

Unit 2. Mission Planning Fundamentals

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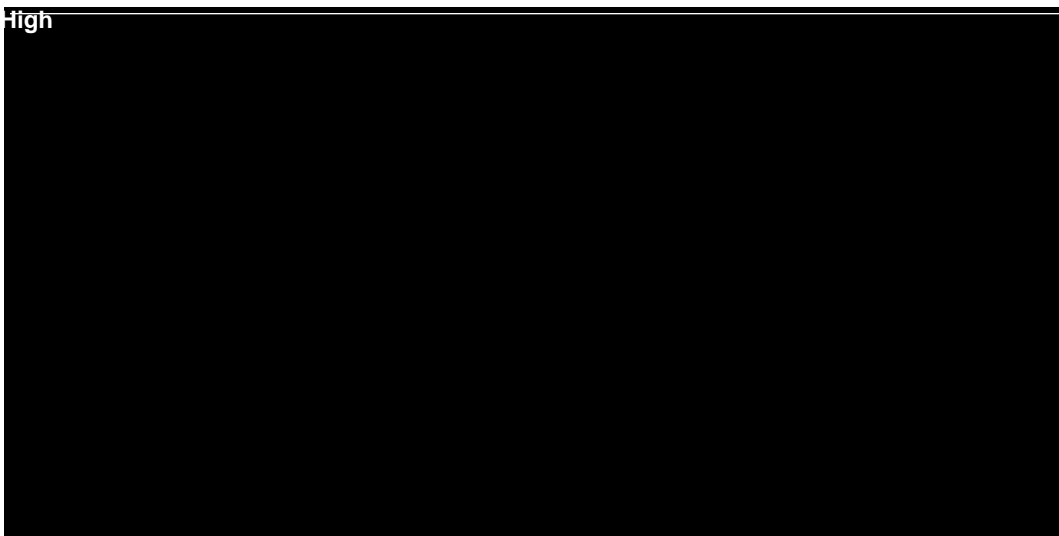
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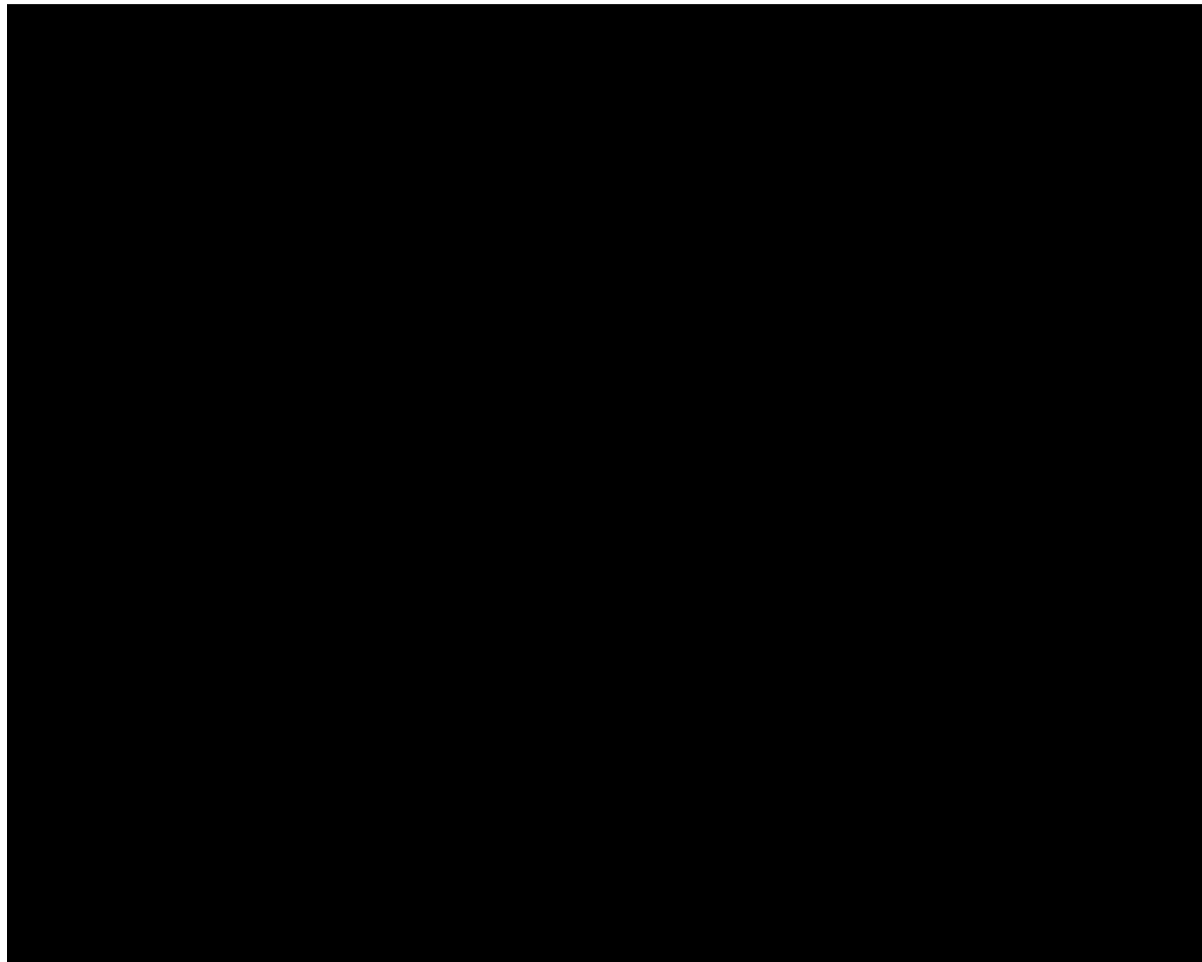
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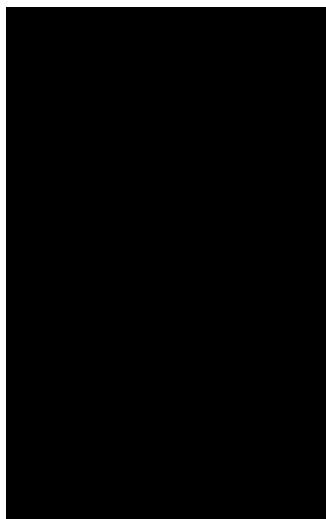
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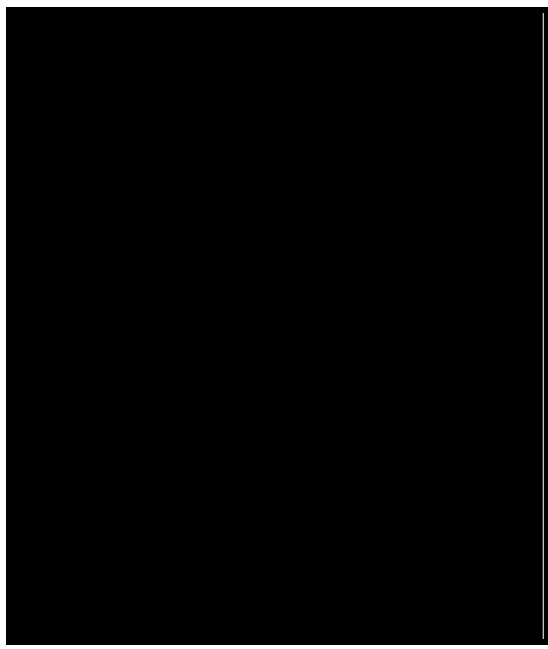
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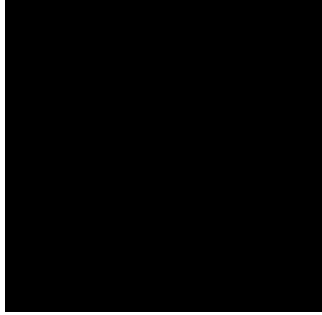
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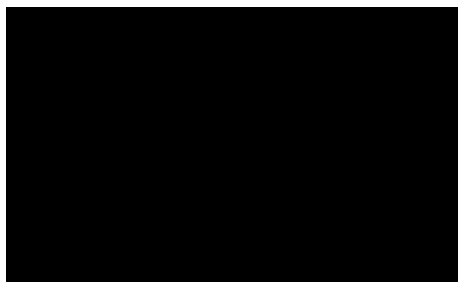
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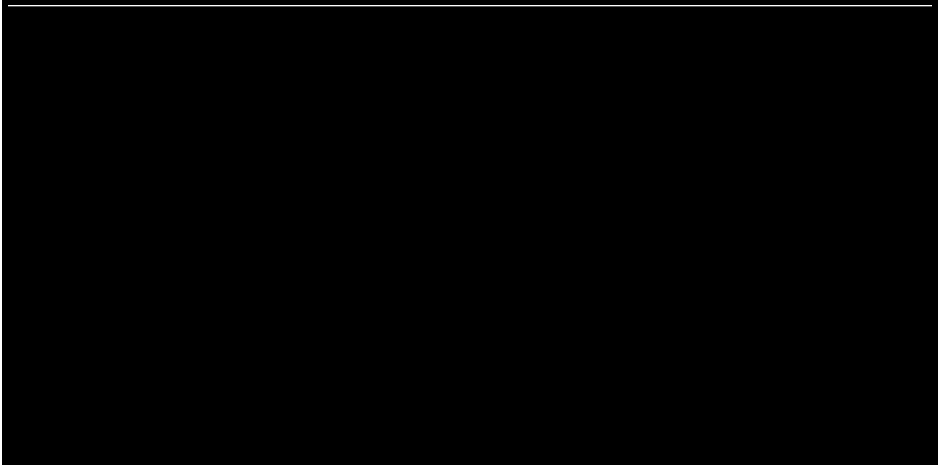
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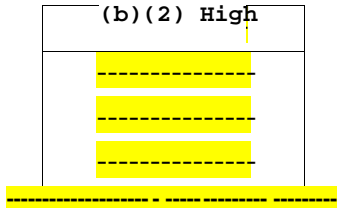
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2-3. Targets Materials

