* Minimum Controls Speed, Air (VMCA) – 86 KIAS [NATOPS 29.2.1]
  + The minimum flight speed at which the aircraft is directionally controllable as determined in accordance with Federal Aviation Regulations. The aircraft certification conditions include:
    - The critical engine inoperative and windmilling,
    - A 5° bank toward the operative engine
    - Takeoff power in operative engine,
    - Landing gear up
    - Flaps in takeoff position(s),
    - And most rearward cg
  + Furthermore, the TC-12B VMCA of 86 KIAS is based on a Standard Day at Sea Level at 12,500 lbs gross weight. For some conditions of weight and altitude, stall can be encountered at speeds above VMCA as established by the certification procedure described above, in which even stall speed must be regarded as the limit of effective directional control.
* Minimum Control Speed, Ground (VMCG) – 85 KIAS [NATOPS 29.2.1]
  + The minimum speed at which the aircraft can maintain runway centerline using rudder and ailerons (no brakes or nose wheel steering) with the loss of the critical engine and takeoff power set on the operative engine.
* Pilot in Command (PIC) Decision Making [NATOPS 27.2.2/OPNAV 3.5.1]
  + The PIC is responsible for the safe and successful accomplishment of the assigned flight.
  + Responsible for briefing crewmembers on all aspects of the flight
  + Must ensure that all preflight preparation has been accomplished.
  + Monitors progression of all tasks assigned to other crewmembers.
* Severe Weather Watches Bulletins [Primary Weather FTI 304]
  + Teletype presentations identified by the letters “WW” in the heading, that originate from the National Storm Prediction Center, and are sometimes referred to as Severe Weather Forecasts.
  + Not issued on a scheduled basis, but rather as required by the progress and development of severe weather. The forecast period is also variable, again depending on the particular weather.
  + All times are given in local time and when possible, the area of coverage is limited in size to 10,000 square miles to provide increased accuracy.
  + Aviators may also encounter a Severe Weather Forecast Alert Message (AWW), which is a preliminary message issued to alert users that a WW is being issued.

WW Format

* + - The heading of the bulletin consists of a few lines of information including the station identifier of the message originator (KXXX), the teletype identifier (WW), the date-time group of issue (181845), the bulletin number (29), and the time of issue (1245 PM CST)
    - The bulletin is arranged in several paragraphs giving such information as the area of coverage, the effective time of the watch, the expected type of severe weather, the mean wind vector, and any amplifying remarks deemed necessary.
    - Whenever possible, wording in teletype presentations is shortened by abbreviating words or phrases according to the FAA Contractions Manual. Omitting the vowels usually shortens words or phrases.

WW are issued for two types of expected severe weather conditions:

* + 1. Funnel clouds or tornadoes.
    2. Severe thunderstorms, defined by frequent lightning and one or more of the following
       1. 50 knots of wind or greater
       2. ¾ inch diameter hail or larger
  + Since WWs restrict the operation of military aircraft, aviators should always first check for WWs when beginning the flight planning process. Otherwise, you may plan a flight and fid out during the weather brief that you are unable to fly that plan.
  + The OPNAVINST 3710.7 Series restrictions for USN/USMC aircraft regarding WWs is listed as follows:

Except for operational necessity, emergencies, flights involving all-weather research projects or weather reconnaissance, pilots shall not file into or through areas the National Weather Service (NWS) has issued a WW unless one of the following exceptions applies:

* + - 1. Storm development has not progressed as forecast for the planned route. In such situations:
         1. VFR filing is permitted if existing and forecast weather for the route permits such flights
         2. IFR flight may be permitted if aircraft radar is installed and operative, thus permitting detection and avoidance of isolated thunderstorms.
         3. IFR flight is permissible in positive control areas if visual meteorological conditions (VMC) can be maintained, thus enabling aircraft to detect and avoid isolated thunderstorms.
      2. Performance characteristics of the aircraft permit an en route flight altitude above existing or developing severe storms.

Note: Only a qualified forecaster can make the determination as to whether storm development has progressed as forecast.

* + The Chief of Naval Air Training (CNATRA) may also issue warnings in the form of a CNATRA Aviation Weather Warning (CAWW) for the local operating areas in the absence of WWs and/or SIGMETs and when conditions warrant such action.
    - These warnings will be issued when one or more of the following criteria have been reported, detected by radar, or are imminently expected within 100 miles of the station and WW coverage is inadequate or nonexistent:
      * Embedded Thunderstorms
      * Severe Thunderstorms
      * Tornadoes
    - When flying aircraft under operational control of CNATRA, pilots are prohibited from filing into areas covered by a CAWW in the same manner as if a WW had been issued.

