TIER-1 DESIGN READINESS SYSTEM

TIER-1
CONCEPT REVIEW



CRR
CONCEPT REVIEW REPORT

COMPILED BY:
TIER-1 ENGINEER, LLC

PREPARED FOR:

K. MILLER JUNGLE OUTFITTERS

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CONCEPT REVIEW OVERVIEW

- CONFIDENTIAL - PREPARED ONLY FOR:
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KMILL@MOBASE.COM

PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
CRR-11-0038	11/13/2011	K. MILLER JUNGLE OUTFITTERS

CLIENT TYPE
SMALL BUSINESS

CONCEPT NAME
RIFLE KEEPER

CONCEPT STAGE
PRE-PROTOTYPE

CONCEPT DESCRIPTION
A RIFLE/SHOTGUN HIP HOLSTER THAT FITS ONTO A BELT, IN ORDER TO RETAIN THE FIREARM IN A MORE FIXED POSITION WHEN USED IN CONJUNCTION WITH A SLING.

EST. QUANTITY
250 / YEAR

CONCEPT / DESIGN INTENT (INTENDED USE)

- BELT-MOUNTED
- RETAIN FOREND WHILE RUNNING
- EASY INSERTION/REMOVAL
- MINIMAL MOVEMENT IN USE
- MINIMAL NOISE
- MUST NOT LOSE RETENTION
- MINIMAL SNAGGING ON GEAR
- TOUGH AND RUGGED
- MUST WITHSTAND HARD USE
- MUST WITHSTAND OUTDOOR USE

INTENDED USER(S)
HUNTERS, HIKERS, MILITARY, SHOOTERS

KEY UNKNOWNS

- RETENTION POCKET UNIVERSALITY
- RETENTION FORCE NEEDED
- FLEXIBILITY NEEDED
- TARGET NUMBER OF DUTY CYCLES
- EASE OF INSERTION/REMOVAL

MAIN CLIENT CONCERNS

- MATERIAL CHOICE
- RETENTION FORCE
- INSERTION/REMOVAL EASE
- ENVIRONMENTAL DURABILITY
- POTENTIAL NOISE
- PROTOTYPING METHOD

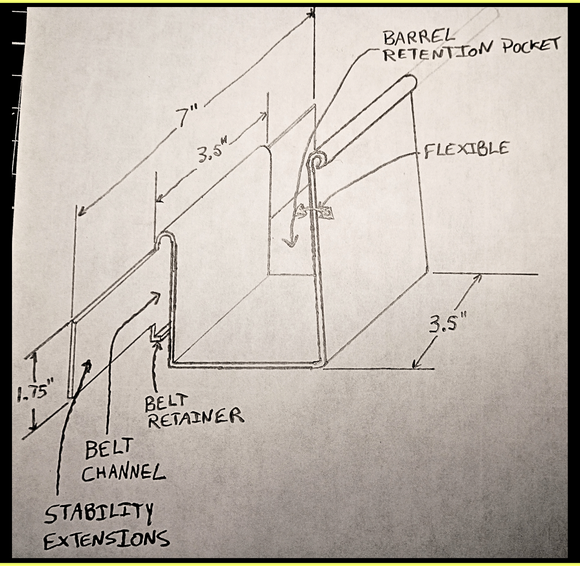
SUBMITTED CONCEPT MATERIALS

1. PRODUCT CONCEPT OVERVIEW
2. SKETCH: Rifle Keeper V3-ISO.png
3. SKETCH: Rifle Keeper V3-PROFILE.png

CONCEPT LEVEL

- **CONCEPT STATEMENT**
- **SKETCH**
- 2D DIMENSIONED DRAWING
- ROUGH CAD
- COMPLETE CAD
- PROTOTYPE
- EXISTING PRODUCT MODIFICATION

CONCEPT OVERVIEW



APPROXIMATE SIZE / SCALE
7.0" x 3.25" x 5.5"

PRIMARY FUNCTION
RETAIN A RIFLE/SHOTGUN FOREND ON THE HIP IN ORDER TO REDUCE SWINGING OF THE FIREARM

PROBLEM BEING SOLVED
RIFLES AND SHOTGUNS CARRIED ON A SLING CAN SWING, BOUNCE, SNAG, OR INTERFERE WITH HANDS-FREE WALKING, HIKING, CLIMBING, OR WORKING. THE CONCEPT IS INTENDED TO PROVIDE TEMPORARY HIP RETENTION OF THE FOREND/BARREL TO REDUCE UNCONTROLLED FIREARM MOVEMENT WHILE KEEPING THE FIREARM ACCESSIBLE FOR QUICK DEPLOYMENT.

EXPECTED LOADS / FORCES APPLIED
FIREARM WEIGHT, WALKING MOTION, BELT ROTATION, INSERTION / REMOVAL FORCE, BRUSH CONTACT, AND OCCASIONAL SNAGS OR IMPACTS DURING FIELD USE.

DESIRED FINISH / APPEARANCE
POWDER COATED - MULTIPLE COLORS

PREFERRED MATERIALS
SPRING STEEL

PREFERRED PROTOTYPE METHOD
NOT KNOWN

PREFERRED MANUFACTURING METHOD
NOT KNOWN

APPLICABLE ENVIRONMENTAL EXPOSURES

INDOOR	HIGH HEAT	**WET**	**DIRT / SAND / DUST**
OUTDOOR	**COLD**	SUBMERGED	MARINE
HEAT	**FREEZING**	**ABRASIVE**	CHEMICAL

TARGET PROTOTYPE COST	TARGET TOOLING BUDGET	TARGET UNIT COST
$2,500	NOT KNOWN	NOT KNOWN

CONCEPT REVIEW BRIEF

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CONCEPT INFORMATION

CONCEPT NAME

RIFLE KEEPER

CONCEPT DESCRIPTION

A RIFLE/SHOTGUN HIP HOLSTER THAT FITS ONTO A BELT, IN ORDER TO RETAIN THE FIREARM IN A MORE FIXED POSITION WHEN USED IN CONJUNCTION WITH A SLING.

CONCEPT FEASIBILITY

MOSTLY FEASIBLE

CONCEPT FEASIBILITY REFERS TO WHETHER THE SUBMITTED CONCEPT APPEARS PRACTICALLY CAPABLE OF SATISFYING THE STATED PURPOSE, USE CASE, AND BASIC DESIGN INTENT.

THE SUBMITTED CONCEPT APPEARS FEASIBLE AS A BELT-MOUNTED RETENTION DEVICE FOR REDUCING UNCONTROLLED FIREARM MOVEMENT DURING WALKING, HIKING, OR WORKING. HOWEVER, THE DESIGN **REQUIRES CLARIFICATION** OF RETENTION FORCE, FIREARM FIT RANGE, BELT STABILITY, MATERIAL BEHAVIOR, AND SAFE FIELD USE BEFORE MOVING FORWARD.

PROTOTYPE READINESS

READY FOR LEVEL 1 PROTOTYPE

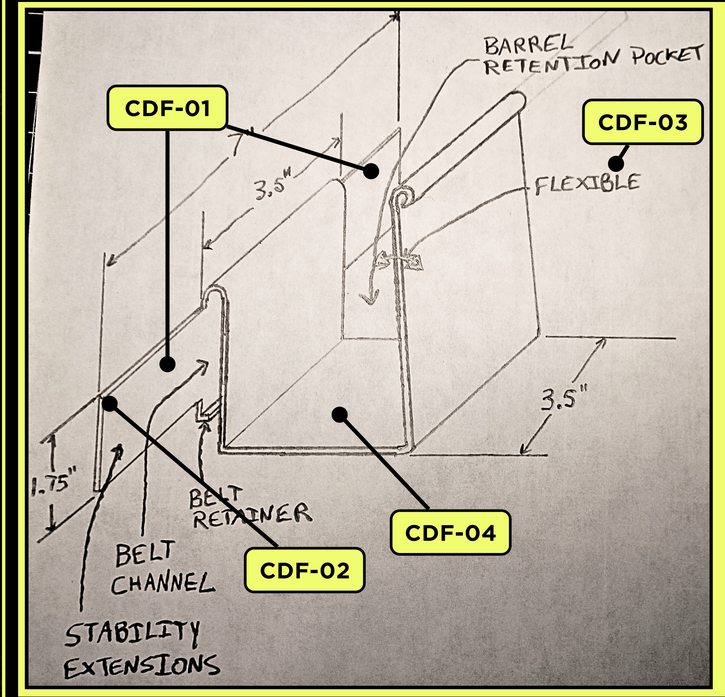
PROTOTYPE READINESS REFERS TO WHETHER THE SUBMITTED CONCEPT IS DEFINED WELL ENOUGH TO BEGIN PRACTICAL TESTING.

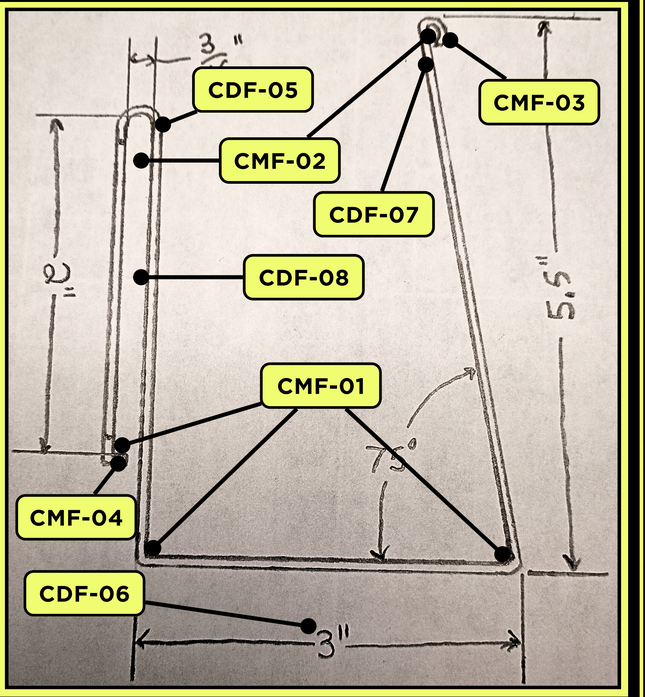
THE CONCEPT **IS READY** FOR A LOW-COST FORM / FIT PROTOTYPE (LEVEL 1) TO CHECK SIZE, BELT POSITION, USER MOTION, FIREARM FITMENT, AND BASIC INSERTION / REMOVAL. IT IS **NOT READY** FOR HIGHER-LEVEL FUNCTIONAL OR SPRING-STEEL RETENTION TESTING UNTIL THE RETENTION POCKET GEOMETRY, EDGE CONDITION, AND CONTACT SURFACES ARE REVISED TO ADDRESS STATED DESIGN / MANUFACTURABILITY FINDINGS.

