NITROFIREX

DRONES

APLICACIONES PARA

EL CONTROL Y LA EXTINCION

DE INCENDIOS FORESTALES

6/20/2016

NITROFIREX

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.- EXTINCION NOCTURNA

.- NITROFIREX

REGULACION ESPAÑOLA SOBRE DRONES

3. Podrán realizarse actividades aéreas de trabajos técnicos o científicos por aeronaves civiles pilotadas por control remoto, **de día y en condiciones meteorológicas visuales** con sujeción a los siguientes requisitos:

a) ....

b) ....

c) Las aeronaves civiles pilotadas por control remoto cuya masa máxima al despegue exceda de 25 Kg. y no sea superior a 150 Kg. **y aquéllas cuya masa máxima de despegue sea igual o superior a 150 kg. destinadas a la realización de actividades de lucha contra incendios** o búsqueda y salvamento, sólo podrán **operar, con las condiciones y limitaciones establecidas en su certificado de aeronavegabilidad** emitido por la Agencia Estatal de Seguridad Aérea, **en espacio aéreo no controlado.**

d)

***Real Decreto-ley 8/2014, de 4 de julio* (Sección 6ª, Articulo 50.3)**

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ANALISIS REGULATORIO

REGULACION ESPAÑOLA SOBRE DRONES

Proyecto de Real Decreto por el que se regula la utilización civil de las aeronaves pilotadas por control remoto

ARTICULO 2. Ámbito de aplicación.

1.

2. Este real decreto no es de aplicación a:

a) Las aeronaves pilotadas por control remoto cuya masa máxima al despegue sea superior a 150 Kg., salvo cuando efectúen actividades o servicios de aduanas, policía, búsqueda y salvamento, lucha contra incendios, guardacostas o similares, conforme a lo dispuesto en el Reglamento (CE) 216/2008 del Parlamento Europeo y del Consejo de 20 de febrero de 2008, sobre normas comunes en el ámbito de la aviación civil y por el que se crea una Agencia Europea de Seguridad Aérea, y se deroga la Directiva 91/670/CEE del Consejo.

ARTICULO 12. Requisitos de la operación

1.

E) IGUAL ANTERIOR +

Si así se contempla en dicho certificado, podrán operar más allá del alcance visual del piloto (BVLOS), dentro del alcance de la emisión por radio de la estación de control, en espacio aéreo no controlado, siempre que cuenten con sistemas que permitan a su piloto detectar y evitar a otros usuarios del espacio aéreo.

ARTICULO 28. *Limitaciones.*

4. Solamente podrán realizarse vuelos en condiciones meteorológicas de vuelo visual (VMC) diurno. La realización de vuelos nocturnos requerirá la autorización expresa de la Agencia Estatal de Seguridad Aérea, previa solicitud del operador, que deberá acompañarla de un estudio aeronáutico de seguridad que constate que la seguridad queda garantizada con las condiciones o limitaciones que se establezcan al efecto.

20/06/2018

NITROFIREX

REGULACION EUROPEASOBRE DRONES

RIGA MEETING (06/03/2015):

1. THE OPERATION OF DRONES SHOULD BE REGULATED IN A MANNER PROPORTIONATE TO "EL RIESGO ESPECIFICO DE LA OPERACION"

4. LA ACEPTACION PUBLICA ES FUNDAMENTAL PARA EL DESARROLLO DE LA OPERACION DE LOS DRONES.

DOCUMENTO EASA (15/03/2015) :

CONCEPTO DE OPERACION PARA DRONES:

"CLASIFICACION BASADA EN EN EL RIESGO PARA REGULAR LA OPERACION DE LOS AVIONES NO TRIPULADOS"

.- CATEGORIA ABIERTA

.- CATEGORIA ESPECIFICA DE OPERACION (INCENDIOS FORESTALES / NITROFIREX)

.- CATEGORIA CERTIFICADA

COMENTARIOS

.- REGULACION EN EVOLUCION

.- ASUMIR DIFERENCIA DE "PERCEPCIÓN CIUDADANA" DRONES / AVIONES

.- BARRERAS DE ENTRADA: SEGURIDAD .- AEREA
.- TERRESTRE
PRIVACIDAD CIUDADANA

.- VENTAJA EUROPEA

.- CASOS / INCIDENTES (43 GRUPO / INCIDENTES USA)

.- NO PREPARADOS OPERACIÓN COMBINADA TRIPULADA / NO TRIPULADA

.- CORTO-MEDIO PLAZO DRONES INCENDIOS FORESTALES "OPERACIÓN NOCTURNA"

.- ZONA INCENDIO ESPACIO AEREO SEGREGADO

DRONES DE APOYO OPERACIONES DE EXTICION

DRONES DE ATAQUE OPERACIONE DE EXTICION

DRONES DE APOYO OPERACIONES DE EXTICION

CAPACIDADES OPERATIVAS:

.- OPERACIÓN H24

.- OBTENCION TRANSMISION INFORMACION TIEMPO REAL

.- GRAN VARIDAD SENSORES (INFRARROJOS, VISUAL, ETC)

.- RELE COMUNICIONES (OTROS ESTACIONES TIERRA, AVIONES TRIPULADOS, ATC)

.- SEÑALAR OBJETIVOS DRONES ATAQUE (LASER, GEOLOCALIZACION)

.- OBTENCION PARAMETROS METEOROLOGICOS

DRONES DE ATAQUE AL INCENDIO: EXTICION

CAPACIDADES OPERATIVAS:

.- OPERACIÓN H24

.- DESCARGA AGENTE EXTINTOR CON PRECISION

.- MANIOBRA DE DESCARGA SIN RIESGO PARA LAS TRIPULACINES

.- MEJORAR LA EFICACIA OPERATIVA RESPECTO MEDIOS AEREOS ACTUALES

.- MEJORAR LA EFICIENCIA ECONOMICA RESPECTO MEDIOS AEREOS ACTUALES

DRONES APOYO

TOW ≤ 25 KG

.- GRAN VARIEDAD EN EL MERCADO

.- DESPEGUE / ATERRIZAJE: VERTICAL (COPTERS) O A MANO (ala fija)

.- AUTONOMIA: PEQUEÑA - MEDIA

.- BUENA: PORTABILIDAD

.- CARGA UTIL: 5-8 KG

.- RANGO DE PRECIO: DECENAS MILES €

.- DISPONIBILIDAD EN EL MERCADO: ALTA

NITROFIREX

DRONES DE APOYO

DRONES APOYO
TOW ≤ 25 KG

CATUAV - ATMOS 50
MTOW: 2.9 kg
Payload: 900 g
Endurance: 120 minutes
Take-off: Hand-launch / Landing: parachute

USOL - HEXAELFO

MTOW: 6,990 kg
Payload: 3,320 Kg
Endurance: 40 minutes
Take-off / Landing: VERTICAL

Insitu Scaneagle	Textron Aerosonde Mark 4.7	Lockheed Martin Stalker XE
Electro-Optic Imager	Electro-Optic Imager	Electro-Optic Imager
Up to 170X Zoom	35X zoom	26x Zoom
Mid Wave Infrared	Mid Wave Infrared	Infrared
12X zoom	10X zoom	2X zoom
24 Hour Endurance	18 Hour Endurance	8 Hour Endurance
10' Wingspan	11.5' Wingspan	10' Wingspan
50 Lbs MGTOW	55 Lbs MGTOW	225 Lbs MGTOW
19,000' Ceiling	15000' Ceiling	15000' Ceiling
Catapult Launch/Skyhook Recovery	Catapult Launch/Net Recovery	Hand/Bungee Launch/Belly landing

6/20/2016

DRONES APOYO

TOW ≤ 150 KG

.- GRAN VARIEDAD EN EL MERCADO

.- DESPEGUE / ATERRIZAJE: CATAPULTA / RED / PARACAIDAD / AERODROMO

.- AUTONOMIA: GRANDE

.- PORTABILIDAD: MODERADA

.- CARGA UTIL: 30-50KG

.- RANGO DE PRECIO: CENTENAS MILES €

.- DISPONIBILIDAD EN EL MERCADO: MEDIA

DRONES APOYO

TOW ≤ 150 KG

USOL – K150

MTOW: 150 kg
Payload: 50 Kg
Endurance: 18 HORAS
Take-off / Landing: PISTA

AERTEC – TARSIS 75

MTOW: 75 kg
Payload: 12 Kg
Endurance: 8 HORAS
Take-off: Catapulta
Landing: Paracaidas

INDRA – PELICANO

MTOW: 200 kg
Payload: 30 Kg
Endurance: 8 HORAS
Take-off: Catapulta
Landing: Paracaidas

ESTADO del ARTE

Tecnologías aeronáuticas, procedimientos de coordinación y metodología operativa de hace + de 60 años…

Los medios aéreos actuales son:

- Lentos
- Descargas manuales
- Operación diurna
- Aviones de un solo uso
- Operación muy arriesgada

PARADOJA TECHNOLOGICA:

TIEMPO de DETECCION vs. TIEMPO de REACCION

ESTADO del ARTE

.- Avances otras ramas de la aviación vs aviación forestal
.- Operación en el peor de los entornos (meteorológico y orográfico)
.- Aviones tripulados y caros vs DRONES (no tripulados) y baratos
.- Aumento grandes incendios nivel mundial
.- Medios aéreos actuales insuficientes ante grandes incendios

NUEVA ESTRATEGIA Y OBJETIVOS:

- **MAYOR CAPACIDAD DE DESCARGA**
- **REDUCION TIEMPOS REACCION**
- **OPERACIÓN H-24**
- **SIN RIESGO PARA LAS TRIPULACIONES**
- **SIGNIFICATIVA REDUCION DE COSTES**

.- NO OPCION, CBALLO GRANDE ANDE O NO ANDE // SOLUCION A LO AMERICANO // PASADA A 50 NM

.- CUENCA 2009 , TMA NADRID, PERRO, ALTO, SE FUE

.- NO NOCHE

NO VALIDO PRIMER ATAQUE, MUCHO TIEMPO, CARO DE OPERAR

AUSTRALIA LO DESCARTO

AUSYTARLIA NO ANFIBIOS

UNO LLEGO CON UN MOTOR TOCADO DC-10

.- GRECIA COMPRO 10 ¿????

