



# Elimination of ILS Navigational HMI in the Operational Environment

*By: Mickey Lindecker  
FAA, AJW143*

# Hazardously Misleading Information (HMI)

- Radiated HMI

“Erroneous information that is sent by navigational aids to an aircraft instrument, and that is presented in a manner that could result in a significant reduction in terrain, obstacle, or object clearance.” (FAA Order 6000.15)

- Operational Environment HMI

A perspective where a correctly adjusted and radiating ILS Signal-In-Space (SIS) may; “...result in a significant reduction in terrain, obstacle, or object clearance”; due to the operational environment.

# ILS HMI Risk Mitigation

- There are many methods of mitigating ILS HMI risk.
  - Flight Inspection confirmation that ILS approaches are obstruction free.
  - Specific maintenance instructions during HMI procedures.
  - Risk/benefit consideration to leave an ILS “ON” during Abnormal Airport Environments (AAE).
  - NOTEMS issued alerting pilots to ILS condition.
  - Radar guidance for aircraft while operating under IMC and IFR conditions.

# Mistakes Happen

- Much attention focused on minimizing the probability that a ILS maintenance HMI mistake will occur.
  - HMI warning statements in maintenance orders.
  - HMI maintenance procedures examined to reduce time or provide alternate procedures developed.
  - Cross-checks of NOTEM issuance.
  - IDENT removed.
- Pilot usage of ILS during maintenance HMI procedure addressed.
  - Associated facility turned “OFF” to help prevent auto-couple.
  - Associated facility “OFF” helps indicates that the ILS isn’t in a normal state.

