The background of the entire page is a photograph of a war-torn city street. The street is filled with rubble, including twisted metal, bricks, and debris. On either side, multi-story buildings are severely damaged, with many windows missing and structural elements exposed. In the distance, a plume of smoke rises from the street, and a person wearing a red shirt is visible walking through the debris. The overall atmosphere is one of devastation and conflict.

# THE URBAN CALCULUS

A Highly Abstracted  
Systems Dynamics Model  
of Modern Urban Conflict

**David Burden**

**v1 – Apr 25**

**[www.taunoyen.com/games/tuc](http://www.taunoyen.com/games/tuc)**

# The Urban Calculus Game

Rules for the abstract consideration of  
Urban Conflict

v250425

David Burden  
david@burden.name



# BASIC GAME RULES

v0.0.1 – first rough draft.  
 v0.0.2 – card-based model  
 v240529 – completing the rules  
 v240605 – after first playtest at BSU  
 v240904 – after COW, and Evolved rules  
 v241022 – final internal playtest  
 v241106 – draft for blind playtest  
 v250425 – first formal release

## 1. THE BASICS

### 1.1 Introduction

The Urban Calculus game (TUC) is designed to provide a very abstract game which considers modern urban conflict at strategic/political-military level.

The game was principally inspired by trying to develop a model (or calculus) of how modern urban conflicts work, particular those which are fought in the full glare of the media and world opinion. TUC games are not expected to be balanced or symmetrical (in any sense of that word), and the system allows a variety of governmental (and non-governmental) actors to be represented. Designer's Notes are at Annex A, and further notes on the website.

There is more information, a full set of print-n-play files, video tutorials and a selection of scenarios at <http://www.taunoyen.com/games/tuc/>.

### 1.2 Level

TUC has a completely abstract representation of force size. Cubes are more representative of "effort" than they are of fixed military formations, and terrain is not represented at all. However, it is hoped that the game still has a distinctly urban flavour.

### 1.3 Core Mechanic

TUC uses playing cards rather than dice. You will need at least 1 pack per player, but just the cards 1-10. Jokers and picture cards are not used in the base game.

Whenever you are out of cards just reshuffle the discard deck and continue.

To reduce reshuffles and the ability to card count you could give both sides two decks, or have both sides work from a common 2 or 3 deck pile, or place a Joker in each deck, with the Joker causing a reshuffle. Whatever works for you.

The standard mechanic in TUC is to draw a card, apply some modifiers (not many) and see if you can equal or beat a target number (TN) (shown as TN+, e.g. 6+) for success.

## 1.4 Ground and Time Scale

There is no map, combat is just assumed to take place in (or around) the city.

There is also no explicit timescale. One of the challenges with modern urban conflict is that they can take days, months or even years – and there seems to be no immediately discernible *a priori* reason as to whether the duration will be short or long.

To model this the following is suggested, and scenarios may have their own variations:

At the end of each turn draw 1 card to determine how long that turn represented, the default table is:

♥	1 week
♣	2 weeks
♦	3 weeks
♠	4 weeks

## 1.5 The Game Board

The game board consists of boxes representing the following:

- For each side:
  - Infantry-heavy assaults
  - Armoured-heavy assaults
  - Fires
  - Strategic Capability
  - Reinforcements
  - Military Casualties
  - Government Will
  - Societal Support
  - Global Adverse Opinion
- Independent:
  - Civilian Harm
  - Structural Damage
  - Loss of Livelihood

The board is shown in Figure 1. It should be A2 sized, but A3 will work if necessary.

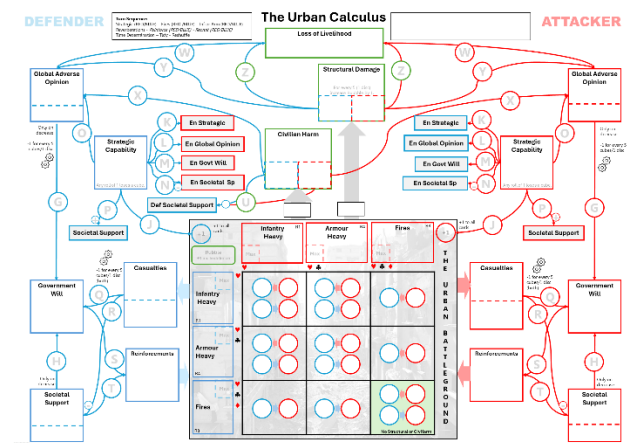


Figure 1: The TUC Game Board

Annex B provides detail on what each value/box represents.

All the values from the scenarios are written directly on the board. In order to make the board re-usable try one of the following in conjunction with a dry-wipe pen:

- Cover the whole map in Fablon or similar;
- Put the map in an A2 picture frame with a Perspex front;
- Stick 25mm circular clear plastic labels (available on Amazon) over the code circles;
- Stick bits of Sellotape over the code circles.

## 1.6 Terminology

### 1.6.1 Attacker/Defender

The rules refer to the two sides as Attacker/Red and Defender/Blue. "Enemy" refers to the side of the opposite to that being discussed. The lower case terms "attacker" and "defender" are used to indicate who is initiating a particular tactical offensive action and who is reacting to it, independent of their role in the scenario.

### 1.6.2 Cubes

A game of TUC needs a reasonable number of simple cubes, counters, markers, tiddly-winks, coins or similar to indicate different states and assets (see Section 3.2). For simplicity these will be referred to as "cubes" in these rules, but substitute for whatever you are using.

### 1.6.3 x5 Discs

The board can become cluttered with a lot of cubes so feel free to use the round discs as the equivalent of 5 cubes (or even 10 for big games - just agree the number at the start). You can break down and make up discs at any point and for no cost. Optionally some x5 markers are provided on the counter sheet.

