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MID-AIR'S ABOVE POLICE / ACCIDENT SCENES

Research Request:

The airspace above a police or accident scene pose varying levels of risk and complexity. Looking at what factors are involved, how risk can be mitigated and through what controls, is some of the topic items discussed in this report. Each agency should consider completing a thorough risk assessment of their local airspace and look at what controls and procedures are currently in-place and what can be improved upon.

Disclaimer:

This research brief should be used as informational purposes to help your organization development counter measures to prevent accidents and incidents above law enforcement and ground emergency scenes. This report will provide suggestions and best practice techniques which should be properly evaluated by your management prior to use or implementation.

Background:

Mid-air collisions of aircraft normally produce very devastating results and our main line of defense for mid-airs are; TCAS if onboard the aircraft, "see and avoid," de-confliction and separation from ATC and by using CTAF or pre-arranged agency frequencies.

See and avoid is our primary means for avoiding mid-airs and we need to understand what limits two pilots flying their aircraft at the same speed encounter when it comes to "seeing and avoiding" the other aircraft. The flight environment they must scan includes an entire 180-degree hemisphere—from 90 degrees out to the sides, above and below—to directly ahead. But there are blind areas beneath the cabin floor, above its ceiling and behind the wings or airframe. Additionally, scanning for traffic usually is limited in practice to the area directly ahead or fixed below at the target, perhaps within a 60-degree visual cone. This is a habit we've learned from years of driving on relatively narrow, well-defined roads and through intersections where all relevant traffic is clearly visible, more or less dead ahead of us.

An environment with other aircraft flying the same speed as you is the most dangerous and difficult situation for visually acquiring and avoiding them. This primarily is because of the blind spots above and beneath your cockpit, but also because of the very large scan-demand angle (the 180-degree forward hemisphere). Looking at human factors we will also see that the demand to monitor targets on the ground while also ensuring we comply with, see and avoid, and communicate with aircraft and ground units can place a very high demand on crews and its inevitable that one of these tasks will not get the resources needed from the crew. Most importantly though the old adage of "Aviate, Navigate and Communicate" is most fundamental.

On the next page we will take a look at a high profile accident that occurred in Phoenix, Arizona in 2007.

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Accident Report

On July 27, 2007, about 1246 mountain standard time, two electronic news gathering (ENG) helicopters, N613TV and N215TV, collided in midair while maneuvering in Phoenix, Arizona. The Eurocopter AS350B2 helicopters, from local channels 3 and 15, had been covering a police pursuit. N613TV, the channel 3 helicopter, was operated by KTVK-TV, and N215TV, the channel 15 helicopter, was operated by U.S. Helicopters, Inc., under contract to KNXV-TV.

After receiving a report of a police pursuit of a suspect who had reportedly stolen a pickup truck and backed it into a police car after being pulled over, the channel 15 helicopter departed Scottsdale Airport (SDL), Scottsdale, Arizona, about 1222. According to the air traffic control (ATC) transcript, about 1226:08, the channel 15 pilot contacted the air traffic control tower (ATCT) at Phoenix Sky Harbor International Airport (PHX), Phoenix, Arizona; advised that he had automatic terminal information system (ATIS) information "Kilo"; and requested to enter the tower's class B airspace via "Sharp Echo." A controller at the local control north position responded to the channel 15 helicopter pilot, stating "proceed via Sharp Echo as requested, say altitude and destination." The pilot advised that his helicopter was "going to be heading downtown … eighteen hundred feet [mean sea level (msl)] … to intercept the police chase." About 1229:03, the channel 15 pilot advised the controller that his helicopter would be climbing to 2,000 feet to get out of the way of the police helicopter following the pursuit, which was operating at 1,900 feet at the time, and the controller acknowledged this transmission.

The channel 3 helicopter departed SDL about 1232 to cover the police pursuit. The ATC transcript indicated that the channel 3 helicopter pilot contacted the ATCT about 1236:41 and informed the controller, about 10 seconds later, "Sharp Echo … going where the other helicopters are over there." The controller responded, "radar contact, proceed via Sharp Echo as requested."