TOP 3 CONCEPT ISSUES

CDF-03	FLEXIBILITY / RETENTION REQUIREMENT NOT WELL DEFINED	PAGE 1-3
CDF-05	MATERIAL / REQUIRED PROPERTIES NOT WELL DEFINED	PAGE 1-4
CMF-01	FORMED BENDS APPEAR TO HAVE ZERO / VERY SMALL BEND RADII	PAGE 1-5

CONCEPT CONCERNS IDENTIFIED





CONCEPT DESIGN FINDINGS	8	PAGE 1-3 - 1-4
CONCEPT MANUFACTURABILITY FINDINGS	4	PAGE 1-5

RECOMMENDED NEXT STEPS

QUANTIFY & FINALIZE REQUIREMENTS

↓

REVISE DESIGN CONCEPT AS NEEDED; CREATE 3D CAD

↓

PROCEED TO PROTOTYPING & TESTING

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PRE-PROTOTYPE

EST. QUANTITY
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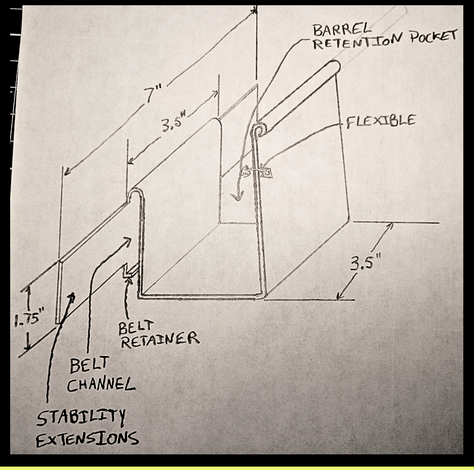
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CONCEPT UNDER REVIEW

FILE	FILE TYPE	UNITS
Rifle Keeper V3-ISO.png	PNG	IMPERIAL



TIER-1 CONCEPT REVIEW

CRR

SECTION 1

CONCEPT DESIGN REVIEW

THIS SECTION EVALUATES THE SUBMITTED CONCEPT AGAINST THE STATED DESIGN INTENT, USE CASE, AND PRACTICAL REQUIREMENTS. IT REVIEWS HIGH-LEVEL DESIGN ALIGNMENT, FIT, FUNCTION, USABILITY, FIELD-USE CONCERNS, AND EARLY MANUFACTURABILITY RISKS

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SECTION 1
CONCEPT DESIGN REVIEW

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CONCEPT INFORMATION

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CONCEPT DESIGN SUMMARY

THE SUBMITTED CONCEPT GENERALLY ALIGNS WITH THE STATED INTENT OF PROVIDING A BELT-MOUNTED RETENTION AID FOR REDUCING UNCONTROLLED RIFLE OR SHOTGUN MOVEMENT WHILE WALKING, HIKING, OR WORKING HANDS-FREE. THE OVERALL DESIGN APPROACH, HIP-MOUNTED LOCATION, OPEN CRADLE GEOMETRY, AND FLEXIBLE RETENTION CONCEPT APPEAR REASONABLE FOR AN EARLY-STAGE CONCEPT.

THE DESIGN **SHOULD NOT BE CONSIDERED READY FOR HIGHER-LEVEL FUNCTIONAL PROTOTYPING** AS SUBMITTED. SEVERAL DESIGN DETAILS SHOULD BE CONSIDERED BEFORE MOVING BEYOND A LEVEL 1 FORM / FIT PROTOTYPE, INCLUDING RETENTION FORCE DEFINITION, BELT ROTATION CONTROL, FIREARM CONTACT SURFACES, EDGE CONDITIONS, FOREND / BARREL LEAD-IN, AND COMPATIBILITY WITH DIFFERENT FIREARM PROFILES.

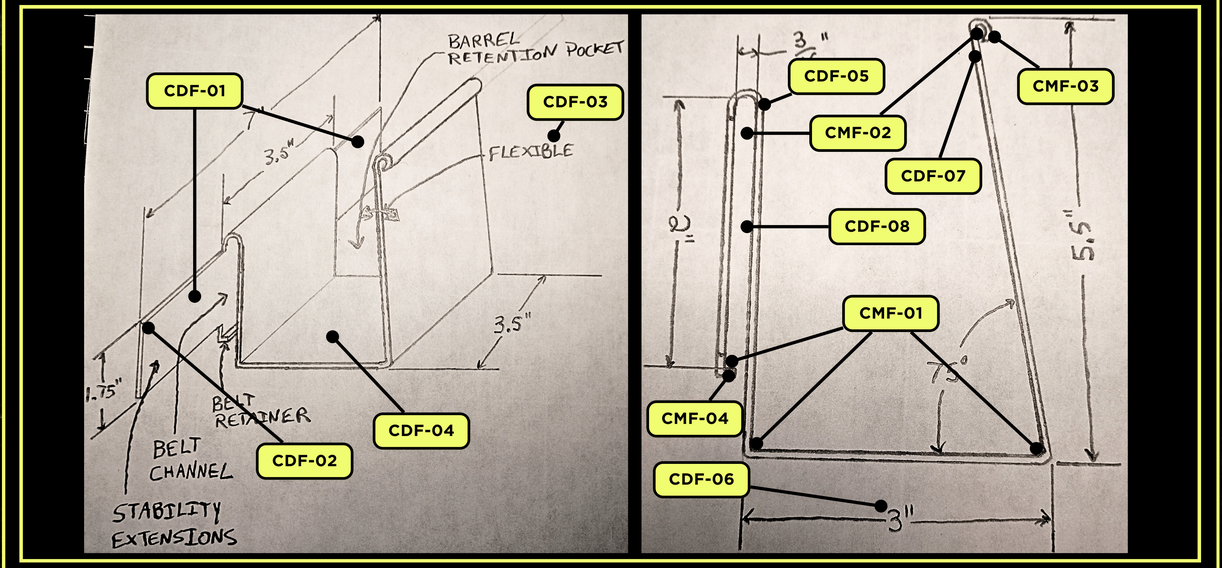
THE RECOMMENDED NEXT STEP IS TO **REVISE THE CONCEPT GEOMETRY, CREATE 3D CAD OF THE CONCEPT, AND PROCEED TO LEVEL 1 PROTOTYPING AND TESTING**.

CONCEPT DESIGN MATURITY

CONSIDER REVISIONS

DESIGN FINDINGS	8
MANUFACTURABILITY FINDINGS	4

CONCEPT REVIEW FINDINGS



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SECTION 1
CONCEPT DESIGN REVIEW

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CONCEPT ALIGNMENT FACTORS

DESIGN APPROACH

DOES THE BASIC FORM, MECHANISM, LAYOUT, OR APPROACH MAKE SENSE FOR THE INTENDED PURPOSE?

DESIGN APPROACH
BELT-MOUNTED, FLEXIBLE RETENTION HOLSTER THAT RETAINS THE FIREARM AGAINST THE USER'S HIP, HANDS-FREE

THE GENERAL DESIGN APPROACH SUPPORTS THE INTENDED PURPOSE. A HIP-MOUNTED RETENTION HOLSTER IS A PRACTICAL DIRECTION FOR REDUCING FIREARM SWING WHILE KEEPING BOTH HANDS AVAILABLE. HOWEVER, THE CURRENT GEOMETRY NEEDS REFINEMENT TO IMPROVE STABILITY, COMFORT, INSERTION, AND FIELD USE.

CONCEPT ALIGNMENT:
MOSTLY ALIGNED

ACTION NEEDED:
FINALIZE RETENTION NEEDS AND CONSIDER DESIGN UPDATES ACCORDING TO FINDINGS IN THIS REPORT

PRIMARY FUNCTION

DOES THE CONCEPT APPEAR CAPABLE OF PERFORMING THE PRIMARY JOB IT WAS CREATED FOR?

PRIMARY FUNCTION
TEMPORARILY RETAIN THE FOREND OR BARREL AREA OF A SLUNG RIFLE OR SHOTGUN.

THE CONCEPT APPEARS CAPABLE OF SUPPORTING THE PRIMARY FUNCTION, BUT THE REQUIRED RETENTION BEHAVIOR IS NOT YET DEFINED. THE DESIGN NEEDS TO PROVE THAT IT CAN HOLD THE FIREARM STEADY DURING MOVEMENT WHILE STILL ALLOWING SMOOTH INSERTION AND REMOVAL.

CONCEPT ALIGNMENT:
MOSTLY ALIGNED

ACTION NEEDED:
DEFINE RETENTION FORCE, RELEASE FORCE, FIT RANGE, AND REPEATED-USE REQUIREMENTS

PERFORMANCE REQUIREMENTS

DOES THE CONCEPT APPEAR ROBUST ENOUGH TO MEET EXPECTED LOAD, MOTION, OR DURABILITY NEEDS?