### 1.6.4 Holding Boxes

Whenever the result of an action is to reduce or increase the number of cubes in a box, place these cubes initially in the smaller dashed off area of the box, as at the end of the turn you will need to determine any reverberating effects from them.

### 1.6.5 Reverberating Effects and Reverberating Damage

Reverberating Effects refers to the general way in which the loss or addition of a cube in one box may trigger the loss or addition of cubes in other boxes. Reverberating Damage refers specifically to the creation of either Civilian Harm or Structural Damage from battleground engagements.

## 2. Stocks and Flows

TUC is based around the concept of a "stocks and flows" model from System Dynamics (Duggan, 2016). Each of the boxes is a "stock" and either builds up or reduces down in value – shown by the number of cubes. The reduction in cubes from one box and their increase in another is then effectively the flow – typically in this game of information and sentiment, rather than of assets or people.

The main "stocks" in TUC are shown in the table below, along with whether they are positive (high value = good, low value = bad) or negative (high value = bad, low value = good), and whether by default they are built up or reduced down. The meanings are hopefully obvious from the titles, but Annex B goes into more detail about what each stock represents in the real world. You survive in TUC by keeping your Government Will and Military Forces (split into Infantry Heavy, Armour Heavy and Fires) stocks above zero.

Stock	Sense	Direction
Government Will	Positive	Reduces Down
Societal Support	Positive	Reduces Down
Global Adverse Opinion	Negative	Builds Up
Strategic Capability	Positive	Reduces Down
Casualties	Negative	Builds Up
Reinforcements	Positive	Builds Up & Down
Military Forces	Positive	Reduces Down
Civilian Harm	Negative	Builds Up
Structural Damage	Negative	Builds Up
Loss of Livelihood	Negative	Builds Up

## 3. GAME OBJECTIVES

Each scenario will define the game objectives for each side – typically in terms of eliminating enemy combat capability or Government Will, or lasting a certain amount of time whilst also maintaining some of your own combat capability. These may be constrained by maximum levels of civilian or own military casualties, or of structural damage.

Normally, if your Government Will falls to 0 you instantly lose.

## 4. SET-UP

### 4.1 Sides

A TUC game has two sides, the Attacker and the Defender. TUC is designed to allow for symmetric and asymmetric games – with an expectation that every game is likely to be asymmetric (and possibly also unbalanced) as it's very unlikely that two forces will not only have the same capabilities but also the same calculus in terms of how Government Will, Societal Support and Global Opinion interact.

The set-up for each side is usually defined by the scenario (see 3.2 below), but the alternative

approaches such as a random set-up or a points-based set up are also possible.

## 4.2 Starting Quantities

The starting quantities of cubes for each side for each of the following will be given in the scenario. Place the appropriate number of cubes in the relevant boxes.

Parameter	Notes
Infantry Heavy Combat Strength	Typically 5-10
Armour Heavy Combat Strength	Typically 5-10
Fires	Typically 3 – 6
Strategic Capability	Typically 3 - 10
Reinforcements	Often 0
Government Will	Usually 5 or 10, depends how long a game you want
Societal Support	Usually 5 or 10, depends how long a game you want

Note that a scenario may also place a limit on how many resources of each type are available per side for the whole game, and also how many can be used per turn.

The following areas typically start with no cubes:

- Civilian Harm
- Structural Damage
- Loss of Livelihood
- Global Adverse Opinion

You'll need about 100 cubes in total. Discs (or blocks or larger cubes) to represent groups of 5 are useful too, about 10-20 should do (alternatively counters for those are on the counter sheet). Cubes can be of any colour (even all the same) but the game state is easier to read if you use different colours. Our preferred option is:

- BLUE/Defender – Blue
- RED/Attacker – Red
- Civilian Harm and Structural Damage – Grey
- Global Opinion - Yellow

## 4.3 Target Numbers

Target Numbers (TN) control how one parameter affects one or more others in a turn. They are the number which a drawn playing card needs to equal or exceed in order to be successful. The values are defined in the scenario and should be written in the relevant circle on the board. More information on the details in Annex B.

For combat Target Numbers are shown on the 3x3 urban battleground grid for each side and each possible combination of attack:

Type	Situation
attacking	Infantry Heavy vs Infantry Heavy
	Infantry Heavy vs Armour Heavy
	Armour Heavy vs Infantry Heavy
	Armour Heavy vs Armour Heavy
	Fires vs Infantry Heavy
defending	Fires vs Armour Heavy
	Fires vs Fires
	Infantry Heavy from Infantry Heavy
	Infantry Heavy from Armour Heavy
	Infantry Heavy from Fires
	Armour Heavy from Infantry Heavy
	Armour Heavy from Armour Heavy
	Armour Heavy from Fires
Fires from Fires	

Note that here "attacking" and "defending" refers to the players role a particular engagement, not whether they are the strategic Attacker or Defender in the whole game. "From" means "in response to an attack from". Also note that the 3x3 matrix is representing the combination of possible engagements – NOT the spatial area of a city. The maximum number of cubes per type which can be used in an attack each turn may also be specified.


For non-battleground Target Numbers:

Code	From	To
G	Global Adverse Opinion	Government Will
H	Societal Support	Government Will
J	Strategic Capability	Battleground
K	Strategic Capability	Enemy Strategic Capability
L	Strategic Capability	Enemy Global Adverse Opinion
M	Strategic Capability	Enemy Government Will
N	Strategic Capability	Enemy Societal Support
O	Strategic Capability	Own Global Adverse Opinion
P	Strategic Capability	Own Societal Support
Q	Casualties	Government Will
R	Casualties	Societal Support
S	Government Will	Reinforcements
U	Civilian Harm	Defender Societal Support
T	Societal Support	Reinforcements
W	Loss of Livelihood	Both Global Adverse Opinion
X	Civilian Harm (CH)	Own Global Adverse Opinion
Y	Structural Damage (SD)	Own Global Adverse Opinion
Z	Structural Damage	Loss of Livelihood

A "Spinal Tap" setting of 11+ for a target number indicates that it is impossible for one parameter to change another – typically due to the complete global societal or government deafness to what is going on! This is different from n/a which represents a lack of capability.

