翻译内容：

# 5.6.7 Return to Base (RTB) Flight Mode

5.6.7 返回基地（RTB）飞行模式

The RTB flight mode is used for aircraft that have run out of weapons, targets, fuel, or time. The RTB Flight mode directs aircraft back to their home airbase, i.e., their first waypoint. The RTB mode expects aircraft to start from a normal flight mode, such as waypoints, rather than a reaction flight mode, such as Engage or Drag. When a platform is scheduled for the RTB mode, it is explicitly put into a normal flight mode.

RTB飞行模式用于武器、目标、燃料或时间耗尽的飞机。RTB飞行模式导航飞机回到他们的母港空军基地，即他们的第一个航路点。RTB模式希望飞机从正常的飞行模式开始，如航路点，而不是在响应飞行模式中改出，如交战或拖曳。当一个平台被安排到RTB模式时，它被明确地放入正常的飞行模式。

The RTB mode sets the direction, velocity, force of gravity, and maximum altitude for the aircraft. A direction vector is obtained from the platform’s current position to the platform’s first waypoint. The velocity of the aircraft is adjusted according to its distance from its first waypoint. RTB aircraft are flown at their cornering speed if they are over 5,000 m from the base. Helicopter corner speed is 75% of maximum speed. Otherwise, the aircraft is flown at the greater rate of 50 m/sec or 30% above minimum velocity. The force of gravity used will be one half of the aircraft’s maximum force of gravity. The maximum altitude will be the greater of the aircraft’s commanded altitude at its current location or 5,000 m. Helicopters’ maximum altitude during RTB is set to 20 m.

RTB模式为飞机设定方向、速度、重力和最大高度。从平台的当前位置到平台的第一个航路点会得到一个方向矢量。飞机的速度根据它与第一个航路点的距离来调整。RTB飞机如果离基地超过5000米，就以其转弯速度飞行。直升机转弯速度是最大速度的75%。否则，飞机以50米/秒或最低速度30%中的较大速度飞行。使用的重力将是飞机最大重力的二分之一。最大高度将是飞机在当前位置的指令高度或5000米中的较大者。直升机在RTB期间的最大高度被设置为20米。

The aircraft is flown at each internal time step. The angle between the airbase position and the direction vector is obtained. If the aircraft is less than 15 deg to the airbase’s position in the elevation plane and not out of fuel, terrain following will be used to adjust the climb angle of the aircraft. The terrain following methodology is described in Subsection 5.4.3. The floor altitude used by the terrain following is set by the commanded AGL altitude.

飞机在每个内部时间步长内根据获得的空军基地位置和方向矢量之间的角度进行飞行。如果飞机在仰角平面上与空军基地位置的夹角小于15度，并且没有耗尽燃料，将使用地形跟踪来调整飞机的爬升角度。地形跟踪方法在5.4.3小节中描述。地形跟踪所使用的底层高度是由指令AGL高度设定的。

If terrain following is not necessary, the direction vector is modified to account for Earth curvature by flying the aircraft while maintaining a constant altitude rate. Subsection 5.4.4 explains the constant altitude rate methodology. If the direction vector causes the aircraft to fly above the ceiling altitude or below the floor altitude, it is adjusted, as described in Subsection 5.4.3, for altitude monitoring. The ceiling altitude for altitude monitoring is set to the airframe’s service altitude limit. The floor altitude is set to 200 m.

如果没有必要进行地形跟踪，则保持恒定高度率下飞行，修改方向矢量以考虑地球曲率。5.4.4小节解释了恒定高度率的方法。如果方向矢量导致飞机飞到上下界，则按照第5.4.3小节所述，对其进行调整，以进行高度监控。用于高度监控的上界高度被设定为机体的使用高度极限。底层高度被设置为200米。

The angle between the aircraft’s velocity vector and the vector to the airbase determines the flight method to reach the climbing point. If the angle is less than 0.8 degrees, the aircraft will fly straight to the climbing point; otherwise, it will fly in a curve to the climbing point. If the distance to the airbase is less than 1,000 m, the aircraft’s velocity vector is set to the commanded speed (the greater of 50 m/s or 30% above minimum velocity, as explained above in this section) times each component of the unit velocity vector. The floor altitude is also set to 0m, so that the aircraft can fly as low as necessary to land.

飞机的速度矢量与通往空军基地的矢量之间的角度决定了到达爬升点的飞行方式。如果该角度小于0.8度，飞机将直飞到爬升点；否则，飞机将以曲线的方式飞向爬升点。如果到空军基地的距离小于1000米，飞机的速度矢量被设置为指令速度（50米/秒或比最小速度高30%的较大者，如本节上文所述）乘以单位速度矢量的每个分量。底层高度也被设置为0米，这样飞机就可以飞到降落所需的最低高度。

The wingman will follow the Wingman Flight mode procedures until 5 Km from homebase. Its airspeed will be commanded to the maximum of the aircraft approach speed (1.3 Min Speed) and 50 m/sec. If the distance to the airbase is less than 1 Km, the wingman will land at the airbase.

僚机将遵循僚机飞行模式的程序，直到距离基地5公里。它的空速将被指令为飞机进场速度的最大值（1.3倍最小速度）和50米/秒的速度。

As the distance to the airbase is updated, FP determines if the aircraft has landed. The aircraft has landed at the airbase when the distance to the airbase is less than or equal to the aircraft’s turning radius and the dot product of the unit direction and unit velocity vectors is negative.

随着到空军基地的距离被更新，FP确定飞机是否已经降落。当到空军基地的距离小于或等于飞机的转弯半径，并且单位方向和单位速度矢量的点积为负数时，飞机已经降落在空军基地。

# 5.6.8 Avoid Flight Mode

5.6.8 避让飞行模式

The Avoid flight mode always uses the truth to navigate, because it is performed relative to targets that are in track. Perception errors will therefore wash out.

避让飞行模式总是使用真实值来导航，因为它是相对于在轨道中的目标执行的。因此，感知误差会被冲掉。

However, if the aircraft has a navigation element, the Avoid flight mode will update the aircraft’s perception of its own state, using the formulas in Section 5.5.1. If the aircraft has no navigation element, then perception will be set and updated with the same values as the truth.

然而，如果飞机有导航组件，避让飞行模式将使用5.5.1节中的公式更新飞机对自身状态的感知。如果飞机没有导航组件，那么感知（误差）将被设置，并以与事实相同的值更新。

The Avoid mode of flight for aircraft causes the aircraft to maintain a flight path normal to the vector for the aircraft being avoided. This flight mode is currently used by the Wild Weasel, AGAttacker, Fighter, and Flexible Commander rulesets. These rulesets makes use of this flight mode in a reaction to being locked by a SAM system.

飞机的避让飞行模式使飞机保持一个与被避让飞机的矢量正常距离的飞行路径。这种飞行模式目前被Wild Weasel, AGAttacker, Fighter和Flexible Commander规则集所使用。 这些规则集将使用这种飞行模式来应对被SAM系统锁定的情况。

The user controls the Avoid maneuver through the ruleset options.. The user can select the Wild Weasel or AGattacker to perform this maneuver during the lock phase. The use of this maneuver during the React-to-SAM-Lock phase is also controlled by the user. The user can specify the duration of the maneuver, as well as the altitude at which the maneuver will be performed. For more details on the ruleset control of this flight mode, see Subsection 4.7.24.

用户通过规则选项来控制避让机动。用户可以在锁定阶段选择 "野鼬 "或 "攻击者 "来执行这一机动动作。在响应到SAM-Lock阶段时使用该机动动作也由用户控制。用户可以指定该机动的持续时间，以及执行该机动的高度。关于该飞行模式的规则集控制的更多细节，见4.7.24小节。

When operating in the Avoid flight mode, the aircraft attempts to maintain a course normal to the platform being avoided (i.e., the aircraft remains at a constant distance from the avoided platform). Within this flight mode, the aircraft may fly terrain following at the altitude commanded by the ruleset. The terrain following methodology is described in Subsection 5.4.3. The floor altitude used by the terrain following is set by the commanded AGL altitude.

在避让飞行模式下运行时，飞机试图保持与被避让平台的正常航线（即飞机与被避让平台保持恒定距离）。在这种飞行模式下，飞机可以在规则集指挥的高度进行地形跟踪飞行。 地形跟踪方法在5.4.3小节中描述。地形跟踪所使用的底层高度是由指令的AGL高度设定的。

If terrain following is not necessary and if the direction of flight causes the aircraft to fly above the ceiling altitude or below the floor altitude, it is adjusted as described in Subsection 5.4.3 for altitude monitoring. The ceiling altitude for altitude monitoring is set to the airframe’s service altitude limit. The floor altitude is set to 200 m.

如果不需要地形跟踪，如果飞行方向导致飞机飞到上界以上或底层高度以下，则按5.4.3小节所述调整高度监控。用于高度监控的上界被设置为机体的使用高度极限。底层高度被设置为200米。

The target vector from the avoiding platform to the avoided platform is first computed. The avoidance vector that is normal to the target vector is next computed as the cross product of the target vector with the avoiding platform’s position. This avoidance vector is the vector that defines the direction of flight for the platform. This avoidance vector will cause the platform to fly to the right while avoiding the platform. If the platform to be avoided is to the right of the avoiding platform’s current velocity vector, the avoidance vector undergoes a 180-deg phase shift to cause the platform to fly to the left to avoid the platform.

首先计算从避让平台到被避让平台的目标矢量。接下来计算出与目标矢量呈法线关系的避让矢量，作为目标矢量与避让平台位置的交积。这个避让矢量是定义平台飞行方向的矢量。这个避让矢量将使平台在避让平台的同时向右飞行。如果要避让的平台在避让平台的当前速度矢量的右边，则避让矢量会发生180度的变化，使平台飞向左边以避让该平台。

Once the avoidance vector, i.e., the direction vector, is established, the aircraft is flown using the aircraft flight modeling described in Subsection 5.4.

一旦避让矢量，即方向矢量被确定，飞机就会使用第5.4节所述的飞机飞行模型进行飞行。

# 5.6.9 Vector Flight Mode

5.6.9 矢量飞行模式

This flight mode flies a fighter in a direction rather than on a pursuit course after another platform. The C3I model computes an Intercept Point (IP) for an incoming airborne platform and vectors the fighter by sending to FP the heading, the ground range to the interception point, the altitude, and the speed the fighter should fly. The decision to use the Vector flight mode is made by C3I based on the fighter’s ruleset. This flight mode is only available for aircraft using the fighter ruleset.

这种飞行模式使战斗机朝着一个方向飞行，而不是在追赶另一个平台的过程中飞行。C3I模型计算出一个来袭的空中平台的拦截点（IP），并通过向FP发送航向、到拦截点的地面距离、高度和战斗机应该飞行的速度来为战斗机定向。使用矢量飞行模式的决定是由C3I根据战斗机的规则集做出的。这种飞行模式只适用于使用战斗机规则集的飞机。

## 5.6.9.1 Vector Flight Mode Initialization

5.6.9.1 矢量飞行模式的初始化

After making the decision to use the vector flight mode, the C3I model sends to FP the ground range and heading to the IP and the altitude and speed the fighter is to fly. This information is used to compute the intercept point including the ground range, heading and altitude. For the laser case, C3I sends to FP the position of the target centroid, so that the intercept point does not have to be computed from the heading and ground range. The calculation of the IP varies depending on the underlying Earth model.

在做出使用矢量飞行模式的决定后，C3I模型向FP发送地面范围和前往IP的航向以及战斗机要飞行的高度和速度。这些信息被用来计算拦截点，包括地面距离、航向和高度。对于激光情况，C3I向FP发送目标中心点的位置，这样拦截点就不必从航向和地面距离计算出来。IP的计算根据基础地球模型的不同而不同。

## 5.6.9.2 Vector Flight Mode Platform Update

5.6.9.2 矢量飞行模式平台更新

If the aircraft has a navigation element, the Vector flight mode will update perception according to the equations in Section 5.5.1. In order to navigate according to perception, it is also necessary that the Accumulate Error Only option is not selected, the laser target centroid maneuver is not being performed, and the target to which the aircraft is vectoring is not in track. If any of these conditions fails or if there is no navigation element, this flight mode navigates according to truth, and perception will be set and updated with the same values as the truth. Note that this means that in the following discussion, whenever it is stated that a perceived value is used, this will correspond with the truth value if the aircraft is flying according to the truth.

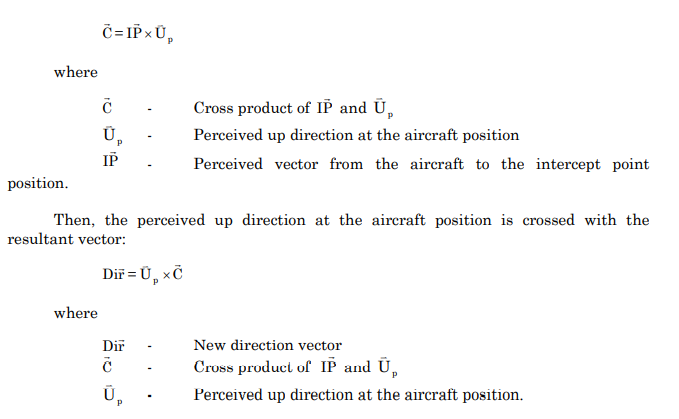
如果飞机有导航组件，矢量飞行模式将根据第5.5.1节的方程式更新感知。为了根据感知进行导航，还需要不选择“Accumulate Error Only”（仅累积误差）选项，不执行激光目标中心点机动，以及飞机正在矢量的目标不在轨道上。如果这些条件中的任何一个不成立了，或者没有导航组件，这个飞行模式就会按照真实情况进行导航，感知将被设置并更新为与真实情况相同的值。请注意，这意味着在下面的讨论中，在说到使用感知值的情况下，如果飞机是按照真实值飞行的，那么感知仍将与真实值对应。

Platform movement for the vector flight mode is performed in steps up to the end of the update interval. At the beginning of the update interval, command speed VCmd is initialized to the desired speed sent from the C3I model. The perceived altitude HP of the aircraft is computed using DblECEFtoAlt described in Appendix B10. The aircraft is flown at a constant altitude.

矢量飞行模式的平台运动是分步进行的，直到更新时间间隔结束。在更新间隔的开始，指令速度VCmd被初始化为从C3I模型发送的期望速度。飞机的感知高度HP是使用附录B10中描述的DblECEFtoAlt计算的。飞机在一个恒定的高度上飞行。

Next, the desired direction of flight vector is calculated. First the direction vector is computed using the methodology described in section 5.5.1 with the intercept point position as the destination. Then, the cross product of that direction vector to the intercept point position and the perceived up direction at the aircraft position is found:

接下来，计算所需的飞行方向矢量。首先，使用第5.5.1节中描述的方法，以截获点位置为目的地，计算出方向矢量。然后，找到该方向矢量与截获点位置和飞机位置上感知到的上升方向的交积。

  
   
 The resultant vector is normal to the perceived up direction at the aircraft position and consequently is normal to the surface of the Earth. It also points in the direction of the intercept point. This is the desired perceived direction vector. If terrain following or an altitude adjustment is required, the terrain following methodology described in Subsection 5.5.3 is used to modify the direction vector. The floor altitude used by the terrain following is set by the commanded altitude. Due to the nature of the vector flight mode maneuver, the perceived altitude maintained will be measured MSL rather than AGL.

结果矢量在飞机位置上与感知的上升方向呈法线，因此与地球表面成法线，同时还指向拦截点的方向。这就是期望的感知方向矢量。如果需要地形跟踪或高度调整，则使用5.5.3小节中描述的地形跟踪方法来修改方向矢量。地形跟踪所使用的底层高度是由指令高度设定的。由于矢量飞行模式机动的性质，保持的感知高度将被测量为MSL而不是AGL。

If terrain following or altitude adjustment is not necessary, the perceived direction vector is modified to account for Earth curvature by flying the aircraft while maintaining a constant altitude rate. Subsection 5.5.4 explains the constant altitude rate methodology. If the perceived direction vector causes the aircraft to fly above the ceiling altitude or below the floor altitude, it is adjusted as described in Subsection 5.5.3 for altitude monitoring. The ceiling altitude for altitude monitoring is set to the airframe’s service altitude limit. The floor altitude is set to 200 m.

如果没有必要进行地形跟踪或高度调整，则保持恒定高度率飞行，同时对感知方向矢量进行修改，以考虑地球曲率。5.5.4小节解释了恒定高度率的方法。如果感知方向矢量导致飞机飞到上界以上或底层高度以下，则按第5.5.3小节所述的高度监测方法进行调整。用于高度监控的上界被设置为机体的使用高度极限。底层高度被设置为200米。

Once terrain following, altitude adjustment, and constant altitude rate have been checked and the perceived direction vector modified accordingly, the truth direction vector is calculated according to the translation methodology laid down toward the end of Section 5.5.1.

一旦检查了地形跟踪、高度调整和恒定高度率，并相应地修改了感知方向矢量，就可以根据第5.5.1节末尾规定的翻译方法计算真实方向矢量。

Next, the aircraft climbs or descends to the commanded intercept altitude while turning and proceeding toward the target. The climb/descent angle is limited to give a reasonable climb/descent. Once the fighter perceives that it has reached the commanded altitude, it flies to the intercept point at that altitude.