.- ESPAÑA DESETIMO PANTANOS SEQUIA T.O. RUN

.- DEPOSITO DE AGUA MUY EXTENDIDO

.- POSIBLE COMPARA ESPAÑA ????

.- EN EL MAR ISLAS CON SOTAVENTO

.- QUITA Y PON

.- GUARDIA NACIONAL

.- ESTE AÑO UNO ESTRELLADO

.- QUITA Y PON

.- GUARDIA NACIONAL

.- ESTE AÑO UNO ESTRELLADO

ESTADO del ARTE

PCADS

Precision **C**ontainer **A**erial **D**elivery **S**ystem

.- 2.000 Lb. (907 liters) Bulk Liquid Packages that disperse liquid media onto a specific target.

.- 100% Bio-Degradable

.- 500 Ft + AGL

.- 3.000 USG (11.356 L) - C-130

.- 12.000 USG (45.424) - C-17

Caylym Guardian Deployment System (ISRAEL) 1,500"

NITROFIREX

DRONES DE ATAQUE

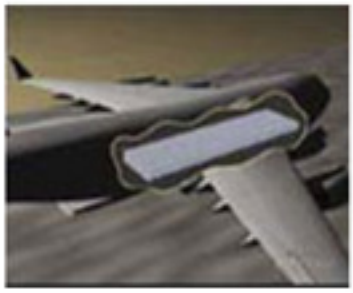
ESTADO del ARTE

BOEING WATER BOMSLETS

.- 2.800 WATER BOMBS X 50 POUNDS (22,5 LITROS)

.- USEFUL WATER BY FLIGHT = 65.317 LITERS

.- 1,000 to 2,000 FEET ABOVE GROUND LEVEL USING PRECISION NAVIGATION AND AIRDROP INSTRUMENTATION.



William Cleary, a project manager in the Boeing Integrated Defense Systems Advanced Airlift and Tanker organization, shows off the sphere he designed to drop from C-17s on wild fires.

.- AVION GRNDE DE BOEING

.- NO NOCHE

.- BOLIDOS

FLAMINGO (EMBEMTION)

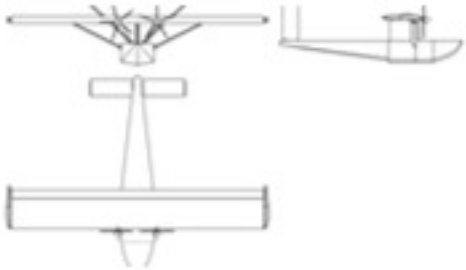
ESTADO del ARTE

- FLAMINGO IS A GUIDED BOMB
- NS / GPS AND OTHER SENSORS. WITH A LOAD OF 200 LITERS
- INCORPORATES A RECOVERY MECHANISM THAT ALLOWS THE SEPARATION OF THE CONTROL UNIT WHICH RELEASES A PARACHUTE JUST BEFORE IMPACT

NITROFIREX

DRONES DE ATAQUE

ESTADO del ARTE



SINGULAR AIRCRAFT26

SUPERFICIES DE OPERACIÓN: AGUA & TIERRA
MTOW = 3.500 KG
MAX LOAD CAPACITY = 2,200 KG (fuel + water)
CRUISE AT 75% POWER (MTOW) = 150 KTS

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NITROFIREX
DRONES DE ATAQUE
ESTADO del ARTE
K-MAX
A Revolutionary Unmanned Aerial System:
Night Unmanned Aerial Firefighting
KAMOV
Rotor Aviation
LOCKHEED MARTIN


ESTADO del ARTE
NITROFIREX

CAPACIDAD OPERATIVA DE EXTINCION NOCTURNA

- LA GRAN CARENCIA OPERATIVA DE LOS MEDIOS AEREOS
- LA OPERACION AEREA NOCTURNA DEBE Y PUEDE SER "NO TRIPULADA"

- LA LUCHA CONTRA LOS INCENDIOS DESDE EL AIRE TIENE QUE SER H-24 (NON STOP FIGHTING)
- APROVECHAR LAS MEJORES CONDICIONES METEOROLOGICAS NOCTURNA
- LA PRIMERA NOCHE CLAVE EN LOS GRANDES INCENDIOS

- SER COMPLEMENTO DE LOS MEDIOS AEREOS DIURNOS
- MEJOR OPCIONES REGULADORAS

NITROFIREX

EXTINCION NOCTURNA

6/20/2016


NITROFIREX
EXTINCION NOCTURNA
747 SUPERTANKER
NIGHT OPERATIONS
A new paradigm ?

DROP STATS
EFFECTIVE DROPS/CL

400-? ft. AGL
+300 ft. footprint
.6 – 2 mi. length
CL 2-8

GSTS QUESTIONS

- ✓ Is the technology there?
- ✓ Can it be done safely?
- ✓ What are the advantages?
- ✓ Can it be done as safely, or more safely and effectively than day ops?
- ✓ Do benefits outweigh risks?
- ✓ Is it cost effective compared to day ops?
- ✓ What are the prerequisites for "tactical operations?"
- ✓ Challenging environment - RiskAssessment
- ✓ Higher drop AGL required
- ✓ Must be "fire specific"
- ✓ Has potential – fire WX modification and direct attack

NITROFIREX

EXTINCION NOCTURNA

"The introduction of Night Vision Goggles has been the single most important advance in night flying Operations for the Rescue Helicopter Service and has

significantly enhanced the overall safety for the flight crew, allowing a better Air Ambulance and Search and Rescue capability..."

NVG Disadvantages

- Cost of startup (Cockpit Lights, Goggles and Training)
- Cost of maintaining pilot currency if not used frequently in routine operations
- Field of view is 40 degrees
- Limited depth perception
- Visual illusions associated with the night flight and the use of NVG's
- The dynamic range of handling bright lights in a dark background is limited. High end military grade NVG have superior dynamic range
- Low time pilots may exceed their skill level attempting to combine flying on fires in the mountains at night
- Loss of situational awareness or spatial disorientation
- Potential CFIT
- **Significant overall increased risk to aviation operations**

NITROFIREX

EXTINCION NOCTURNA

The decision to fly helicopters at night for water drops should only be considered after a thorough risk / benefit analysis. Nighttime helicopter operations may be appropriate in situations where the following conditions exist:

- Lives are or will be threatened
- Structures are or will be threatened
- Resources or infrastructure of significant value are or will be threatened

The assigned pilots(s) must approve of the operation:

- Confirm operation is in compliance with FIRESCOPE Night Flying Operations
- Pilots should NEVER be pressured into night operations!

NITROFIREX

Unmanned Firefighting Need

Many challenges exist when fighting fires including manned helicopters ability to only fly in visual flight conditions. Unmanned systems can shift this paradigm by enabling 24/7 fire suppression support.

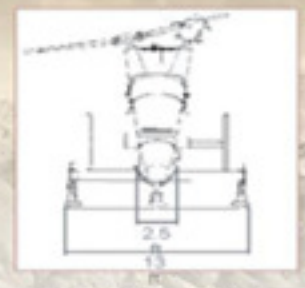
Using the K-MAX Helicopter Unmanned Aerial Systems (UAS) specifically tailored to this unique mission can provide significant benefit to firefighting efforts.

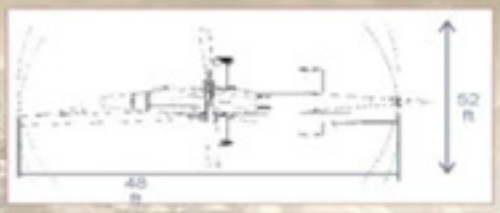
Capabilities:
- Autonomous Water Pickup
- Hotspot Identification
- Dynamic UAS Retasking
- Autonomous Water Delivery
- Delivery Effects Evaluation
- Cooperative UAS Operations
- Precision Resupply Operations
- Personnel Recovery & Equipment Delivery

Night Operations:
- Sensors Package – Allows Night Operation
- High Risk Missions
- Allows 24/7 Continuous Operations
- Increases Situational Awareness
- Autonomous Resupply
- Not degraded by smoke

NITROFIREX

K-MAX Air Vehicle Overview





- Engine: One 1,800 shp Honeywell T5317A -1
- Internal fuel: 228 U.S. Gallons (1550 lbs)
- Empty weight: 5,500 lb. (2500 Kg)
- Maximum gross weight: 12,000 lb. (5,443 Kg)
- Hook/Multi -Hook capacity: 6,000 lb. (2,722 kg)

Over 300,000 fleet flight hours accumulated since 1994 FAA certification.

PRECIO > 7,5 M€

COSTE HORA VUELO = 1.300€

Optionally Piloted K-Max Demonstration

Successes

- Consistently and reliably delivered cargo to a variety of locations
- Multiple loads on one flight
- Accurate to within 2-3 feet
- Fit into existing training for firefighters
- Able to build wetline
- IR camera can assess accuracy
- Satcom relay allowed for BLOS operations
- Camera was able to lock on and track targets
- IR capable of "erasing" smoke
- Able to operate in terrain with DTED

Challenges

- Satcom can drop out if helo is on N heading
- 6o Meter DTED was not high enough resolution
- Radar altimeter sometimes senses load vs. ground
- Operators unfamiliar with tactics normally used in fire

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NITROFIREX
NIGHTTIME AERIAL FIREFIGHTING SOLUTIONS

NITROFIREX

CONCEPTO

NITROFIREX, es un innovador concepto en el mundo de los DRONES, cuyo objetivo es desarrollar la capacidad de **rociar o espolvorear** una gran cantidad de agente en entornos donde hacerlo con aviones tripulados es **peligroso, difícil o imposible.**

(CONCEPTO PATENTEDO NIVEL MUNDIAL, ver diapositivas reserva nº 67)

6/20/2016

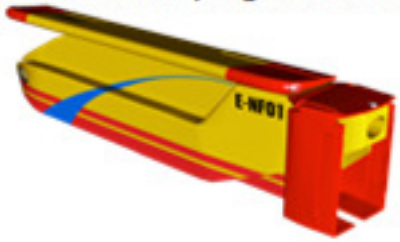
NITROFIREX

DEFINITION

NITROFIREX's the main **elements** to be usedare:

"LAUNCHER AIRCRAFT" or LA
A heavy transport aircraft with a rear ramp.