Note that arrows to Societal Support have a small + or – circle on them to indicate whether the effect is to increase or decrease Societal Support. The sense of other changes should be obvious from the rules.

#### 4.4 Ratchets

Links from Global Adverse Opinion and Casualties to Government Will have a ratchet effect, represented by the  symbol. What this means is that whenever you get to a multiple of 5 counters in the main source box the Target Number for the link to Government Will reduces by one – to reflect spiralling problems. Just write the new number in the box if using marker pens, or place a block or dice there – whatever works for you. Changing out the 5 counters for a x5 counter at the same time helps to remind you that the change has been made. Note that the change in TN is done once the multiple of 5 is reached in the main part of the box, excluding the pending area, and so *after* any TN test is made for a new cube (but would then apply for a 2<sup>nd</sup> cube that turn). Should some counters be recovered back under 5 then the ratchet does not change back, or go up again when back up to 5. Should the count every get to 10, 15 etc then apply the ratchet again.

### 5. TURN SEQUENCE

Every turn follows this sequence (those marked \* are compulsory, others are optional, italic are advanced):

- Attacker strategic actions } (simultaneous)
- Defender strategic actions }
- Attacker Fires
- Defender Fires
- Attacker Infantry or Armour led attack
- Defender Infantry or Armour led attack
- Reverberating Effects (simultaneous)\*
- *Deploy Reinforcements (Attacker then Defender)*
- *Raise Reinforcements (Attacker then Defender)*
- Time Determination\*
- Tidy\*
- Reshuffle\*

The strategic actions phase can be played semi-blind, where each side allocates Strategic Capability resources to each action without it being seen by the enemy, and then allocations are revealed and actions played.

Scenarios may vary the side order in each phase.

### 6. STRATEGIC ACTIONS

Strategic actions encompass the full range of non-combat activities, and probably some combat ones

(such as Deep Fires) as well. It includes the Diplomatic, Information and Economic actions of the DIME model.

Usually players simultaneously allocate cubes to actions as detailed below, then either the Attacker carries out all their actions followed by the Defender, or the players can alternate – but all effects are treated as simultaneous.

The following shows the strategic actions available and some examples of what each action might represent in the real world.

Action vs	Examples
Battleground	Satellite ISR, HUMINT, Cyber, EW, Theatre assets etc
Enemy Strategic Capability	Deep Strike vs enemy non-kientic assets. Cyber attack.
Enemy Global Adverse Opinion	Information war campaign. Disinformation. Controlling the narrative.
Enemy Government Will	Cyber attack. Assassination. Deep strike vs industrial capability.
Enemy Societal Support	Deep strike vs infrastructure. Cyber attacks. Disinformation. Uprisings/riots/protests.
Own Global Adverse Opinion	Regain the narrative. Good news stories/overtures.
Own Societal Support	Regain the narrative. Good news stories/overtures. Building a common enemy. Distraction.

You can take as many Strategic Actions in a turn as you have cubes in your Strategic Capability box. There is a default maximum of 2 attempts per action per turn, but this may vary by scenario.

To take a strategic action:

- Choose an action from the table below (also shown by the links on the battle map);
- Place a cube from your Strategic Actions box on the relevant action target box;
- Draw a card. If the card is greater than or equal to the TN shown for the action then the action is successful and the result is given below;
- Note that if the card is an Ace (1) then you lose the cube permanently from the game;
- At the end of the turn return the cubes back to the Strategic Capability box at the end of the turn.

#	Action	Success Effect
J	Battleground	All cards on battleground at +1 that turn (Place a marker/counter on the +1 circle on the battleground. Also helps to then move this into each combat box in order not to forget it). Max one +1 even if 2 cubes successful.
K	Enemy Strategic Capability	Enemy permanently lose 1 Strategic Capability cube
L	Enemy Global Adverse Opinion	Increase by 1 cube
M	Enemy Government Will	Decrease by 1 cube
N	Enemy Societal Support	Decrease by 1 cube
O	Own Global Adverse Opinion	Decrease by 1 cube
P	Own Societal Support	Increase by 1 cube*

\* Can't increase beyond start value

Strategic Actions are simultaneous, so if the enemy destroys one of your cubes before you've played its action then it still gets to conduct that action – perhaps move the cube to the side of the target action box to remind you.

If you play two actions of the same type and both are successful then you apply the resulting effect twice – except for the Battleground action where you only get +1, not +2. Note that the counter sheet has a +1 Marker to use for this action so as to not confuse it with cubes.

Cubes removed from “decreased” results just go back into your off-board pool of cubes.

In the base game there is no way to recover lost, or add new, Strategic cubes, these don't go back into a pool.

See TUC Evolved in Section 13 of these rules for a Capability Card alternative for Strategic Actions.

## 7. PENDING EFFECTS

An important aspect of TUC is the way that reverberating effects are emphasised – you do one thing and it has 2<sup>nd</sup> and even 3<sup>rd</sup> order effects on other things. When through Strategic Actions, Combat Actions or reverberating actions a cube is lost or added (excepting Strategic Actions cubes), the cube should be placed in the dashed area of its home box. For military units this means the dashed area of the casualty box. Then during the Reverberating Effects phase (see Section ) there will be additional tests to make to see if there are any reverberating effects – which may in turn result in lost or gained cubes being

placed in the dashed area for then immediate re-assessment.

## 8. COMBAT ACTIONS

Combat actions are what is happening on the (urban) battlefield. In TUC this may be one city that is being fought over, or an abstract collection of multiple cities.

### 8.1 Fires

Fire actions always go first and can target any enemy type – but in the basic game only one type per turn. Fires against the enemy's Fires is referred to as Counter-Battery.