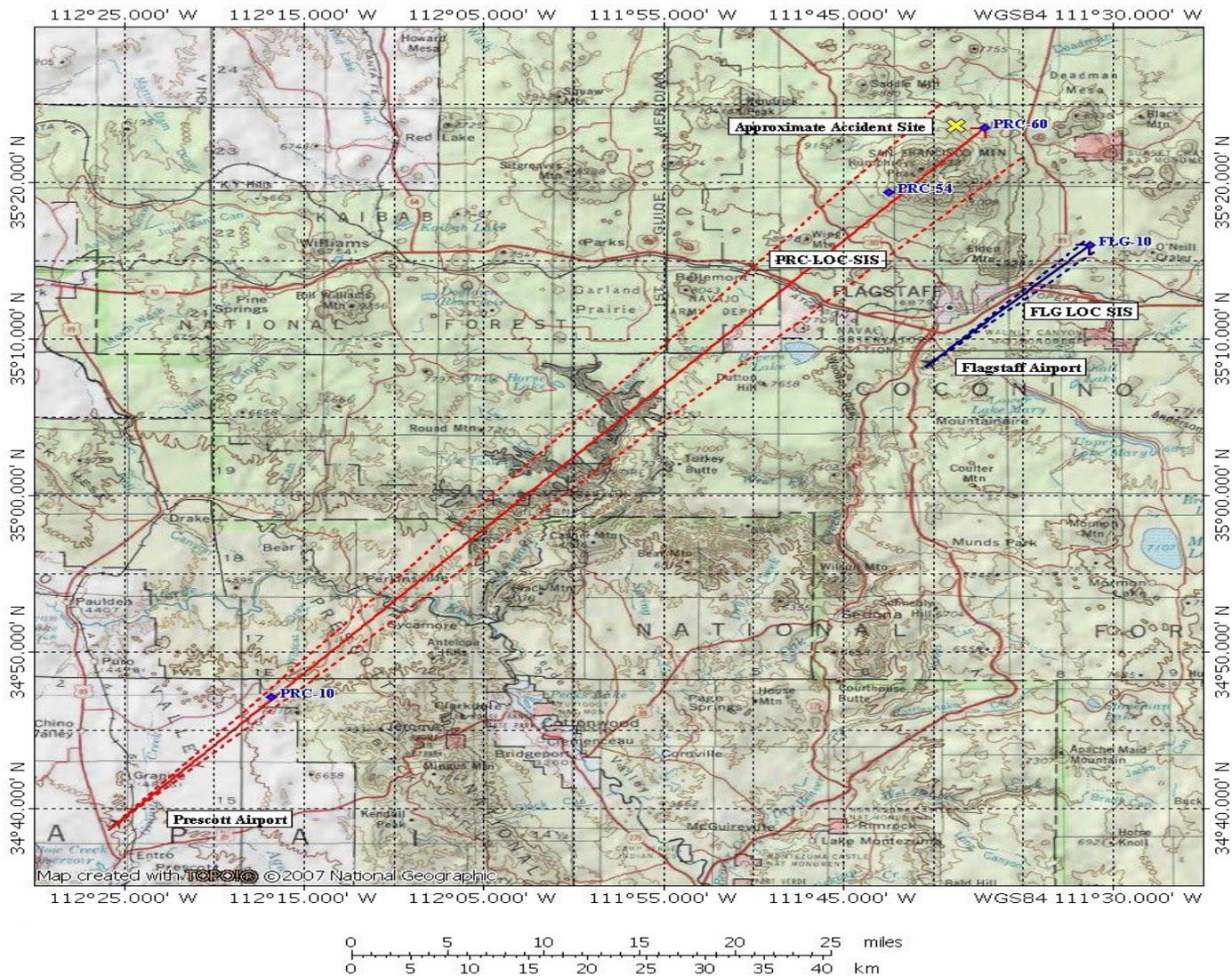
# An Overlooked ILS HMI Danger

- Approach to Flagstaff Pulliam Airport, Arizona, Runway 21 (FLG) ILS.
  - Radar service terminated.
  - Clearance by ZAB for ILS 21 approach.
  - IMC and IFR conditions.
- Interception of Prescott Ernest A. Love Field Airport, Arizona, Runway 21L (PRC) ILS?
  - Pilot mistake with radio's? IDENT not verified?
  - Local controller ask *“you are on the ILS, verify”* pilot's response; *“that's right I'm doing the ILS 21”*.
- Subsequent aircraft collision into Mount Humphreys.

# Investigation of PRC ILS SIS Around Mount Humphreys

- Engineering request for Flight Inspection check of PRC ILS Signal-In-Space (SIS) around and behind Mount Humphreys, approximately 65 NM.
  - Run Sheet developed.
  - Both PRC and FLG SIS examined.
  - PRC SIS examined along entire 65 NM path to Prescott.
- PRC ILS SIS found low but usable within  $1^{\circ}$  and  $1.5^{\circ}$  of centerline at 10,000 ft (3,048 m).
- PRC ILS centerline found flyable at 13,500 ft (4,115 m).