Targets materials supporting combat air missions.

Combat Mission Folders (CMF)

With regard to mission planning, one point cannot be overemphasized. The objective is to provide the information necessary for the aircrew to get to the assigned target, successfully perform the assigned mission, and get back home again.

The previous lessons in this course have dealt with everything from general mission planning factors to mission briefings and debriefings, and everything in between.

As you have seen, mission planning takes a lot of work and generates a lot of material. The question is, "How do we make sure all the material is managed efficiently and gets to the aircrew(s) intact?" The answer is the combat mission folder.

CMFs are combined and assembled collections of target materials and intelligence data. They are designed to give the aircrew all of the materials and data they need to plan, study, and execute their assigned missions. Intelligence personnel must be experts in CMF compilation.

In regard to combat mission folders, this lesson will cover general considerations, CMF mission preparation section (MPS), CMF combat mission section (CMS), symbology, annotations, and terminology.

417. Understanding guidelines for the preparation of combat mission folders

The CMF contains a collection of the essential intelligence and operations data required by an aircrew to study and execute a specific mission. Although all CMFs are generally alike, differences will exist because of the various types of targets and different types of aircraft we use in our operations; therefore, unit level operations group (OG) commanders (or equivalent) will be the office of primary responsibility (OPR) for mission folder preparation.

Mission folder review boards and CMF updates

Each group or wing will have a mission folder review board (MFRB) made up of qualified representatives from unit intelligence and operations functions. MFRB is tasked to review required materials for preplanned missions at least once a year to evaluate the following:

- Route and tactics planning.
- Correct use of forms, annotations, and procedures.
- Content and accuracy of information.
- Currency of materials.

CMF reviews

It is essential to maintain the currency of target folders. You could build an accurate target folder, but if its contents are not current, it could be entirely useless. The review boards may check all of the target folders at the same time or schedule each folder for a single review. The procedure will vary among the operational commands. You should know how and when these review boards would take place.

CMF updates

While the periodic review is an excellent method of updating your target folders, certain changes occur that will require an immediate update. After all, new material is constantly flowing into the intelligence shop. It must be analyzed to see whether or not it affects the currency of your target folders. Some of the items that you must constantly watch for are new or revised target materials, imagery, search and rescue (SAR) procedures, and new enemy order of battle.

New or revised target materials

Suppose you receive a new target chart. You can't just replace the old chart in CMS and MPS. The new edition chart may show a vast buildup of construction in their target area. This could change the radar predictions and possibly call for a change in an OAP. Again, the old edition chart may have shown a 250-foot contour line on track that was used to figure the altitude of the target run. In contrast, the new chart might show a 2,500-foot peak in the same area. Consequently, if the pilot had to fly on instruments alone due to weather, he would collide with the peak. New graphics can change the mission profile.

Imagery

New imagery could show new construction or air defenses in the target area, before a new chart could be produced; or, as an extreme, it could show that the target is really a dummy target.

Search and Rescue procedures

A change in authentication information could mean the difference between life or death for a pilot. Therefore, it is best that you are aware of changes in this area before the aircrew member is. The member's opinion of your entire program can go from a "high" to an all time "low" if you don't get the word, and he or she does.

New enemy order of battle

The aircrews want to know about the new SAM and AAA sites along their routes. They don't want any surprises. They want to survive, and they depend on you to give them the right information.

These are just a few of the items you must be aware of. You must realize that every item placed in the CMF can, and often does, change.

Types of CMFs

Whether a mission is preplanned or immediate, the type of air operation and aircraft involved will determine how the CMF is put together. The four basic types of CMFs and their related mission types are:

1. Attack folders for tactical conventional missions.
2. Strike folders for tactical nuclear missions.
3. Emergency war order (EWO) folders for strategic nuclear missions.
4. Contingency or conventional sortie folders (CSF) for strategic conventional missions.

Generally, CMFs are divided into two parts, a mission preparation section and one or more combat mission section. Each of these will be covered in detail in the topic presentations that follow.

As we stated earlier, there will be some differences in the format and content of each type of CMF. The differences will depend on the type of unit to which you are assigned and the unit's mission. We will cover a format that is basic to all the types of CMFs. This should give you adequate knowledge of the required elements, as well as prepare you to make intelligent choices as to additional material that may be included.

For our purposes, we will be using a "tactical" CMF as the basis for explaining CMF content. As we mentioned previously, this will give you a good general knowledge of CMF format and content. This will help you to quickly adapt to your specific unit's requirements.

Operational information

The information we are responsible for portraying with respect to the navigation portion is as vital to the success of the mission as the information we give dealing with enemy order-of-battle. The flight plan information is usually provided to the intelligence section, but remember, we must annotate the target materials with that information or we have not done a full job.

Here is an example of how operational information is used. In a unit based outside the immediate combat area but flying missions into the combat zone, the navigational information is annotated on a navigational chart covering the area from home base to the IP, which marks the start of the bomb run. Any segment of the route that passes over hostile territory must be researched, and all enemy defenses must be annotated.

The immediate target area is portrayed on a large-scale chart where waypoints can be more easily identified. The navigational information must still be portrayed, however, as well as the enemy defenses. If a distinction can be made, this segment is probably the most critical, and there is no room for error in the target materials annotations.

The annotations made on target materials used for mission planning may be slightly more detailed than those that are used to actually fly the mission. This is not to say that the planning charts are cluttered with unnecessary information, but there are more graphics used in mission preparation. Complete sets of target graphics cover all aspects of the mission from takeoff to return to base. In addition, supplemental materials, such as imagery and large-scale charts, are also used and must be appropriately annotated.

When USAF units are required to prepare target folders of any kind, the intelligence personnel become deeply involved. The procedures for preparing some types of target folders are classified due to the types of targets and air operations involved. However, the preparation of tactical target folders as presented in MCR 55-125, is unclassified. Therefore, we have used this regulation as a guide in our discussion of target folder preparation.

