

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

**Draft Failure Definitions and Scoring Criteria
for the Gun Safety Technology Challenge**

National Institute of Justice

June 2016

45 **Introduction**

46
47 This document has been developed for the National Institute of Justice (NIJ) Gun Safety
48 Technology Challenge. It describes the failure definition (FD) and scoring criteria (SC) that
49 will be used to “score” test events that occur during the testing of handguns, such as pistols
50 and revolvers, in the Challenge. These firearms or firearms accessories can be understood
51 to use integrated components that exclusively permit an authorized user or set of users to
52 operate or fire the gun and automatically deactivate it under a set of specific circumstances,
53 reducing the chances of accidental or purposeful use by an unauthorized user. The
54 integrated gun safety technology may include different authentication technologies such as
55 radio frequency identification and fingerprint sensors.

56
57 This document follows the testing methodology published in *Draft Test Procedures for the*
58 *Gun Safety Technology Challenge* to provide meaningful comparison between similar
59 firearms in order to determine whether the reliability of the tested firearms differs
60 significantly based on performance. Testing and evaluation is designed to prioritize the
61 collection and use of data that can substantiate conclusions about the relative performance
62 of firearms such that firearms with and without advanced gun safety technology that are
63 similar with respect to type, form factor, caliber, and other physical characteristics are
64 tested and evaluated using a common methodology and equivalent ammunition. Testing
65 and evaluation is not designed to provide comparison of test results against absolute
66 performance requirements or safety criteria, but rather to provide a meaningful
67 comparison of test results of one firearm against another, similar firearm, or a firearm with
68 and without a relevant safety accessory. The end result of the scoring process is to provide
69 “scored” data points in order to form a basis to determine whether the addition of a smart
70 gun technology does or does not significantly reduce the reliability of the firearm system
71 compared to existing firearms.

72
73 Together, the FD and SC serve as a tool for guiding a reliability scoring panel through the
74 test event scoring process, with the intent of eliminating as much subjectivity from the
75 process as possible. The purpose of the FD is to define degraded handgun performance or
76 functionality which is considered a failure when evidenced by a malfunction. The purpose
77 of the SC is to define a specific and agreed upon process for scoring test events which occur
78 during firearm testing. The scoring process involves the characterization of each test event
79 into the proper category based upon its impact on the firearm’s operational performance
80 or functionality, followed by attributing the cause of the test event to a particular cause.
81 The content of this FDSC follows U.S. Army guidance, such as *Guidelines for Developing*
82 *Reliability Failure Definition and Scoring Criteria*, to characterize the impact of malfunctions
83 on the handguns tested in the Challenge, consistent with the failure definitions that have
84 traditionally been applied to small arms.

85
86 Please direct any feedback on this document by email to gunsafetytechnology@usdoj.gov.

87
88
89
90

91 **1 Scope**

92

93 **1.1** This document describes the failure definition (FD) and scoring criteria (SC) that
94 will be used to “score” test events that occur during the testing of handguns, such as pistols
95 and revolvers, in the Challenge.

96

97 **1.2** This document follows the testing methodology published in *Draft Test Procedures*
98 *for the Gun Safety Technology Challenge* to provide meaningful comparison between similar
99 firearms in order to determine whether the reliability of the tested firearms differs
100 significantly based on performance.

101

102 **1.3** Testing and evaluation is designed to determine whether the addition of a smart gun
103 technology does or does not significantly reduce the reliability of the firearm system, as
104 compared to existing firearms.

105

106 **1.4** Reliability shall be assessed by a panel of qualified experts familiar with testing and
107 evaluation of firearms using the FDSC in this document.

108

109 **1.5** Inherent hardware failures shall be recorded and appropriately scored according to
110 the FDSC.

111

112 **1.6** Induced failures attributable to the operator, technical documentation,
113 maintenance, training, and applicable support equipment shall be recorded and
114 appropriately scored according to the FDSC. Induced failures are included in the overall
115 evaluation to capture and convey the impact of deficiencies which are rooted in sources
116 other than hardware, but which ultimately manifest themselves in the form of equipment
117 malfunctions, in order to provide a more complete picture of performance to the end user.