PERFORMANCE REQUIREMENTS
USE FLEXIBLE MATERIAL BEHAVIOR TO PROVIDE RETENTION WHILE RESISTING WALKING/RUNNING MOTION, SNAGGING, AND FIELD USE.

THE PERFORMANCE REQUIREMENTS ARE NOT DEFINED WELL ENOUGH FOR CONFIDENCE IN THE CURRENT DESIGN. RETENTION FORCE, FLEX LIFE, BELT ROTATION, IMPACT LOADS, INSERTION EASE, AND DUTY CYCLES SHOULD BE ESTABLISHED BEFORE THE DESIGN CAN BE CONSIDERED MECHANICALLY SOUND.

CONCEPT ALIGNMENT:
NEEDS DEFINED

ACTION NEEDED:
DEFINE RETENTION FORCE, RELEASE FORCE, FIT RANGE, AND REPEATED-USE REQUIREMENTS

USE ENVIRONMENT

DOES THE CONCEPT APPEAR SUITABLE FOR THE EXPECTED USAGE ENVIRONMENTS?

USE ENVIRONMENT
OUTDOOR FIELD USE DURING HUNTING, HIKING, WALKING, WORKING, AND ROUGH HANDLING.

THE CONCEPT DIRECTION MATCHES THE EXPECTED USE ENVIRONMENT, BUT THE DESIGN SHOULD BETTER ACCOUNT FOR DIRT, WATER, BRUSH, COLD WEATHER, GLOVES, GEAR CONTACT, AND ABRASION. FIELD USE WILL LIKELY EXPOSE WEAKNESSES THAT ARE NOT OBVIOUS IN THE SKETCH.

CONCEPT ALIGNMENT:
MOSTLY ALIGNED

ACTION NEEDED:
PROTOTYPE WITH REPRESENTATIVE MATERIAL AND COATING, AND TEST DURABILITY

DESIGN PRACTICALITY

DOES THE CONCEPT APPEAR PRACTICAL, BUILDABLE, TESTABLE, AND COST EFFECTIVE?

DESIGN PRACTICALITY
SIMPLE FORMED RETENTION DEVICE WITH LOW PART COUNT AND BASIC BELT ATTACHMENT.

THE CONCEPT IS PRACTICAL IN OVERALL DIRECTION BECAUSE IT USES A SIMPLE BODY, OPEN RETENTION POCKET, AND LIMITED NUMBER OF FEATURES. HOWEVER, THE TIGHT BENDS, ROLLED EDGES, SHORT BELT RETAINER, AND FLEXIBLE RETENTION FEATURE MAY CREATE PRODUCTION COMPLEXITY IF NOT REVISED EARLY.

CONCEPT ALIGNMENT:
MOSTLY ALIGNED

ACTION NEEDED:
ADDRESS FORMABILITY ISSUES AND ANY ERGONOMIC CONCERNS OUTLINED IN THIS REPORT

SPECIAL FEATURES

DO ANY UNIQUE FEATURES APPEAR NECESSARY AND WORKABLE FOR THE INTENDED CONCEPT PURPOSE?

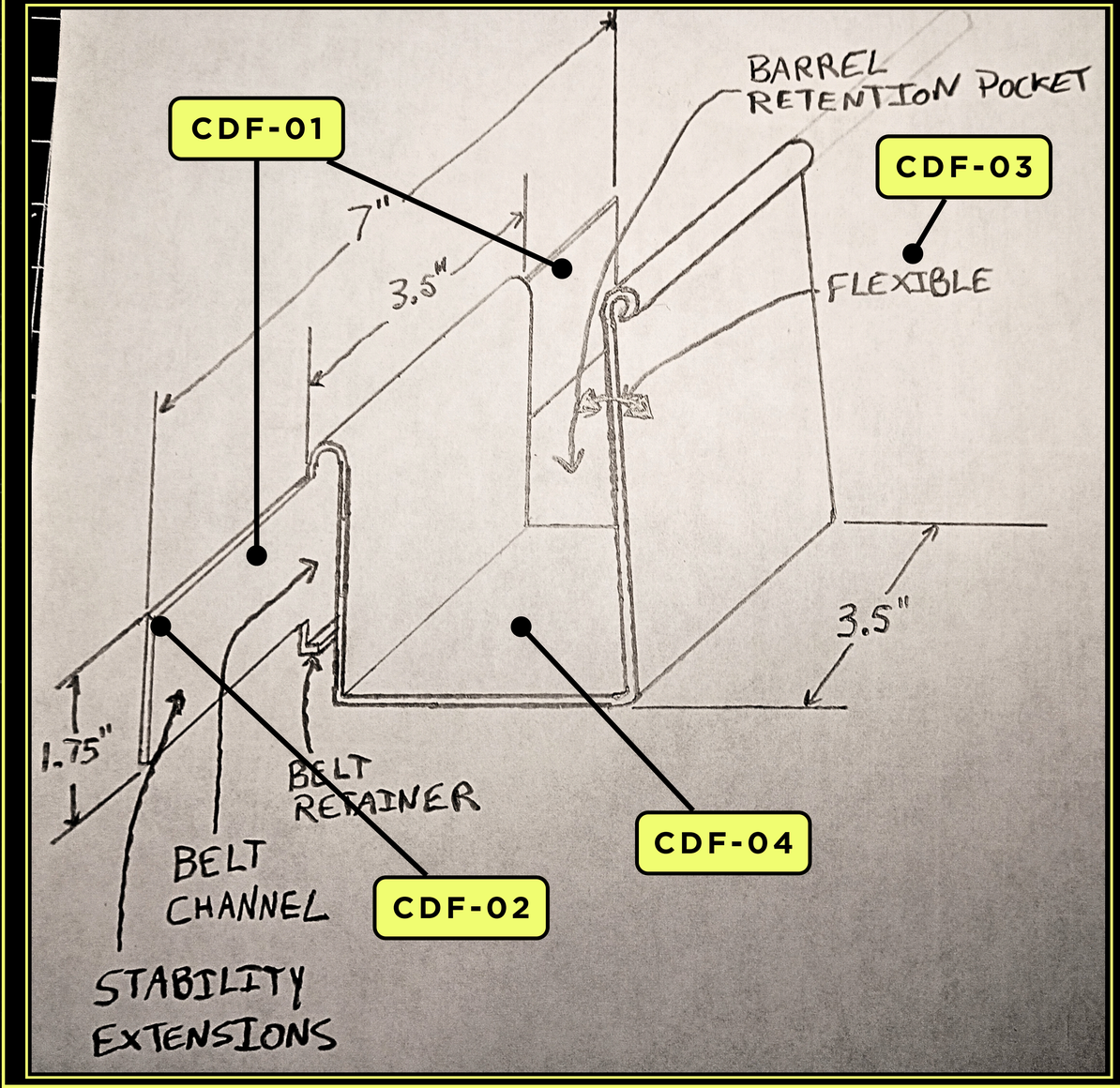
SPECIAL FEATURES
FLEXIBLE RETENTION POCKET, STABILITY EXTENSIONS, BELT RETAINER, AND FORMED EDGE FEATURES.

THE SPECIAL FEATURES MAY SUPPORT THE INTENDED PURPOSE, BUT THEY EACH NEED TO PROVE THEIR VALUE. FLEX RETENTION, STABILITY EXTENSIONS, AND FORMED EDGE FEATURES COULD HELP FUNCTION, BUT THEY MAY ALSO CREATE SNAGGING, DISCOMFORT, FIREARM WEAR, HARD RELEASE, OR MANUFACTURING DIFFICULTY.

CONCEPT ALIGNMENT:
NEEDS VALIDATED

ACTION NEEDED:
VALIDATE THESE DESIGN FEATURES THROUGH PROTOTYPE TESTING

CONCEPT DESIGN FINDINGS 01-04



CDF-01 — LONG, FLAT STABILITY EXTENSIONS

ISSUE SEVERITY

THE LONG FLAT STABILITY EXTENSIONS MAY HELP CONTROL ROTATION, BUT THEY MAY NOT MATCH BODY CURVATURE AND COULD CREATE PRESSURE POINTS, SNAGGING, OR COMFORT ISSUES DURING FIELD USE.

TOP RISK AREAS: ERGONOMICS

POSSIBLE SOLUTION(S)
SHORTEN THE EXTENSIONS, ROUND THE ENDS, OR FORM THEM TO BETTER MATCH BODY CURVATURE.

CDF-02 — SHARP EDGES AND CORNERS

ISSUE SEVERITY

THE BENT SHEET-STYLE CONCEPT MAY CREATE EXPOSED EDGES THAT CUT HANDS, SNAG CLOTHING, CATCH BRUSH, OR SCRATCH THE FIREARM.

TOP RISK AREAS: SAFETY, ERGONOMICS

POSSIBLE SOLUTION(S)
ADD EDGE RADIUS, ROLLED EDGES, DEBURRING, EDGE TRIM, OR A PROTECTIVE LINER.

CDF-03 — FLEXIBILITY / RETENTION REQUIREMENT IS NOT WELL DEFINED

ISSUE SEVERITY

THE CONCEPT DEPENDS ON FLEXIBLE RETENTION, BUT THE REQUIRED GRIP FORCE, RELEASE FORCE, AND MAX DUTY-CYCLES ARE NOT DEFINED.

TOP RISK AREAS: FUNCTION LOSS

POSSIBLE SOLUTION(S)
DEFINE RETENTION FORCE TARGETS BY TESTING A SIMPLE SPRING OR FLEX RETENTION PROTOTYPE.

CDF-04 — POWDER COATED STEEL MAY BE ABRASIVE TO FORENDS AND BARRELS

ISSUE SEVERITY

POWDER COATED STEEL MAY CREATE A HARD CONTACT SURFACE THAT CAN RUB, SCRATCH, OR WEAR FIREARM FORENDS, BARRELS, OR FINISHES DURING REPEATED USE.

