



ARTS3047

7cbhYa dcfUfm7 f]hWU`UbX`7 i `hi fU`H\Ycfm

GYa YghYf`C bY`#`&\$%



7ci fgY`Cj Yfj]Yk

`GHUZZ7cbhUWhi8YHU]`g`

`7cbj Ybcfg`

B Ua Y	9a U]`	5j U]UV]]]m	@cWWhcb	D\cbY
G][]`>ch_UbXh	g"ch_UbXh4 i bgk "YXi "Ui	A cbXUmg`Uh(K YVghYf' %>	l) *, %

GWcc`7cbhUWhi`bZcfa Uh]cb

Fcca "`%&Z`Yj Y`` `F cVYfhK YVghYf'6i]X]b[

D\cbY. f\$&L'-',) '(,) *

9a U]: [gUa 4 i bgk "YXi "Ui](#)

K YVg]hY: [\hdg.#gUa "Ufhg"i bgk "YXi "Ui](#)

H\Y`GWcc`cZHY`5fng`UbX`A YX]U`k ci `X`_]Y`hc`F YgdYWZ`m5W_bck`YX[Y`hY`HfUX]h]cbU`7i`g]cX]Ubgz`hY`6YXY[U`fP`Ybg]b[`hcb`WLa`di`gkz`;`UX][`U`f7`]mUbX`5fh/`8Yg][`b`7`Ua`di`gYg`U`bX`hY`B`[`i`bbUk`U`dYcd`Y`f5i`ghU]Ub`8YZYbVW`:`cfW`5WUXYa`m]b`7`UbVYffU`cZHY`UbXg`k`YfY`YUWX`WLa`di`g`cZI`BGK`]g`cWWhYX"

5hYbXUbW`F`Yei`]fYa`Ybhg

5`gh`XYbh]g`YI`dYW`X`h`U`hY`b`X`U`W`U`gg`W`b`h`U`W`h`ci`fg`Z`c`f`U`Z`U`W`!`h`!`Z`U`W`f`l`&`L`c`f`V`Y`b`X`Y`X`W`i`fg`Y`Ub`X`W`a`d`Y`h`U`U`W`h`j`h`Y`g`Z`c`f`U`V`Y`b`X`Y`X`c`f`Z`m`c`b`]`b`Y`W`i`fg`Y"

5`gh`XYbhk`c`U`ff`j`Y`g`a`cfY`h`Ub`%`a`]bi`h`g`U`h`a`Um`V`Y`d`Y`b`U`]g`Y`X`Z`c`f`b`c`b`!`U`h`Y`b`X`U`b`W`"Z`gi`W`U`d`Y`b`U`h`m`]g`]a`d`c`g`Y`X`Z`h`Y`gh`XYbhia`i`gh`V`Y`]b`Z`c`fa`Y`X`j`Y`f`V`U`m`U`h`h`Y`Y`b`X`c`Z`W`U`gg`U`b`X`U`X`j`]g`Y`X`]b`k`f`h`b`[`k`]h`]b`&(`

]bHfj Ybhcb`]b`Ub`UWXYa]WX]gW`gg]cb""H\]g`Wci fgY`]g`gi ddcffX`Vm@YUfb]b[`A UbU[Ya YbhGmgHYa
Wca dcbYbhgž`dfcj]X]b[`Wci fgY`]bZcfa Uh]cb`UbX`i dXUHYgž`Wcd]Yg`cZHYI hg`UbX`UXX]h]cbU`"]b_g`hc`fY`UHYX
gWc`Uf`mfYgci fWgž`cb`]bY`X]gW`gg]cb`[fci dg`Zcf`[fci d`k`cf_"

5ggYgga Ybh' . 'Gma dcg]i a

GhUfhXUHY . %\$#\$(#&\$%

@Yb[h. '9ei]j U'YbhcZ%\$\$\$'k cfXg

8YHJ]g. 'H\Y'Gma dcg]i a ']g'U'a]b]!WcbZYfYbW' fi b'VmihY'gh XYbhtg'hck UfXg'h\Y'YbX'cZh\Y'Wci fgY"
Gh XYbhtg'UfY'cf[Ub]gYX']bhc '[fci dg'UbX'a YYhcb']bY'UbX'ZJW' hc ZJW' hc dfYdUfY'h\Y]f'dfYgYbHhcb'cb'U
h\I hZca 'h\Y'Z]bU'a cXi 'Y']b'h\Y'Wci fgY" H\]g]g'h\Y'Z]bU'UggYgga YbhHtg_"Gh XYbhtg'fYW'j Y'U'a Uf_g\YYh
hUhXYHJ]g'hk c '[fUXYg.'cbY'Zcf'h\Y' [fci d'k cf_'Ug'U'k \c'Y'UbX'cbY'Zcf'h\Y]f']bX]j]Xi U'Wcbhf]Mi h]cb"

5XX]h]cbU'XYHJ]g.

