather complex set with several exceptions and exceptions on exceptions, making distinctions between entries, runways, visibility conditions, types of aircraft involved, times of the day, wind speeds, et cetera. On top of that, there are very common rules for controllers which are not even mentioned in the manual, operating modes which have evolved over time but were not formalised, notifications for temporary changes, and more.

Do controllers know them all? Well, they know most of them, and if not by heart, they know where to find them if applicable. *"Hmm, we shift to mixed mode operations on runway 14 with limited visibility, let me check the manual, as there is something then with the entry G4, I believe"*. Controllers are trained to apply the manual, they apply the procedures regularly, they call each other to account, they understand the logic.



The procedure is clear, the explanation not entirely.

Do controllers apply them always? Well, no. That is: they act to the spirit but not necessarily to the letter. Here are some examples:

- The procedures at airport A state that a minimal separation of 3 NM needs to be applied. The approach controllers indeed work towards that spacing; not less as that would be unsafe and not more as that would be inefficient. The controller is however not sure about the precise lateral trajectories, the moments of decelerations, the final approach speeds, et cetera. This leads in some instances to infringements of radar and wake vortex separation norms. *"That little loss is not really an issue. The aircraft cannot collide and wake turbulence is within bounds if aircraft are, say, 2 NM spaced. At some airports, they simply apply 2.5 all the time."*
- The procedures at airport B state that the landing clearance may only be given if the runway is freed by the predecessor; that is: all of the aircraft's metal should have passed the yellow line. The runway controllers however often issue a landing clearance when the runway is still occupied, in order to comfort the air crew, when they anticipate that the runway is free sufficiently early. *"The other aircraft is quickly taxiing towards the exit, it almost starts to turn, and I can always issue a go around if things do not work out as expected"*.

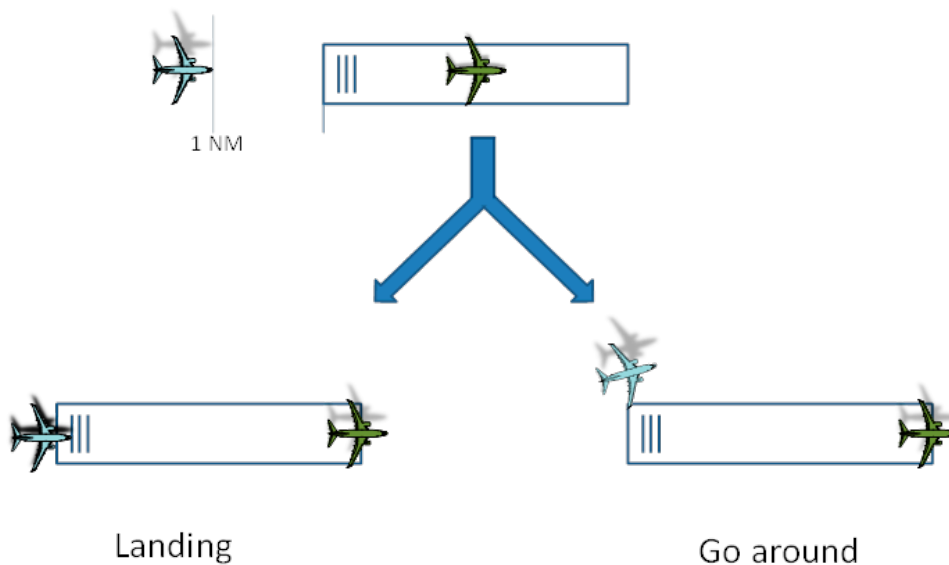
- The procedures at airport C state that a particular taxiway can only be used in the North-South direction. However, during night operations, when there is little traffic, the taxiway is also used in the opposite direction, as it is a short cut to several gates. *“Everybody does, and I know what I am doing”*.

2 Non-adherence: is it wrong?

2.1 No, it is not

"Rules are for the obedience of fools and for the guidance of wise men." Indeed, why not use a bit of the safety margins in the separation minima in a very controlled way to increase efficiency? And, it is effectively safer to avoid a go around in the actual world at the cost of a violation of a rule in a formal, strict sense. And, can the controllers help that the guys from the Procedures Department sometimes act a bit insipid?

So, yes, it is generally accepted that there is some tension between the formulation of ATC procedures and the way they are applied in practice, and, yes, it is understood by ATC procedure designers that controllers have some freedom to color a bit outside the lines or to prioritize things depending on the circumstances.