接下来，飞机爬升或下降到指令的拦截高度，同时转向并向目标前进。爬升/下降的角度是有限的，以完成一个合理的爬升/下降过程。一旦战斗机认为它已经达到了命令的高度，它就在这个高度上飞向拦截点。

Another property of the vector flight mode is that the fighter will fly to its perceived intercept point and then fly beyond the point to a reattack range specified in the Vector Phase of the fighter ruleset. This allows the fighter to search for the attacker target for some distance after passing the perceived intercept point. Consequently, the fighter must still fly along the current direction of flight after passing the intercept point until the reattack range has been surpassed. Therefore, once the fighter passes the perceived IP and the computed direction vector is in the opposite direction of the fighter direction of flight, the negative of the direction vector is used to guide the fighter.

矢量飞行模式的另一个特性是，战斗机将飞到其感知的拦截点，然后飞过该点，到达战斗机规则集的矢量阶段中指定的再攻击范围。这使得战斗机在通过感知拦截点一段距离后，仍然可以搜索攻击者目标。因此，战斗机在通过拦截点后仍必须沿当前的飞行方向飞行，直到超过再攻击范围。因此，一旦战斗机通过感知的IP，并且计算出的方向矢量与战斗机的飞行方向相反，方向矢量的负值就被用来导航战斗机。

If an aircraft located within a Missile Engagement Zone (MEZ) is being vectored at a heading to intercept a target aircraft, it will follow the associated Low-Level Transit Route (LLTR), if any, to exit the MEZ before flying to the perceived IP point. Once out of the MEZ, it will transition to the Vector flight mode and fly to the perceived IP as described above.

如果位于导弹交战区（MEZ）内的飞机正前往拦截目标飞机，它将遵循相关的低空过境路线（LLTR），如果有的话，在飞往感知的IP点之前离开MEZ。一旦离开MEZ，它将过渡到矢量飞行模式，如上所述，飞向感知的IP。

# 5.6.10 Maneuver Flight Mode

5.6.10 机动飞行模式

The maneuver flight mode can be performed while an aircraft is executing a defensive maneuver to avoid a SAM Lock or SAM Launch or via a User Rules response. A maneuver is composed of multiple user-defined segments. The maneuver flight mode executes each of these segments and then returns to the default flight mode when the last segment is completed. Each segment lasts until one of the specified termination values has been reached, depending on the type of segment.

机动飞行模式可以在飞机执行防御性机动以避免SAM锁定或SAM发射时进行，或通过用户规则响应进行。 一个机动动作由多个用户定义的片段组成。机动飞行模式执行每一个片段，然后在最后一个片段完成后返回到默认的飞行模式。达到指定的终止值之一时，每个片段将结束，这取决于片段的类型。

The aircraft is flown at internal time steps. At each time step, a check is performed to see if any of the segment’s termination conditions are satisfied. If so, the aircraft transitions to the next segment and performs that action.

飞机在内部时间步长中飞行。在每个时间步长，进行检查，看是否满足该段的任何终止条件。如果是的话，飞机就会过渡到下一个航段并执行该动作。

If the aircraft has a navigation element, the Maneuver flight mode will update perception as described in Subsection 5.5.1. If the Apply Error to Navigation option is selected for the navigation element, then the aircraft navigates according to perception; otherwise it navigates according to the truth and perception is set and updated with the same values as the truth. Note that this means that in the following discussion, whenever it is stated that a perceived value is used, this will correspond with the truth value if the aircraft is flying according to the truth.

如果飞机有导航组件，机动飞行模式将按5.5.1小节所述更新感知。如果为导航组件选择了 "将误差应用于导航 "选项，则飞机根据感知进行导航；否则就根据真值进行导航，感知的设置和更新与真值相同。请注意，这意味着在下面的讨论中，在说到使用感知值的情况下，如果飞机是按照真实值飞行的，那么感知仍将与真实值对应。

If the Define Direction of Flight option is selected, then a vector in the desired direction of flight is computed as described in Subsection 5.5.1. The destination position is computed based on the selected maneuver segment execution values. If the Compute Direction of Flight option is selected then the direction vector is computed as described in Subsection 0. Once a perceived direction vector has been computed according to the chosen maneuver segment definition, the angle between the aircraft’s current perceived direction and this new perceived direction is then found. If the angle is less than 0.8 degrees, the aircraft will fly straight; otherwise, it will fly in a curve.

如果选择了 "定义飞行方向 "选项，那么将按照第5.5.1小节所述，计算出所需飞行方向的矢量。目的地位置是根据选定的机动段执行值来计算的。如果选择了计算飞行方向选项，那么方向矢量的计算如第0子节所述。一旦根据所选的机动段定义计算出一个感知方向矢量，那么就会计算飞机当前的感知方向与这个新的感知方向之间的角度。如果这个角度小于0.8度，飞机将直线飞行；否则，它将以曲线飞行。

When the maneuver has been completed, a check is made to determine if any waypoints are perceived to have been passed and should therefore be skipped. Only route type waypoints will be skipped. If the current simulation time has exceeded the off time of a waypoint, it will be skipped. If the simulation time does not exceed the waypoint off time, but the off time will be exceeded before the aircraft can reach the waypoint, then that waypoint will be skipped.

当动作完成后，将进行检查以确定是否有任何航路点被认为已经通过，因此应该被跳过。只有路线类型的航路点会被跳过。如果当前的模拟时间超过了某个航路点的关闭时间，它将被跳过。如果模拟时间没有超过航路点的关闭时间，但在飞机到达航路点之前将超过关闭时间，那么该航路点将被跳过。

Maneuver elements are defined by the user in Scenario Generation. Maneuvers are limited by the user defined floor and ceiling altitudes. The floor altitude is the minimum AGL altitude at which the aircraft is allowed to fly during the maneuver. The ceiling altitude is the minimum of either the airframe’s service altitude limit or the maximum MSL altitude at which the aircraft is allowed to fly during the maneuver.

机动元素是由用户在方案生成中定义的。机动受到用户定义的最低和最高高度的限制。下限高度是飞机在机动中被允许飞行的最低AGL高度。上限高度是机体的使用高度限制或允许飞机在机动期间飞行的最大MSL高度的最小值。

## 5.6.10.1 Maneuver Segments

5.6.10.1 机动部分

Each maneuver segment type has different maneuver parameters available that can be used to define how the aircraft flies during the segment and when to transition to the next segment.

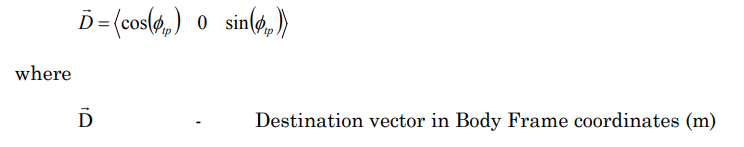
每种机动段类型都有不同的机动参数可用，可以用来定义飞机在该阶段中的飞行方式以及何时过渡到下一个阶段。

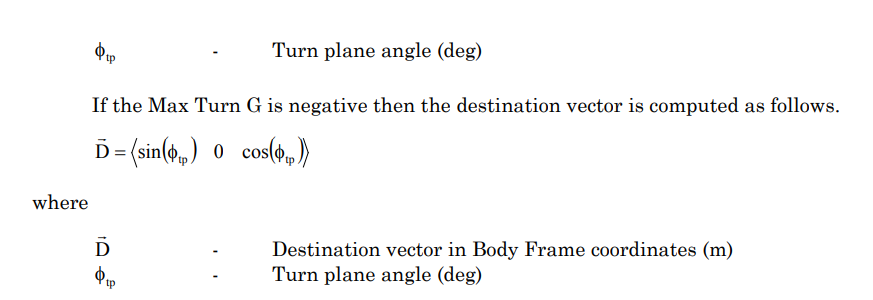
### 5.6.10.1.1 Direction of Flight

5.6.10.1.1 飞行方向

There are two options available for determining the desired direction of flight during each maneuver segment. If the Compute Direction of Flight option is selected then the direction of flight is computed based on the Roll, Roll Rate, Max Turn G, and Bank Angle execution values. This option allows the flight dynamics associated with a turn to be defined resulting in the direction of flight as the final outcome of the segment as opposed to directly defining the desired direction of flight. The Roll and Roll Rate are used in conjunction with the Max Turn G and Bank Angle to determine the turn plane and turn radius as described in section 5.6.10.1.2.1.2. The turn plane and turn radius determine the direction of flight that results from the turn. The bank angle and the angle between the local zero roll plane and turn plane about the longitudinal axis are computed as described in section 5.6.10.1.2.1.2. These parameters are then used to compute a destination vector in the turn plane orthogonal to the current velocity vector in body frame coordinates. If the Max Turn G is positive then the destination vector is computed as follows.

在每个机动阶段，有两个选项可用于确定期望的飞行方向。如果选择 "计算飞行方向 "选项，那么飞行方向将根据滚转、滚转率、最大转弯半径和倾斜角度的执行值来计算。这个选项允许定义与转弯相关的飞行动力，使飞行方向成为该段的最终结果，而不是直接定义所需的飞行方向。如第5.6.10.1.2.1.2节所述，滚转和滚转率与最大转弯半径和倾斜角一起使用，以确定转弯平面和转弯半径。转弯平面和转弯半径决定了转弯后的飞行方向。如5.6.10.1.2.1.2节所述，转弯平面和转弯半径决定了转弯时的飞行方向，转弯角度和机体零滚平面与转弯平面之间的角度被计算出来。然后，这些参数被用来计算转弯平面内与当前速度矢量正交的机体坐标的目标矢量。如果最大转弯G是正的，那么目的地矢量的计算方法如下。



  
  
 The destination vector is transformed from Body Frame coordinates to ECEF coordinates using the ECEF2Body and Rotate2 functions described in Subsections B10.2.4 and B10.3.14 respectively. The destination vector, turn plane, and turn radius are then used to fly the aircraft in a curved flight path as described in Subsection 5.5.3.2. The resulting aircraft position is computed at the end of each integration interval until a termination value is satisfied. When the segment terminates, the aircraft continues to fly at the resulting flight path angle, heading, and roll. The Compute Direction of Flight option is only available for the Custom segment type. Carefully select the termination values used with the Compute Direction of Flight option because it is possible to setup segments which never meet the termination conditions.

目的地矢量通过B10.2.4和B10.3.14小节中描述的ECEF2Body和Rotate2函数从机体坐标转换到ECEF坐标。然后，目的地矢量、转弯平面和转弯半径被用来使飞机按照5.5.3.2小节中描述的弯曲飞行路径飞行。在每个积分区间结束时都将计算得到的飞机位置，直到满足一个终止值。当该段终止时，飞机继续以产生的飞行路径角度、航向和滚转飞行。计算飞行方向的选项只适用于自定义航段类型。仔细选择用于计算飞行方向选项的终止值，因为有可能设置的航段（永远不可能）不符合终止条件。

The velocity at the start of the maneuver segment lies in the turn plane. Therefore, the turn is made with the turn plane oriented at the flight path angle of the aircraft at the start of the segment. Two maneuver segments can be used to define a maneuver segment using the Compute Direction of Flight option relative to a given FPA. Define the first maneuver segment using Define Direction of Flight that orients the aircraft at the desired FPA. If the maneuver segment that follows uses the Compute Direction of Flight option, then it will initiate from the FPA achieved in the preceding segment. A single custom maneuver segment can be used with the Compute Direction of Flight option to achieve a particular FPA using the FPA termination value as described in Subsection 5.6.10.1.2.2.2

机动段开始时的速度位于转弯平面内。 因此，转弯时，转弯面的方向是该段开始时飞机的飞行路径角。两个机动段可以用来定义一个机动段，使用相对于给定FPA的计算飞行方向选项。使用 "定义飞行方向 "定义第一个机动段，使飞机在所需的FPA处定向。如果后面的机动段使用计算飞行方向选项，那么它将从前面的机动段中获得的FPA开始。在使用FPA终止值的情况下，一个单一的自定义机动段可以使用计算飞行方向选项来实现一个特定的FPA，如5.6.10.1.2.2小节所述。

If the Define Direction of Flight option is selected then the Flight Path Angle, Heading Angle, or Altitude Execution Values can be used to define the desired final direction of flight for this maneuver segment and Roll, Turn G, and Bank Angle execution values are used to compute and limit the G’s used during the turn to point the aircraft in that direction.

如果选择了 "定义飞行方向 "选项，那么飞行路径角、方位角或高度执行值可用于定义该机动段所需的最终飞行方向，而滚转、转弯G和倾斜角执行值则用于计算和限制转弯时使用的G，以便将飞机指向该方向。

### 5.6.10.1.2 Maneuver Parameters

5.6.10.1.2 机动参数

For each maneuver segment, maneuver parameters describe how the maneuver segment is flown and when it is complete. A maneuver parameter can be defined as either an execution value or a termination value, or as both. Each maneuver parameter is defined by a random number distribution type. A random draw is made from each distribution at the beginning of the maneuver segment to define the parameter used throughout the segment. This statistical representation can be used to create variability between aircraft maneuvers to simulate minor pilot adjustments. The mean value of each distribution is displayed in each maneuver parameter field. If randomness has been eliminated from the scenario, the mean value of each maneuver parameter is used.

对于每个机动段，机动参数描述了机动段的飞行方式和完成时间。一个机动参数可以定义为执行值或终止值，也可以定义为两者。每个机动参数由一个随机数分布类型定义。在机动段开始时，从每个分布中随机抽取，以定义整个机动段使用的参数。这种统计表示法可以用来在飞机操纵之间创造随机性，以模拟飞行员的微小调整。每个分布的平均值将显示在每个机动参数区域。如果随机性已从方案中消除，则使用每个机动参数的平均值。

#### 5.6.10.1.2.1 Execution Values

5.6.10.1.2.1 执行值

The selected maneuver parameter execution values are applied to the aircraft while it is performing the current maneuver segment. These parameters can be used to define the desired final outcome of the maneuver segment or limit the aerodynamic flight of the aircraft during the segment. Only some execution values are applied as limits and they are only applied as limits for certain cases. The details of when and how these are applied as limits are discussed in each execution value subsection. If Define Direction of Flight is enabled then the Roll, Max Turn G, and Max Bank Angle are used to compute the G’s pulled during any turns used to achieve the desired direction of flight. If Define Direction of Flight is enabled and the Roll, Max Turn G, and Max Bank Angle are not selected as execution parameters, then a max G turn is performed in order to achieve the desired direction of flight.

选择的机动参数执行值在飞机执行当前机动段时被应用到飞机上。这些参数可以用来定义机动段的预期最终结果或限制飞机在该段中的空气动力飞行。只有一些执行值被应用为限制值，而且它们只在某些情况下被应用为限制值。在每个执行值小节中讨论了何时和如何作为限制值进行应用的细节。

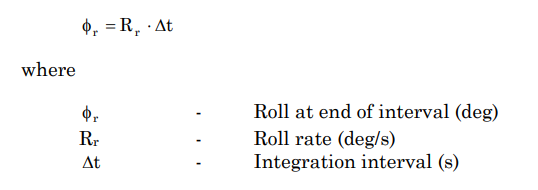
如果 "定义飞行方向 "被启用，那么滚转、最大转弯G值和最大倾斜角度将被用来计算任何转弯过程中的G值，以实现所需的飞行方向。如果 "定义飞行方向 "被启用，并且没有选择 "滚转"、"最大转弯G "和 "最大倾斜角度 "作为执行参数，那么将执行一个最大G的转弯，以实现所需的飞行方向。

##### 5.6.10.1.2.1.1 Roll Rate

5.6.10.1.2.1.1滚转率

Roll Rate is applied as the rate of change of roll which the aircraft can achieve during this maneuver segment. If the Define Direction of Flight option is selected and the maneuver requires the aircraft to roll, then the specified Roll Rate will be utilized to achieve the required roll. If the Compute Direction of Flight option is selected then the Roll Rate can be used with the Max Turn G or the Max Bank Angle to define the turn plane and the radius of the turn without defining the Roll. The turn plane and turn radius determine the direction of flight that results from the turn. In this case the Roll Rate is applied to compute the resulting roll at the end of each integration interval. A positive roll rate will cause a clockwise roll from the pilot’s perspective in order to achieve the desired roll. A negative roll rate will cause a counterclockwise roll from the pilot’s perspective in order to achieve the desired roll.

滚转率是作为飞机在这个机动段中可以实现的滚转变化率来应用的。如果选择了 "定义飞行方向 "选项，并且该机动动作需要飞机滚转，那么将利用指定的滚转率来实现所需的滚转。如果选择了计算飞行方向选项，那么滚转率可以和最大转弯半径或最大倾斜角一起使用，来定义转弯平面和转弯半径，而不需要定义滚转。转弯平面和转弯半径决定了转弯后的飞行方向。在这种情况下，滚转率被应用于计算每个积分区间结束时的滚转结果。从飞行员的角度看，一个正的滚转率将导致顺时针的滚转，以达到预期的滚转。从飞行员的角度看，负的滚转率将导致逆时针滚转，以达到预期的滚转。



The resulting roll is then used in conjunction with either the defined Max Turn G or the Max Turn G computed from the Max Bank Angle to compute the turn plane and the turn radius as described in Subsection 5.6.10.1.2.1.2.