418. Preparing the mission preparation section

The mission preparation section (MPS) is that portion of the CMF that contains a comprehensive package of materials used for mission planning and a study of the mission route, enemy defenses, escape and recovery procedures, target area, and aiming points.

The CMF for all preplanned strike missions is required to have an MPS; however, an MPS is not required for attack missions. Although not required, all essential information should be available to the aircrew.

MPS contents

MPS consists of the following five parts:

1. Mission folder inventory/index.
2. Target and weapon information.
3. Mission data, defense analysis, and intelligence summary.

4. Maps, charts, and target materials.
5. Supplemental materials.

The parts will be arranged in the CMF in the order previously given. Each of the five parts of MPS may be inserted into 6-part folders with primary target information showing first. If the mission involves multiple or alternate targets, place their related materials immediately behind the primary target in the appropriate part of MPS. Let's take a closer look at each of the five parts of MPS.

MPS part 1—mission folder inventory/index

MF/MPS/CMS inventory index (locally devised form, formerly AF Form 208) is used for part 1—Mission folder inventory/index of MPS. Inventory index is required for all classified CMFs and is used to list, verify, and be the receipt for contents of the CMF. It enables the issuer to account for the classified portions of the folder. Use of inventory index for unclassified CMFs is at the discretion of the wing commander.

When the folder is issued, the recipient indicates the inventory of the CMF is correct by entering a diagonal line in the first available block in columns 1 through 18 for each item in the folder. When the folder is returned, the issuer will verify the content and complete the "X" in columns 1 through 18 for each line entry. The reverse side of the inventory index provides date and signature blocks for both the recipient and the issuer of the folder and general instructions for filling out the form.

Accountable changes to CMF materials are tracked by maintaining a record of changes immediately behind the Inventory Index. Each accountable item is assigned an item number and is listed on the front of the form.

MPS part 2—target and weapon information

This section contains information on target location, a description of the desired ground zero/desired mean point of impact (DGZ/DMPI), and the target's significance.

The target significance may be found in the target data inventory (TDI), target training graphics (TTG), basic target graphics (BTG), operational target graphics (OTG), or may be determined from past experience, as well as through other means.

MPS part 3—mission data, defense analysis and intelligence summary

The third section of MPS contains the mission data, defense analysis, intelligence summary, and escape and recovery information. This summary is designed to rapidly convey vital operations and intelligence information to the aircrew to plan the mission and flight profile.

In general, the part 3 summary should meet the specific needs of each mission; however, copies of the same summary may be used for all missions tasked against the same target complex and having similar flight profiles and routes.

This part is divided into three major sections: mission data section, defense analysis and intelligence section, and escape and recovery section.

Mission data section

The mission data section should begin with a summary of general information about the mission, such as configuration, weapons data, sensor data, and reporting instructions. Following the general information, summarize the mission profile and include such information as ingress route axis of attack and weapons delivery. Next, cover the target area profile including a target description, attack plan, etc. Last, present return profile data and include information about route, recovery base, and alternate recovery bases.

This information and data may be expanded to include other facts and factors pertinent to the mission. Categories may be deleted if they are not applicable. The important point to remember is that the

objective of the part 3 summary is to convey vital information used to meet specific mission planning needs.

Defense analysis and intelligence section

The defense analysis, or threat assessment, provides details of threats along the mission route. Threats should be described in the sequence that they will be encountered along the planned profile. Specific threats to be considered include enemy radar, enemy SAM and AAA, and enemy air, naval, and ground capabilities.

Escape and recovery section

The last section of part 3 of MPS should include escape and recovery (E&R) information that was formerly known as escape and *evasion* (E&E). This should outline an evasion plan of action (EPA) that covers general E&R guidelines, suggested plans of action, a potential egress route, and specific SAR procedures. Additionally, maps showing selected areas for evasion (SAFE) along the route should be provided.

MPS part 4—maps, charts, and target materials

Part 4 contains maps, charts, and target materials required in mission planning and route/target study. Primary graphics, imagery materials, and tactical target materials (TTM) used in this part of MPS will be annotated with the appropriate symbols necessary to explain or clarify significant portions of the mission profile. This required symbology will be reviewed later on in this lesson. For now we will just discuss the basic materials that are suggested for inclusion in this part of MPS.

The weapon system to be used and the MAJCOM involved will dictate, to some extent, the specific content of part 4 of MPS. Navigation and target materials that are suggested for inclusion in part 4 are a primary graphic chart, imagery and tactical target materials. The primary graphic chart in part 4 should be a 1:250,000 scale or larger (a JOG-A, JOG-R, or an ATC). If these graphics are available, coverage from the IP to the target is required. Other aeronautical, navigation, or topographical charts may be substituted if the 1:250,000 scale or larger is not available, or if map portrayal better suits mission needs.

Imagery, as available, is included to cover a minimum of target, IP, and OAP/IP. When available, TTM must be included to help the aircrew to identify visual cues of the target area. The primary TTM will be the tactical target graphic (ATTG) or basic target graphic, whichever one is most current.

MPS part 5—supplemental materials

This section contains information that does not appear in other parts of MPS, but is considered necessary to planning, study, and conduct of the mission. Examples of supplemental material would include the following information:

- Climatological data such as time of sunrise and sunset, sun angle tables, and seasonal climatic conditions.
- Bibliographic listing of additional material which, due to size or classification, cannot be included in the CMF, but may be useful to the aircrew.
- Reconnaissance units place their escape and recovery data here.
- Now we're ready to discuss the second part of a tactical CMF, the combat mission section.

419. Preparing the combat mission section

Combat mission section

The combat mission section of CMF is carried on board the aircraft for in-flight use by the aircrew. CMS contains only the necessary material required for the aircrew to hit their target and return home.

CMS consists of 12 items that we'll discuss separately and give examples, where possible, of what may be used to satisfy the requirements for each item. The mission category, MAJCOM, and weapon system will dictate what specific materials will be included in each CMS item.

Launch data

Launch data is displayed on a launch data card and includes information essential to successfully launch the mission. Wings may publish the launch data card in a format that best meets the demands of the mission and weapon system. The suggested OPR for providing the launch data card for CMS is operations.

Combat mission flight plan

The combat mission flight plan contains route data for the entire flight. The combat mission flight plan is entered on either a combat mission flight plan—Format I, combat mission flight plan—Format II, or on a wing approved substitute form. A printout of a computer-generated flight plan is authorized and may also be used. The suggested OPRs for providing the combat mission flight plan are operations and intelligence.

Maps and charts

Maps and charts, using the appropriate scale for the mission, are prepared to provide continuity of the planned flight route from launch to the planned recovery base. The suggested OPRs for providing the mission maps and charts are operations and intelligence.

The route of flight will be displayed in strip chart format from launch to the planned recovery base. Points throughout the flight will be designated with sequential, numerical, alphabetical, or data point identifiers as appropriate for the weapon system. All low level charts will be prepared from the most current editions available, except when the ATC 200 series is specified by targeting documents.

Chart update manual changes

The chart update manual (CHUM) or Electronic CHUM (E-CHUM) will be used to ensure the highest obstructions within 5 NM of the intended route, within 5 NM of the low-level boundaries, or within the planned working area (MOA, restricted area, and so forth) are annotated on the chart.

Obstructions within 100 feet of the planned minimum altitude (that is, FLIP or other published minimum altitude or aircrew minimum altitude, whichever is higher) that are within 5 NM of the intended route, within 5 NM of route boundaries, or within the planned working area will be annotated on the chart as well. In the case of multiple map/chart series use, the route will be evaluated for high terrain on each chart. The minimum safe altitude (MSA) and route abort altitude (RAA) will be computed from the series with the highest terrain. Color copy machine reproductions of completed charts may be used for additional copies.

Overall mission portrayal

The overall mission portrayal (OMP) is normally the first chart in CMS, and it shows the entire route to be flown. The primary chart is either a jet navigation chart (JNC) or a global navigational planning chart (GNC). The route is shown with the direction of flight indicated and an arrow indicating true north. Each critical waypoint is identified with the appropriate symbol. A solid black course line will represent the planned route of flight; a dashed line will depict alternate and secondary routes.