Convective SIGMET (WST) [Primary Weather FTI 307]

* + Issued only for thunderstorms and related convective phenomena (as described below) over the conterminous US.
  + Appended to each WST is an outlook valid for up to four hours beyond the end of the WST.
  + They are not scheduled, but rather issued as needed, when any of the following occurs and/or is forecast to occur for more than 30 minutes of the valid period regardless of the size of the area affected:
    - Tornadoes
    - Lines of thunderstorms
      * At least 60 miles long with thunderstorms affecting at least 40 percent of its length.
    - Embedded thunderstorms
      * Occurring within and obscured by haze, stratiform clouds, or precipitation from stratiform clouds.
      * Avoidance by visual or radar detection of the thunderstorms could be difficult or impossible.
    - Thunderstorm areas greater than or equal to thunderstorm intensity of four or greater with an area coverage of 40% or more
    - Hail greater than or equal to ¾ inch in diameter or greater
    - Wind gusts to 50 knots or greater
* Wake Turbulence [AIM 7.3]
  + Every aircraft generates a wake while in flight. This disturbance is caused by a pair of counter-rotating vortices trailing from the wing tips.
  + The vortices of larger aircraft pose problems to encountering aircraft, for instance, the wake can impose rolling moments exceeding the roll-control authority of the encountering aircraft.
  + Vortex Generation
    - The pressure differential [above and below the wing] triggers the roll up of the airflow aft of the wing resulting in swirling air masses trailing downstream of the wing tips.
    - Most of the energy is within a few feet of the center of each vortex, but pilots should avoid a region within about 100 feet of the vortex core.
  + Vortex Strength
    - The strength of the vortex is governed by the weight, speed, and shape of the wing.
    - The vortex characteristics of any given aircraft can also be changed by extension of flaps or other wing configuring devices, as well as by change in airspeed.
    - However, as the basic facto is weight, the vortex strength increases proportionately.
    - The greatest vortex strength occurs when the generating aircraft is HEAVY, CLEAN, and SLOW.
  + Vortex Behavior
    - Vortices are generated from the moment aircraft leave the ground.
    - Vortex circulations is outward, upward around the wing tips when viewed from either ahead or behind the aircraft.
    - Vortices remain spaced a bit less than a wingspan apart, drifting with the wind, at altitudes greater than a wingspan from the ground.
    - Vortices of larger aircraft sink at a rate of several hundred feet per minute, slowing their descent and diminishing in strength with time and distance behind the generating aircraft.
    - When vortices of larger aircraft sink close to the ground, they tend to move laterally over the ground at a speed of 2 or 3 knots.
  + Vortex Avoidance
    - Landing behind a larger aircraft – same runway
      * Stay at or above the larger aircraft’s final approach flight path – note it’s touchdown point and land beyond it.
    - Landing behind a larger aircraft – when parallel runway is closer than 2,500 feet
      * Consider possible drift to your runway. Stay at or above the larger aircraft’s final approach flight path and note it’s touch down point.
    - Landing behind a larger aircraft – crossing runway
      * Cross above the larger aircraft’s flight path
    - Landing behind a departing larger aircraft – same runway
      * Note the larger aircraft’s rotation point – land well prior to rotation point
    - See AIM for other scenarios
* Reduced Vertical Separation Minimum (RVSM) [AIM 4.6 / Online]
  + The goal of RVSM is to reduce the vertical separation above flight level (FL) 290 [thru FL 410] from the 2000-ft minimum to 1000-ft minimum. This allows aircraft to safely fly more optimum profiles, gain fuel savings and increase airspace capacity.
  + Applies to the lower 48 states of the United States, Alaska, Atlantic and Gulf of Mexico High Offshore Airspace and the San Juan FIR.
  + RVSM enhances ATC flexibility, mitigates conflict points, enhances sector throughput, reduces controller workload and enables crossing traffic.
  + Operators gain fuel savings and operating efficiency benefits by flying at more fuel efficient flight levels and on more user preferred routings.
* Course Deviations for Weather
  + When needing to deviate for weather, request course or altitude deviations with the controlling agency.
  + When unable to reach the controlling agency (due to lost communications, or heavy radio traffic) FAR/AIM says to deviate and notify ATC as soon as possible.
* Weight & Balance Form F [NATOPS 26/SOP]
  + Basic Weight is that weight that includes all fixed operating equipment, unusable fuel, and engine oil.
    - The term “basic weight” when qualified with a word indicating the type of mission, such as basic weight for personnel transport, basic weight for ferry, etc., may be used in conjunction with directives stating what the equipment shall be for these missions.
  + Operating Weight is the basic weight of the aircraft, plus the weight of the crew and all equipment required for the mission, excluding the weight of fuel or payload.
  + Gross Weight is the total weight of an aircraft and it’s content.
    - The takeoff gross weight is the operating weight plus the variable and expendable load items that vary with the mission.
    - The landing gross weight is the takeoff gross weight minus the expended load items.
  + Reference Datum is an imaginary vertical plane at or forward of the nose of the aircraft from which all horizontal distances are measured for balance purposes.
  + Arm is the horizontal distance in inches from the reference datum to the cg of the item.
  + Moment is the weight of an item multiplied by its arm.
    - Moment divided by a constant is generally used to simplify balance calculations by reducing the number of digits. For the TC-12B, inches and moment/100 have been used.
  + Average Arm is the arm obtained by adding the weights and adding the moments of a number of items and dividing the total moment by the total weight.
  + Basic Moment is the sum of moments of all items making up the basic weights.
  + Center of Gravity (cg) is the point about which and aircraft would balance if suspended.
    - It’s distance from the reference datum is found by dividing the total moment by the gross weight of the aircraft.
  + Cg Limits are the extremes of acceptable forward or aft cg location.
    - The cg of the loaded aircraft must be within these limits at takeoff, in the air, and on landing.
  + Form F [NATOPS 26.8]
    - The summary of the actual disposition of load in the aircraft for a particular flight. It records the weight and balance status of the aircraft step-by-step through out the flight.
    - It serves as a worksheet on which the weight and balance technician records the calculations and an corrections that must be made to ensure the aircraft will be within weight and cg limits throughout the flight.
    - If also serves as the record that weight and balance were determined to be acceptable for the flight. It is necessary to complete Form F prior to flight whenever an aircraft is loaded in a manner for which no previous valid Form F is available.
  + We are required to do a new weight & balance when carry 5 passengers or more than 410 lbs of cargo (per SOP).
* Land As Soon As Possible [NATOPS Preface]
  + Land at the first landing site at which a safe landing may be made.
* Land As Soon As Practicable [NATOPS Preface]
  + Extended flight is not recommended. The landing and duration of flight is at the discretion of the pilot in command.
* Student Brief CRM Case Study
* Threat and Error Management
  + A systems approach to aviation safety originally developed by human factors researchers at the University of Texas.
* CRM Seven Skills/Callouts [NATOPS 27.4]
  + CRM is the responsibility of the Pilot In Command (PIC). The PIC is responsible for the successful completion of any assigned mission. Utilizing each crewmember to his/her full capacity ensures good crew resource management.
  + CRM is intended to improve the mission effectiveness of all aviation communities by enhancing crew coordination through increased awareness of associated behavioral skills. Practicing CRM principles will improve mission effectiveness and reduce mishaps that result from poor crew coordination and human error.
  + The seven CRM Skills:
    - Decision-Making
      * Ability to use logical and sound judgment based on the information available.
    - Assertiveness
      * Willingness to actively participate and the ability to state and maintain your position, until convinced by the facts (not the authority or personality of another) that your position is wrong.
    - Mission Analysis
      * Ability to make long-term and contingency plans and to coordinate, allocate, and monitor crew and aircraft resources.
    - Communication
      * Ability to clearly and accurately send and acknowledge information, instructions, or commands and provide useful feedback.
    - Leadership
      * Ability to direct and coordinate the activities of other crewmembers and to encourage the crew to act together as a team.
    - Adaptability/Flexibility
      * Ability to alter course of action to meet situational demands, to maintain constructive behavior under pressure, and to interact constructively with crewmembers.
    - Situational Awareness
      * Cognizance of what is happening in the cockpit and the in the mission, and knowledge of how that compares with what is suppose to be happening.
  + For Standard CRM callouts reference NATOPS 27.6
  + The responsibility of the PIC