Attacker Fires first, then Defender Fires.

Place the firing cubes onto the appropriate square on the grid for the enemy type they are targeting and follow the common combat procedure below.

Note that:

- the Counter-Battery action does not cause Civilian Harm or Structural Damage as target is assumed to be outside the urban battleground (box shaded green as a reminder).
- Fire actions also cannot remove the last cube from a box (except enemy Fires).

**Optional Rule:** By mutual consent before the game you can allow Fires to be split between all three target areas, it just makes the game a bit longer.

### 8.2 Infantry Heavy or Armour Heavy

Then the Attacker can decide whether to attack with their Infantry Heavy or Armour Heavy cubes. Again, in the basic game only one enemy type can be targeted, and the scenario will define the maximum number of attacks/cubes allowed per turn (which should be written into the small dashed boxes on the grid sides as a reminder). Fires cannot be targeted.

Note that cubes do not represent separate units but capability. It is assumed that all combatants are sensible enough to use combined arms tactics and formations – hence the descriptions being infantry-heavy and armour-heavy, not just infantry and armour. If they are not using combined arms then this will be reflected in their TNs, and they will typically have only an Infantry Heavy option.

Attacker attacks first, then Defender. The Defender may only attack against the type of attack (infantry heavy or armour heavy) that the Attacker just used –

seeing as those are the Attacker's forces active in the city at that time.

Place the attacking cubes onto the appropriate square on the grid and follow the common combat procedure below.

**Optional Rule:** By mutual consent before the game you can allow combat forces to be split between both target areas, and even for both Infantry and Armour Heavy forces to be used in combination.

### 8.3 Common Combat Procedure

The combat procedure (for each attacking cube) is:

- For attacker in the engagement:
  - Draw a card per attacking cube;
  - Add 1 if an attacker Strategic Capability cube has been successfully assigned to the battleground (shown by a cube or other marker on the +1 circle in the corner of the battleground);
  - Check the target number (TN) - the number in the circle of the player's colour at the base of the arrow in the relevant cell for the attacking and target type;
  - For each modified card equal or greater than the TN there is a potential hit. Keep the card which hit out ready for the reverberating damage check below;
- For defender in the engagement:
  - The defender draws a card for each potential hit;
  - Add 1 for every 5 structural damage cubes (i.e. 1 disc) to represent the effects of rubble (doesn't apply to counter-battery defence);
  - Add 1 if a defender Strategic Capability cube has been successfully assigned to the battleground (shown by a cube or other marker on the +1 circle in the corner of the battleground);
  - Check the target number (TN) - the number in the circle of the player's colour at the point of the arrow in the relevant cell for the attacking and target type;
  - For each modified card equal or greater than the TN nullify one hit.
- For each successful hit left one defender cube is lost – place it in the holding area of the casualty box.
- For each potential hit card (i.e. whether nullified or not) follow the Reverberating Damage (RD) procedure below.

A few "gotchas" to watch out for:

- "attacker" and "defender" in the above refer to the attacker and defender in each engagement on the battleground, NOT to the Attacker and Defender in the scenario;
- Regardless of the amount of rubble a defender never has a net TN of better than 2+ (i.e. never 1+);
- It's helpful to move the +1 bonus marker from Strategic Capability (if successful) to the Fires cell and then to the combat cell on the grid to make sure you remember to use it.
- The defender can use the +1 bonus in their defence, if they have it available.

**Example: Combat and Reverberating Damage**

Red has decided to attack with their Armour Heavy forces against Blue's Armour, and has moved all 5 cubes into the Armour/Armour cell of the grid.

Red needs to draw 5+ to hit. They draw 5 cards and get 2♥, 7♥, 8♣, 4♦, 9♠. This gives 3 potential hits. Blue needs a 6+ to save against these 3 attacks and draws 6♣, 3♦, 5♠, so saves 1 hit. This means they lose 2 of their armour units, and these are moved into the pending area of their Casualty box ready to be assessed for reverberating effects at the end.

Going back to Red's 3 cards that hit, they had 7♥, 8♣, 9♠. Looking at the top of the column (would be end of row for Blue) reverberating damage is caused by ♥ or ♣, so in this case they have 2 reverberating damage. They draw 2 more cards to decide what sort of damage, drawing 1♦ and 10♠. The 1 (suit ignored) means Civilian Harm, so they place one cube in the Red pending area of the Civilian Harm box. The 10 means Structural Damage, so they place one cube in the pending area of the Structural Damage box.

It is now Blue's turn to respond, but note they can only respond against Red's Armour Heavy force, but can choose to do so with either their own Armour (in which case they move their cubes into the same cell), or with their Infantry (in which case they move their cubes into the Blue Infantry vs Red Armour cell – the one above the cell with the Red cubes).

In the Reverberating Effects phase the effects of the 2 Blue casualties, the civilian harm and the structural damage will all be worked out.

## 8.4 Reverberating Damage

For each potential hit card (i.e. whether nullified or not) check its suit against the unit type to see if any collateral damage is caused. The default collateral damage table is:

Inf Heavy	♥
Armour Heavy	♥♣
Fires (NOT counter-battery)	♥♣♦

This information is also shown on the battleground grid.

For each potential hit card that caused Reverberating Damage draw a new card and check its value to determine whether the impact is on Civilian Harm (CH) or Structural Damage (SD), or both. Default values are:

- Civilian Harm: 1-2
- Structural Damage: 3-10

For each point of Reverberating Damage, add one cube (I use grey cubes) to either the Civilian Harm or Structural Damage box as per the card draw, placed in the holding area that is the same colour as the attacker who caused the casualty.

Note: Scenario rules may overlap the CH/SD values so one card can cause both.