Navigation charts

Navigation charts will cover the entire route of flight. High altitude charts should provide adequate detail for navigation to and from the low-level portions of the route. Low altitude portions of the route are depicted on charts of sufficient scale (normally a TPC, 1:500,000) to provide detail for precise visual or radar navigation. Larger scale charts may be used if desired.

Target area charts are usually a Series 200 Air Target Chart, a 1501–Radar (JOG–R), or a 1501–Air (JOG–A), depicting the IP to target route. If cockpit materials include an IP to target run section with

a JOG or larger scale depiction of this leg, the target area map is not required. As a minimum, this map will be annotated with the inbound course line, IP, target symbol, coordinates, OAPs (if applicable), RP(s), egress heading, and altitude.

Strip chart booklet

A strip chart booklet presents a continuous depiction of the entire mission from takeoff, including ingress route, target area, egress route, and return to home base. This method of route depiction will be used for strike and other missions where the materials are prepared and maintained for use by any assigned aircrew. Strip charts may be prepared in one of two formats.

Format I

Format I consists of a booklet with the hinge located horizontally at the bottom. Cockpit space permitting, aircrews should use the standard 6 × 9 inch format. Wing commanders may authorize a smaller booklet. Adequate presentation of terrain features along the route must not be sacrificed for cockpit convenience. The chart segments in format I are usually stripped and glued to present a continuous route of flight. Orient the chart to display the primary and alternate routes, if applicable, and to show alternate recovery airfields. If necessary, a foldout section or a mini page may be added.

High level navigation charts should be stripped to position the maximum portion of the course line down the center of the page. If large turns are planned, repeat the turn point on a subsequent chart stripped to display the new course line in the center of the page.

Low altitude charts should have the course line approximately centered on the strip. Annotations must not obscure significant terrain features. A foldout section or a mini page may be added to the target area maps to present a continuous IP to target display on one page.

The route segment on each page should be oriented to fully display terrain and radar significant features. Chart overlap beyond waypoints may extend approximately 10 NM on a TPC or 5 NM on a JOG. A route leg may extend beyond one fold-open page, but when possible, the final check point for the leg should be located on the far leaf of a fold-open page. More than one route leg may be placed on a fold-open page if all required information can be displayed without obscuring terrain features. A mini page may be used to facilitate the point-to-point display in a full 2-page spread. To provide route continuity, action points are repeated on the subsequent page whenever the chart scale changes, or as necessary to meet the requirements stated above. An arrow should be used to indicate the outbound course on the previous page and to indicate the inbound course to the point being repeated.

Multiple target routes are depicted in the same manner as single target routes. Whenever a target is used as the IP for a subsequent target, it is annotated with the target symbol only.

Alternate target routes are depicted by a dashed black course line from a common waypoint on the primary ingress route, through the alternate target, to a common waypoint on the primary egress route. Plot the alternate target route on a separate strip chart if it cannot be plotted without cluttering the primary chart. This additional strip chart will be placed in the booklet behind the last page of the primary egress route and will be annotated with a thin black border on the left and right sides of the pages.

An acceptable variation to the bound or glued version of format I is a loose-leaf configuration with chart segments bound in sequence by one or more rings. The chart segments need not be mounted to card stock or inserted into vinyl sleeves. This format is most typically used in bomber aircraft and pages up to 8.5 × 14 inches are authorized.

Format II

Format II is constructed with a vertical hinge on the left side as in a normal book. The pages should be constructed of stiff paper (such as card stock) or be enclosed in suitable clear vinyl envelopes. When the booklet is opened, the right-hand page will display a segment of the strip chart. The left-hand page will display general navigation leg information such as radar predictions, switch settings,

and navigation information blocks. The booklet should be as large as practical to display the maximum amount of navigation data. Size will be uniform throughout a wing.

Orient the chart strip to show primary and alternate routes and alternate recovery airfields. If vinyl envelope pages are used, the OMP may be folded before insertion to show the primary route. If stiff paper pages are used, an extension may be added to include the required information.

High-level navigation charts should be stripped to display the course line down approximately the center of the page. If large turns are planned, repeat the waypoint on a subsequent page with chart oriented to show the new course line in the center of the page.

Low altitude chart strips should have the course line approximately centered on each page. Annotations must not obscure significant terrain features.

If cockpit materials include a bomb run with the JOG depiction of the IP to target leg, the target area map is not required on the strip chart. Minimum annotations on the map or associated navigation information page will be the IP, inbound course line, target symbol, coordinates and OAPs (if applicable), RPs, egress heading and altitude.

The route segment on each page should be oriented to fully display terrain and radar significant features. Chart overlap beyond waypoints should be approximately 10 NM on a TPC, or 5 NM on a JOG.

The format II strip chart requires a different technique than format I in portraying a navigation leg, which extends beyond one right-hand page. A route segment that is longer than the chart section of one page can be continued on the following page provided a prominent reference point on the preceding page is used on the second page to provide navigation leg continuity. Examples of a prominent, common reference point are a navigation waypoint or a distance-to-go mileage mark. If a route segment is continued beyond one page, it will be divided so that the destination point is on the far edge of the last page of the segment.

An action point or common reference point will be repeated on the next page whenever the chart scale changes or as necessary for strip chart continuity. Action points along the route include navigation waypoints, IPs, or targets. Use arrows to indicate the outbound course from the last action or reference point on a page, and the inbound course to the point being repeated on the next page.

Multiple target routes are depicted in the same manner as single target routes. Whenever a target is used as the IP for a subsequent target, it is annotated with the target symbol only.

Alternate target routes are depicted by a dashed black course line from a common waypoint on the primary ingress route through the alternate target to a common check point on the primary egress route. Plot the alternate routing on separate pages. These pages will be placed behind the last page of the primary egress route and will be annotated with a thin black border on the top, bottom and right edges of each right-hand page.

General leg information will be displayed on the left-hand pages. Items will include, but are not limited to, navigation information block/course arrow box, coordinates, changes to cockpit switch settings, and if required, radar predictions and weapon delivery parameters.

Recovery and emergency landing base data

Recovery and emergency landing base data includes information on the primary recovery base, alternate recovery bases, and emergency landing bases. Information should include:

- Airfield name.
- Barriers.
- Coded designator.
- Airfield tower frequencies.

- Airfield coordinates.
- GCI call sign.
- Airfield elevation.
- Airfield navigation aids.
- Length.
- Heading, distance, and fuel required from the primary to alternate recovery bases.

The suggested OPR for providing this data is operations. Now let's look at the rest of the items in CMS.

Weapons data

Weapons data may be included on any of several different types of forms and in several formats. Operations will be responsible for information and procedures involving weapons, weapon systems, and their use. Two methods of presenting weapons information for CMS include weapons and subsystems checklists, and weapons data cards.

Weapons and subsystems checklists

Weapons and subsystems checklists include checklists for the release procedures of the weapons and subsystems of the aircraft being employed.

Weapons data cards

Weapons data cards contain the weapons settings and ballistics for preflight, in-flight monitoring and arming, and primary and alternate deliveries for specific weapons.

Sensor data

Sensor data is displayed on systems data cards which show the various systems configurations and settings for preflight, in-flight monitoring, and the on and off times for primary and alternate target assignments. This applies to electronic combat aircraft only. Electronic combat will be responsible for providing the information regarding sensors.

Communications data

Communications data includes call signs, frequencies, nets, preset channel data for controlling agencies, and frequencies of emergency bases along the route of flight. Operations and communications share the responsibility for providing communications data for CMS.

Radar advisory information

Radar advisory information consists of the necessary radar advisory service information including the mode and code settings and procedures for identification friend or foe/selective identification feature (IFF/SIF). Operations are responsible for providing this information.

Authentication data

Authentication data consists of the materials, data, and procedures needed to perform required authentication. Authentication consists of a system of challenges and responses used by the military, primarily in voice communications, to confirm the identity of a transmitting unit and prevent imitative deception. Authentication materials that are controlled or change frequently need not be maintained in CMS but must be available prior to executing the mission.