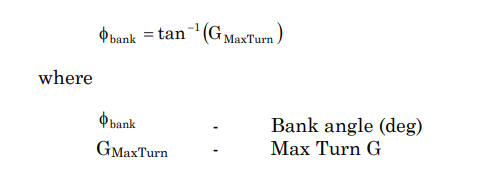
然后，所得到的滚转与定义的最大转弯G，或从最大倾斜角计算的最大转弯G一起使用，以计算转弯平面和转弯半径，如5.6.10.1.2.1.2小节所述。

##### 5.6.10.1.2.1.2 Roll

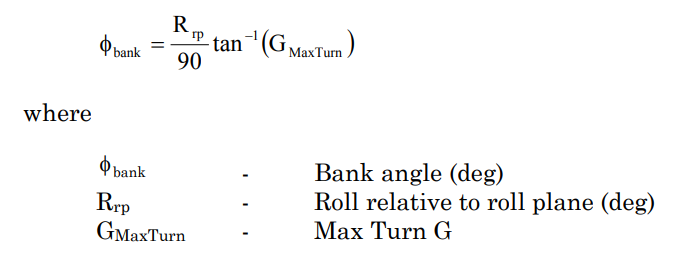
5.6.10.1.2.1.2 滚转

Roll is defined as the angle about the lateral axis of the aircraft with zero roll defined as having the aircraft wings level in the lateral direction with the top of the aircraft pointing away from the ground. The aircraft may be pitched up or down, therefore the wings may or may not be level in the longitudinal direction. The wings of the aircraft with zero roll define the zero roll plane discussed below. The zero-roll plane remains level in the lateral direction but remains aligned with the pitch and azimuth of the aircraft. Note that the longitudinal axis of the aircraft is aligned with the velocity vector and that positive roll is defined as a clockwise rotation from the pilot’s perspective. If Compute Direction of Flight is selected and Roll is selected as an Execution Value then the Roll is used in conjunction with either the Max Turn G or the Bank Angle to determine the orientation of the turn plane and the turn radius, which define the direction of flight at the end of each integration interval until a termination value is satisfied. The Max Turn G is computed as described in Subsection 5.6.10.1.2.1.3. The Max Turn G is used to compute the bank angle relative to the turn plane. If the Max Turn G is positive then the bank angle is computed as follows.

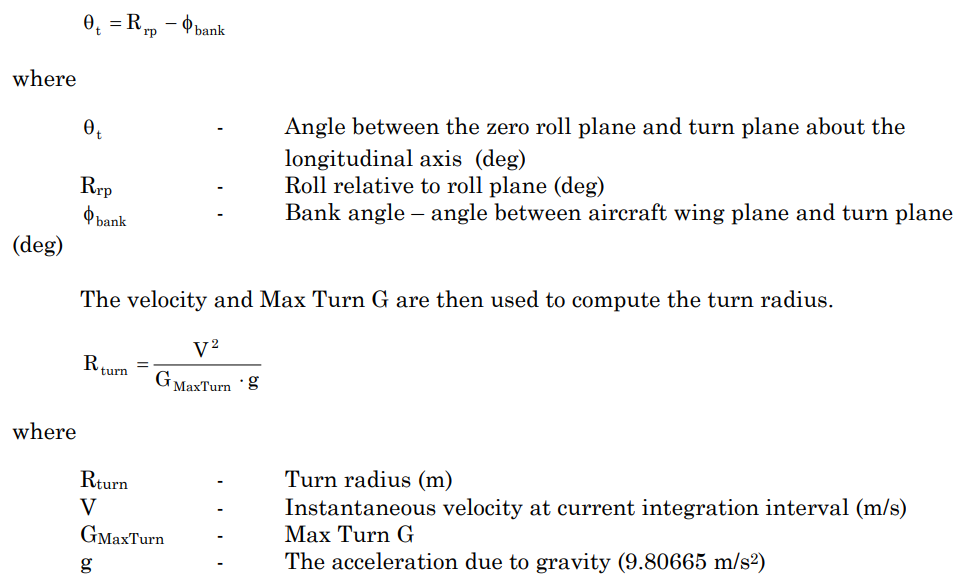
滚转角被定义为围绕飞机横向轴线的角度，零滚转角被定义为飞机机翼在横向方向上是水平的，飞机的顶部指向远离地面。飞机可以向上或向下俯冲，因此机翼在纵向上可能是也可能不是水平的。具有零滚转角的飞机机翼定义了下面讨论的零滚平面。零滚平面在横向上保持水平，但与飞机的俯仰和方位角保持协调。请注意，飞机的纵轴与速度矢量对齐，从飞行员的角度看，正滚转被定义为顺时针旋转。如果选择了“计算飞行方向”，并且选择了滚转作为执行值，那么滚转将与最大转弯G或倾斜角一起使用，以确定转弯平面的方向和转弯半径，这定义了每个积分区间结束时的飞行方向，直到满足一个终止值。最大转弯G的计算方法如5.6.10.1.2.1.3小节中所述。最大转弯G用于计算相对于转弯平面的倾斜角。如果最大转弯G是正数，那么倾斜角的计算方法如下。

  
 If the Roll Rate execution value is also selected then the roll achieved at each integration interval is computed as described in Subsection 5.6.10.1.2.1.1. If the Max Turn G is negative then a nose down turn is being performed therefore a scale factor is applied to the bank angle calculation.

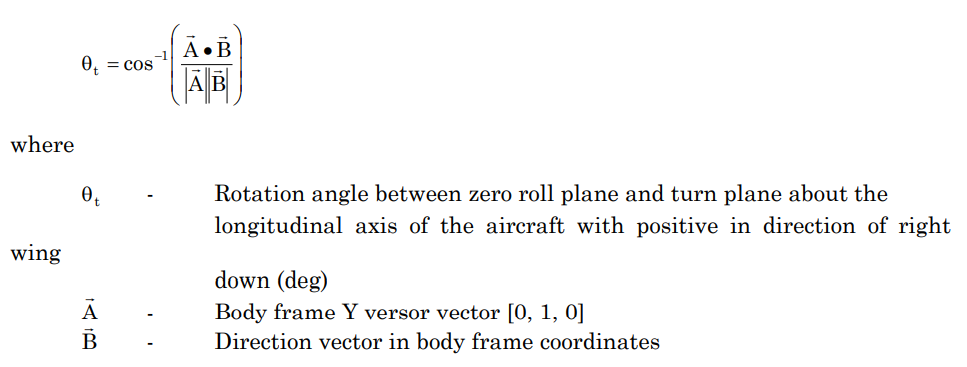
如果也选择了滚转率执行值，那么在每个积分区间实现的滚转将按照5.6.10.1.2.1.1小节所述进行计算。如果最大转弯G为负值，那么正在进行机头向下的转弯，因此一个比例系数被应用到倾斜角计算中。

  
 If the Bank Angle execution value is selected and if the magnitude of the Bank Angle is less than the magnitude of the computed bank angle then the Bank Angle execution value is used instead of the computed bank angle. Then, the bank angle and roll are used to compute the angle between the local zero roll plane and turn plane about the longitudinal axis.

如果选择了倾斜角执行值，并且如果倾斜角的大小小于计算的倾斜角的大小，那么倾斜角执行值将被用来代替计算的倾斜角。然后，倾斜角和滚转被用来计算本地零滚平面和转弯平面之间关于纵轴的角度。

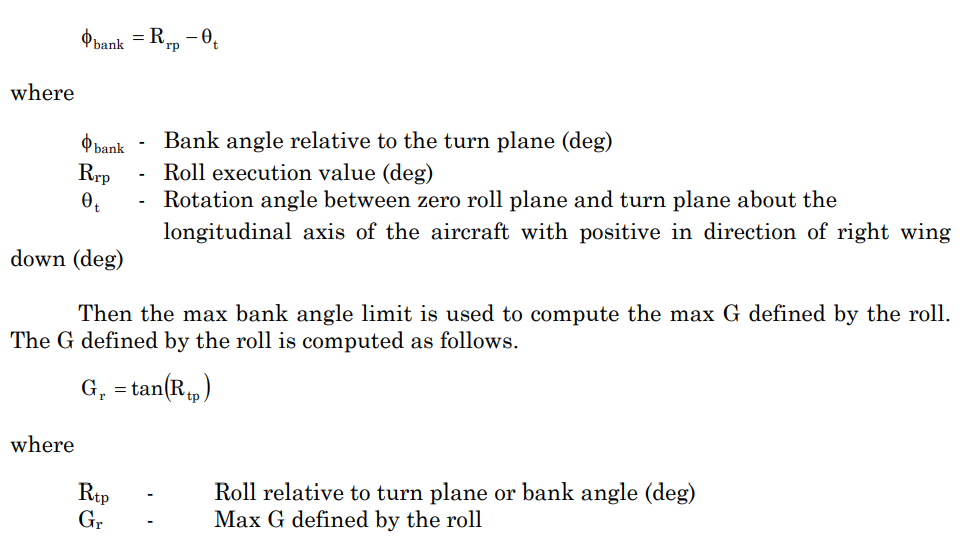
  
   
 If Define Direction of Flight is enabled and Roll is selected as an Execution Value, then the Roll is used to limit the amount of roll that is achieved during a turn in this maneuver segment and hence limit the G’s available for turns during this maneuver segment. The Rotation angle between zero roll plane and turn plane about the longitudinal axis of the aircraft is computed by first converting the direction vector to body frame coordinates using the ECEF2BodyMatrix function described in Subsection B10.2.6. Then the angle is computed from the Y versor vector.

如果 "定义飞行方向 "被启用且 "滚转角"被选为执行值，那么 "滚转角"将被用来限制在此机动段中转弯时实现的滚转量，从而限制此机动段中转弯的可用G值。零滚平面和转弯平面之间关于飞机纵轴的旋转角度是通过使用B10.2.6小节中描述的ECEF2BodyMatrix函数首先将方向矢量转换为机体坐标来计算的。然后从Y方向矢量计算出角度。



The roll is used to compute the max bank angle limit. In this case the turn plane is defined by the current direction of flight and the desired direction of flight.

滚转角将被用来计算最大的倾斜角限制值。在这种情况下，转弯平面由当前的飞行方向和期望的飞行方向定义。

  
 The actual G used for the turn is set to the minimum of the G defined by the specified roll, the Max Turn G defined for the segment, and the max G available computed from the airframe.

用于转弯的实际G值被设置为由指定的滚转定义的G值、为该段定义的最大转弯G值和从机体计算的最大G值的最小值。

##### 5.6.10.1.2.1.3 Max Turn G

5.6.10.1.2.1.3 最大转弯G

If Compute Direction of Flight is enabled and Max Turn G is selected as an Execution Value then the minimum of the Max Turn G, airframe available G, and the G computed from the Bank Angle is used in conjunction with the Roll and Roll Rate to determine the turn plane and radius which define the final direction of flight at the end of each integration interval until a termination value is satisfied.

如果计算飞行方向被启用，并且最大转弯G被选为执行值，那么最大转弯G、机身可用G、以及从倾角计算出的G的最小值与滚转角和滚转率将一起被用来确定转弯平面和半径，在每个积分区间结束时定义最终的飞行方向，直到满足终止值。

If Define Direction of Flight is enabled and Max Turn G is selected as an Execution Value then the minimum of the Max Turn G, the turn G computed from the Bank Angle, the airframe available G, and the turn G computed from the Roll is used to define the amount of G’s that can be achieved to perform a turn during this maneuver segment.

如果 "定义飞行方向 "被启用，并且 "最大转弯G "被选为执行值，那么 "最大转弯G "的最小值、从倾斜角度计算的转弯G、机体可用G和从滚转计算的转弯G被用来定义在此机动段中执行转弯所能达到的G值。

The Max Turn G can be defined as positive or negative. Positive Max Turn G causes the aircraft to use a nose up to execute a turn or change altitude while a negative Max Turn G causes the aircraft to use a nose down to execute a turn or change altitude.

最大转弯G可以定义为正或负。正的最大转弯G导致飞机使用机头向上来执行转弯或改变高度，而负的最大转弯G导致飞机使用机头向下来执行转弯或改变高度。

Max Turn G Mode defines how the Max Turn G is specified for the segment. The available options are Absolute, %MIL, and %AB. The Absolute Max Turn G mode is defined as the ratio of the total acceleration experienced by the aircraft and the acceleration due to gravity at sea level. The %MIL mode allows specification of the Max Turn G as a percentage of the available MIL G computed from the airframe MIL G available table for HIFI airframes or from the Max G airframe parameter for non-HIFI airframes. The %AB mode allows specification of the Max Turn G as a percentage of available MAX AB G computed from the airframe MAX AB G available table for HIFI or from the Max G airframe parameter for non-HIFI airframes.

最大转弯G模式定义了如何为该段指定最大转弯G。可用的选项有绝对、%MIL和%AB。绝对最大转弯G模式被定义为飞机经历的总加速度和海平面重力加速度的比率。%MIL模式允许指定最大转弯G为可用MIL G的百分比，对于HIFI机身，从“机身可用MIL G表格”计算，对于非HIFI机身，从最大G机身参数计算。%AB模式允许将最大转弯G指定为根据HIFI机身的MAX AB G可用表或对于非HIFI机身的Max G机身参数计算出来的，可用的MAX AB G的百分比。

##### 5.6.10.1.2.1.4 Max Bank Angle

5.6.10.1.2.1.4 最大倾斜角

Bank angle is defined as the angle about the longitudinal axis of the aircraft relative to the turn plane of the aircraft. If Compute Direction of Flight is enabled and Max Bank Angle is selected as an Execution Value then the minimum of the Max Bank Angle and the bank angle computed from the Max Turn G is used in conjunction with the Roll and Roll Rate parameters to determine the turn plane and turn radius which define the direction of flight at the end of each integration interval until a termination value is satisfied.

倾斜角被定义为相对于飞机转弯面的关于飞机纵轴的角度。如果计算飞行方向被启用，并且最大倾斜角被选为执行值，那么最大倾斜角的最小值和从最大转弯G计算出来的倾斜角与滚转角和滚转率参数可以一起使用，以确定转弯平面和转弯半径，在每个积分区间结束时定义飞行方向，直到满足一个终止值。

If Define Direction of Flight is enabled and Max Bank Angle is selected as an Execution Value then the minimum of the Max Turn G, the turn G computed from the Bank Angle, the airframe available G, and the turn G computed from the Roll is used to define the amount of G’s that can be achieved to perform a turn during this maneuver segment.

如果 "定义飞行方向 "被启用，并且最大倾斜角被选为执行值，那么最大转弯G、从倾斜角计算的转弯G、机体可用G和从滚转角计算的转弯G的最小值被用来定义在此机动段中执行转弯所能达到的G值。

##### 5.6.10.1.2.1.5 Flight Path Angle

5.6.10.1.2.1.5 飞行路线角度

If the Define Direction of Flight option is selected and the Execution Value option is selected for Flight Path Angle (FPA) but not for Altitude then the user defined FPA defines the desired direction of flight. A positive value represents a FPA in the up direction and a negative value represents a FPA in the down direction. The Heading Angle Execution Value can be used in conjunction with the FPA to define the desired direction of flight. If the Altitude Execution Value is enabled then the FPA input limits the flight path angle that can be flown to achieve the desired altitude to the range [-FPA, FPA]. The altitude is achieved using the largest magnitude FPA that the aircraft is capable of achieving.

如果选择了 "定义飞行方向 "选项，并且为飞行路径角度（FPA）选择了执行值，但没有为高度选择，那么用户定义的FPA将定义所需的飞行方向。正值代表向上方向的FPA，负值代表向下方向的FPA。航向角执行值可与FPA结合使用，以定义所需的飞行方向。如果高度执行值被启用，那么FPA输入将飞行路径角度限制在[-FPA, FPA]的范围内，以实现所需的高度。高度是用飞机能够达到的最大量级的FPA来实现的。

There are three options for defining the FPA. In Absolute FPA mode, the FPA is defined as the angle between the velocity of the aircraft and the local horizontal plane. This is also the angle between the nose of the aircraft and the local horizontal since the orientation is aligned with the velocity vector for all maneuver segment types except for TSPI. This mode can be used to define a desired pitch when using a yaw, pitch, roll absolute coordinate frame. In the Relative FPA mode, the FPA is defined as an angle in the vertical direction relative to the FPA at the start of the segment. In the Relative LOS FPA mode, the FPA is defined as the desired angle between the line of sight (LOS) between the aircraft and the target to which the maneuver is relative and the aircraft’s velocity vector. For example, this mode can be used to accomplish a drag away maneuver segment where the aircraft drags directly away from the target by setting the FPA to 180 degrees and setting the Heading Angle execution parameter to Relative LOS mode and 180 degrees. If the Altitude execution value is selected then the only mode available is the Absolute mode.

定义FPA有三个选项。

在绝对FPA模式下，FPA被定义为飞机速度与本地水平面的角度。这也是飞机机头与本地水平面的角度，因为除TSPI外，所有机动段类型的方向都与速度矢量对齐。当使用偏航、俯仰、滚转的绝对坐标框架时，该模式可用于定义一个期望的俯仰。

在相对FPA模式中，FPA被定义为相对于航段开始时的FPA在垂直方向的一个角度。

在相对LOS FPA模式中，FPA被定义为飞机与机动相对的目标之间的视线（LOS）与飞机的速度矢量之间的期望角度。例如，该模式可用于完成拖离机动段，即飞机直接拖离目标，方法是将FPA设置为180度，并将Heading Angle执行参数设置为Relative LOS模式和180度。如果选择了高度执行值，那么唯一可用的模式就是绝对模式。

##### 5.6.10.1.2.1.6 Heading Angle

5.6.10.1.2.1.6 航向角

Heading angle defines the heading to which the aircraft is to turn during the maneuver segment. The actual heading angle for the segment is determined by the specified value and the selected angle mode. If selected as an execution parameter, the aircraft will turn toward the specified heading until the angle is achieved or until the termination condition is reached. If the heading angle is achieved before a termination condition is met then the aircraft will continue to fly at that heading until a termination condition is met. If a termination condition is met before the heading angle is met then the current segment terminates.