"AUTONOMOUS GLIDING CONTAINERS" or AGCs
These carry the payload from the LA to the the programedrelease point.



6/20/2016

NITROFIREX

OPERATION PHASES OF THE AGC

2.- GLIDE and GUIDANCE

The AGCs containing the payload glide to their target and are equipped with a guidance system which makes it fully autonomous from the launch to the targeted release point (glided-guided bomb).

AGM-154A (JSOW)

POSSIBLES USOS DEL CONCEPTO

INCENDIOS FORESTALES DE NOCHE

OTROS FUEGOS

EMERGENCIAS NUCLEARES, QUIMICAS or BIOLOGICAS

FENOMENOS METEOROLOGICOS

FUMIGACION PLANTACIONES DE DROGAS

FUMIGACION de PLAGAS o SEMBRADO (Áreas remotas y/o inaccesibles)

6/20/2016

NITROFIREX

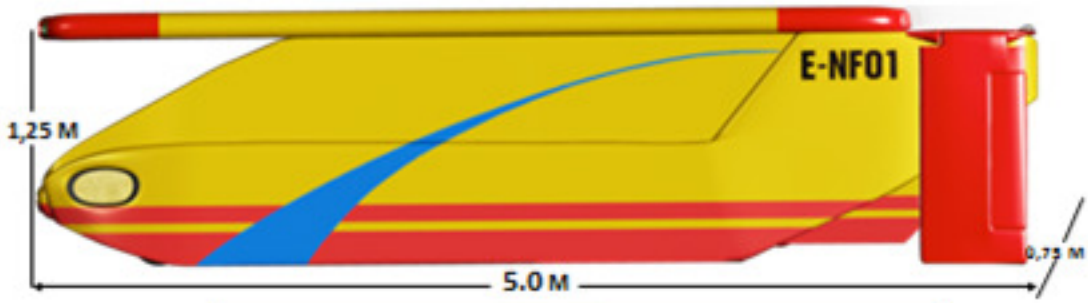
AGC DESCRIPTION

DROMADER : 2.200 L

NITROFIREX: 2.500 ± 250 L

AIR TRACTOR: 3.100 L

CANADAIR CL-215/415: 5.500 L



AGCs TOTAL WEIGHT : 3.000 kg (+/-250 kg)
AGCs EMPTY WEIGHT : 500 KG (~20 % TOTAL WEIGHT)
AGCs PAY LOAD : 2.500 (+/- 250) LITRES (48 -58 % total volume / 72 -80 % AGCs volume)
AGCs DIMENSIONS (meter): 5,00 LENGTH, 1,25 HIGH, 0,75 WIDTH
AGCs VOLUME: 3,75 M³ (80 % total volume)
TOTAL VOLUME NECESSARY : 4,6875 M³

20/06/2016

NITROFIREX

EJEMPLOS AVIONES LANZADORES

AIRCRAFT TYPE	PAYLOAD (TM.)	USEFUL WATER LITERS	NUMBER OF AGCs	
C-130 (WT)	19,4 -28,9	18.368 - 22.000	6 / 8	
AN-12	20	16.600	6	
A-400M	37	31.000	12	
IL-78 (T / MD / TD / MF)	40 /47/50/60	33.000 - 60.000	14 / 20	
C-17	77,3	85.280	24	

20/06/2016

NITROFIREX

Estadísticas Incendios Forestales en España

- Economic loss over the last 20 years (1992-2011) — 6.139 mill € (**307 mill €/year**)
- Average affected surface last 20 years (1993-2012) — **133.288 ha/year**
- Average annual fires last 20 years (1993-2012) — 18.322 fires/year
- N° of fires years 05 to 12→ **25.492 / 16.334 / 10.932 / 11.612 / 14.793 / 11.722 / 16.028 / 15.902**
- Number fires with use of aircraft 07 / 08 / 09 / 10 → 2.594 / 2.702/ 4.235 / 2.963
- Average number of aircraft used in firefighting (last 5 years) →**+160** (**74 PLANE 8 / above 86 HEL**)

DATA FROM REPORT "LOS INCENDIOS FORESTALES EN ESPAÑA. AÑO 2007, Pgs 105-107(M.M.A.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2008", Pg 193 (M.A.R.M.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2007", Pg 111 (M.A.R.M.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2008", Pg 6 / 45 (M.A.R.M.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2009", Pg 10 / 41 (M.A.R.M.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2010", Pg 7 / 79 (M.A.R.M.)
DATA FROM REPORT "INCENDIOS FORESTALES EN ESPAÑA. AÑO 2011", Pg 20 (M.A.G.R.A.M.A.)
DATA FROM REPORT "LOS INCENDIOS FORESTALES EN ESPAÑA. AÑO 1(ENE - 31 DIC 2012" (AVANCE INFORMATIVO) Pgs 17 (M.A.G.R.A.M.A.)

6/20/2013

NITROFIREX

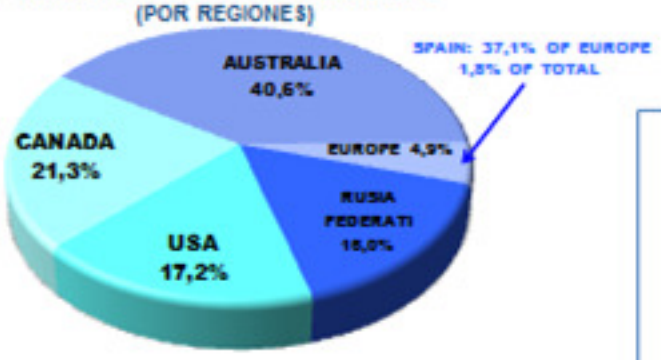
ANALISIS MERCADO

NITROFIREX PATENTED COUNTRIES (see back up slide nº 40)	PERIOD (YEARS)	AVERAGE YEARLY BURNT AREA (HECTARES)
EUROPE (Portugal Spain France Italy Greece)	1980-2009	470.910
RUSSIA FEDERATION	1991-2001	1.200.455
USA	1980-2009	1.699.995
CANADA	1970-2009	2.101.333
AUSTRALIA	2001-2009	4.000.119
	TOTAL:	9.861.001

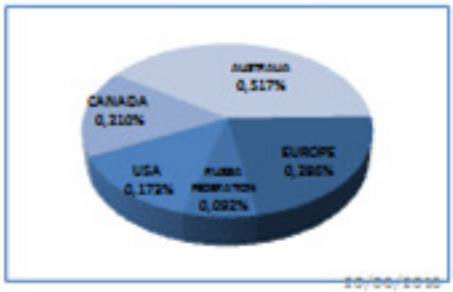
ESTO REPRESENTA SOLAMENTE EL 2,7 % AREA QUEMMADA EN EL MUNDO ANUALMENETE

TOTAL AREA QUEMADA ANUALMENTE = 371.2 Mha = 6,3 VECES LA PENINSULA IBERICA (see back up slide nº 46)

AREA QUEMDA ANUALMENTE
(POR REGIONES)



AREA QUEMDA ANUALMENTE
(% TOTAL PAIS)



NITROFIREX

ANALISIS MERCADO

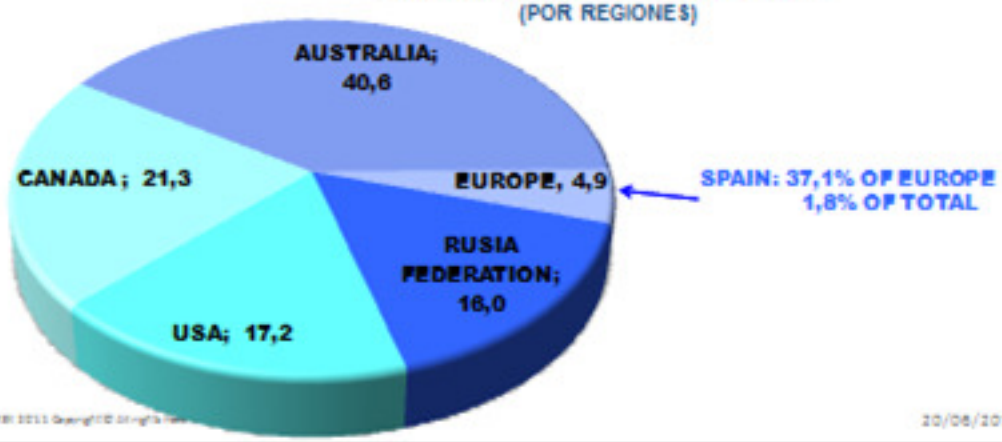
PERDIDAS ECONOMICAS

1,8 %.....307 M€
100 %.....~~17.028~~ M€
8.000 M€

AVIONES

1,8 %.....160 ACFT
100 %.....~~8.800~~ ACFT
4.000 ACFT (1/2 Planes + 1/2 HEL)

AREA QUEMADA ANUALMENTE
(POR REGIONES)




NITROFIREX
SAFETY CONSIDERATION
MODO EMERGENCA / ABORTO VUELO :
- ONE MAN IN THE LOOP
- Automático / Manual modos de aborto
- Sistema Automático: RADIO ALTIMETER / GPWS
- Carga útil usada como seguridad "anti-crash"
L.A.
DATA LINK
RECUPERACION
A.G.C
GUIA FINAL
MODO EMERGENCIA
GPWS

PERFIL VUELO AGC,s NITROFIREX

FASE DE APROXIMACION: DESDE LA RAMPA TRASERA DEL L.A. AL PUNTO DE DESCARGA

EL LANZAMIENTO Y LA APROXIMACION AL PUNTO DE DESCARA SE REALIZA EN "ESPACIO AEREO SEGREGADO" BAJO EL CONTROL DE:

- ATC
- L. A.
- EQUIPOS DE TIERRA

FASE DE RECUPERACION: FROM THE FOREST FIRE TO THE L.A. OP¨s BASE

- RCUPERACION NOCTURNA A BAJA ALTURA (500')
- PROGRAMADA SOBRE ZONAS NO HABITADAS
- EQUIPADO CON PARACAIDAS Y AIRBAG DESPLEGADOS AUTOMATICAMENTE EN CASO DE PARADA DE MOTOR ASEGURAR UN ATERRIZAJE "SEGURO"

NITROFIREX

DARPA : http://www.darpa.mil/news-events/2015-08-28

NITROFIREX :
www.nitrofirex.com

NITROFIREX

CONCLUSIONES

CAMBIO DE FILOSOPIA:

AFRONTAR LA IMPORTANCIA DEL PROBLEMA

NUEVA ESTRATEGIA Y OBJETIVOS:

- MAYOR CAPACIDAD DE DESCARGA
- REDUCION TIEMPOS REACCION
- OPERACIÓN H-24
- SIN RIESGO PARA LAS TRIPULACIONES
- SIGNIFICATIVA REDUCION DE COSTES

AFRONTAR LOS RETOS: REGULATORIO
ECONOMICO
TECNOLOGICO
OPERATIVO


QUESTIONS?

