



712CD

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Original title on 712 A/B: Quantifying IWEDA Rules: How Red is Red?

If the title was revised please list the original title above and the revised title here:

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Report Documentation Page

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Quantifying IWEDA Rules: How **Red** is **Red**?

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What is IWEDA

**IWEDA stands for the Integrated Weather
Effects Decision Aid**

It is a collection of system rules with associated critical values for aiding the commander select an appropriate platform, system or sensor under given weather conditions

Results are displayed via a red/amber/green color matrix overlaid on a background map



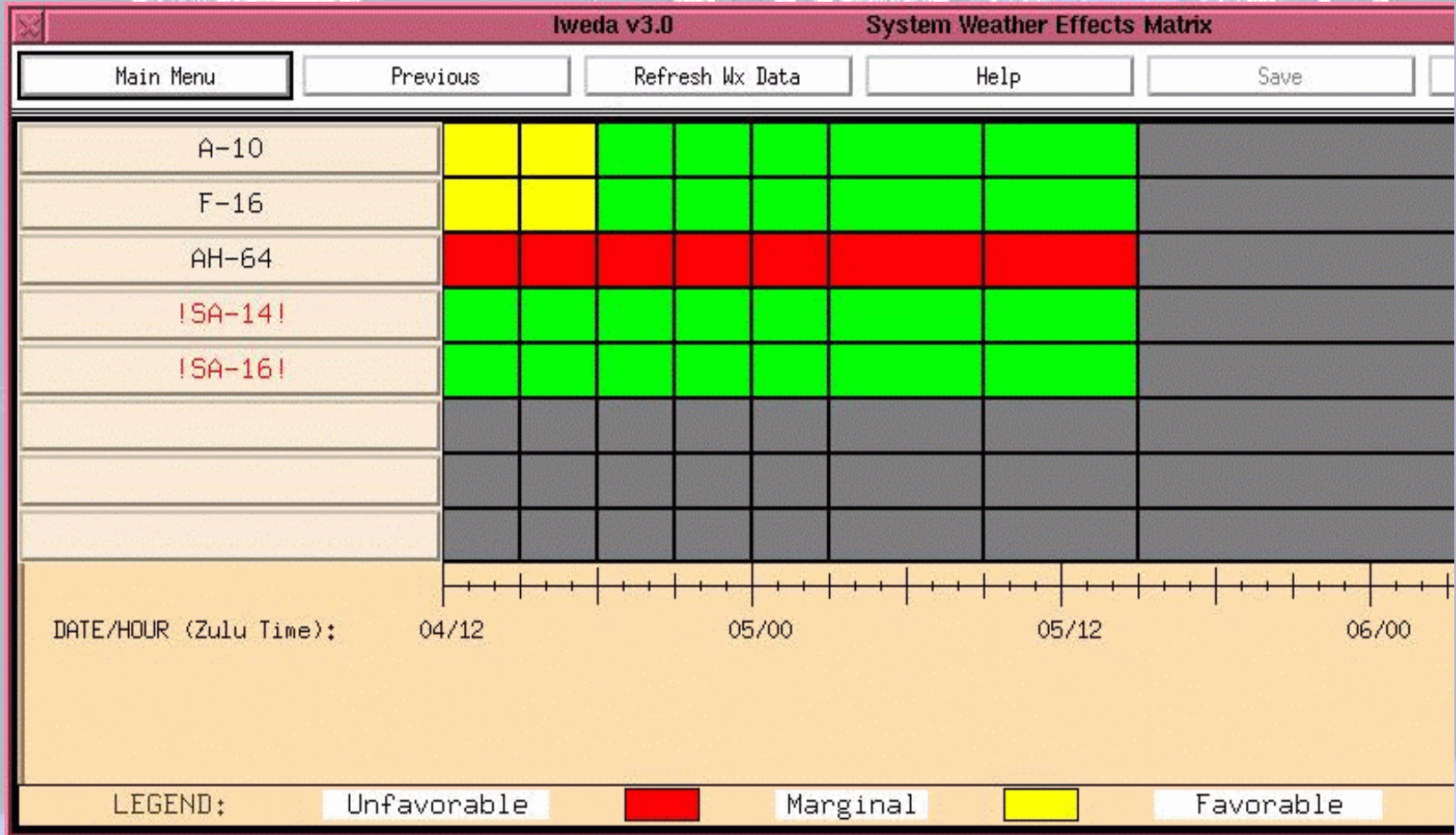
Integrated Weather Effects Decision Aids (IWEDA)