118

119 **1.7** Malfunctions of the firearms induced by ammunition failure shall be recorded and
120 appropriately scored according to the FD, however further separate assessment of
121 ammunition reliability is outside the scope of this document.

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137 **2 References**

138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182

Draft Test Procedures for the Gun Safety Technology Challenge, National Institute of Justice, Washington, DC, April 2016, <http://www.nij.gov/funding/pages/fy16-gun-safety-challenge.aspx>.

Guidelines for Developing Reliability Failure Definition and Scoring Criteria, 3rd ed., U.S. Army Training and Doctrine Command, Army Capabilities Integration Center, April 2012.

Charles E. Ebeling, *An Introduction to Reliability and Maintainability Engineering*, 2nd ed., (Long Grove, IL: Waveland Press), 2010.

Siegmund Halpern, *The Assurance Sciences: An Introduction to Quality Control and Reliability* (Englewood Cliffs, NJ: Prentice-Hall), 1978.

183 **3 Terms and definitions**

184

185 **Reliability**

186 The probability that a device will perform its intended function for a specified period of
187 time under stated conditions.¹

188

189 **Maintainability**

190 The probability that a failed component or system will be restored or repaired to a
191 specified condition within a period of time when maintenance is performed in accordance
192 with prescribed procedures.²

193

194 **Malfunction**

195 A test event where the firearm does not perform its intended function properly.

196

197 **Test event**

198 Any occurrence during testing, whether expected or unexpected, that requires the operator
199 to make an adjustment or take corrective action.

200

201 **Operator**

202 Individual person using the firearm.

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

¹ Halpern, p. 7. Ebeling provides a similar definition on p. 5.

² Ebeling, p. 6.

226 **4 Failure definition**

227
228 The failure definition formally defines what constitutes a failure as it relates to testing the
229 firearm’s essential functions.

230
231 **4.1 General considerations**

232
233 **4.1.1** Observed test events are divided into three general categories:

- 234 — “Failure” events related to reliability;
- 235 — “Non-failure” events related to maintainability; and
- 236 — Events or failures not related to reliability or maintainability.

237
238
239 **4.1.2** A failure related to reliability is characterized by a malfunction in which the
240 firearm fails to perform its intended function properly.

241
242 **4.1.3** Any test event that involves a malfunction of the firearm shall be scored as a
243 “failure” for the purpose of evaluating reliability.

244
245 **4.1.4** The cause shall be assigned after the failure has been scored by referencing the
246 established event chargeability categories.

247
248 **4.1.5** As failures generate maintenance demands, a test event should still be classified
249 as a failure even if “corrective” action to address the malfunction may be deferred until
250 testing has been completed.

251
252 **4.1.6** Any observed problem that does not require immediate corrective action and
253 which can be remedied through the execution of a routine operating procedure, such as an
254 adjustment, prescribed in the firearm’s instructional materials should not be scored as a
255 failure.

256
257 **4.1.7** Any expected test events that can be considered exceptions to exclude from
258 scoring as a failure shall be documented in writing prior to testing.

259
260 **4.1.8** Any test methods that may not conform to, may deviate significantly from, or
261 may be obviously in conflict with the acceptable range of test firearm use shall be identified
262 and documented in writing prior to testing.

263
264 **4.1.9** In order for a deficiency of the firearm to be included in the evaluation of
265 reliability, the firearm must first be capable of performing the function to which the
266 deficiency pertains.

267
268 **4.1.10** If the firearm is incapable of performing a particular function, then a malfunction
269 related to that function cannot have occurred.

272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317

4.1.11 Performance limitations caused by design deficiencies where no malfunction has occurred shall not be scored as failures related to reliability, and should be evaluated as a performance limitation.

4.1.12 Failure to observe this protocol will result in the firearm being penalized twice for the same test event by *improperly* charging the firearm with a reliability-related failure in addition to a performance-type failure event.

4.2 Failure events related to reliability

4.2.1 A test event meeting the definition of a “failure” related to reliability shall be scored in accordance with the failure categories in this section.