⊕'&\$% ž'h\Y'7 f]h]W'Gma dcg]i a 'k]''h]_Y'd'UW']b'hk c'\U'j Yg''H\Y'Z]fgh\U'Zk]''cVW' f']b'h\Y'k YY_
Z'ck]b['a]X]gYa Yghf'VfYU_ž'UbX'h\Y'gYWcbX']b'K YY_'%&"

Gi Va]gg]cb'bcH]g. ⊕!WUgg[[fci d'UbX']bX]j]Xi U'UggYgga Ybhtg

Hi fb]h]b'gYh]b[. 'H\]g]g'bchU'Hi fb]h]b'Ugg][ba Ybh

Gi Va]gg]cb'cZ5ggYgga YbhHUg_g

Gh XYbng'UFY'YI dYWVX'hc'di hHAY'f'buA Yg'UbX'ghi XYbhbi a VYfg'cb'Yj YfmdU[Y'cZHY]f'Ugg][ba Ybng"

Hi fb]hb'Gi Va]gg]cb

Zmci 'YbWci bHY'U'dfcV'Ya 'k \Yb'UHYa dh]b['hc'gi Va]hrci f'Ugg][ba YbhHfci [\ 'Hi fb]hbzd'YUgY
HY'Yd\cbY'9I HYfbU'Gi ddcfhcb'-' ,) ' ' ' %cf'Ya U]'HYa 'cb'[YI HYfbU'HY'fji ddcfh4 i bgk "YXi "Ui."](#)Gi ddcfh
\ci fg'UFY' , \$\$Ua '-%\$. \$da 'cb'k YY_XUmg'UbX'-' . \$Ua '-) . \$da 'cb'k YY_YbXg'f1 *) 'XUmg'U'mYUfL'Zmci
UFY'i bUVY'hc'gi Va]hrci f'Ugg][ba YbhXi Y'hc'U'ZU' 'hk]H'Hi fb]hb'mci 'a UmUdd'mZcf'Ub'YI HYbg]cbZ'Vi hrci
a i ghfYU]b'mci f'h]W_Yhbi a VYfZ'ca '9I HYfbU'Gi ddcfhfU'cb['k]H'UbmchYf'fY'Yj UbhXcW a Ybng'hc
]bWi XY'Ug'Yj]XYbW'hc'gi ddcfhrci f'YI HYbg]cb'Udd'jW]hcb"Zmci 'Ya U]'9I HYfbU'Gi ddcfhrci 'k]'
Ui 'ca Uh]W'mfYW'j Y'U'h]W_Yhbi a VYfZ'Vi h]Zmci 'HY'Yd\cbY'mci 'k]'b'YX'hc'gdYW]W'mUg_Zcf'cbY"
Hi fb]hb'U'gc'dfcj]XYgi dXUH'g'cb'HY]f'gmghYa 'ghU'g'cb'Hk]HYf"

; YbYfU'mZ'UggYgga YbhHUg_g'a i ghVY'gi Va]HYX'Y'YWfcb]W'mj]U'Y]H'Yf'Hi fb]hb'cf'U'A ccX'Y
Ugg][ba YbH' 'b]bgHUbW'g'k \YfY'h]g']g'bchdcgg]V'YZ'hk]'VY'g'UH'X'cb'mci f'Wci fgY'g'A ccX'Y'g]HY'k]H
U'HYfbU]j Y'gi Va]gg]cb'XYU]g"

@UH'5ggYgga YbhDYbU'h]Yg

5b'UggYggYX'fUg_']g'XYYa YX'UH']Z]h]g'gi Va]HYX'UZ'Yf'HY'gdYW]YX'h]a Y'UbX'XUH'Ug'gYhci h]b'HY
Wci fgY '@YUfb]b['A UbU[Ya YbhGmghYa 'f@A GL"

H\Y'UH'dYbU'm]g'HY'cgg'cZ) i 'cZHY'hcU'dcgg]V'Ya Uf_g'Zcf'HY'fUg_'Zcf'YUW'XUmcfdUfhHYfYcZHY
k cf_']g'UH'@UH'bYgg'k]']bWi XY'k YY_YbXg'UbX'di V]W\c'XUmg" H\]g'XcYg'bchUdd'mhc'U'fUg_'hUh]g
UggYggYX'Vi hbc'a Uf_']g'Uk UfXYX"