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Time Dependent - IWEDA Impact Matrix - One Row for each system showing time dependent impact over entire domain





Rule Based TDA - Integrated Weather Effects Decision Aid



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lweda v3.4

EXPLAIN: [TFXXI]/*M1/*LASER RANGEFINDER ND:YAG

Main Menu

Previous

Refresh Wx Data

Help

Save

Exit

DATE/TIME: 16/12

Component -> LASER R/D Day/Hr -> 16/12

COMPONENT(S) FOR *LASER RANGEFINDER ND:YAG

LASER R/D

CLICK COLORED CELL(S) ABOVE, THEN MAP FULL IMPACTS:

LASER R/D: MARGINAL

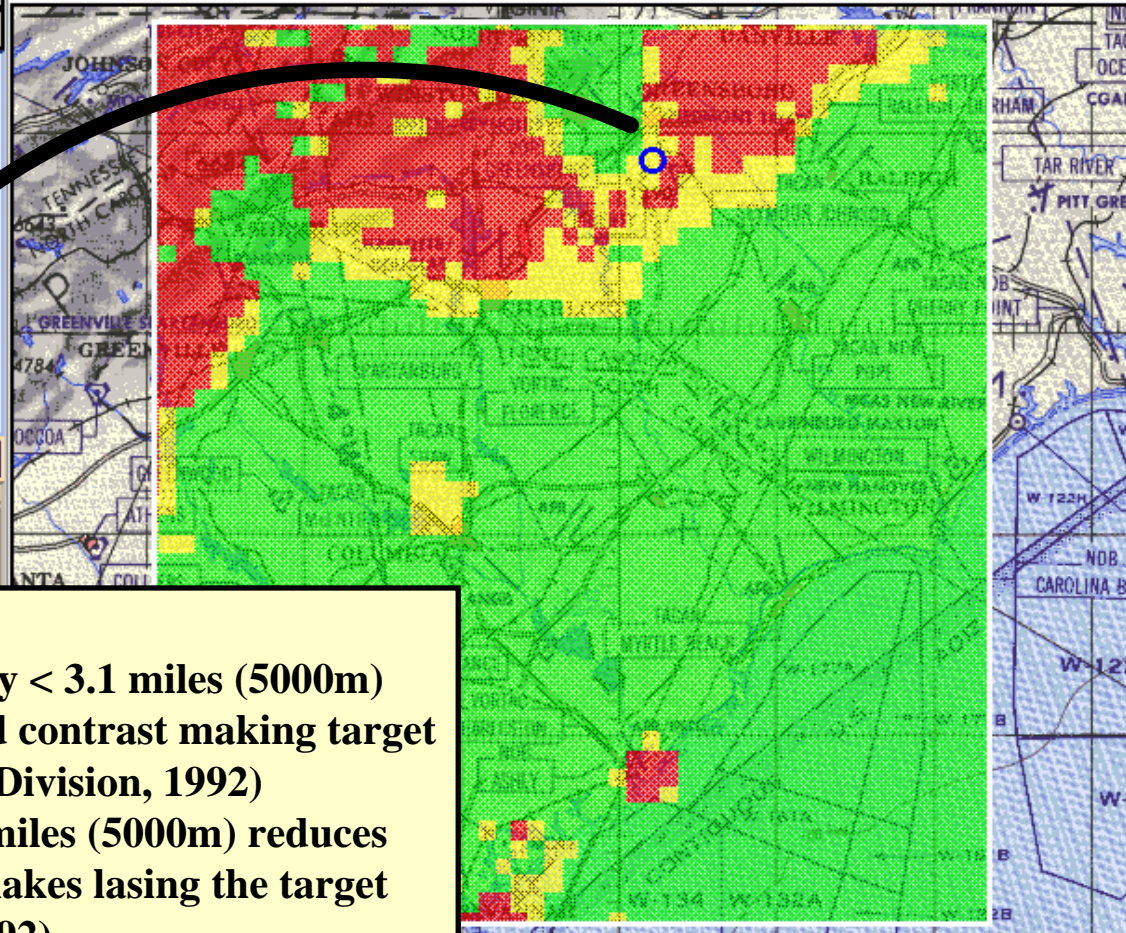
Any occurrence of fog and visibility < 3.1 miles (5000 m) reduces the target and background contrast making target acquisition difficult. (1st Cavalry Division, 1992)

