REMOTE VIRTUAL CONTROL TOWER

SKS-RTWR

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INTRODUCTION

Operational requirements have les **Skysoft Servicios** to offer a new product that promises to change the way in which Air Traffic Control Services are carried out, offering safety, operational advantages and improved efficiency: The **REMOTE VIRTUAL CONTROL TOWER**.

Skysoft Servicios has identified operational requirements as well as areas where to improve processes and existing technology. Based on State-of-the-Art technology and the development of new, multiple on-site test procedures, a solution has been found to optimize Remote Flight Tower operation.

THE PROBLEM

Aviation expansion worldwide continues, new aerodromes are open, air traffic increase is significant, and operational requirements get more complicated daily. Different types of system restrictions come to light, area remoteness, lack of infrastructure even lack of physical space for existing airport expansion. New threats and airspace issues arise, drug trading, contraband, the growth in the use of drones. It is in this context that **Skysoft Servicios** is looks for solutions to existing problems, by developing this new product, that addresses the following issues.

- Manage remote airfields, and all the traffic they handle. Enabling visual access to all local movement.
- Avoid having to man these remote locations.
- Optimize personnel downtime in remote low traffic areas.
- Avoid construction of expensive Control Towers for remote airfields.
- Centralize and improve air traffic control of all airfields as required.
- Space use optimization for urban airfields, where space is unavailable or extremely expensive.

THE SOLUTION

By implementing video equipment, audio transmission equipment, remote controlled switching and a telecommunications channel, Control Towers can be operated remotely.

A single Virtual Control Center can control several Remote Towers. Here the remote site video is projected, with Panoramic views and strategically placed high resolution, maneuverable, cameras, all activity in the air and on the ground can be monitored. Audio channels will enable communication with the aircraft and local telephones and the controlled switching will enable all essential equipment control, lights, alarms, all managed as required remotely. By working with the Skysoft ATM workstation, the center

operators will also have access to flight plans, meteorological, NOTAM and other implemented data banks.

This Remote-Control state does not impede Local Override as and when required.

This remote controlling of flight control towers will not only make airfield (type D) control more efficient, but it will also enable previously unmanned airstrips (type G) to be converted to a type D by the installation of the afore mentioned equipment.

A. **Video Subsystem**

This subsystem is designed to give the remote controller the most realistic view possible, as if in a locally based Control Tower. In order to reach a balance between resolution and transmission bandwidth required, we have settled on the use of 2 Mbps cameras with H265 compression, this enables an efficient flow of images, based on a five (5) camera system, using a transmission bandwidth no higher than 4Mbps, as used by internet providers. The number of cameras can be adjusted based on runway length to provide a complete panoramic view of the area. The image above shows a four (4) camera set up. Additionally, a high definition camera can be added with Pan, Tilt and Zoom capabilities to emulate the use of binoculars on site. This camera is also able to focus on specific predefined points for efficient and swift viewing of critical areas.

B. **VHF radio and remote-control subsystem**

Skysoft has developed a specific product that enables both static and handheld VHF radio operation from the virtual tower. It is based on having a half-duplex audio channel on IP with directional switching using a multiple simultaneous Push to Talk (PTT) radios. In this way, exiting radios with no radio over IP (RoIP) capabilities can continue to be used.

In this configuration remote control of runway lights, alarms and other local instruments is included.
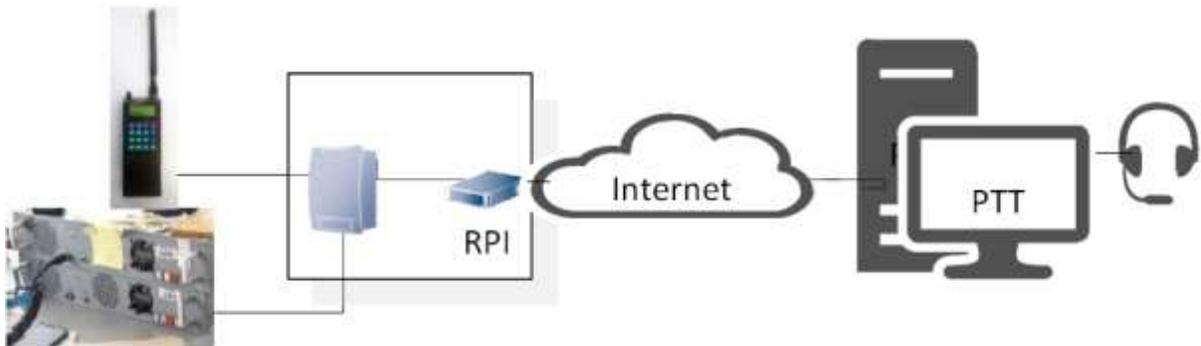
C. Telephone subsystem

In order to access available telephones such as airport extensions, direct lines, point to point lines with ACC and mobile telephone lines, a voice over IP gateway is installed with as many FXO lines as required. At the virtual end a second gateway with FXS cards is installed which closes the telephone loop.

