To land or not to land

Causal and contributory factors in landing without clearance events

by Alfonso Barba

Last year an Air India B737 was reported to have landed at Mumbai airport without an ATC clearance. Luckily, there was no other aircraft on the runway at the time, and the incident was acknowledged within the air safety community to illustrate yet again the need to focus on runway safety priorities, including runway incursion prevention strategies.

The landing of an aircraft on an active runway without a specific clearance from ATC is not such a rare event as would be expected in a professional environment where air traffic is under the control of a service provider which has as its major objective the safe and expeditious flow of traffic, including guidance and instructions to aircraft so they do not conflict with each other or any obstacle, including terrain.

Yet landings – as well as departures – without a clearance occur at most airports in the world some time or other, even in conditions of busy traffic, although fortunately only on very few occasions have such situations led to a collision between aircraft. This kind of event constitutes one of the most lethal potential risks in a runway environment at an airport and falls under the category of a runway incursion in most occasions, when the presence of the landing aircraft on the runway surface and its protection area is inadequate against all standards whether the aircraft experienced some kind of communications problem, assumed a clearance that was never given, or simply failed to comply with ATM procedures.

Scope

Last year, various circumstances triggered an interest at Aena in carrying out a more in depth study of the causes and factors behind landings and departures without a clearance, with a special focus on the former:

- Although both are a safety concern of sufficient magnitude, the higher proportion of landings without clearance (LwC) as compared to departures without an ATC clearance (DwC), and the higher number of human performance and systemic – contextual, human performance, and even environmental – factors involved make landings a potentially a more critical occurrence. Aena´s analyses of departure and landing events ranging from 2007 to 2012 show a global figure of around 126 events of which 83 were landings, i.e. a rough over 65% and an average of almost 12 per year.

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- The release of a report by the Spanish AIB (CIAIAC) on their investigation into a the landing without a clearance event at Alicante on 6th January 2011 which identified both flight crew and ATC action or inaction which led to it and made corresponding recommendations. Also, another CIAIAC report of a landing on a closed runway by another commercial aircraft at Mahon in 2011 drew the attention of the safety Division and regional departments to the need for a more comprehensive study of the possible causes for such events.

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has a 37-year career as an ATCO, with extensive experience in the fields of controller training and assessment, flow management and test development for the Eurocontrol ELPAC tests. He joined Safety management in the early 2000s helping to build up Aena´s SMS, with a special focus on human factors in ATM incident investigations.He is currently safety manager for the Balearic ATS Region and a member of the Safety Improvement and Safety Human Performance subgroups.

- Data analyses from airports and the opinion of crews, the ATS network in Europe and the FAA indicated that the phenomenon is widely known and addressed, albeit there seems to be no common strategy specifically focused on the prevention or reduction of departures or landings where a clearance is missing.

- The publication by EUROCONTROL earlier this year of two safety priorities related to runway safety – occupied runway detection and landing without clearance which arose from the development of the SISG SAFMAP technique to show the progression towards accident outcomes. Clearly enough, landings without clearance stand out as an important link in the chain of many runway accidents, with other familiar contributory factors such as unstable approaches, communications congestion, late clearances and runway incursions/excursions.

An earlier review by safety analyst Dr Sherry L. Chappell using the responses of pilots based on 37 NASA ASRS reports showed that the communications factor is a common cause of non-compliance with ATM procedures by both groups of professionals involved, where ATCOs are trained to expect that a pilot will go around rather than risk landing on a runway of which there is no last minute information about availability and conditions. Reality has proved this to be an overoptimistic assumption for which some providers have already created a safety barrier by inserting specific provisions for aircraft not to land unless previously authorized, except on emergency cases.

A recent survey by UK CAA for the years 2008-2012 shows 91 landings without clearance for that period, of which 43% were by commercial air transport aircraft and 54% by private, training or solo flights, demonstrating that this is a concern across the range of aircraft operations, even if most of the events were “no risk” occurrences. Identified in the Aena study are factors related to the use of the Tower frequency, where pilots did not call at all, or found the frequency busy with continuous RT, or simply mis-selected or selected a wrong frequency, high cabin workload (for any reason), forgetting to contact Tower, or the misunderstanding or misuse of phraseology, as shown on next page.

