



HETMAN

ARTIFICIAL COMMANDER ver. 1.0 beta

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INTRODUCTION

Addon „HAC” enlivens battlefield in way, I hope, that would do a living leader. „HAC” does not deal with the manner, in which orders are executed, but he deals with issue orders. In other words, this addon gives one or both sides of conflict an field commander level AI.

INSTALLATION

Addon version is installed by placing folder “@Ryd_HAC” in the same place, where are situated other addon folders. Script version is installed by placing contents of folder “Source” in a mission folder in which shall be used. Addon version requires CBA.

USAGE

To activate „HAC” for one side, one of units of this side must be named **leaderHQ**. Highly recommend also placement of any object on the map (can be empty trigger) named **RydHQ_Obj**, for example near leader of opposite side. Its position will determine a target point, which Artificial Commander will try to conquer. In order to give to addon control over units of both sides must also be named **leaderHQB** any unit of second side (I suggest an officer/boss unit. If it is AI controlled unit, will receive “HOLD” order and will not move. Death of these “field commander” units means the end of script control - army is losing its „brain”. It may be compared to a “King” piece in chess). Similarly, we also place for the other side on map object called **RydHQB_Obj**. After these preparations, „HAC” should take command over fighting units and completely automatically assign them tasks adequately to the situation on the battlefield.

For script version should also be placed in the init field of any object, in the activation field of a trigger or waypoint, or in a separate file, following code:

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nul = [ ] execVM „RydHQInit.sqf”;
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„HAC” will start working after about 15 seconds from start of the mission and will control all units of given side and their allies (except civilians).

HOW IT WORKS

„HAC” works cyclically; if it controls both sides, their cycles occur alternately. Interval between cycles depends on the number of subordinates, the situation on the battlefield, CPU computational power, commanders “personality” and on optional settings. Usually should last for no less than several tens of seconds and no longer than a few minutes. Each cycle consists of three main phases:

First Phase: „*What's going on?*” - „HAC”, using many global variables, mostly array type, collects information about actual situation on the battlefield (re-creates a list of subordinates, known enemy units; these units are divided according to their categories (infantry, tanks, air, antitank, antiaircraft, artillery, etc..) defines morale, and so on...);

Second Phase: „*What would we do?*” - On the basis of gathered info „HAC” decide, what orders to issue subordinate units (Should to attack? How to attack a given enemy? Should first send a scout? Should try to flank?). If Artificial Commander is not aware of any enemy, it sends a scout in direction of the target point. If scout does not discover any enemy, there is sent a group of units to secure objective. If noticed enemy, „HAC” rather first will attempt to destroy it and send the appropriate number of units of appropriate type, that will try to outflank and destroy enemy group. In addition is retained a certain amount of forces as reserve. At a certain moment part of this reserve is used for large-scale encirclement of whole known enemies line. Note: there is a good chance, that Artificial Commander will not send to attack armored units, if he knows about presence of enemy anti-tank weapons (such as ATGM units). Similarly rather not send air units in the area in which presence of AA weapons was found, also will not be too willing to send units in the area, where they are doing poorly, such as armored units into the city or forest. If „HAC” concludes, that enemy has a sufficiently large advantage, and when morale will be low enough, chances are good that army will go into defensive mode and cast of properly selected positions between a „leaderHQ (B)” and the enemy, or, when the enemy is to close or when none is known, around leader unit. Commander may decide to place them in positions on the near reverse slope – hidden in ambush. Behave similarly, if a defensive mode is manually set.

Third Phase: „*Yes sir!*” - are activated scripts, that send troops to appointed positions (waypoints are assigned, usually a SAD, in front and sides of attacked enemy, at a distance depending on type of attacker), cycle ends when last command is given.

Morale - reflects will of fight and army fatigue. At the start is equal to 0. Over time (with subsequent cycles) it will slowly decrease, or, at best, remain constant. The rate of decrease depends on the overall losses, the losses recently incurred and the relative strengths (taken into account are only known enemy units, so the more soldiers see enemy units, the faster they lose courage ...). The minimum level of morale is - 50. The lower, the greater is chance for activation defense mode (giving up initiative) and even for surrender of whole army. This factor can be raised only by manually manipulating of relevant global variable (**RydHQ_Morale** for the „A” and **RydHQB_Morale** for the „B”).

Surrender of entire army - can occur when morale is low and advantage of the enemy is big enough. Cause an end of script control for a side that is surrendered, units give up their weapons and are switching in „captive” state. Also raise their hands for a while. In „debug” mode also appears appropriate message.

Artificial Commander's personality - behavior described above are subject to a random factor and the influence of characteristics, by which commanders personality is defined. If they are not individually determined, are randomly set at the start and most likely will have a fairly average value. Influence of personality on the course of battle is noticeable, but not directly. It does not guarantee certain behaviors, only increases or decreases chances of their occurrence.