航向角定义了飞机在机动段中要转到的航向。该段的实际航向角由指定值和选择的角度模式决定。如果选择作为执行参数，飞机将转向指定的航向，直到达到该角度或达到终止条件。如果在满足终止条件之前达到了航向角度，那么飞机将继续以该航向飞行，直到满足终止条件。如果在达到航向角之前满足了终止条件，那么当前航段就会终止。

There are four ways to define how the heading angle is specified for the segment. The available options are Absolute, Relative, Relative LOS, and Absolute LOS. An absolute heading is defined relative to North. A relative heading is defined relative to the aircraft’s heading at the initiation of the maneuver segment. Both LOS heading modes are defined relative to the current line of sight vector between the aircraft and its target/attacker. When the Relative LOS mode is selected, the aircraft will turn in the direction that requires the smallest angle of turn to achieve the heading angle relative to the target. When the Absolute LOS mode is selected, the aircraft will fly directly to the angle specified relative to the current heading to the target. To specify an angle to the right of the target use a positive value, to the left of the target use a negative value.

有四种方法来定义如何为该段指定航向角。可用的选项是绝对、相对、相对LOS和绝对LOS。绝对航向是相对于北方定义的。相对航向是相对于飞机在机动段开始时的航向定义的。两个LOS航向模式都是相对于飞机和目标之间的当前视线矢量定义的。

##### 5.6.10.1.2.1.7 Altitude

5.6.10.1.2.1.7 海拔高度

As an Execution Value, Altitude defines to what altitude the aircraft is to fly during the maneuver segment. The actual altitude desired for the segment is determined by the specified value and the selected altitude mode. If selected as an execution parameter, the aircraft will climb or dive to the altitude specified as quickly as possible limited by the FPA and maintain that altitude until the segment is terminated. Section 5.6.10.1.2.1.5 describes how the FPA is used to limit the aircraft’s climb and descent.

作为一个执行值，Altitude定义了飞机在机动段要飞到什么高度。该段所需的实际高度由指定值和选择的高度模式决定。如果选择作为执行参数，飞机将在FPA的限制下尽快爬升或俯冲到指定的高度，并保持该高度，直到该段结束。第5.6.10.1.2.1.5节描述了FPA如何用于限制飞机的爬升和下降。

Altitude mode defines how the altitude is specified for the maneuver segment. The available options for this field are 'Rel', 'AGL', and 'MSL'. Relative altitudes are specified as plus or minus the aircraft’s altitude at the start of the maneuver segment. If the AGL option is selected, then the aircraft will fly terrain following. If the MSL option is selected, then the aircraft is flown to the specified MSL altitude without terrain following.

高度模式定义了如何为机动段指定高度。这个字段的可用选项是 "相对"、"AGL "和 "MSL"。相对高度被指定为机动段开始时飞机高度的加减。如果选择AGL选项，那么飞机将跟随地形飞行。如果选择MSL选项，那么飞机将飞到指定的MSL高度，而不进行地形跟踪。

##### 5.6.10.1.2.1.8 Speed

5.6.10.1.2.1.8 速度

Defines what commanded speed to use while the aircraft is flying the current maneuver segment. The actual speed desired for the segment is determined by the specified value and the selected speed mode. If selected as an execution parameter, the aircraft will attempt to fly at the speed specified during the maneuver segment and maintain that speed until the segment is terminated.

定义了飞机在飞行当前机动段时要使用的指令速度。该段所需的实际速度由指定值和选定的速度模式决定。如果被选为执行参数，飞机将试图在机动段中以指定的速度飞行，并保持该速度，直到该段结束。

Speed mode defines how the speed is specified for the maneuver segment. The available options are Absolute, Relative, % MIL Throttle Setting, % AB Throttle Setting, Target Multiplier, and Platform Multiplier. Relative speeds are specified as plus or minus the aircraft’s speed at the start of the maneuver segment. Throttle Setting speeds are specified as a percentage of the thrust, AB thrust, or max thrust computed from the Hi-Fidelity thrust and AB thrust tables. For aircraft, the thrust is used to compute the acceleration which determines the speed. If the %AB option is used and the afterburners are not available for this airframe, then the maximum MIL thrust is used. For helicopters, if the %MIL option is selected, then the maximum thrust is computed as follows.

速度模式定义了如何为机动段指定速度。可用的选项有绝对速度，相对速度，MIL油门设置百分比，AB油门设置百分比，目标乘数和平台乘数。相对速度被指定为机动段开始时飞机速度的加减。油门设置速度被指定为推力、AB推力或从高保真推力和AB推力表中计算的最大推力的百分比。对于飞机来说，推力是用来计算决定速度的加速度的。如果使用%AB选项，并且该机身没有加力燃烧室，那么将使用最大MIL推力。对于直升机，如果选择了%MIL选项，那么最大推力的计算方法如下。

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If the %AB speed mode setting is selected for helicopters then the maximum thrust is computed using 100% or full Mil. If using Target Multiplier mode, the value specified is multiplied by the target’s speed at the start of the maneuver segment to obtain the desired speed. This speed mode option should only be used for maneuvers adopted relative to a target through the User Rules. If using Platform Multiplier mode, the value specified is multiplied by the aircraft’s speed at the start of the maneuver segment to obtain the desired speed.

如果为直升机选择了%AB速度模式设置，那么最大推力是用100%或全密计算的。如果使用目标乘数模式，指定的值将乘以机动段开始时的目标速度，以获得期望的速度。这个速度模式选项只能用于通过用户规则采用的相对于目标的机动动作。如果使用平台乘数模式，指定的值将乘以飞机在机动段开始时的速度，以获得期望的速度。

#### 5.6.10.1.2.2 Termination Values

5.6.10.1.2.2 终止值

The selected maneuver termination values determine the conditions for the aircraft to terminate the current maneuver segment when the specified values are reached. If multiple termination parameters are selected, the first termination criterion met will cause the transition to the next maneuver segment. The Duration termination value is monitored continuously to allow transition to the next segment at the exact time that the condition is met. All other termination values transition at the integration interval. If this is the last segment for this maneuver then the aircraft will transition back to default flight mode, or, if the maneuver was initiated from the User Rules, then the aircraft will transition back to ruleset control at the end of the current scenario interval. In this case, the aircraft is flown using the maneuver flight mode until the end of the current scenario interval.

所选择的机动性终止值决定了当达到指定值时，飞机终止当前机动段的条件。如果选择了多个终止参数，满足第一个终止标准将导致过渡到下一个机动段。持续时间终止值被持续监控，以允许在满足条件的确切时间过渡到下一个片段。所有其他的终止值在整合间隔时间内过渡。如果这是该机动的最后一段，那么飞机将过渡到默认的飞行模式，或者，如果该机动是由用户规则启动的，那么飞机将在当前想定区间结束时过渡到规则集控制。在这种情况下，飞机将使用机动飞行模式飞行，直到当前想定区间结束。

##### 5.6.10.1.2.2.1 Roll

5.6.10.1.2.2.1 滚转

If Roll is selected as a Termination Value, the absolute value of the roll of the aircraft reaching or exceeding the user defined Roll threshold will terminate the maneuver segment. Roll is defined as the angle about the lateral axis of the aircraft with zero roll defined as having the aircraft wings level in the lateral direction with the top of the aircraft pointing away from the ground.

如果滚转被选为终止值，飞机滚转的绝对值达到或超过用户定义的滚转阈值将终止该机动段。滚转被定义为关于飞机横向轴线的角度，零滚转角被定义为飞机机翼在横向方向上是平的，飞机的顶部指向远离地面。

##### 5.6.10.1.2.2.2 Flight Path Angle

5.6.10.1.2.2.2 飞行路线角度

If the Flight Path Angle Termination Value option is selected, then the maneuver segment terminates when the flight path angle of the aircraft reaches or crosses the specified parameter. If the FPA at the beginning of the maneuver segment is greater than the specified FPA, then the segment terminates when the FPA is less than or equal to the specified FPA. If the FPA at the beginning of the maneuver segment is less than the specified FPA, then the segment terminates when the FPA is greater than or equal to the specified FPA.

如果选择了飞行路径角度终止值，那么当飞机的飞行路径角度达到或越过指定的参数时，该机动段就会终止。如果机动段开始时的 FPA 大于指定的 FPA，那么当 FPA 小于或等于指定的 FPA 时，该机动段就会终止。如果机动段开始时的FPA小于指定的FPA，那么当FPA大于或等于指定的FPA时，该段就终止了。

There are three options for defining the FPA. In Absolute FPA mode, the FPA is defined as the angle between the velocity of the aircraft and the local horizontal plane. This is also the angle between the nose of the aircraft and the local horizontal since the orientation is aligned with the velocity vector for all maneuver segment types except for TSPI. This mode can be used to define a desired pitch when using a yaw, pitch, and roll absolute coordinate frame. In the Relative FPA mode, the FPA is defined as an angle in the vertical direction relative to the FPA at the start of the segment. In the Relative LOS FPA mode, the FPA is defined as the desired angle between the line of sight (LOS) between the LOS from the aircraft to the target and the aircraft’s velocity vector. If the Altitude execution value is selected, then the only mode available is the Absolute mode.

定义FPA有三个选项。在绝对FPA模式下，FPA被定义为飞机速度与当地水平面的角度。这也是飞机机头与本地水平面的角度，因为除TSPI外，所有机动段类型的方向都与速度矢量一致。当使用偏航、俯仰和滚转绝对坐标框架时，该模式可用于定义一个期望的俯仰。在相对FPA模式中，FPA被定义为相对于航段开始时的FPA在垂直方向的一个角度。 在相对LOS FPA模式下，FPA被定义为从飞机到目标的LOS与飞机速度矢量之间的视线（LOS）的期望角度。如果选择了高度执行值，那么唯一可用的模式就是绝对模式。

##### 5.6.10.1.2.2.3 Heading Angle

5.6.10.1.2.2.3 航向角

If selected as a termination parameter, the segment will end when the aircraft reaches or crosses the specified heading angle. If the heading angle at the beginning of the maneuver segment is greater than the specified heading angle, then the segment terminates when the heading angle is less than or equal to the specified heading angle. If the heading angle at the beginning of the maneuver segment is less than the specified heading angle, then the segment terminates when the heading angle is greater than or equal to the specified heading angle.

如果选择作为终止参数，当飞机达到或越过指定的航向角时，该航段将结束。如果机动段开始时的航向角大于指定的航向角，那么当航向角小于或等于指定的航向角时，该段就会终止。 如果机动段开始时的航向角小于指定的航向角，那么当航向角大于或等于指定的航向角时，该段就会终止。

There are four ways to define how the heading angle is specified for the segment. The available options are Absolute, Relative, Relative LOS, and Absolute LOS. An absolute heading is defined relative to North. A relative heading is defined relative to the aircraft’s heading at the initiation of the maneuver segment. Both LOS heading modes are defined relative to the current line of sight vector between the aircraft and its target/attacker. When the Relative LOS mode is selected, the aircraft will turn in the direction that requires the smallest angle of turn to achieve the heading angle relative to the target. When the Absolute LOS mode is selected, the aircraft will fly directly to the angle specified. Positive values specify an angle to the right of the target, while negative values specify an angle to the left of the target.

有四种方法来定义如何为该段指定航向角。可用的选项是绝对、相对、相对LOS和绝对LOS。绝对航向是相对于北方定义的。相对航向是相对于飞机在机动段开始时的航向定义的。两个LOS航向模式都是相对于飞机和目标之间的当前视线矢量定义的。

##### 5.6.10.1.2.2.4 Altitude

5.6.10.1.2.2.4 海拔高度

If selected as a termination parameter, the segment will end once the aircraft crosses the altitude specified. If the altitude at the beginning of the maneuver segment is greater than the specified altitude, then the segment terminates when the altitude is less than or equal to the specified altitude. If the altitude at the beginning of the maneuver segment is less than the specified altitude, then the segment terminates when the altitude is greater than or equal to the specified altitude.

如果选择作为终止参数，一旦飞机越过指定的高度，该航段就会结束。如果机动段开始时的高度大于指定的高度，那么当高度小于或等于指定的高度时，机动段就会终止。如果机动段开始时的高度小于指定的高度，那么当高度大于或等于指定的高度时，机动段就终止了。

Altitude mode defines how the altitude is specified for the maneuver segment. The available options for this field are 'Rel', 'AGL', and 'MSL'. Relative altitudes are specified as plus or minus the aircraft’s altitude at the start of the maneuver segment. If the AGL option is selected, then the aircraft will fly terrain following. If the MSL option is selected, then the aircraft is flown to the specified MSL altitude without terrain following.

高度模式定义了如何为机动段指定高度。这个字段的可用选项是 "相对"、"AGL "和 "MSL"。相对高度被指定为机动段开始时飞机高度的加减。如果选择AGL选项，那么飞机将跟随地形飞行。如果选择MSL选项，那么飞机将飞到指定的MSL高度，而不进行地形跟踪。

##### 5.6.10.1.2.2.5 Speed

5.6.10.1.2.2.5 速度

If selected as a termination parameter, the segment will end once the aircraft has reached or crossed the speed specified. If the speed at the beginning of the maneuver segment is greater than the specified speed, then the segment terminates when the speed is less than or equal to the specified speed. If the speed at the beginning of the maneuver segment is less than the specified speed, then the segment terminates when the altitude is greater than or equal to the specified speed.

如果选择了终止参数，一旦飞机达到或超过了指定的速度，该航段将结束。如果机动段开始时的速度大于指定的速度，那么当速度小于或等于指定的速度时，该段就会终止。如果机动段开始时的速度小于指定速度，那么当高度大于或等于指定速度时，该段就会终止。

Speed mode defines how the speed is specified for the maneuver segment. The available options are Absolute, Relative, % MIL Throttle Setting, % AB Throttle Setting, Target Multiplier, and Platform Multiplier. Relative speeds are specified as +/- the aircraft’s speed at the start of the maneuver segment. Throttle Setting speeds are specified as a percentage of the MIL thrust, AB thrust, or max thrust computed from the Hi-Fidelity thrust and AB thrust tables. For aircraft, the thrust is used to compute the acceleration which determines the speed. If the %AB option is used and the afterburners are not available for this airframe then the maximum MIL thrust is used. For helicopters, if the %MIL option is selected then the maximum thrust is computed as follows.

速度模式定义了如何为机动段指定速度。可用的选项有绝对速度，相对速度，MIL油门设置百分比，AB油门设置百分比，目标乘数和平台乘数。相对速度被指定为+/-飞机在机动段开始时的速度。油门设置速度被指定为从高保真推力和AB推力表中计算出的MIL推力、AB推力或最大推力的一个百分比。对于飞机来说，推力是用来计算决定速度的加速度的。如果使用%AB选项，并且该机身没有加力燃烧室，那么将使用最大MIL推力。对于直升机，如果选择%MIL选项，那么最大推力的计算方法如下。

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If the %AB speed mode setting is selected for helicopters then the maximum thrust is computed using 100% Mil. If using Target Multiplier mode, the value specified is multiplied by the target’s speed at each integration interval to obtain the desired speed. This speed mode option should only be used for maneuvers adopted relative to a target through the User Rules. If using Platform Multiplier mode, the value specified is multiplied by the aircraft’s speed at the start of the maneuver segment to obtain the desired speed.

如果为直升机选择了%AB速度模式设置，那么最大推力是用100%Mil计算的。如果使用目标乘数模式，指定的值将乘以目标在每个积分区间的速度，以获得所需的速度。这个速度模式选项应该只用于通过用户规则采用的相对于目标的机动动作。如果使用平台乘数模式，指定的值将乘以飞机在机动段开始时的速度，以获得期望的速度。

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##### 5.6.10.1.2.2.6 Duration

5.6.10.1.2.2.6期限

Duration defines how long the current maneuver segment should be performed. If selected as a termination parameter, the aircraft will transition to the next maneuver segment in the maneuver element once the maneuver segment has been executed for the specified amount of time. The transition to another segment occurs at the exact time defined by duration regardless of the integration step size. If this is the last segment for this maneuver, then the aircraft will transition back to default flight mode, or, if the maneuver was initiated from the User Rules, then the aircraft will transition back to ruleset control at the end of the current scenario interval. In this case, the aircraft is flown using the maneuver flight mode until the end of the current scenario interval.

持续时间定义了当前机动段应执行多长时间。如果选择作为终止参数，一旦该机动段执行了指定的时间，飞机将过渡到机动元素中的下一个机动段。无论积分步长大小，都会在持续时间定义的准确时间内过渡到另一个段。如果这是该机动的最后一个片段，那么飞机将过渡到默认的飞行模式，或者，如果该机动是由用户规则启动的，那么飞机将在当前想定区间结束时过渡到规则集控制。在这种情况下，飞机将使用机动飞行模式飞行，直到当前想定区间结束。

##### 5.6.10.1.2.2.7 Min Vertical Velocity

5.6.10.1.2.2.7 最小垂直速度

When selected, the segment will end when the vertical component of the aircraft’s velocity vector falls below the specified value. The vertical component of the aircraft’s velocity is computed using the scalar projection of velocity onto a local up vector at the aircraft’s position. The DblECEFtoUp routine described in Subsection B10.2.21 is used to compute the local up vector.

选择后，当飞机速度矢量的垂直分量低于指定值时，该航段将结束。飞机速度的垂直分量是用速度的标量投影到飞机位置的本地向上矢量来计算的。B10.2.21小节中描述的DblECEFtoUp程序被用来计算本地上升矢量。

vector in ECEF coordinates

ECEF坐标中的矢量

##### 5.6.10.1.2.2.8 Max Vertical Velocity

5.6.10.1.2.2.8 最大垂直速度

When selected, the segment will end when the vertical component of the aircraft’s velocity vector exceeds the specified value. The vertical velocity is computed as described in section 5.6.10.1.2.2.7.

