

EI 1597

Procedures for overwing fuelling to ensure delivery of the correct fuel grade to an aircraft

2nd edition

EI 1597

PROCEDURES FOR OVERWING FUELLING TO ENSURE
DELIVERY OF THE CORRECT FUEL GRADE TO AN AIRCRAFT

2nd edition

January 2017

Published by

ENERGY INSTITUTE, LONDON

The Energy Institute is a professional membership body incorporated by Royal Charter 2003

Registered charity number 109789

The Energy Institute (EI) is the chartered professional membership body for the energy industry, supporting over 23 000 individuals working in or studying energy and 250 energy companies worldwide. The EI provides learning and networking opportunities to support professional development, as well as professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The EI's purpose is to develop and disseminate knowledge, skills and good practice towards a safe, secure and sustainable energy system. In fulfilling this mission, the EI addresses the depth and breadth of the energy sector, from fuels and fuels distribution to health and safety, sustainability and the environment. It also informs policy by providing a platform for debate and scientifically-sound information on energy issues.

The EI is licensed by:

- the Engineering Council to award Chartered, Incorporated and Engineering Technician status;
- the Science Council to award Chartered Scientist status, and
- the Society for the Environment to award Chartered Environmentalist status.

It also offers its own Chartered Energy Engineer, Chartered Petroleum Engineer and Chartered Energy Manager titles.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.

This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

For further information, please visit <http://www.energyinst.org>

The EI gratefully acknowledges the financial contributions towards the scientific and technical programme from the following companies

Apache North Sea	Repsol Sinopec
BP Exploration Operating Co Ltd	RWE npower
BP Oil UK Ltd	Saudi Aramco
Centrica	Scottish Power
Chevron North Sea Ltd	SGS
Chevron Products Company	Shell UK Oil Products Limited
CLH	Shell U.K. Exploration and Production Ltd
ConocoPhillips Ltd	SSE
DCC Energy	Statkraft
DONG Energy	Statoil
EDF Energy	Tesoro
ENGIE	Taqva Bratani
ENI	Total E&P UK Limited
E.ON UK	Total UK Limited
ExxonMobil International Ltd	Tullow Oil
Innogy	Uniper
Kuwait Petroleum International Ltd	Valero
Maersk Oil North Sea UK Limited	Vattenfall
Nexen CNOOC	Vitol Energy
Phillips 66	Woodside
Qatar Petroleum	World Fuel Services

However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

Copyright © 2017 by the Energy Institute, London.

The Energy Institute is a professional membership body incorporated by Royal Charter 2003.

Registered charity number 1097899, England

All rights reserved

No part of this book may be reproduced by any means, or transmitted or translated into a machine language without the written permission of the publisher.

ISBN 978 0 85293 956 7

Published by the Energy Institute

The information contained in this publication is provided for general information purposes only. Whilst the Energy Institute and the contributors have applied reasonable care in developing this publication, no representations or warranties, express or implied, are made by the Energy Institute or any of the contributors concerning the applicability, suitability, accuracy or completeness of the information contained herein and the Energy Institute and the contributors accept no responsibility whatsoever for the use of this information. Neither the Energy Institute nor any of the contributors shall be liable in any way for any liability, loss, cost or damage incurred as a result of the receipt or use of the information contained herein.

Hard copy and electronic access to EI and IP publications is available via our website, <https://publishing.energyinst.org>.

Documents can be purchased online as downloadable pdfs or on an annual subscription for single users and companies.

For more information, contact the EI Publications Team.

e: pubs@energyinst.org

Contents		Page
Legal notices and disclaimers.		4
Foreword		5
Acknowledgements		6
1 Introduction – all misfuelling incidents are preventable.		7
1.1 Delivering the correct grade of fuel to an aircraft.		7
1.2 The need for a misfuelling prevention programme.		7
2 Procedures and equipment		9
2.1 Summary		9
2.2 Fuel grade confirmation.		9
2.2.1 Verbal orders		9
2.2.2 Written records		10
2.2.3 Grade/product names		10
2.3 Wing decals.		10
2.4 Fuel grade confirmation forms.		11
2.5 Selective nozzle spouts (overwing fuelling).		12
2.6 Overwing fuelling procedures		13
2.7 Control of unattended fuellings.		14
2.8 Control of self-service fuellings		15
2.9 Grade identification markings for refuelling equipment		16
2.9.1 Aviation fuel dispensing vehicles		16
2.9.2 Stationary/fuelling trailer or kerbside fuelling cabinets		16
2.9.3 Dispensing nozzles.		16
2.10 Fuelling procedures/training.		17
Annexes		
Annex A Overwing fuel grade decals.		18
A.1 Introduction		18
A.2 Design		18
A.2.1 Decal #1		19
A.2.2 Decal #2		19
A.2.3 Decal #3		20
A.3 Material specification.		20
A.3.1 Overview		20
A.3.2 Composition		20
A.3.3 Colour		20
A.3.4 Configuration		21
A.3.5 Film thickness.		21
A.4 Decal storage		21
Annex B Example fuel grade confirmation form		22
Annex C Task breakdown sheet		23
C.1 Aircraft fuelling using a refueller – overwing		23
Annex D References.		34