Operational Risk Management (ORM) [NATOPS 27.3]

* + A systematic, decision making process used to identify and manage hazards that endanger naval resources.
  + A tool used to make informed decisions by providing the best baseline of knowledge and experience available.
  + It’s purpose is to increase operational readiness by anticipating hazards and reducing the potential for loss, minimize risks to acceptable levels, reduce mishaps, lower costs, and provide for a more efficient use of resources.
  + ORM is a five step process to deal with the risks associated with military operations. The five step process:
    1. Identify hazards
    2. Assess hazards
    3. Make risk decision
    4. Implement control
    5. Supervise
  + A matrix can be used as a tool to accomplish the steps of the process. A matrix does provide a consistent framework for evaluating risks.
  + A Risk Assessment Code (RAC) defined by the matrix represents the degree of risk associated with the hazard. The RAC is an expression of risk, which combines the elements to hazard severity and mishap probability.
  + The ORM process is utilized on three levels based upon time assets available. In the environment one should be able to employ this time-critical process to make sound and timely decisions that generate tempo and facilitate decisive results. The three levels are as follows:
    - Time-critical – A quick mental review of the five-step process in a time compressed situation (ex. In flight mission/situation changes).
    - Deliberate – Experience and brainstorming are used to identify hazards and is best done in group (ex. Planning of upcoming operations/damage control or disaster response planning.
    - In-depth – More substantial tools are used to thoroughly study the hazards and their associated risk in complex operations (ex. Development of tactics/training).
  + The ORM process is guided by and incorporates the follow four principles:
    - Accept risk when benefits outweigh the cost.
    - Accept no unnecessary risk.
    - Anticipate and manage risk by planning
    - Make risk decisions at the right level.
  + The ORM process provides an additional tool to use in reducing risks inherent in military operations. Hazards should be identified, risk assessed, and controls developed and implemented during the earliest planning stages.
* Completed Instrument Rating Request form 3710/2 [OPNAV 13]