



# Mid-Air Collision Avoidance Guide





# 128 AIR REFUELING WING

GENERAL MITCHELL INTERNATIONAL AIRPORT  
MILWAUKEE, WI

## MEMORANDUM FOR ALL WISCONSIN AVIATORS

FROM: 128 ARW/CC  
1919 E. Grange Ave.  
Milwaukee, WI 53207

SUBJECT: Midair Collision Avoidance – INFORMATION MEMORANDUM

1. The airspace around Milwaukee is crowded with various aircraft making the need for a local midair collision avoidance program (MACA) absolutely imperative. My goal is to disseminate our program's safety material to all local airports to share detailed knowledge of where typical air traffic operate and how to mitigate potential air threats. With this information I hope it will increase everyone's margin of safety and minimize the chance of a mid-air mishap.
2. The included pamphlet presents information about routine aircraft operations flown by the 128 Air Refueling Wing (ARW). The pamphlet describes the local high traffic areas so that aviators can increase their vigilance and avoid potential hazardous situations. Please review this pamphlet when planning to operate at or near General Mitchell International Airport (MKE).
3. Close cooperation with the local general aviation community has resulted in an outstanding aviation safety record that we must continue to pursue. Please call the 128th ARW Safety Office at 414-944-8492 with any questions or suggestions about local flying and any concerns regarding aviation safety.

//SIGNED//  
Adria P. Zuccaro, Col, WI ANG  
128 ARW, Commander



## Your Role in Collision Avoidance...

Studies of midair collisions involving aircraft by the National Transportation Safety Board (NTSB) determined that:

- Most of the aircraft involved in collisions are engaged in recreational flying, not on any type of flight plan.
- Most midair collisions occur in VFR weather conditions during weekend daylight hours.
- The vast majority of accidents occurred at or near uncontrolled airports and at altitudes below 1,000 feet.
- Pilots of all experience levels were involved in midair collisions, from pilots on first solo ride, to 20,000-hours.
- Flight instructors were on board the aircraft during 37 percent of the accidents in the study.
- Most collisions occur in daylight with visibility greater than 3 miles.

Here's how **you** can contribute to professional flying and reduce the odds of becoming involved in a midair collision:

- Practice the "see and avoid" concept at all times re-



gardless of whether the operation is conducted under Instrument (IFR) or Visual (VFR) Flight Rules.

- Always use transponder with Alt Encoding (if equipped) when VFR, even when out of radar coverage. Aircraft equipped with Traffic Collision Avoidance Systems (TCAS) can receive traffic and resolution advisories directly from the system, providing immediate instructions for separation.
- Under IFR control, don't always count on ATC to keep you away from other aircraft. They're human, and can make mistakes.
- Understand the limitations of your eyes and use proper visual scanning techniques. Remember, if another

### REACTION CHART

See Object	0.1
Recognize Aircraft	1.0
Become aware of a collision Course	5.0
Decision to turn left or right	4.0
Muscular reaction	0.4
Aircraft Lag time	2.0
<b>Total</b>	<b>12.5</b>

aircraft appears to have no relative motion, but is increasing in size, it is likely to be on a collision course.

- Execute appropriate clearing procedures before all climbs, descents, turns, maneuvers, or aerobatics.
- Be aware of the type airspace in which you intend to operate in and comply with the applicable rules.

### Collision Avoidance Checklist

1. Plan ahead
2. Clean windscreen
3. Obey the Rules
4. Brief passengers and crew
5. Complete checklist early
6. Know your aircraft
7. Talk and listen
8. Scan continuously

# KC-135 Operations

## Approach work & Traffic Pattern

Under ATC radar control, spacing is usually not as much of an issue, with the exception of wake turbulence.

### FACT:

- Total gross weight of the KC-135 may be as high as 320,000 pounds.
- Both altitude and distance separation **MUST** be maintained to avoid possible severe wake turbulence.