Debug Mode - when activated, shows the course of events on the battlefield through entries in the file .rpt (commanders attributes, info about giving up the army) sidechat message (the message indicating start of a new cycle reveals simultaneously actual morale, is also displayed info about giving up the army) and markers (dots) on the map:

Red: points of attack. **Inf** - infantry and cars, **air** - air force, **arm** - armor, **rec** - scout, **snp** - snipers, **cap** – target points for groups send for occupying objective;

Orange: shows stages of flanking forces route;

Black: in a defensive mode means good observation points for reconnaissance and for the forces in an ambush;

Brown: show occupied defensive positions. **rec** - reconnaissance, **air** – air units, **LMCU** - „land mobile combat units”;

Green: indicates center of defense perimeter;

Color change to blue: indicates completed order;

Yellow crosses: indicate points, toward which are directed specific units on defensive positions.



OPTIONAL CUSTOMIZATION

Functioning of „HAC” can be modified by manipulating the corresponding global variables.

RydHQ_Wait - default 15. Time in seconds before “HAC” will start working.

RydHQ_Debug – default false; if true, debug mode starts for side “A”;

RydHQB_Debug – default false; if true, debug mode activates for side „B”;

RydHQ_Order = “DEFEND” – sets army of “A” side (**RydHQB_Order** is for “B” side) in defensive mode. Units will keep positions near their commander. Re-defining this variable with any other value will set army back in attack mode;

RydHQ_Excluded (array) contains names of the commanders of groups of „A” side, which shall not be controlled by “HAC”. Eg: **RydHQ_Excluded = [LeaderA, LeaderC, LeaderG];**

RydHQB_Excluded - as above, for „B” side;

RydHQ_Fast and **RydHQB_Fast** - default is „false”. If „true”, commander of given side will not be waiting with new cycle for end of opposing side cycle or even for end of its own previous cycle. This creates a risk of „clogging” computer with calculations, so recommend caution.

RydHQ_CommDelay and **RydHQB_CommDelay** - default 1. Multiplier of pause between end of one cycle and start of new one for given side. I advise caution with values smaller than 1. Flow of information possibly can be significantly disturbed that way. Values higher than 1 are for realism fans, who would like, that issue orders took as much time, as much should in reality.

„HAC” recognizes types (classes) of units from Arma 2 1.10. To take into its consideration also units eg from OA, or units originating from addons, you must define the corresponding global array variable by typing in appropriate categories class names of new units types. Categories are not separable. For example, a soldier with RPG will, or at least should belong both to *InfAT* and *Inf* categories. In general, depending on which category unit is assigned depends, to what sort of tasks will be that unit used by addon. Thus, truck entered to *armor* category will be treated by artificial commander like an armored vehicle. Some categories (eg *naval*) are used only to that, to „HAC” knew, which units should be ignored always or under certain circumstances. An example of a defined variable.:

RHQ_Crew = [„US_Soldier_Crew_EP1”, „CZ_Soldier_Pilot_EP1”];

Categories’ arrays:

RHQ_Recon - reconnaissance units;

RHQ_Snipers - snipers, sharpshooters;

RHQ_ATInf - infantry and unarmored vehicles with antitank weapons;

RHQ_AAInf - infantry and unarmored vehicles with antiaircraft weaponry;

RHQ_Inf - infantry in total;

RHQ_Art - artillery;

RHQ_HArmor - tanks;

RHQ_LArmor – all light armored vehicles, APCs, etc. excluding self propelled artillery like MRLS;

RHQ_LarmorAT - as above, with weapons effective against armored vehicles (such as mounted ATGM launchers);

RHQ_Cars - vehicles without armor;

RHQ_Air - helicopters and planes;

RHQ_Naval - boats;

RHQ_Static - static weapons including MG nests;

RHQ_StaticAA - as above, anti-aircraft;

RHQ_StaticAT - as above, anti-tank;

RHQ_Support - logistics and medical support units;

RHQ_Cargo - all units able to carry passengers;

RHQ_NCCargo - as above, unarmed;

RHQ_Crew - only pilots and designated vehicles crew members.

(similarly for the B: **RydHQB_** ... etc).

HAC's personality variables – personality is defined by several attributes, which value determines a tendency for a behavior of given type. Their influence is not too great, but I think it's noticeable. Typically, they are set randomly (should have values in the range of 0 to 1, average 0.5), but you can set them manually too. There are two ways:

1. Each attribute separately:

RydHQ_Recklessness (and **RydHQB_** ...) - the higher value, the greater tendency for risky orders, for example, more likely to send a helicopter to area, where opponent has deployed AA weapons or to send tanks in urban area.