In addition to the channel 3 and 15 helicopters and the police helicopter, three other ENG helicopters were operating in the airspace over the police pursuit.

Along with their flying duties, the channel 3 and 15 pilots were responsible for reporting information about the event while airborne. (The channel 3 and 15 photographers were responsible for operating a remotely mounted video camera to show the event as it unfolded.) The transmissions over the air-to-air frequency about 1242:25 and 1242:28 were the last times that the channel 3 and 15 pilots coordinated their helicopter‟s position or their intentions with each other. (These transmissions occurred about 4 minutes before the collision.)

The occupants on board both helicopters were killed, and the helicopters were destroyed by impact forces and post-crash fire. The helicopters were operating under the provisions of 14 *Code of Federal Regulations* Part 91. No flight plans had been filed. Visual meteorological conditions prevailed at the time of the accident.

The National Transportation Safety Board determines that the probable cause of this accident was both pilots‟ failure to see and avoid the other helicopter. Contributing to this failure was the pilots‟ responsibility to perform reporting and visual tracking duties to support their station's ENG operation. Contributing to the accident was the lack of formal procedures for Phoenix-area ENG pilots to follow regarding the conduct of these operations.

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Procedures, Techniques and Training to prevent Mid-Air Accidents

When a organization looks at how they can prevent mid-air accidents one could create the following categories that emphasis should be given to:

1. Crew-Member Training
2. Aircraft Equipment
3. Organizational airspace agreements with the FAA / ATC
4. Flight and Communication Procedures
5. Policies & Procedures for enacting a TFR or creating restricted airspace

When looking at the above items one should note that items 1 and 4 should already be part of your annual flight training and proficiency program. Although these items may be over-looked, its very important to review these training items and look at improving these based off any changes to the operating environment, mission or hazard reports of NMAC (Near Mid-Air Collisions). Including ground units into the communication training program is another way of improving the safety of the crew. When concise information is being transferred back and forth between the supported units and air, the work load of the aircrew will be less and will provide for better decision making and focus. Outside of training ground units, the thought of having a collaborative training with other aviation agencies / operators, and with the local ATC operators is another great way to ensure everyone is on the same sheet of music when a mission appears that requires a quick response and a lack of time to coordinate airspace. Mid-Air Collision prevention training should be broken down into the following groups:

1. Flight Crew Training
2. Ground Unit Training
3. Local Outside Agency Training (ATC, Other local Agencies, Operators of News and EMS aircraft)

The training program should focus on Scanning Techniques, Aircraft Recognition, Communication Procedures, Air Crew Coordination, Radio Discipline, Air-space Familiarization, Review of any letters of agreement and review of all frequency uses, procedures and agreements.

This report is broken down into the 5 different areas mentioned above and provides guidance for understanding how these areas can proactively prevent mid-air collisions.

On the following page is excerpts of the FAA Advisory Circular (AC-90-48C) *Pilots Role in Collision Avoidance*

Which is a great training aid for air-crew members.

FAA Advisory Circular AC-90-48C *Pilots Role in Collision Avoidance*

Below are some key points from the Advisory Circular:

A. "See and Avoid" Concept.

(1) The flight rules prescribed in Part 91 of the Federal Aviation Regulations (FAR) set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained at all times, by each person operating an aircraft, regardless of either the operation is conducted under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).

(2) Pilots should also keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of aircraft being flown. Remember that most MAC accidents and reported NMAC incidents occurred during good VFR weather conditions and during the hours of daylight.

B. Visual Scanning.

(1) Pilots should remain constantly alert to all traffic movement within their field of vision, as well as periodically scanning the entire visual field outside of their aircraft to ensure detection of conflicting traffic. Remember that the performance capabilities of many aircraft, in both speed and rates of climb/descent, result in high closure rates limiting the time available for detection, decision, and evasive action.