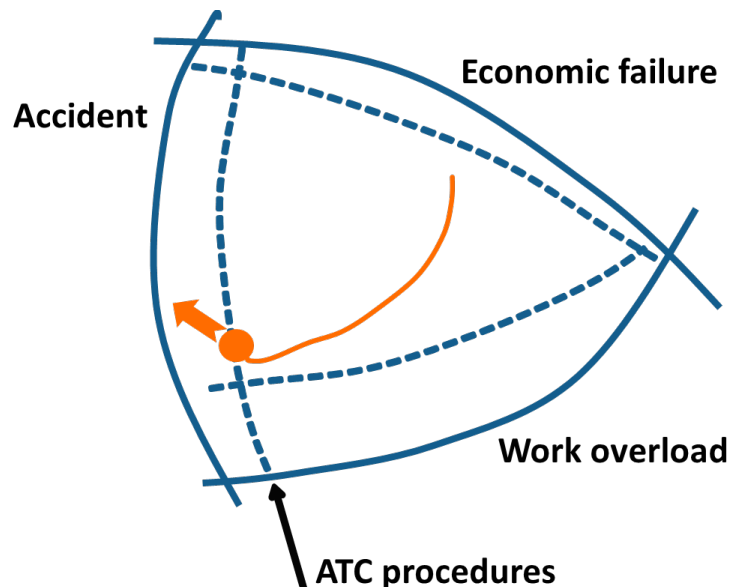


The ATC manual states that "Landing clearance should only be provided when the runway is cleared" and, in addition, "The clearance should be provided at least 1 NM before threshold." Now assume that a runway is used for landings and take-offs and that the take-off is about the rotate as the approach is at 1NM. Should the controller stick to the rules or prioritize the judgment about the operational safety in that particular situation?

2.2 Yes, it is

There are basically three dangers to take into account when it comes to non-adherence to procedures. The first one is the so-called organizational drift, as Rasmussen calls it. That is: the outside pressure for other performance areas—efficiency, noise, capacity, task load, fellowship—make that work practices first pass the boundary defined by the produces and then slowly drift towards the invisible, real safety boundary. *"It went well for several years, so why should it go wrong today?"*

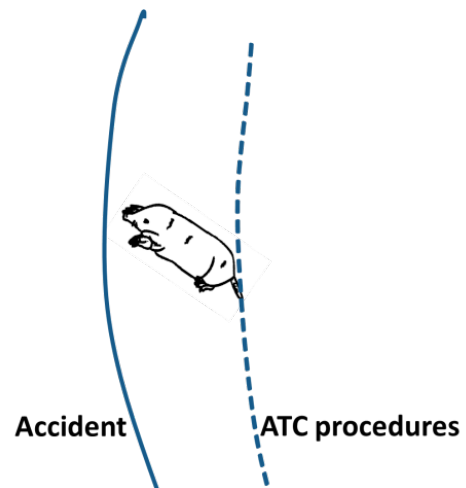
The second danger is that once a severe incident or accident happens, the investigations might clearly point to a gap between procedures on paper at one hand and working practice at the other hand ("2NM straight and level flight before interception is prescribed but the aircraft was vectored such that the last 2NM were both curved and descending, implying two violations against one procedure").



According to Rasmussen's idea of drifting organizations, an ANSP develops in a search between boundaries defined by work overload, economic failure and accidents. The later boundary is mainly protected by the set of ATC procedures. If the procedures are not adhered to, a new but less stable protection is developed: the accepted working practice. The shift may proceed further.

It might then seem that the gap is incomprehensible, but the ones involved consider the gap as not that relevant, at most a slightly contributing factor. The controllers, the procedure designers and the safety manager might feel that such a different point of view on non-adherence is too easy taken after something went wrong. Now that the gap is so clearly shown, there is blame, guilt and regret.

The last danger is related to safety management. It does not concern the drift itself but the slippery bottom of the sea, where the anchor cannot take grip. It does not concern the regret about the crash of the ship but the ignorance of the captain. The danger is: the gaps between practices and procedures are not known. It is known that there are gaps, most on the working floor will admit, but there is no knowledge about the extent, the frequency and the depths of the gaps: the adherence to procedures is not monitored and can therefore not be managed. That is the first point this article tries to make: organizations acknowledge that some procedures are sometimes violated by some, but they do not know to which extent, and they have not a clue about the future developments of non-adherence.



A refinement of the figure above: once the procedures are partly in oblivion, the organization may not only be at drift but also effectively blind for it.

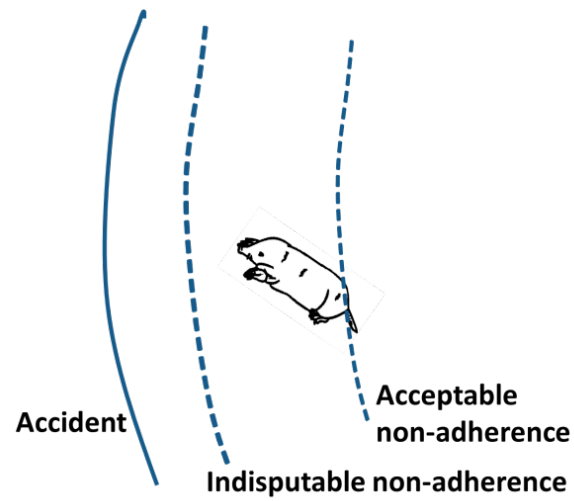
3 Monitor adherence (and loosen the procedures)

When ANSPs some ten years ago started to detect separation infringements automatically on the basis of radar tracks and ADS-B data, they often found much more conflicts than was reported about. After examination, it turned out that this could largely be explained by the strict setting in the algorithm: each time two aircraft were spaced less than 1000ft and, say, 5 nautical miles is counted as a conflict. Controllers allowed such situations for some period without any hesitation, for example if one aircraft is clearly passing behind another one. There however also appeared automatically detected infringements that were not reported about although all experts considered them as evidently severe. In other words, the pure geometrical definition of a conflict did not distinguish situations the way controllers do. It was therefore often decided to adapt the settings in the algorithm, to get rid of the false conflicts.

