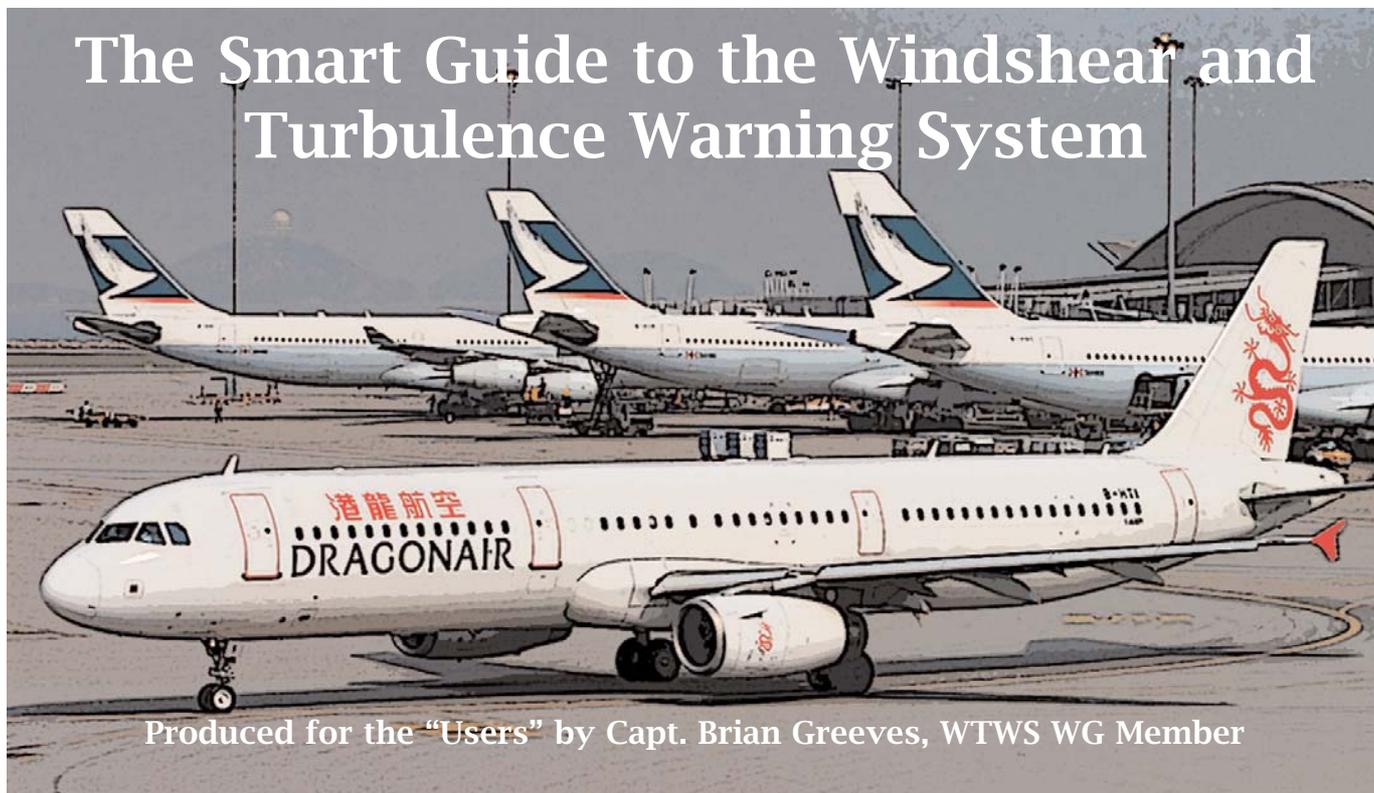


## The Smart Guide to the Windshear and Turbulence Warning System



Produced for the “Users” by Capt. Brian Greeves, WTWS WG Member

### Introduction

The Hong Kong Observatory and the International Federation of Airline Pilots’ Associations have produced a booklet on “Wind shear and Turbulence at the Hong Kong International Airport”. This is intended to be a fairly comprehensive guide to wind shear and turbulence phenomena that can occur at the airport and the system that has been developed to provide forecasts, warnings and alerts. Obviously, pilots still may have questions, so I was tasked with producing a “Smart Guide”, in the form of FAQs, to supplement the booklet plus, of course, your airline manuals and other information documents. As always, your feedback is very welcome (Brian Greeves email: [tasco@netviagtor.com](mailto:tasco@netviagtor.com) )