NITROFIREX

BACK UP

SLIDES

20/06/2018

NITROFIREX

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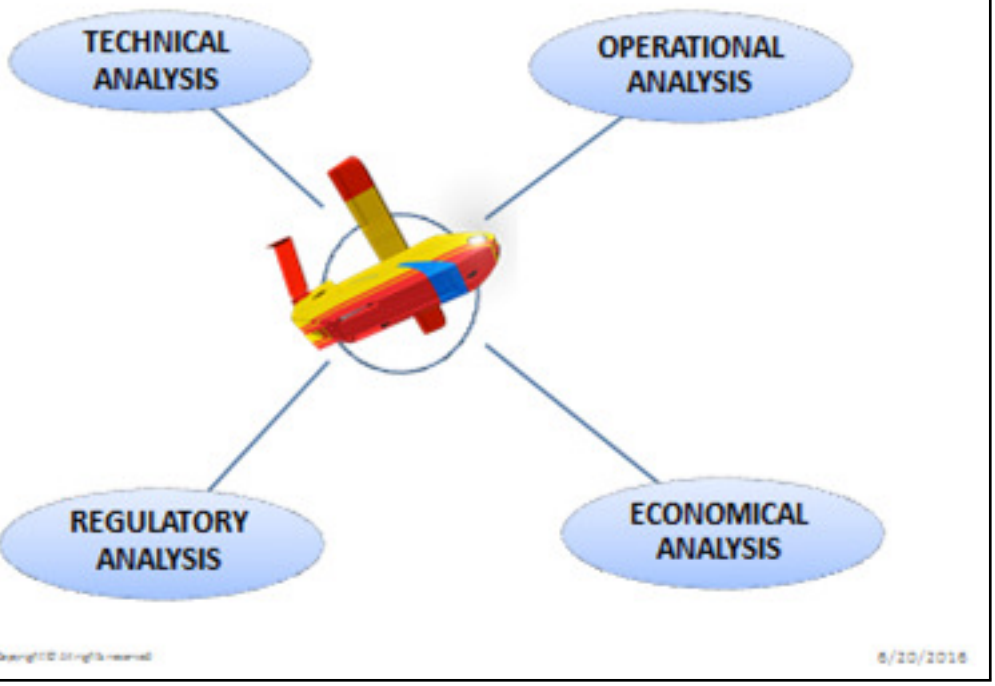
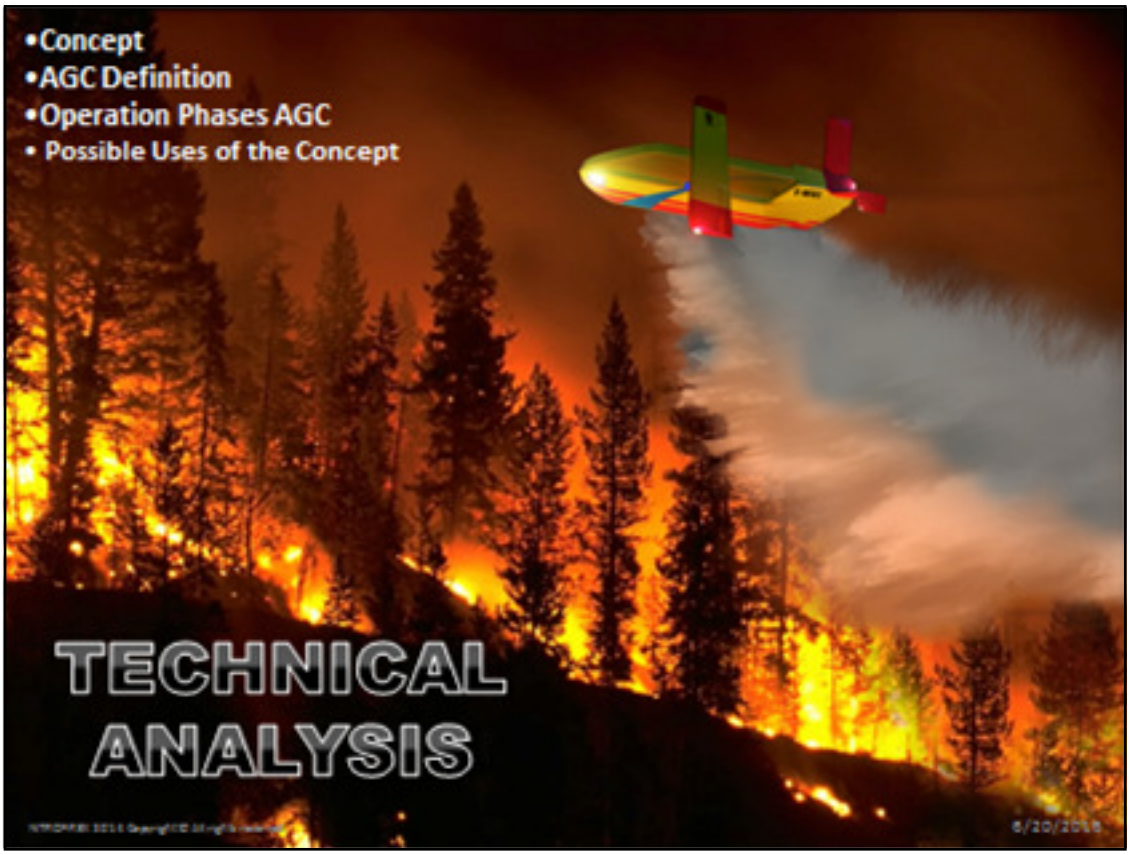


6/20/2016


•Concept
•AGC Definition
•Operation Phases AGC
• Possible Uses of the Concept
TECHNICAL
ANALYSIS
6/20/2018

NITROFIREX

OPERATION PHASES OF THE AGC

1.- LAUNCH

Initial phase of the operation in of which the AGCs are mechanically launched from the L.A.

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OPERATION PHASES OF THE AGC

3.- DROP

Reaching their targeted release point the AGCs drop their content automatically and with great precision.

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OPERATION PHASES OF THE AGC

5.- RECOVERY and LANDING

Once empty and removed of the hostile zone, the AGCs begin their recovery phase by means of their small jet engine, recovering and landing in the base of operation of the L.A. in a completely autonomous way

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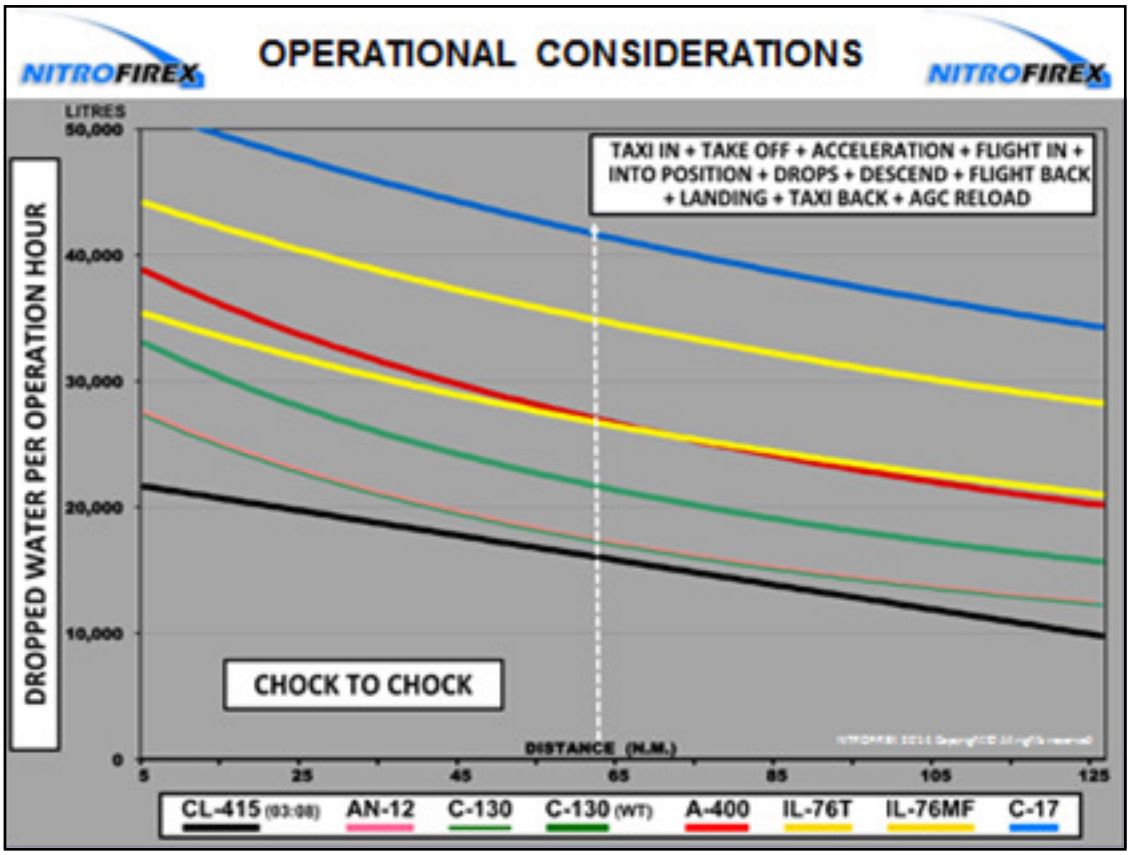
• Current Status
• AGC Description
• Launcher Aircraft
• Operational Advantages
• Economical Advantages
FOREST FIRES
OPERATIONAL
ANALYSIS