TOP RISK AREAS: ABRASION, CORROSION

POSSIBLE SOLUTION(S)
ADD A SOFT CONTACT LINER, WEAR PAD, RUBBER INSERT, POLYMER SLEEVE, OR REPLACEABLE CONTACT SURFACE.

RISK AREA KEY

ERGONOMICS
MAY AFFECT USER COMFORT, HANDLING, ACCESS, MOTION, OR EASE OF USE.

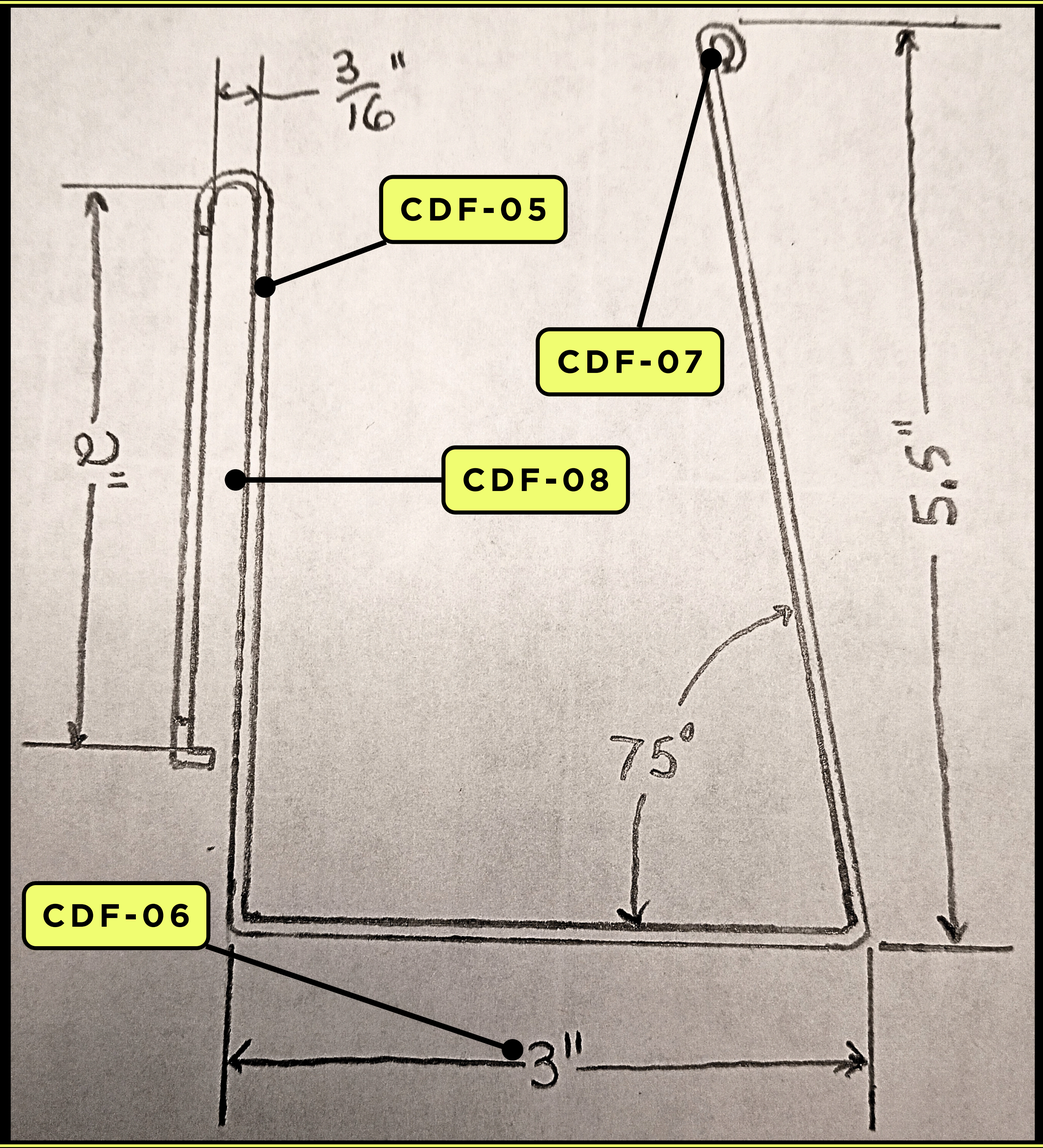
SAFETY
MAY CREATE CUT, PINCH, IMPACT, MISUSE, OR USER HAZARD CONCERNS.

FUNCTION LOSS
MAY REDUCE PERFORMANCE OF THE INTENDED PRIMARY FUNCTION.

ABRASION
MAY CREATE RUBBING, SCRATCHING, WEAR, SURFACE DAMAGE, OR CONTACT DAMAGE.

CORROSION
MAY ALLOW RUST, OXIDATION, MOISTURE DAMAGE, OR DEGRADATION.

CONCEPT DESIGN FINDINGS 05-08



CDF-05 — MATERIAL AND REQUIRED MATERIAL PROPERTIES NOT WELL DEFINED

ISSUE SEVERITY

MATERIAL SELECTION CANNOT BE FINALIZED UNTIL THE REQUIRED FLEXIBILITY, RETENTION FORCE, TOUGHNESS, CORROSION RESISTANCE, AND FIELD DURABILITY ARE BETTER DEFINED.

TOP RISK AREAS
- FUNCTION LOSS

POSSIBLE SOLUTION(S)
DEFINE REQUIRED MATERIAL BEHAVIOR FIRST, THEN COMPARE MATERIAL GRADES TO DETERMINE BEST FIT.

CDF-06 — 3" RETAINER WIDTH MAY NOT BE AS UNIVERSAL AS POSSIBLE

ISSUE SEVERITY

A 3 INCH RETAINER WIDTH MAY NOT FIT THE INTENDED RANGE OF FORENDS, BARRELS, HANDGUARDS, AND FIREARM PROFILES WITHOUT EXCESSIVE LOOSENESS OR INTERFERENCE.

TOP RISK AREAS
- FUNCTION LOSS

POSSIBLE SOLUTION(S)
MEASURE TARGET FIREARM PROFILES AND SIZE THE RETENTION POCKET AROUND THE AVERAGE FIT RANGE.

CDF-07 — LACK OF BARREL / FOREND LEAD-IN MAY REDUCE EASE OF USE

ISSUE SEVERITY

THE STRAIGHT POCKET OPENING MAY MAKE INSERTION HARDER DURING WALKING, GLOVED USE, LOW VISIBILITY, OR ONE-HANDED OPERATION.

TOP RISK AREAS
- FUNCTION LOSS
- ERGONOMICS

POSSIBLE SOLUTION(S)
ADD AN ANGLED LEAD-IN, FLARED ENTRY, ROUNDED MOUTH, OR GUIDED INSERTION FEATURE.

CDF-08 — SITTING HIGH ON THE BELT MAY INTRODUCE UNWANTED ROTATION / INSTABILITY

ISSUE SEVERITY

THE HIGH BELT POSITION MAY PLACE THE FIREARM LOAD TOO FAR ABOVE THE BELT LINE, INCREASING ROTATION, TIPPING, AND INSTABILITY DURING MOVEMENT.

TOP RISK AREAS
- FUNCTION LOSS
- ERGONOMICS

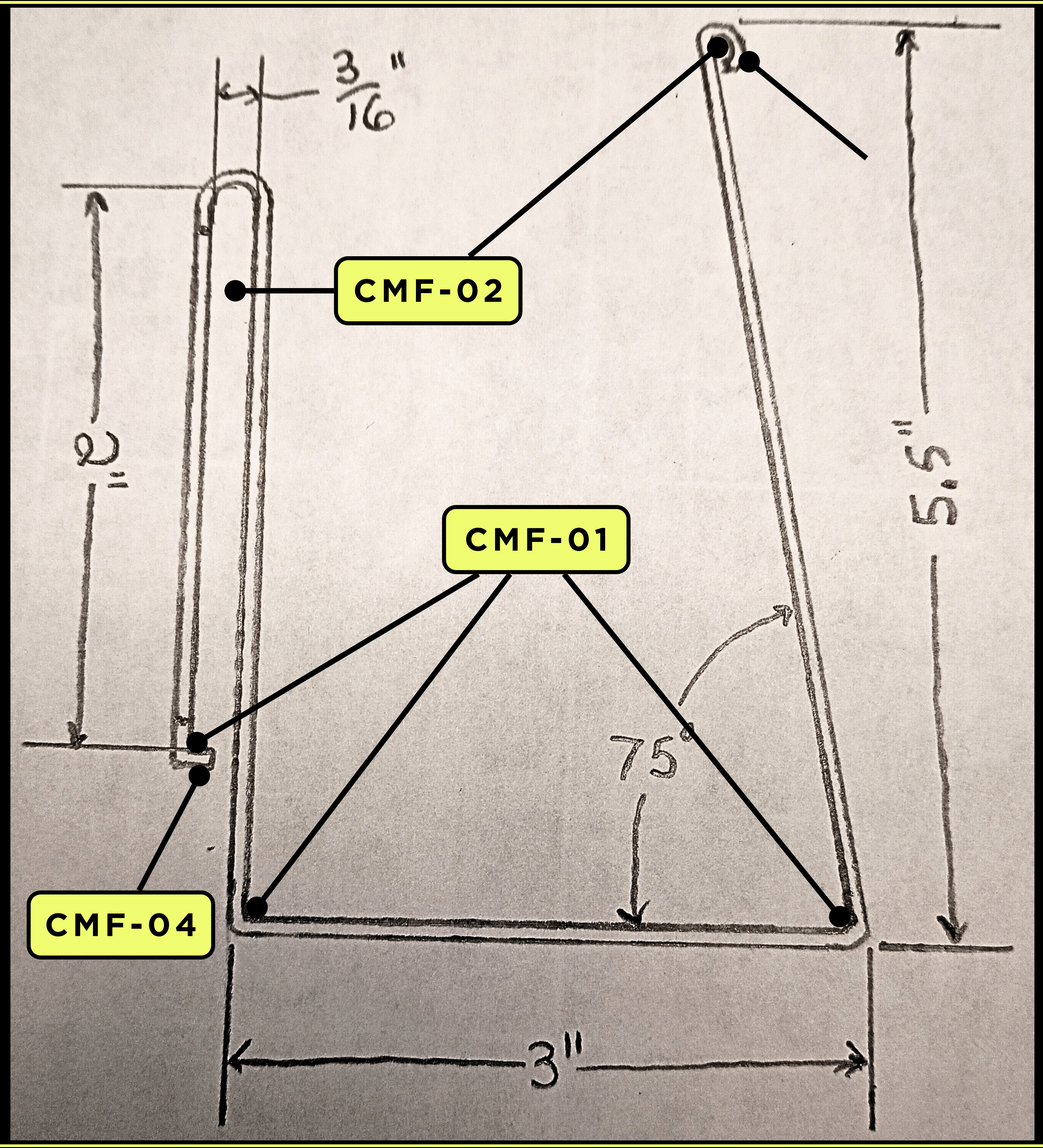
POSSIBLE SOLUTION(S)
LOWER THE RETENTION POCKET, WIDEN THE BELT INTERFACE, OR ADD A SECOND STABILIZING CONTACT POINT.

