No. 18162

UNITED STATES OF AMERICA
and
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Memorandum of Understanding concerning co-operation in the testing and development of anti-misting kerosene and related equipment (short title: AMK) (with appendix). Signed at Washington on 1 June 1978 and at London on 14 June 1978

Authentic text: English.

Registered by the United States of America on 5 December 1979.

ÉTATS-UNIS D'AMÉRIQUE
et
ROYAUME-UNI DE GRANDE-BRETAGNE ET D'IRLANDE DU NORD

Mémorandum d'accord concernant une coopération pour l'essai et la mise au point d'un kérosène antivaporisation et de matériel connexe (titre abrégé : KAV) [avec appendice]. Signé à Washington le 1er juin 1978 et à Londres le 14 juin 1978

Texte authentique : anglais.

Enregistré par les États-Unis d'Amérique le 5 décembre 1979.

MEMORANDUM OF UNDERSTANDING[1] BETWEEN THE GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND, REPRESENTED BY THE UNITED KINGDOM PROCUREMENT EXECUTIVE OF THE MINISTRY OF DEFENCE, AND THE GOVERNMENT OF THE UNITED STATES OF AMERICA, REPRESENTED BY THE UNITED STATES DEPARTMENT OF TRANSPORTATION/FEDERAL AVIATION ADMINISTRATION, CONCERNING CO-OPERATION IN THE TESTING AND DEVELOPMENT OF ANTI-MISTING KEROSENE AND RELATED EQUIPMENT (SHORT TITLE: AMK)

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SECTION I. INTRODUCTION

A. The Government of the United Kingdom of Great Britain and Northern Ireland, represented by the Procurement Executive of the Ministry of Defence (MOD(PE)), and the Government of the United States of America, represented by the Department of Transportation/Federal Aviation Administration (DOT/FAA), with the purpose of saving lives and property through reducing the number and severity of fires following aircraft accidents in which there are survivors of the impact, intend to co-operate in the examination, development and testing of anti-misting kerosene fuels and of equipment related to the use of such fuels.

B. This co-operation will be undertaken by the MOD(PE) and the DOT/FAA, each pursuing with their associates and contractors a part of the program of work set out in the appendix to this Memorandum of Understanding.

C. This Memorandum of Understanding sets out the arrangements and procedures established by the Governments for co-operation in the carrying out of the program of work.

[1] Came into force on 14 June 1978 by signature, in accordance with section X (A).

SECTION II. DEFINITIONS

In this Memorandum of Understanding:

(1) "Government" means the MOD(PE) or the DOT/FAA as the context may require; and "Governments" means the MOD(PE) and DOT/FAA.

(2) "Program of work" means the work set out in the appendix to this Memorandum of Understanding.

(3) "Related work" means work relating to anti-misting safety fuels for use in aircraft carried out before the day of entry into operation of this Memorandum of Understanding by the representatives or agencies or by an agent or contractor of either of the Governments or by a body under the control of either of the Governments.

(4) "Facility" means a laboratory test location or research establishment under the control of or under contract to one of the Governments.

SECTION III. MANAGEMENT

A. Each Government will appoint initially three members to a Management Group, whose function will be to undertake on behalf of the Governments the review of policy relative to, and general direction of, the program of work. Meetings of this Management Group will be held alternately in the United States and in the United Kingdom, and will be convened by a chairman, chosen from the members appointed by the host country. In the case of the United States, the co-chairman, and one other, will be from the DOT/FAA, and the third will be from the National Aeronautics and Space Administration. In the case of the United Kingdom, the co-chairman will be from the MOD(PE) and the one representative each from the Department of Industry and the Civil Aviation Authority.

B. The Management Group will meet, as required, to review progress and establish program guidance and priorities at significant decision points in the program. It is expected that this will normally be not more than twice and not less than once a year. It is hoped in particular that a decision can be taken by the Management Group as early as possible, within the first two years of operation of this Memorandum of Understanding, as to the overall viability of this program of work. Such a decision will take into account the technical issues, the potential cost, and the prospects for international implementation of anti-misting kerosene fuels.

C. The Management Group will approve the appointment of two Project Officers, one from the DOT/FAA and one from the MOD(PE). These Project Officers will act alternately as chairman of a joint Technical Group to be responsible for the technical supervision of the program. Each Project Officer will select, with the approval of the appropriate National Co-Chairman of the Management Group, a maximum of four members each from the United States and the United Kingdom respectively for the Technical Group. In addition, as necessary, the two Project Officers may invite additional representation from specialized areas of technical expertise and experience.