For every 5 SD cubes accumulated replace them with 1 SD x5 disc *and* place a x5 SD disc (or Rubble marker) in the Rubble box of the battleground. It helps to then move these into each combat box as combat happens in order not to forget them. Each disc represents a "unit" of rubble, which allows the defender in each engagement to add 1 to the value of their card draw. The defender target number can never be less than 2+, regardless of how many rubble counters there are.

## 8.5 Opting Not to Fight

The Defender (or Attacker) may opt not to make an Infantry or Armour Heavy attack, but if so must make a card draw against their TN from Casualties to Societal Will to reflect the bad opinion it might cause. If they draw equal or higher than the TN then reduce Societal Will by 1, and check for reverberating effects. Fires can always be skipped without penalty.

Note: Neither side suffers a penalty until the first Infantry or Armour Heavy attack by the Attacker happens – this allows the attacker the "soften up" the city by bombardment before committing ground troops.

## 9. REVERBERATING EFFECTS (SIMULTANEOUS)

Once the combats have been resolved both players can resolve the reverberating effects on their side.

These can be done simultaneously. Actions should work back in a logical way towards Government Will. The main effects are:

- Casualties may reduce Government Will and Societal Support
- Structural Damage (SD) and Civilian Harm (CH) may increase Global Adverse Opinion
- Structural Damage (SD) may increase Loss of Livelihood
- Civilian Harm (CH) may reduce defender's Societal Support (or in some scenarios actually increase it).
- Societal Support may reduce Government Will
- Global Adverse Opinion may reduce Government Will

For each cube in the dashed pending draw 1 card per arrow out from the box (e.g. for cubes in Casualties box, draw 2 cards and check for reverberation on Government Will and on Societal Support). If the card is equal or higher to the TN leading out of the box (which may be modified by a ratchet) then add or remove a cube from the box at the end of the arrow as appropriate.

### Example: Reverberating Effects

For example, a cube in the Red pending box of Civilian Harm tests once for impacting Red Global Adverse Opinion (GAO) (TN 8+) and once for Defender's Societal Support (SS) (TN9+). A 9♥ is drawn for GAO, so add a cube there to its pending box, and a 10♣ is drawn from SS so one cube is moved to the pending area of the box.

Now test for the reverberating effect of the GAO change, it has a TN of 10+ to Government Will (GW), with no ratchet, a 7♦ is drawn so no effect. Move the cube from pending to the main area of GAO.

Finally test for the reverberating effect of the SS change, it has a TN of 9+ to Government Will (GW), with no ratchet, a 9♠ is drawn so on GW cube is removed. Move the cube from pending to the main area of SS.

Note that suits have no relevance in these draws, it is just the value that matters.

Note that, as in the above example, cascading effects may occur, so that a Casualty check causes a loss of Societal Support, which then requires a test of Societal Support against Government Will.

In each case it helps to place any new cube (from any phase) into the dashed pending area of the target box, and then once its reverberating effect has been assessed move it to the main area of the box. You should also at this point convert groups of 5 cubes to discs.

x5 Discs/Counters (sets of 5 cubes) have a variety of effects depending on the box/connection in question and these are shown on the map, and may be augmented by scenario rules. The key ones are:

- Every SD disc acts as unit of rubble and gives a +1 to defender cards.
- Every Casualty disc reduces the tests to Government Will and Societal Support through a ratchet (see §4.4) by 1.
- Every Global Adverse Opinion disc reduces the test to Government Will through a ratchet (see §4.4) by 1. Also see the optional Variable Ceasefire rule at Section 11.6.

Note that If Societal Support is reduced to zero, then any action which would result in further loss of Societal Support immediately reduces Government Will instead.

## 10. END OF TURN ACTIONS

### 10.1 Time

Either player draws a card and consults the scenario table to see how much real time the turn represented. Advance the time markers accordingly. The default table is:

♥	1 week
♣	2 weeks
♦	3 weeks
♠	4 weeks

### 10.2 Tidy

If you haven't already done so move any cubes in the pending areas into the main areas (or remove from the board for Government Will and Societal Support), and from the battleground to the unit type boxes, and from the Strategic Capability actions to the Strategic Capability box.

### 10.3 Reshuffle

Shuffle the discard pile back into the deck.

Note: If at any point during a turn you run out of cards just reshuffle the discard pile and that becomes the new deck.

## 11. OPTIONAL RULES/MODES

The aim is very much for TUC to be a framework that you can adjust to your own needs. This may even include adding new boxes to the map, and new actions/TNs to connect them.

Here are some specific options in terms of the core play that you can try.

### 11.1 Free-form Attacks

Allow players to use a mix of Infantry-heavy and Armour-heavy cubes in an attack. You can even let them divide these against enemy infantry and armour, and even let them allocate Fires across all 3 target groups. Start simple, and then free up as people want more flexibility is probably the answer.

### 11.2 Card Hands

Rather than drawing each card as needed, at the start of the turn draw a hand of 5 cards. Then play these cards as required, only drawing a new hand once you have used all the cards. Do not use these cards for collateral damage tests.

This provides the players with a bit more agency than in a random draw, but forces them to choose between actions that will probably fail, and those which they can improve the chances of success for.

### 11.3 Dice

Seeing as TUC basically uses a 1-10 system there is no reason why you can't use dice instead of cards – but the results will be that much more random and it will probably be slower. Also, when rolling for hits you'll need to roll a D4 for each hit to see if collateral is caused before rolling the D10 for type of collateral.

### 11.4 Points Set Up

In order to enable a player to "build" their army (and state) you can give each player a number of Force Points (FP) and allow them to spend these on infantry, armour and fires capabilities at the same rates as for reinforcements (i.e. 1/4/8). You could also extend this to include non-kinetic (suggest at a cost of 5 FP). A typical FP budget could be 50 if not including non-kinetic, or 80 FP including kinetic.

### 11.5 Hidden Information

For hidden information play you can play TUC double blind so you don't see your opponents half of the board at all, so you don't know how many cubes they have left, or have built up to, in each area until the game is over! Needs an umpire!