RISK AREA KEY

ERGONOMICS
MAY AFFECT USER COMFORT, HANDLING, ACCESS, MOTION, OR EASE OF USE.

FUNCTION LOSS
MAY REDUCE PERFORMANCE OF THE INTENDED PRIMARY FUNCTION.

CONCEPT MANUFACTURABILITY FINDINGS 01-04



CMF-01 — FORMED BENDS APPEAR TO HAVE ZERO OR VERY SMALL BEND RADII

ISSUE SEVERITY

THE SHARP OR NEAR-ZERO BEND RADII MAY BE DIFFICULT TO FORM CONSISTENTLY AND COULD CREATE CRACKING, TEARING, OR SPRINGBACK CONTROL ISSUES.

TOP RISK AREAS: DFM

POSSIBLE SOLUTION(S)
INCREASE BEND RADII TO MATCH MATERIAL THICKNESS, MATERIAL TYPE, AND FORMING METHOD.

CMF-02 — MOSTLY-ENCLOSED AREAS MAY PREVENT FULL POWDER COAT COVERAGE

ISSUE SEVERITY

MOSTLY ENCLOSED POCKET AREAS MAY BLOCK POWDER COATING ACCESS AND CREATE UNCOATED INTERNAL SURFACES THAT CAN TRAP MOISTURE AND CORRODE.

TOP RISK AREAS: QUALITY, DFM, CORROSION

POSSIBLE SOLUTION(S)
OPEN THE ENCLOSED AREAS, ADD COATING ACCESS, USE E-COAT FIRST, OR CHANGE THE FINISH STRATEGY.

CMF-03 — ROLLED EDGE MAY BE VERY DIFFICULT TO FORM

ISSUE SEVERITY

THE ROLLED EDGE MAY BE DIFFICULT TO FORM IN SPRING MATERIAL WITHOUT SPECIAL TOOLING, EXTRA OPERATIONS, OR INCONSISTENT EDGE QUALITY.

TOP RISK AREAS: QUALITY, DFM

POSSIBLE SOLUTION(S)
INCREASE THE ROLL RADIUS, SIMPLIFY THE EDGE FORM, OR USE A SEPARATE EDGE TRIM OR LINER.

CMF-04 — BELT RETAINER IS VERY SHORT; MAY BE DIFFICULT TO FORM ACCURATELY

ISSUE SEVERITY

THE SHORT BELT RETAINER TAB MAY BE HARD TO FORM ACCURATELY AND MAY NOT PROVIDE ENOUGH FEATURE LENGTH FOR CONSISTENT TOOLING CONTROL.

TOP RISK AREAS: QUALITY, DFM

POSSIBLE SOLUTION(S)
LENGTHEN THE TAB, SIMPLIFY THE BEND, OR CHANGE TO A SEPARATE FASTENED BELT RETENTION FEATURE.

RISK AREA KEY

QUALITY
MAY CREATE INCONSISTENCY, DEFECTS, POOR FIT, OR RELIABILITY ISSUES.

DFM / MFG
MAY CREATE MANUFACTURING, TOOLING, ASSEMBLY, OR PRODUCTION ISSUES.

CORROSION
MAY ALLOW RUST, OXIDATION, MOISTURE DAMAGE, OR DEGRADATION.

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KMILL@MOBASE.COM

PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
CRR-11-0038	11/13/2011	K. MILLER JUNGLE OUTFITTERS

CLIENT TYPE	CONCEPT NAME
SMALL BUSINESS	RIFLE KEEPER

CONCEPT STAGE
PRE-PROTOTYPE

EST. QUANTITY
250 / YEAR

CONCEPT DESCRIPTION

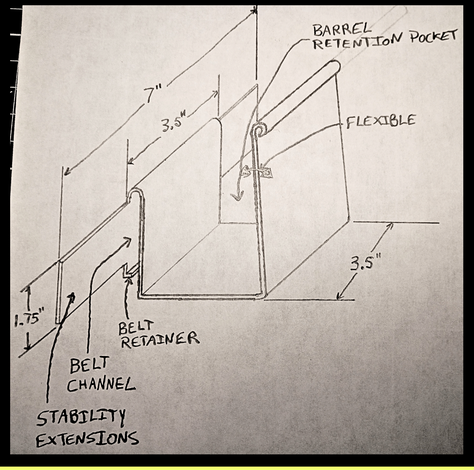
A RIFLE/SHOTGUN HIP HOLSTER THAT FITS ONTO A BELT, IN ORDER TO RETAIN THE FIREARM IN A MORE FIXED POSITION WHEN USED IN CONJUNCTION WITH A SLING.

CONCEPT / DESIGN INTENT (INTENDED USE)

- BELT-MOUNTED
- RETAIN FOREND WHILE RUNNING
- EASY INSERTION/REMOVAL
- MINIMAL MOVEMENT IN USE
- MINIMAL NOISE
- MUST NOT LOSE RETENTION
- MINIMAL SNAGGING ON GEAR
- TOUGH AND RUGGED
- MUST WITHSTAND HARD USE
- MUST WITHSTAND OUTDOOR USE

CONCEPT UNDER REVIEW

FILE	FILE TYPE	UNITS
Rifle Keeper V3-ISO.png	PNG	IMPERIAL



TIER-1 CONCEPT REVIEW

CRR

SECTION 2

PROTOTYPE DEVELOPMENT PLAN

THIS SECTION DEFINES THE RECOMMENDED PROTOTYPE PLAN FOR THE SUBMITTED CONCEPT. IT IDENTIFIES PRACTICAL PROTOTYPE LEVELS, TESTING CATEGORIES, METHOD SELECTION, MATERIAL OPTIONS, AND ANY KEY ITEMS THAT SHOULD BE PROVEN BEFORE REFINED CAD, SUPPLIER DISCUSSION, OR PRODUCTION PLANNING.

PROTOTYPE PLAN OVERVIEW	2-1
PROTOTYPE TESTING CATEGORIES	2-2
PROTOTYPE TESTING CATEGORIES, CONT.	2-3

SECTION 2
PROTOTYPE DEVELOPMENT PLAN

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CONCEPT PROTOTYPE PLAN

1. **REVISE GEOMETRY ACCORDING TO FINDINGS, AND CREATE 3D CAD**
   UPDATE THE CONCEPT GEOMETRY TO ADDRESS THE IDENTIFIED CONCERNS, AND DEVELOP 3D CAD MODEL.
2. **BUILD LEVEL 1 PROTOTYPE AND TEST LEVEL 1 ITEMS**
   USE FDM TO TEST FORM, FIT, BELT POSITION, FIREARM FITMENT, INSERTION PATH, AND BASIC HANDLING.
3. **REVISE DESIGN BASED ON LEVEL 1 TESTING**
   CORRECT SIZE, CLEARANCE, FIT, COMFORT, LEAD-IN, AND USER-INTERFACE ISSUES FOUND DURING LEVEL 1 TESTING.
4. **BUILD LEVEL 2 PROTOTYPE AND TEST LEVEL 2 ITEMS**
   USE SLS TO TEST PRIMARY FUNCTION, REPEATED HANDLING, INSERTION / REMOVAL, AND USER INTERACTION.
5. **REVISE DESIGN BASED ON LEVEL 2 TESTING**
   CORRECT RETENTION, WEAR, DURABILITY, FIT-RANGE, AND FIELD-USE ISSUES FOUND DURING LEVEL 2 TESTING.
6. **BUILD LEVEL 3 PROTOTYPE AND TEST FINAL RETENTION BEHAVIOR**
   USE HAND-FORMED SPRING STEEL TO TEST NEARLY PRODUCTION-REPRESENTATIVE PERFORMANCE.