当选择时，当飞机的速度矢量的垂直分量超过指定值时，该段将结束。垂直速度的计算方法如5.6.10.1.2.2.7节中所述。

##### 5.6.10.1.2.2.9 Min Available G

5.6.10.1.2.2.9 最小可用 G

When selected, the segment will end when the aircraft’s available G falls below the specified value.

当选择时，当飞机的可用G值低于指定值时，该段将结束。

##### 5.6.10.1.2.2.10 Max Available G

5.6.10.1.2.2.10 最大可用G

When selected, the segment will end when the aircraft’s available G meets or exceeds the specified value.

当选择时，当飞机的可用G达到或超过指定值时，该段将结束。

### 5.6.10.1.3 Maneuver Segment Types

5.6.10.1.3 机动段类型

A maneuver is created using one or more of the pre-defined maneuver segment types or a Custom segment type. More than one segment can be used to define a maneuver. An example maneuver with just one segment is to Drag Away from the target for 30 seconds. An example of a maneuver with more than one segment is to Turn to Relative Angle and Fly Straight and Level for 30 seconds. Only the valid combinations of maneuver parameters are available for each pre-defined maneuver segment type. The speed execution value is available for all segment types. If Speed is not selected as an execution value, then the aircraft’s speed at the start of the segment will be maintained. Speed is used to set the commanded speed during each segment. The aircraft attempts to achieve the commanded speed using the aerodynamic parameters as described in Subsection 5.5.2.

一个机动是使用一个或多个预先定义的机动段类型或自定义段类型创建的。可以使用一个以上的片段来定义一个机动。 一个只有一个段的机动例子是拖离目标30秒。一个多段机动的例子是：转到相对角度，直线和水平飞行30秒。对于每个预先定义的机动段类型，只有有效的机动参数组合是可用的。速度执行值对所有航段类型都是可用的。如果没有选择速度作为执行值，那么飞机在航段开始时的速度将被保持。速度被用来设置每个航段的指令速度。 飞机尝试使用5.5.2小节中描述的空气动力学参数来达到指令速度。

#### 5.6.10.1.3.1 Change Altitude Maneuver Segment

5.6.10.1.3.1 改变高度机动段

The Change Altitude maneuver segment can be used to specify a new altitude for the aircraft. The available execution values that apply are altitude, altitude mode, speed, speed mode, max turn G, Max Bank Angle, and FPA. The steepness of the climb or dive to the new altitude is limited to [-FPA, FPA]. The max turn G limits the turn used to achieve the FPA. The FPA allows the aircraft to achieve its new altitude as fast as possible given the specified elevation constraint. Altitude and duration are the termination values for the change altitude maneuver segment. The segment is flown until either the aircraft perceives that altitude has been reached or the segment Duration has been exceeded.

改变高度机动段可以用来为飞机指定一个新的高度。适用的可用执行值是高度、高度模式、速度、速度模式、最大转弯G、最大倾斜角和FPA。爬升或俯冲到新高度的陡峭度被限制在[-FPA, FPA]。最大转弯G限制了用于实现FPA的转弯。FPA允许飞机在指定的高度约束下尽可能快地达到新高度。高度和持续时间是改变高度机动段的终止值。该航段一直飞行到飞机认为已经达到高度或超过航段持续时间。

#### 5.6.10.1.3.2 Drag Away Maneuver Segment

5.6.10.1.3.2 拖曳机动段

The Drag Away maneuver segment defines a type of maneuver which flies the aircraft directly away from the perceived location of the platform causing the reaction. If a drag maneuver is to be performed, the direction vector is calculated by using the methodology described in Subsection 5.5.1 with the attacker’s position as the destination. The negative of the direction vector is then computed. The calculations are similar to those in the discussion of the drag maneuver in Subsection 5.6.6. The execution values available for this maneuver are the Roll Rate, Roll, Max Turn G, Max Bank Angle, and the Speed at which the aircraft will attempt to fly during the drag maneuver. Roll Rate, Roll, Max turn G and Max Bank Angle are used as limits on the turn to the desired direction. The Duration of the drag is the only termination value that is used.

拖曳机动段定义了一种机动类型，它使飞机直接飞离引起响应的平台的感知位置。如果要进行拖曳机动，则使用第5.5.1小节所述的方法计算方向矢量，以攻击者的位置为目的地。然后计算出方向矢量的负值。其计算方法与第5.6.6小节中讨论的拖曳机动的方法类似。这个机动的执行值是滚转率、滚转、最大转弯G、最大倾斜角，以及飞机在拖曳机动中试图飞行的速度。滚转率、滚转、最大转弯G和最大倾斜角被用来作为转弯到所需方向的限制。拖动的持续时间是唯一使用的终止值。

#### 5.6.10.1.3.3 Drag Away Level Maneuver Segment

5.6.10.1.3.3 拖走水平操纵段

The Drag Away Level maneuver segment is similar to the Drag Away segment, except that the aircraft maintains its current perceived altitude. The segment is flown until the Duration time is reached.

Drag Away Level机动段与Drag Away段类似，除了飞机保持其当前的感知高度。该段飞行直到达到持续时间。

#### 5.6.10.1.3.4 Fly Abeam Maneuver Segment

5.6.10.1.3.4 Fly Abeam 机动段

The Fly Abeam maneuver segment causes the aircraft to fly with the LOS to the perceived location of the platform causing the reaction at a 90 degree heading relative to the nose of the aircraft. The direction vector is calculated as described for a beam maneuver in Methodology Manual Section 5.6. The execution values available for this maneuver are the Roll Rate, Roll, Max Turn G and the Speed of the aircraft. Roll Rate, Roll, and Max turn G are used to limit the turn to the desired direction as described in section 5.6.10.1.2.1.2 for Define Direction of Flight. The segment is flown until the Duration termination value is reached.

Fly Abeam机动段使飞机以LOS飞向感知到的平台位置，造成相对于飞机机头的90度方向的响应。方向矢量的计算与《方法学手册》第5.6节中对波束机动的描述一样。这个机动的执行值是滚转率、滚转、最大转弯G和飞机的速度。如第5.6.10.1.2.1.2节定义飞行方向所述，滚转率、滚转和最大转弯G用于限制转弯到所需方向。该航段一直飞行到达到持续时间终止值。

#### 5.6.10.1.3.5 Fly Default Mode at New Altitude Maneuver Segment

5.6.10.1.3.5 在新高度机动段飞行默认模式

The Fly Default Mode at New Altitude maneuver segment allows the user to specify a new altitude for the aircraft to fly during default flight mode. The default flight mode is the Waypoint flight mode for flight leaders or the Wingman flight mode for wingmen. Subsections 5.6.1 and 5.6.2 describe the Waypoint and Wingman flight modes respectively. The available execution values for this segment are the Max Turn G, Altitude, and Speed. The Altitude and Speed parameters are commanded values that the flight processing model attempts to achieve. The radius of the vertical turn used to achieve the altitude is limited by the Max Turn G. The segment is flown until the Duration termination value is reached.

在新高度飞行默认模式机动段允许用户指定一个新的高度，以便飞机在默认飞行模式下飞行。默认飞行模式是编队长机的航路点飞行模式或僚机的僚机飞行模式。第5.6.1和5.6.2小节分别描述了Waypoint和Wingman飞行模式。该段的可用执行值为最大转弯G、高度和速度。高度和速度参数是飞行处理模型试图实现的指令值。用于实现高度的垂直转弯半径受最大转弯G的限制，该段飞行直到达到持续时间终止值。

#### 5.6.10.1.3.6 Fly Straight and Level Maneuver Segment

5.6.10.1.3.6 飞行直线和水平操纵段

The Fly Straight and Level maneuver segment allows the aircraft to fly at the current heading and MSL altitude. The available execution values for this maneuver are the Roll, Roll Rate, Max Turn G, Max Bank Angle, and Speed. The Speed is used to set the commanded speed and the minimum of the Max Turn G, the turn G computed from the Bank Angle, the airframe available G, and the turn G computed from the Roll is used to define the amount of G’s that can be achieved during the vertical turn to level, if required. The segment is flown until the Duration time is reached. If it is desired that a particular roll angle be maintained during the Fly Straight and Level segment, a Roll execution value can be specified, but the segment should be preceded by a Roll segment to get to aircraft to the desired angle.

直线和水平飞行机动部分允许飞机以当前的航向和MSL高度飞行。这个动作的可用执行值是滚转、滚转率、最大转弯G、最大倾斜角和速度。速度用于设置指令速度和最大转弯G的最小值，转弯G由银行角计算，机身可用G，转弯G由滚转计算，用于定义在垂直转弯到平飞过程中可以达到的G值，如果需要的话。该段飞行直到达到持续时间。如果希望在直飞和平飞段中保持一个特定的滚转角度，可以指定一个滚转执行值，但该段之前应该有一个滚转段以使飞机达到所需的角度。

#### 5.6.10.1.3.7 Roll Maneuver Segment

5.6.10.1.3.7 滚转机动段

The Roll maneuver segment allows the aircraft to perform a roll without resulting in a turn. The available execution values for this segment are the Roll Rate and speed. The aircraft rolls at the user-defined Roll Rate and attempts to accelerate to the Speed execution value for the Duration of the segment. The segment transitions to the next segment when the Duration termination value is reached.

滚转转作段允许飞机进行滚转而不导致转弯。此段的可用执行值是滚转率和速度。飞机以用户定义的滚转率进行滚转，并试图在该段的持续时间内加速到速度执行值。当达到持续时间终止值时，该段过渡到下一个段。

#### 5.6.10.1.3.8 Turn to Angle Off of LOS Maneuver Segment

5.6.10.1.3.8 转向角度偏离LOS的机动段

The Turn to Angle Off of Line of Sight (LOS) maneuver segment allows the aircraft to turn to an angle relative to LOS to the perceived location of the target or platform initiating the maneuver response. The available execution values for this segment are Roll Rate, Roll, Max Turn G, Max Bank Angle, Heading Angle, Altitude, and Speed. The Heading Angle and Altitude parameters define the desired direction of flight during this segment. A perceived direction vector is computed from the target location and the perceived location of the aircraft.

转向角度偏离视线（LOS）机动段允许飞机转向到相对于LOS的一个角度，以启动机动响应的目标或平台的感知位置。该段的可用执行值为：滚转率、滚转、最大转角、最大倾斜角、迎角、高度和速度。航向角和高度参数定义了在这一环节中所期望的飞行方向。一个感知的方向矢量是由目标位置和飞机的感知位置计算出来的。

The Roll Rate, Roll, Max Turn G, Max Bank Angle, Heading Angle, and Altitude parameters are used to limit the turn used to cause the aircraft to move in that direction. Once the aircraft has reached the Heading Angle termination value, the segment is terminated. To cause the aircraft to continue to fly at the new Heading Angle and Altitude, the Turn To Angle Off of LOS segment can be followed with the Fly Straight and Level segment. The Fly Straight and Level segment allows definition of the Duration of the aircraft flight at the current altitude and heading.

滚转率、滚转、最大转弯G、最大倾斜角、迎角和高度等参数用于限制用于使飞机向该方向移动的转弯。一旦飞机达到了Heading角度的终止值，该航段就会终止。为了使飞机继续以新的迎角和高度飞行，可以在转弯到离地角度段之后再进行直飞和平飞段。直线和水平飞行段允许定义飞机在当前高度和航向的飞行时间。

#### 5.6.10.1.3.9 Turn to Beam Maneuver Segment

5.6.10.1.3.9 转向波束机动段

The Turn to Beam maneuver segment allows the aircraft to turn and fly such that the perceived target location is 90 degrees off nose in the horizontal direction. The available execution values for this segment are Roll Rate, Roll, Max Turn G, Max Bank Angle, and Speed. The Roll Rate, Roll, Max Turn G, and Max Bank Angle are used as limits on the G’s used in the turn as described in section 5.6.10.1.2.1.2 for the Define Direction of Flight option. Once the aircraft has reached the new heading angle, the segment will terminate. To cause the aircraft to fly for a specified duration at this altitude or heading, this maneuver segment can be followed by a Flight Straight and Level maneuver segment. The direction vector is calculated as described for a beam maneuver in Subsection 5.6.

转向波束机动段允许飞机转弯和飞行，使感知的目标位置在水平方向上偏离机头90度。这个部分的可用执行值是滚转率、滚转、最大转弯G值、最大倾斜角和速度。如5.6.10.1.2.1.2节中定义飞行方向选项所述，滚转率、滚转、最大转弯G和最大倾斜角被用作转弯中使用的G的限制。一旦飞机达到了新的航向角，该航段将终止。为了使飞机在这个高度或航向上飞行一个指定的时间，这个机动段可以在飞行直线和水平机动段之后进行。方向矢量的计算与5.6小节中对波束机动的描述相同。

#### 5.6.10.1.3.10 Turn to Relative Angle Maneuver Segment

5.6.10.1.3.10 转向相对角机动段

The Turn to Relative Angle maneuver segment allows the aircraft to turn to an angle relative to its orientation at the start of the segment. The execution values for this segment are Roll Rate, Roll, Max Turn G, Max Bank Angle, Heading Angle, and Speed. The Heading Angle defines the relative angle that is desired. The Heading Angle defines the desired direction of flight. The Roll Rate, Roll, Max Turn G, Max Bank Angle, and Heading Angle parameters are used to limit the turn used to cause the aircraft to move in that direction as described in section 5.6.10.1.2.1.2 for the Define Direction of Flight option. Once the aircraft reaches the new heading angle termination value it terminates the segment. To cause the aircraft to fly for a specified duration at this altitude or heading, this maneuver segment can be followed by a Fly Straight and Level maneuver segment.

转到相对角度机动段允许飞机转到相对于它在该段开始时的方向的一个角度。此段的执行值为：滚转率、滚转、最大转角、最大倾斜角、朝向角和速度。航向角定义了所需的相对角度。航向角定义了所需的飞行方向。如5.6.10.1.2.1.2节中定义飞行方向选项所述，滚转率、滚转、最大转弯G、最大倾斜角和航向角参数用于限制用于使飞机向该方向移动的转弯。一旦飞机到达新的航向角终止值，它就终止了这一航段。为了使飞机在这个高度或航向上飞行一个指定的时间，这个机动段可以用一个直线和水平飞行的机动段来跟上。

#### 5.6.10.1.3.11 Custom

5.6.10.1.3.11 自定义

The Custom segment type allows any valid combination of maneuver parameters to be used to define a maneuver segment. The definition of each of the execution value maneuver parameters depends on the Direction of Flight setting described in section 0. The custom segment type can be used to define any of the pre-defined segment types except for TSPI and Fly Default Mode at New Altitude. But the additional execution and termination values available allow more flexibility to customize the segment. To define a custom segment type that behaves like another segment type, create a new segment with the desired type and then change the segment type to Custom. This will bring the default options for that segment over to the custom segment. The custom segment type allows the use of the Compute Direction of Flight option described in section 0.

自定义段类型允许任何有效的机动参数组合来定义一个机动段。每个执行值机动参数的定义取决于第0节中描述的飞行方向设置。 除了TSPI和新高度飞行默认模式外，自定义段类型可用于定义任何预先定义的段类型。但是额外的执行和终止值可以更灵活地定制段。要定义一个行为类似于另一个航段类型的自定义航段，可以用所需的类型创建一个新的航段，然后将航段类型改为自定义。这将把该段的默认选项带到自定义段上。自定义线段类型允许使用第0节中描述的计算飞行方向选项。

#### 5.6.10.1.3.12 Time Space Position Indicated

5.6.10.1.3.12 显示的时间空间位置

Time Space Position Indicated (TSPI) data includes the actual measured position and orientation of an aircraft performing a maneuver. TSPI data can be collected for an aircraft and imported into EADSIM as a TSPI maneuver segment. The TSPI segment type allows TSPI data to be either imported from a text file or defined as inputs in Scenario Generation. The TSPI maneuver segment provides the specifics of a maneuver initiated relative to the current position and heading of the aircraft. When the segment is executed, the aircraft will snap to the defined flight path instead of using aerodynamic flight to fly to each point. This allows the exact flight path and orientation of the aircraft to be explicitly flown throughout the maneuver segment. The aircraft velocity is computed from the TSPI position and time data.

时间空间位置指示（TSPI）数据包括飞机执行机动任务的实际测量位置和方向。TSPI数据可以为飞机收集并作为TSPI机动段导入EADSIM。TSPI段的类型允许TSPI数据从文本文件中导入或在方案生成中定义为输入。TSPI机动段提供了相对于飞机当前位置和航向启动的机动的具体内容。当该段被执行时，飞机将锁定在定义的飞行路径上，而不是使用空气动力飞行来飞到每个点。这使得飞机的精确飞行路径和方向在整个机动段中被明确地飞过。飞机的速度是由TSPI的位置和时间数据计算出来的。

If the Apply Error to Navigation option is selected for a Navigation Device on the aircraft then the navigation error is accumulated throughout the maneuver segment and the aircraft is flown directly to the TSPI data points. When the segment completes the aircraft navigates according to perception.

如果为飞机上的导航设备选择了 "将误差应用于导航 "选项，那么导航误差将在整个机动段中累积，飞机将直接飞向TSPI数据点。当该段完成后，飞机根据感知进行导航。

##### 5.6.10.1.3.12.1 Time

5.6.10.1.3.12.1 时间

The time is defined in decimal seconds relative to the initiation of the maneuver. The data points do not have to be evenly spaced in time. In EADSIM, the position of each platform is updated at each integration interval in flight processing. There may not be a TSPI data point defined for each integration time step. Therefore the position and orientation at each integration time step are computed using the flight smoothing algorithm described in section 5.6.10.1.3.12.9.

