Product Requirements Document (PRD)

DualCam Pro - Professional Dual Camera Recording App

Version: 1.0
Date: October 24, 2025
Status: Final
Author: Product Development Team

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1. Executive Summary

1.1 Product Vision

DualCam Pro is a next-generation dual camera recording application for iOS that enables users to simultaneously capture video from both front and rear cameras with a unique stacked preview layout. Built with Swift 6 for iOS 18-26, the app features Apple's cutting-edge Liquid Glass UI design and provides three simultaneous video outputs, setting a new standard for mobile videography.

1.2 Target Market

- **Primary:** Content creators, vloggers, and social media influencers
- **Secondary:** Educators, trainers, and video professionals
- **Tertiary:** Casual users interested in creative video recording

1.3 Market Opportunity

As of October 2025, the dual camera app market is dominated by apps like MixCam (4.7/5 rating) and DoubleTake by Filmic, but none offer:
- Stacked vertical preview layout
- Three simultaneous video outputs
- Complete iOS 26 feature parity
- Modern Liquid Glass UI
- Independent per-camera controls

With iPhone 17 series adoption increasing and native Dual Capture features limited to Apple's camera app, there's significant opportunity for a premium third-party solution.

1.4 Success Metrics

- **Launch:** 50,000 downloads in first 3 months
- **Engagement:** 40% weekly active users
- **Retention:** 60% 30-day retention rate
- **Rating:** 4.5+ stars on App Store
- **Technical:** <1% crash rate, <1% frame drop rate

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2. Product Overview

2.1 Product Name

DualCam Pro

Alternative taglines:
- “Professional Dual Camera Recording”
- “Capture Every Angle”
- “Front + Back = Complete Story”

2.2 Core Value Proposition

“The only dual camera app that gives you everything: stacked preview, three video outputs, and all iOS features wrapped in beautiful Liquid Glass design.”

2.3 Key Differentiators

1. **Unique Stacked Layout:** Vertical arrangement of camera previews (only app with this layout)
2. **Triple Output Recording:** Save combined video + individual front/back feeds
3. **Liquid Glass UI:** Premium iOS 26 design language
4. **Complete Feature Parity:** All iOS recording features (4K 60fps, Dolby Vision, ProRES, etc.)
5. **Independent Controls:** Separate zoom/focus for each camera
6. **Swift 6 Architecture:** Modern, safe, performant codebase
7. **iOS 18-26 Support:** Works on devices from iPhone XS to iPhone 17

2.4 Platform Requirements

- **Minimum:** iOS 18.0
- **Optimized for:** iOS 26.0+
- **Devices:** iPhone XS, XS Max, XR and later (multi-cam support)
- **Language:** Swift 6.0
- **Frameworks:** SwiftUI, AVFoundation, Metal, Core Image
- **Size:** ~50MB download, ~200MB installed

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3. Target Audience

3.1 Primary Personas

Persona 1: “Content Creator Chloe”

- **Age:** 22-28
- **Occupation:** Full-time YouTuber/TikToker
- **Goals:** Create engaging reaction videos, vlogs, tutorials
- **Pain Points:** Current apps lack flexibility, limited outputs, poor UI
- **Needs:** Professional quality, multiple outputs for editing, reliable recording

Persona 2: “Educator Eric”

- **Age:** 30-45
- **Occupation:** Online course instructor, trainer
- **Goals:** Record demonstrations while showing his reactions

- **Pain Points:** Need both product view and presenter view simultaneously
- **Needs:** Easy to use, high quality, ability to share both angles

Persona 3: “Pro Videographer Val”

- **Age:** 25-40
- **Occupation:** Freelance video producer
- **Goals:** Capture B-roll with reaction shots, client presentations
- **Pain Points:** Lack of professional features in consumer apps
- **Needs:** ProRES recording, full manual controls, reliable multi-camera sync

3.2 User Needs

Must Have

- Reliable simultaneous recording from both cameras
- High-quality video output (4K minimum)
- Save videos to Photos library
- Basic recording controls (start/stop, settings)

Should Have

- Multiple resolution/format options
- Independent zoom controls
- Manual focus and exposure
- Preview before recording

Nice to Have

- Filters and effects
- Cloud backup
- Video editing tools
- Social media integration

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4. Feature Specifications

4.1 Core Features (MVP - Phase 1)

F1: Dual Camera Capture

Priority: P0 (Critical)

Description: Simultaneously record video from front and rear cameras using AVCaptureMultiCamSession.

Requirements:
- Support all iPhone models with multi-cam capability (XS+)
- Check device support with `AVCaptureMultiCamSession.isMultiCamSupported`
- Handle graceful degradation for unsupported devices
- Maintain audio/video sync across both streams
- Support recording up to 3 hours continuously

Acceptance Criteria:
- [ ] Both cameras record simultaneously without frame drops
- [ ] Audio is synchronized with video

- [ ] No crashes during recording
- [ ] Hardware cost stays below 1.0
- [ ] Thermal throttling is handled gracefully

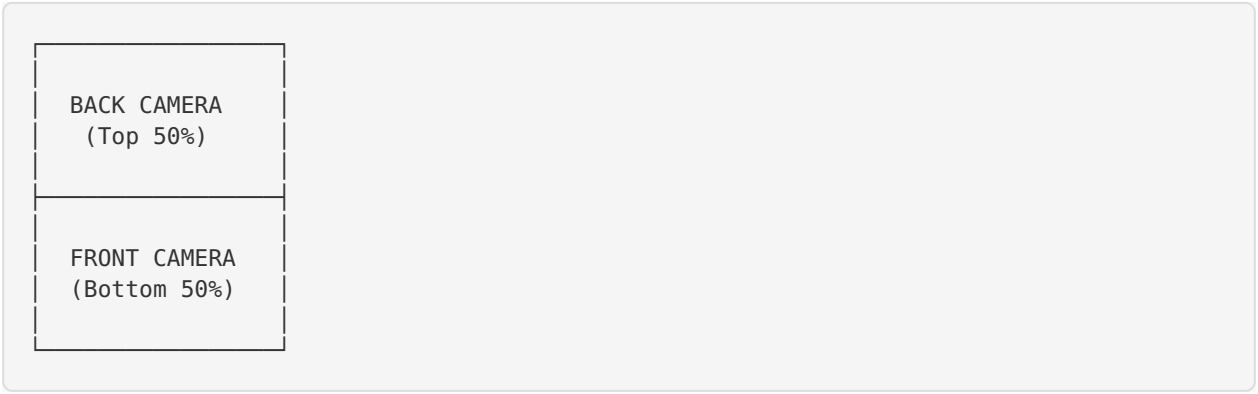
F2: Stacked Preview Layout

Priority: P0 (Critical)

Description: Display live camera previews in a vertical stacked layout.