NITROFIREX
OPERATIONAL CONSIDERATIONS
NITROFIREX
LITRES
50,000
40,000
30,000
20,000
10,000
0
DROPPED WATER PER OPERATION HOUR
TAXI IN + TAKE OFF + ACCELERATION + FLIGHT IN + INTO POSITION + DROPS + DESCEND + FLIGHT BACK + LANDING + TAXI BACK + AGC RELOAD
CHOCK TO CHOCK
DISTANCE (N.M.)
5
25
45
65
85
105
125
CL-415 (93-08)
AN-12
C-130
C-130 (WT)
A-400
IL-76T
IL-76MF
C-17

NITROFIREX

OPERATIONAL ADVANTAGES

- 24H OPERACION (OPERACION NOCTURNA)
- SE REDUCEN TIEMPOS DE REACCION
- MUCHA MAS CAPACIDAD DE LANZAMIENTO DE AGUA POR HORA DE OPERACION COMPARADO CON LOS MEDIOS AEREOS ACTUALES
- MAXIMA EFICACIA DE LAS DESCARGAS DE LOS AGC.s AL SER REALIZADAS EN SECUENCIA
- MAXIMA PRECISION DE LAS DESCAGAS DE AGUA
-
- MAXIMA CONCENTRACION DEL AGENTE EXTINTOR EN EL PUNTO DE DESCARGA
- NO SE VE AFECTADO POR POR VIENTOS TURBULENCIAS NUBES Y HUMO
- NO SE VE AFECTADO POR POR LA OROGRAFIA DEL TERRENO
- POSIBILIDAD DE ATENDER INCENDIOS DISTANTES EN EL MISMO VUELO
- GRAN CAPACIDAD DE DESPLAZAMIENTO: GRAN RADIO DE ACCION A GRAN VELOCIDAD DE LOS AVIONES DE TRANSPORTES USADOS COMO L.A
- OPERACION SIN RIESGOS PARA LAS TRIPULACIONES
- DAR APOYO DIRECTO A LOS EQUIPOS DE TIERRA POR LA NOCHE

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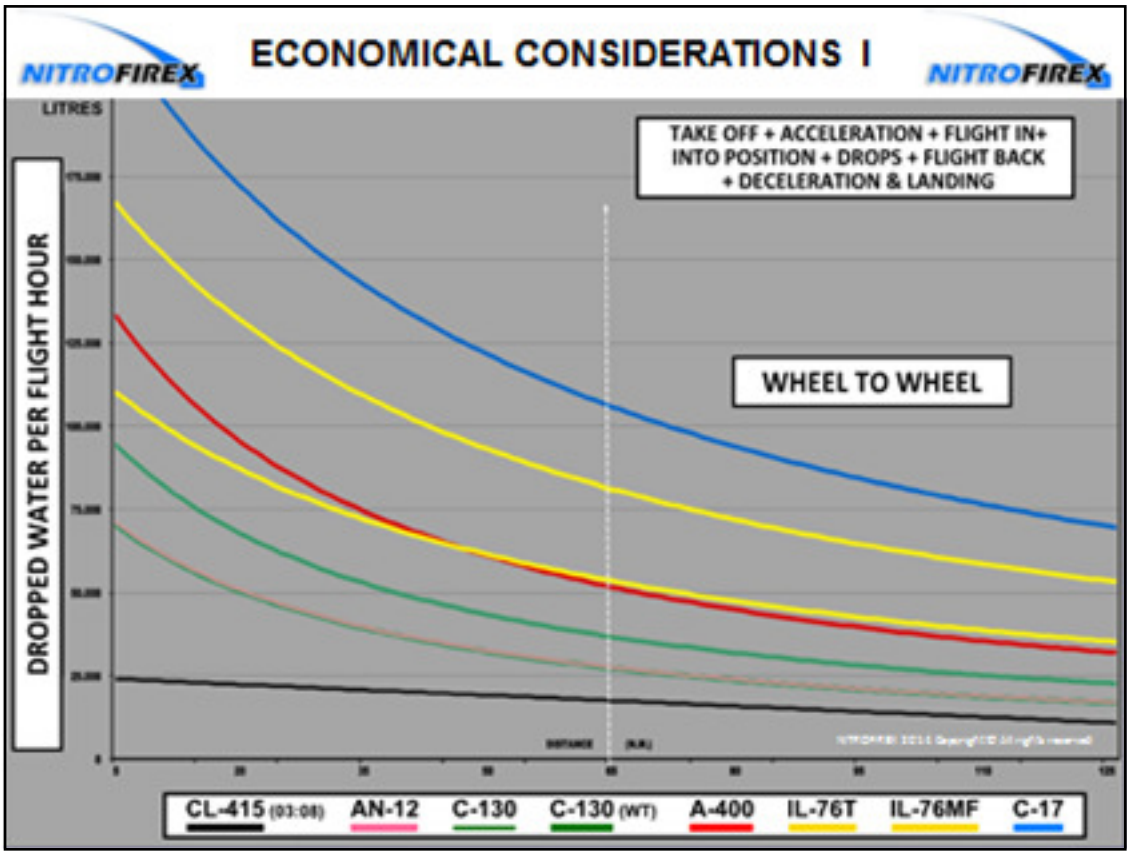
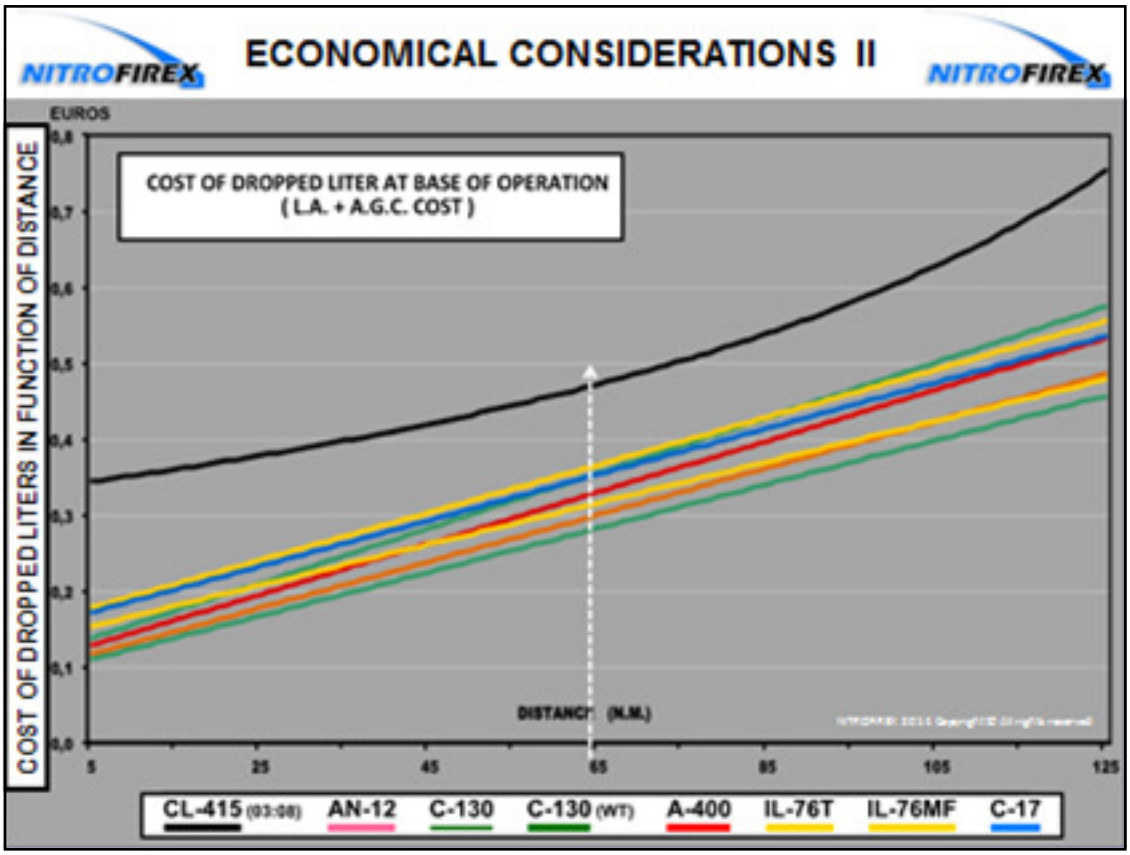

NITROFIREX
ECONOMICAL CONSIDERATIONS I
NITROFIREX
LITRES
DROPPED WATER PER FLIGHT HOUR
TAKE OFF + ACCELERATION + FLIGHT IN+
INTO POSITION + DROPS + FLIGHT BACK
+ DECELERATION & LANDING
WHEEL TO WHEEL
CL-415 (03:08)
AN-12
C-130
C-130 (WT)
A-400
IL-76T
IL-76MF
C-17


NITROFIREX
ECONOMICAL CONSIDERATIONS II
NITROFIREX
EUROS
COST OF DROPPED LITERS IN FUNCTION OF DISTANCE
COST OF DROPPED LITER AT BASE OF OPERATION
(L.A. + A.G.C. COST)
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
5
25
45
65
85
105
125
DISTANCE (N.M.)
CL-415 (03-08)
AN-12
C-130
C-130 (WT)
A-400
IL-76T
IL-76MF
C-17

ECONOMICAL ADVANTAGES

- **MUCHA MAS CAPACIDAD** DE LANZAMIENTO DE AGUA **POR HORA DE VUELO** COMPARADO CON LOS MEDIOS AEREOS ACTUALES
- **MENOR COSTE POR LITRO LANZADO**
- AGCs SER LANZADOS DESDE **MUCHOS TIPOS DE AVIONES DE CARGA**
- **MINIMO DESPLIEGUE** DE FLOTA
- **L.A. NO EXCLUSIVOS** – UN AVION DOS MISIONES
- **AHORROS ECONOMICOS** EN AMORTIZACIONES, PERSONAL, MANTENIMIENTO Y REPUESTOS.
- **GRAN DISPONIBILIDAD** DEAVIONES DE TRANSPORTE PESADOS PARA SE RUSADOS COMO L.A.
- L.A. **NO** REQUIREN **MODIFICACION**
- **LAS TECHNOLOGIAS** NECESARIAS ESTAN DESARROLADAS, MADURAS Y **DISPONIBLES**