K cf_'gi Va]HYX'Zci fHYb'f%('XUmg'UZ'Yf'HY'Xi Y'XUH'k]'VY'a Uf_YX'UbX'Z'YXVUW'dfcj]XYX'Vi hbc'a Uf_
k]'VY'fYWcfXYX"ZHY'k cf_'k ci 'X'\Uj Y'fYW'j YX'U'dUgg'a Uf_'Vi hZcf'HY'UH'bYgg'UbX'HY'k cf_']g'U
Wca di 'gcfmWci fgY Wca dcbYbH'U'ghi XYbhk]'VY'XYYa YX'hc'\Uj Y'a YhHUhfYei]fYa YbH'H\]g'XcYg'bch
Udd'mhc'U'fUg_'hUh]g'UggYggYX'Vi hbc'a Uf_']g'Uk UfXYX"

K cf_'gi Va]HYX'k Ybhmcby'f&%('XUmg'UZ'Yf'HY'Xi Y'XUH'k]'bchVY'UW'WdhX'Zcf'a Uf_]b['cf'Z'YXVUW_
UbX'k]'fYW'j Y'bc'a Uf_'cf[fUXY"ZHY'UggYgga YbhHUg_']g'U'Wca di 'gcfmWca dcbYbhcZHY'Wci fgY'U
gh XYbhk]'Ui 'ca Uh]W'mZU]'HY'Wci fgY"

GdYW]U'7cbg]XYfU]cb'5dd'jW]h]cbg

Mci 'Wb'Udd'mZcf'gdYW]U'Wcbg]XYfU]cb'k \Yb']'bYgg'cf'chYf'W]FW a ghUbW'g']bHYfZYf'k]H'mci f
UggYgga YbhdYfZ'ca UbW"

G]W_bYggza]gUXj Ybhi fY'cf'chYf'W]FW a ghUbW'g'VYncbX'mci f'Wcbf'c'a Um

f'DfYj Ybhrci 'Zca 'Wca d'Yh]b['U'Wci fgY'fYei]fYa YbH'

f'?YYd'mci 'Zca 'UH'YbX]b['Ub'UggYggUV'Y'UW]j]mZ

f'Ghd'mci 'gi Va]hb['UggYggUV'Y'k cf_'Zcf'U'Wci fgYz

f`G][b]Z]W]b]h]m]U]Z]Y]W]h]m]i] f]d]Y]f]Z]c]f]a] U]b]W]W]]b]U]g]g]Y]g]g]U]V]`Y]`k] c]f]_]Z]V]Y]`]h]U]`Z]c]f]a] U]`Y]b]X]!]c]Z]g]Y]a] Y]g]h]f]`Y]I] U]a]]b]U]h]c]b]Z]U] W]U]g]g]`h]Y]g]h]Z]U]`U]V]c]f]U]h]c]f]m]h]Y]g]h]Z]U]`g]Y]a]]b]U]f]d]f]Y]g]Y]b]h]U]h]c]b]`c]f]U]b]m]c]h]Y]f]Z]c]f]a] `c]Z]U]g]g]Y]g]g]a] Y]b]h]

: c]f]Z] f]h]Y]f]X]Y]h]U]`g]`]b]`f]Y]`U]h]c]b]`h]c]`G]d]Y]W]U]`7]c]b]g]X]Y]f]U]h]c]b]`]b]W]i] X]b] [``K] \]Y]b]`h]c]`5]d]d]`m]Z]``<]c]k] `h]c]`5]d]d]`m]`U]b]X] `G]i] d]d]c]f]h]b] [`8]c]W] a] Y]b]h]U]h]c]b]``d]`Y]U]g]Y]`f]Y]Z]f]`h]c]`h]Y]`G]d]Y]W]U]`7]c]b]g]X]Y]f]U]h]c]b]`k] Y]V]g]h]Y]`.

[\\]h\]c\]g.\]#\]g\]h\] X\]Y\]b\]h\]i\] b\]g\]k\] "Y\]X\]i\] "U\]i\] #\]g\]d\]Y\]W\]U\]`!\]W\]c\]b\]g\]X\]Y\]f\]U\]h\]c\]b\]](#)

5 WUXYa]W<c bYghmUbX 'D`U[]Uf]ga

D`U[]Uf]ga]g`i g]b['hY`k cfXg`cf]XYUg`cZchYfg`UbX`dfYgYbh]b['hYa`Ug`mci f`ck b" #WUb`hU`Y`a Ubm
Zcfa gZ`Zca`XY`]VYfUHy`WXYU]b['hc`UWV]XYbU`mW`dm]b[`Zca`U`gci fW`k]hCi hUW_bck`YX[Ya`Ybh`

I BGK` [fci dg`d`U[]Uf]ga`]bhc`hY`Zc`ck]b[`WUHy` [cf]Yg.

