Lack of
Threat Error Management
(TEM)

A CASE STUDY

"Flight To Tuk"

This video is not based on an actual event but is one that could occur if the circumstances were "wrong" and the pilots lacked awareness of the threats that became an error and ended as an an undesirable outcome.

As you watch the video note the many threats that lead to the error that results in the accident. Be prepared to discuss how Threat & Error Management may have prevented the accident.

The accident has a last chance of an Emergency Response Plan (ERP) helping to lessen the consequences. Note how this one is being handled.

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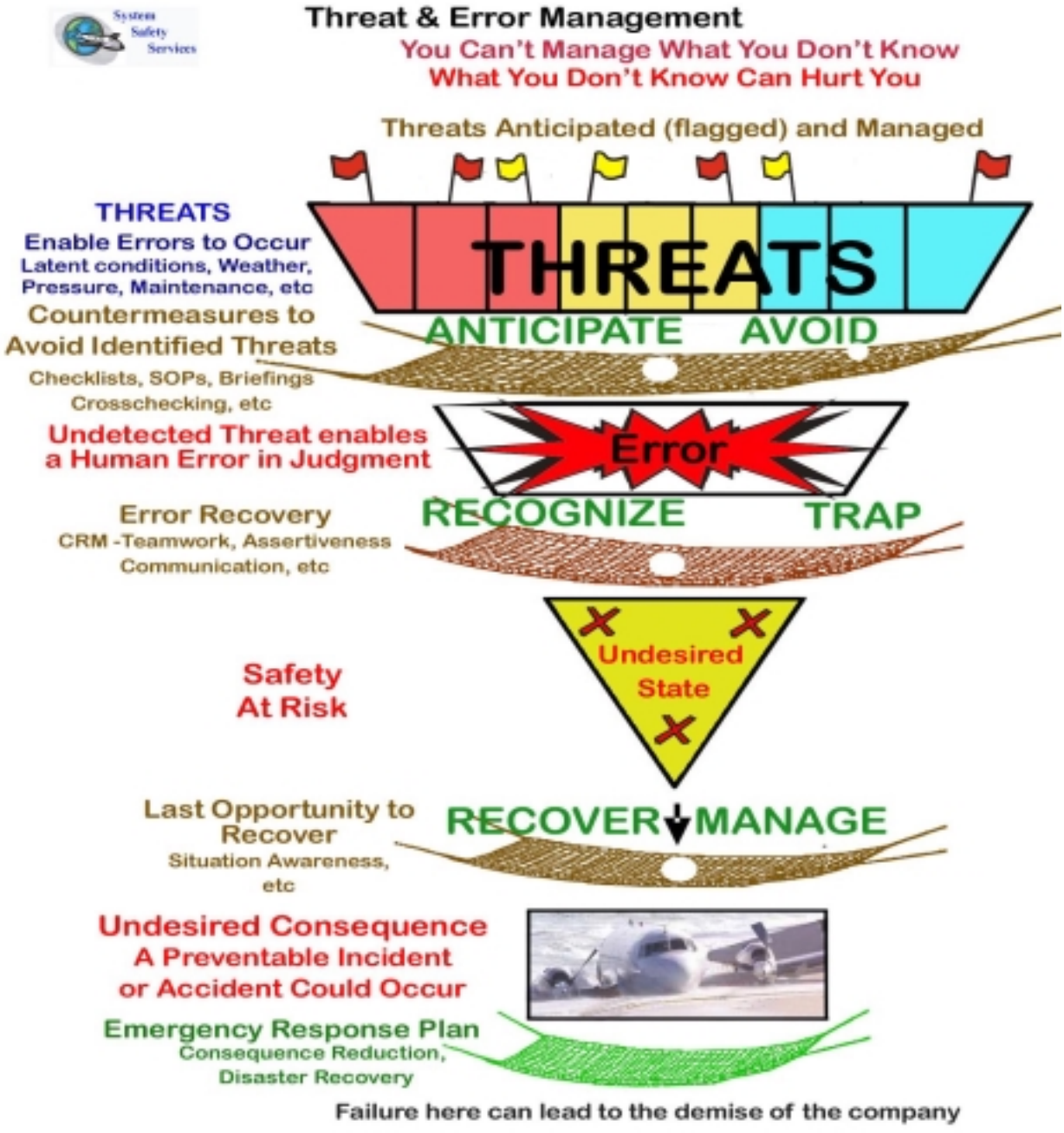
Flight To Tuk

Threat & Error Management (TEM)

Threat & Error Management is a Safety tool that enables a crew to recognize and manage threats or hazards that could cause or enable them to make an error. The following model illustrates the many steps used to prevent and/or contain the many links that can form to result in an accident.