Any of the re...
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LASER R/D: MARGINAL

Any occurrence of fog and visibility < 3.1 miles (5000m) reduces the target and background contrast making target acquisition difficult. (1st Cavalry Division, 1992)

Any occurrence of visibility < 3.1 miles (5000m) reduces the range and reflectiveness and makes lasing the target difficult. (1st Cavalry Division, 1992)



Cursor: 35,398, -81,810



IWEDA RULES: HOW RED IS RED?



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- IWEDA rules are implemented in terms of stop light charts
 - Red-Yellow-Green
 - Boundaries are 70% (R/Y) and 30% (Y/G) reduction in effectiveness
- Reality dictates boundaries should be fuzzy
- Simulations have *repeatedly* asked for numbers
- Initial study shows feasibility
 - limited number of cases
 - may not be possible for all rules





IWEDA RULES: HOW RED IS RED?

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First Case: Helicopter Accidents Related to Wind

- **NTSB data used**
 - on-demand Part 135*
 - multiple causes and factors for accidents are cited resulting in a sum greater than the total number of accidents
- **Assumption**
 - Weather related accidents are equal for military and civilian craft
- **Blade number not considered**

*aircraft with a maximum seating capacity of 9 passengers in piston-engine airplanes, 30 passengers in turbo-prop or jet airplanes, and 12 passengers in helicopters.

Initiating Event for an Accident Flight

(on-demand Part 135 2002)



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Factors underlying Airplane Accidents

Loss of Control - In-flight	6
Overrun	4
Airframe Component or System Failure	3
In-flight Collision with Object	3
In-flight Collision with Terrain or Water	3
In-flight Encounter with Weather	3
On Surface Collision with Terrain or Water	3
Collision between Aircraft (Not Midair)	2
Loss of Control – Surface	2
Loss of Engine Power (Total) Nonmechanical	2
Midair Collision	2
On Surface Collision with Object	2
Gear Collapsed	1
Loss of Engine Power	1
Loss of Engine Power (Partial) Nonmechanical	1
Main Gear Collapsed	1
Miscellaneous/Other	1
Undershoot	1
Total	41

Factors underlying Helicopter Accidents

Loss of Control - In-flight	4
In-flight Collision with Object	2
In-flight Collision with Terrain or Water	2
In-flight Encounter with Weather	2
Airframe, Component, or System Failure	1
Fire	1
Loss of Control – On Ground/Water	1
Loss of Engine Power (Total) Mechanical	1
Roll Over	1
Total	15