An important part of the safety management system of ANSPs is now based on counting incidents, whether automatically detected or reported, such as the conflicts mentioned above. Frequencies of occurrences of some particular types of incidents constitute safety indicators and information about such indicators can be used to decide to adapt the way services are delivered. However, adherence to particular procedures is often not a part of the safety management system, and it is certainly not part of the current ATM performance schemes on national or international level.

What would happen if a tool keeps track of the number of times a certain set of procedures are violated for a certain ATC unit? What would probably happen, at first instance, is the same as when the separation infringements were automatically counted: several violations would appear, but would then not be considered relevant as there is an understandable gap between procedures and working practices. It might then be decided to adapt the counting algorithm: *"not 5NM but 4.5NM"*, *"unless the other aircraft is turning towards the exit 5 seconds after touch-down"* and *"only when traffic volumes are high"*. It might also be decided to loosen the procedures, such that the gap between procedures and practices disappear.

It is noted that this last point, loosening the procedures, might be considered as a kind of organizational drift, which is to be avoided. The intention is however the opposite: to clearly demarcate the accepted working practices, to identify actions beyond it and then to interfere. That is the second point this article tries to make: procedures often require a precise reformulation in order to distinguish the serious violations from the acceptable ones.

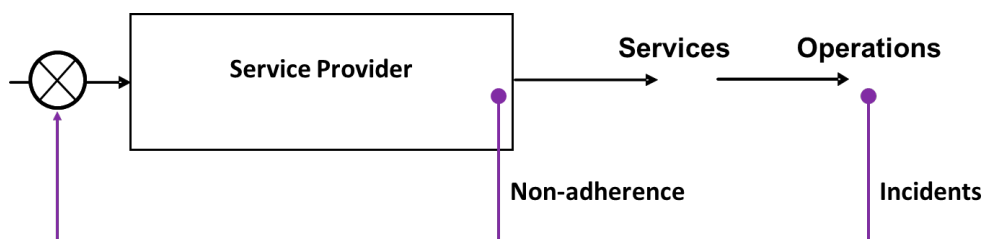


Non-adherence is often acceptable as the procedure might be formulated too strict or does not allow reasonable exceptions. The indisputable non-adherence is more relevant.

4 Less coincidental safety management

It is certainly not easy to monitor the adherence to ATC procedures. It requires just culture, clear and precise reformulations of some procedures, advanced monitoring tools and, as explained above, some fine-tuning of the settings. There might be a lot to learn along the process. It certainly helps in clarifying the roles of procedure designers, controllers and management when it comes to the tension between safety and other qualities and capacity and efficiency. It defines more precisely who takes which burden of the competition between them.

The real benefit of such a step however appears if the monitoring of ATC procedures is actually implemented as a substantial part of the safety management system. The point is: today's safety management is most of the time based on incidents; that is: on actual encounters. But such encounters are partly based on coincidences, as they require that somethings went wrong, and there was bad luck in the sense, for example, that there happened to be other traffic. It is as if the police would only fine you if you drive through red light and almost hit another vehicle. The proper logic of ATM safety management should however be: design a system of hardware, procedures and people that it is demonstrably safe if everything does what it should do. Then keep on verifying whether everything is indeed doing what it should do. And the most important aspect in that is: are procedures correctly applied all the time? Check it! That is the third point this article tries to make: making sure that procedures are always applied correctly by safety management brings more risk reduction than analysing incidents.



Safety management implies: knowing the risks by actual evidence, analysing the results and improving the service delivery on the basis of that. The information about non-adherence to procedures might be richer and more beneficial in the safety loop than the statistics of incident reporting.

5 What can we do?

One step is: we check your ATC procedures manual -handed over in confidence- with respect to clarity, alignment with ICAO standards, consistency, formulations and hierarchy. The latter for examples implies that it is checked whether the procedures are *should's* or *shall's*, requirements, guidelines or agreements.

The next step: we verify how far the ATC procedures on paper are from their application in practice. We do so with controllers knowing the situation in practice. This is not easy, and the subject is sometimes a bit sensitive. It requires a just culture in your ANSP and an understanding of the controller's situation from our side.

The third step might be: we suggest some safety performance indicators for measuring adherence to procedures. This is not only a sensitive issue but also technically complex one, and might therefore take some time and communications.

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