Flight To Tuk (Continued)

Definition of Terms

• **Avoid** – Anticipate the Threat and put Safety Nets in place to Avoid it causing an Error

• **Emergency Response Plan** (ERP) – A predetermined plan of action on responding to and recovering from an major incident or accident

• **Errors** – An action or lack of action that could result in an Undesired State

• **Manage** – Recover from the Undesired State and Manage it

• **Safety Nets** – Measures put in place to prevent or lessen the opportunity for an Error, Undesired State or Undesired Consequence to occur

• **Threat & Error Management** (TEM) – A model to help us understand and manage conditions (threat or hazards) that can lead to an accident

• **Threats** – Anything that could cause you grief and increase the potential for an error to occur

• **Trap** – Recognize the Error and work to contain it in order to avoid an Undesired State

• **Undesired Consequence** – An incident or accident

• **Undesired State** – A condition that can lead to an Undesired Consequence incident or accident

Threat Versus Hazard

- For the sake of our model, they can be interchanged as both can cause us grief
- Both do no harm until released
- Often they are not recognized until they are released
- Both, if recognized, can be analysed for risk
- Both will usually have a means of controlling to some degree
- They are all around us

Flight To Tuk (Continued)

Storyline

Earlier the Day of the accident

The generator on the number one engine goes unserviceable in Vancouver and there is no serviceable parts in stock at this base. Shipping one from stores in Calgary will cause a delay and the aircraft's next flight is to their main base in Calgary in less than an hour where the unserviceable part can be changed. The decision is made to MEL (Minimum Equipment List) it to enable the aircraft to fly with one functioning engine generator plus the functioning APU (Auxiliary Power Unit) generator.

Cockpit Prior to Departure

As the pilots are going through their checks in preparation for the flight to Calgary, the APU shuts down dropping the aircraft power to the battery. Unable to determine the cause of the shutdown, the pilots restart the APU and contact the Maintenance Control Centre (MCC) After discussing the anomaly with MCC, who have no prior history of unexplained APU shutdowns, the crew agree to fly to Calgary and do not enter the event in the logbook. The one hour flight to Calgary is uneventful.

Company Base Calgary

A shortage of pilots causes the Operation Control Centre (OCC) to have to "draft" a pilot in from his day off for a special charter to Tuktoyaktuk (Tuk), Northwest Territories via Yellowknife. The pilot, Steve, is a little hung over and in a very bad mood because of the call out. He reflects this during the nonexistent crew briefing with the new on the job Copilot and the two Flight Attendants. He glances at the release and heads off for a coffee before the aircraft arrives for a 20 minute turnaround. The gate service attendant was more interested in talking to a passenger that coordinating the loading of the yet to arrive aircraft.

As the Copilot was doing the walk-around on the soon to depart aircraft, the APU once more shuts itself down. He is not concerned about the event but continues to complete his walk-around. When the Captain arrives in the cockpit he asks the Copilot if he had shut the APU down. He replied that he hadn't but suggested that perhaps the arrival crew had. He fails to mention that it had shut down during his walk-around.

A check of the logbooks failed to show any APU problems and MCC was not contacted. The one hr. 37 minute flight to Yellowknife was uneventful.

Flight To Tuk (continued)

Flight Yellowknife to Tuk

About 15 minutes into the one hour 25 minute flight, one of the flight attendants reports to the cockpit that one of the passengers is harassing the other flight attendant by mooing every time she walked by thus suggesting that she is a "cow.." The cockpit crew are amused by it even joining in it by asking for a glass of milk.
About this time the APU once more shuts down leaving only the number two generator to provide all electrical power. In order to carry the load it sheds some less essential electrical items including the autopilot. An audio alarm sounds to warn of the problem but the Captain assumes that it is sounding due to the autopilot shutting down only and silences it.. Being in a bad mood he blames all of the problems on poor maintenance.
The flight attendant in the cabin notices the lights dim as the remaining generator sheds some of the load. She does not report this unusual event to the cockpit as they had been told not to bother the pilots unless it was important. The flight crew are unaware that the APU has shut down and they have only the one remaining generator because the warning lights are above their head and it is daylight making it difficult to see unless looking directly at it.

Lost of Remaining Generator

A problem in the constant speed drive (CSD) on the number 2 generator activates a Master Warning light and "#2 Constant Speed Drive caution light." This may be for a variety of reasons from low oil pressure to overheat. Without verifying the reason the Captain activates the CSD disconnect switch and effectively shuts down the #2 generator.
The aircraft is now running on emergency battery power only, that can last a maximum of 30 minutes. The closest airport is to return to Yellowknife which is now more than 30 minutes flight time away.
A decision is made to land off airport before the battery power expires.
At this point the crew emergency training kicks in and the Standard Operating Procedures (SOP) for the emergency are followed. The aircraft crew now function as a true single group with a common goal.

Flight To Tuk (continued)

The Company Emergency Response Plan (ERP)

In Front of Company Headquarters

The company aircraft has gone down north of Yellowknife. A news reporter stands in front of the company door wanting to know what has occurred. The company has locked the doors and no one is talking. The reporter is determined to get a story and will not leave until he gets one. If he doesn't get one soon he will begin to make one up and it won't favour the company.

The survival of this company can now rest on how they handle this accident.

WORKSHEET

A Threat or Hazard can become a link in the chain of events that lead to an accident

What were the Threats (Hazards)

What was the Error?

What was the Undesired State?

What was the Undesired Consequence?

What SAFETY NETS could you put in place for the above?