Requirements:
- Back camera preview on top half
- Front camera preview on bottom half
- Both previews update in real-time
- Support portrait and landscape orientations
- Handle device rotation smoothly
- Maintain aspect ratio (16:9 or user-selected)
- No visible lag between cameras

Layout Specification:



Acceptance Criteria:
- [ ] Previews render at 30+ fps
- [ ] Layout adapts to screen rotation
- [ ] No black bars or distortion
- [ ] Gesture controls work correctly
- [ ] UI overlays don’t obstruct important areas

F3: Three-Output Recording

Priority: P0 (Critical)

Description: Save three separate video files for each recording session.

Outputs:
1. **Combined video:** Both cameras composited into single file (stacked layout preserved)
2. **Back camera video:** Isolated rear camera footage
3. **Front camera video:** Isolated front camera footage

Requirements:
- All three files save simultaneously
- Identical timestamps for sync
- Same resolution/format settings
- Atomic save operation (all succeed or all fail)
- Automatic file naming convention
- Storage space check before recording

File Naming:

```
DualCam_YYYYMMDD_HHMMSS_combined.mov
DualCam_YYYYMMDD_HHMMSS_back.mov
DualCam_YYYYMMDD_HHMMSS_front.mov
```

Acceptance Criteria:
- [ ] Three files save successfully every time
- [ ] Files are perfectly synchronized
- [ ] Storage warnings appear when space is low
- [ ] Failed saves roll back gracefully
- [ ] Files are immediately accessible in Photos library

F4: Photos Library Integration

Priority: P0 (Critical)

Description: Save recorded videos to iOS Photos library.

Requirements:
- Request Photos library permission on first use
- Save all three outputs to Photos
- Create custom album “DualCam Pro”
- Preserve video metadata (date, location, settings)
- Handle permission denial gracefully
- Show save progress indicator

Acceptance Criteria:
- [ ] Videos appear in Photos app immediately
- [ ] Custom album is created automatically
- [ ] Metadata is preserved correctly
- [ ] Permission flow is clear to users
- [ ] Denied permission shows helpful message

F5: Basic Recording Controls

Priority: P0 (Critical)

Description: Essential controls for starting, stopping, and managing recordings.

Controls:
- **Record button:** Start/stop recording (red dot icon)

- **Camera swap:** Switch front/back camera positions
- **Settings button:** Access recording settings
- **Gallery button:** View recorded videos
- **Timer display:** Show current recording duration

Requirements:
- Large, accessible touch targets (44x44pt minimum)
- Clear visual feedback for all actions
- Disable controls during processing
- Keyboard shortcut support (if hardware keyboard connected)
- Haptic feedback for button presses

Acceptance Criteria:
- [ ] All controls respond instantly
- [ ] Visual state changes are clear
- [ ] No accidental recordings
- [ ] Timer updates smoothly
- [ ] Controls are accessible (VoiceOver compatible)

4.2 Enhanced Features (Phase 2)

F6: Liquid Glass UI

Priority: P1 (High)

Description: Implement Apple's Liquid Glass design language throughout the app.

Requirements:
- Use `.glassEffect()` modifier for all controls
- Frosted glass background for settings panels
- Translucent overlays for indicators
- Dynamic blur responding to camera content
- Smooth animations for all transitions
- Support light and dark modes
- Maintain accessibility contrast ratios

UI Elements with Glass Effect:
- Recording controls overlay
- Settings panel
- Zoom indicators
- Focus/exposure indicators
- Status indicators (battery, storage, timer)
- Alert dialogs

Acceptance Criteria:
- [ ] All UI elements use consistent glass aesthetic
- [ ] Contrast meets WCAG 2.1 AA standards
- [ ] Animations are smooth (60fps)
- [ ] Works correctly in light/dark mode
- [ ] No performance degradation from effects

F7: Independent Zoom Controls

Priority: P1 (High)

Description: Allow separate zoom control for front and back cameras.

Requirements:
- Pinch-to-zoom gesture on each preview area
- Independent zoom levels (1x - max optical zoom)
- Smooth zoom animation
- Zoom level indicator for each camera
- Zoom level persists during recording
- Support digital zoom up to maximum device capability

Zoom Ranges by Device:
- iPhone 17/17 Air: 0.5x - 10x (digital)
- iPhone 17 Pro: 0.5x - 40x (optical + digital)
- Front camera: 1x - 5x (digital)

Acceptance Criteria:
- [ ] Zoom works independently for each camera
- [ ] Smooth zoom animation without judder
- [ ] Zoom level indicators are clear
- [ ] Maximum zoom respects device capabilities
- [ ] No performance issues during zoom

F8: Resolution & Format Options

Priority: P1 (High)

Description: Support all iOS video recording resolutions and formats.

Resolution Options:
- 720p HD (30fps)
- 1080p HD (30fps, 60fps)
- 4K (24fps, 30fps, 60fps)

Format Options:
- HEVC (H.265) - Default
- H.264 - Compatible
- ProRES (iPhone 17 Pro/Pro Max only)
- ProRES RAW (iPhone 17 Pro/Pro Max only)

Quality Presets:
- **High Efficiency:** HEVC, smaller file size
- **Most Compatible:** H.264, larger file size
- **Professional:** ProRES, maximum quality

Requirements:
- Settings accessible from main camera view
- Real-time format switching
- Storage estimate for each format

- Format info tooltip for education
- Graceful handling of unsupported formats

Acceptance Criteria:
- [ ] All supported formats record correctly
- [ ] Format selection persists across sessions
- [ ] Storage estimates are accurate
- [ ] ProRES only available on Pro models
- [ ] Clear labels for each option

F9: Audio Mix API Integration (iOS 26+)

Priority: P1 (High)

Description: Integrate iOS 26 Audio Mix API for post-capture audio adjustment.

