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DEPARTMENT OF TRANSPORTATION
DOCKETS

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DOT-FAA
14 CFR Parts 1, 101, 400 and 401
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NPRM Page No 32816

Author Jerry Irvine Expertise:
-Founded the consumer High Power Rocketry industry as it now stands as a "civil consumer activity."
-Served on CA OSFM (formerly CSFM) rules committee
-Served on NFPA rules committee
-Served on TRA rules committee
-Provided services to NAR rules committee
-Had the first TRA "HPR consumer motors".
-Had an HPR consumer motor decertified by TRA due to FAA 15 second burn time rule change. Loss of commerce estimated at $100,000.
-Motors approved in UK, EU, USA and others.
-Co-founded TRA (#00012)
-Current or past member Claremont Rocket Society (Class 1-MR), NAR (Class 1,2,3-MR,HPR), TRA (Class 1,2,3-MR,HPR), PRS, RRS, RRI, IEAS (Class 1,2,3,4-Amateur or civil rocketry)
-Proposed the expansion of MR propellant from 113g to 125g for metric compliance. Rule pushed through FAA by NAR
-Proposed the addition of LMR above 1 pound liftoff weight and adopted was 3.3 pound weight limit. Author's brand rockets were used in the NAR Blue Ribbon Report supporting that successful FAA regulatory change.

AREAS OF AGREEMENT with proposed rule

- unmanned rockets scope
- modify ballistic coefficient
- eliminate burn time limit
- directly recognize HPR
- directly recognize and provision civil rocketry

AREAS OF AGREEMENT IN PRINCIPAL
WITH MODIFICATION OF WORDS OR TABLES

Reasons:
-Vast simplification
-Conformance with other CFR
-Deregulation of big, low, slow rockets (show rockets)
-Safety is always superior now

Stated goals:
-Safety
-Reporting
-Disclosure of high performance operations
-Allow BDR (Big Dumb Rockets)

Categories of Rockets

Table 1 column 1

FAA

Model Rockets (Class 1)
<125g/4.4 oz. propellant
Uses a slow burning propellant
Paper, wood, plastic
Contains no substantial metal parts
Weighs no more than 454g/16 oz.
FAA exempt

Large Model Rockets (Class 2)
<125g/4.4 oz. propellant
Uses a slow burning propellant
Paper, wood, plastic
Contains no substantial metal parts
Weighs no more than 1500 g/3.3 lb.
FAA NOTAM required

High Power Rockets (Class 3)
Age 18 present
Fire control/report
Up to 36,818 Lb-sec
FAA 7711-2 Waiver required

Advanced High Power Rockets (Class 4)
Big hassle. Being fixed now.

Table 1 column 2

IRVINE PROPOSAL

Model Rockets (Class 1)
-Increase the size of it. Changes proposed.
<1000g/35.33 oz. propellant or, *
<2200g/87 oz. propellant *
Eliminate total weight limit. (A heavy rocket always goes a much lower altitude on a given power.)
-Exempt Model Rockets (Class 1) from DOT and USPS restrictions (allows mailing, remailing, shipping of these common goods without special labeling and papers. Possibly have a 25 -50KG per package weight limit and description of goods (Model Rockets FAA Class 1) on

outside of box).
- FAA superceeds NFPA

-Keep existing guidelines
Uses a slow burning propellant
Paper, wood, plastic
Contains no substantial metal parts
FAA exempt

Large Model Rockets (Class 2)
-Eliminate this provision (now incorporated into Class 1)
< 8000 feet AGL, FAA notification, unlicensed VFR operations
> 8000 feet AGL, FAA waiver process, unlicensed VFR operations
- FAA superceeds NFPA

High Power Rockets (Class 3)
-Rename to Class 2

-Keep proposed guidelines
Age 18 present
Fire control/report
Up to 36,818 Lb-sec

Advanced High Power Rockets (Class 4)
-Change to Class 3 (simplification)
-Rename to Civil Rockets

Process definitions:
VFR -Visual Flight Rules. Rockets shall yield to aircraft. Rockets may be flown when no aircraft are within the maximum ballistic range of the rocket at a 15 degree off vertical launch angle.