4.2.2 Failures related to reliability are divided into three general categories:

- Essential function failures (EFF);
- Non-essential function failures (NEFF); and
- Dependent malfunctions (DM).

4.2.3 Essential function failure (EFF)

An EFF is a failure that renders the firearm incapable of performing one or more essential functions, or which degrades the ability to properly perform an essential function to the point where the residual utility of the function is deemed “operationally” inadequate.

Essential function failures are further characterized into three subcategories by level of criticality in accordance with the following historical small arms failure definitions:

- A Class I EFF is an immediately clearable failure or stoppage of the firearm adversely impacting one or more essential functions that the operator can correct in approximately 10 seconds or less through the execution of immediate action procedures, such as removal and reinstallation of the magazine or manually removing an ammunition round or empty casing;
- A Class II EFF is an operator clearable failure or stoppage of the firearm adversely impacting one or more essential functions which requires the operator to take more than 10 seconds to correct through execution of prescribed operator level troubleshooting and corrective action procedures, either with or without the use of common tools or cleaning kit components; and
- A Class III EFF is a severe failure or stoppage of the firearm that the operator is unable to correct through execution of prescribed operator level troubleshooting and corrective action procedures, either because the malfunction requires higher level

318 maintenance that is non-deferrable, or the need for tools, equipment, or parts go
319 beyond common tools or cleaning kit components.

320

321 **4.2.4 Non-essential function failure (NEFF)**

322

323 A NEFF is a failure that renders the firearm incapable of performing one or more non-
324 essential functions, but which *does not* adversely or significantly impact the ability of the
325 firearm to perform an essential function.

326

327 A NEFF may be assigned to a group of recurring operator actions of a particular type that,
328 while they may fit in the category of *routine operating procedures* [in section 4.x], have
329 become so frequent that the constant interruption becomes a significant problem.

330

331 **4.2.5 Dependent malfunction (DM)**

332

333 A DM is a failure caused by or directly attributable to another “primary” test event, such as
334 a preceding or prior malfunction of the firearm. To characterize a malfunction as a DM,
335 analysis of the failure shall positively confirm that it occurred as the direct result of a
336 specified primary event.

337

338 The score ultimately assigned to the primary event shall be based on the overall impact or
339 severity of both test events on system functionality. If the impact of the dependent
340 malfunction was greater than that of the primary event, then the score assigned to the
341 primary event should reflect that level of severity, based on the secondary failure’s
342 functional impact.

343

344 **4.2.6 Reliability-related failure event chargeability categories**

345

346 **Primary failure**

347 This category is used to identify the cause of failure events that are classified as DM. The
348 chargeability for each confirmed DM should be assigned to the *primary failure* category.

349

350 **Quality control**

351 This category is used to address failure events that are attributable to inadequate quality
352 control in the equipment manufacturing, production, or assembly process.

353

354 **Manufacturer furnished hardware**

355 This category is used for malfunctioning hardware developed or furnished by the
356 equipment manufacturer and operator-related test events attributable to the hardware
357 design that may lead to malfunctions. This is distinct from a performance limitation
358 described in 4.3.7, in that the hardware is the cause of a malfunction.

359

360 **Operator**

361 This category is used for failure events induced by the operator that are not rooted in
362 hardware design problems, inadequate training, deficiencies or errors in the technical

363 documentation, or the result of abuse.

364

365 **Technical documentation**

366 This category is used for failure events attributable to misleading, incorrect, or nonexistent
367 information in technical documentation provided with the firearm. Inadequate
368 instructional materials may cause operator or maintenance errors, and in such cases the
369 failure event should be charged to the technical documentation.

370

371 **Maintenance personnel**

372 This category is used for failure events attributable to errors caused by maintenance
373 personnel, such as not adhering to the established repair procedures.

374

375 **Training**

376 This category is used for failure events that can be directly attributed to inadequacies in
377 training due to omitted or incorrect training procedures, inappropriate training material,
378 or inadequate or insufficient training time.

379

380 **Manufacturer furnished support equipment**

381 This category is used for failure events directly attributable to tools and external test,
382 measurement, and diagnostic equipment furnished by the manufacturer.