Audio Mix Modes:
- **In-Frame:** Focus on subjects in camera frame, reduce external sounds
- **Studio:** Clean studio sound, minimize background noise and reverb
- **Cinematic:** Spatial audio with voice isolation + environmental sounds

Requirements:
- Available only on iOS 26+ devices
- Toggle during or after recording
- Preview audio mix in real-time
- Apply to combined output
- Save mix setting as metadata

Acceptance Criteria:
- [ ] Audio mix modes work correctly on iOS 26+
- [ ] Graceful degradation on iOS 18-25
- [ ] Real-time preview available
- [ ] Mix settings save with video
- [ ] Clear UI for audio mode selection

F10: Focus & Exposure Controls

Priority: P1 (High)

Description: Manual and automatic focus/exposure controls for each camera.

Focus Controls:
- Tap-to-focus on either preview
- Auto-focus (continuous)
- Focus lock (AE/AF Lock)
- Focus indicator (yellow square)

Exposure Controls:
- Auto exposure
- Exposure compensation (EV -2 to +2)

- Exposure lock
- Exposure indicator (sun icon)

Requirements:
- Independent controls for each camera
- Visual indicators for focus point
- Smooth animations for focus changes
- Lock state persists during recording
- Reset to auto after recording stop

Acceptance Criteria:
- [ ] Tap-to-focus works accurately
- [ ] Exposure adjustments apply smoothly
- [ ] Lock state is visually clear
- [ ] Controls work independently per camera
- [ ] Auto mode re-engages correctly

4.3 Advanced Features (Phase 3)

F11: Cinematic Mode Support

Priority: P2 (Medium)

Description: Enable Cinematic Mode for depth-of-field effects.

Requirements:
- Available on iPhone 17 series
- Shallow depth of field (f/1.4 - f/16)
- Automatic focus transitions
- Post-capture focus adjustment
- Works with front camera (Center Stage compatible)

Acceptance Criteria:
- [ ] Cinematic mode records correctly
- [ ] Focus transitions are smooth
- [ ] Post-capture adjustment works
- [ ] Only available on supported devices

F12: Action Mode Stabilization

Priority: P2 (Medium)

Description: Ultra-stabilized video recording using Action Mode.

Requirements:
- Available on iPhone 17 series (iOS 26+)
- Toggle on/off in settings
- Works with both cameras
- Minimal crop for stabilization
- Auto-disable if hardware cost too high

Acceptance Criteria:
- [ ] Action mode significantly reduces shake
- [ ] Works with dual camera recording
- [ ] Performance remains stable
- [ ] Clear toggle in UI

F13: Center Stage Front Camera

Priority: P2 (Medium)

Description: AI-driven auto-framing for front camera using Center Stage.

Requirements:
- Available on iPhone 17 series
- Automatic subject tracking
- Group detection and framing
- Smooth panning and zooming
- Toggle on/off per recording

Acceptance Criteria:
- [ ] Center Stage tracks subjects accurately
- [ ] Works seamlessly with dual recording
- [ ] Toggle is accessible
- [ ] No performance degradation

F14: Filters & Effects

Priority: P2 (Medium)

Description: Real-time video filters and effects.

Available Filters:
- Vivid
- Dramatic
- Mono
- Silvertone
- Noir

Requirements:
- Apply to one or both cameras
- Real-time preview
- No performance degradation
- Save filter choice with video

Acceptance Criteria:
- [ ] Filters apply in real-time
- [ ] No frame rate drop
- [ ] Preview matches output
- [ ] Independent application per camera

F15: ProRES/LOG Recording (Pro Models)

Priority: P2 (Medium)

Description: Professional recording formats for advanced users.

Requirements:
- iPhone 17 Pro/Pro Max only
- ProRES 422 and ProRES 422 HQ
- LOG color profile option
- External recording via USB-C
- Storage warnings (large file sizes)

Acceptance Criteria:
- [ ] ProRES records correctly
- [ ] LOG profile is accurate
- [ ] External recording works
- [ ] Storage checks are effective

4.4 Polish Features (Phase 4)

F16: AirPods Remote Capture (iOS 26+)

Priority: P3 (Low)

Description: Control recording with AirPods stem clicks.

Requirements:
- AirPods with H2 chip
- Single click to start/stop
- Custom audio feedback
- Works when phone is locked
- Configurable in settings

Acceptance Criteria:
- [ ] AirPods trigger recording correctly
- [ ] Audio feedback is clear
- [ ] Works reliably from distance
- [ ] Settings allow customization

F17: Camera Control API (iPhone 16+)

Priority: P3 (Low)

Description: Physical Camera Control button integration.

Requirements:
- iPhone 16/17 with Camera Control button
- Press to start/stop recording
- Slider for zoom control
- Haptic feedback
- Customizable actions

Acceptance Criteria:
- [ ] Button press triggers recording
- [ ] Zoom slider works smoothly
- [ ] Haptics are appropriate
- [ ] Customization is intuitive

F18: Advanced Gesture Controls

Priority: P3 (Low)

Description: Additional gesture controls for power users.

Gestures:
- Double-tap preview to swap cameras
- Triple-tap to lock focus/exposure
- Two-finger swipe to adjust exposure
- Long-press for recording lock
- Three-finger pinch for aspect ratio

Acceptance Criteria:
- [ ] Gestures don’t conflict
- [ ] Visual tutorials available
- [ ] Gestures are responsive
- [ ] Optional disable in settings

F19: Custom Video Editing

Priority: P3 (Low)

Description: Basic in-app video editing tools.

Features:
- Trim recordings
- Adjust audio levels
- Add text overlays
- Color grading
- Export edited versions

Acceptance Criteria:
- [ ] Editing is non-destructive
- [ ] Export maintains quality
- [ ] Tools are intuitive
- [ ] Performance is acceptable

F20: Cloud Backup Options

Priority: P3 (Low)

Description: Automatic backup to cloud storage.