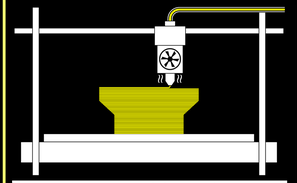
PROTOTYPE RECOMMENDATIONS

TESTING CATEGORY	RECOMMENDED PROTOTYPE LEVEL		
	LEVEL 1	LEVEL 2	LEVEL 3
FIT / FORM	■		
PRIMARY FUNCTION		■	
MECHANICAL PERFORMANCE			■
USER INTERACTION		■	
DURABILITY / ENVIRONMENT			■
SAFETY / MISUSE			■

PROTOTYPE METHOD RECOMMENDATIONS

CONCEPT NAME
RIFLE KEEPER

PROTOTYPE LEVEL 1



SHAPE ACCURACY

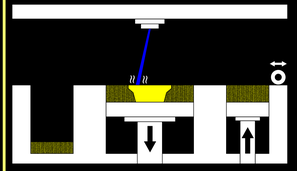
FUSED DEPOSITION MODELING (FDM 3D PRINT) — 3D CAD REQUIRED

USE FDM AS THE FIRST PROTOTYPE LEVEL TO CHECK BASIC SIZE, SHAPE, BELT POSITION, CLEARANCE, INSERTION PATH, AND USER HANDLING. THIS LEVEL IS BEST FOR FAST FORM / FIT LEARNING BEFORE SPENDING MONEY ON HIGHER-FIDELITY FUNCTIONAL PROTOTYPES.

ADVANTAGES
- LOW COST
- FAST TURNAROUND
- MULTIPLE MATERIAL OPTIONS
- RAPID DESIGN ITERATION

DISADVANTAGES
- WEAK LAYER STRENGTH
- LIMITED FLEXIBILITY
- LOW DURABILITY
- ORIENTATION-DEPENDENT STRENGTH

PROTOTYPE LEVEL 2



SHAPE ACCURACY

SELECTIVE LASER SINTERING (SLS 3D PRINT) — 3D CAD REQUIRED

USE SLS AFTER BASIC GEOMETRY IS CONFIRMED AND HIGHER-LEVEL FUNCTIONAL TESTING IS NEEDED. THIS LEVEL IS BETTER FOR REPEATED HANDLING, FIELD MOTION, CONTACT WEAR, RETENTION FEEL, AND TOUGHNESS CHECKS THAN BASIC FDM PRINTING.

ADVANTAGES
- STRONGER THAN FDM
- GOOD FUNCTIONAL PROPERTIES
- HIGH SHAPE COMPLEXITY
- HIGH DIMENSIONAL ACCURACY

DISADVANTAGES
- HIGHER COST
- SLOWER TURNAROUND
- LIMITED MATERIAL OPTIONS
- INACCURATE SPRING BEHAVIOR

PROTOTYPE LEVEL 3



SHAPE ACCURACY

HAND-FORMED

USE A HAND-FORMED SPRING STEEL PROTOTYPE WHEN THE CONCEPT DEPENDS ON REAL FLEX, PINCH FORCE, RELEASE FORCE, EDGE CONDITION, AND METAL CONTACT BEHAVIOR. THIS LEVEL IS BEST FOR PROVING THE ACTUAL RETENTION PRINCIPLE BEFORE REFINED DESIGN.

ADVANTAGES
- PRODUCTION-INTENT MATERIAL
- ACCURATE FUNCTIONAL PROPERTIES
- PRODUCTION-INTENT FEEDBACK
- FIELD-TEST READY

DISADVANTAGES
- HIGH BUILD EFFORT
- LESS SHAPE ACCURACY
- DIFFICULT TO ITERATE
- LARGE TIME COMMITMENT

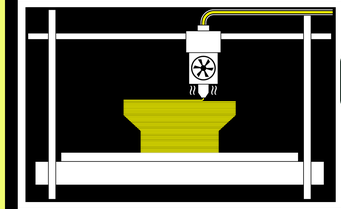
SECTION 2
PROTOTYPE DEVELOPMENT PLAN

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PROTOTYPE TESTING CATEGORIES

FIT / FORM

DOES THE CONCEPT'S BASIC SHAPE, SIZE, AND PHYSICAL LAYOUT SUPPORT THE INTENDED USE?



REASONABLE PROTOTYPING METHOD

LEVEL 1 — FDM 3D PRINT

REASONABLE MATERIAL(S):

- PLA+
- PETG
- ABS
- ASA

PROTOTYPE STRATEGY

USE FDM AS A LOW-COST FIRST CHECK. CREATE A SIMPLE CAD MODEL, PRINT MULTIPLE VARIATIONS, AND ORIENT PRINT LAYERS TO AVOID OBVIOUS WEAKNESS IN THE MAIN HANDLING DIRECTION. PRIORITIZE SIZE, CLEARANCE, BELT POSITION, AND INSERTION PATH.

TEST PLAN

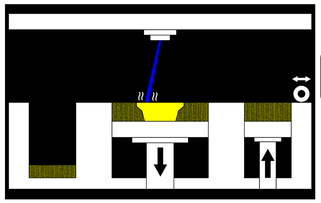
OVERALL SHAPE / FORM	ANALYZE SHAPE AND CONFIRM THE CRADLE HEIGHT, POCKET DEPTH, ANGLE, AND LEAD-IN FEEL REASONABLE DURING BASIC HANDLING.
BELT FITMENT	CHECK BELT SLOT WIDTH, BELT THICKNESS CLEARANCE, RIDE HEIGHT, BODY CONTACT, AND WHETHER THE HOLSTER STAYS PUT.
FIREARM FITMENT	CHECK FOREND/BARREL CLEARANCE AND FITMENT, INSERTION EASE, CONTACT POINTS, AND REMOVAL MOTION.
LIGHT USER ERGONOMICS	CHECK WALKING, BENDING, CROUCHING, REACHING, AND TWO-HAND USE TO IDENTIFY DISCOMFORT, SNAGGING, OR AWKWARD MOTION.

LIMITATIONS

FDM PLASTIC IS APPROPRIATE FOR EARLY SHAPE AND FIT CHECKS, BUT IT IS NOT REPRESENTATIVE OF THE FINAL METAL PART. LAYER DIRECTION, PRINT INFILL, NOZZLE SIZE, MATERIAL SHRINKAGE, AND PLASTIC STIFFNESS CAN DISTORT FIT, EDGE FEEL, FLEX RESPONSE, AND CONTACT BEHAVIOR.

PRIMARY FUNCTION

DOES THE CONCEPT PERFORM THE MAIN JOB IT WAS CREATED TO DO?



REASONABLE PROTOTYPING METHOD

LEVEL 2 — SLS 3D PRINT

REASONABLE MATERIAL(S):

- PA12
- PA11
- PA12-GF

PROTOTYPE STRATEGY

USE SLS AFTER BASIC SHAPE IS DEFINED. CREATE A CAD MODEL WITH THE INTENDED RETENTION POCKET, CONTACT SURFACES, AND FIT RANGE. ORDER FROM AN SLS PROTOTYPE SUPPLIER AND TEST BASIC HOLDING, INSERTION, REMOVAL, AND SWING CONTROL.

TEST PLAN

RETENTION FUNCTION	CHECK WHETHER THE CONCEPT HOLDS THE FIREARM IN POSITION WITHOUT UNWANTED RELEASE DURING BASIC USE.
INSERTION / REMOVAL	CHECK WHETHER THE FIREARM CAN BE INSERTED AND REMOVED SMOOTHLY WITHOUT BINDING, SNAGGING, OR AWKWARD MOTION.
SWING CONTROL	CHECK WHETHER THE CONCEPT REDUCES UNWANTED MOVEMENT, ROTATION, OR SWINGING DURING WALKING AND BODY MOTION.
REPEATABLE USE	CHECK WHETHER THE FUNCTION CAN BE REPEATED MULTIPLE TIMES WITHOUT NOTICEABLE LOSS OF RETENTION OR USABILITY.

LIMITATIONS

SLS NYLON IS STRONGER AND MORE USEFUL THAN FDM FOR FUNCTION CHECKS, BUT IT STILL DOES NOT REPRESENT SPRING STEEL. NYLON FLEX, SURFACE FRICTION, WALL STIFFNESS, CONTACT WEAR, AND RELEASE FEEL MAY BE VERY DIFFERENT FROM THE FINAL FORMED METAL DESIGN.

MECHANICAL PERFORMANCE

DOES THE CONCEPT APPEAR STRONG ENOUGH FOR THE EXPECTED LOADS, FORCES, AND USE CONDITIONS?



REASONABLE PROTOTYPING METHOD

LEVEL 3 — HAND FORMED

REASONABLE MATERIAL(S):

- 301 SS
- 1075 SPRING
- 1095 SPRING

PROTOTYPE STRATEGY

USE A HAND-FORMED METAL PROTOTYPE TO CHECK REAL FLEX, LOAD RESPONSE, AND RETENTION BEHAVIOR. DEFINE MATERIAL THICKNESS, BEND RADII, AND FORMING SEQUENCE BEFORE BUILDING. MEASURE RETENTION FORCE, RELEASE FORCE, DEFLECTION, AND BELT ROTATION DURING TESTS.

TEST PLAN

STATIC LOADING	APPLY EXPECTED LOADS AND CONFIRM THE PROTOTYPE DOES NOT BEND, CRACK, SLIP, SAG, OR LOSE POSITION.
DYNAMIC LOADING	CHECK MOTION, BOUNCING, WALKING, VIBRATION, AND REPEATED MOVEMENT TO IDENTIFY LOOSENING OR INSTABILITY.
FLEX AND DEFLECTION	CHECK WHETHER FLEXIBLE OR THIN FEATURES DEFLECT TOO MUCH, RECOVER POORLY, OR CHANGE FUNCTION DURING USE.
RETENTION FORCE	CHECK WHETHER HOLDING FORCE IS STRONG ENOUGH TO RETAIN THE OBJECT BUT LIGHT ENOUGH FOR PRACTICAL RELEASE.

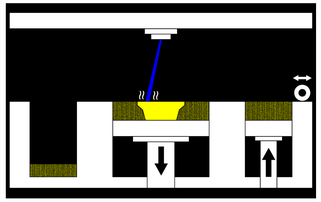
LIMITATIONS

HAND-FORMED METAL CAN SHOW REAL MATERIAL RESPONSE, BUT IT IS NOT THE SAME AS A CONTROLLED PRODUCTION PART. MANUAL BENDS, UNEVEN RADII, WORK HARDENING, MATERIAL VARIATION, EDGE CONDITION, AND FORMING INCONSISTENCY CAN AFFECT RETENTION FORCE, RELEASE FORCE, AND LOAD RESPONSE.