383

384 **Laboratory furnished support equipment**

385 This category is used for failure events directly attributable to tools and external tests,
386 measurements, and diagnostic equipment furnished by the laboratory.

387

388 **Accident**

389 This category is used only for those failure events resulting from accidents which are not
390 attributed to the design of the firearm. However, accidents due to inadequate training,
391 inadequate warnings in the technical documentation, careless operation, or failure to
392 perform preventative maintenance should not be charged as an “accident” but rather to the
393 appropriate *root* cause of the accident.

394

395 **Unknown**

396 This category is used only for those failure events for which the cause or source cannot be
397 determined.

398

399 **4.3 “Non-failure” events related to maintainability**

400

401 This includes test events leading to maintenance actions that are performed for reasons
402 *other than* to correct failures or malfunctions related to reliability.

403

404 Maintenance type actions in this category include:

405

406 — Preventive maintenance;

407

408 — Scheduled maintenance;

- 409
- 410 — On-condition maintenance;
- 411
- 412 — Cosmetic maintenance;
- 413
- 414 — Routine operating procedures;
- 415
- 416 — Malfunctions or maintenance induced by the ammunition; and
- 417
- 418 — Performance limitation.
- 419

420 **4.3.1 Preventive maintenance**

421

422 Actions that the operator is required to perform which are necessary to maintain the

423 system in proper working condition in accordance with procedures defined as

424 preventative maintenance in the applicable technical documentation. This does not

425 include corrective type maintenance that is performed to correct firearm deficiencies

426 *detected* during preventative maintenance, as such actions are required either to remedy a

427 “failure” or execute a routine operating procedure.

428

429 **4.3.2 Scheduled maintenance**

430

431 This includes any periodic preventive maintenance defined in the firearm’s technical

432 documentation that is to be performed at prescribed intervals by dedicated maintenance

433 personnel in order to keep the firearm in proper operational condition, and that are

434 considered to be scheduled maintenance. To qualify as scheduled maintenance, an event

435 must be consistent with the prescribed service interval, such as rounds fired, operating

436 hours, or calendar time.

437

438 This does not include corrective type maintenance that is performed to correct firearm

439 deficiencies *detected* during scheduled maintenance, as such actions are required to either

440 remedy a “failure” or execute a routine operating procedure. This category does not

441 include corrective maintenance that is performed during the scheduled maintenance

442 period to fix known deficiencies.

443

444 **4.3.3 On-condition maintenance**

445

446 This includes maintenance not related to a failure executed in order to replace worn parts

447 or components which have met their expected service life. For such actions to be

448 characterized as on-condition maintenance, the part or component must have been

449 functioning at the time of its replacement.

450

451 A test event in which a part or component physically fails almost immediately after its

452 expected service life may not be characterized as a “non-failure” depending on a number

453 of factors, including monitoring accuracy of the part or component by cognizant

454 personnel, shortcomings in the technical documentation, or periodic maintenance
455 schedules.

456
457 Parts or components that continue to exhibit gradual degradation after meeting their
458 expected service life that do not experience sudden or catastrophic physical failure should
459 not be scored as a reliability-related failure, if they continue to be used for an extended
460 period of time prior to replacement, and consequently show excessive wear at the time of
461 replacement.

462
463 Parts or components that experience sudden or catastrophic physical failure if they
464 continue to be used for an extended period of time after meeting their expected service life
465 should not be scored as a reliability-related failure, but attributed to another cause, such as
466 abuse due to excessive use.

467
468 **4.3.4 Cosmetic maintenance**

469
470 This includes any maintenance not related to a malfunction that is undertaken to correct a
471 cosmetic deficiency or anomaly, such as deburring a rough external surface or sharp edge
472 to prevent personal injury, rather than for the purpose of restoring lost or degraded
473 functions.

474
475 **4.3.5 Routine operating procedures**

476
477 This includes tasks that can be performed quickly and readily, such as those prescribed in
478 firearm instructional materials, which are not considered immediate corrective action.
479 This is to prevent the system from being penalized for needing a minor operator action that
480 is considered a normal, routine operating procedure, such as an adjustment. A task to
481 correct a malfunction does not constitute a routine operating procedure nor should an
482 immediate action such as clearing a stoppage be considered routine.