LEGAL NOTICES AND DISCLAIMERS

This publication has been prepared by the Energy Institute (EI) Aviation Committee.

The information contained in this publication is provided as guidance only, and although every effort has been made by the EI to assure the accuracy and reliability of its contents, **THE EI MAKES NO GUARANTEE THAT THE INFORMATION HEREIN IS COMPLETE OR ERROR-FREE. ANY PERSON OR ENTITY MAKING ANY USE OF THE INFORMATION HEREIN DOES SO AT HIS/HER/ITS OWN RISK. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE INFORMATION HEREIN IS PROVIDED WITHOUT, AND THE EI HEREBY EXPRESSLY DISCLAIMS, ANY REPRESENTATION OR WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE EI BE LIABLE TO ANY PERSON, OR ENTITY USING OR RECEIVING THE INFORMATION HEREIN FOR ANY CONSEQUENTIAL, INCIDENTAL, PUNITIVE, INDIRECT OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOST PROFITS), REGARDLESS OF THE BASIS OF SUCH LIABILITY, AND REGARDLESS OF WHETHER OR NOT THE EI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR IF SUCH DAMAGES COULD HAVE BEEN FORESEEN.**

The contents of this publication are not intended or designed to define or create legal rights or obligations, or set a legal standard of care.

The EI is not undertaking to meet the duties of manufacturers, purchasers, users and/or employers to warn and equip their employees and others concerning safety risks and precautions, nor is the EI undertaking any of the duties of manufacturers, purchasers, users and/or employers under local and regional laws and regulations. This information should not be used without first securing competent advice with respect to its suitability for any general or specific application, and all entities have an independent obligation to ascertain that their actions and practices are appropriate and suitable for each particular situation and to consult all applicable federal, state and local laws.

THE EI HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OR RESPONSIBILITY FOR LOSS OR DAMAGE RESULTING FROM THE VIOLATION OF ANY LOCAL OR REGIONAL LAWS OR REGULATIONS WITH WHICH THIS PUBLICATION MAY CONFLICT.

Nothing contained in any EI publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

No reference made in this publication to any specific product or service constitutes or implies an endorsement, recommendation, or warranty thereof by the EI.

THE EI, AND ITS AFFILIATES, REPRESENTATIVES, CONSULTANTS, AND CONTRACTORS AND THEIR RESPECTIVE PARENTS, SUBSIDIARIES, AFFILIATES, CONSULTANTS, OFFICERS, DIRECTORS, EMPLOYEES, REPRESENTATIVES, AND MEMBERS SHALL HAVE NO LIABILITY WHATSOEVER FOR, AND SHALL BE HELD HARMLESS AGAINST, ANY LIABILITY FOR ANY INJURIES, LOSSES OR DAMAGES OF ANY KIND, INCLUDING DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES, TO PERSONS, INCLUDING PERSONAL INJURY OR DEATH, OR PROPERTY RESULTING IN WHOLE OR IN PART, DIRECTLY OR INDIRECTLY, FROM ACCEPTANCE, USE OR COMPLIANCE WITH THIS PUBLICATION.

FOREWORD

This Recommended Practice has been prepared by the EI's Aviation Committee. It is intended to provide recommendations to assist those involved in overwing fuelling of civil aircraft to ensure that the correct fuel grade is always delivered to an aircraft, thereby preventing aircraft misfuelling (e.g. delivery of the incorrect fuel grade to an aircraft during overwing fuelling).

This publication is intended to provide recommendations for safe practice, rather than rigid guidelines. Users of this publication shall be aware that due consideration shall be given to the effect of any unusual or abnormal circumstance, on which it is not possible to generalise within the scope of this publication. Specialist advice shall be sought in these cases.