In-flight report format card

The in-flight report format card is a fill-in-the-blank type form that provides a convenient method of in-flight reporting. Pilots and aircrew members use it to report mission results, or any other tactical information of such urgency that the delay, if reported by normal debriefing, would negate the usefulness of the information. Different formats may be used depending on the unit. The important

point is that both the sender and receiver of the information must use the same format. The OPR for this card is intelligence and/or operations.

Weather data card

The weather data card contains such information as an en route weather forecast, winds at various flight levels, and a weather forecast for the target area, recovery, and alternate recovery bases. The OPR for information included on the weather data card is the local weather detachment.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

417. Understanding guidelines for the preparation of combat mission folders

1. What is the definition of a CMF?
2. Where are the basic guidelines for the preparation of CMFs found?
3. According to MCR 55-125, who is the office of primary responsibility for mission folder preparation?
4. According to MCR 55-125, how often should a MFRB review preplanned missions?
5. Concerning CMF updates, what are some of the items you must be constantly monitoring for currency?
6. What are the four types of CMFs and their related mission types?
7. Generally, what are the two parts of a CMF?

418. Preparing the mission preparation section

1. What is MPS used for?
2. List the five parts of the MPS?

3. In the defense analysis and intelligence section, how should you describe the threats along the mission's route?
4. The evasion plan of action is outlined in what section of the MPS?
5. What factors dictate the contents of part 4 of the MPS?
6. The primary graphic chart in part 4 should be of what scale?
7. What types of information can be found in part 5 of the MPS?

419. Preparing the combat mission section.

1. How are changes to the CMF tracked?
2. What types of information are listed in part 2, Target and Weapon Information?
3. What is the summary contained in part 3 designed to do?
4. What are the three major sections of the MPS, part 3?
5. How is a CMS used by aircrews?
6. CMS consists of only the necessary materials required to do what?
7. What information is contained on the combat mission flight plan?
8. What portion of the mission are maps and charts prepared for?

9. Who is the OPR for providing mission maps and charts?

10. On what type of chart is the OMP normally portrayed?

11. What types of charts are normally used for the strip chart booklet?

12. When is a target area chart not required?

13. What portion of the mission is portrayed in the strip chart booklet?

14. What type of missions are portrayed using strip chart booklets?

2-4. Automated Mission Planning

In the modern battlefield situation, timely intelligence is vital to any military operation. Within minutes the entire battlefield situation could drastically change. For this reason, the DOD has embarked on projects to decrease the length of time from when intelligence is collected until it is disseminated to commanders. Since the Situation Map (SITMAP) is a major tool on which commanders base their decisions, automated SITMAPs are inherent in today's modern warfare.

420. Understanding automated mission planning

Improved speed and reliability of computer systems has increased the demand for small computer applications throughout the Air Force. Our goal is to learn how to apply the capability as it becomes available and apply it in the most efficient manner possible.

Air Force Mission Support System (AFMSS) is a consolidated aircraft and weapon mission planning system encompassing evolutionary software and hardware development in an open-systems architecture. The Mission Planning System Program was established in 1990 to consolidate mission planning development efforts into a single unit-level mission planning system. AFMSS supports nearly 50 individual aircraft, weapons, and UAV programs. AFMSS consists of the Mission Planning System (MPS), a Unix-based system, the Portable Flight Planning System (PFPS), a PC-based system. Additionally, AFMSS provides the combat mission folder consisting of maps, charts, flight logs, turn points, target imagery, weapons delivery calculations, and radar predictions to aid in mission execution. Individual platforms tailor the AFMSS core software with system specific modules for aircraft, weapons, and electronics (A/W/E modules). The combined software gives the warfighter the full spectrum of mission planning and combat capabilities for their aircraft or weapon including interoperability with Theater Battle Management Core Systems (TBMCS).

AFMSS is a unit deployable, groundbased; integrated, multi-user system that interfaces to the aircraft through a DTD (digital transfer device). The portable AFMSS is used for rapid/contingency deployment until the groundbased system at the wing and squadron level arrive in-theater. AFMSS consists of workstation equipment and software, which provides significant upgrades as well as

interoperability with TBMCS. AFMSS (laptop version) is faster, has refined functionality, has increased data storage capacity, and is more user friendly than current Mission Planning Systems.

Theater Battle Management Core Systems (TBMCS) is an integrated command and control (C2) system supporting C2 from the Air Operations Center through the unit level, during all aspects of air operations to include theater air and missile defense. It contains Joint and Air Force specific applications used to plan and execute contingency theater operations forces through the unit level, and includes required intelligence information and functional capabilities. TBMCS incorporates legacy functionality of Contingency Theater Automated Planning System (CTAPS), Wing Command and Control System (WCCS), and Combat Intelligence System (CIS) and fields a Y2K compliant system that utilizes DOD's Global Command and Control System (GCCS) defense information infrastructure common operating environment (DII COE).

PFPS provides an integrated environment supporting all mission and aircraft. The primary outputs include user-customized keyboard cards, combat mission folders, and data transfer services. All mission-planning tools are integrated under a common, consistent Microsoft Windows user interface and can be installed on inexpensive, commercially available desktop and portable computer systems. FalconView is an integral part of the Personal Flight Planning Software (PFPS). FalconView is a Windows 2000/NT mapping system that displays various types of maps and geographically referenced overlays. Many types of maps are supported, but the primary ones of interest to most users are aeronautical charts, satellite images and elevation maps. FalconView also supports a large number of overlay types that can be displayed over any map background. The current overlay set is targeted toward military mission planning users and is oriented towards aviators and aviation support personnel.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

420. Understanding automated mission planning.

1. What system is a consolidate aircraft and weapon mission planning system encompassing evolutionary software and hardware development in an open-systems architecture?

2. AFMSS consists of what two Mission Planning Systems?

Answers to Self-Test Questions

409

1. The ATO is a stand-alone order that lists daily air tasking.
2. The next 24-hour period of the conflict.
3. Exercise or operation name and who published the ATO.
4. Mission number, package number, mission call sign, number and type of aircraft, mission type, alert status, primary and secondary ordnance configurations, and IFF setting.
5. The DMPI.
6. By their name or a code number from a target listing.

410

1. Daily Airspace Control Procedures.
2. Minimum risk routes (MRR), base defense zones (BDZ), weapons free zone (WFZ), and ancillary ACO data.
3. Rules of engagement, air refueling tanker tracks, airborne control tracks (AWACS), and flight altitude restrictions for ingress and egress of enemy airspace.
4. Special instructions (SPINS).
5. Tanker operations, CSAR procedures, AWACS information, and reporting procedures.

411

1. Delivery of the weapons on the target, survival of the aircrew, and recovery of the aircraft.
2. The unit commander.
3. To receive the ATO.
4. The Mission Folder Review Board.
5. Mission reports (MISREPS).

412

1. Mission tasking, target identification, and mission route characteristics.
2. Usually from higher headquarter via an ATO or OPLAN
3. A global navigation and planning chart (GNC), or a jet navigation chart (JNC).
4. Joint operations graphic (JOG).
5. A solid black line.
6. Alternate target routes.

413

1. Ingress phase, initial point (IP) to target/weapons release phase, and egress phase.
2. High and low
3. Weapons system and weapons characteristics and capabilities, reference points, target identification, and enemy defenses.
4. 5,000 feet.
5. Any portion or leg of a mission, planned or flown at altitudes below 5,000' AGL.
6. Delivery of the weapons on the target, survival of the aircrew, and recovery of the aircraft.
7. To use the benefits of terrain masking.
8. Direct and indirect terrain masking.
9. To avoid detection by enemy radar.
10. High level flight requires less fuel to be burned, increasing aircraft range. There is also a decreased threat from AAA.

414

1. MCR55-125.
2. A checkpoint or turn point.
3. The point for which a radar prediction has been made.
4. Consecutive numbers or letters.
5. The total running time, and a hack resets the clock to zero.
6. The low level portion.