Supported Services:
- iCloud Drive
- Google Drive (optional)
- Dropbox (optional)

Acceptance Criteria:
- [ ] Backup is reliable
- [ ] Progress is visible
- [ ] Wi-Fi only option
- [ ] Selective file backup

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5. Technical Architecture

5.1 System Architecture

5.2 Data Flow

Recording Flow

```
User Taps Record
    ↓
CameraManager.startRecording()
    ↓
RecordingManager.startThreeOutputRecording()
    ↓
├─→ Back Camera → AVCaptureMovieFileOutput → back.mov
├─→ Front Camera → AVCaptureMovieFileOutput → front.mov
└─→ Both Cameras → CompositorManager → combined.mov
    ↓
Files saved to temporary directory
    ↓
StorageManager.saveToPhotosLibrary()
    ↓
PHPhotoLibrary adds three assets
    ↓
User sees success message
```

Preview Flow

```
Camera Session Running
    ↓
AVCaptureVideoDataOutput (Back Camera)
    ↓
CMSampleBuffer → CIImage → CALayer
    ↓
Back Preview Updates

AVCaptureVideoDataOutput (Front Camera)
    ↓
CMSampleBuffer → CIImage → CALayer
    ↓
Front Preview Updates
```

5.3 Core Components

CameraManager (Actor)

Responsibilities:
- Manage AVCaptureMultiCamSession lifecycle
- Configure camera inputs (front/back)
- Handle device capabilities
- Monitor hardware cost
- Manage session state (running/stopped)

Key Methods:

```
actor CameraManager {
    func setupSession() async throws
    func startSession() async
    func stopSession() async
    func configureCamera(_ position: AVCaptureDevice.Position, settings: CameraSet-
tings) async throws
    func getHardwareCost() async -> Float
}
```

RecordingManager (Actor)

Responsibilities:
- Coordinate three-output recording
- Manage file URLs and naming
- Handle start/stop recording
- Monitor storage space
- Provide recording status

Key Methods:

```
actor RecordingManager {
    func startRecording(settings: RecordingSettings) async throws -> RecordingSession
    func stopRecording() async throws -> [URL]
    func pauseRecording() async throws
    func resumeRecording() async throws
    var recordingDuration: TimeInterval { get async }
}
```

CompositorManager

Responsibilities:
- Real-time video composition
- Combine front/back feeds into single output
- Apply layout transformations (stacked)
- Handle effects and filters
- Manage Metal rendering pipeline

Key Methods:

```
actor CompositorManager {
    func startCompositing(backBuffer: CVPixelBuffer, frontBuffer: CVPixelBuffer)
async throws -> CVPixelBuffer
    func applyLayout(_ layout: CompositionLayout) async
    func applyFilter(_ filter: VideoFilter, to camera: CameraPosition) async
}
```

StorageManager (Actor)

Responsibilities:
- File system management
- Photos library integration
- Storage space monitoring
- Album creation
- File cleanup

Key Methods:

```
actor StorageManager {
    func saveToPhotosLibrary(urls: [URL]) async throws
    func createAlbum(named: String) async throws -> PHAssetCollection
    func getAvailableStorage() async -> Int64
    func cleanupOldFiles() async throws
}
```

5.4 Data Models

CameraSettings

```
struct CameraSettings: Codable, Sendable {
    var resolution: VideoResolution
    var frameRate: Int
    var format: VideoFormat
    var zoomLevel: Float
    var focusMode: FocusMode
    var exposureMode: ExposureMode
    var exposureCompensation: Float
}
```

RecordingSettings

```
struct RecordingSettings: Codable, Sendable {
    var backCameraSettings: CameraSettings
    var frontCameraSettings: CameraSettings
    var audioMixMode: AudioMixMode? // iOS 26+
    var enableActionMode: Bool
    var enableCenterStage: Bool
    var enableCinematicMode: Bool
    var compositionLayout: CompositionLayout
}
```

RecordingSession

```
struct RecordingSession: Identifiable, Sendable {
    let id: UUID
    let startTime: Date
    var duration: TimeInterval
    var backCameraURL: URL?
    var frontCameraURL: URL?
    var combinedURL: URL?
    var settings: RecordingSettings
}
```

5.5 Technology Stack

Component	Technology	Version
Language	Swift	6.0+
UI Framework	SwiftUI	iOS 18+
Camera	AVFoundation	iOS 18+
Video Processing	Metal	iOS 18+
Image Processing	Core Image	iOS 18+
Storage	Photos Framework	iOS 18+
Concurrency	Swift Concurrency	Swift 6+
Minimum OS	iOS	18.0
Target OS	iOS	26.0

5.6 Performance Requirements

Metric	Target	Critical Threshold
Frame Rate	60 fps (preview)	30 fps minimum
Frame Drop Rate	<0.5%	<1%
Recording Latency	<100ms	<200ms
Memory Usage	<300MB	<500MB
Hardware Cost	<0.9	<1.0
Startup Time	<2s	<3s
Battery Drain	<15%/hour	<25%/hour

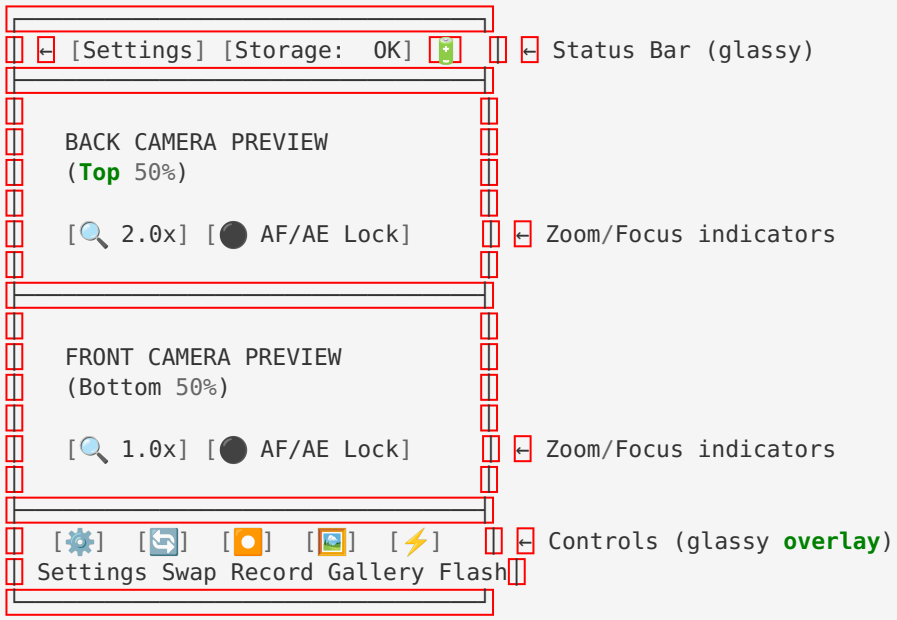
6. User Interface Specifications

6.1 App Structure

```
App Launch
    ↓
Camera View (Main)
    ├→ Settings Sheet
    ├→ Gallery View
    └→ Recording View (overlay)
```