D. Each Project Officer, advised by the Technical Group, will be responsible to the Management Group for:

(*a*) The implementation of his own Government's respective part of the program of work.

(*b*) The co-ordination of, and any modification of, the parts of the program of work. Modifications to the program will be effective provided that they are set out in writing, signed by both Project Officers, and endorsed by the Management Group.

(*c*) Exchange of information arising from the program of work and related work in accordance with section VI of this Memorandum of Understanding.

Meetings of the Technical Group will normally be held alternately in the United States and the United Kingdom, and will be arranged by the Project Officers as the work program requires.

The Project Officers will report, as required, to their respective Management Group Chairmen and may be invited to be in attendance at the meetings of the Management Group.

SECTION IV. COSTS AND SUPPLY OF MATERIALS

A. The cost of performing any item of the program work will be borne by the Government in whose facility the item of work is performed, unless otherwise specifically agreed by the Management Group.

B. The supply of information, material, or equipment by one Government to the other for the purpose of carrying out the program of work will normally be at the cost of the recipient Government, but the cost chargeable to the recipient Government will be limited to the actual cost of procurement by the supplying Government plus normal transportation, insurance costs, and identifiable taxes and customs duties. These arrangements may be varied in specific instances by the Management Group.

C. Either Government may loan to the other information, equipment or material.

D. The recipient Government will use the information, material or equipment only for the purpose of the program of work and in cases of loans, will return the information, material, or equipment at the request of the supplying Government and in accordance with the applicable law.

E. Any arrangement necessitating transfer of funds, arising out of the transfer or loan of information, material, or equipment from one country to the other will be the subject of a separate arrangement between the Governments or their respective agencies.

SECTION V. ACCESS TO FACILITIES

A. Each Government will afford all the members of the Technical Group appointed by the other Government (and any person acting for the other Government and authorized by the two Project Officers) access to its facilities for the purpose of aiding appreciation of the performance of any item of the program of work which may be in progress at the facility.

B. This access will be subject to reasonable notification and to the normal security restrictions in existence at the facility and will be subject to the provisions of sections VI and VII of this Memorandum of Understanding.

SECTION VI. EXCHANGE, USE AND COMMERCIAL SECURITY OF INFORMATION

A. The Governments intend, subject to the rights of third parties, to exchange regularly information in their possession and which relates to their

respective part of the program of work. The information will be exchanged only through the medium of or with the concurrence of the Project Officers. All information exchanged will be, so far as is practical, in the form of documents.

B. The exchange of information will be on the basis that the information is supplied only for study and evaluation by the recipient Government and that the information will not, without the prior approval in writing of the Government supplying the information, or the owner of the information, be passed to a third person except as may be required by applicable law or published or used for the design, development, or improvement of equipments, chemical products or processes.

C. In furtherance of paragraph B above, each Government will make every effort that it legally may to maintain the information free from any liability to disclosure under any present or future legislative provisions. Each Government may mark documents transmitted to the other with words indicating their owner, their country of origin, that they relate to the program of work, and that they are furnished under conditions of confidence (i.e., are not to be disclosed to or used by a third party without the prior permission of the transmitting Government) or alternatively establishing the conditions of release. The recipient Government will confirm that the documents are received under the conditions indicated.

D. At the specific request of the transmitting Project Officer setting forth the reasons for the request, the intended recipient Project Officer will review documents prior to formal receipt and advise the other Project Officer of his Government's view of its ability to maintain the confidentiality of the documents under applicable law. In doubtful cases, the Project Officers will consult concerning what steps can be taken to provide for confidentiality. It is the understanding of the Governments that this provision should be invoked only in the most unusual circumstances.

E. Each Project Officer will ensure that any request under applicable law for disclosures of information in documents originating in the other country and furnished in accordance with this Memorandum of Understanding is promptly notified to the other Project Officer to afford the latter the opportunity to object to disclosure. The notification will identify applicable time limits and the legal principles involved in the request. If the Government processing the request determines that the requested information cannot legally be withheld, the Government's Project Officer will so advise the other Project Officer sufficiently in advance of the projected disclosure date to permit the latter to initiate whatever steps are deemed appropriate. In cases involving loaned information, the information will be returned to the lender, in accordance with the applicable law.