D. System integration

All the equipment is housed in a robust cabinet with a secure power feed that also includes the network active equipment and the connectivity link if it is not already available at the airfield. The data packages of all these subsystems are sent as a single package sent in a L2TP tunnel or similar in order to secure the operation and simplify local installation. The cabinet is designed to facilitate the installation in the tower that is to be remote.

E. Virtual tower equipment
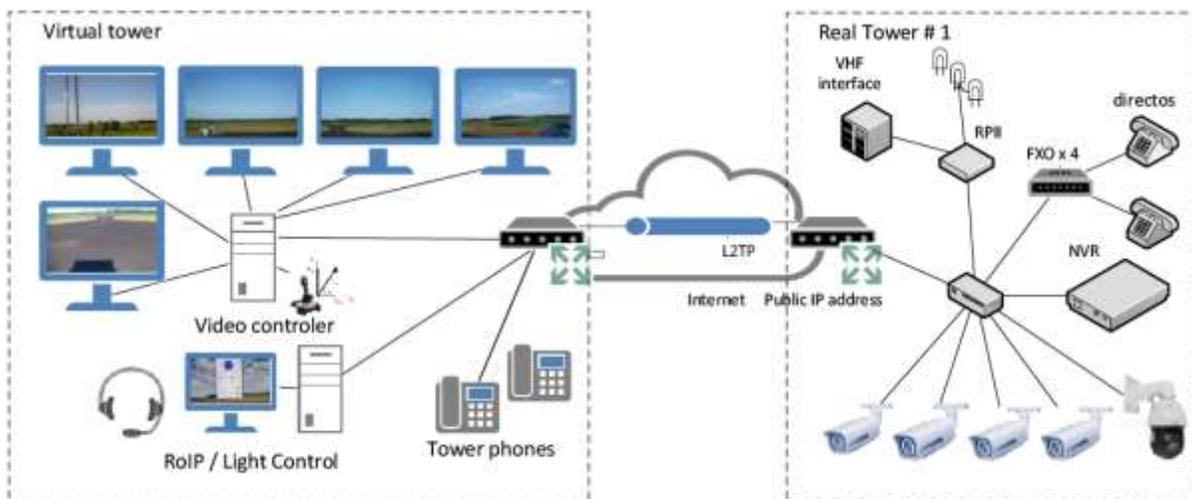
Each one of the subsystems described has its corresponding system in the operations control location. The panoramic view should be monitored with at least a 52" High

Resolution Monitor, for the Pan Tilt and Zoom a joystick or onscreen operation can implemented.

The data tunnel connectivity enables instant secure switching between towers with no need for equipment reconfiguration.

F. AMHS and ATM system integration

The system includes an Air Traffic Management (ATM) touch screen workstation, here Flight Plans are received, reviewed and "translated" into electronic flight strips. This ATM workstation is an additional tool that enables the reception of NOTAM messages, meteorological information, statistics and the touch screen management of the flight strips.

This enables complete information management from one place with complete integration for the controller for all air traffic requirements.
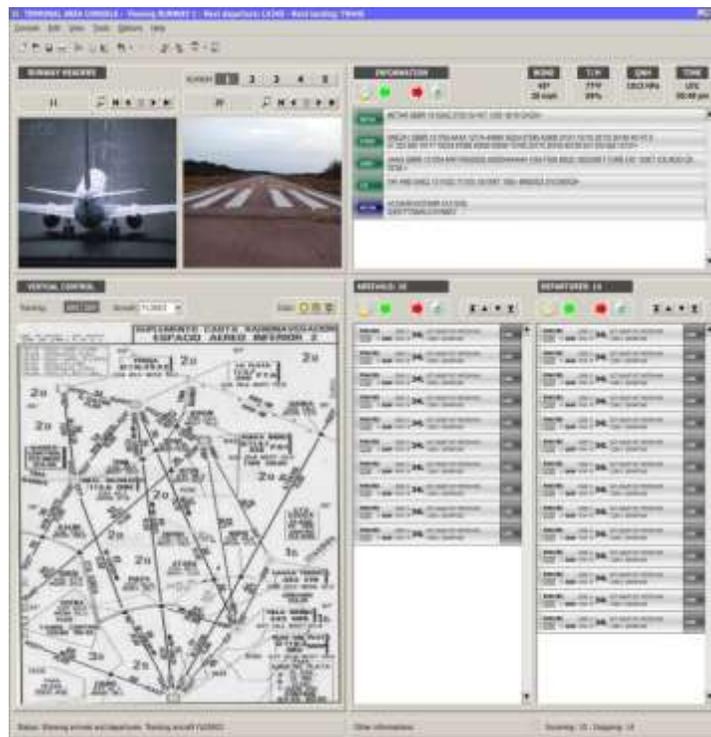
ADVANTAGES