### **Q1. What are the differences between forecasts, warnings and alerts.**

The forecasts are produced by the forecaster, but this is perhaps a little misleading. The forecaster uses an array of equipment, including all or some of the components of the Wind shear and Turbulence Warning System to judge whether wind shear and/or turbulence may occur. It is definitely a lot more than an educated guess! If the forecast is verified by a pilot report, the phraseology “forecast and reported” will be used on the ATIS. The “warning” is associated with a pilot report of an encounter. The “alert” is a “warning” generated by the WTWS. We cannot mix these terms, because they are defined in the ICAO Annex 3. The long term hope is

that we can simplify this for pilots, as the accuracy of the various ground based systems is verified by proven experience.

### **Q2. Why did I not encounter any wind shear, even though it was forecasted (and reported)?**

It was your lucky day! You may not have encountered wind shear, but the aircraft behind you or one ahead may do so, because of the sporadic nature of the wind shear that is most common in Hong Kong. Remember this is a LOW LEVEL Wind Shear and Turbulence System and the alerts/forecasts are for the approach/depart-

ture corridors- basically out to 3nm and up to 1600 feet.

**Q3. Why are there so many wind shear forecasts?**

“Perception is reality”! It may seem that the system over-warns, but the system is now very accurate, thanks in part to your reports and feedback; in fact more than 90% of your reports (i.e. pilot reports of significant wind shear) for the 07L and 07R approaches are forecasted or detected by the wind shear system...(but, it never happens to me-see Question 1). The “over-warning” tends to be associated with the departure. Here are the reasons:

- \* The wind shear (+/-15 knots change) may occur over 4kms (which is roughly 50 seconds at 150 knots) and therefore is not significant to most aircraft on departure. Departure is a busy time and the gradual change may go unnoticed and therefore unreported by the crew.
- \* The climb gradient of the aircraft may put it above the nominal gradient used for wind shear detection or forecasting.

There are still a few system limitations, but these are being addressed by the installation of additional detection equipment  
In fact, a number of options are being looked at to reduce the system’s false alarm rate.  
There is an understandable frustration, which sometimes is expressed as a lack of confidence in the system, both by pilots and controllers. Be assured that IFALPA, IFATCA, IATA, the CAD and the HKO are all working to make this system more “user friendly”!

**Q4. Why does the ATIS state that wind shear is forecast, but the system does not produce an alert?**

The forecast is generated either manually or automatically and is then passed to air traffic, which actually puts the data into the “ATIS”. The forecaster is expecting the wind shear to be generated within the period of the forecast, but it may not yet have reached the “magical” 15 knots to trigger the automatic alerts, which the tower controller passes onto the pilot.



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**Q5. Ok ,but sometimes the ATIS forecasts the wind shear, the controller gives me an alert, but also tells me that no report has been received, why’s that?**

The answers are given in Q1 and Q2!

**Q6. Why cannot we do away with forecast and rely on the system, if it is so accurate?**

The forecast actually helps with the overall accuracy of the system-i.e. the 90% hit rate on approach. Remove the forecasting element and the “probability of detection” for the overall system will fall to around 80%. Eventually we hope to remove the forecast and rely on the system’s detection capabilities and this is why we will soon be installing a second LIDAR, as part of that process.

