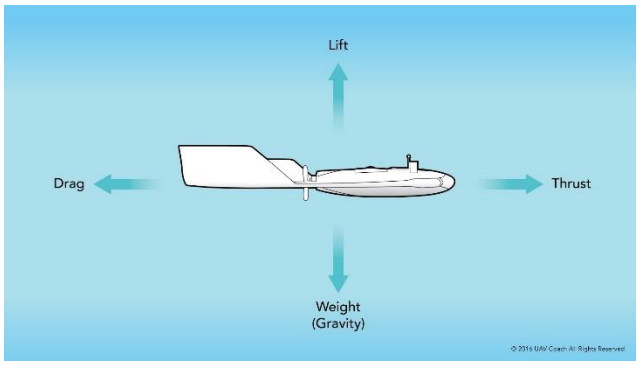
Flight Operations

- No. 1 rule is to maintain aircraft control.
- Always prepare for failure.
    - Loss of signal, birds, auto return to home and issues associated with it
- Hazardous Flight Operations examples
    - Interfering with manned aircraft
    - Improper loading
    - Flying near emergency responders
    - Flying over people
- Common Factors of UAS Accidents
    - Improper preflight prep/planning
    - Failure to maintain flight speed or directional control.
    - Failure to avoid objects.
    - Improper operation of flight controls, distance, and speed
    - Mismanagement of battery
    - Flying over unsuitable terrain
- Stay away from guy wires for towers. FAA recommends 2000 ft horizontally unless inspecting them.
- Smokestacks and cooling towers can have invisible emissions. Can be hazardous to flights.
- Unmanned balloons can have trailing wires or antennae trailing from them.
- PIC is responsible for informing others about emergency procedures.
    - UAS Failures. Aircraft. People on the ground.
    - Plan for possible failures.
    - Don't' take jobs you feel uncomfortable about.
- Emergency Maneuver may be warranted. (i.e., loss of site, birds, fly away, mechanical error, people or aircraft in the line of flight)
    - Should be prepared to take over from automated flight.
    - Land ASAP and let the adrenaline rush subside.
- Be aware of wing tip vortices that large aircraft give off.
- Aircraft control and video feed usually operate on two different frequencies. The radio control operates at 2.4 gigahertz, and the video operates at 5.8 gigahertz, generally line of sight frequencies. Some frequencies require licensing from FCC.
- LiPo battery issues
    - Store in a fireproof bag
    - Do not pack in checked baggage.
    - Watch for swollen or damaged batteries.
    - Temperatures matter
        - Store at room temp, not in a hot car or refrigerator.
        - Don't charge warm batteries.
        - Doesn't work well in cold weather (careful at -10 degrees Celsius. Could cause drawn to fail suddenly.
    - Don't overcharge or drain your batteries fully.
    - Don't leave fully charged.
- Aeronautical Decision- Making (ADM)
    - is a systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances.
        - Conduct attitude assessment before a flight
        - Learn how to recognize and cope with stress.
        - Use Vos
        - Complete a thorough preflight inspection.

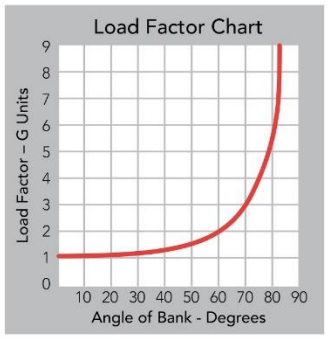
        - Weather, know surroundings, plan for mitigating circumstances, aircraft loading.
- Crew Resource Management (CRM) – Pilots operating in crew environments.
    - Communication Procedures (VO communicates flight status, hazards, and changing conditions to PIC)
    - Communication Methods (PIC and VO figure out methods of communication such as radios)
    - Task Management (area of operation and crewmembers needed)
    - Other resource (weather, ATC, FAA, landowners)
- Situational Awareness – PIC can lose (getting behind the aircraft) mental awareness when overtaxed.
    - Checklists can help with this situation.
- **PAVE** model to identify hazards.
    - **P** – PIC – Illness, medication, stress, alcohol, fatigue, emotion or eating
    - **A** – Aircraft – preflight check, take-off, and landing sites clear, safe conditions, equipment attached securely
    - **V** – Environment – weather, can I fly in conditions, have an "out", alternative landing for emergency
    - **E** – External Pressures – Stressed or anxiety, pressure, unhealthy safety culture, Standard Operating Procedures in place for safety, honesty with self about abilities
- **DECIDE** model – used to continually evaluate for risks and hazards.
    - **D**etect – the fact that a change has occurred.
    - **E**stimate – the need to react to or counter the change.
    - **C**hoose – a desirable outcome for the flight or situation.
    - **I**dentify – actions to control the change successfully.
    - **D**o – take the necessary actions.
    - **E**valuate – the effects of the action to react to or counter the initial change.
- Hazardous Attitudes – they will ask for the antidotes for these as well.
    - Anit-Authority – "Don't tell me."
    - Impulsivity – "Do it quickly."
    - Invulnerability – It won't happen to me."
    - Machismo or Macho – "I can do it."
    - Resignation – "What's the use?"
- Forces on Flight
    - Thrust – Power
    - Drag – Friction
    - Weight – Gravity
    - Lift
    - In a straight-and-level, unaccelerated flight, lift equals weight and thrust equals drag.



