

SOLAR DOMINION: THE FACTION WARS

Game Design Document

Game Type: 4X Turn-Based Strategy

Setting: Hard Science Fiction, Solar System

Platform: PC (Initially)

Target Audience: Strategy gamers interested in hard sci-fi, physics-based gameplay, and complex resource management

1. EXECUTIVE SUMMARY

Solar Dominion is a hard science fiction 4X strategy game set in a near-future solar system where multiple human factions compete for resources and control. The game emphasizes realistic orbital mechanics, physics-based gameplay, and detailed resource management. Taking inspiration from The Expanse series, the game presents a gritty, realistic vision of space colonization without faster-than-light travel, artificial gravity (except via rotation), or other fantastical technologies.

2. GAME CONCEPT

2.1 High Concept

Players take control of one of several human factions in our solar system, managing resources, technology, and military assets to achieve dominance. Unlike many space 4X games, Solar Dominion focuses exclusively on our solar system, with realistic distances, physics, and resource constraints creating a deeply strategic experience.

2.2 Unique Selling Points

- **Real Orbital Mechanics:** Ship movement follows Newtonian physics with realistic delta-v budgets
- **Light-Speed Communications:** Commands to distant units experience realistic delays
- **Resource Dependency Networks:** Complex supply chains with physical transport requirements
- **Realistic Space Combat:** Kinetic weapons, point-defense systems, and radiation concerns
- **Faction Asymmetry:** Each faction has unique starting conditions and mechanics reflecting their situation in the solar system

2.3 Target Platform

Initial development will focus on PC with mouse and keyboard controls. Interface will be designed for precision control required for complex strategy mechanics.

3. GAMEPLAY

3.1 Core Loop

1. **Manage Resources & Infrastructure:** Allocate resources to colonies, stations, and fleets
2. **Plan & Execute Missions:** Design missions with orbital calculations and contingencies
3. **Research Technologies:** Unlock new capabilities through a branching tech tree
4. **Expand Influence:** Build new habitats and secure strategic resources
5. **Engage in Diplomacy & Conflict:** Negotiate with or confront rival factions

3.2 Turn Structure

Each turn represents one month of game time. The sequence of a turn is:

1. **Faction Updates:** Population growth, resource production, and maintenance costs
2. **Mission Execution:** Previously planned missions continue or complete
3. **Research Progress:** Technology research advances
4. **Diplomatic Actions:** Negotiations and agreements processed
5. **Player Commands:** New orders issued (subject to light-speed delay for distant units)

3.3 Map & Navigation

The game map is a true-to-scale 3D representation of the solar system. Players can view it from multiple perspectives:

- **System View:** Entire solar system with orbital paths
- **Region View:** Focused on a planetary system (e.g., Earth-Luna, Mars, Jupiter and moons)
- **Local View:** Detailed view of a single celestial body or habitat

Navigation involves calculating transfer windows, delta-v requirements, and travel times based on real orbital mechanics.

3.4 Resource Management

Resources fall into several categories:

- **Basic Resources:** Water, oxygen, food, fuel, construction materials
- **Strategic Resources:** Rare metals, radioactives, specialized compounds

- **Infrastructure:** Habitats, factories, research facilities, spaceports
- **Human Resources:** Population with various specializations (engineers, scientists, etc.)

All resources must be physically transported between locations, creating complex logistical challenges.

3.5 Technology System

The technology tree is divided into several branches:

- **Propulsion:** From chemical rockets to fusion drives
- **Habitation:** Life support, radiation protection, artificial gravity
- **Industry:** Manufacturing efficiency, resource extraction, recycling
- **Communications:** Signal processing, encryption, autonomous systems
- **Military:** Weapons, defenses, stealth technologies

Research requires specialized facilities and personnel, with each faction having areas of expertise.

3.6 Combat System

Space combat emphasizes realistic physics:

- **Weapon Types:** Kinetic impactors, guided missiles, laser systems
- **Defenses:** Point-defense systems, armor, compartmentalization
- **Tactical Considerations:** Orbital positioning, delta-v reserves, sensor coverage
- **Damage Model:** System-specific damage rather than abstract "hit points"

Combat resolution is turn-based with simultaneous planning and execution phases.

3.7 Victory Conditions

Multiple paths to victory include:

- **Industrial Dominance:** Control majority of system's industrial capacity
- **Technological Supremacy:** Achieve breakthrough technologies before rivals
- **Population Expansion:** Support largest sustainable human population
- **Coalition Victory:** Form alliance controlling critical infrastructure
- **Military Conquest:** Neutralize or subjugate rival factions

4. FACTIONS

4.1 United Nations (Earth)

Core Worlds: Earth, Luna, orbital habitats

Starting Advantages:

- Largest population base
- Diverse industrial capacity
- Established agricultural systems

Starting Disadvantages:

- Resource depletion issues
- Climate instability
- Political fragmentation

Unique Mechanics:

- "Legacy Infrastructure" provides established but aging industrial capacity
- "Diplomatic Leverage" grants advantages in inter-faction negotiations
- "Earth Export Restrictions" creates tension with colonial dependencies