### 11.6 Variable Ceasefire

Every time either side (or depending on the scenario, just the attacker) amasses 5 Global Adverse Opinion cubes, draw a card and check against a ceasefire table – default below. Move a Ceasefire Marker that many weeks earlier from the End Ops marker. The game ends when the Week counter reaches the Ceasefire counter.

♥	1 week
♣	2 weeks
♦	No change
♠	No change

This enables the modelling of the situation where growing global outrage forces the UN to try and impose a ceasefire.

## 12. REINFORCEMENTS/RESERVES

Allow one or both sides to place additional cubes in the Reinforcements box at the start of the game which cannot be targeted. Scenarios may define how many reserve cubes are available, and when they can be called forward in a game.

In the Reinforcements phase you may call forward as many cubes as you have in the Reinforcements box, although scenarios may add limitations to this. Reinforcement cubes convert by default to combat force cubes at the following rate:

Infantry Heavy	1 cube
Armour Heavy	4 cubes
Fires	8 cubes

Scenarios may have different conversion rates and limits as to how many can be converted each turn and the maximum numbers of each capability which may be created from reverses.

## 13. RECRUITMENT

Some scenarios allow you to recruit and form new reserves/reinforcement units during a battle. By default you can try and recruit 1 cube per turn for each Government Will and Societal Support cube by making the target draw. The default target draw is 9+ for each.

Place any recruited cubes into the Reinforcements box. Scenario rules may vary this in amount or set a not-before-turn-X or other criteria. Note that recruitment happens after reinforcement, so newly recruited units can't deploy til the next turn.

## 14. TUC EVOLVED

TUC Evolved is a major TUC variant which replaces the fixed and highly abstract non-kinetic target numbers with capability cards. Nothing else in the game is changed.

### 14.1 Strategic Capability Cards



Each card consists of:

- A title;
- A cost in Strategic Capability cubes;
- A cost in Fires cubes (only some cards);
- The target number (replaces that on the board);
- The letter code of the action linkage it refers to;
- The name of the action it relates to;
- A description of the real-world nature of the action;
- A description of the in-game effects.

The abbreviations used for game effects are:

Abbreviation	Meaning
BG	Battleground
EGW	Enemy Govt Will
ESS	Enemy Societal Support
GAO	Global Adverse Opinion
OGW	Own Govt Will
OSS	Own Societal Support
SC	Strategic Capability

Note: Card art was generated via DALL-E/ChatGPT.

### 14.2 Creating the Deck

Two identical standard sets of 27 cards are provided. For a typical game choose 15 of these that reflect the scenario (or as instructed by the scenario), and use these to form the game deck. As with the rest of TUC feel free to also create your own cards and we may also produce cards for specific sorts of games (e.g. asymmetric).

### 14.3 Drawing Cards

At the start of every turn (including the first) draw enough cards from the top of the deck to give you a number of cards in your hand equal to your Strategic Capability cubes +2. If the deck is empty (including mid-draw) shuffle the discard pile and that becomes the new deck.

### 14.4 Card Actions

You use the cards in the Strategic Capability (SC) phase. For every card in your hand you can do *one* of the following:

- Burn the card, which means remove the card and put it on a trash pile where it will take no further part in the game;
- Discard the card to your discard pile, so it may be available later in the game.
- Hold on to the card, so you will draw one less card next turn, and have the option of using the card next turn (or of any of the other options for it).
- Deploy the card. To deploy the card place Strategic Capability (SC) cubes to the cost of the card as shown top right. Most cards need only 1 SC cube, some need 2 SC cubes, and some may also need 1 or 2 Fires cubes, which will then not be available for Fires tasks that go.

Once both players have decided how to use their cards, and have all their cards deployed cards laid out (face down) with their cubes on the card backs the Attacker plays through their cards and then the Defender plays through theirs. Each card has its own target number to be drawn against, a reminder as to which linkage on the game board it refers, details of the effects if successful, and also details of any penalty if you fumble the draw. Once a card has been played put it on the discard pile unless it says otherwise.

Note that card play is assumed to be simultaneous, so any SC cube losses should be taken at the end of the SC phase.

## ANNEX A – DESIGNER’S NOTES

The Urban Calculus Game (TUC) came about when I was prepping my slides for my GUWS presentation on urban wargaming (Burden, 2024) and I decided I needed a slide with a nice simple diagram to try and show how civilian and related factors fed into kinetic decisions - particularly the use of Fires and the choice as to whether to go in infantry heavy or armour heavy - and the implications of those choices. My thoughts were at the time (early 2024) very much driven by what was happening in Gaza. And the whole concept of reverberating effects and loss of livelihood came out of a series of interviews that the staff at the International Committee of the Red Cross' *Forces Armées et de Sécurité* (FAS) Unit were kind enough to let me do in the early days of my PhD. The minute I sketched out the eight-node diagram for the GUWS presentation I knew I had something that was calling out to be a game.

My aim with TUC is to try and represent the high-level considerations around an urban conflict. It is highly abstracted so "urban conflict" could be a single big conflict such as Gaza which is primarily urban, or a single large urban battle, or even a conflict involving multiple urban centres. The game is principally about try to educate people to this notion of an urban calculus, and getting them to understand some of the linkages, reverberating effects and trade-offs involved. I don't see it really played as a head-to-head game to see who wins, but rather it being played and the value of linkages for real world conflicts, the types of actions and the implications of results being talked about as the game is played. It is very much a sandbox game and people are welcome to vary the target numbers and even introduce new boxes and linkages as they see fit.