6.2 Main Camera View

Layout



Elements

Status Bar (Top)

- Back button to exit (if entering from gallery)
- Settings gear icon
- Storage indicator (color-coded: green/yellow/red)
- Battery percentage (if recording)
- Recording timer (when active)

Camera Previews

- Equal height split (50/50)
- Rounded corners (12pt radius)
- Subtle divider line
- Tap-to-focus gesture areas
- Pinch-to-zoom gesture areas
- Focus indicators (yellow square)
- Exposure indicators (sun icon)

Control Bar (Bottom)
- Settings: Access recording settings
- Swap: Flip front/back positions
- Record: Large red button (toggles to stop)
- Gallery: View recorded videos
- Flash: Toggle flash for back camera

Recording Overlay (when recording)
- Red recording indicator (pulsing)
- Timer display (MM:SS)
- Stop button (large, red square)
- Pause button (optional)
- Storage warning (if low)

6.3 Settings View

Structure

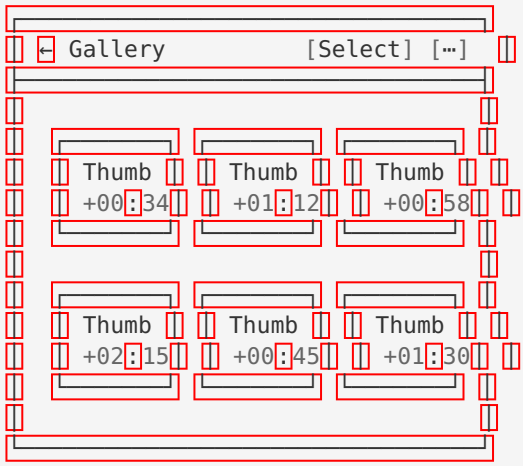
```
Settings (Sheet presentation with Liquid Glass background)
├── Video Quality
│   ├── Resolution (720p, 1080p, 4K)
│   ├── Frame Rate (24, 30, 60fps)
│   └── Format (HEVC, H.264, ProRES)
│
├── Camera Settings
│   ├── Back Camera Zoom (slider)
│   ├── Front Camera Zoom (slider)
│   ├── Enable Action Mode (toggle)
│   └── Enable Center Stage (toggle)
│
├── Audio Settings
│   ├── Audio Mix Mode (iOS 26+)
│   │   ├── In-Frame
│   │   ├── Studio
│   │   └── Cinematic
│   └── Wind Noise Reduction (toggle)
│
├── Advanced
│   ├── Cinematic Mode (toggle)
│   ├── Filters (list)
│   └── ProRES Options (Pro models)
│
└── About
    ├── App Version
    ├── Device Compatibility
    └── Help & Support
```

UI Guidelines

- Use `.glassEffect()` for all panels
- Group related settings with headers
- Include info icons (ⓘ) with explanatory tooltips
- Disable unavailable options (with explanation)
- Show storage estimates for quality settings
- Instant preview of changes (where possible)

6.4 Gallery View

Layout



Features

- Grid layout (3 columns)
- Video thumbnails with duration
- Recording date/time
- Tap to play/preview
- Long-press for context menu:
- View Combined Video
- View Back Camera Only
- View Front Camera Only
- Share
- Delete
- Export

6.5 Liquid Glass Design System

Colors

```
// Liquid Glass Colors
let glassBackground = Color.white.opacity(0.15)
let glassBorder = Color.white.opacity(0.3)
let glassShadow = Color.black.opacity(0.1)

// Tints
let glassTintBlue = Color.blue.opacity(0.2)
let glassTintGreen = Color.green.opacity(0.2)
let glassTintRed = Color.red.opacity(0.2)
```

Typography

- **Headers:** SF Pro Display, Bold, 24-28pt
- **Body:** SF Pro Text, Regular, 16-17pt
- **Captions:** SF Pro Text, Regular, 12-13pt
- **Buttons:** SF Pro Text, Semibold, 16-17pt

Spacing

- **Small:** 8pt
- **Medium:** 16pt
- **Large:** 24pt
- **XLarge:** 32pt

Animations

- **Duration:** 0.3s (default), 0.5s (emphasis)
- **Easing:** ease-in-out (default), spring (interactive)
- **Transitions:** fade, slide, scale

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7. User Experience Flows

7.1 First Launch Flow

```
1. App Launch
   ↓
2. Onboarding Screen
   - Welcome message
   - Key features showcase (3-4 slides)
   - "Get Started" button
   ↓
3. Permission Requests
   - Camera permission (required)
   - Microphone permission (required)
   - Photos library permission (required)
   - Location permission (optional)
   ↓
4. Device Compatibility Check
   - Check AVCaptureMultiCamSession.isMultiCamSupported
   - If not supported: Show error + suggest alternative
   - If supported: Continue
   ↓
5. Main Camera View
   - Show quick tutorial overlay (optional skip)
   - "Tap here to record"
   - "Pinch to zoom"
   - "Tap to focus"
   ↓
6. Ready to Record
```

7.2 Recording Flow

```
1. User on Main Camera View
   ↓
2. (Optional) Adjust Settings
   - Open settings sheet
   - Select resolution/format
   - Configure cameras
   - Close settings
   ↓
3. (Optional) Adjust Preview
   - Pinch to zoom on either preview
   - Tap to focus/expose
   - Lock focus/exposure if desired
   ↓
4. Tap Record Button
   - Button turns red (stop icon)
   - Timer starts
   - Recording indicator pulses
   - Disable camera swap and settings
   ↓
5. While Recording
   - Monitor storage space
   - Show warnings if low
   - Allow pause (optional)
   - Allow stop
   ↓
6. Tap Stop Button
   - Recording stops
   - "Processing..." indicator
   - Three files save simultaneously
   ↓
7. Save Complete
   - Success message: "Saved 3 videos"
   - Option to view in gallery
   - Option to share
   ↓
8. Return to Camera View
```

7.3 Gallery Viewing Flow

```
1. Tap Gallery Button
   ↓
2. Gallery View Loads
   - Fetch recordings from Photos library
   - Display thumbnails in grid
   ↓
3. User Taps Thumbnail
   ↓
4. Video Player View
   - Play combined video by default
   - Tabs to switch: [Combined] [Back] [Front]
   - Playback controls (play/pause, scrubber)
   ↓
5. User Actions
   - Share button: Share current video
   - Edit button: Trim/adjust (Phase 4)
   - Delete button: Remove video
   - Close button: Return to gallery
   ↓
6. Return to Gallery or Camera View
```