Fig. 1 - Aena figures for landings and departures without an ATC clearance (end 2007-April 2014)

To land or not to land - Causal and contributory factors in landing without clearance events (cont'd)

Systemic Contributory Factors

Based on our preliminary analyses of recent cases in the commercial air transport industry (CAT), with special focus on Aena´s airports network, it is not difficult to identify a commonality of contributing factors pertaining both to ATC and pilots under the direction of Final Approach or Aerodrome Control. Some detail on the factors addressed in the taxonomy used for our investigation as supplemented by consideration of crew-related tasks on the approach will allow focus on those factors which are relevant to LwC:

Usually, one or more factors will feature in particular LwC occurrences and investigators will try to find a connection which explains why a landing without "all" the formalities and the required ATC clearance took place. It is easier to make sense of an otherwise inexplicable decision by a crew to continue their approach and land if they are aware of not having received an authorisation if a sequence of events containing one or more of these factors is established. In the Alicante incident for instance, factors like expectation by both ATC and crew, inadequate management of frequency selection and the lack of supervision by Approach and Tower mixed with complacency and invalid assumptions by the crew resulted in a landing without clearance which neither Approach nor Tower were aware of until the aircraft called on the ground.

Some Findings: Systemic Contributory Factors for LWC Occurrences

[AENA, based on 83 Events from the end if 2007 to 31March 2014]

Investigation of ATM incidents usually employs a standard taxonomy of causal and associated contributory factors de-

1. ORGANISATIONAL: BARRIERS & PROTECTION

- **A. Procedures, including prompts or cues indicating crew/Tower that aircraft has been cleared to land (checklists).**
- **B. Awareness of factors contributing to Landings without a clearance (ASRs, Bulletins, training, other).**
- **C. Strip annotation.**
- **D. Go around/Unstable approaches awareness and management as part of training for ATCOs.**
- **E. Handover routines and procedures between Approach and Tower Control.**
- **F. Other SOPs**
- **G. Visual airport alerts of runway occupancy for pilots and ATC**
- **H. CRM and crew roles**
- **I. Flight crew checklists**
- **J. Electronic traffic information displays**
- **K. Use of radar**
- **L. Training**

2. SITUATIONAL/ CONTEXTUAL FACTORS

- **A. Communications load (too many instructions/too much information).**
- **B. Handover APP-TWR issues: shift within the unit, handover of traffic from APP to TWR.**
- **C. OJT (ATC) under supervision.**
- **D. Distractions: calls from another sector, unit, company Operations, etc.**
- **E. Configuration of working positions in Tower (e.g. Local ATCO managing both arrivals and departures).**
- **F. Flight deck task accumulation/workload (e.g. high energy states requiring the undivided attention of the crew).**
- **G. Late change of runway.**
- **H. Late clearance.**
- **I. Wake turbulence or weather issues requiring task prioritisation.**
- **J. Use of non-standard or ambiguous phraseology.**
- **K. Misunderstandings/False assumptions.**
- **L. Exceptional local procedures.**
- **M. Differences in national regulations (e.g. issuing landing clearances concurrently to several aircraft).**
- **N. Distractions of any kind.**
- **O. Use of checklists and items included (as a standard, the "Before landing" checklist does not include a bullet to verify if landing clearance has been obtained, as normally they need to be completed before a landing clearance is acknowledged).**
- **P. Radio silence during very low traffic load periods.**
- **Q. Unilateral anticipation of a clearance by flight crew.**
- **R. Technical issues with radio communications such as interference or range.**
- **S. Pressure on the crew derived from ATC airspace and aerodrome capacity-related issues.**