(2) The probability of spotting a potential collision threat increases with the time spent looking outside, but certain techniques may be used to increase the effectiveness of the scan time. The human eyes tend to focus somewhere, even in a featureless sky. In order to be most effective, the pilot should shift glances and refocus at intervals. Most pilots do this in the process of scanning the instrument panel, but it is also important to, focus outside to set up the visual system for effective target acquisition.

(3) Pilots should also realize that their eyes may require several seconds to refocus when switching views between items in the cockpit and distant objects. Proper scanning requires the constant sharing of attention with other piloting tasks, thus it is easily degraded by such psychophysiological conditions such as fatigue, boredom, illness, anxiety, or preoccupation.

(4) Effective scanning is accomplished with a series of short, regularly-spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed 10 degrees, and each area should be observed for at least 1 second to enable detection. Although horizontal back-and-forth eye movements seem preferred by most pilots, each pilot should develop a scanning pattern that is most comfortable and then adhere to it to assure optimum scanning.

C. Clearing Procedures.

Execute appropriate clearing procedures before all turns, abnormal maneuvers, or acrobatics.

The complete FAA AC 90-48C can be found at: http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC90-48c.pdf

Aircraft Equipment to alert and prevent mid-air's

Anti-Collision Lights

To fulfill the Federal Aviation Regulation (FAR) requirements, the anti-collision lighting system must create a flash rate of between 40 and 100 flashes per minute at 360° around the aircraft's vertical axis and also cover an area within 75° above and below the horizontal plane. In overlapping areas, not more than 180 flashes per minute are permitted. The minimum effective intensity is 400 candelas along the aircraft's horizontal plane. Each anti-collision light must be Aviation Red or White – depending on the location of the units.

LED lights are considered a safer and more efficient option. Advantages of the new LED system include weight, power savings, longer lifetime, higher reliability and significantly reduced maintenance effort in comparison to the previous anti-collision lighting.

TCAS

There is no doubt that the TCAS display rapidly becomes one of the more important instruments in the cockpit. A **traffic collision avoidance system** or **traffic alert and collision avoidance system** is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder, independent of air traffic control, and warns pilots of the presence of other transponder-equipped aircraft which may present a threat of mid-air collision (MAC) The enhanced situational awareness provided by TCAS allows the pilots to concentrate on flying and operating the aircraft with higher levels of confidence and safety than would be possible with other systems. One major limitation to this equipment is that the other aircraft most have a transponder to interrogate.

ADS-B

Automatic dependent surveillance – broadcast (**ADS–B**) is a cooperative surveillance technology in which an aircraft determines its position via satellite navigation and periodically broadcasts it, enabling it to be tracked. The information can be received by air traffic control ground stations as a replacement for secondary radar. It can also be received by other aircraft to provide situational awareness and allow self separation.
ADS–B is "automatic" in that it requires no pilot or external input. It is "dependent" in that it depends on data from the aircraft's navigation system

Organizational airspace agreements with the FAA / ATC

When Special Use Airspace (SUA), Military Training Routes (MTR), Slow Routes (SR), and/or Low Altitude Tactical Navigation (LATN) Areas are located over lands within an agency's jurisdiction or within their area of normal flight operations (fire or nonfire), the agency should consider instituting an agreement with the appropriate DoD entity.

An airspace agreement will have a name depending on its purpose. The FAA and DoD frequently enter into LOAs (Letters of Agreement) which specify airspace responsibilities. Other agencies utilize MOUs (Memorandums of Understanding) and IAs (Interagency Agreements) to facilitate cooperation between agencies. Agency Aviation Managers should work closely with their Agency Agreement Specialists to ascertain they are following specific agency protocol for agreements and utilizing the proper instrument for the purpose.

Airspace agreements are usually nonmonetary and establish protocol for emergency and non-emergency contacts. It is prudent that all agencies be a party to a common airspace agreement with the DoD when land management or wildland firefighting agencies share or overlap boundaries within jurisdictions that underlie DoD managed or assigned airspace. Use and coordination with DoD Military Representatives, as well as the appropriate agency Aviation Managers, is highly recommended.