7. Only the even minute ticks, except for the IP-to-target run where all of the time ticks are numbered.
8. The distance to the next checkpoint or target in decreasing amounts along the direction of flight.
9. Only the odd numbered distance ticks are labeled.
10. An alternate airfield.
11. An emergency airfield, with the line identifying the axis of the primary runway.
12. The minimum required information for navigation but does not contain geographic coordinates.
13. The NIB contains coordinates.
14. Information or data not provided for by other standard symbols.
15. The speed advisory box.

415

1. The IP is used to establish the final AOA into the target.
2. Aircraft and delivery tactic involved.
3. Aircraft sensors and desired mission profile.
4. They should be the most readily identifiable features in the area and should be both visually and radar significant.
5. Direct aiming point and offset aiming point (OAP).
6. When the target can be identified by the aircraft sensor.
7. When the target cannot be identified by the aircraft sensor.
8. Ease of identification, refined crosshair placement, orientation, accurate positioning data, range, line-of-sight, consistency of return, and location.
9. Computing the range and bearing.
10. In a number of feet north (or south) and east (or west) from the target to the offset or vice versa, depending on your individual system.
11. Maximum acquisition range.

416

1. Absolute altitude.
2. Actual range (Ra).
3. Trail (L).
4. Time-to-go (TTG).

417

1. Combined and assembled collection of target materials and intelligence data.
2. Multi-Command Regulation 55-125, Preparation of Mission Planning Material.
3. The unit level operations group commander, or equivalent.
4. At least once a year.
5. New or revised target materials, imagery, search and rescue procedures, order of battle, etc.
6. Attach folders - tactical conventional missions; strike folders- tactical nuclear missions; emergency war order folders- strategic nuclear missions; contingency or conventional sortie folders - strategic conventional missions.

7. Mission preparation section and combat mission section.

418

1. Mission planning and study of the mission route, enemy defenses, escape and recovery procedures, target area, and aiming points.
2. Mission folder inventory/index, (2) target and weapon information, (3) mission data, defense analysis, intelligence summary, and escape and recovery information, (4) Maps, charts, and target materials, (5) supplemental materials.
3. In the sequence which they will be encountered along the planned profile.
4. Part 3- mission data, defense analysis, and intelligence summary, under the escape and recovery information section.
5. The weapon system to be used and the MAJCOM involved.
6. 1:250,000 scale or larger.
7. Information that is not contained in other parts of the MPS but is considered necessary to planning, studying, and conducting the mission.

419

1. By maintaining a record of changes immediately behind the MF/MPS/CMS inventory index.
2. Information on target location, a description of the DGZ (desired ground zero)/DMPI (desired mean point of impact), and the target's significance.
3. To rapidly convey vital operations and intelligence information to the aircrew in order to plan the mission and flight profile.
4. Mission data section, defense analysis and intelligence section, and escape and recovery section.
5. It is carried onboard the aircraft for in-flight use.
6. For the aircrew to hit their target and return home.
7. Route data for the entire flight.
8. For the planned flight route from launch to the planned recovery base.
9. Operations and intelligence.
10. Either a JNC or a GNC.
11. ONCs for the high altitude portions, TPCs for the low altitude portions, and ATC 200s or JOGs for the target area chart.
12. When the cockpit materials include an IP-to-Target run with a JOG or larger scale depiction of the bombing run.
13. The entire mission from takeoff, including ingress route, target area, egress route, and return to home base.
14. Strike and other missions where the materials are prepared and maintained for use by any assigned aircrew.

420

1. Air Force Mission Support System (AFMSS).
2. Mission Planning System (MPS), a Unix-based system, the Portable Flight Planning System (PFPS), a PC-based system.

Volume Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all volume review exercises, transfer your answers to ECI (AFIADL) Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

Volume 3 – Volume Review Exercise

1. (401) What provides the necessary framework upon which all other relevant strategic and tactical information is layered?
 - a. OPLAN.
 - b. OPORD.
 - c. Chart scale.
 - d. Geospatial information.

2. (401) What is a concept for the collection, production, archiving, dissemination and exploitation of information about the Earth's surface?
 - a. GI&S.
 - b. OPLAN.
 - c. OPORD.
 - d. Chart scale.

3. (402) What is a graphic representation of an area of the earth's surface illustrated on a flat surface, at an established scale, including natural and man-made features?
 - a. Map.
 - b. Scale.
 - c. Datum.
 - d. Geodesy.

4. (402) What is a specialized map with aeronautical information or hazards to flight?
 - a. Map.
 - b. Scale.
 - c. Chart.
 - d. Datum.

5. (402) What is the branch of mathematics that deals with the determination of the size of the earth and the positions of points on its surface?
 - a. Scale.
 - b. Datum.
 - c. Geodesy.
 - d. World geodetic system (WGS-84).

6. (402) What is the overall size of features on a map or chart relative to the true size of the feature on the surface of the earth?
 - a. Scale.
 - b. GI&S.
 - c. Datum.
 - d. Geodesy.

7. (402) What is usually depicted by a representative fraction or by ratio?
 - a. Scale.
 - b. Datum.
 - c. Geodesy.
 - d. MADTRAN.

8. (402) How is scale referred to?
 - a. Datums.
 - b. Small and large.
 - c. Small and medium.
 - d. Small, medium and large.

9. (402) All charts below 1:200,000 are considered to be what scale?
 - a. WGS-84.
 - b. Small-scale.
 - c. Large-scale.
 - d. Medium scale.

10. (402) All charts between 1:200,000 and 1:600,000 are considered to be what scale?
 - a. WGS-84.
 - b. Small-scale.
 - c. Large-scale.
 - d. Medium-scale.

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11. (402) All charts above 1:600,000 are considered to be what scale?
- WGS-84.
 - Small-scale.
 - Large-scale.
 - Medium-scale.
12. (402) What is the scale of a global navigational chart (GNC)?
- 1:250,000.
 - 1:1,000,000.
 - 1:2,000,000.
 - 1:5,000,000.
13. (402) What is the scale of a jet navigational chart (JNC)?
- 1:250,000.
 - 1:1,000,000.
 - 1:2,000,000.
 - 1:5,000,000.
14. (402) What is the scale of an operational navigational chart (ONC)?
- 1:250,000.
 - 1:1,000,000.
 - 1:2,000,000.
 - 1:5,000,000.
15. (402) What is the scale of a tactical pilotage chart (TPC)?
- 1:250,000.
 - 1:500,000.
 - 1:1,000,000.
 - 1:2,000,000.
16. (402) What chart is used for close air support, interdiction and navigation by all aircraft at low and very low altitudes?
- JOG-A.
 - JOG-G.
 - JOG-C.
 - JOG-T.

17. (402) The Army and Marine Corps primarily use which chart?
- JOG-A.
 - JOG-G.
 - JOG-C.
 - JOG-T.
18. (402) What chart is used for RADAR navigation and RADAR bombing?
- JOG-A.
 - JOG-G.
 - JOG-C.
 - JOG-T.
19. (403) What is the foundation of how we relate position and data to a reference or coordinate system?
- Scale.
 - Datum.
 - WGS-84.
 - Geodesy.
20. (403) What are fixed locations or starting points on the Earth's surface that are placed on charts?
- Scale.
 - Datum.
 - WGS-84.
 - Geodesy.
21. (403) What is used to determine the vertical or horizontal location of other points on the earth?
- Scale.
 - Datum.
 - WGS-84.
 - Geodesy.

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22. (403) Datums are figured by what means?
- Geodesy.
 - MADTRAN.
 - Location on the earth's surface.
 - Physical or satellite triangulation.
23. (403) What are the two types of datums used in mapping?
- Indian and European.
 - Small and large scale.
 - Horizontal and vertical.
 - Tokyo and North American.
24. (403) What is used to determine elevations of any land feature on Earth?
- Scale.
 - Vertical datum.
 - Horizontal datum.
 - Mean sea level (MSL).
25. (403) What are the four datums recognized by the DoD?
- North American, European, Tokyo, and Indian.
 - North American, European, Asian and African.
 - North American, Asian, African and Tokyo.
 - North American, European, Asian, and Australian.
26. (403) Where is the origin of the North American datum?
- St. Louis, Missouri.
 - Marquette, Michigan.
 - Offutt AFB, Nebraska.
 - Meades Ranch, Kansas.
27. (403) Where is the origin of the European datum?
- Potsdam, Germany.
 - Stockholm, Sweden.
 - Greenwich, England.
 - Geneva, Switzerland.