F. Each Government will grant to the other, or to a person nominated by the other, a licence on fair and reasonable terms to use, for commercial purposes in the United Kingdom and the United States and in other countries to which the licence may be extended under relevant laws and regulations, patented inventions and confidential technical information owned by the Government granting the licence and arising out of its respective part of the program of work. Each Government will also grant a similar licence in respect of patented inventions and confidential technical information which it owns and which arose out of related work.

G. In the event that personnel of both Governments or their contractors participating in the program of work make a joint invention, design, or discovery, then both Governments will in accordance with their national laws take appropriate action to ensure that both Governments or persons nominated by either of them will have the right to the free use for commercial purposes, in the United Kingdom and the United States and in other countries to which the licence may be extended under relevant laws and regulations, of the joint invention, design or discovery. The appropriate action may include making joint application for a patent and the assigning of the patent to one or jointly to both Governments and the granting of a free licence to one or both Governments or to a person nominated by either Government.

H. Any such licence as is referred to in paragraphs F or G of this section will include the provision that the licencee will be obliged to inform the licensor of all developments, improvements, or inventions that the licencee may make in relation to the subject of the licence and will be obliged to grant a return licence on fair and reasonable terms to the licensor in respect of all the developments, improvements or inventions so made should the licensor so wish.

I. Each Government will use its good offices to arrange for a licence as described in paragraph F of this section to be granted by a third person who may own relevant patented inventions, designs, discoveries or confidential information in respect of which that Government does not have the right to grant such licences.

SECTION VII. MILITARY SECURITY

A. All classified information or material or equipment supplied in accordance with sections IV and VI will be protected in accordance with established security arrangements between the Government of the United Kingdom and the Government of the United States of America.

SECTION VIII. LIABILITY

Neither Government will be liable to the other for any damage, loss, or injury to personnel, material, or equipment occasioned by or during any activities undertaken pursuant to this Memorandum of Understanding.

SECTION IX. INTERPRETATION, APPLICATION AND MODIFICATION

Any disagreement regarding the interpretation or application of this Memorandum of Understanding will be resolved by consultation between the Governments and will not be referred to any international tribunal or third party for settlement.

The terms of this Memorandum of Understanding may be modified as provided in section III.D or by the Governments. In the second case, any modification will enter into operation on signature by the duly authorized representatives of the Governments.

SECTION X. ENTRY INTO OPERATION AND TERMINATION

A. This Memorandum of Understanding will enter into operation on the date on which it is signed on behalf of the two Governments. The program of work will be pursued for at least two years from the date on which this Memorandum of Understanding enters into operation. Either Government may terminate

the pursuit of its respective part of the program of work after giving 90 days notice in writing.

B. In the event that one or both Governments terminate their participation in the program of work the understandings concerning exchange, use and commercial security of information as set out in section VI and concerning Military Security as set out in section VII will remain in effect.

SECTION XI. SIGNATURES OF AUTHORIZED REPRESENTATIVES

A. The foregoing represents the understandings reached between the Government of the United Kingdom of Great Britain and Northern Ireland represented by the Procurement Executive of the Ministry of Defence and the Government of the United States of America represented by the Department of Transportation, Federal Aviation Administration, upon the matters referred to therein.

United States represented by DOT/ Federal Aviation Administration	United Kingdom represented by Ministry of Defence Procurement Executive
By: [*Signed — Signé*][1]	*By:* [*Signed — Signé*][2]
Title: Assistant Administrator for International Aviation Affairs (Acting)	*Title:* Director of Resources and Programs
Date: June 1, 1978	*Date:* 14 June 78

APPENDIX

PURPOSE OF JOINT US/UK PROGRAM

A. The purpose of the joint program is to reach an early decision whether anti-misting kerosene (AMK) is a potential candidate for certification or whether its ultimate use in commercial service is too improbable to justify further work. It is envisaged that this decision will be made by the Management Group before the end of FY-80.