483
484 **4.3.6 Malfunction or maintenance induced by the ammunition**

485
486 This includes malfunctions or stoppages caused by the ammunition. These test events
487 could be due to improper physical dimensions of the cartridge which prevents it from
488 being properly fed or chambered, failure of the ammunition to fire when adequately struck
489 by the firing pin, or an improper powder charge causing inadequate gas pressure or recoil
490 force that may lead to an extraction or ejection failure. Should a malfunction be due to
491 excessive carbon build-up in the firearm, the failure may be attributed to inadequate
492 preventative maintenance.

493
494 **4.3.7 Performance limitation**

495
496 The inability of a firearm to meet a specified performance criterion where no malfunction
497 has occurred should be considered a performance limitation attributable to a design
498 deficiency, rather than a failure related to reliability. A design deficiency generally cannot
499 be eliminated through typical maintenance or repair actions. Instead, some form of

500 equipment redesign or modification will be required to remedy the problem that is causing
501 the limitation in performance.

502

503 An indicator of a design deficiency would be the inability of the firearm to perform a
504 particular function at any time where no maintenance action can be performed to correct
505 the problem. In order for a design deficiency to be scored as a performance limitation
506 instead of a failure related to reliability, a definitive numeric performance criterion shall
507 exist with regard to the affected area of performance.

508

509 **4.4 Test events not applicable to reliability or maintainability**

510

511 This includes test events that are not related to and have no impact on the reliability or
512 maintainability of the firearm. The assignment of events to this category should in no way
513 be construed to imply that they are invalid or insignificant, as they can impact on other
514 functional areas of system evaluation. This category includes:

515

516 — Pretest inspection;

517

518 — Equipment modifications;

519

520 — Test-peculiar events;

521

522 — Abuse;

523

524 — Unrelated damage; and

525

526 — Other test events not applicable to reliability or maintainability.

527

528 **4.4.1 Pretest inspection**

529

530 This includes test events observed or detected during pretest inspection or other
531 designated pretest activities. Pretest events are not scored against the reliability or
532 maintainability of system as they have occurred outside of the actual testing “phase,”
533 however all events detected after the pretest period will be scored on their own merit.

534

535 **4.4.2 Equipment modifications**

536

537 This includes test events involving maintenance actions associated with the installation or
538 incorporation of modified or upgraded firearm hardware. These events have no
539 applicability to reliability or maintainability unless the original hardware item was
540 nonfunctional, or was malfunctioning prior to being upgraded or replaced as part of the
541 modification. In those cases where there is applicability to reliability or maintainability,
542 the event of removing and replacing a faulty item will be scored on its own merit.

543

544

545

546 **4.4.3 Test-peculiar events**

547
548 This includes test events consisting of malfunctions and maintenance efforts caused by
549 equipment that is not part of the system being tested, such as tools or instrumentation
550 peculiar to the test, or by people who are not official test participants, such as people other
551 than operators or maintenance personnel. Test-peculiar events are not attributable to the
552 system being tested, and have no applicability to its reliability or maintainability.

553
554 **4.4.4 Abuse**

555
556 This includes test events in which official test participants, such as operators or
557 maintenance personnel, cause damage to the system either willfully or through gross
558 carelessness or negligence. This category also includes any events in which the test
559 personnel directs the deliberate abuse of the system, such as a test excursion to over-stress
560 or exceed the performance limits of the system for investigative purposes, whether called
561 for by the test plan or not.

562
563 **4.4.5 Unrelated damage**

564
565 This includes test events in which damage is caused by natural phenomena or other
566 influences that are beyond the control of official test participants. Because the source of
567 these events is external to the system being tested, they should not be included in the
568 evaluation of reliability and maintainability.