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• Market Analysis
• Marketing Strategy
• Sales Forecast
• Funding
ECONOMICAL ANALYSIS
6/20/2018

NITROFIREX

FUNDING

Project Development Costs

- Complete Project Development Budget: 15 – 20 M€

  1 CANADAIR CL-415 PRICE: ~25- 30M€
- Project Milestones

1. Company startup and demonstrator building: 6 months
2. Fundraising: 4 months
3. Preliminary design: 6 months
4. Detailed Design: 8 months
5. Prototype manufacturing and system real tests: 18 months
6. Certification: 6 months
7. Commercialization

20/06/2018


• Safety
• Spanish Regulations
• European Regulation
• Flight Profile
• Why at Night ?
• Conclusions
SAFETY & REGULATORY ANALYSIS
6/20/2018

PATENT INFORMATION

SPANISH PATENT : Request date : 26 January 2005 14:00H
Application number: 2005 00143 (0)
Publication number: 2265260 (A1)
Date of publication and mention of the grant of the patent: 27/11/2007
Bulletin: 1 January 2008

EUROPEAN PATENT: Application number 06710264.0 (EP 1 845 017 B1)
International application number: PCT/IB2006/000122
International publication number: WO2006 / 079899
Date of publication and mention of the grant of the patent: 23/07/2008
Bulletin; 2008/30

USA PATENT: Patent No.: US 7,690,438 B2
Date of Patent: April, 6, 2010
Application No: 11/795,711

RUSIA FEDERATION PATENT : Nº 2007129575 (0322079)

AUSTRALIAN PATENT: Nº: 2006209377

CANADIAN PATENT: Nº: 2594783

20/06/2016

NITROFIREX

Funding

Assessing variability and long-term trends in burned area by merging multiple satellite fire products

Table 2. 1997–2008 estimated annual regional and worldwide area burned.

	Area Burned ($\times 10^4$ km^2=Mha)												
Region	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean
BONA	0.9	4.5	1.5	0.7	0.3	3.2	2.0	5.0	2.9	1.9	1.5	1.4	2.2
TENA	0.5	1.1	1.8	2.2	1.2	1.4	1.3	0.7	1.7	2.4	2.7	1.5	1.5
CEAM	0.9	3.2	1.3	1.7	1.0	1.0	1.7	0.8	1.9	1.3	1.1	1.2	1.4
NHSA	1.7	2.8	2.0	2.4	2.0	1.1	3.3	3.2	1.8	1.5	2.5	1.8	2.2
SHSA	16.0	38.9	30.9	15.8	19.4	21.3	16.1	18.7	22.1	12.5	33.8	13.4	21.6
EURO	0.4	0.8	0.6	1.2	1.1	0.4	0.9	0.5	0.6	0.5	1.0	0.5	0.7
MIDE	0.6	0.9	0.8	0.6	1.2	1.0	0.9	0.8	0.7	0.9	1.2	0.6	0.9
NHAF	152.4	148.7	143.5	145.9	114.4	126.1	128.0	116.4	139.9	115.2	123.4	117.7	131.0
SHAF	111.6	153.1	123.1	118.3	117.3	113.9	126.6	127.1	134.1	122.2	124.2	131.5	125.2
BOAS	3.1	12.9	4.7	7.2	5.8	8.1	15.9	1.6	2.8	4.3	3.2	12.0	6.8
CEAS	17.4	14.6	8.1	11.0	15.0	25.0	12.8	15.6	15.1	17.5	12.5	14.0	14.9
SEAS	3.9	7.9	9.5	4.5	4.5	7.7	6.3	10.7	7.1	5.9	9.9	7.0	7.1
EQAS	9.4	2.6	0.6	0.4	0.7	2.4	0.8	1.2	1.1	2.7	0.5	0.4	1.9
AUST	40.5	39.0	80.2	81.7	88.3	73.1	29.0	60.4	24.9	53.1	48.7	26.6	53.8
Global	359.6	431.2	408.7	393.8	372.1	385.6	345.6	363.0	356.7	342.0	366.3	329.7	371.2

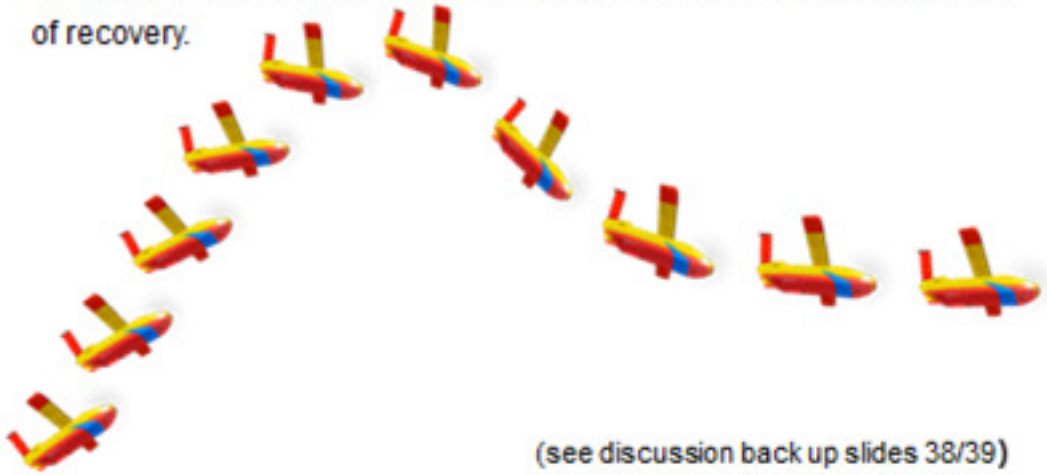
20/06/2018

NITROFIREX

OPERATION PHASES OF THE AGC

4.- ESCAPE MANEUVER

Then the AGCs rapidly escape from the hostile zone taking advantage of the amount of height gained due to the big and sudden loss of weight. This maneuver is used as a transition into the following phase of recovery.



(see discussion back up slides 38/39)

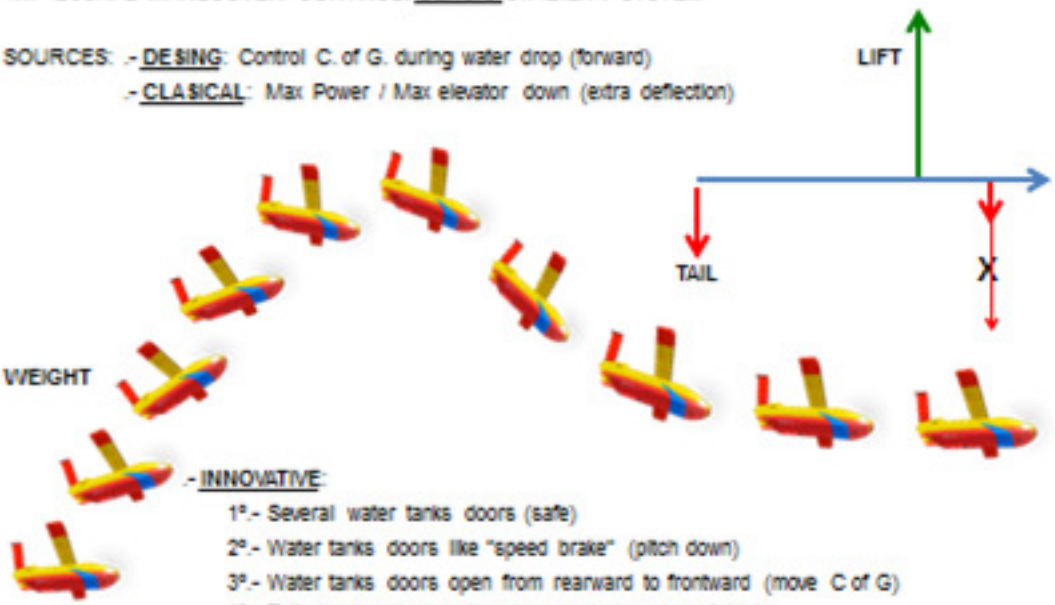
NITROFIREX

OPERATION PHASES OF THE AGC

4.1.- ESCAPE MANEOUVER CONTROL: *CLASIC STABILITY SYSTEM*

SOURCES: .- DESING: Control C. of G. during water drop (forward)

.- CLASICAL: Max Power / Max elevator down (extra deflection)



.- INNOVATIVE:

1º.- Several water tanks doors (safe)

2º.- Water tanks doors like "speed brake" (pitch down)

3º.- Water tanks doors open from rearward to frontward (move C of G)

4º.- Tail-pipe thrust vectoring downward (counterweights)

5º.- Main wing backward (3 to 5 G,s)

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NITROFIREX

OPERATION PHASES OF THE AGC

4.2.- ESCAPE MANEOUVER CONTROL: *DYNAMIC STABILITY SYSTEM*

SOURCES: .- **DESING**: Electronic Flight Control

.- **CLASICAL**: Max Power / Elevator down (extra deflection)

.- **INNOVATIVE**:

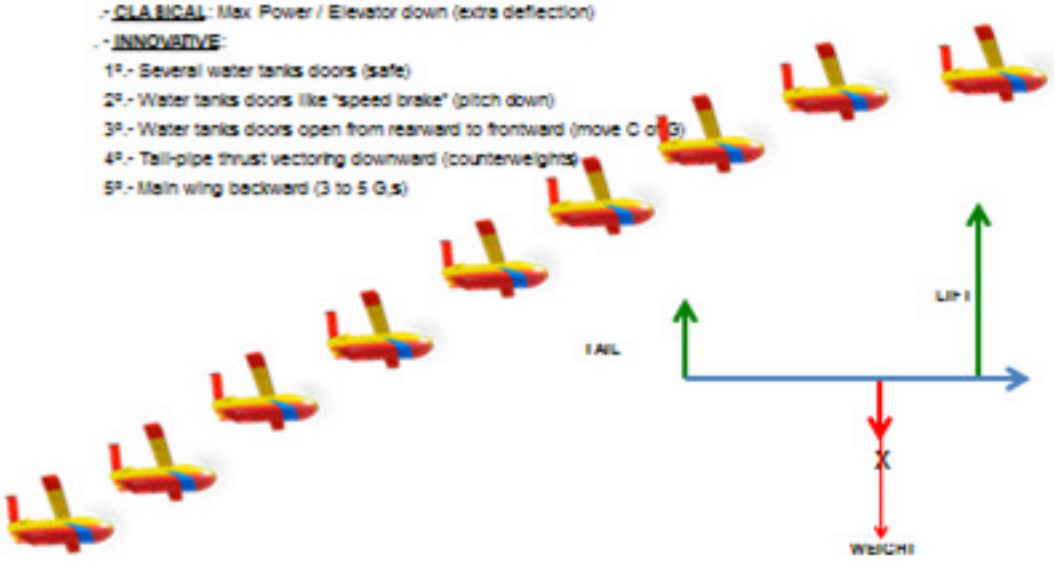
1º.- Several water tanks doors (safe)