28. (403) What utilizes satellite triangulation vs physical triangulation to create a mathematical model of the size and shape of the earth?
- Datum.
 - WGS-84.
 - Geodesy.
 - MADTRAN.
29. (403) What is designed to convert map and chart coordinates from local geodetic systems to WGS-84?
- Scales.
 - Datums.
 - Geodesy.
 - MADTRAN.
30. (404) What is equal to one-half of the contour interval on a chart?
- Scale.
 - Datum.
 - Vertical accuracy.
 - Horizontal accuracy.
31. (404) If a chart's contour interval is 100 feet and there is an elevation of 1950 feet on the chart, the elevation falls somewhere between where?
- 1850-1950 feet.
 - 1900-2000 feet.
 - 1950-2050 feet.
 - 2000-2100 feet.
32. (404) What are the two types of horizontal accuracies?
- Absolute and relative.
 - Satellite and physical.
 - Vertical and horizontal.
 - Systematic and Cartographic.
33. (404) When a horizontal distance is measured from a datum or a known point, the horizontal accuracy is considered?
- Absolute.
 - Relative.
 - Systematic.
 - Cartographic.

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34. (404) When features on a chart are compared to each other, but not tied to a datum or a starting point, how accurate are they considered?
- Absolute.
 - Relative.
 - Systematic.
 - Cartographic.
35. (404) What explains most of the symbols on a map or chart?
- Scale.
 - Datum.
 - Geodesy.
 - Marginal data.
36. (404) Hydrographic is the study of what?
- Water.
 - Dry land.
 - Water and drainage.
 - Water, drainage and dry land.
37. (404) Hypsographic is the study of what?
- Water.
 - Dry land.
 - Water and drainage.
 - Water, drainage and dry land.
38. (404) What is one method of showing relief on a map or chart?
- Marginal data.
 - Elevation tinting.
 - Vertical accuracy.
 - Horizontal accuracy.
39. (404) What is a second method used to represent relief on a chart?
- Contour lines.
 - Marginal data.
 - Vertical accuracy.
 - Horizontal accuracy.

40. (404) What are the four main types of contour lines?
- Index, Intermediate, Supplementary, and Depression.
 - Intermediate, Supplementary, Depression, and Vertical.
 - Supplementary, Depression, Vertical and Horizontal.
 - Vertical, Horizontal, Intermediate and Supplementary.
41. (404) What is considered the prescribed difference in elevation between each contour line?
- Geodesy.
 - Contour interval.
 - Vertical accuracy.
 - Horizontal accuracy.
42. (404) What type of terrain is indicated by two adjacent contours that are close together?
- Flat.
 - Steep.
 - Uneven.
 - Uniform.
43. (404) The terrain is considered to be _____ when two adjacent contours are farther apart.
- Flat.
 - Steep.
 - Uneven.
 - Uniform.
44. (404) _____ is the darkest contour line shown every fourth or fifth contour with an assigned elevation.
- Index.
 - Depression.
 - Intermediate.
 - Supplementary.
45. (404) On a chart, what uses a thick dark number to represent an area of interest for aerial navigation?
- Depression.
 - Critical spot elevation.
 - Normal spot elevation.
 - Approximate spot elevation.

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46. (404) On a chart, what uses an “x” with a “+” or “-“ sign to measure elevations which cannot be accurately measured?
- Depression
 - Critical spot elevation
 - Normal spot elevation
 - Approximate spot elevation
47. (404) What are the numbers representing the elevation of the highest feature known within a quadrangle?
- Critical spot elevation.
 - Normal spot elevation.
 - Maximum elevation figure.
 - Approximate spot elevation.
48. (404) How tall must an obstruction be before it is depicted on a chart?
- 100 feet.
 - 200 feet.
 - 500 feet.
 - 1,000 feet.
49. (404) What map is used for an in-depth target study?
- JOG-G.
 - JOG-T.
 - Topographic map.
 - Series 200 Air Target Chart (ATC).
50. (405) What coordinate system is an earth-centric system used by Global Positioning Systems (GPS) satellites?
- Cartesian System.
 - Universal Transverse Mercator (UTM).
 - Military Grid Reference System (MGRS).
 - Geographic Coordinate System (GEOCORDS).

51. (405) What coordinate system point of origin is the intersection of the equator and the Prime Meridian?
- Cartesian System.
 - Universal Transverse Mercator (UTM).
 - Military Grid Reference System (MGRS).
 - Geographic Coordinate System (GEOCORDS).
52. (405) What has a value of 00 degrees latitude and divides the world into northern and southern hemispheres?
- Equator.
 - Prime Meridian.
 - Magnetic North Pole.
 - International Date Line.
53. (405) What has a value of 000 degrees and divides the world into eastern and western hemispheres?
- Equator.
 - Prime Meridian.
 - Magnetic North Pole.
 - International Date Line.
54. (405) Within the Air Force and Navy, what coordinate system is most commonly used?
- Cartesian System.
 - Universal Transverse Mercator (UTM).
 - Military Grid Reference System (MGRS).
 - Geographic Coordinate System (GEOCORDS).
55. (405) What is the maximum value of meridians of longitude?
- 0 degrees.
 - 90 degrees.
 - 179 degrees.
 - 180 degrees.

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56. (405) What is the maximum value of meridians of latitude?
- 0 degrees.
 - 90 degrees.
 - 179 degrees.
 - 180 degrees.
57. (405) The Army and Marine Corps typically use which coordinate system?
- Cartesian System and Universal Transverse Mercator (UTM).
 - Military Grid Reference System (MGRS) and Universal Transverse Mercator (UTM).
 - Universal Transverse Mercator (UTM) and Geographic Coordinate System (GEOCORDS).
 - Geographic Coordinate System (GEOCORDS) and Military Grid Reference System (MGRS).
58. (405) UTM coverage applies between ___ South and ___ North and is a rectangular grid with parallel lines forming a series of squares on a map or chart.
- 80 degrees and 84 degrees.
 - 84 degrees and 80 degrees.
 - 90 degrees and 84 degrees.
 - 84 degrees and 90 degrees.
59. (405) How is the UTM coordinate system measured?
- Feet.
 - Meters.
 - Miles.
 - Statue miles.
60. (405) How many zones is the UTM system broken out into?
- 24.
 - 60.
 - 180.
 - 360.

61. (405) What coordinate system is used on a global basis for tactical-level operations?
- Cartesian System.
 - Universal Transverse Mercator (UTM).
 - Military Grid Reference System (MGRS).
 - Geographic Coordinate System (GEOCORDS).
62. (405) What is the difference between the UTM and MGRS coordinate systems?
- MGRS subdivides the UTM grid with 6 degree north-to-south belts.
 - UTM subdivides the MGRS grid with 6 degree north-to-south belts.
 - MGRS subdivides the UTM grid with 8 degree north-to-south belts.
 - UTM subdivides the MGRS grid with 8 degree north-to-south belts.
63. (405) Within the MGRS coordinate system, each 6 by 8 degree block is divided into how large of areas?
- 1,000 meter.
 - 10,000 meter.
 - 100,000 meter.
 - 1,000,000 meter.
64. (405) Using the MGRS coordinate system, a 6-digit coordinate offers an accuracy of plus or minus _____ meters.
- 10.
 - 100.
 - 1,000.
 - 10,000.
65. (405) The first three characters (example 15S) of MGRS indicate_____.
- 6 degree by 8 degree rectangle.
 - 8 degree by 6 degree rectangle.
 - 80 degree by 84 degree rectangle.
 - 84 degree by 80 degree rectangle.