4.2 Martian Congressional Republic (Mars)

Core Worlds: Mars, Phobos, Deimos

Starting Advantages:

- Advanced terraforming technology
- Unified political structure
- Military efficiency

Starting Disadvantages:

- Water dependency
- Vulnerable atmospheric systems
- Distant from key resources

Unique Mechanics:

- "Terraforming Projects" gradually improve Mars habitability
- "Military Discipline" enhances unit performance and coordination

- "Colonial Independence" grants bonuses against Earth-based factions

4.3 Outer Planets Alliance (Asteroid Belt, Jupiter, Saturn)

Core Worlds: Ceres, scattered belt habitats, Jovian and Saturnian moons

Starting Advantages:

- Resource abundance
- Vacuum adaptation
- Decentralized resilience

Starting Disadvantages:

- Fragmented leadership
- Limited industrial base
- Vulnerable supply lines

Unique Mechanics:

- "Void Adaptation" enhances space construction and operations
- "Guerrilla Tactics" enables asymmetric military options
- "Resource Monopolies" creates leverage over inner planets

4.4 Protogen Corporation (Various Locations)

Core Worlds: Research stations and corporate enclaves throughout the system

Starting Advantages:

- Cutting-edge technology
- Vast financial resources
- Information networks

Starting Disadvantages:

- Limited military power
- Widely distrusted
- Dependent on external resources

Unique Mechanics:

- "Corporate Espionage" allows technology theft

- "Hybrid Workforce" combines human and AI labor
- "Black Market Operations" enables illegal resource acquisition

4.5 Lunar Development Corporation (Luna)

Core Worlds: Luna, Earth orbital infrastructure

Starting Advantages:

- Proximity to Earth
- Helium-3 mining
- Extensive underground habitats

Starting Disadvantages:

- Caught in Earth politics
- Limited agricultural capacity
- Heavy Earth trade dependency

Unique Mechanics:

- "Low-G Manufacturing" enhances production efficiency
 - "Earth Market Access" provides trade advantages
 - "Orbital Dominance" grants control over Earth-Luna space
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5. TECHNICAL SYSTEMS

5.1 Orbital Mechanics

The game implements a simplified but realistic model of orbital mechanics:

- Hohmann transfer orbits for efficient travel
- Gravity assists for fuel-saving maneuvers
- Orbital inclination considerations
- Lagrange points for strategic positioning
- Realistic travel times based on orbital positions

5.2 Light-Speed Communication

Communication between distant units is subject to light-speed delay:

- Earth to Mars: 4-24 minutes depending on orbital positions
- Earth to Jupiter: 35-52 minutes
- Earth to Saturn: 68-84 minutes

This creates strategic depth as players must plan for contingencies when units are beyond immediate control.

5.3 Habitat Engineering

Different environments require specialized habitat approaches:

- **Vacuum Environments:** Radiation shielding, micrometeorite protection
- **Low Gravity Bodies:** Structural considerations, dust management
- **High Radiation Zones:** Enhanced shielding, maintenance requirements
- **Temperature Extremes:** Thermal management systems

Habitat development requires balancing multiple engineering constraints.

5.4 Supply Chain Management

Resources must be physically transported between locations:

- Transport ships with specific cargo capacities
- Transit times based on orbital mechanics
- Piracy and interdiction risks
- Stockpile management at each location

The physical nature of supply creates strategic vulnerabilities and opportunities.

6. USER INTERFACE

6.1 Main Screen Layout

The interface is divided into several key areas:

- **System Map:** Interactive display of the solar system
- **Information Panel:** Details on selected objects or systems
- **Action Menu:** Available commands and operations
- **Resource Overview:** Critical resource statuses
- **Notification Feed:** Important events and updates

Interface styling emphasizes clarity and functionality, inspired by modern space mission control systems.

6.2 Specialized Interfaces

- **Mission Planner:** Detailed interface for spacecraft movement planning
- **Resource Flow Analyzer:** Visual representation of supply chains
- **Research Network:** Technology tree visualization
- **Diplomatic Dashboard:** Faction relationships and agreements
- **Habitat Engineer:** Detailed habitat design and management

Each specialized interface provides detailed tools for specific gameplay elements.

6.3 Accessibility Features

- **Colorblind Modes:** Alternative color schemes
 - **Variable Text Size:** Adjustable information displays
 - **Customizable Controls:** Remappable keyboard shortcuts
 - **Tutorial System:** Integrated learning tools
 - **Difficulty Settings:** Adjustable challenge levels
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7. VISUAL & AUDIO DESIGN

7.1 Visual Style

The game employs a realistic visual style:

- Scientifically accurate celestial bodies
- Functional spacecraft and habitat designs
- Subtle faction-specific design languages
- Realistic lighting and shadow effects
- Information-rich visual displays

For the prototype phase, 2D pixel art will be used to establish core gameplay before transitioning to the full visual style.