* Table 1 (p32818) shows 250 g/500 N-s as "I". 500 g/1000 N-s as "J", 1000 g/2000 N-s as "K". These are propellant mass and estimated power for given NAR letter classes.

New Table 5 **

Basis:
Address inconsistencies (p32818 (2), Impose clarity (p32818 (3)
(c) categories of amateur rockets
(1) industry categorization (power table)

Justification:
- Regulation should allow all readily safe activities. Ie. compliance with FAA superseeds NFPA/NAR/TRA.
- Big Dumb Rockets (BDR) widened access. (from LMR over 125 g/4.4 oz. propellant, over 1500 g/3.3 lb. liftoff mass, to BDR, no liftoff mass limits and a higher propellant mass limit)

AREAS OF INNOVATIVE THINKING

FAA make provision for inter-country treaty by simple letter from any foreign government sub-

component with jurisdiction over territory, shipping, mailing, or airspace. Treat as a civil activity. Invoke NAFTA to lower barriers but not add requirements
- Regulation gives DOT authority to write letter on exempt goods or regulated goods to another country on this specific topic. cc Dept. of State. Initial request may be made by US-DOT, by foreign government agency or citizen users.

Letter inside shipment box.
- If package breaks open in shipment, letter indicates materials at issue (Model Rockets FAA Class 1)
- If package is inspected, letter indicates materials at issue (Model Rockets FAA Class 1)
- Upon arrival, letter indicates materials at issue (Model Rockets FAA Class 1)

Benefits:

Vastly simplified compliance and enforcement
Vastly improved reporting on a low incident activity

AREAS OF DISAGREEMENT
with proposal as written

Suborbital trajectory is duplicative despite excuse, but not "harmful".

1500 feet to nearest structure (eliminate or reduce to 100 feet)
- The actual offset distance by NASA for sounding rockets ie Loki of this type is 300 feet.
- Change to 300 feet.
- In practice, rocketeers voluntarily choose open sites, but to exclude a good site due to nearby workshop or something is silly.
- The distance is a "blast zone". Rockets have relatively small blast zones. In fact, there is no blast at all. They use a slow burning propellant and the occasional case rupture occurs in less than 50 feet radius.

Use of term Large Model Rocket
- Term specific to current FAA Class 2. Not used elsewhere
- Eliminate
- Include this class of rockets into Class 1 (simplify)

Use of term Experimental
- Popularized by Irvine and Kline in 1980, abandoned in favor of HPR, Abandon.

Use of term Advanced High Power Rockets
- Duplicative and confusing with other established class. Eliminate.

RELATED REGULATION

CPSC (jurisdiction not required)

- defines an explosion as an article action time under 0.05 seconds.
- allows minors to use motors with a NAR letter class under F
- requires adulthood for purchase or use of motors with a NAR letter class over F

DOT (jurisdiction guaranteed)

- Change to exempt Model Rockets FAA Class 1, including their associated igniters, delay modules, ejection modules under 2g net each, clustering or staging fuse, igniter dip kits, motors, propellant modules. (a list can be maintained by NAR/TRA/CAR/UKRA via websites). Lodge list with DOT, USPS, affected foreign mail streams.
- Under 25 KG per box if by air. Including passenger air.
- Under 50KG per box net on all modes of transport including vessel, passenger road and rail.
- Under 100KG per box or crate net on all modes of freight transport including road and rail.
- Approvals of new items should be done "by reference" to existing items within 60 days of notification letter to DOT.
- DOT letter of exemption based on this regulation contained in each caselot or shipment box.
- Package marked "Model Rockets FAA Class 1".

- Change to exempt High Power Rockets FAA Class 2, including their associated igniters, delay modules, ejection modules under 10g net each, up to two one pound black powder cans, clustering or staging fuse, igniter dip kits, motors, propellant modules. (a list can be maintained by NAR/TRA/CAR/UKRA via websites). Lodge list with DOT, USPS, affected foreign mail streams.
- Under 25 KG per box if by air. Including passenger air.
- Under 50KG per box net on all modes of transport including vessel, passenger road and rail.
- Under 100KG per box or crate net on all modes of freight transport including road and rail.
- Approvals of new items should be done "by reference" to existing items within 60 days of notification letter to DOT.
- DOT letter of exemption based on this regulation contained in each box.
- Package marked "High Power Rockets FAA Class 2".