Another factor in its design was that I'd just been to the NATO/KCL Wargaming Week and heard a NATO wargamer talking about how most military types didn't like dice and so not to use them. Whilst I'm not 100% in agreement with this, it is a refrain I've heard several times so thought it would be an interesting design challenge to design a game without dice (luckily they said nothing about not liking stochastic gaming!). I'd started that with my One Page Urban Wargame rules, but the development of TUC suddenly sped past that and so I abandoned an initial dice-based version of TUC and moved over cards. Quite apart from not being dice, there are five big advantages that I can see in cards:

- They are faster, no hunting around for the correct dice and waiting for them to stop rolling;
- The probability distribution is not only fixed but the outcomes for a play through the deck are also fixed - you know you are going to get four 1s, four 2s etc - no change of getting fifty-two 1s! If you want

to stop too much card counting you can always give each player 2 or even 3 decks, have them share the decks, or if you want to break-up the complete predictability reshuffle the deck whenever a joker is drawn;

- You not only get a D13/D10 (full suit/just 1-10) with every draw but also a D4 (the suits), which opens up some nice possibilities, and you can also treat picture cards as something special;
- There are the jokers, which can trigger random events, reshuffles and other actions; and
- If you want to give players a bit more control they can draw a hand of cards (e.g. 5) and then play those out in whatever order they want (akin to the chits in Brian Train's *District Commander: Maracas* (Train, 2019) before drawing a new hand.

And that's before thinking about the potential of multi-function cards, such as in *Albedo Combat Patrol 164* (Surdu, 2019).

I like the data-model-game tiered approach to wargames described by Bradbeer & Manley (2024), but TUC is almost all model with no data underlying it, and a minimal set game mechanics above the model so that the model is exposed to the player in all its (in)glory. It's also inspired by approaches such as system dynamics (Duggan, 2016; Bala et al, 2017), indeed I view TUC as a playable systems dynamics model as much as a wargame. There is an admitted danger that it feels too much like the players are the card dealers for the AI. Whilst doing a computerised, numeric "simulation" based on the model would be very possible it would have no real value since the Target Numbers are chosen for "feel" rather than based on data. Also, as US national security adviser, Jake Sullivan said regarding Gaza, there was no mathematical formula to decide if a plan was acceptable. "*What we're going to be looking at is whether there is a lot of death and destruction from this operation or if it is more precise and proportional*" (Wintour, 2024). It's the discussion around a play of TUC that is the most important thing - not the "winning" of it, as the civilian population is always likely to be the loser.

BTW I have a book chapter on *Wargaming and the Just War* (Burden, 2025) which is due out in 2025 and to which this game could make a good companion piece.

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## ANNEX B – VALUE DESCRIPTIONS

### Nodes/Stocks

#### *Government Will*

Government will is just that - the will of the Government to carry on the fight. Note that you can't do anything to increase Government Will - as it's assumed you're already committed, and the number of starting cubes shows the level of your commitment. From there it's only downhill, and once Government Will hits zero you've lost.

#### *Global Adverse Opinion*

This show the extent to which other global powers, and to a lesser extent the global public, disapprove of what each side is doing. It is probably best thought of not as an average "global" opinion, but rather biased to that of the countries and people who might be your natural supporters - and whose loss of support will have the most impact.

#### *Societal Support*

Again, this can probably be thought of as being biased towards your natural supporters, who's loss of good will, practical support (e.g. in terms of recruitment) is vital, and who, if they start taking to the streets in protest will hasten your downfall.

#### *Civilian Harm*

Civilian harm includes not just those killed and injured, but also those made orphans, or who lose children, or who lose their houses or access to utilities, and who suffer from starvation and disease.

#### *Structural Damage*

This includes damage to buildings, homes, offices, shops factories etc, and the destruction of infrastructure including water, sewerage, power, communications, transport etc

#### *Loss of Livelihood*

It is perfectly possible for someone not to be directly injured by the fighting but for it to have a devastating effect on them through the loss of their livelihood. This might include the loss of their place of work, of a shop or garage they own, of their livestock, or the school they taught in or where learning in, or even the destruction of the local economic system so there are no markets, or payment systems or savings - everything is reduced to barter. The loss of livelihood can last well behind the end of the conflict, and one of the biggest problems with it is that it can be hidden and it's long-term impact not appreciated.

### *Fires*

Fires includes all the kinetic forms of attack which can be made at a distance including artillery, air strikes, bombing, glide bombs, drones, and cruise missiles. The collateral and reverberating damage from such strikes will be quite high, and as rubble builds they tend to lose their effectiveness. There is a case for having a linkage between Fires and Civilian Support to reflect strikes against a countries hinterland, but for now this can be considered part of the societal support element of the non-kinetic actions.

### *Infantry Heavy/Armour Heavy*

The cubes in these boxes do not represent units as such but capability. Infantry Heavy covers attacks which are led by infantry with tanks in support. Infantry casualties may be high, but at least they can eventually wheedle the enemy out from amongst the rubble. Infantry Heavy covers attacks which are led by tanks but with infantry in close support. Own casualties are likely to be less, but collateral destruction higher and defending infantry will be harder to dislodge unless you just bring whole buildings down on top of them.

