Remote Tower Operations

1 Introduction

1.1 Over the past few years many Air Navigation Service Providers (ANSPs) around the world have announced the intention to develop remote tower operations, several of which are to be consolidated in Remote Tower Centres, where staff in one operations room will control air traffic at several airports.

1.2 The Air Safety Group has several concerns over recent developments in this field, as well as the future direction of airport air traffic management (ATM).

2 Background

2.1 The initial driver for developing technology to permit remote tower operations was one of geography. In sparsely-populated areas, such as those found in northern Scandinavia, airports often serve as lifelines to the small communities found in those areas, where road and rail links may not exist. The cost of maintaining ATM staff at such airports, which might only see one or two flights a day, is relatively high.

2.2 However, the desire to cut costs has led to a 'gold rush' towards remote towers for many busy international airports, before the technology and concept has been given time to mature at those small, very quiet airports mentioned above. ANSPs are under mounting pressure from airline and airport customers to reduce staffing costs that a strong attraction is the ability to consolidate airport ATM in one location, thus allowing cross-training of staff to control multiple airports.

2.3 While acknowledging that remote tower technology appears to bring some desirable features, such as surveillance data presented overlaid on to the view 'out of the window', the Air Safety Group has several concerns regarding this disturbing trend.

3   Remote Tower Visual Presentation

3.1   A common practice in many of the remote towers being developed is to compress the 360° view into 270°, or even less, when presented to the ATM staff. There are many claimed justifications for this; from the ease of access into the operational area, to the elimination of the staff member having to look behind them.

3.2   Presenting a video picture to ATM staff inevitably compresses the vertical extent of the picture. The cameras used for a remote tower might have a vertical field of view of 50°, but when this picture is presented to the ATM staff at the remote tower on a monitor which might be a few metres away, the monitor may only consist of 10° or vertical arc. This compression, both in the vertical and horizontal, may make the controller less able to use the visual picture than they would a control tower window. It may lead to mistakes in judgement or position and relative distance.

3.3   Larger, multi-position control towers rely on a number of ATM staff working closely together, aided by the fact that each operational member of staff is looking at the same visual picture. For a corresponding multi-position remote tower, it is difficult to envisage how such a visual picture could be presented to the team of ATM staff, short of using cinema-sized screens. If each control position was equipped with a number of dedicated individual monitors, coordination between them may be made more difficult and less safe due to the potential difference in visual picture between the two members of staff.

3.4   There is a high likelihood that displaying objects, aircraft and vehicles in the distance will be beyond the technical capabilities of even modern 4K, or even 8K, monitors. While many remote towers may be equipped with a so-called 'PTZ' (Pan/Tilt/Zoom) camera which can be manually directed to a certain position and provide a magnified picture, it is yet to be demonstrated that this function will be sufficient at a larger airport. Many such cameras might be required just for one control position, which would prove impossible to control and direct and would distract the ATM staff from their primary activities. The complexity increases when considering a multi-positon remote tower: At a major airport there may be two runway controllers, two ground controllers, and possibly two Aerodrome Ground Lighting (AGL) light panel operators, each with their own demand on PTZ functionality. It is imperative that the human machine interface (HMI) to use this functionality is seamless and will not in any way increase workload. The view from the PTZ camera is usually presented as a 'picture in picture', overlaid on top of the 'normal' view from the remote tower. Again, in a complex and busy environment, it is imperative that the PTZ window does not obscure from view a critical area at a critical time.

3.5   **Visual Observation**

3.6   The ability for an airport ATM staff to look out of the window is key to the job, and a crucial safety barrier: Aircraft are observed during all phases of flight (i.e. take off, landing and taxying), allowing swift intervention if anything untoward is noticed; and approaching weather is observed, and its probable impact on airport operations determined.

3.7 ICAO (International Civil Aviation Organisation) Doc 4444, Doc 7030, Doc 9426 and Annex 11 all describe the provision of Air Traffic Services (ATS). In all of these documents, the provision of aerodrome control ATS is predicated on the principle of direct visual observation of the traffic by the air traffic controller.

3.8 ICAO have themselves referred to remote tower operation in their Global Air Navigation Plan (ICAO Doc 9750) and as part of the Aviation System Block Upgrades programme. EASA (European Aviation Safety Agency) has published limited guidance material for remote towers in ED 2015/014/R. In neither of these is the meaning of 'visual observation' made unambiguous.

3.9 EASA and ICAO should work to define a clear, unambiguous definition of 'visual observation' and, if a remote tower is expected to use ATC procedures that require visual observation, minimum standards of the quality of the picture presented to the ATM staff must be introduced.

