Designation: F2316 – 12 (Reapproved 2022)

Standard Specification for Airframe Emergency Parachutes[1]

This standard is issued under the fixed designation F2316; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers minimum requirements for the design, manufacture, and installation of parachutes for airframe mounted Airframe emergency parachutes addressed in this specification refer to parachutes designed, manufactured, and installed to recover an aircraft and its occupants at survivable descent rates. This specification is not applicable to deployment parachutes, pinwheel parachutes, drogue parachutes, or other airframe emergency aerodynamic decelerators not specifically intended for safely lowering the airframe and occupants to the ground. The specification is applicable to the use of parachutes if the aerodynamic portion of an airframe emergency parachute system is designed to recover the airframe and occupants at survivable descent rates.

1.2 The values stated in SI units are to be regarded as standard. The equations given in parentheses are mathematical conversions to inch-pound units. Values in parentheses are provided for information only and are not considered standard.

1.2.1 Notwithstanding any information contained in accordance with International Civil Aviation Organization (ICAO) agreements. While the values stated in SI units are regarded as standard, certain aircraft currently designed in known and already in service may acceptable standard.

1.3 *Airframe emergency parachute recovery systems have become an acceptable means of greatly reducing the likelihood of serious injury or death in an in-flight emergency. Even though they have saved hundreds of lives in many different types of conditions, inherent danger of failure, even if properly designed, manufactured and installed, remains due to the countless permutations of random variables (attitude, altitude, accelerations, airspeed, weight, geographic location, etc.) that may exist at time of usage. The combination of these variables may negatively influence the life saving function of these airframe emergency parachute systems. They are designed to be a supplemental safety device and to be used at the discretion of the pilot when deemed to provide the best chance of survivability.*

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory requirements prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents in this specification.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *ballistic device, n*—mortar, rocket motor, explosive projectile, piping, or other high energy device.

3.1.2 *completely opened parachute, n*—the parachute has reached its maximum design dimension for the time.

3.1.3 *parachute deployment, n*—process of parachute activation and inflation.

4. Materials and Manufacture

4.1 *Materials*—Material used for parachute assemblies, the failure of which could adversely affect safety, must meet the following conditions:

4.1.1 Material shall be suitable and durable for the intended use.

4.1.2 Design allowables (strength) must be chosen to have statistical parameters of material allowables, load concentration, or both.

4.1.3 The effects of environmental conditions, such as temperature and humidity, expected in service must be taken into account.

5. Reserved

5.1 This section is being used as a placeholder to maintain the previous section numbering.

[1] This specification is under the jurisdiction of ASTM Committee F37 on Light Sport Aircraft and is the direct responsibility of Subcommittee F37.70 on Cold Weather Gliding.

Current edition approved April 1, 2022. Published April 2022. Originally approved in 2003. Last previous edition approved in 2014 as F2316 – 12 (2014). DOI: 10.1520/F2316-12R22.

6. Parachute System Design Requirements

6.1 *Strength Requirements:*

6.1.1 S engh e i emen a e peci ed in e m of limi load (he ma im m load o be e pec ed in e ice) and i l ima e load (limi load m l iplied b a p e c ibed fac o of afe).

6.1.1.1 Unle o he ' i e p o ided, p e c ibed load a e limi load .

6.1.1.2 Unle o he ' i e p o ided, an i l ima e load fac o of afe of 1.5 m be i ed.

6.1.2 S em e al a ion b anal i m i e an acce p ed comp a ional me hod ha ha been e i ed h o gh e ing. In o he ca e , load e ing m be cond c ed.

6.1.3 S em e al a ion b e ing m be i ppo ed ' i h in i men calib a ion e i ed b an applicable ' eigh and mea i e eg la o bod , fo e ample, a e and fede al go e nmen .

6.2 *System Design*—The follo' ing minim m pe fo mance anda d fo he ba ic pa ach e em hall be me .

6.2.1 *Parachute Strength Test*—A minim m of h ee i ce- fi l d op e of he pa ach e a embl hall be cond c ed i nde i l ima e load condi ion o demon a e he pa ach e' eng h. The ma im m pa ach e opening fo ce mea i ed in he h ee e ' ill be he i l ima e pa ach e opening load. A he' pa ach e a embl ma be i ed fo each e . The ' eigh of he pa ach e a embl i incl ded in he e eigh . Da a ac i i ion hall be pe fo med fo each e and hall incl de eco ding of in a ion load a a f nc ion of ime.