569
570 **4.4.6 Other test events not applicable to reliability or maintainability**

571
572 This includes test events which have no bearing on reliability and maintainability that do not
573 fit into other categories. Examples may include suggested improvements, reports of
574 inadequate test procedures, recommended improvements to technical manuals, unusable
575 or unacceptable replacement parts discovered prior to or during installation, test delays,
576 general information regarding the condition of equipment or components where no failure
577 related to reliability has occurred, and suggested human factors improvements.

578
579
580
581
582
583
584
585
586
587
588
589
590
591

592 **5 Essential functions**

593
594 Essential functions represent the core operational functions that the firearms shall be
595 capable of performing. Five essential functions are enumerated below and described more
596 in 5.1 through 5.5:
597

- 598 — The operator shall be able to install a full load of rounds into the ammunition magazine
599 and subsequently both insert the magazine into and remove it from the firearm;
600
- 601 — Safety mechanisms shall function properly and remain in the selected state until
602 actuated by the operator;
603
- 604 — The firearm shall feed and properly chamber each individual round/cartridge without
605 inducing a stoppage that requires corrective action;
606
- 607 — The firearm shall fire chambered rounds by properly striking the primer of each
608 individual cartridge with sufficient impact to initiate firing in all firing modes available
609 on the firearm without inducing a stoppage that requires corrective action; and
610
- 611 — The firearm shall extract and eject empty casings and unfired cartridges without
612 inducing a stoppage that requires corrective action.
613

614 **5.1 Essential function 1**

615
616 The operator shall be able to install a full load of rounds into the ammunition magazine and
617 subsequently insert the magazine into and remove it from the firearm.
618

619 **5.1.1 Essential function failure**

620
621 This function is considered seriously degraded and results in an EFF with regard to the
622 scoring of firearm reliability when there is a significant reduction on the ability to install a
623 full load of rounds into the ammunition magazine and subsequently insert the magazine
624 into and remove it from the firearm.
625

626 **5.1.2 Non-essential function failure**

627
628 This function is not considered degraded and results in a NEFF with regard to the scoring
629 of firearm reliability when there is at most a minimal reduction of the ability to install a full
630 load of rounds into the ammunition magazine and subsequently insert the magazine into
631 and remove it from the firearm.
632

633 **5.2 Essential function 2**

634
635 Safety mechanisms shall function properly and remain in the selected state until actuated
636 by the operator.
637

638 **5.2.1 Essential function failure**

639

640 This function is considered seriously degraded and results in an EFF with regard to the
641 scoring of firearm reliability when safety mechanisms fail to remain in the proper
642 operator-selected state, including both mechanical safeties and integrated gun safety
643 technology that may include different authentication technologies like radio frequency
644 identification and fingerprint sensors. Examples may include the firearm discharging with
645 the safety “on” or the operator not being able to toggle from “safe” to “fire” or vice versa.

646

647 **5.2.2 Non-essential function failure**

648

649 This function is not considered degraded and results in a NEFF with regard to the scoring
650 of firearm reliability when there is at most a minimal impact on safety mechanisms
651 remaining in the proper operator-selected state, such as when a mechanism is difficult to
652 manipulate but the operator can actuate it to the desired state with no significant delay.

653

654 **5.3 Essential function 3**

655

656 The firearm shall feed and properly chamber each individual round/cartridge without
657 inducing a stoppage that requires corrective action.

658

659 **5.3.1 Essential function failure**

660

661 This function is considered seriously degraded and results in an EFF with regard to the
662 scoring of weapon reliability when there is a failure to feed or properly chamber a round,
663 however a failure or stoppage due to bad ammunition shall not be considered an EFF of the
664 firearm.

665

666 **5.3.2 Non-essential function failure**

667

668 This function is not considered degraded and results in a NEFF with regard to the scoring
669 of firearm reliability when there is no adverse impact to feed or properly chamber a round,
670 such as damaged or worn components that do not degrade essential functionality of the
671 firearm to any appreciable degree.

672

673 **5.4 Essential function 4**

674

675 The firearm shall fire chambered rounds by properly striking the primer of each individual
676 cartridge with sufficient impact to initiate firing in all firing modes available on the firearm
677 without inducing a stoppage that requires corrective action.