B. The critical questions in evaluating the future potential of AMK for worldwide commercial service have been identified as:

1. Can the additive be made available in adequate quantities and at an acceptable cost with adequate control of quality for worldwide deployment?
2. What degree of protection would AMK provide in post-crash fuel fires?
   a. A few minutes after refuelling; i.e., typically in the take-off case;
   b. At the end of a typical flight cycle; i.e., typically in the approach/landing case.
3. What changes, if any, are necessary to enable a civil aircraft to use AMK? For example, are changes necessary to the fuel system tanks, pumps, filters, etc., and/or to the engine fuel management system?
4. Is it feasible in day-to-day commercial operation to blend the additive with kerosene at the fuelling point?

[1] Signed by Norman H. Plummer — Signé par Norman H. Plummer.
[2] Signed by Jack Burnham — Signé par Jack Burnham.

5. To what degree must AMK be degraded before it is suitable for operation in an engine system, and how can this controlled degradation be achieved?

FEDERAL AVIATION ADMINISTRATION

ANTI-MISTING KEROSENE (AMK) FUEL PROGRAM

1. *Objective:* Determine compatibility of an aircraft fuel system using AMK fuel.

   Approach: A fuel system rig that is representative of a typical commercial aircraft will be selected to process AMK fuel through representative mission cycles. Test and evaluations of components will be made, followed by a complete integrated fuel system evaluation. The effect of the systems operation on the fuel anti-misting characteristics as required to assess any loss in fire resistance capability will be evaluated.

2. *Objective:* Assess the fire resistance capability of AMK conducted under representative impact-survivable crash conditions.

   Approach: Aircraft with large fuel capacity will be subjected to simulated survivable crash conditions to confirm the evidence available from small-scale test results. It is envisioned that up to two tests will be accomplished in FY-78 and a potential of 3-6 tests in FY-79.

3. *Objective:* By fire test simulation, expand range of knowledge of fire resistance capabilities of AMK.

   Approach: A fire test rig will be developed that will provide a wider range of post-crash conditions than now exists. Data will be collected for increased dump rates over a range of velocities to supplement existing data.

4. *Objective:* Develop a suitable method for degrading and measuring AMK fuel properties for use in aircraft turbine engines.

   Approach: A review will be made of concepts for the degradation of AMK. One or two of the most promising concepts will be experimentally evaluated. As a companion effort, methods or equipment as required to measure fire resistance quality of the AMK will be developed.

UNITED KINGDOM PROGRAM

1. *Objective:* To develop methods of producing AMK at an acceptable cost and to an acceptable level of quality on a large scale.

   Approach: Problems arising in the worldwide manufacture of AMK will be investigated. In particular solutions will be sought to the problems of quality control of the additive/carrier fluid dispersion and the stability of such dispersions.

2. *Objective:* To demonstrate the feasibility of blending FM9 with kerosene at the aircraft fuelling point at or near realistic aircraft fuelling rates.

   Approach: Final optimization of additive/carrier fluid dispersion will be made with the object of ensuring rapid blending of the additive with fuel and the development of fire resistance of the blend within an acceptable time. A suitable blender will be constructed capable of handling flow rates at or near full scale.

3. *Objective:* To demonstrate the fire resistance of AMK under a wide range of conditions.

   Approach: Rocket-sled fire tests will be carried out on FM9 dispersions in a range of kerosenes of different chemical compositions including fuels of relayed specification having lower flash points. Tests on fuels made from aged dispersions and on fuels degraded in typical fuel systems will be included.

4. *Objective:* To investigate the feasibility of degrading AMK to an acceptable level by means of a rotary mechanical device.

   Approach: The rotary mechanical degrader already developed at RAE will be optimized and scaled-up.

5. *Objective:* To demonstrate the compatibility of AMK with typical fuel system components and to determine the degree to which the fuel is degraded by such components.

   Approach: The effectiveness of typical fuel system components with AMK will be determined. The degree to which AMK is degraded by such components will also be determined.

6. *Objective:* To determine whether AMK will give rise to serious problems in the presence of water.

   Approach: The compatibility of water with fuels containing FM9 will be determined over a range of realistic operational conditions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

1. *Objective:* Examine present day jet aircraft engine components with a view toward defining the problems associated with operating on AMK.

   Approach: Conduct all-up engine tests to map undefined areas needing further investigation. Concurrently, perform single combustor tests to characterize the effect of AMK on engine starting, altitude relight, emission, performance, deposits, liner temperature, efficiency, etc.

2. *Objective:* Perform basic rheology studies to characterize AMK.

   Approach: Establish means of ascribing "quality" of degraded AMK. Examine degrader concepts. Investigate pool fire build-up inhibition.