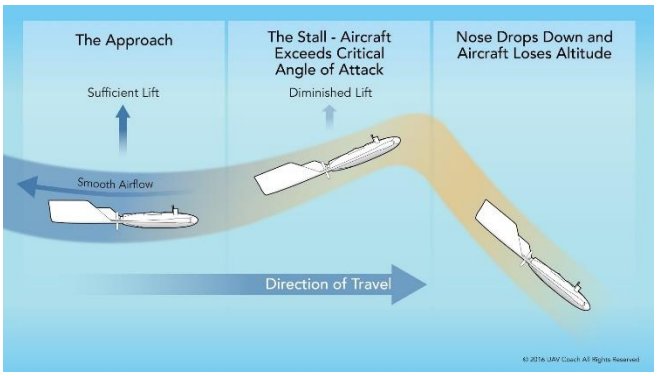
- Effect of loads on drone
    - Know the load limits of your UAS – user manual.
    - Higher density altitude (higher elevations, temps, and humidity) lessens maximum gross takeoff weight.
    - Consider the takeoff area and how it can influence the drone's ability to get airborne.
    - Maneuvers other that straight and level flight will increase load factor on wings.
    - Weight changes during flight can influence aircraft performance.

- Load Factor Chart
    - Load Factor x Actual Weight of the Aircraft and its Contents = Total Load Supported by the Aircraft's Wings

Angle of Bank Φ	Load Factor n
0°	1.000
10°	1.015
30°	1.154
45°	1.414
60°	2.000
70°	2.923
80°	5.747
85°	11.473
90°	∞



- Center of Gravity – the point on your aircraft where it is balanced.
    - Adding components to your drone will change center of gravity (CG)
    - Will change performance at both low and high speeds. Hover after takeoff to check for stability.
        - A change to the rear of the craft will make craft harder to control (fly)
    - Follow load instructions according to UAS manual
    - Overloaded plane deficiencies:
        - Higer takeoff speed
        - Longer takeoff run
        - Reduce rate and angle of climb
        - Lower maximum altitude
        - Shorter range
        - Reduced cruising speed
        - Reduced maneuverability
        - Higher stalling speed -smaller gap between max speed of plane and stall speed
        - Higher approach and landing speed
        - Longer landing roll
        - Excessive weight on the nosewheel or tailwheel
    - Stalls happen when you exceed the critical angle of attack



- Maintenance
    - Under Part 107, an sUAS must be maintained in a condition for safe operation. And that responsibility lies with the remote pilot-in-command, who should conduct a check of the sUAS and verify that it is in fact in a condition for safe operation prior to each flight.
        - Document any repair, modification, overhaul, or replacement of a system component resulting from normal flight operations. This should be accomplished with either a written or online maintenance log for each of your sUAS.
        - Record the time-in-service for that component at the time of the maintenance procedure.
    - KEEP A LOG OF FLIGHTS AND MAINTENANCE
    - Use a pre-flight checklist to inspect the craft for issues.
- Remote ID
    - Must comply by Sept 16, 2023
    - Not required for drones under .55 lbs. and used recreationally.
    - Needed for any drone used as Part 107
    - Three ways to meet the requirement.
        - Built-in
            - Must broadcast from takeoff to shut down.
            - If no longer broadcasting must land immediately
            - Must have a permanent label affixed to the drone stating it is compliant.

        - Not limited to VLOS
    - Broadcast module
        - Same requirements as Built-in but is limited to VLOS.
    - Fly in a FRIA zone (FAA-recognized identification area)
        - Don't need any registrations, licenses, or remote ID.
        - Must remain in VLOS.

Radio Communications

- Do not need a radio but could be useful.
- The standard aviation format of radio communications is:
    - Who you're calling.
    - Who you are (call sign);
    - Where you are; and
    - What you want.
- Not require or recommended to communicate on radio – requires special training.
- CTAF frequency allows pilots to talk to one-another around uncontrolled airports. Frequency is just be for the "C" in a circle in the info section for the airport on a sectional chart.

			Communication/Broadcast Procedures		
	Facility at Airport	**Frequency Use**	**Outbound**	**Inbound**	**Practice Instrument Approach**
1.	UNICOM (No Tower or FSS)	Communicate with UNICOM station on published CTAF frequency (122.7; 122.8; 122.725; 122.975; or 123.0). If unable to contact UNICOM station, use self-announce procedures on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
2.	No Tower, FSS, or UNICOM	Self-announce on MULTICOM frequency 122.9.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	Departing final approach fix (name) or on final approach segment inbound.
3.	No Tower in operation, FSS open (Alaska only)	Communicate with FSS on CTAF frequency.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	Approach com-pleted/terminated.
4.	FSS Closed (No Tower)	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
5.	Tower or FSS not in operation	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure.	10 miles out. Entering downwind, base, and final. Leaving the runway.	
6.	Designated CTAF Area (Alaska Only)	Self-announce on CTAF designated on chart or Chart Supplement Alaska.	Before taxiing and before taxiing on the runway for departure until leaving designated area.	When entering designated CTAF area.	

- Unicom frequencies are used at non-towered airports and may be identified as the CTAF. Can provide airport information.
    - When there's a non-towered airport and UNICOM isn't available, a pilot will use the 122.9 frequency to communicate.
- Automatic Terminal Information Service (ATIS)
    - Automated broadcast of recorded aeronautical information in busier airports.
- Radio communications phraseology
    - https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap4_section_2.html
- Times are usually given is Universal time (ZULU)
    - For Mountain Standard Time add 7 hours