678

679 **5.4.1 Essential function failure**

680

681 This function is considered seriously degraded and results in an EFF with regard to the
682 scoring of weapon reliability when there is a failure to fire a properly chambered round,

683 however a failure due to bad ammunition shall not be considered an EFF of the firearm.
684

685 **5.4.2 Non-essential function failure**
686

687 This function is not considered degraded and results in a NEFF with regard to the scoring
688 of firearm reliability when there is at most a minimal impact to fire a properly chambered
689 round, such as damaged or worn components that do not degrade essential functionality of
690 the firearm to any appreciable degree.
691

692 **5.5 Essential function 5**
693

694 The firearm shall extract and eject empty casings and unfired cartridges without inducing a
695 stoppage that requires corrective action.
696

697 **5.5.1 Essential function failure**
698

699 This function is considered seriously degraded and results in an EFF with regard to the
700 scoring of weapon reliability when there is a failure to extract and eject the cartridge casing
701 from any ammunition round, as well as when the firearm is unable to extract and eject an
702 unfired cartridge, however a failure due to bad ammunition shall not be considered an EFF
703 of the firearm.
704

705 **5.5.2 Non-essential function failure**
706

707 This function is not considered degraded and results in a NEFF with regard to the scoring
708 of firearm reliability when there is at most a minimal impact to extract and eject the
709 cartridge casing from any ammunition round, such as damaged or worn components that
710 do not degrade essential functionality of the firearm to any appreciable degree.
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728

729 **6 Scoring criteria**

730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774

The scoring criteria outlines the process that is to be used to classify test events into proper categories based upon their impact on firearm functionality, and to subsequently charge the cause of the test event to a particular source.

6.1 The scoring panel should know and understand the definitions and explanations of scoring process terms before scoring is initiated.

6.2 The scoring panel shall have access to all test results.

6.3 All scoring decisions shall be recorded in electronic format.

6.4 The scoring panel shall use the scoring procedure defined below by reading the applicable statements, choosing the appropriate option, and then executing the associated directives.

6.4.1 The panel shall select the appropriate category below that applies to the test event being scored, then proceed as directed.

- If the test event is not applicable to reliability or maintainability in accordance with 4.4, the scoring panel shall proceed to 6.4.2.
- If the test event is a “non-failure” related to maintainability in accordance with 4.3, the scoring panel shall proceed to 6.4.3.
- If the test event is a failure related to reliability in accordance with 4.2, the scoring panel shall proceed to 6.4.4.

6.4.2 The panel shall assign the test event to the appropriate category below, then proceed to the next test event.

- Pretest inspection;
- Equipment modifications;
- Test-peculiar events;
- Abuse;
- Unrelated damage; or
- Other test events not applicable to reliability or maintainability.

775 **6.4.3** The panel shall assign the test event to the appropriate category below, then
776 proceed to the next test event.

- 777
- 778 — Preventive maintenance;
- 779
- 780 — Scheduled maintenance;
- 781
- 782 — On-condition maintenance;
- 783
- 784 — Cosmetic maintenance;
- 785
- 786 — Routine operating procedures;
- 787
- 788 — Malfunctions or maintenance induced by the ammunition; or
- 789
- 790 — Performance limitations.

791

792 **6.4.4** The panel shall assign the test event to the appropriate category below, then
793 proceed to 6.4.5.

- 794
- 795 — Class I EFF;
- 796
- 797 — Class II EFF;
- 798
- 799 — Class II EFF;
- 800
- 801 — NEFF; or
- 802
- 803 — DM.

804

805 **6.4.5** The panel shall assign the test event to the appropriate category below, then
806 proceed to the next test event.

- 807
- 808 — Primary failure;
- 809
- 810 — Quality control;
- 811
- 812 — Manufacturer furnished hardware;
- 813
- 814 — Operator;
- 815
- 816 — Technical documentation;
- 817
- 818 — Maintenance personnel;
- 819
- 820 — Training;

- 821
- 822 — Manufacturer furnished support equipment;
- 823
- 824 — Laboratory furnished support equipment;
- 825
- 826 — Accident; or
- 827
- 828 — Unknown.
- 829