7cdm]b[.`i`g]b['hY`gUa`Y`cf`j`Yfmg]a`]Uf`k`cfXg`hc`hY`cf][]bU`hY`hcf`]XYU`k`]hCi hUW_bck`YX[]b['hY`
gci fW`cf`i`g]b[`ei`chU]cb`a`Uf`g`"H`]g`U`gc`Udd`]Yg`hc`]a`U[YgZ`UfhUbX`XYg][`b`dfc`YWgZ`Ug`k`Y`Ug`
dfYgYbhU]cbg`k` \Yf`gca`YcbY`dfYgYbh]b[`Ubc`hY`f`g`]XYUg`cf`k`cfXg`k`]hCi hWYX]h`

#Uddfcdf]UHy`dUfUd`fUg]b[.`W`Ub[]b[`U`Zy`k`cfXg`UbX`d`fUgYg`k` \]Y`a`cghm`fYU]b]b['hY`cf][]bU`
g]fi`W`fY`UbX`]bZcfa`U]cb`k`]hCi hUW_bck`YX[Ya`Ybh`"H`]g`U`gc`Udd`]Yg`]b`dfYgYbhU]cbg`k` \Yf`gca`YcbY`
dUfUd`fUgYg`Ubc`hY`f`g`]XYUg`cf`k`cfXg`k`]hCi hWYX]h` #U`gc`Udd`]Yg`hc`d`]YW]b[`hc`[Y`hY`f`ei`chYg`UbX`
dUfUd`fUgYg`]bhc`U`bYk`k` \c`Yzk`]hCi hfY`ZYfYbW]b[`UbX`U`gh`XYbh`g`ck`b`UbU`mg]g`hc`Vf]b['hY`a`U`hY`f]U`
hc`[Y`hY`f`"

7c`i`g]cb.`k`cf_]b[`k`]h`chYfg`Vi`hdUgg]b[`cZ`hY`k`cf_]Ug`U`dYfgcb`g`]bX]j`]Xi`U`k`cf_]7c`i`g]cb`U`gc`
]bWi`XYg`dfcj`]X]b[`mci`f`k`cf_]hc`Ubc`hY`f`gh`XYbhVY`Zc`fY`hY`Xi`Y`XU`hY`Zc`f`Zc`f`hY`di`fdcgY`cZ`hY`a`
d`U[]Uf]g]b[`Uh`Ubmi]a`Y`Z`dUm]b[`Ubc`hY`f`dYfgcb`hc`dYfZcfa`Ub`UWUXYa`]W]Ug`_`Z`ghYU`]b[`cf`UW`ei`]f]b[
Ubc`hY`f`dYfgcb`g`UWUXYa`]Wk`cf_]UbX`W`dm]b[`]Z`c`ZYf]b[`hc`W`ca`d`Y`hY`Ubc`hY`f`dYfgcb`g`k`cf_]cf`gYY_]b[
dUma`YbhZc`f`W`ca`d`Y]b[`UWUXYa`]Wk`cf_]`

#Uddfcdf]UHy`W]U]cb.`7`]h]b[`gci`fW`g`k` \]W` \Uj`Y`bchVYYb`fYUXZ`k`]hCi hUW_bck`YX[]b['hY`"gYW`bXUfm`
gci fW`Zca`k` \]W`_bck`YX[Y`cZ`hY`a` \Ug`VYYb`cV]U]bYX`"

8i`d`]WU]cb`ffgY`Zd`U[]Uf]ga` "E`gi`Va`]h]b[`mci`f`ck`b`k`cf_]b`k` \c`Y`cf`]b`dUf]Z`k` \YfY`]h` \Ug`dfYj`]ci`g`m`
VYYb`dfYdUfYX`cf`gi`Va`]hY`X`Zc`f`Ubc`hY`f`UggY`gga`Ybhcf`W`ei`fgY`Uhi`BGK`cf`Ubc`hY`fi`b]j`Yfg]m`"

7c`ffY`W`fY`ZYfYbW]b[`dfUW]W]g.

