Control Stability & Flip Mechanics System

Overview

This document outlines the complete system for modeling how municipalities maintain or lose control in "A War Without Victory." The system distinguishes between **initial control conditions** (Sept 1991 - April 1992) and **war-phase control dynamics** (April 1992+), where municipalities can flip from contested/weak states to absolute control.

Part 1: Initial Control Calculation (IMPLEMENTED)

1.1 Control Strength Formula

Each faction's strength in a municipality is calculated as:

```
Control Strength = Political Authority + Population Base + Demographic Bonuses

Where:
- Political Authority: +25 points if faction won 1990 election
- Population Base: Faction's % of population (e.g., 43.9% = 43.9 points)
- Strong Majority Bonus: +15 if faction has >55% population
- Plurality Lead Bonus: +5 if faction has plurality AND >10% lead over 2nd place
```

1.2 Control Status Determination

Based on the top 3 faction strengths:

Condition	Status	Description
Top ≥60 AND lead ≥15	**SOLE CONTROL**	Dominant faction, clear authority
Top ≥45 but fails sole control	**WEAK CONTROL**	Leading but unstable
Top 2 within 20 pts, 2nd ≥25	**CONTESTED (2-way)**	Two factions competing
Top 3 within 25 pts, all ≥20	**CONTESTED (3-way)**	All three factions relevant

Result: Creates realistic starting positions showing political tension without military control.

Part 2: Control Stability System (IMPLEMENTED)

2.1 Stability Score Calculation

Each municipality gets a **Stability Score (0-100)** indicating how resistant it is to flipping control.

```
Stability = Base (50) + Demographic Factors + Organizational Factors - Vulnerabilities
```

Demographic Factors

Controller's Population	Modifier	Note
>60%	+25	Strong majority
50-60%	+15	Majority
40-50%	+5	Plurality
<40%	-15	Minority (vulnerability)

Organizational Factors (Currently Simplified)

Factor	Condition	Modifier
Police Loyalty	Loyal to controller	+15
	Mixed	-10
	Hostile	-15
TO (Territorial Defense)	Controlled	+15
	Contested	-10
SDS Penetration	Strong (non-RS areas)	-15
Patriotska Liga	Strong (RBiH areas)	+10
JNA Presence	Present (RS areas)	+10
	Present (non-RS areas)	-10

Geographic Vulnerabilities (TO BE IMPLEMENTED)

Factor	Modifier
Adjacent to hostile majority territory	-20
Strategic route/corridor location	-10
Isolated/enclave	-10
Connected to friendly rear	+10

2.2 Stability Status Bands

Score	Status	Meaning
80-100	**Very Stable**	Extremely resistant to flip
60-80	**Stable**	Secure control
40-60	**Unstable**	Vulnerable under pressure
20-40	**Very Unstable**	High flip risk
0-20	**Collapse Imminent**	Will flip quickly in war

2.3 Implemented Features

✅ **Stability calculation** based on demographics and organization ✅ **Vulnerability tracking** showing specific weaknesses ✅ **UI display** showing stability status and flip warnings ✅ **Status color coding** (green → amber → red)

2.4 Example: Prijedor

Initial State (Sept 1991):
- Election: SDA won → RBiH nominal control
- Population: Bosniak 44.0%, Serb 42.5%
- Control Status: RBiH weak control (55 vs 42.5 strength)

Stability Calculation:
Base: 50
RBiH controls but <50% population: -15
Police: Mixed (Serb police chief): -10
SDS: Strong organization: -15
JNA: Presence vulnerability: -10 [placeholder]

```
Adjacent to RS areas: -20 [TO BE IMPLEMENTED]

STABILITY SCORE: -20 → COLLAPSE IMMINENT
```

Result: UI shows critical flip warning, indicating this will fall to RS quickly when war starts.

Part 3: Flip Mechanics (PARTIALLY IMPLEMENTED)

3.1 Flip Trigger System

Flips only occur during **Main War Phase** (April 1992+).

A flip occurs when:

```
Stability Score + Applied Pressure ≥ Flip Threshold (50)
```

3.2 Pressure Sources

Pressure Source	Points	Implementation Status
Adjacent hostile control	+30 per adjacent	⏳ Needs adjacency data
Coercion events	+20 per event	⏳ Needs event system
Military operations	+40	⏳ Needs combat system
Regional momentum	+15 (if 3+ adjacent flips)	⏳ Needs adjacency tracking

3.3 Flip Execution (IMPLEMENTED FRAMEWORK)

When flip threshold is reached:

```
javascript

1. Record pre-flip control
2. Set effectiveControl = targetFaction
3. Zero out all other faction strengths
4. Set new controller strength = 100
5. Mark hasFlipped = true
6. Record flipTurn
7. Lock for consolidation period
```

3.4 Post-Flip Effects (TO BE IMPLEMENTED)

Once flipped:

- ✅ Control becomes 100% (implemented)
- ⏳ Population displacement begins (needs displacement system)
- ⏳ Local legitimacy permanently damaged (needs legitimacy tracking)
- ⏳ Municipality locked for X turns (needs turn system)
- ⏳ Conquered population becomes IVP issue (needs constraint system)

Part 4: Data Requirements

4.1 Currently Using (Simplified Estimates)

✅ **Police Loyalty**: Estimated from election + demographics ✅ **TO Control**: Estimated from election winner + majority ✅ **SDS/Patriotska Liga**: Estimated from demographics ✅ **JNA Presence**: Very rough estimate (Serb majority + SDS areas)

4.2 Needed Historical Data

Data Type	Purpose	Priority
Municipality Adjacency	Calculate geographic pressure	**HIGH**
Actual Police Chiefs (1991)	Refine police loyalty	MEDIUM
TO Armory Locations	Refine TO control	MEDIUM
JNA Garrison Locations	Precise JNA presence	HIGH
SDS Municipal Boards	Refine SDS penetration	LOW
Patriotska Liga Organization	Refine PL strength	LOW
Strategic Routes	Identify vulnerable corridors	MEDIUM

4.3 Data Structure

Each municipality should eventually have:

```
javascript
```

```
municipality: {
  // Basic info (implemented)
  id, name, population, ethnicComposition,

  // Control (implemented)
  nominalControl, effectiveControl, controlStrength,

  // Stability (implemented)
  stability: {
    score: number,
    status: string,
    vulnerabilities: array
  },

  // Organization (simplified implementation)
  organization: {
    police: 'loyal' | 'mixed' | 'hostile',
    policechief: string (name) [TO BE ADDED],
    to: 'controlled' | 'contested' | 'lost',
    toArmory: boolean [TO BE ADDED],
    sds: 'strong' | 'moderate' | 'weak',
    patriotskaLiga: 'strong' | 'moderate' | 'weak',
    jna: 'present' | 'garrison' | 'absent',
    jnaUnits: array [TO BE ADDED]
  },

  // Geography (TO BE ADDED)
  adjacentMunicipalities: array,
  strategicLocation: boolean,
  onCorridor: string,

  // Flip tracking (implemented)
  hasFlipped: boolean,
  flipTurn: number,
  preFlipControl: string,
  coercionLevel: number,
  underAttack: boolean,

  // Post-flip state (TO BE IMPLEMENTED)
  consolidationTurnsRemaining: number,
  displacementActive: boolean
}
```

Part 5: Game Phase Integration

5.1 Early War Phase (Sept 1991 - April 1992)

Current Implementation:

- ✅ Display contested/weak control statuses
- ✅ Show stability warnings
- ✅ Calculate flip risk

Player Actions (TO BE IMPLEMENTED):

- Strengthen local organization
- Coercion/intimidation campaigns
- Police/TO reorganization
- Political maneuvering

No actual flips occur - this is political positioning phase.

5.2 Main War Phase (April 1992+)

Flip Triggers (PARTIAL):

- ⏳ Turn resolution checks flip conditions
- ⏳ Coercion events accumulate pressure
- ⏳ Military operations apply pressure
- ⏳ Regional cascades (adjacent flips)

Flip Execution:

- ✅ Framework implemented
- ⏳ Needs integration with turn system
- ⏳ Needs event/action triggers

Post-Flip:

- ⏳ Displacement mechanics
- ⏳ Exhaustion impact
- ⏳ IVP consequences

Part 6: UI Representation (IMPLEMENTED)

6.1 Municipality Detail Panel

Now displays:

```
PRIJEDOR
Nominal Control: RBiH (SDA won 1990)
Effective Control: RBiH (Weak)

CONTROL STABILITY: COLLAPSE IMMINENT (25/100)
⚠ Vulnerabilities:
- demographic minority
- mixed police
- sds organized
- jna present

⚠ FLIP RISK: CRITICAL
This municipality may flip control when war begins
```

6.2 Map Display

- **Color coding** indicates current effective control
- **Contested areas** shown in burnt amber
- **Weak control** shown in lighter faction colors
- Hovering shows stability status (TO BE ENHANCED)

6.3 Status Icons/Warnings (TO BE ADDED)

Municipalities should display:

- ⚠️ High flip risk icon
- 🔄 Flip in progress indicator
- 🔒 Consolidated/locked status
- 📊 Stability trend (improving/declining)

Part 7: Implementation Roadmap

Phase 1: Foundation (COMPLETED ✅)

- ✅ Control strength calculation
- ✅ Stability score calculation
- ✅ Basic organizational factors
- ✅ UI display
- ✅ Flip mechanics framework

Phase 2: Historical Data (NEXT PRIORITY)

Highest Priority:

1. **Municipality adjacency data** - Needed for geographic pressure
2. **JNA garrison locations** - Critical for early war dynamics
3. **Strategic routes/corridors** - Identifies vulnerable areas

Medium Priority: 4. Police chiefs by municipality (1991) 5. TO armory control (1991) 6. Major road/rail networks

Lower Priority: 7. SDS municipal board strength 8. Patriotska Liga organization details

Phase 3: Pressure System (UPCOMING)

1. Adjacency-based pressure calculation
2. Coercion event system
3. Military operation pressure
4. Regional momentum/cascade effects

Phase 4: Integration (UPCOMING)

1. Connect to turn resolution system
2. Connect to combat mechanics
3. Connect to displacement system
4. Connect to exhaustion/constraints

Phase 5: Advanced Features (FUTURE)

1. Player-initiated takeover attempts
2. Defensive strengthening actions

3. Diplomatic intervention effects
4. International observer impact

Part 8: Key Design Principles

8.1 Asymmetry is Intentional

Different factions have different vulnerabilities:

- **RBiH**: Often controls municipalities where Serbs are plurality (SDS organized, JNA presence)
- **RS**: Often controls municipalities where Bosniaks are plurality (but police/TO already seized)
- **HR H-B**: Mixed municipalities with both Bosniak and Serb populations

8.2 Flips Are Irreversible (Within Phase)

Once a municipality flips:

- Control becomes absolute (100%)
- Other factions completely expelled/suppressed
- Can only be retaken through military reconquest (different mechanic)
- This models the ethnic cleansing/consolidation dynamic

8.3 Stability ≠ Legitimacy

A municipality can have:

- High stability but low legitimacy (held by force)
- High legitimacy but low stability (weak defenses)
- Both or neither

Stability = resistance to flip
Legitimacy = local support (affects exhaustion, recruitment, etc.)

8.4 Historical Plausibility

The system should reproduce historical patterns:

- **April-May 1992**: Rapid RS gains in mixed eastern areas (Bijeljina, Foča, Zvornik, Prijedor)
- **1993**: Croat-Bosniak conflict in central Bosnia (Gornji Vakuf, Prozor, Bugojno)
- **1994-95**: Frontlines mostly stabilized except major offensives

Flips should cluster in:

1. Early months (rapid consolidation)
2. Specific regional conflicts
3. Major offensives only

Part 9: Testing & Validation

9.1 Test Cases

High Stability (Should NOT flip easily):

- Cazin (RBiH: 97.3% Bosniak)
- Banja Luka (RS: 54.6% Serb + SDS control)
- Ljubuški (HR H-B: 92.2% Croat)

Low Stability (Should flip quickly):

- Prijedor (RBiH nominal, Serb plurality, SDS+JNA)
- Foča (RBiH nominal, barely Bosniak plurality)
- Zvornik (RBiH nominal, Bosniak majority but strategic)

Contested (Should flip based on pressure):

- Modriča (3-way, highly unstable)
- Brčko (Strategic corridor, all sides want it)
- Doboj (Serb plurality, SDA nominal)

9.2 Historical Validation

Compare model output to historical timeline:

- April 1992 flips: Bijeljina, Zvornik, Foča, Prijedor, etc.
- Did these municipalities have low stability scores? ✓
- Did stable municipalities NOT flip? (needs verification)

9.3 Balance Testing

Ensure system doesn't create:

- Instant total collapse (too many flips)

- Frozen frontlines (no flips at all)
- Unrealistic faction advantages

Part 10: Future Enhancements

10.1 Gradual Control Shifts

Instead of instant 100% flip, model:

- Control percentages shifting over multiple turns
- "Frontline" municipalities with mixed control
- Gradual ethnic cleansing/displacement

10.2 Reconquest Mechanics

Different from initial flip:

- Requires sustained military operations
- Hostile population creates problems
- Very different stability calculation

10.3 International Impact

Observers, peacekeepers, safe zones:

- Increase flip threshold
- Prevent certain takeover methods
- Create artificial stability

10.4 Local Resistance

Pockets of resistance after flip:

- Reduce effective control
- Create IVP/exhaustion problems
- Require resources to suppress

Summary

Currently Implemented:

- ✅ Control strength formula with demographic bonuses
- ✅ Stability score calculation (0-100)
- ✅ Organizational factors (simplified)
- ✅ Flip mechanics framework
- ✅ UI display with warnings

Next Steps:

1. Add municipality adjacency data (critical)
2. Add JNA garrison locations (critical)
3. Implement pressure calculation from adjacency
4. Connect flip mechanics to turn system
5. Integrate with displacement system

Long-term:

- Refine organizational data with historical research
- Add player actions for strengthening/weakening
- Implement post-flip consequences
- Add reconquest mechanics

The system creates a foundation for realistic control dynamics that distinguish between political authority and military control, and models how quickly some municipalities could flip once war began.