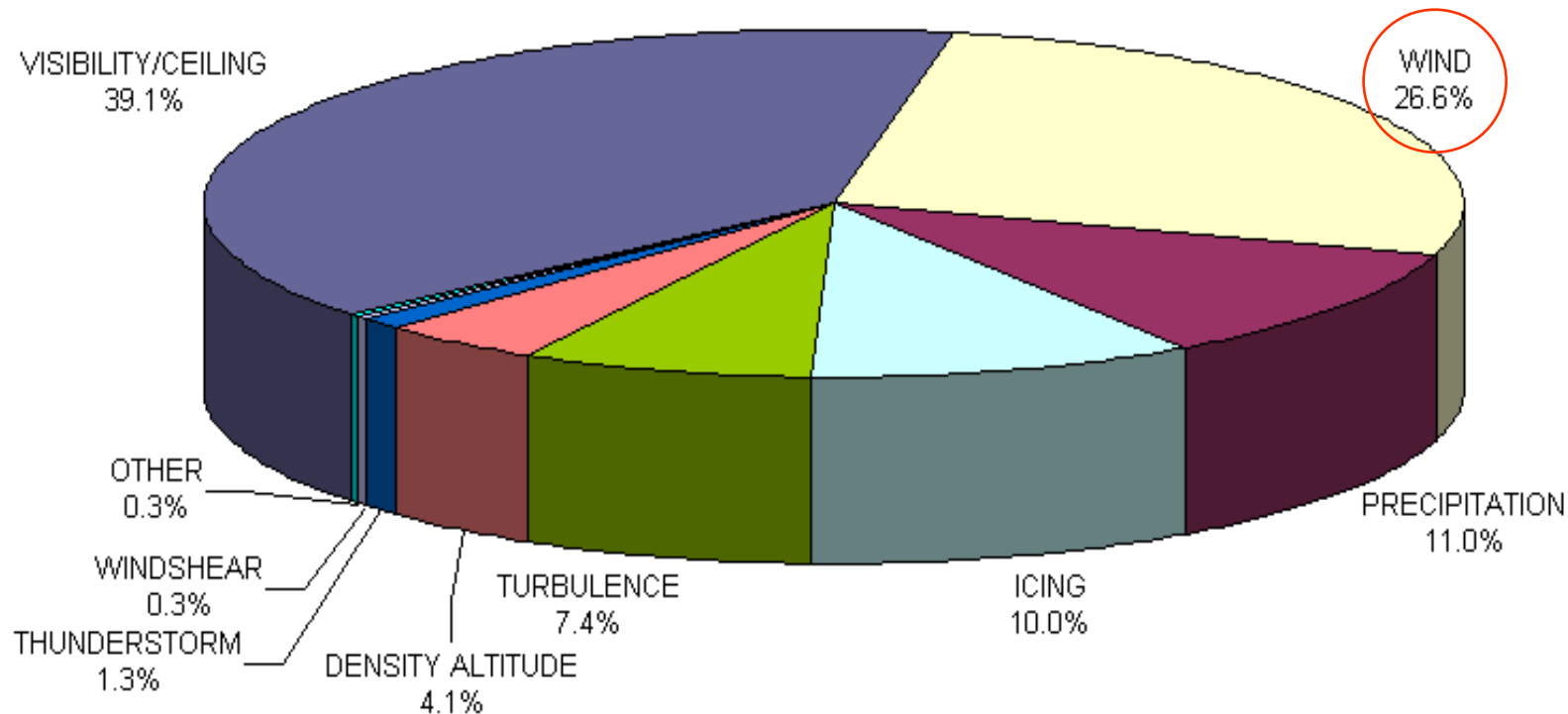


40% of Weather-related Accidents occur to Helicopters

Part 135 accidents decreased from a peak in 1996, with 2002 showing a 17% decrease from 2001