时间的定义是相对于机动开始时的小数秒。数据点在时间上不一定是均匀的。 在EADSIM中，每个平台的位置在飞行处理中的每个积分间隔都会更新。可能没有为每个积分时间步骤定义的TSPI数据点。因此，每个积分时间步长的位置和方向是用5.6.10.1.3.12.9节中描述的飞行平滑算法计算的。

##### 5.6.10.1.3.12.2 Position and Orientation Coordinates

5.6.10.1.3.12.2 位置和方向坐标

The TSPI position is defined in a local body coordinate system that remains fixed with the origin located where the aircraft initiated the maneuver segment, thus each position is defined as the offset from the location of the aircraft at initiation of the maneuver segment. This body frame coordinate system is defined as follows:

TSPI的位置是在一个本地体座标系统中定义的，该系统保持固定，原点位于飞机启动机动段的位置，因此每个位置被定义为从飞机启动机动段时的位置的偏移。这个机体坐标系定义如下。

Z: Local up

Z：当地人了

Y: Perpendicular to plane formed by Z and Velocity vector X: Orthogonal to YZ plane

Y：垂直于由Z和速度矢量X形成的平面。与YZ平面正交

The position is converted from body frame to ECEF coordinates using the DblECEF2BodyMatrix and Rotate2 routines described in Appendix sections B10.2.7 and B10.3.14 respectively.

使用附录中B10.2.7和B10.3.14节分别描述的DblECEF2BodyMatrix和Rotate2程序，将位置从体框架转换为ECEF坐标。

The orientation is defined by the yaw, pitch, and roll rotation angles. Yaw is defined as the angle about the up vector measured positive clockwise relative to true north, pitch is defined as the angle between the nose of the aircraft and the local horizontal plane, and roll is defined as the angle about the lateral axis of the aircraft relative to level flight. Positive yaw is defined with the nose turning to right, positive pitch is defined as nose towards up, and positive roll is defined as the right wing moving down. At runtime, the yaw of the first TSPI data point is used to translate the yaw of all other data points based on the aircraft’s heading at the start of the segment.

方向是由偏航、俯仰和滚转的角度定义的。偏航被定义为相对于真北的正顺时针方向测量的关于上升矢量的角度，俯仰被定义为飞机机头与当地水平面的角度，滚转被定义为相对于水平飞行的关于飞机侧轴的角度。正偏航是指机头向右转，正俯仰是指机头向上，正滚转是指右翼向下移动。在运行时，第一个TSPI数据点的偏航被用来转换所有其他数据点的偏航，其依据是飞机在该段开始时的航向。

Yyyyyyyyyyyyyyyyyyyyyyyyy

Ψ Ψ Ψ Ψ Ψ Ψ Ψ Ψ。

This allows the maneuver segment to be initiated from any angle in azimuth and still maintain its pitch and roll profile characteristics.

这使得机动段可以从方位角的任何角度启动，并仍然保持其俯仰和滚转的剖面特征。

##### 5.6.10.1.3.12.3 Segment Initialization

5.6.10.1.3.12.3 段落初始化

If the Smooth Transition option is selected then the transition to this maneuver segment from the default flight mode or previous segment is smoothed. Two segments of type Custom are automatically created to fly the aircraft to the initial orientation and velocity of the TSPI segment. The aircraft starts the TSPI segment when it reaches the orientation and velocity defined by the first two TSPI data points. This may cause a delay between when the segment starts and when the first TSPI point is reached. If the Smooth Transition option is not selected then the aircraft will snap directly to the first TSPI velocity and orientation at the start of the segment. This removes the possibility of a delay but adds the possibility for discontinuities in the aircraft orientation and velocity. If this option is not selected, a custom maneuver segment can be added by the user to precede the TSPI segment in order to allow the aircraft to reach a satisfactory state entry point.

如果选择了平滑过渡选项，那么从默认飞行模式或前一航段过渡到这一航段的过程是平滑的。两个自定义类型的航段被自动创建，以使飞机飞行到TSPI航段的初始方向和速度。当飞机达到前两个TSPI数据点定义的方向和速度时，开始TSPI段。这可能会造成航段开始和到达第一个TSPI点之间的延迟。如果不选择平滑过渡选项，那么飞机将在航段开始时直接捕捉到第一个TSPI速度和方向。这消除了延迟的可能性，但增加了飞机方向和速度不连续的可能性。如果不选择这个选项，用户可以在TSPI段之前添加一个自定义机动段，以使飞机达到一个满意的状态进入点。

##### 5.6.10.1.3.12.4 Importing TSPI Data

5.6.10.1.3.12.4 导入TSPI数据

TSPI data can be imported directly from a user-selected raw TSPI data file. User defined file format options allow flexibility in types of TSPI files that can be imported. There are several data format options which allow the raw TSPI data to be defined in different units and coordinate frames. Raw TSPI data is defined using absolute time and absolute position and orientation coordinates. Within the TSPI maneuver segment, TSPI data is defined using relative time and body frame coordinates for position of the aircraft. When the data is imported the time is translated into decimal seconds relative to the start of the maneuver segment and the position is transformed into local body frame coordinates.

TSPI数据可以直接从用户选择的原始TSPI数据文件导入。用户定义的文件格式选项使得可以导入的TSPI文件的类型具有灵活性。有几种数据格式选项，允许以不同的单位和坐标框架定义原始TSPI数据。原始TSPI数据是用绝对时间和绝对位置及方向坐标来定义的。在TSPI机动段内，TSPI数据是用相对时间和飞机位置的机体坐标来定义的。当数据被导入时，时间被转换为相对于机动段开始的十进制秒数，位置被转换为本地机体坐标。

EADSIM supports any ASCII text file format where the data is tab, comma, or space delimited. The user defines which column in the file contains each of the time, position, and orientation parameters, and what delimiter is used. The file can contain additional columns which are ignored during the import. If the first line of the file contains any characters other than the positive, negative, decimal point, and numeric characters (+ - . 1 2 3 4 5 6 7 8 9 0) then it is also ignored during import. This allows flexibility when importing raw TSPI data. The position and orientation must be in decimal notation.

EADSIM支持任何ASCII文本文件格式，其中数据以制表符、逗号或空格为界。用户可以定义文件中哪一列包含时间、位置和方向参数，以及使用何种分隔符。该文件可以包含额外的列，这些列在导入过程中会被忽略。如果文件的第一行包含除正数、负数、小数点和数字字符（+ - . 1 2 3 4 5 6 7 8 9 0）以外的任何字符，那么在导入时也会被忽略。这使得在导入原始TSPI数据时具有灵活性。位置和方向必须是十进制的符号。

There are several different data format options available for importing raw TSPI files. The time can be in either decimal seconds or decimal hours. The position can be defined in one of four available coordinate frames. There are two options available for the Latitude, Longitude, Altitude (LLA) coordinate frame and one option available for the Earth Centered Earth Fixed (ECEF) coordinate frame described in Methodology Manual section B10.1.1. Note that the ECEF coordinate frame must be defined relative to the WGS84 spheroid earth model. The ENU and NED coordinate frame options are also available. The ENU coordinate frame is described in section B10.1.3 and the NED coordinate frame is described in section 5.7.2.2. If the LLA option is selected, then the altitude can be defined in either feet or meters and the latitude and longitude can be defined as decimal degrees (dd.ddddd) or degrees minutes seconds (dd mm ss). The orientation is defined as a yaw, pitch, and roll which are described in section 5.6.10.1.3.12.2.

在导入原始TSPI文件时，有几种不同的数据格式可供选择。时间可以是十进制的秒，也可以是十进制的小时。位置可以用四个可用的坐标框架之一来定义。纬度、经度、高度（LLA）坐标框架有两个选项，方法手册B10.1.1节中描述的地球中心固定（ECEF）坐标框架有一个选项。请注意，ECEF坐标框架必须是相对于WGS84球体地球模型而定义的。ENU和NED坐标框架也可以选择。ENU坐标系在B10.1.3节中描述，NED坐标系在5.7.2.2节中描述。如果选择了LLA选项，那么高度可以用英尺或米来定义，纬度和经度可以定义为十进制度数（dd.dddd）或度分秒（dd mm ss）。方向被定义为偏航、俯仰和滚转，这在5.6.10.1.3.12.2节中有描述。

When the data is imported the time is translated from decimal hours to decimal seconds, if necessary, and then it is translated to be relative to the start of the segment. The time for the first point is set to zero. The time for all subsequent points is computed as follows.

当数据被导入时，如果有必要，时间会从十进制小时转换为十进制秒，然后被转换为相对于该段的开始时间。第一个点的时间被设置为零。所有后续点的时间按以下方式计算。

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The orientation is imported directly without any translation. The position is transformed into relative local body frame coordinates based on the selected position format option as described in the following sections. The translated and transformed time, position, and orientation values are then displayed in the TSPI segment definition table.

方向是直接导入的，没有任何平移。位置根据所选择的位置格式选项被转换为相对本地体框架坐标，如以下章节所述。然后，翻译和转换后的时间、位置和方向值将显示在TSPI段定义表中。

##### 5.6.10.1.3.12.5 Latitude Longitude Altitude to Body Frame

5.6.10.1.3.12.5 纬度经度高度到车身框架

If the Latitude Longitude Altitude (LLA) position format is selected, then the raw TSPI position data is translated from geodetic LLA to the local body frame coordinates defined in section 5.6.10.1.3.12.2 upon import. The Latitude and Longitude are translated from degrees/minutes/seconds (DMS) to decimal degrees (DD), if necessary, when the raw TSPI data file is read in. The location of the first point in body frame coordinates is set to (0, 0, 0). Each subsequent point is first transformed from LLA to ECEF coordinates using the LLAtoDblECEF routine described in section B10.2.10 and then to body frame using the DblECEF2BodyMatrix and Rotate1 routines described in sections B10.2.7 and B10.3.10 respectively. The ECEF position of the first point is used as the origin of the body frame coordinate frame and is sent into DblECEF2BodyMatrix as Position. The velocity sent into DblECEF2BodyMatrix is computed as described in section 5.6.10.1.3.12.10. Spherical earth is used for this transformation since the ECEF coordinate frame is an intermediate step in the transformation.

如果选择了纬度经度高度（LLA）位置格式，那么在导入时，TSPI的原始位置数据将从大地的LLA翻译成5.6.10.1.3.12.2节中定义的本地体框架坐标。纬度和经度从度数转换为

##### 5.6.10.1.3.12.6 WGS84 Earth Centered Earth Fixed to Body Frame

5.6.10.1.3.12.6 WGS84地球为中心的地球固定体框架

If the WGS 84 Earth Centered Earth Fixed (ECEF) position format is selected then the raw TSPI position data is translated from ECEF to the local body frame coordinates defined in section 5.6.10.1.3.12.2 upon import. The location of the first point in body frame coordinates is set to (0, 0, 0). Each subsequent point is transformed from ECEF to body frame coordinates using the DblECEF2BodyMatrix and Rotate1 routines described in sections B10.2.7 and B10.3.10 respectively. The ECEF position of the first point is used as the origin of the body frame coordinate frame and is sent into DblECEF2BodyMatrix as Position. The velocity sent into DblECEF2BodyMatrix is computed as described in section 5.6.10.1.3.12.10. Oblate earth is used for this transformation since the data being imported is assumed to be relative to WGS84 spheroid.

如果选择了WGS 84地球中心固定（ECEF）位置格式，那么在导入时，原始TSPI位置数据将从ECEF转换为第5.6.10.1.3.12.2节中定义的本地机体坐标。体座标中第一个点的位置被设置为（0, 0, 0）。之后的每一个点都会使用B10.2.7和B10.3.10节中描述的DblECEF2BodyMatrix和Rotate1程序从ECEF转换到体框架坐标。第一个点的ECEFF位置被用作体座标框架的原点，并作为Position被送入DblECEF2BodyMatrix。送入DblECEF2BodyMatrix的速度是按5.6.10.1.3.12.10节所述计算的。由于被导入的数据被假定为相对于WGS84球体，因此在这种转换中使用了钝角地球。

##### 5.6.10.1.3.12.7 North-East-Down to Body Frame

5.6.10.1.3.12.7北东-下至车身框架

If the North-East-Down (NED) position format is selected then the raw TSPI position data is translated from NED to the local body frame coordinates defined in section 5.6.10.1.3.12.2 upon import. NED is an Earth-fixed system with the x-axis aligned with north, the y-axis aligned with east, and the z-axis opposing the local vertical as described in section 5.7.2.2. NED coordinates are first translated directly to ENU coordinates by swapping axes.

如果选择了北-东-下（NED）位置格式，那么在导入时，原始TSPI位置数据将从NED转换为5.6.10.1.3.12.2节中定义的本地机体坐标。NED是一个地球固定系统，X轴与北面对齐，Y轴与东面对齐，Z轴与5.7.2.2节所述的本地垂直方向相对。NED坐标首先通过交换轴线直接转换为ENU坐标。

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The resulting ENU coordinate positions are transformed to body frame as described in section 5.6.10.1.3.12.8.

产生的ENU坐标位置按照5.6.10.1.3.12.8节所述，转换为体框架。

##### 5.6.10.1.3.12.8 East North Up to Body Frame

5.6.10.1.3.12.8 东北至车身框架

If the East North Up (ENU) position format is selected then the raw TSPI position data is translated from ENU to the local body frame coordinates defined in section 5.6.10.1.3.12.2 upon import. If the first ENU raw data position values are non-zero then the raw TSPI data is relative to a point other than the platform performing the maneuver, such as the location of the TSPI data collection sensor. The position points are translated so that they are relative to the aircraft location at the start of the maneuver with (0, 0, 0) as the position of the first ENU data point.

如果选择了 "北东"（ENU）位置格式，那么在导入时，TSPI原始位置数据将从ENU转换为5.6.10.1.3.12.2节中定义的本地机体坐标。如果第一个ENU原始数据的位置值非零，那么原始TSPI数据是相对于执行机动的平台以外的一个点而言的，如TSPI数据收集传感器的位置。位置点被转换，使其相对于机动开始时的飞机位置，（0，0，0）为第一个ENU数据点的位置。

The location of the first point in body frame coordinates is set to (0, 0, 0). Each subsequent point is first transformed from ENU to BF coordinates using the DblENU2BodyMatrix and Rotate1 routines described in MM sections B10.2.28 and B10.3.10 respectively.

第一个点在机体坐标中的位置被设置为（0, 0, 0）。之后的每一个点首先使用MM章节B10.2.28和B10.3.10中描述的DblENU2BodyMatrix和Rotate1程序从ENU坐标转换到BF坐标。

##### 5.6.10.1.3.12.9 Flight Smoothing

5.6.10.1.3.12.9 飞行平滑化

A curve fit to a second order polynomial is used during runtime to determine the position and orientation at each integration interval. The curve fit is performed on each component of the position and orientation using the LeastSquares routine described in Subsection B10.4.22. LeastSquares computes the coefficients of the second order polynomial that most closely fits the data.

在运行期间使用二阶多项式的曲线拟合来确定每个积分区间的位置和方向。曲线拟合是使用B10.4.22小节中描述的最小二乘法程序对位置和方向的每个分量进行的。最小二乘法计算最接近数据的二阶多项式的系数。

The number of points used in the curve fit is defined by the user. The points used

曲线拟合中使用的点的数量由用户定义。使用的点

in the curve fit are selected so that the current point is as close to the middle of the curve as possible. No smoothing is performed for the first point since the aircraft will snap directly to it. For the first N/2 points in the segment, where N is the user defined number of points to use for smoothing and N/2 is rounded to the nearest integer, the smoothing is applied to the ith point using points zero to 2\*i where i is the point number starting with 1. For the last (N/2 – 1) points in the segment the smoothing is applied to the ith point using points (i - N/2 + 2) to k, where k is the total number of TSPI data points. But the minimum number of points used for smoothing is three, so the last three points are always used to smooth each of the last two points. For example, if the total number of TSPI data points is 50 and the number of points to use for smoothing is 4, then the first point is not smoothed, the second point is smoothed over points one through three, the third point is smoothed over points one through four, the fifth point is smoothed over points two through five, and so on. Points 49 and 50 are smoothed over points 48 through 50. The EvaluateLeastSquares routine described in section B10.4.23 is used to compute each component of the position and orientation from the polynomial coefficients at each integration time step.

曲线拟合中的点被选择，以便当前的点尽可能地接近曲线的中部。对第一个点不进行平滑处理，因为飞机会直接扣到它。对于航段中的前N/2个点，其中N是用户定义的用于平滑的点的数量，N/2被四舍五入为最接近的整数，平滑被应用于第i个点，使用零到2\*i，其中i是以1开始的点号。但是用于平滑的最小点数是三个，所以最后三个点总是用来平滑每一个最后的两个点。例如，如果TSPI数据点的总数是50个，用于平滑的点数是4个，那么第一个点不平滑，第二个点对第一至第三个点进行平滑，第三个点对第一至第四个点进行平滑，第五个点对第二至第五个点进行平滑，以此类推。第49点和第50点在第48点到第50点的基础上进行平滑处理。 B10.4.23节中描述的EvaluateLeastSquares例程被用来计算每个积分时间步长的多项式系数中的位置和方向的每个分量。

Three or more points are necessary to fit to a second order polynomial. If the user defined number of points is two, then a linear interpolation between the two closest points is used to determine the position and orientation at each integration interval. If the user defined number of points is one, then the closest point is used for the position and orientation at each integration interval.