The agreement should be signed by the appropriate level of authority within the land management agency (consult with agency procurement office and/or agreement specialist). The commander of a military unit is the responsible agent in these documents. Though others within the unit may be identified for particular tasks, the commander is the signatory. If that person doesn't agree to support the agreement, none of the units assigned to the commander will be bound to execute its terms.

Airspace agreements provide local level leadership a tool within the interagency cooperative process to define protocols that consistently address recurring activities, coordination of time critical responses and resolving unforeseen issues of mutual concern.

In addition to establishing procedural protocol for deconflicting airspace or coordinating TFRs, the airspace agreement identifies each agencies specific responsibilities. This is particularly important in providing continuity when either local level resource management agency or DOD leadership changes. This Guide provides a wide array of cooperative methods and processes for local leadership to tailor agreements in order to meet their specific area's interagency challenges. Airspace agreements should sufficiently define responsibilities, methods, procedures and local points of contact (POCs).

For more information, review the interagency coordination guide that can be found at:
http://www.airspacecoordination.org/guide/Chapter12.pdf

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Pre-Mission and enroute planning

Below is an example of how a pre-arranged agreement and pre-mission coordination could have prevented the below report.

Narrative:

While responding on a law enforcement mission in a state aircraft to a location near a towered airport below Class B airspace, we set up an orbit over the location of the report at 4,500 FT MSL. We later discovered that half of our orbit was inside the Class B airspace and the other half of the orbit was clear of controlled airspace. After departing the primary airport, and being given a heading to turn southbound, Tower handed us to TRACON. We had climbed to 4,500 FT MSL before we had an opportunity to check in with TRACON and advised TRACON that we were at 4,500 FT and requesting direct to the scene (approximately 15 miles southeast of our current position). TRACON advised we were clear of the Bravo and to squawk 1200. Approximately 10 miles west of ZZZ we contacted ZZZ Tower and advised we were at 4,500 FT and would be over their airspace (top of ZZZ Class D airspace is 3,000) and were calling as a courtesy. After approximately 10 minutes, ZZZ Tower asked if we were still monitoring their frequency and to call TRACON. We did so and TRACON advised that we had been flying into and out of a slice of the Class B airspace based on our altitude of 4,500 FT. The section of airspace that we were clear of became controlled at 5,000 FT (the airspace we were in after being instructed to squawk 1200 after our initial call to TRACON after departing.) Of note: We use commercially available geo-referenced iPad software to show aircraft position over an electronic sectional chart. Before departing, a direct route was plotted from our hangar to ZZZ. The software displayed a solid magenta line. That magenta line showing the direct course, aligned perfectly with the Class B airspace boundary that marked the Class B floor change from 5,000 FT MSL to 4,500 FT [4,000] MSL. This magenta line obscured the Class B boundary line that we ended up flying over during our orbit(s). After contacting TRACON, we asked for and received a squawk and clearance, and remained on scene until released by ground officers. Continued vigilance of airspace altitude changes, with respect to locating our ground target (visually) is required to prevent a repeat occurrence. Asking TRACON for continued flight following, instead of accepting their request to squawk 1200 during the initial call to TRACON and not plotting a direct course that obscured the airspace boundary would have aided in preventing this occurrence.

Synopsis

C210 pilot reports inadvertently orbiting in and out of Class B airspace on a law enforcement mission. An iPad was being used for navigation and a magenta course line from the departure airport to the scene coincided with and obscured a line denoting a Class B floor change from 5,000 FT to 4,000 FT.

Flight and Communication Procedures

Having standardized phraseology and procedures will help flight crews have a set of tools to smoothly communicate and respond accordingly. All crew members should be versed in air crew coordination and know how to call out traffic along with ensuring each member performs their actions correctly.