The operation of the **REMOTE VIRTUAL CONTROL TOWER** is based on the installation of state of the art cameras at the remote airport, this enables the combination of high resolution and infrared equipment, which offer complete monitoring of the different areas of the airport, such as the aircraft parking area, access roads ground based operations, runways etc.

The images picked up by the cameras are sent back to the Remote-Control Room, which can be many kilometers away from the airport. Here the controllers have a Panoramic Viewing System, where they monitor everything going on in all areas and runways as if looking through a Control Tower Window. This control remote control room has all the standard Air Traffic Control Systems as well as the Communication Systems to interact with pilots on the ground or in the air as well as with all the necessary services related to the aircraft services.

Additionally, to being able to control various airports simultaneously from one single location this technology offers advantages such as improved visibility for the Air Traffic Controller, thanks to the incorporation of critical position-based cameras, such as runway headers and in natural blind spots.

Centralizing information control and management as well as alarms, indictors, enables complete, more efficient and precise control of all remote locations.

The **REMOTE VIRTUAL CONTROL TOWER** can also incorporate functions such as Augmented Reality, which enables the viewing of additional information such as meteorological information, runway conditions and aircraft information on additional screens.

This new Air Traffic Control System offers many advantages, such as enabling airports with low traffic levels need not close, which would enable more operational hours and availability, to cater for Emergency Sanitary Flights or VIP transportation amongst other applications.

The camera zoom also enables the Air Traffic Controller to keep a closer look on the runways, by having enabling specific point or object monitoring, specifically dedicated cameras can also take care of critical angles or blind spots, that would otherwise possibly remain hidden from view in a conventional Control Tower Environment all with better detail levels than the human eye, and as such bringing modernization and improvement to air traffic operations.

The cameras are located on top of a Tower and have "PAN-TILT-ZOOM" (PTZ), which allows the user to control the movement and position of the camera lenses from remote positions in horizontal and vertical movements. Experts believe that these tools carry a higher level of detail than the human eye, thus modernizing and improving Air Traffic Control Operations.

Skysoft Servicios is characterized because of their ability to adapt the product range to the needs of the customers, offering competitive advantages over other solutions available, add to this very competitive pricing and the combination is very attractive.

The operational specification employed is based on a case by case analysis of the technology required, looking for the best solution that will enable the shortest delay between the images captured by the camera and their display on the screens of the Remote Controlled Tower (never over 1 second).

BACKGROUND

The initial concept was produced by the German Investigation Agency *(Deutsches Zentrum für Luft- und Raumfahrt e.V.)* DLR back in 2002; since then various companies have invested to further develop this technology.

In April 2015 the Swedish authorities were the first to approve the REMOTE CONTROL TOWER SYSTEM or RTC (Remote Tower Control), after seven years of testing and operation, mostly centered on the human factors and sampling of air traffic controller information, similar to a conventional flight control tower. Since then the Airport of Omskoldsvik is controlled from the Airport of Sundsvall, located more than 100 kilometers away.

Skysoft Servicios S.A. has planned and developed this REMOTE VIRTUAL CONTROL TOWER since 2017, considering all relevant aspects needed for successful operation, also contemplating the limitations in the communications infrastructure of the region.

CONCLUSIONS

The REMOTE VIRTUAL CONTROL TOWER is a technological solution that optimizes cost saving capacity, whilst still offering a secure solution for small to midsize airfields.

As we have shown it optimizes resources related to small airfields scattered over a large territory, offering better control and management of them. Not only does it reduce operational costs, it also avoids unnecessary expenditure on infrastructure, offering a high return on the investment.

Skysoft Servicios S.A. is an Argentine company certified ISO 9001:2015 for its developments. Our commitment to operational and technological quality are second to none. That is why we seek that all services offered by the REMOTE VIRTUAL CONTROL TOWER cover all the operations defined by ICAO Doc. 4444 (Air Traffic Control), 9426 (Air Traffic Planning Services Manual) and 9476 (Ground Control Movement and Systems Guidance Manual), as well as the AFIS Eurocontrol Manual.