4 Training and Familiarisation

4.1 Busy, complex airports rely on highly trained, experienced and motivated ATM staff to function to their capacity. They are intimately familiar with the airport layout and characteristics, how such characteristics influence flight crew and vehicle drivers, as well as how they are interpreted (and misinterpreted) by those groups.

4.2 Moving the location of ATS provision to a remote location will lead to the significant challenge of maintaining that expertise and intimacy amongst the ATM staff, let alone the even greater challenge of providing an ab initio trainee with that same level of intimacy.

4.3 The distance between the location of ATM provision and airport will lead to related and similarly significant challenges:

4.3.1 Maintaining the professional relationships between ATM staff and airport authority staff, both in terms of the strategic; works projects and planning, and of the tactical, more day-to-day *comraderie* with airport authority drivers and other staff who enable the airport to function. Being co-located at an airport enables these relationships to flourish and bring both parties closer together in mutual understanding.

4.3.2 Most airport ATM staff chose their branch of the ATM profession due to the desire to work at an airport, to feel an integral part of the wider aviation system. Working in a control tower is a very rewarding career and one would struggle to find a more motivated and dedicated group of professionals. The impact on job satisfaction of relocating to a remote tower cannot be positive. It must be anticipated that a proportion of ATM staff, having been relocated to a remote tower, would be very soon looking for alternatives. Very few, if any, aspiring pilots enter flight training to fly drones. Very few, if any, aspiring ATM staff would prefer to work in a remote tower centre.

4.3.3   Following on from the above, UK ATC staffing is at near-crisis levels (for more details, see the Air Safety Group's briefing paper on ATC staffing). It is already increasingly difficult to recruit trainees of the required standard. Reducing the attractiveness of the final career may well have a negative impact on recruitment.

5   Safety Regulation

5.1   EASA, in ED 2015/014/R, has published guidance material on remote tower operations. Being non-binding, EASA guidance material can be completely ignored by ANSPs who can continue to develop their own remote tower concepts according to their own criteria, which vary significantly across Europe apart from the common driver of saving cost. EASA has only addressed single tower operations, while many ANSPs are preparing remote tower centres which will control multiple airports. Tragedies such as the Uberlingen mid-air collision show the dangers of loading excess work on to ATM staff, and EASA need to mandate against such practices.

5.2   Strong barriers must be in place to prevent the situation where one controller might be controlling two completely separate airports at the same time. While area controllers can currently control multiple sectors of airspace at the same time in quieter periods, the safety procedures and separation requirements are often similar, if not identical. Airports are much more varied in terms of safety procedures, minimum separation requirements and locally specific practices. The potential for confusion in this case is greatly increased.

6   Resilience

6.1   It cannot be overstated that remote towers must have resilient links to the input sensors located at the airport it serves, both from physical and cyber harm. Cameras can be affected by phenomena that the human eye and brain can adapt to, or are just not subject to; such as bright light (low sun on a winter's day), and vibration cause by high winds.

6.2   If remote tower centres, where several airports may be controlled by a large team of ATM staff in one location, are established, the resilience of the remote tower centre itself must be considered. Depending upon local arrangements, there may exist contingency procedures to land all aircraft in the case of an area control centre failure. If the remote tower centre is co-located at the area control centre, then there is no contingency. If located in a separate location, the impact of several airports in one country closing without warning must be considered.

7 The Air Safety Group Position

7.1 The Air Safety Group is concerned by the trend by ANSPs to develop remote tower operations, especially where cost saving is the main driver.

7.2 The Group believes that the current level of safety must be **improved** by remote tower operations, not merely maintained and most certainly not reduced.

8 Conclusion

8.1 The Group recommends that:

8.2 EASA conduct a more thorough Rule Making Task on remote tower operations which addresses several failings of the current guidance material, and the output of which must be Implementing Rules, and this should address all of the issues detailed above.

8.3 Any ANSP which desires to develop remote towers must involve operational ATM staff at every stage of the development process, and that process must be incremental. Committing to provide a remote tower at a busy, complex airport must only take place once it is proven that the concept works at a quiet airfield.

8.4 Robust training and familiarisation plans must be demonstrated prior to the commissioning of any remote tower operation, and familiarisation programmes must be ongoing through the life of the remote tower.

8.5 The Safety Case of any proposed remote tower should demonstrate how the level of safety has been improved over a conventional control tower.

8.6 The Safety Case of any proposed remote tower centre must consider the impact of its total closure, and the ability of the ATM system to cope.

8.7 Comprehensive human factors studies should be conducted to determine the impact on ATM staff of using remote towers in a busy environment, including how operational procedures may change, especially considering the compressed visual picture as described above, and if there is any change in how ATM staff identify, and react to, both usual and unusual situations.

8.8 Further research is conducted to determine the medium and long term impact of remote towers at small, quiet airfields before any attempt at introducing such facilities at larger, more complex airports is considered.