### Linkages/Flows

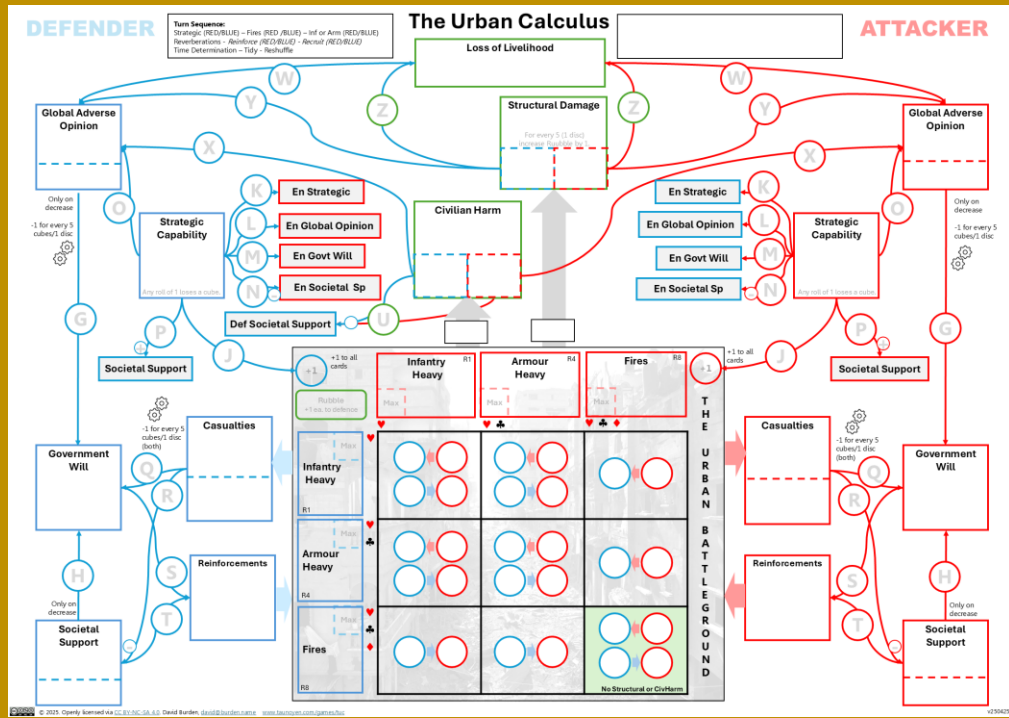
<b>Global Adverse Opinion → Govt Will</b>
Media and other governments exert direct or indirect pressure on the government to stop operations
<b>Societal Support → Govt Will</b>
Society begins to lose faith in the government's handling of the operation. May include demonstrations, strikes, refusal to serve etc.
<b>Strategic Capability → Battleground</b>
The deployment of national ISR, EW and cyber assets in support of the tactical/operational fight.
<b>Strategic Capability → En Strategic Capability</b>
Eliminating the enemies strategic capability – e.g by cyber hacks, sabotage, long range fires etc.
<b>Strategic Capability → En Global Adverse Opinion</b>
Building a narrative against your enemy, eg through highlighting atrocities, or manufacturing atrocities as fake news and disinformation. Using botnets to amplify messages.
<b>Strategic Capability → En Government Will</b>
Directly affecting the enemy governments will to persecute the operation, such as through sanctions, unmasking potential traitors and scandals, building your own alliances, lawfare etc

<b>Strategic Capability → En Societal Support</b>
Misinformation campaigns, trade embargos, cyber attacks and physical attacks against infrastructure, terror attacks
<b>Strategic Capability → Own Global Adverse Opinion</b>
Regaining control of the narrative, exposing misinformation and generating a positive spin
<b>Strategic Capability → Own Societal Support</b>
Seeding good news stories, building soldier heroes, tax cuts
<b>Casualties → Government Will</b>
The more body bags that turn up the less some elements of the government might support the operation
<b>Casualties → Societal Support</b>
The more body bags and disabled warfighters that turn up the less society might support the war. May also operate in the opposite sense such that attacks and losses build a "blitz spirit" and a desire for revenge.
<b>Govt Will → Reinforcements</b>
The government has the capability and will to recruit and train more soldiers.
<b>Societal Support → Reinforcements</b>
Societal support is high enough that volunteer rates are high and desertion rates are low.
<b>Civilian Harm (CH) → Global Adverse Opinion</b>
The media and other governments are appalled at the loss of life and level of civilian harm.
<b>Civilian Harm (CH) → Defender Societal Support</b>
The more civilian body bags and disabled casualties appear less society might support the war. May also operate in the opposite sense such that attacks and losses build a "blitz spirit" and a desire for revenge.
<b>Structural Damage (SD) → Global Adverse Opinion</b>
The media and other governments are appalled at the reduction of the city to rubble.
<b>Structural Damage (SD) → Loss of Livelihood</b>
Some structural damage may have long term implications for the recovery of the city and the ability of its inhabitants to earn a livelihood after the fighting is over – for instance the destruction of power stations, power transformers, shops, transportation systems.

<b>Loss of Livelihood → Global Adverse Opinion</b>
In a more informed world, the loss of livelihood that is being generated would generate the same, and potential more outrage than the more visible rubble of buildings.

### Acronyms and Glossary

Term	Meaning
EW	Electronic Warfare
Fires	Artillery, close air support etc
Humint	Human Intelligence (i.e. spies and agents)
ISR	Intelligence, Surveillance and Reconnaissance
Non-Kinetic	Things that don't fire bullets etc, so cyber, EW, Influence etc
TN	Target Number



Players: 2 (or solo)  
 Game Time: ~30-60 mins  
 Complexity: Low  
 Umpire: Not required  
 Mode: Competitive

*The Urban Calculus (TUC)* is essentially a very high-level, highly abstracted model of modern urban conflict – and particularly its non-combat implications and trade-offs. It is a systems model, and the “game” is really there to help to get people to look at, consider and discuss the model and to think how the values in the model/game might vary for different past and future urban conflicts.

The game uses standard decks of cards (at least 2) rather than dice to introduce levels of uncertainty, and the map/board has been designed so that the model values can be written using a dry-wipe pen and changed from game to game – or even mid-game if someone makes a good enough argument! The game needs about 100 cubes (or similar counters), and ideally about 20 larger/different counters to represent stacks of 5 cubes.

*The Urban Calculus* was designed by David Burden, who is currently completing a PhD on Urban Wargaming. You can find out more about his PhD at [www.taunoyen.com/phd](http://www.taunoyen.com/phd) or by following him at @urbanwargamer. © 2025 David Burden



A view of the rubble of buildings hit by an Israeli airstrike, in Jabalia, Gaza strip, on Oct. 11, 2023. Credit: AP Photo/Hatem Moussa,