PART 135 NTSB WEATHER RELATED ACCIDENTS BY WEATHER CONDITION 1994-2003

831 PART 135 ACCIDENTS



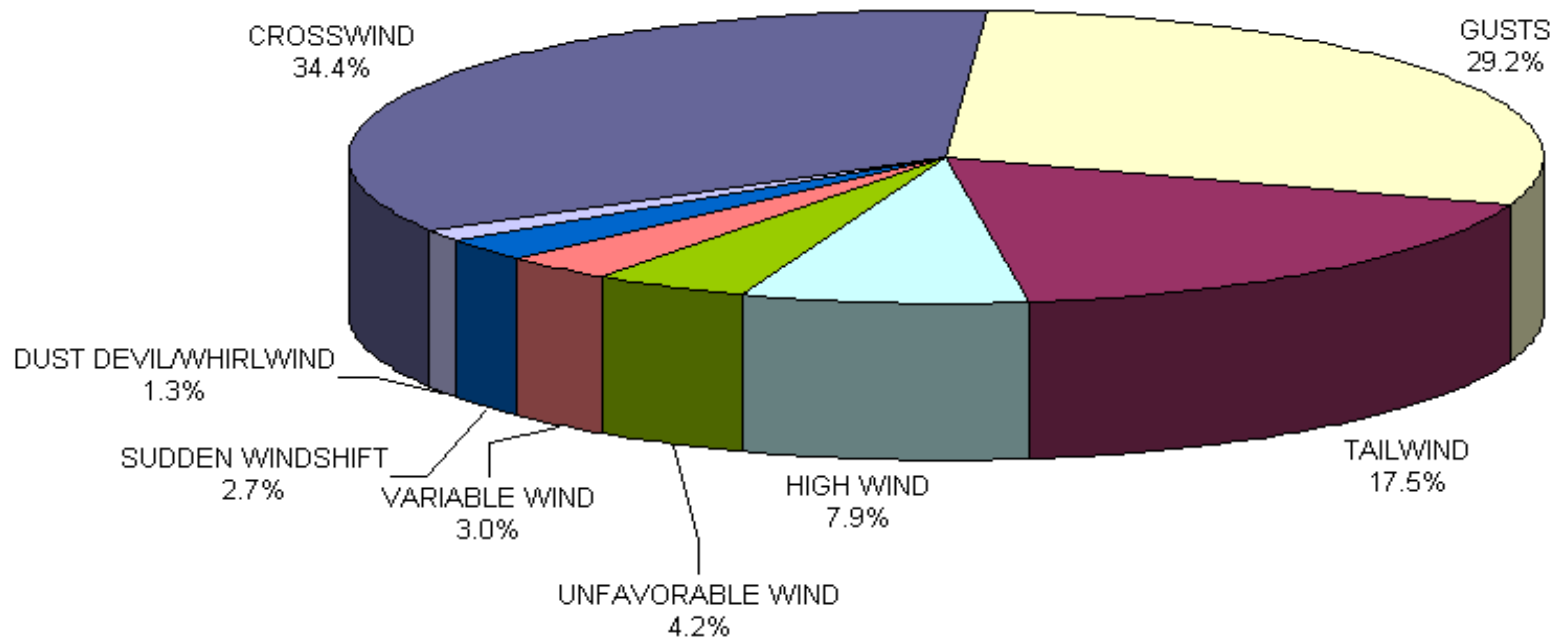
Between 1994 and 2003, there were 19,562† aircraft accidents, involving 19,823 aircraft, of which 831 were conducted under FAR Part 135. Weather was a contributing cause or factor in 257 of the Part 135 accidents. This chart identifies the breakout of Part 135 weather related accidents according to the weather condition(s) involved in the event.

† Accidents include final reports only where causal factors were identified.

§ A single accident may involve multiple weather conditions.

DISTRIBUTION OF WIND CONDITIONS IN NTSB WEATHER RELATED ACCIDENTS 1994-2003

4,159 WEATHER RELATED ACCIDENTS



Between 1994 and 2003, there were 19,562† aircraft accidents, involving 19,823 aircraft. Weather was a contributing factor in 4,159 of these accidents and involved 4,167 aircraft. Of the 4,159 weather related accidents, a wind condition was cited as a contributing cause or factor 2,726 times. This chart identifies the breakout of the wind conditions.

† Accidents include final reports only where causal factors were identified.

§ A single accident may involve multiple weather conditions.



Helicopter Accidents Related to Wind



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- **NTSB data**
 - **40% of the weather related accidents occurred to helicopters**
 - **30.9% of all accidents were weather related**
 - **26.6% of all weather related accidents were due to wind**
- **3.3% of helicopter accidents are due to wind**