6.2.1.1 Fo a i cce fi l d op e he pa ach e em m be able o i ppo he i l ima e load demon a ed d ing he d op e . No de lmen al pe manen defo ma ion o damage ma occ d ha p e en he em f om e ing i p po e. The pa ach e hall:

(1) Main ain a de cen a e a o belo' i de igned a e of de cen fo a gi en ' eigh and al i de.

(2) Ha e comple el opened ' i hin i de igned pa ame e of ime.

6.2.1.2 An i l ima e load fac o of afe of 1.5 i achie ed b cond c ing he pa ach e eng h e a follo' :

(1) Parachute Strength Test with Aircraft in Flight If he pa ach e i eng h e ed ' hile a ached o an ai c af in igh , he follo' ing e pa ame e hall be applied:

Min. Te ' eigh = 1.25 Ai c af Ma im m G o Takeoff Weigh

Min. Te Speed = 1.1 Aicaf ' Ma im m In ended Pa a- ch e Deplo men Speed

NOTE 1 In hi e a ian , he fac o of afe i con ide ed applicable o he ene g of he ai c af . Ho' e e , i i no pe mi ible o cale e e i l b i ing an ene g e i a ion app bach.

(2) Parachute Strength Test with "Dead Weight" Payload If he pa ach e i eng h e ed ' hile a ached o a dead- ' eigh (den e ma and, me al chain , a e , e c. and limi ed ol me), he follo' ing e pa ame e hall be applied:

Min. Te ' eigh = Ai c af Ma im m G o Takeoff Weigh

Min. Te Speed = Ai caf ' Ma im m In ended Pa ach e Deplo men Speed

NOTE 2 Thi e me hod i b na e con e a i e, a a dead ' eigh doe no ho' an pi ching o o a ion endenc ha ab o b ene g d ing he pa ach e opening h , a a eal ai c af al' a doe . The efo e, e ' i h ma im m ' eigh and peed e l in l ima e load .

6.2.2 *Rate of Descent*—Ra e of de cen da a hall be e- co ded fo all e in 6.2.1. Thi da a ma be co ec ed fo he a ia ion in e ehicle ' eigh o de e mine he a e of de cen a he g o ' eigh of he peci c ai c af . De cen a e da a f om pa ach e canopie hall be co ec ed o 1500 m (5000 f) den i al i de and anda d empe a e. Ai c af man fac- e and pa ach e man fac e hall coo dina e ha e io inj o occ pan i nlikel ' hile landing nde pa ach e.

6.2.3 *Staged Deployment*—The pa ach e a embl hall be de igned o age he deplo men e ence in an o de l manne o ed ce he chance of en anglemen o imila malfi nc ion .

6.2.4 *Environmental Conditions*—The em m be e al a ed fo ope a ion in empe a e condi ion of −40 °C o 48.9 °C (−40 °F o 120 °F).

6.3 *Installation Design*—A peci c Pa ach e In alla ion Man al (PIM) fo he in alla ion of a pa io la pa ach e em in o each ai c af model m be c ea ed. The PIM m p o ide fficien info ma ion o en e e co ec in alla ion of he pa ach e em o he peci c ai f ame.

6.3.1 *Coordination*—Ai f ame and pa ach e man fac e m coo dina e and join l app o e he PIM fo co ec ne . De ign o con g a ion change ha impac he pa ach e in alla ion, pe fo mance, o ope abili e i e e-e al a ion ela i e o he e i emen of hi peci ca ion. Bo h ai f ame and pa ach e man fac e hall coo dina e he e an icipa ed change befo e implemen a ion. The e change hall be doc - men ed in a e i ed PIM.

6.3.2 *Weight and Balance*—The in alla ion of he pa ach e em m be acco n ed fo in he de ign da a of ' eigh and balance limi of he ai f ame.

6.3.3 *System Mounting*—The ha d' a e ed o in all he pa ach e em hall no become loo ened o de ached a a e l of no mal ' ea and ea .