三个或更多的点对于拟合二阶多项式是必要的。如果用户定义的点的数量是两个，那么在两个最近的点之间进行线性插值来确定每个积分间隔的位置和方向。如果用户定义的点的数量是一个，那么在每个积分区间的位置和方向就使用最接近的点。

Flight smoothing is applied in body frame coordinates. The smoothed data point is then converted to ECEF coordinates using the DblECEF2BodyMatrix and Rotate2 routines described in Subsections B10.2.7 and B10.3.14 respectively.

飞行平滑是在机体坐标中应用的。然后使用B10.2.7和B10.3.14小节中描述的DblECEF2BodyMatrix和Rotate2程序将平滑后的数据点转换为ECEF坐标。

##### 5.6.10.1.3.12.10 Velocity Calculation

5.6.10.1.3.12.10 速度计算

The TSPI data may not include the velocity of the aircraft. Velocity is necessary for all platforms in EADSIM. Therefore, the velocity is computed from the smoothed TSPI position. First, the position polynomial coefficients are computed for each component of the position as described in section 5.6.10.1.3.12.9. Then the derivatives of each component of the position polynomials are computed to get the velocity.

TSPI的数据可能不包括飞机的速度。速度对于EADSIM中的所有平台都是必要的。因此，速度是由平滑的TSPI位置计算出来的。首先，按照5.6.10.1.3.12.9节所述，对位置的每个分量计算位置多项式系数。然后计算位置多项式各分量的导数，得到速度。

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The current time is then used to compute each component of the velocity. The velocity is converted from body frame to ECEF coordinates using the ECEF2BodyMatrix and Rotate2 routines described in Appendix sections B10.2.6 and B10.3.14 respectively. Coordinated flight causes the aircraft’s orientation vector to always be aligned with its velocity vector. When an aircraft is in the TSPI maneuver segment flight mode it is allowed to fly using uncoordinated flight if the defined orientation does not align with the computed velocity.

然后用当前时间来计算速度的每个分量。使用附录B10.2.6和B10.3.14节分别描述的ECEF2BodyMatrix和Rotate2程序，将速度从体座转换为ECEF坐标。协调飞行使飞机的方向矢量总是与它的速度矢量保持一致。当飞机处于TSPI机动段飞行模式时，如果定义的方向与计算的速度不一致，它允许使用非协调飞行。

##### 5.6.10.1.3.12.11 Fuel Consumption

5.6.10.1.3.12.11 燃料消耗量

There are two options available for calculation of fuel flow throughout the TSPI maneuver segment. The first option allows the fuel flow to be calculated from the TSPI position data. The second option allows an average fuel flow rate throughout the segment to be defined. In a tactical system, the ability to perform a maneuver segment and the fuel flow during the segment are both influenced by instantaneous weight throughout the segment. While performing a TSPI maneuver segment in EADSIM, the ability to perform a maneuver is only degraded if the aircraft runs out of fuel. The variable fuel flow throughout the segment can be captured using the Calculate Fuel Flow option.

在整个TSPI机动段，有两个选项可用于计算燃油流量。第一个选项允许从TSPI位置数据中计算燃料流量。第二个选项允许定义整个段的平均燃料流量。在战术系统中，执行机动段的能力和机动段中的燃料流量都受到整个机动段中瞬时重量的影响。在EADSIM中执行TSPI机动段时，只有当飞机耗尽燃料时，执行机动的能力才会下降。整个航段的可变燃油流量可以通过计算燃油流量选项来获取。

If the Calculate option is selected, then the velocity computed as described in section 5.6.10.1.3.12.10 from the TSPI position data is used to compute the instantaneous fuel flow throughout the maneuver segment.

如果选择了计算选项，那么按照5.6.10.1.3.12.10节所述从TSPI位置数据中计算出的速度被用来计算整个机动段的瞬时燃料流量。

First, the required acceleration from the previous to the current integration time step is computed as the derivative of the velocity polynomial.

首先，从上一个积分时间步数到当前积分时间步数的所需加速度被计算为速度多项式的导数。

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The required thrust is then used to compute the throttle setting and the throttle setting is used to compute the fuel consumed as described in Subsection 5.5.2.1. The thrust limits applied do not prevent the aircraft from being able to fly the TSPI data points. So if the thrust required is off the thrust tables or greater than the max thrust, the max fuel flow will be used but in reality the aircraft would consume more than this amount of fuel because it would be exceeding the max available thrust. To prevent this from happening, be sure the airframe is capable of producing the thrust and fuel flow required to fly the TSPI maneuver segment. Note that this is an approximate fuel consumption algorithm.

然后，所需的推力被用来计算油门设置，油门设置被用来计算燃料消耗，如5.5.2.1小节所述。应用的推力限制并不妨碍飞机能够飞行TSPI的数据点。因此，如果所需的推力不在推力表中或大于最大推力，将使用最大燃油流量，但实际上飞机消耗的燃油将超过这一数量，因为它将超过最大可用推力。为了防止这种情况发生，要确保机体能够产生飞行TSPI机动段所需的推力和燃油流量。请注意，这是一个近似的燃料消耗算法。

If fuel flow has been defined as an Average Fuel flow rate, then the specified value will be used to determine the fuel expended throughout the TSPI maneuver segment. If, at any time during the maneuver segment, the aircraft runs out of fuel, then the thrust is set to zero causing the aircraft to accelerate towards the center of the earth.

如果燃料流量被定义为平均燃料流量，那么指定的值将被用来确定整个TSPI机动段的燃料消耗。如果在机动段的任何时候，飞机耗尽了燃料，那么推力被设置为零，导致飞机向地球中心加速。

##### 5.6.10.1.3.12.12 TSPI Report

5.6.10.1.3.12.12 TSPI报告

The TSPI report within the Maneuver Definition can be used to view the smoothed position, velocity, average acceleration, orientation, and average orientation rates at a user specified time interval. The data will be smoothed using a curve fit to a second order polynomial over the user specified number of curve fit points as described in section 5.6.10.1.3.12.9. The segment data points can be generated relative to a starting location and heading of a platform. Selecting the LLA/ECEF Report option causes the report to be generated in absolute coordinates. The position will be generated in both LLA and ECEF (x, y, z) coordinates. The velocity will be generated in ECEF (x, y, z) coordinates. The orientation and orientation rates will be generated in absolute Yaw, Pitch, and Roll relative to the ENU coordinate axis. If the Body Frame Report option is selected, then the data will be generated in the relative body frame coordinate system defined in section B10.2.6.

机动定义中的TSPI报告可用于查看用户指定时间间隔内的平滑位置、速度、平均加速度、方向和平均方向率。如5.6.10.1.3.12.9节所述，数据将使用二阶多项式的曲线拟合来平滑用户指定的曲线拟合点的数量。段落数据点可以相对于平台的起始位置和航向产生。选择LLA

Specify the same time interval that is used in runtime in order to generate data points that represent the smoothed data points that will be used in runtime. During runtime, if the scenario is running in an HLA federation and the ABT update rate is less than 1.0 second, the aircraft will be flown using the specified update time. Otherwise, a

指定在运行时使用的相同的时间间隔，以便生成代表将在运行时使用的平滑数据点的数据点。在运行时，如果想定在HLA联盟中运行，并且ABT更新率小于1.0秒，那么飞机将使用指定的更新时间进行飞行。否则，一个

0.5 second update time is used.

使用0.5秒的更新时间。

The velocity contained in the report is computed from the TSPI position data as described in section 5.6.10.1.3.12.10. The average acceleration is computed as described in section 0.

报告中包含的速度是按照5.6.10.1.3.12.10节所述，从TSPI位置数据中计算出来的。平均加速度的计算方法如第0节所述。

The average orientation rate is computed as the rate of change of orientation over the data time step.

平均方向率被计算为数据时间步长的方向变化率。

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# 5.6.11 Processing of Captive Platforms

5.6.11 处理圈养平台

Captive platforms are created by placing a specific platform on the target list of a ground-capable Fighter, Bomber, AGAttacker, Fighter-Bomber, Red TEL, or SSFU host platform and specifying a waypoint at which the captive platform will be launched from the host platform. This state of being a captive is not treated as a true flight mode; instead, it causes the platform to be inactive in the scenario, while potentially contributing to the RCS of an airborne host platform.

俘虏平台是通过将一个特定的平台放在具有地面能力的战斗机、轰炸机、AGAttacker、战斗机-轰炸机、Red TEL或SSFU主机平台的目标列表中，并指定一个航路点来创建的，俘虏平台将从主机平台发射。这种作为俘虏的状态不被视为真正的飞行模式；相反，它导致平台在场景中不活跃，同时可能对空中主机平台的RCS有所贡献。

The ruleset of the host platform makes the decision to transition a captive platform to a fully operational platform, i.e., to launch the platform. The ruleset sends the engagement commands to launch the weapon system and to activate the captive platform. These commands require the initialization of the captive platform’s state. The initial state in terms of position and velocity of the captive platform is set to the state of the host platform at the time of launch. A captive launched by a stationary ground platform has its initial position set to that of the host platform at the time of launch, with its speed initialized to the airframe’s minimum speed and its orientation set in the direction of its first waypoint. The captive platform will then proceed to fly in the user-selected Waypoint flight mode. Unlike other platforms, the captive platform will fly to its first waypoint rather than use it only to set the initial state of the platform.

主平台的规则集做出决定，将一个俘虏平台过渡到一个完全可操作的平台，即发射平台。规则集发送交战命令以启动武器系统和激活俘虏平台。这些命令需要初始化俘获平台的状态。俘虏平台的位置和速度方面的初始状态被设置为发射时主平台的状态。由静止的地面平台发射的俘虏，其初始位置设置为发射时主机平台的位置，其速度初始化为机体的最低速度，其方向设置为其第一个航路点的方向。然后，俘虏平台将以用户选择的航路点飞行模式继续飞行。与其他平台不同的是，俘虏平台将飞向其第一个航路点，而不是只用它来设置平台的初始状态。

# 5.6.12 Low-Level Transit Routes (LLTRs)

5.6.12 低级别的交通路线（LLTRs）。

EADSIM models LLTRs across an MEZ. These routes allow for the safe passage of aircraft within an MEZ.

EADSIM建立了跨越MEZ的LLTRs模型。这些路线允许飞机在MEZ内安全通过。

Aircraft will examine their flight routes at transitional times to see if the planned flight route will carry the aircraft within an MEZ that the aircraft knows about. Aircraft which determine that their planned flight route will carry them within an MEZ will search for and adopt an LLTR that allows them safe passage. If no LLTR is found which is suitable, the aircraft will proceed through the MEZ.

飞机将在过渡时期检查其飞行路线，以了解计划的飞行路线是否会将飞机带入其知道的MEZ内。确定其计划的飞行路线将在MEZ内飞行的飞机将寻找并采用一个允许其安全通过的LLTR。如果没有找到合适的LLTR，飞机将继续通过MEZ。

Once an LLTR has been adopted, it is simply followed as a set of waypoints. Normally, an aircraft will not depart the transit route once it is on the route. There are exception conditions which are described below. Aircraft may also adopt an LLTR and then abandon it prior to reaching the LLTR.

一旦采用了LLTR，它就被简单地作为一组航路点来遵循。通常情况下，飞机一旦进入该航线，就不会离开该航线。有一些例外情况，将在下文说明。航空器也可以采用一个LLTR，然后在到达LLTR之前放弃它。

## 5.6.12.1 Aircraft Determination of MEZ Crossings

5.6.12.1 飞机确定穿越MEZ的情况

Aircraft will examine their flight routes at transitional times to see if the planned flight route will carry the aircraft within an MEZ of which the aircraft is aware.

飞机将在过渡时期检查其飞行路线，看计划的飞行路线是否会将飞机带入飞机所知道的MEZ内。

The aircraft knowledge of the MEZ is based on the aircraft being explicitly associated with the MEZ during the setup of the scenario. This association is accomplished in Scenario Generation.

飞机对MEZ的了解是基于飞机在想定设置过程中与MEZ的明确关联。这种关联是在想定生成中完成的。

The transitional flight situations at which the aircraft examines the route

飞机检查航线的过渡性飞行情况

are:

是。

• when it is activated, either at the beginning of the scenario or later

- 当它被激活时，无论是在场景的开始还是后来

• when it reaches one of its waypoints

- 当它到达其中一个航路点时

• when it vectors toward a target in the early stages of an engagement, unless that target is in an MEZ

- 当它在交战的早期阶段朝向一个目标时，除非该目标在MEZ中。

• when it executes either a scripted or dynamically determined takeoff

- 当它执行脚本化或动态确定的起飞时

• when it enters the RTB flight mode

- 当它进入RTB飞行模式时

• when it has reached the end of an LLTR

- 当它达到一个LLTR的终点时

• when it skips a waypoint (platforms with Bomber or Fighter-Bomber ruleset types only)

- 当它跳过一个航路点时（仅适用于轰炸机或战斗机-轰炸机规则集类型的平台

• when it returns to normal flight mode.

- 当它恢复到正常飞行模式时。

The planned aircraft route is not examined when the aircraft enters the latter stages of an engagement or when it is reacting to an attack.

当飞机进入交战后期或对攻击做出响应时，不对计划的飞机路线进行检查。

In all cases, the aircraft will examine its flight route from its current position to its intended destination. When an aircraft is vectored to a target, it uses the current target position as the intended destination.

在所有情况下，飞机将检查其从当前位置到预定目的地的飞行路线。当飞机被导航到一个目标时，它使用当前的目标位置作为预定目的地。

The aircraft will determine the distance from its current position to the point at which it would cross the boundary of the MEZ. In the case where the planned flight path will carry it within multiple MEZs, the closest MEZ (as determined by the distance to the boundary crossing) will be considered for selection of an LLTR.

飞机将确定从其当前位置到它将穿越MEZ边界的距离。在计划中的飞行路线将在多个MEZ内进行的情况下，将考虑选择最近的MEZ（根据跨越边界的距离确定）来选择LLTR。

## 5.6.12.2 Rules for Adoption of LLTRs

5.6.12.2 采用LLTR的规则

Aircraft which determine that their planned flight route will carry them within an MEZ will search for an LLTR associated with that MEZ which allows them safe passage. An LLTR may be used to cross an MEZ only if all of the following conditions are true:

当飞机确定其计划的飞行路线将在一个MEZ内飞行时，将搜索与该MEZ相关的、允许其安全通过的LLTR。只有在以下所有条件都成立的情况下，才可以使用LLTR来穿越MEZ。

• It is a two-way LLTR or a one-way LLTR running in the direction the aircraft wishes to cross.

- 它是一个双向的LLTR或单向的LLTR，在飞机希望穿越的方向运行。

• The aircraft does not need to cross the MEZ to reach the starting point of the LLTR.

- 飞机不需要穿越MEZ来到达LLTR的起点。

• The aircraft does not need to cross the MEZ to fly from the end of the LLTR to its destination.

- 飞机不需要穿越MEZ就可以从LLTR的末端飞到目的地。

If several LLTRs are found to be valid routes across an MEZ, the one which gives the shortest flight path to the aircraft’s objective will be used. If no valid LLTRs are found, the aircraft will fly across the MEZ.

如果发现有几个LLTR是穿越MEZ的有效路线，那么将使用提供到飞机目标的最短飞行路径的那个。如果没有发现有效的LLTR，飞机将飞过MEZ。

## 5.6.12.3 Aircraft Flight on an LLTR

5.6.12.3 飞机在LLTR上飞行

Once an LLTR has been adopted, it is simply followed as a set of waypoints. The aircraft will proceed from its current position to the entry point of the LLTR. During this time, it will be considered to be approaching the LLTR but not yet on it. It will then proceed from waypoint to waypoint along the LLTR.

一旦LLTR被采用，它就被简单地作为一组航路点来遵循。飞机将从其目前的位置出发，前往LLTR的进入点。在这段时间内，它将被认为是在接近LLTR，但还没有到达它。然后，它将沿着LLTR从一个航路点到另一个航路点前进。

A decision to stop or abort an engagement will interrupt the approach to the LLTR. The aircraft will drop the LLTR. A decision to stop or abort an engagement will not interrupt the transiting of the LLTR. The aircraft will proceed to the end of the LLTR. A decision to react to attack will cause the aircraft to be drawn off the LLTR. The aircraft will return to the LLTR later when the aircraft resumes normal flight.

停止或中止交战的决定将中断对LLTR的接近。飞机将放弃LLTR。停止或中止交战的决定不会中断穿越LLTR的过程。飞机将继续前进到LLTR的末端。对攻击做出响应的决定将导致飞机离开LLTR。当飞机恢复正常飞行时，飞机将返回到LLTR。

A decision to return to base will cause the aircraft to drop the LLTR.

决定返回基地将导致飞机放弃LLTR。

## 5.6.12.4 Effects of LLTR Adoption

5.6.12.4 采用LLTR的影响

The adoption of an LLTR has several impacts in the C3I model. These are briefly described here for clarity. A more in-depth description is contained in Section 4 of this document.

在C3I模型中，采用LLTR有几个影响。为了清楚起见，这里对这些影响进行了简单的描述。更深入的描述见本文件第4节。

Aircraft on an LLTR are not considered for engagement by friendly SAMs operating in Truth mode. In this case, Friendly SAMs are those defined as being of the same alliance as the aircraft. If the aircraft is drawn off the LLTR by an enemy attack, it may be engaged by friendly SAMs until it returns to the LLTR. In perception mode, operating on an LLTR can feed point to the identification of the target through Procedural Identification.