---

8. Success Criteria & Metrics

8.1 Launch Success Criteria

Must Have (Launch Blockers)

- [ ] All P0 features implemented and tested
- [ ] No critical bugs (crash rate <0.5%)
- [ ] App Store review approval
- [ ] Performance benchmarks met (see 5.6)
- [ ] Accessibility compliance (VoiceOver support)
- [ ] Privacy policy and terms accepted

Should Have

- [ ] Most P1 features implemented
- [ ] User testing completed (10+ users)
- [ ] Marketing materials ready
- [ ] App Store Optimization (ASO) completed

8.2 Key Performance Indicators (KPIs)

Acquisition Metrics

- **Downloads:** 50,000 in first 3 months
- **App Store Rating:** 4.5+ stars (target)
- **Conversion Rate:** 10% free to paid (if applicable)

Engagement Metrics

- **Daily Active Users (DAU):** 15,000 by month 3
- **Weekly Active Users (WAU):** 30,000 by month 3
- **DAU/WAU Ratio:** >0.5 (high engagement)
- **Session Duration:** Avg 5-10 minutes per session

- **Sessions per User:** 3-5 per week

Retention Metrics

- **Day 1 Retention:** 70%+
- **Day 7 Retention:** 50%+
- **Day 30 Retention:** 60%+ (target due to niche use case)

Technical Metrics

- **Crash Rate:** <0.5% of sessions
- **Frame Drop Rate:** <1% during recording
- **ANR Rate:** <0.1% (App Not Responding)
- **Startup Time:** <2 seconds (90th percentile)

User Satisfaction Metrics

- **NPS (Net Promoter Score):** 40+ (good)
- **In-App Rating Prompts:** 4.5+ stars
- **Support Ticket Volume:** <2% of users

8.3 A/B Testing Plan

Test 1: Recording Button Size

- **Variant A:** 60pt diameter (standard)
- **Variant B:** 80pt diameter (large)
- **Metric:** Accidental recording rate, user satisfaction

Test 2: Default Resolution

- **Variant A:** 1080p 30fps (balanced)
- **Variant B:** 4K 30fps (high quality)
- **Metric:** Storage complaints, video quality ratings

Test 3: Onboarding Flow

- **Variant A:** 3-slide onboarding
- **Variant B:** Interactive tutorial
- **Metric:** Completion rate, time to first recording

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9. Development Roadmap

9.1 Phase Breakdown

Phase 1: MVP (Core Features) - 6 weeks

Goal: Functional dual camera app with basic features

Weeks 1-2: Foundation
- [ ] Project setup (Xcode, Git, CI/CD)
- [ ] AVCaptureMultiCamSession implementation
- [ ] Basic SwiftUI views
- [ ] Camera permission handling

Weeks 3-4: Core Recording
- [ ] Stacked preview layout

- [ ] Simultaneous recording (three outputs)
- [ ] Basic recording controls
- [ ] File management

Weeks 5-6: Integration & Polish
- [ ] Photos library integration
- [ ] Error handling
- [ ] Basic UI polish
- [ ] Testing and bug fixes

Deliverable: MVP app ready for internal testing

Phase 2: Enhanced Features - 4 weeks

Goal: Feature-rich app with Liquid Glass UI

Weeks 7-8: UI Enhancement
- [ ] Liquid Glass UI implementation
- [ ] Settings view with all options
- [ ] Gallery view
- [ ] Improved controls layout

Weeks 9-10: Camera Features
- [ ] Independent zoom controls
- [ ] Focus and exposure controls
- [ ] Resolution/format options
- [ ] Audio Mix API (iOS 26+)

Deliverable: Feature-complete app ready for beta testing

Phase 3: Advanced Features - 3 weeks

Goal: Pro-level features

Weeks 11-12: Pro Features
- [ ] Cinematic Mode support
- [ ] Action Mode stabilization
- [ ] Center Stage integration
- [ ] Filters and effects

Week 13: ProRES & Optimization
- [ ] ProRES/LOG recording (Pro models)
- [ ] Performance optimization
- [ ] Beta feedback implementation

Deliverable: Professional-grade app ready for App Store

Phase 4: Polish & Launch - 2 weeks

Goal: Launch-ready app

Week 14: Final Polish
- [ ] AirPods remote capture (iOS 26+)
- [ ] Camera Control API (iPhone 16+)
- [ ] Advanced gestures
- [ ] Final bug fixes
- [ ] Accessibility audit

Week 15: Launch Preparation
- [ ] App Store submission
- [ ] Marketing materials
- [ ] Press kit
- [ ] Launch strategy execution

Deliverable: App live on App Store

9.2 Milestones

Milestone	Target Date	Status
M1: MVP Complete	Week 6	Pending
M2: Internal Testing	Week 7	Pending
M3: Beta Launch	Week 10	Pending
M4: Feature Complete	Week 13	Pending
M5: App Store Submission	Week 14	Pending
M6: Public Launch	Week 15	Pending

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10. Risk Assessment & Mitigation

10.1 Technical Risks

Risk 1: Multi-Camera Performance Issues

Severity: High
Probability: Medium

Description: Simultaneous recording from two cameras may cause frame drops, thermal throttling, or crashes on some devices.

Mitigation:
- Extensive device testing (XS through 17 series)
- Hardware cost monitoring (<1.0 threshold)
- Adaptive quality reduction on thermal warning
- Clear device compatibility warnings

Risk 2: Swift 6 Concurrency Complexity

Severity: Medium
Probability: Medium

Description: Swift 6 strict concurrency may introduce complex debugging challenges with AVFoundation callbacks.

Mitigation:
- Incremental concurrency adoption
- Use @preconcurrency for legacy APIs
- Extensive use of Thread Sanitizer
- Actor-based architecture from start

Risk 3: Three-Output Recording Stability

Severity: High
Probability: Low

Description: Saving three files simultaneously may fail or cause data corruption.

Mitigation:
- Atomic save operations (all or nothing)
- Extensive error handling
- Automatic retry logic
- User-facing save progress indicators

Risk 4: Storage Space Exhaustion

Severity: Medium
Probability: High

Description: Three outputs consume 3x storage; users may run out of space mid-recording.