PROTOTYPE TESTING CATEGORIES

USER INTERACTION

DOES THE CONCEPT APPEAR EASY, SAFE, AND PRACTICAL FOR THE INTENDED USER TO OPERATE?



REASONABLE PROTOTYPING METHOD

LEVEL 2 | **SLS 3D PRINT**

REASONABLE MATERIAL(S):

PA12 | **PA11** | **PA12-GF**

PROTOTYPE STRATEGY

USE SLS TO TEST HANDLING WITH A STRONGER, MORE REALISTIC PROTOTYPE THAN FDM. CHECK HOW THE USER LOCATES, INSERTS, REMOVES, WEARS, AND MOVES WITH THE PART. INCLUDE GLOVES, BELTS, STRAPS, CLOTHING, AND NORMAL FIELD MOTION.

TEST PLAN

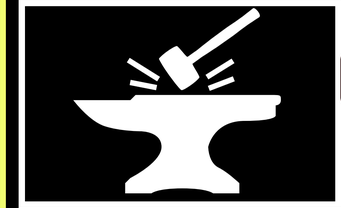
BASIC HANDLING	CHECK WHETHER THE USER CAN LOCATE, GRIP, GUIDE, INSERT, RELEASE, AND USE THE CONCEPT WITHOUT CONFUSION.
BODY MOTION	CHECK WALKING, BENDING, CROUCHING, REACHING, TURNING, AND NORMAL MOVEMENT TO IDENTIFY INTERFERENCE.
COMFORT AND SAFETY	CHECK WHETHER EDGES, CORNERS, HEIGHT, WIDTH, OR CONTACT SURFACES CREATE DISCOMFORT OR PRESSURE POINTS.
GEAR INTERFERENCE	CHECK WHETHER CLOTHING, BELTS, GLOVES, PACKS, STRAPS, TOOLS, OR OTHER EQUIPMENT INTERFERE WITH USE.

LIMITATIONS

SLS NYLON CAN SUPPORT REPEATED HANDLING, BUT ITS SURFACE TEXTURE, EDGE SHARPNESS, WEIGHT, STIFFNESS, AND CONTACT FEEL WILL NOT MATCH COATED OR LINED METAL. USER COMFORT, GEAR SNAGGING, NOISE, AND FIREARM CONTACT MAY CHANGE SIGNIFICANTLY IN THE FINAL MATERIAL.

DURABILITY / ENVIRONMENT

DOES THE CONCEPT APPEAR SUITABLE FOR THE EXPECTED ENVIRONMENT, EXPOSURE, AND FIELD CONDITIONS?



REASONABLE PROTOTYPING METHOD

LEVEL 3 | **HAND FORMED**

REASONABLE MATERIAL(S):

301 SS | **1075 SPRING** | **1095 SPRING**

PROTOTYPE STRATEGY

USE A HAND-FORMED METAL PROTOTYPE TO EXPOSE REAL FIELD-USE ISSUES. TEST EDGE CONDITION, DEBRIS COLLECTION, COATING OR LINER NEEDS, ABRASION, CORROSION CONCERNS, AND FUNCTION AFTER ROUGH HANDLING, TEMPERATURE CHANGE, AND REPEATED USE.

TEST PLAN

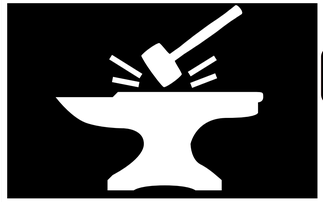
DIRT AND DEBRIS	CHECK WHETHER THE PROTOTYPE COLLECTS DIRT, MUD, GRASS, LEAVES, SAND, OR OTHER DEBRIS DURING USE.
WATER EXPOSURE	CHECK WHETHER WATER COLLECTS, DRAINS POORLY, CAUSES SLIPPING, AFFECTS FUNCTION, OR CREATES CLEANING ISSUES.
ABRASION AND WEAR	CHECK WHETHER CONTACT SURFACES RUB, SCRAPE, POLISH, GOUGE, OR WEAR AGAINST THE FIREARM OR OTHER GEAR.
TEMPERATURE EXPOSURE	CHECK WHETHER HEAT, COLD, SUN, OR STORAGE CONDITIONS AFFECT STIFFNESS, FIT, COMFORT, OR BASIC FUNCTION.

LIMITATIONS

HAND-FORMED METAL CAN EXPOSE FIELD-USE PROBLEMS, BUT A SIMPLE PROTOTYPE MAY NOT HAVE FINAL COATING, LINERS, CORROSION PROTECTION, EDGE FINISH, OR PRODUCTION-CONTROLLED GEOMETRY. WEATHERING, ABRASION, CLEANABILITY, COATING LIFE, AND LONG-TERM FATIGUE CANNOT BE FULLY PROVEN.

SAFETY / MISUSE

DOES THE CONCEPT CREATE OBVIOUS SAFETY, HANDLING, MISUSE, OR UNINTENDED-USE CONCERNS?



REASONABLE PROTOTYPING METHOD

LEVEL 3 | **HAND FORMED**

REASONABLE MATERIAL(S):

301 SS | **1075 SPRING** | **1095 SPRING**

PROTOTYPE STRATEGY

USE A HAND-FORMED METAL PROTOTYPE TO IDENTIFY OBVIOUS CONTACT, SNAGGING, PINCHING, RELEASE, AND WRONG-WAY USE CONCERNS. TEST WITH UNLOADED EQUIPMENT ONLY. REVIEW SHARP EDGES, HARD CONTACT POINTS, UNINTENDED RELEASE, AND USER ASSUMPTIONS BEFORE FIELD USE.

TEST PLAN

SHARP OR HARD EDGES	CHECK WHETHER EDGES, CORNERS, CONTACT SURFACES, OR PROTRUSIONS COULD CUT, SCRATCH, PRESS, OR CAUSE DISCOMFORT.
PINCH AND SNAG POINTS	CHECK WHETHER GAPS, HOOKS, FLEXING FEATURES, OR OPENINGS CAN PINCH SKIN, CATCH CLOTHING, OR SNAG GEAR.
UNINTENDED RELEASE	CHECK WHETHER THE PROTOTYPE CAN SLIP, DROP, RELEASE, ROTATE, OPEN, OR DISENGAGE WHEN USED INCORRECTLY.
MISUSE SCENARIOS	CHECK COMMON WRONG-WAY USE CASES TO IDENTIFY HAZARDS, CONFUSING FEATURES, OR UNSAFE USER ASSUMPTIONS.

LIMITATIONS

HAND-FORMED METAL CAN IDENTIFY OBVIOUS SHARP EDGE, PINCH, SNAG, RELEASE, AND MISUSE RISKS, BUT IT IS NOT A CERTIFIED SAFETY SAMPLE. MANUAL FABRICATION, LIMITED TEST CONDITIONS, AND NON-PRODUCTION FINISHES PREVENT ANY CLAIM OF COMPLETE HAZARD CONTROL.

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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
CRR-11-0038	11/13/2011	K. MILLER JUNGLE OUTFITTERS

CLIENT TYPE	CONCEPT NAME
SMALL BUSINESS	RIFLE KEEPER

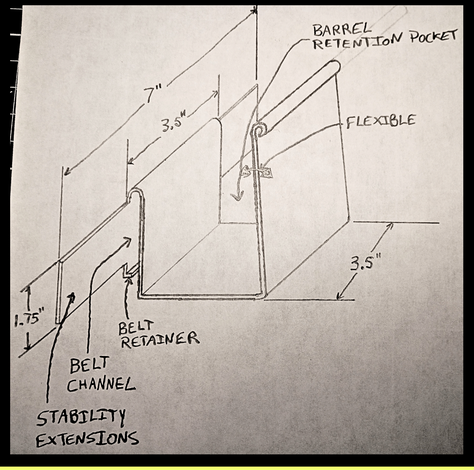
CONCEPT STAGE	CONCEPT DESCRIPTION
PRE-PROTOTYPE	A RIFLE/SHOTGUN HIP HOLSTER THAT FITS ONTO A BELT, IN ORDER TO RETAIN THE FIREARM IN A MORE FIXED POSITION WHEN USED IN CONJUNCTION WITH A SLING.
EST. QUANTITY	
250 / YEAR	

CONCEPT / DESIGN INTENT (INTENDED USE)

- BELT-MOUNTED
- RETAIN FOREND WHILE RUNNING
- EASY INSERTION/REMOVAL
- MINIMAL MOVEMENT IN USE
- MINIMAL NOISE
- MUST NOT LOSE RETENTION
- MINIMAL SNAGGING ON GEAR
- TOUGH AND RUGGED
- MUST WITHSTAND HARD USE
- MUST WITHSTAND OUTDOOR USE

CONCEPT UNDER REVIEW

FILE	FILE TYPE	UNITS
Rifle Keeper V3-ISO.png	PNG	IMPERIAL



TIER-1
CONCEPT REVIEW
CRR

SECTION 3
NEXT STEPS & REVIEW CLOSEOUT

THIS SECTION PROVIDES THE FINAL CONCEPT REVIEW DISPOSITION, TOP RECOMMENDED FIXES, NEXT-STEP GUIDANCE, AND OFFICIAL REVIEW CLOSEOUT STATEMENT.

NEXT STEPS & REVIEW CLOSEOUT	3-1
REFERENCE: KEY TERMINOLOGY	3-2

SECTION 3
NEXT STEPS & REVIEW CLOSEOUT

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FINAL CONCEPT ASSESSMENT

The submitted Rifle Keeper concept is workable as a belt-mounted firearm retention aid intended to reduce uncontrolled rifle or shotgun movement during walking, hiking, or hands-free field activity. The core idea appears practical enough to continue development, and the concept is appropriate for staged prototype testing.