6.3.4 *Extraction Performance*—Ai f ame and pa ach e man fac e m coo dina e and ho' ha he e ac ion de ice ' ill cleanl pene a e an co e ing o emo e he pa ach e em' co e , if an , and e ac he pa ach e a embl o fi ll pen ion line e ch (line ha connec he pa ach e canop o he ha ne e) ' i ho inhibi ing o damaging he pa ach e e pon eg e . While i i ecogni ed ha he ai c af con g a ion i np edic able in an eme genc i a ion (fo e ample, b oken pa c ea ing deb i), all d e ca e m be aken o p o ide a pa h of lea e i ance a ming an e emel apid a e of depa e.

6.3.5 *Parachute Attachment to the Airframe*—The pa ach e a embl m be a ached o he p ima c e of he ai f ame ' i h an ai f ame a achmen ha ne ha ma be compo ed of a ingle ha ne ec ion o a e ie of ha ne ec ion . The ai f ame and pa ach e man fac e m coo dina e and ag ee o en e ha he pa ach e a achmen o he bjec ai f ame complie i h he follo' ing condi ion :

6.3.5.1 Pa ach e deplo men ind ce ni e load di ib - ion o he ai f ame, la gel d e o geome ic loca ion of he ha ne a achmen poin . The ai f ame a achmen poin and

ai f ame a achmen ha ne fo each indi id al ai c af model m compl ' i h he l ima e pa ach e opening load mea- ed in he pa ach e ehg h e de c ibed in 6.2.1. Thi load al ead con ain he e i ed afe fac o of 1.5.

6.3.5.2 The ha ne em and a ach poin m be con g ed in a manne ha p e en he ai c af in a de cen and landing a i de ha ma imi e he abili of he ai f ame c e o ab o b he an icipa ed landing load and minimi e he p obabili of inj o he occ pan .

6.3.5.3 The ai f ame a achmen ha ne m be o ed f om he in alled pa ach e o he ai f ame a achmen poin and co ed in a manne ha ' ill p e en i f om impac ing no mal igh ope a ion . I m al o be ho' h ha he ha ne ' ill be fficien l ipped f ee af e ac i a ion of he pa a- ch e em o en e ade a e fi nc ioning of he em.

6.3.5.4 The ai f ame a achmen ha ne de ign m mini- mi e he po en ial fo con ic ' i h he p opelle . If con ic ' i h he p opelle i na oidable b in alla ion de ign o ope a o in c ion ch a h ing do' n he engine, he ai f ame a achmen ha ne m be man fac ed f om ma- e ial ha ield a ea onable likelihood of i ing a con ic i h he p opelle .

6.3.6 *Activating Housing Routing*—The pa ach e em

f om 276 76 76 76e76e76 76 ig76 76 he p obabi e em.

11.2.1 *Installation and Size of Placard or Label*—The ai f ame man fac e hall pe manen l in all he ' a ning placa d o label in a manne de ned b hi pec ca ion and doc men ed in he PIM.

11.2.2 *Label Size and Color*—All placa d o label hall follo' he colo a ion me hod de c ibed belo' . The h ee i e of placa d o label ill add e diffe en loca ion fo in alla ion.

11.2.2.1 *Danger Placard*—Dange placa d o label hall be p in ed ' i h a ed bo de ' i h ' hi e (o e e e pe) le e ' i h a de c ip i e g aphic elemen .

(1) Danger Placard for Interior Parachute Installation—A 7.62 cm (3 in.) minim m iang la placa d o label ' i h he ' o d Dange – (ee ample placa d Fig. X1.1 of Appendi X1) m be placed adjacen o he pa ach e eg e poin fo enclo ed ai c af ' he e he pa ach e em ma no be i ible f om he e e io .

(2) Danger Placard for Exterior Parachute Installation—A 5.08 cm (2 in.) minim m iang la placa d o label (ee ample label Fig. X1.1

S3.1.1 The eme genc pa ach e em man fac e hall e abli h in pec ion and e hece a o en e ha each a icle p od ced confo m o he o iginal enginee ing peci ca ion , a de ned belo' :

S3.1.1.1 In pec ion fo a' ma e ial , p cha ed i em , and pa and a emblie p od ced b pplie , incl ding me hod ed o en e accep able ali of pa and a emblie ha canno be comple el in pec ed fo confo mi and ali ' hen dell e ed o he pa ach e man fac e ' facili .