2º.- Water tanks doors like "speed brake" (pitch down)

3º.- Water tanks doors open from rearward to frontward (move C of G)

4º.- Tail-pipe thrust vectoring downward (counterweight)

5º.- Main wing backward (3 to 5 G,s)



6/20/2016

NITROFIREX

MISSION ANALYSIS

65 N.M. AIRPORT COVERAGE - OPERATIVE BASE

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MISSION ANALYSIS

MARSEILLE DEPLOYMENT BASE

NITROFIREX

RACK OPERATION

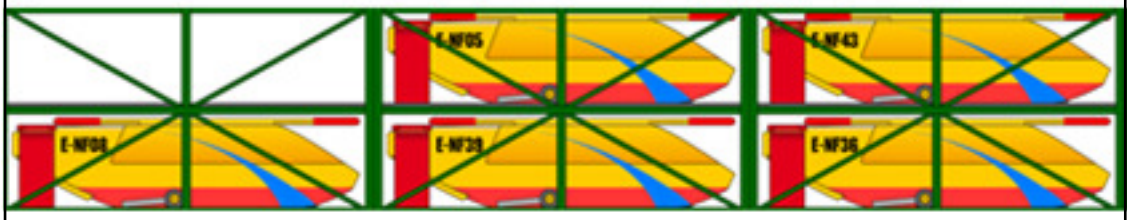
A-400M RACK
4 x 3 x 2 AGC,s

QUICK & SAFE: .- DEPLOYMENT
.- AGC RECOVERY

RACK: .- TRASPORT
.- GOUND RECOVERY
.- MODULAR

GROUND RECOVERY:

.-FOLD MAIN PLANE
.- FOLD CONTROL SUFACES
.- FOLD LANDING GEAR
.- STOW IN THE RACK
.- REFUEL WATER & FUEL
.- GROUND CHECK



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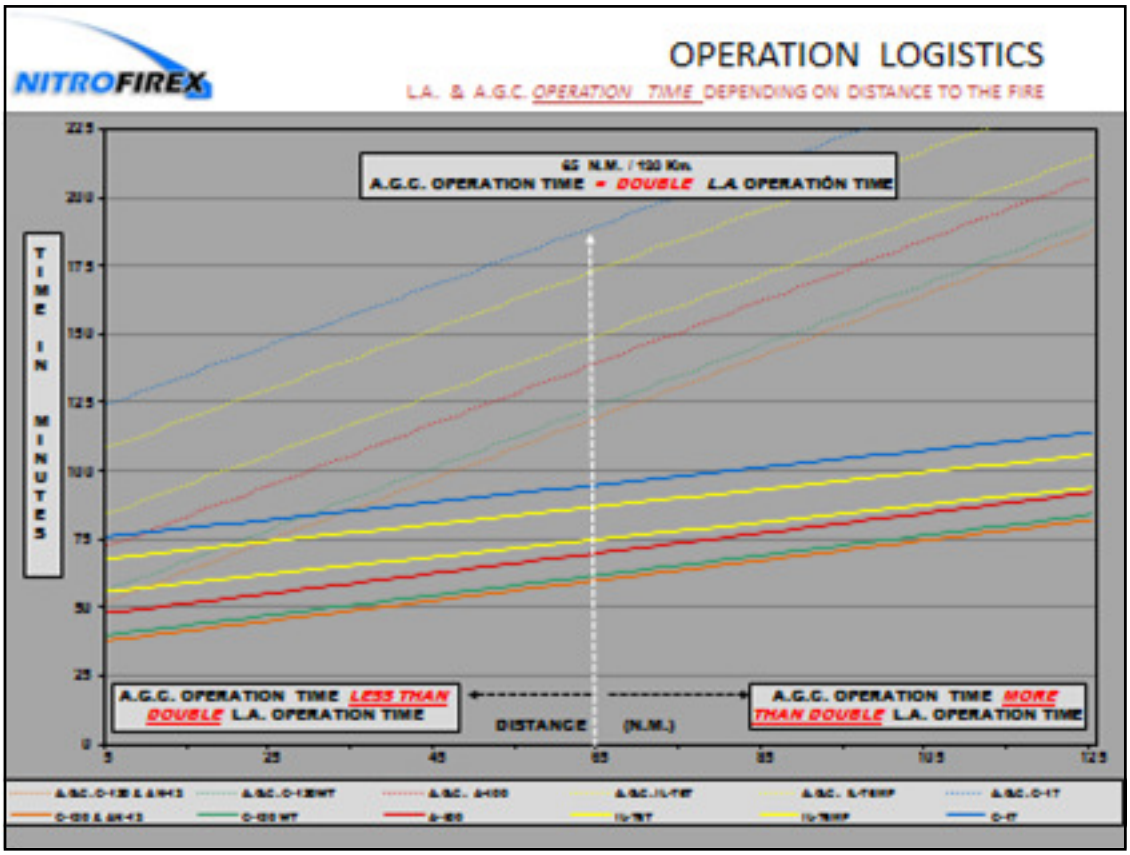

NITROFIREX
OPERATION LOGISTICS
L.A. & A.G.C. OPERATION TIME DEPENDING ON DISTANCE TO THE FIRE
65 N.M. / 120 Km.
A.G.C. OPERATION TIME = DOUBLE L.A. OPERATION TIME
TIME IN MINUTES
A.G.C. OPERATION TIME LESS THAN DOUBLE L.A. OPERATION TIME
DISTANCE (N.M.)
A.G.C. OPERATION TIME MORE THAN DOUBLE L.A. OPERATION TIME

NITROFIREX

MARKETING STRATEGY

SWOT Analysis

STRENGHTS

- Technologies to implement currently developed
- Real need of night forest firefighting capability worldwide
- Patented technology to cover unmanned systems to spread substances on the atmosphere
- Most easily civil unmanned flight operation to be accepted by the regulatory agencies
- Lower operational costs than existing firefighting technologies

WEAKNESSES

- Financial support required to continue with the design
- No demonstrator has been built to show the technology
- The Nitrofirex team is not working on the project full time, despite of being high experienced professionals
- Industrial partners required to finish the design and start the production

OPORTUNITIES

- Utilization of this same technology in other areas with less operational complexity
- Becoming part of the RPAS regulatory legislation board in Europe
- Vertical integration to cover other markets
- Forest firefighting service for Canada and Australia due to their lack in cargo aircraft

THREATS

- Public sector as main customer
- Regulatory framework for UAS in Europe and USA by 2015
- Reaction of firefighting companies that have long term relationships with different Public Agencies and Governments
- Project costs increment due to the implementation of Defense Standards in the design and certification

20/06/2014

NITROFIREX

SALES FORECAST

Estimation of AGCs Need per Region

REGION	% DAILY FIRE FIGHTING CAPACITY OF TOTAL BURNT AREA					
	1	1	2	2	3	3
	% OF AIRLIFT CAPACITY	TOTAL A.G.C. REQUIRED	% OF AIRLIFT CAPACITY	TOTAL A.G.C. REQUIRED	% OF AIRLIFT CAPACITY	TOTAL A.G.C. REQUIRED
EUROPE	7,5	227	14,9	422	22,4	650
RUSSIA FEDERATION	19,6	801	39,1	1.593	58,7	2.394
USA	4,6	860	9,2	1.719	13,8	2.579
CANADA	~~168,4~~	~~1.064~~	~~334,5~~	~~2.113~~	~~502,9~~	~~3.177~~
AUSTRALIA	~~422,2~~	~~2.020~~	~~841,7~~	~~4.027~~	~~1.263,8~~	~~6.047~~
		4.972		9.874		14.846
CORRECTED BY ACTUAL FLEET						
CANADA	25,5	161	46,6	295	55,3	349
AUSTRALIA	23,1	111	44,0	211	48,5	232
		2.160		4.240		6.204

20/06/2018

MARKETING STRATEGY

- Niche market to cover a real need
- Best positioning in the new UAS American and European regulatory frameworks
- Focus on existing technologies
- Positioning of NITROFIREX as convenient technology for investment instead of defense programs
- NITROFIREX is an integrator and seller, not manufacturer
- This makes flexible our production rate and offer the possibility of industrial return to potential customers