# Prescott and Flagstaff Localizer Signal-In-Space



# Conclusion

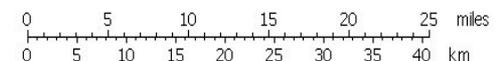
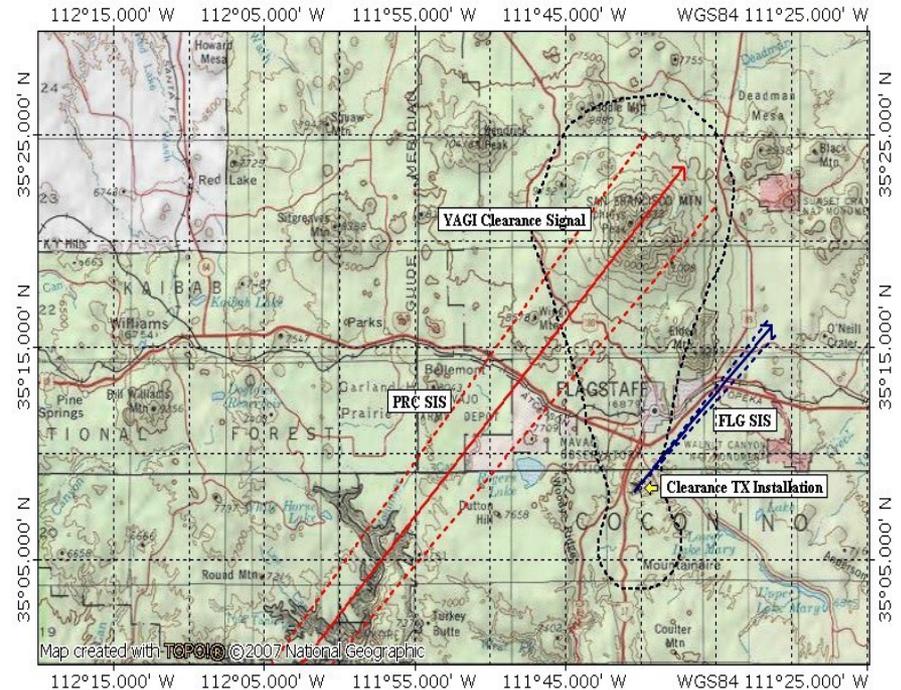
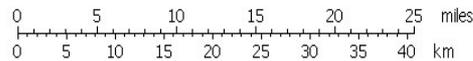
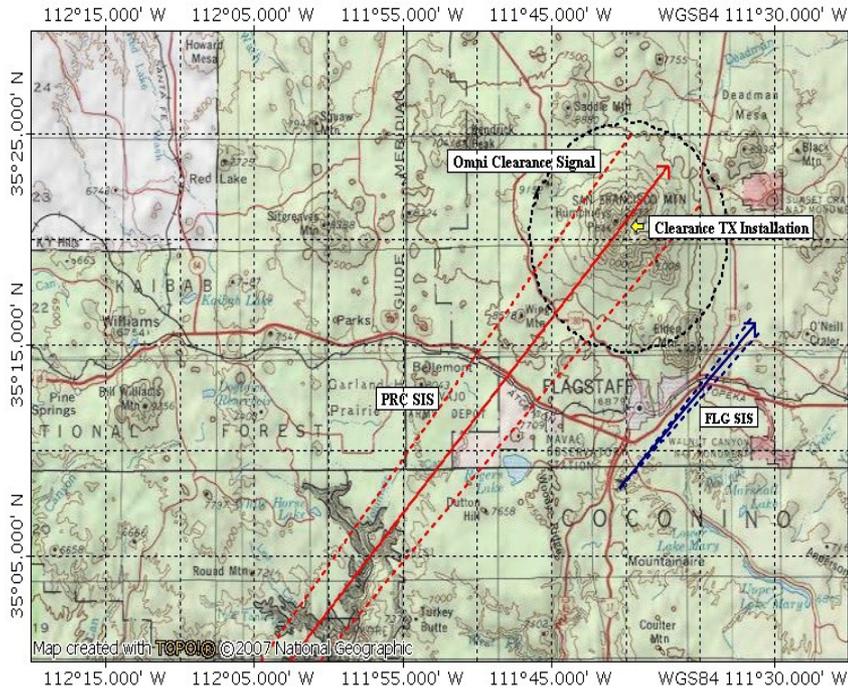
- PRC Runway 21L LOC SIS exist in the FLG Runway 21 approach area, around and in a direct path with Mount Humphreys.
- That the ILS “HMI” condition exist as a result of unanticipated ILS installation circumstances.
- If utilized by a pilot during IMC and IFR can lead to deadly consequences.
- The risk of this ILS HMI condition is considered low by this author - but not zero.

# Flagstaff Runway 21 Approach Recommendations -

- Short Term:
  - ATC request verification of FLG 21 IDENT.
  - And/or verification of FLG ILS Frequency.
- Permanent: Elimination of PRC 21L ILS HMI.
  - Change PRC ILS Course (not recommended).
  - Reduce RF output power (not recommended).
  - Add Voice Warning to LOC signal (doesn't get rid of the problem – not recommended).
  - Install “Clearance” transmitter (recommended). Possible use of unmodulated carrier 8KHz below PRC LOC.

# Elimination of ILS HMI for Flagstaff Runway 21 Approach

## Addition of Signal of Proposed Clearance Transmitter



# Identification of Similar ILS HMI Conditions Recommendations -

- Flight Inspection & International Organizations – Be aware of this type of ILS HMI danger and inspect for similar situations during ILS facility flight inspections.
- Installation Engineering Personnel - Brief on the possibility of this type of ILS HMI condition and check for similar conditions during ILS installation designs.
- For Benefit of All – Form teams of FI, Safety, and Engineering personnel to review existing approaches and installations for possible similar HMI conditions that is one-step-away from deadly consequences.