USPS (jurisdiction cooperation)

- Exempt Model Rockets FAA Class 1 and their associated Materials, including their associated igniters, delay modules, ejection modules under 2g net each, clustering or staging fuse, igniter dip kits, motors, propellant modules. (a list can be maintained by NAR/TRA/CAR/UKRA via websites). Lodge list with DOT, USPS, affected foreign mail streams.
- Under 25 KG per box if by air. Including passenger air.
- Under 50KG per box net on all modes of transport including vessel, passenger road and rail.
- Under 100KG per box or crate net on all modes of freight transport including road and rail.
- DOT letter of exemption based on this regulation contained in each box.

International mail (seek jurisdictional cooperation and treaty of similar standards)

International freight (seek jurisdictional cooperation and treaty of similar standards)

NFPA (treaty or DOT-FAA regulatory fiat)

- FAA standards, compliance levels, exempt goods superseed NFPA guidelines
- NFPA (1122/1125/1127) reduced in stature for purposes of rocketry to guidelines or suggested standards, since it was formed and promulgated by conflicted parties.

** NEW TABLE 5

Simplify vastly.

Goal: Make compliance and enforcement as simple and clear as possible.

Table 5

	Unmanned Rockets Consumer, Amateur, Civil			Government
	1-MR	2-HPR	3-Civil	Govt
Notice:	None			
Notification-NOTAM		<8000'AGL		yes
Waiver 7711-2		>8000'AGL	>8000'AGL <150KM	>8000'AGL
Launch analysis			>150KM	>150KM

Table 5a Clarify

7711-2 Waiver

Submission of data in email:
Operator name, address, email
Affected altitude
Affected area
Date, time, duration
Estimated number of rockets and max power or impulse
Disclosure on on-ground based launchers
Will recovery be attempted?
OPERATOR AGREES TO YIELD TO AIRCRAFT within the maximum ballistic range of the rocket at a 15 degree off vertical launch altitude, and also have courtesy for aircraft within visual range.

Table 5b Clarify

7711-2B Launch Analysis

2 page report.

ARGUMENT FOR SUPERIORITY CLAUSE

1. State rules vary. Rocket operation is federal jurisdiction. Rocketry is so safe in practice, no regulation can be justified beyond that presented here in my updated proposal.

2. NFPA is a building code framework. Their statements should be relegated to suggestions and not have the force of law.
-It was promulgated and modified by conflicted persons and it has been widely criticized as being authored to favor some firms over others and those provisions have been harshly enforced by clubs to effectively exclude those willing, able and compliant firms from the industry. A superiority clause will provide a federal regulatory level playing field and make

ineffective the targeted restrictions of the NFPA process, the CA OSFM regulations (the only state with such regulations), and the national club approvals which are regularly in favor of some firms and adverse to others, quite arbitrarily. This proposed regulation is entirely consistent with current industry safety guidelines and operational practice but eliminates all opportunities for arbitrary vendor level de-selection.

3. Club rules are more arbitrary and restrictive than law and under the NFPA framework are enforced as if law or regulation. That is a dangerous trend, even if it were not already being abused.

4. Conform to or act in awareness of NAFTA, EU, CE, UN and spread proposed exemptions for small shipments, modest propellant mass rockets to those jurisdictions via treaty, consultation and referring regulation as adopted and as presented herein. Foreigners have a tendency to conform to forward leaning USA regulations such as this proposed one by Irvine.

5. State abuse
- amateur rocketry regulations in WA state were abusive until McGoffin assisted to get regulations vastly relaxed
- CA has an extensive, unique and overreaching regulatory environment for rocketry that should be bypassed then eliminated. It was tailored after the custom special effects industry with its journeyman approach to make entry to the market difficult to new players to favor the entrenched and experienced companies and unions. That dynamic simply does not apply to rocketry. It is a public, consumer product ,and learning is done by vendor technical manuals and web based educational information.