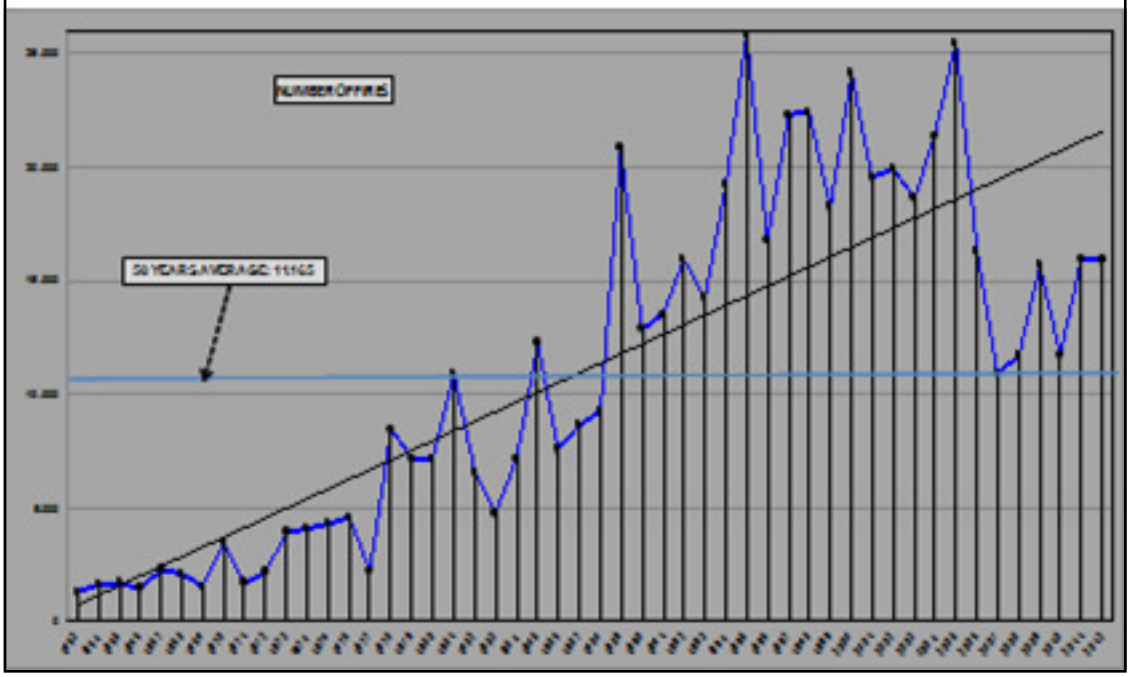
Economical assumptions

#	Assumption
1	The cost estimation for the project development including prototypes and tests is 18M€
2	The required resources to fully design the system are showed on the Project Annexes
3	The aircrafts sales are based on the 1% cargo fleet usage (pessimistic theater)
4	Maintenance incomes: 5% of aircraft price with first and second echelon maintenance done by the user
5	Maintenance incomes: 8% of Control System Price Per year:
6	Price per engine overhaul: 20.000€
7	Price per mechanic training: 10.000 €
8	Price per pilot training: 15.000 €
9	The Main Office costs are assumed to be the one showed on the Start-up costs
10	The Workshop expenses are assumed to be 144.000 €
11	The production cost per AGC is 200.000 € (based on guided bomb prices)
12	The annual number of AGC sales is estimated as progressive year by year
13	The initial price per AGC is 450.000 €

NITROFIREX

PRECEDENTS II

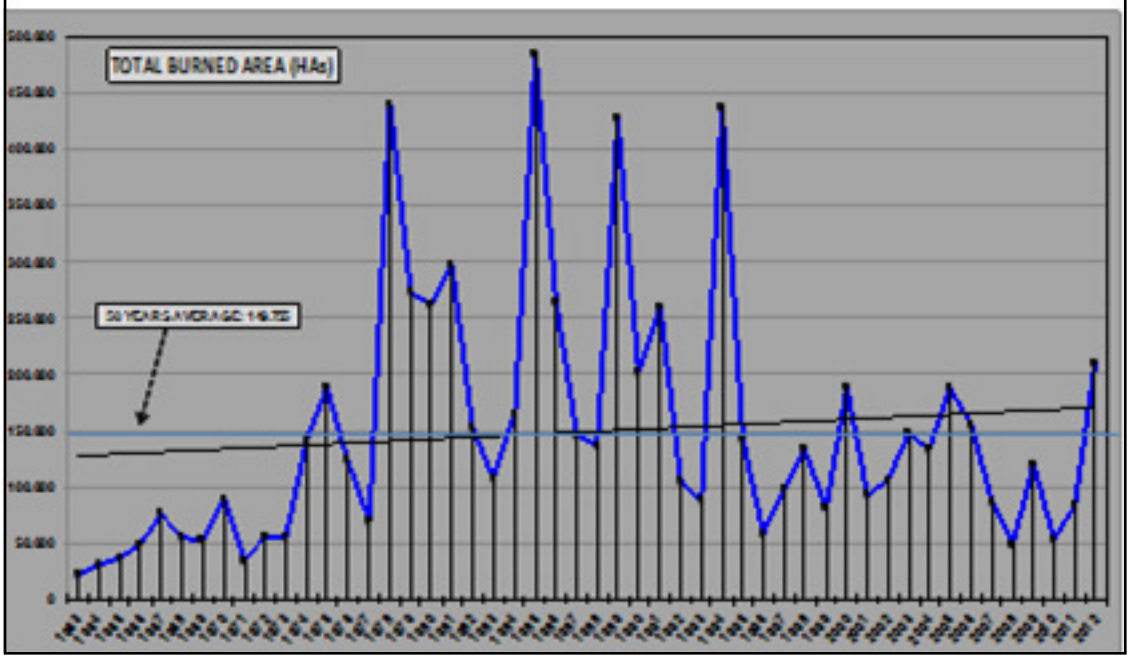
FORESTFIRE STATISTICS IN SPAIN



NITROFIREX

PRECEDENTS II

FORESTFIRE STATISTICS IN SPAIN



NITROFIREX

OPERATIONAL ANALISIS

DISTANCE TO THE FIRE : 120 KM. (65 N.M.) // A.G.C. WEIGHT: 500 KG

- **SPAIN AVERAGE OPERATION DROPS BY CL FLEET:** **6.283 DROPS/YEAR**
  (YEARS 2002-2012)

  (average: 5.344 Liters /Drop)
- **NITROFIREX EQUIVALENT AIR DROPS (A-400M):** **12.996 DROPS/YEAR**
  (NITROFIREX: 2.583 Liters)
- **ESTIMATED AGC NEEDS FOR SPAIN :** **100 UNITS**

This means that
4 A-400 FLYING 650 H (AT NIGHT)
are equivalent to
22 CL FLYING 1.923 H (AT DAY)
(66,2 % flight time saved)

20/06/2016

NITROFIREX

OPERATIONAL ANALISIS

DISTANCE TO THE FIRE : 120 KM. (65 N.M.) // A.G.C. WEIGHT: 500 KG

- **SPAIN AVERAGE OPERATION DROPS BY CL FLEET:** **6.283 DROPS/YEAR**
  (YEARS 2003-2012)
  (average: 5.344 Liters /Drop)
- **NITROFIREX EQUIVALENT AIR DROPS (C-130 WT) :** **12.209 DROPS/YEAR**
  (NITROFIREX: 2.750 Liters)
- **ESTIMATED AGC NEEDS FOR SPAIN :** **100 UNITS**

This means that
6 C-130-WT FLYING 916 H (AT NIGHT)
are equivalent to
22 CL FLYING 1.923 H (AT DAY)
(52,4 % flight time saved)

20/06/2016

NITROFIREX

OPERATIONAL ANALISIS

DISTANCE TO THE FIRE : 120 KM. (65 N.M.) // A.G.C. WEIGHT: 500 KG

- **SPAIN AVERAGE OPERATION DROPS BY CL FLEET:** **6.283 DROPS/YEAR**
  (YEARS 2002-2012)
  (average: 5.344 Liters /Drop)
- **NITROFIREX EQUIVALENT AIR DROPS (C-17) :** **12.341 DROPS/YEAR**
  (NITROFIREX: 2.720 Liters)
- **ESTIMATED AGC NEEDS FOR SPAIN :** **100 UNITS**

This means that
2 C-17 FLYING 317 H (AT NIGHT)
are equivalent to
22 CL FLYING 1.923 H (AT DAY)
(83,5 % flight time saved)

20/06/2016

POSSIBLE USES OF THE CONCEPT

	FOTREST FIRE FIGHTING	OTHERS FIRES	NUCLEAR, CHEMICAL, BIOLOGICAL EMERGENCY	METEOROLOGICAL PHENOMENA	DRUG PLANTATION SPRAYING	PESTS SPRAYING or SEEDING
MAX URGENT	-2	-1	-1	-1	0	0
OPS CLOSET AEPTO	-2	-1	-1	0	0	0
FAST RECOVERY	-2	-1	-1	0	0	0
COORDINATION	-2	-1	-1	-2	0	0
DROPS PRECISION	-2	-2	-2	-1	0	0
DROPS OVERLAP	-2	-1	-1	0	0	0
NON STOP	-2	-1	-1	0	0	0
	-14	-8	-8	-4	0	0

SPANISH RPAS REGULATION

- C) THE CIVILIAN AIRCRAFT REMOTELY CONTROLLED WITH A TAKE-OFF WEIGHT OVER 25 KG AND BELLOW 150 KG, *AND THOSE OVER 150 KG USED FOR AERIAL FIREFIGHTING OR SEARCH AND RESCUE ACTIVITIES* COULD ONLY BE OPERATED WITH THE LIMITATIONS DESCRIBED IN THEIR AIRCRAFT CERTIFICATION BY THE SPANISH AIRCRAFT SAFETY AGENCY, IN SEGREGATED AIRSPACE.

Real Decreto-ley 8/2014, de 4 de julio (Sección 6ª, Articulo 50.3C)

EUROPEAN RPAS REGULATION

RIGA MEETING (06/03/2015):

1. THE OPERATION OF DRONES SHOULD BE REGULATED IN A MANNER
TIONATE TO

"THE RISK OF THE SPECIFIC OPERATION"

4. PUBLIC ACCEPTANCE IS KEY TO THE GROWTH OF DRONE SERVICES.

EASA DOCUMENT (15/03/2015) :

CONCEPT OF OPERATIONS FOR DRONES:

"A RISK BASED APPROACH TO REGULATION OF UNMANNED
FT"

.- OPEN CATEGORY

.- SPECIFIC OPERATION CATEGORY" (NITROFIREX)

.- CERTIFIED CATEGORY

WHY AT NIGHT?

- TO BE A COMPLEMENT OF DAYTIME AERIAL MEANS:
  - NON STOP FIGHTING
  - H-24
- BETTER REGULATORY OPTIONS

NITROFIREX OPERATIONS DO NOT AFFECT RPAS BARRIER ENTRANCE:

AIR/GROUND *SAFETY* AND/OR CITIZEN´S *PRIVACY*

CURRENT TECHNOLOGICAL STATUS

Current airborne firefighters are:

- Slow
- Manual water drops
- Daytime operation
- Single role aircraft
- Risky operations

TECHNOLOGICAL PARADOX:

DETECTION TIME vs. REACTION TIME