## Wake Turbulence Avoidance

You don't necessarily have to collide with another aircraft to become a statistic. The NTSB has cited a phenomenon known as wake turbulence as contributing factors in many aircraft accidents. Examples are the December 1983 crash of a Westwind following a Boeing 757 on approach at John Wayne Airport in Orange County, CA and the 1994 accident at Pittsburgh International Airport involving a Boeing 737. More recently, wake turbulence may have played a role in the November 2001 American Airlines Flight 587 accident.

Aircraft wake turbulence originates at the wingtips as counter rotating vortices (tornado-like composition) that begin as soon as the wings are providing lift.

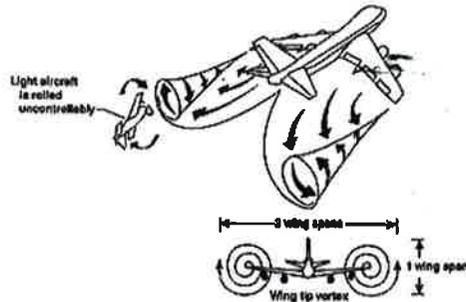
### FACT:

- The vortices rotate inward and in a no-wind environment, will descend at a rate of 400 fpm to approximately 1000 feet below the aircraft and remain there until they gradually dissipate.
- When the aircraft is, heavy, slow and clean (flaps and gear up), it generates the most wake turbulence. Tests have shown wake turbulence can reach vortex velocities of over 130 knots.

Military operations routinely require formation flying. Despite a conscious effort to avoid the preceding aircraft's vortices, an aircraft will invariably fly through vortices on occasion. The vortices produced by a KC-135 will shake another KC-135 at about a mile in trail with a force similar to moderate turbulence. Imagine what these same



vortices would do to a light aircraft. Be alert to situations where wake turbulence may be expected and avoid them. Remember that a pilot's acceptance of instructions to follow another aircraft "...is also an acknowledgement that the pilot accepts the responsibility for wake turbulence separation..." (AIM 4-4-14 (b))."



## VFR Approach work

During VFR conditions, the KC-135s often utilize a visual pattern for multiple approaches and landings to maximize training efficiency. A standard tanker pattern is a **2 mile wide** downwind leg, usually at a pattern altitude of **1000 to 1500 AGL**.

## Formation Sorties

Military requirements necessitate the use of large aircraft formations for refueling efficiency. Formation work is often practiced during local sorties for pilot proficiency. This means that though civilian pilots may spot one tanker, they must remain vigilant and attentive to visual clues and radio transmissions for following KC-135s.

### FACT:

- Aircraft in formation are usually **1 mile** apart and separated **500 feet** vertically. There are often 2 to 3 tankers in one formation, so if you see one tanker make sure you are looking for additional tankers in formation.

## ...more cool tanker info

The KC-135 is a long range, high speed, four engine, jet, tanker aircraft capable of takeoff weights in excess of 322,000 lbs. With a fuel off-load capability of over 25,000 gallons, the KC-135's primary mission is to extend the range of USAF, USN, and allied military aircraft. The KC-135 is a military version of the Boeing 707 jet transport and is characterized by its swept wings and its air-refueling boom located below the horizontal stabilizer.

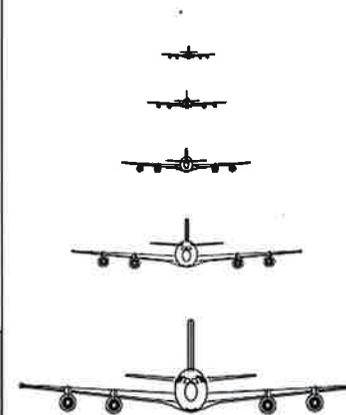
- Wingspan: 131 ft
- Length: 137 ft
- Color: Dark Grey
- Max takeoff Weight: 322,500 lbs
- Max Cruise Speed: 585 MPH at 30,000 ft MSL
- Approach Speed: 120-180 KIAS
- VHF radio: **yes**
- TCAS II: **yes**



## KC-135 Closure Rate Chart

DISTANCE SECONDS

	AT	AT
	600 MPH	210 MPH
10 MILES	60	170
5 MILES	30	85
3 MILES	18	56
2 MILES	12	38
1 MILE	6	18
0.5 MILE	3	9



The areas in the gray box are the danger areas. This is based on recognition and reaction times.