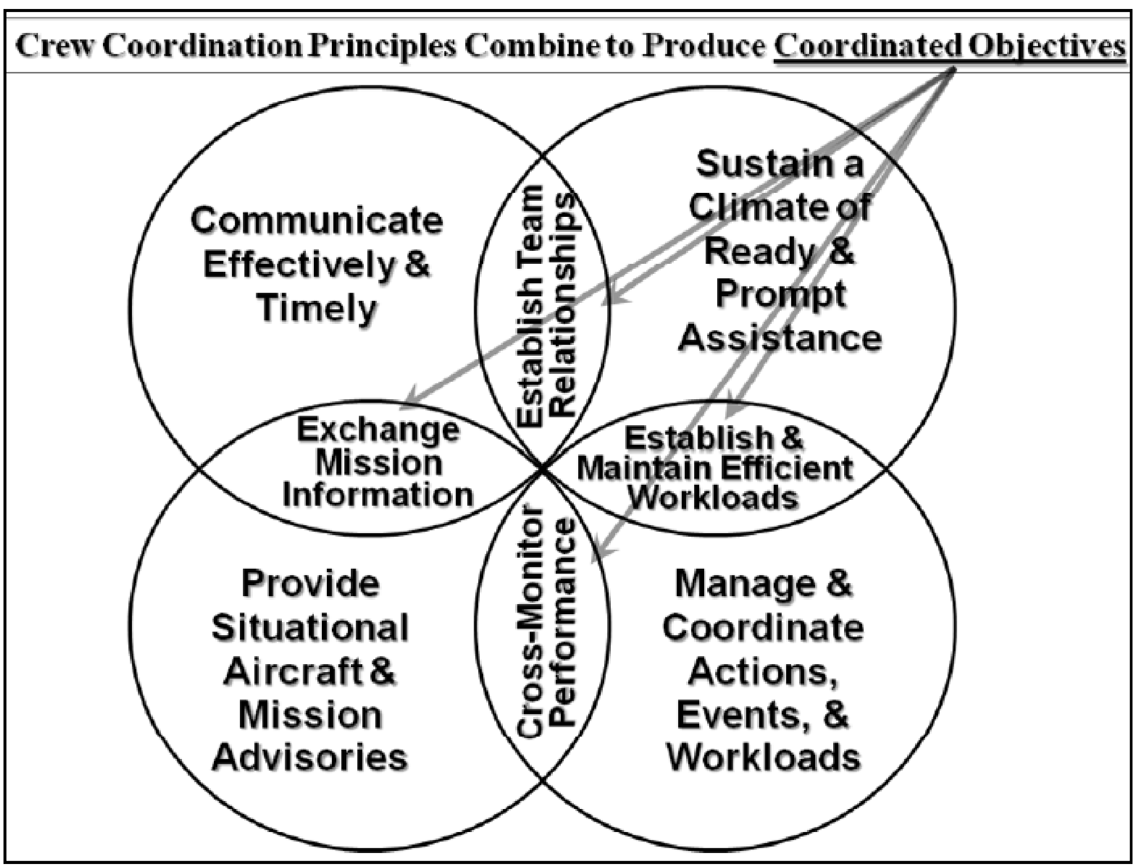
When calling out traffic in the cockpit, follow a simple guideline:

1. **Announce that you see traffic.**
2. **Provide location, type, color and any other identifiable characteristics.**
3. **Lastly monitor traffic and advise of any actions that need to be taken to avoid impact.**

Example: (Traffic, 10 o'clock, same altitude, moving left to right, looks like a small Cessna, lets turn left slightly to stay clear.)

Outside of calling out traffic, it is very important to assign sectors of the aircraft in which crewmembers will be responsible for monitoring. At any point where a crew member is not able to look outside, they should announce that they are "inside" the aircraft. Once this occurs, the next available crewmember should pickup the lost scan sector.

Establishing internal de-confliction procedures with associated company aircraft is advised and can also be very helpful if reviewed and confirmed during pre-mission planning. Assigning call signs, altitudes, frequencies and sectors in which each aircraft will fly are some examples of items to consider.