S3.1.1.2 P od c ion in pec ion of indi id al pa and comple e a emblie , incl ding he iden i ca ion of an pecial man fac ing p oce e in ol ed, he mean ed o con ol he p oce e , and he nal e ali in pec ion of he comple ed eme genc pa ach e em.

S3.1.1.3 A nonconfo ming ma e ial e ie' em ha incl de doc men a ion of pa di po i ion deci ion and a em o di po e of ejec ed pa .

S3.1.1.4 A em fo info ming compan in pec o of a en change in enginee ing d a' ing , peci ca ion , and ali con ol p oced e .

APPENDIX

(Nonmandatory Information)

X1. SAMPLE OF LABELS (PLACARDS)

X1.1 The ample label ho' n in Fig. X1.1 mee he e i emen p o ided in 11.2.2.1.

X1.2 The ample label ho' n in Fig. X1.2 mee he e i emen p o ided in 11.2.2.2.

X1.3 The ample label ho' n in Fig. X1.3 mee he e i emen p o ided in 11.2.2.3.

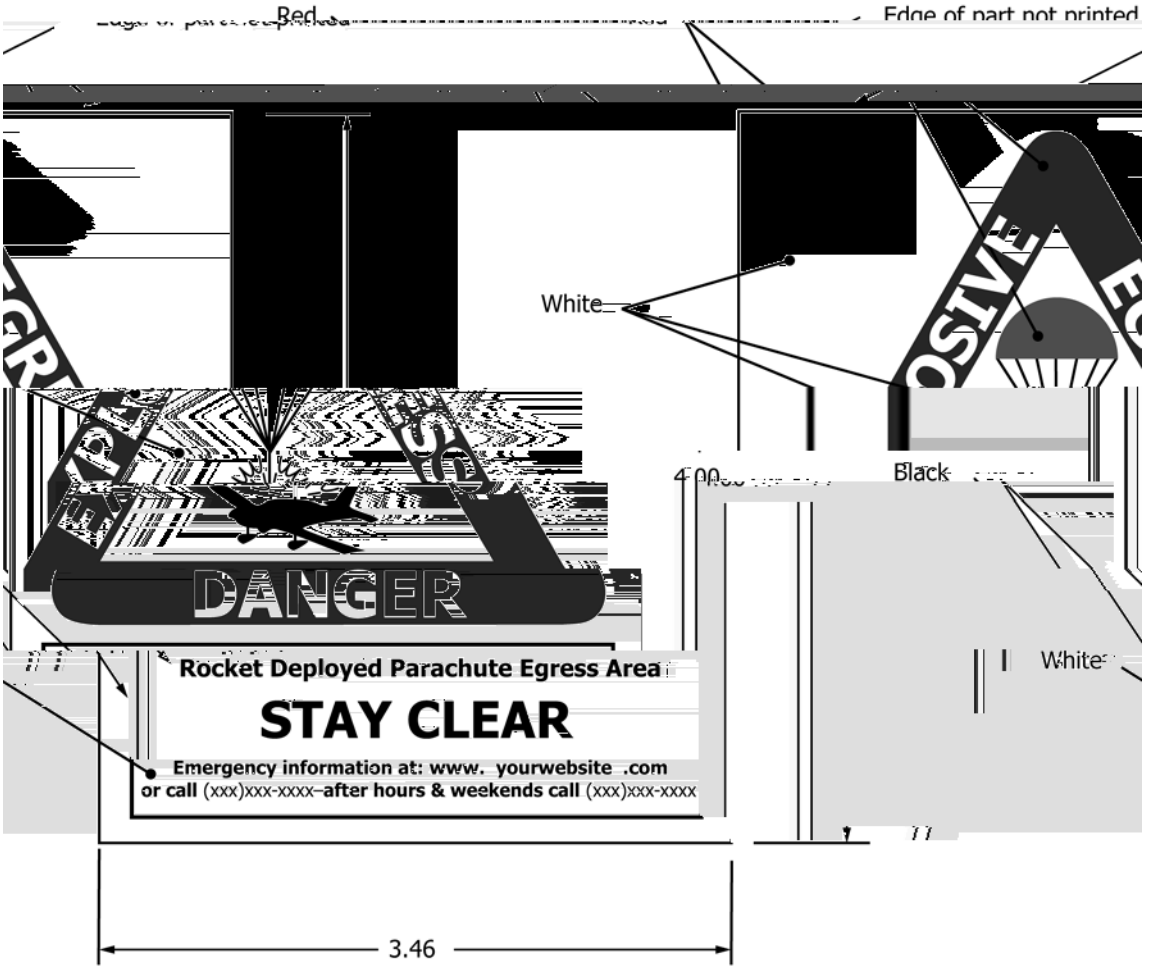

FIG. X1.1 Sam le Dange Label

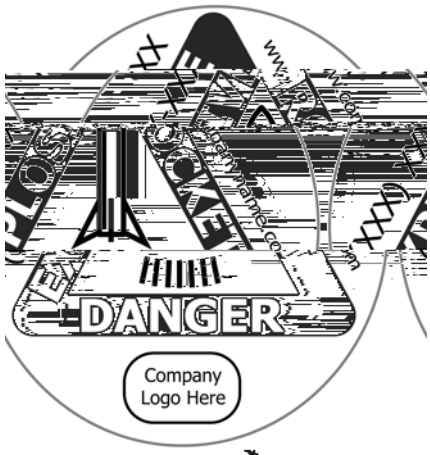

FIG. X1.2 Sample Identifying Label

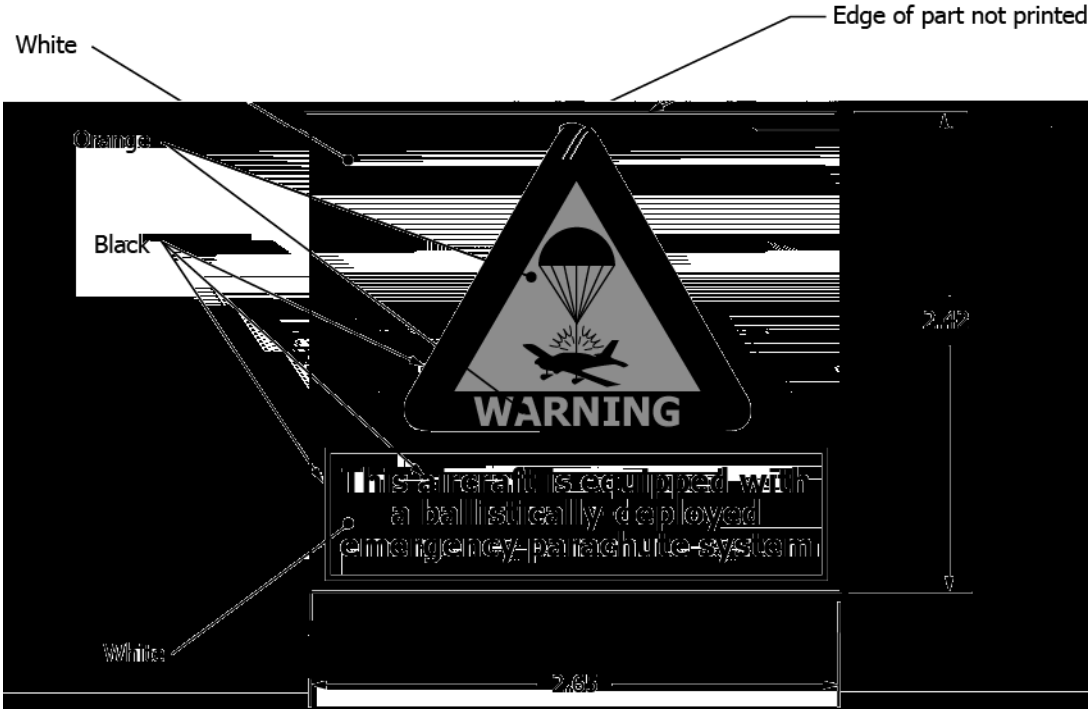

FIG. X1.3 Sample Label