6. Federal FAA, by far the most sensible regulator regarding rocketry in the United States.

Federal explosives via BATFE
-Until very recently all rocket motors, propellants, igniters and associated goods were exempt under 27 CFR 55.141(a)(8) and 27 CFR 55.141 (a)(7), wherein Class C was exempt and DOT under 49 CFR redefined Class C as inclusive on new 1.4S and 1.4C. In addition to that, explosives are defined in the BATFE enactment language as substances that "function by explosion" and, as we have seen, CPSC specifically defines it in this exact context as 0.05 seconds to consume substantially all of the material. Since rocket propellants are "slow burning solids" (4-9mm/s) they not only are not explosives, but do not even burn fast enough (10mm/s in EU 100mm/s in USA) to qualify as flammable solids DOT 4.1 under 49 CFR. Rocket motors themselves typically burn from 0.5 to 20 seconds in duration. There has been recent overreaching regulatory changes by BATFE, not motivated by any problem, but as a misdirected attempt to respond to 9/11/2001, which is entirely ineffective and kills citizen rights. There is a lawsuit Tripoli vs BATFE addressing this overreach pending at this time. There has already been a ruling that "The problem in this case is that ATFE's explanation for its determination that APCP deflagrates lacks any coherence. We therefore owe no deference to ATFE's purported expertise because we cannot discern it. ATFE has neither laid out a concrete standard for classifying materials along the burn-deflagrate-detonate continuum, nor offered data specific to the burn speed of APCP when used for its common or primary purpose. On this record, the agency's decision cannot withstand judicial review."
- The proposal within to make rocket goods under a (2.2KG ea, 25KG air, 50KG package, 100KG freight) mass threshold entirely exempt from FAA, BATFE, DOT, USPS, CA-OSFM, NFPA seeks to unify the exemptions that have been in place at various times in the past (without incident).
- BATFE refuses to take a position in the lawsuit or its regulations on what the burn-

deflagrate-detonate thresholds are in an effort to maintain arbitrary regulatory power without oversight. Despite the agency's legal and scientific denial there is a threshold that exists both in law and in science.
-- In law under BATFE the standard is "function by explosion". Under CPSC the standard of "explosion" is substantially all of the material consumed in under 0.05 seconds (1/20 of one second). This passes the smell test as well since anybody who has seen an explosion knows it is a "boom" with the saying of that word substantially consistent with the duration of an explosion itself.
-- In science, the deflagrate threshold is about 10cm/s or 100mm/sec. Below that a substance is found to be smoldering or burning (ie paper, candles, APCP propellant). Above that it is considered to be deflagrating. Deflagrating substances when contained in "bombs" can explode, but in most cases not outside of such a "bomb" (article in DOT terminology). There is yet another threshold of speed of combustion called detonation. Most commercial explosives function by detonation such as ANFO, TNT, C4, etc., and are activated by a special starter called a "detonator". A detonator itself detonates, not merely deflagrates, and the shock wave it generates initiates a shock wave in the "detonating explosives". The function of the explosion is by a shock wave passing through the material at a speed necessarily greater than Mach 1 (1160 fps, 760 mph), the speed of sound.
- Not only is rocket propellant slow burning below the threshold of even a DOT Flammable Solid 4.1, the associated igniters and fuses and ejection charges also operate by combustion (burning) not explosion. Many of these materials are thus mis-categorized by DOT, largely due to the low funding vendors have for specialized testing and obscure rules and procedures used by DOT to "overclassify" goods to grab jurisdiction. Grabbing jurisdiction is also the motivation for the mis-statements and regulatory overreach of BATFE and CPSC.
- Consumer rocketry has a zero user death record over 45 years.
- Facts, science, and tests to show a material (substance) or product (article) "falls out" of consideration for a particular shipping class in the case of DOT, or permit class in the case of BATFE, are regularly disregarded or refused by agency enforcers and application reviewers, even when set forth in regulation. That is both illegal and common. It substantially harms commerce and exposes citizens illegally to risk of criminal charges and administrative fines (which has actually occurred).