RydHQ_Consistency - the higher value, the less likely transition from attack to defense and vice versa.

RydHQ_Activity – the higher value, the greater tendency to attack and to remaining in this mode. If value is low, commander will easily give up initiative and often will choose defense mode.

RydHQ_Reflex - the higher value, the faster commander reacts to changes on battlefield and more often issue a new orders.

RydHQ_Circumspection - the higher value, the greater percentage of forces commander would leave in reserve and for flanking maneuver.

RydHQ_Finess - the higher value, the greater chance for flanking maneuver and a greater propensity to set ambushes on the reverse slope when in defense mode.

2. Selection of entire package of attributes with a single variable:

RydHQ_Personality (**RydHQB_** .. for the „B”). Here are possible values of this variable and attributes assigned to them:

RydHQ_Personality = „GENIUS“: (RydHQ_Recklessness = 0.5; RydHQ_Consistency = 1; RydHQ_Activity = 1; RydHQ_Reflex = 1; RydHQ_Circumspection = 1; RydHQ_Fineness = 1).

It is true that „Genius” does not make artificial commander military genius, but in my opinion, it sets optimal value.

„IDIOT“: (RydHQ_Recklessness = 1; RydHQ_Consistency = 0; RydHQ_Activity = 0; RydHQ_Reflex = 0; RydHQ_Circumspection = 0; RydHQ_Fineness = 0).

As above, but on the contrary ...

„COMPETENT“: (RydHQ_Recklessness = 0.5; RydHQ_Consistency = 0.5; RydHQ_Activity = 0.5; RydHQ_Reflex = 0.5; RydHQ_Circumspection = 0.5; RydHQ_Fineness = 0.5).

Average values, similar to default randomized.

„EAGER“: (RydHQ_Recklessness = 1; RydHQ_Consistency = 0; RydHQ_Activity = 1; RydHQ_Reflex = 1; RydHQ_Circumspection = 0; RydHQ_Fineness = 0).

Reckless, act faster than think. Prefers to regret what he did, than that refrain. Corpses of his subordinates may have entirely different opinion on this matter.

„DILATORY“: (RydHQ_Recklessness = 0; RydHQ_Consistency = 1; RydHQ_Activity = 0; RydHQ_Reflex = 0; RydHQ_Circumspection = 0.5; RydHQ_Fineness = 0.5).

Still has doubts; lingers as much as possible. Rather avoid errors resulting from haste, but his tardiness could mean defeat.

„SCHEMER“: (RydHQ_Recklessness = 0.5; RydHQ_Consistency = 1; RydHQ_Activity = 0; RydHQ_Reflex = 0; RydHQ_Circumspection = 1; RydHQ_Fineness = 1).

Tricks are his hobby. Devises a complicated plans and implement them consistently.

„BRUTE“: (RydHQ_Recklessness = 0.5; RydHQ_Consistency = 1; RydHQ_Activity = 1; RydHQ_Reflex = 0.5; RydHQ_Circumspection = 0; RydHQ_Fineness = 0).

Finesse? What is that? Ruse? What for? Most important is fight to the death. Enemy death, of course. But not mindless... He will do anything to keep initiative.

„CHAOTIC“: (RydHQ_Recklessness = 0.5; RydHQ_Consistency = 0; RydHQ_Activity = 1; RydHQ_Reflex = 1; RydHQ_Circumspection = 0.5; RydHQ_Fineness = 0.5).

He acts quickly and easily changes his mind. He is unpredictable, even for himself.

KNOWN PROBLEMS AND LIMITATIONS

Sometimes in .rpt file a message may appear, such as *O 1-1-E: Cycle as first waypoint has no sense.* Source unknown (script doesn't use "cycle" waypoints), probably related to removal of existing waypoints before issuing the order. Well. It does not impinge on the functioning of addon.

Happened to me sometimes, that script is not activated for first try, or stop working after some time. Cause unknown, perhaps a matter of too many calculations and iterations. Well. Very few I know about proper code optimization.

Addon was tested for battles up to about 500 ground and flying units at low-end hardware and run quite smoothly, however, especially when in use are other "heavy" addons, there may occurs some small lags and, perhaps, errors.

„HAC” does not control naval units. Controls air units, but planes will remain in air (helicopters take off and land properly);

„HAC” works on the basis of waypoints setting. With only few exceptions does not control, what units are doing for fulfillment of its waypoints. For this reason, Artificial Commander will be rather addition than competition for addons dealing with unit or group level AI, as long as a particular addon does not assign waypoints.

„HAC” was not designed for the MP and was not tested in multiplayer. It is also not signed.

Some features aren't extensively tested, so it's a beta version.