Mitigation:
- Pre-recording storage check
- Real-time storage monitoring
- Warnings at 10GB, 5GB, 1GB remaining
- Option to save only combined output

10.2 Market Risks

Risk 5: Low User Adoption

Severity: High
Probability: Medium

Description: Niche app may struggle to attract users in crowded camera app market.

Mitigation:
- Clear positioning (unique stacked layout + 3 outputs)
- App Store Optimization (ASO)

- Content creator influencer partnerships
- Free tier with paid upgrades (freemium model)

Risk 6: Competitor Response

Severity: Medium
Probability: High

Description: MixCam or DoubleTake may copy our features.

Mitigation:
- Move fast with unique features
- Build brand loyalty through quality
- Continuous innovation (Phase 4+ features)
- Community engagement

10.3 Business Risks

Risk 7: Apple Feature Duplication

Severity: High
Probability: Medium

Description: Apple may enhance native Dual Capture to match our features.

Mitigation:
- Always stay ahead with advanced features
- Focus on power user needs (3 outputs, manual controls)
- Build community and brand
- Pivot to professional market if needed

Risk 8: App Store Rejection

Severity: High
Probability: Low

Description: App may be rejected for privacy, performance, or guideline violations.

Mitigation:
- Follow all App Store guidelines strictly
- Thorough privacy policy
- Extensive testing before submission
- Pre-submission consultation with Apple (if possible)

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11. Monetization Strategy

11.1 Revenue Model

Freemium Model

Free Tier:
- Dual camera recording (720p, 1080p)
- Stacked preview layout
- Three-output recording
- Basic controls (zoom, focus, exposure)
- Save to Photos library
- Watermark on combined video

Pro Tier ($4.99/month or $39.99/year):
- Remove watermark
- 4K recording
- ProRES/LOG (Pro models)
- All filters and effects
- Cinematic Mode
- Action Mode
- Cloud backup
- Priority support

Lifetime Purchase: $99.99

11.2 In-App Purchases (Alternative)

- **Remove Watermark:** $2.99 (one-time)
- **4K Unlock:** $4.99 (one-time)
- **Pro Features Bundle:** $9.99 (one-time)
- **Filters Pack:** $1.99 (one-time)

11.3 Revenue Projections (Year 1)

Assumptions:
- 50,000 downloads in first 3 months
- 150,000 downloads by end of Year 1
- 5% conversion to Pro tier
- 50% annual subscribers, 50% monthly

Projected Revenue:
- Monthly subscribers: 3,750 × $4.99 = $18,712/month
- Annual subscribers: 3,750 × $39.99 = $149,962/year (one-time)
- **Total Year 1:** ~$300,000

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12. Privacy & Security

12.1 Data Collection

Collected Data:
- Camera usage statistics (anonymous)
- App performance metrics (anonymous)
- Crash reports (anonymous)
- Recording duration and frequency (anonymous)

NOT Collected:
- Video content

- Location data (unless user enables geotagging)
- Personal information
- Contacts or photos (beyond saved recordings)

12.2 Permissions Required

Permission	Reason	Required
Camera	Record video from front/back cameras	Yes
Microphone	Record audio with video	Yes
Photos	Save recordings to library	Yes
Location	Geotag recordings (optional)	No

12.3 Privacy Compliance

- **GDPR Compliant:** No personal data collected without consent
- **COPPA Compliant:** Age gate (13+)
- **Privacy Policy:** Clear, accessible from app and App Store
- **Data Deletion:** All recordings stored locally; user controls deletion

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13. Accessibility

13.1 VoiceOver Support

- All buttons labeled clearly
- Camera preview descriptions
- Recording status announcements
- Focus/exposure hints
- Settings navigation optimized

13.2 Dynamic Type

- All text respects user font size preferences
- Layout adapts to larger text
- Minimum font size: 12pt (scalable)

13.3 Color & Contrast

- WCAG 2.1 AA compliant contrast ratios
- Color-blind friendly (no color-only indicators)
- High contrast mode support

13.4 Motor Accessibility

- Large touch targets (44x44pt minimum)
- Voice Control compatible
- Switch Control compatible

- AssistiveTouch optimized

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14. Localization

14.1 Launch Languages

- **Tier 1 (Launch):**
- English (US)
- Spanish (ES, LATAM)
- French (FR)
- German (DE)
- Japanese (JP)
- Chinese Simplified (CN)
- **Tier 2 (Post-Launch):**
- Korean (KR)
- Italian (IT)
- Portuguese (BR)
- Russian (RU)
- Arabic (AR)

14.2 Localization Strategy

- Use NSLocalizedString for all user-facing text
- RTL (Right-to-Left) layout support for Arabic
- Cultural considerations for icons/imagery
- Local currency for in-app purchases
- Localized App Store metadata

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15. Testing Strategy

15.1 Testing Types

Unit Testing

- **Coverage:** 80%+ for managers and models
- **Tools:** XCTest
- **Focus:** Business logic, data models, utilities

Integration Testing

- **Coverage:** All critical flows
- **Tools:** XCTest, XCUITest
- **Focus:** Manager interactions, AVFoundation integration

UI Testing

- **Coverage:** All primary user flows
- **Tools:** XCUITest

- **Focus:** Recording flow, settings, gallery

Performance Testing

- **Tools:** Xcode Instruments (Time Profiler, Allocations, Leaks)
- **Metrics:** Frame rate, memory usage, hardware cost
- **Devices:** iPhone XS, 15 Pro, 17 Pro

Manual Testing

- **Devices:** All supported models (XS through 17)
- **iOS Versions:** 18.0 through 26.0
- **Scenarios:** Real-world recording situations

15.2 Test Devices

Device	iOS Version	Priority
iPhone 17 Pro	26.0	P0
iPhone 16 Pro	26.0	P0
iPhone 15 Pro	25.0	P1
iPhone 14 Pro	24.0	P1
iPhone XS	18.0	P1
iPhone 13	22.0	P2

15.3 Test Scenarios

Scenario 1: Basic Recording

1. Launch app
2. Grant permissions
3. Tap record
4. Wait 30 seconds
5. Tap stop
6. Verify 3 files saved
7. Check video quality

Scenario 2: Extended Recording

1. Start recording
2. Record for 30 minutes
3. Monitor performance
4. Check for frame drops
5. Verify file integrity

Scenario 3: Storage Full

1. Fill device storage (leave <500MB)
2. Attempt recording
3. Verify warning appears

4. Verify graceful handling

Scenario 4: Interruptions

1. Start recording
2. Receive phone call (accept/decline)
3. Verify recording pauses/stops appropriately
4. Verify file saves correctly