在LLTR上的飞机不考虑被在真实值模式下运行的友军SAM所攻击。在这种情况下，友军SAM是指那些被定义为与飞机同属一个联盟的导弹。如果飞机被敌方的攻击引离了LLTR，它可能会被友军SAM攻击，直到它返回到LLTR。在感知模式下，在LLTR上操作可以通过程序性识别为目标的识别提供指向。

Bombers and fighter-bombers will not select a target while on an LLTR. Fighters will select a target while on an LLTR but will not break off the LLTR to vector to the target.

轰炸机和战斗轰炸机在LLTR中不会选择目标。战斗机在LLTR中可以选择目标，但不会脱离LLTR而向目标移动。

# 5.6.13 Profile Deployment

5.6.13 剖面的部署

Deployment of profile waypoint sets provides a dynamic capability for adopting a certain flight profile when a platform engages against a ground target. It allows the platform to leave its original waypoint set and follow the profile waypoints until within range of the target to engage. Once the engagement has been completed, the platform can then return to its original set of waypoints. Since the profile waypoints are set up at the ruleset level, the same flight profile can be used by multiple aircraft within the scenario, regardless of which target is being engaged and where that target is located within the scenario.

剖面图航路点集的部署为平台在与地面目标交战时采用某种飞行剖面提供了动态能力。 它允许平台离开其原来的航路点集，并遵循剖面航路点，直到进入目标的范围内进行交战。一旦交战完成，平台就可以返回到其原来的航路点集。由于剖面图航路点是在规则集层面上设置的，因此同一飞行剖面图可以被想定中的多架飞机使用，而不管哪个目标被交战以及该目标在想定中的位置。

## 5.6.13.1 Profile Definition and Set-Up

5.6.13.1 剖面的定义和设置

Profiles are set up in the Target Select Phase of the Bomber, Fighter-Bomber, and AGAttacker rulesets. A profile is a series of waypoints that defines the path the platform will follow when reaching the target area. The path will be followed until the platform is within weapon’s range of the target and the actual engagement can begin. The profile will be initiated once the flight leader flies to within a ruleset-defined initiation range of a target location. When this initiation range has been reached by the flight leader, each aircraft in the flight will adopt its individual profile and attempt to engage its target. Once the profiles have been initiated, the profile waypoints will be followed by each aircraft until it has found and engaged its targets or until the flight leader has orbited in its profile the number of orbits defined by the ruleset.

剖面图是在轰炸机、战斗轰炸机和AGA攻击机规则集的目标选择阶段设置的。剖面图是一系列的航路点，定义了平台到达目标区域时将遵循的路径。该路径将被沿用，直到平台进入目标的武器射程，并开始实际交战。一旦领航员飞到目标地点的规则定义的启动范围内，就会启动该剖面。当编队长机达到这个启动范围时，飞行中的每架飞机将采用其各自的剖面，并试图与目标交战。一旦剖面被启动，每架飞机将遵循剖面的航路点，直到它找到并接触其目标，或者直到领航员在其剖面中运行了规则集定义的轨道数量。

Each waypoint in the profile is defined relative to a generic target location. The waypoints are set by downrange and crossrange distances from the generic target location, speed at which to approach each waypoint, altitude of the waypoint in either MSL, AGL, or TGT units, and whether the platform should fly terrain following to the waypoint. TGT units are relative to the target. Terrain following is automatically set to ‘No’ when you select TGT or MSL altitude mode. Setting these waypoints using relative distances from a generic target rather than using absolute waypoint locations allows for the use of this ruleset and its defined profiles by multiple aircraft in the scenario engaging against a variety of ground targets located throughout the scenario.

剖面图中的每个航路点都是相对于一个通用目标位置而定义的。这些航路点是由距通用目标位置的下行和上行距离、接近每个航路点的速度、航路点的高度（MSL、AGL或TGT单位）以及平台是否应跟随地形飞行到该航路点。TGT单位是相对于目标的。当您选择TGT或MSL高度模式时，地形跟踪会自动设置为 "否"。使用与一般目标的相对距离来设置这些航路点，而不是使用绝对的航路点位置，可以让场景中的多架飞机使用这个规则集及其定义的剖面，来对付整个场景中的各种地面目标。

Waypoint profiles can be set for each platform in a flight. The flight leader has its own unique profile. Each wingman can have the same default profile or a profile specific to the wingman position in the flight. For example, if a ruleset is set up with different profiles for the first two wingmen in the flight, the remainder of the wingmen will adopt the default wingman profile once the flight leader penetrates the initiation range to its target.

可以为飞行中的每个平台设置航路点剖面。飞行编队长机有自己独特的剖面。每个僚机可以有相同的默认剖面，也可以有针对飞行中僚机位置的剖面。例如，如果一个规则集为飞行中的前两个僚机设置了不同的剖面，一旦飞行编队长机穿透启动范围到达目标，其余的僚机将采用默认的僚机剖面。

When defining the profiles for each aircraft in a flight, the user has the option to scale the profile for all platforms that use the ruleset, scale the profile for complex weapons only, or to not scale the profile. If profile scaling is enabled the profile will be scaled when the weapon is launched within the maximum profile waypoint downrange. Each waypoint is adjusted based on the horizontal and vertical scale factors.

当为飞行中的每架飞机定义剖面时，用户可以选择为所有使用该规则集的平台缩放剖面，只为复杂武器缩放剖面，或者不缩放剖面。如果启用剖面图缩放，当武器在最大剖面图航路点范围内向下发射时，剖面图将被缩放。每个航路点都会根据水平和垂直比例系数进行调整。

The horizontal scale factor is computed by dividing the launch range from the target by the greatest downrange of the profile waypoints. The vertical scale factor is computed by dividing the launch altitude by the first profile waypoint altitude. The horizontal scale factor is then multiplied by the downrange and the vertical scale factor is multiplied by the altitude of each profile waypoint to scale the profile. If profile scaling is not enabled the user has the option to designate which waypoint leg can be adjusted for range and altitude. This capability has been provided to allow for profile adjustments should initiation of the profile be at a range or altitude relative to the target that is insufficient to allow the profile to be flown exactly as specified. Only one leg can be adjusted for range and only one for altitude. The same leg may be selected for both. Only legs where altitude changes occur may be selected for altitude adjustment. The minimum altitude for all waypoints can be designated using floor altitude. The default floor altitude is 200m.

水平比例系数的计算方法是，从目标出发的发射范围除以剖面航路点的最大下限。垂直比例系数的计算方法是用发射高度除以第一个剖面航路点的高度。然后，水平比例系数乘以下行距离，垂直比例系数乘以每个剖面航路点的高度，以缩放剖面。 如果没有启用剖面图缩放功能，用户可以选择指定哪一个航路点段可以进行范围和高度调整。这一功能的提供是为了在启动剖面图时，如果相对于目标的范围或高度不足以让剖面图完全按照指定的方式飞行，可以对剖面图进行调整。只有一条腿可以调整范围，只有一条腿可以调整高度。同一个腿可以被选择用于两者。只有发生高度变化的航段才可以被选择用于高度调整。所有航路点的最低高度都可以用底限高度来指定。默认的最低高度是200米。

When adoption of a profile occurs, absolute positions are computed for each profile waypoint. For flight leaders, the profile is simply inserted into its waypoint list prior to its next waypoint. The flight leader continues to fly in waypoint mode and flies these profile waypoints. For a wingman, the profile becomes its waypoint set since wingmen normally do not have waypoints. The wingman changes from Wingman flight mode to Waypoint flight mode and flies the waypoints. Once each aircraft is within weapon’s range to its respective target, the aircraft engages the target using the Bomber flight mode and then drops the profile once the engagement is complete. If the flight leader never engages its target, it will orbit the specified number of times and then drop its profile and return to its original waypoint set. If a wingman never engages, it will orbit until the flight leader drops its profile and then it, too, will drop its profile. When the flight leader drops its profile, all the profile waypoints are simply removed from the waypoint list and it flies to the next remaining waypoint in the list. When the wingman drops its profile, it switches back to Wingman flight mode and vectors to its formation location relative to the flight leader’s position.

To provide for a cruise missile capability, a profile option exists that allows the platform to drop all remaining original waypoints from its waypoint list when it adopts the profile. This allows for a one-way flight into the target. Once the last profile waypoint is reached, the platform will engage the target if it is within weapon’s range. If not, the platform will simply disappear, since no more waypoints exist. This option allows a very specific maneuver to be performed by a cruise missile-like platform when it flies into its target.

为了提供巡航导弹的能力，存在一个剖面选项，允许平台在采用剖面时从其航路点列表中删除所有剩余的原始航路点。这就允许了单程飞行进入目标。一旦到达最后一个剖面图的航路点，如果目标在武器的射程之内，平台将与之交战。如果不是，平台将直接消失，因为没有更多的航路点存在。这个选项允许类似巡航导弹的平台在飞入目标时进行非常特殊的机动。

## 5.6.13.2 Profile Waypoint Absolute Location Calculation

5.6.13.2剖面图航路点的绝对位置计算

When computing the profile waypoint absolute locations, the local reference frame must be computed. The up directions at the target and platform are obtained using ECEFtoUp with the target and platform locations respectively. Then, the cross product of the up directions at the target and platform is computed:

在计算剖面航路点的绝对位置时，必须计算出本地参考框架。目标和平台的上升方向分别用ECEFtoUp和目标和平台的位置来获得。然后，计算目标和平台的上升方向的交积。

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Once the local reference frame has been computed, the profile for the platform must be found. If the platform is the flight leader, the first profile in the profile list off the ruleset structure is used. If the platform is a wingman and no specific profile was set up for it, the profile used is the default wingman profile which is the second profile in the list. If the platform is a wingman and a specific profile is set up for it, the profile list is looped over, starting from the third profile in the list until the correct profile is found.

一旦本地参考框架被计算出来，就必须找到平台的剖面。如果该平台是领航员，则使用规则集结构中剖面列表中的第一个剖面。如果该平台是僚机，并且没有为其设置特定的剖面，则使用的剖面是默认的僚机剖面，即列表中的第二个剖面。如果该平台是一个僚机，并且为其设置了一个特定的剖面，则剖面列表将被循环，从列表中的第三个剖面开始，直到找到正确的剖面。

After initializing the range and altitude adjustment variables to 0.0, the profile waypoints are looped over from the last waypoint to the first and each waypoint absolute position is computed in ECEF coordinates. Adjustments, if necessary, are dependent upon where in the profile waypoint list the adjustment legs are located. If the current profile waypoint is used to adjust both range and altitude, the range and altitude differences are stored in the adjustment variables:

在将范围和高度调整变量初始化为0.0后，剖面航路点从最后一个航路点循环到第一个航路点，每个航路点的绝对位置都以ECEF坐标进行计算。如果需要调整，则取决于调整腿在剖面航路点列表中的位置。如果当前的剖面图航路点同时用于调整范围和高度，则范围和高度的差异将存储在调整变量中。

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Then the range adjustment value is computed based on certain conditions. If a previous leg represented a waypoint altitude change, if the platform’s altitude above the target is greater than the previous waypoint’s altitude, and if adjusting for range is allowed and a range adjustment has not yet occurred, similar triangles are used to compute the range adjustment value. First, the altitude difference between waypoints is computed:

然后根据某些条件计算出射程调整值。如果前一个航段代表了一个航路点的高度变化，如果平台在目标上方的高度大于前一个航路点的高度，如果允许调整范围，并且还没有发生范围调整，那么类似的三角形被用来计算范围调整值。首先，计算出航路点之间的高度差。

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Next, the range difference is computed:

接下来，将计算出范围差。

Since the actual altitude difference based on the platforms current position and the previous waypoints altitude can be computed by

由于基于平台当前位置和前一个航路点高度的实际高度差可以通过以下方式计算出来

the actual downrange difference can be computed according to:

实际的下限差值可以根据以下方法计算。

The range adjustment is then computed as:

然后，范围调整的计算方法是：。

If a range adjustment has not yet occurred but is allowed, the altitude adjustment is left unchanged and the range adjustment is computed by:

如果范围调整尚未发生但允许，则高度调整保持不变，范围调整通过以下方式计算。

yyyyyyyyyyyyyyyyyyyyyyyyy

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If no leg adjustment for range is necessary or if the range adjustment leg has already been passed, the altitude adjustment is left unchanged and the range adjustment is set to the actual downrange difference:

如果没有必要对射程进行腿部调整，或者射程调整腿部已经通过，则高度调整不做改变，射程调整被设置为实际的下行差。

If any adjustments were made in either altitude or downrange or both, the waypoint distances relative to the target location are computed as:

如果在高度或下限或两者中做了任何调整，相对于目标位置的航路点距离计算为：。

If no adjustments were allowed or necessary, the waypoint distances relative to the target location are set by:

如果不允许或没有必要进行调整，那么相对于目标位置的航路点距离就由。

Once the waypoint distances of downrange and altitude are set, the waypoint relative position direction vectors are computed relative to the target location in ECEF coordinates as:

一旦设定了下行距离和高度，就可以计算出相对于目标位置的ECEF坐标的航路点相对位置方向矢量，即。

The ECEF relative position vector of the waypoint is then computed as the vector sum of the components of the direction vectors X, Y, and Z:

然后，航路点的ECEF相对位置矢量被计算为方向矢量X、Y和Z的分量的矢量和。

The actual waypoint ECEF vector is then computed as the sum of the ECEF relative position vector of the waypoint and the target position:

然后，实际的航路点ECEF矢量被计算为航路点ECEF相对位置矢量与目标位置之和。

The latitude and longitude corresponding to this location are then computed. The position of this waypoint is then recomputed to account for the altitude of the waypoint in the user-desired AGL, TGT, or MSL units. If AGL, the waypoint altitude used is the value of WH added to the terrain elevation at the waypoints’ latitude and longitude. If MSL, the waypoint altitude used is the value of WH. If TGT, the waypoint altitude used is the value of WH added to the target elevation at the target’s latitude and longitude. This new position, the latitude, longitude, and profile waypoint altitude are all stored in the waypoint structure. The bit designating this waypoint as a profile point is then set. If the profile point is a hover waypoint, the waypoint on time is set to 0.0 and the off time is set to the profile hover point duration. If the profile point is not a hover waypoint, the waypoint on and off times are set to the default values of 0.0 and 99,999.0, respectively. Once all of this has been completed, this waypoint is added to the platform’s waypoint list, and the loop continues to the next profile waypoint, repeating the procedure until all profile waypoints have been inserted into the waypoint list.

然后计算出与该位置相对应的经度和纬度。然后重新计算该航路点的位置，以考虑用户所需的AGL、TGT或MSL单位中的航路点高度。如果是AGL，使用的航路点高度是WH值加上航路点经纬度的地形高度。如果是MSL，使用的航路点高度是WH的值。如果是TGT，使用的航路点高度是WH值加上目标经纬度的目标高程。这个新的位置、纬度、经度和剖面航路点高度都存储在航路点结构中。然后，指定该航路点为剖面点的位被设置。如果剖面点是一个悬停航路点，则航路点开启时间被设置为0.0，关闭时间被设置为剖面悬停点持续时间。如果剖面图点不是悬停航路点，则航路点开启和关闭时间分别被设置为默认值0.0和99,999.0。所有这些都完成后，这个航路点将被添加到平台的航路点列表中，然后循环到下一个剖面航路点，重复这个过程，直到所有剖面航路点都被插入到航路点列表中。

# 5.6.14 State Vector Mode

5.6.14 状态矢量模式

State Vectors provide the precise position, velocity, and orientation of an aircraft platform at a specific time. A State Vector consists of waypoint number, time, latitude, longitude, altitude, speed, heading, pitch, bank, and yaw. In addition to state vectors, waypoints are specified in the state vector mode of operation for weapon delivery.

状态矢量提供了一个飞机平台在特定时间的精确位置、速度和方向。一个状态矢量包括航路点编号、时间、纬度、经度、高度、速度、航向、俯仰、倾斜和偏航。 除了状态矢量外，在武器投送的状态矢量操作模式下，也会指定航路点。

The State Vector mode is defined by the user through Scenario Generation for airborne platforms. Inputs controlling platform movement in this mode are read from a file, which contains both waypoints and state vectors.

状态矢量模式是由用户通过场景生成为机载平台定义的。在这种模式下，控制平台运动的输入从一个文件中读取，其中包含航路点和状态矢量。

In the state vector mode, the first state vector defines the platform OnTime. Platforms move from one user-defined state to another in the order defined by the user. For platform movement between time steps input by the user, all state vector parameters are adjusted by means of a linear interpolation. When the last state is reached, the platform is deactivated and removed from the scenario.

在状态矢量模式下，第一个状态矢量定义了平台的OnTime。平台按照用户定义的顺序从一个用户定义的状态移动到另一个。对于用户输入的时间步骤之间的平台移动，所有的状态矢量参数都通过线性插值的方式进行调整。当达到最后一个状态时，平台被停用并从场景中移除。

In state vector mode, the waypoints and state vectors specified in the input file maintain complete control over the platform position, velocity, orientation, weapon delivery, etc. throughout the simulation. Any commands from the C3I model to vector to a new heading, begin drag maneuver, return to base, etc. for these platforms will be ignored in flight processing.

在状态矢量模式下，输入文件中指定的航路点和状态矢量在整个模拟过程中保持对平台位置、速度、方向、武器投放等的完全控制。对于这些平台，C3I模型发出的任何向新航向、开始拖曳机动、返回基地等命令在飞行处理中都会被忽略。

5.10 INTERCEPTOR MISSILE FLIGHT

5.10 拦截导弹飞行

The Interceptor Flight Model uses common algorithms with the general missile flight modeling described in Section 5.6.

干扰飞行模型与第5.6节中描述的一般导弹飞行模型使用共同的算法。