CFIT Precursors and Defences

Precursor Identification and Analysis

The traditional role of accident prevention has been to analyse accidents and serious incidents in order to determine their causal factors, and then to create defences with the aim of preventing recurrence. This fundamentally reactive approach takes no account of lesser events that have not – so far – had serious consequences.

Modern accident prevention strategies also take into account the circumstances which gave rise to these lesser events if it appears that a more severe outcome could have followed in only slightly different circumstances. This process is able to increase the body of precursors - events or factors - which can inform better accident prevention.

The process of identifying precursors should make use of safety data from any available safety reporting or monitoring scheme, such as:

- Feedback from training (especially simulator) sessions;
- Pilots' reports;
- Flight data analysis;
- Line observations (e.g. Line Operations Safety Audit

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Clearly, the sharing of lessons learned between operators, manufacturers and others is also important. This was the driving force behind the Global Aviation Safety Network (GAIN) initiative. Although this project has not been active for ten years or more, Reports of the various GAIN working groups are available at GAIN's webpage and some contain still-relevant content.

The IATA Safety Trend Evaluation, Analysis & Data Exchange System (STEADES), which has the world's largest database of de-identified narrative safety reports, provides its members (and others on payment of fees) with a means to access analysis based on this database. Such analyses can help various stakeholders in aviation safety develop safety management strategies.

Precursors of CFIT Events

Examples of CFIT precursors that have been identified are listed below. By definition, this list cannot be exhaustive and continuous efforts must be made to identify other precursors.

CFIT Precursors - Occurrences

- GPWS/TAWS alert/warning (genuine, nuisance or false)
- MSAW warning
- Other cases of reduced terrain separation
- Prolonged loss of communication (PLOC) between pilot and controller(s)
- Low-energy state during approach
- Land short (runway undershoot) event
- Low altitude pattern following a go-around
- Inappropriate low altitude manoeuvring
- Low-on-fuel condition/fuel starvation

CFIT Precursors - Deviations (Procedural/Flight Path)

- Descent/flight below segment or sector safe altitude
- Altimeter setting error
- Failure to check navigation accuracy before approach
- Lateral deviation during approach (STAR)
- Failure to revert to navaids raw data in case of doubts on automation
- Incorrect or inappropriate radar vectoring by ATC (i.e., below minimum vectoring altitude (MVA) and/or toward high terrain)
- Premature descent to the next step-down altitude during a multiple-steps-down non-precision approach
- DME confusion (non-collocated DME versus ILS-DME), in identifying the final descent point
- Premature descent to DA(H) before G/S intercept or premature descent to MDA(H) before final descent-point/FAF
- Premature descent below MDA(H) before reaching the visual descent-point (VDP)
- Flight below desired flight path during initial and/or final approach
- Continued approach, when below DA(H) or MDA(H), after loss of visual references
- Late or inadequate response to GPWS/TAWS alert/warning
- Late or inadequate response to MSAW warning
- Late or inadequate response to windshear warning
- Unstabilized approach (steep or shallow approach)
- Failure to go-around
- Lack of effective flight path control during go-around
- Failure to follow published missed-approach procedure
- Inadequate fuel management

CFIT Defences and Controls

Identification of accident precursors is only half the battle; it is also necessary to define and implement defences and control strategies to address the threats involved

- Industry prevention strategies and best practices (See also Further Reading)
- Adherence to SOPs (task sharing, briefings, use of checklists, standard calls and excessive-deviation callouts, mutual crosscheck and backup)
- Cross-check of takeoff data: mass and balance, fuel distribution, wind component, runway conditions, flaps setting, V_1/V_r speeds, etc.
- Adherence to sterile-cockpit rule
- Adopting the constant-angle non-precision approach (CANPA)/constant descent final-approach (CDFA) concept
- Use of an aircraft/airport-specific Engine Out Standard Instrument Departure (EOSID) in case of engine failure
- Adequate use and supervision of automation
- Vertical and horizontal flight paths monitoring (situational and energy awareness)
- Altimeter setting cross-check
- Cross-checking cleared altitude versus minimum safe altitude
- Timely and adequate response to GPWS/TAWS alert or warning
- Timely and adequate response to MSAW warning
- Timely and adequate response to windshear alert or warning
- Awareness of minimum vectoring altitudes
- Awareness of approach design criteria (PANS-OPS versus TERPS)
- Awareness of relationship between track distance to runway threshold and height (300 ft/nm rule-of-thumb)
- Awareness of low-OAT correction to be added to minimum approach altitudes/heights
- Awareness of minimum safe radio-altimeter readings for each approach segment (IAF-IF, IF-FAF)
- Awareness of "black-hole" or other visual illusions for

display, head-up display, enhanced-vision, etc.)

Further Reading

Industry Prevention Strategies and Best Practice Risk factors (threats) observed in CFIT events as well as recommended prevention strategies and best practices are identified in the following documents:

- FAA/Industry – CFIT Education and Training Aid:
  - CFIT Checklist – Evaluate the Risk and Take Action.
- Flight Safety Foundation – ALAR Toolkit:
  - ALAR Risk Awareness Tool (RAT);
  - ALAR Risk Reduction Guide (RRG); and,
  - ALAR Briefing Notes.
- Flight Safety Foundation CFIT Education and Training Aid;
- Airbus Flight Operations Briefing Notes – Operating Environment section:
  - Enhancing Terrain Awareness

About Accident and Incident Precursors The role of accident and incident precursor identification and analysis is well described in the presentation and supporting article presented to the 2010 Flight Safety Foundation European Aviation Safety Seminar by Michel Tremaud. The article lists identified precursors and defences/controls for a range of different accident and incident types.
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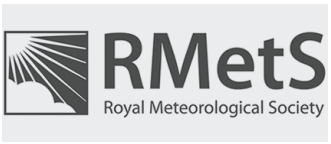

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