Federal CPSC
- regulates access to minors
- not applicable to adults in the context of the regulations
- CPSC also does not have jurisdiction over "precursors or components" to fireworks, which themselves are not explosives or fireworks, but has been over reaching in the case of Firefox and other supplier cases where they claim a paper tube (or other components) "could" be used to make a firecracker, which is legal to use, on indian reservations, with fireworks permits, and with BATFE explosives permits, and thus enforce against these suppliers for selling the paper tube, and other "potential" elements to a firecracker. That is illegal. Penalties for regulatory overreach should be added to provide for treble damages against regulators found by clear and convincing evidence to have damaged a citizen or person by overreach. Liquidated damages of $50,000 and ALL ATTORNEY FEES to incentivize the agency. It should be made retroactive since government agencies are not in need of protection from retroacticvity clauses, as sovereign citizens and persons are.

Federal USPS
- Currently uses old language to permit for example NA-0323 model rocket motors which is in lesser use and limits units to about 25.4g or 30g per unit depending on who you listen to. DOT has redefined Class C as either 1.4S or 1.4C. As such USPS should bring DMM into

conformance with the proposed 2.2KG ea, 25KG air, 50KG package, 100KG freight mass thresholds, and expressly permit FAA Model Rockets Class 1, including their associated igniters, delay modules, ejection modules under 2g net each, clustering or staging fuse, igniter dip kits, motors, propellant modules. (a list can be maintained by NAR/TRA/CAR/UKRA via websites). Lodge list with DOT, USPS, affected foreign mail streams. If done, every agency would be operating from the same consistent, unconfusing, proven save, zero incident, zero death, zero accident base of experience. Decades of experience. Internationally.

7. Superceeds state, county, local, fire code, inconsistent club, and shipper standards in the narrow field of consumer and civil rocketry. Federal superiority would result in any compliant supplier to have access to the national market, despite "local politics".

APPENDIX

Supporting website for this proposal:

http://www.v-serv.com/FAA/BDR

The site contains ballistic performance charts for three typically sized and powered BDR's as well as copies of the vendor proffered safety codes contained with each and every initial order to all customers of rocketry products. The safety codes are the device that have caused the impeccable safety record in model rocketry since 1957, and what later became High Power Rocketry since 1978.

Acronyms used:

DOT- Department of Transportation
FAA- Federal Aviation Administration
USPS- United States Postal Service
CFR- Code of Federal Regulations
NPRM- Notice or Public Rule Making
CA- California
OSFM- Office of State Fire Marshal
CSFM- California State Fire Marshal
NFPA- National Fire Protection Association
TRA- Tripoli Rocketry Association
NAR- National Association of Rocketry
HPR- High Power Rocketry
UK- United Kingdom
EU- European Union
USA- United States of America
PRS- Pacific Rocket Society
RRS- Reaction Research Society
RRI- Rocket Research Institute
IEAS- International Experimental Aerospace Society
MR- Model Rocket
LMR- Large Model Rocket

BDR- Big Dumb Rocket
AGL- Above Ground Level
VFR- Visual Flight Rules
NAFTA- North American Free Trade Agreement
CE- Marking for consumer safety (similar to Underwriters Laboratory in USA)
UN- United nations
NASA- National Aeronautics and Space Administration
DMM-Domestic Mail Manual
BATFE (ATF, ATFE)- Bureau of Alcohol, Tobacco, Firearms, and Explosives
APCP- Ammonium Perchlorate Composite Propellant (desensitized cast solid)
BPP- Black Powder Propellant (pressed solid)
ANFO- Ammonium Nitrate Fuel Oil
TNT- Tri-Nitro Tolulene
C4- Military (plastic) explosives term of art
N-s- Newton-seconds
Lb-s- Pound-seconds
g- gram
lb- pound
oz- ounce
KG- kilogram
KM- Kilometer
Cd- Coefficient of Drag
Cdr- representative Coefficient of drag at an average of the Reynolds numbers between 10^6 and 10^7. Or Cd representative.
F motor- Under 80n-s total impulse which is about 42g APCP (105g BPP) propellant mass each
CAR- Canadian Association of Rocketry
UKRA- United Kingdom Rocketry Association

Conversions:

28.3g per ounce
453g per pound
4.448 N-s per Lb-sec
1000g per KG
16 oz per pound
0.6 KM per mile
5280 feet per mile
25.4mm/s is 1.0 in/sec

by Jerry Irvine - September 2007