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66. (406) In which way are MGRS coordinates plotted?
- Right and up.
 - Up and right.
 - Left and up.
 - Up and left.
67. (407) On a chart with a scale of 1:500,000, one inch represents how much distance on the ground?
- 500,000 feet.
 - 500,000 miles.
 - 500,000 meters.
 - 500,000 inches.
68. (407) How large of measurement is one degree on any great circle?
- One statute mile.
 - One nautical mile.
 - 60 statute miles.
 - 60 nautical miles.
69. (407) How large of measurement is one minute?
- One statute mile.
 - One nautical mile.
 - 60 statute miles.
 - 60 nautical miles.
70. (407) What is the most commonly used system in air navigation?
- True course.
 - Azimuthal system.
 - Reciprocal heading.
 - Cardinal Point system.
71. (407) The azimuthal system is based on how many degrees?
- 45.
 - 90.
 - 270.
 - 360.

72. (407) What is the raw course line that is drawn on a chart?
- a. True course.
 - b. Agonic lines.
 - c. Isogonic lines.
 - d. Magnetic course.
73. (407) What is the course an aircraft would actually fly to reach its destination?
- a. True course.
 - b. Agonic lines.
 - c. Isogonic lines.
 - d. Magnetic course.
74. (407) What is the reciprocal heading for 214 degrees?
- a. 34 degrees.
 - b. 124 degrees.
 - c. 214 degrees.
 - d. 304 degrees.
75. (408) What are two methods for converting coordinates?
- a. Eyeball and graphic.
 - b. Digital and graphic.
 - c. Automated and digital.
 - d. Graphic and automated.
76. (408) What is a datum transformation and coordinate conversion software used by the US Army?
- a. PCI-3.
 - b. AFMSS.
 - c. TBMCS.
 - d. GEOTRANS2.

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77. (409) What document does the JFACC develop to indicate the daily plan for joint air operations?
- ATO.
 - ACO.
 - SPINS.
 - OPLAN.
78. (409) What document is a stand-alone order that lists daily air taskings for the next 24-hours?
- ATO.
 - ACO.
 - SPINS.
 - OPLAN.
79. (410) What document institutes daily airspace control procedures?
- ATO.
 - ACO.
 - SPINS.
 - OPLAN.
80. (410) What document provides essential information enabling control elements to regulate the airspace and resolve real-time conflicts?
- ATO.
 - ACO.
 - SPINS.
 - OPLAN.
81. (410) What are temporary routes for aircraft to use for entry and re-entry of friendly airspace specifically for airspace deconfliction?
- ATO.
 - BDZ.
 - MRR.
 - WFZ.

82. (410) What are zones established for the defense of friendly airfields?
- a. BDZ.
 - b. WFZ.
 - c. ACO.
 - d. SPINS.
83. (410) In which document would you find information on CSAR procedures or AWACS information?
- a. ATO.
 - b. ACO.
 - c. SPINS.
 - d. OPLAN.
84. (411) What are three major mission route planning factors?
- a. Target, aircrew survival, and aircraft recovery.
 - b. Target, aircrew survival and CSAR recovery forces.
 - c. Aircrew survival, aircraft recovery and CSAR recovery forces.
 - d. Aircrew survival, CSAR recovery forces, and AWACS support.
85. (411) Which cycle of the mission planning cycle does the MPC select optimum routes and mission profiles and construct target and combat mission folders?
- a. Execution phase.
 - b. Mission planning phase.
 - c. Pre-mission planning brief.
 - d. Mission planning validation.
86. (411) Who validates mission planning for pre-planned missions in support of an OPLAN?
- a. MPC.
 - b. ACC.
 - c. Aircrew.
 - d. Mission Folder Review Board.

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87. (412) Which charts are used for low-altitude routes during mission planning?
- a. GNC.
 - b. ONC.
 - c. TPC.
 - d. JOG.
88. (412) Which charts will normally depict the target areas for mission planning?
- a. GNC.
 - b. ONC.
 - c. TPC.
 - d. JOG.
89. (412) When mission planning, what does a dashed mission course line indicate?
- a. Rescue route.
 - b. Primary route.
 - c. Alternate route.
 - d. Emergency route.
90. (412) Where is all essential navigation and altitude data placed on a chart?
- a. Centered on turn points.
 - b. Left side of the mission course line.
 - c. Right side of the mission course line.
 - d. Centered over the mission course line.
91. (413) What phase of a mission begins with the start, taxi, takeoff (STTO), and continues to the IP?
- a. Ingress.
 - b. Egress.
 - c. IP to target run.
 - d. Alternate mission route.

92. (414) In mission planning, what is a point where an aircraft course is altered and key en route positions, such as navigation points, may occur?
- Turn point.
 - Initial point.
 - Update point.
 - Prediction point.
93. (414) In mission planning, what marks the beginning of a target run?
- Way point.
 - Initial point.
 - Update point.
 - Prediction point.
94. (414) A target is depicted by what symbol on a chart?
- Circle.
 - Square.
 - Triangle.
 - Two concentric circles.
95. (414) On a mission route, time is displaced where on a mission course line?
- Left.
 - Right.
 - Center.
 - Only at turn points.
96. (414) How is time displayed along a mission course line?
- All numbers.
 - Odd numbers.
 - Even numbers.
 - Only during IP to Tgt run.
97. (414) How is distance displayed along a mission course line?
- All numbers.
 - Odd numbers.
 - Even numbers.
 - Only during IP to Tgt run.

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98. (414) What is a radar-significant point that can be used to direct the aircraft to the desired weapons release point?
- Turn point.
 - Initial point.
 - Update point.
 - Offset aim point.
99. (414) What is a radar or visually significant point used by the aircrew to correct and refine aircraft position in navigation and/or bombing computers?
- Turn point.
 - Initial point.
 - Update point.
 - Offset aim point.
100. (414) What does a dual concentric circle on a chart indicate?
- Closed airfield.
 - Alternate airfield.
 - Emergency airfield.
 - Start-taxi-takeoff airfield.
101. (414) What does a single circle with a line drawn through it indicate?
- Closed airfield.
 - Alternate airfield.
 - Emergency airfield.
 - Start-taxi-takeoff airfield.
102. (414) What contains the minimum required information for navigation but does not contain geographic coordinates?
- Update point.
 - Advisory box.
 - Course arrow box.
 - Navigational information box.

103. (414) What provides navigation information to the next waypoint?
- a. Update point.
 - b. Advisory box.
 - c. Course arrow box.
 - d. Navigational information box.
104. (415) What is used to establish the final AOA into the target?
- a. Turn point.
 - b. Initial point.
 - c. Update point.
 - d. Off-set aimpoint.
105. (416) What is the vertical distance in feet from the aircraft to impact or detonation of a munition?
- a. Trail.
 - b. Height of fall.
 - c. Height of burst.
 - d. Actual time of fall.
106. (416) What is the horizontal distance in feet that the bomb lags or trails behind the aircraft?
- a. Trail.
 - b. Actual range.
 - c. Height of fall.
 - d. Height of burst.
107. (417) What document is a collection of essential intelligence and operations data required by an aircrew to study and execute a specific mission?
- a. ATO.
 - b. ACO.
 - c. SPINS.
 - d. Combat mission folder (CMF).

108. (417) CMFs are divided into how many parts?
- a. Two.
 - b. Three.
 - c. Four.
 - d. Five.
109. (418) A mission preparation section consists of how many parts:
- a. Two.
 - b. Three.
 - c. Four.
 - d. Five.
110. (418) What information is located in part two of a MPS?
- a. Mission folder inventory.
 - b. Target and weapon information.
 - c. Maps, charts, and target materials.
 - d. Mission data and intelligence summary.
111. (419) Which part of a CMF is carried on board an aircraft for in-flight use by the aircrew?
- a. CMS.
 - b. MPS.
 - c. ATO.
 - d. SPINS.
112. (419) A CMS consists of how many parts
- a. Two.
 - b. Five.
 - c. Eight.
 - d. Twelve.