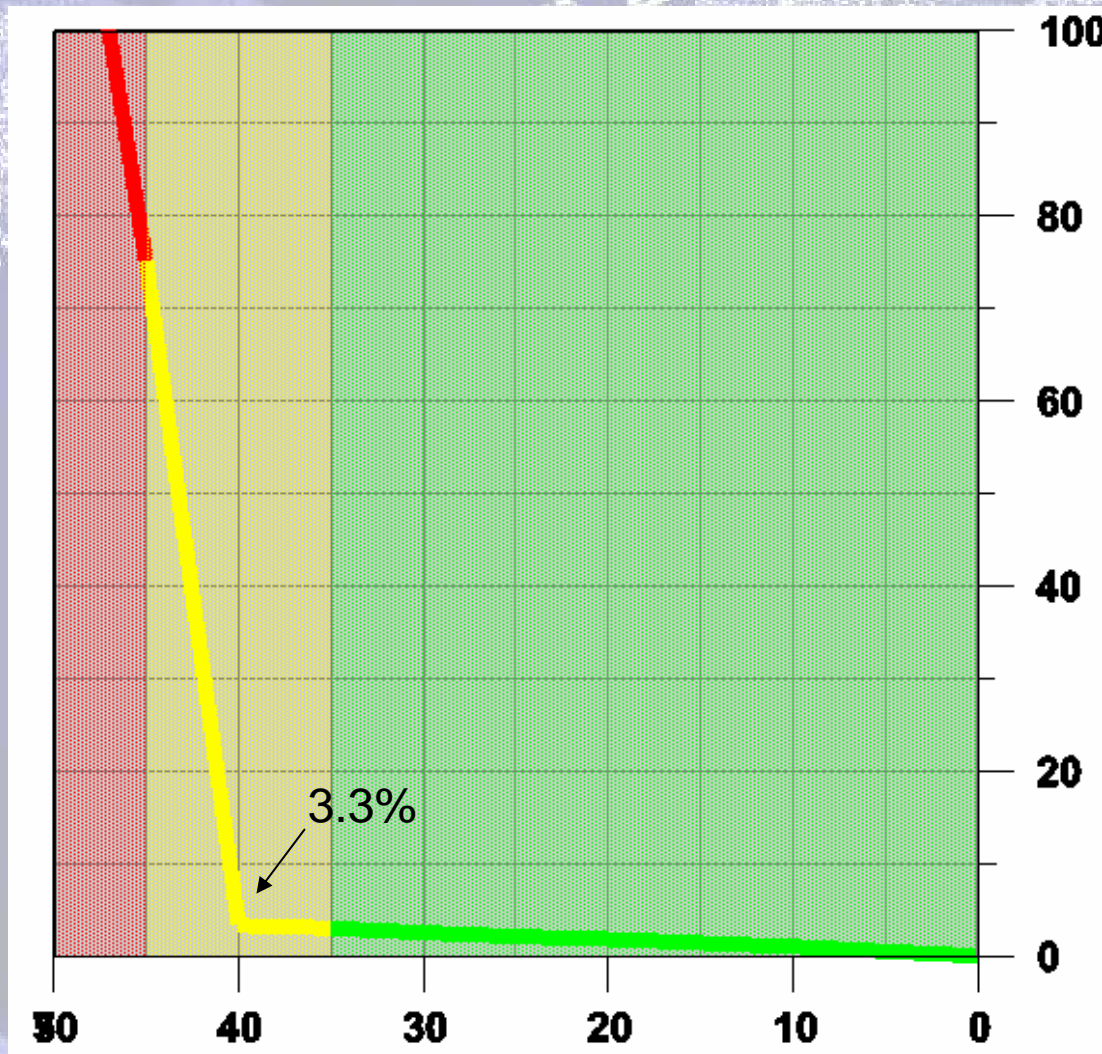


Helicopter Risk Assessment



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Wind Speed (knots)