**Q7. Ok I buy that, but if the HKO forecast wind shear all the time, the system will achieve a 100% hit rate, but there will be many occasions, when it is not present and this will lead to mistrust in the system and/or complacency?**

Spot on! So we have to achieve a sensible compromise. At the moment the hit rate (probability of detection=POD) for the 07L and 07 R approach is more than 90%, if we include the forecasts, (about as good as it gets!) and for departures is around 82% (good, but some improvement needed), but, despite HKO’s efforts, and here is the downside, we still have a “false alarm rate” (FAR) of 30%. This is the figure we really wish to improve and we are doing it by installing new equipment, but, more importantly, considering what is really significant to you. Along the way, we have to abide by the ICAO standards and recommendations and “best practice” elsewhere. Furthermore, the WTWS WG has recommended some “world firsts” in terms of the phraseology and in the detection and sensor equipment, installed within the system.

The WTWS WG is presently considering all the factors listed in A2, in order to reduce the FAR and maintain and, where possible improve the POD

**Q8. In the USA and other countries, a specific location, such as 2 miles, is given with the alert. In Hong Kong, only a general location of approach and departure is used. Why the difference?**

A good question! When the WTWS was first installed into Hong Kong, the terminology and phraseology were adopted from those developed by the FAA and the users of the Terminal Doppler Weather Radar (TDWR) in the USA. There seemed to be no point to “reinvent the wheel” and there were obvious advantages to try to have a “Global standard”. In practice, it was found that the “first encounter-maximum intensity” logic caused some confusion, particular when there were multiple wind shear events on the approach or departure corridors. It was, therefore, decided, after extensive consultation with the “users”, to change the alert to give a more general location. This means, if an alert is generated by the WTWS, pilots need to expect that wind shear and/or turbulence may occur anywhere along the respective approach or departure corridor. It is understood that this still causes some US pilots to ask for the specific location, but overall the new phraseology seems to be preferred by the pilots.

**Q9. I understand that the “Microburst Alert” (MBA) generated by the WTWS may be different to what I understand by a microburst-what is the difference?**

You are right! The first thing to note, however, is that the MBA means a LOSS of 30 knots or more, so the most important factor is not to make an approach or carry out a departure into one of these events!!! (Less than 30 knots loss is a wind shear alert (WSA)-NOTE-if it is a GAIN, it will also be given as a WSA, even it is greater than 30 knots.) Now back to the question-the MBA is generated by the TDWR. The TDWR works when there is precipitation in the air and therefore is very good at detecting wind shear from CBs. This was why it was originally developed. In Hong Kong, because of the vicinity of Lantau Island (to the South),

southerly winds that blow through the small valleys are subject to a Venturi effect- causing areas of slower and faster air to cross the approach/departure corridor. This means that if you fly along the corridor, you may only experience a “downdraft” and NOT the typical “updraft” followed by a “downdraft” associated with the “traditional” microburst from a CB. This is particularly important factor to consider, when a wind shear alert (of 20 knots or more) is generated and the wind is from the South.

**Q10 So how can I help?**

In one word: REPORT-this is sometimes called the “sky truth”! Now this is sometimes easier said than done, as we know! Once your operational and safety factors have been satisfied and, time permitting, pass your report to ATC (ideally the tower controller), who will then pass this to other aircraft and to the HKO (weather bureau).

So what do we need in your report?

The location that the event was encountered (e.g. 2nm on approach)

The loss or gain experienced (e.g. 20 knot loss)

Any other relevant information (For Airbus pilots, it has been noticed, by comparing the PIREPs against QAR data, that the reported wind shear loss or gain is sometimes based on the “trend arrow” rather than the actual change in IAS experienced, so please try to give the actual wind shear not the predicted.)

Remember it also helps to have NIL reports (e.g. “No wind shear experienced”)...but remember Ans1-if you are following an aircraft that has given the NIL report-you may experience the forecasted and/or alerted wind shear!



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