## How to get additional information:

**128ARW Safety Office**  
1919 E. Grange Ave.  
Milwaukee, WI 53207  
414-944-8492  
414-944-8471

**128.ARW.SE@us.af.mil**



### Info on the Web

- AOPA Safety Advisors and Safety Briefs (Collision Avoidance):  
<https://www.aopa.org/training-and-safety/online-learning/safety-advisors-and-safety-briefs/collision-avoidance>
- Aviation Safety Reporting System (ASRS):  
<http://asrs.arc.nasa.gov>
- Order JO 7110.65Y Air Traffic Control:  
<https://www.faa.gov/documentLibrary/media/Order/7110.65Y.pdf>
- Pilot/Controller Glossary (P/CG):  
[https://www.faa.gov/air\\_traffic/publications/media/pcg\\_8-15-19.pdf](https://www.faa.gov/air_traffic/publications/media/pcg_8-15-19.pdf)
- Aeronautical Information Manual (AIM):  
[https://www.faa.gov/air\\_traffic/publications/media/aim\\_basic\\_8-15-19.pdf](https://www.faa.gov/air_traffic/publications/media/aim_basic_8-15-19.pdf)
- FAA Regulations and Policies:  
[https://www.faa.gov/regulations\\_policies/](https://www.faa.gov/regulations_policies/)
- Federal Aviation Regulations:  
[https://www.ecfr.gov/cgi-bin/text-idx?&c=ecfr&tpl=/ecfrbrowse/Title14/14tab\\_02.tpl](https://www.ecfr.gov/cgi-bin/text-idx?&c=ecfr&tpl=/ecfrbrowse/Title14/14tab_02.tpl)
- FAA Aviation Safety Program:  
[http://www.faa.gov/aviation\\_safety/](http://www.faa.gov/aviation_safety/)
- National Transportation Safety Board (NTSB) Aviation Database:  
[https://www.nts.gov/\\_layouts/nts.gov/aviation/index.aspx](https://www.nts.gov/_layouts/nts.gov/aviation/index.aspx)
- Flight Standards District Offices:  
[https://www.faa.gov/about/office\\_org/field\\_offices/fsdo/](https://www.faa.gov/about/office_org/field_offices/fsdo/)

## Where do KC-135's fly in the Midwest?

Here is where we typically fly in the Midwest to practice our approaches and landings...

Alpena County Regional  
<https://alpenairport.com/>

Duluth International Airport  
<http://www.duluthairport.com/>

Sawyer International Airport  
<http://www.sawyerairport.com/>

General Mitchell International Airport  
<http://www.mitchellairport.com/>

Gerald R. Ford International Airport  
<http://www.flygrandrapids.org/>

Madison Dane County Regional Airport  
<https://www.msairport.com/>

Chicago Rockford International Airport  
<https://flyrfd.com/>

Volk Airbase, WI  
<http://www.volkfield.ang.af.mil/>

Green Bay Austin Straubel International Airport  
<https://www.flygrb.com/>

General Wayne A. Downing Peoria International Airport  
<https://www.flypia.com/>

Quad City International Airport (Moline)  
<https://www.qcairport.com/>

Grissom Air Reserve Base  
<https://www.grissom.afrc.af.mil/>

Lincoln Airport  
<https://www.lincolairport.com/>

Sioux Gateway Airport  
<https://flysux.com>



# Some of the airports in the local area of KMKE that have significant Jet traffic, FAA Part 135 Operations, Corporate, or Flight Training....

- KMWC– Timmerman 11.5 n.m.
- KUES- Waukesha 16.0 n.m.
- KENW– Kenosha 21.1 n.m.
- KRAC– Racine 11.7 n.m.
- KETB– West Bend 30.3