% Risk

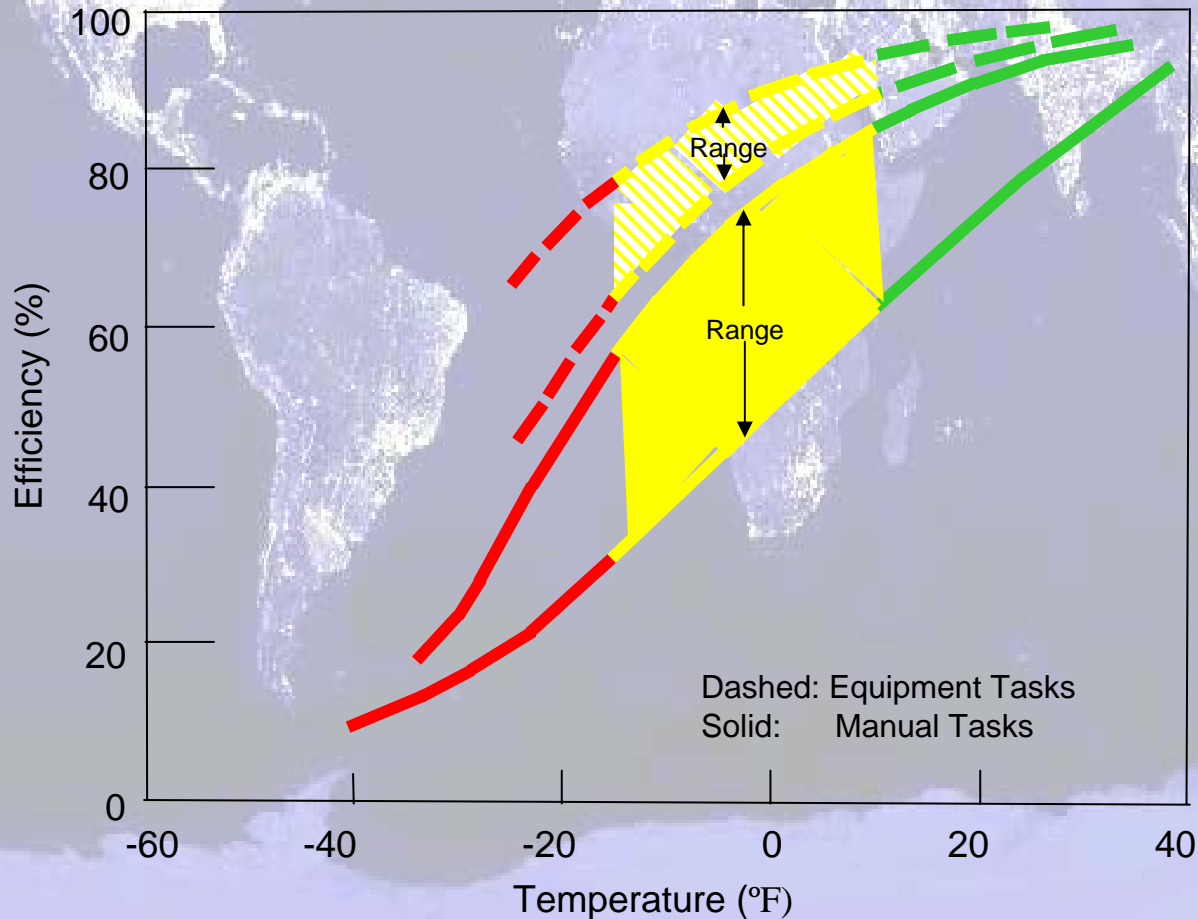
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Second Case: Effect of temperature on Army personnel manual and equipment tasks