However, the design **should not be considered ready** for functional release, supplier quoting, or production planning as submitted. The retention force, material behavior, formed geometry, firearm fit range, edge condition, belt stability, and field-use safety concerns should be addressed before moving beyond early prototype testing.

PRACTICAL NEXT STEP — **REVISE CONCEPT, AND DEVELOP 3D CAD MODEL**

TOP 3 ISSUES TO FIX

CDF-03 — FLEXIBILITY / RETENTION REQUIREMENT IS NOT WELL DEFINED

ISSUE SEVERITY

THE CONCEPT DEPENDS ON FLEXIBLE RETENTION, BUT THE REQUIRED GRIP FORCE, RELEASE FORCE, AND DUTY CYCLE ARE NOT YET DEFINED. DEFINE THE TARGET RETENTION BEHAVIOR FIRST, THEN REVISE THE POCKET GEOMETRY AND TEST A SIMPLE LEVEL 1 / LEVEL 2 PROTOTYPE BEFORE MOVING TO SPRING STEEL.

CDF-05 — MATERIAL AND REQUIRED MATERIAL PROPERTIES NOT WELL DEFINED

ISSUE SEVERITY

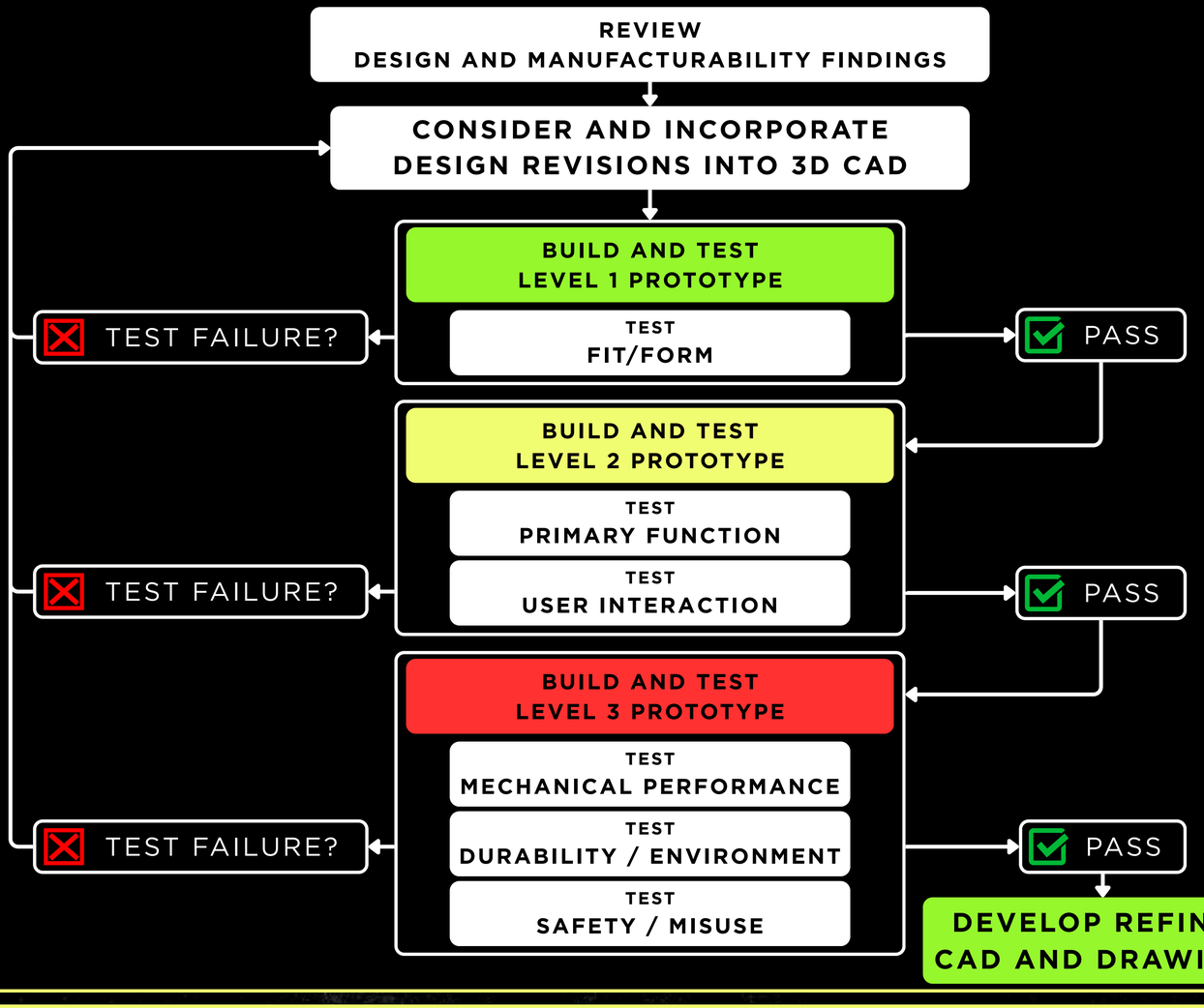
THE MATERIAL CANNOT BE SELECTED CONFIDENTLY UNTIL THE REQUIRED FLEXIBILITY, TOUGHNESS, CORROSION RESISTANCE, WEAR BEHAVIOR, AND FIELD DURABILITY ARE BETTER UNDERSTOOD. DEFINE THE MATERIAL REQUIREMENTS, THEN COMPARE SPRING STEEL, STAINLESS SPRING STEEL, LINERS, AND COATING OPTIONS.

CMF-01 — FORMED BENDS APPEAR TO HAVE ZERO OR VERY SMALL BEND RADII

ISSUE SEVERITY

THE SHARP OR NEAR-ZERO BEND RADII MAY BE DIFFICULT TO FORM CONSISTENTLY AND COULD CREATE CRACKING, TEARING, SPRINGBACK, OR PART-TO-PART VARIATION. INCREASE BEND RADII TO MATCH THE MATERIAL THICKNESS, SPRING MATERIAL, AND HAND-FORMING OR PRODUCTION FORMING METHOD.

CONCEPT DEVELOPMENT ACTION PLAN



Delivery of this CRR constitutes official closeout of the Tier-1 Concept Review under the approved review scope. New files, design revisions, supplier feedback, added requirements, implementation support, or expanded questions are outside this closed review scope and may require separate review.

TIER-1 ENGINEER, LLC



SECTION 3
KEY TERMINOLOGY

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TERM	DEFINITION
Belt Rotation	Unwanted twisting, tipping, or outward movement of a belt-mounted product during use.
Concept Alignment	The degree to which the submitted concept appears to support the stated design intent and use case.
Concept Design Review	A high-level review of the submitted concept's design direction, function, usability, and practical risks.
Concept Feasibility	Whether the submitted concept appears practically capable of satisfying its intended purpose at an early stage.
Concept Maturity	How developed the submitted concept is based on available information, design clarity, and readiness for next steps.
Concept Review	An early-stage engineering review focused on concept direction, major concerns, and prototype planning.
Contact Surface	Any area of the concept that touches the user, retained object, mating part, gear, or environment.
Design Finding	An observed concept-level design concern that may affect fit, function, use, durability, safety, or next-step readiness.
Design Intent	The stated purpose, function, use case, and practical requirements the concept is expected to satisfy.
Design Practicality	Whether the concept appears simple, usable, testable, and reasonable for the intended development path.
Duty Cycle	The expected number of repeated uses, insertions, removals, flex cycles, or load events the concept should survive.
Edge Condition	The sharpness, radius, finish, trim, or treatment of an edge that may contact hands, gear, or the retained object.
Environmental Exposure	The expected field conditions the concept may face, such as heat, cold, moisture, dirt, abrasion, or UV.
FDM	Fused Deposition Modeling, a 3D printing process commonly used for low-cost form, fit, and early function prototypes.
Field Use	Real-world use outside a controlled setting, including walking, hiking, weather exposure, gear contact, and rough handling.
Fit Range	The range of sizes, shapes, users, equipment, or mating objects the concept is expected to fit or interface with.

TERM	DEFINITION
Flex Retention	Retention created by elastic bending, spring force, clamp force, or controlled deflection of a feature.
Form / Fit Prototype	A prototype used to check size, shape, clearance, position, fitment, and basic physical interface.
Hand-Formed Prototype	A prototype made by manually bending, shaping, or forming material to evaluate physical behavior before production tooling.
Manufacturability Finding	An observed concept-level concern related to making, forming, finishing, coating, assembling, or repeating the design.
Material Direction	The recommended material path or material family based on function, durability, environment, and prototype goals.
Mechanical Performance	How the concept responds to load, force, motion, impact, retention, flexing, or repeated use.
Misuse Scenario	A likely wrong-way or unintended use condition that could reveal safety, handling, release, or durability concerns.
Prototype Level	A staged prototype category used to match prototype method and material to the type of learning needed.
Prototype Readiness	Whether the concept is defined well enough to begin useful prototype testing.
Release Force	The force required to remove, disengage, release, or pull an object out of the retention feature.
Retention Force	The force used to hold, pinch, clamp, cradle, or secure an object during intended use.
Review Scope	The approved boundary of what the Concept Review evaluates and what it does not evaluate.
SLS	Selective Laser Sintering, a powder-based 3D printing process often used for stronger functional nylon prototypes.
Spring Steel	Steel designed to flex and return toward its original shape, commonly used for clips, springs, and retention features.
Springback	The amount a formed material returns after bending, which can affect final shape, fit, and retention behavior.
User Interaction	How the intended user holds, wears, inserts, removes, adjusts, carries, operates, or handles the concept.