Flight and Communication Procedures Continued

Air-to-air communication between all airborne incident aircraft is critical to safety and effectiveness of resources. The most common choice of communication is accomplished using VHF-AM radios. Knowing which frequency to talk-on and monitor is the next step. Most organizations will have a internal, primary and secondary frequency that can be used for internal communications. Organizations should also have standardized frequency cards that pilots have available to them and located in the aircraft. Frequencies that should be listed include: All internal Air-to-air and air-to-ground frequencies, Local ATC frequencies, Local CTAF frequencies, Downtown traffic or metro frequencies, Inter-agency frequencies and other frequencies relevant to the organizations operating environment and missions.

Scene or Tactical Air Commander: The first aircraft on the scene is typically the designated airborne Commander. Their responsibilities vary by organization but for the purpose of this research brief topic, they shall coordinate all airborne aircraft separation, consciously update their location, altitude and direction of flight and assign missions and tasks as necessary. These policies and procedures should be clearly spelled out within a organization.

Entry procedures into a scene: An example is: Announce direction, altitude, type of aircraft and intent of entry 10 miles out from the scene. Monitor pre-designated frequencies and plan accordingly.

Coordination with Local ATC: It is important to have letters of agreement and keep ATC abreast of any developing situations that may require airspace to be dedicated to your flight and mission needs. ATC should provide separation and notification of any intruders that may be on course to enter your blocked airspace and can help steer aircraft clear of your operations.

Communicating with Intruders or near non-incident aircraft: The Tactical Air Commander should attempt to make radio contact with the intruder aircraft and provide information on airspace restrictions, request the intruder deviate around the airspace, or try to provide separation during emergency situations.

—COMMON FREQUENCIES—

122.750 MHz: FAA General Purpose air-to-air frequency

122.900 MHz: FAA Mulitcom frequency or common CTAF for airports without a published CTAF or tower.

Airport CTAF: Published in and on navigational maps and directories.

123.025 MHz: Helicopter EMS / Helicopter Air to Air Common Frequency

148.150 / 148.125: Civil Air Patrol National Frequency

121.5 MHz / 243 MHz: Guard / Emergency Distress Frequency

—REFERENCES—

NIFC Interagency Air Tactical Group-Supervisor's Guide: http://gacc.nifc.gov/nrcc/dispatch/aviation/ATGSguide.pdf

Policies & Procedures for enacting a TFR or creating restricted airspace

A TFR may be a suitable option for providing safe airspace above an active scene. The TFR would require prior coordination and approval from the FAA which may not be a option unless the scene continues into a two or more day event.

Title 14: Aeronautics and Space
Part 91 - General Operating and Flight Rules
§ 91.137 Temporary flight restrictions in the vicinity of disaster/hazard areas.
(a) The Administrator will issue a Notice to Airmen (NOTAM) designating an area within which temporary flight restrictions apply and specifying the hazard or condition requiring their imposition, whenever he determines it is necessary in order to—
(1) Protect persons and property on the surface or in the air from a hazard associated with an incident on the surface;
(2) Provide a safe environment for the operation of disaster relief aircraft; or
(3) Prevent an unsafe congestion of sightseeing and other aircraft above an incident or event which may generate a high degree of public interest.
The Notice to Airmen will specify the hazard or condition that requires the imposition of temporary flight restrictions.

REQUEST FOR A TEMPORARY FLIGHT RESTRICTION

DATE: ______________________ TIME: ______________________	FAA ARTCC requires phone notification. ARTCC ______________________ FAA PHONE:____________FAX:____________
Resource Order Number: ______________________ Request Number: A -_______	DISPATCH OFFICE ______________________ PERSON REQUESTING TFR: ______________ 24 HR. PHONE (No Toll Free #s) ______________

Circular Degrees Minutes Seconds Only – use zero's for seconds if unavailable

LAT/LONG of Center Point (US NOTAM OFFICE FORMAT ddmmssN/dddmmssW)	RADIUS (NM) (5 NM is standard)
N/ W	