The guidance contained in this publication is primarily intended for overwing fuelling operations of civil aircraft.

In addition, in some areas local or national statutory regulations also apply. This publication is intended to be complementary to these established controls and practices.

The EI is not undertaking to meet the duties of employers to warn and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations under local and regional laws and regulations.

Nothing contained in any EI publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither shall anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

Every effort has been made by the Energy Institute to assure the accuracy and reliability of the data contained in this publication; however, the EI makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any local or regional laws or regulations with which this publication may conflict.

Suggested revisions are invited and should be submitted to the:

Technical Department
Energy Institute
61 New Cavendish Street
London
W1G 7AR
e: technical@energyinst.org

ACKNOWLEDGEMENTS

The preparation of this publication was undertaken by Mr J. Thurston (World Fuel Services, Inc.) and Mr D. Freeman (Consultant) on behalf of the EI's Aviation Committee. The following companies and organisations are thanked for their participation and contribution to the preparation of this publication:

Air BP Limited
Air TOTAL
Airlines for America
Chevron
Compañía Logística de Hidrocarburos (CLH)
ExxonMobil
International Air Transport Association
Joint Inspection Group
Kuwait Petroleum International Aviation Company Ltd.
Phillips 66
Shell Aviation Ltd.
Shell Global Solutions
Tesoro
Vitol Aviation
World Fuel Services

A draft version of this publication was distributed to industry stakeholders for technical review. The following (in addition to representatives from the above companies/organisations) generously gave of their time to provide feedback, which is greatly appreciated:

Jack Buffin	US Navy
Kyriakos Gennadis	ofc Aviation Fuel Services S.A.
Ross Gregson	Phillips 66
Richmond Hannah	Aviation Refuelling Compliance Solutions
Luc Maes	Skytanking
Stewart Proctor	Z Energy

Figures 2 and 3 were kindly supplied by Ryan Manor, Phillips 66. Figure 4 was kindly supplied by Ger O'Donnell, Shell Aviation.

Project coordination and editing was undertaken by Martin Hunnybun (EI).

1 INTRODUCTION – ALL MISFUELLING INCIDENTS ARE PREVENTABLE

1.1 DELIVERING THE CORRECT GRADE OF FUEL TO AN AIRCRAFT

For the safe operation of aircraft **IT IS CRITICAL** that a system of procedures and specific equipment is implemented to ensure the correct fuel grade is always delivered to aircraft during overwing fuelling.

The system depends on clear, well-defined communication between the into-plane fuel service operator and the customer regarding the fuel grade to be delivered by overwing fuelling on every occasion that an aircraft is fuelled.

The delivery of an incorrect grade of fuel to an aircraft can have severe consequences that may result in engine failure.

This publication provides a system for use by aircraft fuelling ground staff to assist with the delivery of the correct aviation fuel grade to an aircraft during overwing fuelling.

Misfuelling incidents have occurred at single fuel locations when aircraft have landed and requested fuel unaware that the grade they require is unavailable. Therefore this publication is applicable equally to locations that supply only jet fuel or only avgas, as well as those locations that supply both grades.

1.2 THE NEED FOR A MISFUELLING PREVENTION PROGRAMME

Delivering the incorrect type or grade of fuel into an aircraft is termed a 'misfuelling'. For piston engine aircraft this includes:

- delivery of jet fuel to a spark ignition piston (e.g. avgas) engine aircraft, or
- delivery of avgas fuel into a compression ignition (e.g. diesel) piston engine, or
- delivery of avgas into a spark ignition piston engine where the octane level of the delivered avgas is lower than the required octane level for the engine.

For jet turbine-powered aircraft this includes:

- delivery of avgas to a turbine powered aircraft.

The risk of delivering the wrong grade of fuel exists because many General Aviation (GA) aircraft and some schedule, commuter and charter airline type aircraft are fuelled by an overwing procedure and can therefore be potentially fuelled with avgas or jet fuel as the fuelling nozzles used may be non-selective (e.g. can fuel aircraft requiring either type of aviation fuel).

The serious consequences of misfuelling include:

- Total engine failure due to knock damage if jet fuel is delivered into a spark ignition piston engine powered aircraft that requires avgas.
- Ignition failure if avgas is delivered into a compression ignition (diesel) piston engine powered aircraft that requires jet fuel.