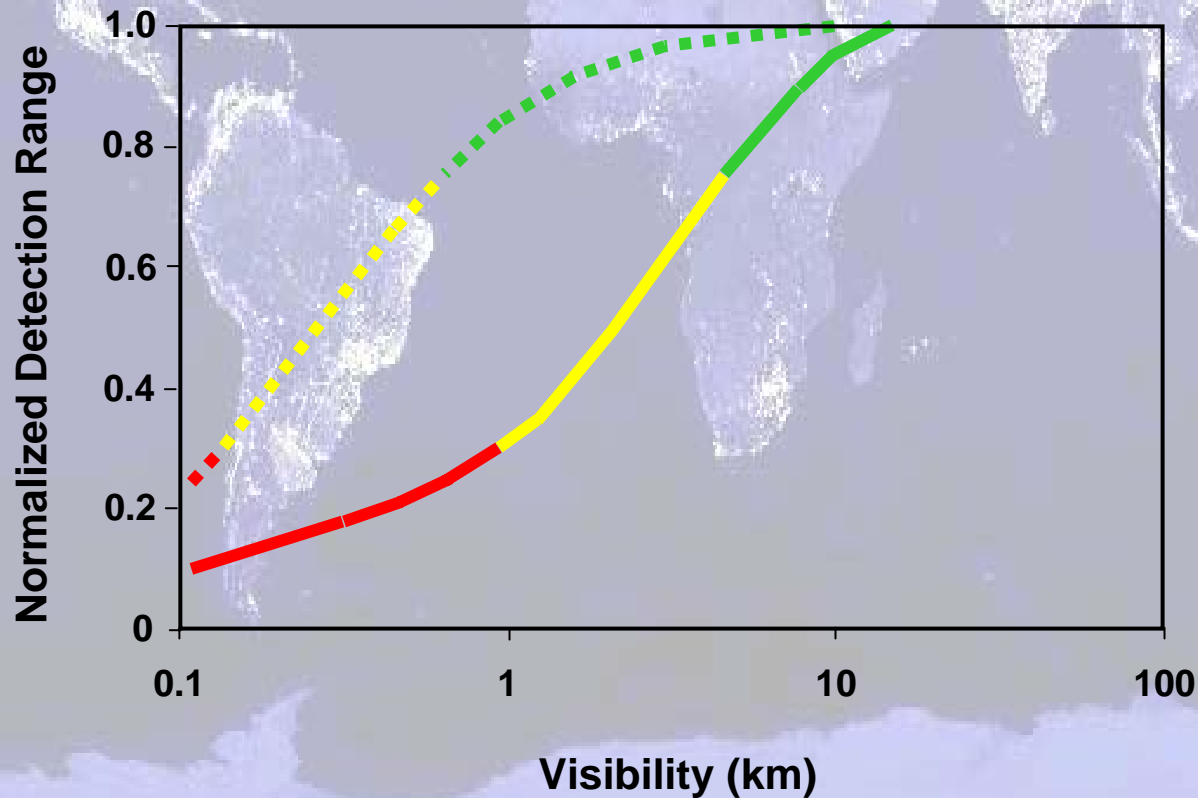


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Third Case: Effects of different aerosol types on detection range for an average FLIR at 1500



Dashed: Rural (cloudless & overcast)

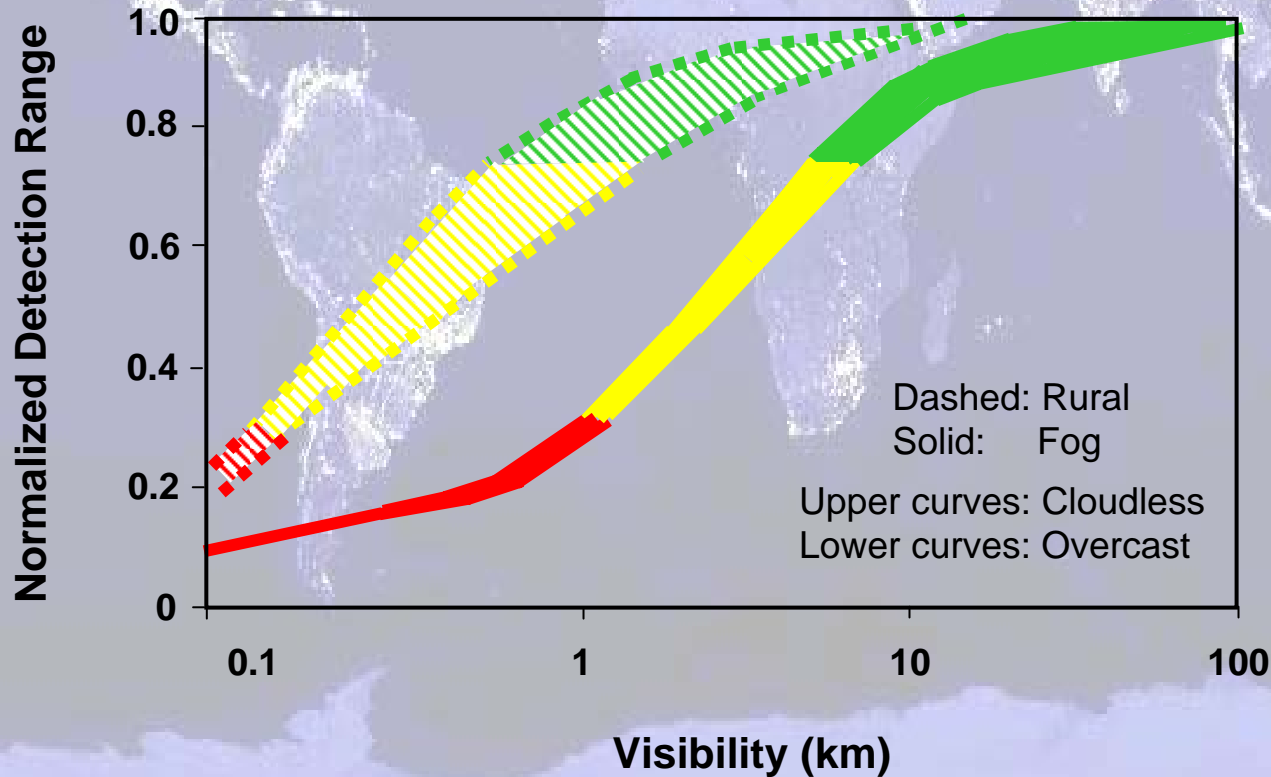
IWEDA RULES: HOW RED IS RED?



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Third Case: Effects of different aerosol types on detection range for an average FLIR at 0900





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