Polygon (List perimeter points in clockwise order). For NES Input: Use the same NAVAID if possible for each point. List nearest NAVAID (distance < 50 NM) - do not use NDB or T-VOR. (For lat/long - Degrees Minutes Seconds only)

Point #	Lat/Long format **ddmmssN/dddmmssW**		Point #	Lat/Long format **ddmmssN/dddmmssW**	
1	N	W	5	N	W
2	N	W	6	N	W
3	N	W	7	N	W
4	N	W	8	N	W

NOTAM # of TFR being replaced______________________

Altitude (MSL: Only) ______________________
24 hours a day? ___________ **or** Daytime Operational Hours: (UTC) ______________to ______________
Incident TFR Duration:______________________ to ______________ (Estimate – 2 months out is ok)
Format: YYMMDDhhmm to YYMMDDhhmm

Geographic Location of Incident (NM from nearest well known location recognizable to general aviation or local town, state)
____

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Conclusion

Midair Collision Avoidance (MACA) is a subject that is gaining heightened awareness among both civilian and military aviation communities. With increasing numbers of aircraft taking flight and many airports approaching gridlock, knowledge of air traffic and airfield operating procedures becomes more vital for pilots and aircrews.

"See and avoid" is the proverb by which all aircrews must adhere regardless of operating IFR or VFR. Nonetheless, it is everyone's responsibility to visually scan for traffic at all times. Therefore, all aircraft operating in congested airspace are highly encouraged to use all available aircraft lighting, transponder, and Air Traffic Control (ATC) advisory services to the maximum extent possible.

Many pilots believe any time they hear "Radar Contact" the controller has taken over all separation responsibilities. Never are pilots exempt from seeing and avoiding traffic conflicts. When under radar contact, the controller will share the responsibility with the pilot to resolve traffic conflicts. In the air, pilots are expected to pay attention to their surroundings.

Anticipate what might happen by scanning the sky and listening to air-to-air and ATC frequencies. Know where traffic (Company or intruders) is and where you are. Most conflicts can be avoided by knowing where traffic is and where they are headed. Don't put all your trust in ATC when it comes to traffic avoidance! However, use radar services to the maximum extent possible and have a organization plan on how to quickly set-up and maintain airspace that is needed for your mission. ATC is responsible to resolve traffic conflicts and can help you safely traverse controlled airspace but your required to help notify them of your request for help and what your typical flight paths are during persuits, rescues or other situations requiring air-support.

Resources:

https://www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=6851

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Conclusion Prevention Tips

1. Clear constantly for other aircraft, both visually and over the radios.

2. Know where high-density traffic areas are.

3. Always monitor the appropriate frequencies.

4. Obtain an IFR clearance or participate in radar flight following whenever possible and continue to practice "see and avoid" at all times.

5. Under IFR control, do not count on ATC to keep you away from other aircraft. There may be VFR aircraft operating in your environment that ATC is unaware of.

6. Use landing lights at lower altitudes, especially when near airports.

7. Announce your intentions on UNICOM and use standard traffic pattern procedures at uncontrolled airfields…. Be predictable!

8. Keep your aircraft transponder turned on and adjust it to reply on both Mode 3/A and C.

9. Use the appropriate hemispherical altitudes and don't let your altitude "wander."

10. Fly at prearranged altitudes and out of busy corridors such as approach gates.

11. Keep your windscreen clean. A bug on the windscreen can obstruct other airborne aircraft coming your way.

12. Don't get complacent during instruction! Statistically, instructors are on board during 37 percent of flying accidents.

13. When flying at night, avoid white light in the cockpit. White light disrupts your night vision, even when used momentarily.

14. Beware of wake turbulence.

15. Understand the limitations of your eyes and use proper visual scanning techniques. If an aircraft appears to have no relative motion but is increasing in size, you are on a collision course.

16. Practice appropriate clearing procedures before and during all climbs, descents, and turns.

17. Be aware of the type airspace in which you intend to operate and comply with applicable rules.

18. Avoid complacency. SEE AND BE SEEN!