7.2 Audio Design

Audio emphasizes the contrast between vacuum silence and habitat environments:

- **Space:** Minimal audio limited to communication and internal ship sounds

- **Habitats:** Ambient machinery, environmental systems, population activity
 - **Interface:** Subtle feedback sounds for user actions
 - **Events:** Distinctive audio cues for important developments
 - **Music:** Atmospheric tracks varying by location and situation
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8. DEVELOPMENT ROADMAP

8.1 Prototype Phase

- 2D pixel art implementation focusing on core gameplay mechanics
- Simplified version of orbital mechanics
- Basic resource management systems
- Two playable factions (Earth and Mars)
- Limited technology options
- Simple combat resolution

8.2 Alpha Development

- Expanded simulation systems
- Complete faction implementation
- Full technology tree
- Enhanced UI development
- Basic tutorial implementation
- Single-player campaign framework

8.3 Beta Development

- Full 3D system implementation
- Comprehensive balancing pass
- Advanced AI behavior
- Complete mission planning system
- User interface refinement
- Performance optimization

8.4 Post-Launch Content

- Additional factions

- Extended outer planets content
 - Advanced technology options
 - Enhanced mission types
 - Multiplayer implementation
 - Scenario editor
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9. TECHNICAL SPECIFICATIONS

9.1 Development Environment

- **Engine:** Unity (for cross-platform capabilities)
- **Programming:** C# for game logic
- **Physics:** Custom orbital mechanics system
- **Database:** SQLite for game state management
- **Build System:** CI/CD pipeline for rapid iteration

9.2 Minimum Requirements (Projected)

- **OS:** Windows 10, macOS 10.15, or Ubuntu 20.04
 - **CPU:** Intel Core i5 (8th gen) or AMD Ryzen 5
 - **RAM:** 8GB
 - **Storage:** 10GB
 - **GPU:** DirectX 11 compatible with 2GB VRAM
 - **Input:** Mouse and keyboard
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10. TESTING & PROTOTYPING

10.1 2D Pixel Prototype Approach

The fastest path to testing core mechanics is developing a 2D pixel art prototype with the following focus:

- **Simplified Visuals:** Basic orbital representations and unit sprites
- **Core Mechanics:** Orbital movement, resource management, technology progression
- **Interface Concepts:** Critical UI elements for gameplay testing
- **Faction Asymmetry:** Testing balance between different starting conditions
- **Victory Paths:** Evaluating different strategic approaches

10.2 Prototype Development Plan

1. **Phase 1 (2 weeks):** Basic system map with orbital mechanics and time progression
2. **Phase 2 (2 weeks):** Resource management and habitat development systems
3. **Phase 3 (2 weeks):** Simple mission planning and unit operations
4. **Phase 4 (2 weeks):** Technology research and faction differentiation
5. **Phase 5 (2 weeks):** Combat resolution and victory conditions
6. **Phase 6 (2 weeks):** Playtesting, balancing, and refinement

10.3 Evaluation Metrics

The prototype will be evaluated on several key factors:

- **Core Loop Engagement:** Is the basic gameplay compelling?
- **Strategic Depth:** Do mechanics create meaningful decisions?
- **Balance:** Are factions and strategies appropriately balanced?
- **Clarity:** Are complex systems understandable?
- **Pacing:** Does the game maintain interest over time?

Feedback from this evaluation will inform full development priorities.

10.4 Prototype Technical Specifications

- **Development Tools:** Game Maker Studio 2 or Godot (for rapid 2D development)
 - **Art Assets:** Minimal pixel art focusing on functionality
 - **Scope:** Earth to Mars orbital system only
 - **Testing Platform:** PC desktop only
 - **Distribution:** Private builds for testing team
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11. MONETIZATION & BUSINESS MODEL

11.1 Initial Release

- Standard pricing model with single purchase
- Limited cosmetic DLC options
- Free post-launch support and updates

11.2 Expansion Content

- Major expansion packs adding significant gameplay features
- Minor content packs for specialized mechanics or scenarios
- All expansions optional with core game remaining complete experience

11.3 Community Support

- Active community engagement
 - Modding support and toolsets
 - Regular content and balance updates
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12. RISKS & CHALLENGES

12.1 Technical Challenges

- Implementing accurate but performant orbital mechanics
- Balancing simulation depth with gameplay accessibility
- Creating intuitive interfaces for complex systems

12.2 Design Challenges

- Maintaining strategic depth while controlling complexity
- Balancing faction asymmetry
- Ensuring multiple viable paths to victory

12.3 Market Challenges

- Niche appeal of hard sci-fi setting
- Complex mechanics may limit casual appeal
- Standing out in crowded strategy market

12.4 Mitigation Strategies

- Early prototyping to test core mechanics
 - Extensive playtesting with target audience
 - Scalable complexity options for different player experience levels
 - Clear tutorial systems and in-game assistance
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13. CONCLUSION

Solar Dominion: The Faction Wars offers a unique take on the 4X strategy genre by combining hard science fiction with detailed physical simulation. The game's emphasis on realistic orbital mechanics, resource logistics, and faction dynamics creates a deeply strategic experience unlike conventional space 4X games. With its strong basis in scientific realism and inspiration from acclaimed hard sci-fi like The Expanse, Solar Dominion has the potential to create a compelling niche in the strategy game market.