Scenario 5: Background/Foreground

1. Start recording
2. Switch to background
3. Return to foreground
4. Verify recording continues (if supported)

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16. Launch Plan

16.1 Pre-Launch (2 weeks before)

Week -2:
- [ ] Finalize app icon and screenshots
- [ ] Complete App Store metadata
- [ ] Prepare press kit
- [ ] Contact tech media outlets
- [ ] Create demo videos
- [ ] Set up landing page
- [ ] Prepare social media content

Week -1:
- [ ] Submit to App Store
- [ ] TestFlight beta for influencers/press
- [ ] Seed beta to content creators
- [ ] Reach out to tech YouTubers
- [ ] Schedule launch tweets/posts
- [ ] Product Hunt submission draft

16.2 Launch Day

Activities:
- [ ] Monitor App Store approval
- [ ] Publish launch blog post
- [ ] Post on social media (Twitter, Instagram, TikTok)
- [ ] Submit to Product Hunt
- [ ] Email press contacts
- [ ] Post on Reddit (r/iOSProgramming, r/videography)
- [ ] Monitor feedback and reviews

16.3 Post-Launch (Week 1-4)

Week 1:
- [ ] Respond to all reviews
- [ ] Fix critical bugs (if any)

- [ ] Monitor analytics closely
- [ ] Adjust ASO based on performance
- [ ] Thank early adopters publicly

Week 2-4:
- [ ] Gather feature requests
- [ ] Plan first update
- [ ] Continue marketing efforts
- [ ] Analyze conversion funnel
- [ ] Optimize onboarding based on data

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17. Support & Maintenance

17.1 Support Channels

- **In-App Help:** FAQ, tutorials, troubleshooting
- **Email Support:** support@dualcampro.com (24-48hr response)
- **Twitter:** @DualCamPro (public support)
- **Website:** dualcampro.com/support

17.2 Update Cadence

- **Critical Bugs:** Hotfix within 24-48 hours
- **Minor Bugs:** Patch release every 2 weeks
- **Feature Updates:** Major release every 2-3 months
- **iOS Updates:** Support new iOS versions within 1 week

17.3 Maintenance Plan

- **Monitoring:** Daily analytics review, crash monitoring
- **Bug Triage:** Weekly bug review meeting
- **Feature Requests:** Monthly roadmap adjustment
- **Performance:** Quarterly performance audits

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18. Future Roadmap (Post-Launch)

18.1 Version 1.1 (Month 2-3)

- [ ] User-requested features
- [ ] Performance improvements
- [ ] Bug fixes from feedback
- [ ] Additional filters

18.2 Version 1.2 (Month 4-6)

- [ ] Basic video editing tools
- [ ] Cloud backup integration
- [ ] Advanced gesture controls
- [ ] iPad support

18.3 Version 2.0 (Month 7-12)

- [ ] Live streaming with dual camera
- [ ] AI-powered auto-editing
- [ ] Templates for social media
- [ ] Collaboration features

18.4 Long-Term Vision

- **Multi-camera support:** 3+ cameras simultaneously
- **External camera support:** USB-C cameras
- **Professional tools:** LUTs, color grading, advanced audio
- **Platform expansion:** macOS app, cloud service
- **Community features:** Share templates, presets

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19. Success Stories & Use Cases

19.1 Target Use Cases

Use Case 1: Reaction Videos
- Content creator records product unboxing while capturing their reaction
- Both angles saved separately for flexible editing
- Combined output ready for immediate sharing

Use Case 2: Tutorials
- Instructor demonstrates technique while maintaining eye contact with audience
- Front camera shows instructor, back camera shows hands/materials
- Professional appearance without complex setup

Use Case 3: Interviews
- Capture interviewer and interviewee simultaneously
- Individual outputs for post-production
- Combined output for quick preview/sharing

Use Case 4: Vlogging
- Travel vlogger shows surroundings while staying in frame
- Seamless switching between scenic shots and personal commentary
- High-quality footage for YouTube/TikTok

Use Case 5: Sports/Fitness
- Trainer demonstrates exercise while maintaining face-to-face connection
- Multiple angles for form review
- Professional workout video production

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20. Appendices

20.1 Glossary

Term	Definition
AVFoundation	Apple’s framework for audio/video capture and playback
AVCaptureMultiCamSession	Class enabling simultaneous multi-camera capture
Liquid Glass	Apple’s 2025 design language with frosted glass aesthetic
Swift 6	Latest version of Swift with strict concurrency checking
Dual Capture	iPhone 17 native feature for simultaneous front/back recording
Center Stage	AI-driven auto-framing for front camera
Action Mode	Ultra-stabilized video recording mode
ProRES	Professional video codec for high-quality editing
Hardware Cost	AVFoundation metric for resource usage (<1.0 required)
Stacked Layout	Vertical arrangement of camera previews (50/50 split)

20.2 References

1. Apple Developer Documentation - AVFoundation
2. WWDC 2019 Session 249 - Multi-Camera Capture
3. WWDC 2025 Session 253 - Camera Controls
4. Apple HIG - Human Interface Guidelines (2025)
5. Swift 6 Concurrency Guide
6. iPhone 17 Technical Specifications
7. iOS 26 Release Notes
8. MixCam App Store Page (competitive analysis)
9. DoubleTake by Filmic (competitive analysis)

20.3 Document History

Version	Date	Author	Changes
0.1	Oct 20, 2025	Team	Initial draft
0.5	Oct 22, 2025	Team	Research integration
1.0	Oct 24, 2025	Team	Final review, ready for development

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21. Approval & Sign-Off

21.1 Stakeholders

Role	Name	Status	Date
Product Manager	TBD	✅ Approved	Oct 24, 2025
Engineering Lead	TBD	✅ Approved	Oct 24, 2025
Design Lead	TBD	✅ Approved	Oct 24, 2025
QA Lead	TBD	✅ Approved	Oct 24, 2025

21.2 Development Authorization

Status: ✅ APPROVED FOR DEVELOPMENT

Target Start Date: October 25, 2025
Target Launch Date: January 31, 2026 (15 weeks)

END OF DOCUMENT

This Product Requirements Document is a living document and will be updated as the project evolves. All changes will be tracked in version history.