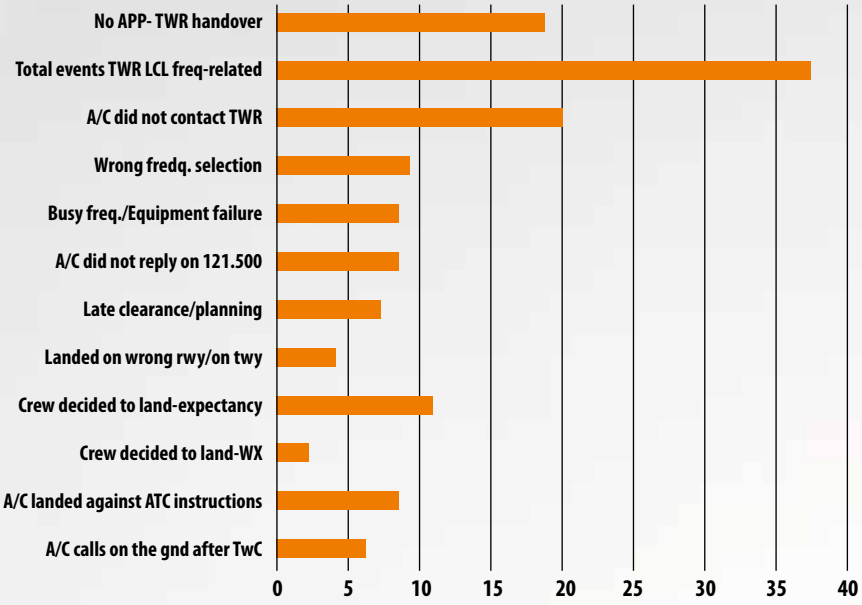

Fig. 2 - Aena study of 83 LwC events and resulting contributing factors

rived from EUROCONTROL and CANSO plus an expanded sub-classification of factors developed by ANSPs to suit their own SMS needs. Typically, the LwC cases at Aena are categorised under the "runway incursion where no evasive action was necessary" label, as regardless of ATM contributory issues (e.g. lack of awareness of an approaching aircraft or crew assumptions) its presence on the runway constitutes an undesired state in safety terms when no authorisation has been given. A deeper analysis of factors following such events may help highlight new areas for improvement: (or aspects not explicitly identified previously), springing from the investigations of 83 events at Aena airports during in the last six years:

3. HUMAN PERFORMANCE FACTORS

- **A. Slips, lapses.**
- **B. Forgetting to do an action.**
- **C. Divided attention.**
- **D. Lack of supervision (by Supervisor/OJTI).**
- **E. CRM-related factors.**
- **F. No action by ATC/Crew.**
- **G. Crew compliance.**
- **H. Failure to detect lack of clearance (ATC/Crew)**
- **I. Misinterpretation of instructions/clearance.**
- **J. Loss of mental picture by ATC.**
- **K. Wrong selection of Tower frequency.**
- **L. False expectations or assumptions.**
- **M. Deferred clearances.**
- **N. Memory and information processing factors.**
- **O. Mis-hearings/ misunderstandings.**
- **P. Incoming flight awareness (Visual detection.)**
- **Q. Complacency.**

The quality of investigations leading to the above results has improved over the years increasingly throughout the years, as SMS processes have matured and investigators have gained expertise. Correspondingly, a more thorough review of each ASR investigation and the use of more detailed factors fed into the SMS have identified several sources of concern which can inform strategies for LwC event reduction.

1. Failure to transfer an approaching aircraft from Approach Control to Aerodrome or Tower Control opens a too wide window of opportunity for other factors to intervene, with negative safety consequences (complacency, crew focus on other tasks, visual surveillance by Tower, etc.).

2. On too many occasions the aircraft did not call Tower, even if correctly instructed to do so. Attentional issues and crew task workload were mainly identified as well as the fact that there is often no specific "landing clearance confirmation" bullet on the pre-landing check list.

3. Visual surveillance by Tower controllers is possibly the one before the last safety barrier, second only to a go-around manoeuvre. With multiple runway operations, configuration of operational positions at the CONTROL tower and extensive use of information displays, the "old" way of doing things in a Tower through your eyes only has changed radically, sometimes at the cost of matching the expected arrival with what you see is approaching the airfield.

4. But perhaps the most worrying of factors leading to LwC is the conscious act of volition, where the crew decides to land when fully aware that no landing clearance has been received. Expectation that the runway will be clear at touchdown, assumed RT failure with subtle application of ICAO procedures when in VMC and the visual 'assurance' that the runway is clear of obstacles (and will remain so) are all a major source of concern which we should endeavour to address through appropriate and common procedures.

Only recently, the Spanish Safety Agency launched a survey for ATCOs and pilots based on the EUROCONTROL September 2013 Operational Safety Study on Landings without ATC Clearance, taking on board in the corresponding questionnaire an extended version of the barriers which the aviation community may deem most effective in preventing an aircraft from landing when it has received no ATC clearance to do so. Hopefully, the results will help recommendations for better protections which we could try to put in place as service providers for the benefit of runway safety.