- VYhYf'a UbU[Y'mci f'hja Y

7 ci fgY'GWXYXi `Y

[J.Jyk.WUgg.ha.YhUV.Y](#)

H]a YhUV`Y`

8UH	HmdY	7cbhYbh
K YY_%&* : YVfi Ufm! (A UfVX	@YWi fY	hfcXi Wjcb'hc'7f]hWU'UbX'7i`hi fU`H\Ycfm`K \Uh]g H\YcfmB
	GYa]bUf	F YUX]b[g. 'F c`UbX'6Ufh\Yg'UbX'>YUb'6Ui Xf]'UfX
K YY_&.) 'A UfVX '!`%% A UfVX	@YWi fY	: Ya]b]ga
	GYa]bUf	F YUX]b[g. '<Y'YbY'7]i ci g'UbX'>i`]'U'? f]ghY] U
K YY_'. :`%&'A UfVX '!`% A UfVX	@YWi fY	Dgn\XcUbU'mg]g
	GYa]bUf	F YUX]b[g. 'G][a i bX': fYi X'UbX'9"H"5"'<cZa Ubb
K YY_('. :`% 'A UfVX '!`&) A UfVX	@YWi fY	DcghVc'cb]U'ga
	GYa]bUf	F YUX]b[g. '<ca]'6\UV\U'UbX'9Xk UfX'GU]X
K YY_)'. :`&'A UfVX '!`% 5df]'	@YWi fY	BYk '<]ghf]W]ga
	GYa]bUf	F YUX]b[g. 'A]WY': ci Wji 'h'GH'd\Yb'; fYybV'Uth UbX';]'Yg'8Y'Yi nY
6fYU_.'&'5df]'!'. '5df]'	F YUX]b[
	F YUX]b[
K YY_*. :`5df]'!`% '5df]'	DfYgYbU]h]cb	7f]hWU'`H\YcfmGma dcg]i a`%
K YY_+. :`% '5df]'!`&& 5df]'	@YWi fY	H\Y'BYk '7f]h]W]ga
	GYa]bUf	F YUX]b[g. '7'YUbh'6fcc_g'UbX'F cVYfhDYbb K UffYb
K YY_). :`&'5df]'!`&- 5df]'	@YWi fY	Dcgh]ghfi W]i fU'ga
	GYa]bUf	F YUX]b[g. '>UWéi Yg'8Yff]XU'UbX'D'Uhc
K YY_-. :`\$ '5df]'!`* 'A Um	@YWi fY	Dcghdcgh]ghfi W]i fU'ga
	GYa]bUf	:]'Yg'8Y'Yi nYž: Y']i ; i UthUf]UbX'>i X]h'6i hYf

F Ygci fWg

DfYgWf]VYX`F Ygci fWg`

A cghcZH`Y`fYei]fYX`hYI hg`UFY`Zca`h`Y`@adfa` 3` fZa`aYk`&bX`9X]hcb`f&\$\$%\$L"

F YWca a YbXYX`F Ygci fWg

C h`Yf`fYWca a YbXYX`hYI hg.

>[fWScK FZWack, 3` 3` fZa`aYk`&bX`9X]hcb`&bX`9X]hcb`zYXg">i`j`Y`F`j]`_]b`z`A`jWUY`F`mUb`f6`UW`k`Y`z`&\$\$`(`L

FZWBaefZ5a`a` [S^E fgV[W6 DWSVWd`&bX`9X]hcb`zYXg"6]`5g`Wfc`Zz; UfYh` ; f]Z]h`g`z`<Y`Yb`H]Z]b`fF`ci`hYX`[Y`z`&\$\$`+L

7ci fgY`9j`U`i`Uh]cb`UbX`8Yj`Y`cda`Ybh

=k`j`VY`dYf]cX]WJ`m[`Uh`Yf]b[`g`h`i`XYbhZYXVUW`cb`h`Y`W`i`fgY`h`f`ci`[`\`j`Uf]ci`g`a`YUbgz`]bW`i`X]b[`g`h`i`XYbh`ZYXVUW`_]b`Y`V`h`fYg`UbX`gYa`]bUfg`Ug`k`Y`Ug`h`Y`A`m9I`dYf]YbW`gmg`h`Ya`"i`=k`ci`X`UddfYW]U`h`]h]Z`m`ci`k`ci`X`h`U`_`Y`U`a`]bi`h`Y`Uh`h`Y`YbX`c`ZH`Y`W`i`fgY`h`c`d`f`c`j`]X`Y`m`ci`f`fYg`d`c`b`g`Y`g"

=a`U[`Y`7`fYX]h

\hdg.##b`k`_]dYX]U"cf[`#`_]#h\YS<i`a`UbS7`cbX]hcbSi`&,`A`U[`f]hYi`&-

7F`=>`CG

7F`=>`CG`Dfcj`jYf`7`cXY`.\$\$\$`-,`;